

INTERNATIONAL MONETARY FUND

Monetary Policy Communication and Financial Markets in India

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WP/22/209

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WORKING PAPER

IMF Working Paper

Asia and Pacific Department

**Monetary Policy Communication and Financial Markets in India
Prepared by Faisal Ahmed, Mahir Binici, and Jarkko Turunen**Authorized for distribution by Nada Choueiri
October 2022

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ABSTRACT: Forward-looking monetary policy communication has become a key element of flexible inflation-targeting regimes across advanced and emerging market economies. The Reserve Bank of India's implementation of a flexible inflation targeting framework since 2016 has been supported by a broad set of communication tools, more recently aided by policy innovations such as forward guidance on policy rates and asset purchases, increasing the predictability of monetary policy. A review of the recent innovations of monetary policy communications during the initial waves of the pandemic suggests forward guidance likely played a key role in moderating uncertainty and supporting some asset prices. We also find that the relationship between monetary policy surprises and yields for government and corporate securities across all maturities are positive and statistically significant. The results support an important role for monetary policy communication in guiding market expectations about the monetary policy stance, including the likely path of policy interest rates.

JEL Classification Numbers:	E43, E44, E52, E58, G12
Keywords:	Monetary policy; communication; forward guidance; inflation targeting; India
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WORKING PAPERS

Monetary Policy Communication and Financial Markets in India

Prepared by Faisal Ahmed, Mahir Binici, and Jarkko Turunen¹

¹ We thank Elif Arbatli Saxegaard, Marco Casiraghi, Nada Choueiri, Alfred Schipke, Sergio Sola, TengTeng Xu, and the participants at the RBI seminar for useful comments and suggestions, and Nimarjit Singh and Ankita Goel for excellent help with the data.

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I. Introduction

Forward-looking monetary policy communication has become a key element of flexible inflation targeting regimes adopted across advanced and emerging market economies.¹ The Reserve Bank of India (RBI) implemented a flexible inflation targeting framework in 2016, which has been associated with improved anchoring of inflation expectations (Blaggrave and Lian 2020). The flexible inflation targeting framework is supported by a set of communication tools, including monetary policy statements and minutes, press releases, and the governor's press conference. These tools have provided directional guidance on policy rates, enhancing the predictability of monetary policy.

The RBI has undertaken important innovations in monetary policy communication in recent years. Starting in October 2019 in the aftermath of the nonbanking financial company shock of 2019 and during a growth slowdown that preceded the COVID-19 outbreak, the RBI introduced forward guidance that focused on reviving growth and providing state-contingent direction on the duration of accommodative monetary policy. In October 2020, amid the unprecedented uncertainties stemming from the pandemic, the RBI introduced time-based forward guidance, committing to an accommodative stance for "at least during the current financial year and into the next financial year." Amid elevated macro and inflation uncertainties, the central bank returned to its state-contingent forward guidance in April 2021 while also introducing forward guidance on asset purchases.

From a policy design perspective, it is important to understand how monetary policy communication affects policy transmission, including market outcomes. While disentangling the impact of communication on financial market outcomes can be challenging, market participants have highlighted that forward-looking communication reduced market uncertainty and helped better anchor market expectations in India during the pandemic. For example, even with inflation outside the RBI's tolerance band, and amid a sizeable increase in pandemic-related public sector borrowing, the volatility of 10-year government bond yields remained moderate during 2020, aided by the guidance on the direction and duration of monetary policy support.

The impact of monetary policy communication is ultimately an empirical question. Given recent innovations in communication, including on forward guidance, the natural questions that arise include: Does communication have a quantitatively significant impact on financial markets in India? How can the impact be measured? What do asset price movements suggest about the impact of monetary policy communication?

This paper finds that, based on the movement of asset prices, monetary policy surprises² have a statistically significant impact on both short- and long-term risk-free rates and corporate yields, but less so on equity prices and foreign exchange rates. These results are consistent with the findings in studies for other emerging markets, such as Chile (see Pescatori, 2018) and Indonesia (Ahokpossi et al., 2020). The results also confirm an improvement in the predictability of monetary policy during the FIT regime in India. Furthermore, the paper finds that monetary policy communication, including forward guidance, impacts longer-term yields for government securities, consistent with the interpretation that monetary policy communication conveys important information about the future direction of monetary policy. This is confirmed by a narrative analysis of the intraday data, which suggests that specific forward guidance announcements facilitated a reduction in market uncertainty and helped guide longer term interest rates. For example, the RBI's monetary policy

¹ Based on the work done by Unsal et al. (2022), many emerging markets (EMs) and low-income and developing countries (LIDCs) have made progress in recent years along various dimensions of monetary policy communications.

² Monetary policy surprise is defined as the difference between the central bank's rate decision and the market analyst's expected rate actions.

committee (MPC) decision on October 9, 2020, and the Governor's statement on forward guidance, adding specificity to the duration of the RBI's accommodative stance, contributed to a decline in 10-year rates on the same day.

The paper is structured as follows: Section II briefly reviews related literature. Section III reviews the RBI's monetary policy communication framework since the adoption of flexible inflation targeting. Section IV discusses narrative analysis of recent RBI communication, and its implications for financial markets, with focus on asset prices. Section V presents data and methodology, and key results from an empirical analysis of communication and its impact on asset prices. Section VI summarizes results and policy recommendations.

II. Literature

A large share of the literature on monetary policy communication focuses on advanced economies, particularly on the impact channels, including on uncertainty. The evidence suggests that communication can be a powerful component of the central bank's toolkit—it can meaningfully impact asset prices and enhance the predictability of monetary policy decisions even if the channels through which this occurs are not often clear (see Blinder et al. 2008; Boukus and Rosenberg 2006; Carvalho, Hsu, and Nechio 2016; Gürkaynak, Sack, and Swanson 2005).

Using theoretical models, Nakamura and Steinsson (2018) show that monetary policy shocks transmit information about economic fundamentals that affect long-run market expectations of economic conditions, called “the information effect”. The information effect impacts beliefs not only about monetary policy but also about other economic fundamentals, playing an important role in the overall causal effect of monetary policy shocks on output. Communications can also affect market expectations. Hansen, McMahon, and Tong (2019), using data from the Bank of England's Inflation Report, focuses on the “uncertainty channel” and shows that central bank communication affects market beliefs about long-term uncertainty. Coenen et al. (2018) argue in a related point that announcements of the ECB's asset purchase programs have lowered market uncertainty, particularly when accompanied by a contextual release of implementation details such as the envisaged size of the programs. Furthermore, evidence suggests that forward guidance reduces uncertainty more effectively when it is state-contingent or when it provides guidance about a long horizon, as opposed to when it is open-ended or covers only a short horizon. Analyzing asset prices, Altavilla et al. (2019) show that the existence of perceived policy target, timing, forward guidance, and quantitative easing (QE) which influences short-, medium-, and long-term segments of the yield curve. This is consistent with earlier evidence that central bank communication may lead to substantial revisions in expectations of monetary policy and can impact interest rates at longer maturities (Gürkaynak, Sack, and Swanson (2005) and Brand, Buncic, and Turunen (2010)). Altavilla et al. (2019) also find that the market response to monetary policy surprises depends on whether the announcements are perceived to reveal information about the state of the economy.

In the emerging market context, recent analyses have looked at how monetary policy communication affects asset prices. McMahon, Schipke, and Li (2018) assess the impact of People's Bank of China monetary policy communication on financial markets using various types of communication, including (1) the quarterly Monetary Policy Executive Report, (2) MPC minutes, (3) press conferences and speeches by governors and deputy governors, and (4) open market operations notices. The results show that communication innovations, such as open market operation information notices, reduced volatility and improved monetary policy effectiveness. In Chile, Pescatori (2018) find that the predictability of policy decisions has been relatively high and has increased over time. Furthermore, the efficacy of statements at times of monetary policy surprises is quite high and

monetary policy surprises significantly affect the medium and long end of the yield curve, and communication has helped the predictability of the monetary policy. Forward guidance from statements is found to shift the entire yield curve, while surprise actions tend to tilt the short end of the curve rather than shift the whole curve. Ahokpessi et al. (2020) focus on the transparency, clarity, predictability, and impact of monetary policy communication on financial markets in Indonesia by examining two channels of communication—monetary policy press releases and reports. They find that monetary policy surprises have a significant impact on money market rates up to maturities of one month, but no significant impact on the bond market and the exchange rate. Also, monetary policy press releases and monetary policy reports themselves do not have a significant impact on market rates.

