



# Monetary policy in India: is something amiss?

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## Abstract

**Purpose** – Indian monetary policy performed reasonably well in the past, while both strategy and operational framework were evolving on par with domestic financial and monetary markets. The purpose of this paper is to document how this good track record came to an abrupt stop in recent years as inflation rose sharply and, more worryingly, expected inflation followed suit.

**Design/methodology/approach** – This paper has analytical, empirical and policy dimensions. Given the recent surge in inflation in India, as well as in inflation expectations, a discussion of the role of monetary policy is needed. This is presented by resorting to survey evidence on expectations as well as to indirect evidence inferred from the market reactions to macroeconomic news.

**Findings** – The authors documented the unhinging of inflation expectations in India in the aftermath of the financial crisis. The evidence gathered leads to the conclusion that both the monetary policy strategy and framework of the Reserve Bank of India would benefit from further evolution in the direction of a precisely defined and overarching objective (price stability), instead of the present multiplicity of goals, and of a well-defined operating target, enhancing the transparency, communication and signalling effect of policy moves. The authors suggest that embracing a flexible inflation targeting approach is a possible solution.

**Originality/value** – This is a highly topical issue that has attracted a great deal of attention in policy discussions, both in India and in the region. Very few papers combine the analytical and empirical considerations in this topic.

**Keywords** India, Asia, Monetary policy, Fiscal policy, Inflation targeting, Monetary policy rules

**Paper type** Research paper

## 1. Introduction

Until the end of 2007, by the standards of many emerging economies, India was successful in maintaining price stability. From 2000 to 2007 inflation, measured by the year-on-year change in the monthly wholesale price index (WPI), averaged 5 percent. This performance was not dissimilar from that of other countries in the Asian region and it compared well with the average inflation in developing countries. From 2008 prices started to rise sharply in India, largely driven by the run-up in commodity prices, a factor common to other emerging economies and the rest of the world as well. WPI inflation crossed 12 percent in some months, and remained above 10 percent for almost the entire 2010; the consumer price index (CPI) index growth rate hovered

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## JEL classification – E52, E58

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stubbornly above 10 percent. What singles India out, though, is not the inflationary spike itself, albeit persistent, but rather the speed and the extent by which it translated into an increase in short- and long-run expectations. The monetary policy tightening enforced by the Reserve Bank of India (RBI) over the period, admittedly very gradual, so far has had a very limited success in curbing inflation and reining in expectations, currently standing at 6 percent over the five years horizon[1].

There is a widespread consensus in the economic literature concerning the desirability of low and stable inflation and the costs of failing to achieve it (Fischer and Modigliani, 1978; Mishkin, 2011). This literature has identified characteristics of the institutional setup and of the monetary policy strategy that are conducive to improved outcomes in terms of price stability. In particular, it has underlined the crucial role of the expectations and their management has become a central tenet of monetary policy theory (Woodford, 2003). Reputation and institutional design play a fundamental role in avoiding time inconsistencies in the definition of the policy (Barro and Gordon, 1983) and in sheltering the central bank from short run pressures to stimulate the economy motivated by the political cycle. While the formal independence of the central bank is a prerequisite that can be granted by law, building up a reputation functioning as a commitment device requires a precise definition of the policy targets, a well-specified nominal anchor, a transparent policy process and a straightforward communication strategy. The central bank's operational framework and procedures are instrumental not only to the transmission of monetary policy but also to its communication to the public; in fact, by clearly identifying the relevant intermediate targets and by removing the ambiguities concerning which instruments, prices or aggregates should be watched they enhance the effectiveness of the policy signal (BIS, 2001).

The monetary policy in India underwent gradual changes concerning both its strategy and its implementation. Quite some progress has been done in the direction indicated by best practices and the economic theory[2]. Notwithstanding these changes, the RBI has been until recently unwilling to commit its monetary policy to a single objective and a clear definition of intermediate targets[3].

RBI monetary policy strategy is still guided by the multiple objectives of price stability, growth and financial stability, with relative weights depending upon evolving domestic and global macroeconomic and financial conditions. Price stability is an important but not the exclusive goal of monetary policy in India (Mohan, 2008).

In the eve of the financial crisis, some observers called into question this strategy, suggesting a gradual move towards a framework keener to the inflation targeting adopted in other emerging economies (Rajan, 2008)[4].

It has been argued that there is an in-built strong anti-inflation bias in India, as shown by the considerable political turmoil that inflation bouts historically stirred in the country. According to this view attempts at redefining the monetary policy strategy in the direction of an inflation targeting regime are unnecessary or even harmful.

The recent surge in inflation associated with an upward movement in inflation expectations called into question these arguments. Inflation expectations, especially those at longer horizons, reflect the credibility of monetary policy and are crucial for stabilizing prices. The ability to control expectations at policy relevant horizons is therefore the acid test for the monetary policy strategy of a central bank.

In this paper we first investigate to which extent inflation expectations, in particular at longer horizons, have become unhinged in India. We do so by observing

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survey-based forecasts of inflation at horizons up to ten years and by comparing their behaviour in a set of Asian and Latin American emerging countries. India stands out as an outlier since inflationary shocks (common to other countries) transmitted to a larger extent into expectations.

Also looking at *ex-post* real interest rates India emerges in the sample of countries considered having maintained negative rates for most of the recent period, notwithstanding mounting inflationary pressures. This evidence of insufficient tightening is reinforced by an analysis of the path of policy rates implied by standard Taylor rules.

Markets' expectations can be inferred from changes in the term structure of interest rates at dates close to monetary policy decisions. Ellingsen and Soderstrom (2001) showed how, assuming asymmetric information, movements in the yield curve can signal whether agents believe the central bank has private information on the macro economic outlook (parallel shifts) or, rather, it has changed the weights in the policy reaction function (a tilt in the curve). We collected data on the overnight interest swaps (OIS) the most liquid swap market in India. Based on OIS data we show that in May 2011, when the RBI moved the reference interest rates by 50 bps, the curve tilted, in contrast to previous episodes of gradual tightening (by 25 bps) that provoked only parallel shifts. On the one hand this can be interpreted as a good sign, whereby the markets finally caught on with the serious anti inflationary commitment of the RBI, on the other this also proves that up to then the RBI failed to convey the intended anti-inflationary message to the public, thus contributing to the dis-anchoring of expectation.

Further evidence of markets difficulty in anchoring their expectations to a clearly defined level of inflation in the medium term emerges from the systematic reactions of forward inflationary risk premia to macroeconomic news. When the monetary policy is credible the effect of these news, while visible in the very short run, should vanish at longer horizons (Gurkaynak *et al.*, 2010). We show that in India the term structure of interest rates (OIS) is affected also at longer horizons, even controlling for the shifts occurring at the short end of the curve.

We attribute our findings to the lack of a clear objective for the monetary policy and to the insistence on the part of the RBI to adapt its anti inflationary attitudes (weights in an ideal objective function) according to the prevailing economic scenario. Therefore, despite the progress that has been made, a further change in emphasis is called for in the RBI strategy, recognizing that a commitment to price stability as a priority (independent from the evolution of the economy) is the way to ensure agents will find a credible nominal anchor and to minimize the time inconsistency problem.

The paper is organized as follows. Section 2 describes the salient features of the evolution of the monetary policy strategy in India in the last two decades. Section 3.1 focuses on the reaction of inflation expectations in the aftermath of the global economic crisis. We conclude that at least three factors might still be present in the monetary policy implementation and strategy that can help explaining the disanchoring of inflationary expectations in the recent inflation burst. Section 3.2 investigates the first one: a too timid reaction to inflationary shocks. First, we compare the call money rate path with the path this rate would have followed under a Taylor rule with the parameters originally hypothesized by Taylor, next we fit Taylor rules on Indian data to check to what extent the policy rates reacted too mildly to the inflation upsurge. In Section 3.3 we investigate a further possible factor that can hinder the effectiveness of monetary

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policy: the uncertain or difficult interpretation of monetary policy moves by markets. This can be (tentatively) explored by looking at the reaction of the Indian yield curve to monetary announcements in daily data. In Section 4 we argue that a further step toward a flexible inflation targeting regime might be necessary to shelter India from inflationary risks. In Section 5 we conclude summarizing our findings.

## 2. The RBI monetary policy strategy and framework

The monetary policy strategy as well as the operational framework followed by the RBI underwent significant changes over the last two decades, mirroring in part the process of general economic liberalizations initiated in the early 1990s. This evolution is direct proof of the constant endeavour of the RBI to tune up its instruments and actions with a rapidly changing economic environment. This evolution is described by the RBI not as a sequence of abrupt modifications but as a gradual adjustment to changing macroeconomic and institutional conditions, always within the boundaries of an ample and complex mandate:

The Preamble to the Reserve Bank of India Act, 1934 (the Act) under which it was constituted, specifies its objective as to regulate the issue of Bank notes and the keeping of reserves with a view to securing monetary stability in India and generally to operate the currency and credit system of the country to its advantage. The objectives outlined in the Preamble hold good even after 75 years [...] the Reserve Bank role and priorities have, in the span of 75 years, changed in tandem with changing national priorities and global developments (RBI, 2010b).

