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Calculation of the Monetary Condition Index (MCI) in Iran Economy (1978–2012)

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Abstract

The completed MCI includes three main channels of interest rate, exchange rate and credit rate. In developing countries such as Iran, this indicator, which contains a credit channel, could be better used to illustrate the country's monetary condition. This study has been done to calculate this index for the period of 1978–2012. For this purpose, the function of the total economy demand is estimated in order to extract the variables weight in this index, using the self-explanatory Autoregressive Distributed Lag (ARDL) approach. According to the model estimation results, the exchange rates weights are higher than interest rate channel in the MCI calculation. Using the weights derived from the model estimation, the nominal and real MCI have been calculated. Eventually, by estimating the inflation equation and comparing the root mean squared error (RMSE) of the two, it has been found that the predictive power of inflation in the real MCI is higher than the nominal.

Keywords: Monetary Policy, Nominal MCI, Real MCI, Root Mean Squared Error.
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1. Introduction

The mechanism of monetary influence is governed by the conflict of economic variables that correlates monetary changes to the real sector of the economy. There are various mechanisms for transferring

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monetary policy. The MCI, which is a combination of monetary influence mechanisms, is designed to illustrate the condition (closeness or openness degree of the economy) of monetary policy in a given period. MCI helps the policymaker to better estimate and assess the general monetary condition. Because the content of the MCI information, fixes the pressure degree of monetary policy on the economy, and so it specifies the total demand and finally the inflation rate. Therefore, in order to define the MCI, it can be stated that it is an indicator that, on the one hand, measures monetary policies implemented by the country, and on the other hand, warns the central bank when implement an expansionary monetary policy, and when implement contractionary monetary policy. So, it is very important in terms of policymaking (Kesriyel, 1999: 3). MCI is usually defined as the weighted sum of real interest rate and real effective exchange rate, which weights represent relative effects on the total demand and inflation. Typically, open-standard macroeconomic models indicate that both interest rate and exchange rate are important in monetary policy transfer channels (Hataiseree, 1998). Gerlach and Smets (2000) extracted a theoretical model, and showed that the "optimal feedback rule" could be written according to the MCI. That is, the central bank can optimize its target functions by setting the average weighted interest rates and exchange rates, according to macroeconomic condition. The optimal weight of the exchange rate, depends on the total demand elasticity relative to the real interest rate and real exchange rate (Peng and Leung, 2005). Also, theoretical foundations indicate that given the incomplete information and other oppositions in the credit market, the banks' credit status has a significant complementary effect on the monetary policy transfer (Bernanke and Gertler, 1995). Since the early 1990s till now, several central banks, including central banks of Canada, New Zealand, Australia and Thailand, have identified MCI as monetary policy index or even as operational target for monetary policy (Hatayer, 1998). Nevertheless, issues in relation with the MCI use for these purposes have been increasingly identified (Stones, 1998). Gerlach and Smets (2000) showed that the theoretical assumptions for making the MCI a desirable policy goal, were relatively limited. Exchange rates are affected by factors other than the monetary policy; therefore, it is difficult for central banks to assess the source and the nature of the exchange rate shocks, and adopt appropriate policies. Thus, nowadays emphasizing on the MCI as a monetary indicator and financial condition rather than the political goal, is especially applicable for economies with a fixed exchange rate regime (Pong and Lang, 2005). However, MCI is still a suitable tool for evaluating a monetary condition. The use of bank credit in calculating the MCI, is due to the fact that the credit growth directly better reflects the change in the bank lending status and the authorities' enforcement actions to control the credit expansion. This index has recently been discussed in some countries in the world, such as Canada, Britain, Pakistan and Turkey, and central banks of Canada, New Zealand, Norway and Sweden each have somehow tried to expand it, and use it to guide monetary policy. In addition, the International Monetary Fund (IMF) and the OECD countries have used this index to assess monetary policies. Moreover, some of the big banks in the world like Deutsche bank, Goldman Sachs and JP Morgan, calculate the monetary situation for different countries. This study was conducted to calculate the MCI for Iran economy over the period 2001–2012, by employing the self-explanatory ARDL approach, and applying Eviews 9 software. Then, it was estimated the total demand function coefficients for calculating the index. Afterwards, estimating the inflation equation, we compared the power of forecasting the nominal MCI to the real MCI.

