Measuring Monetary Policy Communication: The Indian Experience

by Michael Debabrata Patra, Shweta Kumari and Indranil Bhattacharyya ^

Applying natural language processing (NLP) techniques, this article finds that uncertainty induced by the pandemic and the Russia-Ukraine conflict led to longer monetary policy statements by the Governor in which reassurance was provided through confidence building words. While the overall duration of press conferences fluctuated, significant improvement in readability of transcripts was recorded over time. Market volatility on the policy announcement day remained range bound and similar to non-policy days. Intraday volatility appeared to pick up before the start of the Governor's statement, but it tapered off by the time of conclusion of the press conference.

Introduction

Since the turn of this century, central banks have shed their traditional reticence and constructive ambiguity to communicate more openly and clearly about monetary policy goals and strategies. The objective is to manage the public's expectations consistent with the policy stance as also to enhance accountability in the public eye. During the global financial crisis of 2008 and thereafter – especially during and after the pandemic – challenges such as the zero lower bound on interest rates and acute anxiety about the loss of life and livelihood and the recent inflation surge resulted in communication being elevated to the status of an instrument. Monetary policy communication performed the role of an anchor in an ocean of fear and vast unknowns (Patra, 2024).

While the quantity of monetary policy communication has certainly increased, whether or not it has been effective in navigating the surrounding uncertainty and in engaging the public, thereby instilling public understanding, confidence and trust, remains an unsettled question. It has been pointed out that 95 per cent of monetary policy communication is not understood by 95 per cent of the people (Haldane, 2017). It is in this context that evaluating the quality of communication in terms of its clarity, ease of understanding and resonance with the shaping of public expectations assumes importance.

These issues assume relevance in India for a similar rationale. Accordingly, natural language processing (NLP) methodologies are being employed in the Reserve Bank of India since 2022 to assess the efficacy of monetary policy communication by extracting quantitative information from unstructured/semi-structured text heavy sources such as news articles, social media and formal documents. While NLP or text mining is similar to reading, these computer-enabled approaches can process and summarise far more text than a human reader can. Moreover, these tools can also extract meaning from text that is missed by the human eye, including due to 'blind spots' formed by prior beliefs and expectations (Bholat *et al.*, 2015).

The first such effort in the RBI analysed resolutions of the monetary policy committee (MPC) using NLP methodologies during October 2016 to October 2023 which showed that inflation remained central to the discussions. During the pandemic (March 2020 to February 2022); liquidity and its distribution to pandemic hit entities and agents received central focus (RBI, 2024). With the

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geopolitical crisis in 2022, inflation returned as the core topic (March 2022 to October 2023). This was complemented by a study that examined the tone of pandemic and post-pandemic monetary policy communication using a customised dictionary and assessing the impact of communication on overnight indexed swap rates (Kumari and Kuruganti, 2024).

This article extends these initial efforts and focuses on the Governor's monetary policy statement and the press conference that immediately follows, which provides a quick assessment of the impact of the statement on the wider public opinion for which the financial market acts as a proxy. It employs text modelling to these statements over the period 2019 to 2024, supplemented by an examination of the impact on financial markets in terms of daily market volatility as well as intraday volatility on the monetary policy day. Intraday market patterns are complemented by the analysis of press conferences in the context of confirmation, reconsideration or reinforcement of policy decisions.

The key findings are that uncertainty induced by the pandemic and the Russia-Ukraine conflict led to longer statements and reassurance was provided through confidence building words. While the overall period of press conferences fluctuated, significant improvement in readability of transcripts was recorded. Market volatility on the policy announcement day remained range bound. Intraday volatility appeared to pick up before the start of Governor's statement, but it tapered down quickly.

As for the rest of the article, Section II undertakes a focused survey of the select literature to draw out the underlying motivation of the article and the rationale underlying the choice of methodology which is presented in Section III. The results are set out in Section IV. Some policy perspectives that emerge from the analysis are given in Section V which concludes the article.

II. Gleanings from the Literature

State-of-the-art text-mining methodologies employed on conventional and unconventional monetary policies during the COVID-19 crisis suggest that central bank communications reflected considerable uncertainty and heterogeneity during the pandemic, over time and across communication types. Moreover, such communications were more reactive than during the global financial crisis (GFC) and the dot-com crisis (Benchimol *et al.*, 2021).

The clarity of central bank communication conditions the attention of journalists and social media users and, in turn, the wider public. The application of language complexity tools as a proxy for communication clarity (or lack of) shows that greater complexity is significantly correlated with lower levels of media coverage (Ferrara and Angino, 2022). Overall, communication clarity is found to be a significant and robust predictor of media engagement.

The hosting of post-policy press conferences has gained legitimacy across major central banks in which monetary policy decisions are explained in detail and journalists are given the opportunity to question top central bank officials. Analysing how financial markets perceive the explanations provided by central banks on monetary policy decisions in these press interactions shows that the information content is closely linked to the nature of the policy decision: the less a decision has been anticipated by the market, the stronger is the reaction to the introductory statement, suggesting that the statement contains relevant explanations for the reasons underlying the decision (Ehrmann and Fratzscher, 2009). Press conferences are found to have a larger effect on financial markets, on average, than the policy decisions. Question and answer (Q&A) sessions in press conferences are found to play a clarificatory role, in particular, during periods of large macroeconomic uncertainty.

Intraday trading data reveal that market volatility is more than three times higher during the press conferences of the current Fed Chair than during press conferences of his two immediate predecessors (Narain and Sangani, 2023). Press conferences since the beginning of Covid-19 are found to be largely responsible for the heightened volatility in the recent period. It is also observed during this period that the market tends to move in the opposite direction during press conferences *vis-a-vis* its movement following the publication of the FOMC statement. In contrast, press conferences during the previous two Fed Chairs tended to reinforce the market's initial reaction to the information released in the FOMC statement. Text analysis of the Q&A portions of the current Fed Chair's press conferences suggest that the choice of language is highly correlated with market movements.

III. Data and Methodology

In India, the MPC's resolutions and minutes are structured communication documents deliberating on the goal variables and strategies. By contrast, the Governor's statements are more flexible in terms of design and content coverage in the assessment of growth and inflation as well as other aspects such as liquidity and financial market conditions, external sector developments, financial stability as well as developmental and regulatory measures. During the period of study (2019 to 2024), 39 statements were delivered in all, with two statements made outside the MPC meeting cycle – one in April 2020 at the outbreak of the pandemic and another in May 2021 at the peak of the second wave. "*Footnotes*" represent a distinguishing feature of these statements, highlighting data-driven insights.

