CENTRO DE INVESTIGACIÓN Y DOCENCIA ECONÓMICAS, A.C.

ENHANCING MONETARY POLICY IMPACT: EVALUATING THE EFFECTIVENESS OF CENTRAL BANK COMMUNICATION IN SHAPING INFLATION EXPECTATIONS

TESINA

QUE PARA OBTENER EL TÍTULO DE

LICENCIADA EN ECONOMÍA

PRESENTA

VALERIA OVALLE MOLINA

DIRECTOR DE TESINA: M.E. EDWIN SALIM TAPIA ALVARADO

LECTOR DE TESINA: DR. DANIEL VENTOSA SANTAULÀRIA

CIUDAD DE MÉXICO 2024

Acknowledgments

As my trajectory at CIDE and as an undergraduate student comes to an end through the presentation of this work, I would like to take this moment to thank the people who not only walked beside me in this process but also gave me a hand when needed and, at times, even a little push.

First, I would like to thank my family, who supported me unconditionally in this process, celebrating my victories, making me laugh when I failed, and reminding me of my goals when I seemed to forget them. They were a constant source of joy, inspiration, and, above all, patience, since listening to a person talk daily about their career, subjects, professors, and exams must not have been easy. It was not a particularly easy four years for them. However, they never let me stray from what was essential and the person I wanted to become, someone they can be as proud of as I am of them.

Secondly, I would like to thank my social service friends; they were a source of laughter, joy, and coffee trips during months of stress, work, and pressure. They were a guide in the experience of getting to know what I love, giving a 180-degree change to the trajectory of my life plans and helping me stay focused and confident that I had the capabilities to achieve what I wanted. These are friendships that I value and am grateful for, whose love and support are reflected in the completion of this dissertation. Moreover, I would like to thank and recognize the work of my thesis director, M.E. Edwin Tapia Alvarado, and reader, Dr. Daniel Ventosa, whose guidance and support were crucial for developing this work.

Third, I would like to thank my friends Mariana Ramírez, Abigail Basáñez, María José Cortés, and Daniela Chavez for the genuine love and support they have shown me in the last four years. They have filled my days with laughter, movie runs on Mondays, early morning jogging trips, and Taylor Swift songs. They were a source of peace and stability, a family far from home but just as real.

Lastly, I would like to thank myself for not giving up, even when she didn't feel she was enough for the standards or her goals. Let it be a reminder that she has people who love and support her in fulfilling her objectives, and, most importantly, she has herself.

Abstract

As the economic environment becomes more complex and exposed to external shocks that complicate the mandate of inflation-targeting banks, Central Banks are turning away from conventional monetary tools and implementing efficient but unconventional tools, such as communication. However, its implementation only guarantees results with the correct use of the following components: readability, complexity, and tone. Communication works as a double-edged sword; in its efficient use, it can reduce economic uncertainty, reinforce central bank credibility, and anchor inflation expectations. Otherwise, it can create more noise, distrust, and inconsistency within monetary policy deciding groups. Therefore, the analysis of these three components is of utmost importance for their correct implementation in the primary communication instruments used by Banco de Mexico: the Minute and Monetary Policy Statement.

This thesis aims to perform an exploratory analysis of the Minute and Statement using readability metrics and dictionary methodology. It will measure communication efficiency based on comprehensibility, complexity, and tone within a hawkish and dovish threshold. It will further resolve the language barriers that cloud the efficiency of communication analysis for Spanish tests by creating a Dictionary and Tone indicator to measure tone projection capabilities for key macroeconomic variables, especially for anchoring inflation expectations.

Abbreviations

- Banco de Mexico ..... (Banxico)
- Federal Open Market Committee ..... (FOMC)
- Federal Reserve Board ..... (Fed)
- Inflation Targeting ..... (IT)
- International Monetary Fund ..... (IMF)
- Kaiser Meyer Olkin ..... (KMO)
- Machine Learning Dictionary ..... (MLA)
- Principal Components Analysis ..... (PCA)

Contents

List of Tables

List of Figures

1. Introduction

Central banks, such as Banco de Mexico (Banxico), fight inflation with a clear strategy: the Inflation Targeting Scheme. This approach launched in 2001, featuring medium-term inflation targets and transparent monetary policies to foster economic stability, aiming for minimal deviations from mid-term forecasts and the target inflation rate (Banxico, 2018b). With a steadfast goal of achieving a 3% inflation rate, the Bank maintains an open dialogue with financial markets and the public in its decisions and rationales to enhance accountability, credibility, and predictability of future actions, effectively reducing monetary policy uncertainty (Banxico, 2018a). This transparency clarifies the Bank's rationale, steadying market expectations and anchoring the nation's financial future through clear Monetary Policy Statements and Minutes to discuss inflation outlooks and determinants.

In addition, by openly discussing the decision-making process of shifts in the interest rate and the expected inflation trajectory, the Bank assigns responsibility and accountability to manage financial market expectations and align them with the economy's trajectory. This approach directly controls expectations, thereby increasing monetary policy's effectiveness in parallel. Nevertheless, for the decision discussion to be effective, as portrayed by the IMF's Central Bank Communications Handbook, " monetary policy communication depends on a well-defined policy framework, with its objectives clearly defined and prioritized, as well as the corresponding instruments and operational procedures" (Casiraghi, 2022).

In order for Central bank to effectively use communication mechanisms to achieve their inflation target objectives, Statements must act as a noise reduction mechanism and provide clear market signals; especially in complex economic scenarios Luangaram et al. (2017) and Heath (2023) identify that effective communication hinges on four key attributes: readability, topic depth, tone, and complexity. Therefore, a text effectively communicating monetary policy should be easy to read and use straightforward language with minimal academic and technical jargon. Thus, it should maintain a low complexity level, ensure a coherent organization of topics without abrupt transitions, and employ concise sentences with accessible and familiar vocabulary and simple syntax. This approach targets a broader audience, effectively shaping economic agents' expectations. By doing so, transparency in communication reduces uncertainty, offering insights into the rationale behind monetary policy decisions, thereby enhancing the policy's functional impact.

Researchers measure communication effectiveness through quantitative literary review methods, assigning numerical values to critical characteristics, such as text complexity, vocabulary, sentence count, length, and conciseness to enhance readability. Similarly, the Flesch readability scales assess how easily one can read central bank communications, categorizing texts as tricky,

standard, or relatively easy. These tools enable comparisons across Central Banks within the inflation targeting scheme for developed and developing countries (Bulíř et al., 2011). Additionally, sentiment analysis quantifies communication tone, identifying shifts in inflation risk or interest rate increase cycles such as a worsening inflation risk balance consistent with Hawkish signals or signs of an economic slowdown and relaxation in interest rates with Dovish signals (Investopedia, 2024).

Since 2020, Banxico has significantly improved its communications instruments by reducing its word count, sentence and word length. Consequently, these documents, publicly accessible and dating from 2011 through 2024,[1] now incorporate inflation projections, topic sentences and eliminate redundant paragraphs, among other strategies. This allows both Minutes and Statements to be more readable and understandable for the general public and instills hope for even better communication strategies in the future. Therefore, this text pursues the hypothesis that Mexico's Central Bank's improved communication strategy has not only enhanced the readability of its Monetary Policy Statements and Minutes but also its effectiveness.

Considering an exploratory analysis of shifts in Banxico's communication strategies with the help of Readability Metrics and the creation and quantification of a Tone Indicator for Minutes and Statements, this text proves not only the importance of effective communication but also its correlation with effective monetary policy. Based on the results available through the tone indicator, it can be concluded that the tone from Banxico's communication instruments can forecast inflation through different lags, especially short-term inflation expectations. Moreover, the changes in communication strategy based on Fleschh Readability Metrics have proven to be effective, converging Minutes and Statements to the desired values.

The organization of this text is as follows: Section 2 reviews the literature on historical changes in Central Bank communication and debates on transparency in Monetary Policy; Section 3 explores the methodologies explored, including Flesch Scales and the development of a sentiment indicator and dictionary; Section 4 provides results regarding readability, communication developments and the relationship between tone and macroeconomic variables; Section 5 includes Statistical tests regarding the tone indicator and Section 6 robustness tests. Section 7 presents the relevant monetary policy recommendations and, finally, Section 8 concludes.

[1] To access Banxico's monetary policy documents see: `https://www.banxico.org.mx/publications-and-press/minutes-of-the-board-of-governors-meetings-regardi/minutes-regarding-monetary-po.html`

2. Communication as an instrument

2.1. Historical evolution of communication strategies within central banks

Since the 1990s, central bank communications have significantly evolved towards greater transparency. This shift involved openly sharing information on past, present, and future monetary policy decisions, interest and inflation rates, and economic forecasts with the public. However, the move towards transparency has sparked debates regarding how central banks disclose their policy decisions. The future of central banks is a balancing act between improved predictability and effectiveness of monetary policies, in contrast with potential downsides like reduced flexibility and increased market volatility. Bernanke (2005) and studies on the Federal Open Market Committee (FOMC), among others, have provided evidence of the benefits of communication such as the capacity to directly influence the economy's expectations. Nonetheless, the risks associated with greater transparency, including market instability and diminished trust in central banks, highlight the complexities of effective communication.

The transition from a secretive approach to embracing transparency essentially began with Alan Greenspan's tenure on the Federal Open Market Committee Board of Governors.Woodford (2005) labeled this period the *Greenspan Policy Regime*, and starting in 1987 after Paul Volcker,it marked a pivotal change in central bank communication channels. Under Greenspan, central banks started using communication as a monetary policy strategy to enhance its effectiveness, a departure from the prior reliance on market surprises, as Poole and Rasche (2003) noted.

The transformation gained momentum in 1994, when the FOMC abandoned the previously endorsed philosophy that "(..)monetary policymakers should say as little as possible, and say it cryptically" (Blinder et al., 2008), to a strategy of transparent engagement. According to Alan Greenspan, one of the main reasons for the increase in communication was to manage the market's expectations by transparently disclosing the future levels of the federal funds rate. This shifted from "mumbling with great incoherence" (Greenspan, 2003) to issuing detailed bank statements that enhanced market and public understanding (Blinder et al., 2008). This approach has altered policy effectiveness according to the authors and significantly improved the FOMC's credibility and clarity of future decisions, underscoring a fundamental change in the dynamics between central banks, markets, and the general public.

Once the transformation of the Greenspan era has been established as one of the first shifts of communication as a monetary policy strategy, the origins of its increase in relevance in the last 15 years have yet to be discussed. Its importance became more pronounced in the early 1990s and gained momentum following the Great Financial Crisis of 2008. In the context of economic turmoil, central banks, as noted by De Haan (2019), played a pivotal role in mitigating

macroeconomic shocks, particularly when forced to lower their interest rate to the lowest bound possible. Their communication efficiency restored trust, provided certainty, and ensured the successful implementation of monetary policies to combat the recession. Furthermore, as conventional monetary instruments reached their limit, the strategic use of communication emerged as a primary focus for central banking, highlighting its growing significance in addressing economic challenges.

2.2. Communication Process

In pursuit of stabilizing inflation, central banks often deploy unconventional strategies to shape expectations during uncertain economic outlooks. Among these strategies, open communication channels with financial markets and the general public play a crucial role. Such communication efforts, especially in complex financial environments, strengthen a bank's credibility and mitigate uncertainty exacerbated by contradicting information from multiple sources. This process involves two key steps: 1) reducing noise and uncertainty through signaling efforts and 2) creating certainty within the economic outlook through brief, clear, and concise statements, as highlighted by Blinder et al. (2008).

The first step involves signaling about future central bank decisions and view on the economic outlook to manage expectations within the financial markets and the general public, thereby reducing uncertainty. This process encompasses past, current and anticipated future monetary policy decisions. Known as forward guidance, this strategy by central banks aims to anchor expectations to an estimated economic trajectory, thereby enhancing predictability (De Haan, 2019).

The challenge regarding bank statements containing imperfect and irrelevant information (known as *noise*) is it complicates message comprehension, as observed by Österholm et al. (2008). This issue is further aggravated by contradictory information being available from various sources, obscuring the public's capacity to understand the intended message. Major banks can diminish the noise and volatility by delivering well-constructed communications, in doing so increasing predictability and reinforcing economic expectations. Transitioning smoothly from the challenge of reducing noise, the creation of releases, Monetary Statements or reports represents a strategic dissemination of economic information primarily aimed at shaping the short-term effect and the economic narrative (Österholm et al., 2008). This narrative includes a vast range of topics, from the economy's outlook, key macroeconomic variables to the anticipated impact of current monetary policies to guide the economic discourse.

The initial step for generation of effective communication pieces involves receiving data containing both the desired monetary policy signals and noise. This data then undergoes what can be refereed to as a "black box", a process to refine the information and ensure that only the in-

tended message is communicated in a clear and concise manner. This is supported by readability measurement claiming comprehensibility is increased by concise statements, short paragraphs, and sentences with a small word count, particularly for audiences with limited expertise (Bulíř et al., 2011).

Subsequently, the refined message emerges from the black box, ready to be incorporated into bank statements and released to the public. This practice of open communication enhances the bank's transparency by presenting information in an accessible and comprehensible manner regarding its decisions, rationale, and future objectives. Such transparency not only boosts the bank's credibility and authority during periods of economic uncertainty, but also requires careful management to maintain its legitimacy without compromising its future credibility and flexibility, as Woodford (2005) discussed.

Focusing on the generation of effective communication pieces emphasizes the importance of readability in avoiding the reintroduction of noise in the already-cleaned information. Moreover, Luangaram et al. (2017) and Heath (2023) highlight in their analysis that readability, dictated by the subject matter, tone, and structure complexity, significantly influences comprehension. Therefore, a bank statement that is both straightforward and engaging enhances the public's understanding of the economic outlook, potentially mitigating volatility and boosting the effectiveness of monetary policies (Blinder et al., 2008).

To ensure a communication statement is easily understood, it should minimize complex and technical language, considering the audience's existing knowledge. Effective communication demands short sentences, consistent themes and tones, and concise paragraphs for clarity, even when addressing sophisticated subjects. Readability metrics such as the FleschSzigriszt method, and text sentiment analysis methods by Bulíř et al. (2011) provide this quantitative assessment of a statement's clarity and its ability to enhance comprehension by assigning numeric values to their performance . These tools not only gauge the readability of a bank‘s communication but also allow for comparisons between central banks across different countries, evaluating the effectiveness of their communication strategies.

Considering the strategies of news creation and noise reduction, it's clear that the optimal communication strategy for central banks remains under exploration. However, there is a broad consensus on the advantages of employing concise, transparent communications to convey economic news. Such approaches enhance the predictability of future monetary policy decisions, lower financial market volatility, and stabilize inflation expectations. The tone of communication also plays a crucial role; varying tones can obscure monetary policy predictability by introducing additional noise. Despite this, research into the most effective structure to diminish conflicting messages and the impact of the "announcement effect" is ongoing (Blinder et al., 2008). This underscores the delicate balance between transparency and flexibility, particularly

regarding forward guidance, which could compromise the bank's credibility if macroeconomic variables shift unexpectedly.

2.3. Relevance of tone as a communication element

Effective monetary policy communication crucially hinges on the ability to clearly convey intentions to the public. Therefore, the bank must articulate the reasons behind any deviations in the inflation targets to the public rather than just the deviations themselves. This transparency and accountability in explaining policy shifts are what bolster the bank's reputation according IMF (2023) . Thus, sentiment coherence emerges as a vital component in the communication process, anchoring the public's perception of the bank's messages.

Sentiment analysis has become increasingly significant in recent years for evaluating whether Central Bank documents reflect the direction of monetary policy decisions. The analysis typically distinguishes between hawkish and dovish tones. As Evdokimova et al. (2023) suggests, aligning the tone with policy decisions clarifies the message and minimizes surrounding noise. Effective communication acts as a noise reduction mechanism, necessitating the use of tone to align public sentiment with policy trajectories and signal upcoming monetary decisions.

The study of tone and sentiment analysis, although challenging due to the complexity of quantifying intention and perception, remains a critical area of research. Innovative methodologies, including dictionary-based approaches, zero-shot models, and machine learning, have been employed. Researchers like Nakayama (2023), in a study of the Federal Reserve's communication efficiency, emphasize that consistency between the bank's policy decisions and its communications is paramount. This consistency fosters a confidence bonus, enabling the Institution to align expectations with its policy trajectory through clear signaling about the macroeconomic outlook, target goals, and policy rationale.

3. Methodologies

In the past two decades, central banks have increasingly recognized the importance of effective communication with the public, transitioning from a traditionally opaque approach to one of transparency in monetary policy decisions (Woodford, 2005). This evolution has sparked debate in two directions: the benefits of enhanced communication and the associated risks, particularly regarding reduced policy flexibility, mainly regarding the lack of flexibility after announcements. Nevertheless, the central thesis of this text proposes that improved central bank communication directly enhances transparency with financial markets and the general public. Such transparency, in turn, fosters greater accountability, increasing the bank's credibility (Beaupain, 2020). To explore the evolution in communication mechanisms, this text will take on two empirical strategies, the first focused on enhanced readability, the second on tone and its effect on macroeconomic variables.

3.1. Database description

This study utilizes the Szigriszt-Flesch and Fernández Huerta methods to analyze the readability and a Dictionary Method to identify the tone from Mexico's central bank communication instruments, focusing on Minutes and Statements published between January 21, 2011, and November 9, 2023.[2] The selection of documents from this period allows for a comprehensive evaluation of the central bank's communication effectiveness and evolution over approximately 12 years.[3] This time frame is significant as it marks the coexistent publication of the Monetary Policy Statements and Minutes, providing a robust dataset for assessing changes in the bank's communication clarity.

3.2. Empirical strategy - Flesch scale

This paper employs two complementary methods to evaluate advancements in the readability, comprehensibility, and transparency of central bank communications: the Flesch–Kincaid readability tests, the Szigriszt-Pazos method, and the Fernández–Huerta readability measurements for the Spanish dictionary.

On the one hand, the Flesch-Kincaid test empirically assesses the readability index of documents, generating two crucial values: a readability score from 0 to 100, indicating ease of reading and a grade level requirement for comprehension. These metrics are instrumental in

[2] The Minutes are analyzed using the Szigriszt and Fernandez Huerta method, using a timeline from February 4, 2011 to November 23, 2023. Communication Statements range from January 21, 2011, to November 9, 2023, and were measured exclusively with the Szigriszt-Flesch technique.

[3] There are documents before 2011, however are not considered in this text.

understanding the impact of central bank communications on diverse audiences. Readability, as determined by the Flesch-Kincaid formula, reflects the structural elements of communication, including document length, word and sentence length, and overall composition of the text (WebFX, sf). Research indicates that readability improves when these elements are optimized to convey complex topics concisely. This challenges central banks tasked with conveying intricate subjects into accessible language (Bholat et al., 2019).

On the other hand, the academic level necessary for understanding central bank communications is vital. These institutions employ a multilayered communication technique to address audiences with varying levels of prior knowledge within the same document. Therefore, recognizing the required academic level helps banks tailor their messages, ensuring that the general public and financial market experts can grasp the content. Flesch's 1943 documents underscore that word length and the use of prefixes and suffixes complicate comprehension, emphasizing the importance of drafting messages that captivate the audience's interest without sacrificing clarity (Hernández, 2017).

The Flesch readability score is crucial for central banks targeting both expert and non-expert audiences. A score of around 60 denotes sufficient readability, categorizing texts as very easy, easy, relatively easy, standard, somehow arid, hard, and relatively hard (Readable, sf):

$$206.835–1.015x(words/sentences)–84.6x(syllables/words)$$

The grade level, using the same factors but with the formula further aids in adjusting communication complexity (Bulíř et al., 2011):

$$0.39x(words/sentences) + 11.8x(syllables/words)–15.59$$

The Fernández-Huerta method, a Flesch adaptation for Spanish texts, emphasizes text clarity or perspicuity. P stands for average syllable count for every 100 words and F is the average sentence count for every 100 words. It calculates readability and categorizes texts according to their ease of understanding for the intended audience (Korntheuer, 2015):

$$206.84–0.60P–1.02F$$

Unlike the regular Flesch scale, and proving its relevance to the Spanish language, it doesn't take into consideration word count.

This complementary method, Szigriszt-Pazos, a Flesch adaptation employs the formula (Szigriszt, 1993):

$$P = 206.835 - (62.3S)/P - P/F$$

Table 3.1: Perspicuity levels in the Szigriszt-Pazos readability index

P	Style	Study Level
0-15	Very hard	College Graduates
16-35	Arid	Selectivity and University Studies
36-50	Quite hard	Secondary Courses
51-65	Normal	Popular
66-75	Quite easy	13 years
76-85	Easy	11 years
86-100	Very easy	6-10 years

Source: from "Índice de perspicuidad de Szigriszt-Pazos", Szigriszt (1993).

where P represents perspicuity, S total syllables, P word count and F sentence count.

Linking each style to a specific academic level ensures texts meet the comprehension abilities of their audience. Assuming that the general public with access to and interest in central bank communications is at least at a high school education level, an optimal perspicuity index is between 36 and 50, with a minimum value of 16 to maintain accessibility. Nevertheless, for optimal comprehension by the general public, with different levels of prior knowledge, central banks should aim for an optimal readability score between 50-60 as seen in Figure 3.1 (Szigriszt, 1993).

3.3. Empirical strategy - Development of tone indicator

Effective communication is crucial for Central Banks to foster credibility and policy efficacy. In this regard, the tone of Central Bank documents plays a pivotal role by aligning public expectations with monetary policy decisions. It serves as a consistent bridge between the bank's declarations and actions. To fully analyze every element that contributes to efficient monetary policy communication: readability, tone, and complexity, a sentiment indicator needs to be generated specifically for Spanish vocabulary. This study utilizes a modified version of the sentiment analysis framework of Evdokimova et al. (2023), originally used to compare communication strategies between emerging market central banks and major institutions like the Federal Reserve and the European Central Bank.