According to this reading, the RBI objectives remained those stated in the Act, i.e. ensuring price stability and adequate flows of credit to the economy, with a change in emphasis as the external conditions suggested. These goals were recently enriched with that of maintaining financial stability[5].

The overall goal of promoting growth in a context of price stability is not peculiar to the RBI: similar general provisions can be found in the statute of the Fed and in the Treaty for what concerns the ECB[6]. Broadly speaking, what still distinguishes the RBI strategy from that of the central banks of other emerging economies and of the advanced countries is the insistence on a quite wide range of objectives, without a formal statement concerning their ordering. What might constitute a reasonable explanation for this apparent lack of focus in the policy is the fact that the RBI has operated within the context of a rapidly changing emerging economy, with relatively underdeveloped financial markets. This has hindered the usual transmission channels of monetary policy. Furthermore, until the second half of the 1990s, the RBI was required to accommodate the fiscal deficit via the purchase of *ad hoc* treasury bills and this fact effectively limited the independence of the RBI and its ability to control the monetary base. Both these factors help to explain the resort to a variety of quantitative control measures that were adopted to maintain price stability and funnel credit to specific economic sectors.

These obstacles have been progressively removed or reduced in importance. Financial and money markets developed, favoured by a host of specific measures. Fiscal dominance was progressively eased with the phasing out of the *ad hoc* t-bills since 1997 and the Fiscal Responsibility and Budget Management Act (2004) which prohibited financing government debt in the primary market.

A parallel evolution of the operating framework of the RBI followed. This evolution can be characterized as a move from direct control of money and credit through

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administrative measures to an ever greater reliance on indirect controls operated through market instruments (repo and reverse repo operations) and prices (money market interest rates).

For the whole period spanning the independence of India up to the early 1990s monetary policy was subject to the needs of a developing country with financial markets still operating under many constraints. Monetary policy targeted credit expansion (either directly or considering the incremental credit-to-deposit ratio). Fiscal dominance was in place and administrative measures were enforced both to control the amount of credit available and to channel it to preferred sectors. The bank rate, the interest at which banks could borrow funds from the RBI, was used quite actively in this period. Among its policy instruments, the RBI also started to use the cash reserve ratio, which establishes the percentage of cash that banks are required to keep with the Reserve Bank as a proportion of their net demand and time liabilities (NDTL), and the statutory liquidity ratio, defined as the share of NDTL that banks must invest in securities issued by the government (this effectively raised additional resources for the central government)[7].

From 1985/1986 the RBI conducted monetary policy through an intermediate target for credit or broad money growth. The growth of M3 constituted the nominal anchor for policy, while reserve money was used as an operating target. From 1990/1991, the target became more forward looking being based on projections for real GDP growth, inflation, and velocity. However, as pointed out by Callen and Chang (1999), the success in achieving the announced targets was limited, with broad money growth being in line with the target in only four years between 1985/1986 and 1997/1998. Since 1994, with the liberalization of the exchange rate, the external value of the rupee became a further element in both the operations (via foreign market interventions) and the strategy of the RBI.

From 1998 the RBI moved away from the broad money target toward a “multiple indicators” approach (although it still announced a projection for M3 growth). Over reliance on a single indicator like M3 was deemed inappropriate given the instability of the money demand function, associated with the process of financial deregulation as well as the increased relevance of capital flows in the creation of liquidity.

According to Mohan (2008), compared with other emerging economies, in the late 1990s monetary policy in India took a “contrarian” view, by not favouring:

[...] the adoption of inflation targeting, while keeping the attainment of low inflation as a central objective of monetary policy, along with that of high and sustained growth that is so important for a developing economy. Apart from the legitimate concern regarding growth as a key objective, there are other factors that suggest that inflation targeting may not be appropriate for India.

These factors were the above mentioned notion of high inflation as socially unacceptable, the lack of a well functioning monetary transmission mechanism, the prevalence of supply shocks driving prices, and the lack of a representative price index.

By the end of the 1990s the RBI liquidity management operations had moved effectively from direct to indirect instruments[8]. In April 1999 an interim liquidity adjustment facility (ILAF) was introduced, a corridor for the call money rate was created where the bank rate, used as a marginal lending facility, acted as a ceiling and the reverse repo rate, fixed in auctions used to withdraw excess liquidity, as a floor. In the following period a full-fledged LAF was gradually put in place. The repo rate, used in refinancing operations acts as the upper bound of the corridor, the reverse repo as the floor.

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This latter move brought the operating framework of the RBI very close to that of the Fed or the ECB. As discussed by Patra and Kapur (2010) the predominant reliance on the LAF for signalling the policy stance by modulating bank reserves meant that the interest rate is becoming the “effective target” for monetary policy.

The recently advanced proposal of the *Working Group on Operating Procedure of Monetary Policy* (RBI, 2011a), if accepted, would mark another step in the same direction. The new LAF, under this proposal, would closely resemble the sketch version of the operating procedures of the Fed or the ECB. One operating target, the interbank rate (like the FFR or the Eonia), a corridor of fixed width between two standing facilities for liquidity absorption (floor) or injection (ceiling), and fixed price periodic (daily or weekly) auctions to signal the policy stance. The repo rate would be the single policy rate at the periodic liquidity injection auction to signal the policy stance, the bank rate and the reverse repo would act respectively as the ceiling and the floor of the corridor.

While the operating procedures are gradually moving in the direction of selecting just one operating target, the monetary policy strategy is still focused on multiple, potentially conflicting ends and a plethora of non market instruments and administrative controls are still widely used.

As the necessity to adopt an eclectic approach has become less compelling with the development of financial markets and the growing independence of the RBI, one might wonder if, at present, the RBI should make a further step and abandon the pretense of pursuing multiple and equally important objectives. What would be the advantages? Clarity, the first, as (Blanchard, 2006) emphasized “[. . .]inflation targeting, Taylor rules, are gigantic improvements over the morass of conflicting monetary targets, intermediate targets, and instruments that passed for monetary policy theory twenty years ago”, without necessarily endorsing a particular, narrowly defined strategy, there is much to be gained in clarifying priorities and order objectives. Greater accountability is the second, having a clearly defined primary target (like a quantitative version of price stability) would make it immediately clear whether the Central Bank is operating successfully or not. Finally, the communication strategy would be greatly simplified by having a single policy rate and a clearly stated primary objective.

The next sections will explore the extent to which the current setup may be failing to convey credible and convincing signals to the markets.

### **3. Anchoring expectations**

#### *3.1 Surveys of inflation forecasts*

Measures of inflation expectations are not readily available and need to be either estimated or directly elicited from private agents using surveys. In many developed countries, trading of inflation indexed government bonds allows policy makers to monitor the so-called break-even inflation rate, extracted from financial markets data, as the difference between the redemption yield of an ordinary government bond and the one of inflation-indexed bonds with corresponding maturity[9]. Surveys, by asking people directly their expectations, are the most common source of information for inflation expectations. However, depending on the type of respondents they can present several problems. In particular, while those of professional forecasters are routinely used by Central Banks, gauging inflation expectations from households can be difficult, as the respondents typically form their judgment on a narrow basket of goods and have only a vague idea of the horizon over which to compute the growth rate[10].

In this section, we look at two measures of inflation expectations in India: consensus forecasts (CF) and the survey of professional forecasters (SPF) conducted by the RBI since early 2008. Let us consider the CF first: Table I reports the expectations for two-year ahead inflation for both WPI and CPI-IW, surveyed in April of each year, for example for April 2010 we report expected inflation in 2011-2012[11]. As shown in Table I, between April 2009 and April 2011 the entire distribution of the respondents inflations expectations shifted upwards and the Consensus mean rose by almost 2 percent points for both the CPI (from 5.2 to 7.0 percent) and the WPI (from 4.7 to 6.3 percent).

