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Investigating and Comparing the Impact of the Global Financial Crisis on the Economies of Iran and Turkey using (DSGE) Method

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Abstract

While most policymakers and economists agree that the global financial crisis will have adverse consequences for the global economy as a whole, relatively little empirical research has been done to examine the effects of the financial crisis on macro variables and the real sector of the Iranian economy. In this paper, we aim to examine the effect of the financial crisis on the economies of Iran (as a relatively closed economy) and Turkey (as a relatively open economy) in the framework of the new Keynesian school, using the two-country Dynamic Stochastic General Equilibrium (DSGE) model. For this purpose, using the parameters estimated by Bayesian method during the period 1998:1 to 2017: 4, the effects of the global financial crisis on the economies of Iran and Turkey were analyzed separately through the application of five shocks: monetary policy, investment, productivity in tradable and non-tradable goods and risk premium to the world economy. Then, the response of important macroeconomic variables of Iran and Turkey to these shocks such as GDP, consumption, inflation, investment, and net exports and the components of each of these variables were simulated. According to the findings of this study, both the economies are affected by the crisis, but the severity of the impact of the Iranian economy is less than the Turkish economy due to its less economic relationship with the world, but the persistence of the impact of shocks is greater on the Iranian economy than on the Turkish economy.

Keywords: Dynamic Stochastic General Equilibrium (DSGE), Financial Crisis, New Keynesian School, Iranian Economy, Turkish Economy.

JEL Classification: E12, G01, C68.

1. Introduction

The issue of financial crises and the governments' focusing on controlling or preventing its negative effects on the economies of countries is considered as one of the important issues of macroeconomics today. This is important because the emergence of a financial crisis can have a negative impact on the performance of the real sector of the economy of the countries. The financial crisis causes major shocks to production, trade, employment, income, and

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wealth. There are several definitions of the concept of the financial crisis. One of the relatively complete definitions is the one given by Kalsins and Kouzeh (2013). They believe that financial crisis is often accompanied by one or more of the following phenomena: significant changes in the volume of credit and the price of assets; severe disruptions in financial intermediaries and global financing for various actors in the economy; many problems in the balance sheets of companies, households, financial intermediaries and the government. According to this definition, we understand that the financial crisis phenomenon is not a new one in the world. The structure of an economy or a set of economies may face a financial crisis. The greater the entanglement and interdependence of economies are, the greater their influence on each other will be. The controversial issue is the impact of the global financial crisis on the Iranian economy. Iran faces a clear contradiction in its international relations and relation with the global economy. That is the Iranian economy, based on some available evidence and statistical indicators, is both strongly connected to the global economy and on the margins of the global economy. This issue has created an ambiguous situation regarding the position and impact of the Iranian economy on the world economy. Accordingly, this study intends to investigate this ambiguity in order to clarify the ambiguity mentioned in this regard using economic theories and new modeling techniques. In this regard, and to further deepen the results, in addition to the Iranian economy, the Turkish economy was also studied and a comparison between the results was made.

2. Method

Our model is a dual country DSGE model based on Slanicay's (2016) model. In this model, it is assumed that there are only two economies in the world: the domestic economy is denoted by D (for Iran or Turkey) and the foreign economy is denoted by F (for the rest of the world). One economy is much smaller than the other, and this is shown using the *n* parameter, which indicates the relative size of the two economies.

Households: It is assumed that the Iranian economy is made up of similar households that have an indefinite lifespan and, assuming that they gain utility by consuming goods and maintaining real cash balance and lose utility by working, they maximize its expected utility (MIU) function, as shown below.

$$U_t(j) = E_t \sum_{k=0}^{\infty} \beta^k \left[\frac{\varepsilon_{P,t+k}}{1-\sigma} (C_{t+k}(j) - H_{t+k})^{1-\sigma} + \frac{1}{1-b} \left(\frac{M_t}{p_t}\right)^{1-b} - \frac{1}{1+\xi} L_{t+k}(j)^{1+\xi} \right] \quad (1)$$

But, due to structural differences, the household utility function in the model of Turkey and the world is defined as follows:

$$U_t(j) = E_t \sum_{k=0}^{\infty} \beta^k \left[\frac{\varepsilon_{p,t+k}}{1-\sigma} (C_{t+k}(j) - H_{t+k})^{1-\sigma} - \frac{1}{1+\xi} L_{t+k}(j)^{1+\xi} \right] \quad (2)$$

Where E_t represents the expectations in period t, $0 \le \beta \le 1$ is the discount factor, σ represents the inverse of Elasticity of Intertemporal Substitution, $H_t = hC_{t-1}$ represents the external habit (keeping up with the Joneses), which is considered by the households as an exogenous variable. h shows the parameter of habit formation, C_t indicates the index of compound consumption, $\frac{M_t}{P_t}$ is the real cash balance, L_t denotes the labor supply, and ξ shows the inverse labor supply elasticity. $\varepsilon_{p,t}$ is the shock of the consumer preferences in period *t* that influence consumption decisions.