The remainder of this paper is organized as follows. Section 2 explains the theoretical foundations, and Section 3 provides the research background. In Section 4, it is estimated the ARDL time series econometric model. Section 5 deals with selecting the appropriate MCI, and in Section 6 the conclusion is presented.

2. Theoretical Foundations

Given that the MCI is a combination of mechanisms for the monetary policy transfer, this section introduces it. Then the theoretical foundations for calculating MCI will be presented.

2.1 Mechanisms of Monetary Policy Transfer

In general, there are two Keynesian and Monica's main views related to the mechanism of monetary transfer and its impact duration.

Keynesians, with particular emphasis on interest rates and the link between all markets through it, only consider the interest rate channel and the monetary policy transfer effects from this channel, but monetarist assuming that the elasticity of the demand for money is low, and the LM curve is approximately vertical, believes that the monetary policy is effective through channels other than interest rates. According to the monetarist, increasing the money volume leads to total demand increase, and given the delay in adjusting wages in the labor market or the lack of prices flexibility, the price and product levels increase, and if wages are fully adjusted, increasing uniquely the money volume will lead to higher prices. Thus, in general, monetarist believes that an increase in the money volume, leads to an increase in nominal production, and over time, wages which are fully adjusted, show increasing the money volume in increasing prices, and production returns to its initial level (Branson, 1979). Some of the most important money transfer channels are: the traditional interest rate channel, the exchange rate channel, the stock price channel, the bank lending channel, the corporate balance sheet channel, and effects of the household balance sheet channel. In summary, the pattern of any mechanism for the monetary policy transfer is as follows:

Traditional Interest Rate Channel:
Money supply ↑ ⇒ real interest rate ↓ investment expenses ↑ ⇒ production ↑

Duct Exchange:
Money supply ↑ ⇒ real interest rate ↓ ⇒ local currency valuation ↓ ⇒ export balance ↑ Production ↑

Stock Price Channel:
Money supply ↑ ⇒ stock price ↑ ⇒ value of financial wealth ↑ ⇒ consumption ↑ ⇒ production ↑

Bank Lending Channel:

Money supply ↑ ⇒ bank deposits↑ ⇒ bank loans↑ ⇒ investment ↑ ⇒ production ↑

Enterprises Balance Sheet:
Money supply ↑ ⇒ stock prices ↑ ⇒ inconsistent choice ↓ and ethical risks ↓ ⇒ money lending↑ ⇒investment ↑ ⇒ Production ↑

Household Balance Sheet Effects:
Money supply ↑ ⇒ stock price ↑ ⇒ valuation of financial assets ↑ ⇒ the likelihood of a financial problem ↓ ⇒ expenditure on durable consumer goods and creating housing ↑ ⇒ production ↑

2.2 MCI and How Calculating It

Interest rate and exchange rate are two important channels of money transfer that influence economic and inflation activity through monetary policy. Typically, two channels of interest rate and exchange rate are used to explain the monetary condition effect on determining total demand and inflation (Xiong, 2012). A combination of interest rate and exchange rate can be used to indicate monetary condition which is called MCI. The use of MCI as a monetary policy tool for the central bank is based on the assumption that both factors of interest rate and exchange rate are important factors influencing economic condition, especially inflation. When interest rates or exchange rates increase, lowering inflation is considered as their impact. By contrast, when interest rates or exchange rates decrease, their impact on costs, consumption and investment will enhance them in the future, which results in increasing the inflation rate. After calculating the MCI, it is allowed to divide the monetary policy of the country into expansionary and contractile policies. An increase in the MCI indicating a contractionary monetary policy and a decline in it, reflect an expansionary monetary policy. Ericsson et al. (1997) found that MCI is important in several respects: it is easy to understand, and easy to calculate, making both domestic and foreign effects on the general monetary condition of a country. In addition, it is useful for institutions and government, and is considered as a leading indicator for monetary authorities in their political considerations. De Wet (2002) defines the MCI as a composition of changes in short-term interest rates and effective exchange rates from a base year. So, “the MCI is a weighted index of real interest rates and real effective exchange rates with weighted values that indicates the impact of interest rates and exchange rates on inflation.”