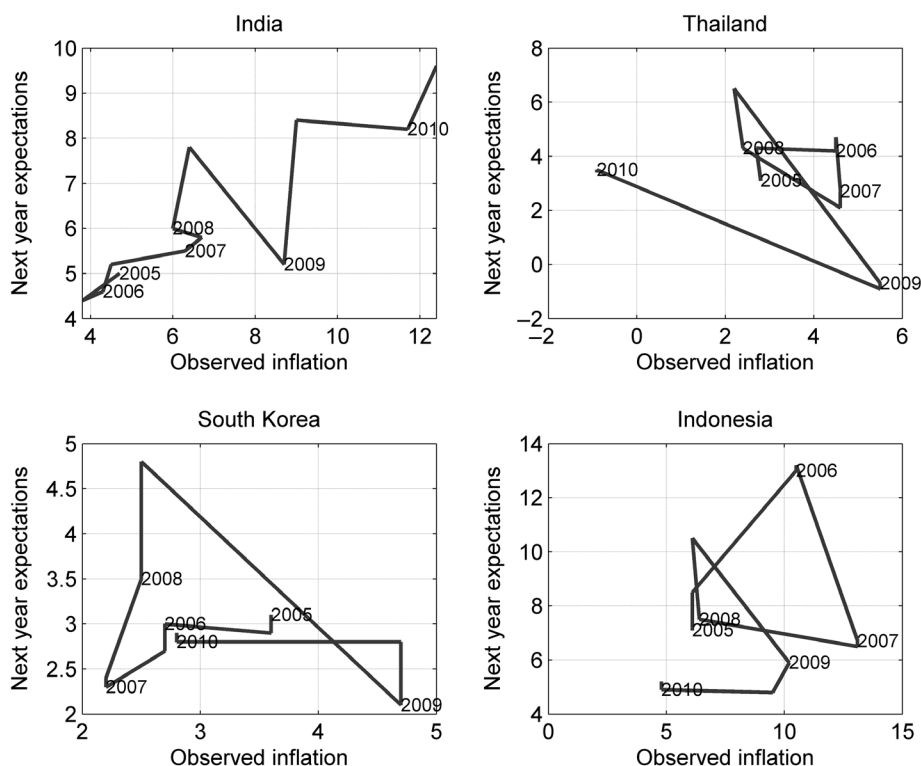
To assess to what extent the increase in inflation expectations has been peculiar to India rather than common to other countries in the region, we first look at the relation between current and expected inflation, focusing, to set the stage, on the two-years ahead forecasts we have just discussed. In Figure 1, we plot the expected inflation rate as a function of the most recent observed annual rate of inflation (once again we consider data collected in April of each year  $t$  by CF, concerning the expectations for year  $t + 2$ ).

While expected inflation displays a clear positive correlation with current inflation in the case of India, such a pattern does not emerge for the other countries considered in the sample (in their case the correlation is actually negative).

One may argue that two-year ahead expectations are too closely linked to current developments, especially if the degree of inflation persistence is high. Furthermore, given the long and variable lags with which the real economy responds to policy actions, it seems more appropriate to assess the credibility of the monetary policy over longer horizons. To address this concern, we exploit the fact that twice a year (in April and October) CF collects expectations up to a ten-year horizon[12]. We would expect long-term expectations to be unaffected by current developments and instead to be rather closely linked to the credibility of the monetary policy strategy. In general, long-term expectations may be considered anchored if they are found to oscillate modestly around some “norm”, be it an explicit target or a comfort level defined by the Central Bank communication. Several authors noted (Erceg and Levin, 2003; Orphanides and Williams, 2004) that as the degree of uncertainty faced by the public regarding the long-term inflation objective of the central bank increases, the degree of

Survey in	Reference year	Mean	CPI-IW		Mean	WPI	
			High	Low		High	Low
April 2000	2001/2002	6.2	8.0	4.4	6.0	8.0	4.8
April 2001	2002/2003	4.9	5.9	3.7	5.5	7.0	4.2
April 2002	2003/2004	4.6	6.5	2.5	4.1	5.5	2.0
April 2003	2004/2005	5.0	6.2	3.0	4.7	6.0	3.6
April 2004	2005/2006	4.6	5.5	3.5	4.9	6.5	3.7
April 2005	2006/2007	5.0	5.5	4.5	5.6	6.0	5.0
April 2006	2007/2008	4.6	5.5	4.2	5.1	5.6	4.8
April 2007	2008/2009	5.4	8.5	4.3	4.9	6.1	4.0
April 2008	2009/2010	5.4	6.9	4.5	4.6	6.0	3.5
April 2009	2010/2011	5.2	6.6	3.9	4.7	6.0	2.8
April 2010	2011/2012	6.1	8.0	4.5	5.6	7.3	4.0
April 2011	2012/2013	7.0	8.9	5.0	6.3	7.0	5.0

**Table I.**  
Consensus forecasts:  
current and next year  
expectations



**Figure 1.**  
Current and expected  
short-run inflation in  
selected Asian economies

persistence in inflation follows suit, so that shocks to current inflation lead to sizable effects on long-term expectations.

Figure 2 shows the six-year ahead expected inflation rate as a function of the most recent observed annual rate of inflation.

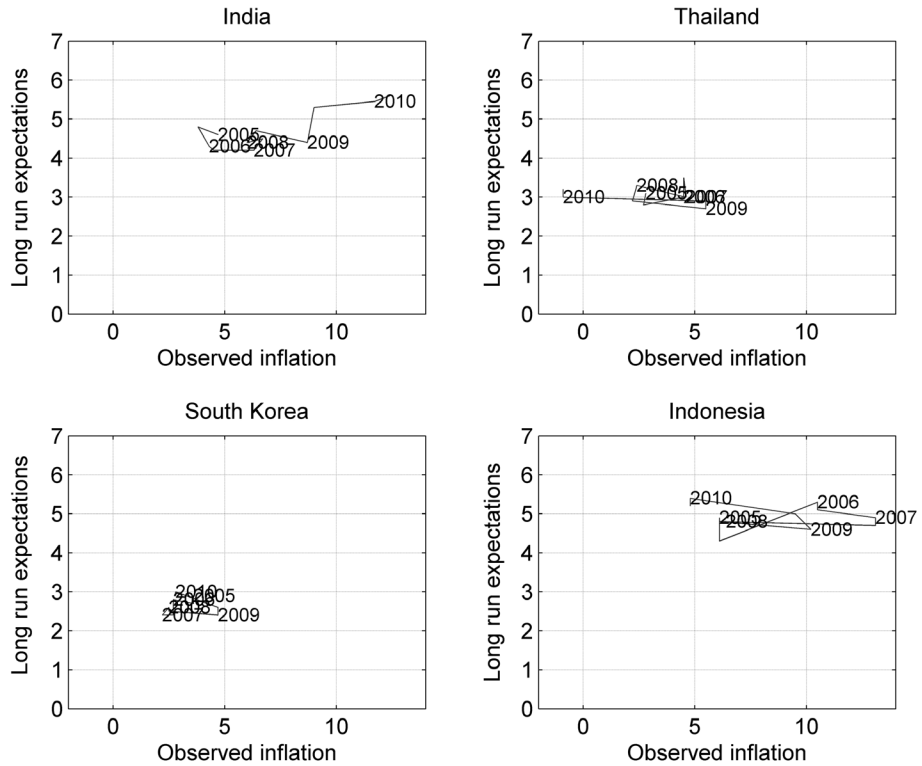
While for the other countries there is hardly any visible pattern, with past inflation having little effect on expected future inflation (all dots lie on a horizontal line), in India (top-left panel) the last three years of higher inflation are clearly shown to have triggered an increase in long-run expectations.

To reinforce the graphical evidence, we regress the change in expected inflation for country  $i$  at horizon  $h$ ,  $(\pi_{i,t+1}^{e,t+h+1} - \pi_{i,t}^{e,t+h})$ , recorded in comparing two successive surveys (say October 2009 and October 2010) on the change in current inflation  $(\Delta(\pi_{i,t+1}) = \pi_{i,t+1} - \pi_{i,t})$ , occurred in the same period[13]. We fit this relation on the panel of emerging Asian and Latin American countries for which CF surveys are also available at longer horizons:

$$\left( \pi_{i,t+1}^{e,t+h+1} - \pi_{i,t}^{e,t+h} \right) = \alpha + \beta \Delta(\pi_{i,t+1}) + \gamma \Delta(\pi_{i,t+1}) D_{India} + u_t \quad (1)$$

To check whether expectations in India are more responsive to price shocks than elsewhere in Asia and Latin America, the change in observed inflation is interacted with a dummy variable for India's observations,  $D_{India}$ . Table II shows that the dummy





**Figure 2.**  
Current and expected  
long-run inflation in  
selected Asian economies

variable for India is positive and significant at all horizons. At horizons up to two years, an increase in current inflation (with respect to previous year) is found to affect negatively inflation expectations in most countries except for India. This suggests that while inflation expectations are mean reverting in most emerging countries (i.e. a positive shock in current inflation is expected to be offset in the next couple of years) they follow instead an adaptive process in India. At longer horizons, movements in current inflation do not trigger significant changes in expectations in other countries, while they still appear to positively affect those in India.