On India, Patnaik and Pandey (2020) review the institutional framework supporting inflation targeting and conclude that, aided by the specification of the inflation target and the central bank's communication framework, the institutional framework has been largely successful in keeping headline inflation within the target range. Mathur and Sengupta (2020), based on quantitative analyses of the monetary policy statements of the RBI during 1998–2018, find a persistent semantic shift in RBI's monetary policy communication since adoption of inflation targeting. They find that the RBI's communication is linguistically complex on average, but the length of monetary policy statements has gone down, and readability has improved significantly recently. Lengthier statements are found to be associated with higher volatility in equity and currency markets, but not in bond markets. Lakdawala and Sengupta (2021) analyze official statements and the corresponding media narrative from RBI announcement dates to assess the markets' response to such announcements and how they update their expectations. The research findings suggest that bond and stock markets react strongly to monetary policy shocks but exhibit notable heterogeneity across regimes and across governors. They also find some evidence of the conventional transmission of monetary policy to prices. Finally, RBI (2021a) finds that the overnight interest rate swap (OIS) rates in India are good predictors of the direction of monetary policy, if not the exact timing of policy changes.

III. Monetary Policy Communication Framework in India

The RBI's monetary policy framework and communication have evolved significantly over time (see Box). With the adoption of flexible inflation targeting in 2016, forward-looking monetary policy communication has become a key element of the framework to anchor inflation expectations and hence ensure price stability. In addition to setting a medium-term inflation target (4 percent with a 2 percent tolerance band), the monetary policy communications strategy was also designed such that the MPC decisions are published after the conclusion of every meeting and the minutes of the proceedings released on the 14th day following the meeting. The minutes provide background information on the decision, including the statement of each MPC member.

The RBI also publishes a Monetary Policy Report every six months, explaining the sources of inflation. The report forecasts inflation for a period between six to eighteen months from the date of publication of the document. Finally, if the inflation target is not met for three consecutive quarters, the RBI is required to submit a report providing reasons for the failure, propose remedial actions, as well as an estimate when the inflation target is meant to be met.

The flexible inflation targeting framework is supported by other communication tools, including the governor's addresses and statements that are released following each MPC meeting, other press releases, and the

governor's press conferences. As with other inflation targeting central banks, the information content of the resolution of the MPC meetings may be more substantive than the change to the benchmark policy rate, as it may entail important information about the direction of policy actions to support the predictability of monetary policy and to anchor inflation expectations.

Cross-country evidence suggests that implementation of the flexible inflation targeting framework has contributed to improvements in monetary policy credibility in India, reflected in lower frequency of monetary policy surprises since 2016 (Figure 1). This suggests that monetary policy communication is important in anchoring expectations and thus reducing uncertainties. It should be noted that the increase in size of the surprises in recent years (2016-21) captures the pandemic-related easing in the context of increased certainty.

Box 1. Evolution of Monetary Policy Framework and Communication

India's monetary policy framework has evolved over the recent decades. This evolution was also accompanied by changes in monetary policy communication. Initially, the focus of monetary policy centered around expanding the access and availability of credit for development. Subsequently, following the inflationary pressures during the 1970s, inflation control was largely based on price controls by the Government and selective credit controls and moral suasion by the Reserve Bank (Das, 2022).

During the 1980s, amid high inflation and fiscal dominance, a rule-based monetary targeting framework was adopted. In this framework, reserve money was used as the operating target and broad money as the intermediate target for controlling inflation by regulating monetary expansion consistent with inflation and growth objectives. In the late 1990's, following the trade and financial sector reforms in the early 1990s and growing financial integration and innovation, the monetary targeting framework that rested on the assumption of a stable relationship between money, output and prices came under pressure.

Consequently, the RBI adopted a multiple indicators approach in 1998, which placed greater emphasis on the interest rate vis-à-vis money supply for monetary policy formulation, with policy emphasis shifting to price of credit rather than its quantity. Accordingly, short-term interest rates were the key instruments in signaling the monetary policy stance and the liquidity operations of the RBI were geared to align market rates with the policy stance. One challenge of monetary policy communication under the multiple indicators approach was that the approach, with its focus on a large set of indicators, did not provide a clearly defined nominal anchor for monetary policy.

Subsequently, an Expert Committee set up by the RBI (2014) recommended headline inflation as the nominal anchor for monetary policy. Since the formal adoption of the flexible inflation targeting framework in June 2016, monetary policy communication has focused on this streamlined objective.³ In its communication, the RBI has referred to the tolerance band of 4 ± 2 percent as the tolerance band. The amended Act states the role of the RBI in monetary policy as follows: "the primary objective of monetary policy is to maintain price stability while keeping in mind the objective of growth".

As mentioned above, the shift in the monetary policy frameworks were reflected in the way the RBI communicated its policy stance. Recent analysis of the monetary policy communication of the RBI and its evolution over a 20-year period by Mathur and Sengupta (2020) show that the move towards an inflation targeting regime is reflected in the monetary policy statements of the RBI. With the adoption of inflation targeting, RBI's monetary policy communication appears to highlight its focus on inflation. Using text analysis, they show that during the period that the multiple indicators approach was used, the words inflation or price did not have much prominence in

³ Recent BIS study highlights that monetary policy communication is important for financial market development and stability (BIS 2020).

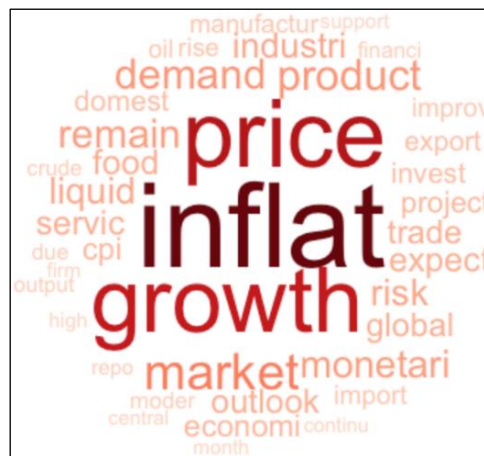
communication whereas, words such as financial market, credit etc., were used more frequently. Consistent with the streamlined objective, during the flexible inflation targeting period, select words – *inflation, price, growth* – featured more prominently instead.

Evolution of Monetary Policy Framework and Communication

Multiple indicators



Flexible inflation targeting

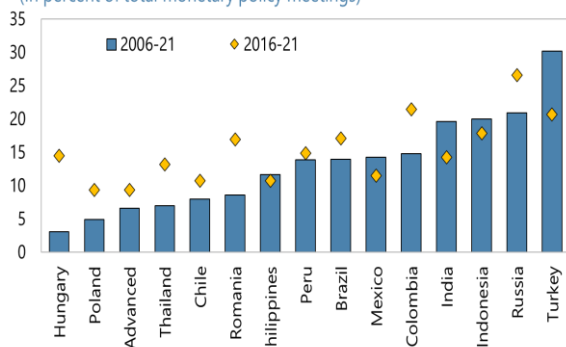


Source: Mathur and Sengupta (2020).

Figure 1. Monetary Policy Surprises: Cross-Country Evidence

Frequency of Monetary Policy Surprises, 2006-21 1/

(In percent of total monetary policy meetings)



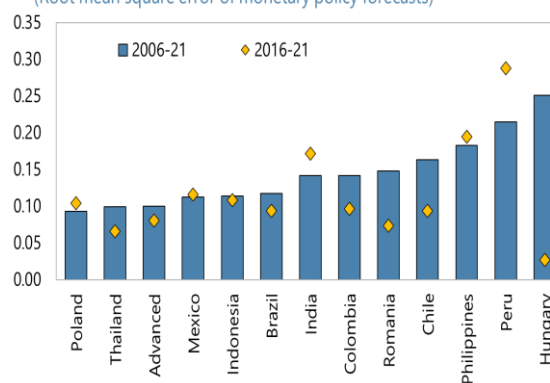
Sources: Bloomberg L.P.; and authors estimates.

1/ Monetary policy surprise is the difference between the central bank's rate decision and analysts' expected rate

Note: 'Advanced' includes average of Canada, Australia, Czech Republic, Korea, New Zealand, Norway, United Kingdom, and United States.

Size of Monetary Policy Surprises, 2006-21

(Root mean square error of monetary policy forecasts)



Sources: Bloomberg L.P.; and authors estimates.

Note: 'Advanced' includes average of Canada, Australia, Czech Republic, Korea, New Zealand, Norway, United Kingdom, and United States.