Their methodology extends the existing sentiment analysis tools developed by Gonzalez and Table in 2022.[4] It assigns numerical values to the text based on the classification of keywords and modifiers into hawkish or dovish sentiments. This classification relies on the frequency and context of each word within the document, breaking down the text into manageable parts using punctuation and conjunctions to isolate the impact of each segment.

[4] To see the full article and dictionary see the following link: `http://dx.doi.org/10.2139/ssrn.4628672`

3.3.1. Dictionary generation and calibration

For the dictionary's generation, it is essential to note that the Monetary Policy Statements and Minutes used to identify keywords and modifiers are incorporated in their original language: Spanish. Although the formats of these communication instruments are publicly available in English, the vocabulary list won't be translated to reduce any errors between languages as there is room for translation discrepancies regarding synonyms that could alter the word's frequency and the Dictionary's KMO.

Terms are categorized into two main groups: keywords, typically nouns that are the subject of the sentence, and modifiers, which are verbs or adjectives that directly influence the keywords.

Moreover, to fit the specifications of the posterior analysis and the numerical value assigned to each keywords, this are distributed into clusters: Forward Guidance, Direct Keywords, Financial Stability Keywords, Negative Keywords, Supply Side Factor Keywords, Reverse Keywords, Direct and Reverse Compound Keywords. The same is done for the modifiers, but this are only cataloged into 2 groups: positive and negative (Evdokimova et al., 2023).

Figure 3.1: Self-made Dictionary

Forward Guidance	actual, anterior, debajo, espera, mantenerse en niveveles, mantenerse por un periodo previamente, mantuvieron por un periodo, necesario, al esperado, mientras que a un nivel que , a un nivel de , reciente, han mantenido, tendencia, con el objetivo de , en los siguientes , converja , a partir del , recientemente, anticipaba, anticipada, previsto , esperada, por un periodo prolongado, que mantendrá, después de la última decisión de política monetaria, desde la decisión de política monetaria previa , prevé, previsiones, necesarias , prevén, nivel actual , prevista, en las siguientes decisiones de política monetaria rango objetivo , anticipa , horizonte de pronóstico, decidió por unanimidad , próximas reuniones , mantener el objetivo, mantuvieron sin cambio, mantener la tasa, lapso prolongado, tomará las acciones
Direct Keywords	actividad, balance, base, brecha, condiciones, confianza, consumo, oferta, cambiaria, crecimiento, crédito, demanda, economía, efectos, expectativas, gasto, impacto, inflación laboral, mercados, monetaria, política, posibilidad, precios, actividad, producción, reserva, sector, tasa, trayectoria, dólar, subyacente, inversión, entorno, peso , rango , objetivo , niveles , producto, voto , ritmo , mercado, pronóstico, panorama, tasa, holgura, meta
Financial Stability Keywords	activos, ajuste, ciclo, comportamiento, estabilidad, financiera, financieros, fiscal, interés, inversión, primas, magnitud
Negative Modifiers	advirtió, corto, desaceleración, desacelerado, descenso, deterioro, disminución,, disminuyeron, menor, menores, apretada, reducción, incierto, apretamiento , disminuir, agravamiento , a la baja, reduzcan, descendente, complicado , reto, contracción,apreciación, incertidumbre, reducir, sujeto a diversos riesgos, sujetas a riesgos, volatilidad, implicar riesgos, apretadas, bajo, bajos, complejo
Positive Modifiers	al alza, aumento, avanzadas, depreciación, emergentes, encima, estables, apoyo, fortaleza, importante, incremento, inflacionarias, mayor, mayores, mayoría, recuperación, superior más, resistencia, persistencia, niveles altos, resistencia a disminuir , incrementar, persisten aumentando , elevados, acelerados, adecuado, incrementarse, ampliación, acentuada superiores, resiliencia, mitigación , mitigar , recuperandose , recomposición , destacan, aumentaron , prolongación, prevalece, fortalecer , incrementos, favor,importantes apoyo, reforzar, estable, arriba, congruente, elevadas, resiliente, inflacionario, evolución amplias
Supply Side Factors Keywords	bienes, choques, energéticos, servicios, costos
Reverse Keywords	debilidad, desinflacionario , riesgos, reto, retos, tensiones, distanciamiento, desbalance, conflicto
Reverse Compound Keywords	problema inflacionario
Direct Compound Keywords	tipo de cambio, política monetaria, mercado financiero , economia global , inflación subyacente, inflación no subyacente, tasa de interés de corto plazo , tasa de interés de mayor plazo , tasa de interés interbancaria, actividad economica mundial , Bancos Centrales , Inflación general , Actividad económica, choque financiero , economía mundial, fundamentos macroeconómicos, pronósticos de inflación general, balance de riesgos , expectativas de mediano plazo , expectativas de largo plazo , tasa de referencia, tasas de interés,inflaciones generales, panorama inflacionario, inflación global, condiciones financieras, condiciones monetarias, merados financieros

Source: self made elaboration using the Gonzalez and Tadle and the McDonald Dictionary as guidance for classification. The dictionary was calibrated to effectively read documents from Banxico, specially the Statements and Minutes. Publicly published Statements and Minutes where used as vocabulary and frequency source, dating from 2011 to 2023.

Although the original methodology effectively established the clusters and target vocabulary, the identification, generation, and calibration process for the dictionary was different. While the base dictionaries were recovered and used, such as those by Gonzalez and Tadle and the Loughran and McDonald Dictionary, the fact that these dictionaries are built for the English language proved to be a language barrier. A simple translation effort would've been insufficient

to overcome this challenge, mainly due to the multiple possible verb conjugations per time and subject in Spanish.

For that reason and to ensure that only high-frequency words that would contribute to a classification of tone between hawkish, dovish, and natural were used, the generation process was as follows:

1. Generate a literal translation of the Gonzalez & Tadle (2022) Dictionary, considering any possible conjugations and synonyms. Use a computerized program to identify such keywords within the Minutes and Statements, registering those with high frequency.

2. Using a computerized model that identifies the most frequently used simple and compound keywords within Banxico's communication pieces, expand the existing list and check its presence within the established data set. Once a preliminary vocabulary list is made, classify the words into the established clusters from the original methodology and use as a reference both base dictionaries (positive, negative, uncertainty, neutral, direct, amongst others)

3. For the manual calibration process, a series of Minutes and Statements were selected for every year, standardizing by months to minimize a particular factor that could influence the keyword selection. All of the available Minutes and Statements for February and September were manually analyzed to corroborate the existing vocabulary list and expand on any term missed by the computer.

4. For the calibration process, once the methodology model was carried out digitally with the help of R-studio, for each Minute and Statement of every available month within the website, a parallel manual process was done for every Minute and Statement within the shifting years previously discussed. This was done to identify keywords and compound phrases used in the instruments before 2019, where more references were made to the external context. Therefore, this process allowed for the dictionary to be calibrated to every time interval considered in this text and provided a hawk or dove result even with different communication strategies implemented. Both base dictionaries were used to ensure the correct classification of keywords in the dictionary and were tested in more recent publications to ensure their frequency.

Based on this process, the visual dictionary illustrated in Figure 3.1 was developed for further use in a tone analysis for Banxico's communication instruments. According to their positive or negative connotation, the keywords and modifiers are given a numerical value incorporated into a model that catalogs sentence fragments based on the relationship of such elements. Each

sentence fragment is subsequently analyzed to determine whether the overall communication of such an instrument leans towards a hawkish or dovish tone.

3.3.2. Keyword classification process and relationship

Conducting a tone analysis of Banxico's Minutes and Statements begins with developing a new dictionary. This was followed by implementing an analytical model, a critical component that assigns numerical values along the hawkish-dovish spectrum. To do so, sentences composing each written document's paragraphs were broken down into fragments, using punctuation marks as delimiters. This fragmentation simplifies computational processing and ensures each fragment maintains a consistent tone. It also highlights areas where the tone varies within the same line, indicating a need for improved tonal consistency.

Each text fragment receives a numerical score: [1] for hawkish, [-1] for dovish, and [0] for neutral tones. A hawkish value of [1] is assigned if positive modifiers outnumber negative ones alongside keywords and vice versa for a dovish score. A neutral score is assigned when the presence of keywords and modifiers is balanced. The keywords and modifiers are specified in the generated dictionary in Figure 3.1. Considering the nature of the language, a distinction is made for keywords and compound words to avoid double counting.

Furthermore, specific rules adjust these values. For example, sentences containing forward guidance keywords automatically receive a [-1]. If negations like *no, not, never, without, or prevent* appear, they invert the original score of the fragment. The overall sentiment of a Statement is calculated as the average of these individual values, reflecting the central bank's communicative intent, as explained by Evdokimova et al. (2023).

For example (done in English for simplicity):

Annual headline inflation *(Direct Compound Keyword)* increased *(Positive Modifier)* from 3.62% to 4.10% between July and the first half of September 2020, **(+1)** // due to increases *(Positive Modifier)* in both the non-core *(Direct Compound Keyword)* and core components. *(Direct Compound Keyword)* **(+1)**.

Average tone: **Hawkish (+1)**

The relationship between the keywords and modifiers is the following according to the original methodology:

- Hawkish score: Direct keywords are accompanied by more positive modifiers than negative.

- Dovish score: Direct keywords are accompanied by more negative modifiers than positive.
- Hawkish score: Reverse keywords are accompanied by more negative modifiers than positive.
- Dovish score: Reverse keywords are accompanied by more positive modifiers than negative.
- Neutral score: Same amount of keywords, reverse keywords and modifiers.

Therefore, the anticipated outcomes of this methodology should reveal a precise correlation between the bank's rhetoric and its actions. To bolster credibility, Central Banks must utilize a tone that aligns with the nature of the monetary decision at hand. For instance, an interest rate increase, categorized as a hawkish move, necessitates communication in a correspondingly hawkish tone. This strategy ensures the message is anchored effectively, mitigating noise and reducing subsequent uncertainty. Similarly, dovish decisions require a dovish communication style. For monetary policies aimed at maintaining current rates, the tone —either hawkish or dovish— will be determined by the specific nature of the communication, making it a critical factor in policy dissemination.

3.3.3. Modifications to the original methodology

Adjustments are necessary to apply this methodology to the Spanish vocabulary used in Banxico's communication documents. While Gonzalez and Tadle's dictionary serves as a reference, it has been expanded using an algorithm that identifies frequently used terms in official communications. This text largely adheres to Evdokimova's approach, with adaptations to accommodate the specifics of sentiment indicators in Spanish. For instance, the algorithm now considers sentence decomposition based on the presence of commas and semicolons, with k defined as two commas within a sentence.

An additional rule classifies a text fragment as neutral: if terms from the dictionary are present and these keywords are matched by an equal number of positive and negative modifiers, the fragment receives a [0] score. This approach addresses the stylistic nuances of Monetary Statements, which may include compound sentences with contrasting modifiers applied to the same keyword. At times, keywords appear without clear positive or negative connotations, yet the dictionary facilitates their quantification.

The most crucial adaptation is the scoring of forward guidance terms. Contrary to the original methodology that assigns a dovish value of [-1], this re-calibration reflects a hawkish intent due to Banxico's macroeconomic context of implementing tight monetary policies. This adjustment allows the integrity of the sentiment analysis to be maintained, ensuring that it accurately

represents the Central Bank's strategic efforts. Specifically, this process now considers the original value that would have been assigned without the presence of forward guidance elements. If the original value differs from [-1], the forward guidance rule is not applied unless the original value matches or if a forward guidance element is the sole component found in the fragment.

4. Results: Exploratory Analysis

4.1. Flesch Scale- descriptive statistics

This analysis dissects the readability of Mexico's central bank communications from 2011 – 2023, employing descriptive statistics to identify shifts in clarity. Available data from Minutes and Statements from the Banxico website is segmented into four critical periods, reflecting potential changes in communication effectiveness as measured by the Flesch scale (see Figure 4.3):

Panel (A): April 2011 – December 2013

Panel (B): January 2014 – July 2017

Panel (C): August 2017 – December 2019

Panel (D): January 2020 – November 2023

Focusing on Minutes and Bank Statements, this study uses the Flesch scale for readability to examine the linguistic composition of monetary policy across these panels. The analysis includes eight yearly documents, considering word count, sentence structure, average word, and sentence length. These metrics aid in applying the Szigriszt and Fernandez-Huerta method to evaluate the documents' readability and comprehension levels.

4.1.1. Monetary Instrument: Minutes

The first communication instrument analyzed is Mexico's Central Bank Minutes, documents detailing the Board of Governors' monetary policy discussions. Such documents have evolved since their first publication in 2011 to enhance transparency and comprehension. Up to November 9, 2023, *104* Minutes have been published on Banxico's website. Their effectiveness in communicating to the financial markets and the general public is crucial, as clarity in these documents is vital for anchoring expectations and reducing uncertainty (Blinder et al., 2008). Hence, examining the evolution of these Minutes holds significant importance as they function as a pivotal tool in monetary policy, facilitating continual enhancement.

Significant changes to the presentation of these Minutes have been made to improve readability and transparency since its first publication on the website in 2011. Essential modifications include relocating the "Current Economic and Financial Developments and Outlook" section to the document's end in 2018, adding details to the voting processes, including the voter's name

and the rationales to underscore transparency in decision-making, and in 2020, refining paragraph organization with topic sentences, clear sections and signaling the semantic field of quantification. These adjustments aim to make the Minutes more accessible to non-expert audiences and provide a more straightforward understanding of the monetary policy discussions.

To illustrate these improvements, it is possible to analyze the visually structural differences between Minute 10 (March 16, 2012) and Minute 104 (November 9, 2023), as retrieved from Banxico's official website.

Figure 4.1: Minute Comparison: document - 10 (2012)

Meeting are held in person, with the address provided.

1. LUGAR, FECHA Y ASISTENTES

1.1. Lugar: Av. Cinco de Mayo número 2, 5o. piso, Col. Centro, Ciudad de México, Distrito Federal.

1.2. Fecha de la sesión de la Junta de Gobierno: 15 de marzo de 2012.

1.3. Asistentes:

Dr. Agustín Guillermo Carstens Carstens, Gobernador y presidente de la sesión.

Lic. Roberto Del Cueto Legaspi, Subgobernador.

Dr. Manuel Ramos Francia, Subgobernador.

Dr. Manuel Sánchez González, Subgobernador.

Dr. José Julián Sidaoui Dib, Subgobernador.

Dr. José Antonio Meade Kuribreña, Secretario de Hacienda y Crédito Público.

Mtro. Gerardo Rodríguez Regordosa, Subsecretario de Hacienda y Crédito Público.

Dr. José Antonio González Anaya, Subsecretario de Ingresos de la Secretaría de Hacienda y Crédito Público.

Lic. Héctor Reynaldo Tinoco Jaramillo, Secretario de la Junta de Gobierno.

No annex reference.

Se hace constar que en fechas anteriores a la celebración de esta sesión, se desarrollaron trabajos preliminares en los que se analizó el entorno económico y financiero, así como la evolución de la inflación, sus determinantes y perspectivas.

It´s clarified who generated the section in question.

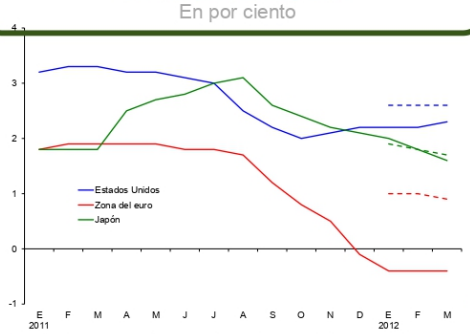
2. EVOLUCIÓN ECONÓMICA Y FINANCIERA RECIENTE Y PERSPECTIVAS

La presente Sección fue elaborada por las Direcciones Generales de Investigación Económica y de Operaciones de Banca Central, ambas del Banco de México.

2.1. Perspectiva económica internacional

En la segunda parte de 2011 las perspectivas para el crecimiento de la economía mundial y la confianza en los mercados financieros internacionales presentaron un deterioro importante. Sin embargo, durante los primeros meses de 2012 éstas parecen haberse estabilizado, aunque con algunas diferencias entre regiones (Gráfica 1 y Gráfica 2). Si bien aún prevalecen riesgos que podrían propiciar un deterioro adicional en el entorno previsto para los siguientes trimestres, ha disminuido la probabilidad de que ocurra un evento catastrófico en particular en Europa.

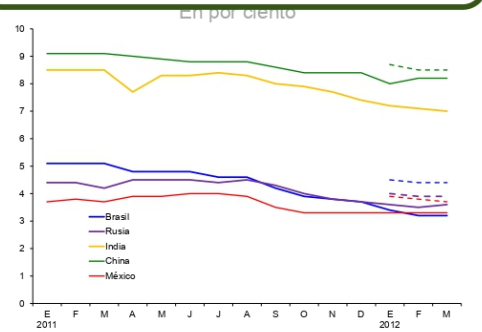
Gráfica 1
G3: Evolución de Pronósticos de Crecimiento del PIB para 2012 y 2013
En por ciento



Nota: las líneas punteadas se refieren a los pronósticos para 2013.
Fuente: Blue Chip.

Graphs > Text To explain the external context.

Gráfica 2
Economías Emergentes: Evolución de Pronósticos de Crecimiento del PIB para 2012 y 2013
En por ciento



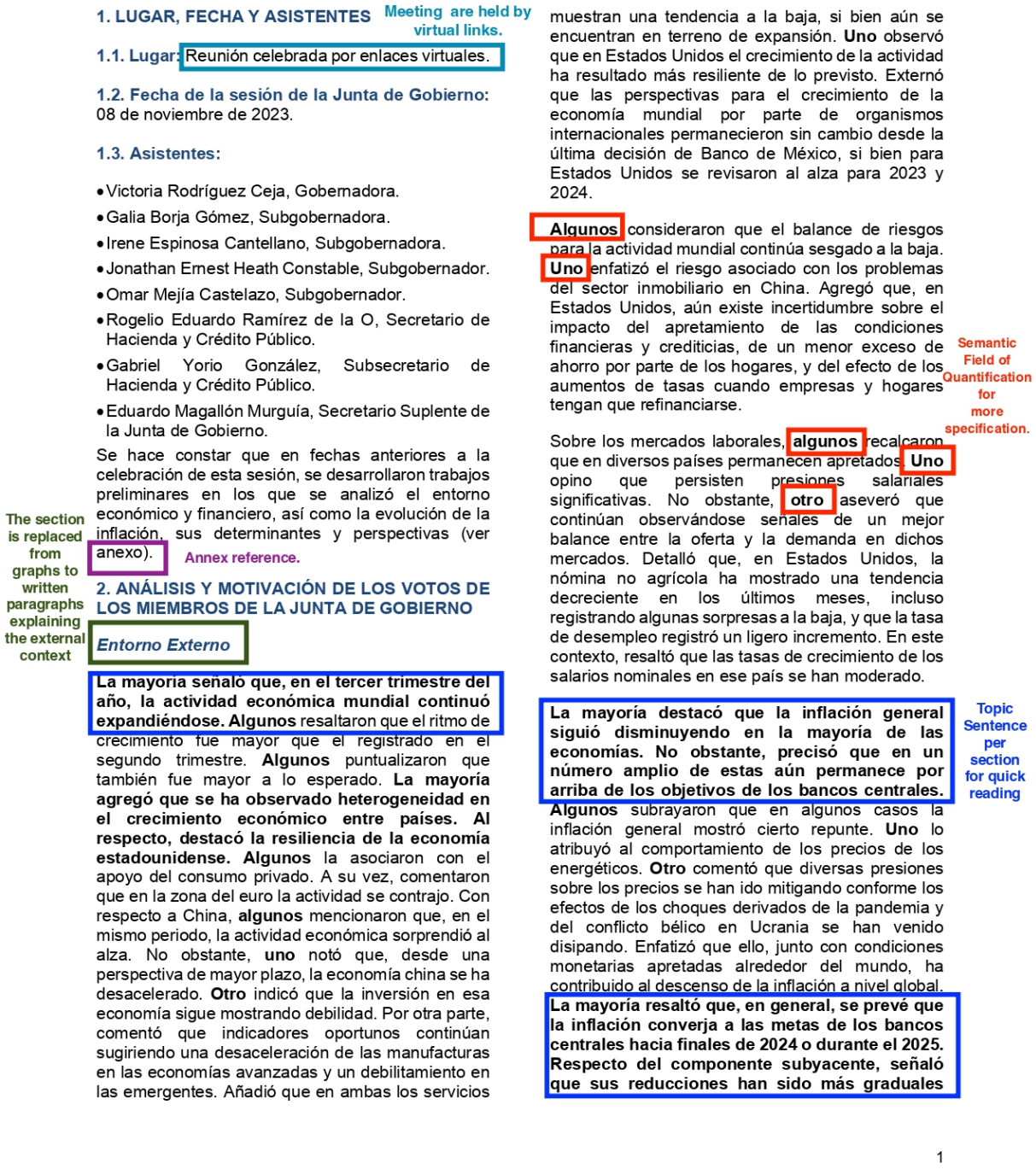
Nota: las líneas punteadas se refieren a los pronósticos para 2013.
Fuente: Blue Chip.

No highlighted Topic Sentence per section for quick reading

En la zona del euro, las medidas extraordinarias adoptadas por el Banco Central Europeo (BCE) y los avances en los planes de consolidación fiscal han contribuido a un mejor funcionamiento de los mercados interbancarios y de deuda soberana. Sin embargo, continúa observándose una retroalimentación negativa entre el desapalancamiento de los bancos y la actividad económica.

No quantification semantic field use. There is no specification as to how many members think in that particular way, the idea is generalized as if all members share it.