To ensure that our findings are not driven by the particular sample of private institutions surveyed by CF, we look at the quarterly SPF run by the RBI, which also draws expectations from private as well as public institutions for the five and ten years horizons[14].

The same anecdotal evidence found for CF is detectable in the responses of the SPF. We find that, from the second quarter of 2010, SPF inflation expectations for both CPI-IW and WPI have crept up, in an unprecedented manner (Figures 3 and 4) rising by 1 percent point, an increase similar to that recorded by CF.

The RBI recently published for the first time the results of its household survey of inflationary expectation, where consumers are asked about the expected inflation rate, up to one year ahead. The same pick up in expectations is evident from this source, too[15].

	Years ahead						
	1	2	3	4	5	6	7-11
$\beta$	-0.570 (-5.24)**	-0.157 (-3.49)**	-0.023 (-0.99)	-0.024 (-0.94)	-0.023 (-1.09)	-0.009 (-0.54)	0.001 (0.05)
$\gamma$	1.004 (4.10)**	0.259 (2.47)**	0.214 (5.50)**	0.163 (2.51)**	0.190 (4.02)**	0.205 (5.04)**	0.119 (2.37)**
$R^2$	0.282	0.186	0.078	0.057	0.088	0.095	0.027
No. of obs.	60	60	57	57	57	57	57

**Notes:** Significant at \*10 and \*\*5 percent; for the Philippines, inflation expectations at horizons beyond two years are available only from 2009; see the Appendix for the list of countries considered; robust *t*-statistics in parentheses; all regressions also include a constant term, omitted here

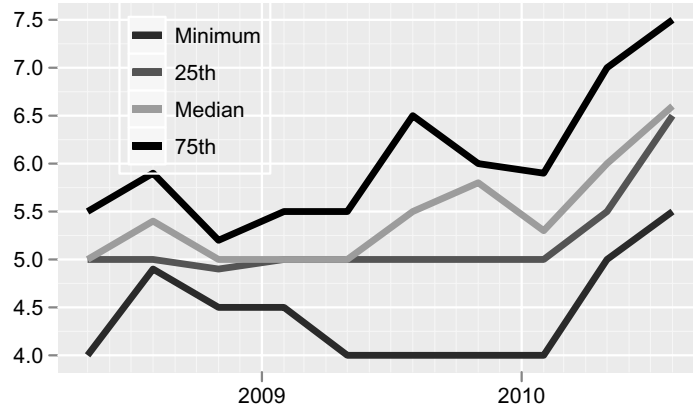
**Sources:** Consensus forecasts for Asia Pacific and Latin America; October surveys from 2007 to 2010 for 15 countries

**Table II.**  
The response of inflation expectations to an observed inflation shock

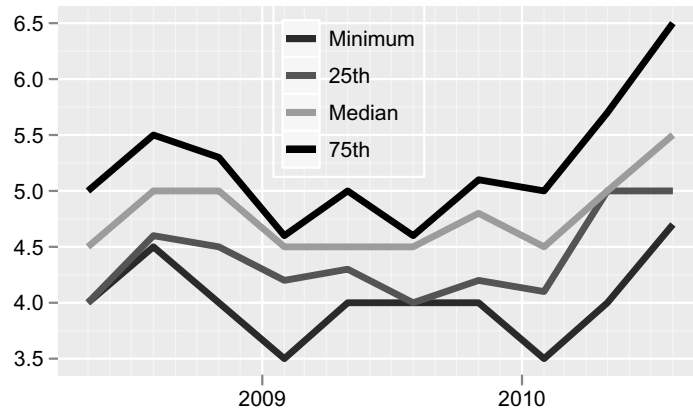
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**Figure 3.**  
SPF from RBI: ten years  
ahead CPI inflation



**Figure 4.**  
SPF from RBI: ten years  
ahead WPI inflation



In combination with the previous evidence on longer term expectations from professional forecasters, it reinforces the case for a serious lack of anchoring of the expectations in India.

This is not just our concern, the RBI has recognized that the increase occurred notwithstanding the strong emphasis placed on anchoring expectations in recent official communications:

[...] unwinding of loose monetary policy that started in October 2009 should continue *until inflation expectations are firmly anchored* and inflation is brought down (RBI, 2010a).

### 3.2 The Taylor rule

Why does India seem to have less control over inflation expectations when compared with other emerging countries that adopted a different monetary policy regime? As we argued above, the RBI pursues a complex strategy, addressing multiple objectives and this in turn might create two problems:

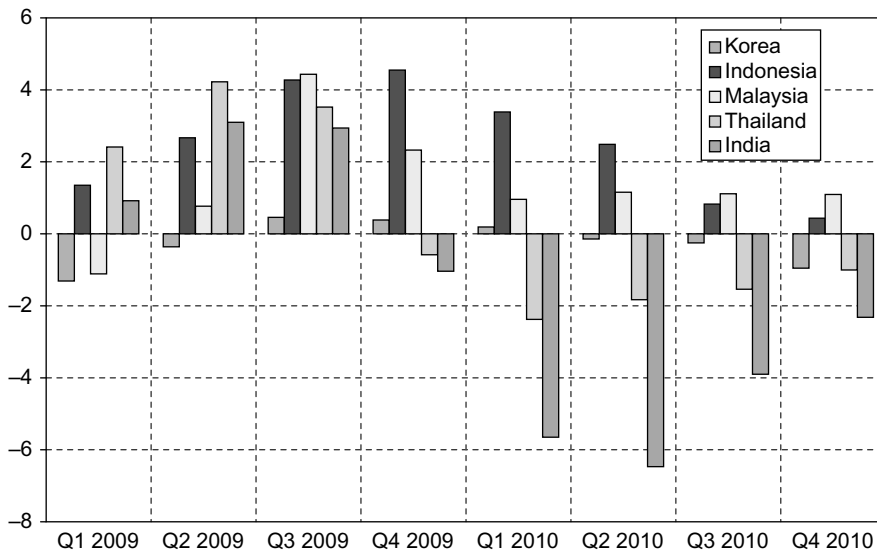
- (1) The reaction to inflationary shocks might be muffled due to other concerns (growth, exchange rates, capital inflows).
- (2) The interpretation of policy moves might be difficult for economic agents and the communication of the stance by the RBI might get fairly complex, in view of the various targets and instruments involved.

In this section we investigate the first point by comparing the level of the reference short-term interest rates set by the RBI with what would be obtained applying a simple calibrated Taylor rule. Rates set by the RBI facing rising inflation that are systematically below those implied by the calibrated Taylor rule can be interpreted as evidence of an insufficient tightening with respect to a standard benchmark. To motivate this analysis one can look at short-term real interest rates (Figure 5).

Quite at odds with other Asian emerging countries, during the most recent period, as the economy was rapidly recovering and the rate of inflation soaring pushed by rising food and energy prices, not only the real rate in India did not increase, it became and remained negative.

A direct way, even though an admittedly rough one, to gauge the monetary stance is to compare the actual real rate path with what would be suggested by applying a calibrated Taylor rule to Indian data (here we use the parameter values originally specified in Taylor (1993))[16]. Given the target nominal interest rate  $i_t^*$ , where  $i_t^* = r_t^* + \pi_t^*$  i.e. the sum of the equilibrium real interest rate and the inflation rate, the Taylor rule describes by how much the nominal interest rate should be moved in response to departures of actual inflation and real output from their targets or equilibrium values. The short-term nominal policy rate is described by the following equation:

$$i_t = \rho i_{t-1} + (1 - \rho) \left[ i_t^* + \alpha_\pi (\pi_t - \pi^*) + \alpha_y (y_t - y^*) \right] \quad (2)$$



**Figure 5.**  
Short-term real rates (*ex-post*)

and upon rearranging the terms:

$$i_t = (1 - \rho)(r_t^* - \alpha_\pi \pi_t^*) + \rho i_{t-1} + (1 - \rho)(1 + \alpha_\pi)\pi_t + (1 - \rho)\alpha_y(y_t - y^*) \quad (3)$$

$$i_t = c + \rho i_{t-1} + (1 - \rho)(1 + \alpha_\pi)\pi_t + (1 - \rho)\alpha_y ygap_t$$

where  $\rho$  is a parameter allowing for inertial behaviour in setting optimal interest rates,  $\pi_t$  is the current inflation rate (or the expected in forward looking formulations) and  $ygap_t = (y_t - y^*)$  the output gap[17].

Using the following calibration  $\alpha_\pi = \alpha_y = 0.5$  and  $\rho = 0.75$  (Taylor, 1993; IMF, 2010) and collecting terms we obtain:

$$i_t = c + 0.75i_{t-1} + 1.5\pi_t + 0.5ygap_t \quad (4)$$

where  $c = 0.25(r_t^* - 0.5\pi_t^*)$ .

