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Do words transform into actions? The consistency of central banks' communications and decisions

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Abstract

Research background: This study investigates central banks' (CB) intentions as reflected in their minutes and their relationship with policy decisions. Although CB communication is an inherent part of their inflation targeting (IT) strategy, their communication does not necessarily result in actions.
Purpose of the article: This study aims to extract policy intentions from central bank minutes and juxtapose these with actual policy decisions to investigate the consistency of their words and deeds in a comparative context. Additionally, we compare the applicability of three dictionaries in policy communication assessments.
Methods: Computational linguistics and textual methods are applied to create proxies for tone from a large dataset of texts. A transformation of words into time series involves the application of a general economic dictionary and two monetary policy-adjusted dictionaries. We examine the association between tone and actual CB decisions with the eta squared coefficient. The research covers 15 European CBs, divided into three subgroups according to the CB experience in inflation targeting. The sample starting points differ as they relate to each country's IT implementation year; the analysis ends in mid-2019.
Findings & value added: This paper's value added is firstly methodological, as we test three dictionaries to determine their usefulness. Statistical and qualitative analysis allows us to conclude about superiority of monetary policy specific lexicons for this kind of studies. The extra

value added is about the study's coverage: it covers a large sample and provides a broader illustration compared to most previous examinations. Our results suggest that a relationship exists between communications and actions, although the weakest for late joiners to IT. The latter group of CBs needs to strengthen communication practices. In experienced inflation targeters the short run dimension of credibility exists and opens the room for creating effective monetary policy in terms of managing the expectations of a general audience.

Introduction

This study investigates central bank (CB) communications as reflected in their minutes and their relationship with actual monetary policy decisions. Our sample covers 15 central banks at different stages of inflation targeting (IT) implementation. Consequently, we investigate the consistency of CBs' words and deeds in a comparative context.

We detect this 'words and deeds' relationship by applying computational linguistics and textual methods. The primary empirical challenge in this study involves the transformation of raw communication — words — into numerically expressed data. We address this by applying dictionary methods. Three dictionaries are used to confirm our results' robustness and compare their applicability in monetary policy analyses: Loughran and McDonald's (2011) standard economic and financial dictionary, and dictionaries designed by Bennani and Neuenkirch (2017) and by Apel and Blix Grimaldi (2012) to analyse minutes' dovishness and hawkishness. The automatic approach offered by computational linguistics avoids the subjectivity involved in narrative analyses. The final step of our procedure covers an examination of the associations between message tone and actual CB decisions for different horizons.

The results of previous studies suggest that (1) there is a relationship between releases and actions (Rosa & Verga, 2007; Baranowski *et al*., 2021), (2) minutes informativeness differs substantially (Jansen, 2011; Farka, 2011). We highlight the context and the results of previous studies in the Literature Review section. Despite the advances in communication literature, several issues remain unanswered. Most studies present results for the narrow sample of the world leading central banks. The lexicon applied is chosen arbitrary, according to the significance and robustness of the results. The novelty of this study is that most papers only examine world-leading central banks. Small open economies deserve research attention too, as mistakes in policy-making affect their outputs. Moreover, our study contributes by applying three dictionaries, which allows for a comparison in the context of monetary policy analyses.

Undoubtedly, this issue is significant, as communication is more often addressed directly towards the public. CBs' communication has recently

become an extraordinary, powerful tool in policymaking. It was especially appreciated after the 2008 global financial crisis, as policy operations at the zero lower bound required extra support. Extraordinary CB reactions have been enhanced under the pandemic. A vast majority of communication literature has been devoted to leading economies and their central banks, while ours is not; thus, our work augments existing literature.

The remainder of this paper is as follows: the next section briefly reviews the existing literature in the field, and the third section describes the study's data and methods. The fourth section presents our results and analyses. The fifth section discusses the results. Finally, the paper concludes with our findings.

Literature review

Inflation targeting implementation endorses greater transparency and communication in a CB's actions. Communication — which is the focus of this study — reflects not only information, but also its provision to the public (Blinder *et al.*, 2008, p. 5). Operationally, while communication is analysed, one or two communication modalities are prioritised. This is also reflected in this study's approach: we extract the tone of CBs' communication based on their minutes.

Rosa and Verga (2007) provided an early application of dictionary methods to follow monetary policy announcements. They prepared a glossary that translated the qualitative information of the European Central Bank press conferences on an ordered scale. The authors aimed at probing whether the European Central Bank is clear about its future monetary policy stance. They found the predictive power of these statements and market expectations reacted to unexpected components of information.

Jansen (2011) applied readability indices to investigate monetary policy reports from the Chairman of the US Federal Reserve Bank to Congress on the state of the US economy, monetary policy clarity, and the effects of such clarity on financial market indicators' volatility. A readability index — or specifically, a Flesch score (Flesch, 1948) — was used as a proxy for text difficulty, referring to the length of words and sentences as well as the number of syllables. The Flesch score was then modified as the Flesch-Kincaid grade level (Kincaid *et al.*, 1975), which could be interpreted in terms of years of education needed to grasp a message. Jansen (2011) confirmed clearer communications reduced financial markets' volatility for a majority of financial variables, especially those in the short- and medium-term. Farka (2011) investigated a similar research question, with that study

using less formalised tools to analyse communication, as the author simply classified whether the minutes' content was informative.

