Dollar's Rials Injected into Iran's Economy

Najafi H[1]* and Nikjou G[2]

[1]Faculty of Economics, Payame Noor University, Iran
[2]Faculty of Economics, Allameh Tabataba'i University, Iran

Abstract

Nowadays awareness about monetary conditions is really important for economic agents. Monetary conditions index is a significant indicator in regards of central bank's monetary policies so that it shows the expansion and contraction of monetary policies. In order to investigate the Dollar's Rials injected into Iran economy we have applied the MCI. Actually change in real interest rate and real exchange rate to the base year are considered while positive changes in MCI indicate a contraction monetary policy and negative changes indicate an expansion monetary policy. According to our findings, application of monetary policy in Iran is severely affected by changes in foreign exchange incomes as a result of increase in oil price. Therefore, the government's expenditures should be adjusted based on inflation and stagnation gap. Considering the lack of real data, in this study it is tried to calculate the monetary conditions index for Iran's economy using annual time series data and Johansen-Juselius convergence method over the period 2008-1987. In fact the expansion and contraction monetary policy implemented by central bank are separated and results show that the government's monetary policy was contractile in the years 1987, 1989, 1991, 1992, 1995, 1999, 2000, 2003, 2005. It means that there was no Dollar's Rials injection into economy. About the other years monetary policy was expansionary and Dollar's Rials has been injected into economy for twenty years.

Keywords: Monetary policies; Monetary conditions index (MCI); Exchange rate; Interest rate; Implicit price

Introduction

Fiscal policy is an important instrument for Iranian policymakers, since people pursue increase in the state or government budget, pensions, etc. The reason is that people figure out the impact of fiscal policy on their life objectively. In fact, the importance of monetary policy is less clear for people and generally people do not know that monetary policy has a decisive role. In this regard who is the most powerful person in a country? Perhaps the politicians; but the reality is that politicians cannot influence on individual economic behavior so that it is imagined. For example, politicians cannot enforce individuals to save their incomes and through this saving they sell a home or not. But monetary policies are clear at Federal Reserve Board (the American model), board of the central bank (the European model), money and credit council (the Iranian model) and represented by the central bank chiefs. In fact, monetary policy is a set of measures that the central bank imposes to change the volume of money and liquidity, in order to stabilize the economic situation [1].

Monetary and fiscal policies are also named as demand management policies that are applied to manage and control the demand [2]. These policies are employed to achieve macroeconomic goals namely growth, development and social welfare. Given that sometimes some conflicts are unavoidable and contradictions between the various economic goals causes that achieving to economic ideals would be difficult. Therefore, various economic policies should be aligned with each other to help to society in achieving goals. The importance of monetary policy after the rise of banking technology and the enormous power of banks showing in creating the writing money was increasingly severe.

Hence that was necessary to control the money demand and the money supply. Indeed, central banks and monetary authorities using monitory tools to access the main economic objectives employ two groups of expansionary and contractile monetary policies. In contractile policies, monetary authorities (central bank) reducing the volume of money through the high-powered money restriction or money increasing multiplier limitation, have tried to reduce aggregate economic demand. In expansionary policies, central bank's goals are increase the volume of money decreasing the interest rate and ultimately increasing the volume of aggregate demand in economy [3]. The main goals of monetary policy can be express as: acceleration of economic growth, creation of full employment, stabilizing the prices level, stabilizing the exchange rate through the creation of equilibrium in balance of payment [4]. Central bank should be able to make decision and perform his monetary decisions independently to achieve his economic goals assigned to him by the law. There are different views about the role and impact of monetary policy on economic variables. These views can be classified as Keynesian, Monetarist, Classic, New Keynesian and New Classic.

Classic believes that monetary policy has not any effect on real variables and only change the prices so there would not influence the income distribution and welfare. Keynesian believes that increase in nominal value of money causes the increase in real money supply, for certain prices. As a result, equilibrium interest rate and respectively investment and production increases are dropped and then the welfare is affected (due to the impact on employment and incomes). Monetarist believes that just monetary policies can change the aggregate demand and affect production and prices. New classics believe that when monetary policies are predictable these policies are neutral. But the monetary policies can influence output and welfare, if these are unpredictable (in flexible wages mood). New Keynesian believes that in lack of full flexible wages and prices in short-term, monetary policy can affect the real economic variables such as the production [5].