The RBI has also introduced important communication innovations over the past few years. A key innovation is the introduction of forward guidance on the monetary policy stance since October 2019. Specifically, after the

nonbanking financial company stress of 2019 and amid the pre-COVID-19 growth slowdown, in October 2019, the RBI introduced state-contingent forward guidance that provided additional clarity on the stance of monetary policy (Table 1). The forward guidance was preceded by a series of policy rate cuts in 2019 as growth and inflation were subdued. Following the introduction of forward guidance in October 2019 and accompanying its subsequent innovations amid the unprecedented uncertainties stemming from the COVID-19 pandemic, both conventional and unconventional tools were used actively. Importantly, the design of the forward guidance explicitly cited growth, with implications for the relative weights of inflation and growth in the RBI's reaction function. Along with two policy rate cuts, in March and May 2020, the RBI embarked on a series of extended lending and term-funding facilities, asset purchases and operation twist programs to ensure proper market functioning. As uncertainty increased further due to macro and inflation developments during the COVID-19 pandemic, the RBI recalibrated its forward guidance to both state- and time-contingent setting in October 2020, including a commitment to keep the inflation within the target. The RBI returned to its state-contingent setting in April 2021 while introducing additional forward guidance on its asset purchase program. As discussed in the narrative analysis of the next section, in the context of a stable policy rate and other unconventional policies, forward guidance on the monetary policy stance has become the central component of monetary policy communication. The RBI has also communicated the timing and volume of its Government Securities Asset Purchase Program in April 2021 and its subsequent discontinuation of the program in October 2021.

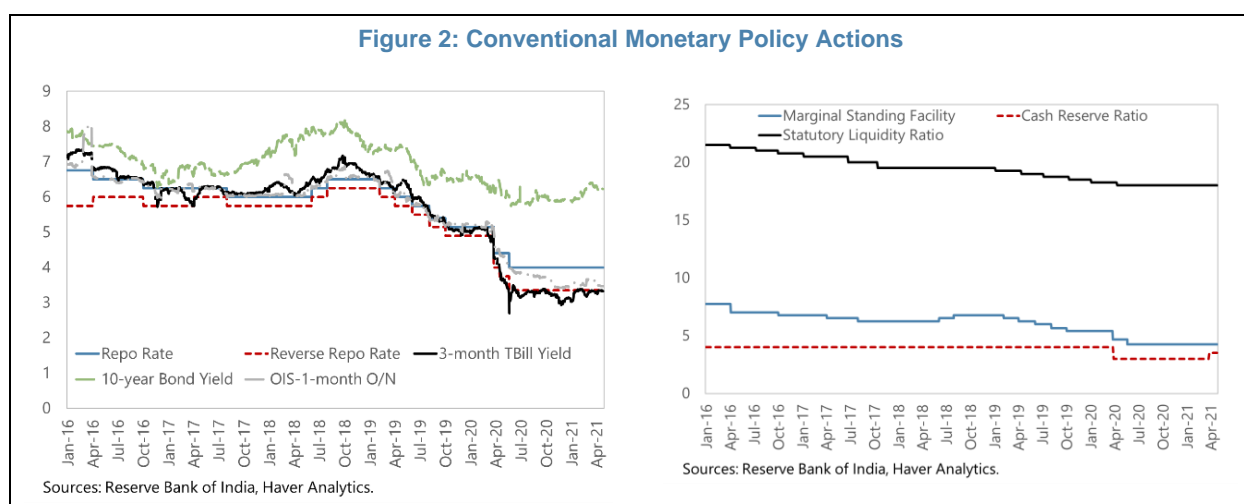
Table 1: RBI Forward Guidance Evolution

Meeting	Statement	Context
Aug 2019	35 bps easing, maintain the accommodative stance	NBFC shock, growth slowdown
Oct 2019	... an accommodative stance as long as it is necessary to revive growth , while ensuring that inflation remains within the target.	Continued growth slowdown and inflation expected to remain below target
Dec 2019		Inflation above target
Feb 2020		Covid-19 Shock
Mar 2020	'ABOVE' and mitigate the impact of Covid-19 on the economy.	...
May 2020	...	Rise in inflation due to temporary supply shock
Aug 2020
Oct 2020	... at least during the current financial year and into the next financial year – to revive growth on a durable basis ..., while ensuring that inflation remains within the target going forward
Dec 2020	...	Moderating inflation
Feb 2021
Apr 2021	... accommodative stance as long as necessary to sustain growth on a durable basis and continue to mitigate the impact of COVID-19 on the economy, while ensuring that inflation remains within the target going forward.	COVID-19 second wave

IV. A Narrative Analysis of Communication and Asset Prices

The innovations in forward guidance, especially since the pandemic shock in March 2020, allow exploration of how monetary policy communication can affect transmission, particularly through asset prices. That said, careful selection of the communication innovations and events is important to analyze the impact of forward guidance, given the size and types of monetary and financial sector measures introduced during the pandemic amid significant policy rate easing and liquidity injections (Figures 2 and 3). The impacts of these measures on different asset prices varied.

An event study around select important policy announcement dates during the recent easing cycle is conducted using announcement dates from December 2019 to October 2020, which cover the important monetary policy communication innovations since the pandemic.

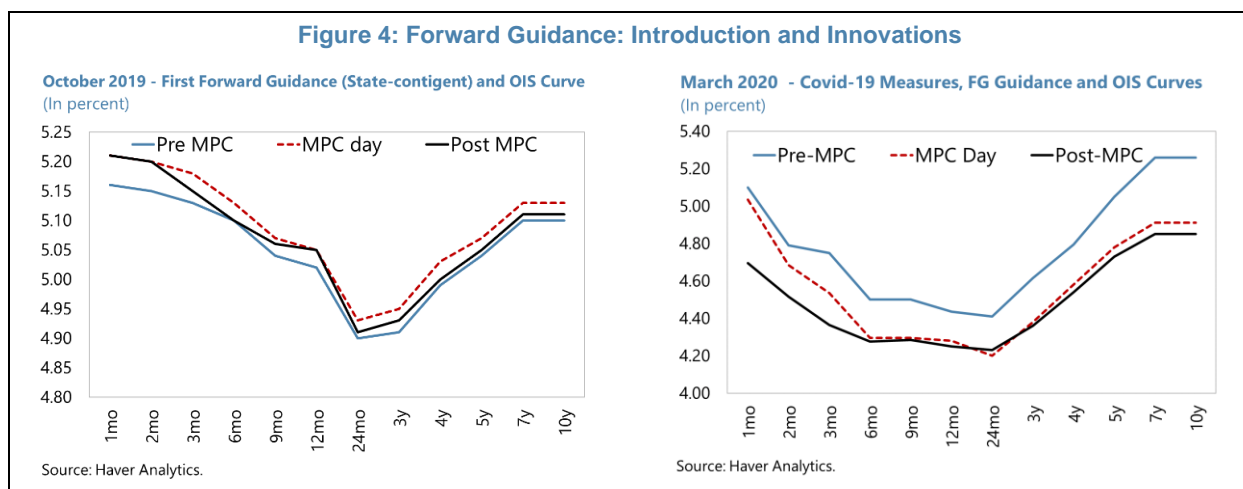
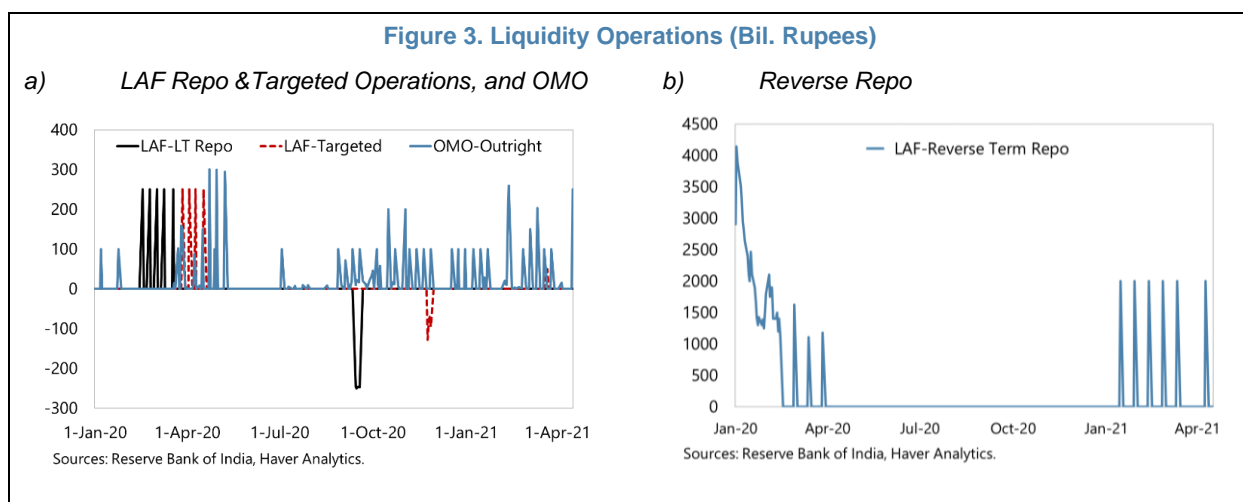


