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CONTENTS

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CONTENTS

Central bank communication in unconventional times: Some evidence from a textual analysis of the National Bank of Poland communication during the COVID-crisis

Lada Voloshchenko-Holda[1]   **Paweł Niedziółka**[2]

Abstract

The article analyses the communication of the National Bank of Poland (NBP) one year after the announcement of the crisis response package adopted after the outbreak of the COVID pandemic. It presents the perspective of a central bank that first entered unconventional monetary ground during the COVID-crisis. The analysis aims to answer the question of what message about monetary policy objectives may have been conveyed in communication with regard to possible interpretations of the response actions by economic agents. Misinterpretations of policy actions at the time, fuelled by the increased attention to inflation, could later contribute to higher inflation persistence. The article presents findings based on the innovative use of MAXQDA Pro 2022 solutions for textual analysis of central bank's communication. It points to three inconsistencies in the NBP's communication that could potentially lead to misinterpretation of the NBP's policy actions in response to the crisis and thus affect the formation of expectations.

Keywords

- Central bank communication
- textual analysis
- financial stability
- price stability
- monetary policy
- attention to inflation

JEL codes: E52, E58

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[1] The Institute of Banking, SGH Warsaw School of Economics, al. Niepodległości 162, 02-554 Warsaw, Poland, corresponding author: lvolos@sgh.waw.pl, https://orcid.org/0000-0002-4401-3634.

[2] The Institute of Banking, SGH Warsaw School of Economics, al. Niepodległości 162, 02-554 Warsaw, Poland, pniedz@sgh.waw.pl, https://orcid.org/0000-0002-1659-7310.

Introduction

The COVID-crisis is associated with an unprecedented simultaneous easing of monetary and macroprudential policies in many countries. A year following the massive response of central banks to the outbreak of the pandemic, countries in many regions were confronted with a marked increase in inflation and short-term inflation expectations, leading to a significant tightening of monetary policy. A number of factors contributed to the rise in inflation, including the significant role of supply-side factors. However, the continued persistence of inflationary pressure raises concerns about whether central banks' unprecedented policy response to the COVID-crisis may have been excessive and whether communication played a sufficient role in explaining monetary policy actions to economic agents.

Traditionally, central banks have relied more on communicating with an expert audience and trying to influence their expectations. Recently, this approach has changed, partly as a result of the lessons learned from the COVID-crisis. The unprecedented nature and urgency of the latter brought central banks to the forefront of public debate. The demand-shock nature of the COVID-crisis may have drawn even more public attention to monetary policy actions than it did during the Global Financial Crisis (GFC), which was triggered in the financial system. In order to enhance the accountability of monetary policy and thus to better guide inflation expectations, it may be worth directing central bank communication towards a broader audience and explaining policy actions better. However, reaching the general public as well as improving the clarity of communication in order to avoid misinterpretation and unwanted reactions by economic agents seems to be quite a challenge (Blinder et al., 2022).

In contrast to the vast majority of studies on central bank communication in unconventional times, which focus on the experiences of the major central banks,[3] the article presents the perspective of a central bank that entered

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[3] The title of this article is inspired by Coenen et al. (2017), which is part of the literature on central bank communication in unconventional times, focusing mainly on the experiences

unconventional monetary ground for the first time during the COVID-crisis and found itself in the spotlight with no experience of "unconventional communication". It examines the communication of the National Bank of Poland (NBP) one year after the announcement of the crisis response package adopted after the outbreak of the COVID pandemic in March 2020 (hereinafter "COVID-communication"). It aims to answer the question of what message about monetary policy objectives it might have conveyed in terms of how the NBP's COVID response actions might have been interpreted by economic agents. Misinterpretations of policy actions by economic agents at the time, fuelled by their increased attention to inflation, could have later contributed to the persistence of higher inflation.

The article attempts to link the NBP's COVID-communication, which has traditionally been addressed to an expert audience, with its possible impact on the interpretation of monetary actions by economic agents. In this context, the choice of the NBP for the study was motivated by the presumed greater attention given to inflation by economic agents in Poland. The article proposes some assumptions about the transmission of the NBP's COVID-communication to the broader public, supported by the results of the literature review and also by measures constructed to illustrate economic agents' demand for information on inflation and how this was supplied by the news media before, during and after the crisis.

The article presents an innovative use of MAXQDA Analytics Pro 2022 solutions for textual analysis of central bank communication, allowing the entire research to be based on textual data in a national language without compromising the general applicability of the methods used. Four dictionaries were created for the purposes of the study. Three of them are attributed to the main domains of the NBP's accountability: 'price stability', 'economic policy/development' and 'financial stability', and are used in the topic modelling of NBP's COVID-communication for the further content analysis. One, created to compute an 'alarmist' proxy, designed to examine a change in the 'alarmist' tone of the NBP's financial stability communication. The article also presents two measures of inflation attention computed for Poland: one based on Google search intensity for the term 'inflation' (following Buelens, 2023), and the other based on inflation topic intensity in news titles (inspired by Marcellino & Stevanovic, 2022).

The article is structured as follows: Section 1 provides an overview of the literature on central bank communication studies and is divided into two parts. Section 1.1 focuses on the textual analysis of central bank communica-

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of major central banks that used unconventional measures in response to the GFC. This confluence of titles is intended to contribute to the debate by providing an overview of the experiences of central banks that have initiated the use of unconventional measures from different backgrounds.

tion, while Section 1.2 focuses on recent findings regarding the transmission of central bank communication to economic agents, including their beliefs, attention to inflation, and possible transmission channels. Section 2 provides the background to the NBP's COVID monetary policy actions, and discusses the data collection and methodology used. Section 3 presents the results. The conclusions summarise three inconsistencies found in NBP's communication that could potentially lead to misinterpretation of its policy actions in response to the crisis. These findings could be valuable for enhancing the design of central banks' communication, especially when directed at the general public.

