

Identification and Analyzing Of Effective Factors Elasticities on Inflation Function in Iran by Using ARDL Methodology

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Abstract— we estimated the function of inflation for the period (1971-2009) by using the autoregressive distributed lag (ARDL) method. In addition, we used the error correction model and stability tests. According to our findings, the explanatory variables include gross domestic production, saving, government expenditure, liquidity and import. The results show that there is a long-run equilibrium relationship between the variables. According to our findings, the liquidity and government expenditure have positive impact on the inflation and gross domestic production; saving and import have insignificant negative effects on the inflation in Iran. The Error Correction Model (ECM) is about 73 percent, which indicates amount deviation of equilibrium. Furthermore, the stability tests show if the inflation function is stable, therefore the two tests confirm that the stability of the inflation function is existent.

Index Terms— Inflation, Stability, ECM, Gross Domestic Product, Liquidity, Import, Saving, Government Expenditure

I. INTRODUCTION

Estimation of the inflation function plays a very important role in the economy for the policy maker to determine and make and perform policies on the economic system. The stable inflation is one of the most important and basic issues in macroeconomic policy analyses. Effective factors on The inflation is a necessary tool that the Iranian Central Bank can use to control or adjust inflation rate of each country. We know these factors can be used as a useful instrument for economic policies. The liquidity is one of important and effective factors on the inflation rate. The growth rate of liquidity can influence economic basic variables, i.e. inflation, employment and production, extremely. When the growth rate of liquidity is fixed, the prices (inflation) will not change or will change only a little. No doubt, when policymakers have successful policies in the inflation field, they have to prevent from great increased or decreased liquidity in the economy regularly because this changing led to create high inflation rate in the economy. In fact, the stability of inflation

rate or a little changing of it is needed for the better performance of policies.

Several studies have used Oskooiee (1995) and Khan (1974) cointegrating technique in examining the long-run relation between the inflation rate and its determinants. These studies include, among others, Louis (1999) for Nigeria; Nili (1985), Olin (2000) and Moradi (2002) for Iran.

Most of the studies, or better to say, their main results, showed that inflation rate, was converged with M_2 , broadly money supply definition, Gross domestic production and government expenditure. In this literature, the relationships among variables that are named "short-run" and "long-run" will be surveyed. Also inasmuch as the policies cause increased income and production, we should survey and have almost stability or a little increasing in inflation. Only when a country enjoys targeted inflation, economic policies can be implemented successfully. This paper will analyze conditions and relations, and, finally, it will put forward strategies.

II. MODEL SPECIFICATION AND ESTIMATION TECHNIQUE

According to the inflation theories and important hypotheses in the inflation field that have diverse and widespread spectra, there exist several kinds of inflation in the economy, that is to say structural inflation, shortage of supply and/or surplus of demand. In general, the researchers examined the relationships which can exist between the inflation rate, also named level of prices, with variables influencing it. Therefore, we suppose our function has seven variables that are showed in the following equation:

$$IN = (GDP, G, S, IM, LM_2, D54, D57, D59, T)$$

In this essay, IN is inflation rate, LM_2 real money volume, GDP is the gross domestic product, G is government expenditure, S is savings, D54, D57 and D59 are the dummy variables for the shock of petroleum, the revolution and the war which happened in Iran and trend. When we estimate this function, it should be changed to log-linear form. In this work, linear model of money demand in Iran is as follows:

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$$LIN_i = \sum_{i=1}^{p_1} B_{1i} LIN_{i-1} + \sum_{i=0}^{p_2} B_{2i} LGDP_i + \sum_{i=0}^{p_3} B_{3i} LM_i + \sum_{i=0}^{p_4} B_{4i} LS_i + \sum_{i=0}^{p_5} B_{5i} LG_i + \sum_{i=0}^{p_6} B_{6i} LIM_i + D_{54} + D_{56} + D_{59} + T$$

According to the above model and by using that, we can write the following model in a similar manner for estimation as follows:

$$LIN = aLGDP + bLS + cLG + dLM + iLIM + eD54 + fD57 + gD59 + hT$$

We estimate this linear model, where LIN is the logarithm of inflation rate, LGDP is the logarithm of gross domestic product at constant 1998 prices, LM is the logarithm of money volume, LS is the logarithm of savings, LG is the logarithm of government expenditure, D54, D57 and D59 are the dummy variables for the said shock of petroleum, revolution and war, and T is the trend.