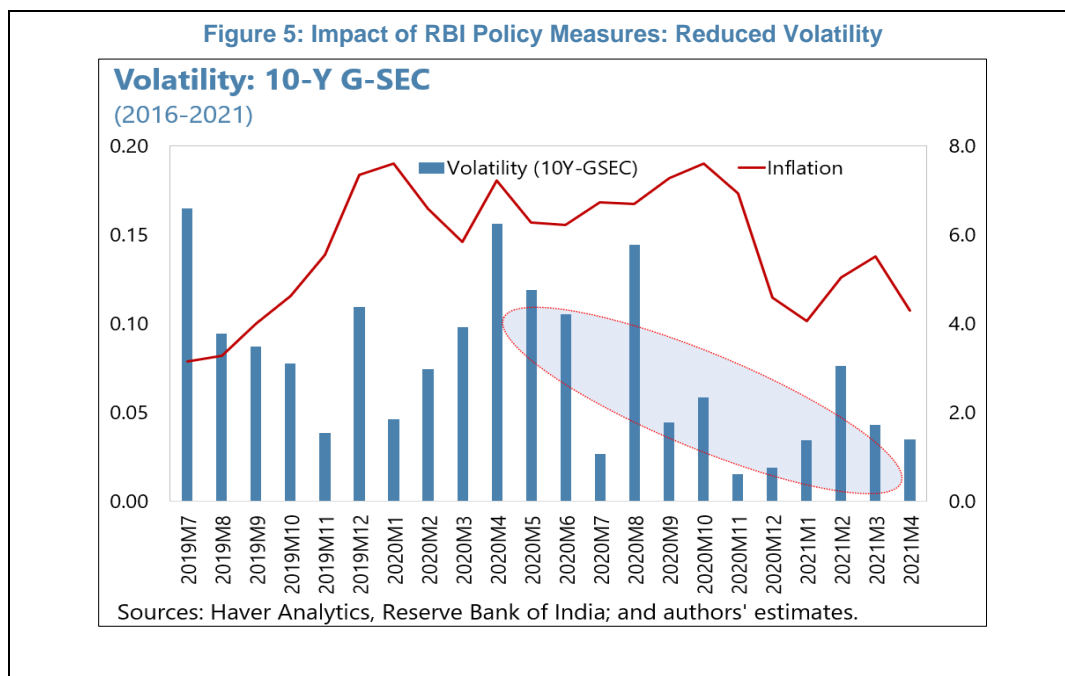
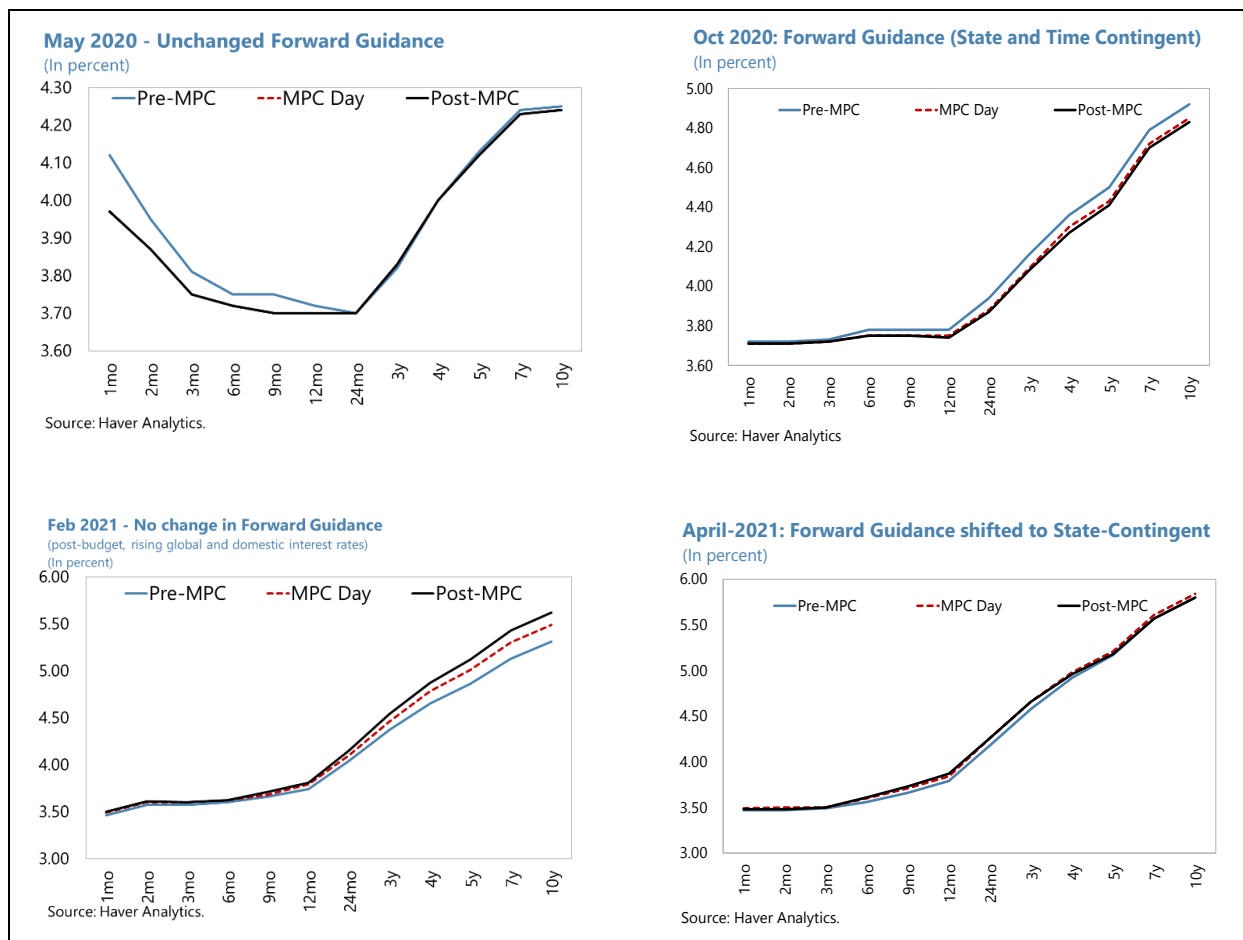
By analyzing the behavior of the overnight indexed swap curve (OIS rates for maturities ranging from the day before, to the day of the MPC decision, and the day after), we can observe how various announcements impacted market expectations for interest rates.⁴ Figure 4 shows that during the early phase of the easing cycle (e.g., December 2019, March and May 2020), the OIS curve displays a U-shape, implying that markets expected additional policy easing⁵. By the summer of 2020, with significant liquidity measures announced by the RBI, markets formed the view that the easing cycle of the policy rates was largely complete, as reflected in the upward-sloping OIS curve. The OIS curve shifted downwards around the March and May 2020 MPC dates, when the RBI demonstrated its commitment to monetary easing through policy rate easing and various financial sector measures. Amid elevated inflation in October, due to supply side shocks that were perceived to

