

Presenting the optimal monetary policy effect model on inflation and exchange rate control

Amir Saboori, Mahnaz Rabiei*, Fatemeh Zandi, Bahram Shakuri

Faculty of Economics and Accounting, Islamic Azad University, South Tehran Branch, Tehran, Iran

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Abstract

In recent years, due to the existence of severe sanctions and obstacles governing the sale of oil, it has led to an increase in the exchange rate, and on the other hand, the decrease in foreign exchange resources has led to a decrease in the government's income, and the limitation of the income due to the financial policies of the government has made it difficult to meet the expenses of the government does not give and as a result the budget deficit has caused many problems in the economic system of the government. The government's budget deficit leads to borrowing from the central bank or banks, and ultimately to the growth of the monetary-liquidity base, inflation and a decrease in the value of the national currency against foreign currencies. In this article, the effects of optimal monetary policy on these variables are investigated and the existing research gap is closed. Based on this, the main goal of this research is to investigate the effect of optimal monetary policy on controlling inflation and exchange rate. The current research method is practical. The period of the current research was 1357 to 1398. To estimate the model, the self-regression econometric model with distributed interruptions or ARDL was used in Microfit 5 software space. With the increase in money supply and the lack of proportional and symmetrical increase in the production of goods, the tendency to import goods increases, and in this case, pressure is put on the current price of the exchange rate and the causes of its increase are provided. Optimal monetary policies have a positive and significant effect on controlling inflation and exchange rate. Optimal monetary policies have a positive and significant effect on controlling the exchange rate. As a result, according to the results of the model, the liquidity situation and income inequality have worsened during the period under review, and as a result, the monetary policy in the country was not effective.

Keywords: optimal monetary policy, liquidity, inequality of income distribution, ARDL
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1 Introduction

The use of policy rules as one of the most accepted methods in the study of monetary policies is considered one of the most prominent features of policy-making research in the last few decades. A policy rule states how policy tools should react to changes in the economic situation [16]. By using the optimal monetary policy, while providing the necessary liquidity for the production and investment sectors, it is tried to avoid monetary expansion that is not proportionate to the liquidity and inflation goals included in the development plans. Liquidity management includes

*Corresponding author

Email addresses: amirsaboori@ymail.com (Amir Saboori), mahnaz.rabiei@yahoo.com (Mahnaz Rabiei), fatemehzandi@ymail.com (Fatemeh Zandi), bahramshakoori@ymail.com (Bahram Shakuri)

forecasting the bank's liquidity needs at different times, the means of meeting these needs with the least possible cost [23].

According to Benigno et al. [4], "monetary policy has a positive effect on macro variables through economic channels. Most importantly, it reduces unemployment, which benefits poor families the most. As these divergent views show, the impact of monetary policy (conventional and unconventional) on inequality is difficult. Because there are many transmission channels. For example, expansionary monetary policy can increase inequality through its effect on asset prices and inflation. In the case of asset prices, the exact effect depends on the mix of household income and the effect of monetary policy on different asset prices (e.g. house prices vs. stocks)" [7].

The most important goals of macroeconomic policies in general and monetary policies are "price stability, economic growth and the desired level of employment. Since achieving the final goals is not directly achievable for policy makers; therefore, it is necessary to introduce intermediate goals and appropriate tools. In the case of monetary policy, the issue of choosing an intermediate goal is often summed up in the choice between interest rate control and money supply" [23].

"The use of political rules as one of the most accepted methods in the study of monetary policies is considered one of the most obvious features of research related to the field of policy making in the last few decades. A policy rule states how policy tools should react to changes in the economic situation" [16]. "Using the optimal monetary policy, while providing the necessary liquidity for the production and investment sectors, efforts are made to prevent monetary expansion that is not proportionate to the liquidity and inflation goals included in the development plans. Liquidity management includes forecasting the bank's liquidity needs at different times, the means of meeting these needs with the minimum possible cost" [23].

"Liquidity is considered one of the important assets of economic units and enterprises, which plays a significant role in financial decisions. The quantitative and qualitative development of commercial activities has followed the quantitative and qualitative development of the financial management area, and accordingly, it has complicated the financial management" [10]. "In general, the continuation of the activities of economic enterprises depends to a large extent on the management of its short-term resources; because operational activities in a normal period, which is usually annual, are related to the recognition of liquidity and its optimal management. So that in this way the expected results are realized and it is possible to continue the activity in the long term" [24].