A MCI is a weighted average of the percentage point change in the domestic interest rate(s) and percentage change in an exchange rate, relative to their values in a base period. It can be calculated using both nominal and real variables (Batini and Turnbull, 2002). MCI has been operationalized around the world in several ways. Freedman (1994; 1995) understood it as an indicator, assisting the central bank in tracing the transmission process from policy instruments, over operating and intermediate targets to ultimate target. Bofinger (2001) built a model in which the MCI helped minimize the loss function of the central bank subject to internal and external equilibrium conditions, which yielded a unique method to predict the real interest and the exchange rate. Stevens (1998) considered MCI as a hybrid of instrument and target of a central bank, as in a free floating regime no direct control existed over the exchange rate. Mayes and Viren (2000) put emphasis in this context on the profound knowledge of empirical interactions between the interest rate and the exchange rate. According to Frochen (1996), MCI cannot be treated as the synthetic indicator of monetary policy actions. Because it takes market-based variables into account. Market is also pricing in its own expectations and perception.

This thought seems to have been widely accepted in subsequent literature. Siklos (2000) emphasized on the MCI role in communication, as a feedback from the financial markets towards the central bank. Blot and Levieuge (2008) studied the MCI appropriateness in G-7 countries in order to explain future economic activities. They realized that the MCI informational content was extremely sporadic. Also, they came to the conclusion that the past evolution of exchange rate, interest rate and asset prices affected the economic activity with different impact and timing. Esteves (2003) calculated a MCI for the Portuguese economy. He stated that despite all the simplifying assumptions underlying its construction, the dynamic versions of the MCI may be helpful in explaining the contribution of monetary conditions to the evolution of the Portuguese economy, especially in the more recent past.

The MCI is generally written in the following form:

$$MCI_t \equiv \alpha \Delta r_t + \beta \Delta e_t \quad (1)$$

In this equation, Δr_t is the changes in the interest rates, Δe_t is the changes in the exchange rate index relative to a base year, and α and β are parameters. In other words:

$$\Delta r_t = (r_t - r_0) \quad (2)$$

$$\Delta e_t = (e_t - e_0) \quad (3)$$

The exchange rate index is determined in a way that its value for one base year equals to 1. The zero year or the base year is usually the year in which, the economy is in a stable state. In fact, Δr_t and Δe_t not only designates changes in a period, but also show the sum of the total changes made from the base year to the period t (Burger and Knedlik, 2004).

The remained important issue, is the determination of the weights available in calculating the MCI. Freedman (1994) proposed two ways to determine the MCI weights. According to him, the weights available in calculating the MCI can be obtained based on the effect of each variable on the total demand or the prices. Based on the point, and according to the first case where MCI weights are obtained by estimating the total demand function, the following equation can be written:

$$Y = \alpha r + \beta e + w \quad (4)$$

In this equation, Y is the product level, r is the interest rate, e is the exchange rate, and w is the vector of other variables affecting the total demand; while all variables are real. The parameters α and β calculate the required weights in the MCI index. In the latter case, the changes effect of interest rates and exchange rates on the price level, is considered. In this case, the price function is estimated. In fact, the price level is calculated as a function of interest rates and exchange rates. The contraction of bank lending with executive tools is still considered as a useful tool for monetary policy. Interest rate regulations and non-liberalization also avert affordable pricing of credit risk, and force banks to use credit portfolio adjustments in order to control the risk of their loan portfolios (Pong and Lang, 2005). Accordingly, the supply of credit and real interest rates are two independent forces which affect overall demand growth.

