Macroeconomic Effects of Inflation Targeting: Evidence from the Middle and High-Income Countries

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Abstract. *By employing Propensity Score Matching analysis, this study aims first to show how inflation targeting affects macroeconomic indicators in middle and high-income countries, and second highlights whether the global financial crisis has created a change in the way that inflation targeting impacts on them. Results prove that adopting inflation targeting increases the real GDP and budget deficit, and decreases the current account deficit. However, its effect on inflation is puzzling. The high-income inflation targeters should be careful about implementing the strategy and inflation targeting should be accompanied by the fiscal policy either in middle or in high-income countries.*

Keywords: Inflation Targeting, Propensity Score Matching, Middle-Income Countries, High-Income Countries, Global Financial Crisis.

JEL Classification: C21, E52.

1. Introduction

Inflation targeting approach that is defined as announcing an official quantitative inflation target or target range to the public in order to realize within certain time dimension through government or central bank actions or their mutual actions (Bernanke and Mishkin, 1997) was first implemented in 1990 by New Zealand. Since it has shown positive performance, many developed and/or developing countries have started to implement this strategy.

Inflation targeting is a future-oriented monetary policy. In this regards, central banks make predictions on what way the inflation will follow in the future. This prediction is compared with the target inflation rate and the difference between the prediction and the target helps determining in what way the monetary policy should be adjusted (Debelle et al., 1998).

According to Mishkin (2001), there are five key elements of the inflation targeting strategy: 1) public announcement of medium-term numerical targets for inflation; 2) an institutional commitment to price stability as the primary, long-run goal of monetary policy and a commitment to achieve the inflation goal; 3) an information inclusive strategy in which many variables and not just monetary aggregates are used in making decisions about monetary policy; 4) increased transparency of the monetary policy strategy through communication with the public and the markets about the plans and objectives of monetary policymakers; and 5) increased accountability of the central bank for attaining its inflation objectives.

Inflation targeting regime offers a more flexible strategy compared to the other alternative regimes providing price stability. Inflation targets usually defined for the medium-term and short-term deviations can be acceptable (Schaecher et al., 2000). In order to successfully practice the inflation targeting strategy, the central bank should have clear power autonomy to form monetary policy tools with its discretionary power, and the public should be informed about monetary policy framework and management (Mason et al., 2007). Furthermore, the fiscal policy should be supporting the monetary policy and should coincide with it.

The 2008 Global Financial Crisis has brought some doubts about the inflation targeting approach. Before the crisis, the FED, the Bank of Japan and the European Central Bank have adopted their monetary policy strategies over a middle-term inflation target, even if they do not follow an explicit inflation targeting program. However, the crisis has weakened the faith on inflation targeting. It is suggested by many of the economists that inflation targeting is not capable of preventing a financial crisis or avoiding an economy to fall in a recession (Reichlin and Baldwin, 2013). In this context, countries implementing inflation targeting strategy have started to target the financial stability as well as the price stability (Williams, 2014). Thus, the aim of this study is first to show how inflation targeting affects macroeconomic variables such as the GDP, inflation rate, the current account deficit and the budget deficit in middle and high-income countries for the periods 2007 and 2011, and second to highlight whether the global financial crisis has created a structural break in the way that inflation targeting impacts on macroeconomic

indicators in consideration. To this end, the study employs Propensity Score Matching (PSM) model with the cross-section data of 31 middle-income[1] and 32 high-income[2] countries. Countries are classified in light of World Bank's income classification.

Rest of the paper is organized as follows: Next section summarizes the literature and describes the novelty. Section 3 presents the data, methodology and results. Finally, Section 4 concludes.

2. Literature

Ever since the first adoption of inflation targeting by New Zealand in 1990, the topic has become a vast field of interest. Hatcher and Minford (2014) have recently surveyed the inflation targeting literature in detail. However, there are some pioneering studies in the field that should be stated here. For instance, Bernanke and Mishkin (1997) investigate how inflation targeting approach has been applied in practice. Accordingly, this approach has several advantages such as being more transparent, coherent and accountable.

Mishkin (2000) examines what inflation targeting includes for emerging markets and investigates the advantages and disadvantages of this approach. The study reveals that although inflation targeting is not a nostrum and may not be convenient for many emerging market countries, it can be a notably useful monetary policy approach in several of them.

Mishkin and Schmidt-Hebbel (2007) show that inflation targeting helps countries in achieving lower inflation rates in the long run, strengthen monetary policy independence, improve monetary policy efficiency, and obtain inflation outcomes closer to target levels.

Đurović-Todorović and Djordjević (2008) explore the main properties of inflation targeting as a sort of monetary policy. Inflation targeting come out of two parts: a policy system of constrained discretion and a communication strategy which attempts to focal expectations and clarify the policy system to the public. These two factors support both price stability and inflation expectations. Also, imaginative strategy of inflation targeting can preserve good results with regard to output, employment and inflation. Communication plays different important roles in inflation targeting.