III.1 Governor's Statements

In pursuance of the central motivation of this article set out in Section I, specific words related to uncertainty and confidence in the Governor's statements have been identified and customised dictionaries have been developed to capture the subtle nuances of narrative communication. While the uncertainty dictionary is influenced by the widely used uncertain wordlist (Loughran-McDonald, 2011), the confidence dictionary is constructed from the corpus of words found in the Governor's statements. Words such as *uncertain*, *volatile*, *unprecedented* and their variants are identified as words expressing uncertainty. On the contrary, confidence inspiring words include terms such as *watchful*, *calibrate*, *nimble*, *vigilant*, *resolute* and *proactive*.

As the size of statements varied over time, a normalised measure of uncertainty has been computed as the proportion of number of sentences containing uncertainty terms to total number of sentences during a particular period. The confidence index has been similarly derived, as specified below:

$$\text{Uncertainty Index} = \text{UN}_{i|t} = \frac{\sum_{j=1}^{m} S_{i|t}^{j}}{\sum_{i=1}^{n} S_{i|t}} * 100 \qquad \dots (1)$$

$$\text{Confidence Index} = \text{CF}_{i|t} = \frac{\sum_{k=1}^{p} S_{i|t}^{k}}{\sum_{i=1}^{n} S_{i|t}} * 100 \qquad \dots (2)$$

where,

$S_{i|t}$ is a sentence pertaining to topic "i" in the Governor's statement of period "t"

$S_{i|t}^{j}$ is a sentence with uncertainty term, pertaining to topic "i" in period "t"

$S_{i|t}^{k}$ is a sentence with confidence term, pertaining to topic "i" in period "t"

These normalised indices have been used for comparison across the various statements during the study period.

III.2 Press Conferences

The press conferences that follow the Governor's statements provide an avenue to elaborate and emphasise the considerations behind policy decisions, including 'surprises'. The Governor's statement is telecast from 10 am (IST). Two hours later – at around 12 pm (IST) – the press conference is telecast live comprising (i) the Governor's opening remarks; and (ii) a question-and-answer session.

A key feature of the press conferences is ease of clarity and understanding, as gauged from readability scores of transcripts. Readability indicators are typically based on sentence size, word size and pronunciation aspects. Alternate indices *viz.*, Automated Readability Index (ARI), Flesch-Kincaid grade level (FK) and Gunning-Fog index (GFI) are used for comparability and robustness checks. The indices vary in their computation; however, the interpretation remains similar *i.e.*, lower values of all these indices imply higher readability.

$$ARI = 4.71 * \left(\frac{\text{total characters}}{\text{total words}}\right) + 0.5 * \left(\frac{\text{total words}}{\text{total sentences}}\right) - 21.43 \quad (3)$$

$$FK = 11.8 * \left(\frac{\text{total syllables}}{\text{total words}}\right) + 0.39 * \left(\frac{\text{total words}}{\text{total sentences}}\right) - 15.59 \quad (4)$$

$$GFI = 0.4\left[\left(\frac{\text{total words}}{\text{total sentences}}\right) + 100 * \left(\frac{\text{total complex words}}{\text{total words}}\right)\right] \quad (5)$$

where a complex word is a defined as one with 3 or more syllables.

III.3 Financial Markets Volatility

In the first stage, market volatility on the monetary policy announcement day is examined *vis-à-vis* non-monetary policy announcement days of the same month. India VIX of daily frequency is considered as a measure for market volatility. In the second stage, intraday patterns in the stock market are analysed in different time windows in terms of squared returns of the NIFTY 50 index in intervals of 5 minutes, as indicated below.

$$\text{Squared Return} = RT_{t|d} = \left[100 * \left(\ln N_{t|d} - \ln N_{t-5|d}\right)\right] ^\wedge 2 \quad \ldots (6)$$

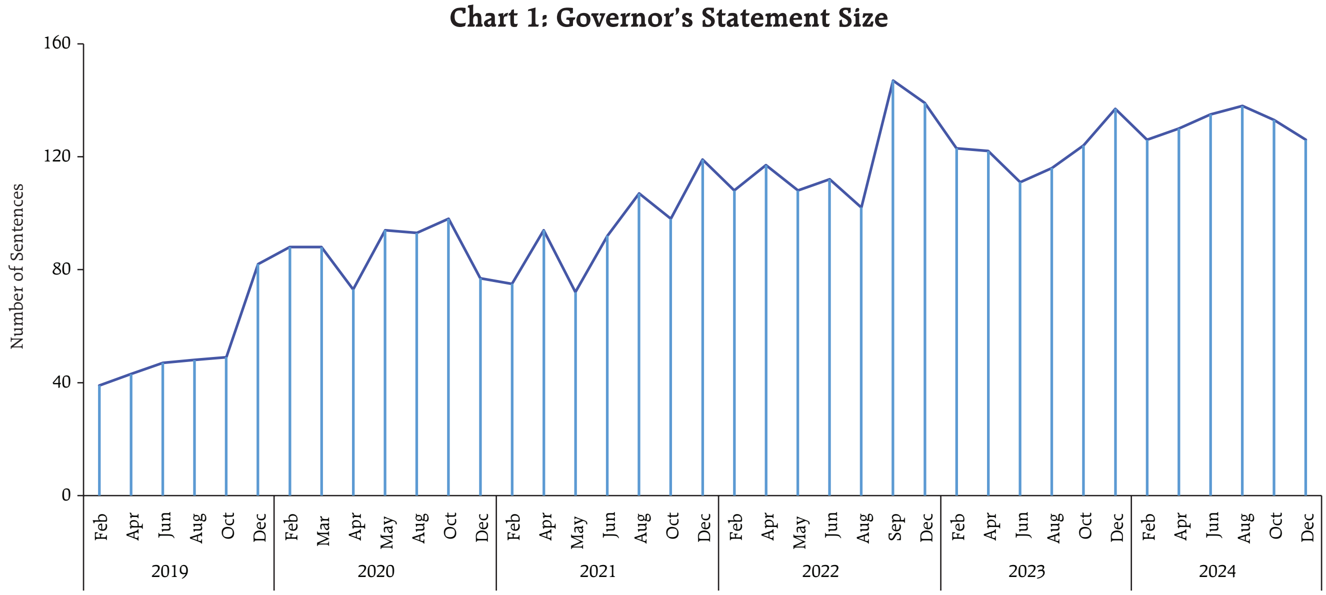
where $N_{t|d}$ indicates NIFTY50 index at minute "t" on monetary policy day "d".

India VIX daily data has been obtained from the website of the National Stock Exchange (NSE), while intraday minute-by-minute tick data has been sourced from Bloomberg. This analysis is carried out for monetary policy days only as the aim is to understand how the policy decisions influence market reactions, and how the press conference adds or reduces volatility.

