Monetary Policy Report as a Communication Tool: Evidence from Textual Analysis

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Using semi-automated textual analysis, this study, parsing through the RBI's flagship half-yearly publication, the Monetary Policy Report (MPR), since 2016 assesses the following – (a) What central bank communicates – its focus, (b) How it communicates – its tone and subjectivity and (c) How well it communicates – its readability. It draws the conclusion that MPR broadly fairs well in all these aspects, thus, upholding its remit under the RBI Act as an important communication tool.

Introduction

There has been greater recognition of the importance of communication as an influential instrument for monetary policy in the recent years. Constructive ambiguity of yesteryears has given way to communicating with prescience and clarity, the latter being a key to effective monetary policy, which can better anchor consumer expectations, guide markets and enhance monetary policy transmission (Das, 2022; Bouscasse *et al.*, 2023; and RBNZ, 2020).

In this endeavour towards clear communication, central banks very often face challenges varying across economies, reflecting different economic and institutional setups in their countries. While advanced economies (AEs) have used forward guidance as a powerful tool to directly make an impact on the public's expectations since the global financial crisis (GFC), emerging market economies (EMEs) have faced different challenges concerning the need for communication to support the transition to new

frameworks or explaining policy outcomes in the existence of several objectives that central bank had to deliver. Over the last twenty years, central banks have increasingly adopted a Flexible Inflation Targeting (FIT) regime. The FIT framework facilitates the desired balancing between the medium-term objective of the central bank of price stability and the needed flexibility to accommodate short-term objectives. However, the scale of short-term flexibility varies among central banks, related directly to the credibility gained by the central bank over the years, indicating effective communication and consistent policy actions (Gaspar, 2016). Central bank communication acts as a primary and significant tool to enhance policy dialogue with the general public, better anchor market expectations and in the process significantly upscale monetary policy credibility to achieve macroeconomic stability (Blinder, 1998; Bernanke and Reinhart, 2004; Sturm and De Haan, 2011; Berger *et al.*, 2011; and Oshima and Matsubayashi, 2018).

The Reserve Bank of India (RBI) reaches out to the general public through several tools – the bi-monthly Monetary Policy Committee (MPC) resolutions and minutes; Governor's statement; press conferences/media interactions, speeches, monthly RBI Bulletin and statutory RBI publications - Annual Report, as well as the full-fledged semi-annual publication, the Monetary Policy Report (MPR). Section 45ZM of RBI Act, 1934 read along with Regulation 6 of Reserve Bank of India Monetary Policy Committee and Monetary Policy Process Regulations, 2016, indicate that the Bank shall publish a document to be called the MPR once in every six months, containing the following: (a) Explanation of inflation dynamics in the last six months and the near term inflation outlook; (b) Projections of inflation and growth and the balance of risks; (c) An assessment of the state of the economy, covering the real economy, financial markets and stability, fiscal situation, and the external sector, which may entail a bearing on monetary policy decisions; (d) An updated review of the operating

procedure of monetary policy; and (e) An assessment of projection performance.

Applying textual analysis to this flagship monetary policy publication of the RBI, this paper attempts to check the effectiveness of using MPR as a communicating tool. Construing through 16 issues of the MPR since April 2016, we check for its focus, sentiment or tone, subjectivity, readability, and overall consistency with other macroeconomic variables.

The article is structured as follows. Section II presents a quick overview of the literature. Section III deliberates on the methodology for the sentiment analysis while the results are explained in Section IV. Section V concludes.

II. Review of Literature

After the 2008 GFC, the key policy challenge for central banks was to effectively manage the market and expectations of agents. According to Naghdaliyev (2011), a central bank can avoid the knowledge burden that could lead to the *"deterioration of the rational decision-making process by the public"* by initiating a transparent and effective communication style. Such a communication style should involve both transitional and final objectives as given in Figure 1.

With the increasing importance of communication as a tool in the monetary policy arsenal, literature in this area has surged over the past decade focussing on quantitative assessments of monetary policy documents to examine how best they serve this role. Such evidence is more commonly found among AEs, inflation targeting countries and mostly for analysing policy documents and press releases/statements (Cherry and Tong, 2023; Gonzalez and Tadle, 2021; and Shapiro and Wilson, 2019) and occasionally for inflation reports by central banks as well (Bulir *et al.*, 2012). Small open economies like Nigeria and Ghana have also attempted similar studies on the tone and readability of the MPC's communication. A brief overview of such studies is shown in Table 1. Cross correlation across nations established that during international crises, the tone of monetary policy press releases moves closer together (Gonzalez and Tadle, 2021).

