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Financial Sanctions, Oil Revenues and Monetary and Fiscal policies in Iran: DSGE Model

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Abstract:

Financial sanctions have many economic consequences for the oil exporting economies. The sanctioned economy adopts economic policies to deal with it. This paper examines the relationship between financial sanctions, oil revenues and monetary and fiscal policies in Iran and explicates how financial sanctions have affected Iran's access to oil revenues. It also examines the role of fiscal and monetary policies in financial stability and resilience in Iran's economy. To this end, we employed a DSGE model with the new Keynesian approach. The results indicate that the interest rate, consumption, imports and inflation have a positive reaction to the oil revenue shock resulting from financial sanctions. However, the production, export, private sector investment and oil sales indicate a negative reaction to the oil revenues' shock.

Regarding the monetary policy shock, the reaction of production and consumption to the shock is positive. However, the reaction of oil sales and interest rate to this shock is negative. In terms of financial policy shock, production, consumption, investment and export indicated a positive reaction to this shock. However, the interest rate, imports and oil sales indicated a negative reaction to the fiscal policy shock. Monetary and fiscal policy shocks increase the effect of financial sanctions for a short period, while monetary policy shock has reduced the effect of financial sanctions for three periods. Therefore, monetary policy has been more effective than fiscal policy in reducing the effect of financial sanctions.

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1. Introduction

Over the past 10 years, extensive sanctions have been imposed on the financial sector, including the banking system including central bank, the oil sector, including crude oil and the export of petroleum products, and other important activities such as transportation and insurance, which increase friction in Iran's foreign trade (Tayebi and Sadeghi, 2017) and as a result, financial sanctions have had adverse effects on Iran's macroeconomic variables, especially oil revenues, GDP and consumer price index (Nakhli et al., 2020, p. 36).

Since 2011, Iran's economy has faced comprehensive financial sanctions (banking system including central bank). Therefore, financial sanctions along with the economic structure dependent on oil revenues have caused Iran's economy to be targeted and face with more problems in realizing its development plans (Mirjalili. 2022).

The escalation of financial sanctions against Iran since the end of 2010 and especially in 2011 have led to declining of the main source of foreign exchange revenue in Iran's economy. The sanctions on the banking system, especially the Central Bank of Iran, imposed costly transactions for Iran's economy due to the restriction of international financial exchanges. This, along with the reduction of oil revenues, has created extensive restrictions on the supply of foreign exchange in Iran's economy during the period of sanctions (Miraali, 2023, p: 4).

When sanctions were intensified in 2012 to target all sectors of Iran's economy, the ability to sell oil was limited. The revenues and financial ability to import needed supplies in the world market decreased significantly and Iran's access to US dollars and Euros for imports was limited (Heydarian et al., 2024).

Therefore, over the period of intensifying financial sanctions on Iran during 2012-2015, financial sanctions had adverse effects on the revenues and expenditures of the government budget. Financial sanctions have led to a sharp devaluation in the exchange rates, an increase in the cost of international transactions, and in the risk of investment in Iran (Pahlavani et al., 2021, p. 217).

As a major oil exporter, Iran relies on oil exports for a significant portion of its revenues. However, oil revenues have been affected by several sanctions. Therefore, the role of financial sanctions is also important in the occurrence of fluctuations in oil revenues and the effect of these fluctuations on monetary and fiscal policies. Financial sanctions by limiting its proceeds affect the exchange rate upwards, and this in turn leads to an increase in production costs due to the increase in the price of imported raw materials and capital goods after which non-oil production and export are under pressure (Jahani and Salatin, 2022).

The objective of economic sanctions on Iran as explicitly mentioned in the "Art of Sanctions" was to damage the ability of the sanctioned economy to obtain and use of economic resources (Mirjalili,2021, p.87).

Therefore, financial sanctions were effective economic shocks that caused fluctuations and significant changes in macroeconomic variables and the

behavior of economic agents. Among others, financial sanctions have affected income distribution and increased inequality in Iran's economy (Pahlavani et al. 2021).

By declining oil revenues Due to the financial sanctions, it has become more important to choose appropriate monetary and fiscal policies. These policies need to be employed to achieve financial stability and to deal with the adverse effect of declining oil revenues including the reduction of foreign exchange reserves which in turn affected monetary and fiscal policies.

Therefore, financial sanctions can have a significant impact on the economy, especially if the economy relies on oil exports.

Another effect of financial sanctions is the distortion in monetary policy. As in this situation, the central bank does not have enough currency to allocate for imports and intervene in the market. Moreover, the blocking of oil revenue is a result of financial sanctions (Vesali and Torabi, 2010).

Due to the lack of full access to foreign exchange revenues and reserves, not only the transaction costs will increase, but also, part of the government foreign exchange revenues will not be usable (Heydarian et al., 2021).

Therefore, in this paper, we examine the impact of financial sanctions on oil revenues and monetary and financial policies to deal with it in Iran's economy.

Financial sanctions, directly and indirectly affect macroeconomic variables, markets and economic sectors. Therefore, it is necessary to design a framework for evaluating the effects of sanctions in which it includes markets and sectors in a general equilibrium structure, taking into account the dynamics and economic realities.

Thus, formulation of appropriate monetary and fiscal policies to achieve economic stability requires awareness of the mechanism of the impact of financial sanctions shocks on the state of the monetary and fiscal policies as well as macroeconomic variables. Achieving these goals requires modeling of internal and external sectors and monetary and fiscal affairs of the economy in a dynamic equilibrium framework.

In this regard, this paper aims to present a dynamic stochastic general equilibrium (DSGE) model to analyze the effect of financial sanctions on macroeconomic variables in Iran's economy. To this end, we employed the DSGE model with the new Keynesian approach.

The model includes the household sector, the enterprises producing final goods in a monopolistic competition producers' market and capital goods and price stickiness as well as other features provided in the New Keynesian approach (Mirjalili, 2015:433-439). It also includes, exporters and importers, as well as the government representing fiscal sector and the central bank representing monetary policy.

Therefore, we need to provide a framework for analyzing the effects of financial sanctions so that policymakers can adopt the most appropriate monetary and fiscal policies to reduce the adverse effects of sanctions.
What has not been addressed in the literature about the financial sanctions is how the adoption of appropriate monetary and fiscal policies by policymakers can reduce the adverse effects of financial sanctions.
The behavior of economic policy makers is very important in achieving economic equilibrium. The central bank (CB) as a monetary and exchange rate policy maker may have significant effects on the equilibrium of economic variables (Blinder et al., 2008).
We know that sanctions, especially oil and financial sanctions, have a direct and indirect effect on macroeconomic variables of Iran's economy. Therefore, we need to provide a framework for analyzing the effects of sanctions which includes markets and sectors in a general equilibrium structure, taking into account the dynamics and economic realities.
Therefore, this paper employs a DSGE model to analyze the effects of financial sanctions on selected macroeconomic variables of Iran's economy. The issues such as price stickiness, adjustment costs, imperfect competition, voluntary unemployment, and non-neutrality of money among others have led to employing DSGE with the new Keynesian approach(Mirjalili, 2015:433-449). To the best of our knowledge, the DSGE model has not been used to analyze the impact of financial sanctions on monetary and fiscal policy in Iran. In addition, the effects of financial sanctions on monetary and fiscal policies simultaneously have not yet been analyzed.
The paper is organized as follows: in section 2, the theoretical background is provided. In Section3, the model is detailed. Section 4 calibrates the parameters. Section 5 evaluates the fit and accuracy of the model. Section 6 analyzes the impact of sanctions' shock in the form of impulse-response functions (IRFs), and finally, section 7 deals with the conclusions and policy implications.

2.Theoretical background

The application of financial sanctions has extensive and costly effects on the target country and is more effective than trade sanctions (41% vs. 25%) (Hufbauer et al., 2009). Therefore, the use of economic, financial and technological instruments has been the most effective instruments to achieve security goals (Laudati and Pesaran, 2021).
Oil revenue has two functions in Iran's economy. It provides a major part of the government's revenue, and it is the supplier of the major part of the country's foreign exchange for imports. On the other hand, financial sanctions distort the normal flow of transactions related to oil exports and often prevent access to international markets and buyers. This distortion can lead to a significant decrease in oil sales and oil revenues. On the other hand, the US financial

sanctions against Iran have deteriorated the risk of commercial banks. Oil export revenues constitute more than 60% of foreign exchange revenues and 40% of government revenues (Mohaddes, 2019).

Financial sanctions on Iran's economy began in 2006 and intensified in 2011 with further restrictions on Iran's international financial transactions (Heydarian et al., 2021).

Iran's economy has faced a declining oil revenue due to financial sanctions during the following periods:

2006-2010: The United Nations Security Council imposed a series of sanctions against Iran in response to Iran's nuclear program. These sanctions have targeted Iran's oil industry among other sectors and led to a decrease in revenues (European Council,2012). The oil extraction decreased more than one million barrels per day due to intensification of sanctions (Danesh Jafari and Karimi, 2013).

2012-2015: The period of intensification of financial sanctions against Iran by the European Union and the United States, which led to a decrease in the oil revenues of the government, a sharp increase in the exchange rate, an increase in the cost of international transactions and an increase in the risk of investing in Iran (Pahlavani et al., 2021). In this regard, in July 2012, the United States imposed severe financial sanctions against banks that received funds from the export of crude oil, petroleum products, and petrochemicals from Iran and had financial relationships with the National Iranian Oil Company and Naftiran Intertrade Company (Nakhli et al, 2021). In 2012, following the imposition of new sanctions, the oil revenues decreased 25.5%.

2018-2021): After the United States withdrew from Iran nuclear deal (so called JCPOA) in 2018 and reimposed sanctions, Iran's oil exports were once again severely affected. Sanctions targeted Iran's ability to sell oil globally, which has led to a decrease in Iran's oil revenues (Salavati & Aloosh, 2019).

Among the countries whose oil revenues have been reduced by sanctions, like Iran, is Venezuela, which has one of the largest oil reserves in the world and is under US sanctions.

