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Inflation Targeting in India: A Further Assessment

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INFLATION TARGETING IN INDIA: A FURTHER ASSESSMENT

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Abstract

We assess India's inflation-targeting regime at the eight-year mark. The Reserve Bank of India continues to be a flexible inflation targeter: it responds to both the output gap and inflation when setting policy rates. It has become neither more hawkish nor more reactive with the transition to inflation-targeting. Evidence points to improved outcomes: inflation is lower and less volatile; inflation expectations are better anchored; and the transmission of monetary policy is more effective. Given this record, radical changes such as broadening the RBI's monetary mandate, abandoning the target in favor of a more discretionary regime, targeting core instead of headline inflation, or altering the target and tolerance band would be risky and counterproductive. One obvious area for improvement entails updating the weight of food prices in the CPI basket. We estimate the correct weight of food at today's per capita income to be closer to 40 percent instead of the current 45.8 percent. This would likely fall further to around 30 percent in a decade from now due to the projected increase in per capita incomes. This correction should ameliorate concerns about the design and practice of the current inflation targeting regime.

Keywords: Inflation Targeting, Monetary Policy, India

JEL classification: E5, E52

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1. Introduction

In mid-2020, shortly after the outbreak of the COVID-19 pandemic, we published an interim assessment of the performance of inflation targeting in India. That earlier assessment, at the four-year mark, reached broadly positive conclusions. We presented evidence that adoption of inflation targeting by the Reserve Bank had rendered inflation more stable, more predictable and better anchored. We speculated that the credibility of the commitment to the target gave the RBI more room for manoeuvre when the pandemic struck – more scope for adopting accommodating monetary policies in response to the public health, economic and financial emergencies.

Given the availability now of four additional years of data and experience, we revisit these issues. There are several good reasons for another look. First, COVID was a major stress test for the inflation targeting regime. If this monetary rule-cum-anchor performed well in the extreme circumstances of COVID, one can be more confident that it will perform well under a wide variety of different circumstances. We update our earlier tables, charts and analysis in an effort to shed light on this issue.

Second, the literature on inflation targeting in India has expanded considerably since our early assessment. The present paper thus affords an opportunity not only to extend and revise our own earlier analysis but also to take on board the views of others, including those adopting different methodological approaches.

Third, a number of voices have questioned the advisability of inflation targeting as it is currently practised by the RBI. Some have recommended a mandate where inflation is only one of several variables targeted by the central bank. Others have advised retention of the inflation targeting framework but modifying the point target, the target range, the reference price index, or other operational aspects. Still others have suggested abandoning inflation targeting altogether. The next scheduled review of the RBI's inflation targeting framework is due in 2026.

We show that the Reserve Bank of India continues to be a flexible inflation targeter: it responds to both the output gap and inflation when setting policy rates. It has become neither more hawkish nor more reactive following the transition to inflation-targeting.

Evidence points to improved outcomes during inflation targeting: inflation is lower and less volatile; inflation expectations are better anchored, and the transmission of monetary policy is more effective. Given this record, radical changes such as broadening the RBI's monetary mandate; abandoning the target in favor of a more discretionary regime; targeting core instead of headline inflation; or altering the target or tolerance band around it would be risky and counterproductive. The 4 percent point target, +/- 2 percentage point tolerance band and focus on headline inflation remain broadly appropriate for now.

One obvious area of improvement pertains to updating the weight of food-price inflation in the CPI inflation basket. We estimate the correct weight of food at today's per capita income to be closer to 40 percent instead of the current 45.8 percent. This would likely decline further to around 30 percent in a decade from now due to the projected increase in per capita income levels. This correction alone should ameliorate some concerns regarding the design and practice of the current inflation targeting regime.

2. Background

The government and RBI signed an inflation-targeting agreement (IT) in February 2015 and amended the RBI Act in May 2016.[1] The inflation target was set by the government in consultation with RBI with the possibility of revisiting it after five years. Accordingly, the government announced, via the Official Gazette, 4 percent Consumer Price Index (CPI) inflation as the target from August 5, 2016, with an upper tolerance limit of 6 percent and a lower limit of 2 percent. It announced that the government would constitute a six-member Monetary Policy Committee (MPC), including three ex officio members from the RBI -- the Governor (who would also be its Chairperson), the Deputy Governor in charge of Monetary Policy, and one officer nominated by its Central Board -- together with three external members to be appointed by the government. External members were to hold office for four years and could not be reappointed.

The RBI was required to organize at least four meetings of the MPC annually, as per a schedule published in advance.[2] It was asked to publish a Monetary Policy Report every six months, explaining the sources of inflation. It was to provide forecasts of inflation for a period between six to eighteen months; the resolution adopted by the Committee; further details on the fourteenth day after every meeting of the MPC, including the minutes of the proceedings of the meeting; the vote and statement of each member of the MPC; and a document explaining steps to be taken to implement the decisions of the MPC. Finally, if the inflation target was not met, the RBI was required to submit a report detailing the reasons for failure to achieve it; remedial actions; and the estimated time-period within which the inflation target could be achieved. The agreement specified that the RBI would be deemed to have missed its target if inflation exceeded 6.0 percent or declined below 2.0 percent for three straight quarters.

The first MPC successfully completed its term four years ago, and in September this year a second MPC will complete its full term. There has been a smooth transition of the external members as well as the three members from the RBI, with changes in the latter coinciding with the turnover of the RBI staff. Altogether 6 external members and 10 RBI staff have been the members of the two MPCs (which includes three Governors and two Deputy Governors).

For most part, targets set under the IT have been met; and on almost all counts, the IT has performed as envisaged. It has been only once that inflation exceeded the upper tolerance band of 6 percent for three consecutive quarters (during January 2022-September 2022). The RBI, in its own review of inflation targeting in 2021, endorsed its continuation in all respects, including the targets, design, and implementation. The only revision it suggested was that failure may be deemed to have occurred when the inflation band is breached for four consecutive quarters rather than three.

[1] For details see amendment to the Reserve Bank of India Act, 1934, Inserted by Finance Act, 2016, Chapter III F, Monetary Policy.

[2] The first meeting of the MPC was held on October 3 and 4, 2016.

3. Recent Literature

The RBI's own analysis of its experience with inflation targeting postdates our earlier paper while coinciding with the first official five-year review of the framework in March 2021 (Reserve Bank of India 2021). This documents a significant decline in inflation volatility (as measured by the standard deviation of inflation) relative to the preceding five-year period, and relatively few instances of large deviations from mean inflation during the IT period. It shows that inflation expectations of households moderated in the IT period, though continuing to exceed the upper bound of the RBI's target range.

Bhattacharya (2023) also examines the recent behavior of inflation expectations in India, using the survey of households' inflation expectations conducted and published by the RBI. She does not find that inflation expectations respond in stabilizing fashion to changes in RBI policy. Under credible inflation targeting, tightening by the RBI (an increase in the repo rate) should cause above-target inflation expectations to decline toward target. Her analysis of quarterly data for the period 2008 Q4 to 2019 Q4, using a cointegrated vector-autoregression model, finds little evidence to this effect. However, this study does not distinguish the pre- and post-2016 periods, presumably because of a dearth of observations for the second subperiod. It thus leaves open the possibility that expectations became better anchored following the adoption of inflation targeting.

Kishor and Pratap (2023) consider this possibility directly. They analyze inflation forecasts from professional forecasters and an inflation sentiment index derived from text mining of newspaper articles covering the period 2010 through 2022. They decompose their measure of inflation expectations into a trend and a cycle, where they identify the trend with long-term expectations and the cycle with short-term expectations. Their analysis confirms that long-term inflation expectations became less sensitive to inflation sentiment in the post-2016 period, consistent with the view that the adoption of inflation targeting helped to better anchor these expectations.

Pattanaik, Nadhanael and Muduli (2023) similarly investigate whether medium-term inflation expectations in India became better anchored following the adoption of inflation targeting. Also using survey data on household inflation expectations, they show that inflation expectations react less to new information about inflation following the adoption of IT; that expectations became better aligned with the central bank's inflation target; and that the dispersion of views regarding expected inflation declined with the adoption of IT. Combining the three measures, they construct an index of the overall anchoring of inflation expectations, and find a secular improvement starting in 2019. They interpret the finding as consistent with better anchoring following the adoption of inflation targeting.

Relatedly, Muduli and Shekhar (2023) use quantile regressions to analyze the determinants of lower- and upper-tail inflation outcomes. Analyzing monthly data spanning the period 2009-2019, they find a significant decline in both lower- and upper-tail risks of inflation in the post-IT-adoption period, which they interpret as "add[ing] to the success story of the adoption of the IT framework in India in stabilizing CPI headline inflation."

Finally, Bhalla, Basin and Loungani (2023) compare the performance of inflation and growth in countries where central banks have or have not adopted inflation targeting. India (since 2016) is one of their 33 treatment cases of countries adopting inflation targeting. They document a decline in average rates of inflation between three pre-IT and three post-IT years for 22 of their 33 countries, including India. But they cannot rule out the "regression to the mean hypothesis", namely that countries suffering from relatively high inflation and then adopting inflation targeting see inflation fall not because of the role of IT in ensuring good

outcomes, per se, but simply because periods of unusually high (and unusually low) inflation tend to be transitory. They find significant effects of IT for inflation stabilization in approximately a third of their cases, and also weak evidence that IT adoption is associated with slower economic growth.

Thus, the majority of recent studies conclude in favor of constructive effects of inflation targeting, in India and more broadly, although there remains some skepticism and disagreement about the generality and robustness of the findings.

