



Is Inflation Targeting Working for India?

Udeesha Sharma, Smith College

Inflation targeting is a monetary policy in which the central bank follows an explicit target for the inflation rate for the medium term and announces this inflation target to the public. There are several features that characterize inflation targeting. (Bernanke and Mishkin, 1997) First, it involves an explicit announcement by the government or the central bank that in the future the central bank will strive to hold inflation at or near a numerically specified number or range. Second, the control of inflation and keeping it at a low and stable level is declared to be the primary goal of monetary policy. Since the central bank is held accountable for meeting the inflation targets, this regime is also characterized by increased accountability and credibility of the central bank. Fourth, in most inflation-targeting countries, the central bank publishes regular and detailed assessments on forecasts of inflation which has improved communication. This increase in openness along with several accountability mechanisms that often characterize inflation targeting has increased central bank transparency as well.

Inflation targeting is expected to improve macroeconomic performance since when the central bank makes an explicit announcement with regards to the inflation rate it would want the economy to achieve in the future, consumers can use that to anchor their expectations. Thus, if they expect an increase in inflation on the basis of central bank forecasts, they would buy or invest more now while prices are still relatively lower. This stimulates demand and theoretically should fuel economic growth. Thus, when prices rise at an ideal pace, it drives consumer and investor demand. Inflation targeting also reduces investor and consumer uncertainty by anchoring expectations as a result of which volatility of inflation and output is also expected to be lower when an inflation targeting(IT) regime is followed. Moreover, IT combines elements of both “rules” and “discretion”. Even though maintaining a precise number or range of inflation is announced as the goal, flexibility is provided by letting the central bank respond to economic shocks in the short term without endangering credibility as any deviation from the said target is perceived by the public as an exception not as a sign of uncertainty or unreliability on part of the central bank.

The failure of money targeting in the mid-1980s and the collapse of fixed exchange rate pegs in the early 1990s led to the emergence of inflation targeting(Hammond, 2012). New Zealand was the first country to follow an inflation targeting regime in 1990. Since then, many advanced as well as developing countries have followed in New Zealand’s footsteps. As of April 2015, 36 countries have adopted IT regimes. The gains from inflation targeting are found to be largest for emerging economies which explains why more and more developing countries have been explicitly declaring inflation targets as their nominal anchors(Mishkin and Schmidt-Hebbel, 2007).

The paper explores the case of India, which adopted a flexible inflation targeting regime in 2016. Flexible inflation targeting implies that there is a range as opposed to a single number that the central bank aims to keep the inflation within. Historically, the Reserve Bank of India(RBI) has always followed a multiple-indicator approach, targeting various inflation metrics like CPI, WPI, inflation expectations, growth, fiscal and current account balances. However, critics of the multiple indicator approach argue that this makes the monetary policy goals of the RBI unclear and confuses the public. The emergence of sustained double-digit inflation between 2009 and

2013 also increased the support for IT. Raghuram Rajan, the Governor of the RBI from 2013-2016 argued that in a country like India, where inflation is not extremely high, and the central bank is considered reasonably credible, focusing on inflation should not lead to a loss in output growth. Finally, on 20th February 2015, a Monetary Policy Framework Agreement (MPFA) was signed between the Government of India and the RBI specifying that the Government has set a target of 4 per cent Consumer Price Index (CPI) inflation as the target for the period from August 5, 2016 to March 31, 2021 with the upper tolerance limit of 6 per cent and the lower tolerance limit of 2 per cent.

The paper will investigate whether an inflation targeting framework has yielded macroeconomic advantages such as reduction in inflation and volatility of inflation and output in the Indian economy or not. The purpose of this paper is to study the evidence since inflation targeting was formally implemented in India in August 2016 and compare those metrics to the performance of the Indian economy prior to inflation targeting. The paper focusses mainly on inflation, inflation volatility, GDP growth and GDP growth volatility and studies the impact of IT adoption on these variables of interest. Our hypothesis is that inflation targeting has reduced the level and volatility of inflation without hurting GDP level, growth rate or volatility.

