

## THE EFFECT PUBLIC DEBT AND MONEY SUPPLY ON INFLATION IN IRAN WITH THE EMPHASIS ON THE FISCAL THEORY OF THE PRICE LEVEL

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### ABSTRACT

In this study the effect of public debt and money supply on inflation in Iran with emphasis on the fiscal theory of the price level (FTPL) has been studied. This study took place by the use of Auto Regressive Distributed Lag Method (ARDL) for the period of 2000-2005 (seasonal). Attraction calculation of short term and long term calculations and Error Correction Model (ECM) shows that the fiscal theory of the price level in Iran is positive and statistically significant. Survey results also shows budget deficit effect on the consumer price index during the year of 20004-20009 (seasonal) that true volume of money and short and long term sold bonds has positive and significant relation with the consumers' price index. Error Correction model also indicates that the estimated effective policies in the long term have been in a way that annually about 34 percent lack of balance in pattern is modified to balance.

**KEYWORDS:** Public Debt, Supply of Money, the Fiscal Theory of the Price Level, Error Correction Model, Auto Regressive Distributed Lag Method

### INTRODUCTION

It is mostly accepted; that the decrease in inflation is largely depends on the monetary policy, especially in its early stages. Based on the money quantity theory, inflation can be determined by the change in the relative supply of money and goods and disinflation policy is framed with the objective of controlling monetary growth to be in line with the expansion in nominal income. Therefore, , many countries have allocated their central banks autonomy hoping that it will insulate them from having to accommodate imprudent fiscal policies.

However, considering that current money demand should be based on expectations about future inflation, efforts at reducing inflation may not be successful. Theoretically, once account is based on expectations, a lot of equilibrium ways for inflation can coexist. In such cases, money supply may not be sufficient to pin down inflation.

Against this, attention has been paid to the role of fiscal policy to determine inflation. Sargent and Wallace (1981) state that the effectiveness of monetary policy to control inflation depends on its coordination with fiscal policy. In their model, harder policy could lead to higher inflation in some cases, the price level holds. The logic will be, with the demand for governmental bonds given and with no changes in fiscal policy; a part of government obligations has to be balanced by Seigniorage (the difference between the value of money and the cost to produce it) in the future.

A similar reasoning lies behind the fiscal theory of the price level (FTPL). Besides seignorage, financing, old ways of analysis of the fiscal effects on inflation focus on Keynesian aggregate demand considerations, public wage spillovers to private sector wages, and taxes affecting marginal costs and private consumption (Elmendorf and Mankiw, 1999). The FTPL states that the effect of government debt as another channel of fiscal influence on inflation (Buiter, 1999; Niepelt, 2004), has built up a wide literature (Woodford, 1994; Sims, 1994;)

This paper provides a study on The Effect Public Debt and Money Supply on Inflation in Iran with the Emphasis on the Fiscal Theory of the Price Level in Iran. Given the importance of policy regimes in the forward looking models, we rely on flexible econometric techniques allowing for our country heterogeneity, which is often neglected in empirical studies.

This study also differs from much of the existing empirical studies (Elmendorf, 1993; Ardagna et al., 2004; Catao and Terrones, 2005) since the researcher focuses on the role of public debt in determining inflation. In so doing, the researcher accounts for the effective channels of fiscal influence on inflation—namely monetization expectations and effects of public debt—which can be formed independently of the size of the budget deficit.

#### **Autoregressive Model with Distributed Lag (ARDL) Method**

To evaluate the long-term and short-term relationships between the dependent variable and the other explanatory variables in the model, Integration method such as the method of *Engle Grenger and* error correction models such as error correction mechanism (ECM) were used to evaluate the long and short-term relationships between the dependent and the other explanatory variables of the model, . However due to the existing limitations in the use of *Engle Grenger* and ECM and also to avoid the existing shortcomings in the models including biased in the small samples and not to be able to carry out statistical tests, a more suitable methods of long and short term analysis of the relationships between variables have been proposed. Regarding this we can point out self-explanatory with extended lag (ARDL) approach (PesaranandPesaran<sup>1</sup>1997). In this method, unlike the method of Engel – Granger, same degree of integration between the variables is not necessary (Joseph, 2000).