The results of the study may have implications for the design of central bank communications, especially those aimed at the general public. The results highlight the importance of economic agents' attention to inflation. Additionally, they confirm the significance of central banks explaining monetary policy in a more transparent manner and clearly separating it from financial stability communication. The latter should aim to enhance the credibility of monetary policy.

1. The literature review

1.1. Textual analysis of central bank communication

The study presented in the article contributes to the rapidly growing literature on textual analysis of central bank communication. A considerable part of such studies based on textual analysis aims to quantify central bank communication by measuring its tone and sentiment. The proxies obtained for sentiment or tone of communication are mainly tested for their abilities to predict future interest rate movements (e.g., Apel & Blix, 2014). In some studies, they are used for studies on communication effectiveness in reducing noise, i.e. its ability in reducing volatility in financial markets (e.g., Born et al., 2011; Londono et al., 2022), communication's influence on economic variables (Hansen & McMahon, 2016) or expectations of financial experts (e.g., Baranowski et al., 2021). Another important group of studies focuses on differences in communication strategies (e.g., Bennani & Neuenkirch, 2017; Keida & Takeda, 2019).

The most common approach is based on the dictionary method, due to its relative simplicity. The textual-analysis-literature on central banks' communication draws on findings from studies exploring ways of using qualitative information in finance. Those studies have shown that the linguistic content of corporate reports or news stories about firms is useful in explaining their

stock variables and a noncomplicated quantification (based on word counts) of such qualitative information offers decent predictive abilities. An example of such studies is the one by Li (2006), who found that frequency measures for words 'risk' and 'uncertainty' in corporate annual reports predict low annual earnings and stock returns. The widely known findings of Tetlock et al. (2007) showed that a high level of pessimism in the popular Wall Street Journal's column determined by word count (dictionary method) precedes lower returns the next day. However, these dictionary-based studies highlight the inadequacy of common dictionaries, such as the widely used Harvard-IV-4 classification dictionary, for sentiment analysis of financial texts—most of the words which this dictionary identifies as negative are not considered negative in the financial context (Loughran & McDonald, 2010). This led to the development of dictionaries specially dedicated to financial texts.

This expertise was used in central banks' communication studies and also resulted in the creation of specialized dictionaries, particularly ones aimed at analysing monetary policy documents and Financial Stability Reports (FSRs). Apel and Blix (2014), for example, developed a list of phrases to capture the predictive power of MPC minutes for future monetary policy decisions. The dictionary constructed by Bennani and Neuenkirch (2017) is tailored to measure the tone of public speeches by the ECB Governing Council members. Correa et al. (2020) developed a dictionary specifically for FSR sentiment analysis and demonstrated that FSR sentiment can be a good predictor of banking crises. Londono et al. (2022) used this dictionary to link the design of macroprudential governance structures with central banks' communication strategies. The authors found robust evidence that communication by central banks involved in inter-agency financial stability committees is more effective in mitigating a deterioration in financial conditions.

Some of the literature on textual analysis of communication uses more sophisticated methods. Rybinski (2019) employs a supervised machine-learning framework to create expert dictionaries for central bank communication topics, and then examines how they are conveyed to the news media. Statistical natural language processing such as LDA (see, e.g., Hansen & McMahon, 2016; Jegadeesh & Wu, 2015; Keida & Takeda, 2019), although more demanding compared to dictionary methods, could be more accurate in content descriptions because it allows the same word to appear in multiple topics with different probabilities (Hansen & McMahon, 2016). LDA also helps to avoid some of the limitations of dictionary methods, such as the subjectivity of the authors inherent in the development of an expert dictionary.

For a number of obvious reasons, textual analysis studies of central bank communication based on dictionary methods and specialised dictionaries are mainly applicable to the English language. However, using the English version of the text rather than the national language version in communication studies has certain limitations due to a potential missing of nuances (see, e.g.,

the discussion in Szyszko & Rutkowska, 2022). For example, Baranowski et al. (2021) examine how the interest rate and inflation expectations of private sector experts in Poland respond to NBP communication. The communication is quantified by measuring the tone of the NBP's documents using the English dictionaries of Apel & Blix (2014) and Bennani & Neuenkirch (2017), whereas the local experts whose opinions are studied perceive this communication in their national language (Polish) and also respond to the expectations survey in their native language. Another important issue for communication studies associated with the texts' language is a possible difference in the content of central bankers' speeches, depending on whether they are addressed to audiences abroad (and therefore delivered in English) or at home (and therefore delivered in the respective national language). Bennani and Neuenkirch (2017) showed such 'home' bias in the speeches of European central bankers, members of the ECB's General Council, who seem to adjust the content to the audience.

1.2. Transmission of central bank communication to economic agents: A background for textual analysis

The article attempts to link central bank communication, addressed rather to experts, with its possible impact on economic agents' interpretation of monetary actions. A body of literature confirms the strong influence of central bank communication on expert audiences, as they follow this channel of communication very closely and response promptly. Although a subject of rapidly growing interest, how central banks' communication reaches economic agents and might thus influence their expectations remains under-researched. This line of research could, in a sense, be divided into a part that considers the demand for information on inflation and monetary policy actions by economic agents and a part that focuses on the supply of such information.