These sanctions targeted the oil industry and its state oil company, PDVSA. As a result, Venezuela's oil exports and revenue have plummeted. Russia's oil industry has faced sanctions from the United States and the European Union, especially after the annexation of Crimea in 2014. These sanctions have affected Russia's oil revenues. Also, Syria's oil sector has been affected by the ongoing civil war and international sanctions. The sanctions of the United States and the European Union have targeted the Syrian oil industry, which has led to a decrease in the country's oil exports and revenues. Although North Korea is not a major oil producer, it has faced sanctions that have affected the country's ability to import refined petroleum products and affected its overall energy situation. Tayebi and

Sadeghi (2017) stated that because more than 50% of the Iranian government budget depends on oil revenues, economic sanctions led to budget deficit.
They added that due to the ensuing economic recession and insufficient tax revenues, the government was forced to borrow from banks or the central bank, which in turn reduced the central bank's ability to manage the foreign exchange market, and led to an increase in exchange rates. Also, Keshavarz Haddad et al. (2019) indicated that during the sanctions' period, the share of oil revenue in the government budget has decreased, and we have seen escalation of sanctions, especially in the energy export sector, which caused a sharp decrease in oil revenue and reducing its share in the government budget.
Rahmati et al. (2016) showed that Iran's economic sanctions reduced crude oil export and government's foreign exchange earnings, and as a result, the increase in the exchange rate due to the reduction of the central bank's ability to intervene in the market.
Haider (2017) showed that the destination of two-thirds of Iran's non-oil exports has changed because of financial sanctions.
Sadegh Mohammadi et al. (2023) indicated that the oil sector has been one of the main targets of economic sanctions. These sanctions are also used as an attempt to prevent the transfer of oil revenues to the country as part of "smart sanctions" against Iran. Heydarian et al. (2021) also concluded that financial sanctions created obstacles in the transfer of money that resulted from the export of oil revenues and hindered the import of basic goods due to the prohibition of money transfer.
On the other hand, Karutin et al. (2019) indicated that the sanctions imposed against Russia in 2014 also caused a shock to the country's oil revenues. Weisbrot and Sachs (2019) showed that both financial and oil sanctions both have led to a significant reduction in Venezuela's oil revenues. According to the results of Mahdilo et al. (2019), financial and banking sanctions of the United Nations with 56%, oil sanctions of the United Nations with 21% and financial and banking sanctions of the European Union with 15% of the impact, are the most destructive sanctions imposed against Iran so far (Mahdiloo et al, 2019:54).

2.1. Dependence of Iran's economy on oil revenues and its effect

The importance of oil in Iran's economy is such that the changes in its production and income affect the economic developments in positive and negative directions and bring relative prosperity or stagnation. Of course, until the productions of other sectors of the economy, especially the industries and mines and related productive services, cannot grow and exceed the share of oil sector, the oil sector will continue to maintain its importance and place. Oil has played a decisive role in the economy and accounts for a major share of production and national income:
Iran's economy is dependent on oil production and export. The role of oil as a supplier of cheap fuel and supplier of raw materials for the refining and

petrochemical industries, compared to its financial and currency role, is still second in importance (Abonouri et al., 2013).

Oil revenues are the most important source of foreign exchange in Iran's economy and play a major role in financing government expenditures. Due to the impact of US financial sanctions since 2018 – both in reducing exports and freezing accounts – Iran has had limited access to its oil export earnings. For example, Iran had 41 billion dollars in oil revenue in 2016 and 53 billion dollars in 2017. However, from March 2019 to March 2020, Iran earned only 8 to 9 billion dollars in oil revenues (Rome, 2021).

Although fiscal deficits and public debt in Iran have been at a relatively moderate level, the injection of export revenues into the economy by the government means providing about 60% of the annual budget from oil revenues (Amouzgar, 2015). However, when there are shocks such as sanctions and export earnings decrease, the country easily slips into crisis. Government spending continues, albeit with larger fiscal deficits, but more importantly, the currency soon depreciates alongside rampant domestic inflation. This has been a standard feature not only in Iran's crises, but also in other oil-exporting countries such as Saudi Arabia (Sivramkrishna ,2016) and Venezuela(Bhavish and Kautilya, 2019).

2.2. Monetary and fiscal policies in Iran

The monetary policy carried out by the central bank seeks to manage inflationary expectations by building trust in the government and monetary authorities, stabilizing the financial system and managing foreign exchange markets. In Iran, whose financing is done through the oil proceeds, an important point in terms of monetary and fiscal policy making in the economy is the dominance of fiscal policy over monetary policy. In Iran's economy, the government's fiscal policy in terms of financing the budget deficit and spending oil revenues has been a determinant in the monetary base and the growth rate of the money volume.

By increasing the oil prices, which leads to an increase in the oil revenues, the government moves towards the preparation of an expansionary budget. The budget figures increase, and these amounts are provided from the oil dollars. The Petro dollars given to the central bank and the government credited with equivalent Rials. This operation has led to an increase in the monetary base, and along with the expansionary fiscal policy, an expansionary monetary policy is inevitably implemented. Therefore, in Iran's economy, the growth rate of the money volume is the main indicator of monetary policy and is mostly influenced by the fiscal policy. Therefore, the stability of the monetary policy and the growth rate of the money volume can be ensured through the stability of the fiscal policy and the growth rate of the government budget. The stability of the government expenditure growth rate depends on the government's budgeting mechanism and the way of managing oil revenues.

2.3. Financial sanctions and oil revenue

As Iran's economy is dependent on oil revenues, oil revenue has been the main target of the sanctions. Banking sanctions have also been used to prevent the transfer of oil revenues to Iran as part of "smart sanctions" against Iran. Sanctions imposed on Iran's oil exports can intensify the fluctuations of macroeconomic variables by reducing foreign exchange earnings and limiting access to capital and intermediate goods. Sanctions also affect household welfare by affecting relative prices as well as household's income and expenditures.

If we consider sanctions as a factor affecting macroeconomic conditions like monetary or fiscal policies, recent developments in macroeconomics and international finance allow economists to address the issues of measuring sanctions and tracking the effects of sanctions for the sender economy and the target economy. (Eyler, 2007)

As discussed in the World Bank paper entitled "Examining the Economic Consequences of Financial Sanctions" (World Bank, 2019), the impact of financial sanctions on oil exporting countries has profound economic consequences, one of the most immediate and tangible of which is a decrease in oil revenues.

Oil revenue often constitutes a significant part of the GDP and government budget in oil exporting countries. Fluctuations in oil prices, along with the impact of financial sanctions, make these economies vulnerable to external shocks.

In response to such challenges in oil proceeds caused by sanctions, the implementation of appropriate monetary and fiscal policies is of great importance. These policies can play a central role in reducing the adverse effects of the reduction in oil revenues caused by financial sanctions. For example, central banks can actively manage exchange rates to counter devaluation pressures caused by reduced revenue flows with the objective of financial stabilization.

In addition, active fiscal policies can help reduce fiscal pressure caused by declining oil revenues. Governments can implement measures such as diversification of income sources, wise budget management and investment in non-oil sectors to reduce dependence on oil revenues and increase economic resilience.

Following the reduction in oil revenues due to financial sanctions, policymakers can draw a path towards economic recovery and long-term stability against external economic pressures by adopting appropriate monetary and fiscal policies.

In summary, the analysis of reduced oil revenues, trade disruptions and financial instability caused by sanctions emphasizes the multifaceted economic challenges that sanctioned countries need to overcome. By understanding the interconnected nature of these effects, policymakers can design and implement strategies to reduce the adverse effects of sanctions on their economies (IMF, 2020).

In the case of Iran, the European Union and the United States imposed a comprehensive trade embargo against Iran, which intensely restricted the financial and commercial channels between Iran and the international community, which resulted in a rapid decrease in Iran's oil production and export. With the decrease in oil revenue, there was a sharp decline in the value of the Iranian currency, which was the result of the dependence of the Iran's economy on oil exports (Xiong and Tian, 2015).

The second channel is the fiscal channel. When the target country is subject to sanctions such as investment bans, financial transaction bans, asset freezes, and export credit bans, the financing of its domestic enterprises is done only through the central bank of that country, and as a result, a large amount of money is produced, and inflation and the increase in exchange rate fluctuations is one of its consequences (Wang and et al, 2019).

3. Literature review

Previous studies can be divided into three groups. **In the first group,** they investigated the impact of economic sanctions on oil revenues.

Nazari Adli and khakestari (2015) examined the approach of Iran in the oil market using cooperative games and the effect of sanctions on oil revenues. In this regard, three players from Iran, Saudi Arabia and USA were defined and a modeled for playing the cooperative game. Then the model was solved as a cooperative game and achieved equilibrium point. In the cooperative game, the results achieved are such that all three players, USA, Saudi Arabia, and Iran, chose the strategy of reducing pressure and less sanction, and reducing pressure and cooperation. At the end, they examined the impact of oil sanctions on Iran's oil exports. The results suggest that even with the multifold increase in the price of oil over the period, Iran's oil revenue has been declining.

Keshavarz Haddad et al. (2020) examined the uncertainty of oil revenue, sanctions and fluctuations of macroeconomic variables using VARMAX GARCH-in-Mean Asymmetric BEKK model in terms of conditional variance structural failure for the period 1370:1 to 1396:4. The results suggest that any shock from the growth of oil revenue or the sanctions index affects the production sector, the currency market and the stock market. Also, the increase in the pressure of sanctions leads to the spillover of uncertainty to all three sectors and the reduction of production activities, and affects the exchange rate upwards, and in contrast, the relative share of the stock market in the selected portfolio of investors increases. In this period, evidence of the asymmetric effects of oil income shocks and sanction exist in the three sectors.

Rodríguez (2022) examined the impact of sanctions on oil production and provides evidence from Venezuela's Orinoco using the difference-in-differences method for 2008 to 2020. The results suggest that financial and oil sanctions led

to the loss of a large volume of oil production in companies that had access to international credits before the sanctions. The estimated effects represent roughly half of the reduction in production by these companies since the sanctions were imposed, totaling a loss of about $6.2 billion a year at current oil prices.

Rasoulinejad (2016) has investigated the effects of sanctions and oil prices on bilateral trade of Iran and Russia using the gravity model. This research examines the impact of financial and non-financial sanctions on the foreign trade of Iran and Russia and the relationship between oil prices and foreign trade of Iran and Russia during 1994 to 2013. The findings suggest the negative relationship between financial and non-financial sanctions and oil price shocks with bilateral trade of Iran and Russia.

Gurvich and Prilepskiy (2015) evaluated the effects of sanctions on the Russian economy. The sanctions imposed on the Russian economy, affected all economic sectors. The results indicated that economic sectors under sanctions, such as banks, and oil and gas industries, were directly affected and other sectors were indirectly affected. The direct effects of the sanctions were due to the limitation of foreign financial resources, and the indirect effects were due to the decrease in the flow of foreign investment.