The current inflation rate  $\pi_t$  is measured by the 12-month change in WPI index while the output gap is measured as deviations of current output from trend estimated via an high pass Christiano-Fitzgerald filter[18]. The constant  $c$  is computed as the sum of the long run real rate and the equilibrium inflation rate (respectively set to 6 and 5 percent). The interest rate we consider is the (annualized) return on three-months T-bills, rather than the more natural choice of the money market call rate in view of the outliers present in the latter series and of the close relation between the two rates: this correlation is 0.68 over the period considered in the regressions (2004-2011), while it rises to 0.88 in 2008-2011[19]. We then compare the “fitted” value of the nominal interest rate obtained from equation (4), to the actual interest rate on three-months T-bills (Figure 6).

Over the last two years and, in particular, since the beginning of the current tightening phase by the RBI in early 2010, the actual rate of interest remained below the path implied by the calibrated Taylor rule, by, on average, more than 100 basis points. Experimenting with different hypothesis concerning the target inflation rate and long run growth (i.e. the value of the constant) does not change the results.

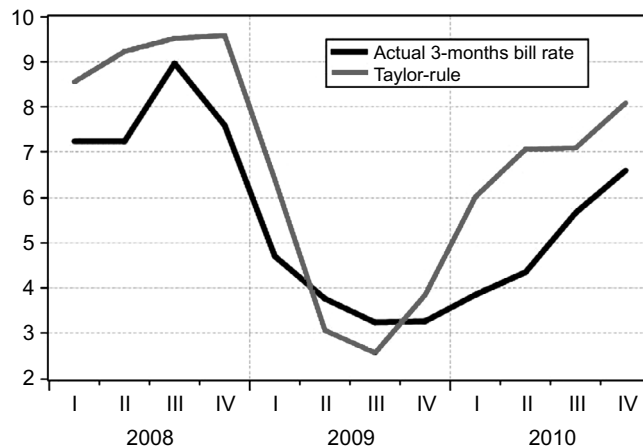


Figure 6.  
Actual and Taylor rule  
implied interest rates

Similar conclusions are reached also by other authors. In IMF (2010) an exercise similar to ours is performed and the same evidence of low policy rates compared to those implied by a Taylor rule is reached. Also financial markets seem to be aware of this feature of the RBI policy, as can be deduced – for example – by a recent Goldman Sachs report that states that “a Taylor-type rule also suggests the repo rate should be at 8 percent, *even with a higher inflation objective of 6 percent by the RBI*”[20].

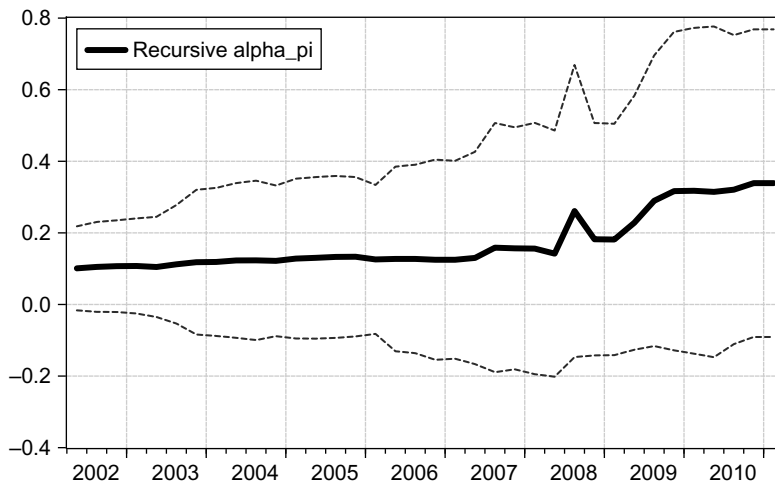
Resorting to a calibrated Taylor rule has the advantage of simplicity and of avoiding the quagmire of estimating a Taylor rule, but it is at best only suggestive of possible problems with the monetary policy stance in India. There exist a vast and growing literature that estimates Taylor rules for India and other emerging countries to gauge the responsiveness of their monetary policy to price shocks.

Using annual data on the 1950-2009 sample period (Singh, 2010) studies Indian monetary policy trying various specifications of Taylor rules and different estimation techniques (OLS, TSLS and GMM). He finds a stronger reaction to output gap than to deviations of inflation from target on the whole sample. However, this result is reversed when only data for the more recent period (from 1988 to 2009) are used. Over this restricted sample the Taylor principle (a more than proportional reaction to monetary policy to inflation deviations) is re-established. Banerjee and Bhattacharya (2008) find that the output gap dominates inflation in determining movements in the policy rates. The IMF (2010) and previous RBI’s studies also confirm this evidence.

Following this strand of the literature, we fit a Taylor rule on Indian quarterly data. The sample of data used is quarterly observations from 1996-Q1 to 2010-Q4. The sample is constrained largely by the relatively short period in which the more market-oriented operational procedures have been in place:

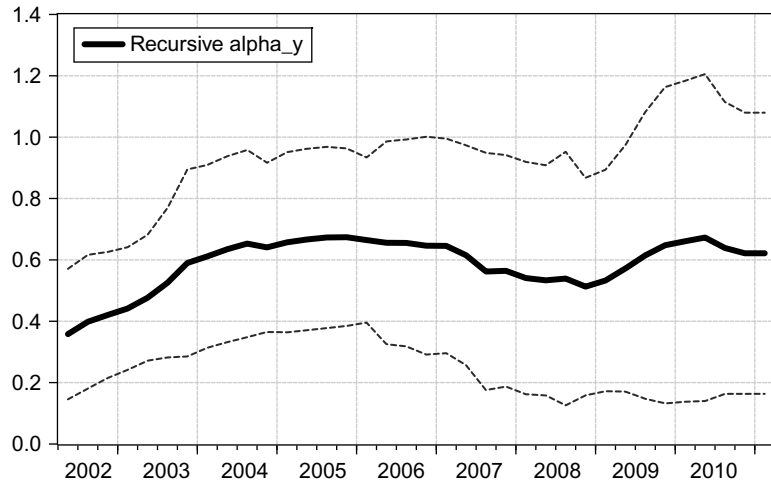
$$i_t = c + \rho i_{t-1} + (1 - \rho)(\alpha_\pi \pi_t + \alpha_y ygap_t) + \epsilon_t \quad (5)$$

Figures 7 and 8 display the recursive estimates of the parameters of interest  $\alpha_{pi}$  and  $\alpha_y$  in equation (5).



**Figure 7.**  
Recursive estimate of  $\alpha_\pi$   
( $\pm 2 \times$  s.e. confidence  
bands)

**Figure 8.**  
Recursive estimate of  $\alpha_y$   
( $\pm 2 \times$  s.e. confidence  
bands)



What is striking is how muted the response of short-term interest rates is to deviations from the inflation norm (here set to 5 percent), with  $\alpha_\pi$  below 0.2 and hardly significant up to the most recent period. In contrast, the responses to deviations from the output gap are larger, on average 0.6, consistently with previous findings by Inoue and Hamori (2009). Interestingly, as more recent observations are added,  $\alpha_\pi$  increases, and from the end of 2008 it grows steadily almost turning statistically significant.

Following Cavoli and Rajan (2008) we also estimate a Taylor rule with expected rather than actual inflation, i.e. we study the reaction of the policy rates to inflation expected at time  $t + h$  conditional on information available at time  $t$ [21].

From April of year  $t$  to March of year  $t + 1$  we consider annual inflation forecast collected (monthly) by CF for fiscal year  $t + 1$ , calling them two-year ahead forecasts ( $E_t(\pi_{t+2})$ ), while we refer to data collected for the same fiscal year over the successive 12 months as one-year ahead forecasts ( $E_{t+1}(\pi_{t+2})$ )[22]. Based on these data, we fit the following equation over the period May 2003-April 2011, for which we can retrieve monthly CF series of inflation:

$$i_t = c + \rho i_{t-1} + (1 - \rho)(\alpha_\pi E_t(\pi_{t+1}) + \alpha_y ygap_t) + e_t \quad (6)$$

Estimates computed on alternative sample periods all confirm that even when we substitute expected inflation for the actual one, the monetary policy reaction to inflation is not significant. This seems to be consistent with some of the evidence found in Cavoli and Rajan (2008), which albeit related to an earlier sample period (1993-2007), fails to find evidence of a significant reaction to inflation forecasts[23].