Theoretical foundations have sufficient evidence to support credit status sensitivity as another important channel to transfer the monetary policy (Bernanke and Gertler, 1995; Kannan et al., 2006). In this paper, the conventional MCI will widen with extending the bank credit. According to Bernanke and Gertler (1995), Stones (1998) and Khan et al. (2006), the completed index of MCI for Iran economy is written as follows:

$$BMCI_t \equiv \alpha\Delta r_t + \beta\Delta e_t + \gamma\Delta c_t \tag{5}$$

In which, Δr_t is the interest rate change, $\beta\Delta e_t$ is the change in the exchange rate index, and Δc_t is the change in the credit volume index relative to the base year. In this study, the real values of the variables will be used. Moreover, the base year in this study is similar to some studies in 1997. In order to estimate this model, the inflation rate has been used as an alternative variable, due to the absence of a real interest rate. In addition, the real exchange rate has been obtained from the product of the free-market exchange rate in the ratio of the US consumer price index to the consumer price index of Iran. The parameters α, β and γ display the components of real interest rate weights, real exchange rate and real credit in the MCI index, respectively. These weights are obtained from the estimation of the total demand function. Of course, government expenditure has also been added to the function as a factor affecting the total demand in Iran. Also, the virtual variable associated with structural failure in the years of the imposed war, is considered. Thus, the total demand function is estimated as follows:

$$Y= \alpha_0+ \alpha_1 rr+ \beta_1 re+ \gamma_1 rc+ \lambda_1 rg+ \mu_1 d+\varepsilon \tag{6}$$

In this equation, y is the actual product logarithm, rr is the real interest rate, re is the real exchange rate logarithm, rc is the logarithm of the actual credit volume, rg is the actual government expenditure logarithm, and d is the virtual variable of the structural failure in the years of the imposed war. The parameters $\alpha 1$, $\beta 1$ and $\gamma 1$ respectively indicate the weights of real interest rate, real exchange rate and real credit in the MCI index. The MCI variables can be either nominal or real. If the variables are nominal, the MCI will be nominal, and in the other case the MCI will be real. In this study, both the nominal and real MCIs are calculated. Finally, the best indicator will be picked.

3. Research Background

Sadeghi et al. (2007) in 'Separation of monetary policies using the MCI (MCI) in Iran', reviewed the Taylor principle, and introduced the monetary policy indicator for Iran which are defined as a combination of changes in real interest rates and real exchange rates relative to the base year, such that the positive changes of this index imply contractionary monetary policy, and its negative changes reflect the expansionary monetary policy. In their paper, they calculated Iran MCI for the period 1973 to 2006, and separated them based on the expansionary and contractionary monetary policies implemented by the central bank.

Khorsandi et al. (2012) in 'Suitable MCI for the Iranian economy', extracted the generalized MCI by adding the variable of credit to two other variables in the standard MCI. Finally, employing non-nested and root mean squared error tests, they suggested that for Iran, the generalized MCI, in which the channel of credit is considered to be suitable to the conventional index, can be preferable. Also, the use of the real monetary condition is preferable as the middle target to the nominal MCI.

Using seasonal data, Wai-Chang (2010) calculated the generalized MCI for ASEAN-5 countries from 1980 to 2004. He operated the cointegration test to determine the key channels of the transfer. Results showed that currency exchange rates, asset prices, and interest rates channels were important for the monetary policy transition in Indonesia and Thailand; while the exchange rate channel, and the short-term and credit interest rates are considered as the main transmission channels in Malaysia and Singapore, and the transmission channels in the Philippines include interest rates, exchange rate, asset, and credit price. The generalized monetary policy index in the studied countries showed that real GDP changes especially after 1997 were made in a good manner. Oriela (2011) extracted the MCI from 1998 to 2008 using the least square method, seasonal data on interest rates and real exchange rates for Albania. Results showed that real interest rates in Albania were more important, and there would occur a one-percent increase in real interest rates which could offset up to 3.8 percent of value in the real exchange rate.

