Analysis of the convergence of optimal monetary policies in Iran's economy and welfare

Mostafa Eskandari[a], Abbas Memarnejad[a,*], Seyed Shamsoldin Hoseini[b]

[a]Department of Economics, Science and Research Branch, Islamic Azad University, Tehran, Iran

[b]Department of Economics, Allameh Tabatabaei University, Tehran, Iran

(Communicated by Javad Vahidi)

Abstract

This study analyzes the convergence of optimal monetary policies in Iran and their impact on societal welfare using a Dynamic Stochastic General Equilibrium (DSGE) model. It evaluates strategic monetary interventions for economic stability and growth, employing an analytical-descriptive and applied research method. The model was calibrated with annual data from 1390 to 1401 (Iranian calendar years) from the Statistical Center of Iran and the Central Bank. Results show that optimal monetary policies significantly enhance economic stability and welfare by controlling inflation, stabilizing exchange rates, and promoting growth. The study emphasizes the need for coordinated monetary and fiscal policies and greater central bank independence. It suggests exploring unconventional monetary policies during economic crises, providing valuable insights for policymakers and future research.

Keywords: optimal monetary policies, dynamic stochastic general equilibrium (DSGE) model, economic stability, fiscal policy, inflation control, economic growth, unconventional monetary policies
2020 MSC: 91B51, 91B62

1 Introduction

Monetary policy, defined as the process by which a central bank manages a nation's money supply and interest rates, plays a crucial role in achieving macroeconomic objectives such as controlling inflation, managing employment levels, and fostering economic growth [9]. The effectiveness of monetary policy is often measured by its ability to positively influence these key economic indicators.

The concept of optimal monetary policy involves strategically using monetary tools to achieve the best possible economic outcomes. This typically includes maintaining price stability, achieving sustainable economic growth, and minimizing unemployment. Theoretical frameworks such as the Dynamic Stochastic General Equilibrium (DSGE) models are frequently employed to analyze and predict the impact of monetary policy interventions [7]. These models incorporate microeconomic foundations, including the behaviour of households and firms, and macroeconomic variables, providing a comprehensive view of the economy. In the Iranian context, the central bank's independence, or lack thereof, significantly affects the implementation and outcomes of monetary policies. Historically, Iran's monetary

policy has been influenced by various internal and external factors, including political decisions, international sanctions, and oil price fluctuations [18]. These factors have created a complex economic environment where the efficacy of monetary policy is continually tested.

DSGE models have become an essential tool for central banks worldwide, including Iran, for formulating and assessing monetary policy. These models are based on microeconomic principles and incorporate random fluctuations to simulate how economies respond to various shocks [12]. By calibrating these models with real-world data, policymakers can predict the outcomes of different monetary policy scenarios and make informed decisions. In Iran, DSGE models are particularly useful given the volatile economic environment. The calibration process involves adjusting the model parameters to reflect the actual economic conditions accurately. This study uses data from 1390 to 1401 (Iranian calendar years)~ 2021 to 2022 (Gregorian calendar years) to calibrate the DSGE model and assess the convergence of optimal monetary policies [17].

Calibration is a critical step in the empirical evaluation of DSGE models. It involves assigning values to model parameters based on empirical data and existing literature. In the absence of comprehensive domestic studies, standard values from global literature are often employed [3]. Parameters that lack robust empirical support can be evaluated by comparing the model's predicted moments with actual economic data. Model validation is achieved by comparing the moments generated from the calibrated model with real-world moments. This process ensures that the model accurately represents the economic reality and can reliably predict the outcomes of various monetary policy interventions [14]. In this study, key indicators such as inflation, output, and interest rates are used to validate the model.

The concept of convergence in monetary policies refers to the alignment of a country's monetary policy framework with optimal practices that achieve desired economic outcomes. In Iran, this involves assessing how well the central bank's policies align with optimal strategies that promote economic stability and growth [15]. The study examines the impact of these policies over several periods, divided into five sub-periods from 1390 to 1401, to capture the dynamic nature of policy implementation and its effects. The analysis focuses on key variables such as consumer prices, wages, exchange rates, and inflation, which directly influence societal welfare. By simulating different policy scenarios, the study aims to identify the most effective monetary strategies for enhancing economic welfare [9].

Monetary policy does not operate in isolation; it interacts with fiscal policy, which involves government spending and taxation decisions. The interaction between these policies is crucial for achieving overall economic stability. In many cases, coordinated monetary and fiscal policies can enhance the effectiveness of economic interventions [2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23]. In Iran, the coordination between monetary and fiscal policies has been challenging due to various economic and political factors. This study explores how these interactions affect the convergence of optimal monetary policies and their impact on welfare. By analyzing the joint effects of monetary and fiscal policies, the research provides a comprehensive view of the policy landscape [5].

Several challenges and limitations exist in analyzing the convergence of optimal monetary policies in Iran. These include data limitations, political and economic instability, and the influence of external factors such as international sanctions and oil price volatility. These factors complicate the calibration and validation of DSGE models and the interpretation of their results [6]. Moreover, the central bank's lack of independence poses significant challenges to implementing optimal monetary policies. Political interference and external pressures often lead to suboptimal policy decisions that hinder economic stability and growth [10]. The findings of this study have important policy implications. By identifying the most effective monetary policies and understanding their interactions with fiscal policies, policymakers can design strategies that enhance economic stability and welfare. The study recommends greater independence for the central bank to ensure that monetary policy decisions are based on economic considerations rather than political influences [2]. Additionally, improving data collection and analysis capabilities will enhance the accuracy and reliability of DSGE models, leading to better-informed policy decisions. Strengthening the coordination between monetary and fiscal policies is also crucial for achieving optimal economic outcomes [4].