4. Analysis

We now analyze how inflation targeting in India has performed along a number of dimensions.

Measures of Inflation

Inflation in India has averaged 7.5 percent or more since the 1980s, except in the early 2000s when it averaged 4 percent and more recently when inflation fell with the move to inflation targeting (Table 1). Levels have exceeded average global inflation for the most part, while fluctuations have broadly tracked those in other low- and middle-income countries (LMI), aside from 2009-2015 (Figure 1).

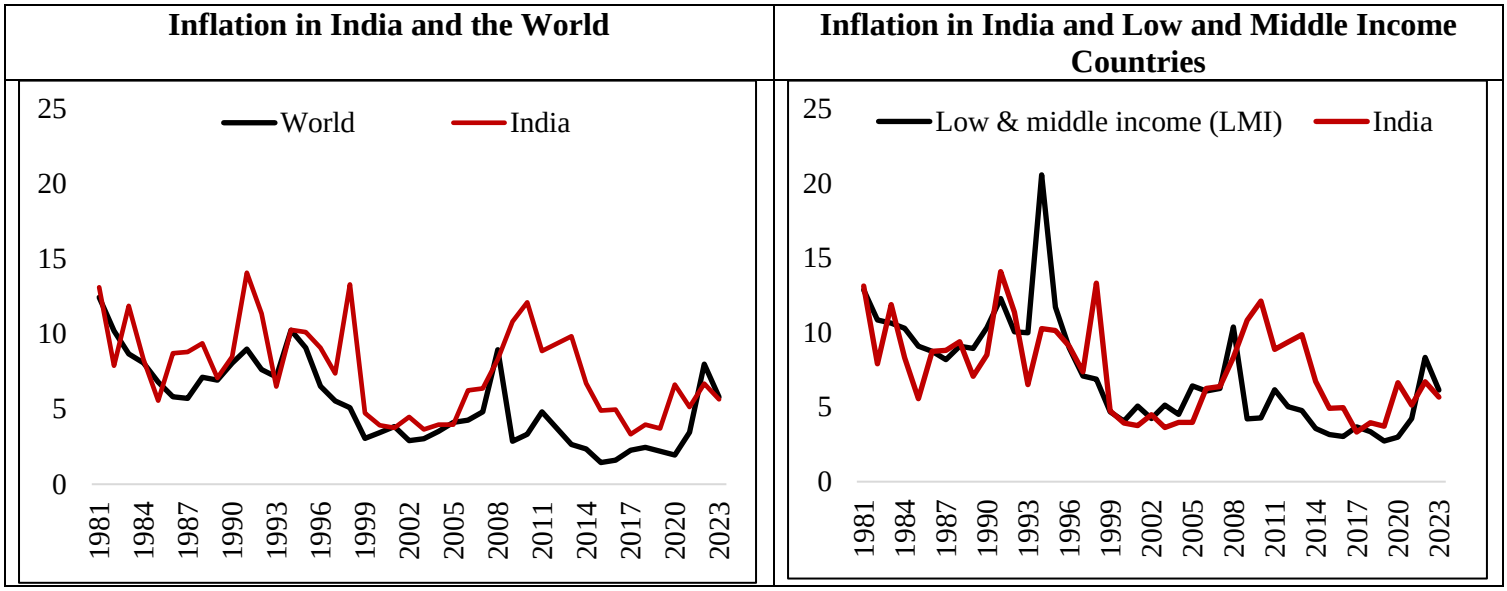
Inflation has declined since the adoption of IT, both compared to the preceding years and relative to the average inflation of the world and LMI. Inflation in India exceeded the global average by about 4.5 percentage points and the average of LMI by 3 percentage points during the decade before IT. The differential has declined to 1.5 and 0.7 percentage points respectively since IT.

Table 1: Average Inflation in India, Low-and Middle-Income Countries, and World

	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10	2011-15	2016-19	2020-23
India	9.3	8.6	10.5	7.6	4.0	8.7	8.0	4.0	6.0
LMIs	10.7	9.1	12.9	6.3	5.1	6.2	4.5	3.2	5.4
World	9.2	6.7	8.6	4.7	3.5	4.8	3.0	2.1	4.8

Note: Years refer to calendar years. Data are from WDI for LMI and World; and from MoSPI and WDI for India.

Figure 1: Co-movement of Inflation in India, Low-and Middle-Income Countries, and World



Note: Years refer to calendar years. Data are from WDI for LMI and world; and from MoSPI and WDI for India.

Alternative Measures

A challenge for monetary policy is measuring inflation. In India, there was no composite Cost of Living index before 2011. Instead, there existed separate Consumer Price Index (CPI) series for industrial workers, agricultural workers and non-agricultural rural workers. The CPI for industrial workers was commonly used as a proxy for the composite CPI.[3]

A unified CPI series has been available since January 2011. Whereas the RBI took into account the Consumer Price Index (WPI) in monetary policy analysis until about March 2014, it now considers the headline CPI.

The question is which series the RBI should target. The WPI may not be best for two reasons. It consists of wholesale prices, not retail prices; and comprises only manufacturing (64 percent weight) and commodities, while excluding services altogether (Table 2).

[3] Different CPI series include: CPI Industrial Workers, CPI Agricultural Labor, CPI Rural Labor, and the CPI Urban Non-Manual Employees. The last one of these has been discontinued. The weights of different components in the baskets for CPI combined, and CPI-Industrial worker are similar; whereas the CPI for agricultural labor and CPI for rural workers have a larger weight on food at nearly 70 percent. See Mohan and Ray (2018) for a discussion of the composition and other features of different inflation series.

Table 2: Composition of Wholesale Price Index and Headline Consumer Price Index

	Weights in WPI		Weights in CPI
Primary Products/Food	22.6	Food, Beverages and Tobacco	48.2
Fuel	13.2	Fuel & Light	6.8
Manufactured	64.2	Housing	10.1
		Miscellaneous	28.3
		Clothing & Footwear	6.5
Total	100	Total	100

Headline CPI inflation is also affected by commodity prices, albeit to a lesser extent than the WPI. More importantly, food prices account for nearly half of the CPI, and are often heavily affected by sector-specific non-monetary factors such as weather and harvests (supply shocks).

Insofar as shocks to food prices are transient, there is an argument that the RBI should look through them. Other arguments are that monetary policy is ineffective in combating supply- driven food inflation; food inflation is higher than the core inflation resulting in tighter monetary policy; and food prices are volatile necessitating more frequent policy changes. Such arguments favor a core (non-food- non-fuel) CPI. In the most direct official statement to this effect, the latest Economic Survey has proposed that "India's inflation targeting framework should consider targeting core inflation, excluding food."[4]

Counterarguments favoring headline inflation include that it is easier to explain to the public and thus more effective in anchoring expectations; food inflation feeds back into core inflation, and hence needs to be tamed lest it becomes structural and strongly entrenched; and food price inflation has not been higher than core inflation. It has been more volatile than core inflation, but less volatile than WPI inflation (Table 3).

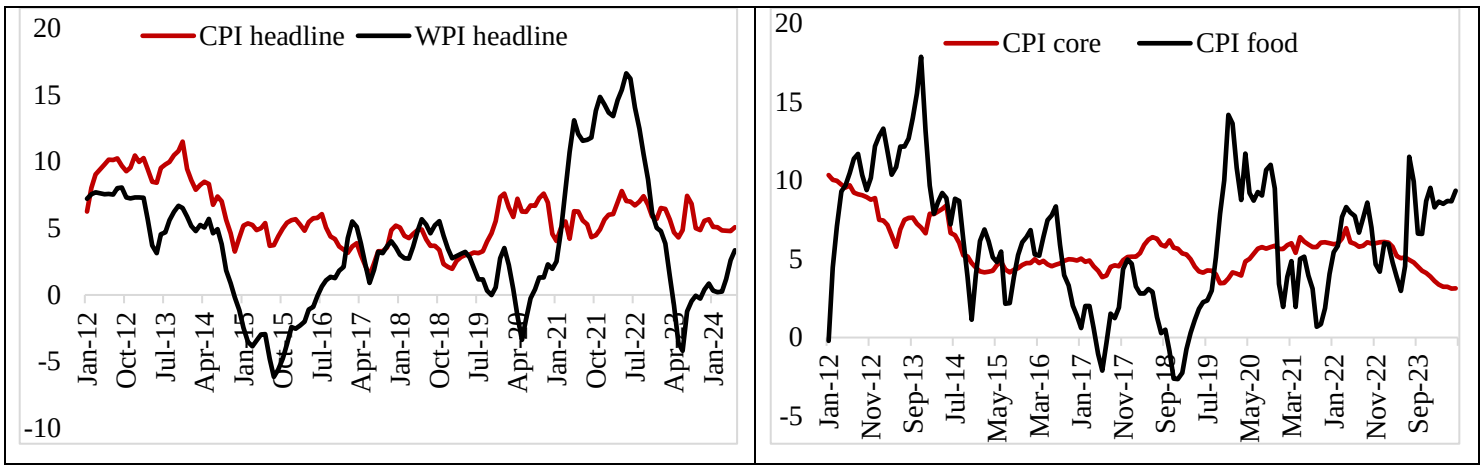
Table 3: Comparing Average Level and Volatility of Different Inflation Series During September 2016 - June 2024

	CPI Headline Inflation	CPI Core Inflation	CPI Food Inflation	WPI Inflation
Mean	4.97	5.12	4.84	4.39
Standard deviation	1.54	0.92	3.25	4.97

The choice of WPI or CPI is inconsequential if the two series co-move closely. But this is not generally the case, as shown in Figure 2.

