

Measuring Communication Quality of Interest Rate Announcements¹

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Abstract

This paper employs text mining analysis to measure the comprehensibility and information quality of the interest rate announcements published by the Bank of Israel over the past two decades. We examine these texts for ease of comprehension and the sentiment conveyed to the public. The findings reveal that readers require fewer years of education to comprehend the Bank of Israel interest rate announcements than they do to understand the interest rate announcements published by the Fed and the ECB. In addition, we show that the sentiment within these announcements is aligned with economic fluctuations and that there is a direct correlation between the uncertainty the communications reflect and the volatility of the domestic market.

Keywords: text mining, central bank communication, monetary policy, financial stability.

JEL Classification: A12, E44, E52, E58.

1 Introduction

“The Fed continues to help build resilience in the financial system and will communicate its policy strategy as clearly and transparently as possible to help align expectations and avoid market disruptions.”

Jerome Powell, Chair of the Federal Reserve⁵

Central bank transparency supports financial stability (Powell, 2018), mitigates shocks, and reduces the risk of a post-announcement market overreaction (Mankiw & Reis, 2018). Central bank transparency is commonly measured by assessing the volume of communications

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⁵ See Powell (2018).

published via the bank’s official website, periodic reports, annual publications, and other documents intended for the broader public (Dincer & Eichengreen, 2014). Central banks throughout the world have become more transparent over the past two decades. When the interest rate is close to the lower bound, communication on the expected future path of this rate (“forward guidance”) has been proven to be an effective policy tool, with its efficacy depending, to a great extent, on the clarity of the messages shared (Coenen et al., 2017).

Many of the previous studies that analyzed central bank policy announcements involved the construction of indices of communication quality against which the effect of communications on financial variables (Brand et al., 2010), financial stability (Born et al., 2011), and the future path of interest rates (Bennani et al., 2020) were investigated. Using several of the indices presented in the existing literature, this paper studies the comprehensibility and information quality of the interest rate announcements published by the Bank of Israel (BoI). In particular, it evaluates the extent to which announcements are (1) readable by, and accessible to, the public; and (2) reflect the economic situation and events.⁶

2 Communication Quality

Interest rate decisions are published at predetermined dates alongside explanations on the reasoning behind the decisions.⁷ For our analysis, we reviewed the content of the English-language interest rate announcements that were published on the BoI’s official website between 2007 and 2018.⁸

2.1 Comprehensibility

Announcement comprehensibility was measured using two indices. The first of these was the type-token ratio (TTR), which describes the variety of the vocabulary employed and is calculated as the number of word types in the text compared to the number of times these words appear (tokens), as follows:

$$TTR_t = 100 \left(\frac{Total\ Types_t}{Total\ Tokens_t} \right) \quad (1)$$

A high TTR value indicates the use of a broad vocabulary within the text that requires more significant effort and knowledge to understand.

⁶ Benchimol et al. (2020) review methods for analyzing the text in central bank announcements.

⁷ Several special situations, such as during the Global Financial Crisis (GFC), involved interest rate decisions outside the preset dates.