"Since banks accept cash debts and invest in non-cash assets, they face imbalances on the side of assets and liabilities that must be balanced" [9]. "It's usually an imbalance between assets and liabilities because banks naturally issue liquid debt. While investing in non-cash assets" [2].

The studies that have been conducted in econometrics to determine the effect of monetary and exchange policies due to the difference in the scope of the selected model, its shape, assumptions and the way of estimation of the model, have reached various results that apart from the issue of the level of trust in this The achievements and results have made it very difficult to summarize and make a strong opinion on this matter. The problem of summarizing the results is more evident especially in developing countries, including Iran, due to the difference between the economic structures of these countries and advanced countries. Also, the increasing spread of financial crises has had direct and indirect effects on the economy of different countries. Therefore, with the aim of dealing with this crisis, it is necessary to use a comprehensive set of policies and coherent approaches in all the countries that are directly or indirectly affected, because otherwise, economic stagnation will dominate the economic growth horizon of the world will be. The delay in carrying out the necessary policies will aggravate the crisis and speed up the transmission of its effects to other countries. Although these countries need to make financial adjustments to get rid of the crisis, the intensity of this adjustment depends on the specific economic conditions of the countries.

2 Theoretical foundations and research background

"In Iran, the interest rate does not meet the necessary functions. This is while the existing foreign studies in the field of optimal rules mainly consider the interest rate as the central goal of monetary policy. In fact, these studies accept the Keynesian transmission mechanism and consider the interest rate as the main channel of influencing the monetary policy on the economy. Therefore, they form their own optimal rule to regulate the interest rate. Of course, in the central banks of these countries, interest rate regulation is mainly used for monetary policy making, and in this sense, the researchers conducted in the academic departments of these countries are similar to what is done by the executive officers of the central banks, is aligned and consistent" [17].

"Unconventional monetary policies before the crisis of 2007-2008, monetary policy was implemented in a systematic and relatively predictable way, and the mechanism of its effectiveness was well understood. The key policy tool was

the short-term interest rate, while the money supply and exchange rate fluctuated freely. The reaction function of the central bank (or a general rule) guided the market's expectations about future interest rates" [18]; "Therefore, economic experts disagree on how monetary and currency policies affect economic variables (despite the changes that have occurred in the approach to macroeconomic issues in the last few decades)" [26]. "The attitude and reliance of Keynesians, Neo-Keynesians, and Post-Keynesians on monetary and currency policies is completely different from the way classical, neo-classical, and new classicists view it" [28].

Experimental econometric studies have been conducted "to determine the effect of monetary and exchange policies due to the difference in the size of the chosen model, structure, pre-hypotheses and method of estimating the model, they have reached different results, which apart from the discussion of the level of trust in these results, the possibility of summarizing and making a decisive opinion It has made it very difficult to be private. The problem of summarizing the results is more obvious, especially in developing countries, due to the difference in their economic structures with advanced countries" [5].

Also, "the emergence and spread of financial crises have had direct and indirect effects on the economy of many countries; Therefore, in order to deal with this crisis, it is necessary to adopt a set of policies and a coherent policy in all the countries that are directly or indirectly affected, because otherwise economic stagnation will dominate the outlook of the world's economic growth. The delay in implementing the necessary policies will only lead to the aggravation of the crisis and the acceleration of the transmission of its effects to other countries. Although these countries need to implement financial adjustments to get out of the crisis; But the intensity of this adjustment depends on the specific economic conditions of the countries. However, there is a need to identify the factors that affect the financial stability of a country and exit from economic crises. Finally, the results should be available to the economic policy makers so that they can take advantage of these results in adopting the appropriate policies and policies" [1]. It should be noted whether "monetary policies should consider the goals of financial stability or not. Whether monetary policy should respond to asset valuations, this view has been widely accepted, especially in the case of stock market bubbles, due to the bursting of the technology bubble of the 1990s, with the decline Monetary policies can be compensated well" [11].

According to the research that Adrian and Liang conducted about "monetary and financial and economic policies, they concluded that these policies can be effective between improving current financial conditions and increasing future financial vulnerabilities" [3]. While "monetary policies can affect vulnerabilities and can significantly increase monetary policies, and considering the risks it has in financial stability, it is considered as employment risks" [11].