IV. Empirical Findings

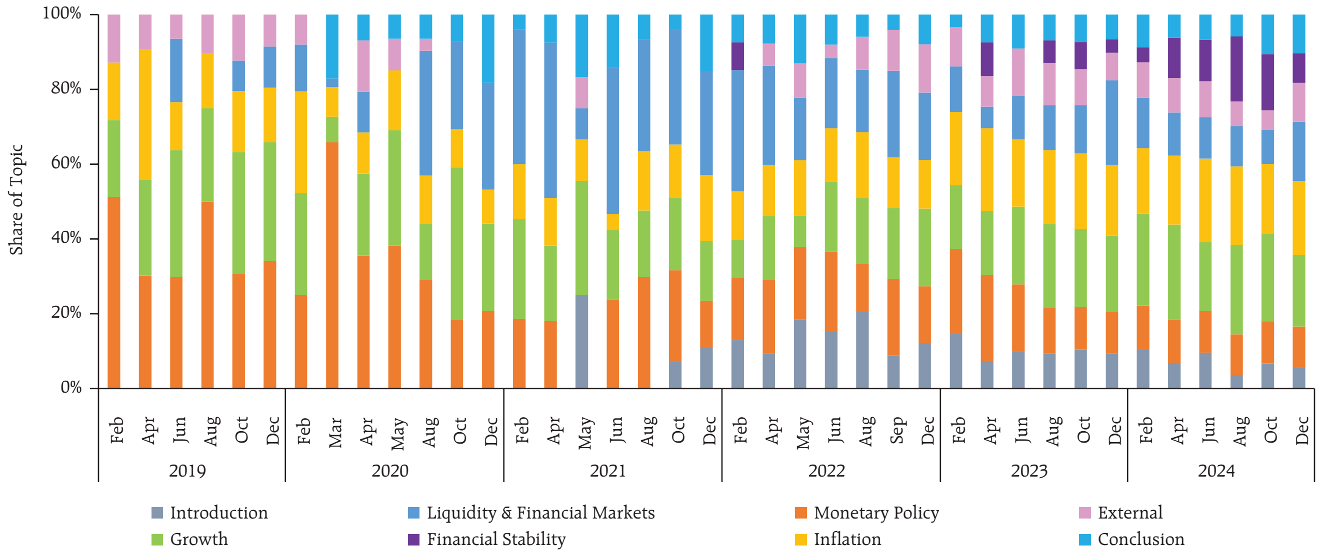
The size of the Governor's statements, measured in terms of number of sentences, varied over the study period (Chart 1). Uncertainty induced by the

Chart 1: Governor's Statement Size



Sources: RBI; and Authors' estimate.

Chart 2: Topic Prevalence in Governor's Statements



Sources: RBI; and Authors' estimate.

pandemic and the Russia-Ukraine conflict were marked by longer statements, presumably reflecting efforts to explain in detail the evolving scenario and the measures taken to tide over the unprecedented situation.

Along with the size, the coverage and relative emphasis on various topics also shifted to reflect changing circumstances (Chart 2), pointing to adaptations in communication strategy to address emerging challenges.

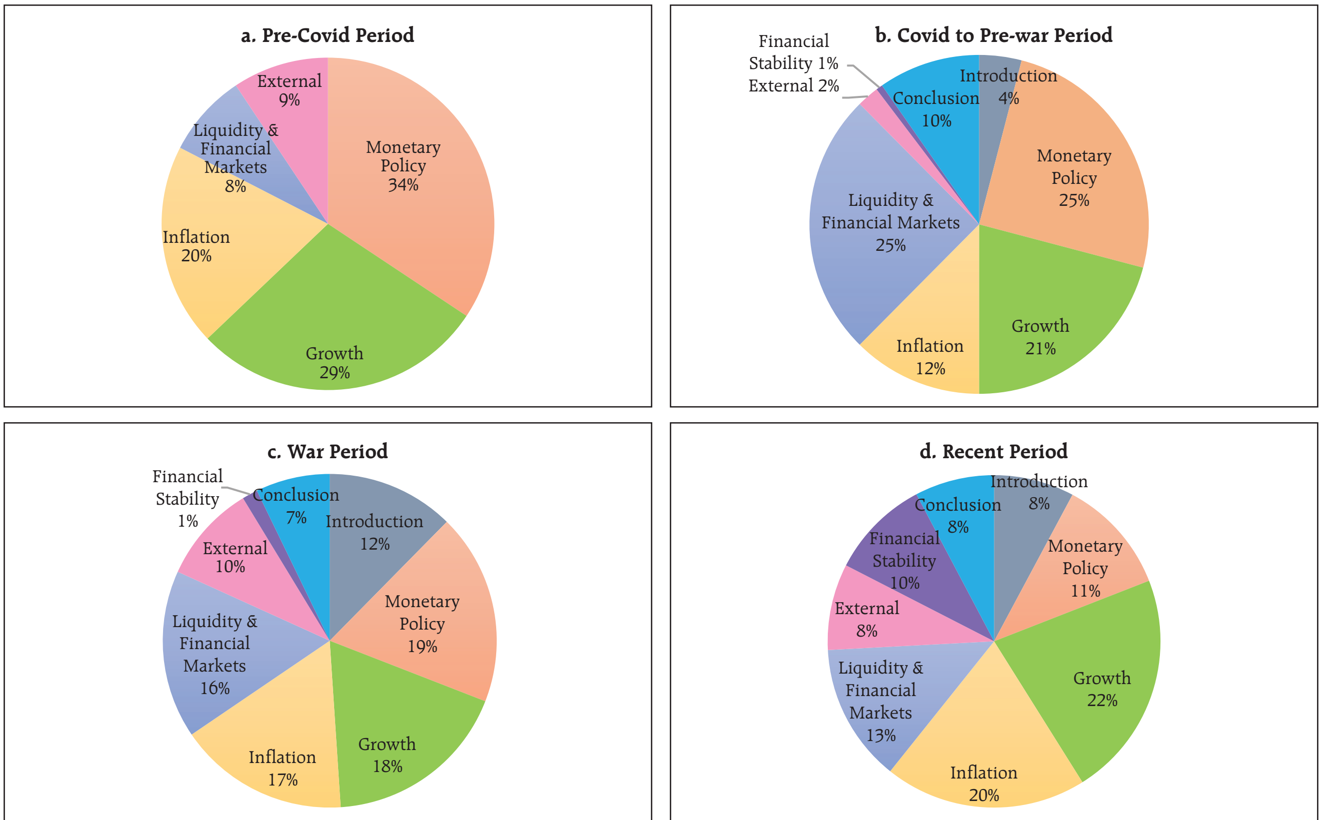
Categorising the study period into different phases yields significant results (Chart 3) (frequently occurring terms within each topic are presented in word clouds in Annex I). "Monetary Policy" emerged as the most discussed topic at the overall level, though its share has reduced in the recent period and more space is being allotted for discussion on other topics. It was followed by "Growth", which occupied considerably larger space than "Inflation" in the Governor's statements, especially prior to April 2022, when multiple waves of the pandemic impacted the economy. This was also reflected in the substantially higher share of "Liquidity" and "Financial Markets" as a topic during the pandemic. These results are a pointer to the use of communication to complement policy actions.