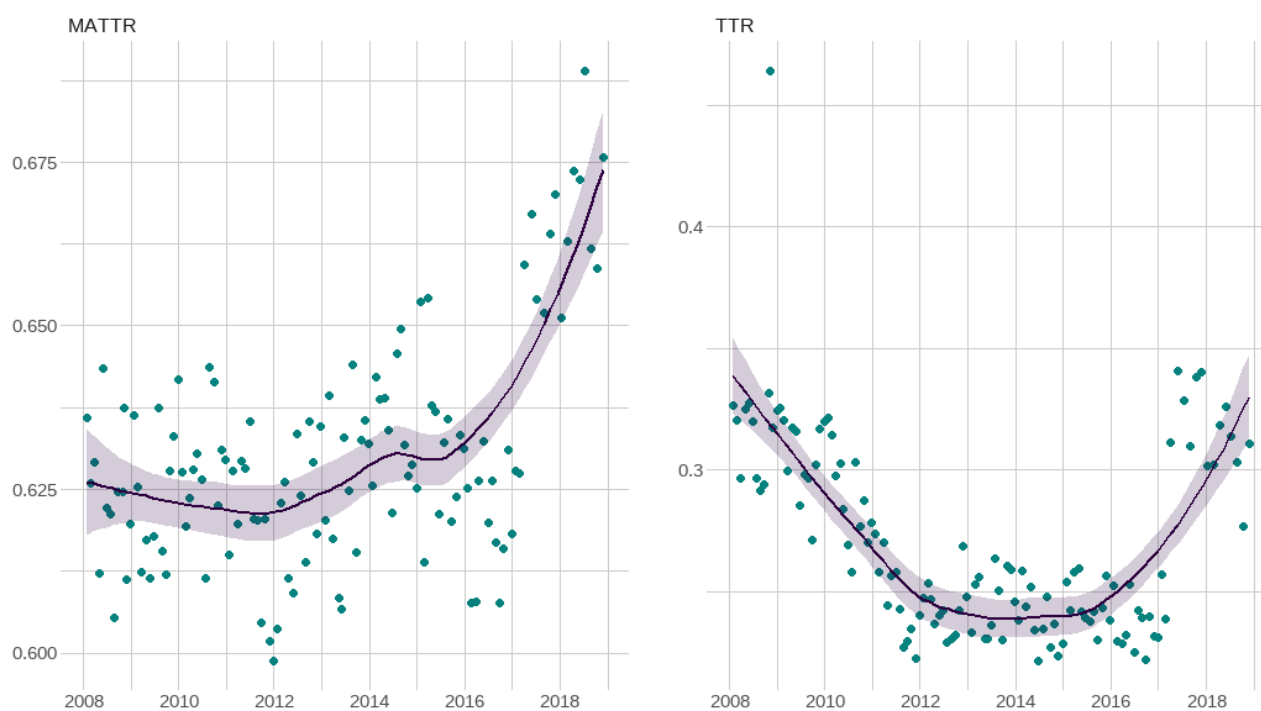
⁸ Text-mining methods are mostly effective for texts in English. We reasonably assume the nature of the messages the announcements contain is maintained during translation.

The second is an index of text complexity that estimates the number of years of U.S. grade-school-level education required to understand a text (Kincaid et al., 1975; Flesch, 1979). Since long words and sentences increase the complexity of a given communication, the index compares the number of words and sentences with the number of syllables and words,⁹ as follows:

$$Complexity_t = 0.39 \left(\frac{Total\ Words_t}{Total\ Sentences_t} \right) + 11.8 \left(\frac{Total\ Syllables_t}{Total\ Words_t} \right) - 15.59 \quad (2)$$

The outcomes of our analysis reveal that the vocabulary variability (Fig. 1, left panel) rose sharply in 2017 after years of relative stability, and even decline. This increase coincided with a change to the announcement format; i.e., shorter texts were used in combination with the provision of more detailed figures about the state of the economy.

Figure 1. Indices of Variety in Vocabulary in BoI Interest Rate Announcements



Notes: The lines and green dots represent the trend lines and index values, respectively. The TTR is calculated over each announcement, while the MATTR is determined over a moving average of 100 words in each announcement.