The paper is organized as follows. Section 2 surveys the existing literature on the effect of inflation targeting for developed and developing countries in general and India in particular. Section 3 explains the methodology used to answer the empirical question. Section 4 presents the main results obtained from the regression analysis which focusses on the effects of inflation targeting on inflation levels, GDP levels and GDP growth as well as a discussion of their implications. Section 5 is a graphical analysis of the inflation levels and GDP growth rates in India as compared to the World and Lower and Middle Income Countries. Section 6 is an analysis of the effects of IT on the volatility of relative GDP growth and inflation levels in India. Section 7 highlights further questions and discussions. Section 8 is the conclusion of the paper.

2. Literature Review

A lot of empirical work has been done in the area of inflation targeting in general as well as for emerging economies in particular. Empirical evidence and research on inflation targeting show IT helps countries not only attain lower inflation in the long run but also reduce responses to oil price and exchange rate shocks, strengthen monetary policy independence, improve monetary policy efficiency and obtain inflation outcomes closer to target levels (Mishkin and Schmidt-Hebbel, 2007). IT has been found to result in an improvement in overall economic performance as indicated by a decline in inflation levels, inflation volatility, and interest rates. Output volatility has not worsened after the adoption of the regime in most countries (Mishkin and Schmidt-Hebbel, 2002).

Mishkin and Schmidt-Hebbel(2002) also demonstrated that the fall in inflation has been greater for emerging economies after adopting IT as compared to developed economies. Gonçalves et. al(2006) used differences-in-differences regression to show that emerging economies adopting the regime saw more significant reductions in average inflation and growth volatility than those with monetary policy frameworks other than IT. IMF's World Economic 2005 outlook also published that IT in emerging countries was associated with lower levels of CPI inflation, volatility of CPI inflation and volatility of output gap. Strong and robust evidence has also been

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found that IT has reduced volatility of international reserves and real and nominal exchange rates in developing economies(Lin, 2010).

On the flip side, there are also several studies that do not find any evidence that IT yields any macroeconomic benefits such as Ball and Sheridan(2012) who were unable to find evidence that inflation targeting improves a country's economic performance. Similarly Brito and Bystedt(2009) concluded that there was no evidence that an IT regime improves macroeconomic performance measured by the behavior of inflation and output growth in developing countries. Additionally, they found robust evidence that output growth reduced during IT adoption. This highlights one of the most common arguments against inflation targeting- that inflation targeters stabilize inflation objectives at the cost of output stabilization.

Several papers have tried to evaluate inflation targeting as a monetary policy objective for India in particular as well as India's preparedness for such a policy regime. Some find inflation targeting to have had economic benefits for the country. Mishra and Mishra(2012) formulated a small open economy model for India with exchange rate as a prominent channel for monetary policy and found that flexible inflation targeting seems a better alternative from an overall macro stabilization perspective in India where financial markets are still not sufficiently integrated. They found that a hybrid Phillips curve for India and the fact that backward dynamics(lag of inflation) are slightly more important than forward dynamics(expected inflation in the next period) indicate the presence of rigidities in price setting behavior resulting in a short-run trade-off between inflation and output. Kannan(1999) had suggested that the implementation of inflation targeting in India should wait until financial sector reforms have been completed. Singh(2006) argued that the first phase of financial sector reforms has been completed and the macroeconomic performance of inflation in interest rates is now suitable for the adoption of IT in India.

Khatkhate(2006) asserted that even though the sources of inflation in India are non-monetary, RBI has to maintain its credibility and authority and thus, targeting headline inflation might be a good policy framework for India to follow. In a recent study, Eichengreen et. al(2020) conducted an interim assessment of the IT framework in India and found that it has reduced the volatility of a range of inflation-related outcomes like the volatility of inflation, inflation expectations and exchange rates. The assessment also argued that one of the main criticisms against IT- namely that the RBI became more hawkish following the transition to IT- was not found to be true as adjusting for inflation and output gap, policy rates became lower not higher. They also found evidence to support that IT had resulted in better anchoring of inflation expectations.

However, there is ample evidence of the contrary as well – that IT is not a suitable framework for a country like India. Jha(2008) argues that with widespread poverty still present, inflation targeting cannot be the exclusive concern of monetary policy and that a primary objective of monetary policy at least in the medium term has to be the attainment of higher economic growth. He argues that since the liberalization of markets and the interest rate channel is far from complete, the banking sector has strong monopoly elements and the financial sector is not too liberalized yet, India should follow a multi-objective regime as before and is not ready for a switch to IT. Subbarao(2013) also pointed out that alleviating poverty should be one of the major concerns of the monetary policy. In a largely non-monetized and agricultural country like India, the growth and inflation trade off becomes all the more important(Jalan, 2000).