In conclusion, the convergence of optimal monetary policies in Iran's economy is a complex but crucial area of study. By employing DSGE models and calibrating them with real-world data, this research provides valuable insights into the effectiveness of various monetary policy strategies. The findings highlight the importance of central bank independence, coordinated monetary and fiscal policies, and robust data analysis in achieving economic stability and growth. As Iran continues to navigate its unique economic challenges, these insights will be vital for designing policies that enhance societal welfare and promote sustainable economic development.

2 Methods and materials

This study employs an analytical-descriptive and applied research method. The primary goal is to analyze the convergence of optimal monetary policies in the Iranian economy and its impact on welfare using the Dynamic Stochastic General Equilibrium (DSGE) model. The DSGE models are based on microeconomic and macroeconomic theories and are designed to optimize the behavior of households and firms. These models also incorporate the behavior of other economic institutions. Covering the entire economy, the DSGE model includes all producers and consumers who aim to optimize their economic objectives while considering the links between them. The term "computable" describes the model's capacity to quantify the effects of a shock or policy on the economy. A DSGE model consists of endogenous and exogenous variables and market-clearing constraints. All equations in the model are solved simultaneously, and the overall equilibrium in the economy is calculated as a set of prices and quantities that equate supply and demand in each market. The researcher creates a "disequilibrium" by altering one or more exogenous variables and recalculates the model to obtain new values for the endogenous variables. The data for this study are obtained from the Statistical Center of Iran and the Central Bank of Iran. The primary data collection method for this study is library research, utilizing published information and credible, up-to-date documents. The sources of information include:

- Databases that publish scientific and research articles both domestically and internationally.

- Organizations and databases that release official information (such as the Central Bank and the Statistical Center of Iran).

- Libraries and scientific research centers.

The data comprises annual time series of macroeconomic monetary and non-monetary variables published by the Central Bank of the Islamic Republic of Iran and other national and international official statistical sources from 1390 to 1401 (Iranian calendar years which is approximately equal to 2011 to 2022). The institutional framework of the model allows for the prediction of actual production, exchange, and consumption through solving the DSGE model. Previous studies typically focus on the government's budget constraint, which includes variables such as current government expenditures, transfer payments, and interest payments on bonds. Government revenues are derived from variables like consumption tax, labor and capital income taxes, money printing, and bond issuance. In this study, following the work of Ortega and Rebei [23], the government's budget constraint is assumed as follows:

$$P_t c_t(i) + P_t t_t(i)(1 + CAC_t(i)) + M_t + \frac{Bd_t(i)}{R_t} + \frac{e_t Bd_t^*(i)}{\kappa_t R_t^*} \leq W_t h_t(i) + R_t^k k_t(i) + M_{t-1} + Bd_{t-1}(i) + T_t + D_t. \quad (2.1)$$

The assumption of no Ponzi game for the government budget is considered as follows:

$$\lim_{T \to \infty} \left(\prod_{t=0}^{T} \frac{1}{\kappa_t R_t^*} \right) Bd_t^*(i) = 0 \quad (2.2)$$

$$\lim_{T \to \infty} \left(\prod_{t=0}^{T} \frac{1}{R_t} \right) Bd_t(i) = 0 \quad (2.3)$$

3 Findings and results

To obtain the model parameters, calibration was used. In this research, according to the steps mentioned in the previous section, the coding of the computable DSGE model was performed using Dynare software. Calibration is one of the most critical stages of empirical evaluation of Dynamic Stochastic General Equilibrium (DSGE) models in both Real Business Cycle and New Keynesian frameworks. Calibration involves assigning values to the parameters using available data and previous studies on some of the parameters present in the country. For some parameters where domestic studies were not found, standard values used in global literature were employed. Parameters for which there is less certainty can be evaluated using the criterion of matching predicted model moments with actual sample moments. As mentioned, selecting prior distributions for parameters is relatively delicate. Micro-level studies conducted in Iran in this field are almost rare and cannot be used for selecting prior distributions and their parameters. Therefore, our choices for prior distributions and their parameters are based on widely used prior distributions in the economic literature. Table 1 presents the parameters and variables related to monetary policy used in the model:

Table 1: Parameters and Variables Related to Monetary Policy

Parameter	Value	Description
C	0.43	Consumption level
L	0.61	Working hours
β	0.30	Time preference rate
b	0.19	Money demand shock
i	0.33	Household investment
CAC	0.40	Capital adjustment cost
W	0.37	Nominal wage
$Bd_t(i)$	0.46	Domestic bonds
$Bd_t^*(i)$	1	Foreign bonds
$Bd_t^*(i)$	0.67	Foreign assets
e	32	Exchange rate
or	0.65	Oil revenues
R	0.1208	Domestic interest rate
R_t^*	0.09	Foreign interest rate
T	0.14	Government transfer payments to households
D	16	Household earnings
K	0.30	Capital
Y	0.25	Production (value added)
A_t^N	0.53	Total factor productivity
π_t^m	0.45	Inflation rate
T	0.59	Tax revenues
R	0.17	Nominal interest rate
Bd	0.67	Government debt
M_t/P_t	0.85	Real money supply
h	0.52	Leisure time
y	0.42	Real GDP
$y_t^{Td}(k)$	0.39	Domestic market consumption
$y_t^X(k)$	0.28	Export units
m	0.63	Share of domestic goods in the final goods basket
$P_t^{(j,m)}$	0.37	Import price index

The validation of the model is performed by comparing the moments generated from the calibrated model with the actual moments from the real world. So far, no test has been proposed to compare the results obtained from model moments and the reality of the economy, and related studies have only been satisfied with the numerical proximity of these variables. In this study, we use the comparison of the main simulated variables in the model with their actual values to evaluate the model.