### 3.3 The interest rates term structure

In this section, we further investigate the apparent RBI's loss of control over inflationary expectations by taking a closer look directly at the markets' reaction to policy and macro news. At the beginning of Section 3.2 we argued that lack of a clear commitment to price stability (i.e. giving priority to this objective over all others) and a fuzzy definition of what the RBI thinks is a comfort level for inflation might confuse markets and lead them to misinterpret policy moves. In fact, while the RBI has recently

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made clear that its paramount concern is keeping expectations under control, it still lacks some clarity as to the quantitative target:

Our commitment in this regard is clearly defined in our own policy documents where we say our objective is to ‘contain *perception of inflation* in the range of 4.0 to 4.5 percent in line with the medium-term objective of 3.0 percent inflation consistent with India’s broader integration with the global economy (Subbarao, 2010b).

The gradualist approach to policy tightening might also have induced markets to think that, at least for some time, a higher than previously envisaged inflation would have been tolerated by the RBI.

To shed some light on these issues, we study markets’ responses as synthesized in the yield curve. The term structure of interest rates plays an important role in the transmission of the monetary policy and it is closely watched by market analysts and by the central banks alike (in the latter case quite often to extrapolate private agents expectations concerning future rates). While movements in the yield curve might depend on a variety of factors and they are not always consistent with a definite pattern, a model by Ellingsen and Soderstrom (2001) provides a plausible interpretation of the shifts in the term structure occurring in days around policy decisions. The central assumption of their model is that there is asymmetric information between private agents and the central bank. In fact, if agents and the central bank share the same information, there should not be any movement at all in the term structure after a policy decision, since market participants are forward looking and they formulate expectations concerning the policy, that, with symmetric information, is fully anticipated. When instead the central bank has private information concerning the economic situation (i.e. it observes shocks that are not seen by markets) the policy decision might surprise agents, in which case the model shows that the yields curve after the policy move will shift (upward or downward depending on the direction of the surprise). It can be the case, though, that agents observe the same shocks as the central bank but are not sure about its objective function, so that they might learn something about the weights in the objective function from the policy moves. In this case if the move “surprises” the agents the yield curve will not just shift, but tilt. To have an intuition of the reason why this will happen one can think of the case in which the move convinces the agents that the central bank is more hawkish than previously thought: the markets will then revise their expectations, now anticipating higher rates in the short term and hence lower inflation and lower rates in the longer term. The model proposed can produce both shifts and rotation in the yield curve, reconciling theory with observations and providing a straightforward interpretation in both instances. Ellingsen and Soderstrom (2001) use the insight derived from the model to interpret movements in the US term structure data in the aftermath of policy moves. Claus and Dungey (2006) run a similar exercise on Australian data. They too find a considerable consistency between the theory and empirical results using a narrative identification of episodes where markets rationalized their surprise by attributing it to macroeconomic developments, or, alternatively, to a change in policy parameters[24].

We applied the same ideas in the Indian case, collecting daily data on Indian OIS. OIS represent the most liquid segment in the interest rate swaps market in India, with a large participation of foreign and private banks; the floating benchmark is the overnight rate (the MIBOR, Mumbai inter-bank offered rate) and OIS are quoted at different maturities up to ten years. It is interesting to compare two episodes. The first



(Figure 9) illustrates the markets' reaction to a 25 bps move in the spring of 2010, during the phase of gradual tightening, as a benchmark we took the yield curve a week before the policy move.

The second episode is the recent increase of 50 bps in reference rates (Figure 10) when it finally became clear that previous moves were not sufficient to prevent inflationary pressures from leaking into longer term expectations.

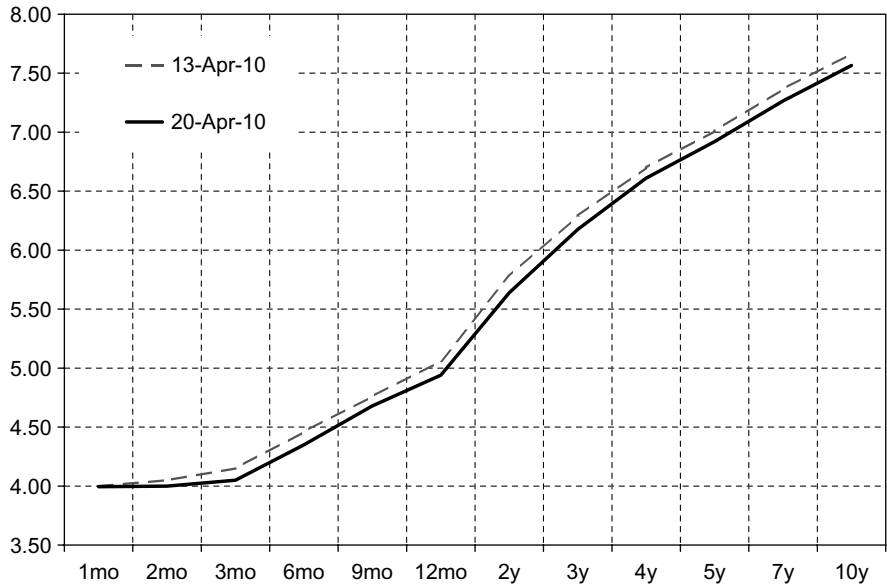


Figure 9.  
OIS yield curve  
movements: 26 April 2010

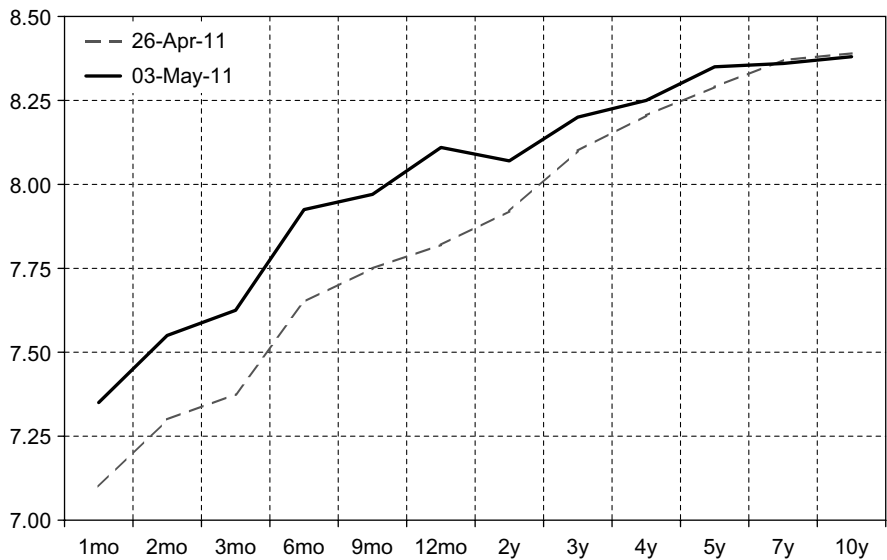


Figure 10.  
OIS yield curve  
movements: 3 May 2011

What can be learned from this comparison? We can tentatively conclude that 25 bps moves were basically anticipated by the markets, as, presumably, agents were led by the RBI communication to expect gradual and – arguably – “too timid” a reaction to rising prices[25]. Reactions that, as we saw, were not sufficient to prevent expected inflation from rising. The last policy move, on the other hand, was interpreted by the agents as signaling a strong change in the stance leading them to revise their opinions concerning the anti-inflationary bias of the RBI. The latter move might well still prove insufficient to rein in expectation but surely marked a difference with respect to the recent past[26].

There is also an alternative way to analyze the term structure of interest rates to extract information about the anchoring of expectations. As argued by Gurkaynak *et al.* (2006, 2007) a credible monetary policy will result in rather stable inflation expectations in face of macroeconomic and policy news as these news will not perturb the (perceptions of) long-run stability. They put to test this idea considering a range of cases – Canada, Chile, the UK and the USA – exploiting the fact that in these economies governments issue inflation indexed bonds at various maturities. This fact allows them to compute the “expected inflation premium” at various horizons as the difference between the return on the nominal and real forward rates at that same maturity. Under the null hypothesis of a perfectly credible policy a regression of the changes in the premia on macro and policy news, should show no impact at least for sufficiently far-ahead horizons. On the contrary, if inflation expectations are not anchored, then the news will shift also far-ahead premia as agents’ opinions on the distribution of long-run inflation outcomes change.

The Indian Government does not issue indexed bonds, hence the analysis must necessarily be confined to nominal rates. This is admittedly a serious shortcoming, as nominal yields incorporate premia for different types of risk and without a real counterpart it is not possible to isolate the inflation risk premium. Anyhow, the use of forward rates permits us to get rid of the direct influence of short-term developments on the yields, thus isolating premia at a particular horizon. Furthermore using high frequency data (daily) and studying the reaction of forward rates in the aftermath of important economic or monetary policy news, should minimize the effects of liquidity and other technical factors on forward rates movements. In this case a predominant role is played instead by changes in the inflation risk premium that depend more directly from these news.