Textual analysis, whereby, big analytical reports are transformed into quantitative structured formats to get meaningful insights has been a preferred method for such analysis. Text sentiment analysis is a branch of Natural Language Processing and is now employed for many purposes, such as social
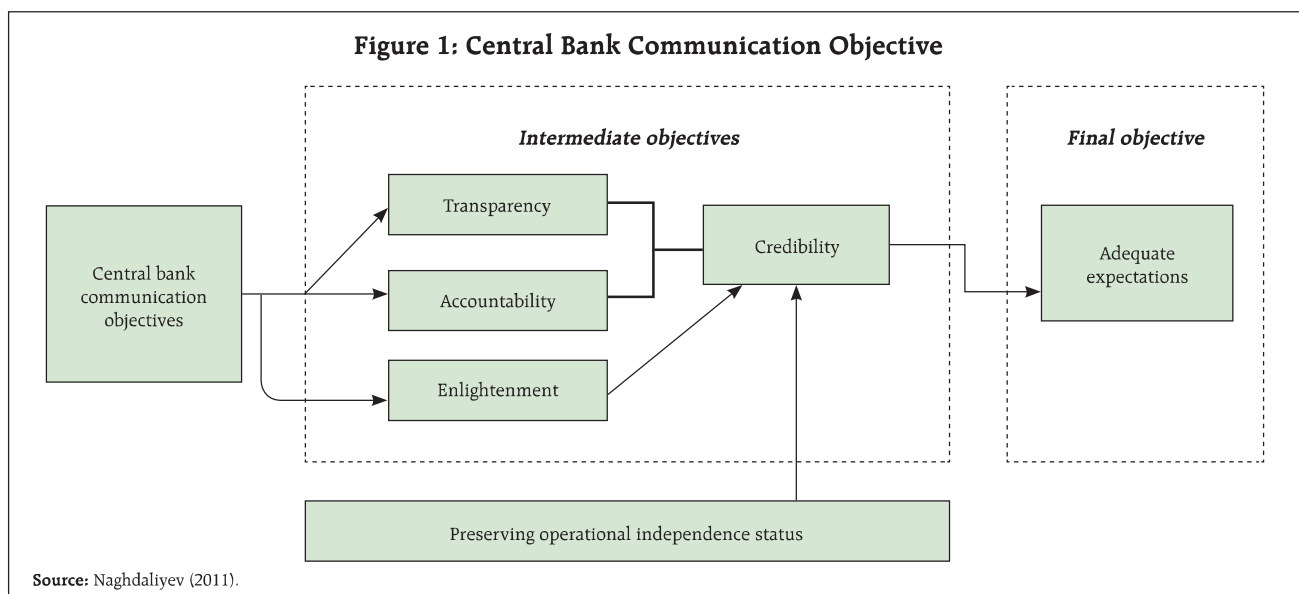

Figure 1: Central Bank Communication Objective

Source: Naghdaliyev (2011).

Table 1: Central Bank Communication Studies

Country-wise			
Country	Study	Coverage	Key Results
United States	Shapiro and Wilson (2019)	FOMC Transcripts, minutes, and speeches during 1986-2013.	• Computed metric for monetary policy sentiment. • Negative sentiments were inversely related to US's output.
Canada	Binette and Tchebotarev (2019)	MPRs.	• Report is complex for an average citizen of the country to understand. • Important macroeconomic events of country were associated with increased levels of verbal innovation in the reports.
New Zealand	Cherry and Tong (2023)	Monetary Policy Statements during Q1:1997 -Q4:2021.	• The tone of MPS has been neutral and objective in nature. • The Monetary Policy Snapshots proved to make communication easier.
South Africa	Segawa (2021)	MPC statements during January 2000 - January 2021.	• Computed measure of readability using the FK Grade level index. • Readability improved since 2016.
Ghana	Omotosho (2020)	12 monetary policy releases during 2018-2019.	• Monetary policy releases have become simpler to read.
Nigeria	Tumala and Omotosho (2019)	MPC Communication during 2004-2019	• MPC communication (word and sentence structures) became more complex, thus reducing its readability over time.
Cross-country			
18 Central Banks[1]	Gonzalez and Tadle (2021)	Monetary Policy Press releases.	• In most cases, some level of college education required to understand the policy documents. • The tone of press releases of central banks tends to move closer together during periods of international crises.
Latin American Central Banks	Taborda (2015)	Minutes of Board meetings in the central banks.[2]	• Readability of the central bank minutes has been broadly unchanged in case of Latin American countries.
Chile, England, Thailand, Czech National Bank, ECB, Poland, and Sverige's RiksBank	Bulir et al., (2012)	Inflation Reports during 1997-2012.	• Inflation reports have become vibrant over time in Chile, Sweden, and England. • ECB's monthly bulletins and Thai inflation reports were less clear during the period.

Sources: Shapiro and Wilson (2019); Binette and Tchebotarev (2019); Cherry and Tong (2023); Segawa (2021); Omotosho (2020); Tumala and Omotosho (2019); Gonzalez and Tadle, (2021); Taborda (2015); and Bulir et al., (2012).

media analysis, digital trading, customer experience management, economic, and financial research. The related economic literature is rapidly growing; the technique provides various ways to quantify a sentiment indicator for different types of economic texts (*i.e.*, articles, speeches, notes, minutes *etc*). Text mining techniques have been applied to many central banking areas like communication in monetary policy (Cherry and Tong, 2023; Ferrara and Angino, 2022);

banking reforms (Amadxarif *et al.*, 2019), and financial stability reports (Correa *et al.*, 2017) *etc.*

While Machine Learning techniques are still at a nascent stage for applicability in economic text analysis (Shapiro *et al.*, 2020), the lexicon method of textual study is extensively used in economics and finance literature. Its main benefit is that it is scalable for a particular document with consistency and transparency being less of a concern (Hansen and

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[1] Australia, Brazil, Canada, Chile, Hungary, Iceland, Indonesia, Israel, New Zealand, Norway, Peru, Philippines, Poland, Romania, South Africa, South Korea, Sweden, and Thailand.

[2] 133 from Brazil; 172 from Chile; 80 from Colombia; 24 from Mexico, and 155 from Peru.