Gharib Nawaz et al. (2015) examined the impact of international sanctions on Iran’s economy using the general equilibrium model. The effects of these sanctions on Iran's economy, the revenue of the Iran’s government, and on the Iranian households (rural and urban), were explored in which the effects on household are detailed through income deciles. The results indicate that sanctions of Iran's oil exports have had a serious negative impact on Iran's economy and the Iranian government's revenues.

In the second group, they examined economic sanctions and monetary policy.

Song and Wang (2023) explored whether monetary policy can deal with sanctions that freeze assets. They examined the consequences of such sanctions on open economies and finds that they may experience severe recession and currency crises. To quantify the effect, they develop a new Keynesian dynamic stochastic general equilibrium model with financial frictions and an asset blocking channel for an open economy. They calibrated their model to capture the unique structures of the Russian economy. Quantitative analysis of the model suggests that sudden asset freeze sanctions lead to large output losses and high inflation. Also, a higher elasticity of import substitution and a lower elasticity of export substitution can reduce the impact of foreign sanctions, while a more aggressive monetary policy can have positive but limited stabilization effects.

Zenchenko et al (2022) examined the monetization of the economy as a new monetary policy priority in the face of economic sanctions using statistical analysis and logical analysis for the period 2015-2017 in Russia. Their results suggest that monetization of the economy is important as the main priority for countries facing economic sanctions. They highlight the challenges facing these

countries and the need for a new monetary policy to address this situation. They also emphasize the potential benefits of income generation, such as reducing dependence on foreign exchange and increasing domestic production. They also discuss the role of central banks in implementing this policy and the importance of coordination between different sectors of the economy. Overall, this paper emphasizes the importance of monetization in reducing the impact of economic sanctions and promoting economic growth.

Nakhli et al. (2021) investigated the impact of oil sanctions and its transmission channels in Iran's economy using a new-Keynesian DSGE model during 2000-2017. The results indicate that in the monetary and foreign exchange activities, sanctions have reduced the ratio of the central bank's foreign reserves to the monetary base, so that it has led to an increase in the nominal exchange rate.

Ezadi (2021) investigated the role of financial sanctions in the utility function and their impact on household behavior using a DSGE model. The results suggest that private consumption decreases, while (due to a positive productivity shock) domestic production leads to a decrease in the wages. Also, due to the reduction of capital accumulation and capital transfer, the domestic inflation rate will increase. Also, following the decrease in the attractiveness of the financial market, because of the decrease in productivity, the household debts increase. Finally, the presence of financial sanctions mechanism in the model significantly strengthens the effect of demand-side shocks – i.e. monetary policy, money demand for investment and capital prices.

Bastin et al. (2019) compared the monetary policy transmission channels with the quantile regression approach during the period 2011 to 2016 under economic sanctions in Iran. The results suggest that the exchange rate had a negative and significant effect on economic growth, and in the upper quantiles, economic growth also weakened. Also, including sanctions in the model, increases the negative effects of the exchange rate on economic growth.

In the third group, they examined economic sanctions and fiscal policy.

Nakhli (2021) explored how financial and oil sanctions affected Iran's economy, using a new Keynesian DSGE model. The model included household, production, trade, oil, government and central bank. The parameters were calibrated using the geometric mean of macroeconomic variables for the period 2004-2017 as the steady state values of the variables in the static model. The results suggest that the tightening of oil sanctions causes a decrease in oil production due to the decrease in investment, technology and oil exports and the decrease in the ratio of the central bank's foreign exchange reserves to the monetary base, which leads to an increase in the exchange rate. Also, oil sanctions lead to the decrease in oil exports and the implementation of an expansionary fiscal policy. Increasing current expenditures and maintaining capital expenditures to prevent recession deepening leads to budget deficits and

then the issuance of more sukuk with higher nominal interest rates. On the other hand, financial sanctions increase transaction costs in tradable sectors, which in turn leads to inflation and a decrease in non-oil exports and an increase in the cost of imports. Due to inflation and uncertainty, household consumption increases, and household investment expenditures decrease.

Dom and Roger (2020) explored the financial response to the economic sanctions of Burundi. They examined Burundi's fiscal response to the economic sanctions and examined how the government was able to meet its spending commitments despite the suspension of budget support by international donors. They argue that imposing economic sanctions, particularly aid suspensions, to directly pressure government is an oversimplification, because government has more financial leverage. The case of Burundi illustrates this argument. Following Burundi's political crisis in 2015, donors imposed economic sanctions on Burundi and suspended all budget support to the national government. Using monthly data on the government's financial position between 2005 and 2017, they provided evidence from a time series analysis in a VAR model. The results suggest that the Burundian government, was able to fulfill its expenditure obligations by relying on internal borrowing. This finding indicates that sanctions have not had a direct and significant impact on the government's ability to maintain its expenditures. governments can mitigate the direct effect of sanctions by adopting alternative fiscal policy to challenge the effectiveness of sanctions as a coercive tool.

Nakhli et al. (2020) investigated the effects of economic sanctions on macroeconomic variables by evidence from the Central Bank of Iran using a New Keynesian DSGE model. The results of the simulation suggest that the intensification of oil and financial sanctions increase the severity of sanctions, foreign and government investment, technology, exports and thus reduces the production of oil. It has led to a decrease in the ratio of the central bank's foreign reserves to the monetary base and an increase in the exchange rate. The decrease in domestic production led to a decrease in exports, an increase in inflation and, as a result, stagflation in the economy. It gave rise to an increase in the consumption expenditure and a decrease in the capital expenditure. On the other hand, it has reduced the government's revenues while current expenditures increased. The government decided to maintain capital expenditures to prevent deepening of economic recession, which caused government's budget deficit.

Bhavish and Kautilya (2019) examined the US sanctions against Iran through part of the financial balances. They utilized the sectoral financial balances (SFB) model to examine the macroeconomic policy options available to Iran. The results suggest that fiscal and monetary policies cannot reverse the consequences of sanctions. Although fiscal deficits increase as a percentage of GDP to meet the domestic private sector's desire to accumulate financial assets. The lack of a strong monetary policy mechanism in Iran makes it difficult to control the impact of expansionary fiscal policy on inflation and devaluation of Iranian Rial.

Botshekan (2013) explored monetary and fiscal policies in the resilient economy under sanctions. By reviewing 25 research conducted in Iran and other countries, he concluded that with the increase in the degree of independence of the central bank, the inflation rate and budget deficit will decrease, and as a result, the financial instability will decrease. His policy recommendation for the resilient economy includes the balance of government budget aim at reducing inflation, reforming the tax system, reducing government intervention in the economy, reforming the banking system and providing grounds for the independence of the central bank are the most important policies to achieve the resilient economy.

The fourth group addressed monetary or fiscal policy shocks using the DSGE model.

Arabi Naeem et al. (2023) employed a new Keynesian DSGE model for a small open economy to examine the monetary policy in Sudan during the period (1998-2021). The results suggest that the exchange rate can be used as a proxy for the policy rate. The findings are that when monetary policy shocks occur, exchange rate depreciation directly leads to a contraction in aggregate demand, and output fluctuations in the short run are mainly caused by output, inflation, and exchange rate shocks.

Omotosho (2022) examined monetary policy in a small open oil-exporting economy, focusing on the role of financial capital and the oil intensity of domestic production, using a DSGE model. The results suggest that the negative oil price shock shrinks domestic production, reduces domestic inflation, lowers the exchange rate, increases producer inflation, and give rise to the contractionary monetary policy. Also, the results indicate that capital inflow moderates the reactions of production and inflation to the oil price shock.

Marzban et al. (2016) explored welfare under different fiscal and monetary policies in the context of financial frictions using a DSGE model. They provided different scenarios to investigate the effects of tax instruments. The results suggest that the number of fiscal policy instruments available are important factors affecting the rate of welfare changes in an optimal fiscal and monetary policy model. Policymakers need to determine the optimal fiscal and monetary policies by considering the effects of economic shocks on the rate of welfare changes.

Mirjalili and Karimzadeh (2021) examined the scenarios for the negative oil revenue shock for depositing in the National Development Fund of Iran as a fiscal policy using the DSGE model. The impact of a negative oil revenue shock such as sanction, not only leads to a decrease in GDP, but also reduces consumption and investment. As a result, the decrease in investment and production leads to stagnation, and counter-cyclical fiscal policy is practically difficult without the resources of the National Development Fund to absorb the

negative shock of oil revenue such as sanctions (Mirjalili and Karimzadeh. 2021. pp. 671-673).

The contributions of our study are as follows:

First, Regarding the challenges of the countries under financial sanctions, appropriate monetary and fiscal policies are needed to deal with financial santions. We rarely can find a published study to discuss the appropriate monetary and fiscal policies for reducing the effect of financial sanctions. Therefore, this paper could be considered as a pioneering study in this field.

Second, a review of previous studies show that although different quantitative methods have been used to analyze the effects of sanctions, as far as we know, there is still no study using the DSGE model to examine the effects of financial sanctions and at the same time discuss the appropriate monetary and fiscal policies to deal with the sanctions. The main contribution of our study is to try to fill the gap in the literature.

Third, the modeling of financial sanctions through the changes in the process of exporting oil, investment and international relations.

Fourth, we examined the effect of financial sanctions on the behavior of households and companies through oil revenues, which has an effect on income inequality through prices and revenue flows.

Fifth, the model includes the features of Iran's economic conditions under financial sanction. The above characteristics distinguish the DSGE model developed in this study from the models of previous studies.

Finally, since the effect of economic sanctions has been examined in previous studies, and in this study, we examined the effect of monetary and fiscal policies on the consequences of financial sanctions. We employed liquidity growth rate as an instrument of monetary policy and government spending as an instrument of fiscal policy.