An important line of research concerns the economic agents demand for information on inflation and monetary policy through their attention that they pay to monetary actions. Coibion, Gorodnichenko, Kumar et al. (2020) find evidence suggesting that monetary policy in advanced economies with a low inflation environment tends to gain little attention from individuals. The situation is different in countries with higher and volatile inflation—economic agents cannot afford not to follow the actions of the monetary authorities, as the costs of ignoring macroeconomic realities in decision-making are substantially greater (Cavallo et al., 2017). A number of studies confirm that episodes of macroeconomic turbulence lead economic agents to pay more attention to monetary authorities' actions, in line with the theory of rational inattention. Coibion and Gorodnichenko (2015), e.g., show how for Ukraine

the proportion of firms that follow the actions of the central bank increases sharply in times of crisis (the first priority of such tracking was to shape exchange rate expectations and then inflation expectations). Buelens (2023) measures agents' attention to inflation by the intensity of Google searches for the topic 'inflation', arguing that this type of direct measure reveals 'active' intrinsic attention compared to proxies that measure the intensity of the topic in the news media. The study shows that agents' attention to inflation increases at an accelerating rate as inflation rises. Marcellino & Stevanovic (2022) also show an increase in the importance of agents' attention proxy, measured similarly, during high and low inflation episodes and since the start of the COVID pandemic, confirming the important role of such attention for inflation expectations.

However, the links between central bank communication and economic agents' attention to monetary policy actions appear to be more complex. Paying attention to inflation does not necessarily translate into tracking central bank actions, and even if it does, the impact of such actions can still be misinterpreted. Binder (2020) shows that only just over a third of respondents in the US consumers survey sample were aware of the Fed's historic interest rate cut in response to the COVID-pandemic outbreak a few days after its announcement and may have trouble interpreting it: this group was found to be relatively more pessimistic about future unemployment and had higher inflation expectations. Coibion, Gorodnichenko and Weber (2022a) examine how the Fed's announcements concerning the policy response to the COVID-crisis affected economic agents' expectations, and show that the effect was quite limited.

The beliefs of economic agents are another concern for central bankers in designing their communication. Recent literature points to some inconsistencies between economic agents' beliefs and the fundamentals underlying monetary policy decisions. In contrast to central bankers and expert audiences who associate demand shocks with a deterioration of the economy, which for them implies a downward revision of inflation forecasts, households associate "bad times" with higher inflation (Andre et al., 2019; Candia et al., 2020; Coibion, Gorodnichenko, Kumar et al., 2020; Dräger et al., 2014). Such inconsistencies may lead to misinterpretations of central bank actions and thus require special communication treatment. Coibion, Gorodnichenko and Weber (2022b) show that the use of simple messages that address the price stability domain appears to be a more effective form of communication with the general public. Rybinski (2019) finds evidence for Poland that central banks' communication on price stability is more effective in influencing media discourse, and thus stands a better chance of gaining the attention of economic agents. Lamla & Vinogradov (2019) show that announcements of monetary policy decisions are more likely to be received by economic agents (with a probability about 10% higher in the case of FOMC press conferenc-

es) compared to other central bank communication events. Ter Ellen et al. (2022) examine the news media transmission channel of monetary policy to the public for Norway by identifying narrative monetary policy surprises (using textual data on central bank communication and news media), and show the significant effect of these surprises on subsequent media coverage. These findings are consistent with those of Rybinski (2019) for Poland, regarding the ability of central bank communication events to influence news media discourse. Marcellino & Stevanovic (2022) measure the supply of information about inflation by standardising the count of Wall Street Journal (WSJ) articles containing the stem "inflat" in their title. They show that media communication about inflation, measured in this way, plays an important role in shaping inflation expectations.

In the context of the demand for/supply of information on inflation and monetary actions, it also seems relevant to consider general insights into individuals' news consumption. Flaxman et al. (2016) confirm that in the case of online news consumption, which tends to dominate over time, individuals are more likely to delegate their information choices to specialised, typically mainstream, news providers. Nimark & Pitschner (2019) show that individuals' beliefs and actions are influenced by both the information conveyed in a news story and the choice to convey it. In line with this evidence, the article consider news media attention to inflation and monetary actions in Poland measuring the topics' intensity in the news stories titles (inspired by Marcellino & Stevanovic, 2022) of the most popular local online news providers.

2. Data and methodology

2.1. The case of Poland: Monetary policy and communication background

The NBP's response to the COVID-19 crisis was prompt and large-scale. In March 2020, the NBP implemented an extensive package of monetary easing measures (the list of easing measures can be found in NBP, 2020a, p. 29). In addition to monetary easing, macroprudential policy was eased as well. During the following two months after the crisis's outbreak, the NBP in total cut the reference rate three times (by 140 bps in total from the pandemic's outbreak onwards) to the historically lowest level of 0.10%. The announcement of the response package, as well as further NBP's communication, did not explicitly tie implied response-measures to specific policy objectives. It is important to note that during the COVID-19 crisis, due to safety concerns,

the NBP suspended the press conferences that were traditionally held after MPC meetings. These conferences were an important communication event with proven power to influence media discourse (Rybinski, 2019).