McMohan, 2016). The dictionary built by Loughran and McDonald (LM) [2011][3] is specific to the domain of economics and finance and has been used extensively for undertaking this exercise. As noted by LM, most dictionaries are not specifically built for economic texts, hence some words inside them could have an opposite connotation if considering an economic context. Therefore, they built their own dictionary precisely designed for the domain of finance and economics (LM dictionary). Given the advantages offered by this approach over alternative approaches in terms of simplicity, efficiency and easy comparability across nations, literature using this lexicon mushroomed since the second half of the 21st century, by when monetary policy communication itself had graduated from the veils of secrecy to the realms of transparency and accountability. Shapiro and Wilson (2019) applied it to minutes of the Federal Open Market Committee's meetings; Armelius *et al.* (2020) used it for Central Bankers' speeches; more recently, Cherry and Tong (2023) used it for analysing the Reserve Bank of New Zealand's monetary policy statements, to cite a few. It is claimed that the predictive accuracy of the LM dictionary on economic texts is comparable to the Harvard General Inquirer Dictionary (Shapiro *et al.*, 2020l); particularly, the sentiment scores assigned by the LM lexicon is comparable with those assigned by human ratings on the same articles. While many studies have created their own dictionaries with innovations to suit country circumstances, given the standardisation that the LM dictionary has established, very often their study results are compared with those of LM dictionary as a robustness check (Gonzalez and Tadle, 2021).

Against this background, we have used text mining practices to examine the MPR from 2016 to 2023. This study is novel in its contribution to the literature in the Indian context as it applies the automated text mining attempt to document data from RBI source. We also measure the legibility of the published MPRs over time by computing readability scores. This work builds on some of the country-specific work as well as cross-country exercise undertaken recently for inflation targeting countries (Cherry and Tong, 2023; Gonzalez and Tadle, 2021).

III. Methodology

For each MPR document starting from April 2016, the text is first separated from the rest *i.e.,* we removed charts, graphs, and other text deterrents to achieve 16 separate text corpuses. In line with customary methods for text mining analysis, we first start with pre-processing our corpus by removing numbers, punctuations, white spaces, and special characters from the documents.

Starting with topic analysis to examine the focus of the publication, many text bags are created to account for select topics. To explore related but distinct topics, we first create a list of keywords each for three aspects – inflation and growth (which are the primary objectives mentioned in the Act) and uncertainty (specified by LM) as well which has been a key variable influencing policy decisions, especially in the last few years.[4]

In order to measure the tone of MPRs, we have used the approach indicated by Cherry and Tong (2023) using text mining measures. From the LM dictionary, we have computed positive and negative scores based on the count of words matched with each corpus of MPR. Subsequently, we obtain two parameters - Polarity Score[5], and the Subjectivity Score[6] for all the MPRs published since April 2016.

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[3] The first public version of the Loughran–McDonald sentiment dictionaries appeared in Loughran and McDonald (2011). The lists and accompanying dictionary are updated periodically and made available at https://sraf.nd.edu. The latest update is for 2021 which has been used for the study.

[4] The words selected for each topic are shown subsequently in results section.

[5] The polarity score is a ratio between -1 and 1. A score in the range of -1 to -0.5 typically indicates negative sentiment. A score between -0.5 and 0.5 indicates neutral sentiment, and a score in the range of 0.5 to 1 typically indicates positive sentiment.

[6] The subjectivity score captures the number of words that carries sentiment as a proportion of total number of words.

Once we obtain positive and negative scores, the difference between the two gives us an estimate for net sentiments as used by Twedt and Rees (2012). The net sentiment score is then normalised by the total number of positive and negative words in each MPR to obtain the polarity assessment, which is a much more balanced and unbiased indicator of sentiment, providing a range for analysis (-1 to +1), rather than a number. Hence, we compute the following scores for their simplicity and transparency (Table 2).

Recognising that readability of reports published by central banks is imperative for general public to understand monetary policy communication clarity of MPR is checked using two Readability metrics following the European Central Bank (Ferrara and Angino, 2022).[7]

The Flesch–Kincaid (FK) Grade Level specifies a score that can be interpreted as years of education necessary to comprehend a manuscript. The higher the score, the greater the difficulty of the language used. The FK formula is set out below (Kincaid *et al.*, 1975).

$$FK = 0.39 \frac{Total\ words}{Total\ Sentences} + 11.8 \frac{Total\ syllables}{Total\ words} - 15.6$$

The Gunning-Fog (FOG) Index considers the number of complex words, rather than total syllables.[8]

Table 2: Sentiment Analysis

Sr. No.	Sentiment Parameter	Expression
1.	Polarity Score	$Polarity_t = \dfrac{Positive_t - Negative_t}{Positive_t + Negative_t}$
2.	Subjectivity Score	$Subjectivity_t = 100 * \dfrac{Positive_t + Negative_t}{N_t}$

Note: $Positive_t$ and $Negative_t$ are the number of terms matched in each report and N_t is the total number of words used.
Source: Cherry and Tong (2023).

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[7] These two indices have also been used by other studies along with additional indices (Cherry and Tong, 2023).

[8] The FOG Index is different from FK Grade Level as it is dependent on vocabulary-based features, namely word categories (e.g., familiar words, proper nouns, *etc.*) operationalised by pre-specified lists. Complex word is defined as words with three or more syllables, and that are not proper or compound nouns or familiar words.