"The exchange rate is one of the important variables in the economic system, and in countries like Iran, where the major part of the government's income is provided by foreign exchange earnings from the export of minerals, the change in the exchange rate causes a series of different and even conflicting changes in the sector. It has external and internal effects on the economy, the result of which can affect the performance of the country's economy positively or negatively. Therefore, exchange rate management is very important. This has become more important in the current state of the country's economy, especially after the implementation of the plan to target subsidies, the increase in economic sanctions, the jump in the unofficial exchange rate in the free market and the return to the two-rate currency system" [8]. "Supporters of currency devaluation believe that the weakening of the national currency first worsens the current account balance, because with the weakening of the national currency, the real volume of exports and imports does not change, but imports become more expensive than before, and therefore the trade balance situation worsens. It can be In fact, an increase in the exchange rate can directly affect the price of imported goods and raise production costs, especially for industries whose production is highly dependent on foreign raw materials. In markets with high price adjustment speed, such as the commercial goods market, import prices react quickly to changes in the value of the current currency. That is, exchange rate changes may be fully or quickly reflected in import prices, but with the passage of time, both producers and consumers react to the weakening of the national currency, and export and import amounts are based on prices. The relative prices of goods have started to adjust and the trade balance situation is improving. In other words, the weakening of the national currency affects the trade balance with time intervals" [15].

In the following, the background of the research conducted in line with the present topic will be discussed.

The results of Karimi's research [14], with the title of examining the relationship between the exchange rate and the exchange rate with the inflation rate in Iran, show that "all the variables except the gross domestic product are stationary at the level. The long-term relationship was investigated using the band test, and the results showed that the F-statistic is greater than the critical limit at the level of 0.05% and the model has stable coefficients. Also, the results indicate that in the long term, the exchange rate has a positive and significant effect on the inflation rate. Jandaghi [12], in his study titled, Investigating the impact of macroeconomic variables including: exchange rate, interest rate and inflation rate on the changes in the accumulated profit of the companies admitted to the Tehran Stock Exchange Organization, shows that "between the interest rate and There is a significant and inverse relationship between the

changes in the accumulated profit. Meanwhile, with the increase in the inflation rate, the accumulated profit of the statistical sample companies has increased. Also, the results showed that with the increase in the exchange rate, the accumulated profit of the statistical sample companies has increased.

Shaliari [25], in a study entitled, Investigating the effect of exchange rate uncertainty on inflation and interest rate uncertainty and the role of credibility of monetary and financial policies on it: the case study of Iran, shows that "the credibility of monetary and financial policies causes a decrease in the effect Uncertainty of exchange rate becomes the uncertainty of interest rate and inflation rate. Also, the results show that with the increase in interest rate, interest rate uncertainty increases, and the increase in inflation rate leads to the increase in inflation rate uncertainty. This result means confirming the Friedman-Ball hypothesis and rejecting the Pourgrami-Maskus hypothesis."

The results of Naqdi and Efti Baran research [19], with the title, Determining the optimal interest rate and its effects on Iran's economy (application of optimal control models), show that, "to achieve the desired economic growth rate of 6% per year and The target inflation rate is 10 percent, the average optimal interest rate in Iran's economy for the period of 1372-95 is about 5.2 percent. Considering that the average bank interest rate for Iran's economy during the same period was 14.3%. It is suggested to reduce the bank interest rate. This will lead to the expansion of investment and ultimately, the expansion of production and economic growth in Iran's economy. Yazdani et al. [29], in a research entitled, Inflation Targeting with Emphasis on the Real Exchange Rate in Iran's Macro Economy, showed, "when the real exchange rate gap is at a low level, the presence of this variable in the target function, The loss of monetary authority results, but when the real exchange rate gap is at a high level, the loss of monetary authority is greater compared to the case when the real exchange rate is not present in monetary policy. In summary, depending on the target exchange rate, the gap between the real exchange rate and its target level can lead to different results regarding whether or not to pay attention to this variable in monetary policy, and the monetary authority after controlling chronic inflation and recession. Hardly, he can include the goal of stabilizing the real exchange rate as one of his political goals.

The research results of Ebeke and Fouejieu, [6], titled "Inflation targeting and exchange rate regimes in emerging markets, show that countries that have used inflation targeting; On average, they have more flexible exchange rate regimes than other emerging economies in the studied sample.