[4] The Economic Survey released in July 2024 stated: "Food constitutes a very high portion of the consumer price index in developing countries. That is par for the course. Hence, when central banks in developing countries target headline inflation, they effectively target food prices. So, when food prices rise, inflation targets come under threat. Therefore, the central bank appeals to the government to bring down the increase in the prices of food products. That prevents farmers from benefiting from the rise in terms of trade in their favor. India's inflation targeting framework should consider targeting inflation, excluding food."

Figure 2: Co-movement of Different Inflation Series



Note: Data have been downloaded from CEIC. WPI headline consists of WPI 2011-12 series monthly y-o-y inflation from April 2013 onwards and WPI 2004-05 series monthly y-o-y inflation prior to it.

The correlation between WPI headline and CPI headline inflation has not been very high, although it is significantly greater than zero at the 90 percent confidence level (Table 4). Given the relative composition of their baskets, it is unsurprising that CPI headline inflation correlates more strongly with food inflation.

Table 4: Correlation Between CPI Headline, WPI Headline, CPI Core, and CPI Food Inflation

Jan 2012-- June 2024	**CPI headline**	**WPI headline**	**CPI core**	**CPI food**
CPI headline	1.00			
WPI headline	0.34*** (0.00)	1.00		
CPI core	0.71*** (0.00)	0.54*** (0.00)	1.00	
CPI food	0.88*** (0.00)	0.06 (0.45)	0.29*** (0.00)	1.00
Sep 2016- June 2024	**CPI headline**	**WPI headline**	**CPI core**	**CPI food**
CPI headline	1.00			
WPI headline	0.24** (0.02)	1.00		
CPI core	0.28*** (0.005)	0.60*** (0.00)	1.00	
CPI food	0.87*** (0.00)	-0.12 (0.25)	-0.21** (0.04)	1.00

Note: *, **, and *** indicate that the correlation coefficient is significant at 1, 5, and 10 percent level, respectively; p-values are shown in parentheses.

We estimate a VAR model to identify the relationship between food price inflation and core inflation, treating food and core inflation as endogenous and fuel inflation as exogenous (as given largely by global economic conditions). We estimate the relationship using quarterly data, and with different specifications including 2, 4 or 8 lags.

Table 5. Granger Causality Wald Tests (VAR Model)

Dependent Variable (y)	Explanatory Variable (x)	F	Df	df_r	Prob > F	Does x granger cause y?
Lag length 2						
Food Inflation	Core Inflation	2.81	2	101	0.06	No
Core Inflation	Food Inflation	3.12	2	101	0.05	Yes
Lag length 4						
Food Inflation	Core Inflation	4.50	4	95	0.002	Yes
Core Inflation	Food Inflation	2.99	4	95	0.02	Yes
Lag length 8						
Food Inflation	Core Inflation	1.01	8	83	0.44	No
Core Inflation	Food Inflation	1.76	8	83	0.09	No

Note: Data are from 1997 Q1 to 2024 Q1. Granger causality is based on 5% significance level; "No" indicates that we fail to reject the null hypothesis: x does not granger cause y. In the table, df refers to 'degrees of freedom' the number of restrictions being tested (the lag lengths) and df_r refers to 'residual degrees of freedom' (total number of observations minus the number of parameters estimated in the unrestricted model). Both are used to calculate the F statistic (df is associated with the numerator and df_r with the denominator).

Results (Table 5) indicate that food price inflation has a larger and more consistent impact on core inflation than vice versa. The impact is significant for two and four quarters. Granger causality tests in Table 5 suggest that food inflation Granger causes core inflation. In contrast, there is little evidence that core inflation Granger causes food inflation. Put differently, past values of food inflation help predict core inflation, but past values of core inflation do not help predict food inflation.

Reaction Functions

We now ask whether monetary policy decisions are influenced more by the output gap or inflation; whether the reaction function changed with the adoption of inflation targeting; whether the output gap and inflation carry different weights in the reaction function at high and low values; and whether the reaction function is different for headline and core inflation.[5] We estimated variants of reaction functions, all of which include the output gap and inflation. In an augmented version, we also include the lagged policy rate, the percentage change in exchange rate, and the budget deficit or borrowing of the central government.

[5] Rangarajan (2020) suggests that inflation targeting in India is flexible in the sense that "what inflation targeting demands is that when inflation goes beyond the comfort zone, the exclusive concern of monetary policy must be to bring it back to the target level. When inflation is within the comfort zone, authorities can look to other objectives". This relative emphasis in monetary policy is confirmed in the text mining analysis of Monetary Policy Statements during 2016-2020 reported in the RBI's Report on Currency and Finance (2020-21).

A number of earlier papers estimated reaction functions for the RBI. These studies find that the output gap is important (Hutchison et al 2013, Mohanty and Klau 2004) but that the exchange rate also matters, especially from the late 1990s when it became more flexible. These analyses typically use quarterly data. Since quarterly GDP growth is available from 1997, we follow this standard practice. For inflation, we use the WPI inflation until 2013 and the CPI inflation thereafter, since these are the inflation rates monitored by the RBI.

For the policy rate, we construct a composite policy rate series in the manner of Patra and Kapur (2012), based on the rate that was used by the RBI for monetary policy at different points in time. Thus, the series comprised bank rate from 1996-February 2002; reverse repo rate from march 2002-June 2006; repo rate from July 2006-Nov 2008; reverse repo rate from December 2008-May 2010; and repo rate from June 2010 onwards.

The exchange rate is calculated as quarter-over-quarter percentage change in the nominal exchange rate with respect to the US dollar. Budget deficit and market borrowing variables are highly seasonal, so we adjust them for seasonality and express them as a percent of seasonally adjusted nominal GDP. The output gap is measured as the difference between seasonally-adjusted real GDP and its trend, obtained via the HP filter (as in Patra and Kapur 2012) and expressed as a percentage of seasonally-adjusted real GDP.[6]

We estimate the following baseline specification of the reaction function using OLS:

$$\text{epr}_t = \alpha_0 + \alpha_1 \text{gap}_t + \alpha_2 \text{inflation}_t + \epsilon_t \qquad (1)$$

where, epr_t is the effective policy rate; gap_t denotes the output gap expressed as a percentage of GDP; and inflation_t denotes the inflation measure as targeted by the RBI. We assess if the policy rate is different, contingent on values for the output gap and inflation, once the country moved to inflation targeting by including a dummy for the period since inflation targeting in the regression. We now expand this specification by including two dummy variables for the post IT period-- an IT1 dummy that, equals 1 during the inflation targeting regime in the period Q3 2016-Q4 2019, and is zero otherwise; and another IT2 dummy that equals 1 during the inflation targeting regime in the period Q1 2020 to Q1 2024, and is zero otherwise.

$$\text{epr}_t = \alpha_0 + \alpha_1 \text{gap}_t + \alpha_2 \text{inflation}_t + \alpha_3 \text{IT1} + \alpha_4 \text{IT2} + \epsilon_t \qquad (2)$$

In all variants in Table 6, the output gap has a positive and significant coefficient, as anticipated. Inflation also has a positive coefficient.[7] When we add the lagged policy rate as

[6] The quarterly real GDP series is seasonally adjusted using the X-11 algorithm (of the US Department of Commerce). Correlations across variables included in the reaction function are presented in Appendix Table A1. The policy rate is positively and significantly correlated with the output gap and exchange rate depreciation. It is also positively correlated with inflation, although the correlation is weaker.

[7] It is significantly less than the standard Taylor rule benchmark of 1.5. The coefficients on the output gap and inflation are similar to those in other papers estimating reaction function for India, including Hutchison et al 2013, Patra et al 2012, RBI Study 2010 (Singh), and Mohanty and Klau 2004. Bhoi et al (2019) estimate a reaction function for 2000-2018, using weighted average call money rate as the policy rate, and similarly find the coefficient on the output gap to be larger post inflation targeting.

an explanatory variable (Woodford 2001 version of the Taylor Rule), its coefficient indicates significant inertia. The coefficients of output gap and inflation remain positive as before.

Table 6: Monetary Policy Reaction Functions (1997Q1 till 2024Q1)
(Dependent Variable is Effective Policy Rate)

	I	II	III	IV
Inflation	0.12	0.10	0.11***	0.10***
	(1.49)	(1.00)	(3.84)	(0.98)
Output gap (% of GDP)	0.15***	0.13**	0.06***	0.07***
	(3.65)	(2.13)	(2.82)	(2.65)
Inflation Targeting T1		-0.92***		-0.10
		(2.75)		(0.88)
Inflation Targeting T2		-1.64***		-0.001
		(5.12)		(0.01)
Lagged Effective Policy rate			0.88***	0.88***
			(21.66)	(20.16)
Constant	5.80***	6.33***	0.15	0.21
	(12.17)	(10.64)	(0.66)	(0.78)
Observations	108	108	107	108
Adjusted R^2	0.07	0.20	0.89	0.89

Note: Robust t statistics in parentheses. *, **, ***, indicate significance at 10, 5 and 1 percent respectively.

When we include dummy variables for the inflation targeting periods to address complaints that interest rates have been higher post-inflation targeting, we find, to the contrary, that rates have been lower once one accounts for inflation and the output gap, though not always significantly.[8]

Policy rates were lowered dramatically during the global financial crisis. Was this reaction unusual, given that growth slowed sharply between 2007 and 2008? In extensions, we added a dummy for the global financial crisis, its coefficient is negative and significant, confirming that the RBI moved more quickly than predicted. Another question is whether policy rates react to the inflation series that the RBI tracks formally or to one or more of the CPI inflation series. When we include different inflation series in the reaction function, the results suggest that monetary policy responds to headline and core inflation but not to food price inflation.