Like FK, the final index is given in terms of number of years needed to understand the text, indicating the higher the index the lower the readability. The FOG Index is presented below (Gunning, 1952).

$$FOG = 0.4 \left[\left(\frac{Total\ words}{Total\ Sentences} \right) + 100 \left(\frac{Complex\ words}{Total\ words} \right) \right]$$

Our focus in this paper is on Chapters 1 to 3 of the MPR primarily for two reasons. First, these three chapters focus on inflation and growth dynamics, their projections and balance of risks. Second, it is these 3 chapters which provide a medium-term growth and inflation outlook, that is sought by the market and is important in influencing the sentiment.
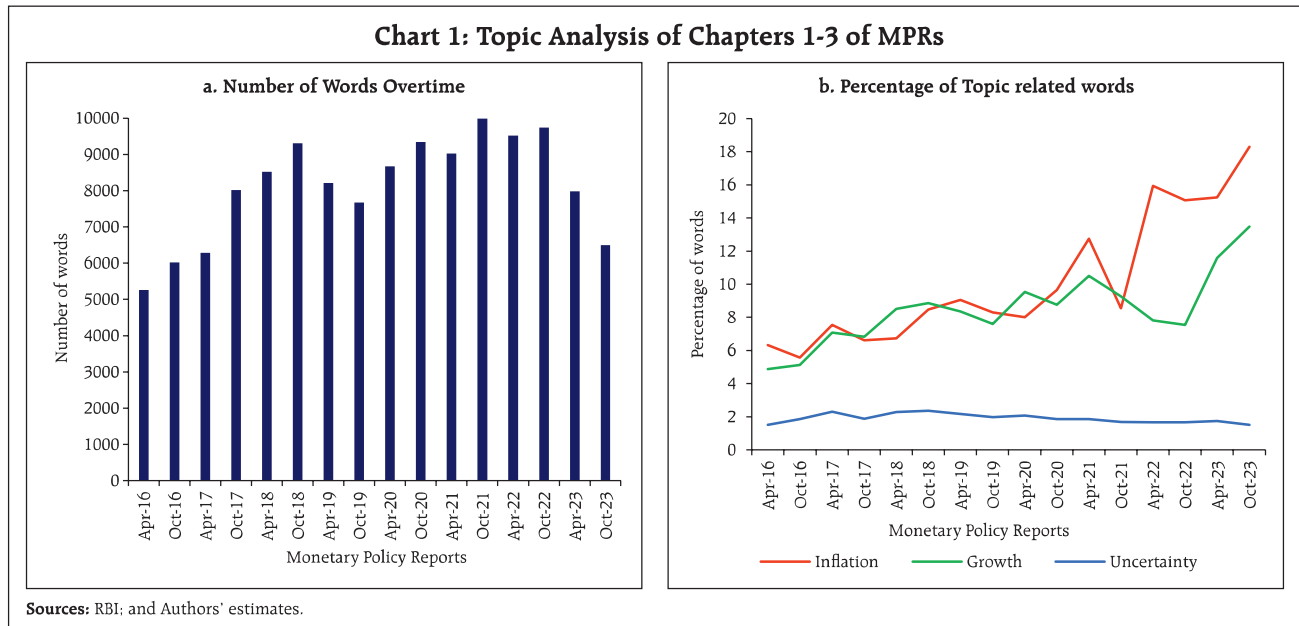
IV. Key Results

Topic Analysis

As per the topic analysis, total words of the MPR increased between 2016 and 2021 and have moderated since then (Chart 1a). October MPR has typically more words than April MPR (in 6 out of 8 occasions), probably reflecting more information by the middle of the year. The trend in words selected for the three topics (Annex I) – inflation, growth, and uncertainty - are indicated in Chart 1b. The share of inflation and growth topics has increased since inception, which is in line with its remit. The inflation related topics have been discussed more frequently *vis-à-vis* growth in the last few MPRs, mirroring the evolving inflation and growth dynamics (Annex II, Chart A1: a to d).

Sentiment Analysis

The overall sentiment associated with MPR is obtained by computing the polarity score, as stated in the methodology section using positive and negative sentiment words as selected by LM. A subset of positive and negative sentiment words picked up by LM as per standard practice and their respective share with respect to total sentiment words is enumerated in Table 3 and Chart 2, respectively. The choice of words duly takes care of the fact that inflation and

Chart 1: Topic Analysis of Chapters 1-3 of MPRs

a. Number of Words Overtime

b. Percentage of Topic related words

Sources: RBI; and Authors' estimates.

growth variables may move in opposite directions to show the sentiment.

The polarity score, so obtained, is shown in Chart 3. It is observed to be time varying, yet broadly within the neutral range (-0.5 to +0.5). Thus, the text of MPR has largely been characterised by a neutral tone since its inception. There are some distinct trends that are pertinent to observe. First, a gradual decline in the sentiment had started even prior to pandemic, which reached the deepest during the COVID-19 pandemic when real GDP contracted sizeably and the sentiment index slipped into the negative range (below -0.5), although it was short-lived. Second, the recovery in sentiment post pandemic was quick and

fast, with the rebound in economic activity. Third, there was again a decline in the sentiment during the Russia-Ukraine conflict with inflation exceeding the upper tolerance level around the target (4 +/- 2 per cent). The sentiment index was at the border line between neutral and negative tone. Fourth, the sentiment has since then gradually improved with

Table 3: Sentiment Words

Positive Words	improving, strong, progress, boost, optimistic, rebounded, leading, impressive, efficiency, profitability, abundant, upturn, opportunities, stability
Negative Words	volatility, adverse, decline, disruptions, slowing, contraction, errors, losses, recession, disruption, shortfalls, burden, dropped, stagnant, lost, unfavourable

Sources: RBI; and Authors' estimates.