Chu (2012) developed a model in order to cover Singapore's entire financial system. He proposed an index that not only attended the monetary variables, but also involved asset prices such as stock and housing prices. He applied the seasonal data from 1978 to 2011, in order to calculate the index in the model. Also, He obtained the variables weights using vector auto-regression (VAR) method, and suggested that housing prices are very important in determining the inflation rate. So it came to the conclusion that the information monetary policy could be derived from the FCI, which clearly reflected the financial condition in Singapore. He finally proposed the calculation of the same index for all Asian countries.

Thanh Ha (2015) extracted the MCI based on a model that considered three channels of monetary transmission, including interest rate channel, the exchange rate channel, and the money channel, and concluded among three policy variable that, the exchange rate comprised the remarkable amount of information about the policy stance.

Siclar and Dogan (2015) in ‘MCI with time varying weights: An application to Turkish data’, reviewed the evaluation of the fluctuations impact in interest rate and exchange rates on monetary policy by employing MCI. The weights for MCI construction are obtained employing the time varying framework by Kalman filter algorithm. Finally, they came to the result that the inflation changes lead to changes in both interest rates and exchange rates. Also, the results demonstrates that the interest rate channel, compared to exchange rate channel, has a stronger and more rapid impact on the changes transfer in policies to economy.

Yaaba (2013) constructed a broad MCI for Nigeria using three key channels of monetary transmission, namely interest rate, exchange rate and credit channels. The result gives dominance to exchange rate channel, followed by credit channel and interest rate channel. He concluded that the resultant MCI traces fairly well the policy direction of the central bank of Nigeria for the studied period. Hence it can benefit as an adequate gauge of monetary policy stance of the Bank.

4. Estimation of ARDL Time Series Econometric Model

It should be noted that all tests and estimates carried out in the following sections, were performed by EViews9 software.

4.1 ARDL Time Series Econometric Model

In the first step, the applied data structure should be determined in a static manner. For the static test of variables, the augmented Dickey–Fuller test (ADF) is commonly used. According to the test results, all variables except the logarithm of the real credits volume, are stable at 95 percent level. The actual volume logarithm of the credits variable, is static at 90 percent.

Table 1: Stationary Test of the Variables Results

Variable	ADF Calculated statistics	ADF Statistical significance at 1%	ADF Statistical significance at 5%	ADF Statistical significance at 10%
Y	-3.406	-3.646	-2.954	-2.615
rr	-3.293	-3.639	-2.951	-2.614
re	-3.060	-3.639	-2.951	-2.614
rc	-2.917	-3.646	-2.954	-2.615
rg	-2.137	-2.644	-1.952	-1.610

Source: Research findings

4.2 Execution Test for Self-Explanatory ARDL Econometric Modeling Assumptions

To estimate the ARDL time series model, several conditions are required: First, all variables are static or all variables are static in the first difference or some variables are static, and others in the first difference is static. Second, the data is issued normally. Third, the data does not have heterogeneity of variance. Fourth, the data is not autocorrelation.

In connection with the first condition in the previous section, it was determined that this condition existed and all variables were static. In relation to the second condition of the Jerque-Bra test using EViews9 software, the normal distribution of data is as follows:

Table 2: Normality Test of Variables

Variable	Jerque-Bra Statistics	Probability of Jerque-Bra Statistics
Y	4.498	0.105
rr	5.093	0.430
re	2.251	0.324
rc	9.200	0.100
rg	3.898	0.142

Source: Research findings

Finally, the Jerque-Bra test does not reject the assumption of data normal distribution. In Jerque-Bra statistics, two criteria of skewness and kurtosis are integrated in order to test the hypothesis of the normal distribution of data. The statistics of this test, which are asymptotically distributed with two degrees free, are as follows:

$$JB = \frac{S^2}{6/T} + \frac{(K-3)^2}{24/T} \tag{7}$$

where S^2 is the skewness criterion, and K is the kurtosis criterion. The normality test is the Jerque-Bra test, which has distribution χ^2 with two degrees of freedom, and with the null hypothesis that the data are normal.