Table 2: Comparison of Moments Obtained from the Model with Real-World Moments

Economic Shocks	Parameter	Prior Distribution	Posterior Mean	90% Confidence Interval
Foreign currency assets	p	N (0.25, 0.1)	0.0825	(0.0692, 0.08236)
Production and oil price increase	p	N (0.01, 0.1)	0.0086	(0.0058, 0.0139)
Tax revenues	T	N (1.5, 0.3)	0.0642	(0.00301, 0.1234)
Government expenditures	Bd	B (0.25, 0.15)	0.3645	(0.3265, 0.3267)
Inflation	π	π(0.250, 0.15)	0.4582	(0.4215, 0.4536)
Technology	Tc	Tc (0.1, 0.1)	0.0163	(0.0057, 0.0324)
Exchange rate	e	E (0.1, 0.01)	0.0362	(0.0624, 0.521)
Welfare	p	p (1.1, 0.1)	0.0642	(0.0125, 0.632)

The primary simulated variables within the model reflect fluctuations in expectations and model estimates. These variables are calibrated using real-world data to enhance the accuracy of forecasting economic dynamics.

Foreign Assets: Initially distributed with a mean of 0.25, this index has decreased to 0.0825 after incorporating real-world data. This substantial decline indicates that current expectations regarding foreign asset levels are significantly lower than previously anticipated. The narrow confidence interval suggests a high degree of precision in this estimation.

Oil Production and Price: With a decrease in the projected mean from 0.01 to 0.0086, this index reflects a revision of initial expectations concerning oil production and prices. The relatively small confidence interval (between 0.0058 and 0.0139) indicates precision in estimating this index, suggesting a limited impact of real-world data.

Tax Revenue: This index has experienced a sharp decline from the initial mean of 1.5 to 0.0642, indicating high volatility and a significant decrease in projected tax revenue. The wide confidence interval reflects increased uncertainty regarding this index, likely due to unstable economic conditions.

Government Expenditure: With an increase in the mean from 0.25 to 0.3645, this index reflects a rise in government spending, potentially implemented to offset economic pressures. The narrow and precise confidence interval suggests the reliability and certainty of this estimate, which could be indicative of expansionary fiscal policies.

Inflation Rate: The mean inflation rate has increased from 0.25 to 0.4582, indicating rising prices and inflationary pressures within the economy. The close proximity of the confidence interval to the posterior value suggests a high degree of accuracy in inflation forecasting with real-world data, likely linked to increased costs and fiscal policies.

Technology: This index, which has decreased from the initial value of 0.1 to 0.0163, indicates a decline in anticipated technological development. This reduction could be attributed to slower technological advancements or limitations in research and development investments. The moderate confidence interval indicates a decrease in the precision of estimating this variable.

Exchange Rate: The decrease in the mean exchange rate from 0.1 to 0.0362 signifies a depreciation of the domestic currency, which could be due to exchange rate fluctuations or changes in foreign trade. The extremely wide confidence interval reflects uncertainty in forecasting this variable, potentially caused by unstable foreign exchange market conditions.

Welfare: This index has decreased significantly from the initial value of 1.1 to 0.0642, indicating a sharp decline in the level of economic welfare. This reduction could be a result of challenging economic conditions or rising living costs. The wide confidence interval suggests high uncertainty in this estimate and reflects severe fluctuations in social welfare.

3.1 Analysis

The analysis of these indices reveals substantial discrepancies in model results following the incorporation of real-world data. These shifts mirror economic pressures, fiscal policies, and unstable economic conditions, which have been more accurately examined and adjusted through the economic model.

Table 3: Stability Index in the Convergence of Optimal Monetary Policies Across Different Periods

Price	Wage	Welfare	Period
0.003	0.01	0.004	1390-1392 ($\sim$ 2011-2013)
0.003	0.009	0.005	1392-1394 ($\sim$ 2013-2015)
0.08	0.07	0.04	1394-1396 ($\sim$ 2015-2017)
0.09	0.09	0.06	1396-1398 ($\sim$ 2017-2019)
0.1	0.1	0.08	1398-1401 ($\sim$ 2019-2022)

In this analysis, three key indicators have been utilized to assess the stability and efficiency of monetary policies:

Price Stability: This indicator reflects the degree of price volatility. A smaller number indicates greater stability and lower inflation. As shown in the table, price stability during the 2011-2013 period was 0.003, indicating high price stability in this period. However, in subsequent periods, this figure gradually increased, reaching 0.1 in the 2019-2022 period, indicating increased price volatility and inflation.

Wage Stability: This indicator measures the fluctuations in wage levels. An increase in this indicator signifies greater wage volatility. For example, in the 2011-2013 period, the figure was 0.01, indicating relative wage stability, but this reached 0.1 in the 2019-2022 period.

Welfare Stability: This indicator reflects the impact of monetary policies and economic changes on public welfare. The higher the value, the lesser the stability in social welfare. In the 2011-2013 period, the value was 0.004, eventually increasing to 0.08 in the 2019-2022 period, indicating a significant decline in social welfare.

The analysis divides existing data into five time periods, each with distinct characteristics in terms of monetary and economic policies:

Period 2011-2013 (1390-1392)

Price Stability (0.003): This figure indicates very low volatility in price levels and inflation during this period. Such low figures imply the relative success of monetary policies in controlling inflation and maintaining economic stability. During this period, it's likely that the Central Bank was able to curb significant price increases through appropriate monetary policies.