The Russia-Ukraine conflict in 2022 triggered supply disruptions and inflationary pressures worldwide. This resulted in an increasing focus on "Inflation" as a topic in the statements during that period. A higher share is also evident in the recent period[1], indicating the focus on aligning and keeping inflation within the target band on a durable basis in the face of multiple and overlapping food price shocks, including due to weather events.

New sections were introduced in the statements. One is the "Conclusion" section introduced during the pandemic which subsequently became the hallmark of the statement to reassure the public and markets. A distinct "Introduction" section is a recent feature; in the past, it was overlapping with

[1] Since October 2023, a sub-section "What do these Inflation and Growth Conditions mean for Monetary Policy?" has also been part of statements. It has been clubbed with "Inflation" section, as it deliberates primarily on inflation related aspects.

Chart 3: Topic Prevalence in Statement - Period wise



Pre-Covid	Covid to pre-War	War	Recent period
Feb 2019 to Feb 2020	Mar 2020 to Feb 2022	Apr 2022 to Aug 2023	Oct 2023 to Dec 2024

Sources: RBI; and Authors' estimate.

the "Monetary Policy" section. The "External Sector' started getting mentioned as a separate section from April 2022 after the Russia-Ukraine war started, reflecting increasing global interlinkages and related policy implications. "Financial stability" has been introduced as a new section in the Governor's statement since August 2023 and it has had a fairly good share of the deliberation[2].

The interplay of uncertainty and confidence and shifts in communication strategy highlight the dynamic relationship between uncertainty, transparency, clarity and reassurance (Chart 4).

[2] It appeared occasionally in earlier periods, *e.g.* April 2023 and February 2022.

Mentions of uncertainty terms increased significantly at the start of the pandemic in March 2020 and again during the second wave in April 2021 (Chart 5). Even when pandemic scars started to heal, uncertainty lingered due to the Omicron variant, and again due to financial market volatility, global spillovers and persistent supply bottlenecks, as reflected in higher value of the uncertainty index in February 2022. It continued to remain elevated after the outbreak of the Russia-Ukraine war and further accentuated in April 2023 due to the banking sector turmoil in some advanced economies.

As a response to uncertainty, reassurance was also provided in terms of confidence building words (Chart 5). Accordingly, the confidence index

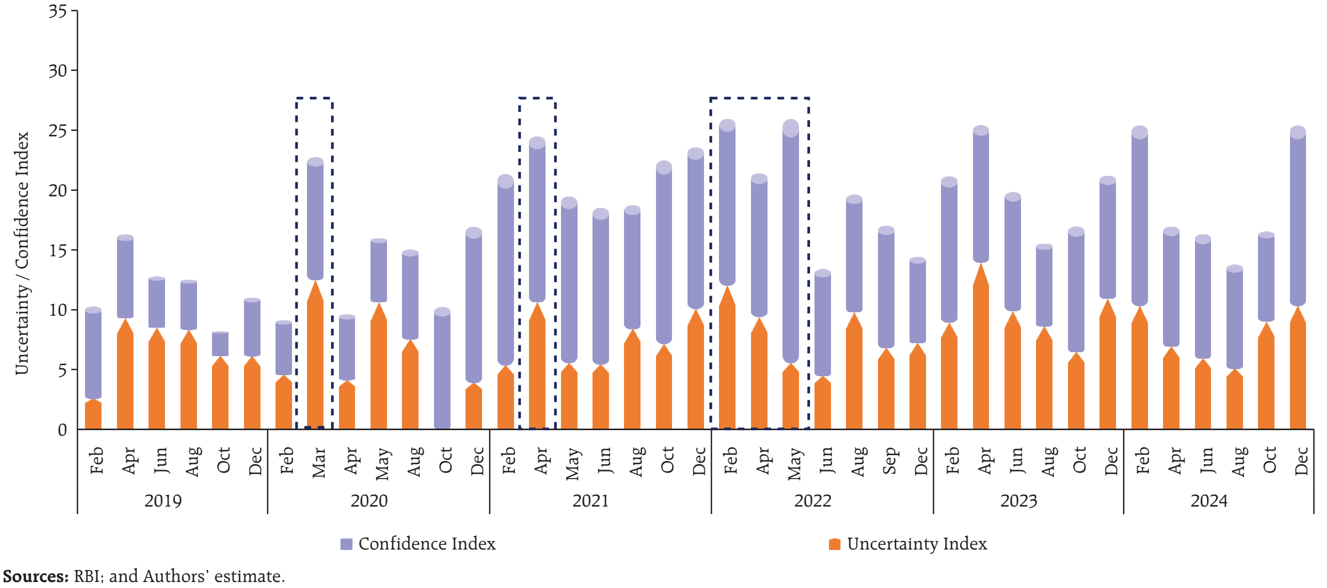
Chart 4: Word Clouds

Sources: RBI; and Authors' estimate.

witnessed a significant increase for the first time in March 2020, and again in 2021. It peaked in May 2022, when an off-cycle MPC meeting was conducted that commenced the rate tightening cycle.

The interplay of uncertainty and confidence index indices differs across periods - while the pre-covid period witnessed low levels of uncertainty and confidence, the period from the pandemic onset to pre-war witnessed a mix of lower and higher levels of uncertainty but with the confidence index generally remaining high[3] (Chart 6). The Russia-Ukraine war period witnessed lower uncertainty (except in April