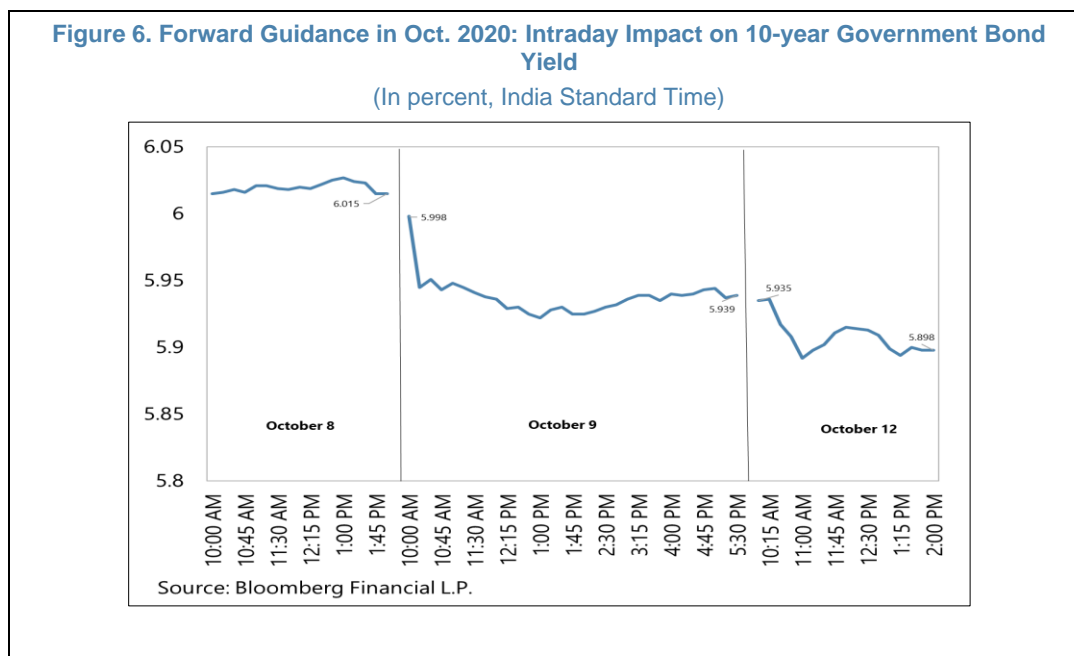
⁴ We use the OIS rates up to the 10-year maturity—while the liquid segment is mostly up to 5-year, and price changes from any changes in expectations or policy measures are well-reflected.

⁵ Figure 4 presents yield curves over various frequencies on the day before MPC meeting (t-1), on the day of MPC meetings (t) and the day after (t+1). All data is as of the end-business day.

be transitory, the MPC provided explicit time-based forward guidance by specifying that the accommodative stance would continue (“...this fiscal year and next...”), thus addressing market uncertainty about the duration of the accommodative policy stance. The October 9, 2020 event is instructive in that the observation serves as a controlled experiment of communication impact, with relatively minimal changes in other policy measures. As seen in Figure 4, the explicit time-based forward guidance led to a downward pivot of the OIS curve, likely a reflection of some reduction in uncertainties. Although inflation increased and remained elevated throughout 2020, the RBI’s monetary policy measures accompanied by liquidity measures and forward guidance throughout the year appear to have contributed to the reduction in volatility of yields for government securities (Figure 5).







To analyze the impact of communication on asset prices, the focus is on the 10-year government securities' yield, given the relative liquidity of both the OIS curve and government securities at this maturity. Figure 6 displays how risk-free asset prices (10-year government bond yield, before and after the monetary policy announcement) behaved when monetary policy communication innovation (forward guidance) included an explicit time-based guidance at the time of the October 9, 2020 monetary policy decision. The time-contingent forward guidance appears to have resulted in a decline in risk-free interest rates (10-year government securities yields).

Notably, during the easing cycle, RBI communication also included announcements on asset purchase programs, special monetary operations ("operation twists") and long-term repo operations. The RBI also conducted an event study analysis around announcement days and found that (1) government securities yield generally reacts to monetary policy surprises, and (2) operation twists and long-term repo operations had significant impact on government securities yields of some maturities (RBI, 2020).

V. The Impact of Monetary Policy Announcements on Asset Prices

V.I Methodology

To measure the impact of monetary policy surprises on asset prices, the following regression is used:

$$\Delta y_t = \alpha + \beta \Delta x_t + \gamma z_t + \varepsilon_t \quad (1)$$

where Δy_t denotes the change in government security yields across different maturities, long-term (10-year) corporate bond yields, exchange rate, or stock market index on the day of monetary policy announcements; Δx_t denotes the surprise component of monetary policy changes; z_t denotes other policy announcements from the RBI on the day of MPC meetings, or other major changes in macro or financial market indicators globally; and ε_t is an error term. Ideally, high frequency (i.e., intra-day) data is needed to estimate the equation (1) that may have Δx_t as a single control variable. However, due to limited availability of intra-day data in India, daily data is used to measure changes in asset prices and surprise components of monetary policy announcements following, for instance, Kuttner (2001). Thus, daily data from MPC meeting days (Table 2) is used to conduct the event study. Estimation of equation 1 using daily data could be subject to bias stemming from simultaneity (the possibility that movements in asset prices and monetary policy surprises could be jointly determined) and omitted variables (the possibility that variables that determine movements if asset prices are excluded from the equation, thus incorrectly attributing their impact to monetary policy surprises). Simultaneity is a potential problem when a major macro data announcement (such as the release of GDP growth data) is made on the same day and prior to the MPC meeting. This does not seem to be a concern in the case of the RBI since no major macro news announcements take place on MPC days. To address potential omitted variable bias, other policy announcements such as RBI's decisions on forward guidance, operation twists, asset purchases, or liquidity ratios are controlled for.⁶ At daily frequency, asset prices might also be responding to external factors such as global risk appetite, major swings in commodity prices, or changes in the US monetary policy and long-term yields. To account for these, the change in the volatility index VIX, oil prices, the US federal fund rate and 10-year treasury yields in the specification (1) is added. Both the relatively small sample size and challenges associated with using daily data to identify the impact of monetary policy surprises on asset prices suggest that the results from the regression analysis should be interpreted with caution.⁷

Table 2: Decisions at the MPC Meetings

Meeting	Decision on policy rate	Stance
4-Oct-16	Reduce by 25 basis points from 6.5% to 6.25%	Accommodative
7-Dec-16	Unchanged at 6.25%	Accommodative
8-Feb-17	Unchanged at 6.25%	Neutral
6-Apr-17	Unchanged at 6.25%	Neutral
7-Jun-17	Unchanged at 6.25%	Neutral
2-Aug-17	Reduce by 25 basis points from 6.25% to 6.0%	Neutral
4-Oct-17	Unchanged at 6%	Neutral
6-Dec-17	Unchanged at 6%	Neutral
7-Feb-18	Unchanged at 6%	Neutral
5-Apr-18	Unchanged at 6%	Neutral
6-Jun-18	Increase by 25 basis points from 6% to 6.25%	Neutral
1-Aug-18	Increase by 25 basis points from 6.25% to 6.5%	Neutral
5-Oct-18	Unchanged at 6.5%	Calibrated tightening
5-Dec-18	Unchanged at 6.5%	Calibrated tightening
7-Feb-19	Reduce by 25 basis points from 6.5% to 6.25%	Neutral
4-Apr-19	Reduce by 25 basis points from 6.25% to 6%	Neutral

⁶ Liquidity ratios are cash reserve requirement (CRR) and statutory liquidity ratio (SLR). See Figure 2 for the evolution of these ratios since the adoption of flexible inflation targeting.

⁷ As discussed in the next section, we present results with the monetary policy surprises only, and including all additional controls in the baseline specification. The latter case, a less parsimonious model, reduces the efficiency of parameter estimates due to lower degrees of freedom. Thus, we also estimate each model by including additional controls individually, along with monetary policy surprises. The parameter estimates for monetary policy surprises are similar across specifications. Results are available upon request.

6-Jun-19	Reduce by 25 basis points from 6% to 5.75%	Accommodative
7-Aug-19	Reduced by 35 basis points from 5.75% to 5.40%	Accommodative
4-Oct-19	Reduced by 25 basis points from 5.40% to 5.15%	Accommodative
5-Dec-19	Unchanged at 5.15%	Accommodative
6-Feb-20	Unchanged at 5.15%	Accommodative
27-Mar-20	Reduced by 75 basis points from 5.15% to 4.40%	Accommodative
22-May-20	Reduced by 40 basis points from 4.40% to 4%	Accommodative
6-Aug-20	Unchanged at 4%	Accommodative
9-Oct-20	Unchanged at 4%	Accommodative
4-Dec-20	Unchanged at 4%	Accommodative
5-Feb-21	Unchanged at 4%	Accommodative
7-Apr-21	Unchanged at 4%	Accommodative

Source: Reserve Bank of India.

To measure the monetary policy surprises, three approaches are used. First, the change in the OIS rates at short maturity (1-month) is used. Recent studies (e.g., Lloyd 2018) show that OIS rates represent market-based measures of monetary policy expectations reasonably well in comparison to the earlier strand of the literature using Federal Funds Futures for U.S. monetary policy expectations. Altavilla and others (2019) rely on OIS rates for their study measuring ECB monetary policy. In India, the market is dominated by MIBOR-OIS, with a large increase in activities across different maturities in recent years (RBI 2021a).