Wage Stability (0.01): Wage volatility was also minimal, indicating a relatively stable labor market without significant wage changes. This suggests continued appropriate financial and monetary policies that maintained workers' purchasing power.

Welfare Stability (0.004): This figure reflects high social welfare stability in this period. Reductions in price and wage volatility contributed to maintaining or improving social welfare. A high social welfare index implies relative societal satisfaction with the economic condition and the provision of basic needs.

Period 2013-2015 (1392-1394)

Despite efforts to maintain stability, price and wage volatility began to increase but remained at an acceptable level. This period experienced relative improvements in some economic indices.

Price Stability (0.003): This indicator remains very low, showing that monetary and fiscal policies continued to control inflation during this period. Despite potential market changes, price levels remained relatively stable.

Wage Stability (0.009): Wages were still subject to less volatility, although there was some improvement compared to the previous period. This indicates labor market stability and the absence of severe inflationary pressures on wages.

Welfare Stability (0.005): Social welfare also experienced a slight increase, indicating that economic policies managed to create improvements in living conditions, although slight fluctuations in wages may have impacted parts of the population.

Period 2015-2017 (1394-1396)

During this period, we observed increased volatility in prices and wages. Stability indices for prices and wages increased significantly, indicating intensified economic fluctuations.

Price Stability (0.08): This figure represents a significant increase in price volatility. Likely, inflation began to rise, and monetary policies were unable to completely restrain it. These increased fluctuations may be due to changes in commodity and service prices or external pressures on Iran's economy.

Wage Stability (0.07): Wages experienced greater volatility, indicating increased market pressures, possibly reducing labor purchasing power due to inflation.

Welfare Stability (0.04): The social welfare index had a noticeable decline compared to earlier periods. This decline could result from rising inflation and decreasing household purchasing power, leading to a reduced living standard and increased poverty in society.

Period 2017-2019 (1396-1398)

Price and wage volatility peaked. This period was marked by increasing inflation and declining social welfare, with monetary policies failing to curb these fluctuations.

Price Stability (0.09): This indicator shows further increases in price volatility, likely from rising inflation and internal and external economic pressures. Continuous increases in price fluctuations indicate growing economic instability in this period.

Wage Stability (0.09): Wage volatility peaked, indicating an inability to stabilize the labor market and a growing gap between wage growth and inflation. Many workers likely faced reduced purchasing power during this period. Welfare Stability (0.06): Reduced social welfare during this period indicates serious economic challenges. Rising inflation and wage volatility led to decreased public welfare, likely imposing greater living pressures on households.

Period 2019-2022 (1398-1401)

This period witnessed the greatest volatility in price and wage indicators. Price and wage stability reached their lowest levels, and social welfare was severely impacted.

Price Stability (0.1): This indicator showed the highest price volatility across all periods. Inflation reached its peak, and monetary policies failed to control it. During this period, Iran's economy was likely severely affected by sanctions and external economic shocks.

Wage Stability (0.1): Severe wage volatility indicated intense labor market pressures. Rising prices significantly reduced workers' purchasing power, negatively impacting their living conditions.

Welfare Stability (0.08): This indicator reflects a severe decline in social welfare. Rising inflation and wage-cost mismatches reduced overall welfare levels, making economic conditions very challenging for Iranian households.

This chart illustrates that changes in economic welfare in Iran during this period are closely linked to optimal monetary policies. At the beginning of the period, in the year 1390 (2011-2012), economic welfare was at a moderate level and subsequently experienced changes throughout the period due to variations in monetary policies. These changes have coincided with domestic and international economic developments, particularly sanctions and oil price fluctuations. In reviewing the year-by-year trend of economic welfare in 1390, optimal monetary policies effectively
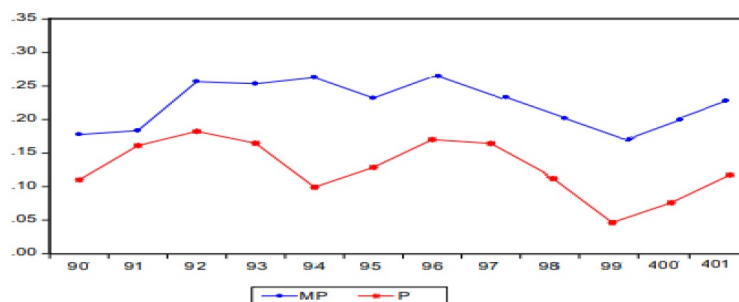
Figure 1: Convergence of Optimal Monetary Policy and Welfare in the Period 1390-1401

worked towards reducing the inflation rate and stabilizing the economy. The chart indicates a relative improvement in economic welfare during this year, possibly resulting from decreased inflation and improved employment conditions. This situation is considered the starting point of the analysis period.

In 1392 (2013-2014), the optimization of monetary policies led to a more significant improvement in the welfare index. The policies adopted during this period appear to have successfully controlled inflation and increased the Gross Domestic Product (GDP). The chart shows a considerable increase in economic welfare in this year, especially compared to previous years, indicating the positive impact of the new monetary policies.

The years 1393 and 1394 (2014-2016) depict a period of declining economic welfare, likely due to inappropriate monetary policies or the adverse effects of sanctions. The chart illustrates this decline in welfare, which may have resulted from economic policy instability or external pressures such as sanctions, hindering the effective implementation of optimal monetary policies.