Chart 2: Share of Positive and Negative Words

Sources: RBI; and Authors' estimates.
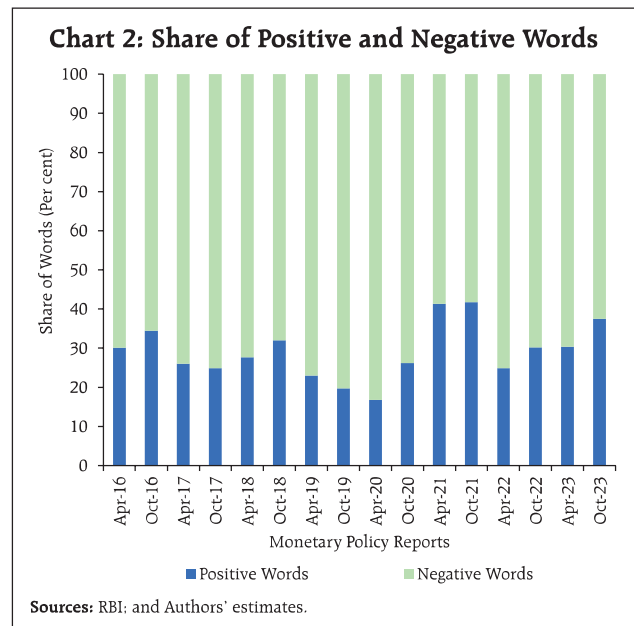
strengthening macro fundamentals, enunciating back again a neutral tone, closer to zero level in October 2023 (Chart 3). Fifth, the time varying nature of MPR sentiment tone mirrors evolving macroeconomic developments and not the monetary policy stance per se (whether accommodative stance or withdrawal of accommodation).

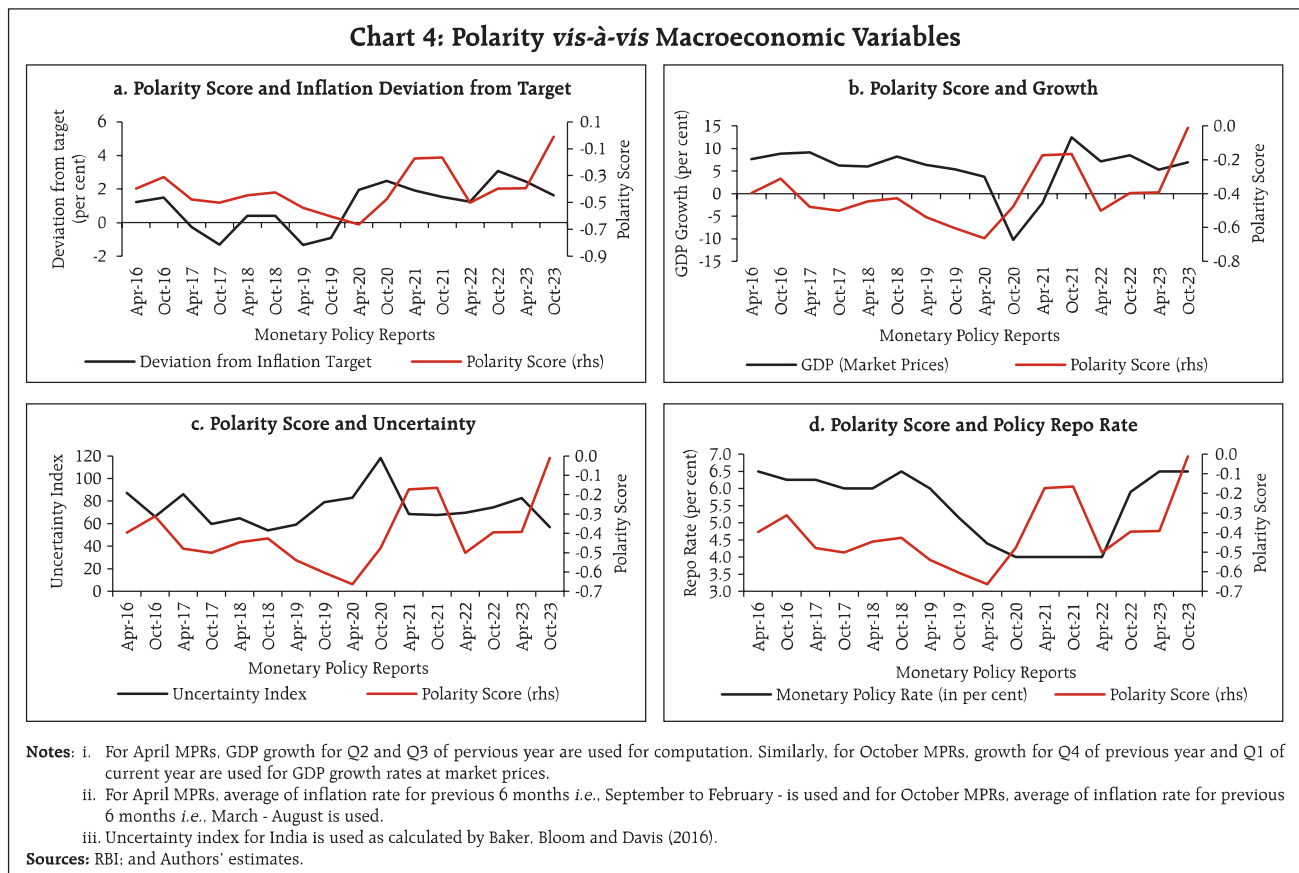MPR being a bi-annual publication, only 16 MPRs have been released so far since 2016. Any examination of the relationship between polarity and macro-economic variables through robust regression analysis will have to wait for more observations. However, a preliminary graphical analysis of the MPR tone as implied from Polarity score *vis-à-vis* the relevant macroeconomic variables (Chart 4) shows that MPR's tone seems to be positively correlated with growth and negatively correlated with deviation of inflation from its central target (4 per cent). Furthermore, the

Chart 3: Sentiment Analysis: Polarity Score

Notes: i. The polarity score is a ratio ranging between -1 and 1. A score in the range of -1 to -0.5 implies negative sentiment. A score between -0.5 and 0.5 implies neutral sentiment, and a score in the range of 0.5 to 1 typically implies positive sentiment.
ii. Green shade is for accommodative stance, Blue for neutral, dark orange for calibrated tightening and light orange for withdrawal of accommodation.
Sources: RBI; and Authors' estimates.