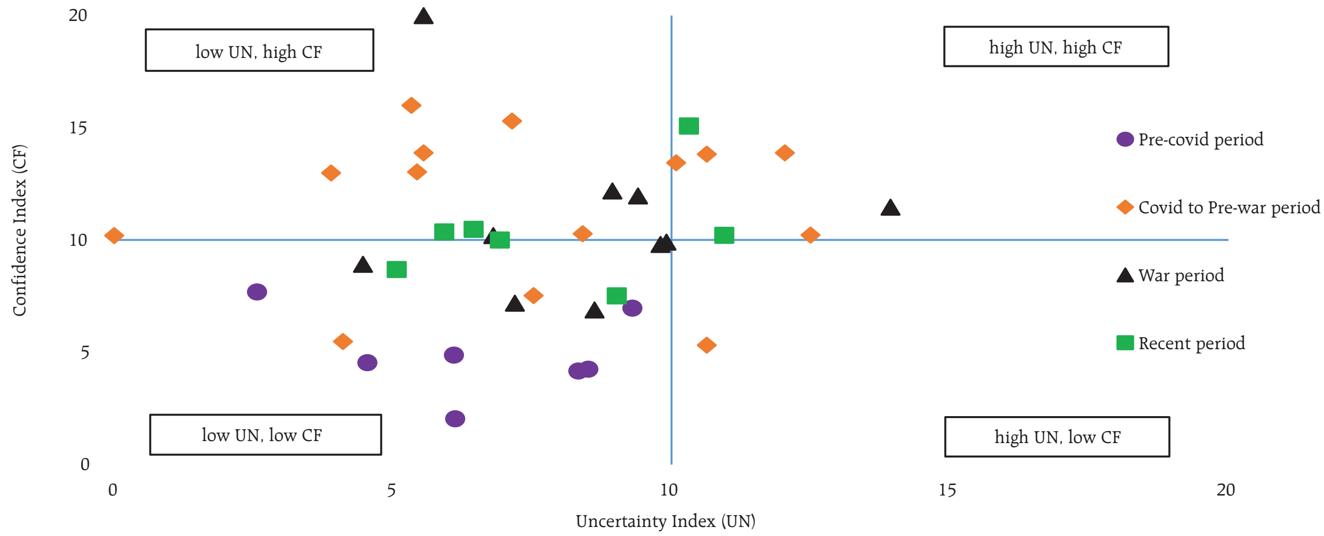
Chart 5: Uncertainty and Confidence



Sources: RBI; and Authors' estimate.

3 Low uncertainty and confidence are characterised by values ranging 0-10 while values between 10-20 indicate high uncertainty and confidence.

Chart 6: Interplay of Uncertainty and Confidence



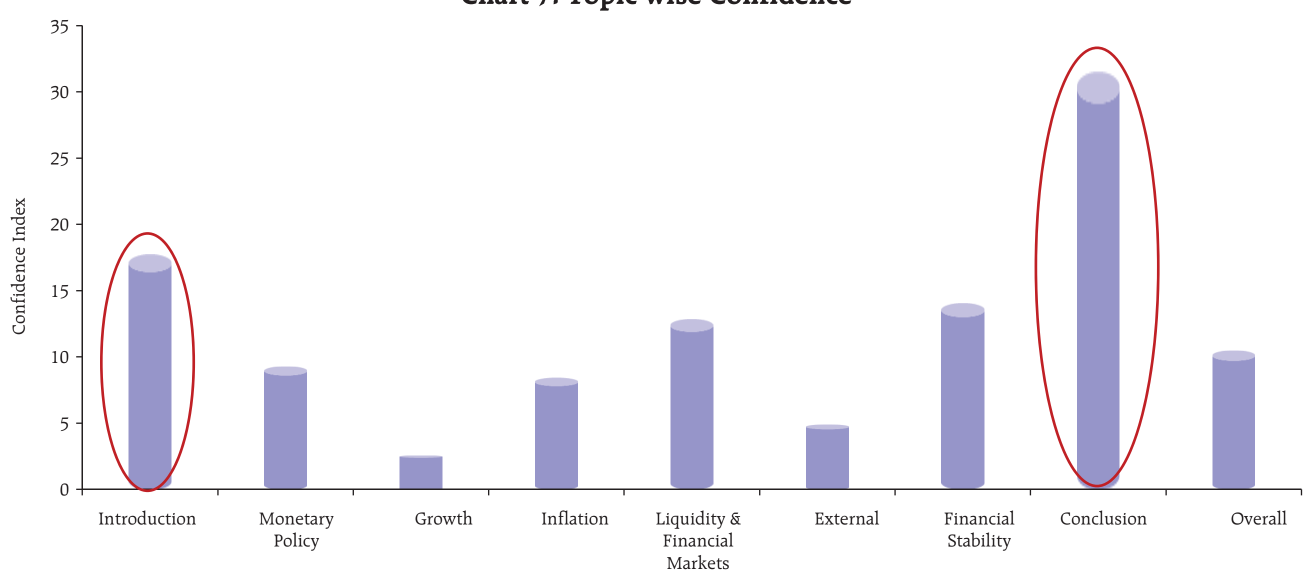
Notes: Mid-point of range (0 to 20) of UN and CF index is taken as separator for above quadrants.
Sources: RBI; and Authors' estimate.

2023), but confidence fluctuated intermittently (with confidence index being at its peak in May 2022).

The inference emanating from these results is that as the Governor's statements are targeted towards the wider public, they have to play a meaningful role in informing and managing expectations. In this context, choice of words matters. In the recent period, while uncertainty indices have been lower than before, the confidence indices have been in the middle range (values of around 10).

In the "Introduction" and "Conclusion" sections of the statements, the level of the confidence index is found to be higher than other sections (Chart 7), reflecting strategic efforts to manage public expectations.

Chart 7: Topic wise Confidence



Sources: RBI; and Authors' estimate.

Chart 8: Press Conference Trends

Sources: RBI; and Authors' estimate.

IV.2 Press Conferences

Press conferences were held after all MPC meetings, except during March to October 2020 owing to the lockdown and social distancing concerns, and also after the off-cycle meeting of May 2022. From December 2020 to February 2022, there were no opening remarks by the Governor. The overall size of the press conferences (number of sentences in transcripts) fluctuated over time, being lower in 2021 and increasing subsequently after introduction of the Governor's opening remarks in April 2022. The number of questions asked also followed a similar pattern (Chart 8).

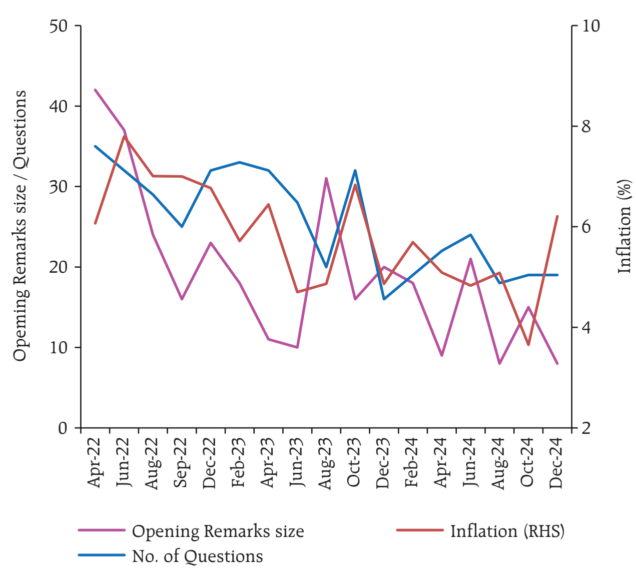
There appears to be close co-movement between the number of questions, the size of opening remarks and inflation (Table 1 and Chart 9). Questions mostly related to monetary policy, inflation, growth and macroeconomic conditions[4].