The years 1395 to 1397 (2016-2018) indicate an improvement in economic welfare, possibly due to successful reforms in monetary policies that managed to stabilize the economic conditions. The chart shows a gradual increase in economic welfare during these years, demonstrating the success of monetary policies in reducing inflation and spurring economic growth. This improvement might be attributed to increased investments and relative stability in exchange rates.

In the years 1398 and 1399 (2019-2021), a significant decrease in economic welfare is observed. This decline may result from external pressures, including new economic sanctions or internal economic shocks such as currency market fluctuations. The chart indicates a sharp decline in economic welfare during these years. High inflation, reduced purchasing power, and increased unemployment rates are likely factors contributing to this downward trend.

In 1400 and 1401 (2021-2023), there is a marked improvement in economic welfare, likely owing to the reimplementation of successful monetary policies and controlling inflation. The chart shows that economic welfare returned to a high level in these two years. This improvement can be attributed to successful inflation control, increased GDP, and improved employment rates.

In the analysis of Chart 1, related to the convergence of optimal monetary policy and economic welfare, convergence refers to the gradual alignment of economic indicators towards a stable and desirable path, particularly in the context of welfare and economic growth. In this chart, periods where monetary policies were optimized are clearly associated with increased economic welfare, whereas periods with inappropriate or unstable policies saw a decline in welfare.

In the early years of the study period, with the implementation of optimal monetary policies, the welfare index follows an upward trend. This indicates the positive impact and convergence of policies aimed at improving the economic situation and the welfare of the populace. However, in the middle years, a period of fluctuations in economic welfare is observed, which may stem from external pressures, such as sanctions, and internal structural issues. These fluctuations have prevented sustainable convergence of policies and economic goals, creating a gap between set objectives and economic reality. In particular, from 1395 to 1397 (2016 to 2018), the chart indicates a return to positive convergence, resulting from efficient and optimal monetary policies. In these years, economic growth and inflation control have fostered greater stability and coordination in the economy, which in turn has led to enhanced welfare levels. This period of convergence demonstrates that monetary policies, if correctly configured and sustained, can play a crucial role in aligning economic growth with sustainable welfare improvement.

Towards the end of the period, in the years 1400 and 1401 (2021-2023), the chart reflects successful convergence and a return of welfare to higher levels. This period demonstrates that optimal monetary policies, particularly through effective inflation control and production increase, have achieved sustainable results and renewed convergence with

economic goals. Overall, the convergence chart shows that sustained convergence between monetary policies and economic welfare is possible when policies are effectively designed and implemented to control inflation, increase production and employment, and reduce economic volatility. Chart 1 clearly shows that optimal monetary policies, especially those contributing to inflation control, exchange rate stabilization, and domestic production growth, have a direct impact on improving economic welfare. Conversely, inefficient monetary policies or external sanctions leading to increased inflation and reduced domestic production cause a decline in welfare.
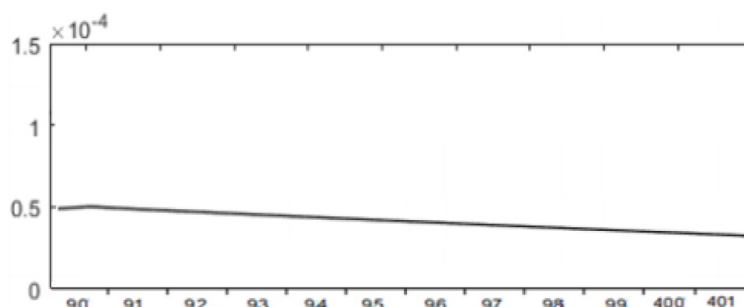

Figure 2: Impact of Optimal Monetary Policies on 0.5% Economic Growth During the Period 1390-1401

The 0.5 percent economic growth depicted in this graph is considered a very preliminary and marginal improvement in the economy. This low growth rate indicates that the implemented monetary policies have had limited effects on aggregate demand and Gross Domestic Product (GDP). At this level of growth, businesses are typically still evaluating economic conditions, and only minor and initial changes in their investment decision-making are observable.

Among the economic consequences of this growth, we can identify the following:

1. Limited Stimulus in the Labor Market: The creation of new jobs is very limited, and unemployment may only see a marginal reduction. This improvement will be more evident in sectors of the economy that are more responsive to monetary policies, such as the services sector.
2. Inflation and Price Pressures: Given that these monetary policies are in their early stages, the anti-inflationary effects are likely to be limited, and the economy may still be under inflationary pressures.
3. Exchange Rate and Interest Rate Volatility: Due to the lack of significant economic growth, exchange rate and interest rate fluctuations will continue, and international investors may be reluctant to enter the Iranian market.

Ultimately, this graph illustrates a trend of gradual improvement; however, it is necessary to implement complementary policies, such as structural reforms in the financial and production sectors, to enhance the effects of optimal monetary policies.
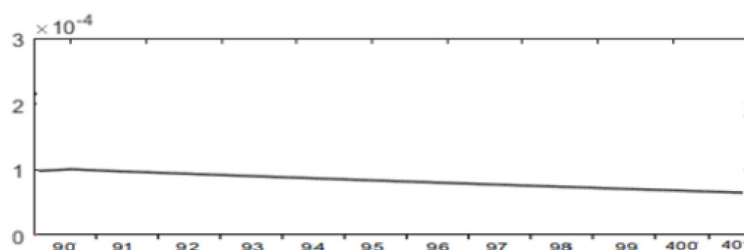

Figure 3: Impact of Optimal Monetary Policies on 1% Economic Growth During the Period 1390-1401