On the contrary, monetary policies are more affected by fluctuations in foreign exchange income arising from increase in the oil prices and government expenditures in Iran. These policies should

be adjusted, based on inflation and stagnation gap of economy. For a correct judgement about the policies which have been adopted by the government, an index is introduced that called MCI (i.e., the monetary conditions index). In this study inflation equation is employed to calculate the MCI index and to obtain the model impact factors that contain three variables including: the implicit price index, short-term interest rates (annual) and the real exchange rate that all the variables are actually to the base year 2000. In this regards the data sources are IFS 2010 and central bank that considering the lack of true data it is studied during the period 1987-2007 for Iran using the Johansen-Juselius method.

Monetary conditions index (MCI)

Over the last two decades, the monetary conditions index has been used as a way to interpretation of monetary policy and its effects on economy. For example, central bank of Canada that is considered as one of the pioneer banks in applying the monetary conditions index has applied this indicator since the early 1990s. Central banks of Sweden and Norway have been used this indicator for interpretation of monetary policy on the economy and the International Monetary Fund (IMF) and OECD countries are using the MCI too. Popularity of monetary condition index provides quantitative information instead of monetary policy for us. Monetary condition index is an indicator that assesses implemented monetary policies of the country on one hand and gives notice or warning to central bank on the other hand. And it shows that when expansionary monetary policy and restrictive monetary policy will be implemented.

Therefore, it is very important from the perspective of policy making. For example, if the MCI is increased the dominant monetary policy would be restrictive and it should be modified and vice versa. Simply MCI is a degree of pressure which monetary policy imposed on the economy. MCI is the average weights of interest rate and exchange rate changes to their value in the base period. Interest rates and exchange rates weights reflect the influence of these variables on inflation. MCI also is applied as an appropriate indicator of money and as a short-term operational goal.

It is noticeable that those weights that are reflected by these variables are estimated by long-term goal variables (like inflation or production). Monetary policies indeed affect inflation through increase in interest or exchange rates which cause the economy slight movements and decrease demand and lower inflation pressure following. Similarly, reduction in interest or exchange rates would normally stimulate the economy and subsequently will increase inflation pressure on the economy. Hence, the purpose of making the MCI is considering the effect of both channels on the economy.

MCI at time t, is measured by total changes in exchange and interest rates in compare with their basic values that is selected at time t=0. It measured as follows:

Here, w_e is the weight of exchange rate and w_r is the weight of interest rate.

$$MCI = w_e(e_t - e_0) + w_r(r_t - r_0) \tag{1}$$

Measuring the MCI

There are many ways to measure the MCI. Freedman [6] suggested two ways. Considering the impact of change of interest and exchange rates on aggregate demand or prices, the MCI would be calculated. In the first case, the MCI weights are obtained from the estimation of aggregate demand function. In this case the estimation results show the

effects of changes in interest and exchange rates on aggregate demand. On the other hand, the second case focuses on the effect of changes in interest and exchange rates on prices. In this case, given weights to the exchange rate is more than interest rate since the exchange rate has a direct effect on the price level while the exchange rate in state of aggregate demand equation and would indirectly influence the demand. The MCI estimate using the aggregate demand function in Canada and obtained weights are used. The MCI defined on the demand side is an index and shows the output gap due to changes in interest and exchange rates but includes the impact of demand shocks. Hence in the absence of demand shocks, positive output gap indicates a high MCI which is in accordance with the basic theory (i.e., a closed economic condition (contraction)) and vice versa.

Empirical Analysis

Indeed, when we get the MCI index, advantage of this index depends on model which the weights are derived from it. It means that chosen model should be a correct model. MCI is applied as a useful political tool providing some assumptions that MCI coefficient come from it. Considering dynamic model, we reach short-term and long-term various models to investigate the relationships between variables. Because MCI weights are obtained from the estimated coefficients of these models, these coefficients depend on dynamics of model. Given the characteristics of time series data, this data have an important role in the MCI structure themselves. Empirically, the stability of time series variables and possible relationships between them should be considered before making the model. In this regard when the data are static, coefficients of the model are different for short-term and long-term values. We should be careful of choosing the variable considered as an exogenous political tool. The stability of parameters is very important, because the MCI is defined for policy making and unstable weights would mislead us.