[8] We also included additional terms, interacting inflation and the output gap with the two IT dummies. The coefficient on the output gap was consistently positive, that on inflation consistently negative, although the few quarterly observations for each of the two IT periods do not give us sufficient variation and degrees of freedom to estimate these coefficients reliably and precisely.

We also ask if the weights on the output gap and inflation are different in periods when these variables take on unusually high or low values. Contrary to previous suggestions, we do not find evidence of threshold effects.[9]

While there is evidence of autocorrelation in our Ordinary Least Squares (OLS) estimates, when we adjust the standard errors using Newey-West correction, significance levels are unaffected. Previous studies have used Generalized Method of Moments (GMM) for estimating the reaction function on the grounds that OLS coefficients may suffer from endogeneity and simultaneity bias. When we do so, the coefficients of inflation and output gap are similar to the OLS estimates obtained when we include the lagged policy rate. When we do not include lagged policy rates, the GMM estimates of the coefficients for both inflation and output gap are larger and more significant than the OLS estimates (see Appendix B).

Finally, contrary to earlier skepticism, it does not appear that IT has made the RBI overly hawkish or reactive to every small deviation in inflation rate from its target of 4 percent or to every spike in food inflation. Since September 2016, the RBI has changed the key policy rate 17 times, majority of them during two turbulent years: in 2019-20 when the policy rate was eased five times by a cumulative 185 basis points in response to a sharp growth slowdown; and in 2022-23 when the policy rate was increased six times by a cumulative 210 basis points in response to accelerated inflation emanating from global shocks. During the remaining 6 years, the policy rate was changed only six times, about once every year. Compared to this, the RBI changed its policy rate 24 times in the 8 years prior to IT (Table 7).

Table 7: Average Policy Action Before and During Inflation Targeting

	Real GDP growth (quarterly average)	**Avg CPI inflation (monthly average)**	**Avg Repo Rate (monthly average)**	**Real Repo rate (Repo - inf)**	**Number of policy changes**	**Number of times Repo raised**	**Number of times Repo lowered**	**Net policy change (bps)**
Pre-IT (January 2010 -August 2016)	7.66	8.32	7.26	-1.07	24	15	9	+175
IT Period (September 2016-June 2024)	5.58	4.97	5.51	0.55	17	8	9	0

[9] Specifically, we define dummies for very high values of inflation when it exceeds 8.7 percent; for very large output gap when it exceeds 2.5; for very low levels of inflation when inflation is below 3.1 percent, and for low output gap when it is below -2.1. The cut-offs have been selected at about top 10 or bottom 10 percent of the observations for inflation and the output gap. We include one of these dummy variables at a time in the regressions. The only coefficient that is significant at 5 percent level is for a high output gap. This coefficient is negative, indicating that at very high GDP growth rate (and output gap), the policy rate does not increase proportionately.

Pre and Post- Inflation Targeting Outcomes

Studies of the impact of inflation targeting have reached different conclusions depending, inter alia, on countries, periods and measures considered. For emerging markets as a class, there is evidence of lower inflation under IT, but results for inflation volatility are less consistent.[10] There is no clear consensus on the effects of IT on output growth—Brito and Bystedt (2010) find a significant negative effect on growth while other studies (Naqvi and Rizvi 2009, IMF 2011) find insignificant effects of IT on growth. Goncalves and Salles (2008) find that IT reduces output volatility, whereas Batini and Laxton (2007) find no such evidence.

We now update our earlier comparisons of the behavior of a range of economic and financial variables before and after the adoption of IT in India. Our earlier baseline specification was of the form:

$$y_t = \alpha_0 + \alpha_1 \mathrm{IT}_t + \alpha_2 \mathrm{GFC}_t + \alpha_3 \mathrm{Post\ GFC}_t + \epsilon_t^y \qquad (3)$$

where, y_t denoted the outcome variable; $\mathrm{IT}_t, \mathrm{GFC}_t$ and $\mathrm{Post\ GFC}_t$ denoted inflation targeting dummy (2016 Q3- 2019 Q4), global financial crisis dummy (2008 Q3- 2009 Q1) and a post global financial crisis dummy (2009 Q2-2019 Q4) respectively.[11] We now revise this specification by including two dummy variables for the post IT period instead of one-- an IT1 dummy that, as before, equals 1 during the inflation targeting regime in the period 2016 Q3-2019 Q4, and is zero otherwise; and another IT2 dummy that equals 1 during the inflation targeting regime in the period 2020 Q1 to 2024 Q1, and is zero otherwise.

$$y_t = \alpha_0 + \alpha_1 \mathrm{IT}_1 + \alpha_2 \mathrm{IT}_2 + \alpha_3 \mathrm{GFC}_t + \alpha_4 \mathrm{Post\ GFC}_t + \epsilon_t^y \qquad (4)$$

For outcome variables, we consider level of inflation across different inflation series and their respective volatility; percentage changes in the exchange rate and in external reserves; bond yields; volatility of the exchange rate; volatility of returns on equities; and the transmission of monetary policy (more on which below). Data used are from 1997 Q1 till 2024 Q1 unless otherwise notes.

CPI headline, core and food inflation are lower in the IT period, as shown in Table 8. While CPI inflation increased after the global financial crisis, all measures of CPI inflation were lower after the shift to inflation targeting. It was lower during the first four years (2016-19) than during the subsequent four years (2020-2023). On the other hand, WPI inflation was broadly similar in post IT period, as during the pre-IT period.

[10] Vega and Winkelried (2005), Batini and Laxton (2007), Lin and Ye (2007), and IMF (2011) conclude that inflation volatility is significantly lower after IT, whereas Goncalves and Salles (2008) and Brito and Bysted (2010) find any difference to be insignificant.

[11] Admittedly, this framework does not establish any causal effects of inflation targeting, since we have not controlled for confounding factors and developments.

Table 8: Inflation is Lower After Inflation Targeting

	WPI Headline Inflation	CPI Headline Inflation	Core Inflation	Food Inflation
Inflation Targeting 1 (IT1)	-1.53 (1.55)	-4.91*** (8.22)	-3.29*** (5.76)	-6.91*** (6.11)
Inflation Targeting 2 (IT2)	1.09 (0.61)	-2.72*** (4.84)	-2.78*** (4.84)	-2.63*** (2.63)
Global Financial Crisis Dummy	2.66 (1.46)	3.98*** (7.13)	0.25 (0.61)	7.79*** (7.80)
Post Global Financial Crisis Dummy	-0.66 (0.70)	3.14*** (4.42)	2.31*** (3.45)	4.20*** (4.05)
Constant	5.14*** (20.47)	5.56*** (11.62)	5.88*** (14.59)	5.12*** (7.11)
Observations	108	108	108	108
Adjusted R^2	0.02	0.29	0.18	0.25

Note: Robust t statistics in parentheses; *, **, ***, indicate significance at 10, 5 and 1 percent. IT1 is a dummy that equals 1 during the inflation targeting regime in the period 2016 Q3 to 2019 Q4, and is zero otherwise. IT2 is a dummy that equals 1 during the inflation targeting regime in the period 2020 Q1 to 2024 Q1, and is zero otherwise. The global financial crisis dummy equals 1 during the period 2008 Q3 to 2009 Q1, and is zero otherwise. The post global financial crisis dummy equals 1 for time periods including and after 2009 Q2, and is zero otherwise.

Similar analysis for inflation volatility, calculated as the quarterly average of the 15-month rolling standard deviation of monthly inflation series, shows lower volatility of CPI headline and core inflation after the adoption of IT (Table 9). Volatility of food inflation has not changed after IT; and the patterns are mixed for WPI inflation. Volatility in WPI headline, and its primary, and manufacturing components declined between 2016-2019, but has reversed since then.

Table 10 indicates no change in exchange rate depreciation or appreciation (computed as an average of daily changes) or foreign exchange reserves. We measure exchange rate and equity market volatility by the standard deviation of percentage changes in daily value of the rupee to dollar exchange rate and equity markets, respectively. Table 10 suggests that the exchange rate and equity market have become less volatile under IT. Yields on government debt are lower after the adoption of IT.[12]

[12] We do not find changes in the rate of growth of government expenditure, revenue (operating and recurrent), or capital spending under the IT regime (results have not been reported for brevity, but are available on request).