Immediately before the crisis began, inflation in Poland was running above the upper limit for deviations from the inflation target. The NBP expected the anticipated economic slowdown would engineer a 'natural' decline in prices. The NBP's communiques of that time even contained warnings about defla-tionary risks, referring to the inter-crisis experience of the Eurozone with a low inflation environment, despite the extensive use of unconventional monetary tools. However, the economic slowdown associated with the COVID-crisis did not lead to a marked drop in inflation in Poland, as was expected. The slump in demand associated with the COVID-crisis caused a notable drop in CPI in-flation globally. The downward trend was also observed in Poland. Inflation fell to 3.3% year-on-year in June 2020, back within the deviation band, while remaining one of the highest among the non-Eurozone CES countries (see NBP, 2020b, pp. 12–13) and still above the inflation target of 2.5%. Thereafter, along with other countries, Poland experienced unfavourable post-COVID in-flation dynamics.
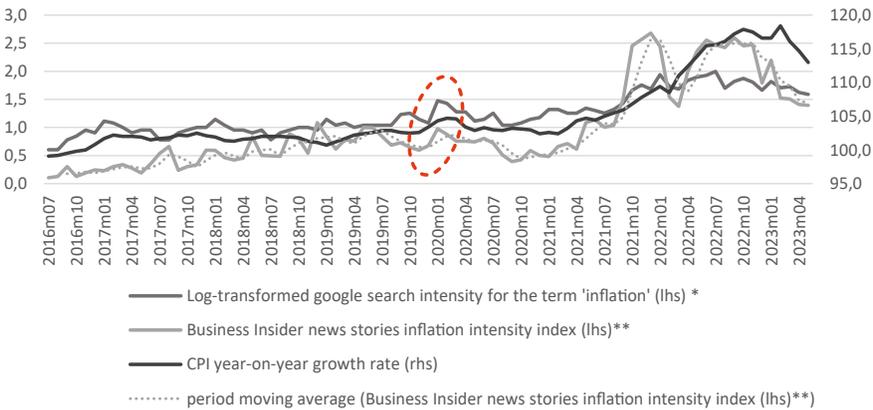
Note: * – refers to the Google Trend time series for the term "inflation" in Poland, sample period: July 2016–May 2023, collected according to the recommendations of Buelens (2023) from (pp. 51–53). The correlation coefficient with CPI is 0.89, which is statistically significant at the 0.001 level. ** – the index counts Business Insider Poland news stories containing the words "inflation" and "price" in their title (the analysis is done for titles in Polish). Business Insider Poland provides business news to the most popular (according to the Reuters' Institute for the Study of Journalism Digital News Report 2023) online information provider https://www.onet.pl/. News stories inflation intensity index = (word count)/(news stories count), $t \in$ [Jul 2016–May 2023], normalised to the mean, the correlation coefficient with CPI is 0.85, which is statistically significant at the 0.001 level.

Figure 1. Attention to inflation in Poland and its relationship with inflation developments in 2016–2023

Source: based on (GUS,2023).

The choice of the NBP case for this study is also motivated by greater attention to inflation among economic agents, probably reflecting the historically short experience of low inflation. Figure 1 demonstrates a high sensitivity of inflation attention in Poland to inflation developments over the entire sample period.[4]

The inflation attention measures show an increase at the end of 2019, as inflation exceeded the ceiling for deviations from the inflation target. This increase may have led to greater attention of economic agents to the monetary actions taken in March and April 2020 in response to the pandemic outbreak, and may have been transmitted to expectation formation through the country's high sensitivity of short-term inflation expectations to inflation (Chmielewski et al., 2020; Goel & Tsatsaronis, 2022).

2.2. Data and methods

Like many central banks around the world, the NBP's ability to clearly explain the policy decisions in response to the COVID-crisis was affected by the urgency and scale of the crisis. The lack of explicit information in the NBP communication on the objectives behind the policy decisions taken in response to the pandemic outbreak suggests an examination of an implicit message that may have been conveyed in its communication. The aim of the content analysis of the NBP's COVID-communication is therefore to answer the question of what message about monetary policy objectives it might have conveyed in terms of the possible interpretations of the NBP's COVID response actions on the part of economic agents.

The article uses a topic modelling framework (see, e.g., Gentzkow et al., 2019) to analyse the content of the NBP's COVID communication. The topic modelling is based on the dictionary method by tagging keywords specific to NBP's communication when its talk focuses on one of three domains (topics) of its accountability: 'price stability', 'economic policy/development'[5] or 'financial stability' (hereafter "topic dictionaries"). The analysis of communication is conducted in MAXQDA Analytics Pro 2022. The MAXQDA solutions

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[4] The period selected partly overlaps with the periods presented in the charts below and covers the time series after the COVID period. The time interval was chosen to show attention dynamics starting from the end of the deflation period in 2016 and the high inflation period which started in the middle of 2021. This is consistent with the findings of Marcellino and Stevanovic (2022), who show a special role of attention to inflation during periods of very high or low inflation.

[5] The NBP's mandate is to maintain price stability (according to the Act on the National Bank of Poland) while supporting the government's economic policy (the secondary remit), provided it does not interfere with the primary objective.

used allow to solve the dilemma of language choice: due to the support of Unicode text in every MAXQDA function, a textual analysis project could be implemented in any language by simply importing the relevant text data. Although the study presented in this article is based on data for Poland, the methodology and tools used are general and can be applied to or replicated with other textual data.

In addition, the article considers the role of financial stability communication. Although this domain of central bank communication has less of an impact on the general public and thus the formation of inflation expectations, its role in counteracting the deterioration in financial conditions during the crisis by reducing uncertainty and thereby supporting the effectiveness of monetary policy could be significant. It could be argued that the NBP, due to its direct role in the Financial Stability Committee, was able to use the regularly published FSRs to more effectively counter the deterioration caused by the pandemic outbreak (see Londono et al., 2022; Matysek-Jędrych, 2018). The direct role of the central bank in macroprudential supervision, according to Londono et al. (2022), leads to the transmission of "calmer messages". In contrast, central banks without such a role should rely more on communication to convey financial stability concerns to other supervisors as well, resulting in the transmission of more "alarmist messages". To show whether the NBP used this ability, the article examines the change in tone in the NBP's financial stability communication, using a specially developed dictionary to create an 'alarmist' proxy. The analysis focuses on the change in the 'alarmist' tone over a longer period, 2007–2020, and aims to make a comparison between the reaction to the COVID-crisis and to the GFC.

The data is organized within the MAXQDA Project (Project) into a document system, which consists of three document groups: 1. *MPC minutes group* – a series of the NBP's MPC minutes published in the period from 2008–2020 (a total of 145 issues), 2. *FSRs group* – a series of the NBP's FSR issues published in the period from 2007–2020 (a total of 26 issues), 3. *COVID communication events* – a total of 12 documents, texts and transcripts of all NBP communication events held during the first year of the COVID crisis, i.e. speeches, interviews, Q&A sessions (speeches and Q&A recordings were transcribed into text specifically for the purposes of this study).