Actually, we begin our study analyzing the data stability. After the stability tests, we examine the convergence relationship to obtain the long-term relationship between variables. Accordingly using the OLS method, we review and estimate the short-term relationship between the variables. Then we calculate the ECM coefficient for this model and finally using the weights obtained from inflation equation; estimate the equation of MCI for Iran and introduce the root of inflation which is whether Dollar or Rial changes.

Methodology and Data Introduction

There are different opinions to calculate MCI applying either the nominal and real exchange rate or nominal and real interest rate. In this study, to calculate the MCI and to obtain the variable weights, we use the inflation equation including three variables; implicit price index, short-term interest rates (annual) and real exchange rate. All variables are realized to the base year 2000 while the data source is IFS 2010 and central bank which are studied during the period 1973 to 2007 for Iran. Inflation equation is as follows:

$$CPI = \beta 1 R + \beta 1 R_{ex} \tag{2}$$

The coefficients obtained from estimating equation model are the weights of MCI equation and variables are as follow:

CPI is an implicit price index, R is the bank interest rate that considered as a proxy variable for interest rate, R_{ex} is real exchange rate to the base year 2000. All data are used as logarithmic form.

The long-term statistical test: Since the most macroeconomic variables are unstable and in Johansen-Juselius convergence method all

the model variables must be accumulated from first degree, hence at first, we show that the variables have these characteristics.

Augmented Dickey-Fuller (ADF) unit root test: Initially for testing time series and variables stationary we run this model as follow:

$\Delta Y_t = b_1 Y_{t-1} + e_t$

$\Delta Y_t = a + b1 Y_{t-1} + e_t$

$\Delta Y_t = a + b_0 t + b_1 Y_{t-1} + e_t$

$\Delta Y_t = a + b_0 t + b_1 Y_{t-1} + \sum_{i=1}^{n} \delta_i \Delta Y_t + e_t$ (3)

Suitable models include intercept and trend. Since the data generating process is unknown, it is better that we build this model with maximum algebraic parameters considering increases in the risk of accepting a false zero hypothesis [7]. If the zero hypothesis is rejected with model it is skewed towards non-stationary acceptance and the result can be accepted more confidently. This is an important point that distribution figure of the test statistics exactly depends on which model is applied, thus we should use the appropriate critical points for validity of test. The following table shows the ADF test results. As you see the variables are non-stationary and with first difference this problem would be solved. In other words, the data have a difference stationary trend (Table 1).

According to Dickey-Fuller unit root test this is observed that all variables in levels are non-stationary but with first difference become stationary.

Determination of the optimum lags in model: the optimum lags in model are determined given the sample size and the number of variables. There are different criteria for choosing the optimal lag length that the Akaike (AIC) and Schwarz- Bayesian (SBC) Criterion can be mentioned, that are used as follows:

$AIC_{(n)} = Ln \det(\Sigma n) + \frac{2m^2 n}{T}$ (4)

$SBC_{(n)} = Ln \det(\Sigma n) + m^2 n \ LnT$ (5)

Schwarz-Bayesian criterion used for smaller samples and Akaike criterion used for larger samples. In this equation, m is the number of model variables, T is the sample size, det(_n) is the covariance matrix determinant. Here the optimum rank of VAR model will be determined through the Schwarz-Bayesian criterion, given that sample size is less than 100. Results of determination the optimal Rank of VAR model are as follows (Table 2).

According to the Schwarz-Bayesian criterion, the rank one is selected as an optimal rank of VAR model. We have applied Trace Statistics and Eigen Value Statistics to determine the number of convergence vectors and the convergence relationship is extracted from Johansen-Juselius method. Also, we can use the following statistic which is called trace matrix to determine the number of accumulation vectors:

$\lambda_{trace} = -2LnQ = -n \sum_{i=r+1}^{n} Ln(1-\lambda_i)$ and r=0,1,2,…, n-1 (6)

Q is the ratio of function of constrained maximum likelihood estimation to the function of non-constrained maximum likelihood estimation function, λ_1 is Eigen values, and n is the number of observations. These statistics are adjusted so those offer zero quantity when there is no convergence vector between model variables. In this regard, assuming r convergence vector, there is r Eigen value (Table 3).