Firms: There are some monopoly and homogeneous competition firms in the commercial and non-commercial sectors that have an indefinite life in the domestic economy. Their production functions, of the Cobb-Douglas type, homogeneous of degree 1, in labor and capital (with constant returns pro-rata to the scale), are defined as follows:

$$\begin{aligned} Y_t(z_N) &= \varepsilon_{a^N,t} L_t(z_N)^{1-\eta} K_t(z_N)^{\eta} \\ Y_t(z_D) &= \varepsilon_{a^D,t} L_t(z_D)^{1-\eta} K_t(z_D)^{\eta} \end{aligned} \quad (3)$$

where η is the production elasticity to capital, and $(\varepsilon_{a^N,t})\varepsilon_{a^D,t}$ is the productivity shock in the tradable (non-tradable) sector.

International risk-sharing: The assumption of complete financial markets expresses favorable conditions for risk-sharing. The following conditions should be met as a requirement:

$$Q_t = k \frac{\varepsilon^*_{p,t}(C^*_t - h^* C^*_{t-1})^{-\sigma^*}}{\varepsilon_{p,t}(C_t - h\, C_{t-1})^{-\sigma}} \quad (4)$$

where *k* is constant and depends on the initial conditions, and Q_t is the real exchange rate.

Government and Central Bank: According to Tavakolian and Afzali (2016) and Esmailipour Masouleh et. al (2017), the monetary base or balance sheet of the Central Bank is considered as follows:

$$M_t = DC + FR \times Q \quad (5)$$

where DC represents the domestic credit, FR is the accumulation of foreign reserves of the Central Bank and Q shows the exchange rate.

But the behavior of the Central Bank in the world and also in Turkey - due to the independence of the Central Bank - is described by a kind of Taylor rule:

$$R_t = R_{t-1}^{\rho}\left[E_t\left\{\left(\frac{Y_{t+1}}{\overline{Y}}\right)^{\xi_y}\left(\frac{P_{C,t+1}}{(1+\overline{\pi})P_{C,t}}\right)^{\xi_\pi}\right\}\right]^{1-\rho}\varepsilon_{m,t} \quad (6)$$

Where R_t is the interest rate, ρ is the parameter of interest-rate smoothing, Y_t is the total production in the economy, $\overline{Y}$ denotes the stable level of production, $\overline{\pi}$ represents the level of inflation in steady-state, ξ_y shows the interest rate elasticity to production, ξ_π is the interest rate elasticity to inflation and $\varepsilon_{m,t}$ is the monetary policy shock.

Market-clearing conditions: The model is designed in compliance with the market-clearing conditions.

$$Y_{N,t} = C_{N,t} + I_{N,t} \quad (7)$$

$$Y_{D,t} = C_{D,t} + C_{D,t}^{*} + I_{D,t} + I_{D,t}^{*} \quad (8)$$

Total production in the economy is the sum of production in the tradable and non-tradable sectors:

$$Y_t = Y_{N,t} + Y_{D,t} \quad (9)$$

Data: In the current study, quarterly data related to Iranian and Turkish economies, on the one hand, and the United States based on Alp and Elekdag (2011) (as the world economy), on the other hand, for the period 1998:1 to 2017:4 were used. The time series of Iran's economic data was collected from the Central Bank and the International Monetary Fund, the US data were obtained from the International Monetary Fund and the Federal Reserve, and the Turkish economic data were obtained from the International Monetary Fund and the Central Bank of Turkey. Fifteen time series (five time series for each economy) including Real GDP, consumption, investment (at constant prices 2012), inflation and short-term interest rates were included. Except for inflation and short-term interest rates (Pfeifer, 2014), all observed variables were seasonally adjusted and expressed as logarithmic differences, then de-trended using the Hodrick Prescott filter with 677 for the Iranian economy and 1600 for the Turkish and American economies. The interest rate was calculated as the gross quarterly rate.

3. Research findings

The results showed that the effect of the 10% monetary policy shock was positive on Iran's investment and consumption and negative on the GDP and inflation and net exports; but this shock in the Turkish economy had a negative effect on the variables of GDP, investment, inflation, and net exports, and a

positive effect on the consumption of that country. The negative 10% shock effect of global investment was negative on the variables of production and inflation of the Iranian economy and positive on investment in consumption and net exports; And the effect of this shock was negative on the variables of production, consumption of the Turkish economy and positive on the other three important variables under study, namely inflation, investment, and net exports. The effect of a negative 10% productivity shock in the global tradable sector was negative on the variables of production, consumption, investment, and net exports in both the Iranian and the Turkish economy and positive on the inflation of both economies. With a negative 10% shock of productivity to the non-tradable sector of the world, consumption and investment in the Iranian economy were positively affected and the rest of the variables under study were negatively affected in this economy. In the Turkish economy, except for the two variables of investment and net exports, the other variables studied in this study were negatively affected by the negative productivity shock. The results show that the positive shock of consumption preferences has a negative effect on investment and consumption variables in Iran and a positive effect on other variables. The effect of this shock is positive on inflation and net exports in Turkey and negative on other variables in this economy. The model estimates shows that the effect of most shocks is more lasting on the Iranian economy than on the Turkish economy.

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