Critics of IT in India believe “one target, one instrument” would not be sustainable due to supply constraints and under-utilization of capacity that makes potential output and output gap estimation difficult. Mahajan et. al(2014) also argue that the pre market conditions like well-developed markets, independence of central banks etc. are absent in the case of India. They cite the fact that inflation in India is caused by supply side factors as opposed to demand side factors as well as the volatile growth and exchange rate as reasons that India should not opt for IT right now.

An important facet to consider while analyzing the effects of inflation targeting in India is that demonization also took place in 2016, the same year in which inflation targeting began. With little warning, 500 and 1000 Rupee notes were removed from circulation. This was done in order to boost a digital economy, make India a cashless economy and combat black money, money laundering, tax evasion and counterfeiting. These two notes were the two biggest currency denominations in India’s currency system and made up more than 85% of the cash in circulation. Majority of transactions in India are done through cash and as a result of this unexpected move, immense pressure was created on the banking system with long queues outside ATMs for 2 months.

There was a huge aggregate demand shock by reducing the money supply and an aggregate supply shock by restricting the currency in circulation as a critical input for specified economic activities, such as purchase of inputs in the agriculture sector. Sales of consumer durable goods also fell drastically and industries that relied on high-volume cash transactions like organized and unorganized retail took a huge hit. Growth slowed down to a four-year low of 6.7%. The fact these huge shocks coincide with the implementation of IT definitely make realizing the full effects of IT harder and should be kept in mind especially while looking at GDP and GDP growth related data in India post 2016.

3. Methodology

Data Collection

The paper makes use of quarterly data starting from the 2nd quarter of 2000 to the 2nd quarter of 2020 i.e. 20 years’ worth of data for the main regression, which was all obtained from <https://fred.stlouisfed.org/>. Since India measures inflation using headline CPI, data on inflation is measured by the growth rate of CPI by the same quarter in the previous year. Broad money is M3 for India in the National Currency. Growth rate of broad money supply was calculated year on year i.e., percentage change from the same quarter a year ago. Openness of the economy was defined as the ratio of exports and imports to total GDP and was calculated as the sum of imports as a percentage of GDP and exports as a percentage of GDP. Real GDP was calculated as GDP by Expenditure in Constant Prices: Total GDP for India in Chained 2000 National Currency Units(Seasonally Adjusted). Exchange rate is calculated as National Currency to U.S. Dollar: Average of Daily Rates for India.

For the analysis of relative inflation and relative GDP growth as well as volatility of those two variables, annual data was obtained from <https://fred.stlouisfed.org/> as well. In this case, data for the World as well as Lower and Middle Income Countries was required and for the comparisons and benchmarking to be sound, we needed to find data for the same measure and with the same

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frequency. Since only annual measures of Inflation and Real GDP per capita could be found, that is what was utilized here. The annual data spans from 1999 to 2019. For the GDP data, Annual, Not Seasonally Adjusted Constant GDP per capita for India, the World and Lower and Middle Income Countries in 2010 U.S. Dollars was utilized. For inflation, Annual CPI inflation rates for India, the World and Lower and Middle Income Countries were utilized. Year on year growth rates for GDP were also calculated in a similar manner as described above. The countries that classify as Lower and Middle Income Countries are mentioned in the appendix.

Empirical Methodology

The study employs regression models to test the hypothesis as follows:

For regression 1:

The null hypothesis(H_0): Inflation targeting regime does not have a negative effect on inflation levels.

The alternate hypothesis(H_1): Inflation targeting regime has a negative effect on inflation levels.

