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Segment from Selected Research Analyses:

Measuring Communication Quality in the Bank of Israel's Interest Rate Announcements

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Abstract

This box makes use of text-mining tools to measure the quality of the Bank of Israel's communications with the public. It focuses on the Bank's interest rate announcements in English that were published between 2007 and 2018. We examine the text's accessibility to its readers, meaning how easy the text is to read. We also conduct a sentiment analysis to examine the message that the announcements try to communicate and their economic content. As expected, the analysis shows that the Bank of Israel's announcements are understandable mainly to readers with post-secondary education, but that even so, they are more accessible than the announcements by the Federal Reserve and the European Central Bank. The analysis further shows that the sentiment reflected in the text of the announcements is consistent with certain characteristics of the economy. In particular, we provide preliminary evidence of a correlation between the uncertainty reflected in the text and the VIX index of volatility in the domestic markets.

Background

"…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 Reserve[1]

Studies show that the quality of a central bank's communication with the public regarding monetary policy is strongly correlated with the public's concept of its transparency and credibility (Berger et al. 2011; Hayo and Neuenkirch, 2015). It has also been found that the central bank's transparency can serve as a tool to strengthen financial stability (Powell, 2018), and that its improvement reduces the chance of "surprises" as well as the risk of a market overreaction following the central bank's announcement (Mankiw and Reis, 2018).

[1] See Powell (2018).

The most common index of central bank transparency is based on the volume of communication through channels such as the central bank's official website, periodic reports, annual publications, and other documents intended for the broad public. Based on this index, Dincer and Eichengreen (2008, 2014) show that central banks around the world have been working for years to increase transparency regarding monetary policy. Moreover, in recent years, with the interest rate close to its effective lower bound, the publication of messages regarding the expected path of the interest rate ("forward guidance") is used by central banks as another important monetary tool, the efficiency of which depends to a great extent on the clarity of the messages (Coenen et al., 2017). Therefore, most of the studies analyzing central bank announcements try to create indices of communication quality, and examine the effect of those announcements on the stability of the financial system, on financial variables (Brand et al., 2010), on the ability to neutralize macroprudential risks (Born et al. 2011), and on the ability to forecast the future interest rate path (Hayo and Neuenkirch, 2010; Jung 2016).

This box is based on a number of indices that have been developed in this research literature, and presents preliminary findings regarding the quality of communication in the Bank of Israel's published interest rate announcements. In particular, it examines two communication quality indices: (1) the extent to which the announcements are readable by and accessible to the public; and (2) the extent to which the economic content in the announcements reflects what is happening in the economy.[2,3] The results and calculations presented herein are based on Benchimol et al. (2019).

Quality of communication in the Bank of Israel's announcements

Through the interest rate announcements, the Bank of Israel essentially influences all interest rates in the economy, and through them economic activity and inflation. The interest rate decisions are published at predetermined dates[4] together with an explanation that includes the reasoning behind the decision. For the purpose of the analysis, we collected the content of the interest rate announcements published between 2007 and 2018 from the Bank of Israel's official website in English, since the advanced data-mining methods are mostly intended for texts in English, and with the reasonable assumption that the nature of the announcements and the messages they contain are maintained during translation.[5]

1. **Accessibility of the announcements**

[2] Bholat et al. (2015) review methods for analyzing the text in central bank announcements.

[3] The use of text mining in this context has become common in recent years. To illustrate, Schonhardt-Bailey and Valles (2015) apply it to notices published by the Bank of England during the last year of Marvin King's term and the first year of Marc Carney's term, and show that when Carney took office, the announcements began focusing much more on forward guidance.

[4] For the most part. There were a number of special situations in the past, such as during the Global Financial Crisis, when interest rate decisions were made outside the preset dates

[5] As common among central banks in countries where English is not the primary language, the Bank of Israel translates all of its press releases, particularly the interest rate announcements. In parallel, the Bank's other important products, such as minutes of the interest rate discussions, monetary policy reports, the Bank of Israel Annual Report, and others, are also translated. In recent years, the Bank has started publishing some of its publications in Arabic as well.