Mollick et al. (2011) explore the effects of inflation targeting on output growth over the period 1986-2004 by using static panel data approach. The study reveals that the adoption of an utterly fledged inflation targeting regime results in higher per capita income in industrialized and emerging economies. On the other hand, the estimated long-run output impact of inflation targeting by using dynamic model for emerging market economies is found to be lower than in the case of static models.

Kurozumi (2012) investigates sustainability of an inflation-targeting policy from the point of sustainable equilibrium by using a canonical model. The study suggests that majorly flexible inflation targeting is not sustainable. When shock persistence is high enough, strict inflation targeting is preferable.

Haung and Yeh (2014) investigate the treatment effects of inflation targeting on unemployment rates in the case of 74 countries over the period 1980-2010. Findings reveal that, on average, inflation targeting presents no noticeable effect on unemployment rates in all samples. On the other hand, when the whole sample is classified under subgroups, adoption of inflation targeting becomes a factor that affects the unemployment rate in industrialized countries.

Ftiti and Essaadi (2014) analyze the effects of inflation targeting on the inflation dynamics in New Zealand, Canada, Sweden and the United Kingdom. Results show that inflation targeting strategy has a conversion period for countries which have high and volatile inflation experience until inflation targeting adoption. It is proved that, a structural change exists in inflation series of New Zealand, Canada and Sweden, thus, governments have intervened to the policy. However, in the United Kingdom, there exists a comparatively lower inflation rate experience before inflation targeting adoption.

Arestis et al. (2014) investigate whether the inflation rates of the countries that pursue inflation targeting have converged in contradistinction to the experience of the OECD non-inflation targeters. They explore the stationary features of the inflation differentials. Results show that the inflation rates converge regardless of the monetary policy framework.

Minea and Tapsoba (2014) examine the performances of inflation targeting adoption from the point of fiscal discipline for developing and developed countries. The study suggests that adoption of inflation targeting has a positive and significant effect on fiscal discipline. However, this effect is statistically significant only in developing countries.

Ayres et al. (2014) aim to advance findings up to now related to inflation targeting by determining effect of timing on the policy decision in developing countries. Results show a significant regional alteration with regards to changes in inflation following a shift to the inflation targeting policy. Besides, there exists a statistically significant positive impact of inflation targeting on real GDP in European, Latin American, and the Middle Eastern developing countries.

The present study differs from the previous studies in several aspects. First, to the best of knowledge, this is the first attempt to analyze whether there is any change in the way the inflation targeting impacts on macroeconomic indicators after the global financial crisis. Second, the present study covers four macroeconomic indicators, two time periods and sixty-three countries to investigate. Finally the third, literature related to treatment effects of inflation targeting is relatively weak to the other strands. Hence, this paper aims to fulfill this gap and contribute to the empirical literature.

3. Data, Methodology and Results

3.1. Data

The multivariate framework includes GDP in constant 2005 U.S. dollars, gross fixed capital formation in constant 2005 U.S. dollars, total labor force, inflation rate as

measured by the consumer price index, M2 as % of GDP, final consumption expenditure in constant 2005 U.S. dollars, budget deficit measured as % of GDP, government total revenue measured as % of GDP, government total expense measured as % of GDP, current account deficit measured as % of GDP, exports of goods and services measured as % of GDP, imports of goods and services measured as % of GDP and foreign direct investment measured as % of GDP. All the data are sourced from the World Bank, World Development Indicators database. The data set covers annual cross-section data for the periods 2007 and 2011.

3.2. Methodology

In this study, it is intended to estimate the Average Treatment Effect on the Treated (ATT) by employing the Propensity Score Matching (PSM) methodology. The PSM methodology classifies the observations under two groups. The first one is the treated that receives the treatment, and the second one is the control group that does not. In the current framework, the "treatment" is adoption of the inflation targeting, the "treated" are middle and high-income countries and the "Effect" are the improvements in GDP, inflation rate, current account deficit and budget deficit of countries in consideration in 2007 and 2011.

Formally, the PSM is a binary model with dependent dummy variable "D" and "x" as the vector of independent variables. The D takes the value 1 if a country adopts inflation targeting and 0 if it does not. It is possible to write the PSM in the following manner:

$$p(x) = prob(D = 1|x) = E(D|x)$$

where p(x) is the propensity score that is the conditional (predicted) probability of receiving treatment of given pre-treatment characteristics of the vector of independent variables. The vector x includes gross fixed capital formation and labor force for the GDP model; M2 and final consumption expenditure for the inflation model; export, import and foreign direct investment for the current account model; and government's revenue and expense for the budget model.

By considering the Eq(1), it is possible to define the ATT as the difference between the outcomes of treated and the outcomes of the control observations if they had not been treated. And this can be formulated as follows:

$$ATT = E(\Delta|D = 1) = E(y_1|x, D = 1) - E(y_0|x, D = 0)$$

where Δ is the difference operator, y is the vector of dependent variables (i.e. GDP, inflation, current account deficit and budget deficit), and x is the vector of independent variables. Since the second term "$E(y_0|x, D=0)$" is counterfactual, the observations from the treated and control group should be matched according to their propensity scores.