For the first regression on inflation levels the following multiple regression equation was used:

$$(1) \text{infl} = \beta_0 + \beta_1 \text{infl_tar} + \beta_2 \text{GDP} + \beta_3 \text{broad} + \beta_4 \text{open} + \beta_5 \text{exchange} + E$$

Here, the y variable or the dependent variable is the level of inflation, the independent variable of interest is the inflation targeting dummy infl_tar . If we expect IT to have a significant impact in reducing inflation levels and want our null hypothesis to be rejected, we would need the coefficient on infl_tar to be negative and statistically significant. β_0 is the constant term. The other regressors are the control variables, namely, GDP levels, broad money supply growth, openness of the economy and exchange rate respectively. E is the error term. The dummy variable $\text{infl_tar}=0$ for years prior to the adoption of IT in India and equals 1 for years post the adoption of IT. Since the RBI Amendment introducing inflation targeting took place in February 2015 but the target was set from August 2016 onwards, we will assume $\text{infl_tar}=1$ from the third quarter of 2016 onwards. As a robustness check, we also run the same regressions with the infl_tar dummy being set to be equal to be 1 from 2015 Q2 onwards i.e., the first quarter after the announcement was made since simply the announcement of the inflation target is likely to have influenced expectations and inflation levels even before the regime was formally adopted.

For regression 2 and 3:

The null hypothesis(H_0): Inflation targeting regime does not have a significant effect on GDP level/GDP growth rate

The alternate hypothesis(H_1): Inflation targeting regime has a significant effect on GDP levels.

For the second regression on GDP levels the following multiple regression equation was used:

$$(2) \text{GDP} = \beta_0 + \beta_1 \text{infl_tar} + \beta_2 \text{infl} + \beta_3 \text{broad} + \beta_4 \text{open} + \beta_5 \text{exchange} + E$$

This is similar to the first equation except that the y variable or dependent variable is the level of GDP and instead of Real GDP levels, we have inflation levels as part of the control variables. Here, if we expect inflation targeting to increase output, the sign on the infl_tar dummy would be positive. To reject the null hypothesis of having no effect, we would want the coefficient to be

statistically significant. However, if the critics of IT are correct in that IT reduces output, the coefficient would be negative.

We also test another version of the second regression wherein we use the growth rate of GDP instead of GDP levels. This equation is the same as the last one other than the difference in the dependent variable.

$$(3) \text{GDP_growth} = \beta_0 + \beta_1 \text{infl_tar} + \beta_2 \text{infl} + \beta_3 \text{broad} + \beta_4 \text{open} + \beta_5 \text{exchange} + E$$

There have been many studies that use inflation targeting dummies to assess the effects pre and post inflation for emerging and developing economies, most notably Ball and Sheridan (2005) whose differences-in-differences cross-section regression was then replicated in many other studies like those done by Goncalves and Salles(2016) and Brito and Bystedt(2009). This paper differs in that it only looks at data from one country and thus, mean reverting dynamics do not need to be accounted for. Moreover, we have introduced several control variables in our study that could have a causal effect on the outcome variable and are correlated with one another as well. The control variables of choice in this paper are broad money, GDP levels(only for the inflation regression), openness and the exchange rate and the levels of inflation(only for the GDP related regressions). Certainly, this is not an exhaustive list as these are not the only variables that could influence inflation, GDP levels and growth rates. However, they do capture a great deal of what may drive GDP and inflation in India based on previous literature and also had easily available quarterly data. Lin and Ye(2009) use similar control variables in their regression but they use a fixed exchange rate dummy and openness in a separate regression whereas this paper utilizes the exchange rate (as it is just a study of one country) and the openness together with the other control variables in both the regressions.

For the analysis of relative GDP and inflation volatility, we follow a simpler approach. We benchmark the inflation levels and GDP per capita growth rates in India by dividing them by the inflation levels and GDP per capita growth rate in the World and in Lower and Middle Income Countries(LMI). The resulting ratios thereby give us two different *relative* inflation and GDP growth rate measures for India. The data in India is scaled in this way so that it gives a better idea of India's macroeconomic performance as compared to the rest of the World and countries that are similar to India in terms of income levels. Such benchmarking would help understand to what extent did inflation targeting contribute to the changes in volatility as opposed to general regional or global trends. This paper calculates the volatility as the standard deviation of the relative inflation, GDP and GDP growth in the period pre and post IT. We use the aid of summary statistics and graphs to compare trends regionally and globally. Also, since only yearly data was available, we take 2016 to be the year in which inflation targeting began for our analysis in this case.

