The Impact of Exchange Rate Policies and Liquidity Creation on Macroeconomic Variables: A DSGE Model Approach

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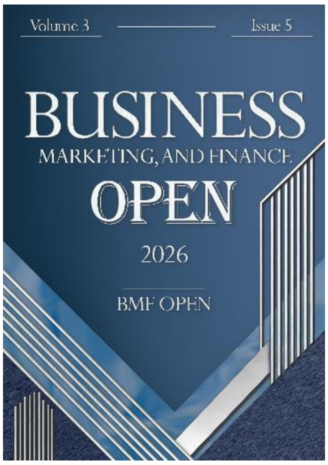

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Abstract: The present study aimed to investigate the effects of liquidity creation shocks and exchange rate policy shocks on macroeconomic variables. For this purpose, data from the period 1991–2023 were utilized. In order to analyze the effects of shocks, a Dynamic Stochastic General Equilibrium (DSGE) model was employed. The interdependence between exchange rate policy and monetary policy has consistently existed in the Iranian economy, making these policies one of the major challenges for economic policymakers in the country. In fact, based on published statistics, a significant portion of government budget expenditures is financed through foreign exchange revenues derived from oil exports and withdrawals from the foreign exchange reserve account. Consequently, the Central Bank is compelled to purchase foreign currency, which in turn leads to an increase in the monetary base. Furthermore, monetary policymakers require an accurate understanding of the transmission mechanisms of monetary policies under oil revenue conditions in order to achieve economic stability. This study examined the impact of exchange rate policy through changes in the exchange rate channel and the effect of monetary policy through the liquidity creation channel on macroeconomic variables. The results indicated that an exchange rate policy shock led to an increase in inflation, while simultaneously reducing consumption and income. In addition, shocks originating from liquidity expansion resulted in increases in inflation, production, and consumption.

Keywords: Exchange rate, liquidity creation, monetary policy, inflation rate, Dynamic Stochastic General Equilibrium (DSGE) model.

1. Introduction

Monetary policy and exchange rate policy are among the most influential macroeconomic policy instruments affecting economic stability, inflation dynamics, production growth, investment behavior, and financial system performance. In developing economies, particularly those characterized by dependence on commodity exports and structural financial imbalances, the interaction between monetary expansion and exchange rate fluctuations has become one of the principal concerns of policymakers and researchers. Exchange rate instability can directly affect inflation expectations, domestic prices, imports, exports, and financial market conditions, while liquidity creation and monetary expansion influence aggregate demand, credit allocation, and macroeconomic equilibrium. Consequently, understanding the simultaneous effects of exchange rate policy and liquidity creation on macroeconomic variables has become an essential issue in contemporary macroeconomic analysis [1-3].

The Iranian economy represents a significant case in this regard because of its dependence on oil revenues, the dominance of the banking system in financial intermediation, recurrent exchange rate fluctuations, and persistent inflationary pressures. In such an economic structure, fiscal and monetary policies are closely interconnected, and exchange rate developments rapidly transmit to domestic markets through inflationary channels and balance-sheet effects. Moreover, the financing of government deficits through monetary expansion has intensified liquidity growth and contributed to long-term inflationary trends. These conditions have increased the importance of investigating how monetary shocks and exchange rate shocks interact and influence macroeconomic variables within a coherent theoretical framework [4-6].

Theoretical foundations concerning the relationship between exchange rates, inflation, and monetary policy can be traced to classical and modern macroeconomic theories. Dornbusch's overshooting model demonstrated that monetary shocks may generate excessive exchange rate volatility due to sticky prices and adjustment frictions [1]. Subsequently, open-economy macroeconomic theories emphasized the role of monetary policy in determining exchange rate dynamics, capital flows, and inflation transmission mechanisms. In emerging economies, exchange rate fluctuations often have stronger effects on domestic production and inflation because imported intermediate goods, external debt structures, and weak financial markets amplify the transmission of external shocks [7, 8].

Recent empirical evidence has further highlighted the importance of exchange rate volatility and monetary uncertainty in developing economies. Oyadeyi (2024) showed that exchange rate volatility significantly affects economic performance and macroeconomic stability in Nigeria, emphasizing the role of monetary and fiscal coordination in controlling volatility [9]. Similarly, Doojav et al. (2024) demonstrated that exchange rate movements in commodity-exporting developing economies produce substantial effects on inflation, output, and consumption patterns through both trade and financial channels [10]. These findings suggest that economies dependent on commodity exports, such as Iran, are particularly vulnerable to exchange rate disturbances and external monetary shocks.

Monetary policy shocks have also attracted considerable attention in international macroeconomic literature. Gürkaynak et al. (2020) argued that unexpected monetary policy announcements significantly influence exchange rate behavior and financial market expectations [11]. Likewise, Gründler et al. (2022) emphasized that information shocks and monetary policy announcements affect exchange rate dynamics beyond conventional interest rate channels [12]. Carvalho et al. (2024) differentiated between temporary and permanent monetary policy shocks and concluded that the persistence of monetary disturbances plays a critical role in determining exchange rate adjustments and macroeconomic responses [3]. In emerging economies, Kim and Lim (2022) found that monetary policy shocks have strong effects on exchange rates due to financial market imperfections and exchange rate pass-through mechanisms [2].

In the Iranian context, exchange rate instability has become increasingly important because of sanctions, oil revenue fluctuations, and structural fiscal imbalances. Abdi Seyyed Kalaei et al. (2025) found that exchange rate fluctuations significantly affect unemployment in MENA countries, indicating the broad macroeconomic consequences of currency instability [13]. Davoodi and Sezavar (2022) showed that exchange rate increases under sanctions conditions intensify inflationary pressures and negatively influence macroeconomic stability in Iran [4]. Similarly, Sadeghi Shahedani et al. (2013), using a Bayesian VAR framework, confirmed a significant relationship between exchange rate changes and macroeconomic variables in the Iranian economy [14].