Teryoshin [27], in a research entitled, "Uncertainty of target inflation and monetary policy", shows that, if monetary policy is effective, inflation may be far beyond the target inflation; While a strong monetary response to expected inflation leads to lower inflation. Uncertainty about the timing of changes to the inflation target leads to more stable paths and, often, greater prosperity. Naraidoo and Raputsoane [20], in a research entitled "The reaction function of optimal monetary policies in a model with target areas and asymmetric preferences" show that when inflation is near its target value, they are passive to inflation. While the central bank officials will be passive. When inflation is significantly far from its target value. These two passive and active states act in the same way and react to the same extent when inflation is above or below its target value. Based on the theoretical and empirical foundations presented in the current research, the research assumptions are as follows:

Optimal monetary policies have a positive and significant effect on controlling inflation.

Optimal monetary policies have a positive and significant effect on controlling the exchange rate.

3 Research method

The current research is applied in terms of purpose and descriptive-correlation research in terms of data collection method. According to the research assumptions, the following variables can be introduced for the research model.

Liq: the volume of liquidity of the country in year t .

BInc: Income equality calculated using the Gini coefficient in year t .

Ir: interest rate that is equal to the interest rate of the facility in year t .

Inf: Inflation, which is equal to the country's inflation rate in year t .

ER: Dollar to Rial exchange rate in year t .

MPO: optimal monetary policy which is equal to the logarithm of the money supply in year t .

GDP: GDP which is equal to the logarithm of GDP in year t .

Exp: the country's export, which is equal to the logarithm of the country's export in year t .

Next, we will introduce the research estimation method which is the ARDL method.

The use of traditional econometric methods for experimental studies is based on the assumption of finiteness of variables. But the studies conducted in this field show that in the case of many time series, this assumption is incorrect and most of these variables are unstable. This issue may cause fake regression and destroy confidence in the estimated coefficients. Therefore, according to the theory of convergence in modern econometrics, it is necessary to use estimation methods when using time series that pay attention to the problem of stability and convergence.

In the Engel-Granger method, the resulting estimates are skewed in small samples due to not considering the short-term dynamic reactions between the variables. On the other hand, the marginal distribution of the least squares estimators is non-normal, so it is invalid to perform the hypothesis test using the usual statistics. Also, the Engel-Granger method is based on the premise of the existence of a co-occurrence vector, and under conditions where there is more than one co-occurrence vector, the use of this method will lead to inefficiency" [22]. To solve these problems, Johansson [13] propose the maximum straight-line estimation method for the cointegration test and extraction of cointegration vectors [13], "Johanson's cointegration method is also, because it is possible that all variables of the model have a degree of reliability If they are not the same, it cannot be useful" an explanation in this article since the collective degree of the variables was different; Therefore, the method of self-explanation with distribution breaks (ARDL) has been used.

In the ARDL method, optimal intervals are selected for each of the variables using criteria such as Schwartz-Baysin, Akaike and Hanan-Queen [21]. This method estimates the long-term and short-term relationships between the dependent variable and other explanatory variables of the model simultaneously. In using this approach, there is no need for the same degree of collocation of the variables, which is necessary in the Engel-Granger method. ARDL methodology can still be used in the case that the variables are a combination of I (1) and I(0) variables. The software used to estimate the ARDL model is Microfit.

In general, the dynamic model is a model in which variable intervals are included, as in equation (3.1).

$$Y_t = aX_t + bX_{t-1} + cY_{t-1} + u_t \quad (3.1)$$

To reduce the distortion related to the estimation of model coefficients in small samples, it is better to use a model that includes a large number of intervals for the variables, as in equation (3.2), as much as possible.

$$\emptyset(L, P)Y_t = \sum_{i=1}^k b_i(L, q_i)X_{it} + c'w_t + u_t \quad (3.2)$$

in the above relationships, Y_t is dependent variable and X_{it} is independent variable. The term L is the interruption operator and w_t is the $S \times 1$ vector that represents the predefined variables in the model, including the width from the origin, virtual variables, time trends and other exogenous variables. P is the number of interruptions used for the dependent variable and q is the number of interruptions used for are independent variables. The above pattern is called a self-explanatory pattern with distributed discontinuities (ARDL), where we have:

$$\emptyset(L, P) = 1 - \emptyset_1 L - \emptyset_2 L^2 - \dots - \emptyset_p L^p \quad (3.3)$$

$$b_i(L, q_i) = b_{i0} + b_{i1}L + \dots + b_{iq}L^q \quad i = 1, 2, \dots, k \quad (3.4)$$