In connection with the third condition, the white test was conducted for variance heterogeneity. Results are presented in Table 3.

Table 3: White Test Results

Test	Statistics	Probability
F-Statistic	0.863	0.547
Obs*R-square	6.413	0.492
Scaled explained SS	5.426	0.608

Source: Research findings

In this test, the null hypothesis is that there is no problem of variance heterogeneity. Given the probability of statistics F which is more than 5 percent, the H_0 is accepted. As a result, in this regression, there is no variance heterogeneity. In relation to the fourth condition, the Breusch–Godfrey serial correlation LM test was performed, which results are presented in Table 4.

Table 4: Breusch–Godfrey Test Results

Test	Statistics	Probability
F-Statistic	1.806	0.185
Obs*R-square	4.449	0.108

Source: Research findings

Here, the null hypothesis is that there is no autocorrelation problem, ie cov (ui, uj) = 0. Given the probability of statistics F which is more than 5 percent, the H0 assumption is accepted. As a result, there is no autocorrelation problem in this regression.

4.3 Dynamic Model Estimation

The ARDL model is used in a method that considers the short-run dynamics between variables, and estimates long-term relationships. In this method, dynamic model, long-term relationship, and error correction pattern are first fitted. According to this estimation, as expected, the real GDP logarithm and real GDP, the real exchange rate, real credits volume, and actual government expenditures logarithm variables have a positive significant effect on the logarithm of the actual product; but the logarithmic effect of the real interest rate is negative.

Table 5: Estimation of the Dynamic Pattern of ARDL (1, 0, 0, 0, 0, 1)

Explanatory variable	Coefficient	t-Statistics	Probability
Y(-1)	0.627	11.957	0.000
rr	-0.003	-3.794	0.000
re	0.148	3.469	0.002
rc	0.142	4.464	0.000
rg	0.147	4.199	0.000
D	-0.038	-0.982	0.335
D(-1)	-0.107	-2.605	0.015
C	-0.294	-0.488	0.630
Durbin-Watson Stat= 1.900		R-Square= 0.996	

Source: Research findings

Figure 1 shows the number of the ARDL model interruptions for 20 best models along with the selected model. It shows 20 models with the smallest value of criterion provided if any of the Akaike (AIC), Schwarz (BIC) and Hannan-Quinn (HQ) criteria is used. The Schwarz benchmark graph is shown in the following.