Table 9: Inflation Volatility under IT

	Volatility of CPI Inflation			Volatility of WPI Inflation		
	Headline	Core	Food	Headline	Primary Articles	Manufacturing
Inflation Targeting 1 (IT1)	-0.42*** (3.32)	-0.80*** (5.01)	-0.28 (1.26)	-0.48* (1.68)	-0.99*** (3.91)	-0.41** (2.17)
Inflation Targeting 2 (IT2)	-0.27* (1.94)	-0.79*** (5.00)	0.35 (1.17)	1.41*** (2.92)	0.98*** (2.89)	1.07*** (3.17)
Global Financial Crisis Dummy	-0.12 (0.43)	-0.65*** (5.15)	-0.31 (0.73)	1.65*** (18.77)	0.33 (1.34)	0.62*** (9.94)
Post Global Financial Crisis Dummy	-0.31 (1.22)	-0.27 (1.44)	-0.13 (0.36)	0.80*** (3.12)	0.59* (1.83)	0.42*** (2.86)
Constant	1.71*** (7.52)	1.57*** (13.01)	2.73*** (8.36)	1.26*** (22.41)	2.69*** (11.47)	1.09*** (18.36)
Observations	108	108	108	108	108	108
Adjusted R^2	0.03	0.29	-0.02	0.36	0.16	0.34

Table 10: Exchange Rates, Reserves, Sovereign Yields, and Equity Market

	Nominal Exchange Rate (% change)	Trade Weighted REER (% change)	Exchange Rate Volatility	% Change in Reserves (q-o-q)	G-Sec secondary market 10-year maximum yield	Equity Market Volatility
Inflation Targeting 1 (IT1)	-0.63 (0.66)	-0.16 (0.24)	-0.03*** (4.86)	0.35 (0.36)	-0.91*** (5.68)	-0.11*** (4.67)
Inflation Targeting 2 (IT2)	-0.16 (0.19)	-0.45 (0.72)	-0.04*** (6.51)	0.53 (0.46)	-1.35*** (8.37)	-0.04 (1.54)
Global Financial Crisis Dummy	5.83*** (2.75)	-0.88** (2.25)	0.08*** (4.23)	-14.12*** (4.10)	-0.56 (0.90)	0.08** (1.55)
Post Global Financial Crisis Dummy	0.70 (0.83)	0.38 (0.63)	0.04*** (6.38)	-5.46*** (6.01)	-0.15 (0.41)	0.005 (0.18)
Constant	0.38 (1.02)	0.09 (0.26)	0.03*** (14.03)	6.7*** (9.45)	8.49*** (24.85)	0.18*** (13.24)
Observations	108	108	108	102	103	108
Adjusted R^2	0.07	-0.03	0.48	0.38	0.11	0.13

Note: Robust t statistics in parentheses; *, **, ***, indicate significance at 10, 5 and 1 percent. IT1 is a dummy that equals 1 during the inflation targeting regime in the period 2016 Q3 to 2019 Q4, and is zero otherwise. IT2 is a dummy that equals 1 during the inflation targeting regime in the period 2020 Q1 to 2024 Q1, and is zero otherwise. The global financial crisis dummy equals 1 during the period 2008 Q3 to 2009 Q1, and is zero otherwise. The post global financial crisis dummy equals 1 for time periods including and after 2009 Q2, and is zero otherwise.

Finally, we examined whether the transmission of policy impulses to banking and financial markets improved with the adoption of IT.[13] We collated monthly data on government bonds yields of 1, 2, 5 and 10- year maturities, treasury bill rates, and average lending rates on new and outstanding loans. We used the repo rate as the relevant policy rate. Table 11 confirms that transmission is greater for treasury bill and short-tenure bonds. Transmission to government bonds yields and bill rates improved somewhat following the adoption of inflation targeting. Transmission to bank lending rates is relatively weak, as other authors have shown, and has not improved with the adoption of IT. Transmission to bond yields of longer tenure securities is weaker and has not improved with the adoption of IT (results not shown for brevity).

Table 11: Transmission of Policy Rate

	1-year govt bond yield	91-day T bill rate	Average bank lending rate on outstanding loans	Average bank lending rate on fresh loans
Repo Rate	0.95***	1.16***	0.64***	0.65***
	(20.44)	(20.09)	(15.75)	(18.34)
Inflation Targeting 1 (IT1)	-0.27	0.76	0.71	0.62
	(0.38)	(1.32)	(1.05)	(1.01)
Inflation Targeting 2 (IT2)	-0.95***	-0.46	1.10***	-0.31
	(2.38)	(1.32)	(3.15)	(1.02)
Repo Rate x IT1	0.15	-0.01	-0.20	-0.18*
	(1.33)	(0.10)	(1.78)	(1.85)
Repo Rate x IT2	0.29***	0.22***	-0.40***	-0.13***
	(4.86)	(3.49)	(8.15)	(3.03)
Constant	0.05	-1.58***	7.10***	6.28***
	(0.15)	(4.03)	(23.19)	(23.77)
Observations	278	278	148	117
Adjusted R^2	0.68	0.68	0.94	0.94

Note: Robust t statistics in parentheses; *, **, ***, indicate significance at the 10, 5, and 1 percent, respectively. Data are monthly, from April 2001 till May 2024 for bond yields, T-bill, and repo rate; lending rates on outstanding loans is from February 2012 and on fresh loans is from September 2014. Inflation Targeting T1 and Inflation Targeting T2 are dummy variables which take a value of 1 between July 2016 - December 2020; and January 2021 – May 2024 respectively, and 0 otherwise.

[13] Historically, evaluations of transmission in India have been mixed. Mishra, Montiel, and Sengupta (2016) examined the strength of transmission using a structural VAR methodology. They found that a tightening of policy is associated with a significant increase in bank lending rates. Although passthrough to lending rates is only partial, they conclude that their result for India compares favorably with those for other developing countries. Consistent with these findings, Acharya (2017) and Dua (2020) argue that transmission to money market and long-term interest rates is rapid and relatively complete, but that bank deposit and lending rates adjust more slowly and less completely.

Are Expectations Better Anchored?

Kose et al. (2019) find that long-term inflation expectations have declined in the past two decades in both advanced economies (AEs) and emerging markets and developing economies (EMDEs). Although inflation expectations are less well anchored in EMDEs, their sensitivity to domestic and global shocks has declined. They suggest that an IT regime and greater central bank transparency are associated with better anchoring.[14]

Studies of India similarly suggest that expectations have become better anchored in recent years. For example, Asnani et al (2019) analyze the inflation expectations of households and find that inflation expectations have become better anchored during the inflation targeting period-- in particular, there is only limited spillover from food inflation to food and non-food inflation expectations in the inflation targeting period.[15]

The RBI has been conducting its Inflation Expectations Survey of Households (IESH) since 2005, recording survey respondents' perceptions of current inflation and expectations of inflation three months and one year ahead. The survey records both qualitative and quantitative responses. It was conducted quarterly (viz., Mar, Jun, Sep and Dec) until March 2014. At that point, two additional rounds in May and November were added to align it with the bi-monthly monetary policy review cycle.

The RBI has also been conducting a survey of professional forecasters since the second quarter of 2007-08, drawing responses from forecasters with both financial and non-financial institutions. Initially, the survey was conducted at quarterly frequency, but this was changed to bi-monthly in 2014-15. The survey collects annual quantitative forecasts for two financial years (current year and next year) and quarterly forecasts for five quarters (current quarter and next four quarters).

We ask how the inflation expectation series for India has changed since the implementation of inflation targeting. For the analysis below, we use both the household and professional forecaster series averaged at quarterly frequencies. We use the CPI inflation expectations of professional forecasters, and compare household and professional forecasts with CPI inflation.[16]

Both professional forecasts and household expectations of inflation declined with the shift to IT. Even so, household expectations of inflation consistently exceed actual inflation, and the deviation has not declined. The averages of professional forecasts have been close to actual inflation, while household expectations have often exceeded actual inflation. In the last few years, and particularly since the shift to IT, expected inflation has declined, in line with the decline in actual inflation (Table 12).

[14] Lower public debt and greater trade openness are also associated with better anchoring of expectations. Analyzing monthly survey data from Consensus Economics for a sample of 22 EMDEs and 14 advanced economies in a structural vector autoregressive model, Davis (2014) similarly finds that the introduction of inflation targeting is associated with a statistically significant reduction in the response of inflation expectations (12-month-ahead) to shocks in oil prices and observed inflation.

[15] Benes et al. (2017) and Patra and Ray (2010) similarly found that lagged inflation, as well as current and lagged changes in fuel and food prices significantly affected inflation expectations prior to inflation targeting.

[16] We use the CPI combined inflation series from 2012 onwards and the CPI-IW prior to it. Professional forecasters' expectations are for the CPI-IW prior to 2014, and for the combined series 2014 onwards.

Table 12: Inflation Expectations Declined After Inflation Targeting

	Household's Expectations			Professional Forecaster's Expectations			
	Current	1-quarter ahead	1-year ahead	1-quarter ahead	2-quarters ahead	3-quarters ahead	4-quarters ahead
Inflation Targeting1 (IT1)	-1.22*** (2.69)	-0.94*** (2.05)	-1.27** (2.58)	-4.08*** (9.48)	-3.39*** (9.11)	-2.89*** (9.44)	-2.74*** (8.11)
Inflation Targeting2 (IT2)	0.24 (0.53)	0.88* (1.89)	-0.21 (0.43)	-3.06*** (7.10)	-2.85*** (7.09)	-2.78*** (8.45)	-2.72*** (7.45)
Constant	9.47*** (22.42)	9.82*** (22.92)	10.52*** (23.89)	8.29*** (20.86)	7.83*** (22.05)	7.44*** (25.99)	7.27*** (26.25)
Observations	71	71	71	62	62	62	38
Adjusted R^2	0.04	0.05	0.02	0.54	0.53	0.58	0.57

Note: Robust t statistics in parentheses; *, **, ***, indicate significance at the 10, 5, and 1 percent, respectively. IT1 is a dummy that equals 1 during the inflation targeting regime in the period 2016 Q3 to 2019 Q4, and is zero otherwise. IT2 is a dummy that equals 1 during the inflation targeting regime in the period 2020 Q1 to 2024 Q1, and is zero otherwise. Data are sourced from CEIC with the original source being RBI. Household expectations data are from 2006 Q3 till 2024 Q1; professional forecasters' data are from 2008 Q1 till 2024 Q1 (data for 2011 Q3, 2013 Q4, and 2014 Q1 are not available). Data for four-quarters ahead from professional forecasters are available from 2008 Q2 till 2024 Q1 (though only twice a year since 2014).

5. Potential Reforms

In this section, we review and assess some recommendations that have been tabled for modifying the Reserve Bank's approach to inflation targeting.

a. Broadening the Mandate?