The 1 percent growth illustrated in this graph signifies a greater improvement in the economy's response to monetary policies. At this stage, consumers and producers gradually build trust in these policies, leading to an increase in economic activities in key sectors such as production and exports. The rise in liquidity and the decrease in interest rates at this level can result in growth in investment and production sectors. This growth may lead to an increase in aggregate demand within the economy. As businesses respond to rising demand by increasing production, this, in turn, fosters job creation. Concurrently, consumer confidence improves, prompting them to purchase more goods and services. This dynamic could contribute to enhancing economic cycles and generate further growth in the future. Additionally, impacts in the labor market begin to emerge. At this level, job creation significantly increases, potentially leading to a reduction in the unemployment rate. There may also be improvements in working conditions

and an increase in wages. Consequently, the 1 percent economic growth indicates that the economy is entering a more stable phase. Although challenges such as high inflation still persist, this graph clearly demonstrates that monetary policies are stimulating the economy and have the potential to lead to long-term improvements.
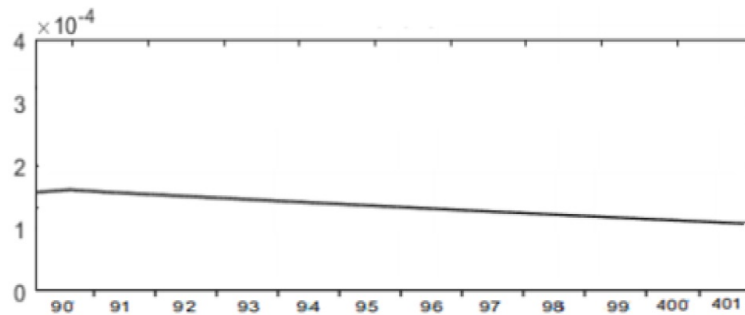

Figure 4: Impact of Optimal Monetary Policies on 1.5% Economic Growth During the Period 1390-1401

The 1.5 percent economic growth depicted in this graph signifies the economy's entry into a phase of expansion. At this level, producers and investors have greater confidence in the economic future, leading to a broader scope of investment activities. A 1.5 percent growth rate is often accompanied by increases in industrial production, infrastructure improvements, and rising exports. During this phase, investment in infrastructure and innovative technologies increases, which can lead to enhanced productivity and reduced production costs. Furthermore, a 1.5 percent growth is typically associated with greater international trade interactions. Domestic companies seek to increase exports and attract foreign investment, which, in turn, contributes to further economic growth. Although the economic growth rate has increased, controlling inflation remains a challenge. Monetary policies must be managed carefully to prevent excessive inflation. This graph suggests that with the continuation of optimal monetary policies and increasing economic interactions, sustainable economic growth could become a reality. However, precise coordination between monetary and fiscal policies remains essential.
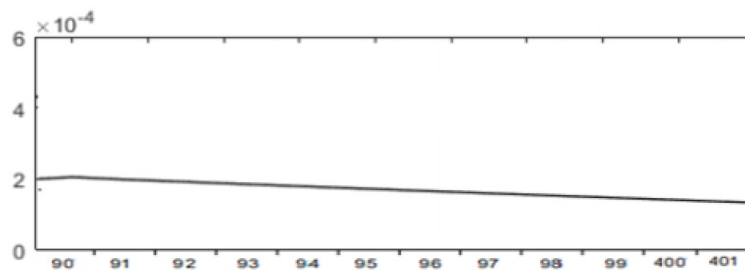

Figure 5: Impact of Optimal Monetary Policies on 2% Economic Growth During the Period 1390-1401

The 2 percent economic growth illustrated in this graph represents a turning point for the economy. At this level, the economy emerges from recession and enters a phase of prosperity. Gross Domestic Product (GDP) has significantly increased, and all sectors of the economy are benefiting harmoniously from this growth. During this period, the unemployment rate decreases sharply, and the demand for labor rises. Businesses respond to this increased aggregate demand by hiring new employees.

A 2 percent growth signifies an improvement in individuals' income levels and an increase in their purchasing power. We also observe enhancements in urban and rural infrastructure and an overall improvement in the quality of life for the population. With sustained economic growth, greater stability is established in monetary and fiscal policies. This contributes to better control of inflation and creates a conducive environment for long-term investments. This 2 percent growth marks the peak of the positive impacts of optimal monetary policies. Such growth indicates the onset of a period of economic vitality in which all segments of society benefit from the advantages of growth. However, to maintain this level of growth, policymakers must pursue greater stability in financial and monetary sectors to prevent a return to recession or severe fluctuations. Considering the criteria values, the structural model fit is confirmed. To assess the overall model fit, the GOF criterion is used, with values of 0.01, 0.25, and 0.36 representing weak, moderate, and strong GOF values, respectively. Given the obtained GOF value of 0.597, the overall model fit is confirmed. In this section, we examine the research hypotheses using PLS software.

4 Discussion and conclusion

The results of this study indicate that the implementation of optimal monetary policies in Iran significantly impacts economic stability and societal welfare. This finding aligns with the broader literature on the effectiveness of monetary policy interventions in influencing macroeconomic outcomes. The discussion will elaborate on these findings, contextualizing them within the framework of existing studies and highlighting the implications for policy and future research.