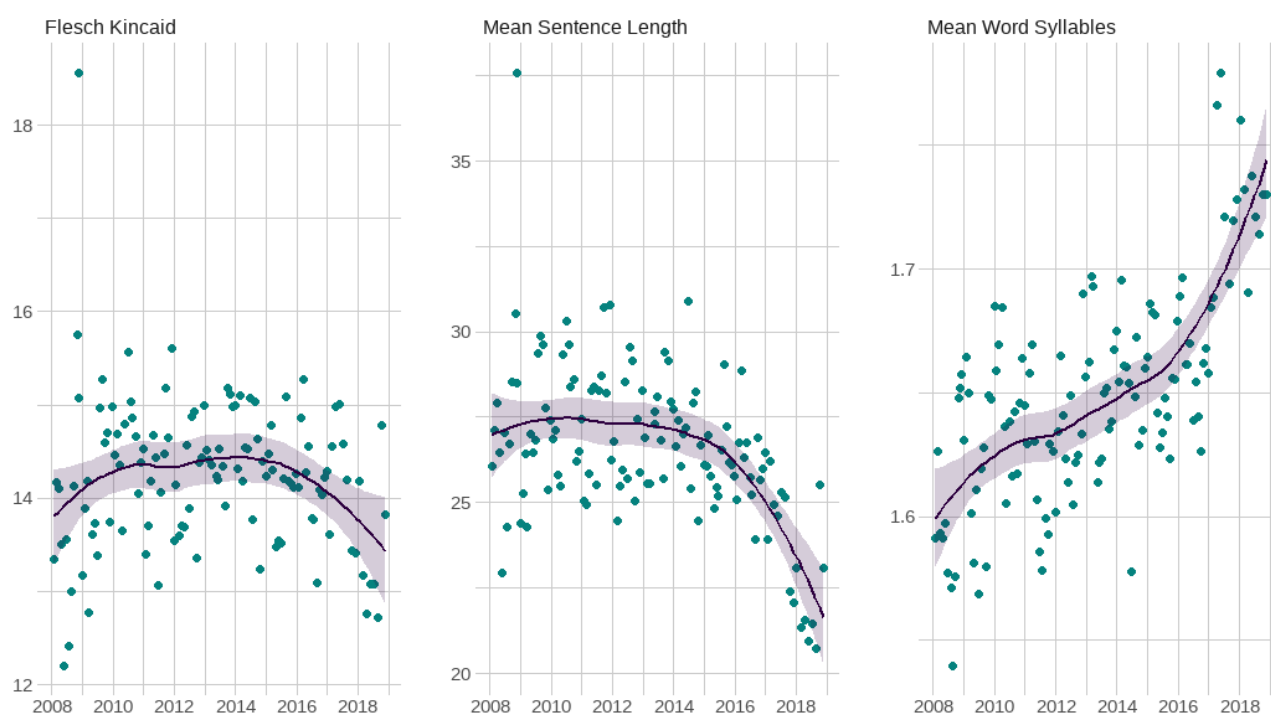
⁹ The ECB recently analyzed the readability of their introductory statements with this index (Praet, 2017).

The TTR index may be sensitive to text length and may decline with longer texts.¹⁰ To examine the robustness of the results, we devised a moving average of TTR values in a window that included 100 words (MATTR). Using this approach, a clear increase in text complexity since 2017 could be observed (Fig. 1, right panel).

The Flesch-Kincaid text complexity index (Fig. 2, left panel) exhibits relative stability with little variance over time. Overall, a U.S. undergraduate-level education (14 years) was required to understand the BoI announcements that were made between 2007 and 2018.

A more precise examination indicated that the average sentence length declined after 2017 (Fig. 2, middle panel) from about 27 to about 22 words per sentence (although levels increased at the end of the sample), making the texts less complicated. In contrast, the average number of syllables per word (Fig. 2, right panel) rose, increasing complexity. In sum, the two factors offset each other such that the complexity index remained stable.