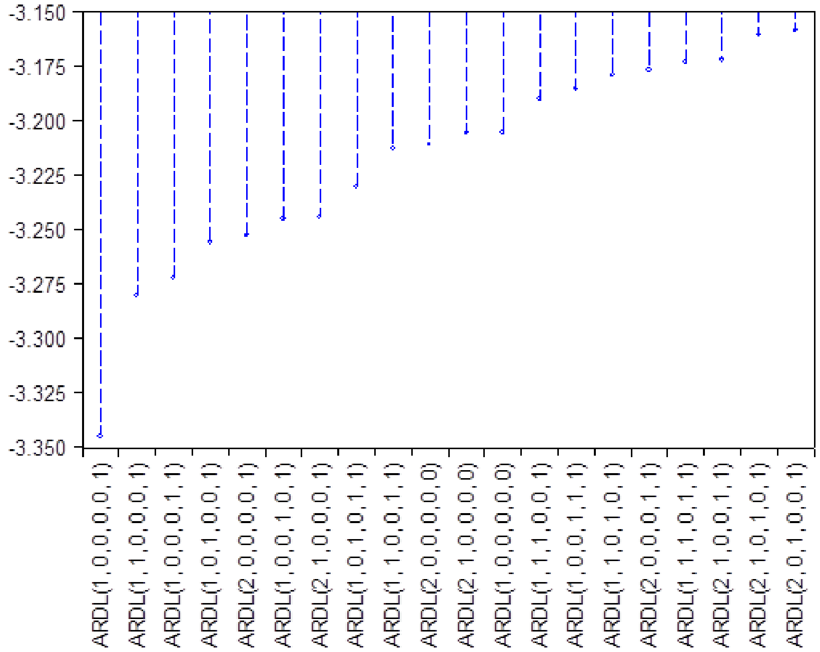

Figure 1: Schwarz Criteria (top 20 Models)

4.4 Long-Term Pattern Estimation

4.4.1 Band Test Results in Self-Explanatory Regression Method with Extended Interruptions

Band test is conducted to find out that if there is a long-term relationship between the explanatory variables and the dependent variable in the ARDL model or not. If a computational statistic is bigger than the critical value of the upper limit, it will be rejected the H0, meaning that there is no long-term relationship, regardless of the cointegration degree of variables. Conversely, if the test statistic is lower than the critical value of the lower limit, the null hypothesis will be accepted. At last, if the test statistic is between the upper and the lower limits, the result is unclear. The results of the Band test are presented in the following table. As explained above, the H0 that there is no long-term relationship, is rejected.

Table 6: Band Test Results

Statistics		Test
16.506		F-statistic
critical value of Band		
I1 Bound	I0 Bound	Significance Level
3.35	2.26	10%
3.79	2.62	5%
4.18	2.96	2.5%
4.68	3.41	1%

Source: Research findings

4.4.2 Long-Term Pattern Estimation Results

The table below presents the results of long-term pattern estimation. As the results show, the sign of all variables is expected. The real interest rate variable has a positive significant effect on the actual product logarithm. The logarithmic variables of the real exchange rate, the logarithm of the credits actual volume, and the logarithm of the actual government expenditures, have a positive significant effect on the logarithm of the actual product. As the results show, the logarithmic effect of the real exchange rate variable, the logarithm of the real credits volume, and the actual interest rate on the logarithm of the actual product is more, respectively. In addition, the effect of two variables of the logarithm of the real exchange rate, and the logarithm of the actual credits volume on the actual product logarithm are close to each other. In fact, the exchange effect, and the effect of the credits rates channel in Iran, is more than the interest rate channel.

Table 7: Long-Run Pattern Estimation Results

Explanatory variable	**Coefficient**	**t-Statistics**	**Probability**
rr	-0.008	-2.921	0.007
re	0.397	4.123	0.000
rc	0.381	6.987	0.000
rg	0.394	5.483	0.000
d	-0.389	-5.723	0.000
C	-0.789	-0.495	0.625

Source: Research findings

4.4.3 Estimation of Error Correction Pattern

The cointegration between a set of economic variables, provides a statistical basis for using the error correction pattern. The main reason for the reputation of these patterns is that they link short-term fluctuations of variables with long-term equilibrium values. These models are in fact kinds of partial equilibrium, in which effective forces in the short-run and approaching speed of the long-run equilibrium, are measured by entering a sustainable waste from a long-term relationship. Estimation of error correction pattern for the model is reported in Table8.

Table 8: Error Correction Pattern Estimation

Explanatory variable	Coefficient	t-Statistics	Probability
rr	-0.008	-2.921	0.007
re	0.397	4.123	0.000
rc	0.381	6.987	0.000
rg	0.394	5.483	0.000
d	-0.389	-5.723	0.000
C	-0.789	-0.495	0.625

Source: Research findings

According to this estimation in the short-run, the real exchange rate logarithm, the logarithm of the actual credits volume, and the logarithm of the actual government expenditures have a positive significant effect on the logarithm of the real product. Yet the logarithm of the real exchange rate has a negative significant effect. A comparison of the variables impact on the short and long-run indicates that the explanatory variables in the short and long-run have the same effect on the real product. An important factor in the model is the error correction coefficient, which shows how to adjust the shocks in the short-run to a long-term equilibrium trend. In calculating this model, this coefficient is equal to –0.373, which has the expected sign (negative), indicating that in each period, 37.3 percent of the shocks occurred in the short-run toward long-term equilibrium values, are adjusted. This adjustment speed is impartially appropriate, and the shocks effects in these three periods are adopted.