When we use one of the econometric techniques to apply a model, we should know which technique is suitable. Therefore, we need to determine the grade of integrated level of each variable. We use one of the tests of integration that are called the "unit root test" and/or "Dickey-Fuller test" to distinguish the level of integration. In this paper, we applied the Augmented Dickey-Fuller (ADF) test. The unit root test was applied and it was tested with two econometric softwares in a similar manner in order that our work would lead to decreased error and increased confidence of estimating. The results of unit root test presented in the Table I.

TABLE I
RESULTS OF UNIT ROOT TEST

Variables Name	ADF TEST BY MICROFIT	ADF TEST BY EVIWES
<i>LIN</i>	<i>I</i> (○)	<i>I</i> (○)
<i>LGDP</i>	<i>I</i> (1)	<i>I</i> (1)
<i>LS</i>	<i>I</i> (1)	<i>I</i> (1)
<i>LG</i>	<i>I</i> (1)	<i>I</i> (1)
<i>LM₂</i>	<i>I</i> (1)	<i>I</i> (1)
<i>LIM</i>	<i>I</i> (1)	<i>I</i> (1)

SOURCE: RESEARCHER AND SOFTWARE OUTPUT

When a model is estimated, the variables should be stationary. Provided that it is stationary, it could be told that our estimation is quite correct, suitable and trustworthy. Table (1) indicates the level of integration. Accordingly, if we used the methodology of Eviews, we would need to transform the non-stationary variables into the stationary ones; however, in view of this problem, Pesaran and Shin (1995, Shin and

Smith (1996) introduced a new method of testing cointegration. This methodology is known as "Auto Regressive Distributed Lag Approach" (ARDL). The main advantage of this approach lies in the fact that it is necessary to classify variables into I (1) or I (0) but not necessary to transform variable from I (1) to I (0). Moreover, we can use ARDL methodology of Microfit, which is easier than methodology of Eviews.

III. EMPIRICAL RESULTS

In this paper, annual data from Central Bank of the Islamic Republic of Iran for the period 1971-2009 were used. We estimated and applied our model by using of ARDL manner and by selecting the four lag criterion that is called "Schwarz Bayesian" criterion (SBC). the statistics of long-run estimations were showed in the table II

TABLE II
LONG-RUN COEFFICIENTS

Variables	Coefficient	Standard Error	T-Ratio	T-[Prob]
<i>LGDP76</i>	-1.1883	0.3639	-3.2654	0.004
<i>LG</i>	0.29716	0.1089	2.7270	0.013
<i>LS</i>	-0.01435	0.1614	-0.0889	0.930
<i>LM₂</i>	2.2755	0.63139	3.6040	0.002
<i>LIM</i>	-0.1820	0.13878	-1.3120	0.204
<i>T</i>	-0.0897	0.02495	-3.9576	0.002
<i>D54</i>	0.2929	0.1541	1.9002	0.071
<i>D57</i>	-0.0979	0.1204	-0.8131	0.425
<i>D59</i>	-0.5641	0.1366	-4.1280	0.000

Source: Researcher and Software Output.