4. methodology

We employed a New Keynesian DSGE model. The model includes household and firms as well as policy-making bodies of government and central bank. In the new Keynesian approach, economic shocks as well as different policies have the ability to affect real variables and, therefore, economic equilibrium. In this structure, financial-oil sanctions are modeled as a random shock,and base on that, the dynamic path of macro variables is examined. In the following, the behavior of each economic player and sector will be illustrated in formulas.

household

In this model, the economy consists of similar households that have an infinite horizon. They use the basket of domestic and imported consumer and capital goods with constant elasticity of substitution (CES) and they hold financial assets in cash m_t, one-year government bonds b_t with a nominal interest rate i_t (Felices and Tuesta, 2010; Tavaklian and Jalali, 2017). The household gains its

utility from private consumption goods C_t and real balance of money $m_t = \frac{M_t}{P_t}$) and loses utility by labor suppl N_t . The utility function of the household provided as follows:

$$Max\ E.\ \sum_{t=0}^{\infty} \beta^t\ U_i(C_t, \frac{M_t}{P_t}, N_t) \quad (1)$$

$$U_t = \frac{C_t^{1-\sigma_c}}{1-\sigma_c} + \frac{\chi_m}{1-\sigma_m}\left(\frac{M_t}{P_t}\right)^{1-\sigma_m} - \chi_{ir}\frac{N_t}{1+\sigma_{ir}} \quad (2)$$

where β∈(0,1) is the inter-temporal discount factor, σ_c is the elasticity of inter-temporal substitution of consumption, σ_m is the elasticity of substitution of the real money balance and σ_{ir} is also the inverse elasticity of Frisch's labor force for the labor force. The household maximizes its preferences subject to the budget constraint and the rule of capital movement (K_{t+1}), and it is assumed that the households own the capital stock that is rented to the represetative firm in each period. In the above equation, the right side is the household income, which includes the supply of capital K_t through the rate of return of capital r_t and the wages of the labor force W_t in Iran, which is deducted from his income at the tax rate on wage t^W. Also, transfer payments (Tr_t) and deflated domestic currency is $\frac{m_{t-1}}{\pi_t}$. On the household payment side (left side) is consumption of goods (C_t), value added tax (t^{VA}), investment (I_t) and of domestic currency (m_t).

$$C_t(1 + t^{VA}) + m_t + I_t^{Pa} = W_t N_t(1 - t^W) + \frac{m_{t-1}}{\pi_t} + Tr_t + r_t K_t \quad (3)$$

The important issue for the oil exporting country is that if a part of the oil revenues is invested, the oil revenues will play an effective role in capital accumulation. In this case, a part of the oil revenues is deposited in the National Development Fund and allocated to the non-governmental private and public sector investment projects. Therefore, the capital accumulation process of the private sector can be presented as follows (Mirjalili, 2021; Sayadi, 2015):

$$K_{t+1} = (1 - \delta)K_t + I_t^{Pa} \quad (4)$$

$$I_t^{Pa} = I_t^P + F_t \quad (5)$$

In this regard, I_t^{Pa} is an augmented investment, part of which is provided by the private sector company I_t^P and part of it is provided by the allocation made by the National Development Fund F_t. In fact, F_t is a part of the oil revenues that is allocated to the private sector in each period to increase its capital accumulation.

By maximizing the utility function subject to the constraints, we have the following equations.

$$N_t^{\sigma_{ir}} = \frac{\lambda_t w_t^{tr}(1-t^W)}{\chi_{ir}} \quad (6)$$

$$\lambda_t = m_t^{-\sigma_m} + \beta E_t \frac{\lambda_{t+1}}{\pi_{t+1}} \quad (7)$$

$$\frac{C_t^{-\sigma_c}}{1-{}^tVA} = \beta E_t[\frac{C_{t+1}^{-\sigma_c}}{1-{}^tVA}(r_{t+1}+(1-\delta)] \quad (8)$$

Also, aggregate consumption of C_t is divided into consumption of domestic goods (C_t^d) and consumption of imported goods (C_t^{pm}) based on the CES model (Tavaklian and Jalali Naini, 2017). In the above relationship θ_c, is the elasticity of substitution between domestic and imported consumer goods and α_c is the share of domestically produced consumer goods in the aggregate consumption.

$$C_t = [\alpha_c^{\frac{1}{\theta_c}} C_t^{d\frac{\theta_c-1}{\theta_c}} + (1-\alpha_c)C_t^{pm\frac{\theta_c-1}{\theta_c}}]^{\frac{\theta_c}{\theta_c-1}} \quad (9)$$

In addition, like consumer goods, it is assumed that private investment also follows the CES model and is divided into domestic production investment (I_t^d) and imported goods investment (I_t^{pm}). In the above relationship, θ_I is the elasticity of substitution between domestic and imported investment and α_I is the share of investment in domestic production from the aggregate investment.

$$I_t^P = [\alpha_I^{\frac{1}{\theta_I}} I_t^{d\frac{\theta_I-1}{\theta_I}} + (1-\alpha_I)I_t^{pm\frac{\theta_I-1}{\theta_I}}]^{\frac{\theta_I}{\theta_I-1}} \quad (10)$$

Labor market

Each household is assumed to be a monopolistically competitive supplier of different labor services, which is required by producers of intermediate goods. Households can determine their wages according to the substitution between different labor services. After determining the wage rate, each household supplies the labor needed by enterprises with this wage without flexibility (Igityan, 2016). The analytical framework that explains the process of wage adjustment in the economy is like price adjustment. Suppose a labor aggregator (for example, an employment agency) rents different labor services from households and transforms them into a homogeneous factor of production N_t^{ir} using the following technology:

$$N_t = [\int_0^1 N(i)_t^{1-\frac{1}{\theta_w^{ir}}} di]^{\frac{\theta_w^{ir}}{\theta_w^{ir}-1}} \quad (11)$$

where $N(i)_t$ denotes the workforce of the ith household. Assuming that w_t is the subscript of the aggregate wage, from solving the problem, the demand function for the labor force of the ith household from the aggregator is provided as follows:

$$N(i)_t = (\frac{W(i)_t^{ir}}{W_t^{ir}})^{-\theta_w^{ir}} N_t \quad (12)$$

The labor aggregator supplies the homogeneous labor force to the intermediary companies under conditions of perfect competition. To model the wage adjustment process, it is assumed that households determine their wages in the

labor market. They supply their labor in the conditions of monopolistic competition, but it is not possible for them to adjust their wages optimally in every period. Now, according to Calvo's pricing (1983), it is assumed that only $(1-\vartheta_w^{ir})$ percent of households can optimally adjust their nominal wages in each period. The household sets the optimal wage at W_t^* so that they cannot change it in the future. Optimization is determined as follows.

$$\sum_{j=0}^{\infty}(\beta v_w^{ir})^j E_t\left[\Lambda_{t,t+j}^{ir}\left(\frac{W_t^{*ir}}{P_{t+j}^{ir}}-M_w^{ir}MRS_{t+j}^{ir}\right)N_{t+j}\right]=0 \quad (13)$$

By defining wage inflation with $\pi_{w,t}$ and inserting W_t^* in the last two equations, the Phillips Keynesian curve for wage inflation is as follows:

$$\pi_{w,t}=\beta\pi_{w,t+1}+\lambda_w^{ir}[mrs_t^{ir}-(W_t-P_t^{ir})] \quad (14)$$

Where

$$\lambda_w^{ir}=\frac{(1-\vartheta_w^{ir})(1-\beta\vartheta_w^{ir})}{\vartheta_w^{ir}(1+\theta_w^{ir}\sigma_{ir})} \text{ و } mrs_t^{ir}=\frac{\chi_{ir}N_t^{ir\,\sigma_{ir}}}{C_t^{-\sigma_c}}.$$

This equation shows that when the real wage is lower than the expected level, the household increases the wage by putting pressure on wage inflation. Therefore, the real wage can be defined as follows:

$$w_t=w_{t-1}+\pi_{w,t}-\pi_t \quad (15)$$

Firms

The model includes two types of domestic firms, i.e. producers of intermediate goods and producers of final goods (Tavaklian and Jalali, 2017). Regarding the firms that produce final goods, it is assumed that there is a firm that buys differentiated goods produced by firms that produce intermediate goods and produces final goods from their combination and sells them to final buyers. Intermediate goods are distinct and imperfect substitutes of each other, which the producer of the final product combines them according to the logic of the Dixit-Stiglitz aggregator as follows.

$$y_t^d=[\int_0^1 y_t^d(i)^{\frac{\theta_d-1}{\theta_d}}di]^{\frac{\theta_d}{\theta_d-1}} \quad (16)$$

The firm producing the final product in a perfect competition and considering the prices of differentiate intermediate goods, tries to determine its purchase from these goods in such a way that its profit is maximized, or its cost is minimized. By solving the first-order condition of the above equation, the demand function for the differentiated product produced by each intermediary firm is provided as follows, which is a function of the ratio of its price to the price of the domestic final product:

$$y_t^d(i) = [\frac{P_t^d(i)}{P_t^d}]^{-\theta_d} y_t^d \quad (17)$$

where, $P_t^d(i)$ is the price of the ith intermediate goods and P_t^d is the price subscript of domestically produced goods. By replacing equation (21) in equation (20), the relation between the price subscript of the domestically produced final product and the price of intermediate goods can be written as follows:

$$P_t^d = [\int_0^1 P_t^{d\,1-\theta_d} di]^{\frac{1}{1-\theta_d}} \quad (18)$$

But intermediary firms use labor and capital inputs as inputs in the production process. Every firm producing intermediate goods using the Cobb-Douglas function under monopolistic competition, and because the oil sector is considered separately in the model, the production of this sector includes the production of non-oil goods (Nakhli et al., 2020):

$$y_t(j) = A_t K(j)_t^{\alpha}\, N(i)_t^{\ \omega} In_t^{1-\alpha-\omega}(j) \quad (19)$$

The firm's demand for labor, capital (K_t) and intermediate goods (In_t) as well as the marginal cost can be derived through cost minimization. In these equations, i was removed from the MC subscript, because it is assumed that all firms have identical marginal costs.

$$N(i)_t = \omega \frac{y_t(i)}{w_t^{ir}} mc_t \quad (20)$$

$$K_t(j) = \frac{\alpha y_t(i)}{r_t} mc_t \quad (21)$$

$$In_t(j) = (1-\alpha-\omega)\frac{y_t(i)}{P_t^{In}} mc_t \quad (22)$$

$$mc_t = (\frac{1}{\omega})^{\omega}(\frac{1}{\alpha})^{\alpha}(\frac{1}{1-\alpha-\omega})^{1-\alpha-\omega} w_t^{ir\,\omega} r_t^{\alpha} P_t^{In\,1-\alpha-\omega} \quad (23)$$

Manufacturing firms supply their products to both domestic and foreign markets, where $y_t^d(i)$ and P_t^d are the supply and price of the produced goods to the domestic market, respectively. Also, $y_t^x(i)$ is the supply of manufactured goods to the foreign market at the price $Ex_t P_t^x$. The production function with constant elasticity provided as follows:

$$y_t(i) = [\alpha_y^{\frac{1}{\theta_y}} y_t^{d\,\frac{\theta_y+1}{\theta_y}}(i) + (1-\alpha_y)^{\frac{1}{\theta}} y_t^x(i)^{\frac{\theta_y+1}{\theta_y}}]^{\frac{\theta_y}{\theta_y+1}} \quad (24)$$