The banking system also plays a crucial role in transmitting monetary and exchange rate shocks to the real economy. Since Iran's financial system is predominantly bank-based, liquidity creation by banks directly influences investment, consumption, and inflation. Shahchera and Taheri (2016) emphasized that monetary policy transmission through bank lending channels and off-balance-sheet activities significantly affects economic fluctuations [15]. Likewise, Gohari Anaraki et al. (2022) demonstrated that liquidity shocks in the banking sector influence excess reserves and business cycles through DSGE mechanisms [16]. Goodarzi Farahani et al. (2021) further highlighted the importance of banking risks and financial frictions in determining macroeconomic outcomes in Iran using a DSGE framework [17].

The interaction between exchange rate fluctuations and financial markets has also been widely examined. Gol Arzi and Khorasani (2023) investigated symmetric and asymmetric effects of exchange rate volatility on stock returns in Iran's pharmaceutical industry and found nonlinear responses to currency fluctuations [18]. Similarly, Taghavi et al. (2022) demonstrated asymmetric effects of monetary policy and exchange rate fluctuations on stock market returns using a nonlinear autoregressive distributed lag approach [19]. These findings indicate that exchange rate shocks not only affect real-sector variables but also alter financial market behavior and investment incentives.

In addition to exchange rate effects, liquidity creation and monetary expansion constitute fundamental drivers of inflation and economic fluctuations. Monetary expansion can stimulate output and investment in the short run by increasing aggregate demand and credit availability; however, persistent liquidity growth often leads to inflationary pressures and macroeconomic instability. Meiri et al. (2015) investigated monetary jumps in the exchange rate and business cycle occurrence in Iran and found that liquidity shocks significantly intensify cyclical fluctuations [20]. Pekani et al. (2023) analyzed monetary policy effects through credit and balance-sheet channels using a DSGE framework and confirmed that monetary shocks affect macroeconomic variables through both financial and real-sector mechanisms [21].

Recent studies have increasingly emphasized the importance of uncertainty arising from monetary and exchange rate policies. Saeedi et al. (2025) demonstrated that uncertainty in monetary and exchange rate policies negatively affects financial stability in Iran using a Markov regime-switching approach [6]. Such uncertainty may weaken investment incentives, increase speculative activities, and amplify exchange rate pass-through to inflation. Therefore, understanding the dynamic effects of policy shocks requires a framework capable of capturing expectations, intertemporal decision-making, and structural relationships among macroeconomic agents.

Dynamic Stochastic General Equilibrium (DSGE) models have become one of the most widely used frameworks for analyzing monetary policy, exchange rate dynamics, and macroeconomic fluctuations. DSGE models integrate microeconomic foundations with macroeconomic interactions and allow researchers to evaluate policy shocks under rational expectations and dynamic optimization conditions. Liu (2008) highlighted the role of international shocks in business cycles using a DSGE-based framework [22]. Similarly, Kakavandi et al. (2021) developed a DSGE model for evaluating the effects of Central Bank of Iran policies on macroeconomic variables and emphasized the significance of monetary policy transmission mechanisms [23]. Goodarzi Farahani and Adeli (2022) also employed a DSGE approach to analyze the relationship between monetary policy and exchange rate jumps in Iran and found that exchange rate volatility substantially affects monetary stability [5].

Another important aspect in analyzing liquidity and monetary policy concerns financial frictions and asset liquidity. Beshears et al. (2025) argued that optimal illiquidity structures influence financial stability and intertemporal economic decisions [24]. Such findings are particularly relevant for economies where financial markets are underdeveloped and liquidity allocation heavily depends on the banking sector. In these economies, liquidity creation by banks may simultaneously stimulate production and increase inflationary pressures, thereby creating policy trade-offs for monetary authorities.

Despite extensive literature on monetary policy and exchange rate fluctuations, several research gaps remain. First, many previous studies have separately analyzed either exchange rate shocks or monetary policy shocks without simultaneously examining the interaction between liquidity creation and exchange rate policy within a unified DSGE framework. Second, in the context of Iran, relatively limited studies have incorporated banking-sector behavior, liquidity creation, government fiscal dependence on oil revenues, and exchange rate dynamics simultaneously in a coherent macroeconomic model. Third, the interaction between monetary policy, fiscal dominance, and exchange rate fluctuations under sanctions and external shocks requires further investigation because these structural characteristics distinguish the Iranian economy from many other developing countries.

Moreover, most previous empirical studies have relied on linear econometric methods such as VAR, ARDL, or BVAR approaches, which may not fully capture dynamic intertemporal optimization and forward-looking expectations among economic agents [14, 18]. DSGE models provide a more appropriate framework for analyzing policy shocks because they allow simultaneous modeling of households, firms, banks, government, and monetary authorities within a dynamic general equilibrium structure. Such models are particularly useful for evaluating policy effectiveness and understanding transmission mechanisms in economies characterized by financial frictions and structural imbalances [17, 21].

Given the importance of exchange rate instability, liquidity growth, inflation persistence, and banking-sector dynamics in the Iranian economy, examining the effects of monetary and exchange rate shocks using a DSGE framework can provide valuable insights for policymakers. Understanding how liquidity creation and exchange rate policy affect inflation, production, consumption, investment, and financial variables is essential for designing effective macroeconomic stabilization policies and reducing economic vulnerability to internal and external shocks.