A *COVID communication dataset*, covering the entire COVID-communication of the NBP on monetary policy, includes *COVID communication events* (12 documents, 71% of the dataset text corpus by word count) and 10 documents from the *MPC minutes group* published after the outbreak of the pandemic from March 2020 onwards (29% of the dataset text corpus by word count). All documents defining the project are in Polish.

Given its key role in monetary policy communication, the MPC minutes series was chosen for the development of the NBP-specific keyword dictionaries for the domains/topics of "price stability" and "economic policy/devel-

opments". The choice is also justified by the power of this document to influence the media discourse (through policy announcements, higher publication frequency, regular press conference after MPC meetings) and thus a higher likelihood of eventually reaching the general public. The choice of the FSRs series as a key financial stability communication document with proven efficiency in 'news creation' and 'noise reduction' (Born et al., 2011) also seems natural. The FSRs are used to develop the NBP-specific keyword dictionary for the financial stability domain, as well as a special dictionary for the construction of a Financial Stability Alarmist Index (FSAI).

2.3. The content analysis

The study covers two-step topic modelling of "COVID-communication". In the first step, the MAXDictio function was used to develop NBP-specific keyword dictionaries for the three domains of the bank's accountability. In the second step, the *COVID communication dataset* documents were coded with the dictionary items. Methodologically, the function used to develop the dictionaries employs the bag-of-words (BoW) technique (see, e.g., by Bholat et al., 2015; Gentzkow et al., 2019). BoW is based on the representation of a document as a vector of words and word counts, which enables an assessment of the importance of single terms within the document by applying a weighting, the most common of which is the proportional occurrence method.

It is worth noting that the length of the text corpus substantially differs between the two groups of documents: *MPC minutes group* and *FSRs group*,[6] without affecting the accuracy of group-specific keywords identification due to the proportional occurrence method used; more relevant to such accuracy is the length of the series and its relative comparability for both groups. The series covers 16 MPC interest rate decisions, including 5 tightening decisions between 2011 and 2012 and 11 easing decisions between 2012 and 2015. The series also includes the two changes of NBP Governor in 2010 and 2016, as well as the change in the composition of the MPC in 2016. It covers the GFC, the sovereign debt crisis, and the COVID-crisis. These events contribute to smoothing out possible variations in the vocabulary used.

Several built-in procedures were used to clean the data, ignoring the following: hyperlinks, email addresses, hashtags, numbers, text in square and curly brackets, minimum number of characters, and applying the following: stop word list and case sensitivity, lemmatisaton of words. The lemmatisation procedure for the Polish language gave quite precise results for the project

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[6] The first covers 145 documents with total text corpus of 222,000 words and the second – 26 documents with total text corpus of 1,235,000 words.

documents, although in some few cases it was necessary to combine some rows in the results table, as they contained words with similar meanings in the context. The basic stop-words list was uploaded from the Countwordfree[7] website and then elaborated by adding common words, neutral for the topic modelling within the project (such as 'current'). Around thirty top-ranked (by frequencies) terms lists obtained for both documents' groups were then analysed with the use of built-in functions for keywords' context through their most likely collocation. Analysis was needed to: 1) divide the top-ranked terms obtained for the text corpus of *MPC minutes group* into two topics, *'T1: price stability'* and *'T2: economic developments'*; 2) reject some terms that are used in the text only in certain combinations, such as 'council' in 'monetary policy council', and which do not define topics in the context of the further content analysis. It resulted in the creation of keywords dictionaries specific to NBP's communication when it talks about : *'T1: price stability'*, *'T2: economic developments* (within monetary policy mandate)' and *'T3: financial stability'*.[8] The topic dictionaries obtained were subjected to a robustness analysis to check the stability of the results in view of small variations in the dictionaries. The analysis included the dependent *t*-test for altered keyword lists (obtained by reducing the dictionary lists). The test results showed a minimal average difference.

An additional technical dictionary of keywords (most frequently used terms, defining the context) specific to the NBP's COVID-communication was also developed. The dictionaries obtained were used for coding the documents from the *COVID communication dataset*. The further summative content analysis of the NBP's COVID-communication is based on counting the occurrences of the topics' keywords and measuring the intensity of the topics, in order to identify a balance between them. The technical dictionary is needed for quantifying and visualizing proximity of the topics within the text corpus.

2.4. The 'alarmist' dictionary

A special dictionary was developed to compute a proxy for examining the NBP's response to the COVID-crisis in communication on financial stability. The 'alarmist' dictionary was constructed, involving an assignment of terms

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[7] Retrieved from https://countwordsfree.com/stopwords/polish

[8] 'T1 Price stability': 'inflation', interest, rate, price, monetary, policy, expectations….; 'T2 economic developments": (within monetary policy mandate)': 'growth', 'economy', 'situation', 'GDP', 'economic/business conditions', 'enterprise'…; 'T3 financial stability': 'bank', 'credit', 'finance', 'sector', 'risk', 'fund', 'asset'… Only sample words are presented here, translated into English. The actual dictionaries in Polish that are applicable to the analysis of the text are available on request.

by hand from the terms' frequencies list obtained for the text corpus of *FSRs group* with a key classifying feature—a negative connotation, mostly irrespective of collocation or context (in total 61 words).[9] The process of selecting the terms was supported by the use of MAXQDA's word explorer tools, as well as PELCRA's collocation search engine for Polish (Pęzik, 2012).[10]

Limiting the method to negative words is in line with the objective of the analysis: the 'alarmist' proxy is designed to examine a change in the 'alarmist' tone of FSRs over time, identifying an 'alarmist' attribute as a word's negative connotation. The construction of a traditional sentiment proxy is based on the neutralization of negative terms by positive ones, with an equal weight for both groups, whereas negative information has a greater relevance for the textual analysis of tone, because, as psychological studies show, it is better remembered than neutral. The method used is also supported by the findings of Tetlock et al. (2007) or Li (2006), e.g., which confirm the good performance of proxies based on negative word counts. Negative terms tend to dominate in financial texts, e.g., the special dictionary developed by Correa et al. (2020) for quantifying the sentiment communicated in FSRs contains 391 words, of which 96 are positive and 295 are negative.