Another test for determining the number of co-integration vectors is the maximum eigen values test as follow:

$\lambda_{max} = -n \ Ln \ (1 - \lambda_{r+1})$ and r=0,1,2,…, n-1 (7)

This statistic has an asymptotic distribution and examines existence of r convergence vector against alternative hypothesis (the existence of r+1 vector). Although in most studies, it is shown that two test statistics of Tracy matrix and maximum Eigen values of matrix leads to similar results, but in some cases the result might be different. According to the Monte Carlo simulation studies the results of Trace Matrix would be more valid when the strain and skew of error sentences is more than normal distribution. But considering that the maximum Eigen value (λ_{max}) have much stronger alternative hypothesis, thus usually this method is used in most studies for choosing the number of convergence vectors (Table 4) [8].

According to the results of these two tests, just there is a convergence vector. Johansen is provided some states for determining the convergence vectors as follow.

-y_t variable has no trend and convergence equation has no intercept. In this case we have:

$H_2(r): \Pi y_{t-1} + B x_t = \alpha \beta y'_{t-1}$ (8)

-y_t has no trend and just convergence equation has intercept. In this case we have:

$H_2(r): \Pi y_{t-1} + B x_t = \alpha(\beta' y'_{t-1} + \rho_0)$ (9)

-y_t variable has trend and convergence equation has intercept. In this case we have:

$H_1(r): \Pi y_{t-1} + B \ x_t = \alpha(\beta' y'_{t-1} + \rho_0) + \alpha_1 \gamma_0$ (10)

Number of lags	Amount of Schwarz - Bayesian(SBC)
0	3.89
1	-4.39
2	-3.39

Source: Research Findings.
Table 2: Results of determination the optimal Rank of VAR.

The critical values at 95% confidence level	Test statistic	Alternative hypothesis	Zero hypothesis
24.27	27.88	r=1	R=0
12.32	8.98	R=2	R=1

Source: Research Findings.
Table 3: Result of trace test.

The critical values at 95% confidence level	Test statistic	Alternative hypothesis	Zero hypothesis
17.79	18.89	r ≥ 1	r=0
11.22	6.35	r ≥ 2	r ≤ 1

Source: Research Findings.
Table 4: Result of maximum Eigen value test.

Statistics of ADF test		
Making first difference with intercept	**In level and with intercept and trend**	**Variable**
-3.77	-2.39	LCPI
-5.85	-1.84	LR
-5.69	-2.46	LR_{ex}
-2.97	-3.58	The critical values of Mc Kinon on 5% significant level

Source: Research Findings.
Table 1: ADF stationary test results for model variables.

-y_t variable and convergence equation have linear time trend. In this case we have:

$$H_1(r): \Pi y_{t-1} + B\, x_t = \alpha\, (\beta' y_{t-1} + \rho_0 + \rho_1 t) + \alpha_1 \gamma_0 \qquad (11)$$

-y_t variable have second degree trend and convergence equation have linear trend. In this case we have:

$$H_1(r): \Pi y_{t-1} + B\, x_t = \alpha\, (\beta' y_{t-1} + '\rho_0 + \rho_1 t) + \alpha_1\, (\gamma_0 + \gamma_1 t) \qquad (12)$$

For determining the number of convergent vectors using the above states, Johansen has suggested that at first, we should test null hypothesis or hypotheses regarding the lack of convergence vector in the 5 state, if the null hypothesis is rejected we test r=1 hypothesis at 5 states. We continue these steps till the null hypothesis is accepted in each of the five methods. Finally, we choose a method that null hypothesis is accepted through it as an appropriate method [9]. Accordingly, Johansson method is determined a number of long-term relationships or co-integration vectors and it is necessary to determine whether these vectors are unique or not. In this respect it is necessary to impose some constrains on the coefficients of the vectors based on previous information to identify present long-term equilibrium relationships. Such constraints in non-constrained method place some coefficients of α_{ij} equal to zero and one [10].

According to the results of both tests, just there is a convergence vector. Long-run equilibrium relationship between variables of model is estimated as follows (Table 5).

Sign of obtained coefficients are as expected. Based on macroeconomic issues, implementation of restrictive monetary policy (expansionary) increase (decrease) the interest rate and increase (decrease) in interest rate decrease (increase) investment and it decreases (increases) the aggregate demand that finally decreases (increase) the general level of prices and inflation. Therefore, we can discuss tight (Easy) monetary policy condition based on obtained results. Consequently, an increase (decrease) in interest rate can be considered as an implementation of restrictive monetary policy (expansionary) and low interest rates reflect expansionary monetary policy [11].