MPR tone moves contra to uncertainty and policy repo rate, *i.e.*, higher uncertainty and higher policy rates

Chart 4: Polarity *vis-à-vis* Macroeconomic Variables

a. Polarity Score and Inflation Deviation from Target

b. Polarity Score and Growth

c. Polarity Score and Uncertainty

d. Polarity Score and Policy Repo Rate

Notes: i. For April MPRs, GDP growth for Q2 and Q3 of pervious year are used for computation. Similarly, for October MPRs, growth for Q4 of previous year and Q1 of current year are used for GDP growth rates at market prices.
ii. For April MPRs, average of inflation rate for previous 6 months *i.e.*, September to February - is used and for October MPRs, average of inflation rate for previous 6 months *i.e.*, March - August is used.
iii. Uncertainty index for India is used as calculated by Baker, Bloom and Davis (2016).
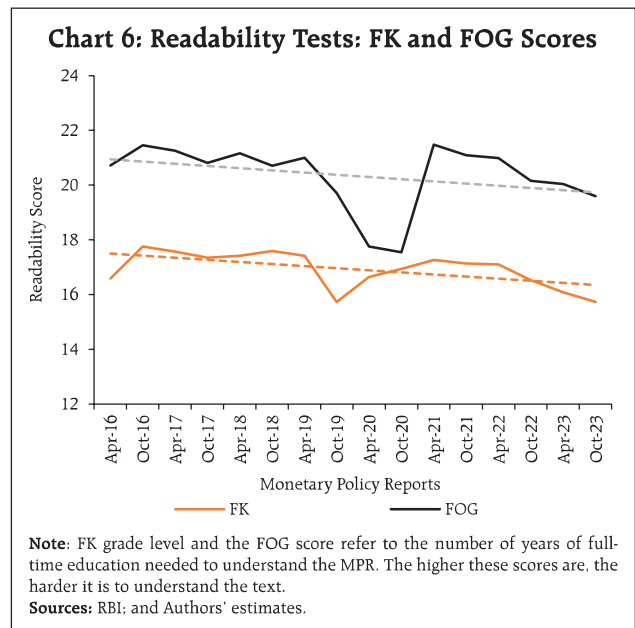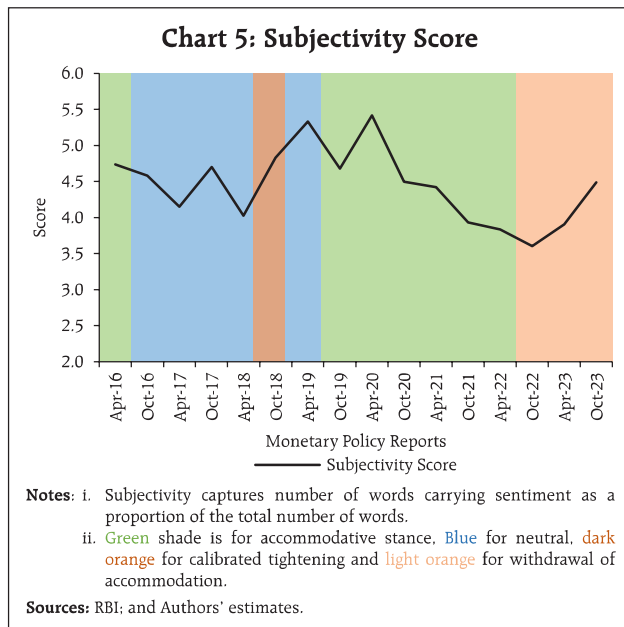**Sources:** RBI; and Authors' estimates.

are associated with lower sentiment score. These associations seem to have strengthened over the years, particularly after 2019-2020 indicating that MPR as a monetary policy publication has matured over the years, giving the right signal amidst uncertainty and stance.[9]

Subjectivity Analysis

The MPR's subjectivity score as shown in Chart 5 is hovering in the range of 3.5 to 5.5 and is in line with other countries (Cherry and Tong, 2023). The subjectivity was high during the initial years of inception of FIT, and it trended downwards during the accommodative phase but has seen slight upward movement during the 'withdrawal of accommodation' phase.

Readability Analysis

The results of two readability test – FK and FOG index - which gauge the years of formal training required to comprehend a writing are shown in Chart 6. The FK measure indicates that the MPR can be understood by readers who have completed about

Chart 6: Readability Tests: FK and FOG Scores

Note: FK grade level and the FOG score refer to the number of years of full-time education needed to understand the MPR. The higher these scores are, the harder it is to understand the text.
Sources: RBI; and Authors' estimates.

Chart 5: Subjectivity Score

Notes: i. Subjectivity captures number of words carrying sentiment as a proportion of the total number of words.
ii. Green shade is for accommodative stance, Blue for neutral, dark orange for calibrated tightening and light orange for withdrawal of accommodation.
**Sources:** RBI; and Authors' estimates.

18 years of formal education while the FOG index suggests even stricter readability parameters with target audience being no less than graduates. This is in line with literature whereby central bank monetary policy press releases/statements are generally observed to have FK and FOG scores in the range of 12-18 years and 17-23 years, respectively (Cherry and Tong, 2023; Gonzalez and Tadle, 2021). Both the readability indices are trending downwards *i.e.*, the readability is seeing a marginal improvement over the years.[10] In this context, complementary communication tools like Governor's statement, press briefings, speeches, and monetary policy and MPR outreach programmes aimed at general public play an important role.