A number of critics have opined that the RBI's mandate to maintain price stability while also "keeping in mind the objective of economic growth" is too restrictive and should be broadened to encompass other goals. It has been suggested that the growth objective should be elevated so that it has parity with the price stability objective, in the manner of the U.S. Federal Reserve's dual mandate. Mehrishi (2024) argues that the RBI's mandate should be expanded to include responsibility for corporate bond market development, to be achieved by purchasing corporate bonds and accepting commercial bank holdings of the same as collateral when obtaining liquidity at the central bank. Dikau and Volz (2021) note that unlike some 70 other central banks worldwide, the RBI has no sustainability objectives or responsibility for the promotion of green finance.

In our view, the costs of broadening the mandate exceed the benefits. King (2024) notes that giving too many responsibilities to the central bank will tend to reduce the time and focus of senior personnel on the main responsibility of achieving price stability. In addition, a first rule of policy is that an institution should not be tasked with hitting targets to which its instruments are ill- suited. It is not clear, in this context, that the Monetary Policy Committee, when setting interest rates, can promote economic growth in additional ways

besides maintaining a stable and predictable rate of inflation conducive to productive investment decisions. Wearing its hat as regulator, the RBI can adopt regulations designed to promote corporate bond market liquidity and green finance, but making these objectives elements of its monetary policy mandate threatens to overload and distort the conduct of interest rate policy. The more objectives the Monetary Policy Committee is tasked with pursuing, the more difficult it would become to communicate its policy toward inflation and thereby help to stabilize inflation expectations. Moreover, a more complex mandate hinders central bank accountability by making it harder for observers to evaluate the central bank's actions relative to its objectives.

b. Is Headline CPI Still Relevant?

Some authors (e.g. Chhiber 2020 and Economic Survey 2024) have suggested that headline inflation is an inappropriate target, that the RBI should "look through" (i.e. disregard) movements in food price inflation on the grounds that food prices are volatile, and that focusing on them distorts the conduct of policy. In responding to food price inflation, the central bank will be focusing on transitory inflation threat and neglecting other more important objectives of policy.

Our results indicate that food-price inflation feeds through to core inflation as producers mark up the prices of other products. Food-price inflation, which is captured by headline inflation, has predictive content for future core inflation, in other words, and should not be disregarded. Whereas central banks in advanced economies have been able to look through fluctuations in food and fuel price inflation without consequences for core inflation and therefore without jeopardizing their inflation targets, in India, where food is a much more important component of consumption baskets, this may not be the case. This is not an argument that the central bank should react to each and every movement in headline and food inflation. But it does suggest that neglecting food price inflation that diverges from target for an extended period can have negative consequences.

c. Should the Consumption Basket be Updated?

Is the weight on food prices in the headline CPI basket excessive? The current basket accords a weight of 45.8 percent to food and beverages. The basket was last calculated in 2011-12 and has not been revised since then, even though per capita incomes have nearly doubled meanwhile.[17]

To calculate an appropriate weight on food in India's consumption basket, we estimated the relationship between the share of food and per capita income across countries. We estimated a similar relationship for the Indian states (for their respective consumption baskets as of 2011-12). The estimates across each regression confirm that the share of food in

[17] We note also the following from the Economic Times: "India mulls major cut to food weighting in new CPI basket: An Indian government panel tasked with revising the nation's consumer price index is considering a substantial cut in the weighting of food, according to a person familiar with the matter, a move that could curb inflation spikes in the South Asian nation. The panel, under the statistics ministry, is discussing a proposal to reduce the weight of food in the consumer price basket by as much as 8 percentage points, according to the person, who asked not to be identified as the discussions are private."
https://economictimes.indiatimes.com/news/economy/indicators/india-mulls-major-cut-to-food-weighting-in-new-cpi-basket/articleshow/112335534.cms?from=mdr

consumption declines as income levels increase (Appendix C). While a Bangladeshi spends 45 percent on food, a Vietnamese spends 33 percent; a Brazilian 24 percent; and a South Korean spends only 14 percent on food. Similar dispersion is seen across Indian states.

Based on these results, the estimated weight of food for India at today's per capita income would be closer to 40 percent instead of the current 45.8 percent. It would likely further decline to around 30 percent in a decade from now, due to the projected increase in per capita income levels. This correction itself should ameliorate concerns on account of food inflation being part of the inflation target.

d. Is a 4 Percent Midpoint for the Target Range Still Appropriate?

A number of other inflation-targeting emerging markets have reduced their point target for inflation as they gained experience with the regime and inflation came down (Appendix D). Thus, the Central Bank of Brazil reduced its target from 4.5 percent in 2018 to 4.25 percent in 2019, 4 percent in 2020, 3.75 percent in 2021, 3.5 percent in 2022, and 3.25 in 2023. Indonesia reduced its target from 5 percent in 2015-17 to 3.5 percent in 2018-9 and 3 percent in 2020. The Bank of Thailand effectively reduced its point target from 2.5 percent to 1.5 percent in 2020.

Compared to these other emerging markets, the RBI's point target of 4 percent is relatively high. Compared to these other cases, however, India is also a lower-income, faster-growing catch-up economy. As such, service-sector inflation in India will be relatively high, following from the Balassa-Samuelson effect. Such considerations suggest that a 4 percent target is more appropriate for India than the advanced-country convention of 2 percent.

e. Should the Tolerance Band be Narrowed?

Similarly, the RBI's tolerance band of +/-2 percent is relatively wide by emerging market standards. The Central Banks of Thailand and Indonesia have a +/-1 percent tolerance band, the Central Bank of Brazil a +/-1.5 percent tolerance band. It might be argued that allowing for relatively wide fluctuations of inflation weakens the anchoring effects of the regime and amplifies the volatility of inflation expectations.

Here the fact that inflation in India is heavily weighted toward food-price inflation, which is perturbed by climate variations, and toward energy-price inflation, which is affected by volatile world energy market conditions, militates against adopting a narrower tolerance band. Keeping inflation within a narrower range would likely require larger, more frequent variations in the policy interest rate. Such variations might create a less predictable climate for investment and hence challenges for economic growth. One wonders whether they would be conducive to financial development and financial stability.

In addition, if the world is, in fact, now entering a period of heightened economic and financial volatility, with geopolitical tensions, high and rising sovereign debts and deficits, and a shift away from trade liberalization, keeping inflation within a narrow band will become even more challenging and require even wider, more frequent swings in interest rates. This is an additional argument against narrowing the RBI's tolerance band at this time.

f. Should the RBI Take into Account State-Level Variations in Inflation?

Inflation in India varies across states and regions, reflecting differences in incomes, agro-climatic conditions, population characteristics, and sectoral economic mix. Occasionally one hears the argument that the Monetary Policy Committee should pay special attention to Indian states where inflation is above or below its target range and adjust policy to bring their inflation rates back within the tolerance band. Households, it is argued, look to local inflation, not national inflation, when forming expectations, so ignoring these outliers runs the risk of de-anchoring expectations. Similarly, rural and urban inflation rates differ, reflecting differences in rural and urban consumption baskets. Looking only at average inflation, it might be argued, elevates the risk that one or the other of these two indices violates the tolerance range, again potentially de-anchoring expectations.

At the same time, there is some evidence of the convergence of state-level inflation rates over time and, in the long run, of urban and rural inflation rates moving together (Reserve Bank of India 2021). Targeting outlying rates of inflation in one state or sector threatens to destabilize the rate of inflation in other states and sectors. Such is the merit of targeting the average.

g. Should Inflation Targeting be Abandoned?

Abandoning inflation targeting would be an extreme alternative. The bulk of the evidence, as we read it, is that monetary policy has been more effective since the adoption of IT in 2016 than before. Monetary policy must be organized around a nominal anchor, be this a target for inflation, a target for the exchange rate, a target for the rate of growth of monetary aggregates, or some other target. Inflation targeting has a better track record than these other options. It is relevant in this connection that, in contrast to other monetary regimes, no country that adopted an inflation targeting regime has abandoned it subsequently.

6. Conclusions

The RBI's inflation targeting regime has worked well. Given this record, radical changes such as broadening its mandate or abandoning the target in favor of a more discretionary regime would be risky and counterproductive. In contrast, the 4 percent point target, +/- 2 percentage point tolerance band and focus on headline inflation remain broadly appropriate. That said, the regime can be tweaked to improve performance. The weight of food-price inflation in the CPI inflation basket should be reduced to better reflect the circumstances of Indian households, for example. Suitably updated, the current inflation targeting regime should remain the framework for the country's monetary policy for the foreseeable future.

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Appendix A

Table A1: Correlation Coefficients Between Variables in the Reaction Function

	Effective Policy Rate	Output gap, % of GDP	Headline Inflation	Exchange rate depreciation	Fiscal deficit, % of GDP	Government market borrowing, % of GDP
Effective Policy Rate	1.00					
Output gap, % of GDP	0.26*** (0.008)	1.00				
Headline Inflation	0.13 (0.18)	-0.09 (0.35)	1.00			
Exchange rate depreciation	0.27*** (0.004)	-0.14 (0.16)	0.20** (0.04)	1.00		
Fiscal deficit, % of GDP	-0.08 (0.38)	-0.33*** (0.00)	0.02 (0.84)	0.08 (0.39)	1.00	
Government market borrowing, % of GDP	-0.15 (0.13)	-0.43*** (0.00)	0.04 (0.68)	0.01 (0.90)	0.30*** (0.00)	1.00

Note: *, **, and *** indicate that the correlation coefficient is significant at 10, 5, and 1 percent level, respectively; p-values are shown in parentheses. Data are from 1997Q2-2024Q1. Exchange rate depreciation is the q-o-q change in INR/USD exchange rate. Monthly data for fiscal deficit and market borrowings of the central government has been aggregated to calculate the quarterly variables which is then seasonally adjusted using the x-11 filter.