Therefore, the aim of the present study is to investigate the effects of liquidity creation shocks and exchange rate policy shocks on selected macroeconomic variables in Iran using a Dynamic Stochastic General Equilibrium (DSGE) model framework.

2. Methodology

In this model, the economy is assumed to consist of the household sector, firms, commercial banks, the government, and the monetary authority. The decision-making process of each sector is explained below.

Household Sector

In the household sector, a representative agent with an infinite lifetime is considered who derives utility from consuming goods and services and holding money balances, while utility decreases through labor supply. The utility function considered in the New Keynesian framework for this representative household is as follows (Berg et al., 2013; Gerali et al., 2010):

$$\sum_{t=0}^{\infty} \beta^t E_t \left[\frac{(c_t)^{1-\sigma_c}}{1-\sigma_c} - \frac{(N_t)^{1+\sigma_n}}{1+\sigma_n} + \frac{1}{1-b}\left(\frac{M_t^h}{P_t}\right)^{1-b} \right] \qquad (1)$$

Equation (1) indicates that the household sector seeks to make optimal decisions regarding consumption (c_t), labor supply (n_t), and money holdings (m_t^h). In this equation, $E_t$denotes the expectation operator, $0 \leq \beta \leq$

1represents the discount factor, $\sigma_c \neq 1$is the inverse of the intertemporal elasticity of substitution in consumption, $\sigma_n$is the inverse of the intertemporal elasticity of substitution in labor, and $b \neq 1$denotes the interest elasticity of money demand. The representative household carries M_{t-1}units of liquidity from the previous period into the current period and supplies labor $N_t$to producing firms, where:

$$N_t = \int_0^1 N_{j,t}\ dj$$

The household receives wage income $w_t$from labor supply and pays taxes $T_t$to the government. In addition, households are assumed to be risk-averse and deposit an amount $D_t$of savings into banks, where D_t^srepresents long-term deposits earning an interest rate of $R_t^{ds} = 1 + r_t^{ds}$. The remaining portion, D_t^d, constitutes demand deposits. It is also assumed that deposit supply across different banks follows the pattern:

$$D_t = \int_0^1 D_{j,t}\ dj$$

Households are also willing to purchase participation bonds $(b_t)$and benefit from their returns. Another assumption is that households use bank credit $(l_t^h)$to finance current expenditures. Whenever households conclude that their recent consumption exceeds income, they borrow from banks. Since households are also the owners of firms, they receive investment loans $(l_t^i)$from banks at the interest rate $ltv_t^{li}$for productive investment purposes and repay them with interest in the following period. It is assumed that the higher the profit margin on investment loans, the greater the demand for such loans, and vice versa:

$$r_t^k > r_t^{li} \rightarrow r^k - r^{li} = \text{Investment Profit Margin}$$
$$l_t^i = qu \times r_t^k$$

The household budget constraint is specified as follows:

$$\begin{aligned} c_t + m_t^h + d_t^s + d_t^d + i_t + t_t \quad & +(1 + ltv_{t-1}^{lh})\left(\frac{l_{t-1}^h}{\pi_t}\right) \\ & +(1 + ltv_{t-1}^{li})\left(\frac{l_{t-1}^i}{\pi_t}\right) + b_t \\ = w_t n_t + r_t^k k_t \quad & +(1 + r_{t-1}^{dt})\frac{d_{t-1}^s}{\pi_t} + \frac{d_{t-1}^d}{\pi_t} \\ & + \frac{m_{t-1}^h}{\pi_t} + \frac{\pi_t^f}{P_t} + \frac{\pi_t^B}{P_t} \\ & +(1 + r_{t-1}^b)\frac{b_{t-1}}{\pi_t} \end{aligned} \tag{2}$$

where $\pi_t^f$and π_t^Bdenote firm profits and banking profits, respectively, which belong to households because they own firms and banks. The representative household also faces a capital accumulation constraint given by Equation (3) (Kakavandi et al., 2021):

$$k_{t+1} = (1 - \delta)k_t + i_t + l_t^i - \frac{\phi_k}{2}\left(\frac{k_{t+1}}{k_t} - 1\right)^2 \tag{3}$$

where $0 < \delta < 1$is the depreciation rate of capital and $\phi_k \geq 0$represents capital adjustment costs. Since bank loans obtained for investment purposes increase future capital stock, the household sector seeks to maximize its utility function with respect to m_t, N_t, d_t, k_t, c_t, l_t, and b_t, subject to the budget constraint.

Firm Sector

Firms in this sector are divided into intermediate goods producers and final goods producers. Each intermediate producer is assumed to produce a differentiated good (j)using a combination of labor and capital and sells it under monopolistic competition within a New Keynesian framework. Intermediate firms are also assumed to obtain working capital loans $(l_t^f)$to finance part of labor and capital costs. Accordingly, the following production function is adopted based on the literature (Gohari et al., 2022):

$$Y_{j,t} = A_t K_{j,t}^{\alpha} N_{j,t}^{1-\alpha} \qquad (4)$$

where $\alpha \in (0,1)$denotes the elasticity of substitution between labor and capital, and $A_t$represents technology, modeled as a first-order autoregressive process:

$$A_t = \rho_A A_{t-1} + \varepsilon_t^A, \varepsilon_t^A \sim iid.N(0, \sigma_A^2) \qquad (5)$$

where ε_t^Adenotes a technology or productivity shock assumed to follow a normal distribution with zero mean and variance σ_A^2.