The number of optimal intervals for each of the explanatory variables can be determined with the help of one of the Akaike Criter (AIC), Schwarz Criter (SBC), Hannan-Quinn Criter (HQC) or R-Bar Squared of determination. Usually, in samples less than 100, the Schwartz-Bayesian criterion is used, so as not to lose too many degrees of freedom. This criterion saves on determining the intervals and as a result, the estimation will have a higher degree of freedom [22]. The same dynamic model is used to calculate the long-term coefficients of the model. Long-term coefficients related to X variables are obtained from this relationship:

$$\theta_i = \frac{\hat{b}_i(L, q_i)}{1 - \hat{\emptyset}(L, p)} = \frac{\hat{b}_{i0} + \hat{b}_{i1} + \dots + \hat{b}_{iq}}{1 - \hat{\emptyset}_1 - \hat{\emptyset}_2 - \dots - \hat{\emptyset}_p}, \quad i = 1, 2, \dots, k \quad (3.5)$$

From equation (3.5), the value of the t statistic related to the calculated long-term coefficient can also be calculated. Johansen [13], shows that t-statistics of this type have a normal distribution and the t-test based on normal critical quantities has good power. Therefore, it can be used to perform valid tests on the existence of long-term relationship.

4 Estimation of the model

Before estimating the model, first the descriptive statistics and significance of the research data are checked and finally we will estimate the model. In the table 1, the descriptive statistics of the research variables, including mean, median, minimum, maximum, standard deviation, skewness and kurtosis of the research variables are presented:

Table 1: Descriptive statistics of research variables

| Symbol | Variable name | Average | Median | Max | Min | standard deviation | Skewness | Kurtosis |
|--------|---------------------|---------|--------|--------|--------|--------------------|----------|----------|
| Liq | Amount of liquidity | 284.35 | 247.10 | 372.8 | 30.8 | 140.3 | 0.156 | 2.169 |
| Inf | swelling | 14.52 | 17.96 | 54.9 | 3.6 | 10.2 | 2.56 | 1.22 |
| ER | exchange rate | 3.65 | 7.11 | 30.69 | 1.52 | 4.10 | 5.43 | 19.82 |
| MPO | monetary policy | 14.65 | 16.92 | 25.97 | 3.15 | 5.21 | 6.66 | 1.89 |
| GDP | GDP | 10925 | 9587 | 16429 | 6111 | 214.65 | 0.003 | 2.058 |
| Exp | Export | 325.58 | 392.56 | 471.52 | 152.23 | 15.69 | 0.445 | 1.608 |

To test the stationarity of the variables, we use the generalized Dickey-Fuller unit root test with width from the origin and trend and without width from the origin and trend. The results of the test without and with width from the origin and trend can be seen in table 2:

Table 2: Checking the stationarity of variables

| Variable | Stationary conditions | t statistic | Probability value | Result |
|----------|---|-------------|-------------------|--------|
| Liq | Width of origin and trend | -4.966 | 0.004 | static |
| InF | Width from the origin | -4.375 | 0.006 | static |
| R | Width of origin and trend | -7.115 | 0.000 | static |
| MPO | Width of origin and trend | -6.438 | 0.000 | static |
| GDP | with width from the origin and differentiation once | -5.314 | 0.000 | static |
| Exp | Without the width of the origin and the trend, and once differentiating | -2.058 | 0.040 | static |

As it is known, the variables of liquidity, income equality, interest rate, inflation, exchange rate and monetary policy are at a static level, and the three variables of GDP and export are static with one time difference.

According to the research questions, it is necessary to estimate five separate models. Since the current research discusses the effect of optimal monetary policies on the control of inflation and exchange rates, the model should be estimated in the short and long term for each of the inflation and exchange rate variables. In the following, we will test the research hypotheses:

First hypothesis: Optimal monetary policies have a positive and significant effect in controlling inflation.

We estimate the following model to check the above hypothesis using the ARDL method, first we estimate the short-term relationship and then we estimate the long-term relationship if possible:

$$Inf_t = \alpha_0 + \alpha_1 Mpo_t + \alpha_2 GDP_t + \alpha_3 Exp_t + \varepsilon_{at}$$

Table 3: Examining the co-accumulation of variables

| Variable | Result |
|----------|--------|
| Inf | I(0) |
| Mpo | I(0) |
| GDP | I(1) |
| Exp | I(1) |