Figure 4.2: Minute Comparison: document - 104 (2023)



1. LUGAR, FECHA Y ASISTENTES Meeting are held by virtual links.

1.1. Lugar: Reunión celebrada por enlaces virtuales.

1.2. Fecha de la sesión de la Junta de Gobierno:
08 de noviembre de 2023.

1.3. Asistentes:

- Victoria Rodríguez Ceja, Gobernadora.
- Galia Borja Gómez, Subgobernadora.
- Irene Espinosa Cantellano, Subgobernadora.
- Jonathan Ernest Heath Constable, Subgobernador.
- Omar Mejía Castelazo, Subgobernador.
- Rogelio Eduardo Ramírez de la O, Secretario de Hacienda y Crédito Público.
- Gabriel Yorio González, Subsecretario de Hacienda y Crédito Público.
- Eduardo Magallón Murguía, Secretario Suplente de la Junta de Gobierno.

Se hace constar que en fechas anteriores a la celebración de esta sesión, se desarrollaron trabajos preliminares en los que se analizó el entorno económico y financiero, así como la evolución de la inflación, sus determinantes y perspectivas (ver anexo). Annex reference.

The section is replaced from graphs to written paragraphs explaining the external context

2. ANÁLISIS Y MOTIVACIÓN DE LOS VOTOS DE LOS MIEMBROS DE LA JUNTA DE GOBIERNO

Entorno Externo

La mayoría señaló que, en el tercer trimestre del año, la actividad económica mundial continuó expandiéndose. Algunos resaltaron que el ritmo de crecimiento fue mayor que el registrado en el segundo trimestre. **Algunos** puntualizaron que también fue mayor a lo esperado. **La mayoría agregó que se ha observado heterogeneidad en el crecimiento económico entre países. Al respecto, destacó la resiliencia de la economía estadounidense. Algunos** la asociaron con el apoyo del consumo privado. A su vez, comentaron que en la zona del euro la actividad se contrajo. Con respecto a China, **algunos** mencionaron que, en el mismo periodo, la actividad económica sorprendió al alza. No obstante, **uno** notó que, desde una perspectiva de mayor plazo, la economía china se ha desacelerado. **Otro** indicó que la inversión en esa economía sigue mostrando debilidad. Por otra parte, comentó que indicadores oportunos continúan sugiriendo una desaceleración de las manufacturas en las economías avanzadas y un debilitamiento en las emergentes. Añadió que en ambas los servicios muestran una tendencia a la baja, si bien aún se encuentran en terreno de expansión. **Uno** observó que en Estados Unidos el crecimiento de la actividad ha resultado más resiliente de lo previsto. Externó que las perspectivas para el crecimiento de la economía mundial por parte de organismos internacionales permanecieron sin cambio desde la última decisión de Banco de México, si bien para Estados Unidos se revisaron al alza para 2023 y 2024.

Algunos consideraron que el balance de riesgos para la actividad mundial continúa sesgado a la baja. **Uno** enfatizó el riesgo asociado con los problemas del sector inmobiliario en China. Agregó que, en Estados Unidos, aún existe incertidumbre sobre el impacto del apretamiento de las condiciones financieras y crediticias, de un menor exceso de ahorro por parte de los hogares, y del efecto de los aumentos de tasas cuando empresas y hogares tengan que refinanciarse.

Semantic Field of Quantification for more specification.

Sobre los mercados laborales, **algunos** recalcaron que en diversos países permanecen apretados. **Uno** opino que persisten presiones salariales significativas. No obstante, **otro** aseveró que continúan observándose señales de un mejor balance entre la oferta y la demanda en dichos mercados. Detalló que, en Estados Unidos, la nómina no agrícola ha mostrado una tendencia decreciente en los últimos meses, incluso registrando algunas sorpresas a la baja, y que la tasa de desempleo registró un ligero incremento. En este contexto, resaltó que las tasas de crecimiento de los salarios nominales en ese país se han moderado.

La mayoría destacó que la inflación general siguió disminuyendo en la mayoría de las economías. No obstante, precisó que en un número amplio de estas aún permanece por arriba de los objetivos de los bancos centrales. **Algunos** subrayaron que en algunos casos la inflación general mostró cierto repunte. **Uno** lo atribuyó al comportamiento de los precios de los energéticos. **Otro** comentó que diversas presiones sobre los precios se han ido mitigando conforme los efectos de los choques derivados de la pandemia y del conflicto bélico en Ucrania se han venido disipando. Enfatizó que ello, junto con condiciones monetarias apretadas alrededor del mundo, ha contribuido al descenso de la inflación a nivel global.

Topic Sentence per section for quick reading

La mayoría resaltó que, en general, se prevé que la inflación converja a las metas de los bancos centrales hacia finales de 2024 o durante el 2025. Respecto del componente subyacente, señaló que sus reducciones han sido más graduales

1

The analisis was performed for the Minute 10 and 104 in their original language (spanish) and obtained from Banxico's central website: https://www.banxico.org.mx/publications-and-press/minutes-of-the-board-of-governors-meetings-regardi/minutes-regarding-monetary-po.html

Analyzing the evolution of the Minutes from 2012 to 2023 reveals strategic enhancements in structure to improve readability. Notably, paragraphs now begin with a topic sentence (blue box), highlighted in bold, serving as a road map to enhance audience comprehension. This format allows readers to graph the Minute's message by scanning the initial sentences. Additionally, the text strategically employs quantification terms such as *one, some, and another*, lending the document an assertive tone that aids in anchoring certainty. Furthermore, a comparison between Minute 10 from 2012 and subsequent Minutes shows a consistent shift in structure from using visuals to relying solely on text and topic sentences for clarity, especially in explaining external conditions.

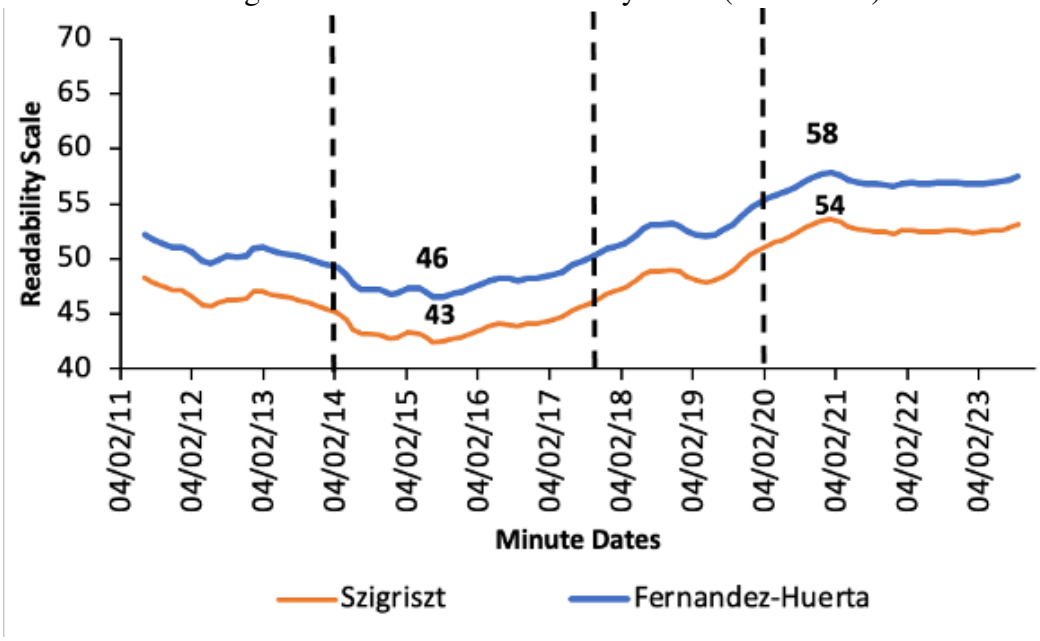
The evolution of the Minutes has notably prioritized the discussion of monetary policy decisions. A key strategy for enhancing transparency in decision-making has included sections detailing voting outcomes, individual opinions, and dissenting votes, clarifying who voted and providing justifications for their viewpoints.

After reviewing the primary communication strategy shifts and their visual representation, we use descriptive statistics derived from the data and readability analyses. Initial findings highlight three significant changes in communication effectiveness over the 12 years, occurring in 2013, 2017, and 2020. These pivotal moments, determined by shifts in the Flesch readability scale, guide our evaluation of how strategic changes in communication have influenced the effectiveness of conveying monetary policy decisions.

As seen in figure 4.3, analyzing Banxico's Minutes from February 2011 to 2023 based on the Flesch readability scale, scores were predominantly in the 50s from 2011 to 2019, with a first discernible shift in 2013 that led to a significant decrease. The Szgiriszt graph scale demonstrated this downturn most markedly, hitting its lowest value at 39.5 by 2014, a pattern also observed in the Fernandez-Huerta method, which stayed below the 50 mark until 2017. This drop in communication effectiveness is likely attributed to external economic challenges, particularly the lingering effects of the 2008 financial crisis, such as an economic slowdown and market volatility. Focusing solely on the domestic economic outlook, in 2013, facing a similar downturn, Banxico opted to lower the interest rate to 4% to stimulate the economy, a decision reflected in that period's Minutes (Suarez, 2013).

However, in the analyzed period, Banxico's communications initially contributed to uncertainty, especially when discussing the decrease in interest rate in 2013. Noisy information led to communication slacking in explicit forwarded signaling about the reference rate's future direction, adversely impacting the hypothesized events as exposed by Suarez (2013). Therefore, this inefficient communication, filled with extraneous details, led to low readability scores on the Flesch scale, indicating unclear Minutes that fueled uncertainty despite attempts at transparency regarding monetary policy changes.

Figure 4.3: Minutes' Readability Scale (2011-2023)



Own elaboration based on self-made readability database scores from Minutes recovered from Banxico's official website. A double averaging process was applied to smooth the series and eliminate their volatility.
Note: Panel Organization:
A From 2011 to 2014.
B From 2014 to 2017.
C From 2017 to 2019.
D From 2019 to 2023.

By 2017-2018, a noticeable improvement in communication effectiveness emerged from the depths of the 2013 decline. Flesch scale values rebounded above 45 for the Szgirist method and over 50 for the Fernandez Huerta above 50. This positive shift was mainly due to Banxico's enhanced transparency strategy, notably in 2018, when it began publishing voter names and rationales behind monetary policy decisions (Fortuna, 2018). This strategic pivot elevated the Bank's communication clarity and bolstered its accountability and perceived reliability in managing monetary policy.

In alignment with its long-standing commitment to transparency, Banxico's Governing Board publicly disclosed its strategy decisions to enhance communication clarity as an essential monetary policy tool. The changes were formally announced in the Banxico Quarterly Report for April-June, published on August 31, 2021, with the implementations starting from May 17, 2018 (Banxico, 2021). The fundamental changes included:

1. Public disclosure of names and votes from the after-minute meetings, introducing a section to outline diverging opinions and decision rationales.

2. Commitment to release meeting transcripts three years after their occurrence.

3. Adopt bilingual monetary policy communications in English and Spanish to mitigate language barriers and ensure multi-layered communication for inclusivity in public access.

4. Accessibility of presentations and speeches to the public, ensuring that the Bank's monetary policy decisions are transparent and understandable to all stakeholders.

Following these initiatives, readability, measured by the Flesch scale for the Szgiriszt and the Fernández-Huerta methods, saw a significant upswing from 2017 onwards. By 2019, this upward trend culminated in the highest recorded value for both methods since their inception, with Szgiriszt exceeding 50 and Fernandez Huerta surpassing 55, evidencing the successful impact of these strategic communication enhancements.

In 2017, Banxico enhanced communication by including central trajectories in quarterly reports, a move that improved transparency and allowed public analysis of monetary policy effectiveness (Banxico, 2018). By 2018, it also began publishing data on general and underlying inflation expectations, showcasing the bank's transparency in its capacity to anchor expectations and acknowledge positive and negative surprises.

The final visual improvement in the graph regarding communication effectiveness continues into 2020 despite a brief dip in 2019. This period, marked by the onset of the COVID-19 pandemic, saw central banks worldwide slashing interest rates to support economies (Long, 2020). During this time, the Fernandez-Huerta and Szgiriszt methods' scores on the Flesch scale exceeded the 50s, with the Fernandez-Huerta series nearing a 60, the optimal value for business-like documents. This indicates that, contrary to previous downturns like the 2008 financial crisis, where central bank communications may have faltered, Banxico's communication not only sustained but increased its effectiveness during the pandemic, challenging the notion that central bank communication diminishes in uncertain economic times (Moschella, 2019).

The notable improvements in communication effectiveness from 2011 to 2020 can be attributed to several factors. Firstly, the impact of changes made in May 2018, including the move to publish more transparent Minutes three years post-meeting, began manifesting significantly in 2021. Additionally, 2020 and 2021 saw the Board of Governors adopt new strategies to enhance transparency. Notably, in 2020, the General Communication Criteria for the Governing Board and public servants were disclosed for the first time. Alongside efforts to reduce noisy and extraneous information in press releases, aiming to better engage with the general public who might not pursue quarterly reports due to lack of interest or understanding. By 2021, Banxico focused on enhancing predictability for financial markets and the public, which is crucial during uncertain times, such as the COVID-19 crisis, to mitigate volatility and anchor expectations. From August 12, 2021, as detailed in the "Banxico- Quarterly Report April-June, August 31, 2021", monetary policy communications were enriched with:

1. A forward guidance strategy incorporating expected values of general and underlying inflation over the next eight quarters in general and underlying inflation forecasts.

2. Detailed press release on the voting mechanism used in monetary policy decisions, including groups in favor and those against.

The enhancements in Banxico's communication strategies, particularly during the volatile period of 2020-2022 and the ongoing pandemic aftermath, were aimed at bolstering accountability and the bank's reliability (Banxico, 2021). Establishing the institution's credibility is crucial for monetary policy to be effective. If the general public and the financial market lack confidence in the bank's crisis management, their expectations may be negatively skewed, undermining efforts to anchor them properly. Figure 4.3 shows Banxico's minute composition adjustments have successfully enhanced communication effectiveness.

Panel (A), covering April 2011 to December 2013, sets the baseline for Banxico's public communication via Minutes on monetary policy decisions. This initial phase is crucial, as 2011 is the first year Minutes became publicly accessible, and 2013 signifies the first observable shift in the Flesch scale of Figure 4.3.

Table 4.1: Panel (A): Descriptive Statistics - Minutes
April 2011–December 2013

Variable	mean	median	mode	sd	var	Q1	Q3
words	4072.83	4093.00	4795.00	692.78	479945.45	3581.00	4692.00
sentences	118.50	119.50	136.00	19.53	381.57	104.25	134.50
avg.sentc.length	34.40	34.15	29.65	2.05	4.20	33.13	35.08
avg.word.length	5.09	5.10	5.10	0.06	0.00	5.07	5.11
Szigriszt	46.95	46.99	51.38	2.02	4.07	45.96	48.20
Fernandez-Huerta	50.90	50.93	55.43	2.04	4.14	49.88	52.15

Source: Own elaboration based on Banxico's public Minute data.
Note: Words: word count; Sentences: Sentence count per document; Avg. sentc.lenght: amount of words that makeup a sentence; Avg. word.lenght: how many letters per word; Szigriszt and Fernandez-Huerta: readability metrics.

This period functions more as an initial reference point than a direct indicator of communication enhancement. The established average sentence length mean of 34.40 and average word length of 5.09 provide the initial benchmark for future comparisons, allowing for a clear assessment of any strategic adjustments in communication, whether improvements or regressions.

The period from 2014 to 2017, identified in Figure 4.2, signifies a critical phase where Banxico's communication experienced its first notable decline in effectiveness. This downturn is attributed to a complex economic and financial environment, with unclear signaling regarding future interest rate movements (Suarez, 2013). Consequently, readability scores deteriorated as measured by the Flesch scale for the Fernandez-Huerta and the Szigriszt series.

Table 4.2: Panel (B): Descriptive Statistics - Minutes
January 2014 – July 2017

Variable	mean	median	mode	sd	var	Q1	Q3
words	5247.11	5322.00	4831.00	771.64	595422.10	4937.50	5563.00
sentences	153.64	156.00	121.00	25.15	632.46	134.50	167.25
avg.sentc.length	34.28	34.59	36.88	1.80	3.25	32.69	35.13
avg.word.length	5.21	5.21	5.12	0.05	0.00	5.18	5.23
Szigriszt	43.58	44.01	43.40	1.67	2.80	42.44	44.79
Fernandez-Huerta	47.66	48.02	47.33	1.69	2.87	46.55	48.89

Source: Own elaboration based on Banxico's public Minute data.
Note: Words: word count; Sentences: Sentence count per document; Avg. sentc.lenght: amount of words that makeup a sentence; Avg. word.lenght: how many letters per word; Szigriszt and Fernandez-Huerta: readability metrics.

Descriptive statistics from this interval reveal an increase in sentence and word count, from 4072.83 to 5247.11 words, and sentence number, from 118.64 to 153.64, indicating decreased communication clarity. This increase aligns with Flesch's 1943 findings described by Hernández (2017), suggesting that a higher word count complicates comprehension. The average word length also increased slightly from 5.09 to 5.21, diminishing readability.

The Szigriszt scale experienced a significant drop in readability, from 46.95 to 43.58, suggesting a challenging text for secondary-level understanding (see Table 3.1). Additionally, a shift in word length distribution was observed, with the third quantile moving from 4,692 to 5,563 words, indicating a substantial increase in content and potentially more noise than clarity. Therefore, these statistics corroborate the observed communication shifts on the Flesch scale, reflecting the economic and financial situation nationally and globally during this period.

The period from 2017 to 2019 marks a significant phase in communication effectiveness, from a period of recovery to strategic enhancements of transparency adopted by Banxico. These enhancements included the publication of central templates, meeting transcripts, presentations, and speeches.

Despite an initial concern of decreased readability due to increased average word and sentence count, analysis reveals an overall enhancement in document clarity. The average sentence length reduced from 34.28 to 30.15, and the average word length slightly decreased from 5.21 to 5.19. Suggesting that while documents became lengthy, they became more straightforward and accessible. This balance indicates a successful adaptation in communication strategy, where increased word count did not compromise readability.

Further supporting this improvement, the Szigriszt and Fernandez-Huerta readability methods demonstrate notable advancements. The application of these methods revealed increases of 4.46 and 4.52 points on the Flesch scale, respectively, surpassing previous benchmarks and reaching the optimal readability range for central bank documents. The Fernandez-Huerta

Table 4.3: Panel (C): Descriptive Statistics - Minutes
August 2017 – December 2019

Variable	mean	median	mode	sd	var	Q1	Q3
words	7583.11	7628.00	7176.00	812.27	659783.40	7019.25	8065.50
sentences	252.11	244.50	240.00	29.03	842.81	235.50	271.25
avg.sentc.length	30.15	29.90	29.90	1.72	2.94	29.46	31.70
avg.word.length	5.19	5.19	5.25	0.05	0.00	5.16	5.23
Szigriszt	48.04	47.79	47.24	1.44	2.08	47.14	48.41
Fernandez-Huerta	52.18	51.91	51.43	1.47	2.16	51.29	52.62

Source: Own elaboration based on Banxico's public Minute data.
Note: Words: word count; Sentences: Sentence count per document; Avg. sentc.lenght: amount of words that makeup a sentence; Avg. word.lenght: how many letters per word; Szigriszt and Fernandez-Huerta: readability metrics.

achieved a notable score of 52.18, which marks a first in the series by meeting the desired Flesch scale target of 50-60.

In the final Minute analysis, covering the next four years, the trend in improving communication effectiveness noted in the preceding period continues. Notably, since 2020, the Minutes' readability on the Flesch scale has significantly surpassed previous records.

Table 4.4: Panel (D):Descriptive Statistics - Minutes
January 2020 – November 2023

Variable	mean	median	mode	sd	var	Q1	Q3
words	7079.71	7140.50	7530.00	588.47	346298.40	6658.75	7473.00
sentences	294.06	295.00	265.00	24.12	581.94	282.25	315.50
avg.sentc.length	24.13	24.18	26.61	1.58	2.49	22.81	25.13
avg.word.length	5.25	5.24	5.20	0.06	0.00	5.22	5.29
Szigriszt	52.55	52.67	50.92	1.36	1.86	51.96	53.52
Fernandez-Huerta	56.87	57.03	55.16	1.37	1.88	56.30	57.88

Source: Own elaboration based on Banxico's public Minute data.
Note: Words: word count; Sentences: Sentence count per document; Avg. sentc.lenght: amount of words that makeup a sentence; Avg. word.lenght: how many letters per word; Szigriszt and Fernandez-Huerta: readability metrics.

Despite a minimal decrease in word count, remaining around 7000 words, and an increase in the mean number of sentences from 252.11 to 294.06, the noteworthy reduction in average sentence length from 30.15 to 24.13 marks the most significant decrease yet observed. This decrease is balanced by a slight increase in average word length from 5.19 to 5.25. This distribution of word lengths, particularly evident in the shift from 5.22 in the first quartile to 5.29 in the third, indicates a broader range in word usage.

The Szigriszt and Fernandez-Huerta methods confirm the sustained improvements in communication efficiency despite the higher word count and average length. Remarkably, the Szi-

griszt method records values above 50 on the Flesch scale for the first time. Categorizing the Minutes within a readability range of 51-65, denoting an effortless understanding level, as per Hernández (2017). The Fernandez-Huerta score increases from 52.18 to 56.87, maintaining its position within the optimal range of 50-60 and nearing the upper desired value of 60, affirming the success of the revised communication strategies in achieving clear and accessible information.

4.1.2. Monetary Instrument: Statements

Having analyzed the Minutes as a communication channel from the central banks, we now focus on a second form of communication: Bank Statements. The documents on the Central Bank website span from January 2011 to November 9, 2023, with eight Monetary Policy Statements issued annually. These Statements begin with a highlighted section on the monetary policy decision regarding the interest rate and its current value, which remains consistent unless changes in the rate occur. Any adjustments to the interest rate are explicitly stated, including the change in basis points and the effective date.