In order to measure the accessibility of the announcements, we used two indices. The first is the Type Token Ratio (TTR), which describes variety in vocabulary. TTR is calculated as the ratio between the number of types of words in the text and the number of times they appear (tokens):

$$(1) \qquad TTR_t = 100\left(\frac{total\ types_t}{total\ tokens_t}\right)$$

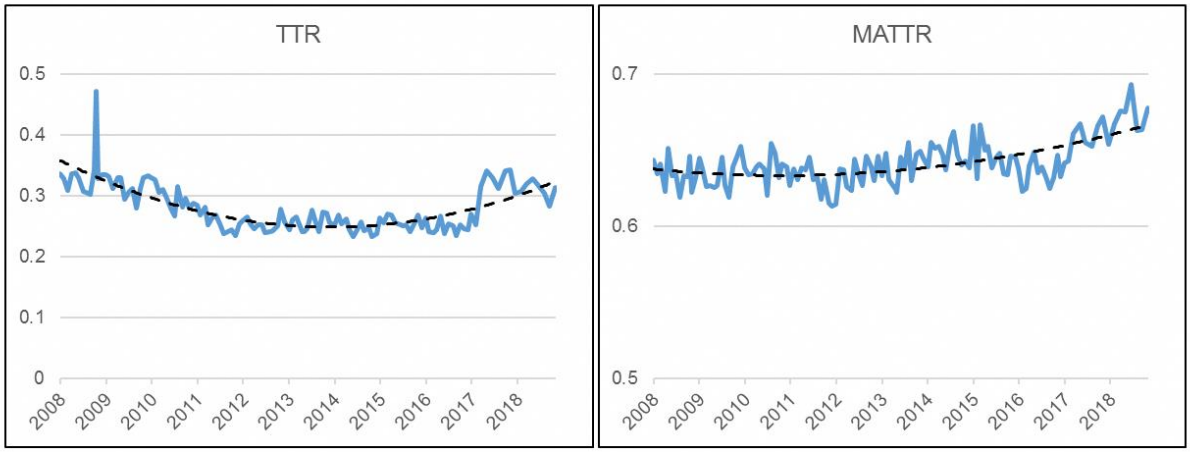
High values in this index show the use of a broad vocabulary and indicate that greater effort and knowledge are required in order to understand the text.

The second is an index of text complexity that was developed by Kincaid et al. (1975) and Flesch (1979), which estimates the number of years of US grade level schooling necessary to understand the meaning of the text. It is based on the lengths of words and sentences in the text, meaning the ratio between the number of words and the number of sentences, and the ratio between the number of syllables and the number of words, accordingly, since long words and sentences increase the complexity of the text.[6,7] This index is calculated using the following formula:

$$(2) \qquad Complexity_t = 0.39\left(\frac{total\ words_t}{total\ sentences_t}\right) + 11.8\left(\frac{total\ syllables_t}{total\ words_t}\right) - 15.59$$

The left side of Figure 1 shows the variety in vocabulary index. The index rose sharply in 2017, after years when it showed relative stability and even declined. The increase took place concurrently with a process in which the format of the announcements changed. The text was shortened, and graphs and messages were added to provide more detail regarding the state of the economy and the background to the interest rate decisions.

Figure 1
Quantitative Indices of Variety in Vocabulary in Bank of Israel Interest Rate Announcements[1], 2007–18



[1] The blue line in each figure represents the index values, and the black dotted line represents the trend line. The TTR is calculated on all the text in each full document, while the MATTR is calculated on a moving average of 100 words in each document.
SOURCE: Bank of Israel.

[6] The values obtained from the text complexity index are translated into the number of years of schooling necessary to understand it. This is a very common index, and is even built into word processing programs such as Microsoft Word. The ECB recently used this index to analyze the readability of announcements presented by the ECB at press conferences (Praet, 2017).

[7] Due to the fact that the Bank of Israel announcements are originally written in Hebrew and then translated into English, the sentences that appear in the English notice may have been longer had they initially been written in English.

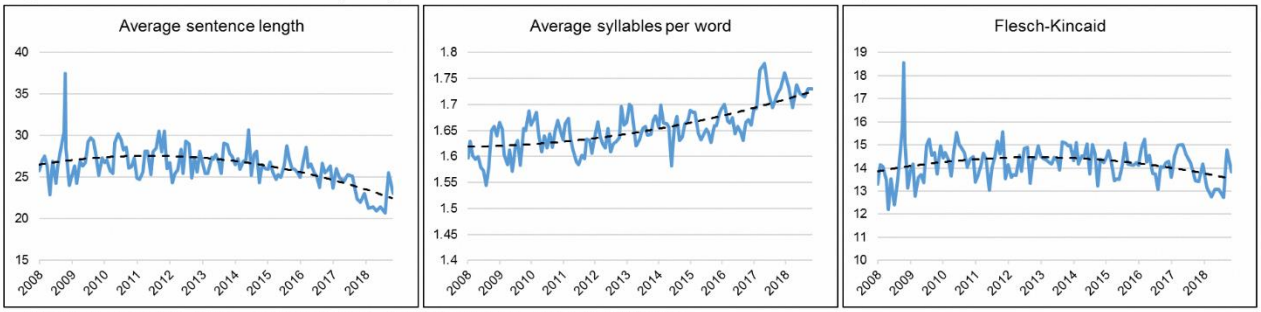
In this context, we note that the TTR index may be sensitive to text length, and may decline for longer texts.[8] In order to examine the robustness of the results, we calculated an additional linguistic variety index that is defined as the average value of the moving average of TTR (MATTR) values in a window that includes 100 words. As the right side of Figure 1 shows, the MATTR also indicates an increase in text complexity beginning in 2017.