Manufacturing firms maximize their profits to determine supply to domestic and foreign markets:

$$y_t^x = (1-\alpha_y)\left(\frac{Ex_t P_t^x}{P_t^y}\right)^{\theta_y} y_t(i) \quad (25)$$

$$y_t^d = \alpha_y \left(\frac{P_t^d}{P_t^y}\right)^{\theta_y} y_t(i) \quad (26)$$

According to the first-order conditions and its combination with the rule of changes in the price index of domestically produced goods, finally, the equation of the dynamics of the inflation rate of domestically produced goods (the new

Keynesian Phillips curve) can be expressed in the following linear-logarithmic form:

$$\hat{\pi}_t^d = \frac{v_d}{1+\beta v_d}\hat{\pi}_{t-1}^d + \frac{\beta}{1+\beta v_d}\hat{\pi}_{t+1}^d + \frac{(1-v_d)(1-\beta v_d)}{\beta v_d(1+\beta v_d)}\widehat{mc}_t \quad (27)$$

Also, the demand for intermediate goods can be divided into two parts: domestic and imported intermediate goods. Therefore, the CES form of demand for intermediate goods will be as follows:

$$In_t = [\alpha_{In}^{\frac{1}{\theta_{In}}} In_t^{d\frac{\theta_{In}-1}{\theta_{In}}} + (1-\alpha_{In})^{\frac{1}{\theta_{In}}} In_t^{m\frac{\theta_{In}-1}{\theta_{In}}}]^{\frac{\theta_{In}}{\theta_{In}-1}} \quad (28)$$

$$In_t^m = (1-\alpha_{In})\left(\frac{P_t^{Inm}}{P_t^{In}}\right)^{-\theta_{In}} In_t \quad (29)$$

$$In_t^d = \alpha_y\left(\frac{P_t^{Ind}}{P_t^{In}}\right)^{-\theta_{In}} In_t \quad (30)$$

By optimizing the behavior, the demand for each of the domestic and imported intermediate goods can be derived as follows, where P_t^{In} is the price of the intermediate goods in the domestic market and P_t^{Inm} is the price of the imported intermediate goods.

Foreign trade

The foreign trade is divided into two parts: export and import, so that the effects of financial sanctions can be examined. Firms producing intermediate goods sell a part of their products in the foreign market. As before, there is a aggregator (for example, an exporting company) that collects domestically produced goods and sells them to the foreign market. The goods exported by each supplier depends on the price of the export goods and the price of each export goods by each firm $P_t^x(i)$.

Therefore, the demand and export price index of each aggregator for export is as follows:

$$y_t^x = [\int_0^1 y_t^x(i)^{\frac{\theta_y-1}{\theta_y}} di]^{\frac{\theta_x}{\theta_x-1}} \quad (31)$$

Now, if according to Calvo's model, only $1-\vartheta_x$ % of the exporters have the opportunity to determine their prices optimally, for other exporters, the prices will be adjusted based on the inflation of the previous period, which is based on price indexation of export is as follows:

$$y_t^x(i) = [\frac{P_t^x(i)}{P_t^x}]^{-\theta_x} y_t^x \quad (32)$$

$$P_t^x = [\int_0^1 P_t^{x\,1-\theta_x} di]^{\frac{1}{1-\theta_x}} \quad (33)$$

$$P_{t+1}^x(i) = (\pi_t^x)^{\tau_x} P_t^x(i) \quad (34)$$

In this way, the Phillips-Keynesian linear-logarithmic curve for export is as follows:

$$\hat{\pi}_t^x = \frac{v_x}{1+\beta v_x}\hat{\pi}_{t-1}^x + \frac{\beta}{1+\beta v_x}\hat{\pi}_{t+1}^x + \frac{(1-v_x)(1-\beta v_x)}{\beta v_x(1+\beta v_x)}\widehat{mc}_t^x \quad (35)$$

Exporters buy domestic intermediate goods at the price of P_t^d and sell to foreign consumers at the price of P_t^x . If there are sanctions, the price of export goods will increase by S_t^x. As a result, the marginal cost of each exporter will be as follows:

$$mc_t^x = \frac{P_t^d}{Ex_t P_t^x} S_t^x \quad (36)$$

Export costs follow the $AR(1)$ process and sanctions increase transaction costs through the ss_x parameter. In this regard, $\overline{S^x}$ represents the value of the steady state resulting from the financial costs of exports.

$$lnS_t^x = (1-\rho_x)ln\overline{S^x} + \rho_x \ln S_{t-1}^x + ssx.sanc_t + \varepsilon_t^x \quad ; \quad \varepsilon_t^x \sim i.i.d.N(0,\sigma_{sx}^2) \quad (37)$$

But importing firms can be considered in three ways (Manzoor and Taghipour, 2016; Nakhli et al., 2020): consumer goods (C_t^M), capital goods (I_t^M) and intermediate goods (In_t^M). To this end, in each of the three mentioned cases, according to Nakhli et al. (2021), the importer in each sector is considered as a aggregator to import the desired goods and then provide them to the applicants, including the private sector or the government in a monopolistic competition market. Here, C_t^M is the supply of the imported good which is a function of the good purchased from each importer (i).

$$C_t^M = [\int_0^1 C_t^x(i)^{\frac{\theta_{cm}-1}{\theta_{cm}}} di]^{\frac{\theta_{cm}}{\theta_{cm}-1}} \quad (38)$$

The aggregator minimizes his cost to determine the demand for each importer and the price of imported goods. In fact, the collector chooses the combination of goods in such a way that the cost of the imported goods is minimized according to the specified import priceP_t^{cm} . From solving the first-order conditions, the demand function faced by each importer i and the price of the export goods are determined.

$$C_t^M(i) = [\frac{P_t^{cm}(i)}{P_t^{cm}}]^{-\theta_{cm}} C_t^M \quad (39)$$

$$P_t^{cm} = [\int_0^1 P_t^{cm\,1-\theta_{cm}} di]^{\frac{1}{1-\theta_{cm}}} \quad (40)$$

Again, according to Calvo's method, only $1-\vartheta_{cm}$ % of the importing companies can determine their prices optimally, and other companies adjust the prices of their imported goods based on the following indexation.

$$P_{t+1}^{cm}(i) = (\pi_t^{cm})^{\tau_{cm}} P_t^{cm}(i) \quad (41)$$

Therefore, the import price index is as follows:

$$P_t^{cm\,1-\theta_{cm}} = \vartheta_{cm}[(\pi_{t-1}^{cm})^{\tau_{cm}} P_{t-1}^{cm}]^{1-\theta_{cm}} + (1-\vartheta_{cm}) P_t^{cm*\,1-\theta_{cm}} \quad (42)$$

Each consumer goods importer decides to get the optimal price P_t^{cm*} to maximize his profit. Now, firms that can adjust the price, maximize their expected future profit flow, to determine the optimal price of the present value. Therefore, the linear-logarithmic Phillips-Keynesian curve for imported goods is as follows:

$$\hat{\pi}_t^{cm} = \frac{v_{cm}}{1+\beta v_{cm}} \hat{\pi}_{t-1}^{cm} + \frac{\beta}{1+\beta v_{cm}} \hat{\pi}_{t+1}^{cm} + \frac{(1-v_{cm})(1-\beta v_{cm})}{\beta v_{cm}\,1+\beta v_{cm}} \widehat{mc}_t^{cm} \quad (43)$$

In fact, importers buy the required goods from foreign markets at the price of P_t^f and sell them to the domestic market at the price of P_t^{cm}. The marginal costs for importers can be measured based on the following equation:

$$mc_t^{cm} = \frac{Ex_t P_t^f}{P_t^{cm}} S_t^{cm} \quad (44)$$

Import costs follow the AR (1) process and sanctions increase costs through the scm parameter.

$$lnS_t^{cm} = (1-\rho_{cm}) ln\overline{S^{cm}} + \rho_{cm} \ln S_{t-1}^{cm} + sscm.sanc_t + \varepsilon_t^{cm} \; ; \; \varepsilon_t^{cm} \sim i.i.d.N(0, \sigma_{scm}^2) \quad (45)$$

Oil sector

There are different ways to include the oil sector in the model. Some researchers consider the oil sector as other firms, however, the others use the exogenous process to model the oil sector. In the modelling, the oil shock is considered through the application of international sanctions against the oil exports in an economy. It is also assumed that the crude oil extracted in the economy is exported at the world price and its foreign exchange revenue added to the government budget.

The revenues from oil export are considered as a first-order AR (1) process, which is affected by sanctions through the ss.oil parameter (Nakhli et al., 2021).

$$lnOil_t = (1-\rho_{oil}) ln\overline{Oil} + \rho_{oil} \ln Oil_{t-1} + ssoil.sanc_t + \varepsilon_t^{oil} ; \varepsilon_t^{oil} \sim i.i.d.N(0, \sigma_{soil}^2) \quad (46)$$

In addition, it is assumed that the accumulation of reserves in the National Development Fund (NDF_t) in each period follows the following process (Sayadi, 2015; Manzoor and Taghipour, 2016; Mirjalili and Karimzadeh, 2015):

$$NDF_t = NDF_{t-1} + \emptyset_F Oil_t - F_t + \alpha_{nd} ND_t + Z_t \quad (47)$$

where NDF_{t-1} denotes the balance of National Development Fund reserves from the previous period that is transferred to the current period. $\emptyset_F$ denotes the fund's share of oil revenues, F_t denotes the lending (or credit) by the fund to the private sector, ND_t denotes the net debt of the private sector to the fund, α_{nd} is the percentage of the net debt of the private sector to the fund that is repaid to the fund in each period and Z_t denotes the interest deposited into the fund from the loan to the private sector.

In fact, a better interpretation for the dynamics of the National Development Fund reserves is that the resources of the NDF are mainly from oil revenues, so that $\emptyset_F$ percent of the oil revenues in each period deposited to the Fund. It is deposited. In each period, the Fund lend F_t percent of resources to the private sector (more precisely, private, cooperatives, and public non-governmental sectors) through commercial banks (Mirjalili and Karimzadeh, 2021)

If we assume that α_F percent of the Fund's resources lend to the private sector in each period, we have:

$$F_t = \alpha_F \, NDF_t \quad (48)$$

Also, the net debt of the private sector to the Fund can be considered as follows:

$$ND_t = ND_{t-1} + (1 + rd)F_t - \alpha_{nd} ND_t \quad (49)$$

The net debt of the private sector to the Fund also includes the accumulated balance of the net debt of the previous period ND_{t-1} which is transferred to the current period, in addition, the principal and debt service(including interest) of Fund lending ($(1 + rd)F_t$) minus loan repayment to the Fund in each period is $\alpha_{nd} ND_t$. In this regard, rd is the interest of the loan granted to the private sector. It is also assumed that r percent interest is also accrued to the Fund's reserve balance in each period as follows:

$$Z_t = r \, NDF_t \quad (50)$$

We are aware that a small economy cannot influence the world oil prices.