Furthermore, Monetary Policy Statements provide concise overviews of global economic activity and inflation scenarios, discussions on national currency valuation, and, most importantly, the inflation rate discussion, which justifies the initial interest rate decision. Recent Statements have included forecasts for headline and core inflation through graphical representations, offering essential forward guidance on economic and inflation expectations to the public and financial markets (see Banxico-Monetary Policy Statement, August 10, 2023).

Secondly, the communication strategy expanded to include detailed inflation forecasts and projections. Unlike the 2018 Statements, which relied on data from past reports for inflation forecasts without providing specific future projections, the latest Statements now feature a dedicated inflation forecast table. This table contrasts data from the previous year with expected values for the next two years, delineating both headline and core inflation figures, thereby providing more targeted forward guidance. The third significant modification involved removing repetitive sections and litanies that contributed more to the document's length than its informational value. This change resulted in a more concise document that better serves as a tool for reducing informational noise.

The effectiveness of these changes is most apparent when visually comparing the strategic advancements in communication over time:

Figure 4.4: Statement Comparison: May 17, 2018 - Page 1

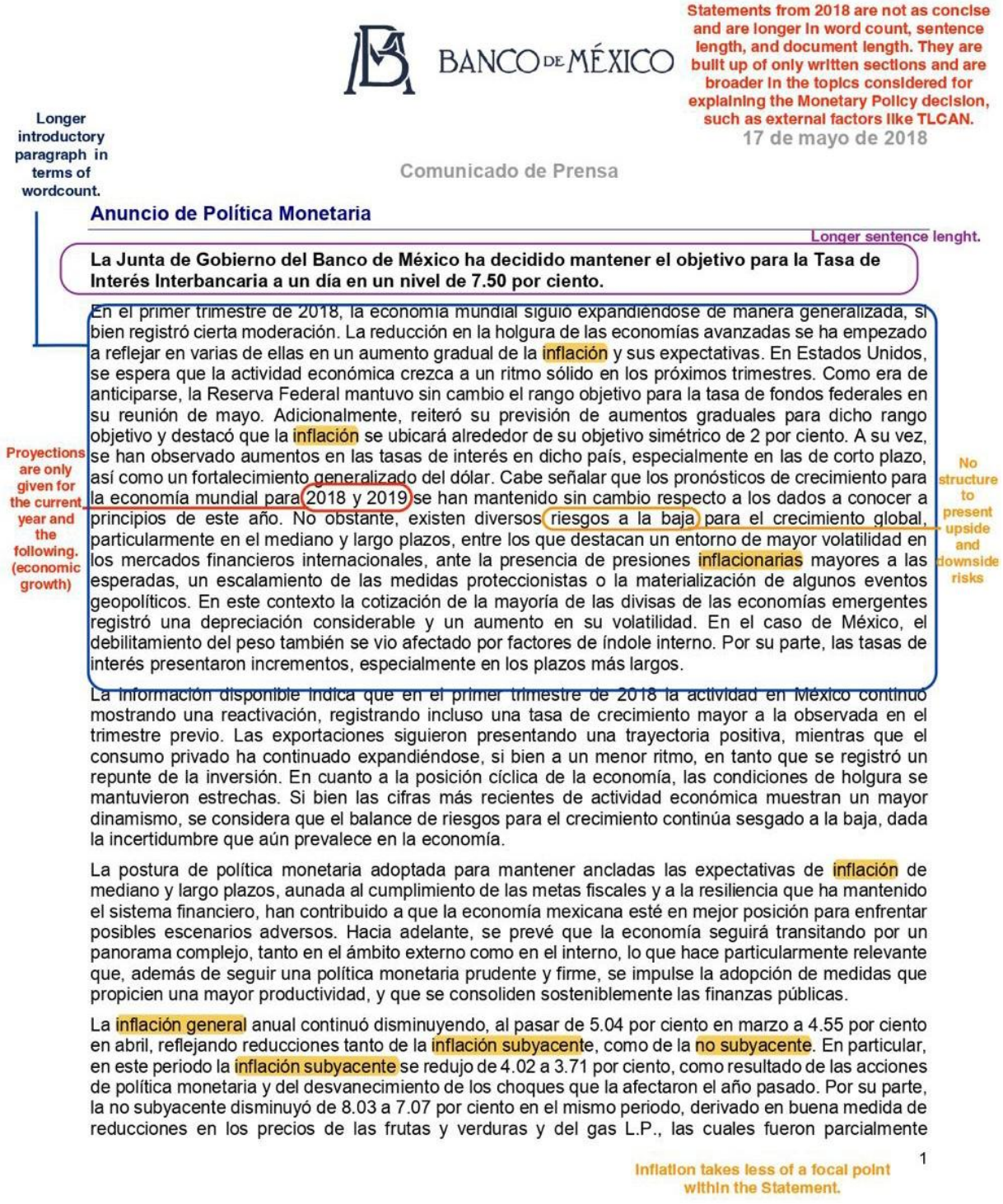
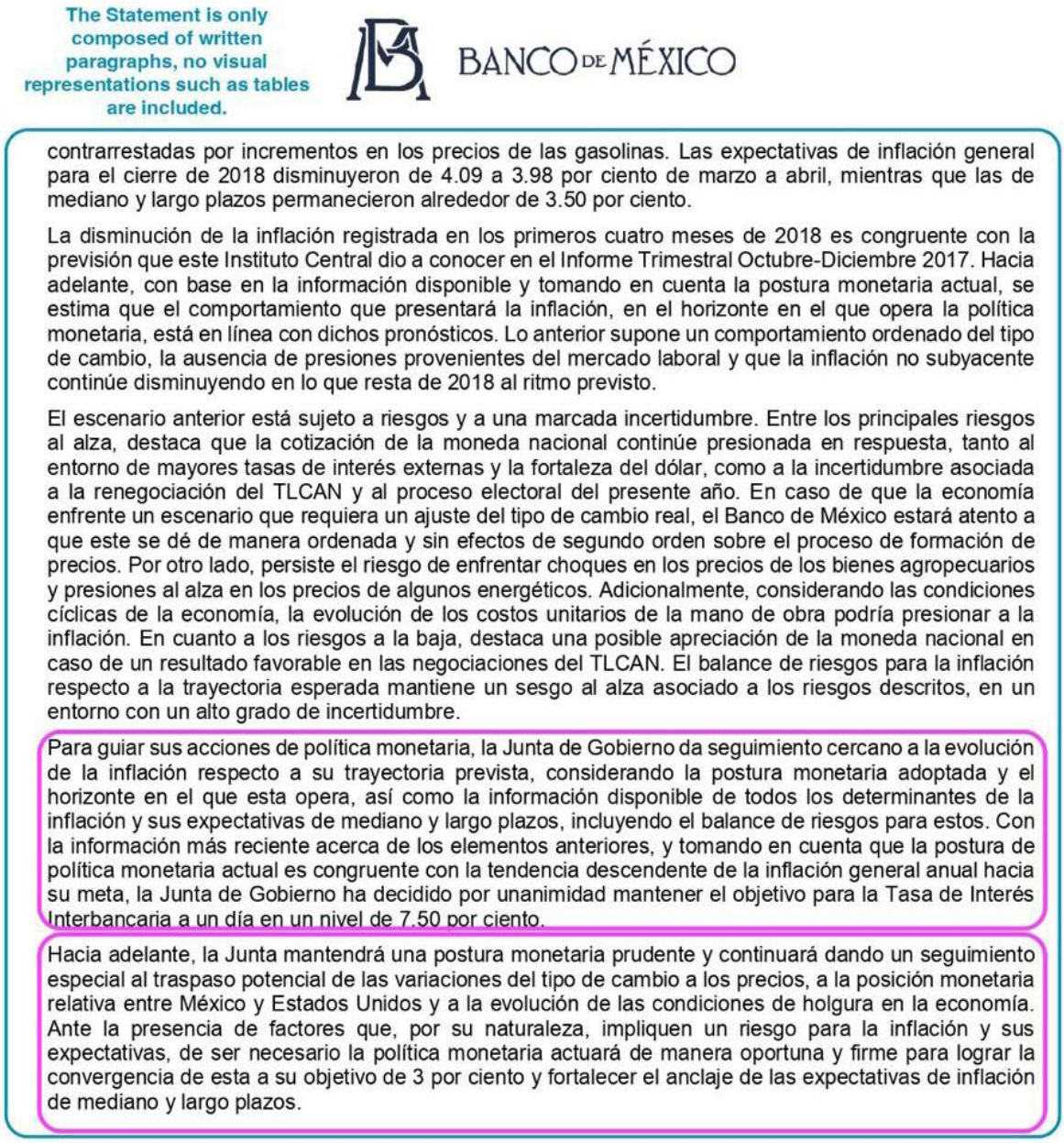


Figure 4.5: Statement Comparison: May 17, 2018 - Page 2



Statements obtained from Banxico's central website: https://www.banxico.org.mx/publicaciones-y-prensa/minutas-de-las-decisiones-de-politica-monetaria/minutas-politica-monetaria-ta.html

Figure 4.6: Statement Comparison: document: November 9, 2023 - Page 1

9 de noviembre de 2023

Comunicado de Prensa

Anuncio de Política Monetaria

Reduction of the wording of the decision, eliminating the expression "at a level of" and adding the % symbol.

La Junta de Gobierno del Banco de México decidió mantener el objetivo para la Tasa de Interés Interbancaria a un día en 11.25%.

Reduction in word count and shorter paragraphs

En el tercer trimestre de 2023 se acentuó la heterogeneidad en la actividad económica entre países. La inflación general continuó disminuyendo en la mayoría de las economías, aunque permanece en niveles elevados. El componente subyacente registró reducciones, aunque más graduales que las de la inflación general. La mayoría de los bancos centrales de las principales economías avanzadas mantuvo sin cambio sus tasas de referencia. Se anticipa que estas permanezcan en niveles altos por un lapso prolongado. Las tasas de interés soberanas aumentaron a nivel global y el dólar estadounidense registró una apreciación generalizada, si bien estos movimientos recientemente se revirtieron. Entre los riesgos globales destacan la prolongación de las presiones inflacionarias, el agravamiento de las tensiones geopolíticas, condiciones financieras más apretadas y, en menor medida, los retos para la estabilidad financiera.

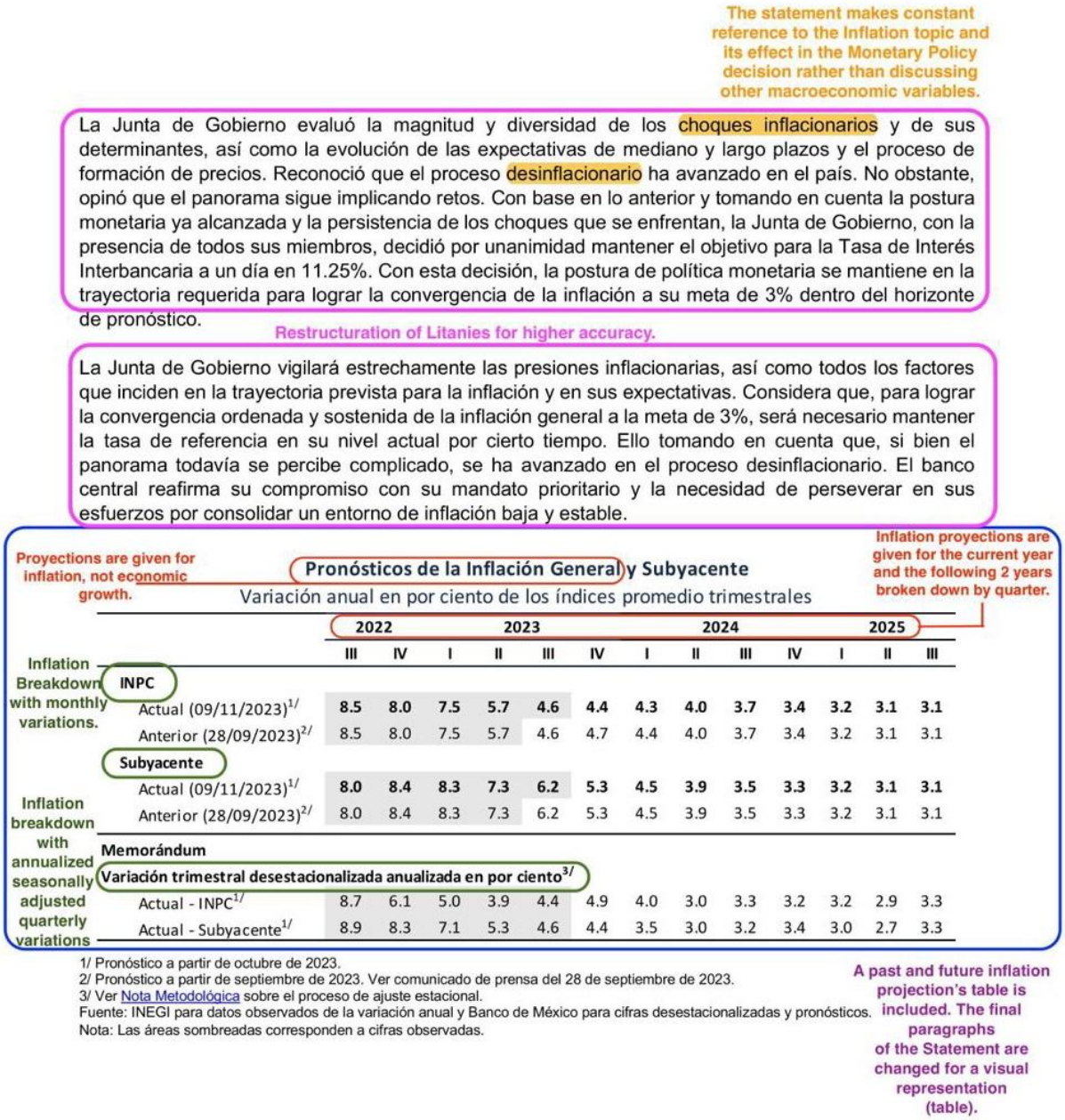
En México, las tasas de interés de valores gubernamentales aumentaron en todos sus plazos y el peso mexicano se depreció. No obstante, en línea con el comportamiento de los mercados financieros internacionales, dichos ajustes tendieron a revertirse. La actividad económica mantuvo una senda de crecimiento robusta y el mercado laboral continuó presentando fortaleza.

Desde la última reunión de política monetaria, las inflaciones general y subyacente anuales siguieron descendiendo. Sin embargo, ambas se mantuvieron elevadas al situarse en octubre en 4.26% y 5.50%, respectivamente. El componente no subyacente se mantuvo en niveles particularmente bajos, al ubicarse en ese mes en 0.56%. Las expectativas de inflación para el cierre de 2023 permanecieron sin cambio en el caso de la inflación general, mientras que las correspondientes a la subyacente disminuyeron. Las de mayor plazo se mantuvieron relativamente estables en niveles por encima de la meta.

Clear structure to present upside and downside risks by numericall y listing them.

La mitigación de los choques derivados de la pandemia y del conflicto geopolítico, junto con la postura de política monetaria, han contribuido a la trayectoria descendente de la inflación. Los pronósticos continúan previendo que tanto la inflación general como la subyacente mantienen dicha trayectoria descendente. Se sigue anticipando que la inflación converja a la meta en el segundo trimestre de 2025 (ver cuadro). Estas previsiones están sujetas a riesgos. Al alza: i) persistencia de la inflación subyacente en niveles elevados; ii) depreciación cambiaria; iii) mayores presiones de costos; iv) que la economía muestre una resiliencia mayor a la esperada; y v) presiones en los precios de energéticos o agropecuarios. A la baja: i) una desaceleración de la economía global mayor a la anticipada; ii) un menor traspaso de algunas presiones de costos; y iii) que los niveles más bajos del tipo de cambio respecto de inicios de año contribuyan más que lo anticipado a mitigar ciertas presiones sobre la inflación. Se considera que el balance de riesgos respecto de la trayectoria prevista para la inflación en el horizonte de pronóstico se mantiene sesgado al alza.

Figure 4.7: Statement Comparison: document: November 9, 2023 - Page 2

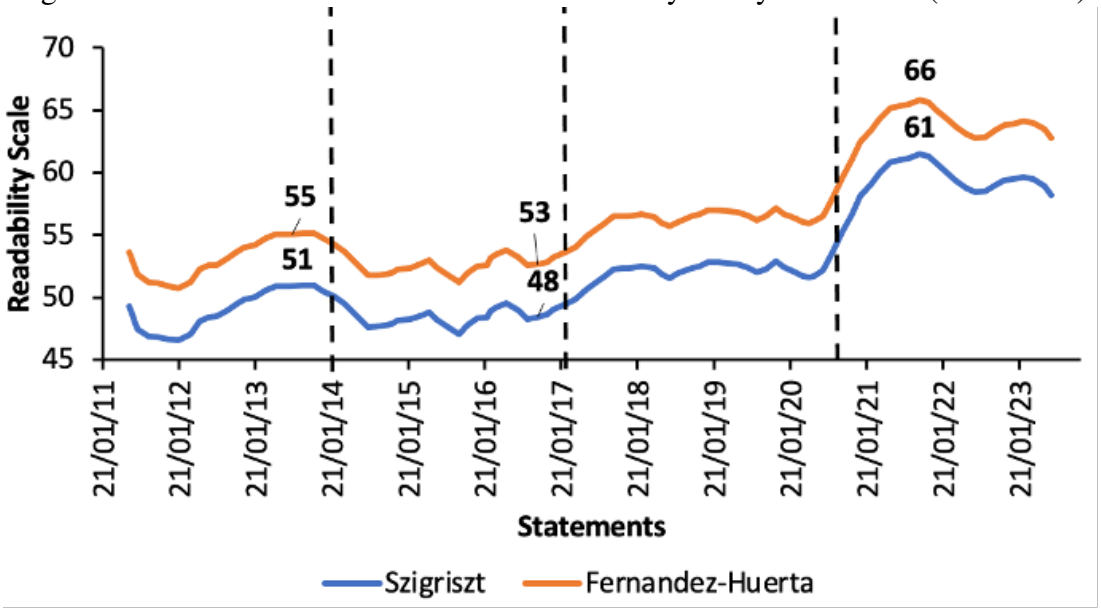


Statements obtained from Banxico's central website: https://www.banxico.org.mx/publicaciones-y-prensa/minutas-de-las-decisiones-de-politica-monetaria/minutas-politica-monetaria-ta.html

The strategic changes in communication have notably enhanced the readability of Monetary Policy Statements, providing a more transparent and precise conveyance of information regarding interest rate decisions. This improvement facilitates a deeper understanding of complex information in the form of multi-layered information for diverse audiences. Having outlined the origin of Monetary Policy Statements, analyzing descriptive statistics from documents on Banxico's website is the next step. This analysis, utilizing the Flesch scale, identifies trends

in document readability from 2011 to 2023. Recognizing these trends enables a discussion on the economic contexts influencing readability changes and how they relate to the previously mentioned strategic communication adjustments.

Figure 4.8: Shifts in the Flesch scale from Monetary Policy Statements (2011-2023)



Source: Elaborated based on self-made readability database scores from Statements recovered from Banxico's official website.
Note: Panel Organization:
A From 2011 to 2014.
B From 2014 to 2017.
C From 2017 to 2019.
D From 2019 to 2023.

The analysis of Monetary Policy Statements using the Flesch readability scale reveals two distinct shifts, indicating changes in document readability. Firstly, 2017 marks a noticeable improvement, with both the Flesch and the Szigriszt scales exceeding the 50-point threshold, a trend that continues for the following three years. Despite occasional fluctuations, the readability scores consistently fall within the 50-60 range in 2017–2019, with a brief deviation in the Szigriszt scale in 2018.

The economic context provides insight into this readability enhancement. The year 2017, characterized by a complex political landscape influenced by the United States' new presidential administration, presented significant challenges. Issues critical to Mexico's economy, such as migration, taxation, and NAFTA negotiation, required clear communication from the Bank. This period demonstrates the Bank's ability to convey intricate economic contexts without compromising readability or adding unnecessary complexity (Bancomext, 2017).

The readability of Monetary Policy Statements has significantly improved, particularly evident in the increase to values above 60 on the Flesch scale from 2020 to 2023. This improvement

stems from the strategic changes in communication, including a substantial reduction in word count from 1322 words in the last Statement of 2019 to 622 words by 2020 (see Table 4.4). This reduction and the halving of sentence numbers underscores the principle that consciousness enhances readability in financial documents. Additionally, introducing an inflation forecast table in the first Statement of 2022 (see Banxico-Monetary Policy Statement, February 10, 2022) further supports this upward shift in clarity, as evidenced by Graph 4.8.

The following analysis applies the same descriptive statistics for Minutes to the Monetary Policy Statements from 2011 to 2023, exclusively employing the Flesch and Szigriszt methods and excluding the Fernandez-Huerta method for Spanish texts.

Table 4.5: Panel (A):Descriptive Statistics - Statements
April 2011 – December 2013

Variable	mean	median	mode	sd	var	Q1	Q3
words	951.12	955.50	663.00	138.50	19181.33	921.00	1059.75
sentences	33.92	33.50	30.00	4.68	21.91	30.00	37.00
avg.sentc.length	28.10	27.88	23.68	2.51	6.28	26.69	30.40
avg.word.length	5.18	5.16	5.17	0.12	0.01	5.13	5.27
Flesch.Szigriszt	49.40	49.34	56.21	2.79	7.81	48.02	51.16
Flesch.es	53.61	53.58	60.42	2.77	7.68	52.21	55.32

Source: Own elaboration based on Banxico's public Statement data.
Note: Words: word count; Sentences: Sentence count per document; Avg. sentc.lenght: amount of words that makeup a sentence; Avg. word.lenght: how many letters per word; Szigriszt and Fernandez-Huerta: readability metrics.