It is worth emphasizing that it is difficult to determine based solely on these indices whether the economic message of the interest rate announcements actually became more difficult to understand. It is reasonable to assume that the addition of graphs, for instance, actually improved the quality of communication, but this improvement is not reflected when focusing on indices that take only word and sentence lengths into account.

The text complexity index presented on the right side of Figure 2 (Flesch-Kincaid), is stable, and it is difficult to identify changes in it over the years. An average of 14 years of schooling in the US education system are necessary in order to understand the text in the English-language interest rate announcements.

A more precise examination of the factors that comprise it—sentence and word length—indicates that sentence length declined after 2017 (left panel of Figure 2) from about 27 words per sentence to about 22 words (although there was a renewed increase at the end of the sample), which contributes to a decline in text complexity. In contrast, the average number of syllables per word (middle panel of Figure 2) increased, which contributes to an increase in text complexity. In summation, the two factors offset each other, such that the complexity index remains stable.

Figure 2
Quantitative Indices of Text Complexity in Bank of Israel Interest Rate Announcements[1], 2007–18



[1] The blue line in each figure represents the index values, and the black dotted line represents the trend line.
SOURCE: Bank of Israel.

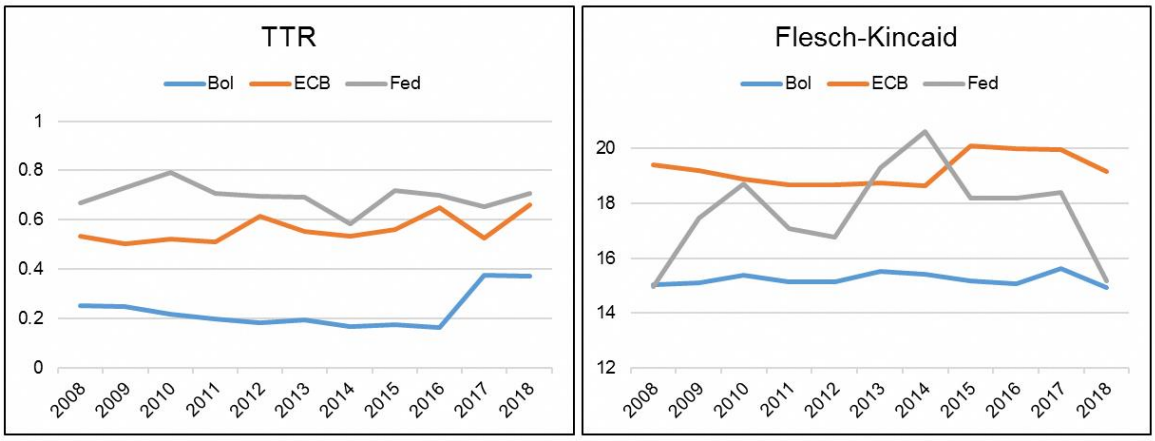
It is important to emphasize that the complexity index does not take into account the content of the text, but it is clear that knowledge in the field relevant to the text helps to understand it. It is also worth noting that a complexity level that is too low will make it very difficult to properly deliver technical and professional messages.

As stated, deriving conclusions based on the quality of the complexity and linguistic variety indices is challenging. These indices are more helpful when comparing texts with similar content—in our case interest rate announcements published by other central banks. Figure 3 presents a comparison that shows that the complexity and linguistic variety indices of the Bank of Israel's announcements

[8] Basically, the more tokens a text contains, the more repetition there is 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 Equation 1).

during the sample are significantly lower than the levels found for the two leading central banks in the world. The announcements by the Fed require an average of about 17 years of schooling, and those of the ECB require about 19 years of schooling. Furthermore, the linguistic variety indices for the Fed and the ECB are about three times as high as for the BOI on average over the sample.

Figure 3
International Comparison of Linguisitic Variety and Text Complexity Indices[1], 2008–18