There are several matching methods such as the Nearest Neighbor, Radius, Kernel and Stratification. The Nearest Neighbor matching (NNM) aims to minimize the propensity score differences between the treated observation and the control observation that has the closest x characteristics. If the NNM is connected to a certain level of radius, then it becomes the Radius matching method. By the Kernel matching model, treated

observations are matched with several control observations, with weights inversely proportional to the distance between the propensity scores of treated and control observations. Finally, the Stratification matching first estimates the propensity score differences between the outcome of the treated observation and outcome of the control observation, and second compares them within intervals/blocks of propensity scores. In this study, the ATTs are estimated by using the Radius matching method.

3.3. Results

The ATTs were estimated by using the Radius matching method and illustrated in Table 1. Accordingly, there is no statistically significant effect of inflation targeting on GDP either for middle-income or for high-income countries in 2007. However, the effect is statistically significant in 2011. It is evident from the table that, after the global financial crisis, adopting inflation targeting strategy increases the real GDP by about 0.3% and 0.5% in middle-income and high-income countries, respectively. In the case of inflation, the ATTs are statistically significant for only middle-income countries in 2007, and for only high-income countries in 2011. Adoption of inflation targeting strategy decreases the inflation rate by about 3.8% in middle-income countries in 2007, whereas it increases the inflation rate by about 1.5% in high income countries in 2011. In the case of current account model, adopting inflation targeting decreases the current account deficit by about 5% in middle-income countries, whereas there is no statistically significant effect for high-income countries in 2007. Besides, in 2011, adoption of inflation targeting lowers the current account deficit by about 4.8% and 4.7% in middle and high-income countries, respectively. Finally, the statistically significant effects of inflation targeting on budget deficit appear as positive. Adopting inflation targeting increases the budget deficit by about 1.1% in high-income countries in 2007. Similarly, adoption of inflation targeting increases the budget deficit by about 1.6% in middle-income countries in 2011.

Table 1. Estimated ATTs of inflation targeting

Macroeconomic variables	2007		2011	
	Middle-income	High-income	Middle-income	High-income
GDP	0.499 (0.614)	0.172 (0.155)	0.321* (2.359)	0.519* (1.875)
Inflation rate	-3.850* (-6.997)	-0.594 (-1.369)	-5.043 (-1.392)	1.569* (2.656)
Current Acc. Def.	-5.068* (-4.342)	-0.394 (-0.176)	-4.808* (-1.695)	-4.790* (-2.548)
Budget Deficit	0.914 (1.328)	1.099* (1.912)	1.582* (2.373)	-1.621 (-0.937)

* Statistically significant at least 10% level of significance. Numbers in parenthesis are t-statistics.

4. Conclusion

In this study, the effects of inflation targeting on macroeconomic indicators such as the GDP, inflation rate, current account deficit and budget deficit in middle and high-income countries for the periods 2007 and 2011 were investigated by using annual cross-section data of 31 middle and 32 high-income countries. And also, considering a before/after approach, it is aimed to show whether the global financial crisis has created a structural break in the way that inflation targeting impacts on macroeconomic indicators. The study employed the Propensity Score Matching framework with the Radius method for the considered purposes.

Results show that, in only statistically significant cases, adopting inflation targeting increases the real GDP and budget deficit, and decreases the current account deficit. However, its effect on inflation rate is puzzling. For middle-income countries in 2007, while inflation targeting decreases the inflation rate, a contrary result has been obtained for high-income countries in 2011. This may be an example for a structural break that the global financial crisis has created.

Findings of the PSM model indicate that the high-income inflation targeters should be careful about implementing the strategy. As Williams (2014) states, high-income countries had better target the financial stability as well as the price stability. And also, inflation targeting should be accompanied by the fiscal policy. Otherwise, it may cause the fiscal instability.

 Finally, lack of balanced cross-section data has restricted the study not to consider all middle and high-income countries in a closer time span. If this problem is solved, it may be a good opportunity for the future researches.

Notes

[1] Middle-income countries are Angola, Armenia, Belarus, Belize, Botswana, Brazil, Bulgaria, Dominican Rep., Egypt, El Salvador, Guatemala, Honduras, Hungary, India, Jordan, Macedonia, Malaysia, Mongolia, Morocco, Namibia, Nigeria, Pakistan, Paraguay, Peru, Philippines, Romania, Serbia, South Africa, Sri Lanka, Thailand and Ukraine.

[2] High-income countries are Australia, Austria, Bahamas, Belgium, Croatia, Czech Rep., Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea Rep., Luxembourg, Holland, New Zealand, Poland, Portugal, Russia, Singapore, Slovenia, Spain, Sweden, Switzerland, England, the USA and Uruguay.

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