Table 1: Correlation (April 2022 to Dec 2024)

	Opening remarks size	Inflation
Number of questions	0.42*	0.61***

Note: * and *** indicates statistical significance at 10 and 1 per cent level respectively.
Sources: RBI; and Authors' estimate.

Chart 9: Opening Remarks and Inflation



Sources: RBI; and Authors' estimate.

4 Questions also related to various measures taken by the RBI, such as CBDC in December 2022, ₹2000 denomination withdrawal in June 2023, incremental CRR in August 2023, risk weights in December 2023, Paytm in February 2024, gold movements and bond inclusion in June 2024, and deposit mobilisation in August 2024.

Chart 10: Readability

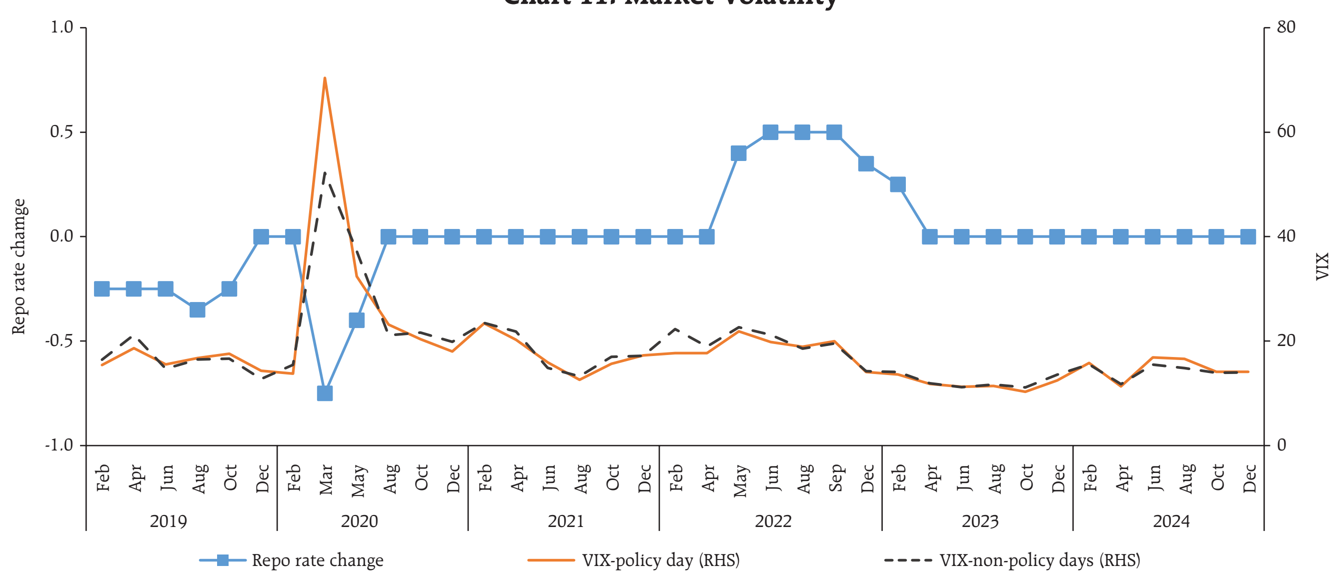
Sources: RBI; and Authors' estimate.

Readability indices trended lower with co-movement of all indices, indicating improvement in readability during the study period (Chart 10).

IV.3 Financial Market Patterns

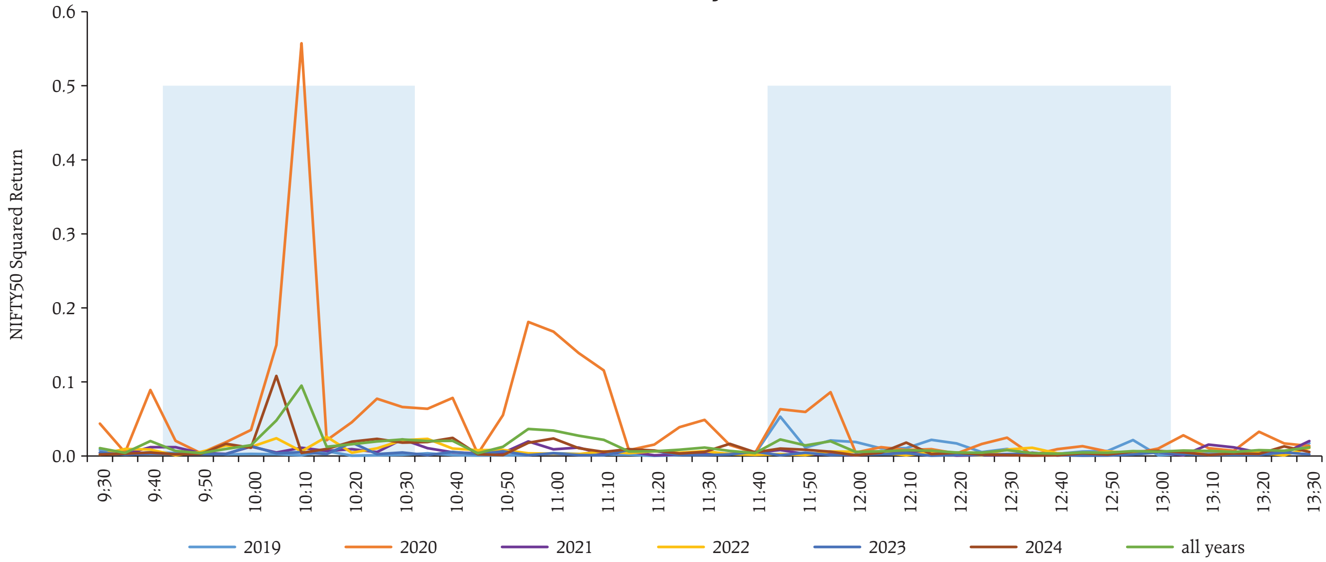
Market volatility (India VIX) on the policy announcement day remained range bound and similar to non-policy announcement days. It was exceptionally high, however, on March 27, 2020 and May 22, 2020, when the MPC meetings were held ahead of schedule due to pandemic induced uncertainty and sharp rate reductions were announced (75 bps and 40 bps, respectively) (Chart 11). The VIX reflected a consistent declining pattern in 2022 and 2023, reflecting high level of confidence

Chart 11: Market Volatility



Sources: RBI, NSE; and Authors' estimate.