While the change in OIS rates at a short maturity by itself is a useful proxy for monetary policy surprises, variation in other short-term OIS rates and longer-term treasury securities could entail further information about the direction of monetary policy. As a second approach, following Gürkaynak, Sack, and Swanson (2005) and the related literature afterwards, a principal component analysis of the OIS and treasury securities to extract monetary policy surprises from the unobserved factors is performed. The factor structure is presented as follows:

$$X = F\Lambda + \eta \quad (2)$$

where X is a $T \times n$ matrix, with rows corresponding to monetary policy announcements, columns corresponding to asset prices, and each element of X reporting the change in the corresponding asset price; F is a $T \times k$ matrix of unobserved factors (with $k < n$), Λ is a $k \times n$ matrix of factor loadings, and η is a $T \times n$ matrix of white noise disturbances. Unobserved factor matrix F is estimated using the standard method of principal components applied to the data matrix X , which includes changes in OIS (1-month, 3-month, 6-month) and treasury securities (2-year, 5-year and 10-year). All variables are standardized to have zero mean and unit variance.⁸

The principal component analysis shows that the first two components explain about 94 percent of variation, but these unobserved factors do not offer any structural interpretation. Gürkaynak, Sack, and Swanson (2005) address this by doing a factor rotation so that the first factor corresponds to surprise changes in the current policy rate and the second factor corresponds to moves in interest rate expectations over a longer term, which are then called “target” and “path factor”. This approach and the two factors in specification (1) are used to assess their impact on the asset prices. Gürkaynak, Sack, and Swanson (2005) associate the target factor with

⁸ In construction of matrix X , we follow the approach taken in Ho and Karagedikli (2021) which looks at the effects of monetary policy communication in Malaysia.

changes in policy interest rates and the path factor with forward-looking monetary policy communication. Brand, Buncic and Turunen (2010) confirm this interpretation using intraday data and separate time windows for ECB announcement of the policy rate decision and forward-looking communication.

For the third approach survey data is used to construct the monetary policy surprises. Bloomberg conducts a survey of market analysts within the 24-hour window prior to the MPC meeting in which analysts report their anticipated policy rate from the forthcoming meeting. In this setting, the difference between the ex-post policy rate (realized after the MPC meeting) and analysts' anticipated rate constitute a policy surprise, which could be written as (Pescatori 2018; Ahokpossi et al. 2020):

$$\Delta i_t = (i_t - E_{t-1}i_t) + (E_{t-1}i_t - i_{t-1}) = \Delta i_t^u + \Delta i_t^a \quad (3)$$

where i_t denotes the central bank policy rate, $E_{t-1}i_t$ is analysts' anticipated policy rate, and Δi_t^u and Δi_t^a are unanticipated (surprise) and anticipated change in policy rate, respectively. As shown in Figure 1, monetary policy surprises in India have become less frequent, but remain sizeable.

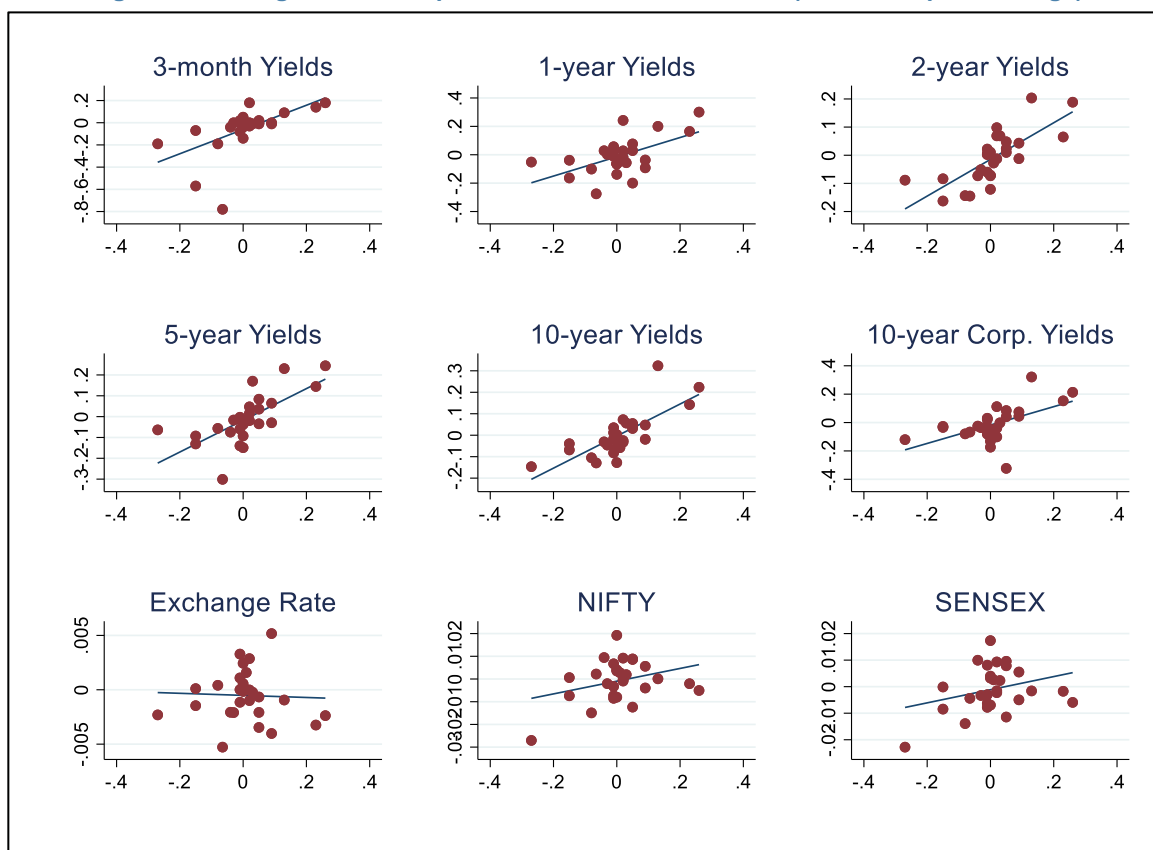
To perform the analysis discussed above, daily data from October 2016 through April 2021 for MPC meeting days (listed in Table 1) is used for the event analysis. Table 1 also shows the decision on policy rate on respective dates, and also the committee's decision on the monetary policy stance, which recently has been geared toward forward guidance. The main data sources are Haver Analytics, the RBI's monetary policy statements, and press releases. RBI's actions on conventional or unconventional policy tools enter the regression specification (1) either in continuous form (such as change in cash reserve ratio (CRR) and the statutory liquidity ratio (SLR) or as an indicator variable (for the targeted longer-term refinancing operation (TLTRO), asset purchases, operation twists, or forward guidance) if any announcements are made as part of the resolution of the MPC or statement by the governor. The impact of these policy actions may already be reflected in OIS rate changes, but we control for them and for the other macro variables to address omitted variable bias problem, and to test for a plausible independent impact, if any, on the asset prices.

V.II Results

At a first pass, the scatter plot of one-month OIS rate changes (on the x-axis) and change in government and corporate securities across different maturities, and other asset prices (exchange rate and stock index) is presented in Figure 7. The results show that the association between monetary policy surprises and government security and corporate yields across all maturities are positive and strong, while this is less evident for the exchange rate and stock prices in the Indian case.

Moving to the results from the regression analysis using specification (1), first relying on OIS rate changes as a proxy for the policy surprise, Table 3a presents results from the reduced form, and Table 3b shows results from the model including additional control for other monetary actions. The results for government security yields imply that, on average, a one percent surprise tightening in the policy rate leads to a 109 basis point (89 basis points when controlling for the other announcements) increase in the three-month yield and a 75 (71) basis point increase in the 10-year yield. Both estimates are highly statistically significant. Table 3a and 3b also suggest that the estimated coefficients, on average, become smaller as we move toward the longer end of the yield curve (and for long-term corporate bonds), but the differences are not statistically different. The impact on exchange rate and stock prices are not statistically significant at the conventional confidence level.

Figure 7: Overnight Index Swap and Asset Price Correlations (% or basis point change)



Sources: Reserve Bank of India, Haver Analytics; and authors' estimates.

Note: Scatter plot for daily change in 1-month OIS rates (x-axis) and asset prices (y-axis).