Also, it simultaneously estimates the existing long short-term patterns in the model and eliminates the problems associated with omitting the variables and Auto correlation. Therefore, ARDL, methods of estimating are efficient because problems like autocorrelation, the creation of unbiased and inner opportunities are avoided (Sidiki 2000).

In the last decades, several studies which aimed to investigate the factors influencing macroeconomic variables and time series analysis have used methods self-explanatory with Distributed Lag (ARDL) methods. . Among which we refer to the studies by *Ismihan et al* (2003), Narayan (2004), Khalilian and Farhadi (1381), Tofighi and Mehrabian (2003), Khdamrdy and Hzhrky any (2002), Vatanpour (2003), Hydari et al (2006).

Therefore, in the present study ARDL model was used was to investigate the impact of public debt and money supply on Iranian inflation in different years. In this study bonds variables were sold in time series. Bonds (B) and true volume of money (M), as the independent variables and the consumer price index (P) as the dependent variable with distributed lags, has been considered. The generalized ARDL model can be as indicated below:

$$\alpha(L, p)y_t = \alpha_0 + \sum_{i=1}^{\kappa} \beta_i(L, q_t)x_{it} + u_t \quad (1)$$

$$i=1, 2, \dots, k$$

Where  $\alpha_0$  is the width from the source and  $y_t$  is the dependent variable and L is the lag operator which is defined as follows:

$$L^i y_t = y_{t-i} \tag{2}$$

Therefore,  $\alpha(L, p) = 1 - \alpha_1 L^1 - \dots - \alpha_p L^p$

$$\beta_i(L, q_i) = \beta_0 + \beta_{i1} L + \beta_{i2} L^2 + \dots + \beta_{iq_i} L^{q_i}$$

Accordingly, dynamic ARDL model for the impact of public debt, the money supply on Iranian inflation will be as followed:

$$P_t = \alpha_0 + \sum_{i=1}^k \gamma_i P_{t-1} + \sum_{i=1}^z \tau_i M_{t-1} + \sum_{i=1}^j \phi_i B_{t-1} + \gamma_0 C_t + \tau_0 M_t + \phi_0 B_t + u_{1t}$$

**Estimating of Models Based on Autoregressive Distributed Lag, ARDL**

In this part of the study in order to investigate relations between short term and long term impact the public debt, the supply of money on inflation this pattern (ARDL) has been used to study relations considering its advantage compared to multivariate times series models.

In this part of the study was to investigate the relationship between short-term and long-term impact on public debt, money supply, inflation and the advantages of ARDL model multivariate time series than the other models, this model is used to examine relationships .

Based on theoretical foundations, to provide accurate inferences about time-series variables, first we should be sure about the static variables over time. Here, the results of Dickey Fuller’s test, generalized evaluation of the static variables in the ARDL model are summarized in table 1.

Test results of Stationary of variables of ARDL model for 1993 q<sup>3</sup>-2009-q<sup>1</sup>

**Table 1**

Width Status From Source and Process	Stationary Level	Optimal Number of Interruptions	Dickey Fuller’s Statistics	Variable
**width with the origin and process	(1)I	0	-9.02*	M
With the origin and process	(0)I	0	-4/73	B
**With the origin and process	(1)I	3	4/92 -	P

\*Significant at the 5% level (P=0/05)

\*\*Stationary tests done with width from the source and without process and also without width from the source and process are carried out and finally these results are confirmed

### Theoretical Study of Fiscal Policy of the Price Level

In this case, the purpose of study is to investigate the budget deficit through monetary and debt on consumers' price index. Accordingly, the dynamic model of ARDL for the consumer price index will be:

$$P_t = \alpha_0 + \sum_{i=1}^k \gamma_i P_{t-1} + \sum_{i=1}^z \tau_i M_{t-1} + \sum_{i=1}^j \phi_i B_{t-1} + \gamma_0 C_t + \tau_0 M_t + \phi_0 B_t + u_{1t} \quad (3)$$

In this equation, k, j and z are, respectively, optimal interruptions for the variables Pt, Mt, and Bt is

The following two-stage method can be used to estimate long-term relationship. First a long-term relationship between the variables under study will be tested. If there is a stable long-term relationship between the variables of the model, then, long-term coefficients will be estimated and conclusions about the value will be deduced. If the total estimated coefficients related to the interruption of the dependent variable are less than 1 then, the dynamic model tends toward balanced long term. Therefore, to test the convergence the following hypothesis will be necessary (Greene, 2000).

