



Inflation targeting and Inflation Tax in selected Countries of the World

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ABSTRACT

This Study examines the effect of inflation targeting policy on inflation tax in selected countries of the world. For this purpose panel data model was used in 36 selected countries during 2003-2009. Also by using mean difference test, the inflation tax for three years before and after inflation targeting was examined. Results suggested an inverse relationship between inflation targeting and the inflation tax by Friedman method. In addition, results of mean difference test for all countries and for each country separately, unexpectedly suggested an increase in inflation tax in the most countries after implementation of inflation targeting policies. In addition results of mean difference test for all countries and for each country separately suggested after implementation of inflation targeting policies, inflation tax is rising. In other words we can say that inflation targeting policies has not been granted to reduce the inflation tax.

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Introduction

Today, confronting with inflation is one of the major and vital macroeconomic objectives for economic development of any country. In the economic literature to implement economic policies to control inflation rate, different frameworks are introduced and applied as targeting frameworks. The most commonly used frameworks until the early 1990s were exchange rate and money volume targeting which choose intermediate targets of exchange rate and money volume to achieve the ultimate goal of reducing and controlling the inflation rate (Bernanke, 1992).

In selecting these frameworks it was perceived that if intermediate goals are provided efficiently, the behavior of ultimate long term goal, reducing and controlling money volume, is acceptable (Mishkin, 2005). However, experience in other countries shows the poor performance of such methods to control. In this regard inflation targeting framework was introduced in the early 1990s, to direct monetary policy towards ultimate goal of control and reducing the rate of inflation. Afterwards, this framework is known as a suitable framework for monetary policy.

Mason (1997), examined the application of inflation targeting in developing countries and stated that in most developing countries, the requirements of inflation targeting were not implemented. Since seignior age is one of the most major sources of state finance.

In this study, we examine the effects of inflation targeting on inflation tax in performer states during three years before and after the inflation policymaking implementation, using mean difference tests.

Literature Review

Mishkin et al (1997), studied Inflation in inflation targeting countries using VAR model. In this study, they have been predicted GDP growth and interest rate is controlled by central bank using Unrestricted Vector Autoregressive model for years after the implementation of inflation targeting for each country separately. The results showed that inflation and interest rate

improved after years of inflation targeting while there is no strong evidence for change in GDP growth.

Neumann and Hagen (2002) by investigating behavior of inflation in inflation targeting countries (Australia, Canada, Chile, New Zealand and the United Kingdom) and Compared to non-inflation targeting countries (Germany, Switzerland and United States) found that implementation of inflation targeting reduce the level and volatility of inflation.

Jafari Samimi and Shamkhal (1997) examined the importance and influenced factors on inflation tax in Iran and in different countries of the world and analyzed affected factors on inflation tax in Iran. They calculated inflation tax as changes in the monetary base to total state revenue (including inflation tax) for 79 countries between 1971-1982 years.

According to inflation tax Ranking in different countries, generally observed that importance of inflation tax in developing countries is more than in developed countries. Also information show that compared with other countries inflation tax situation in Iran has been of considerable importance and between 79 countries Iran has been in 21th rank. The model estimation results indicate that increasing the share of GDP sections that are more appropriate in terms of taxation and the cost of collecting taxes are lower in them, inflation financing would be reduced. Also because of no flexibility in other government resources, has led to greater use inflation tax. Therefore, it is critical for government to rely on productive spending and in order to avoid adverse effects of inflation tax; inflation tax system should reform regular tax system of the country.

Carbo and colleagues (2002) examined the effects of strategy implementation by dividing countries into inflation targeting (Chile, Israel, Australia, Canada, Finland, New Zealand, Sweden and the UK), potential inflation targeting (Columbia, South Korea, Mexico and South Africa) and non-targeted inflation (Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Portugal, Switzerland and United States of America) as control countries.

This study shows that the inflation forecast errors (based on VAR models) is reduced for inflation targeting countries than potential inflation targeting and non-targeted inflation countries. Finally, this study suggests that inflation persistence in inflation targeting implementation years is reduced.

Levine et al. (2004) and Johnson (2002) have focused on the effect of inflation targeting on expected inflation. Johnson using panel data model concluded that inflation targeting has reduced expected inflation level in inflation targeting countries. But it has no effect on changes in expected inflation and the average estimation errors. Levine and colleagues have concluded, inflation targeting has been effective in strengthening the long-run inflation expectations and reduce inflation persistence. During 1994, long-run inflation estimations in private sector in the United States of America and Europe have shown a strong correlation with inflation over last periods.