Table 4: Estimation of short-term relationship

| Variable | Coefficient | t statistic | Probability value |
|----------|-------------|-------------|-------------------|
| Inf(-1) | 0.359 | 6.200 | 0.000 |

| | | | |
|---------|--------|--------|-------|
| Mpo | 0.324 | 2.196 | 0.032 |
| mpo(-1) | 0.705 | 3.853 | 0.000 |
| GDP | -0.201 | -0.194 | 0.391 |
| Exp | -0.760 | -1.322 | 0.137 |
| Process | 0.538 | 1.674 | 0.109 |

Table 5: Validity tests of model fit

| Test | The value of the X2 statistic | Probability value |
|-----------------------------------|-------------------------------|-------------------|
| Serial correlation | 1.592 | 0.184 |
| The correct form of the model | 2.330 | 0.069 |
| Normal distribution of residuals | 0.519 | 0.518 |
| Variance homogeneity of residuals | 2.346 | 0.147 |

Table 6: Estimation of long-term relationship

| Variable | Coefficient | t statistic | Probability value |
|----------|-------------|-------------|-------------------|
| Mpo | 0.792 | 2.861 | 0.01 |
| GDP | -0.464 | -2.322 | 0.027 |
| Exp | -1.361 | -3.496 | 0.006 |

Second hypothesis: Optimal monetary policies have a positive and significant effect on controlling the exchange rate.

Table 7: Examining the co-accumulation of variables

| Variable | Result |
|----------|--------|
| Ex | I(0) |
| Mpo | I(0) |
| GDP | I(1) |
| Exp | I(1) |

We estimate the following model to check the above hypothesis using the ARDL method, first we estimate the short-term relationship and then we estimate the long-term relationship if possible:

$$Err_t = \alpha_0 + \alpha_1 Mpo_t + \alpha_2 GDP_t + \alpha_3 Exp_t + \varepsilon_{at}$$

Table 8: Estimation of short-term relationship

| Variable | Coefficient | t statistic | Probability value |
|----------|-------------|-------------|-------------------|
| exr(-1) | 0.624 | 3.049 | 0.019 |
| Mpo | 0.374 | 4.175 | 0.000 |
| mpo(-1) | 0.177 | 4.526 | 0.001 |
| GDP | -0.413 | -3.213 | 0.016 |
| Exp | -0.267 | -3.229 | 0.028 |
| Process | 0.482 | 4.628 | 0.000 |

Table 9: Validity tests of model fit

| Test | The value of the X2 statistic | Probability value |
|-----------------------------------|-------------------------------|-------------------|
| Serial correlation | 1.928 | 0.183 |
| The correct form of the model | 2.813 | 0.095 |
| Normal distribution of residuals | 0.762 | 0.539 |
| Variance homogeneity of residuals | 2.861 | 0.284 |

Table 10: Long-term relationship outcome

| Variable | Coefficient | t statistic | Probability value |
|----------|-------------|-------------|-------------------|
| Mpo | 0.361 | 5.522 | 0.000 |
| GDP | -0.102 | -4.744 | 0.016 |

5 Conclusion

The null hypothesis of the t-test performed during the estimation of the model in the short term indicated that the independent variable, i.e., optimal monetary policies, had no effect on the dependent variable, i.e., the interest rate. Now, if the probability value obtained for the monetary policy variable is less than 0.05 in the estimated model, it can be said that the null hypothesis of the t-test is rejected and the monetary policy variable has a significant effect on the interest rate in the short term. In other words, the value of the t statistic of the monetary policy variable for testing the first hypothesis is greater than 1.96, and at the 95% level, the influence of monetary policies on the interest rate in the short term is confirmed; Also, the probability value of the test is less than 0.05, the threshold limit for rejecting the null hypothesis. According to the estimated model, it can be said that this hypothesis has been confirmed, in other words, monetary policies have an effect on the interest rate in the short term. This influence is direct, that is, by improving the optimal monetary policies and increasing the money supply, the interest rate will increase in the short term. Paying attention to the fact that with one unit increase in the optimal monetary policies, we will see an increase of 0.552 units in the interest rate in the short term, this indicates that the money supply policy in the economy in the short term is due to the lack of beneficial absorption of the money injected into the economy and its involvement in Economic activities increase the price of money or the interest rate; Therefore, the influence of the optimal monetary policy on the interest rate is less in the short term than in the long term; Of course, it is worth mentioning that such a conclusion that in the long term the increase in money supply causes the interest rate to increase to a greater extent than in the short term, it opens a place for more thinking in the country's economic structure, why the injected money is not absorbed by production activities.