Government

The government finances its expenses by printing and issuing bonds, borrowing from the central bank, collecting taxes, and selling oil and exporting it abroad. In this way, the government's income is provided from tax revenues, foreign currency from the sale of oil and money creation $d_t^G - d_{t-1}^G$ (Khosravi, 2017). Also, government expenditures include transfer payments (Tr_t), government consumption ($C^G{}_t$) at the price of P_t^{cG}، government investmentI_t^G at the price of P_t^{IG}. In this way, the government budget deficit GBD_t in real prices can be expressed through the following equation:

$$GBD_t = \frac{P_t^{cG}}{P_t} C^G{}_t + \frac{P_t^{IG}}{P_t} I^G{}_t + TR_t - \left[\frac{(1-\emptyset_f-\emptyset_{NIOC}-\emptyset_{Dep})oil_t}{P_t} + \frac{\left(d_t^G - d_{t-1}^G\right)}{P_t} + t^w w_t N_t + \right.$$
$$\left. + t_t^{VA}\left(c_t + \frac{P_t^{cG}}{P_t} C^G{}_t\right)\right] \quad (51)$$

The government procures its consumer and capital goods from the domestic market (C_t^{Gd} and I_t^{Gd}) and imported goods (C_t^{Gm} و I_t^{Gm}) which can be presented in a CES function with the elasticity of substitution θ_{cG} and θ_{IG} as follows (Tavakolian and Jalali; 2017):

$$c_t^G = \left[\alpha_{cG}^{\frac{1}{\theta_{cG}}} C_t^{Gd\frac{\theta_{cG}+1}{\theta_{cG}}} + (1 - \alpha_{cG})^{\frac{1}{\theta_{cG}}} c_t^{Gm}(i)^{\frac{\theta_{cG}+1}{\theta_{cG}}}\right]^{\frac{\theta_{cG}}{\theta_{cG}-1}} \quad (52)$$

$$I_t^G = [\alpha_{IG}^{\frac{1}{\theta_{IG}}} I_t^{Gd\frac{\theta_{IG}+1}{\theta_{IG}}} + (1-\alpha_{IG})^{\frac{1}{\theta_{IG}}} I_t^{Gm}(i)^{\frac{\theta_{IG}+1}{\theta_{IG}}}]^{\frac{\theta_{IG}}{\theta_{IG}-1}} \quad (53)$$

Also, it is assumed that the central bank uses the money growth rate as its monetary policy instrument. The reaction function of monetary policy in Iran's economy is used as expressed by Manzoor and Taghipour (2016) in a way that monetary-base growth rate determined based on the deviation of production, inflation, and real exchange rate from their stable values.

Also, according to Khosravi (2017) and given the importance of the government budget deficit (and the impact of the National Development Fund on the government budget), the deviation from the government budget deficit also affects on the growth rate of the monetary base. Therefore, the growth rate of money volume follows the following rule:

$$\dot{m}_t = \rho_p \dot{m}_{t-1} + \rho_\pi \pi_t + \rho_y y_t + \rho_{re} Re_t + \rho_{Gbd} GBD_t \quad (54)$$

where $\dot{m}_t = \frac{m_t}{m_{t-1}} \pi_t$

Terms of market settlement

Finally, in the market settlement condition, several unities are added to the model so that the model is complete and the Walras condition is established. These relationships are as follows:

$$y_t \equiv C_t + \frac{P_t^{CG} C_t^G}{P_t} + \frac{P_t^I Ipa_t + P_t^{IG} I_t^G}{P_t} + \frac{X_t}{P_t} - \frac{M_t}{P_t} \quad (55)$$

$$X_t \equiv P_t^x y_t^x + Ex_t Oil_t \quad (56)$$

$$M_t \equiv P_t^{cm} C_t^M + P_t^{Im} I_t^M + P_t^{Inm} In_t^m \quad (57)$$

$$C_t^M \equiv C_t^{pm} + C_t^{Gm} \quad (58)$$

$$I_t^M \equiv I_t^{pm} + I_t^{Gm} \quad (59)$$

$$y_t^d \equiv C_t + C_t^{gd} + I_t^d + I_t^{gd} + In_t^d \quad (60)$$

5- Estimation and analysis of the results

The simulation of the shock caused by the financial sanctions and the shock of monetary and fiscal policies and the reaction of macroeconomic variables to the shock will be addressed in the following.

model parameters

Bayesian method employed to estimate model parameters. The prior density of the research parameters is estimated with the posterior density based on the Metropolis-Hastings algorithm. Using this algorithm, two parallel chains with a volume of one million have been extracted to obtain the posterior density of the parameters. To estimate the model, GDP, private investment, private consumption, and government consumption have been used seasonally during the period of 1991-2021. All variables have been deseasonalized using Hodrick-Prescott filter. Their geometric mean is considered as stable values according to the available data.

Also, by using the definition of growth rate in the new Keynesian literature, the variable growth rate is defined as the ratio of the variable in period t to the variable in period t-1 and since all variables in the model are defined as the deviation of the logarithm of the variable from the value of the steady state, the growth rate of the variables derived from extracting the HP filter with a value of 677 for the parameter related to the logarithm of the ratio of each variable to its previous period value.

Moreover, the values of the parameters that do not contain the required data are based on the values of identical parameters estimated in previous studies or based on the data and indicators related to Iran's economy (with econometric or mathematic methods) are determined and calibrated. Table (1) provides the values of the calibrated parameters.

Table 1: Calibrated parameters of the model

value	Parameter description	Parameter
0.965	Inter-temporal discount factor	β
1.5	elasticity of substitution of inter-temporal consumption	σ_c
0.048	capital depreciation rate	δ
0.24	wage tax rate	t^w
0.27	VAT rate	t^{VA}
2.9	inverse of labor elasticity of Frisch for the labor force in Iran	σ_{ir}
0.81	share of investment in domestic production to total investment	α_I
0.4	share of capital services in the production of domestic goods	α
0.9	share of domestically produced consumer goods in total consumption	α_c
0.34	share of labor force in the production of domestic goods	ω
0.7	share of domestic inputs in the production of domestic goods	α_{in}
0.68	percentage of workers who are unable to adjust their wages	ϑ_w^{ir}
0.15	share of lending to private sector from the Fund	α_F
0.15	net share of private sector debt to the Fund	α_{nd}
0.2	Fund's share of oil revenues	$\emptyset_F$
0.015	profit share of loan granted to private sector	rd
0.35	AR(1) coefficient of oil export	ρ_{oil}
0.29	coefficient of importance of money growth lag	ρ_m
0.7	coefficient of importance of the budget deficit in determining money growth	ρ_{Gbd}
0.62	coefficient of importance of the real exchange rate in determining money growth	ρ_{re}
-1.54	coefficient of importance of inflation in monetary policy reaction function	ρ_π
-1.7	coefficient of importance of production in monetary policy reaction function	ρ_y
0.42	AR(1) coefficient of financial sanction	ρ_{sanc}

Source: research findings

Other parameters were estimated using the Bayesian method, the results of which are illustrated with a 90% confidence interval in Table (2).

Table (2).Estimation of model parameters

Confidence interval 90%	posterior mean	prior mean	Prior distribution	definition	parameter
1/1402 1/2946	1/21	1/25	Gamma	Relative labor preferences	χ_{ir}
0/5125 0/6754	0/59	0/6	Beta	Wage indexation degree	τ_w
0/9992 1/1551	1/07	1/16	Gamma	Elasticity of substitution between domestic and imported consumer goods	θ_c
1/3324 1/4781	1/4	1/54	Gamma	Elasticity of substitution between domestic and imported investment	θ_I
0/4553 0/6117	0/53	0/45	Beta	Elasticity of substitution between types of labor supplied	θ_w^{ir}
0/5906 0/7284	0/65	0/9	Beta	Share of manufactured goods supplied to the domestic market	α_y
1/1091 1/2499	1/18	1/27	Gamma	Elasticity of substitution between goods supplied to the home and abroad	θ_y
0/4278 0/5768	0/5	0/39	Beta	Substitution elasticity of domestic and imported production inputs	θ_{In}
0/3612 0/4834	0/42	0/35	Beta	Percentage of companies importing consumer goods that are unable to adjust their prices	ϑ_{cm}
0/2438 0/3936	0/31	0/35	Beta	AR(1) financial costs of the coefficient of imported consumer goods	ρ_{cm}
0/3153 0/4768	0/39	0/43	Beta	AR(1) financial costs of the coefficient of imported investment goods	ρ_{Im}
0/0527 0/1796	0/11	0/15	Beta	Percentage of import companies that are unable to adjust their prices	ϑ_{inm}
0/2368 0/3624	0/3	0/36	Beta	Coefficient of financial costs of imported intermediate inputs	ρ_{Inm}
0/7082 0/7957	0/75	0/9	Beta	Share of domestic goods in government consumption	α_{cG}
0/7904 0/9163	0/85	0/81	Beta	Elasticity of substitution of domestic and imported consumption by government	θ_{cG}
0/8832 0/9620	0/92	0/83	Beta	Share of domestic goods in government investment	α_{IG}
0/0404 0/1262	0/08	0/108	Beta	Elasticity of domestic and imported investment substitution by the government	θ_{IG}
0/3089 0/4248	0/36	0/5	Beta	Percentage of export companies that are unable to adjust their prices	ϑ_x
0/2850 0/4230	0/35	0/4	Beta	AR(1)financial costs of coefficient of export	ρ_x
0/4459 1/0938	0/78	0/1	Inverse Gamma	Stability coefficient of non-oil export shock	ε_x

0/1634 0/3119	0/23	0/1	Inverse Gamma	Coefficient of stability of import shock of consumer goods	ε_{cm}
0/1266 0/2355	0/18	0/1	Inverse Gamma	Coefficient of stability of import shock of capital goods	ε_{im}
0/4805 0/8732	0/68	0/1	Inverse Gamma	Stability coefficient of import shock of intermediate goods	ε_{inm}
0/0023 0/0156	0/008	0/1	Inverse Gamma	Stability coefficient of non-oil export shock	ε_{oil}

Source: research findings

In order to check the accuracy of the estimates by the Markov Chain Monte Carlo (MCMC) method, we employed Brooks and Gelman (1998) univariate and multivariate diagnostic tests. The result of the multivariate mode illustrated in Figure 2. Based on the results, the univariate test of intra-sample and inter-sample variance of all parameters are close to each other and eventually converge to a constant value, so the Bayesian estimation results using the MCMC method have good accuracy.