The significant effectiveness of optimal monetary policies observed in this study underscores the critical role of strategic monetary interventions in managing economic stability. The calibrated DSGE model revealed that targeted monetary policies could effectively control inflation, stabilize exchange rates, and promote economic growth. This is consistent with the findings of Lei [15], who highlighted the global spillovers of monetary policies and their substantial impact on domestic economic conditions. In Iran, where economic volatility is often exacerbated by political and external shocks, the ability of monetary policy to stabilize key economic indicators is particularly crucial. The study's results also emphasize the importance of model calibration using accurate and relevant data. The calibration process involved adjusting the DSGE model parameters to reflect the specific economic conditions in Iran accurately. This approach ensures that the model's predictions are closely aligned with real-world outcomes, thereby enhancing the reliability of the policy recommendations derived from the model. As noted by Ji and Wu [12], the use of calibrated models can significantly improve the predictive power of monetary policy rules, providing policymakers with robust tools for economic management.

One of the key aspects explored in this study is the interaction between monetary and fiscal policies. The findings suggest that coordinated policy efforts can enhance the overall effectiveness of economic interventions. This is in line with the work of Foresti [7], who discussed the critical interaction between monetary and fiscal policies in monetary unions and emphasized the need for coordination to achieve macroeconomic stability. In the Iranian context, where fiscal policies are heavily influenced by oil revenues and political considerations, the interaction between monetary and fiscal policies becomes even more pertinent. The study revealed that periods of enhanced welfare and economic stability coincided with phases where fiscal and monetary policies were more aligned. This suggests that greater coordination between these policy areas could lead to more effective economic management, reducing volatility and promoting sustainable growth. The study also highlighted the challenges posed by the lack of central bank independence in Iran. Political interference and external pressures often lead to suboptimal policy decisions, undermining the effectiveness of monetary interventions. This finding resonates with the broader literature, which emphasizes the importance of central bank independence for effective monetary policy [10]. Independent central banks are better positioned to make decisions based on economic considerations rather than political expediency, leading to more stable and predictable economic outcomes.

For instance, in countries where the central bank operates independently, monetary policies tend to be more consistent and focused on long-term objectives such as controlling inflation and supporting economic growth [3]. In contrast, in Iran, where the central bank's decisions are often subject to political influence, achieving these objectives becomes more challenging. The study's findings underscore the need for institutional reforms that enhance the independence of the central bank, thereby enabling more effective monetary policy implementation. The calibration of the DSGE model in this study relied on available data from 2012 to 2023. While this data provided a robust basis for model calibration, the study also identified several data limitations that could affect the accuracy of the model's predictions. For example, the lack of comprehensive micro-level studies in Iran limited the ability to accurately estimate some model parameters. As noted by Güler [9], the availability of high-quality data is crucial for the effective calibration of economic models and the formulation of reliable policy recommendations. Moreover, the study employed standard values from global literature for some parameters, which may not fully capture the unique economic conditions in Iran. This approach, while necessary due to data constraints, highlights the need for more detailed and localized economic studies that can provide more accurate parameter estimates. Improved data collection and analysis capabilities would enhance the accuracy and reliability of DSGE models, leading to better-informed policy decisions.

The findings of this study are consistent with those of other studies on the effectiveness of monetary policy in different economic contexts. For example, Mukhtar and Younas [17] found that monetary policy transmission mechanisms in Pakistan significantly impacted economic indicators such as inflation and growth. Similarly, Albrizio et al. [1] demonstrated the importance of international bank lending channels in transmitting monetary policy effects across borders. In the case of Iran, the study's results suggest that despite the challenges posed by political and external factors, optimal monetary policies can still significantly influence economic stability and growth. This finding is particularly relevant given the broader economic literature, which highlights the importance of strategic monetary interventions in managing economic volatility and promoting sustainable growth.

The study also contributes to the ongoing debate on the role of unconventional monetary policies in emerging economies. Anzuini and Rossi [2] discussed how unconventional monetary policies could influence expectations and economic variables, providing a useful framework for understanding the potential impact of similar policies in Iran. The findings suggest that exploring unconventional monetary tools could be beneficial for Iran, particularly in periods of economic crisis or instability. The significant effectiveness of optimal monetary policies observed in this study has several important policy implications. Firstly, the findings underscore the need for greater central bank independence in Iran. Enhancing the institutional autonomy of the central bank would enable more effective and consistent monetary policy implementation, reducing the impact of political interference and external pressures on economic management. Secondly, the study highlights the importance of coordinated monetary and fiscal policies. Policymakers should strive to align fiscal and monetary interventions to maximize their combined impact on economic stability and growth. This coordination could be achieved through regular policy dialogues and the establishment of joint policy frameworks that ensure a unified approach to economic management. Thirdly, the study emphasizes the need for improved data collection and analysis capabilities. Enhancing the availability and quality of economic data would enable more accurate calibration of economic models, leading to better-informed policy decisions. Policymakers should invest in developing comprehensive economic databases and supporting research initiatives that provide detailed and localized economic insights.

Finally, the study suggests that exploring unconventional monetary policies could be beneficial for Iran, particularly in periods of economic crisis. Policymakers should consider the potential of tools such as quantitative easing, negative interest rates, and forward guidance to manage economic instability and promote growth. The findings of this study open several avenues for future research. Firstly, there is a need for more detailed micro-level studies in Iran that provide accurate estimates of key economic parameters. These studies would enhance the calibration of DSGE models and improve the reliability of policy recommendations. Secondly, future research could explore the potential of unconventional monetary policies in Iran. While this study focused on conventional monetary interventions, the global literature suggests that unconventional tools could also play a significant role in managing economic volatility. Investigating the applicability and effectiveness of these tools in the Iranian context would provide valuable insights for policymakers. Thirdly, the study's findings highlight the importance of central bank independence for effective monetary policy implementation. Future research could explore the institutional and political reforms needed to enhance central bank autonomy in Iran, providing a roadmap for achieving more effective and consistent monetary policy outcomes. Finally, there is a need for more research on the interaction between monetary and fiscal policies in Iran. While this study highlighted the importance of coordinated policy efforts, further research could provide a more detailed understanding of how these interactions influence economic stability and growth. This would involve analyzing specific policy measures and their combined impact on key economic indicators.