As noted earlier, intermediate firms use bank loans to finance part $(\gamma)$of production costs:

$$L_{j,t}^f = \gamma(P_{j,t} r_t^k k_{j,t} + P_{j,t} w_t n_{j,t}) \qquad (6)$$

On the other hand, intermediate firms also face Rotemberg (1982) price adjustment costs:

$$PAC_{j,t} = \frac{\phi_p}{2}\left(\frac{P_{j,t}}{P_{j,t-1}\bar{\pi}} - 1\right)^2 Y_t \qquad (7)$$

where $\phi_p \geq 0$is the adjustment cost parameter or degree of price stickiness, $\bar{\pi}$is the steady-state inflation rate, and $Y_t$denotes aggregate output. Firms generally seek to maximize profits or minimize costs. In this study, the profit-maximization problem is specified as follows (Goodarzi Farahani et al., 2021):

$$E_t \sum_{t=0}^{\infty} \left[\lambda_t \beta^t \frac{\pi_t^f}{P_t}\right] \qquad (8)$$

The nominal profit function of firms is given by:

$$\pi_{j,t}^f = P_{j,t} Y_{j,t} - P_t mc_t Y_{j,t} - PAC_{j,t} \qquad (9)$$

where $PAC_{j,t}$denotes price adjustment costs and mc_trepresents the marginal cost of production. Thus, intermediate firms maximize expected profits subject to Equations (4)–(7), capital stock $k_{j,t}$, labor input $N_{j,t}$, and loans received $l_{j,t}^f$.

Final Goods Producer

The final goods producer purchases intermediate goods and produces the final output using a Dixit–Stiglitz aggregation function. The production function is given as follows:

$$Y_t = \left(\int_0^1 Y_{j,t}^{\frac{\theta-1}{\theta}} dj \right)^{\frac{\theta}{\theta-1}}, \theta > 1 \qquad (10)$$

where $Y_{j,t}$ denotes the output of intermediate firms and θ is the constant elasticity of substitution. The final goods producer maximizes profits based on prices charged by intermediate firms. After deriving the first-order conditions, demand for each differentiated good is obtained as:

$$Y_{j,t} = \left(\frac{P_{j,t}}{P_t} \right)^{-\theta} Y_t \qquad (11)$$

where demand for good j depends on the relative price $\frac{P_{j,t}}{P_t}$ and final output Y_t. Imposing the zero-profit condition for final goods producers yields the aggregate price index:

$$P_t = \left(\int_0^1 P_{j,t}^{1-\theta} dj \right)^{\frac{1}{1-\theta}} \qquad (12)$$

Banking Sector

The financial system in Iran is bank-based, meaning that banks play a dominant role in financial intermediation. The main challenge facing commercial banks is maximizing cash flows subject to balance sheet constraints. Equation (13) presents the bank's objective function given the structure of its balance sheet, where assets include loans (L_t) and government bonds (GB_t^{db}), while liabilities include deposits (IB_t) and bank capital (K_t^b):

$$\begin{aligned} \max E_0 \sum_{t=0}^{\infty} \beta_P^t \lambda_t^P [\quad & (1+R_t)^b \eta_t(j) B_t(j)(1-\delta_t^{db}) \\ & +(1+r_t^g)(1-\eta_t(j))B_t(j) \\ & -(1+r_t^{ib}) IB_t(j) \\ & -K_t^b(j) - Adj_t^{kb}(j) - Adj_t^{mc}(j)] \end{aligned} \qquad (13)$$

where $\beta_P^t \lambda_t^P$ denotes the stochastic discount factor, and R_t^b, r_t^g, and r_t^{ib} are respectively the net loan rate, government bond yield, and interbank interest rate.

The adjustment cost term is defined as:

$$Adj_t^{kb}(j) = \frac{k_{kb}}{2} \left(\frac{K_t^b(j)}{B_t(j)} - \nu_b \right)^2 K_t^b(j) \qquad (14)$$

where K_t^b is the required bank capital. The lower the ratio of bank capital to total assets, the higher the penalty cost of extending an additional unit of loans. The parameter ν^b is set at 8% according to Basel III capital adequacy requirements.

Following Dib (2010), Adj_t^{mc} is interpreted as a monitoring or supervisory adjustment cost:

$$Adj_t^{mc}(j) = \frac{\chi_{db}}{2} [(\eta_t(j) - \bar{\eta}) B_t(j)]^2 \qquad (15)$$

Banks with funding shortages must satisfy the following balance sheet constraint:

$$B_t(j) = IB_t(j) + K_t^b(j) \qquad (16)$$

where total assets B_t consist of government bonds and loans:

$$B_t(j) = L_t(j) + GB_t^{db}(j) \qquad (17)$$

IB_t denotes interbank borrowing by deficit banks from surplus banks, while bank capital evolves according to:

$$K_t^b(j)\pi_t = (1-\delta_b)K_{t-1}^b(j) + \Omega J_{t-1}^{db}(j) \qquad (18)$$

where δ_b and Ω denote the depreciation rate of bank capital and the share of retained earnings allocated to capital accumulation, respectively. The parameter η represents the share of loans in total bank assets:

$$L_t(j) = \eta_t(j)B_t(j) \qquad (19)$$

Government and Monetary Authority

The most important part of the present model is the modeling of the government and the central bank. Due to the lack of central bank independence in Iran, the government and the central bank cannot be modeled separately; instead, they must be considered within an integrated framework. The government aims to maintain a balanced budget, while the central bank acts in a manner that facilitates this objective. At the same time, the central bank attempts to implement monetary policy to achieve price stability and economic growth.