$$H_0 = \sum_{i=1}^m \alpha_i - 1 \geq 0$$

$$H_1 = \sum_{i=1}^m \alpha_i - 1 < 0$$

t test for testing the above hypothesis will be as following:

$$t = \frac{\sum_{i=1}^m \alpha_i - 1}{\sum_{i=1}^m s \alpha_i} \quad (4)$$

Comparing the obtained t, the critical parameters provided by Banerjee, Dolado & Mester and desired confidence level, the presence or absence of long-term equilibrium relationship between the variables of the model can be realized (Greene, 2000). In the long-run the following relationships between variables in the model will be true:

$$P_t = P_{t-1} = \dots = P_{t-k} \quad (5)$$

$$M_t = M_{t-1} = \dots = M_{t-z}$$

$$B_t = B_{t-1} = \dots = B_{t-f}$$

Therefore, long-term relationship between financial asset prices can indicate as the following that:

$$P_t = \delta_0 + \delta_1 P_t + \delta_2 B_t + \delta_3 M + u_{2t} \quad (6)$$

The existence of convergence between a set of economic variables, provides the basis for the use of error correction models (Greene, 2000). Error correction Equation for ARDL model can be written as the below (7):

$$\Delta P_t = \Delta \hat{\alpha}_0 + \sum_{i=1}^k \hat{\gamma}_i \Delta P_{t-1} + \sum_{i=1}^{\tau} \hat{\tau}_i \Delta M_{t-1} + \sum_{i=1}^j \hat{\phi}_i \Delta B_{t-1} + \theta ECM_{t-1} + u_{3t} \tag{7}$$

Which is part of the following (ECMt-1) error correction

$$ECM_t = P_t - \hat{\alpha}_0 - \hat{\gamma}_1 P_t - \hat{\tau}_1 M_t - \hat{\phi}_1 B_t \tag{8}$$

Where  $\Delta$  is the first difference operator and  $\hat{\gamma}_i, \hat{\tau}_i, \hat{\phi}_i$  is the estimated coefficients of equation (3). Coefficient is part of error correction component that measures the speed of adjustment.

However, to study the effect of supply deficiency through monetary and debt on the consumers' price index statistics of the seasons 2004-2005 was used. Given that the survey approach of this article is based on seasonal statistics and due to different published seasonal time series statistics by the central bank statistics, the seasonal statistics of 1904 to 2006 is used. Table 2 shows the results of equations (3).

**Table 2: The Results of the Estimations of Dynamic Model, ARDL (1, 0, 1)**

Variable	Coefficient	SD
Width from the source/ intercept	9/8-	61/5*
Process Consumer price index with a lag period	19/1	38/0**
Actual amount of money	65/0	09/0*
Bonds sold with a lag period	46/0	1/0*
	13/0	1/0 11/0
	29/0	***
	<b>R 299 /</b>	<b>* F = 808</b>

\*, \*\*, \*\*\*, indicates significance at 1, 5, 10, 20 percent.

With the use of dynamism model of factors (ARDL), shown in Table 2, the existence of the long term relationship is assessed and determined between Variables. For this, referring to the relationship (4), obtained statistic equals to -3/68. Therefore, comparing of the determined quantity & critical value or quantity represented by Benerjy, Dolado & Master, null hypothesis was rejected in the model based 95 percent. Therefore, we can say a balanced a long term relationship between variables of the model is established. . Outcome results of assessment of the long term relationship of the consumers' price index, based on (6) relationship, that is presented in the frame of (7) equation and determined long term tensions based on that, are provided in the table 3.

**Table 3: Out Comes Result of Assessment the Long Term Communication & Long Term Tension**

Variable	Deviation	Coefficient	Long Term Tension
Width from Intercept	10.8	-26.1-	
Process	0.28	3.4-	
Actual amount of money	0.14	0.13	0.31
Sold bonds	0.58	0.001	0.016

Based on the on the significant level of 1, 5, 10, 20 percent.