Appendix B: Generalized Method of Moments (GMM) Estimates of the Reaction Function

Below we present results from the GMM estimation of the reaction function. In columns (1), (2), (5) and (6), inflation is instrumented by its four lags while output gap is treated as exogenous; in columns (3) and (7), output gap is instrumented by its four lags while inflation is treated as exogenous; and in columns (4) and (8), output gap and inflation are both assumed to be endogenous and are instrumented by four lags of inflation & output gap.

Table B1: Estimation of Monetary Policy Reaction Function

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Inflation	0.28***	0.31***	0.19**	0.36***	0.11***	0.12***	0.11***	0.13***
	(3.31)	(3.69)	(2.22)	(3.92)	(3.94)	(4.45)	(3.92)	(4.65)
Output gap		0.16***	0.31***	0.35***		0.06***	0.09***	0.10***
		(3.84)	(4.22)	(6.19)		(3.35)	(2.75)	(3.84)
Lagged Effective Policy rate					0.89***	0.86***	0.86***	0.86***
					(23.59)	(22.19)	(19.72)	(21.25)
Constant	4.79***	4.65***	5.26***	4.45***	0.11	0.21	0.25	0.19
	(9.91)	(9.87)	(11.86)	(8.73)	(0.40)	(0.83)	(1.10)	(0.74)
Observations	104	104	104	104	104	104	104	104
Adjusted R^2	-0.01	0.08	0.00	-0.10	0.88	0.90	0.89	0.89

Note: Robust t statistics in parentheses; *, **, ***, indicate significance at the 10, 5, and 1 percent, respectively. Data is for 1997Q1 – 2024Q1. All variables have the same specifications as in Table 6.

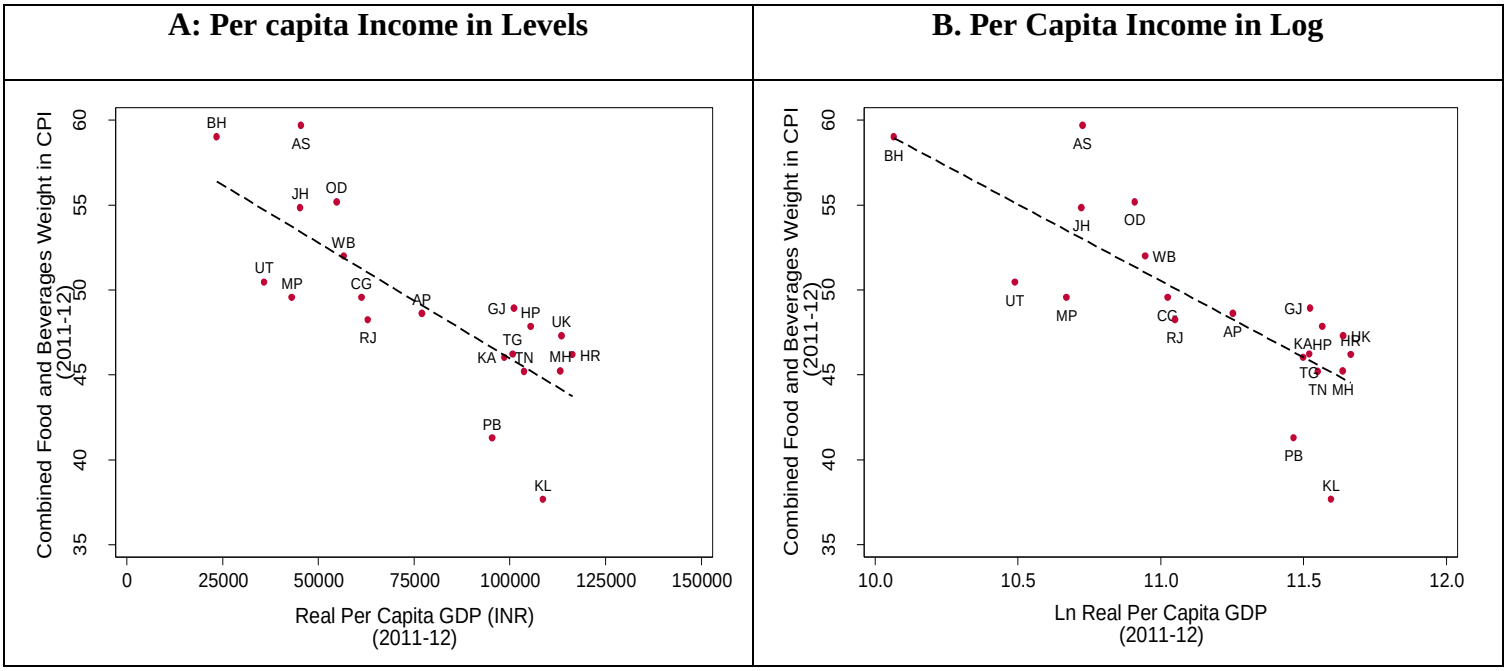
Appendix C: Weight of Food in Consumer Price Index (CPI)

The All-India Consumer Price Index (CPI) allocates a weight of 45.86 to food and beverages in its headline index. The CPI basket has not changed since 2011-12, when the current CPI series was introduced. Meanwhile, real per capita income has increased by nearly 75 percent between 2011-12 and 2023-24, rendering the current CPI basket imprecise. In particular, in light of a strong negative relationship between per capita income and the share of food in consumption basket, the latter would have declined by several percentage points since 2011-12.

Below, we project the current weight of food in India's consumption basket in three ways.

First, we exploit the heterogeneity across 20 largest Indian states in their levels of per capita income and share of food in the consumption basket as of 2011-12. Composition of consumption baskets are available separately for rural and urban areas. Using the rate of urbanisation (share of urban population in total population) for 2011-12 as weights, we construct the overall composition of CPI for the states.[18] In Figure C1, we correlate the share of food in respective CPI of the states with their per capita income (in levels and log).

Figure C1: Weight of Food and Beverages in CPI vs Per Capita GDP (2011-12) Across Indian States



Note: Data for CPI weights as well as real per capita GDP is from Ministry of Statistics and Programme Implementation (MoSPI). States are referred to as below: Andhra Pradesh, AP; Assam AS; Bihar, BH; Chhattisgarh, CG; Gujarat, GJ; Haryana, HR; Himachal Pradesh, HP; Jharkhand, JH; Karnataka, KA; Kerala, KL; Madhya Pradesh, MP; Maharashtra, MH; Odisha, OD; Punjab, PB; Rajasthan, RJ; Tamil Nadu, TN; Telangana, TG; Tripura, TR; Uttar Pradesh, UT; Uttarakhand, UK; West Bengal, WB.

[18] We have analyzed the food shares for 20 largest states, observing that the smaller northeastern states - Arunachal Pradesh, Manipur, Mizoram, Nagaland, Meghalaya, Sikkim, and Tripura – and Goa were outliers.

Table C1: Regressing Weight of Food and Beverages in CPI on Per Capita GDP (2011-12) of Indian States

	(1)	(2)
Real Per Capita GDP	-0.00014***	
	(5.21)	
Log Real Per Capita GDP		-9.012***
		(5.31)
Constant	59.59***	149.70***
	(27.27)	(7.88)
Observations	20	20
Adjusted R^2	0.59	0.58

Note: t statistics in parentheses; *, **, ***, indicate significance at the 10, 5, and 1 percent, respectively. Data for CPI weights as well as real per capita GDP is from Ministry of Statistics and Programme Implementation (MoSPI).

We combine the estimated coefficients of per capita income in Table C1, with the latest available data for per capita income for India to estimate the current weight of food and beverages in today's CPI. Using the estimates in the first column in Table C1, the current weight of food should be smaller by 7.4 percentage points; and as per the estimates by the second column, it should be smaller by 4.8 percentage points.

Next, we use the information on monthly per capita consumption expenditure (MPCE) in the recently released Household Consumer Expenditure Survey 2022-23 to estimate the decline in the share of food and beverages in the consumption basket. The Survey provides separate estimates for rural and urban population. We use the rural and urban population shares for India (sourced from the Report of the Technical Group on Population Projections published by the Ministry of Health and Family Welfare) as weights to calculate the average share of food and beverages for 2011-12 and 2022-23.