The government finances current and development expenditures through lump-sum taxes, bond issuance, and oil revenues. If these three revenue sources are sufficient to balance the budget, money creation does not occur, and the central bank can implement monetary policy independently of fiscal constraints. However, if a deficit persists, the government finances it through borrowing from the central bank or withdrawing deposits held at the central bank, which implies money creation and fiscal dominance. Moreover, foreign exchange revenues from oil sales also affect the monetary base. Accordingly, the government budget constraint is expressed as:

$$G_t + \frac{(1+r_t)B_{t-1}}{P_t} + T_t = Ta_t + \frac{w \cdot OR_t}{P_t^c} + \frac{B_t}{P_t} + \frac{M_t - M_{t-1}}{P_t} \qquad (20)$$

where Ta_t denotes lump-sum taxes, B_t government bonds, $\frac{M_t - M_{t-1}}{P_t}$ changes in the monetary base, T_t government transfers, G_t government expenditures, and OR_t oil revenues. The government spends a proportion w of oil revenues through the budget.

The monetary base is defined as:

$$MB_t = DC_t + FR_t \qquad (21)$$

where DC_t denotes domestic credit and FR_t represents foreign reserves (net foreign assets) of the central bank. Dividing both sides by P_t yields the real monetary base:

$$mb_t = dc_t + fr_t \qquad (22)$$

Real foreign reserve accumulation evolves according to:

$$fr_t = \frac{fr_{t-1}}{\pi_t} + \omega or_t \qquad (23)$$

This specification assumes that foreign reserve accumulation depends on the direct sale of oil revenues by the government to the central bank. Specifically, the government sells a proportion $\omega \in (0,1)$ of oil revenues directly to the central bank in exchange for domestic currency, while the remaining $1-\omega$ is deposited into the National Development Fund. Consequently, the real stock of the fund evolves according to:

$$nfr_t = \frac{nfr_{t-1}}{\pi_t} + (1-\omega)or_t \qquad (24)$$

Given that the main objective of the Central Bank of Iran is controlling the monetary base and that a conventional nominal interest rate mechanism is absent, this study employs a rule similar to the Taylor rule, in which money growth replaces the nominal interest rate as the primary policy instrument. The rule incorporates inflation deviation from target inflation, the output gap, and exchange rate deviation from the target exchange rate:

$$m_t = \alpha_0 + \alpha_1(\pi_t - \pi^*) + \alpha_2(y_t - y^*) + \alpha_3(e_t - e^*) + \varepsilon_t^m \qquad (25)$$

where $m_t$is the monetary base growth rate, $(\pi_t - \pi^*)$denotes inflation deviation from target inflation, $(y_t - y^*)$is the output gap, and $(e_t - e^*)$represents exchange rate deviation from the target level. The disturbance term follows:

$$\varepsilon_t^m \sim N(0, \sigma_r^2)$$

The liquidity creation shock is assumed to follow a first-order autoregressive process:

$$m_t = \rho_m m_{t-1} + \varepsilon_t^m, \varepsilon_t^m \sim iid.N(0, \sigma_m^2) \qquad (26)$$

Similarly, the exchange rate shock follows:

$$e_t = \rho_e e_{t-1} + \varepsilon_t^e, \varepsilon_t^e \sim iid.N(0, \sigma_e^2) \qquad (27)$$

where $\varepsilon_t^e$is normally distributed with zero mean and variance σ_e^2.

Market Clearing Conditions

It is assumed that the final goods market is in equilibrium, implying that aggregate supply equals aggregate demand:

$$y_t = c_t + i_t + g_t + im_t - ex_t \qquad (28)$$

Accordingly, total output (y_t)must equal total demand, including private consumption, investment, government expenditures, and net exports. Model parameters are estimated using Dynare under MATLAB software. In this study, the effects of exchange rate shocks and liquidity creation shocks on selected macroeconomic variables, including inflation, interest rates, output, consumption, and investment, are evaluated, and the impacts of monetary and exchange rate policy shocks are compared.

3. Findings and Results

After introducing the model, the coefficients can be calculated through calibration, estimation, or both. The decision to use these methods may depend on the computational characteristics of the model. In this study, the Bayesian method was used to estimate the model parameters. In this method, initial values for the parameters are specified as prior distributions, and these initial values are combined with maximum likelihood estimation results based on actual data.

To calculate the log-linearized values of the variables, that is, deviations from the steady-state values of the variables, the cyclical components of the logarithm of the data were extracted using the Hodrick–Prescott (HP) filter with $\lambda = 677$. Before estimating the model parameters, it is necessary to calibrate the parameters and indicators that are expressed as ratios or do not require estimation. These parameters are obtained from the steady-state values of the variables, and the mean values of these ratios are considered their steady-state values; therefore, they do not need to be estimated. In this study, the ratio of foreign reserves to money is 0.52, the ratio of net exports to output is 0.05, the ratio of government expenditures to output is 0.41, the ratio of investment to output is 0.21, the ratio of oil exports to the central bank's foreign assets is 0.16, the ratio of domestic credit to money is 0.41, and the average interest rate on government bonds is 1.03.

For Bayesian estimation of the model parameters, the prior distribution, prior mean, and prior standard deviation of the parameters must first be determined. Then, using Dynare under MATLAB software and based on the Markov Chain Monte Carlo method within the Metropolis–Hastings algorithm, the posterior mean and posterior standard deviation of the parameters are calculated. Table 1 reports the prior and posterior distributions and means of the model parameters. The posterior mean values indicate the estimates of the model parameters obtained using the Bayesian method.