Figure 2. Indices of Text Complexity in BoI Interest Rate Announcements

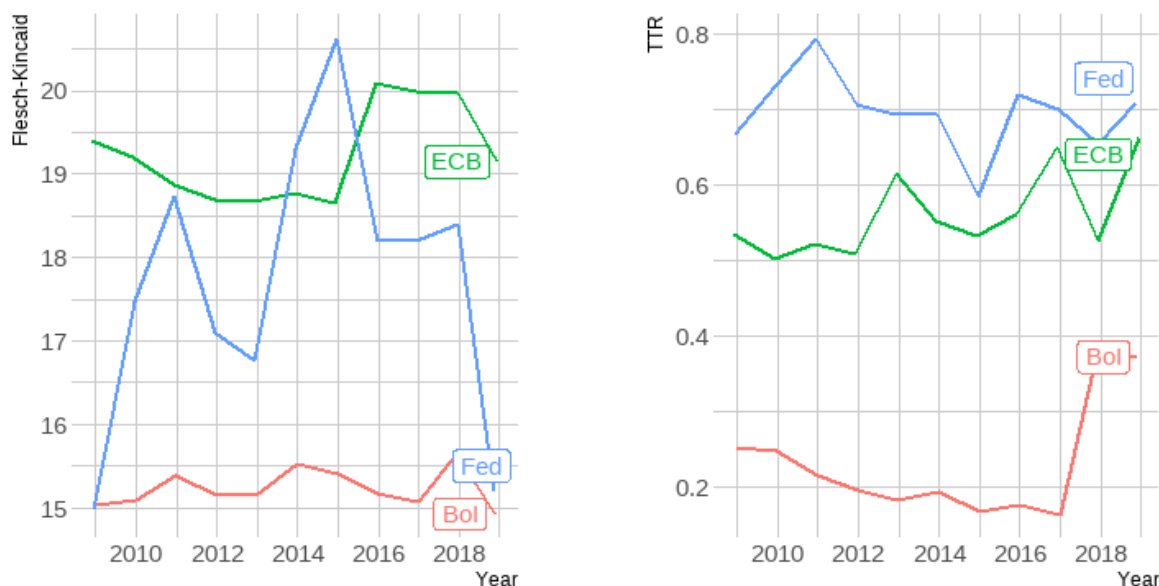


Notes: The lines and green dots represent trend lines and index values, respectively.

¹⁰ Basically, the more tokens a text contains, the higher the repetition of existing types, particularly punctuation words such as “the” and “and.” This leads to an artificial decline in the TTR-defined complexity of the text as sentence length increases (See Eq. 1).

This complexity index does not consider the content of the text and any field-specific knowledge or education that may be required to understand it regardless of education level. However, it represents an average, and aggregated effects may compensate heterogeneities. Also, excessively low complexity levels militate against proper delivery of technical and professional information.

Figure 3. International Comparison of Linguistic Variety and Text Complexity Indices



Notes: Yearly averages based on interest rate announcements.

To draw conclusions based on these indices, we turn our attention to the interest rate announcements published by other central banks. Fig. 3 compares the complexity and linguistic variety indices of the BoI’s announcements with the indices of the communications published by the Fed and ECB. The Fed and ECB’s announcements require an average of around 17 and 19 years of schooling, respectively, to understand. The BoI announcements are relatively more comprehensible, requiring an average of about 14 years of schooling to understand.

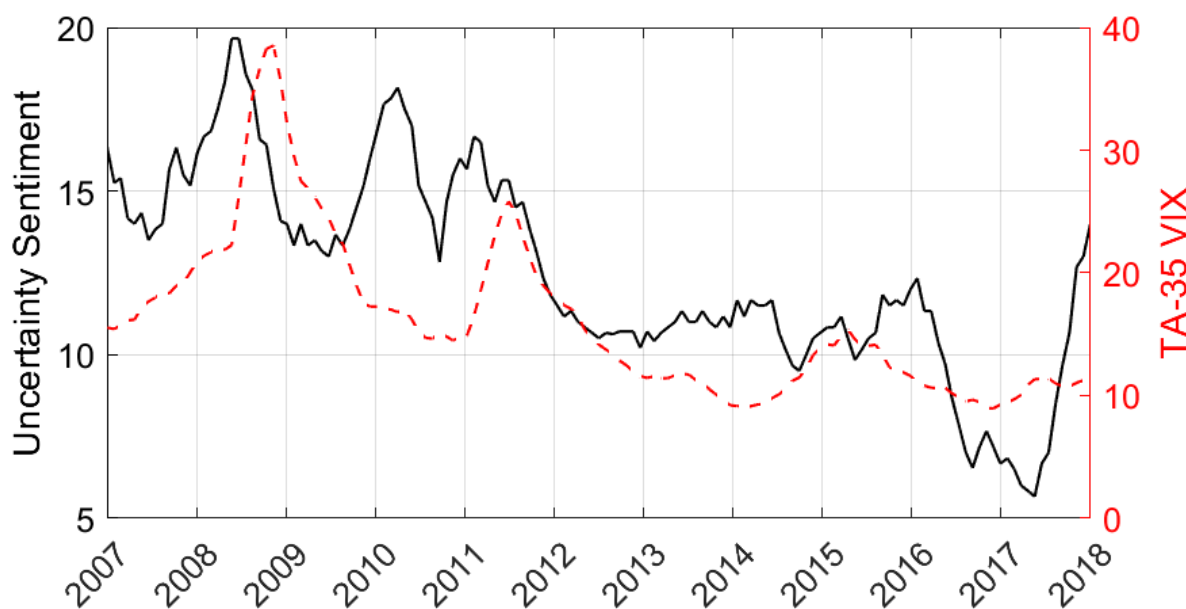
Furthermore, the Fed and the ECB’s linguistic variety indices are almost three times as high as that of the BoI on average over the sample.