4. Results and Discussion of Regression Analysis

Effect of inflation Targeting on Inflation Levels, GDP Levels, GDP Growth Rates (2000 Q2-2020 Q2)

IT beginning in 2016 Q3:

The summary statistics of the three regressions are shown below:

Table 1. Estimates of the Inflation Targeting Effect starting 2016 Q3 on

- (1) Inflation Levels
- (2) GDP Levels
- (3) GDP Growth Rates

	(1) infl	(2) GDP	(3) GDP_growth
infl_tar	-2.705** (-2.71)	7.68936e+12*** (6.06)	0.385 (0.29)

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

IT beginning in 2015 Q2:

A robustness check was also performed with the infl_tar dummy equal to 1 since 2015 Q2 or the first quarter after the announcement regarding IT adoption was made.

Table 2. Estimates of the Inflation Targeting Effect starting 2015 Q2 on

- (1) Inflation Levels
- (2) GDP Levels
- (3) GDP Growth Rates

	(1) infl	(2) GDP	(3) GDP_growth
infl_tar	-4.446** (-2.87)	1.00082e+13*** (6.87)	5.330** (2.72)

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Discussion

The paper focuses on the sign and significance of the inflation targeting dummy variable. In the first regression, the coefficient of inflation targeting is -2.705. This means that India's inflation level was 2.705% lower once it started inflation targeting as compared to before the implementation of the IT regime. This result matches our hypothesis as well and goes to show that switching to an inflation targeting regime has been successful in maintaining price stability by lowering inflation levels in India. It is important to note that the coefficient on the inflation targeting dummy is statistically different from zero. This coefficient was statistically significant at the 5% level which means that at 5% significant level we can reject the null hypothesis that the adoption of inflation targeting has had no effect on the level of inflation.

For the second regression which utilized the level of GDP as the dependent variable, we see that the inflation targeting dummy has a coefficient of 7.689E +12. This means that ever since India started adopting inflation targeting the level of GDP has been Rs. 7.689 trillion more than that before the adoption of the inflation targeting regime. This coefficient was highly statistically significant at the 1% level. For the third regression which had the year on year growth rate of GDP as the dependent variable, the coefficient on the inflation targeting dummy was 0.385 and it was not statistically significant. Thus, we cannot reject the null hypothesis that adoption of inflation targeting has had no effect on the growth rate of the GDP. This conclusion is less worrying then if there was a statistically significant negative effect. That would mean that since the adoption of inflation targeting, the growth rate of GDP has suffered which is what a lot of critics of the inflation targeting regime in India argue. Thus, this result also supports our hypothesis that the adoption of inflation targeting has not had any significantly negative effect on GDP growth.

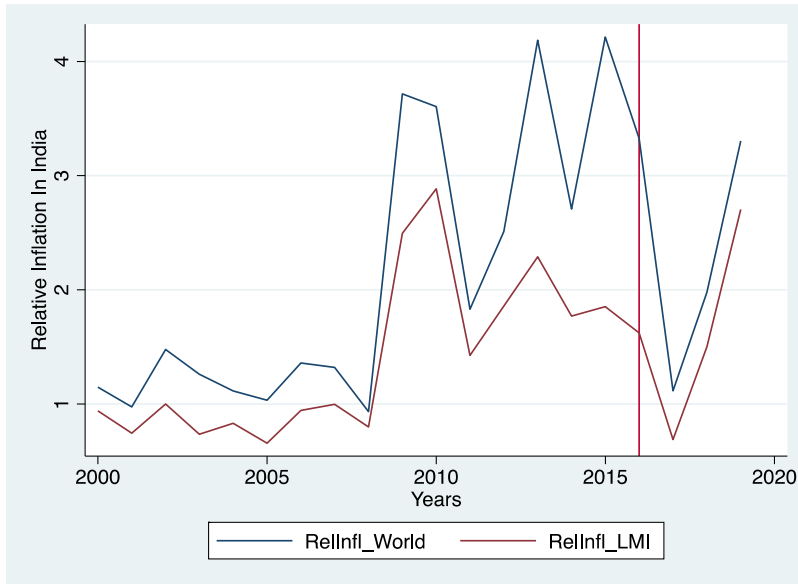
Also, once we perform the robustness check in which we assumed inflation targeting started affecting inflation and output from 2015 Q2 onwards, the absolute magnitudes of the `infl_tar` dummy increased for the inflation and GDP levels equations, indicating that the associated decrease in inflation and increase in GDP levels post IT is even more if we start observing the data right after the announcement of the RBI. Moreover, the coefficient on GDP growth rates not only increased but as seen in Table 2, becomes statistically significant at the 5% significance level.