Table 3a: Response of Asset Prices to Changes in OIS Rates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Government Securities					Corporate	Exchange Rate	Nifty Index
	Three-month	One-year	Two-year	Five-year	Ten-year	Ten-year		
Δ OIS Rate	1.09*** (0.32)	0.68*** (0.22)	0.65*** (0.14)	0.76*** (0.19)	0.75*** (0.14)	0.65*** (0.17)	-0.00 (0.00)	0.03 (0.02)
Other controls	No	No	No	No	No	No	No	No
Constant	-0.06* (0.03)	-0.01 (0.02)	-0.01 (0.01)	-0.02 (0.02)	-0.00 (0.01)	-0.02 (0.02)	-0.00 (0.00)	-0.00 (0.00)
Observations	28	28	28	28	28	28	28	28
R-squared	0.33	0.31	0.56	0.47	0.58	0.30	0.00	0.10

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3b: Response of Asset Prices to Changes in OIS Rates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Government Securities					Corporate	Exchange Rate	Nifty Index
	Three-month	One-year	Two-year	Five-year	Ten-year	Ten-year		
Δ OIS Rate	0.89** (0.39)	0.68*** (0.24)	0.63*** (0.14)	0.71*** (0.15)	0.71*** (0.17)	0.78*** (0.20)	-0.00 (0.01)	0.02 (0.02)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.04 (0.04)	-0.00 (0.03)	-0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	-0.00 (0.02)	-0.00 (0.00)	-0.00 (0.00)
Observations	28	28	28	28	28	28	28	28
R-squared	0.67	0.46	0.71	0.77	0.65	0.52	0.31	0.30

Notes: Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Other controls include the RBI's forward guidance, LTRO, asset purchase announcements, and change in federal fund rate, 10-year US yields, oil price and VIX.

Table 4 reports results using the target and path factors for the analysis. Results for the target factor are broadly consistent with the change in the OIS rates shown above, with statistically significant impact throughout rates with different maturities. The impact is largest for the three-month rate, consistent with the interpretation that the target factor measures the surprise component associated with the near-term policy rate decision. Table 4a shows that the estimates of the effect of the path factor is statistically significant and large for one-year and longer yields. The impact on three-month yields is not significant. Beyond one-year, on average, the estimated impact of path factor on yields is much greater than that of target factor, meaning that the forward-looking monetary policy communication captured in the path factors conveys important information about the future direction of monetary policy. With much larger R^2 statistics, Table 4b suggests that, including other potential policy actions, monetary policy communication does play an important role for the asset prices as the variation in yields seems to be largely explained by the two-factor model. These results confirm the importance of the information content of the MPC decision and governor's statements, as key monetary policy communication tools. As presented in Table 1, during the sample period, the key policy rate was changed only at 11 of 28 MPC meetings. In particular, the main source of information on the monetary policy stance more recently stems from the forward guidance on the monetary policy stance, which was included for the first time in the October 2019 MPC statement as "state" contingent guidance ("... as long as it is necessary ..."). Further, the October 2020 statement included explicit time-based guidance to address market uncertainty about the duration of the stance ("...this fiscal year and next...") of monetary policy. Intra-day data gives further evidence on the impact of policy communication from the October 9, 2020 event (Figure 6), which is instructive in that the observation serves as a controlled experiment, with almost no changes in other policy measures.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Government Securities					Corporate	Exchange Rate	Nifty Index
	Three-month	One-year	Two-year	Five-year	Ten-year	Ten-year		
Target factor	1.16*** (0.33)	0.75*** (0.14)	0.66*** (0.05)	0.80*** (0.07)	0.77*** (0.07)	0.67*** (0.12)	0.00 (0.00)	0.03 (0.02)
Path factor	0.72 (0.49)	0.73*** (0.23)	0.73*** (0.06)	1.03*** (0.13)	0.77*** (0.15)	0.72*** (0.22)	0.00 (0.01)	-0.03 (0.02)
Other controls	No	No	No	No	No	No	No	No
Constant	-0.05* (0.03)	-0.01 (0.02)	-0.01 (0.01)	-0.01* (0.01)	0.00 (0.01)	-0.01 (0.02)	-0.00 (0.00)	-0.00 (0.00)
Observations	28	28	28	28	28	28	28	28
R-squared	0.43	0.55	0.89	0.92	0.89	0.49	0.00	0.13

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Government Securities					Corporate	Exchange Rate	Nifty Index
	Three-month	One-year	Two-year	Five-year	Ten-year	Ten-year		
Target factor	0.83** (0.30)	0.77*** (0.18)	0.69*** (0.06)	0.76*** (0.05)	0.79*** (0.09)	0.86*** (0.16)	-0.00 (0.01)	0.02 (0.02)
Path factor	0.73** (0.30)	0.83** (0.29)	0.76*** (0.09)	0.88*** (0.12)	0.90*** (0.15)	0.96*** (0.21)	-0.00 (0.01)	-0.01 (0.02)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.05 (0.03)	-0.01 (0.02)	-0.02** (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.01 (0.02)	-0.00 (0.00)	-0.00 (0.00)
Observations	28	28	28	28	28	28	28	28
R-squared	0.67	0.62	0.95	0.95	0.94	0.73	0.32	0.31

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See Table 3b for additional notes.

To complement the cross-country evidence on the monetary policy surprises from Figure 1, Table 5 presents the results in using the unanticipated and anticipated policy changes constructed from analysts' surveys. The results are broadly consistent with those from Tables 3 and 4. The monetary policy surprises, unanticipated changes in the policy rate, on average, have statistically significant impact on the government security and corporate yields, and no effect on the exchange rate and stock market. In their exercise for Indonesia in Ahokpossi et al. (2020) show that the monetary policy surprises have significant impact on the money market rates but not on the bond yields, attributing this to a shallow financial market and incomplete yield curve. However, the findings here suggest that monetary policy surprises impact yields at all maturities are similar to Pescatori (2018), which examines the impact of unanticipated monetary policy changes in Chile.

Table 5a: Response of Asset Prices to Anticipated and Unanticipated Policy Change

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Government Securities					Corporate	Exchange Rate	Nifty Index
	Three-month	One-year	Two-year	Five-year	Ten-year	Ten-year		
MP Surprise	0.50*** (0.10)	0.44* (0.22)	0.37*** (0.09)	0.42*** (0.10)	0.35*** (0.12)	0.46*** (0.15)	-0.00* (0.00)	0.02* (0.01)
Anticipated Change	0.05 (0.10)	-0.14 (0.17)	-0.06 (0.09)	-0.11 (0.08)	-0.23** (0.09)	-0.13 (0.17)	-0.00 (0.00)	0.01 (0.01)
Other controls	No	No	No	No	No	No	No	No
Constant	-0.01 (0.01)	-0.02 (0.02)	-0.02 (0.01)	-0.02 (0.02)	-0.02 (0.01)	-0.03* (0.02)	-0.00 (0.00)	-0.00 (0.00)
Observations	24	24	24	24	24	24	24	24
R-squared	0.62	0.42	0.47	0.55	0.54	0.39	0.09	0.12