2.2 Information Quality

In this section, we examine the quality of the information in the interest rate announcements based on the financial context of the words they contain. Instead of analyzing divergence in

the tones (Sadique et al., 2013; Tilleman and Walter, 2019), we build a textual uncertainty index. In the first stage, using common dictionary-based methods that are designed to analyze financial texts, we identified words in the text that conveyed uncertainty;¹¹ for example, “risk,” “uncertainty,” “volatility,” “probability,” and “variable.” In the second stage, we calculated an index of textual uncertainty, which increased as the rate of words classified in the category of uncertainty increased. The uncertainty index (Fig. 4) shows the announcements contained relatively high contextual uncertainty around the time of the GFC. The contextual uncertainty significantly declined thereafter, particularly after 2016, before rising in response to the global economic uncertainties that transpired toward the end of the sample period.

Figure 4. Index of Uncertainty in the BoI Interest Rate Announcements and TA-35 VIX



Source: Bank of Israel and Benchimol et al. (2020).

Dictionary-based classifications are generally executed at the single-word level using an approach that inaccurately negatively construes a two-term phrase that is formed of words that independently have negative meanings (e.g., “uncertainty” and “declined”) as being negative when the combination of the words actually communicates a positive message (e.g., “uncertainty declined.” Our approach is in line with the literature since phrase-level classification significantly reduces the information present in short texts, such as interest rate announcements, and compensation effects may be at work.

¹¹ The classification adopted is based on the categories proposed by Loughran and McDonald (2011).

We noted several instances of correlation between our uncertainty index and real-world economic events. We examined the correlation between uncertainty indices and risk levels in domestic markets, as reflected in the TA-25 VIX index.^{12,13} A positive Pearson correlation of 0.47 was determined across the sample, while a distance correlation of 0.54 confirmed both linear and nonlinear linkages – causality direction or the assertion that uncertainty leads to fluctuations in VIX, or vice versa, could not be inferred from the data available. The announcements may contain analyses that the public are unaware of, thereby causing market volatility. In contrast, the text may describe VIX fluctuations that would have occurred in any case, even without the announcement. Further in-depth research is required to identify causality direction.¹⁴

3 Conclusion

Sharing transparent communications with the public has become an essential central bank tool that significantly contributes to financial stability. The findings of this study indicate that understanding the BoI's interest rate announcements requires a college-level education, albeit a significantly lower level of education than that required to understand the Fed and the ECB announcements. Furthermore, we find that the introduction of a new announcement format at the beginning of 2017 led to a decline in text comprehensibility. Finally, by applying the text uncertainty index to the BoI's interest rate announcements, we find a contemporaneous correlation between these announcements and economic events, and preliminary evidence that contextual uncertainty correlates with changes in the TA-25 VIX index.

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¹² In February 2017, this index was changed to the TA-35 index.

¹³ Calculated on the basis of the implied volatility of options on the index.

¹⁴ Our uncertainty index positively correlates with the U.S. VIX index, although it is lower (Pearson: 0.44; Distance: 0.50). This finding, together with the fact the BoI's interest rate announcements do not influence the U.S. VIX, supports the hypothesis that volatility in the markets causes an increase in the level of uncertainty in the BoI interest rate announcements, not the other way around.

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