This correlation cannot be seen for Australia, Canada, New Zealand, Sweden and Britain. In other words, inflation targeting countries have been successful to cut inflation expectations with fulfilled inflations. Although the random walk hypothesis in consumer price index inflation has been rejected for four of the five inflation targeting countries, but this hypothesis cannot be rejected for United States of America and Europe.

Jafari Samimi (2008) examined the effect of inflation on inflation targeting policy in different countries of the world and its applicability in dealing with Iran and concluded that this policy reduces inflation in studied countries using the mean difference in 1975-2005.

Model

In this article we used data from 36 selected countries over the period 2003 to 2009. Our variable include GDP per capita, Openness, Tax revenue share of GDP, Inflation, Money To calculate the inflation tax. Information of these variables released by the World Bank (2011).

The method used in this study is a descriptive – analytical approach. In descriptive data analysis, inflation tax is fully examined before and after inflation targeting. In analytical methods section to evaluate hypotheses and research questions, results of mean difference test was used¹.

Two types of tests have been carried out in this study:

- 1) All countries (examination of the effect of inflation targeting on inflation tax)
- 2) For individual countries², (unique to each country)

The difference of inflation tax in two situations in community, before and after slightly policy implementation is examined.

We examined the relationship between inflation targeting and inflation tax in countries where inflation targeting has been implemented there. Based on researches in this field, an estimated model was introduced and used variables in the model are examined. To investigate the effect of inflation targeting on inflation tax the following model is used³:

$$INT_F = \beta_0 + \beta_1 OPENNESS_{it} + \beta_2 TAX_{it} + \beta_3 GDPP_{it} + \beta_4 DUM + \varepsilon_{it} \tag{1}$$

INT_F is Inflation Tax, GDPP is GDP per capita, Openness is the ratio (percentage) of trade (imports +exports) to GDP and DUM means dummy variable, it is one for Countries have done inflation targeting and zero for Countries that do not invest for the purpose.

Spearman correlation coefficients

According to Freidman method in 2003 and 2009, to investigate the relationship intensity between two inflation tax variables, Spearman correlation coefficients was used. The Spearman correlation coefficient is equal to 0.75 and it shows there is little difference between countries grade in 2003 and 2009 years. And there is a strong correlation between the inflation tax variable based on Freidman definition in 2003 and inflation tax variable based on Freidman definition in 2009.

Results of model estimation

To specify the model, inflation tax variable share in GDP is used as dependent variable and gross domestic per capita production, the degree of openness of the economy and tax revenues are used as independent variable. Equation is estimated using a combination data method with Eviews and SPSS software.

To estimate the model, it is necessary to determine the estimation type, so to determine the presence or absence of a separate intercept for each of the countries F statistics is used. Then results of F Chow test, confirms model 1.4 by using least square method, and resulted F is less than resulted F in table one. So H_0 about equality of the intercepts will be accepted.

$$F = \frac{\frac{R_{fs}^2 - R_{ols}^2}{n - k}}{\frac{1 - R_{OLS}^2}{nt} - n - k}$$

$$F = \frac{\left(\frac{0}{72} - \frac{0}{51}\right) / 35}{\left(1 - \frac{0}{72}\right) / (250 - 36 - 7)} = 4.61$$

According to the table, used variables in the model, are explain 51% of the variation in the calculated inflation tax by Freidman method. And all coefficients of the used variables in the model are significant at 95% except for openness of the economy. The results of the model estimation and F statistics is demonstrated the validity of the model.

According to estimated model, GDP per capita is negative and statistically significant at 95%. According to estimated model in 2003-2009, this coefficient is estimated -0.34, and it means one percent increase in per capita GDP, reduces inflation tax by 34 percent, which indicates an inverse relationship between per capita GDP growth at current prices and inflation tax in selected countries in desired period.

Also according to the estimated model, the degree of economic openness has a negative and significant impact on inflation tax.

Tax revenue has a direct and significant relationship with inflation tax in regarded period, and tax revenue coefficient is positive and statistically significant at %95. indicated by one percent increase in tax revenue, inflation tax is increases by %9.7.

¹ In this study, Paired – Sample T Test or mean difference in dependency of samples is used.

² In all countries tests, three years before and three years after implementing inflation targeting policy was examined.