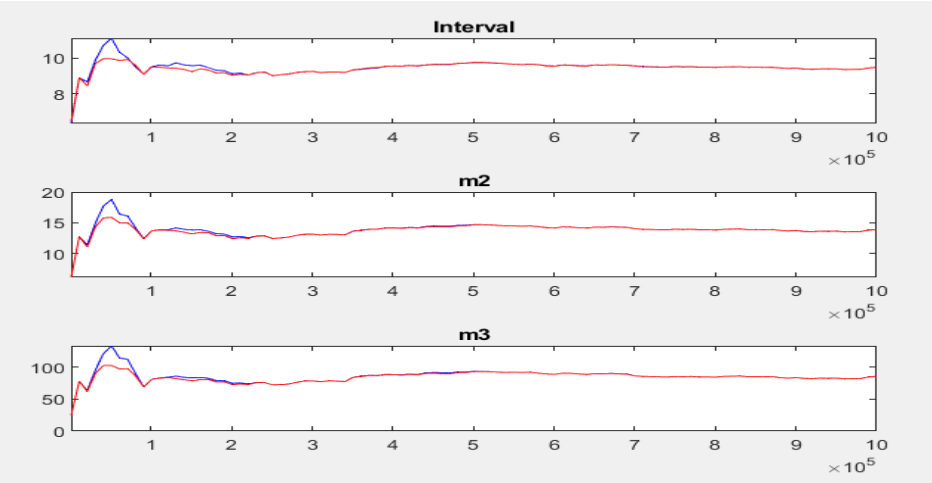


Figure 1 .diagnostic test of accuracy of model parameter estimation

The pre- and post-estimated density of the parameters of the model is depicted in Figure (1). As can be seen in the graphs, the output results of the posterior and prior distribution curves are different from each other in some cases, which indicates that these parameters can be identified, and inter-data information can contribute to determining the parameters. However, for a number of parameters, two diagrams are superimposed on each other, which suggest that the initial information of the previous density is the main factor in determining the parameter values, and as a result, the parameters are practically calibrated. Examining the prior and posterior functions of the estimated model suggest that

the time series used in the model has a significant role in determining the values of the structural parameters of the model.

5.1. Analysis of instantaneous reaction functions:

Instantaneous response functions depict the dynamic behavior of the variables over time and when the impulse affects the corresponding variable. These functions explain how the economy reacts to the impulses of exogenous variables. The reaction of a variable to a shock is expressed as a logarithmic deviation of that variable from its stable value and expressed as a percentage. Here, the results of the impact of the three impulses of oil revenues, the impulse of financial sanctions on economic variables, and the impulse of monetary and fiscal policy on Iran's financial sanctions are illustrated.

• **Impulse of oil revenues:**

Figure (2) indicates the instantaneous reaction functions of an oil revenue shock of one standard deviation. From the analysis of the impulse reaction functions of oil revenues, it can be concluded that the shock of financial sanctions, through the reduction of exports and the increase in the cost of raw materials, causes a decrease in oil revenues and Fund lending to the private sector.

The results also suggest that government spending will increase if this shock is applied. This shows that a larger part of the oil revenues is used for government spending instead of being deposited into the Fund. when a shock occurs, the increasing share of oil revenue in government spending give rise to transferring the fluctuations to the economy while the National Development Fund function is to stabilize the effects of oil revenues fluctuations. In fact, the reduction of oil revenues reduces the resources of National Development Fund and consequently the share of the loan granted by the fund to the private sector. The same results were also discussed in Mirjalili and Karimzadeh (2021) in the case of negative oil revenue shock.

Also, despite the existence of the National Development Fund, private sector investment faces a decrease and returns to equilibrium after several periods of fluctuation.

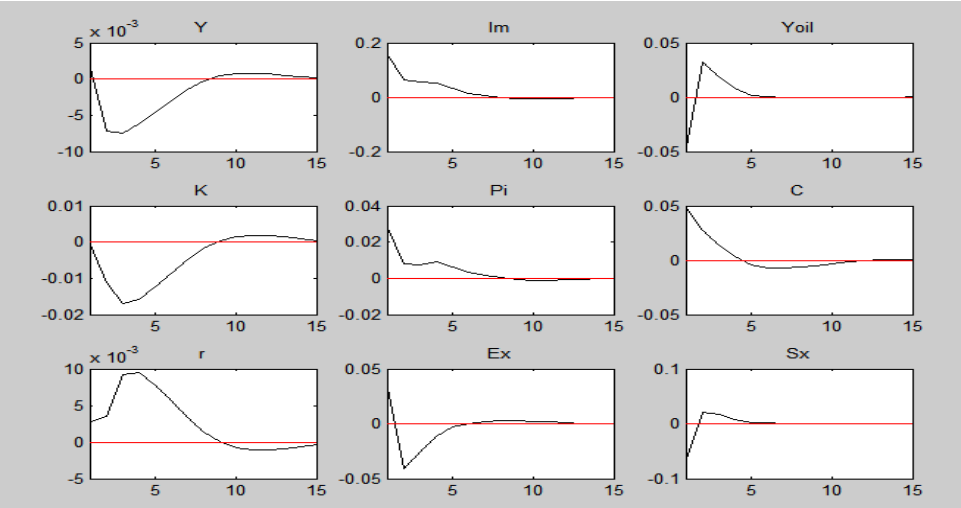


Figure 2: Instantaneous reaction functions of oil shock effect on economic variables

• Impulse of financial sanctions:

Figure (3) shows the instantaneous reaction functions of a financial sanctions shock equal to one standard deviation. From the analysis of the impulse reaction functions of financial sanctions, it can be concluded that the financial shock caused by financial sanctions leads to an increase in the real exchange rate and the marginal costs of exports, and ultimately causes an increase in inflation rate. A reason for this could be the effect of the regulations related to the return of export foreign exchange revenues to the country which applies to exporters. Nevertheless, due to the devaluation of Iranian currency, despite the increase in the marginal cost of exports, the export of some goods to neighboring countries and countries with trade relations with Iran increases.

Therefore, due to the increase in exports, the amount of the private sector's net debt to the Fund will decrease slightly, but it is not stable. In addition, lending to the private sector by the Fund have also been reduced, so the Fund's resources have not been able to provide part of the needs of the private sector. Moreover, it was observed that the shock related to financial sanctions has led to a decrease in economic growth through an increase in production costs.

It was also observed that the shock caused by financial sanctions has led to a decrease in foreign investment due to an increase in uncertainty and a decrease in the investment returns. The results indicated that the shock caused by the financial sanctions through the channel of decrease in oil export led to a decrease in oil revenues and the effect of this shock was negative. Regarding the reaction of income inequality to the shock of financial sanctions, it was observed that the

average income level of households decreased with the shock and the effect of the shock disappeared in the long run. Accordingly, the financial sanctions shock has led to an increase in income inequality. The same results were also discussed in Pahlavani et al. (2021). Finally, it should be noted that with the increase in financial sanctions due to the increase in financial cost, it has led to a decrease in the import of intermediate and capital goods in Iran. The same results were detailed in Heydarian et al. (2023).

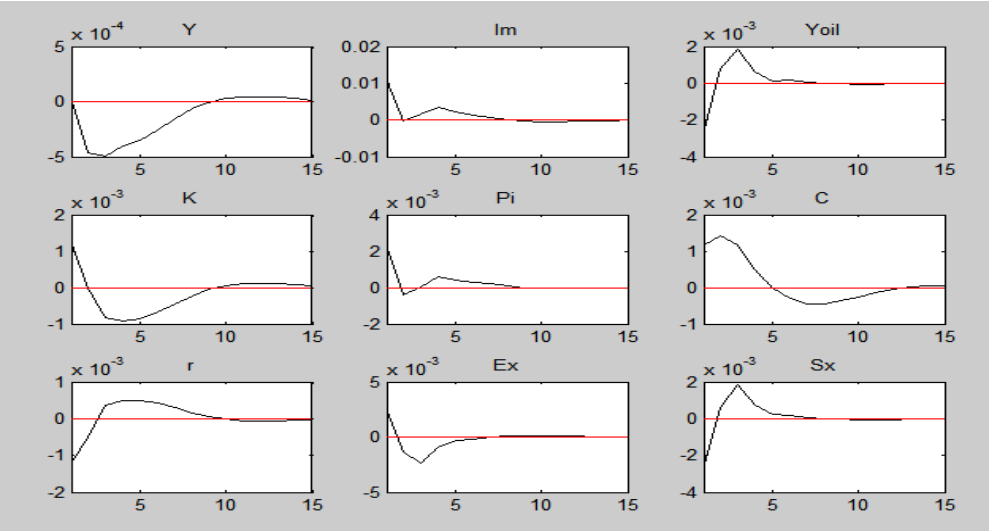


Figure 3: Instantaneous reaction functions of the financial sanctions shock effect on economic variables

• Monetary policy impulse

Figure (4) illustrates the instantaneous reaction functions of a monetary policy shock equal to one standard deviation. The results of the monetary growth rate impulse are shown in the diagram. The results of the dynamics of the variables suggest that the impact of this impulse from the aggregate demand transmission channel give rise to an increase in production, and then the shock effect gradually decreased and became negative in the medium term and the shock effect disappeared in the long term. However, the result of this impulse on real production is positive.

Also, in the short term, in response to this policy, the oil exports will be lower than its stable level due to the decrease in the real exchange rate. Because, the growth impulse of the monetary base rate increases the nominal exchange rate and creates inflation and causes a decrease the real exchange rate and reduces exports.