Table 1. Prior and Posterior Distributions of Model Parameters

Parameter	Parameter Distribution	Prior Mean	Posterior Mean
Household subjective discount rate	Beta	0.99	0.99
Labor supply elasticity	Normal	0.89	0.74
Credit constraint coefficient	Gamma	0.85	0.85
Share of capital in production	Beta	1.56	1.56
Share of labor in production	Beta	0.45	0.41
Government share of oil revenues	Beta	0.65	0.64
Inverse interest elasticity of monetary assets	Gamma	0.85	0.91
Degree of goods price indexation	Beta	0.68	0.45
Financial market friction	Beta	0.31	0.31
Standard deviation of technology shock	Inverse Gamma	0.014	0.014
Standard deviation of monetary policy shock	Inverse Gamma	0.012	0.012
Standard deviation of exchange rate shock	Inverse Gamma	0.015	0.014
Autoregressive coefficient of technology shock	Beta	0.72	0.48
Autoregressive coefficient of exchange rate shock	Beta	0.69	0.35
Autoregressive coefficient of monetary policy shock	Beta	0.87	0.65
Inflation weight coefficient in the monetary reaction function	Normal	1.47	0.99
Output weight coefficient in the monetary reaction function	Normal	1.34	0.98
Exchange rate weight coefficient in the monetary reaction function	Normal	1.29	0.42

One of the important outputs of Dynare is the presentation of figures known as MCMC plots. Dynare runs the Metropolis–Hastings simulation several times, beginning each time from a different point. If the results of these chains are reasonable, the behavior of the chains should be similar or should converge toward one another. Dynare presents three indices through MCMC plots, namely $m2$, $m3$, and interval, which respectively represent the 80% confidence interval for the mean, variances, and third moments of the parameters. In the multivariate diagnostic plots, the same diagrams with similar characteristics are presented, providing an overall index based on the eigenvalues of the variance–covariance matrix of each parameter. These plots provide evidence of convergence and relative stability across all moments of the parameters. If these plots do not show graphical similarity, it indicates that the prior distributions are not appropriate, and the estimation should be repeated with new prior distributions or the number of Metropolis–Hastings simulations should be increased. Figures 1 and 2 present the results of the first, second, and third MCMC moments and the multivariate diagnostic plots, respectively.

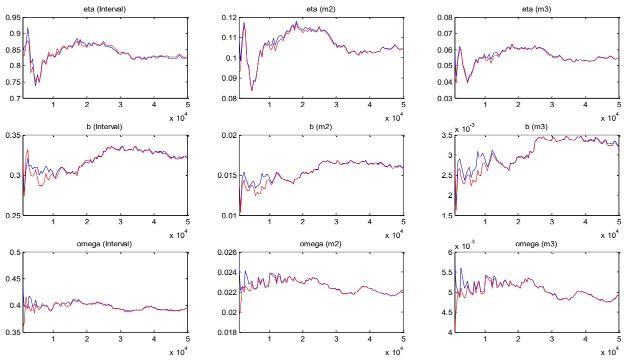

Figure 1. MCMC

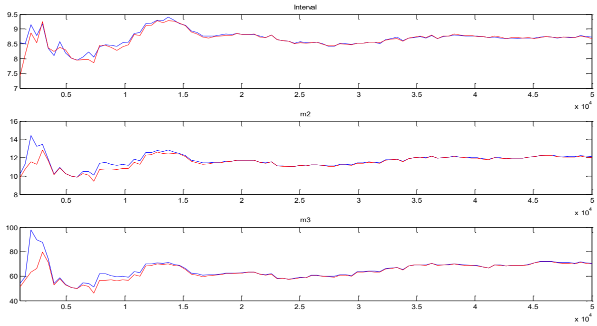

Figure 2. Multivariate Diagnostic Plots

As observed, the MCMC plot and convergence in the other diagrams indicate the goodness of fit of the model. Impulse response functions show the dynamic behavior of the model variables over time when shocks equivalent to one standard deviation are imposed on each variable. In this section, by incorporating the results obtained from estimating the model parameters, the effects of monetary policy shocks and exchange rate policy shocks on macroeconomic variables are examined.

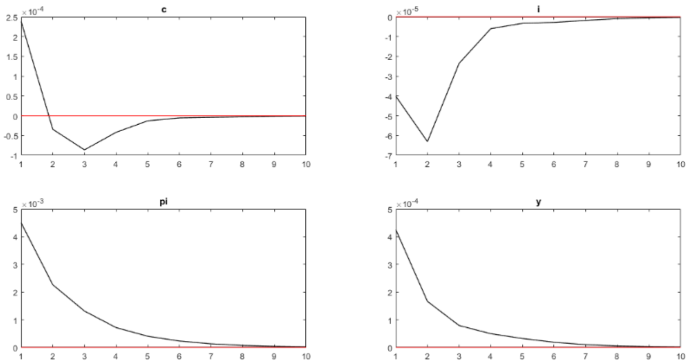

Figure 3. Response of Macroeconomic Variables to a Monetary Policy Shock

The results obtained from the monetary policy shock indicate that household consumption expenditures decreased. The effect of the shock tended to decline from the third period onward and disappeared in the long run. The inflation variable increased sharply in response to the imposed shock, and it took 20 periods for the shock to dissipate. Government tax revenues increased due to the rise in output, and the effect of the shock on this variable disappeared in the long run. The money supply in the economy also increased in response to the shock. The interest rate related to capital rental increased in response to the shock, and its effect disappeared in the long run.

Government debt also decreased in response to the shock, and the effect of the shock disappeared in the long run. Given the increase in the interest rate, the level of investment decreased.