Thus, we have no evidence in this study to prove that inflation targeting in India has had negative effects on the growth of GDP. Moreover, when we utilized the GDP levels we found that inflation targeting has had a statistically significant positive influence on the GDP. So far, this paper has shown that ever since the adoption of inflation targeting, inflation levels in India have fallen, GDP levels have risen and growth rate of GDP has not suffered.

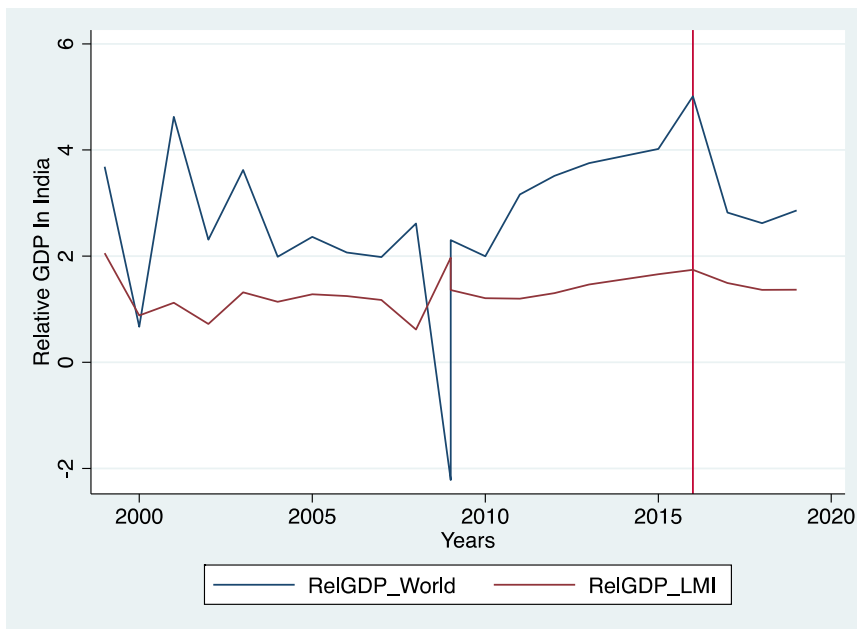
5. Results of Relative Inflation and GDP Growth Rates in India

The following are graphs representing the ratios of the inflation and GDP growth rates in India over those in the World and LMI countries.

Graph 1. Inflation Level in India relative to the World and the Lower Middle Income Countries (1999-2019)



Graph 2. GDP Growth Rate in India relative to the World and the Lower and Middle Income Countries (1999-2019)



Discussion

The following graphs highlight the relative inflation levels and relative GDP growth rates in India. The vertical red line in both graphs indicates the year 2016 in which inflation targeting was adopted by the RBI. A ratio of one in Graph 1 implies that the inflation in India and that in the World or LMI countries is the same. Values on the vertical axis that are greater than one imply that the inflation level in India is relatively higher than that in the World or in other LMI countries and values less than one imply that the inflation in India is relatively lower.

As we can see most of the values on Graph 1 are greater than one which means that the inflation in India has been relatively higher. In Graph 1, there is a drastic decrease in the relative inflation level in India immediately following the implementation of IT. This can be seen as one of the positive impacts of IT. However, we do see that there is an increase in relative inflation in India in around 2017 and since then it has constantly been increasing. In fact, ever since 2019 the inflation rate in India has been consistently higher than the upper limit of 6% that the RBI had initially set. Inflation in India is generally driven by shocks from the supply side, and could have been higher in recent times due to high food and fuel prices which are a huge percentage of the consumer basket and highly volatile as well. Inflation in India also seems to move in the same direction as global commodity prices which could have also led the inflation in India to be higher since 2019.