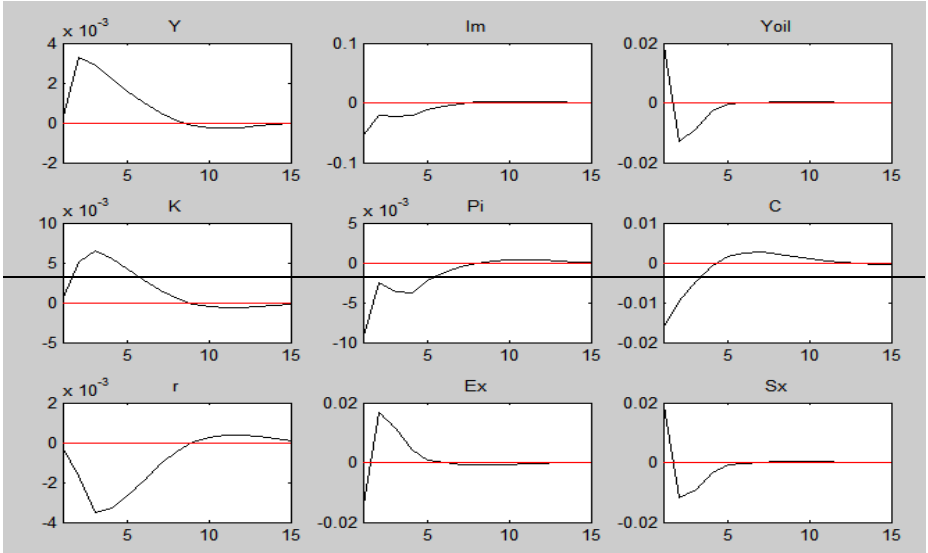


Figure 4: IRF analysis of the effect of monetary policy shock on economic variables

As illustrated in Figure (4), in reaction to inflation, the price level has moved away from its stable value and increased and returns to its stable value almost after ten periods.

Also, following the monetary shock, the imports has decreased. Therefore, intermediate, and capital goods companies cannot sufficiently replace domestic goods with imported goods, which leads to a shock on the production side and a decrease in exports.

Also, the investment first increased and then gradually decreased and became negative in the 8th period. Its effects disappeared in the long term. The decrease in investment, including foreign investment, because of financial sanctions has also achieved identical results in Heydarian et al. (2022).

At first, the consumption decreased, and after 5 periods, the reaction was positive, and then in the 10th period, the effect disappeared. However, the result of this impulse on consumption is positive. With the increase in real consumption, production also increases. In terms of interest rate, initially, it has decreased, and then from the 10th period onwards, the shock effect became positive, and in the long term, the effect disappeared.

With the liquidity growth rate momentum, financial sanctions increased in a short period and after a period its effect decreased and gradually its effect returned to the equilibrium state in the long term. However, the result of this impulse on the financial sanction is positive. Therefore, it can be concluded that a liquidity growth rate shock can increase financial sanctions in the short term. Therefore, if

the monetary policy maker's instrument includes a macro monetary variable, then by changing it, in the short term, we see its effect on financial sanctions, but in the long term, we will see a reduction, and therefore, the real effects of such a policy will be diminished. The huge amount of liquidity in Iran's economy (the debt of the banking system) give rise to the effectiveness of financial sanctions multifold.

- **Fiscal policy impulse**

Figure (5) illustrates the instantaneous reaction functions of a fiscal policy shock equal to one standard deviation. From the analysis of the instantaneous reaction functions of the fiscal policy impulse, it can be concluded that production, consumption, capital and export indicated a positive reaction to this shock, but interest rate, import and oil export indicated a negative reaction to a fiscal policy shock.

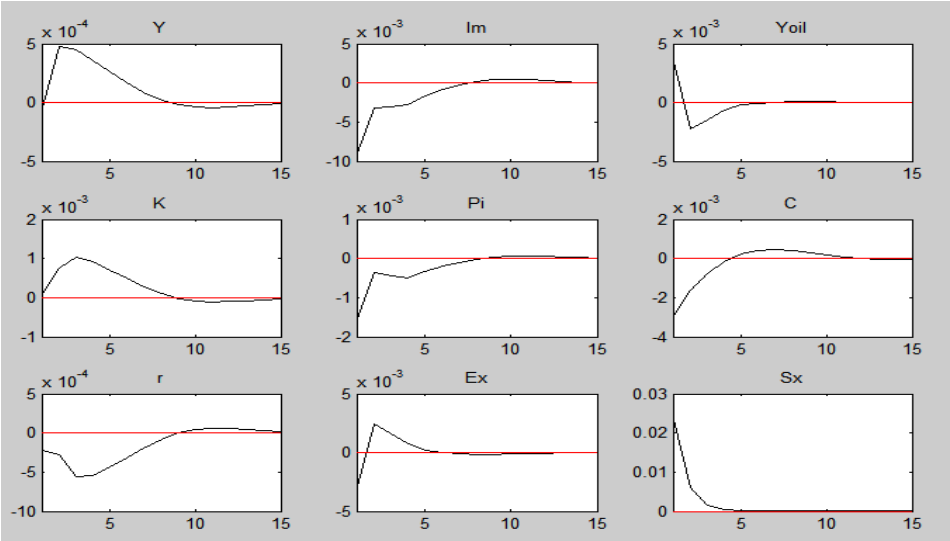


Figure 5: IRF analysis of the effect of fiscal policy shock on economic variables and sanctions

Figure (5) indicates the dynamics of the variables in response to the government's current spending impulse. By the impulse of government spending, the inflation has decreased at first and gradually became positive and its effect has disappeared. This fiscal policy also raises production because of the increase in demand. Due to the inflation that this policy creates, part of the increase in demand is compensated, however, in response to this policy, initially the production increased, however, the shock effect gradually decreases and in the medium term becomes negative and tends to its stable value in the long term.

On the other hand, increasing government spending increases production. However, due to the compensatory effect, part of the increase in production is compensated due to the decrease in private sector investment (replacement with government spending). Finally, as the effect of government spending vanishes over time, the production tends to its stable value.

By government spending shock, investment first increased and then gradually decreased and became negative in the 8th period, which can be due to the decrease in liquidity. Then the substitution effect leads to an increase in investment. Also, the import variable decreased initially due to the financial shock, that is, it gave a negative reaction, and after 6 or 7 periods, it indicates a positive reaction, and its effect disappeared in the long term. Oil production indicates initially a positive reaction, and a negative reaction in the middle term. After 5 periods, the shock effect has completely disappeared.

The occurrence of an impulse in the government's current expenditures, the consumption initially decreases and then reacts positively after 5 periods and then returns to its stable value in the 10th period. The probable reason is the positive effects of the increase in aggregate demand and especially in consumption. The increase in the government expenditure leads to the increases in household's income and consumption.

The interest rate decreased initially, and then from the 10th period onwards, the effect of the shock became positive, and in the long term, its effect disappeared. Exports initially decreased and then increased after one period, and its effect gradually disappeared.

Financial sanctions has shown a positive reaction to the impulse by government's expenditure, and has led to an increase the effectiveness of financial sanctions in Iran.

6- Conclusion

There are several studies that examined sanctions against Iran. With the imposition of sanctions, not only the policy-making space of the target country is limited, but third countries also face restrictions due to the sanctions' policy.

In the case of Iran, the sanctions gain a greater financial dimension and become more influential on the policymaking environment. Financial sanctions are more effective than trade sanctions. In examining the impact of financial sanctions on macroeconomic variables and monetary and fiscal policy to reduce the effect of sanctions, the results suggest that financial sanctions' shock leads to the decrease of oil revenues through the reduction of exports and government expenditure will increase.

In addition to the financial shock caused by sanctions, it will lead to national currency devaluation. Financial sanction by increasing production costs lead to decreasing economic growth and declining foreign investment. It happens due to increasing uncertainty and decreasing the return on investment. The results

indicated that financial sanctions through the channel of decreasing oil export led to decreasing oil revenues.

The result of fiscal policy shock indicates that production, consumption, capital and export reacted positively to this shock, however, interest rate, import and oil revenue reacted negatively to the fiscal policy shock. Financial sanctions variable It also increased by a shock, however, the effect of the shock gradually disappeared. Regarding the monetary policy shock, production and consumption reacted positively to the shock, however, oil revenue and interest rate reacted negatively to the monetary shock.

Financial sanctions reacted positively to the shock, and the shock of liquidity growth rate has led to increasing the effects of financial sanctions. High liquidity and the debt of the banking system gave rise to a situation that the effect of sanctions feel more. We employed liquidity growth rate as a monetary policy instrument to deal with the financial sanctions. We also employed government expenditure as a fiscal policy instrument to deal with financial sanctions. The results suggest that monetary policy has stronger effects than fiscal policy to deal with financial sanctions because monetary policy reduced the adverse impacts of financial sanctions for three periods.

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تحریم های مالی، درآمدهای نفتی و سیاست های پولی و مالی در ایران: مدلDSGE

چکیده

تحریم‌های مالی پیامدهای اقتصادی زیادی برای اقتصادهای صادرکننده نفت دارد. اقتصاد تحریم شده برای مقابله با آن سیاست‌های اقتصادی اتخاذ می‌کند. این مقاله به بررسی رابطه بین تحریم‌های مالی، درآمدهای نفتی و سیاست‌های پولی و مالی در ایران می‌پردازد و چگونگی تأثیر تحریم‌های مالی بر دسترسی ایران به درآمدهای نفتی را توضیح می‌دهد. همچنین به بررسی نقش سیاست های مالی و پولی در ثبات و تاب آوری مالی در اقتصاد ایران می‌پردازد. برای این منظور، ما از یک مدل DSGE با رویکرد کینزی جدید استفاده کردیم. نتایج حاکی از آن است که نرخ بهره، مصرف، واردات و تورم واکنش مثبتی به شوک درآمد نفتی ناشی از تحریم‌های مالی دارند. با این حال، تولید، صادرات، سرمایه‌گذاری بخش خصوصی و فروش نفت نشان دهنده واکنش منفی به شوک درآمدهای نفتی است.

در خصوص شوک سیاست پولی، واکنش تولید و مصرف به شوک مثبت است. اما واکنش فروش نفت و نرخ سود به این شوک منفی است. از نظر شوک سیاست مالی، تولید، مصرف، سرمایه‌گذاری و صادرات نشان دهنده واکنش مثبت به این شوک بود. با این حال، نرخ بهره، واردات و فروش نفت نشان دهنده واکنش منفی به شوک سیاست مالی بود. شوک‌های سیاست پولی و مالی اثر تحریم‌های مالی را برای یک دوره کوتاه افزایش می‌دهد، در حالی که شوک سیاست پولی اثر تحریم‌های مالی را برای سه دوره کاهش داده است. بنابراین سیاست پولی در کاهش اثر تحریم های مالی موثرتر از سیاست مالی بوده است.

کلمات کلیدی: تحریم مالی، سیاست پولی، سیاست مالی، درآمد نفتی، DSGE.