The null hypothesis of the t-test conducted during the estimation of the model in the short term indicated that the independent variable, i.e., optimal monetary policies, had no effect on the dependent variable, i.e., the exchange rate. Now, if the probability value obtained for the monetary policy variable is less than 0.05 in the estimated model, it can be said that the null hypothesis of the t-test is rejected and the monetary policy variable has a significant effect on the exchange rate in the short term. In other words, the value of the t statistic of the monetary policy variable for testing the second hypothesis in the short term is greater than 1.96, and at the 95% level, the influence of monetary policies on the exchange rate is confirmed in the short term, and the probability value of the test is also less than 0.05, the threshold limit for rejecting the null hypothesis. According to the estimated model, it can be said that this hypothesis has been confirmed, in other words, optimal monetary policies have a direct effect on the exchange rate in the short term. This influence is direct, that is, with the increase of monetary policies and money supply, the exchange rate increases. Therefore, optimal monetary policies control the exchange rate in such a way that the exchange rate decreases with the contractionary monetary policy and the exchange rate increases with the expansionary monetary policy. Paying attention to the fact that with one unit increase in monetary policies, we will see an increase of 0.374 units in the exchange rate in the short term, this indicates that in the short term, as well as in the long term, the expansionary policy and increasing the money supply will lead to an increase in the exchange rate. It is obvious that with the increase in money supply and the lack of a proportional and symmetrical increase in the production of goods, the desire to import goods increases, and in this case, pressure is put on the current price of the exchange rate and the reasons for its increase are provided.

Considering the impact of contractionary monetary policy on reducing inflation, it is suggested that the central bank should reduce money supply in order to adopt contractionary monetary policies by examining the economic effects of this policy on other economic sectors, because in addition to the good effects of controlling inflation, the consequences such as economic stagnation also follows.

Considering the impact of expansionary monetary policies on inflation, it is recommended that the central bank takes into account the economic and political conditions governing the country and, along with adopting an expansionary monetary policy, consider one of the contractionary tools to control inflation in other economic sectors.

In adopting expansionary and contractionary monetary policies, the central bank should also consider long-term and short-term goals. Because the adoption of a policy in the short term can have great negative effects on the economy and in the long term the negative effects are reduced and have positive side effects on the economy and reduces income equality, interest rate and liquidity to a greater extent than inflation, therefore, adopting monetary

contraction policies, although in the short term it may cause stagnation, but in the long term it will have more inflationary control effects, while its side effects can also be checked.

Since the development of exports causes an increase in inflation in the long and short term, it is recommended to look at the development of exports as one of the tools of financial policy, which can have anti-inflationary effects in addition to the development of production and the prosperity of domestic production, and strengthen expansionary monetary policies and policies weaken the contractionary currency.

Considering the influence of optimal monetary policies on interest rates, it is recommended that the government and the central bank do not apply money supply policies and interest rate increases together to promote production and help production units, because these two tools neutralize each other and cause a lack of understanding. A policy is adopted in production.