A comparison of polarity scores with readability scores, following Tumala and Omotosho (2019), indicates that whenever sentiment has moved from neutral to negative zone (*viz*, during COVID-19 pandemic and Russia-Ukraine conflict), readability score has improved to ensure better clarity in communication (Chart 7).

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[9] This preliminary analysis needs to be further substantiated with empirical evidence as we populate with more data in coming years.

[10] It may be noted that the FOG readability score saw a sharp, though short-lived, improvement during first wave of the pandemic.

Chart 7: Polarity and Readability Scores
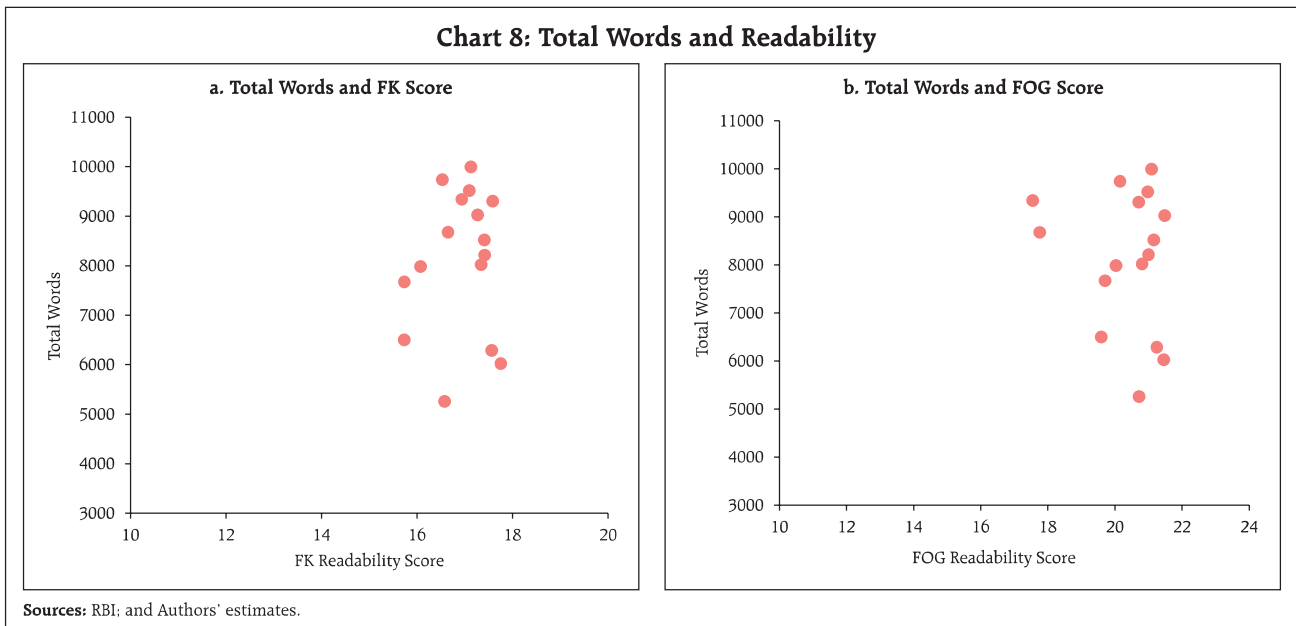
Sources: RBI; and Authors' estimates.
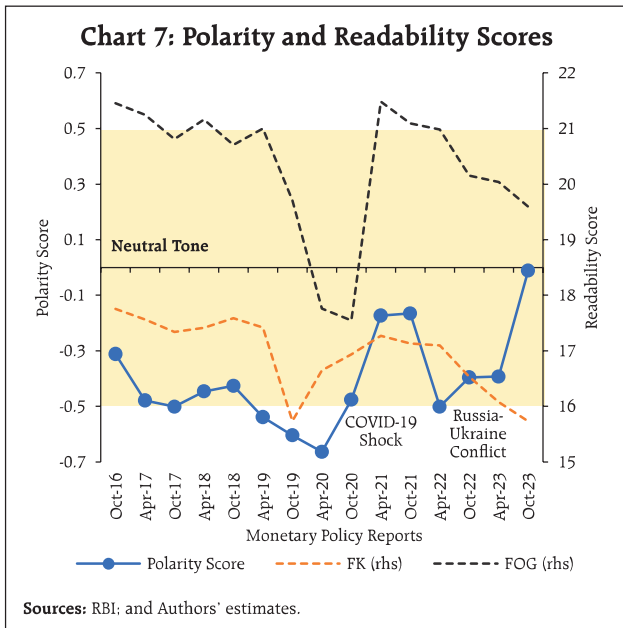
relationship between length and readability of MPRs (Chart 8). This suggests that the readability score is independent of length of MPR, in line with the results observed for Latin American central banks.[11]

V. Conclusion

Parsing through 16 monetary policy reports (MPRs) since 2016 in India, this study attempts to decode intrinsic features regarding the focus, tone, objectivity and clarity of this flagship publication of RBI. The analysis suggests that the MPR broadly fairs well in all these features. First, the textual analysis shows that keywords mentioned in the MPR align broadly with the objectives in the Remit and move in line with incoming data and outlook. Second, the tone of MPR has been broadly neutral, neither too positive nor too negative, barring a few instances driven by large shocks like the COVID-19 pandemic and the Russia-Ukraine conflict. Third, the sentiment in the MPR seems to be moving in tandem with key macro variables. Fourth, the MPR has on the whole used objective language. Fifth, the publication, like

Following Taborda (2015), who associates the length of minutes with the readability score, we examine whether readability can be improved by modifying the length of the text, in our case the length of MPR. Such an analysis shows no trend or statistical

Chart 8: Total Words and Readability

a. Total Words and FK Score

b. Total Words and FOG Score

Sources: RBI; and Authors' estimates.