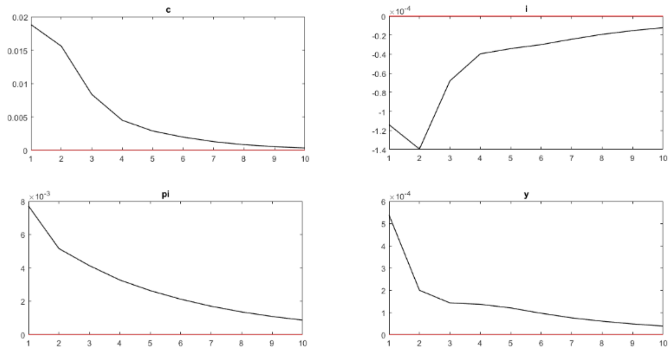

Figure 4. Response of Macroeconomic Variables to an Exchange Rate Policy Shock

In the second part, it was also observed that, following the shock arising from exchange rate policy, private-sector consumption expenditures initially increased but showed a negative response to this shock in the medium run. Due to the financing of the government budget deficit through bond issuance, the money supply was observed to decrease. Investment and government debt also showed a negative response to the imposed shock. Output and inflation increased in response to this shock, and the effect of the shock disappeared in the long run.

4. Discussion and Conclusion

The present study investigated the effects of liquidity creation shocks and exchange rate policy shocks on selected macroeconomic variables in Iran using a Dynamic Stochastic General Equilibrium (DSGE) framework. The findings demonstrated that both monetary policy shocks and exchange rate shocks exert significant effects on inflation, production, consumption, investment, government debt, and money supply dynamics. The estimated impulse response functions indicated that monetary policy shocks generated immediate increases in inflation and liquidity while reducing household consumption expenditures and investment in the short run. In contrast, exchange rate shocks initially stimulated certain macroeconomic variables such as output and inflation but generated adverse medium-term effects on private consumption, investment, and government debt dynamics. These findings highlight the importance of monetary and exchange rate interactions in economies characterized by structural imbalances, financial frictions, and fiscal dependence on oil revenues.

One of the principal findings of this study was the significant increase in inflation following liquidity creation shocks. The results indicated that expansionary monetary shocks increased the money supply and generated persistent inflationary pressures that lasted for approximately 20 periods before gradually dissipating. This finding is theoretically consistent with monetarist and New Keynesian perspectives emphasizing the inflationary consequences of excessive money creation in economies with weak productive capacity and structural rigidities [1, 11]. In the Iranian economy, where fiscal deficits are frequently financed through monetary expansion and banking-sector credit creation, liquidity growth rapidly translates into aggregate demand expansion and inflationary pressures. The results are also consistent with the findings of Meiri et al. (2015), who demonstrated that monetary jumps and liquidity expansion significantly intensify business cycle fluctuations and inflationary dynamics in Iran [20]. Similarly, Pekani et al. (2023) found that monetary policy shocks transmitted through credit and balance-sheet channels substantially affect inflation and macroeconomic instability [21].

The increase in inflation resulting from monetary shocks can also be explained through the exchange rate pass-through mechanism. In economies dependent on imported intermediate and capital goods, monetary expansion weakens the domestic currency and increases import prices, thereby accelerating inflation. This interpretation is supported by the findings of Carvalho et al. (2024), who argued that persistent monetary shocks significantly affect exchange rate dynamics and inflation expectations [3]. Likewise, Kim and Lim (2022) demonstrated that emerging economies experience stronger exchange rate responses to monetary policy shocks because of financial market imperfections and high exchange rate pass-through coefficients [2]. Therefore, the inflationary effects observed in this study reflect both domestic liquidity expansion and indirect exchange rate transmission mechanisms.

Another important finding of this study concerns the decline in household consumption expenditures following monetary policy shocks. Although monetary expansion is conventionally expected to stimulate aggregate demand, the findings showed that consumption decreased in response to liquidity shocks. This result may initially appear counterintuitive; however, in the context of the Iranian economy, persistent inflation generated by monetary expansion reduces real purchasing power and increases uncertainty regarding future economic conditions. Consequently, households tend to reduce real consumption expenditures and increase precautionary behavior. Such a mechanism is consistent with the arguments of Beshears et al. (2025), who emphasized that liquidity conditions and uncertainty regarding financial stability influence intertemporal consumption decisions and asset allocation behavior [24]. Moreover, Saeedi et al. (2025) demonstrated that uncertainty arising from monetary and exchange rate policies negatively affects financial stability and economic confidence in Iran [6]. Therefore, inflationary monetary shocks may undermine consumption by weakening real incomes and increasing macroeconomic uncertainty.

The results also showed that monetary policy shocks increased the rental rate of capital and reduced investment levels. This finding can be explained by the fact that inflationary pressures generated by monetary expansion increase financing costs and reduce the efficiency of productive investment. Higher borrowing costs and financial uncertainty discourage long-term investment projects, particularly in economies with underdeveloped financial markets and banking-sector vulnerabilities. This result aligns with the findings of Goodarzi Farahani et al. (2021), who highlighted the role of banking risks and financial frictions in influencing macroeconomic performance through DSGE channels [17]. Likewise, Shahchera and Taheri (2016) argued that monetary transmission through the banking system significantly affects credit allocation and investment behavior [15]. In addition, the reduction in investment observed in this study may reflect expectations of future macroeconomic instability and reduced profitability of productive activities under inflationary conditions.

The findings further revealed that government tax revenues increased following monetary policy shocks because of temporary increases in production and nominal economic activity. However, these effects gradually disappeared in the long run. This outcome suggests that monetary expansion may generate short-run fiscal improvements through nominal income growth, but persistent inflation ultimately reduces macroeconomic efficiency and sustainable fiscal performance. In economies characterized by fiscal dominance, such as Iran, government dependence on monetary financing creates cyclical interactions between inflation, public debt, and monetary instability. This interpretation is consistent with the findings of Kakavandi et al. (2021), who emphasized the interconnected nature of fiscal and monetary policy in Iran's macroeconomic structure [23].