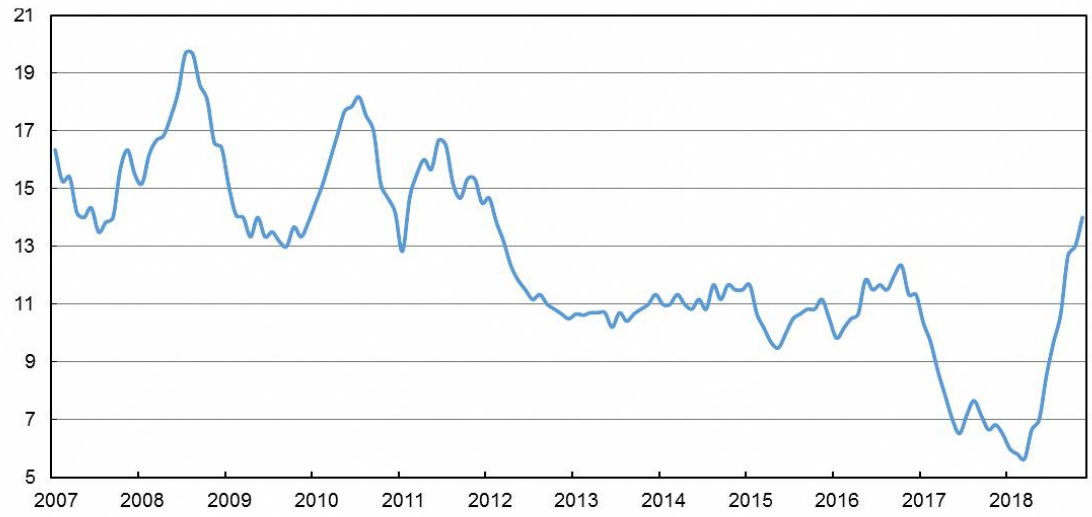
[1] Yearly averages. The comparison is to interest rate announcements made by the Federal Reserve and the European Central Bank.
SOURCE: Bank of Israel.

2. Quality of information in the announcements

We now examine the quality of the information in the interest rate announcements based on the economic-financial context of the words they contain. In the first stage, we find words that express uncertainty in the text, using common dictionary-based methods regarding texts of an economic-financial nature.[9] Examples of words classified as uncertainty include "risk", "uncertainty", "volatility", probability", and "variable". In the second stage, we calculate an index of textual uncertainty. This index increases as the rate of words classified in the category of uncertainty increases. The uncertainty index is presented in Figure 4. As the Figure shows, the uncertainty index is relatively high around the time of the financial crisis that began in 2008, declined significantly thereafter, and particularly after 2016, and increased again at the end of the sample, along with the increase in uncertainty in the global economy.

[9] The classification into these categories is based on Loughran and McDonald (2011).

Figure 4
Index of Uncertainty in the Interest Rate Announcements, 2007–18



SOURCE: Bank of Israel.

We emphasize that this classification, and basically any classification using a dictionary-based method, is generally made at the single word level, and therefore does not take into account phrases such as "uncertainty declined" that should generally reflect a positive message, even though it is comprised of two words that have negative connotations. Even so, we used it as common in the literature, since classification by phrases makes the classification more difficult in that it significantly reduces the information that exists in short texts such as interest rate announcements.

It is interesting to examine the extent to which the uncertainty index actually matches what is happening in the economy, and here we focus on the correlation between it and the level of risk in the domestic market, as reflected in the VIX index on the Tel Aviv 25.[10,11] The correlation between the two indices throughout the sample is found to be positive at 0.64. This is the place to emphasize that it is difficult to indicate causality from this finding. In other words, we should not conclude that textual uncertainty "causes" changes in the VIX or vice versa. Moreover, the direction of causality in this case is not at all clear a priori. The Bank's announcements may contain analyses of which the public is unaware, and thereby cause volatility in the markets. In contrast, the text may contain information concerning changes in the VIX that would have happened in any case, even without the announcement. Identifying the direction of causality in this case requires an in-depth analysis in a follow-on study.[12]

Conclusion

Transparency and communication with the public have become essential tools used by central banks throughout the world to contribute to the stability of the economy and of the financial

[10] In February 2017, this index was changed to the Tel Aviv 35 index.
[11] The VIX index is calculated on the basis of the implied volatility of options on the index.
[12] The correlation between the uncertainty index and the U.S. VIX index is positive, although it is lower (0.47). This finding, together with the fact that the U.S. VIX is not influenced by the Bank of Israel's interest rate announcements, supports the hypothesis that volatility in the markets cases an increase in the level of uncertainty in the interest rate announcements, and not the other way around.

system. We have analyzed the Bank of Israel's interest rate announcements between 2007 and 2018, and we find that understanding the texts requires a high level of education, although significantly lower than what is necessary to understand the interest rate announcements by the Federal Reserve and the ECB. Furthermore, we find that text accessibility declined with the transition to a new announcement format at the beginning of 2017. However, in the new format, the text was shortened and detailed graphs presenting the background conditions to the interest rate decision were added. It is reasonable to assume that these contributed positively to making the economic message that the Bank of Israel communicates at the time of the interest rate decision more accessible, and that this is not noticeable in the indices that we used. Finally, using the index of text uncertainty in the interest rate announcements that we built, we find a contemporaneous correlation with economic events. In particular, we find preliminary evidence that the text uncertainty index is correlated with changes in the Tel Aviv 25 VIX index.

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