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[11] Readability score improves irrespective of two divergent trends – size expansion of the minutes (Brazil, Colombia, Mexico, and Peru) and the size-contraction (Peru) (Taborda, 2015).

other central bank publications, requires a high school education or higher to understand it, though the readability is showing modest signs of improvement in recent years. Overall, even as the MPR is an important communication tool, given the diverse nature of the economy, multiple communication channels are critical for effective communication. Accordingly, the Reserve Bank actively uses a variety of tools – the MPC resolutions and minutes, Governor's exhaustive post-policy statements together with statement on developmental and regulatory measures, press conferences, speeches by top management, MPR and various other publications to anchor expectations (Das, 2022).

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Annex I

Table A1: Select Words for Topic Analysis	
Inflation-related	price, cpi, headline, fuel, food, core, pulses, vegetables, costs, wpi, housing, oil, consumer, diesel, petrol, LPG, electricity, households, confidence, beverages, kerosene, deflator.
Growth-related	output, gdp, gva, manufacturing, services, demand, production, industrial, fiscal, business, investment, imports, exports, merchandise, fiscal, trade, cement, steel, passenger.
Uncertainty-related	risks, anticipated, assumption, reassessment, appears, contingent, volatile, deviation, unclear, possibility, vary, preliminary, random.

Sources: RBI; and Authors' estimates.

Annex II

Chart A1: Inflation, Growth and Uncertainty *vis-à-vis* their respective percentage in MPR words
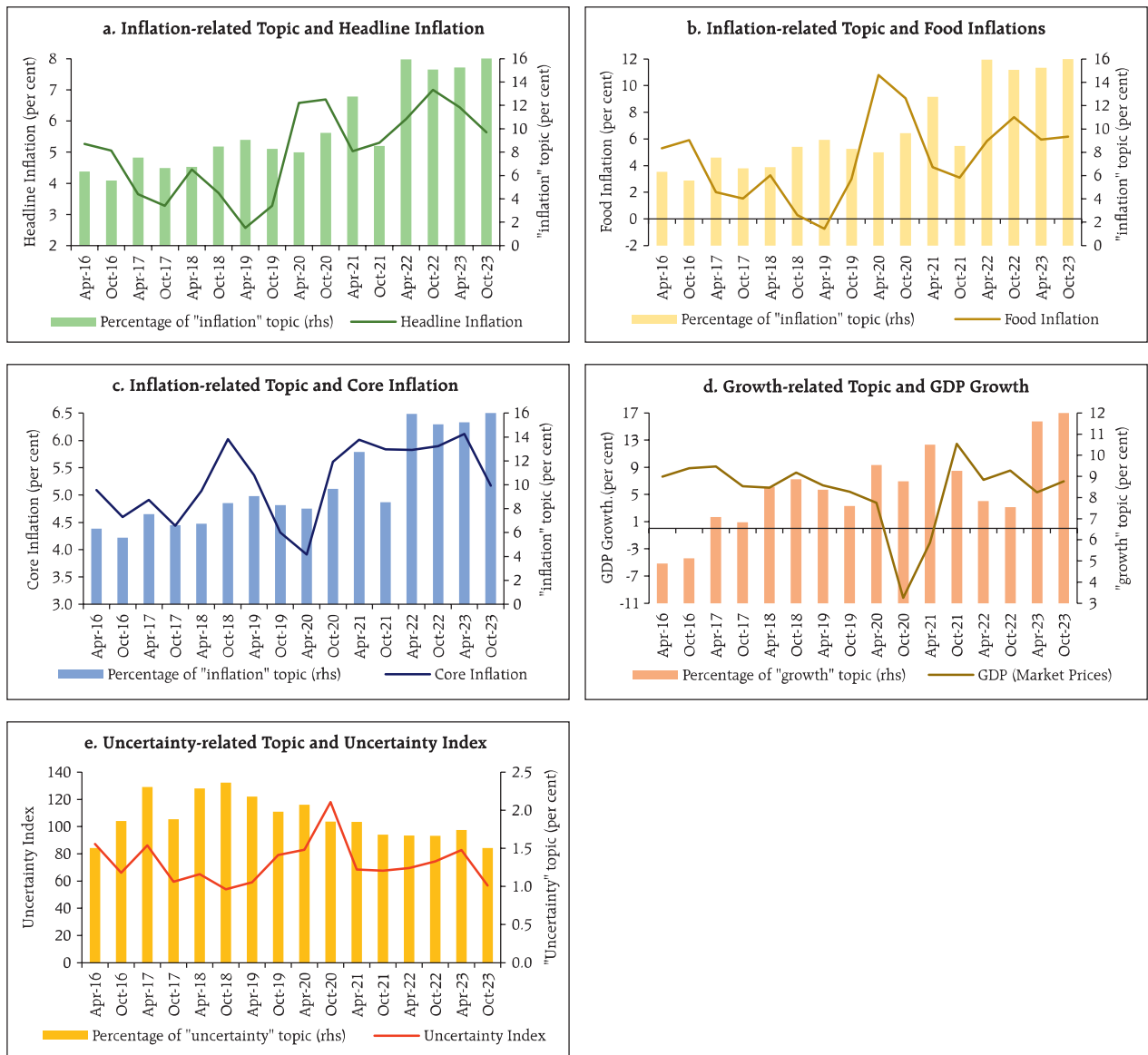
Note: Core Inflation : CPI inflation excluding food and fuel inflation.
Sources: RBI; and Authors' estimates.