The initial descriptive statistics show that bank Statements have nearly double the average word count. Yet only a third of the average sentences are shorter than other analyzed channels, resulting in shorter sentences but slightly longer words. Key readability scores, the Flesch. Szigriszt and Flesch.es method is at 49.40 and 53.61, respectively. The Szigriszt score sits at the border between quite hard and normal readability levels. An improvement of just .60 changes the document's academic grade level required for comprehension, making the Statements more accessible and effective.

Between 2014 and 2017, the readability index declined, as evidenced in the Flesch scale in Graph 4.8. This period saw an increase in the mean number of words from 951.12 to 1278.93 and in average sentence length from 33.92 to 44.37, resulting in longer words and sentences than the previous period. The Szigriszt and the Flesch scales indicate a decrease in readability, reflecting a dip in communication effectiveness during this time-frame.

The period from 2017 to 2019 marks a significant shift towards more transparent and efficient communication, as identified in Graph 4.7. This transition signals the beginning of a move towards enhancing transparency and accessibility, laying the foundation for improved communication channels.

Table 4.6: Panel (B):Descriptive Statistics - Statements
January 2014 – July 2017

Variable	mean	median	mode	sd	var	Q1	Q3
words	1278.93	1276.00	1038.00	330.22	109047.44	1110.00	1495.75
sentences	44.37	44.00	29.00	12.79	163.69	35.75	53.75
avg.sentc.length	29.07	28.72	29.00	2.19	4.80	28.13	30.45
avg.word.length	5.15	5.15	5.08	0.09	0.01	5.09	5.20
Flesch.Szigriszt	48.77	49.03	50.74	2.46	6.07	47.18	49.95
Flesch.es	52.95	53.20	54.85	2.47	6.08	51.38	54.15

Source: Own elaboration based on Banxico's public Statement data.
Note: Words: word count; Sentences: Sentence count per document; Avg. sentc.lenght: amount of words that makeup a sentence; Avg. word.lenght: how many letters per word; Szigriszt and Fernandez-Huerta: readability metrics.

Table 4.7: Panel (C):Descriptive Statistics - Statements
August 2017 – December 2019

Variable	mean	median	mode	sd	var	Q1	Q3
words	1433.20	1356.50	1667.00	270.14	72973.33	1329.00	1661.75
sentences	54.50	52.00	51.00	9.90	97.95	49.75	61.00
avg.sentc.length	26.27	26.41	23.81	2.38	5.67	25.44	27.23
avg.word.length	5.11	5.11	5.26	0.07	0.00	5.07	5.16
Flesch.Szigriszt	52.58	52.33	52.25	2.03	4.11	51.14	53.63
Flesch.es	56.78	56.53	56.61	2.07	4.27	55.34	57.76

Source: Own elaboration based on Banxico's public Statement data.
Note: Words: word count; Sentences: Sentence count per document; Avg. sentc.lenght: amount of words that makeup a sentence; Avg. word.lenght: how many letters per word; Szigriszt and Fernandez-Huerta: readability metrics.

Paralleling Minute's analysis, an uptick in the average word and sentence count is effectively counterbalanced by a shorter word and sentence length average. With word counts persistently above a thousand and sentence count climbing to 54, a decrease in sentence length from 29.07 to 26.27 and word length significantly boosted the Statements' readability. This adjustment is reflected in the Flesch. Szigriszt and Flesch.es scales, where the Szigristzt surpasses the 50-point threshold, recording a 52.58, and the Flesch scale reaches a new high at 56.78. These improvements signal a shift in readability, suggesting a lower required grade level, moving from Secondary Courses to a more general popular audience.

In the final analysis covering 2020 to 2023, a notable shift towards conciseness is observed in the Monetary Policy Statements, with documents shortening to one page from the previously seen two pages. This period witnessed a significant reduction in word count, from 1433.20 to 731.74 words, and in sentence count, from 54.50 to 38.45. Following a significant reduction in the 2017-2019 panel, this marked decrease underscores a strategic move towards more concise communication. As a result, both the Szigriszt and the Flesch method recorded their highest

Table 4.8: Panel (D):Descriptive Statistics - Statements
January 2020 – November 2023

Variable	mean	median	mode	sd	var	Q1	Q3
words	731.74	726.00	860.00	94.25	8883.80	684.00	801.50
sentences	38.45	39.00	38.00	7.21	52.06	35.50	43.50
avg.sentc.length	19.47	19.03	26.71	3.01	9.07	17.49	20.73
avg.word.length	5.17	5.14	5.17	0.10	0.01	5.10	5.26
Flesch.Szigriszt	57.92	58.55	50.52	3.92	15.37	56.73	60.42
Flesch.es	62.31	62.90	54.77	3.90	15.24	61.18	64.79

Source: Own elaboration based on Banxico's public Statement data.
Note: Words: word count; Sentences: Sentence count per document; Avg. sentc.lenght: amount of words that makeup a sentence; Avg. word.lenght: how many letters per word; Szigriszt and Fernandez-Huerta: readability metrics.

value to date, at 57.92 and 62.31, respectively. Notably, the Szigriszt score crosses the optimal 60-point threshold, indicating a level of clarity aimed at enhancing understanding amongst a broader audience.

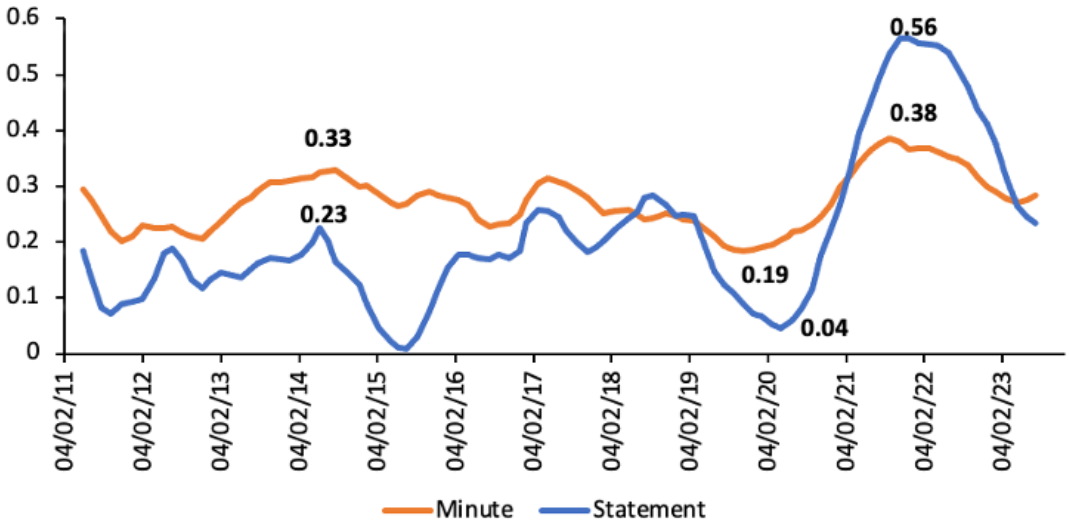
4.2. Tone Indicator

After the comprehensive automation of the adapted methodology, the tone indicator thoroughly processed the information from the Minutes and Statements on Banxico's main website, dating from 2011 to 2023. Based on the obtained tone trajectory for both communication instruments, the evolution of the tone's hawkishness can be assessed concerning macroeconomic variables such as the Product Gap, Inflation, short-term inflation expectations, and medium-term expectations.

Upon evaluating 98 Minutes and Statements, the tone Indicator successfully identified data on the hawkish or dovish nature of Banxico's communications. Theoretically, the tone should mirror the Monetary Policy Decision to ensure clarity, minimize uncertainty, and maintain consistency with the audience. Therefore, a decision to increase interest rates corresponds with a hawkish tone, signaling a shift toward a more restrictive monetary policy, and the reverse is true for dovish tones.

Comparative analysis reveals distinct approaches between the original methodology used to assess the Federal Reserve's communication and the European Central Bank. While the latter often view forward guidance and signaling as dovish strategies, Banxico's application notably occurred in a context of consistent interest rate increases, indicative of a restrictive policy stance. Thus, the Tone Indicator found that both Minutes and Statements consistently exhibited hawkish tones, with positive values ranging from minimal (0.01 and 0.04) to peak (0,56), highlighting the importance of this analysis and a shift from the expected results. Contrary to Evdokimova's

Figure 4.9: Tone indicator trajectory



Source: Own elaboration from self-made tone indicator and Minutes and Statements recovered from Banxico's main website. A double averaging process was applied to smooth the series and eliminate their volatility.

method, which classifies tones from dovish to hawkish, the scoring system for Banxico's communication instruments values the degree of hawkishness based on the specifics of its signaling context implementation.

One significant discovery from this analysis is the comparative restrictiveness of the communication instruments. Initially, the Minute was more restrictive, particularly peaking during the pandemic. However, since 2021, the Statement has overtaken the Minute, suggesting a strategic shift in Banxico's communication during and following the pandemic. Regarding the Statement, the tone scores from the indicator align with the macroeconomic context, displaying a less hawkish tone concurrent with consistent interest rate decreases. Notably, the tone score approached the dovish level, dropping to 0.04 in 2020. This score signaled a move towards expansionary monetary policy, aimed at counteracting the economic slowdown accompanied by a 25-basis point cut at this precise data point, setting the interest rate at 7%.

4.2.1. Stylized facts

Figure 4.10: Product Gap vs Minute Tone Indicator

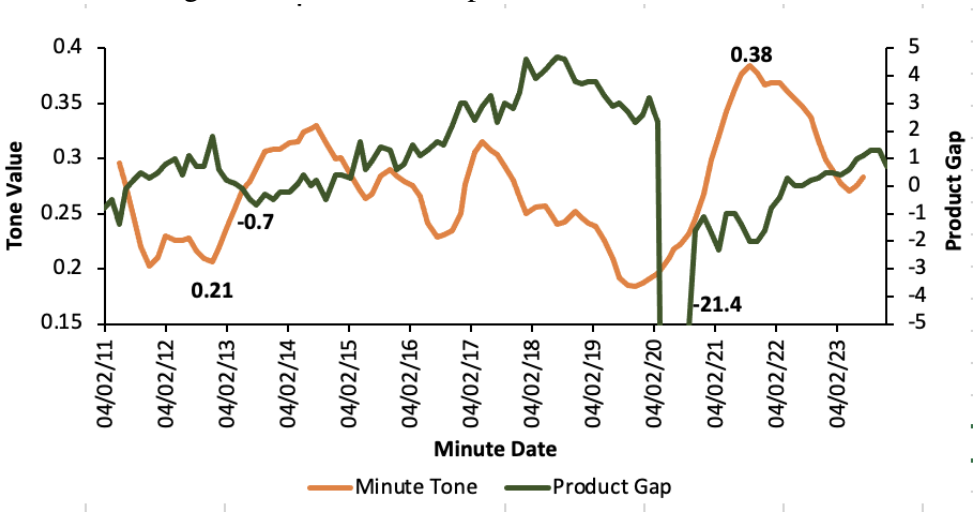
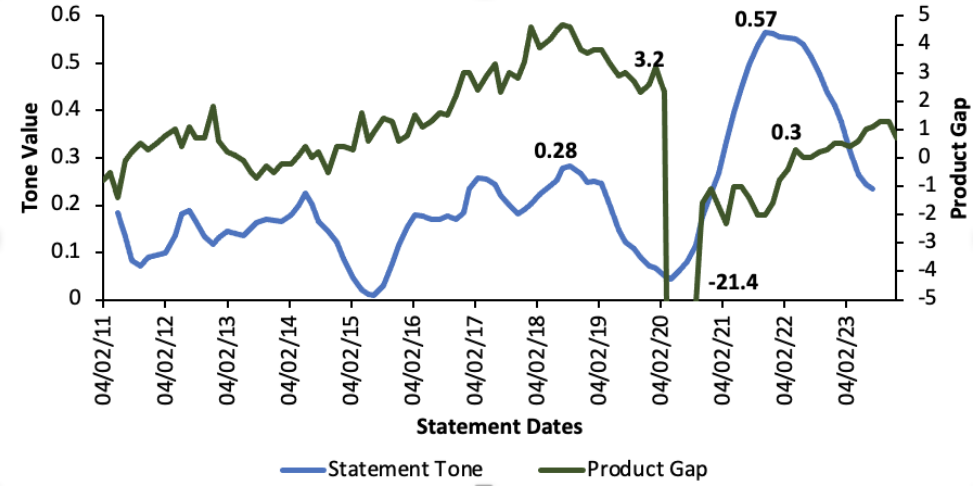


Figure 4.11: Product Gap vs Statement Tone Indicator



Source: Own elaboration from self-made tone indicator and Minutes and Statements recovered from Banxico's main website. A double averaging process was applied to smooth the series and eliminate their volatility. Product Gap data recovered from Banco de Mexico Quarterly Report: Jan - Mar 2023, Oct - Dec 2023.

Regarding the relationship between the tone and macroeconomic variables, the divergence in Graphs 4 and 5 series shows that the tone does not respond to changes in economic activity. Instead, it aligns more closely with the anchoring of economic expectations and inflation shocks, as depicted in Graphs 5.4 and 5.5.

Figure 4.12: Minute tone vs. Inflation

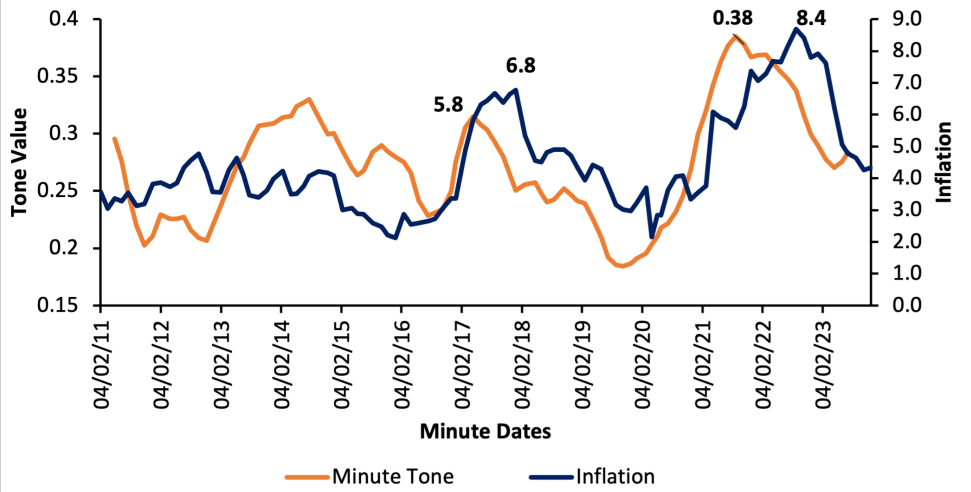
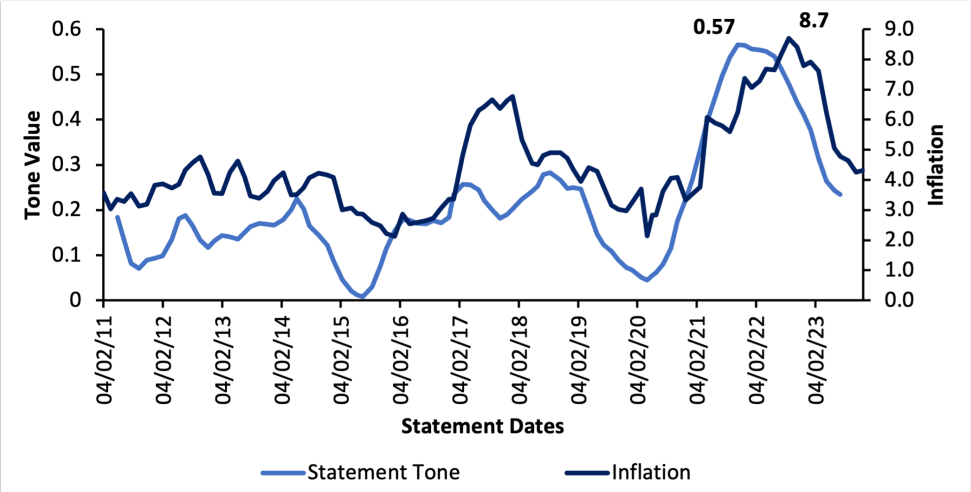


Figure 4.13: Statement tone vs. Inflation



Source: Own elaboration from self-made tone indicator and Minutes and Statements recovered from Banxico's main website. Inflation data recovered from Inegi. A double averaging process was applied to smooth the series and eliminate their volatility.

Banxico, along with numerous other central banks worldwide, adopted the inflation targeting scheme in 2001. This strategy commits the bank to use its policies to converge towards the desired target inflation level. As stated by the Banxico´s Governor, Victoria Rodríguez:

> The adoption of an inflation targeting (IT) framework represented another crucial step towards achieving price stability in Mexico. This regime, which leverages central banks' autonomy, was formally adopted as Bank of Mexico's monetary policy framework in 2001. From that moment to date, the Mexican economy has made significant progress in maintaining a credible monetary policy regime, which in turn has contributed to an environment of low and stable inflation (Rodríguez et al.,

2023).

The tone indicator's response to inflation rather than the product gap aligns with Banxico's central banking objectives, confirming the scheme's focus on inflation metrics.

Analysis of both Minutes and Statements reveals a remarkable precision in the tone's reactions and shifts, often preceding inflation trends. This suggests a predictive lag effect, creating the impression that the tone is anticipating the shock to occur. This effect is particularly pronounced before an inflation peak, indicating a proactive increase in a hawkish tone across both communication instruments. This pattern likely represents a signaling effort by Banxico, showcasing its ability to address anticipated macroeconomic shifts preemptively.

Moreover, the tone indicator's behavior, marked by an initial increase in the tone score followed by a corresponding rise in inflation, acts as a preemptive, restrictive strategy. This is followed by a relaxation in the hawkish tone in the next period, mirrored by the same conduct in the inflation series. This increase is succeeded by softening the hawkish tone, also reflected in the subsequent inflation metric. This pattern may be attributed to the fact that the creators of both Minutes and Statements possess detailed and privileged knowledge about the economy's trajectory and can tailor their communications to anticipated inflationary pressures. Hence, maintaining a consistent tone with monetary policy decisions enhances the mechanisms' effectiveness through improved transparency and predictability. Additionally, the precise alignment between the tone and inflation series underscores the tone indicator's calibration, with the publication lag of Minutes and Statements allowing them to reflect and influence the monetary policy context effectively.

Figure 4.14: Minute Tone vs. Short -term Inflation Expectations

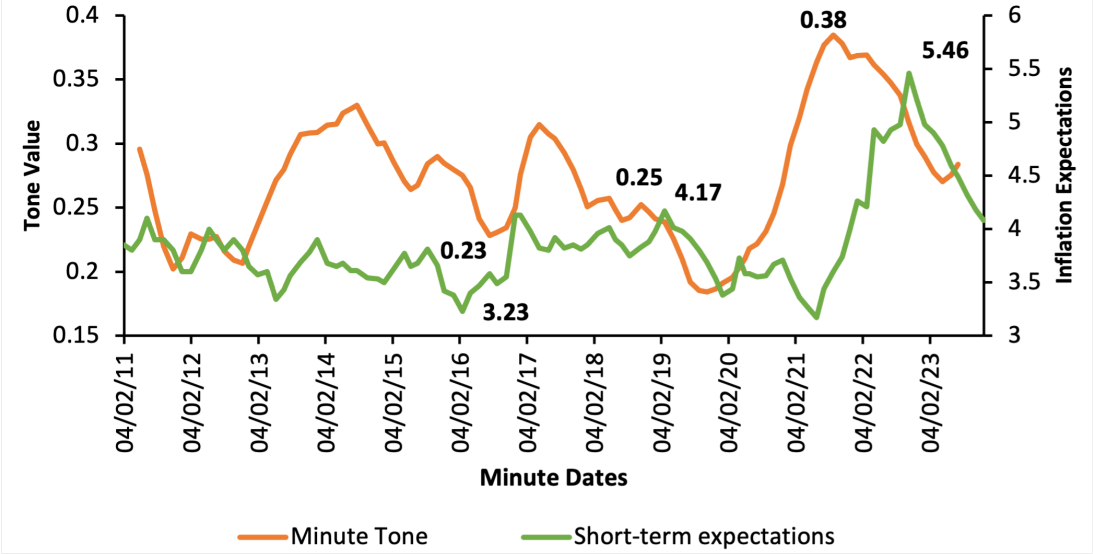
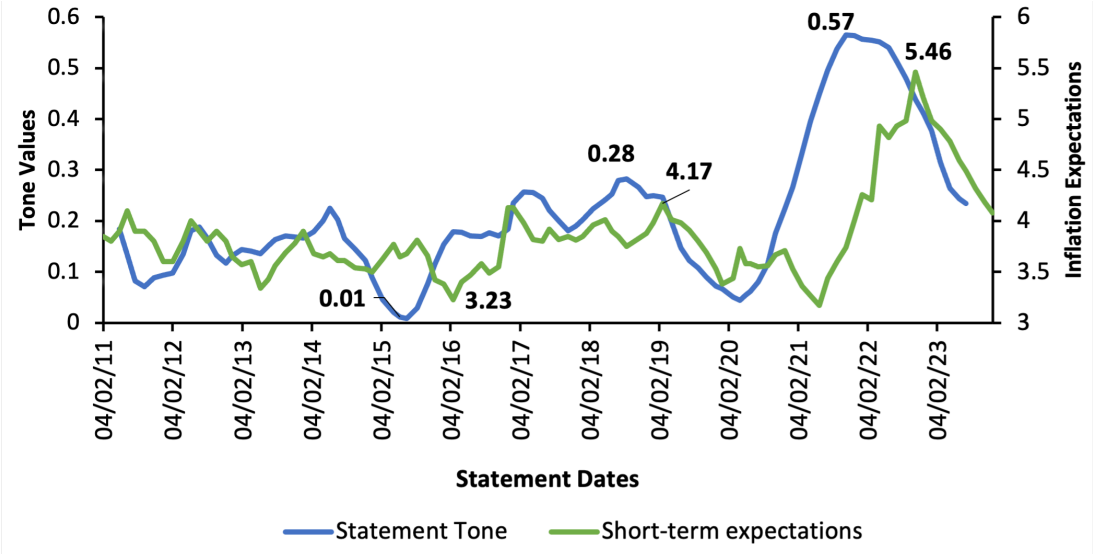


Figure 4.15: Statement Tone vs. Short-term Inflation Expectations



Source: Own elaboration from self-made tone indicator and Minutes and Statements recovered from Banxico's main website. Short-term inflation expectation data recovered from Economic Information system, Banxico: Expectations Series. A double averaging process was applied to smooth the series and eliminate their volatility.