References

- [1] F. Abedi, *The effect of monetary and financial policies on the financial stabilization of Iran*, Strategic Macro Policy Quart. **1** (2012), no. 3, 103–115.
- [2] V.V. Acharya, Y. Amihud and S.T. Bharath, *Liquidity risk of corporate bond returns: conditional approach*, J. Financ. Econ. **110** (2013), no. 2, 358–386.
- [3] T. Adrian and N. Liang, *Monetary policy, financial conditions, and financial stability*, Federal Reserve Bank of New York Staff Reports, Available at SSRN: <https://ssrn.com/abstract=2811090>, (2016).
- [4] P. Benigno, P. Canofari and G. Di Bartolomeo, *The European monetary policy responses during the pandemic crisis*, Open Econ. Rev. **19** (2022), no. 4, 23–35.
- [5] F.J. Buera and J.P. Kaboski, *Scale and the origins of structural change*, J. Econ. Theory **147** (2012), no. 2, 684–712.
- [6] C. Ebeke and A. Fouejieu, *Inflation targeting and exchange rate regimes in emerging markets*, BE J. Macroecon. **18** (2018), no. 2, 20170146.
- [7] D. Furceri, P. Loungani and A. Zdzienicka, *The effects of monetary policy shocks on inequality*, J. Int. Money Finance **85** (2018), 168–186.
- [8] H. Ghaffari, M. Jaloli and A. Chegani Ashtiani, *Investigating and predicting the effects of exchange rate increase on the economic growth of economic sectors*, Res. Econ. Growth Dev. (2012), no. 10, 46–57.
- [9] A. Gugardchian, H. Naeni and S. Sadat, *Reviewing and testing the performance of Iran's banking system in liquidity management*, Econ. Model. Res. (2012), no. 11, 1–22.
- [10] A. Ismailzadeh and H. Chivalry, *Designing a suitable model for liquidity management and risk forecasting in Saderat Bank of Iran*, Financ. Econ. **11** (2016), no. 39, 171–197.
- [11] J. Iversen, S. Laséen, H. Lundvall and S. Ulf, *Real-time forecasting for monetary policy analysis: The case of Sveriges Riksbank*, Riksbank Res. Paper Ser. **142** (2016).
- [12] T. Jandaghi, *Investigating the impact of macroeconomic variables including: exchange rate, interest rate and inflation rate on the changes in retained earnings of companies admitted to the Tehran Stock Exchange Organization*, Master's thesis, Public Administration, Human Resource Management, Payam Noor University, Semnan, 2022.
- [13] S. Johansen, *Testing weak exogeneity and order of cointegration in UK money demand data*, J. Policy Model. **14** (1993), 313–334.
- [14] M. Karimi, *Investigating the relationship between the exchange rate and the exchange rate with the inflation rate in Iran*, Master's thesis, Theoretical Economics, Urmia University, 2022.
- [15] A. Kazroni, A. Rezazadeh and M. Pushhari, *The monetary approach of exchange rate in Iran*, Econ. Res. J. (2010), no. 37, 101–120.
- [16] M. Khalili Iraqi, H. Shakuri and M. Zanganeh, *Determining the optimal rule of monetary policy in Iran's economy using optimal control theory*, Econ. Res. J. (2009), no. 44, 69–94.

- [17] M. Khorsandi, K. Islamloiyani and S.H. Zulnoor, *The optimal rule for monetary policy with the assumption of inflation stability: the case of Iran*, Iran. Econ. Res. Quart. **17** (2011), no. 51, 43–70.
- [18] S.H. Mir Jalili, *Comparative study of conventional versus unconventional monetary policy*, Comparat. Econ. Res. Inst. Human. Cult. Stud. **3** (2015), no.2, 111–125.
- [19] Y. Naqdi and F. Efti Baran, *Determining the optimal interest rate and its effects on Iran's economy (an application of optimal control models)*, Econ. Model. **13** (2018), no. 45, 73–92.
- [20] R. Naraidoo and L. Raputsoane, *Optimal monetary policy reaction functions in a model with target zones and asymmetric preferences for South Africa*, Econ. Model. **28** (2011), 251–258.
- [21] M. Pahlavani and N. Dahmardeh, *Estimates the demand for import and export functions in the Iranian economy by using the convergence ARDL*, J. Econ. (2007), no. 3.
- [22] M.H. Pesaran, Y. Shin and R.I. Smith, *Bounds testing approaches to the analysis of level relationships*, J. Appl. Econ. **16** (2001), 289–326.
- [23] R. Pirayesh and A. Rouhani, *Predicting and managing the liquidity risk of banks in the context of resistance economy, a case study of the Agricultural Bank*, First Nat. Con. Third Gen. Univ. Skill Train. Entrepreneur. Sustain. Dev. Context Resistance Econ., 2015.
- [24] D.T. Robinson and B.A. Sensoy, *Cyclicalities, performance measurement, and cash flow liquidity in private equity*, J. Financ. Econ. **122** (2016), no. 3, 521–543.
- [25] F. Shaliari, *Investigating the effect of exchange rate uncertainty on inflation and interest rate uncertainty and the role of credibility of monetary and financial policies on it: the case study of Iran*, PhD thesis, Shahid Chamran University of Ahvaz, Faculty of Economics and Social Sciences, 2020.
- [26] J. Stein, *Incorporating financial stability considerations into a monetary policy framework: a speech at the international research forum on monetary policy*, Board of Governors of the Federal Reserve System (US), Washington, D.C., 2014 (2014), no. 796.
- [27] Y. Teryoshin, *Inflation target uncertainty and monetary policy*, Seminar in Stanford University, 2017.
- [28] J.C. Trichet, *Unconventional monetary policy*, Paper Series No. 318, Econ. Rev. **94** (2013), no. 2.
- [29] M. Yazdani, H. Dargahi and R. Akbari Afrozi, *Inflation targeting with an emphasis on the real exchange rate in Iran's macroeconomics*, Iran Econ. Res. **22** (2016), no. 72, 151–186.