Floating exchange rate in monetary policy causes some changes in exchange rate. These changes affect prices level as direct and indirect [12]. In addition, the exchange rate can directly affect the prices of imported inputs and consequently the prices of final commodities would affect the economy. On the other hand, indirect effect of exchange rate operates by changing the consumption pattern and finally influences the demand of economy. The effect of exchange rate changes on inflation depends on several factors like past exchange rates, market structure, the elasticity of exports and imports, consumption and investment [13].

Based on Mandel Fleming model, expansionary monetary policy will reduce the exchange rate and restrictive monetary policy will increase exchange rate. It can be argued that reduction in exchange rate is because of the implementation of expansionary monetary policy and

vice versa. As it was seen, the changes in interest rate and exchange rate can be regarded as signs of monetary policies. So that interest rate and exchange rate rises (Internal devaluation) are because of restrictive monetary policy. And reducing the exchange rate (internal evaluation i.e., increases in the value of domestic currency) and interest rate can be considered as signs of expansionary monetary policy [12]. Thus a negative relation exists between inflation and interest rate and a positive relation exists between exchange rate and price level [14].

MCI for Iran

For estimation of MCI for Iran the annual data are used during the period of 1978- 2007, and real MCI is defined for Iran as follows:

$$\text{realMCI} = \left[(R - R_{base}) + \left(\frac{C_{er}}{C_R}\right).Log(rex_{base}) - Log(rex).100 \right] + 1000$$
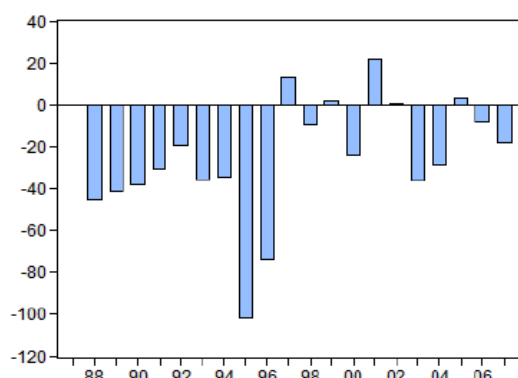
In this equation, C_R is coefficient of interest rate and C_{er} is coefficient of actual exchange rate in the estimated equation of inflation. R_{base} is the amount of interest rate in the base year; rex_{base} is amount of actual exchange rate in the base year. Now using the above equation and the coefficients obtained from inflation equation, MCI is calculated for Iran (Table 6).

As it is visible in the years 1987, 1989, 1991, 1992, 1995, 1999, 2000, 2003, 2005 monetary policy of government was restrictive and in other years it was expansionary. The figure of MCI for Iran is as follows (Figure 1).

DMCI	MCI	Year
-45.0953	1093.675	1978
-41.066	1048.58	1979
-37.8705	1007.514	1980
-30.4939	969.6431	1981
-19.3792	939.1493	1982
-35.6035	919.7701	1983
-34.4577	884.1666	1984
-101.992	849.7089	1985
-73.5242	747.7174	1986
13.03677	674.1932	1987
-8.90637	687.23	1988
1.931855	678.3236	1989
-23.9054	680.2554	1990
21.97615	656.35	1991
0.580212	678.3261	1992
-36.155	678.9064	1993
-28.1792	642.7513	1994
2.957942	614.5721	1995
-8.0454	617.53	1996
-18.0182	609.4846	1997
-50.7247	591.4665	1998
0.123154	540.7418	1999
2.466391	540.865	2000
-5.91154	543.3314	2001
-65.8255	537.4198	2002
34.06136	471.5943	2003
-8.52582	505.6557	2004
45.20149	497.1299	2005
-5.91154	542.3314	2006
-45.0953	536.4198	2007

Source: Research Findings.

Table 6: Amount of MCI using the estimation of inflation during the period 1987-2008.

Amount of t.student statistics	Standard deviation	Coefficient	Variable name
--	--	1	LCPI
4.55	2.31	10.53	LR
-3.82	0.94	-3.16	LR_{ex}

Source: Research Findings.