Based on the OIS rates at different maturities, we computed  $h$ -years-ahead one-year forward rate (i.e. the rate of return between year  $t + h$  and year  $t + h + 1$ ) according to the following definition:

$$f_t^{(h)} = \frac{(1 + i_t^{(h+1)})^{h+1}}{(1 + i_t^{(h)})^h} - 1 \quad (7)$$

where  $i_t^{(h)}$  is the rate of return on a OIS with  $h$ -year maturity.

If long-term forward rates respond to macroeconomic and monetary policy news then, under our postulated interpretation, this means that compensation for inflation risk responds systematically to them, implying that expectations are not well anchored. To verify this hypothesis, we run a series of regressions where the dependent variable is the change in the  $h$ -years ahead forward rate  $\Delta f_t^{(h)}$  and the regressors are macroeconomic and policy news (Gurkaynak *et al.*, 2006). The surprise component in

the macroeconomic data releases is obtained as the difference between the actual release and the median forecast of that release made by professional forecasters surveyed by Bloomberg in the days immediately preceding the publication of the data. The surprise component of monetary policy is computed as the one-day change in the one-month OIS rate on the day of the policy intervention[27].

We estimate the following relation on Indian (daily) data for the period October 2004-May 2011:

$$\Delta f_t^{(h)} = c + \alpha IP_t^s + \beta WPI_t^s + \gamma MP_t^s + \epsilon_t \tag{8}$$

where  $t$  indexes days,  $\Delta f_t^{(h)}$  is the daily change in the one-year forward rate from year  $h$  to year  $h + 1$ ,  $IP_t^s$  is the surprise at time  $t$  in the growth rate of industrial production,  $WPI_t^s$  is the surprise in the WPI inflation and  $MP_t^s$  is the monetary policy surprise. The right-hand side variables therefore assume non-zero values only on the days of the data release events. Data on OIS forward rates clearly present volatility clusters (Figure 11), hence in the estimation we correct for ARCH effects (that turn out to be significant).

In Table III, we report the results for regression (8) at horizons ranging from one month to ten years estimated on a sample of seven years (October 2004-May 2011). If the null is valid we should find that only forward rates at closer horizons systematically respond to macro and policy surprises, while inflationary premia at farther horizons are firmly anchored by the credibility of the monetary policy. As is manifest from our results this not true, growth surprises are significant (at a 90 percent confidence level) at seven to ten years horizon, while monetary policy surprises are at a five to seven years horizon. The inflation surprise is significant also for most medium period forward rates (up to three years)[28].

#### 4. Is something amiss?

Long-term price stability is a central goal of monetary policy for virtually every modern central bank. The evidence described in Sections 3.1-3.3 points to an inherent difficulty from the RBI in communicating effectively its strong anti-inflation commitment and reining in inflation expectations. This occurred notwithstanding both

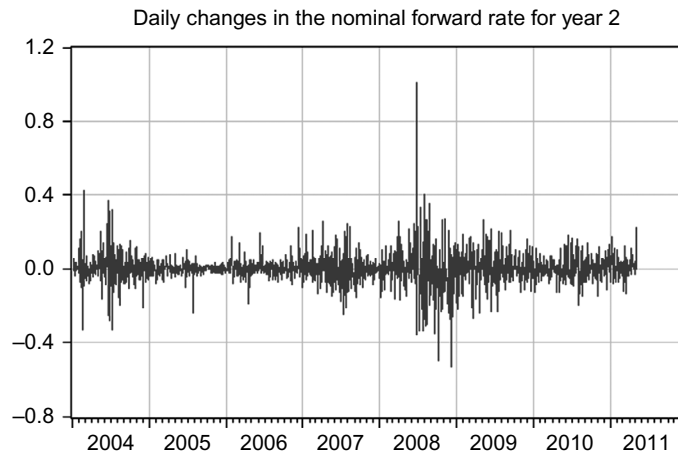


Figure 11.  
Volatility clusters

	1-2 months	3-6 months	6-12 months	1-2 years	2-3 years	3-4 years	4-5 years	5-7 years	7-10 years
IP surprise	2.733	0.305	0.642	1.436	0.731	0.672	0.836	1.034	1.897
Robust $z$ -stat.	-1.906	-0.214	-0.689	-2.338	-0.91	-0.784	-0.538	-1.289	-1.915
WPI surprise	0.837	3.311	4.301	2.496	3.551	0.826	1.114	2.53	1.61
Robust $z$ -stat.	-0.277	-2.842	-2.603	-2.436	-2.07	-0.347	-0.401	-0.574	-0.949
MP surprise	0.936	0.95	0.676	0.69	0.488	0.609	0.832	0.765	0.187
Robust $z$ -stat.	-1.479	-2.945	-2.502	-2.88	-1.881	-2.411	-3.4	-2.498	-1.199

**Note:** All regressions also include a constant term, omitted here; sample: 1,914 observation, for daily data from January 2004 up to 6 May 2011  
**Source:** Bloomberg and authors' calculations

**Table III.**  
Indian forward rate  
responses to economic  
news

the significant steps forward in the operational framework described in Section 2 enacted in the last decade, and the shift toward greater transparency and more active communication about policy decisions and intentions[29].

One may wonder whether something is amiss in the current monetary policy framework. Advocates of the “inflation targeting” approach suggest that it can help build credibility and anchor inflation expectations more rapidly and durably (IMF, 2005). Indeed, some of our findings in Section 3.1 appear to be consistent with this view: the lack of an explicit inflation targeting framework and of a clearly specified tolerance range for inflation may have exacerbated the effects of temporary shocks on expectations.

As emerges from the May 2011 Governor’s Post Policy Press Conference this problem is clearly acknowledged:

RBI’s current priority is inflation as we have said and over the year we expect to be preoccupied with inflation concerns and that we will try to ensure that the inflation comes down to that level and in the process regain our credibility (RBI, 2011b).

In discussing the pros and cons of adopting an inflation targeting approach in India, many observers as well as the central bank, have questioned the applicability of this approach in the Indian context[30]. Their argument echoes that of Eichengreen *et al.* (1999), who argued that technical capabilities and central bank autonomy are severely lacking in most emerging markets, and that certain preconditions should be met. These refer to:

- institutional features (autonomy of the central bank);
- developed technical infrastructure (forecasting/modeling abilities and sufficient data quality);
- economic structure (liberalized system of prices and interest rates); and
- sound and developed capital markets.

However, as discussed by the OECD (De Mello, 2007) inflation targeting in the last two decades was adopted in many emerging countries even though many of the standard preconditions associated with this policy framework had not been fulfilled. These deficiencies did not undermine the implementation of IT in those countries. Rather, the adoption of IT triggered a virtuous cycle that led to those same conditions being met.

The Indian experience suggests that many of these obstacles have already been removed, or are being addressed. To name but a few: discussions on liberalizing the interest rates on currently administered savings accounts are ongoing, a new CPI has been introduced and could well become the key reference rate for the Central Bank (Patnaik *et al.*, 2011).

Notwithstanding the improved communications by the RBI some scope for confusion, in particular regarding the definition of its primary objective, remains. We believe this originates from the still loose legal mandate of the central bank, which translates also in the “words and deeds” of the RBI:

We strive for a balance among multiple objectives with the relative weights assigned to each objective varying as dictated by the prevailing macroeconomic context, we aim to achieve a medium-term inflation target (Subbarao, 2010b).

This view is clearly stated by Cavoli and Rajan (2008):

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[...] it is imperative that the RBI clearly articulate to the public the lexicographic ordering of its objectives (with inflation taking precedence over all others over time), as well as the time-frame over which the monetary authority is committed to returning inflation to its target.

In the aftermath of an inflation shock, like the one recorded in the past two years, the Indian public had to infer the RBI target inflation from observed outcomes. The temporary increase in inflation naturally led to fears that the central bank's inflation objective was actually higher than had been previously believed. Ultimately, it is this instability of beliefs that limits the scope and the ability of monetary policy in stabilizing the real economy[31].

## 5. Conclusions

In this paper we documented the unhinging of inflation expectations in India in the aftermath of the financial crisis. The evidence presented: high correlation between actual and expected inflation, low actual interest rates compared to other countries and to those derived from Taylor rules, responsiveness of the term structure (of forward rates) to macro and policy news even at longer horizons, support our claim that there is still room for improvement in the RBI monetary policy. Much progress has been made over the years in creating liquid monetary and financial markets that are key ingredients in the monetary policy transmission. The monetary policy framework underwent significant changes moving from direct administrative measures to indirect, market-based interventions. These moves contributed to align RBI to best practices in central banking. They also created the conditions for a clearer definition of the set of tools and the objectives of the monetary policy.