The long-run coefficients of estimation provided in the above table represent the long-run elasticities. According to the statistics of T-Ratio or T-Prob mentioned in the table, we can say most of obtained coefficients from the model that we estimated are extremely significant. The coefficients of the government expenditure, money volume and shock of petroleum variables are positive and significant. The coefficient of savings variable is not significant. The coefficients of the gross domestic production, import, trend, war and revolution variables are significant and negative. The negative coefficients were obtained for LGDP, LIM, T, D9 and D57 indicate that their influence on the inflation is inverse. Accordingly, the coefficients of LG, LM and D54 have significant and positive effects on the inflation in Iran. Therefore, with a low-percentage increase in each of the variables, the level of prices would be increased in the future and vice versa. Unlike direct and positive influence of the said variables, the gross domestic production influences the inflation rate inversely, namely this effect is negative or exactly inverted. Hence, according to the signs, which are expected to be indicative of the estimated and obtained coefficients of table 2, the policymakers can change the inflation rate in economy through changing these variables. It

should be noted that those variables which have got the highest coefficients will have more influence on the prices. Accordingly, generally among the policies, those would be successful whose influence on the variables could be traced more. Therefore, in this paper, the performance of GDP or LM policy are higher than those of other policies. Only when a policy enjoys a higher coefficient, herein specifically GDP and LM, can we claim that such a variable has got a better and stronger effect. Finally, any factor which leads to a raise in the GDP or depression in the LM in economy can be used as an instrument of the monetary policy to changing of inflation.

Furthermore, we examined the function of inflation by the two tests. In doing so, we followed Pesaran (1997) and applied the CUSUM and CUSUMSQ tests by ARDL technique.

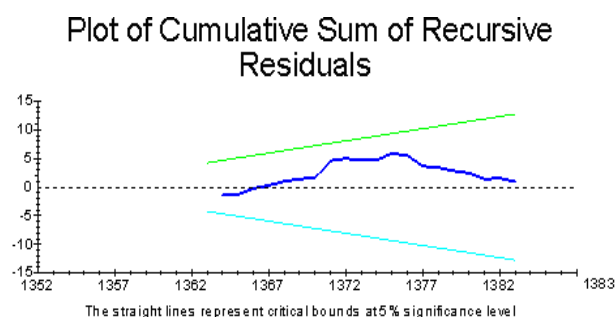


Fig 1 Plot of CUSUM
Source: Researcher and Software Output.

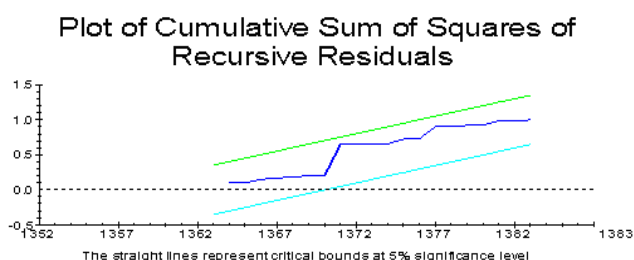


Fig 2 Plot of CUSUMSQ
Source: Researcher and software output.

If the two plots of CUSUM and CUSUMQ statistics stay within and do not cross the critical bounds of 5% significance level represented by a pair of straight lines drawn at 5% level of significance. Figure 1 and 2 show that none of the plots cross and pass the critical bounds. Accordingly, there is no evidence indicative of any significant structural instability, so our function of the money demand is stable. Therefore, according to the results of these tests, we can say that all economic policies have the most influence on the economy. It means that the policies would have the maximum performance when the economy is stable and does not have any structural break.

TABLE III

COEFFICIENT OF ERROR CORRECTION MODEL				
Variables	Coefficient	Standard Error	T-Ratio	T-[Prob]
ECM	-0.733	0.103	-7.114	0.000

Source: Researcher and Software Output.

The estimation of the Error Correction Model is presented in table III. We had expected that the error correction coefficient to have the negative sign and to be highly significant in this case. The coefficient of our ECM indicated that the coefficient was about 73 percent. This is 73 percent corrects more than half of the errors resulting from the deviation of the equilibrium path in each period. The coefficient of ECM can be interpreted as the yearly speed of adjustment of disequilibrium. Therefore, we can say that if any disequilibrium happens in the economy, it will take less than one year to eliminate it.