As with the topic dictionaries, the 'alarmist' dictionary was subjected to a robustness analysis to check the stability of the results to small variations in the dictionaries. In addition, in order to strengthen the robustness of the results, an alternative alarmist dictionary was used, based on the well-known financial stability dictionary proposed by Correa et al. (2020). The list of negative words from this dictionary was translated into Polish. Both the resulting 'alarmist' dictionaries were used for coding the *FSRs group* of documents to create 'alarmist' proxies: *FSAI* (Financial Stability Alarmist Index) and *FSAI Correa.*[11]

3. Results

The analysis of the *COVID communication dataset's* content is divided into two parts based on the types of coding used, depending on the text range: for a 'search item' (a keyword attributed to the dictionaries) and for a 'sentence'

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[9] For example, the dictionary contains words such as 'deficit', 'erosion', 'crisis', 'confrontation', 'destabilisation', 'problem', etc. These are just a few examples common to both English and Polish to give an idea of the approach to attribution. Due to article size limitations, the complete dictionary cannot be included, although it is available upon request.

[10] 'Risk' in non-financial texts has a negative connotation in Polish. However, the collocation 'risk-free', used only in financial texts, cancels out the negative connotation. Therefore, it should be properly adjusted in the methods used.

[11] The obtained frequencies for the "alarmist" dictionary: *FSAI=('alarmist' words count)/ (total words count)*, $t \in [2007:2020]$, normalised to the mean.

(a complete sentence containing a keyword). The former enables the quantification of the similarity between the keywords used in COVID-communication and those attributed to the main domains of NBP's accountability based on their intensity. The latter enables the quantification of the text thematic similarity to the topics associated with the three main domains of NBP's accountability. Figure 2 shows item-level code relations visualising the similarity of COVID-keywords (obtained for COVID-communication) to the wording traditionally used by the NBP when speaking in one of the three domains of its accountability.
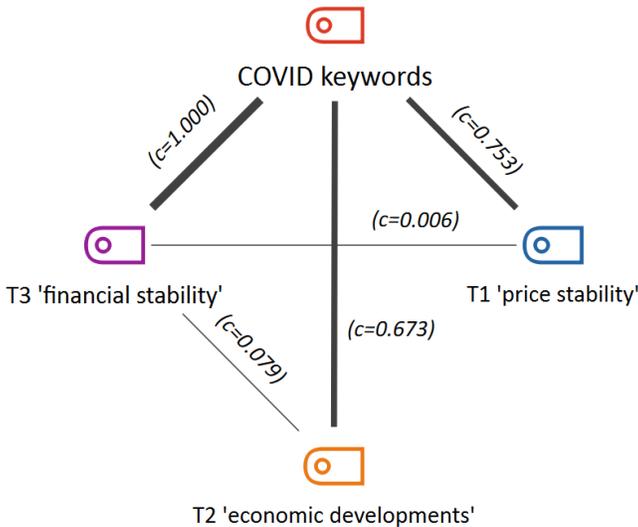
Note: c – frequency of codes' co-occurrence, scaled by the most frequent between 'COVID keywords' dictionary and T3 'financial stability' ($c = 1$) (also shown by the thickness of the lines).

Figure 2. Code co-occurrence model for "COVID-communication"

Source: own work.

Figure 2 demonstrates that the wording used by the NBP in COVID--communication overlaps to a greater extent with the wording traditionally used in 'financial stability' communication. This is primarily due to the prevalence of financial stability wording in the text corpus of COVID communication events (accounting for 70% of the total NBP communication in the COVID--crisis, in terms of number of words). As mentioned above, due to the COVID pandemic, the NBP discontinued the tradition of holding press conferences after MPC meetings. Therefore, the communication events in the text corpus examined here are the only direct communication events that took place at that time with the potential to impact the news media discourse and reach a broader audience.

The prevalence of the 'financial stability' wording is also partly due to the decline in the importance of the 'inflation topic' in the MPC minutes in 2020. Figure 3 demonstrates a gap between the importance of the topic of 'inflation', which declined after the outbreak of the pandemic in March 2020, and inflation, which did not fall much in the wake of the downturn.

Frequency Index for 'Inflation' (lhs)

the 15-percent trimmed mean core inflation measure, corresponding month of previous year = 100 (rhs)