Chart 12: Intraday Patterns



Sources: RBI, Bloomberg; and Authors' estimate.

in markets even during the policy tightening period of May 2022 to February 2023 (Chart 11).

Intraday volatility patterns are examined using NIFTY50 squared returns at 5-minute intervals from 9:30 am to 1:30 pm to encompass the live coverage of the Governor's statement – 10:00 to 10:30 am and the ensuing press conference – 12:00 to 1:00 pm. It is observed that average volatility was low during the study period. Intraday volatility picks up before the Governor's statement but tapers down quickly and becomes almost negligible by the conclusion of the press conference (Chart 12 and Annex II).

Volatility is more pronounced on days when there is a surprise element, *viz.* either in the direction or quantum of policy rate change, or a surprise event (*e.g.* MPC meeting outside the pre-announced calendar). Several factors may have contributed to keeping market volatility low on a daily and intraday basis – targeted use of confidence conveying words; Governor's opening remarks during press conferences; and fine-tuning of communication strategy to provide assurance and confidence.

V. Conclusion

The efficacy of monetary policy is greatly enhanced when policy authorities, market participants and the wider public share a common set of expectations. In fact, when the intent of policy and the desired objectives are clearly understood, the size of policy decisions can be smaller than otherwise. Indeed, the need for policy action may be obviated. This underscores the critical role communication has come to play in complementing monetary policy and making it effective. Our findings show that it is not enough for communication just to be clear, understandable and engaging. It also involves strategy in adapting communication style to the dynamics of uncertainty, especially in times of black swan events and crises when anxiety becomes overwhelming, and reassurance reinforces the magnitude and duration of policy changes and stance. Meticulously crafted Governor's statements with thoughtfully selected and emphasised words have instilled much-needed confidence in India during adverse and uncertain periods.

The press acts as a communication channel for clarification and reinforcement of policy decisions following the release of the Governor's statement. In this context, continuous evaluation of the traction achieved by monetary policy communication in influencing expectations assumes importance. This is, however, easier said than done as it involves the inexact science of gauging sentiment as revealed in sound bytes, text and social media posts. Traditionally, methodologies fall short when quantification has to be extracted from unstructured / semi-structured information sets. In this milieu, the application and refinement of newer technologies such as NLP, as attempted in this article, become increasingly relevant and exciting.

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Annex I: Topic wise Word Clouds[5]

Sources: RBI; and Authors' estimate.

5 Word clouds are based on stemmed words, which present root form of a word.

Annex II: Monetary Policy Day wise Intraday Patterns

Chart A: Intraday Patterns - 2019

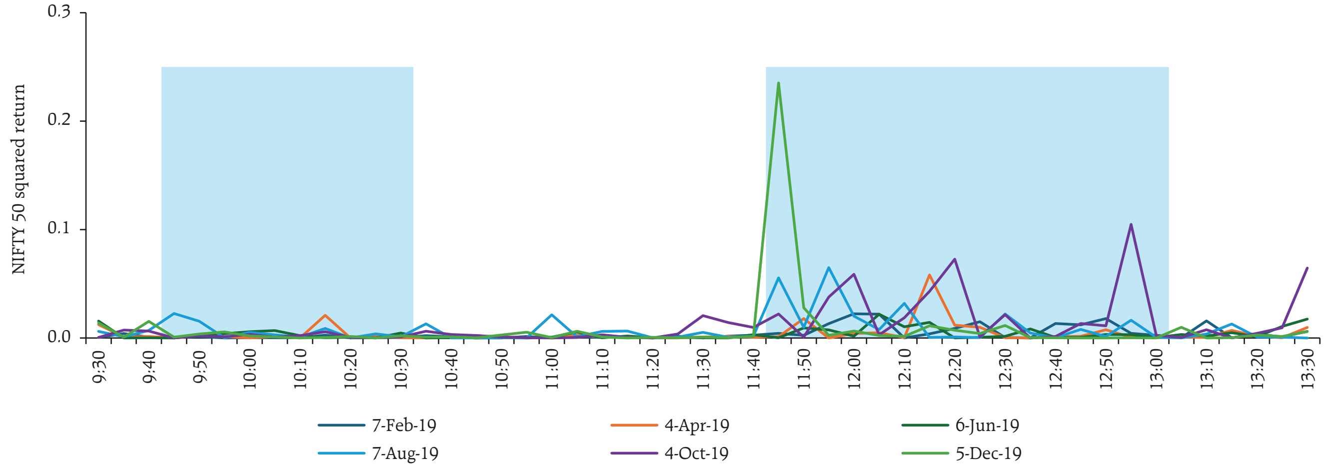
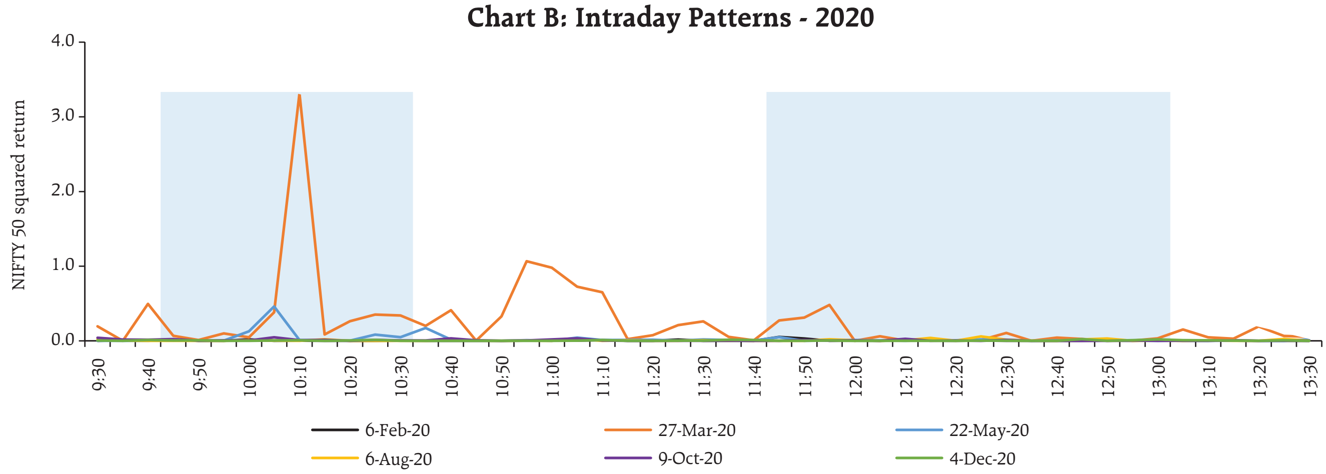


Chart B: Intraday Patterns - 2020



Notes: No press conference was held from March to October 2020.