³ Similar models in other developing countries have been estimated by researchers to examine influential factors. For more details refer to: Cukierman et.all, (1992) DE, haan et.all (1993)

In the following section results of mean difference test to compare inflation tax before and after implementing inflation targeting policy is presented.

Table 1: Panel regression results

Dependent Variable: INT				
Independent Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPENNES	-4.19	231.7	-1.80	0.07
GDP	-0.34	1.552	-2.19	0.02
TAX	0.097	0.006	15.81	0.00
DUM	-30.015	90005.08	-3.33	0.001

R-squared
0.51
Adjusted R-squared
0.50
F-statistic
64.76
Prob (F-statistic) 0.000

Mean difference test

Test for all countries:

Hypothesis 1: there is a significant difference in average inflation tax before and after applying the inflation targeting policy.

μ_1 : Average inflation tax for three years before applying inflation targeting policy.

$H_0: \mu_1 = \mu_2$
 $H_1: \mu_1 \neq \mu_2$

In this section, mean difference test based on paired- sample test (for dependent means) for inflation tax three years before and after policy implementation was done according to current statistics and results are reported.

Table 2. Comparison between means for inflation tax for inflation targeting countries (Friedman method)

	Paired Difference	t Statistics	Degrees of freedom	Significance level
Average	-9.42	-1.54	19	0.13
Standard deviation	2.72			
Standard error	61035			

Source: Computing Research

As can be seen, according to calculated t-statistic (-1/54) and probability of the calculated statistic (0/13) at 95% confidence level, hypothesis of equality of mean inflation tax before and after inflation targeting policy is confirmed in selected countries and the implementation of inflation targeting is not effective.

Test Divided Country

In this section, we examine the inflation tax before and after applying inflation targeting in selected countries. Outputs of this test are reported in table (3).

According to calculated statistics for each country and probability for each calculated statistics in 95% confidence level, the H_0 hypothesis about inflation tax mean equalities before and after inflation targeting policy was examined and if it was rejected, we can conclude after policy implementation, a significant change in inflation tax was created and this policy is affected on inflation tax and if this hypothesis was not rejected, we can conclude that after policy implementing, a significant change is not affected on inflation tax.

Among studied countries, in Australia, Ghana, New Zealand and the Netherlands, the inflation tax situation was improved after inflation targeting policy implementation and this policy is affected on inflation tax policy, but in other

countries there is no significant difference in inflation tax and this policy didn't has any effect on inflation tax.

Table 3. Test results in selected countries of the world (Friedman method)

Country	Mean difference	T-Test	Significance level
Armenia	1.19-	0.18	0.86
Australia	1.2-	-4.6	0.04
Brazil	-7.20	-0.69	0.55
Colombia	-1.04	0.62	0.59
Ghana	-3.97	-2.22	0.15
Canada	-2.13	-0.8	0.5
Hungry	-9.53	-0.6	0.6
Iceland	-1.99	-1.82	0.2
Indonesia	-7.5	-1.87	0.2
Israel	1.35	-0.06	0.9
Korea	-6.88	-0.13	0.9
New Zealand	1.88	2.22	0.15
Peru	-5.64	-0.22	0.84
Philippine	5.39	0.01	0.99
Poland	3.77	1.99	0.18
Romania	1.04	1.64	0.24
South Africa	7.82	1.95	0.19
Sweden	-1.03	-0.79	0.5
Thailand	-1.98	-0.39	0.73
Guatemala	4.45	0.18	0.87
Switzerland	-1.76	-1.41	0.29

Source: Computing research

Conclusion

In this study we examine the effect of inflation targeting policy on inflation tax in selected countries of the world. For this purpose panel data model was used in 36 selected countries during 2003-2009. Also by using mean difference test, the inflation tax for three years before and after inflation targeting was examined. Results suggested an inverse relationship between inflation targeting and the inflation tax by Friedman method. In addition, results of mean difference test for all countries and for each country separately, unexpectedly suggested an increase in inflation tax in the most countries after implementation of inflation targeting policies. In addition results of mean difference test for all countries and for each country separately suggested after implementation of inflation targeting policies, inflation tax is rising. In other words we can say that inflation targeting policies has not been granted to reduce the inflation tax. Should not be expected Inflation targeting framework provide the solution to all economic problems. Inflation targeting framework for central bank decides main task of monetary policy and defines which target is achievable and which is not. Using the inflation targeting policy is suggested in Countries That have Initial conditions and prerequisites such as Central bank independence.

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