.... period moving average (Frequency Index for 'Inflation' (lhs))
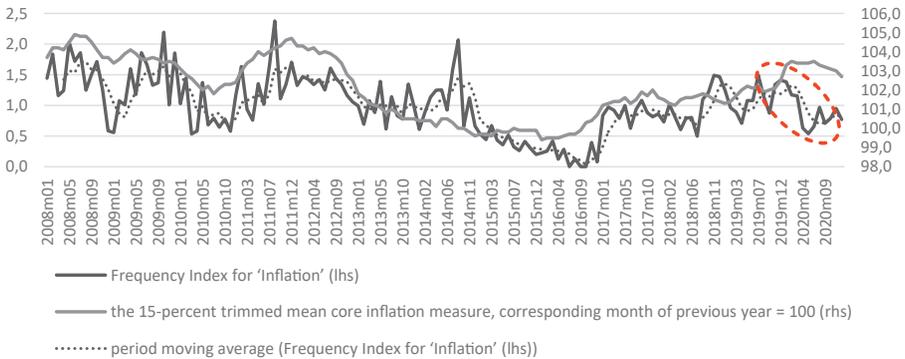
Note: [1] – one of four measures of core inflation published by NBP (2023)*, calculated with the use of statistical method, which allows to eliminate the groups of prices that have changed most significantly; [2] – *Frequency Index for 'Inflation'* = (*'inflation' word count*)/(*total words count*), $t \in$ [2008:2020]), normalised to the mean*.
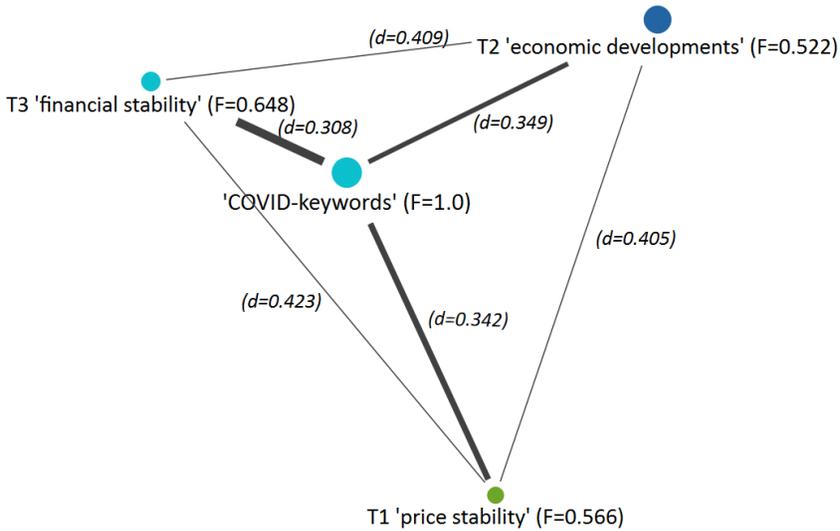
Figure 3. The monthly 15%-trimmed mean core inflation index (year-on-year)[1] versus Frequency Index for 'inflation', obtained for the NBP's MPC minutes[2], 2008–2020

Source: own work.

The declining importance of 'inflation' at MPC meetings is striking in all three crises covered in the chart (see Figure 3): the GFC, the sovereign debt crisis and the COVID-crisis—the central bank then expects that the anticipated economic slowdown caused by a demand shock would lead to a 'natural' fall in prices, inflation forecasts are therefore revised downwards and the importance of the 'inflation' topic drops significantly. The decline in importance, which appears to be a natural consequence for the central bank, has the effect of undermining the topic in its communication (MPC minutes). However, it is important to note that economic agents may perceive a crisis differently to central bankers. As discussed in Section 1.2, they may associate a crisis not with a fall in inflation but with a rise. Although the article cannot confirm whether these beliefs are also characteristic of economic agents in Poland, the results of the analysis indicate a disconnect between the increased attention paid by economic agents to inflation at the end of 2019 (see Figure 1), a few months before the pandemic outbreak, and the near absence of the topic of 'inflation' in NBP's communication after the massive monetary easing actions undertaken in response to the pandemic outbreak. This incon-

sistency may have led economic agents to misinterpret the monetary policy measures taken at that time.

The second type of coding involves coding at the sentence-level. This means that a whole sentence containing a dictionary keyword is coded. If a sentence contains a few words from the same dictionary, it is only coded once. This method allows for an analysis of thematic overlaps. Figure 4 shows a visualisation of the similarity of codes based on their overlap and frequency.

(d=0.409) T2 'economic developments' (F=0.522)

T3 'financial stability' (F=0.648)
(d=0.308)
(d=0.349)
'COVID-keywords' (F=1.0)
(d=0.405)
(d=0.423)
(d=0.342)
T1 'price stability' (F=0.566)

Note: *F* – frequency of a code, scaled to the most frequent code 'Tech dictionary for COVID communication' (shown on the map as 'COVID keywords'), *d* – distance between codes from a distance matrix, converted from a similarity matrix of codes: takes the range from 0 to 1, where 0 means that two codes always occur together (never without each other), 1 means that codes never occur together—the lower the meaning, the higher the similarity (the thicker the line on the map, the higher the similarity).

Figure 4. Map of codes for *COVID communication dataset* at the sentence-level clustered due to their similarity

Source: own work.

The distances between the codes and their frequencies obtained also suggest that communication during the COVID-crisis was thematically more similar to the texts from the NBP addressing the topic of financial stability. The topic of 'price stability' is less presented in COVID-communication. It also hardly concerns the 'inflation' topic (less than 10% by word count for T1 'price stability' dictionary code). The demand-shock nature of the COVID-crisis could imply that central bank policy is focused on economic recovery, and thus NBP's COVID-communication would rather address issues related to economic developments. The results of the content analysis do not confirm this. In the absence of an explicit link between crisis measures and policy objectives, the

dominance of 'financial stability' over other topics in COVID-communication could have been perceived by audiences as implying that financial stability concerns were behind the unprecedented easing of monetary policy. This could have led to a further misinterpretation of the effects of monetary policy measures at the time.