Chart C: Intraday Patterns - 2021

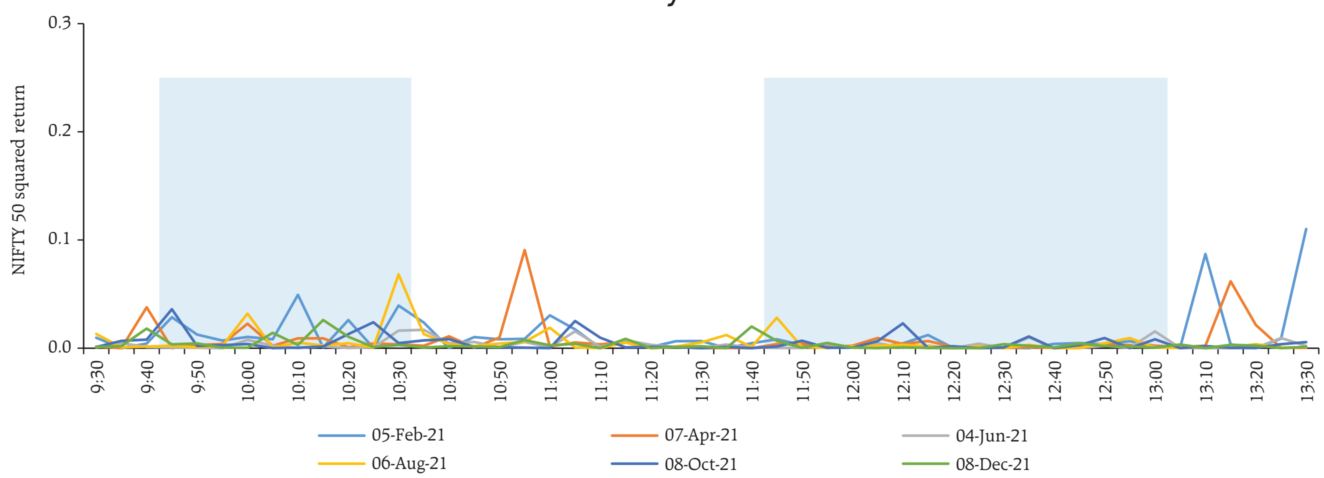
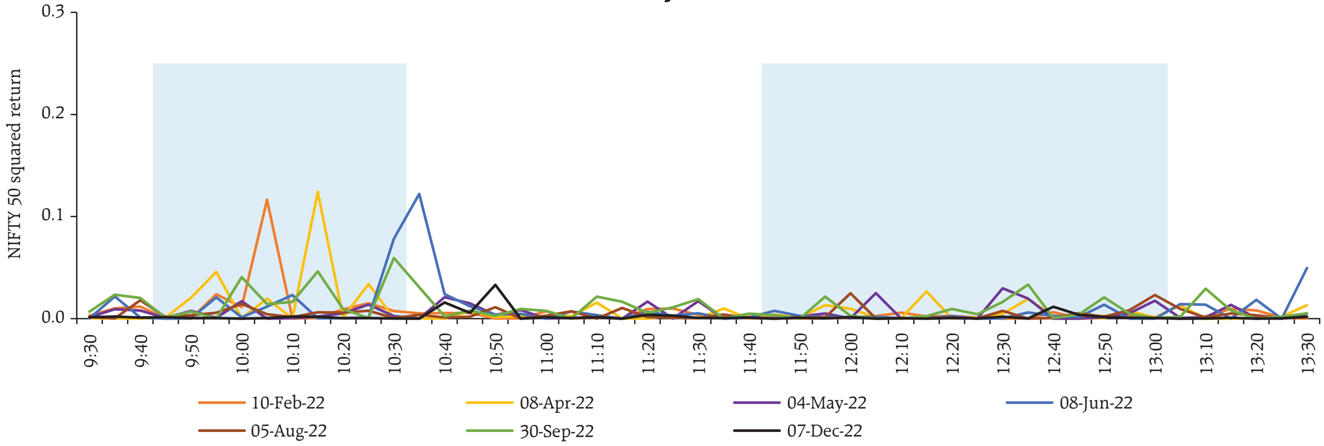


Chart D: Intraday Patterns - 2022



Notes: No press conference was held on 4-May-2022.

Chart E: Intraday Patterns - 2023

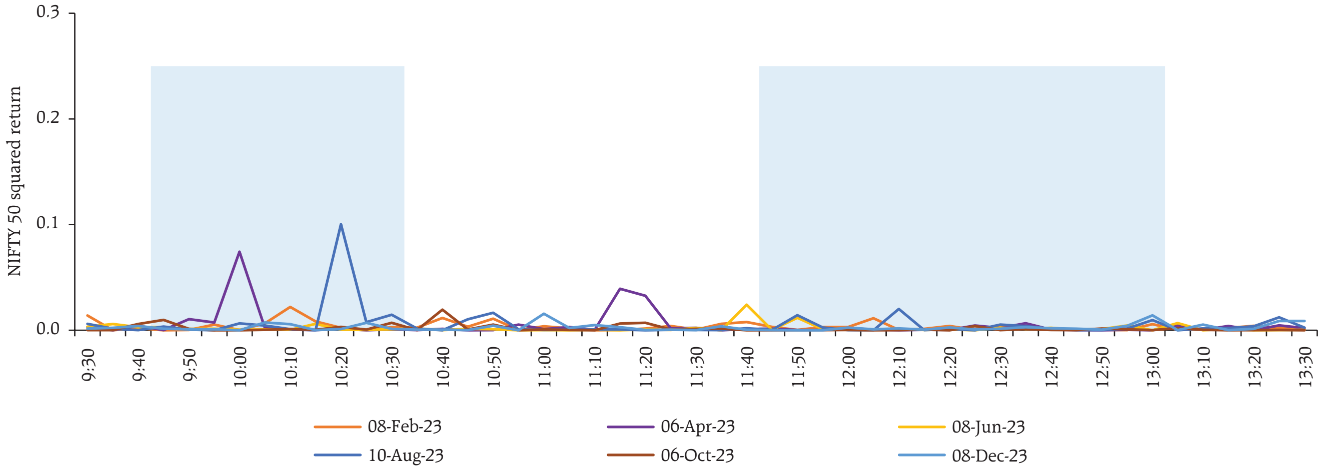


Chart F: Intraday Patterns - 2024