The tone indicator interacts coherently with short-term inflation expectations. Excluding 2013 for the Minutes and 2015 for the Statements, the indicator reacts parallel to expectations with a lag. An increase in inflation expectations follows a hawkish rise in tone, leading to a subsequent relaxation in both series. This pattern is evident in 2018-2019, where an increase in tone precedes higher expectations. For the Minutes in 2018, the tone increased from 0.24 to 0.25, while inflation expectations rose from 3.75 to 4.25. Similarly, for the Statements, the hawkish tone increased from 0.18 to 0.28, and inflation expectations jumped to 4.25.

During the pandemic, starting in 2020, the increase in the restrictive tone of communications, followed by a dovish tendency, became particularly evident. Despite the highest inflation expectations recorded during this period, the readability values also peaked according to the Flesch metrics (figure 5.8 & 5.9). Both Minutes and Statements increased their hawkish tone in response to higher inflation expectations and cycles of interest rate increases. The relationship between a hawkish tone and higher readability remains unclear. For the Minutes, the highest recorded hawkish tone of 0.48 occurred periods after achieving the highest Szigriszt readability value of 54 (Figure 5.8). Similarly, for the Statements, the tone and readability values reacted almost simultaneously, with the tone reaching 0.56 and readability achieving 61 by 2021, marking the first time a communication instrument achieved the desired 60s range.

Figure 4.16: Minute Tone indicator vs. Szigriszt Scale

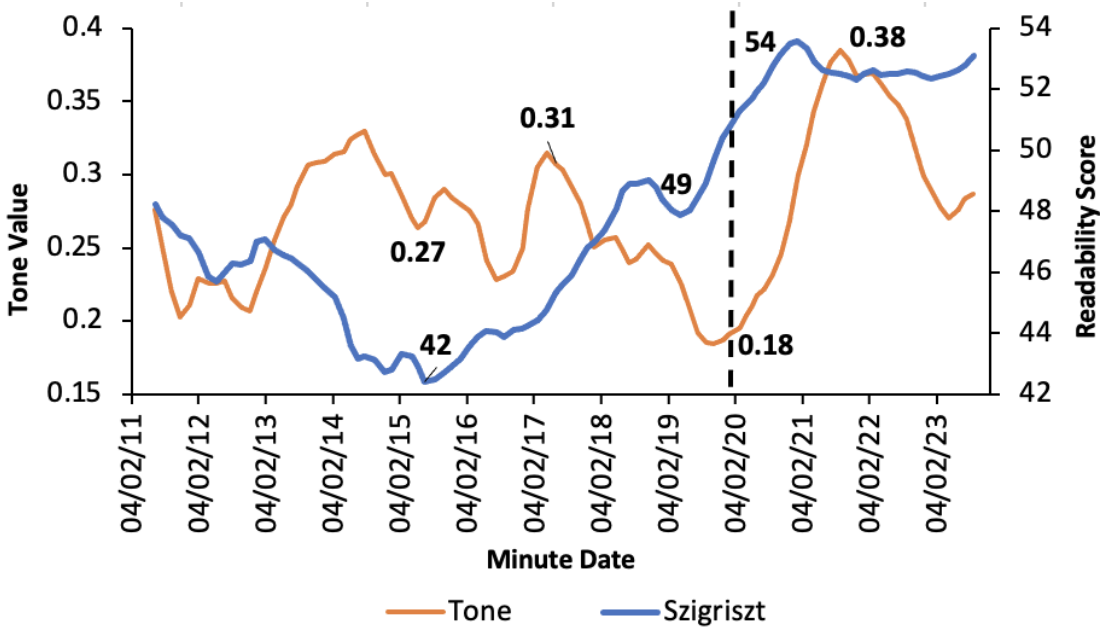
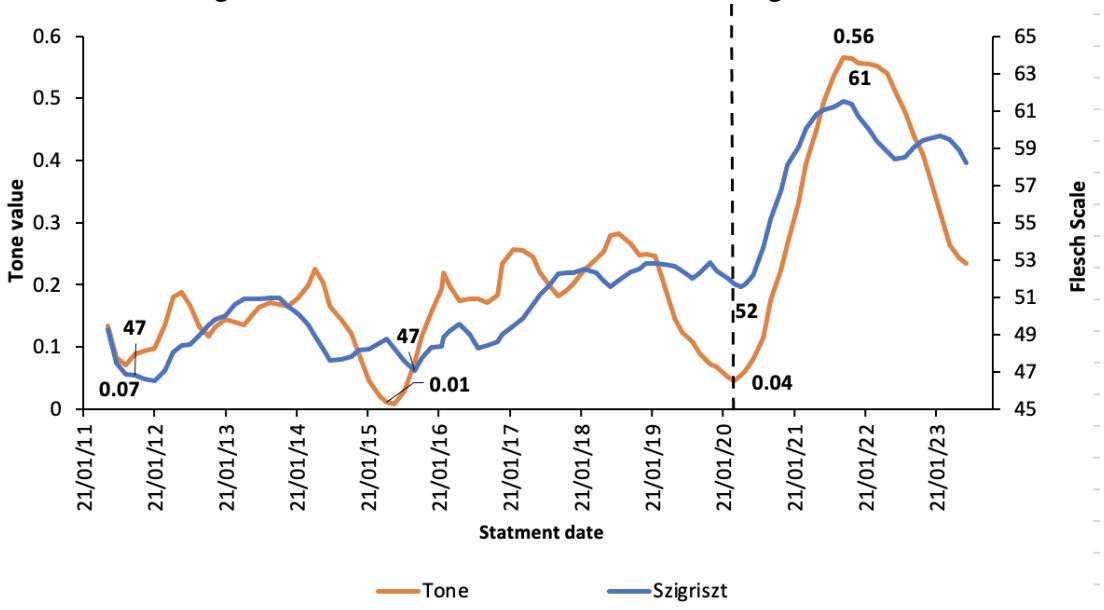


Figure 4.17: Statement Tone indicator vs. Szigriszt Scale



Source: Own elaboration from self-made tone indicator and Minutes & Statements recovered from Banxico's main website. A double averaging process was applied to smooth the series and eliminate their volatility.

In continuance with the study of the pandemic era, short-term inflation spiked drastically, as did the effectiveness of the communication instrument. The Central Bank effectively implemented its communication strategies, as discussed in section 2, with results reflected in the relevant graphs (5.8 & 5.9). For the Statement, the document increased from its second lowest hawkish recorded value –nearly dovish– of 0.04 to its highest one, 0.56, within a year since 2020.

Similarly, the Minute's tone reached its highest hawkish value, from 0.18 to 0.38, although from a higher starting value. Comparing the tone indicator series, the Statement maintained a higher restrictive tone since the pandemic while achieving higher readability.

Figure 4.18: Minute Tone vs. Medium -term Inflation Expectations

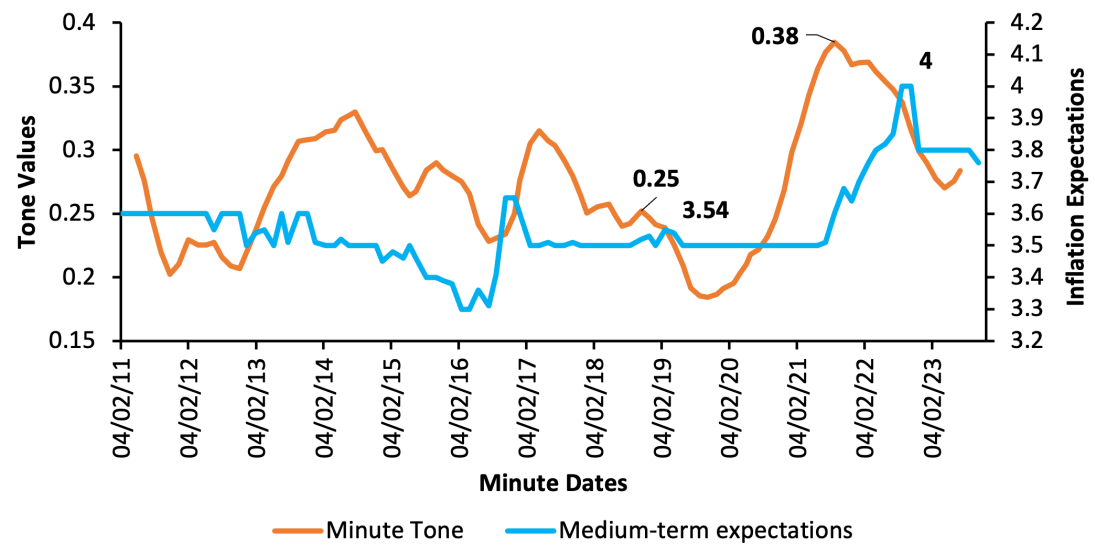
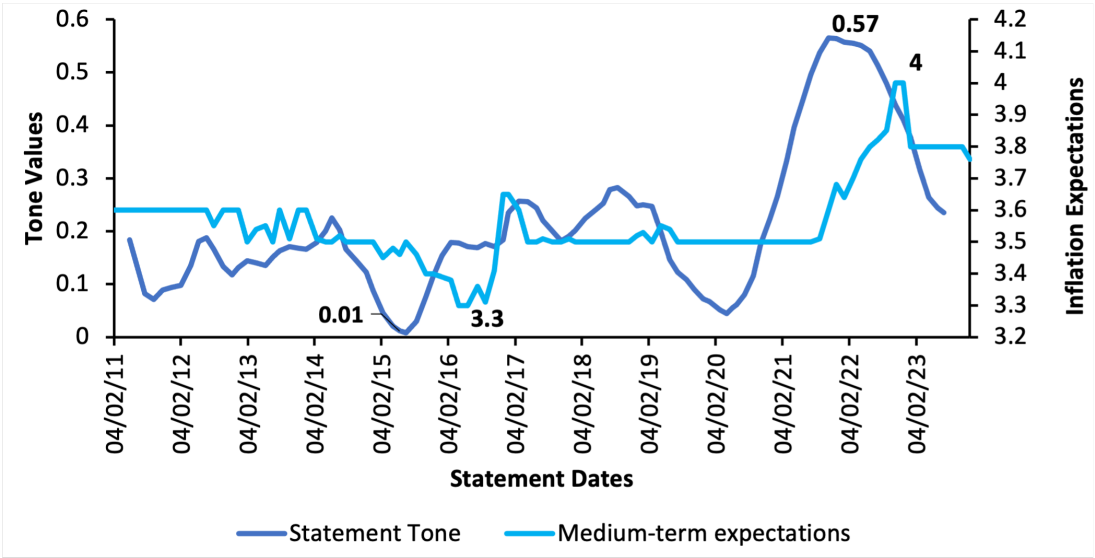


Figure 4.19: Statement Tone vs. Medium-term Inflation Expectations



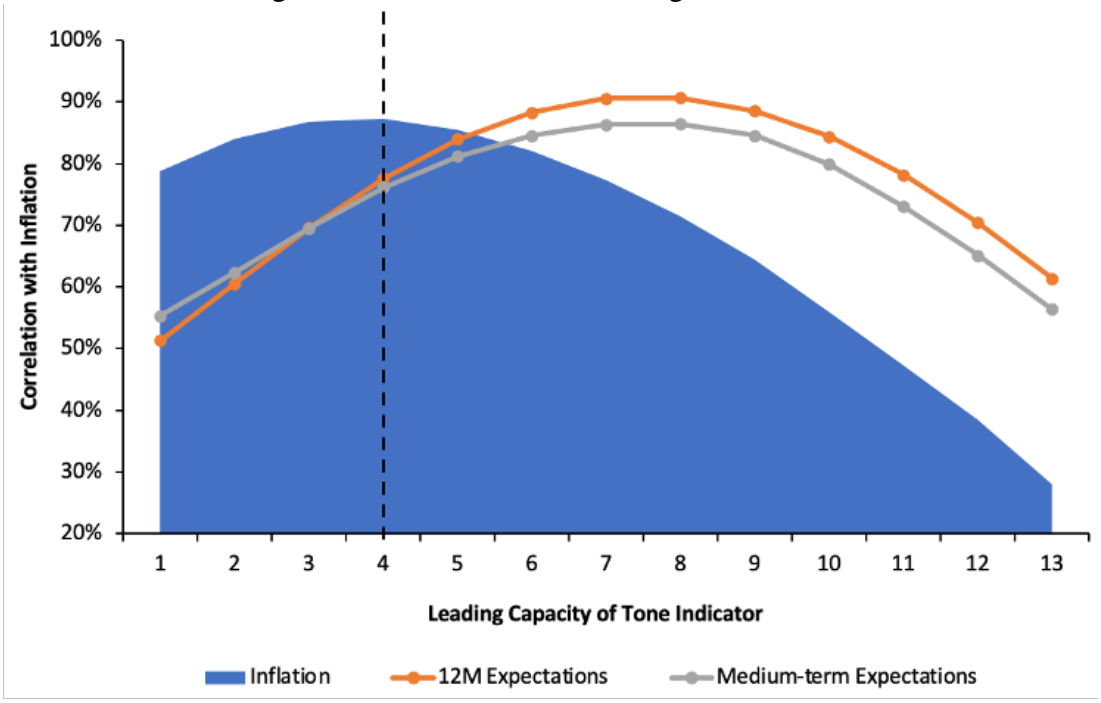
Source: Own elaboration from self-made tone indicator and Minutes & Statements recovered from Banxico's main website. Medium-term inflation expectation data recovered from Economic Information system, Banxico: Expectations Series. A double averaging process was applied to smooth the series and eliminate their volatility.

Although the trajectories from both series in Graphs 4.18 and 4.19 align, the correlation with tone is stronger for short-term inflation expectations than for medium-term ones. There is no apparent lag between these variables until mid-2020, triggered by the pandemic. Before 2020, in

contrast to short-term expectations, one where the tone series reacts before the expectations materialize. However, there is no evident predictability effect or signaling from the tone concerning monetary policy decisions when the time frame expands.

When the tone intensifies, suggesting a hawkish tone consistent with a restrictive monetary policy and higher inflation expectations, the series shows a decrease in restrictiveness, and the expectations decline. This pattern persists in both Minutes and Statements until the onset of the pandemic when a rise in hawkish tone aligns with an increase in inflation expectations. Similarly, a decrease aligns with lower expectations by mid-2022. Despite these fluctuations, since 2001, the tone indicator generally shows greater consistency and has effectively anchored short-term inflation expectations through a predictive effect, with only brief periods of inconsistency.

Figure 4.20: Correlation Tone Lag Vs. Inflation



Source: Own elaboration from self-made tone indicator and short-term and medium-term inflation expectation data recovered from Economic Information system, Banxico: Expectations Series.

The tone indicator measures not only the degree of hawkish and dovish tones of Banxico's main instruments but also their relationship with macroeconomic variables, with inflation expectation playing a leading role. As the primary sources of monetary policy messages, the Statements and Minutes are crucial for analyzing their impact on inflation expectations. Thus, the correlation between the tone indicator and inflation values reflects the relationship between the communication mechanisms' influence over the real inflation value.

As previous figures indicate, the tone indicator has an offset that influences macroeconomic variables. When the tone indicator reacts to a more restrictive or lenient monetary policy deci-

sion, inflation and expectations series respond similarly in subsequent periods. This lag highlights the communication instrument's capacity to predict inflation expectations. Figure 5.12 shows that the correlation between the tone indicator and expectations is about 80% over four periods before losing predictive capacity. Given that the Minute is published after the monetary policy decision, this series offset is expected and coherent. Although the correlation remains above 75% for nearly two trimesters, its main predictive capacity is in the first trimester, showing greater accuracy for short-term expectations than for medium-term ones.

5. Statistical tests

5.1. Granger-Causality Testing

Acording to Granger (1969), Granger causality is a hypothesis test that seeks to determine whether a time series trend precedes a trend in another series. With this in mind, the Granger-causality test is performed for this paper on an X series (the data obtained from the elaborated dictionary) and a Y series of macroeconomic key variables to analyze whether there is enough evidence to conclude that X *"Granger-Causes"* Y.

For this, the test has null hypothesis of: H_0 that X does not *"Granger-Cause"* Y, meaning X does not forecast Y.

The Y series is modeled in the following way once incorporating a Lag component (L) from X_{t-1} to X_{t-L}. This component is necessary as monetary policy usually involves a delay, especially for communication instruments that aren't published immediately, such as the Minute. Furthermore, this lag component is seen in the results section, as it appears that the monetary policy tone reacts first, and a parallel movement of the macroeconomic variable follows.

It is necessary to mention that, to test the tone indicators, these tone indexes had to be generated as a time series so that for each date on which a Minute or Statement was published, there was a tone value for that data. Now, given the components of a time series and its trend, a seasonal adjustment process had to be made using the X-13 ARIMA-SEATS algorithm, a process consistently used by National Institutes of Statistics, Central Banks, and Finance Ministries.[5] Once the series are adjusted, the Granger test is implemented (Heath, J, (Coord.)., 2024).

Let Y be the series to be predicted, and X the series whose tendencies are suspected to forecast it, then, for a certain time t, the Granger-Causality test serves to determine whether Y could be expressed as a combination of it's Auto-Regressive vector of order p along with an Auto-Regressive vector from X. This can be expressed as follows:

$$y_t = a_0 + \sum_{k=1}^{p} a_k y_{t-k} + \sum_{j=1}^{q} b_j x_{t-j} + \varepsilon_t.$$

The test is performed with the following characteristics:

- Significance level of: $\alpha = 0.05$
- X series: Minute and Statement indexes elaborated from information recovered from the dictionary-tone method elaborated in section 3.2.

[5] Alvarado (2021) stresses the importance of discounting the seasonal effects of economic variables, as they are the main source of volatility and short-term economic misinterpretations, especially at the end of the indicator's time window.

- Y series: Inflation, short-term and medium term inflation expectations and product gap.

5.1.1. Results for Monetary Policy Statements

Figure 5.1: Granger-Causality tests for Statement-elaborated dictionary

comunicados Dictionary	lag 1	lag 3	lag 6	lag 9	lag 12
Inflation	6.450 0.013	4.894 0.003	3.013 0.010	2.293 0.025	1.639 0.103
Short-Term Inflation	14.468 0.000	5.478 0.002	2.711 0.019	2.553 0.013	2.127 0.027
Middle-Term inflation	5.394 0.022	3.891 0.011	3.018 0.010	2.600 0.012	2.248 0.019
Output Gap	0.347 0.557	0.208 0.891	0.270 0.950	0.233 0.989	0.502 0.906

Source: Own elaboration from self-made tone indicator, short-term and medium-term inflation expectation and output gap data recovered from Economic Information system, Banxico: Expectations Series.
Note: About the two values on every cell:
1 The number above represents an F-Statistic.
2 The number below represents a p-value.
3 A significance level of 0.05 was considered.

The table is composed of 2 values per cell; the first is the F-statistic score, and the second is the p-value. A significance level of $\alpha = 0.05$, was considered as stated in the test characteristics. Therefore, any p-value below 0.05 will indicate that for its respective lag (with monthly periodicity), the tone indicator can forecast the relevant macroeconomic variables: inflation, short and medium-term expectations, and product gap. For this particular exercise, Lags of 1, 3, 6, and 12 months were considered.

The results are as follows:

- The tone indicator can predict inflation 1, 3, and 6 months before it occurs, although there is not enough evidence to state the same for the 12-month prediction.
- The tone indicator can predict short and medium-term expectations 1, 3, 6, and 12 months ahead.
- Forecasting the output gap poses a significant challenge, as it cannot be reliably predicted using any of the standard time periods.

5.1.2. Results for Minutes

Figure 5.2: Granger-Causality tests for Minute Dictionary

minutas Dictionary	lag 1	lag 3	lag 6	lag 9	lag 12
Inflation	14.044 0.000	4.662 0.004	3.745 0.002	3.030 0.004	2.130 0.027
Short-Term Inflation	4.290 0.041	2.246 0.088	1.316 0.259	1.806 0.081	0.858 0.592
Middle-Term inflation	0.896 0.346	0.273 0.845	0.878 0.515	0.763 0.650	0.684 0.760
Output Gap	1.420 0.236	0.244 0.865	0.403 0.875	0.665 0.738	0.675 0.769

Source: Own elaboration from self-made tone indicator, short-term and medium-term inflation expectation and output gap data recovered from Economic Information system, Banxico: Expectations Series.
Note: About the two values on every cell:
1 The number above represents an F-Statistic.
2 The number below represents a p-value.
3 A significance level of 0.05 was considered.

The results are as follows:

- The indicator can forecast inflation 1, 3, 6, and 12 months in advance.
- Short-term inflation expectations can only be predicted one month in advance.
- There is no evidence to claim that the tone indicator can predict medium-term inflation expectations or the output gap for all the lags considered.

