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The Role of National Development Fund in Confrontation Oil Shocks in Iran Economy from Government Expenditure Channel by Using a Dynamic Stochastic General Equilibrium Model

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Abstract

The aim of this study is to assess the effects of oil shocks on economic variables of Iran as an oil exporting country with a National Development Fund. For this purpose, as the government relies heavily on oil revenue, we provided a dynamic stochastic general-equilibrium (DSGE) model. Then, we studies two different policies for oil revenue volatility and provided a dynamic stochastic general-equilibrium model for policy A and B and estimated them. The results show that when the government saves its oil revenue in an oil fund and invests each period only the return from the fund plus a small additional fraction, the shock generates a milder and more long-lasting expansion, effectively insulating the economy against the volatility of oil prices.

Keywords: Dynamic Stochastic General Equilibrium (DSGE) Model, Oil Shock, Fiscal Policy, Transmission Mechanism of Oil Shocks, National Development Fund.

JEL Classifications: E62, H5, Q48.

1. Introduction

The present study investigated the effect of oil revenue fluctuations on macroeconomic variables of Iran considering the National Development Fund, and the effect of oil shocks on real economic variables from a financial policy channel with a dynamic stochastic general equilibrium model. In order to design a dynamic stochastic general equilibrium model, after examining the transmission mechanism of oil shocks on the Iranian economy based on empirical evidence, we concluded that different responses of government spending to oil revenue shocks by the presence or absence of the National Development Fund is considered as a key transmission mechanism for the fluctuations in the Iranian economy. The present study examined two general options for the flow of oil revenues in the Iranian economy to investigate the

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role of the National Development Fund in economic stability[1] in the face of oil price shocks:

The first option is that the government quickly consumes oil revenues and invests in this field and does not use the National Development Fund. The revenues go directly into the government's public budget in this case and are thus distributed between government spending and investment. In such a situation, oil shocks enter the national economy directly without any controls.

The second option is that the oil revenues are stored in an oil fund by the government stores and only a small portion of the fund's assets is reinvested in each period. In this case, the oil shock will be associated with longer and slower economic growth, and lead to protection of the economy against oil revenues fluctuations. The appropriate fiscal policy can be chosen in the event of an increase or decrease in oil revenues and comparison of the results in these two cases will help to choose a more appropriate fiscal policy.

2. Method

The present study seeks to show how the negative effects of oil shocks are transmitted from the government spending channel to the economy using a DSGE model for the Iranian economy. In the face of oil shock and increased oil revenues, when the government quickly consumes and invests these revenues, the government's capital spending leads investment rate to exceed its rationally favorable macro level. Then, government capital expenditures are replaced with private capital expenditure. Instead of spending private capital, therefore, as mentioned earlier, public capital spending is associated with a kind of crowding-out effect. Along with this effect, government investment, especially investment in infrastructures such as highways, airports, water supply systems, etc., has a complementary relationship with private investment, because higher public investment in such cases leads to an increase in the efficiency and final productivity of private capital, and in this way, instead of crowding out of private capital by public capital, there is practically a crowding in effect, such that public investment spending encourages private investment.

Two DSGE models are designed in this study for two government policies called policies a and b. The basic structure of the model used in this study consists of three sections including households, firms, and government, in which households and producers make decisions based on the optimization of their objective functions. Also, it is assumed that the government is considered as the owner of oil inventory and domestic input is not essential for oil production and

1. According to the International Monetary Fund, also known as the Fund, economic stability refers to the absence of excessive fluctuations in the macroeconomics. In the present study, the economic stability refers to small fluctuations in variables of production, private and public consumption and private and public investment.
How the IMF Promotes Global Economic Stability, IMF Factsheet, September 23, 2016

all its output is exported. Oil price is determined exogenously and affected by random shocks.

3. Analysis of results

The Dynare toolbox used to solve the model is based on the Blanchard-Kahn method. The Blanchard-Kahn condition and the rank condition are first examined after entering the specifications, parameters, ratios, model equations on this software and the amount of shocks. This is done by calculating the eigen values of the coefficients matrix [1] and analyzing them. According to the Blanchard-Kahn conditions, the number of eigen values greater than 1 must be equal to the number of the forward-looking variables in order to have a unique stable path. In addition, the matrix used in solution calculations must have the full rank. These conditions can be divided into two categories: when the eigen values are higher or lower than the number of forward-looking variables, there will be no stable pathway or there will be infinite paths. The Dynare will continue to calculate if there is only one unique stable path. According to Dynare estimations, the present model has 10 eigen values, out of which four are greater than 1. Given that the model has four forward-looking variables, therefore, the rank and Blanchard-Kahn conditions are satisfied. Then, the model summary is shown. This model has 13 variables, six state variables, two stochastic shocks and five static variables. In the next step, the covariance of exogenous shocks, changes (standard deviation and variance) of the simulated variables, analysis of variance, correlation matrix between endogenous variables, and autocorrelation coefficients of variables are presented up to five time delays. According to the model parameter estimation, the torques produced from the calibration of the model are close to real-world torques and there is a significant amount of information available in the data that can be used to update our prior distributions for the parameters used in the model. In other words, for most of the estimated parameters, there is informative information in the data. It means that, there is a significant difference between the later distributions and assumed pervious distributions. So, the designed model can describe the events occurring in the real-world of the Iranian economy and is considered as a successful model and the designed model can simulate the real-world data fluctuations and changes carefully.

Finally, a diagram will be plotted which shows instantaneous response of the variables to the defined shocks. These diagrams show the instantaneous response functions for each of the endogenous variables and can be useful in visualizing the shape of the transfer functions and the manner in which each variable of the shocks is affected. According to the results of modeling for Policy A, in this case, the revenues are directly transferred to the public budget of the state and are, thus, distributed between current expenditures and government investment.

1. In linear algebra, a coefficient matrix is a matrix consisting of the coefficients of the variables in a set of linear equations.

The household consumption increases in the face of oil shocks and from the government spending channel. Increased oil revenues lead to increased private and public capital expenditures. This increases the private and public capital and cause them to exceed the initial stable state. Then, non-oil production and employment will increase and the economy will be placed at a higher level by moving away from the initial stable situation. In contrast, the policy B is the result of a mild fluctuation of economic variables in the present study. In this policy, the reaction of economic variables is less than oil shocks. In other words, in the face of oil shocks, if oil revenues are stored in an oil fund and the government reinvests only part of the fund's returns in each period, economic variables experience a more stable situation.

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