In conclusion, this study provides compelling evidence of the significant effectiveness of optimal monetary policies in Iran. The findings highlight the critical role of strategic monetary interventions in managing economic stability and promoting growth, despite the challenges posed by political and external factors. By emphasizing the importance of central bank independence, coordinated policy efforts, and improved data capabilities, the study provides valuable insights for policymakers and sets the stage for future research in this area. The discussion has contextualized the study's findings within the broader economic literature, highlighting their consistency with global research on monetary policy effectiveness. By exploring the implications and potential future research directions, the discussion underscores the importance of continued analysis and improvement of monetary policy frameworks to achieve long-term economic stability and growth in Iran. In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Acknowledgments

References

[1] S. Albrizio, S. Choi, D. Furceri, and C. Yoon, *International bank lending channel of monetary policy*, J. Int. Money Finance **102** (2020), 102124.

[2] A. Anzuini and L. Rossi, *Unconventional monetary policies and expectations on economic variables*, Empir. Econ. **63** (2022), no. 6, 3027–3043.

[3] K. Assenmacher, *Modeling monetary transmission in Switzerland with a structural cointegrated VAR model*, Swiss J. Econ. Stat. **144** (2008), no. 2, 197–246.

[4] C. Atanasova, *Credit market imperfections and business cycle dynamics: A nonlinear approach*, Stud. Nonlinear Dyn. Econ. **7** (2003), no. 4.

[5] A. Carare, C.D. Resende, and C. Zhang, *Do monetary policy frameworks matter in low income countries?*, Imf Working Paper **2020** (2020), no. 139, 1.

[6] C. Dery and A. Serletis, *Disentangling the effects of uncertainty, monetary policy and leverage shocks on the economy*, Oxford Bull. Econ. Stat. **83** (2021), no. 5, 1029–1065.

[7] P. Foresti, *Monetary and fiscal policies interaction in monetary unions*, J. Econ. Surv. **32** (2017), no. 1, 226–248.

[8] J. Gali and T. Monacelli, *Optimal monetary and fiscal policy in a currency union*, J. Int. Econ. **76** (2008), no. 1, 116–132.

[9] A. Güler, *Interaction of monetary and fiscal policies in Turkey: a dynamic time series data analysis*, Bus. Econ. Res. J. **10** (2020), no. 5, 1039–1049.

[10] F.A. Hajj, G. Dufrénot, K. Sugimoto, and R. Wolf, *Reactions to shocks and monetary policy regimes: Inflation targeting versus flexible currency board in Ghana, South Africa and the WAEMU*, William Davidson Institute Working Paper Number 1062, November 2013.

[11] T.P.J. Jato and J.M. Ayaga, *External economic shocks and monetary policy tools in Nigeria*, Int. J. Res. Innov. Soc. Sci. **06** (2022), no. 07, 110–119.

[12] H. Ji and L. Wu, *Monetary-policy rule as a bridge: Predicting inflation without predictive regressions*, J. Financ. Quant. Anal. **53** (2018), no. 6, 2559–2586.

[13] M. Kliem and A. Kriwoluzky, *Reconciling narrative monetary policy disturbances with structural VAR model shocks?*, Econ. Lett. **121** (2013), no. 2, 247–251.

[14] M. Lanne and H. Lütkepohl, *Identifying monetary policy shocks via changes in volatility*, J. Money Credit Bank. **40** (2008), no. 6, 1131–1149.

[15] W. Lei, *Global spillovers of China's monetary policy*, China World Econ. **32** (2024), no. 3, 1–30.

[16] A. Mountford, *Leaning into the wind: A structural VAR investigation of UK monetary policy*, Oxford Bull. Econ. Stat. **67** (2005), no. 5, 597–621.

[17] T. Mukhtar and M.Z. Younas, *Monetary policy transmission mechanism of Pakistan: Evidence from bank lending and asset price channels*, Asian J. Econ. Modell. **7** (2019), no. 3, 121–139.

[18] J.E. Ogbuabor, C.O. Manasseh, and A. Orji, *Disaggregated analysis of monetary policy effects on the agricultural sector in Nigeria*, Appl. Stud. Agribus. Commerce. **14** (2020), no. 3–4, 47–58.

[19] F.J. Olusegun and A. Omolade, *Impact of monetary policy transmission mechanism in west African countries*, Studia Univ. Vasile Goldis Arad- Econ. Ser. **32** (2022), no. 1, 20–42.

[20] N. Rebei and E. Ortega, *A two sector small open economy model. Which inflation to target?*, Society for Computational Economics, 2005, no. 298.

[21] Y. Song, Y. Yang, J. Yu, and Z. Zhao, *The post-Covid-19 economic policy uncertainty and the effectiveness of monetary policy: evidence from China*, Frontiers in Public Health, **9** (2021), 771364.

[22] V. Ülke and H. Berument, *Asymmetric effects of monetary policy shocks on economic performance: Empirical evidence from Turkey*, Appl. Econ. Lett. **23** (2015), no. 5, 353–360.

[23] F. Wen, F. Ming, Y. Zhang, and C. Yang, *Crude oil price shocks, monetary policy, and China's economy*, Int. J. Financ. Econ. **24** (2018), no. 2, 812–827.