The further analysis of the tone of the FSRs published by the NBP suggests that its financial stability communication could support such perception. Figure 5 shows the dynamics of the specially constructed 'alarmist' proxies, which appear to be much higher during the COVID-crisis than they were during the previous crises, the GFC and the sovereign debt crisis.
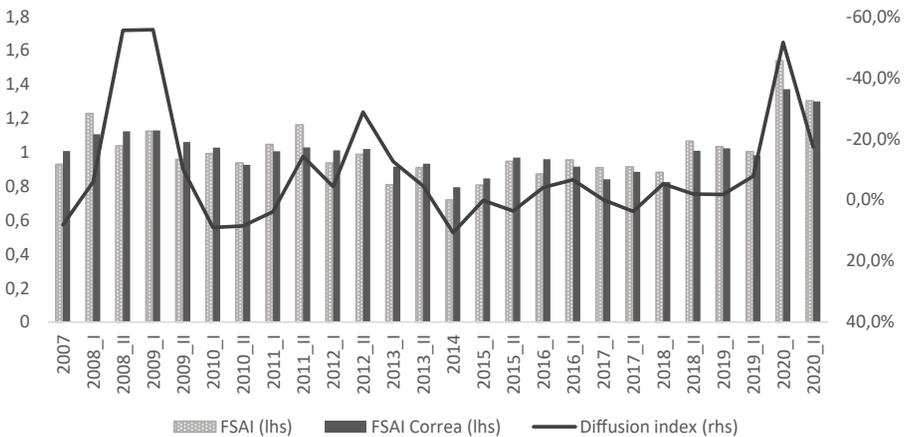
Notes: [1] – The diffusion index for the option "risk related to the expected general economic situation" indicated by respondents in the corporate loan segment (relatively high importance of this loan category compared to GDP) (NBP Senior Loan Officers Opinion Survey); [2] – FSAI and FSAI Correa constructions are discussed in Section 3; [3] – FSR is a biannual publication with pre-defined release schedules. In Poland, after 2016, it is regularly published in June and December. However, there were irregularities during the sample period. For instance, only one report was published in 2007 and 2014. In 2015, two publications were released in January and July. Similarly, in 2016, two publications were released in February and December. 'I' and 'II' on the chart represent the first and second releases respectively. The diffusion index was averaged to correspond with the period of publication.

Figure 5. Diffusion index for banks' responses indicating the risk related to the expected general economic situation with respect to corporate loans[1] compared to the FSR 'alarmist' indices[2], 2007–2020[3]

Source: own work.

The increase shown by the 'alarmist' proxies in 2020 is consistent with the findings of Yang et al. (2020), which confirm a deterioration in financial stability sentiment in 15 out of 17 countries' FSRs published in 2020, including Poland. The authors also note a disconnect between central banks' perception of the pandemic's impact, as measured by FSR sentiment, and tangible financial stability and real-time economic indicators.

Figure 5 compares the behaviour of the 'alarmist' indices obtained with the dynamics of the diffusion index, which can be considered as a proxy for the economic uncertainty perceived by the banking sector (negative values correspond to an increase in uncertainty), in line with Hołda (2019). The change in tone in the FSRs is moderately correlated with an increase in economic uncertainty perceived by the banking sector. The correlation coefficient is -0.57, which is statistically significant at the 0.02 level. The moderate relationship (with the exception of the COVID-crisis) between the tone change and uncertainty perception could be evidence of nonlinear relationships between the two if communication is used effectively as a tool in reducing uncertainty.

The diffusion index captures a similar peak in uncertainty during both the GFC and the COVID-crisis (see Figure 5). It is important to note, however, that the tone of the communication changes in different ways before and after these two crises. During the GFC, it could be seen a gradual increase in uncertainty perception from 2007 onwards, with a further deterioration in 2009, while the alarmist tone of the FSR increased slightly before the onset of the crisis and remained at around the same moderate level during the most stressful period. Communication during the COVID-crisis tended to be highly alarmist, which is inconsistent with the NBP's ability to use communication more effectively in countering a deterioration in financial conditions due to its direct role in the Financial Stability Committee (Londono et al., 2022, discussed in Section 1.1). There is also a striking discrepancy between the highly alarmist tone of the communication and a marked decline in perceived uncertainty in the banking sector in the second half of 2020. The crisis response package, which employed monetary and macroprudential easing measures, was probably effective in reducing uncertainty perception in the banking sector to pre-pandemic levels, as shown by the diffusion index. However, the NBP's communication tone, while slightly softened, remained highly alarmist. Central bank communication through the FSR aims to inform about risks to financial stability, and its highly alarmist tone is itself informative in this respect. Financial markets and economic agents may conclude that the deterioration in financial stability and the depth of the crisis are deeper than they actually are, which could further mislead them in the formation of expectations.

Conclusions

The article analyses NBP's communication one year after the announcement of the crisis response package adopted following the outbreak of the COVID pandemic. The analysis aims to answer the question of what message

about monetary policy objectives may have been conveyed in communication with regard to possible interpretations of the central bank actions by economic agents in Poland by economic agents. Three main inconsistencies are identified that could potentially affect the interpretation of monetary policy actions at that time.

Firstly, there is an inconsistency in the attention given to inflation. Although economic agents in Poland began paying more attention to inflation a few months before the outbreak of the pandemic, the NBP's communication on inflation markedly declined after the extensive monetary easing response to the pandemic. This was due to the expectation that the anticipated economic slowdown would lead to a 'natural' decline in prices. According to the recent literature, economic agents may perceive a crisis differently and associate it with a rise in inflation rather than a fall.

Secondly, there was inconsistency in the communication of policy priorities. The content analysis revealed that the NBP's communication during the COVID-crisis was primarily focused on the topic of 'financial stability', which was not in line with the demand-shock nature of the crisis and the degree of deterioration in financial conditions at the time. It could be argued that the eventual recipients may have inferred that concerns about financial stability were behind the unprecedented easing of monetary policy. This perception may have been reinforced by the highly alarmist tone of the NBP's financial stability communication.

Thirdly, the alarmist tone conveyed in the Financial Stability Reports released in 2020 was inconsistent with the direct role that NBP plays in macroprudential supervision and the extensive package of measures taken promptly in response to the crisis. The alarmist tone maintained in communication at the end of 2020 does not correspond with the decline in uncertainty perception by the banking sector to pre-pandemic levels at that time. The persistent alarmist tone in financial stability communication could have misled the public in their perception of the deterioration in financial conditions and thus the depth of the crisis, and also have affected the formation of expectations.

The results of the study may have implications for the design of central bank communications, especially those aimed at the general public. The results highlight the importance of economic agents' attention to inflation in designing communication. Furthermore, they confirm the significance of central banks providing transparent explanations of monetary policy, separate from financial stability communication. The latter should aim to enhance the credibility of monetary policy.

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