5. Selecting the Appropriate MCI

Since inflation is the main objective of monetary policy and central banks in Iran, an index having a higher predictive power of inflation, is a more appropriate indicator. In this regard, the autocorrelation model is used with disturbance interruptions as follows for inflation:

$$\pi_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \pi_{t-i} + \sum_{i=0}^{q} \beta_i dMCI_{t-i} + \varepsilon_t \tag{8}$$

where π is the inflation rate, and the dMCI is the first order difference of the MCI. Since the MCI itself has no concept, but index change indicates the expansion or contraction of monetary condition, in the above equation, the first-order difference of MCI is used as the effective variable on inflation. This equation is calculated using both indicators. The model of root mean squared error (RMSE) model is used to select the best indicator with a high predictive power rather than the inflation rate. In this case, the lower RMSE index is, the predictive error of the model is less, and therefore, the predictive power is higher. In Table 9, results of the RMSE are compared for the two indices of real and nominal MCI.

Table 9: Predictive Power of Nominal and Real Indices Comparison by RMSE

MCI index	Root Mean Squared Error (RMSE)
Real MCI with demand weight	0.134
Nominal MCI with demand weight	0.143

Source: Research findings

According to the above table, the real MCI, has a lower forecast error than the nominal condition index. Therefore, according to the mean squared error test, the real index is preferable. In the following tables, more detail is provided for estimating these models:

Table 10: Inflation Equation Estimation by Real MCI with Demand Weight

Variable	Estimated coefficient	Uncertainty level
intercept	-0.604	0.027
INF(-1)	0.862	0.000
dMCIr(-1)	0.018	0.079
R-square=0.976	D-W= 1.802	Prob(F-Statistic)= 0.000

Source: Research findings

Table 11: Inflation Equation Estimation by Nominal MCI with Demand Weight

Variable	Estimated coefficient	Uncertainty Level
intercept	-0.871	0.596
INF(-1)	0.559	0.002
dMCIr(-1)	0.017	0.047
R-square=0.973	D-W= 1.861	Prob(F-Statistic)= 0.000

Source: Research findings

4. Conclusion

This study has been conducted aimed to calculate the MCI for Iran during the 1978–2012 period. For this purpose, the generalized MCI was employed including the credit channel, as well as the two traditional channels of interest rate and exchange rate. To estimate the weights of this index, it was used the estimation of the total economic demand equation. The estimation of the total economic demand equation was performed with self-explanatory ARDL time series econometric model. Ultimately, two real and nominal monetary condition indicators were calculated. In order to select the appropriate index among these two indicators, the predictive power of each index in inflation was tested. Finally, it was concluded that the real MCI was more appropriate than the nominal monetary condition for monetary policymakers as a guide.

As Batini and Turnbull (2002) stated MCI could be employed for policy in various ways. MCI offers information about the policy stance level. For example, the MCI relative to a previous or benchmark period can be calculated to indicate if policy has become ‘tighter’ or ‘looser’ relative to those periods. In general, a MCI will typically be a ‘leading’ indicator of stance, inasmuch as changes in current-dated interest rate, and exchange rates are yet to have an effect on output and inflation. A

MCI can be rearranged normalizing on the interest rate to obtain a policy rule where the interest rate is set so as to parallel movements in the exchange rate. This is equivalent to feeding back on the exchange rate level, i.e. it is akin to exchange rate targeting. So, Ball (1999) proposed an alternative of ‘MCI-based’ rule, which implies setting monetary conditions so as to refine deviations of inflation from target, and deviations of output from potential.

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