Table IV P-Values of Diagnostic Tests			
Serial Correlation	Functional Form	Normality	Heteroscedasticity
0.166	0.062	0.796	0.487

Source: Researcher and Software Output.

Table IV indicates the summary of diagnostic statistics. Importantly, if three or all p-values of diagnostic tests of the estimated model should be more than 0.05, we can say our estimate is correct and safe. According to this table, three of all p-values are more than 0.05; thus the function form of the demand for money which was distinguished and determined exactly, and we can say the choice of our pattern and variables was true.

$$\frac{\text{Sum of short-run dependent variable coefficients} - 1}{\text{Sum of short-run dependent variable standard errors}} = \frac{0.26669}{0.10307} = -7.1146$$

A t-test on the error correction mechanism is performed giving a value of -7.11, Being the none standard critical values -3.48 at 90% (sample size=31, k=5) we can reject the null hypothesis of no cointegration therefor equation is well-determinate.

IV. CONCLUSION

At present, according to all our findings, we can say the results show that there is cointegration among LIN, LGDP, LM, LG, LS, LIM, T, D54, and D57and D59. A major implication is that using elasticity estimates from inflation function will help to provide more reliable estimates of future money balances in the country. This means that more stable long-run inflation incorporates a real agreement between inflation rate, real GDP, savings, government expenditure and import. The GDP elasticity is positive as expected and almost more than one. LIN was cointegrating with GDP, LIM, LG, LS, D54, D57, D59 and T. The coefficients of gross domestic product (LGDP), import (LIM), trend(T) and dummy variables (D57, D59) have a negative sign, the

coefficients of money volume (LM), government expenditure (LG) and dummy variable (D54) have a positive sign, the coefficient of savings rate is insignificant. Therefore, we can say if we want to prevent high increasing in the inflation rate or decreasing it, we should increase gross domestic production or decrease growth of liquidity in the economy. No doubt, we should notice always economics can admit and need a little raising in the inflation but should policymakers can't help extreme influence changing of variables on the level of prices especially the money volume and government costs.

The CUSUM and CUSUMQ tests show the estimated relationship is stable. Therefore the inflation stability was contributing to inflationary policies. The variables can be used to influence inflationary policies in Iran. However, the variables enjoying a higher coefficient will have a higher influence of course the sign of coefficients are very important. Finally, we must notice the policymakers in Iran should focus only on those variables in economy which have significant effects on the inflation and the domestic the inflation rate. Anyway, if these conditions, which were mentioned in the foregoing, take place, the inflationary policies performance in Iran for having appropriated inflation would succeed.

Totally, it can be mentioned that financial development is one of the main factors of long term economic growth. Financial market can be resulted in economic growth provided on preparing suitable context to efficiently assign resources and then raise the capital efficiency. Long term economic non-inflationary growth and production and occupation increase need to equip financial resources and their efficient assignment in National economy and such a goal can be reached by help of organized, integrated and efficient financial markets in which there will be variety of financial tools, forming of competitive area and information transparency.

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BIOGRAPHY



Hamid Reza Izadi borne on 1982 in SHIRAZ, got B.A in Economic Sciences majoring in industrial economics sciences, got M.A in economic sciences majoring in economic theory in 2007 from university of Sistan and Bluchestan. Thesis subject: A+ marking" evaluation of function demand for money in Iran in method ARDL.

Scientific research background

.acquisition of third place in under graduate and second place in post graduate course.

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.Project in progress under title of "Marine insurance and its effect on economic growth of Iran" at Maritime sciences University of Chabahar.

. published article in Iran economy scientific extensional journal under title of "identification and survey of geographical potential possibilities in Chabahar free zone".

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Teaching Microeconomics and Macroeconomics (1&2), Public Section economics, Economics systems, Mathematics (1&2), Insurance Principles, Practical Econometric, free and special economic zones principles

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