6. Robustness tests

6.1. KMO Calculations: a comparison from computer-generated dictionaries

The Kaiser-Meyer-Olkin (KMO) test determines whether the elaborated dictionary and its main components (keywords and modifiers) are related. This would mean the dictionary is built correctly and can be effectively used (in the form of a factor model, such as Principal Components Analysis or PCA) to analyze communication instruments. The desired obtained value is to have a KMO close to 100, as it would indicate that the dictionary keywords and modifiers are sufficiently correlated to generate variable clusters for a Principal Components Analysis (PCA) and develop an index . Furthermore, Bartlett's test is used to measure whether the correlation matrix created by the KMO is an identity matrix and should be overruled as the factor model would need to be revised. With a p-value of 0, the null hypothesis of an identity matrix would be rejected as the variables are suitable for analysis (IBM, 2023).

Table 6.1: KMO Dictionary Comparison

Dictionary	KMO	Bartlett_Statistic	p.value
Machine-Learning Dictionary	0.89	6349.933	0
Manual Dictionary	0.90	1886.081	0

Source: Own elaboration from self-made tone indicator and computer-generated through a Machine-Learning process.

Both tests were performed using two dictionaries as comparison samples. The manually-created dictionary is the self-made one for this paper, created initially with computer-identified high-frequency vocabulary and manually calibrated using Banxico communication instruments. *The Machine-learning Dictionary (ML)* is a computer-refined dictionary based on high-frequency vocabulary found on Minutes. Said dictionary was generated as follows:

1. Words that don't contribute in terms of value, rather used for writing coherence, known as *stopwords* (mainly connectors), were defined for the algorithm to ignore.

2. The frequencies for every word across all Minutes were obtained, and the top 50 were kept and added to the dictionary. Seeing as some words such as *Inflación* and *subyacente* formed compound words, they were combined manually and added to the dictionary.

3. The frequency of every single and compound word from this dictionary was obtained for every Minute.

Based on the KMO value, the manually-developed dictionary for this paper demonstrates the strongest relationship between components, achieving a KMO value of 0.9, closest to the ideal value of 1. Therefore, This indicates that the manually-created dictionary is more effective for analyzing effective communication than computer-generated dictionaries, including a refined machine learning *ML* dictionary that only filters high-frequency words, which achieved a KMO of 0.89.

Further supporting this finding, Bartlett's statistic result for the human-calibrated dictionary showed a p-value of 0, indicating a significant relationship between the dictionary components. This result was consistent across the compared computerized dictionary. However, the highest KMO score reinforces the conclusion that the self-made dictionary is the most effective method for measuring communication components.

Moreover, the KMO data obtained from the dictionaries allows for an analysis of their clustering capabilities and effectiveness in communication analysis through a Principal Components Analysis (PCA). This confirms that the clusters derived from the dictionaries are effective regarding the relationship between the components.

6.2. Further comparison analysis based on generated PCA Analysis for computer-generated and manually-generated dictionaries

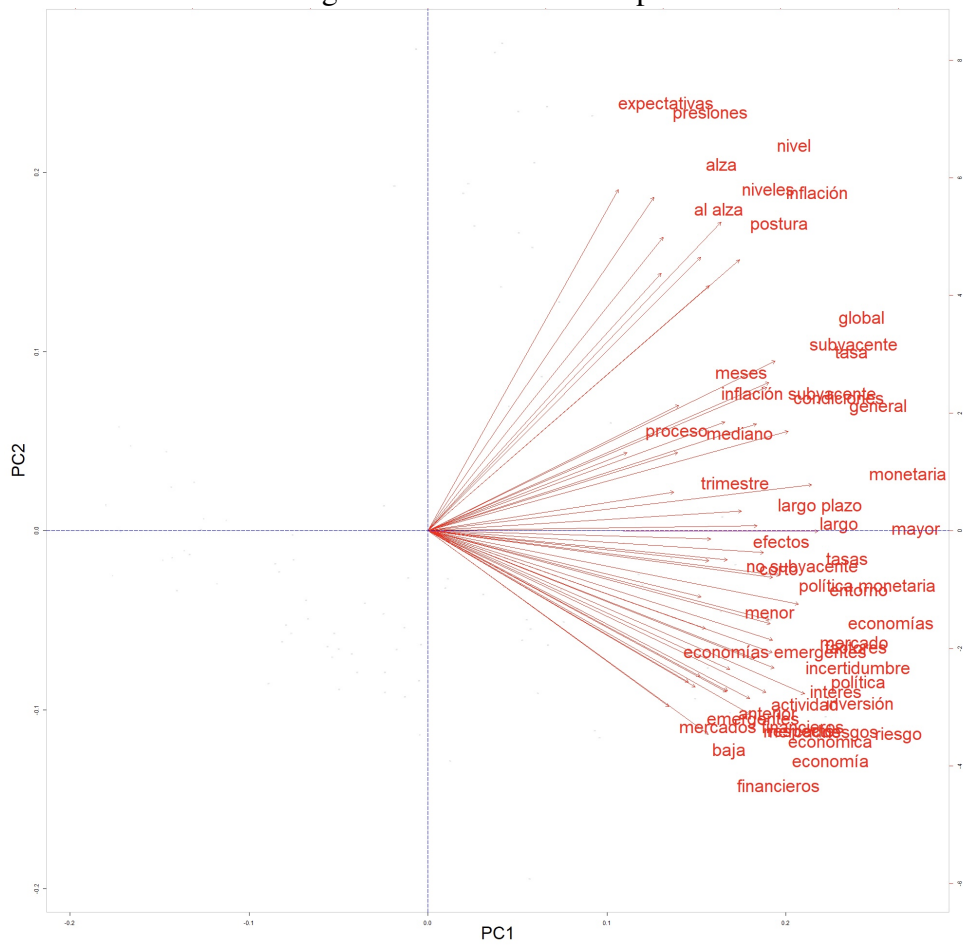
6.2.1. Computer-made dictionary (Machine Learning)

The computer-generated dictionary, consisting of 49 of the most frequent simple and compound words used in Banxico's Minutes, was filtered with great care. This filtering process considered *stopwords*, which are infrequent words that serve as connectors and do not have a connotation within the spectrum of hawk and dove in monetary policy. It was vital to have a filtered dictionary whose creation employing high-frequency words was not skewed by words whose value is grammatical and for text coherence. Furthermore, only words with a KMO score above 0.80 were considered. This stringent criterion ensures enough statistical significance for the dictionary to compare to the manually created one, thereby enhancing the robustness of the research process.

The PCA analysis, or multivariate dimensional reduction method, groups words with an unknown but existing relationship. The objective is to generate indexes based on variables with the highest relationship between them, filtering the dictionaries of any noise that might cloud the vocabulary groups with redundancy.

Based on this analysis, the PCA analysis can be graphically represented using biplots to describe the grouping and behavior of the dictionary keywords:

Figure 6.1: PCA Model Biplot



Source: Own elaboration from self-made PCA model.

Two information clusters where visually generated with a clear distinction based on their characterised positive and negative position (PC_2 marks the differentiation between positive and negative vectors). As this PCA analysis was performed based on keywords recovered from publicly available Minutes at Banxico's website, the data showed that in fact, the word selection per document is actually segmented into specific time intervals:

1. Minutes prior to 2017.

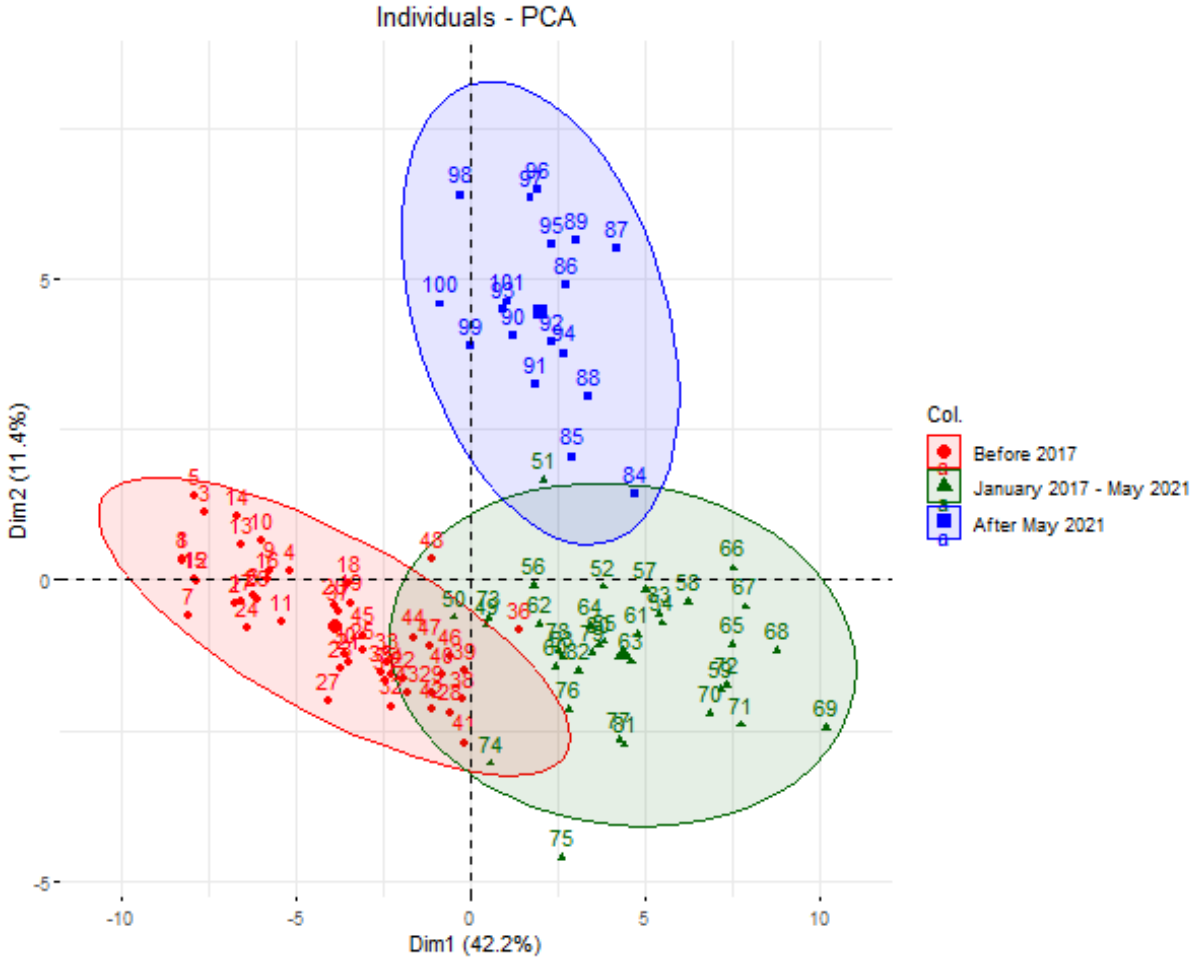
2. Minutes written between January 2017 and May 2021.

3. Minutes after May 2021.

Consistent with the exploratory analysis of communication enhancement strategies executed by Banxico in section 4, these segmented time intervals represent turning points in the elaboration of Minutes, from reduced word count to sentence length and document structure. These clusters can be appreciated in the following graph for every publicly available Minute from the

time this paper was written (Minute 101 is the most recently published when the graph was elaborated).

Figure 6.2: Minute Grouping Computerized Model Dictionary based on PCA Analysis



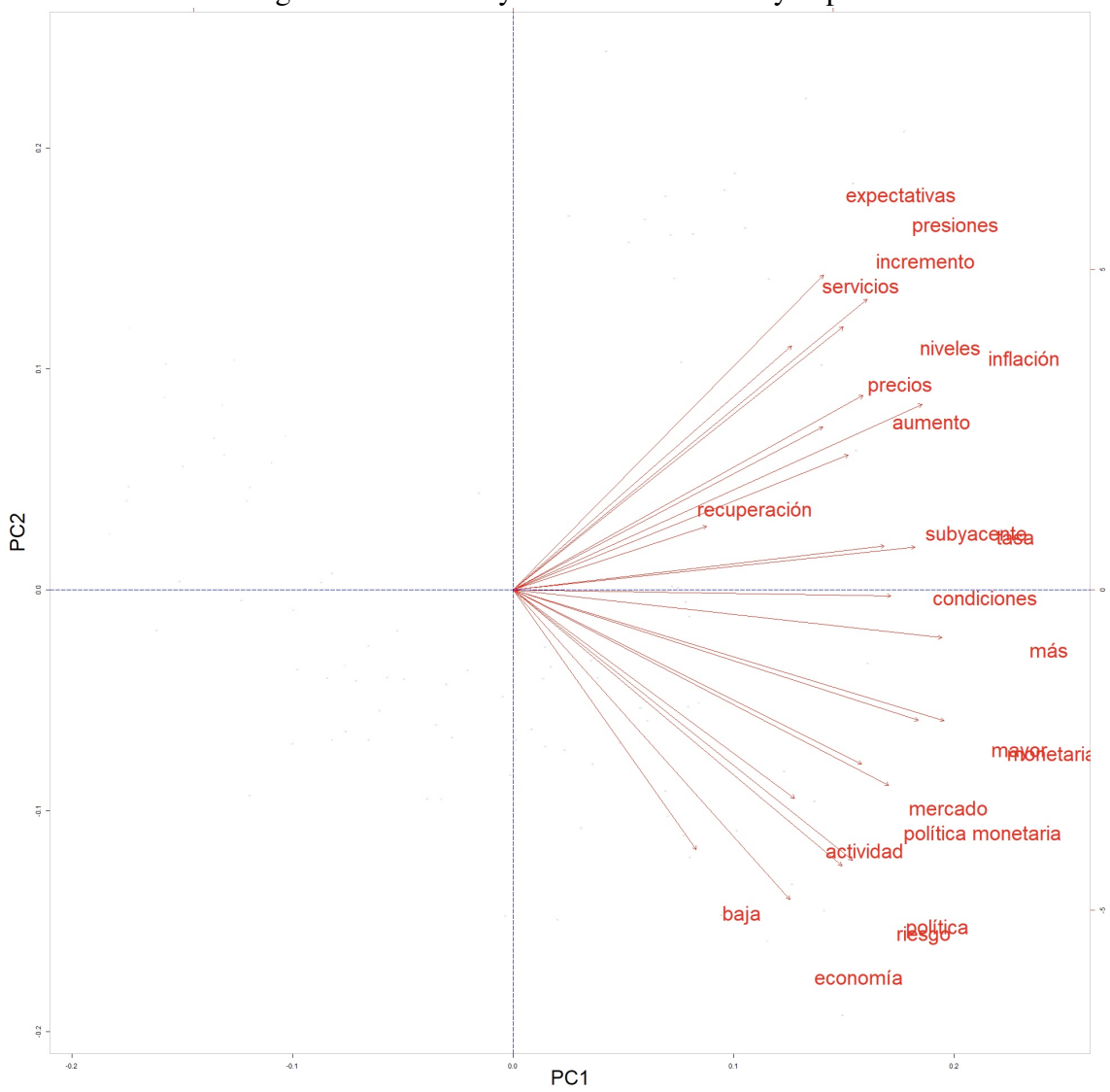
Source: Own elaboration from self-made PCA model.

6.2.2. Manually self-made Dictionary

The same visual analysis was applied to the self-made and manually calibrated dictionary. Similar to the computer-generated dictionary, this dictionary was constructed using high-frequency keywords and modifiers from the Minutes published on Banxico's website. By eliminating words with a KMO value lower than 0.8, the average KMO score for this dictionary reached 0.9. This higher KMO score indicates that the dictionary is more suitable for a PCA model, facilitating the identification and analysis of vocabulary trends or clusters over different time intervals.

Notably, this dictionary's "human factor" required minimal computational refinement, highlighting its effectiveness and even serving as a reference for identifying additional *stopwords* in the *Machine Learning*-generated dictionary.

Figure 6.3: Manually Generated Dictionary Biplot



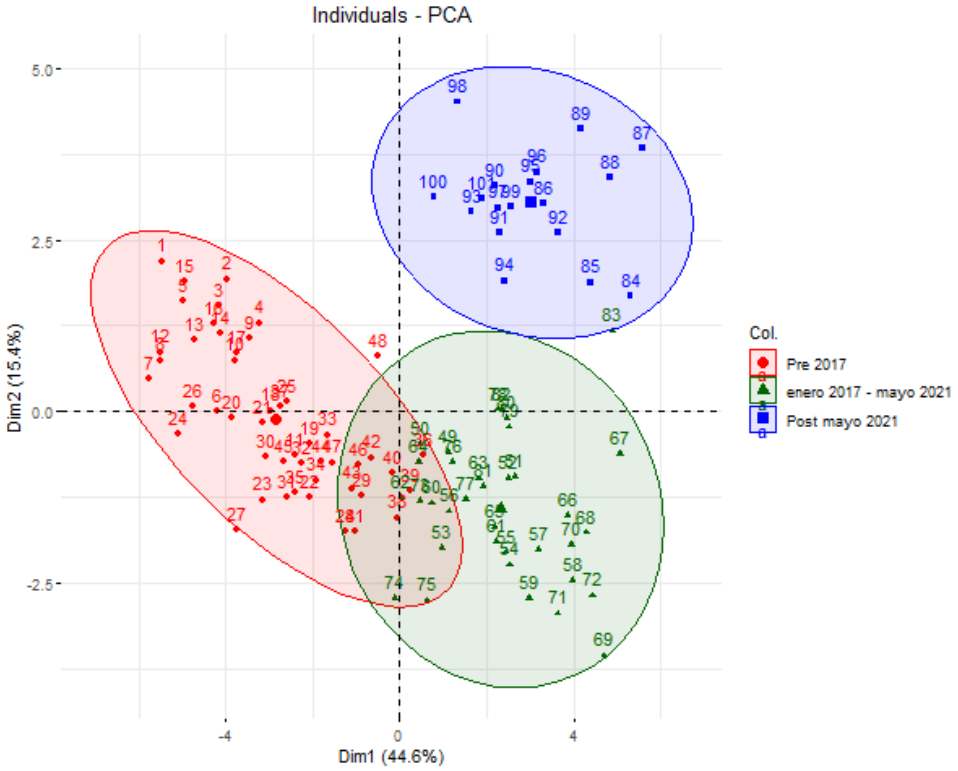
Source: Own elaboration from self-made PCA model.

The plotted keywords in the graph above and below the x-axis demonstrate a grouping of vocabulary according to their connotation within communication and monetary policy. Words such as *baja* or *riesgo* are located in the I quadrant of the plane, while words such as *recuperación, incremento* or *presiones* are positioned in the IV quadrant. This is consistent with the position of the keywords in a tone spectrum with hawk and dove as the axis ends.

Therefore, the selected keywords and modifiers within the dictionary allow for a sentiment analysis. A generalization can be made that keywords in the I quadrant are hawkish due to their connotation of increased, rising, more significant, or pressured, and the IV dovish. Nevertheless, keywords alone can share quadrants or move locations when paired with modifiers within both quadrants, as seen in the Statement and Minute analysis.

Visually, the Minutes are distributed along the graph in the following way:

Figure 6.4: Minute Grouping from Manually-Generated Model Dictionary based on PCA Analysis

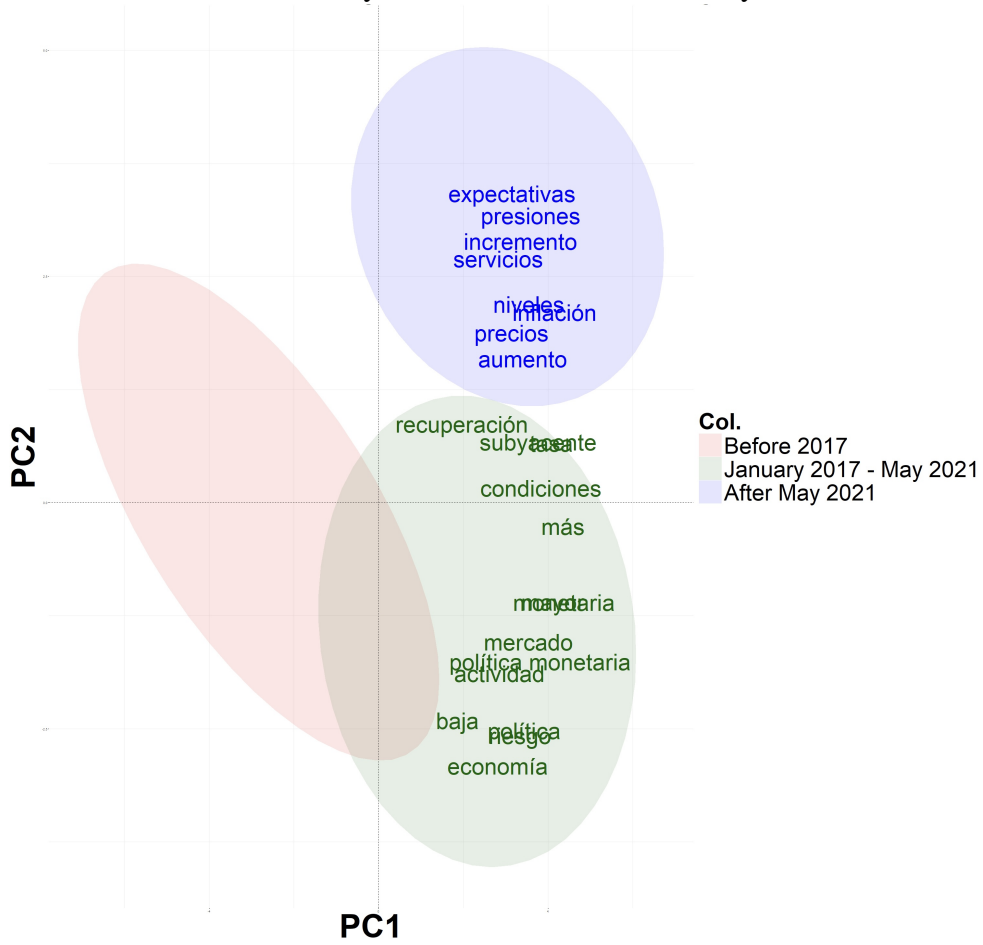


Source: Own elaboration from self-made PCA model.