Another major result of this study concerns the effects of exchange rate policy shocks on macroeconomic variables. The impulse response functions showed that exchange rate shocks increased inflation and output in the short run but generated negative medium-term effects on private consumption and investment. These findings support the traditional open-economy macroeconomic argument that exchange rate depreciation initially improves competitiveness and stimulates output through export expansion; however, persistent depreciation ultimately increases production costs, inflation, and uncertainty [1, 8]. In commodity-exporting economies, exchange rate depreciation often increases export revenues and stimulates domestic production in the short run. Nevertheless, because production structures rely heavily on imported intermediate goods and foreign technology, the inflationary effects of depreciation eventually outweigh the initial output gains.

The positive short-run response of output to exchange rate shocks observed in this study is consistent with the findings of Doojav et al. (2024), who showed that exchange rate movements in commodity-exporting developing economies significantly affect output and trade dynamics [10]. Similarly, Noferesti et al. (2021) found that exchange rate changes influence macroeconomic variables in Iran through the banking system and credit allocation channels [25]. However, the negative medium-term effects on consumption and investment indicate that exchange rate instability ultimately weakens domestic economic welfare and productive efficiency.

The increase in inflation following exchange rate shocks was another important result. Exchange rate depreciation directly increases the domestic prices of imported consumption and capital goods, thereby accelerating inflationary pressures. This phenomenon is especially significant in economies such as Iran where imported intermediate goods play a central role in domestic production. The findings are aligned with those of Davoodi and Sezavar (2022), who demonstrated that exchange rate increases under sanctions intensify inflationary pressures and negatively affect macroeconomic stability in Iran [4]. Likewise, Abdi Seyyed Kalaei et al. (2025) emphasized that exchange rate fluctuations significantly affect labor market conditions and macroeconomic performance in MENA economies [13]. The inflationary consequences of exchange rate shocks in the present study therefore confirm the existence of strong exchange rate pass-through mechanisms in the Iranian economy.

Another notable finding was the reduction in money supply following exchange rate policy shocks. This outcome reflects the financing of fiscal deficits through government bond issuance rather than direct monetary expansion. In this context, the government attempts to absorb liquidity through debt issuance to stabilize exchange rate conditions. However, such policies may increase borrowing costs and reduce private-sector investment. This finding is consistent with the arguments of Goodarzi Farahani and Adeli (2022), who showed that exchange rate jumps significantly affect monetary policy transmission and macroeconomic stability in Iran [5]. Moreover, Gohari Anaraki et al. (2022) highlighted the importance of liquidity shocks and banking-sector behavior in shaping business cycle dynamics through DSGE mechanisms [16].

The negative response of government debt to monetary shocks and exchange rate shocks can also be interpreted within the framework of fiscal dominance and monetary adjustment mechanisms. Inflation generated by monetary expansion reduces the real value of government liabilities in the short run, while exchange rate shocks encourage governments to rely more heavily on debt management and fiscal adjustment tools. However, such effects are temporary and may ultimately weaken fiscal sustainability if inflationary pressures persist. Saeedi et al. (2025) argued that uncertainty associated with monetary and exchange rate policies negatively affects financial stability and increases macroeconomic vulnerability [6]. Therefore, reliance on short-term monetary or exchange rate adjustments may produce temporary stabilization effects while generating long-term structural instability.

The present study contributes to the existing literature in several important ways. First, it simultaneously examined the effects of liquidity creation shocks and exchange rate policy shocks within a unified DSGE framework, allowing for a more comprehensive understanding of macroeconomic interactions in Iran. Second, the study incorporated banking-sector behavior, government fiscal dependence on oil revenues, and monetary policy transmission mechanisms into a coherent structural model. Third, the findings highlighted the importance of financial frictions, inflation expectations, and fiscal dominance in shaping macroeconomic responses to policy shocks.

Overall, the results indicate that both monetary expansion and exchange rate instability generate substantial macroeconomic consequences in the Iranian economy. While monetary shocks temporarily stimulate certain nominal variables, they also intensify inflationary pressures and reduce consumption and investment. Similarly, exchange rate shocks may initially stimulate output but eventually weaken macroeconomic stability through inflation and financial uncertainty. These findings underscore the necessity of coordinated monetary, fiscal, and exchange rate policies aimed at controlling inflation, stabilizing expectations, and reducing structural dependence on monetary financing and oil revenues.

One limitation of the present study is that the DSGE model was estimated using a limited number of observable macroeconomic variables and simplified assumptions regarding household and firm behavior. Although the model incorporated financial frictions and banking-sector dynamics, some institutional features of the Iranian economy, such as informal financial markets, multiple exchange rate systems, and political uncertainty, were not explicitly modeled. In addition, the study focused primarily on aggregate macroeconomic variables and did not examine sector-specific responses to monetary and exchange rate shocks.

Future research could extend the present framework by incorporating heterogeneous households, multiple production sectors, and nonlinear adjustment mechanisms into the DSGE structure. Further studies may also investigate the asymmetric effects of positive and negative exchange rate shocks, as well as the interaction between sanctions, oil price volatility, and monetary policy transmission mechanisms. Moreover, comparative analyses between Iran and other oil-exporting developing economies could provide deeper insights into the role of institutional and structural differences in shaping macroeconomic responses to policy shocks.

From a policy perspective, the findings of this study suggest that policymakers should avoid excessive reliance on monetary expansion as a tool for financing fiscal deficits because persistent liquidity creation generates inflationary pressures and weakens investment and consumption. Strengthening central bank independence, improving coordination between fiscal and monetary authorities, and reducing dependence on oil revenues could contribute to greater macroeconomic stability. Furthermore, exchange rate stabilization policies should be implemented alongside structural reforms aimed at improving domestic production capacity, strengthening financial markets, and reducing vulnerability to external shocks.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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