The results of table 3 shows that, with 10 percent increase in factual money volumes, consumers' price index 3/1 percent. So, in the exiting condition, increase in the factual mass of money will cause increase in the consumers' price index in Iran. According to the above table, it can be stated that, with 10 percent increase in the sold bonds, consumers' price index will increase 1 percent only. Less effect of bonds and more effect of money growth in inflation can be because

of money based budget deficit and financing through debt. Existence the convergence between set of economic variable provides basis for the use of error correction models. Actually error rectification model relates short- term fluctuation of variable with quantity of long- term. To estimates the short- term relation between foreign exchange rate and other investigated variables, error correction model of the frame 7 was used.

Results of error rectification model calculated short- term tensions are shown in Table 4

**Table 4: Results of Assessed Error Rectification Model and Short- Term Tensions**

Variable	Deviation	Coefficient	Long Term Short
The first stage difference from base	***5.6	-8.9	-
The first difference of the process	*0.38	1.1	-
First order difference of the actual amount of money	*0.1	0.46	1.1
First order differencing of sold bonds	***0.1	0.13	0.17
Component of the error correction	*0.34		

\*' \*\*' \*\*\*'\*\*\*\* according to the significant level of 1, 5, 10, 20

**Source:** research findings

As shown in the table 4, in the short term factual mass of money and sold bonds have positive effects on consumers' price index. Based on the calculated short- term tensions shown in the table, 10 percent increase in sold bonds; consumers' price index will increase about 1/3 percent in the short term. Also 10 percent increase in the actual amount of money in the short term, the consumers' price index will increase about 11 percent. Also 10 percent increase of the sold bonds will change consumers' price index about 1.7 percent

Results shows that, coefficient of error rectification ( $ECM_{t-1}$ ) estimated based the equation (8) is meaningful and expected result is (negative). The amount of coefficient equals to 0.34 shows that 34 percent deviation of the consumers' price index of the long term has been removed. Actually, in each period, 34% of non-equilibrium of the model is adjusted to balance. Therefore, we can hope for the term long effects of the policy. But shows long term impact on the financial assets of the markets

Therefore, the results of the effect of budget deficits financing on the consumer price index during the years 2004-2009 (seasonal) shows the actual amount of money and sold Bonds in the short and long-term have positive and meaningful relationship with the consumer price index. Existence of significant coefficients in predicting short-term and long-term proves fiscal policy theory of the price level In Iran. The estimated error correction coefficient model also suggests the influence of policies in the medium term in a way that about 34 percent of annual imbalances in the model has been adjusted to balance.

### **The Results of the Theory of Fiscal Policy of Price Level Investigation**

Statistics of the seasons 2004 to 2008 was used to investigate the effects of governmental budget deficit financing and debt on the consumers' price index. Using the coefficients of the dynamic model, long-term relationships between variables were tested and statistics equal to 68/3 was obtained. So, there is a long term balanced relation between variables of the model. Long-term results of the tension of the variables on the consumers' price index shows 10 percent increase in

the actual amount of money increases consumer price index up to 3.1 percent. Therefore, the increase in real money volume increases in the consumer price index in Iran. Also, it can be said that with 10% growth of sold bonds, the consumer price index will only increase 1 percent. The effect of bonds and effectiveness of real money growth in inflation can be attributed to the financed monetary deficit through debt.

Also, in the short-term the real mass of money and sold bonds have positive and meaningful effects on consumers' price index, in way that 10 percent increase in the sold bonds, in the short time, increases the consumers' price index up to 1.3 percent. Also, 10 percent increase of real mass of money in the short time, will be followed by 11 percentage of consumers' price index and 10 percent increase of sold bonds will increase consumers' price index up to 1.7 percent.. The results show that error correction coefficient ( $ECM_{t-1}$ ) is really meaningful and expected amount is negative. The coefficient equals 0.34 and indicates 34 percent deviation (nonexistence of balance) of index consumers' price variables will be removed from long term quantity after a period. Actually, in the every period, 34% imbalance in the model is adjusted to balance. Therefore, we hope for the effectiveness of policy in the long term. But will show longer term impact of the financial asset of markets.

## CONCLUSIONS

Comparing the results of the impact on the financing budget defect on consumers price index during 2004-2010 (seasonal) indicates that the actual amount of money and sold bonds have positive and meaningful relationship with consumers' price index in short and long term. The presence of meaningful coefficients in the short-term and long-term estimates represents a strong confirmation of the theory "Fiscal policy price level" in Iran. The estimated error correction coefficient model also suggests the influence of policies in the medium term so that about 34 percent of annual imbalances in the model have been adjusted to balance.

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