Table C2: Share of Food and Beverages and Non-Food items in MPCE in 2011-12 and 2022-23

		2011-12	2022-23
Rural India (% share in MPCE)	Food & Beverages	52.90	46.38
	Non-Food	47.10	53.62
Urban India (% share in MPCE)	Food & Beverages	42.62	39.17
	Non-Food	57.38	60.83
Urbanization Rate All-India	Rural	68.51	64.93
	Urban	31.49	35.07
All-India Weighted Average	**Food & Beverages**	**49.66**	**43.85**
	Non-Food	**50.34**	**56.15**

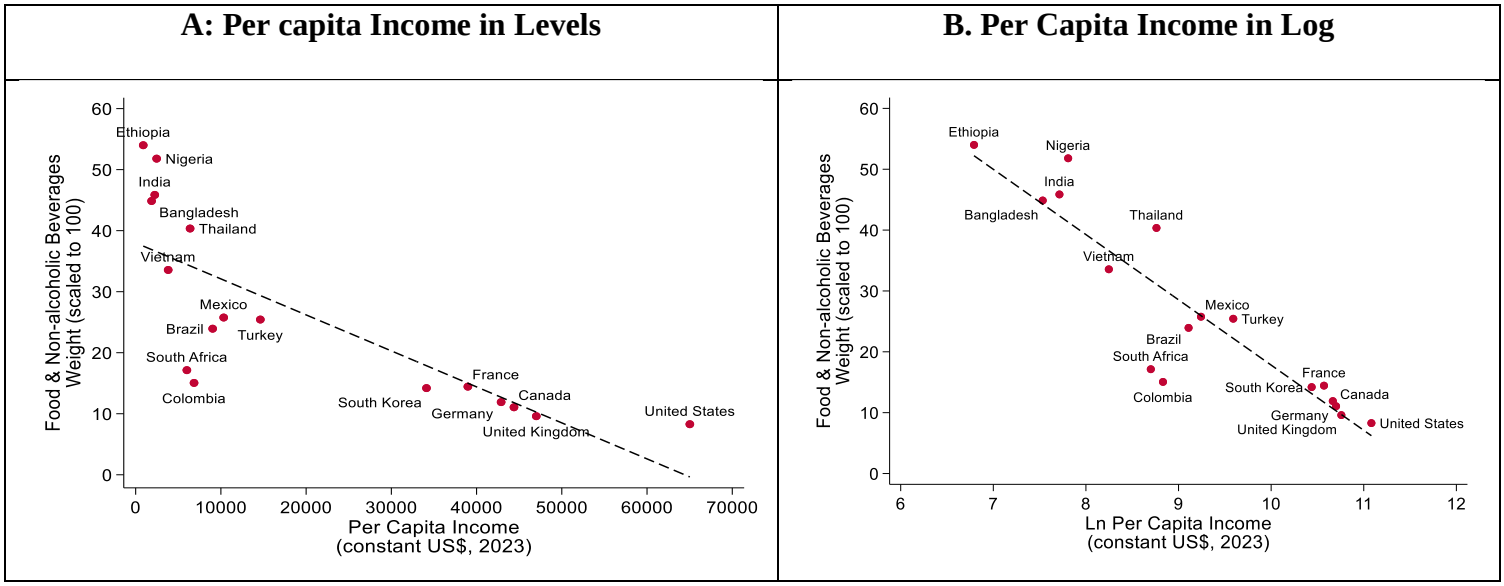
The calculations in Table C2 show that the share of food and beverages has likely declined by 5.8 percentage points during the last decade. With acceleration in per capita income growth and urbanization during the coming decade, it is conceivable that the share will decline faster, and to about 30 percent by the end of next decade.[19]

Finally, we estimate the relationship between the share of food and beverages in CPI and per capita income for a mix of advanced, emerging and developing economies for which data are readily available. The sample comprises 16 countries of which 6 are Advanced Economies (Canada, France, Germany, South Korea, United Kingdom, and United States) and the remaining are Emerging Market Economics (Brazil, Colombia, Mexico, Nigeria, South Africa, Thailand, Turkey, and Vietnam) or Developing Countries (Bangladesh, and Ethiopia).

We regress the weight of Food and Beverages in CPI on real per capita income (in constant US$) in Figure C2 for their respective values in 2023. For India, we include the weight of food in 2011-12 and per capita income for 2023.

[19] Reduced share of food and beverages would be likely taken up by manufacturing and even more significantly by services including education, health, transport, communication, entertainment and such categories. Thus, analyzing the inflation dynamics of services would become important going forward.

Figure C2: Weight of Food and Beverages in CPI vs Per Capita GDP (constant US$) Across Countries



Note: Data have been taken from IMF, IFS for all countries except India and Brazil. For Brazil, the data are from IBGE (Brazil Institute of Geography and Statistics); and for India from MoSPI.

In the regressions reported below, we included a dummy which equals 1 for India. The results (Table C3), show that compared to other countries, the share of food and beverages in India's CPI basket is overweight by 4-10 percentage points.

Table C3: Cross Country Regression of Food and Beverages Weight in CPI on Per Capita GDP

	(1)	(2)
Per Capita Income (constant US$)	-0.001***	
	(4.41)	
Log Per Capita Income (constant US$)		10.50***
		(7.59)
Dummy for India (=1 if country is India)	10.25	4.09
	(0.94)	(0.54)
Constant	36.87***	122.8***
	(9.95)	(9.45)
Observations	17	17
Adjusted R^2	0.57	0.79

Note: t-statistics in parentheses; *, **, ***, indicate significance at the 10, 5, and 1 percent, respectively. Share of food is as of December 2023 (for 2011-12 for India), and the real per capita income is for 2023.

Appendix D: Comparative Data on IT

Table D1: Inflation Targeting Across Select Countries

Country	Year of Implementation	Measure	Target Type	Inflation Target (during time of implementation)	Current Inflation Target	Revisions since implementation	Target Horizon
Brazil	1999 (June)	CPI Headline	**1999-2024:** Target with tolerance band	**1999:** 8 +/- 2 %; **2000:** 6 +/- 2 %; **2001:** 4 +/- 2 %	**2024:** 3 +/- 1.5 %	**2002:** 3.5 +/- 2 %; **2003:** 8.5 +/- 2 %; **2004:** 5.5 +/- 2.5 %; **2005:** 4.5 +/- 2.5 %; **2006-2016:** 4.5 +/- 2 %**;** **2017-2018:** 4.5 % +/- 1.5%; **2019**: 4.25 % +/- 1/5%; **2020:** 4 % +/- 1.5%; **2021:** 3.75% +/- 1.5%; **2022:** 3.5% +/- 1.5%; **2023:** 3.25% +/- 1.5%; **2025:** 3% +/- 1.5%	One year inflation target and its tolerance interval are fixed 30 months in advance.
Mexico	2001	CPI Headline	**2001-2024**: Target with tolerance band	**2001-2024**: 3 +/- 1 %	**2024**: 3 +/- 1 %	No revisions	Permanent target
South Africa	2000 (Feb)	CPI Headline	**2000-2024** Range	**2000:** 3 % to 6 %	**2024:** 3 % to 6 %;	No revisions. **2017**: while maintaining the existing band, the MPC emphasized that it would like to see inflation close to the midpoint at 4.5 %	
Thailand	2000 (May)	CPI Headline	**2000-2014:** Band/Range **2015-2019:** Target with tolerance band **2019-2024:** Range	**2000:** 0 to 3.5 %	**2024:** 1 % - 3 %	**2009 to 2015:** 0.5 % - 3 % **2015 to 2019:** annual average headline inflation at **2.5 % +/- 1.5 %; Dec-2019 to now:** 1 % to 3 %	Medium Term
Indonesia	2005 (July)	CPI Headline	**2005-2024:** Target with tolerance band	**2005:** 6 +/- 1 %	**2024:** 2.5 +/- 1 %	**2006:** 8 % +/- 1 % (adj. from 5.5%);	No Target Horizon

						2007: 6 % +/- 1 % (adj. from 5 %); **2008:** 5 % **+/-** 1 %**; 2009:** 4.5 % +/- 1 %; **2010 to 2011:** 5 % +/- 1 %; **2012 to 2014:** 4.5 % +/- 1 %; **2015 to 2017:** 4 % +/- 1 %; **2018 to 2019:** 3.5 % +/- 1 %; **2020 to 2023:** 3 % +/- 1 %	
Philippines	2002 (Jan)	CPI Headline	**2002-2007:** Band/Range; **2008-2024:** Target with tolerance band	**2002 to 2003:** 4.5 to 5.5 %	**2022- 2024:** 3 +/- 1 %	**2004:** 4 to 5 %; **2005:** 5 to 6 %; **2006 to 2007:** 4 to 5 %; **2008:** 4 % +/- 1 %; **2009:** 3.5 % +/- 1 %; **2010:** 4.5 % +/- 1 %; **2011 to 2014:** 4 % +/- 1 % (reviewed in 2012); **2015 to now:** 3 % +/- 1 % (reviewed in 2017, 2019, 2021)	Revised yearly until 2006, and 2-year horizon (current year and one year ahead) after 2006
Peru	2002 (Jan)	CPI Headline	**2002 to 2013:** Target with tolerance band **2014 onwards:** Range	**2002 to 2006:** 2.5 % +/- 1 %	**2024:** 1 % and 3 %	**2007-2013:** 2 % +/- 1 %; **2014 to now:** 1 % to 3 %	No Target Horizon, the target range must be met on a continuous basis
Chile	2000	CPI Headline	**2000-2024** Target with tolerance band	**2000:** 3 % +/- 1 %	**2024:** 3 % +/- 1 %	No revisions	Two year period
Turkey	Implicitly since 2002; formal adoption in 2006 (Jan)	CPI Headline	**2006-2024** Target with tolerance band	**2006:** 5 % +/- 2 %	**2024:** 5 % +/- 2 %	**2007 to 2008:** 4 % +/- 2 %; **2009:** 7.5 % +/- 2 %; **2010:** 6.5 % +/- 2 %; **2011:** 5.5 % +/- 2 %; **2012 to now:** 5 % +/- 2 %	Three year period
Israel	Informally in 1992; formal adoption in 1997 (June)	CPI Headline	**1997 to 1998:** Range **1999**: Point Target **2000 onwards**: Range	**1997 to 1998:** 7% to 10 %	**2024:** 1 % to 3 %	**1999:** 4 %; **2000:** 3 % to 4 %; **2001:** 2.5 % to 3.5 %; **2002:** 2 % to 3 %; **2003 to now:** 1 % to 3 %	Evaluated continuously referring to the CPI inflation rate in the past 12 months
Russia	2015	CPI Headline	**2015-2024** Point Target	**2015**: 4 %	**2024:** 4 %	No revisions	No Target Horizon