The consistent distribution of Minutes between the manually created dictionary and the machine learning-based one across the three established time intervals is a significant validation of the keyword selection process for the newly elaborated dictionary. This not only underscores the effectiveness of the dictionary elaboration process but also significantly enhances the credibility of the results, as it eliminates any doubts or biases that may accompany a manual process, ensuring the trustworthiness of the research.

The vocabulary distribution based on the selected time-interval clusters in the following graphic representation should be similar to the computer-generated process in Figure 6.2. Although the dictionary creation followed different methods, both dictionaries recount the most frequent keywords and their modifiers. Therefore, if the dictionary was effectively created for a tone analysis, the high-frequency vocabulary list should be similar and similarly distributed in the biplot.

Figure 6.5: Clusters from Manually-Generated Model Dictionary based on PCA Analysis



Source: Own elaboration from self-made PCA model.

Each ellipse represents a cluster of observations (Minutes). Red is for Minutes written before 2017, green between January 2017 and May 2021 (the first change in the communication strategies), and blue after 2021 (the second change). Green words had a higher correlation with the time period of 2017-2021, meanwhile blue words appear more in Minutes from 2021 onwards. The absence of words within the red ellipse is beneficial, as this period corresponds to a time when communication strategy was not as effective. Consequently, a sentiment analysis and tone spectrum couldn't be applied to the Minutes.

If the generated dictionary recovered keywords from Minutes, whose position in the evolution of communication mechanisms is actually the starting point, then it would not be easy to extrapolate them to an analysis for other communication pieces of other central banks. The fact that this ellipse is absent of any words shows that the filtering process to build the dictionary was effective, as no words that could create noise are considered.

As communication and writing strategies have changed, word trends are beginning to appear that allow us to identify tones within the Minutes and Statements in different time intervals.

7. Monetary Policy Recommendations

Communication instruments have been established as an unconventional monetary policy mechanism that has strengthened over the past two decades. In the post-pandemic era, clear and concise communication from Central Banks is crucial to ensure public understanding and coherent inflation expectations that align with desired inflation targets and monetary policy effects. Central Banks must publish coherent, readable, and low-complexity communication pieces whose tone matches the nature of the policy decision. Effective communication enhances the effectiveness of monetary policy decisions and reduces uncertainty in the macroeconomic context, fostering a loop of credibility and accountability.

Statements and Minutes hold significant value in the communication spectrum and should maintain a consistent tone that aligns with interest rate movements. Achieving this requires a careful selection of keywords and modifiers to convey a hawkish or dovish tone corresponding to the monetary policy decision on interest rates. A coherent tone, one of the three main elements of text analysis, along with complexity and readability, enables the audience to interpret the monetary policy context consistently with the insights provided by the Central Bank.

It is essential to recognize the reciprocal relationship between communication and inflation expectations. Communication, as a form of monetary policy, directly affects inflation expectations, which, in turn, influences the policy's effectiveness. The IMF (2023), identified clear communication as a key strategy to reduce inflation, particularly inflation caused by the pandemic and shocks to labor supply and energy prices. Therefore, in the final stretch of addressing post-pandemic inflation, as described by Bernanke (2024), communication plays a vital role in helping the audience understand the Bank's inflation strategy and establishing reliability in managing inflation increases.

Amatyakul et al. (2024) suggestions emphasize the need for a prolonged period of restrictive monetary policy decisions to tackle pandemic inflation. Communicating this restrictive cycle with a coherent hawkish tone and straightforward dissemination tools is of utmost importance. This approach enables audiences of varying knowledge levels to understand the inflation-targeting trajectory and the mechanisms implemented to address it.

8. Conclusions

In conclusion, over the past two decades, numerous Central Banks have recognized the importance of communication as an unconventional yet powerful monetary policy tool. This tool has been instrumental in shaping the financial markets and the general population's expectations, particularly through the inflation channel. The exploratory analysis of Banxico's and the Fed's communication strategies has shed light on the positive effects of establishing a robust communication framework. This framework allows the desired monetary policy messages to effectively reach the audience and guide their expectations in the desired direction.

Notably, Banxico's effective communication, as revealed by the Flesch analysis on Minutes and Statements, was achieved mainly from 2021 onwards, following the implementation of a series of communication strategies. These strategies included the disclosure of votes, a bilingual publication, the implementation of visual tools, and a reduction in word count, among others. The Flesch readability metrics support this conclusion, with both Minutes and Statements reaching the desired 60s values after the changes, indicating an improvement in readability.

Accompanying readability is tone, another crucial characteristic of effective communication, as it allows for a consistent message to be reached and interpreted by the audience. This is of utmost importance, especially with critical or divided monetary policy decisions, where a consistent tone between hawkish, dovish, and natural must blend with the decision's characteristics regarding restrictiveness or relaxation. If done correctly, this would create a solid framework and a united front to justify the monetary policy decision and anchor the public's expectations.

Nevertheless, when studying tone and its connection, a language barrier made itself visible as no dictionary method was designed especially for Spanish bank statements. This wasn't the case for the readability metrics, as the Fernandez Huerta method is specially adapted to fit the language characteristics. For that, this text, in particular, includes creating and calibrating a tone indicator to measure the threshold of hawkishness through a dictionary methodology and its relationship with macroeconomic variables. The conclusions reached are that Minutes and Statements are more hawkish than dovish, only reaching dove values in specific periods and never quite crossing the threshold. This is consistent with a forward-guidance communication strategy implemented by Banxico in a period of rising interest rates, giving this strategy a hawkish characterization measurable in both instruments. Moreover, until 2021, when the communication improvements were implemented, the Minute had a more restrictive tone; this changed, and the Statement reached the highest hawkish level recorded in the indicator.

When it comes to their interaction with key macroeconomic variables, the implementation of a Granger-Casualty test has shown that tone for Minutes and Statements has a predictive ability. This is not only evident in the graphic representation of the indicator series against inflation,

expectations, and output gap, but also quantifiable through casualty and robustness tests. When tested against a lag component of 1, 3, 6, and 12 months, it is concluded that Minute Tone can project inflation for every lag and 1 month in advance for short-term inflation expectations. Similar results are obtained with the Statement Tone, where inflation is projected 1, 3, and 6 months in advance and for short and medium-term expectations in every lag. These results underscore the significant role of communication strategies in projecting inflation expectations, which is consistent with the nature of the monetary policy that contains a lagging component.

Therefore, the study of the components that make up effective communication, such as readability, complexity, and a consistent tone, are crucial for the implementation of monetary policy, as it has been proven that not only does it improve comprehensibility on behalf of the audience, but it has a projection ability to anchor inflation expectations. This is crucial for inflation-targeting banks to fulfill their mandate and push inflation to the objective value. As it is still a field under constant exploration, the door remains open to identify the elements that connect communication and inflation expectations and, most importantly, what improvements must be made to the existing communication tools to convey the connection between both.

Bibliography

Alvarado, E. (2021). Todo lo que se debe saber sobre la estacionalidad. *Lecturas en lo que indican los indicadores: cómo utilizar la información estadística para entender la realidad económica de México*. *Lecturas en lo que indican los indicadores: cómo utilizar la información estadística para entender la realidad económica de México* (Vol. 1, pp. 29-48). Museo Interactivo de Economía.

Amatyakul, P., Igan, D., and Lombardi, M. J. (2024). Sectoral price dynamics in the last mile of post-covid-19 disinflation. *BIS Quarterly Review*.

Bancomext (2017). Outlook on the Mexican Economy (Annual Report 2017). https://www.bancomext.com/staticcontent/informe-anual-2017/en/AnnualReport/outlook-on-the-mexican-economy.html.

Banxico (2018). *Progress in the Communication Strategy of Banco de México* [Excerpt from the Quarterly Report April - June 2017]. Banco de Mexico. https://www.banxico.org.mx/publications-and-press/quarterly-reports/

Banxico (2018a). *Régimen de Objetivos de Inflación con Base en Pronósticos* [Extracto del Informe Trimestral Abril – Junio 2018, Recuadro 5, pp. 59-61]. Banco de Mexico. https://www.banxico.org.mx/publicaciones-y-prensa/informes-trimestrales/recuadros/

Banxico (2018b). *Régimen de Objetivos de Inflación y el Papel de los Pronósticos* [Extracto del Informe Trimestral Octubre – Diciembre 2017, Recuadro 6]. Banco de Mexico. https://www.banxico.org.mx/publicaciones-y-prensa/informes-trimestrales/recuadros/

Banxico (2021). *Informe Trimestral* [Abril - Junio 2021, Recuadro 6]. Banco de Mexico. https://www.banxico.org.mx/publicaciones-y-prensa/informes-trimestrales/recuadros/

Beaupain, R & Girard, A. (2020). The value of understanding central bank communication. *Economic Modelling*, *85*, 154-165.

Bernanke, B. S. Woodford, M. (2005). *The Inflation-Targeting Debate*. The University of Chicago.

Bernanke, B & Blanchard, O. (2024). *An analysis of pandemic-era inflation in 11 economies* (Hutchins Center Working Paper # 91). Peterson Institute for International Economics.

Bholat, D., Broughton, N., Ter Meer, J., and Walczak, E. (2019). Enhancing central bank communications using simple and relatable information. *Journal of Monetary Economics*, *108*, 1-15.

Blinder, A. S., Ehrmann, M., Fratzscher, M., De Haan, J., and Jansen, D.-J. (2008). Central bank communication and monetary policy: A survey of theory and evidence. *Journal of economic literature*, *46*(4), 910-945.

Bulíř, A., Čihák, M., and Jansen, D.-J. (2011). *Clarity of Central Bank Communication About Inflation* (IMF working paper No. 12/9). International Monetary Fund.

Casiraghi, Marco & Perez, L. P. (2022). Central bank communications. *In Monetary and Capital Markets Department: Technical Assistance Handbook*. International Monetary Fund.

De Haan, Jakob & Sturm, J.-E. (2019). Central bank communication. In D. G. Mayes, P. L. Siklos, J.-E. Sturm (eds.), *The Oxford handbook of the economics of central banking* (pp. 231-262). Oxford University Press.

Evdokimova, T., Nagy-Mohacsi, P., Ponomarenko, O., and Ribakova, E. (2023). *Central banks and policy communication: How emerging markets have outperformed the Fed and ECB* (Working Paper No. 23-10). Peterson Institute for International Economics.

Fortuna (2018). Banxico transparenta votos en la junta de gobierno. *Fortuna: negocios y finanzas*. https://revistafortuna.com.mx/2018/05/01/banxico-transparenta-votos-en-la-junta-de-gobierno/.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, *37*(3), 424–438.

Heath, J & Acosta, J. (2023). Claridad y transparencia en la comunicación de la política monetaria. *Revista de Economía Mexicana*, *8*, 93-133.

Heath, J, (Coord.). (2024). *Lecturas en lo que indican los indicadores: cómo utilizar la información estadística para entender la realidad económica de México* (Vol. 1). Museo Interactivo de Economía; INEGI; Banco de México.

Hernández, I. (2017). Un acercamiento a la legibilidad de textos relacionados con el campo de la salud. *Chasqui, 135*, 253-273.

IBM (2023). Análisis factorial: Descriptivos. https://www.ibm.com/docs/es/spss-statistics/saas?topic=analysis-factor-descriptives.

IMF (2023). Managing expectations: Inflation and monetary policy. *In World Economic Outlook: Navigating Global Divergences*. International Monetary Fund.

Investopedia (2024). Inflation hawk: Dovish and hawkish monetary policy explained. https://www.investopedia.com/terms/h/hawk.asp.

Korntheuer, R. (2015). SEO y la prueba de legibilidad de Fernández-Huerta / Flesch-Szigriszt. *SEOQuito*. https://seoquito.com/seo-legibilidad-flesch-szigriszt-fernandez-huerta/.

Long, H. (2020). Federal reserve slashes interest rates to zero as part of wide-ranging emergency intervention. *The Washington Post*. https://www.washingtonpost.com/business/2020/03/15/federalreserve-slashes-interest-rates-zero-part-wide-ranging-emergency-intervention/.

Luangaram, Pongsak, Wongwachara, W., et al. (2017). More than words: a textual analysis of monetary policy communication. *PIER Discussion Papers*, *54*,1-42.

Moschella, Manuela & Pinto, L. (2019). Central banks' communication as reputation management: How the fed talks under uncertainty. *Public administration*, *97*(3), 513-529.

Nakayama, Yasuhiro & Sawaki, T. (2023). Analysis of the fed's communication by using textual entailment model of zero-shot classification. arXiv, arXiv:2306.04277.

Österholm, P., Dale, S., and Orphanides, A. (2008). *Imperfect central bank communication-Information versus distraction* (Working Paper No. 2008/060). International Monetary Fund.

Poole, W. and Rasche, R. H. (2003). The impact of changes in FOMC disclosure practices on the transparency of monetary policy: are markets and the FOMC better" synched"? *Review-Federal Reserve Bank of Saint Louis*, *85*(1), 1-10.

Readable (s.f.). Flesch reading ease and flesch-kincaid grade level. Retrieved December 15, 2023 from https://readable.com/readability/flesch-reading-ease-flesch-kincaid-grade-level/.

Rodríguez, V., Cuadra, G., and Sámano, D. (2023). Inflation targeting in Mexico: evolution, achievements and policy lessons. In Bank for International Settlements (ed.), *Central banking in the Americas: Lessons from two decades* (Vol. 127, pp 113-128). Bank for International Settlements.

Suarez, E. (2013). Banxico dice ¡hasta aquí! dos veces. *El Economista*. https://www.eleconomista.com.mx/opinion/Banxico-dice-Hasta-aqui-dos-veces-20131027-0001.html.

Szigriszt, F. (1993). *Sistemas predictivos de legibilidad del mensaje escrito: Formula de Perspecuidad*. [Doctoral Dissertation, Universidad Complutense de Madrid]. UCM Digital Repository. https://webs.ucm.es/BUCM/tesis/19911996/S/3/S3019601.pdf.

WebFX (s.f.). *Flesch-Kincaid Readability Test*. Retrieved December 14, 2023 from https://www.webfx.com/tools/read-able/flesch-kincaid.

Woodford, M. (2005). *Central bank communication and policy effectiveness* (Working Paper 11898). National Bureau of Economic Research.

9. Appendix

I. Manual methodology testing – Statement (September 29, 2022)

Prueba

Comunicado: 29 de septiembre del 2022

La Junta de Gobierno del Banco de México decidió incrementar (PM) en 75 puntos base el objetivo para la Tasa de Interés Interbancaria (+1) // a un día a un nivel de 9.25%, con efectos a partir del 30 de septiembre de 2022 (FG) (-1)//.

Indicadores oportunos sugieren que la actividad económica mundial (DCK) ha continuado desacelerándose (NM) en el tercer trimestre (-1) //. La inflación global (DCK) siguió aumentando (PM) (+1) // en un entorno (DK) donde persisten (PM) desbalances (RK) entre demanda y oferta (DK) (0) // en diversos mercados (DK) y precios (DK) aún elevados (PM) de alimentos y energéticos (DK) (+1)//. Esto continúa generando expectativas (DK) de un apretamiento (NM) monetario (DK) acelerado (PM) a nivel global (0)// y de tasas de referencia (DCK) en niveles altos (PM) (+1)// por un periodo prolongado (FG) (-1) //. Las condiciones financieras (DCK) se mantuvieron apretadas (NM) (-1) // y el dólar (DK) continuó fortaleciéndose (PM) (+1)//. En su decisión más reciente (FG) (-1) //, la Reserva Federal de Estados Unidos aumentó (PM) el rango objetivo (FG) para la tasa de fondos federales en 75 puntos base por tercera vez consecutiva (+1) //y anticipó futuros incrementos (FG) (-1)// . La creación de empleos en ese país se mantuvo robusta //y, si bien la inflación (DK) en dicha economía (DK) siguió disminuyendo (NM) de manera moderada (-1) // , aún se mantiene elevada (PM) (+1) //. A su vez, un amplio número de otros bancos centrales (DCK) continuaron incrementando (PM) sus tasas de referencia (CDK) (+1) //, algunos en mayor magnitud a lo previsto (FG) (-1)//. Entre los riesgos (RK) globales destacan (PM) los asociados a la pandemia (-1) //, la prolongación (PM) de las presiones (DK) inflacionarias (DK) (+1)//, el agravamiento (NM) de las tensiones (RK) geopolíticas (+1) // y mayores (PM) ajustes (DK) a las condiciones (DK) económicas, monetarias (DK) y financieras (+1) //.

En los mercados financieros (DCK)nacionales, el tipo de cambio (DCK) mantuvo un comportamiento estable (MP) (+1) //, mientras que (FG) las tasas de interés de bonos gubernamentales aumentaron(PM) a lo largo de toda la curva de rendimientos (+1)//. Se prevé (FG) que el ritmo de crecimiento de la actividad económica en el tercer trimestre de 2022 se desacelere (NM) (-1) // respecto del crecimiento (DK) observado en la primera mitad del año, // si bien se anticipa (FG) que las condiciones de holgura sigan disminuyendo (NM) (-1)//. Se mantiene un entorno (DK) incierto (NM)(-1)//, con un balance de riesgos (CDK) para la actividad económica sesgado a la baja (NM) (-1) //.

Las presiones (Dk) inflacionarias (PM) acumuladas derivadas de la pandemia y (+1) // del conflicto (RK) bélico continúan afectando a las inflaciones general (DKC) y subyacente, (0) // que en la primera quincena de septiembre registraron tasas anuales de 8.76% y 8.27% respectivamente, // manteniéndose en niveles (DK) no observados en dos décadas // Las expectativas (DK) correspondientes para 2022

y 2023 volvieron a incrementarse (PM). (+1)// Las de mediano plazo (referencia- CDK) exhibieron en el margen cierto ajuste (DK) al alza (PM) (+1)// y las de largo plazo (referencia- CDK) se mantuvieron estables (PM) (+1)// si bien por arriba (PM) de la meta (DK) (+1) //

Ante choques (DK) inflacionarios (PM) (+1) //de una magnitud mayor a la anticipada (FG) (+1) // y la perspectiva de que sus efectos (DK) tomen más (PM) tiempo en desvanecerse (+1),// los pronósticos para la inflación general (DCK) y para la subyacente (DK) se revisaron al alza (PM) (+1) // para todo el horizonte de pronóstico (-1) .// En este entorno (DK) más (PM) complejo, (0) // se anticipa (FG) que la inflación converja (FG) a la meta de 3% en el tercer trimestre de 2024 (ver cuadro) (-1)//. Estas previsiones (FG) están sujetas a riesgos (NM) . (-1)// Al alza (PM) : i) persistencia (PM) de la inflación subyacente (DCK) en niveles elevados (+1) //; ii) presiones (DK) inflacionarias (PM) externas derivadas de la pandemia (+1) ;// iii) mayores (PM) presiones (DK) en los precios (DK) agropecuarios y energéticos (+1)//por el conflicto (RK) geopolítico (-1)// ; iv) depreciación (PM) cambiaria (DK) (+1);// y v) presiones (DK) de costos. (DK) (+1) // A la baja (NM) : i) una desaceleración (NM) de la actividad económica mundial (DCK) mayor (PM) a la anticipada (FG).(-1)//; ii) una disminución (NM) en la intensidad del conflicto (RK) bélico (+1)//; iii) un mejor funcionamiento de las cadenas de suministro //; iv) un efecto (DK) mayor (PM) al esperado(FG) de la brecha negativa del producto (0) ;// y v) un efecto (DK) mayor (PM) al esperado (FG) del Paquete Contra la Inflación y la Carestía. (0) //El balance de riesgos (DCK) respecto de la trayectoria prevista para la inflación en el horizonte de pronóstico (FG) (-1) // continúa con un considerable sesgo al alza (PM) . (+1)//

La Junta de Gobierno evaluó la magnitud y diversidad de los choques que han afectado a la inflación y sus determinantes // así como la evolución (PM) de las expectativas de mediano y largo plazos (DCK) y el proceso de formación de precios (DK) (+1)// Consideró también los mayores (PM) retos (RK) para la conducción de la política monetaria (DCK) (0) // ante el apretamiento (NM) de las condiciones financieras globales (DCK) (-1) //, el entorno (DK) de acentuada (PM) incertidumbre (NM) (0)//, las presiones (DK) inflacionarias (PM) acumuladas de la pandemia (+1) // y del conflicto (RK) geopolítico// y la posibilidad de mayores (PM) afectaciones a la inflación (+1).// Con base en ello, y con la presencia de todos sus miembros, decidió por unanimidad (-1) // incrementar (PM) en 75 puntos base el objetivo para la Tasa de Interés Interbancaria (+1)//a un día a un nivel de 9.25%. (-1) // Con esta acción, la postura de política monetaria se ajusta a la trayectoria que se requiere para que la inflación converja a su meta de 3% dentro del horizonte de pronóstico (-1).//

La Junta de Gobierno vigilará estrechamente las presiones (DK) inflacionarias (PM) ,(+1)// así como todos los factores que inciden en la trayectoria prevista para la inflación y en sus expectativas.(-1) // Ello, con el objetivo de determinar una tasa de referencia congruente (PM) en todo momento (+1) //, tanto con la convergencia ordenada y sostenida de la inflación general a la meta de 3% en el plazo en el que opera la política monetaria (-1)// como con un ajuste (DK) adecuado (PM) de la economía (DK) y de los mercados financieros (DCK) .(+1)// La Junta de Gobierno valorará la magnitud de los ajustes (DK) al alza (PM) en la tasa de referencia (+1) // de sus próximas reuniones (FG) de acuerdo con las circunstancias prevalecientes(-1)//.

Resultado numerico: 0.15

Categoría: Hawk