The second graph can be interpreted in the same way as the first but instead of inflation levels, we use relative GDP growth rates. These are obtained by dividing the GDP per capita growth rate in India by that in the World and LMI countries. Post 2016, there has been a decrease in relative GDP growth rate in India both compared to the world as well as LMI countries. Our regression analysis earlier had shown that ever since the adoption of inflation targeting, GDP growth rate has been higher than before but here we see the *relative* growth rates falling. One of the possible reasons that the relative growth of GDP in India could be falling post 2016 could be the demonetization that took place that same year. GDP in India could have grown less as compared to the World and other countries with similar income levels since India at that time was experiencing a huge shock to its money supply and demand.

6. Results and Discussion of Inflation and GDP Growth Volatility

Table 3. Volatility of Inflation Levels Pre and Post IT implementation

	Pre IT (1999-2015)	Post IT (2016-2019)
RelInfl World	1.186	1.08
RelInfl LMI	.696	.828

Table 4. Volatility of GDP Growth Pre and Post IT implementation

	Pre IT (1999-2015)	Post IT (2016-2019)
RelGDPWorld	1.566	1.127
RelGDPLMI	.374	.178

Discussion

Volatility in this paper is calculated by measuring the standard deviation pre-and post-implementation of the IT regime. The pre-IT period is defined as the years 1999 to 2015 and post IT period is defined from 2016 to 2019. Table 3 shows that the volatility of inflation level in India relative to the World fell post the implementation of IT and volatility of inflation levels in India relative to LMI countries rose post the implementation of IT. Table 4 shows that the volatility of GDP growth rate in India relative to the World as well as relative to LMI countries fell after IT was implemented. From both these tables, we can conclude that inflation levels and GDP growth rates in India relative to the World fell after the IT regime was adopted. Thus, not only did the IT regime successfully reduce the level of inflation and increase the level of GDP in India, it also successfully reduced the volatility of inflation levels and GDP growth rates in India relative to the World. Reduction in volatility of these variables is often considered as a sign of macro-economic efficiency. Less volatile inflation levels are also indicative of well anchored inflation expectations.

7. Further Questions and Discussion

One of the main limitations of the paper is the lack of high frequency data. Monthly data would have increased the number of observations by a considerable amount, however for the regression analysis only quarterly data was found and for the volatility and graphical analysis, only annual data could be found. As mentioned before, it is possible that the control variables do not capture all the factors impacting the dependent variable. Using output gap instead of output levels and seeing if we still obtain similar results might also be a good idea.

One of the possible routes that could further be explored is whether or not inflation expectations in India have been better anchored due to the adoption of the IT regime. The paper shows that volatility of inflation levels in India has been the lower ever since inflation targeting was implemented. However, an empirical analysis using inflation expectations from household surveys and calculating the RMSE could be a great way to study forecasting errors and could give a deeper insight into how beneficial IT has been. Another avenue for exploration is whether or not credibility and transparency of the RBI have improved post IT. One of the main advantages of an IT regime is that increased communication with the public improves the transparency of the central bank. An analysis of the public’s perception of the transparency of the RBI post-IT adoption would be a great way to understand whether the RBI has successfully carried out the regime or not.

As mentioned before, India has missed the inflation level target in all quarters of 2019 which is something that should be explored in greater detail. Whether the RBI will be able to pull inflation back down into its desired range or if it would need to re-adjust the range all together is also an important discussion. Looking at how IT has influenced interest rates, exchange rates as well as the response of the Indian economy to shocks would also complement this analysis. Another aspect to investigate further could be conducting a cross-country study including other countries in South Asia or Lower and Middle Income Countries in order to better assess India's performance compared to that of similar countries. Lastly and probably the most important, is to consider the impact of demonetization on the performance of IT. Since both these colossal changes in the Indian economy took place in the same year, disentangling the effect of one from the other is definitely a difficult yet crucial task in understanding the impacts of both these policies.

8. Conclusion

The Reserve Bank of India's move to switch from a multiple indicator approach to a flexible inflation targeting regime has potentially huge implications for the Indian economy as well as the conduct and effectiveness of the monetary policy. This paper tries to answer the question of whether inflation targeting has been beneficial for India or not using an empirical approach. The main variables of interest are the level of inflation, the level of GDP, the growth rate of the GDP as well as the volatility of relative inflation level and GDP growth rates.