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

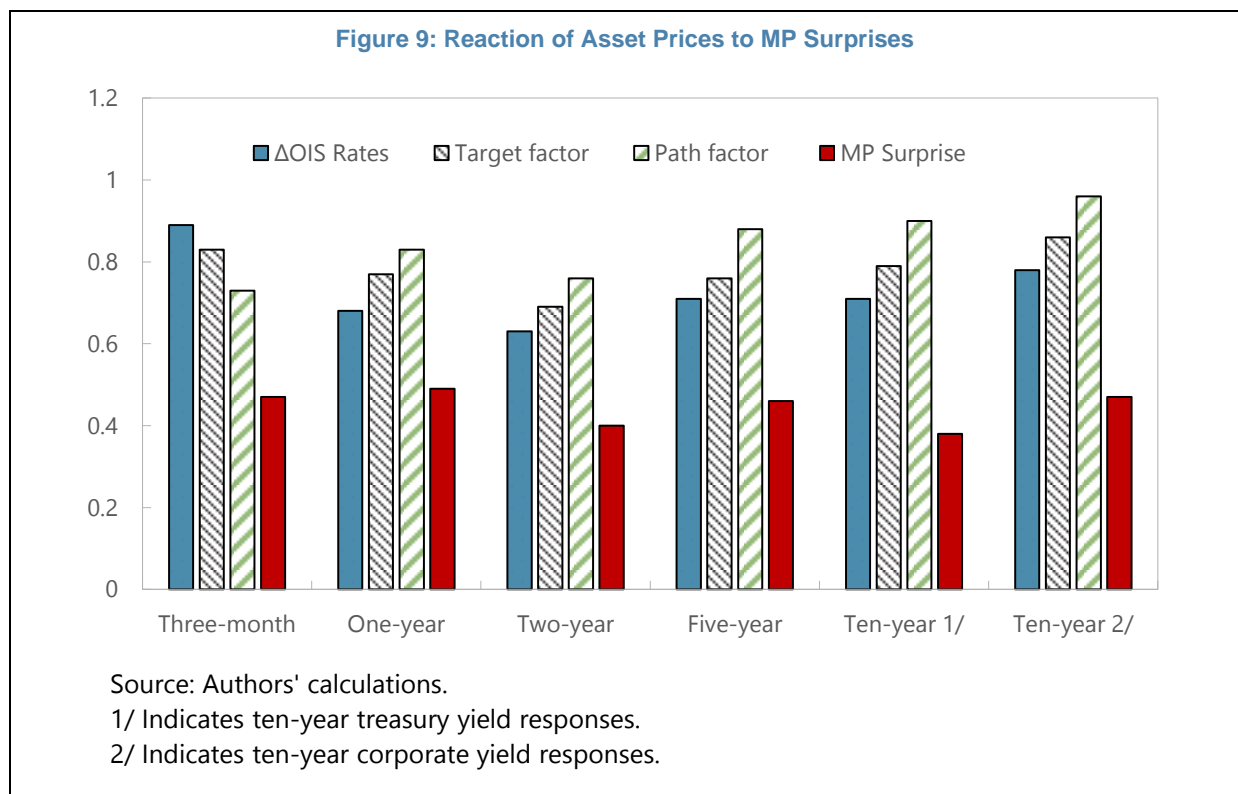
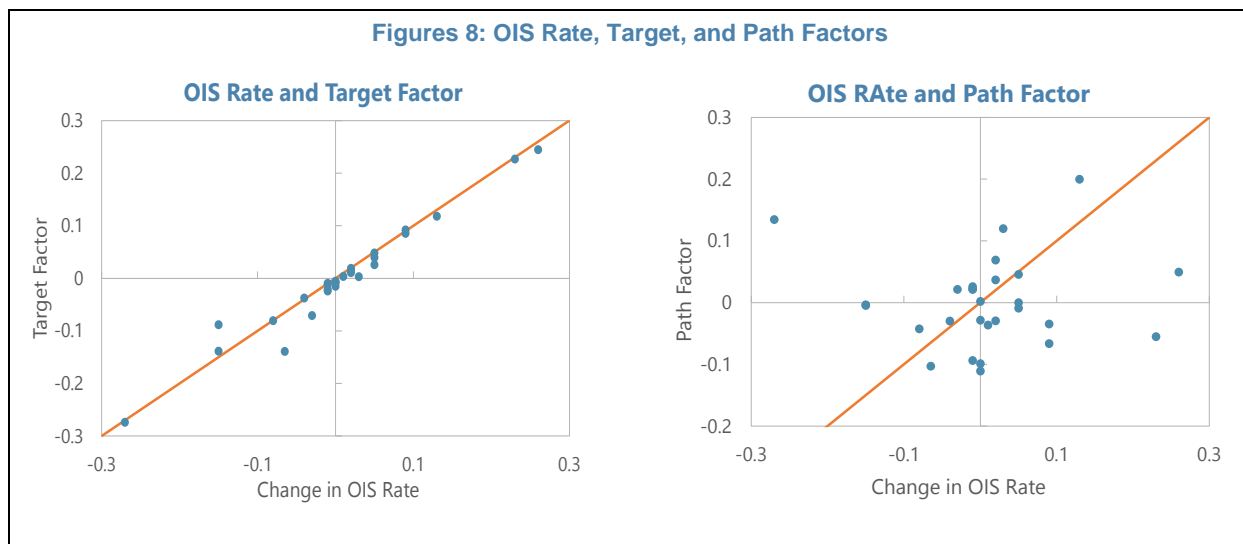
Table 5b: Response of Asset Prices to Anticipated and Unanticipated Policy Change

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Government Securities					Corporate	Exchange Rate	Nifty Index
	Three-month	One-year	Two-year	Five-year	Ten-year	Ten-year		
MP Surprise	0.47*** (0.13)	0.49* (0.24)	0.40*** (0.10)	0.46*** (0.10)	0.38** (0.14)	0.47** (0.21)	-0.01 (0.00)	0.01 (0.01)
Anticipated Change	0.04 (0.11)	-0.17 (0.20)	-0.09 (0.09)	-0.11 (0.08)	-0.24* (0.12)	-0.09 (0.18)	-0.00 (0.00)	0.01 (0.01)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.01 (0.01)	-0.02 (0.03)	-0.02 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.02 (0.02)	-0.00 (0.00)	-0.00 (0.00)
Observations	24	24	24	24	24	24	24	24
R-squared	0.67	0.49	0.69	0.80	0.65	0.54	0.32	0.49

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See table 3b for additional notes.

Figures 8 and 9 summarize results from alternative approaches. Scatter plots of estimated target and path factors and the change in one-month OIS rates are presented. A close association between target factor and OIS change reflects that these two indicators capture similar information about shorter-term changes in markets, while the path factor has additional information, which could be attributed to forward looking communication. Finally, the summary of estimated coefficients from regression tables above using three

alternative approaches across the different segments of the yield curve are presented in Figure 9. Consistent with the scatter plots (Figure 8), the impact of OIS changes and target factors are similar and larger for the shorter end of the yield curve (including both for the government and corporate securities), the path factor explains larger change at the longer end, while the unanticipated change in monetary policy has a smaller and uniform effect across different maturities.



Among the additional control variables, a significant effect of forward guidance from October 2020, and the extended lending/term-funding (long-term repo operations/ TLTRO) facilities particularly on the middle segment

of the yield curve (2-year and 5-year bonds) are found. Additional analyses are also done to examine the impact of outright asset purchases and the operation twists. While outright purchases had limited impact on government bond yields, operation twists had some impact on the term spread (measured by the change in spread between 10-year and 1-year yields), consistent with the RBI (2020, 2021b) findings.

VI. Conclusion

The RBI's monetary policy communication has evolved since the introduction of flexible inflation targeting in 2016. This includes a set of communication tools, including monetary policy statements and minutes, press releases, and the governor's press conference and an increasing role for explicit forward-looking communication about the policy stance and asset purchases, as observed when the pandemic-related monetary and financial sector measures were unveiled in 2020. The paper highlights that forward guidance announcements in India influenced asset prices and have facilitated a reduction in financial market uncertainty amid increased inflationary pressures. Furthermore, quantitatively, the announcement impacts of asset purchases in India are estimated to be broadly in line with those in other emerging markets. Specifically, a review of the recent innovations of monetary policy communications suggests that forward guidance likely played a key role in moderating uncertainty and supporting some asset prices during the pandemic. We also find that the relationship between monetary policy surprises and yields for government and corporate securities across all maturities are positive and statistically significant in India, less so for exchange rate and equity prices, broadly in line with what is observed in other emerging markets. The paper finds that monetary policy communication, including forward guidance, impacts longer-term yields for government securities, consistent with the interpretation that monetary policy communication conveys important information about the future direction of monetary policy. This is confirmed by a narrative analysis of the intraday data, which suggests that specific forward guidance announcements facilitated a reduction in market uncertainty and helped guide longer-term interest rates. For example, the RBI's decision on October 9, 2020 and the governor's statement on forward guidance was more specific about the duration of the RBI's accommodative stance, contributing to a decline in 10-year rates on the same day. The results support an important role for monetary policy communication in guiding market expectations about the monetary policy stance, including the likely path of policy interest rates.

For communication to be useful as an independent policy tool it has to be consistent and credible with the overall macroeconomic context. For example, the degree to which forward guidance can moderate long-term rates is impacted by overall liquidity conditions, inflation expectations, and accumulated monetary policy credibility. Looking forward, RBI monetary policy communication has an important role to play in providing guidance on the likely path of policy normalization, including durable liquidity and the relative sequencing of phased absorption of excess liquidity and future policy rate actions. In this context, consistent communication of any change in the policy reaction function as the recovery strengthens can help guide market expectations, especially amid elevated global and domestic inflationary pressures and the expected tightening in monetary policy in the advanced economies.

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PUBLICATIONS

Monetary Policy Communications and Financial Markets in India
Working Paper No. WP/2022/209