We argue that a lack of a clear definition or ranking in the RBI's objective function is one of the major causes of policy ineffectiveness in the aftermath of the inflation shock linked to rising commodity prices. We find some evidence of this comparing the reaction of the term structure of interest rates to recent policy moves: a tilting of the curve, as showed in Ellingsen and Soderstrom (2001), can be interpreted as agents' revising their opinion concerning weights in the policy function of the central bank. The 50 bps move at the beginning of May 2011, effected such a change, unlike the previous ones. Given the steady increase in inflationary expectations that continued notwithstanding previous moves and RBI's officials declarations, this might indicate that there is still room for convincing markets that the RBI is really fighting inflation.

A bolder and closer step toward a flexible inflation targeting regime might address the remaining problems in the monetary policy strategy and operational framework of the RBI. While it might be desirable in a country like India to have a broader scope for policy, a clear, lexicographic order in the objectives is of paramount importance to establish a reputation and create a credible nominal anchoring for agents' expectations. Changing priorities according to the economic situation should not endanger the reputation of the RBI, nor should it create confusion in the agents as to which objective comes first and with which weight, as it seems to be happening now as we argued in the paper.

This change in emphasis (Rajan, 2008) in the monetary policy strategy should entail a redefinition of the legal mandate of the RBI and thus involve the Government in the process. This would also be the occasion to further proceed in establishing the separation of the monetary policy and banking system from the needs of Government financing.

Notes

1. From April 2010 to May 2011 the RBI increased the repo and reverse repo rates nine times by 25 basis points (bps); in the last occasion, in May 2011, the hike of both rates was by 50 bps.
2. Patra and Kapur (2010) argue that changes in the monetary policy strategy and in the definition of intermediate targets and instruments in India proceeded in parallel with the evolution of economic theory and the practices in advanced countries.
3. The comprehensive mandate of a Central Bank may entail also surveillance and micro prudential policies that are pursued with a set of other instruments like capital requirements, respect of certain ratios in the balance sheet and so forth.
4. The Raghuram Rajan Report of the Committee on Financial Sector Reforms (CFSR) made the following recommendation: "The RBI should formally have a single objective, to stay close to a low inflation number, or within a range, in the medium term, and move steadily to a single instrument, the short-term interest rate (repo and reverse repo) to achieve it".
5. "A core function of the Reserve Bank in the last 75 years has been the formulation and implementation of monetary policy with the objectives of maintaining price stability and ensuring adequate flow of credit to productive sectors of the economy. To these was added, in more recent times, the goal of maintaining financial stability. The objective of maintaining financial stability has spanned its role from external account management to oversight of banks and non-banking financial institutions as also of money, government securities and foreign exchange markets" (RBI, 2010b).
6. The Treaty on the Functioning of the European Union, in art. 127, states that "The primary objective of the European System of Central Banks (hereinafter referred to as "the ESCB") shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union". The ECB's statute better specifies the mandate defining price stability as an explicit target: maintaining the headline inflation rate close but below 2 percent over the medium term.
7. Demand liabilities include all liabilities which are payable on demand, Time Liabilities are those which are payable otherwise than on demand and they include fixed deposits, cash certificates, cumulative and recurring deposits, time liabilities portion of savings bank deposits, staff security deposits, margin held against letters of credit if not payable on demand, deposits held as securities for advances which are not payable on demand and Gold Deposits. See RBI web site: [www.rbi.org.in/scripts/BS\\_CircularIndexDisplay.aspx?Id=3119](http://www.rbi.org.in/scripts/BS_CircularIndexDisplay.aspx?Id=3119)
8. See RBI (2011a).
9. The same measurement issues mentioned in the earlier sections, together with the lack of depth in the government bonds market probably hinder their introduction in India.
10. In the aftermath of the euro changeover inflation expectations and inflation perception became quite unrelated to actual price outcomes (Angelini and Lippi, 2007).
11. In India, the standard reference period is the fiscal year (extending from April to March), respondents are asked about their expectations on annual average inflation in a given fiscal year, starting in April of the previous one.
12. In contrast with the regular monthly surveys only aggregate information on the mean forecasts is available.
13. We use the October surveys of each year, rather than the April ones to account for the fact that the data for India refer to the fiscal year (running from April to March) rather than calendar one. Thereby in April of each year the CF figure for average annual inflation in that fiscal year is not yet available.

14. The Reserve Bank started the SFP quarterly survey from the second quarter of 2007. The survey covers component-wise detailed forecasts of GDP growth, inflation, savings, capital formation, consumption expenditure, export, import, interest rates, money supply, credit growth, stock market movements, corporate profit, etc.
15. According to the RBI (2009), “the households inflation expectations provide useful directional information on near-term inflationary pressures”.
16. A similar analysis is discussed in the last IMF Article IV consultations (IMF, 2010).
17. The output gap measure relevant from a consumer welfare standpoint is not given by the deviation of output from potential, rather it is given by deviation of marginal costs from real social costs, but, as Woodford (2001) suggested, one might argue that even though “real private marginal cost has not covaried closely with detrended output; yet one might conceivably still argue that detrended output is a better proxy for real social marginal cost, if moderate-frequency variation in the natural rate is thought to be due largely to inefficient supply disturbances of the kind just mentioned”.
18. We also tried alternative measures of the inflation rate and the output gap without appreciable changes in the overall results both from calibrated and estimated Taylor rules.
19. For a similar choice (IMF, 2010). Outliers in the call rate have been removed prior to all computations.
20. “India: raising inflation and rate forecasts, reducing GDP”, Goldman Sachs Note, 21 April 2011.
21. Cavoli and Rajan (2008) use the lead of the actual inflation rate rather than the expected rate.
22. For example, from April 2003, the beginning of our sample to March 2004 we collect CF for fiscal year 2004 (i.e. the year spanning the period April 2004-March 2005) and refer to them as two-year ahead projections. By the same token, the forecast for the same fiscal year collected over the successive 12 months (i.e. April 2004-March 2005) are referred to as one-year ahead projections.
23. As stated in Cavoli and Rajan (2008) “The reactions to future inflation tend to suggest that, while the policy regime has an inflation fighting element to it, it is not an inflation targeting arrangement *per se*, i.e. the RBI does not appear to respond to inflationary expectations in setting interest rate policy”.
24. The classification of the different episodes is based on available market sources, see the papers for details.
25. Similar conclusions hold also for other 25 bps policy moves. For example an almost identical graph is obtained for the policy decision that was taken just one month before, in March 2010.
26. See also “India: RBI turns on the heat; raises rates 50 bps”, JPMorgan, 3 May 2011.
27. Bloomberg started to survey the expectations on the monetary policy rates’ announcements only from 2011.
28. A note of caution is on order here since at faraway horizons (beyond five to seven years) the OIS market in India is less liquid than for horizons up to five years, thus the result might well be the consequence of an illiquid market rather than evidence on the firmness of expectations.
29. Following international best practices, the RBI recently introduced a Q&A session for the Governor after the policy decisions and started publishing its projections for GDP growth and inflation.
30. The RBI argued strongly against the IT approach in a recent speech, where it stated that “inflation targeting in India is neither desirable nor practical” (Subbarao, 2010a).



31. As described by De Carvalho Filho (2011), almost three years after the onset of the global financial crisis, post-crisis growth performance was found to be superior in countries with an IT framework. The finding is related to the fact that inflation targeting countries lowered nominal and real interest rates more sharply than others.

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### Appendix

The dataset on macroeconomic surprises was extracted from the Bloomberg platform. Surprises for Indian macroeconomic data are available for the WPI (from the end of 2009), the IIP (from early 2004). Those on the official rates have become available only very recently (beginning of 2011), thus in the latter case we do not use this source of information to construct monetary policy surprises. They are instead computed as the one-day change in the one month OIS rate on the day of the policy intervention.

The long-term CF are collected twice a year (in April and October) and the resulting tables and analysis are displayed in both the hard-copy and PDF versions of the publications. Country panelists are asked to provide forecasts for the next five to ten years; a more detailed description is available on the official web site: [www.consensuseconomics.com/Forecast\\_Surveys/Long\\_Term\\_Economic\\_Forecasts.htm](http://www.consensuseconomics.com/Forecast_Surveys/Long_Term_Economic_Forecasts.htm) (consensus webpage).

We considered the Asia Pacific and Latin America surveys, focusing on emerging economies for which long-term forecasts are available. For the Asian region these are: China, Hong Kong, India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan and Thailand. For the Latin American region: Argentina, Brazil, Chile, Mexico, Venezuela, Colombia and Peru. Given their highly volatile inflation environment, Argentina and Venezuela were excluded from the analysis. We consider only the October surveys (and not April) for two reasons. First, to account for the fact that the data for India refer to the fiscal year (running from April to March) rather than calendar one: in April of each year the CF figure for annual inflation in that fiscal year is not yet available. Second, in April 2010 the CF survey failed to collect data for India for inflation expectations at horizons beyond five years.

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