Table 5: Model to estimate long-run relationship between variables (vector convergence).

Source: Research Findings.

Figure 1: MCI for Iran.

Conclusions

The main goals of macroeconomic policies are reaching to price stability, economic growth and optimal level of employment. Since meeting the final goals is not directly obtainable introduction of intermediate goals and appropriate devices are necessary. In the regard of monetary policy choosing the intermediate goal is often summarized as choosing between interest rate and money supply controls. Iranian policy makers are trying, in addition to providing the needed cash flow of production and investment sectors, to prevent the monetary expansion which is incompatible with goals of inflation and liquidity included in development programs.

According to our findings, application of monetary policy in Iran is severely affected by amounts of changes in foreign exchange incomes as a result of increase in oil price. Therefore, the government's expenditures should be adjusted based on inflation and stagnation gap. Considering the lack of real data, in this study it is tried to calculate the monetary conditions index for Iran's economy using annual time series data and Johansen-Juselius convergence method over the period 2008-1987. In fact, the expansion and contraction monetary policy implemented by central bank are separated and results show that the government's monetary policy was contractile in the years 1987, 1989, 1991, 1992, 1995, 1999, 2000, 2003, 2005. It means that there was no Dollar's Rials injection into economy. About the other years monetary policy was expansionary and Dollar's Rials has been injected into economy for twenty years.

Furthermore, the findings explain that monetary authorities have applied most of changes in volume of real money to determine the monetary policy in Iran. Generally, these tools do not allow to daily, weekly and monthly monetary policy applying. While the MCI index can be calculated monthly too. During the studied period, most of monetary policy has implemented as expansionary and monetary conditions index shows it well. We recommend to the Central Bank of Iran to use the MCI index in the analysis of monetary policy since this index have advantages against other tools and rules (particularly the Taylor rule). Given the expansionary monetary policy and its impact on inflation, it is expected that the government provide more accuracy in employing of foreign exchange incomes from the oil and prevent the Rial injection of oil incomes to community to restrain the inflation.

Our recommendation to researchers and the monetary authorities is that in order to investigate the effects of monetary policy on real economic variables they use the monetary conditions index instead of using real money volume. In addition to traditional credit lines of central bank and open market operations, financial innovations cause the creation of new tools and methods for applying the monetary policy, such as overnight money market and bonds dealing agreements, etc. Although, these methods are indirect; they can be used for monetary policy applying in continuous and routine orders.

References

1. Eisner R (1969) Fiscal and Monetary Policy Reconsidered. Am Econ Rev 59: 897-905.

2. Musgrave RA (1984) Public finance in theory and practice. (4th edn.), New York, McGraw-Hill, pp: 104-109.

3. Modigliani F (1963) The monetary mechanism and its interaction with real phenomena. Rev Econ Stat 45: 79-107.

4. Friedman M (1982) Monetary Policy: Theory and practice. J Money Credit Bank 14: 98-118.

5. Branson WH (1989) Macroeconomic Theory and policy. (3rd edn), Harper & Row New York, pp: 401-430.

6. Freedman C (1994) The use of indicators and the monetary conditions index in Canada.

7. Harris RID (1995) Using co-integration analysis in econometric modeling. Prentice Hall Harvester Wheat sheaf, pp: 77-86.

8. Engle RF, Clive WJG (2004) Co-integration and error correction: Representation, estimation and testing. Econometrica 55: 251-276.

9. Johansen S (1995) Likelihood-based inference in Co-integrated vector autoregressive models. Oxford: Oxford University Press 14: 201-220.

10. Johanson S, Juselius K (1990) Maximum Likelihood Estimation and Inference on Co-integration with Application to the Demand for Money. Oxf Bull Econ Stat 52:169-210.

11. de Wet W (2002) Coping with Inflation and Exchange Rate Shocks in the South African Economy. S AFR J ECON 70: 78-94.

12. Gregory MN (1999) Macroeconomic. (4th edn), Worth Publishers.

13. Cottarelli C, Balino TJT (1994) Frameworks for Monetary Stability Policy Issues and Country Experiences. IMF, Washington, pp: 458-476.

14. Freedman C (1995) The Role of Monetary Condition and The Monetary Condition Index in the Conduct of Policy. Bank of Canada Review, pp: 53-60.