In the regression analysis we found statistically significant evidence at the 5% significance level that the adoption of inflation targeting has reduced the level of inflation in India. Highly statistically significant evidence was also found that post-implementation of the regime, the GDP levels in India rose. This coefficient was found to be statistically significant at 1% significance level. In terms of growth rate of GDP, we did not find statistically significant evidence to indicate that there had been any effect of the implementation of the regime on the growth rate of the GDP. This is in line with our hypothesis according to which the level of inflation reduced post the implementation of the inflation targeting framework without a negative effect on the growth rate or level of GDP. When we consider 2015 Q2 to signify the start of IT as a robustness check, we found a statistically significant positive effect of IT adoption on GDP growth which further supports the argument that IT has not only improved price stability but also boosted economic growth in India.

With the aid of graphs and summary statistics we also try to compare the volatility of relative inflation levels and GDP per capita growth rates before and after inflation targeting commenced in India. We saw that the inflation levels have become less volatile as indicated by a lower measure of standard deviation post implementation of the regime as well as less volatile growth rates when compared to the World. Thus, the reduction in inflation volatility has not come at a cost to the GDP per capita growth rate volatility. There is evidence of a more stable economy as indicated by the lower levels of volatility of not just inflation but also the GDP per capita.

All these results are in line with the proposed hypothesis since they show that IT has yielded several benefits for the Indian economy. Ever since India adopted inflation targeting, inflation

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levels have been lower, GDP levels have been higher and growth has not suffered. Moreover, volatility of inflation levels and GDP growth rates in India relative to the World have also fallen.

9. Appendix

The World Bank classification of Lower and Middle Income Countries used by FRED consists of the following:

Table 5. List of Lower and Middle Income Countries

Angola	Honduras	Papua New Guinea
Algeria	India	Philippines
Bangladesh	Kenya	São Tomé and Príncipe
Benin	Kiribati	Senegal
Bhutan	Kyrgyz Republic	Solomon Islands
Bolivia	Lao PDR	Sri Lanka
Cabo Verde	Lesotho	Tanzania
Cambodia	Mauritania	Timor-Leste
Cameroon	Micronesia, Fed. Sts.	Tunisia
Comoros	Moldova	Ukraine
Congo, Rep.	Mongolia	Uzbekistan
Côte d'Ivoire	Morocco	Vanuatu
Djibouti	Myanmar	Vietnam
Egypt, Arab Rep.	Nepal	West Bank and Gaza

El Salvador	Nicaragua	Zambia
Eswatini	Nigeria	Zimbabwe
Ghana	Pakistan	

Source : The World Bank

Table 6: Regression results for equations(1)-(3) with infl_tar=1 from 2016 Q3 onwards

	(1) infl	(2) GDP	(3) GDP_growth
infl_tar	-2.705** (-2.71)	7.68936e+12*** (6.06)	0.385 (0.29)
broad_growth	0.245** (2.88)	-8.20797e+10 (-0.69)	-0.463 (-1.56)
open	0.149** (3.17)	3.74597e+11*** (8.70)	0.172 (1.68)
GDP	1.85e-13 (1.74)		
exchange	0.00122 (0.02)	4.91148e+11*** (7.06)	-0.291 (-1.89)
infl		2.05732e+11* (2.53)	-0.0388 (-0.22)
_cons	-5.239 (-1.37)	-1.88065e+13*** (-4.67)	23.65* (2.45)
N	81	81	81

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Table 7: Regression results for equations(1)-(3) with infl_tar=1 from 2015 Q2 onwards

	(1) infl	(2) GDP	(3) GDP_growth
infl_tar	-4.446** (-2.87)	1.00082e+13*** (6.87)	5.330** (2.72)
GDP	2.64e-13* (2.40)		
exchange	0.0284 (0.40)	3.44461e+11*** (4.86)	-0.482* (-2.36)
broad	0.249** (3.12)	-9.83420e+10 (-1.03)	-0.488 (-1.69)
open	0.0976* (2.00)	4.00776e+11*** (9.97)	0.202 (1.92)
infl		2.59006e+11** (3.16)	0.0646 (0.42)
_cons	-6.148 (-1.74)	-1.29775e+13*** (-3.51)	31.25** (2.72)
N	81	81	81

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

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