Hansen and McMahon (2016) presented the macroeconomic effects of communication as captured by computational linguistics; the authors applied dictionary methods and an LDA (latent dirichlet allocation) to extract implicit content from FOMC statements. They then verified the effect of announcements regarding current and future economic conditions on real and nominal variables by generating impulse responses from a FVAR model. They discovered that communications about the future stance of the economy to be more influential. Hubert and Labondance (2021) provided a similar application of computational linguistics, as they investigated the effects of optimistic and pessimistic communication on private agents' expectations. This study focused on the United States. The authors quantified the tone of communications, extracted its unpredictable component (sentiment), and applied econometric models to test sentiments' macro-effects on expectations. Baranowski *et al.* (2021) prepared similar work for the European Central Bank and its introductory statements by investigating and confirming the correlation between tone shocks and monetary policy decisions.

Previous studies demonstrate the applicability of dictionary methods and computational linguistics in examining the macro-effects of communication. Although these works primarily examined leading global CBs' communication, some exceptions reviewed smaller banks, such as Baranowski *et al.* (2021) recent study, which covered Poland. This method of analysing communication is versatile: it enables the examination of present communications, intentions, and sentiments (shocks). While this study applies analysis methods similar to those in modern studies, its goals in the examination are dissimilar. Given our diverse sample and less prominent central bank coverage, we do not aim to verify macro-effects, but rather the consistency of words and deeds.

Methods

Our sample covers 15 European central banks, divided into three subsamples according to the central bank's experience in IT implementation. Table 1 displays the economies covered, year of IT adoption, or the beginning of the research period for each CB, and country classification within the subsample. The sample ends prior to the pandemic (June 2019) to avoid disturbances in monetary policy communication arising from the pandemic period. The last column presents the number of minutes, or the number of

observations for each CB. This depends on the length of the sample and the frequency of the monetary policy committee's meetings. As we do not examine CBs jointly, we decided to keep the longest, conditional on the year of IT adoption, specific period for each of them.

Our procedure incorporates two primary steps:

- a tone assessment for the CBs, with the application of dictionary methods; and
- a statistical examination of the decisions' consistency with the tone.

We first assess the communication tone by using the minutes as provided on the CBs' websites. Textual methods allow for tone classification, ordering, and quantification. We used dictionaries to derive the tone of communications; the most applied lexicon is the updated version of the dictionary by Loughran and McDonald (2011), hereafter 'LM', which includes lists of negative and positive words curated as appropriate for economic texts. This lexicon is recognised and broadly applied in similar studies, including those presented in the literature review section, among others (Baranowski *et al*., 2021; Hansen & McMahon, 2016; Hansen *et al*., 2018; Loughran & Mcdonald, 2014).

Given the scope of this study and monetary policy messages, we have decided to apply two dictionaries designed to analyse CB communication: that by Apel and Blix Grimaldi (2012), hereafter 'ABG'; and Bennani and Neuenkirch (2017), hereafter 'BN'. Both distinguish sets of words that reflect an economic situation that could lead to the easing (negative or 'dovish' phrases) or tightening (positive or 'hawkish' phrases) of monetary policy. The difference is that BN presents a list of single keywords, while the ABG's combined list of nouns and verbs can detect more hawkish or dovish approaches.

We use an English version of minutes. We realise that for most CBs we might miss the nuances of communication in the national language. However, this approach is the only one possible due to the availability of dictionaries. We comment on this issue in the Discussion section referring to some other studies.

We calculate the tone using the following Equation 1:

$$tone_{i,n} = \frac{pw_{i,n} - nw_{i,n}}{tw_{i,n}} \tag{1}$$

where $tone_{i,n}$ represents the tone of minutes i for a central bank n; $pw_{i,n}$ denotes the number of hawkish expressions, indicating strong economic conditions; $nw_{i,n}$ is the number of dovish expressions, indicating weak economic conditions; and $tw_{i,n}$ is the total number of words. All word counts are performed after pre-processing the minutes, or specifically, a tokenisation

process to remove punctuation and stop words, and a lemmatisation or stemming process. This automated search and word-counting procedure is performed in language studies using 'tidytext' packages (Silge & Robinson, 2016). The process returns a continuous variable $tone_{i,n}$ for each minute, the value of which varies from -1 (all words are dovish) to 1 (all words are hawkish).

We verify the consistency between words and actions through a variable that represents the CB's actions ($dec_{i,n}$). This is again derived from minutes. As this study's data spans more than 10 years of nonconventional policy measures, we categorised monetary policy decisions as follows:

- A value of 1 was assigned for monetary policy tightening (an increase in interest rates, decrease in a quantitative easing programme, forward guidance about decreased CB's support for the economy);
- A value of 0 was assigned for no change in any policy settings;
- A value of -1 was assigned for any action that involves monetary policy easing (decreasing interest rates, the introduction or expansion of a quantitative easing program, or forward guidance that signals the CB's support for the economy).

We decided to categorise the decision rather than use such alternatives as a shadow interest rate because the benchmarks for a shadow interest rate are unavailable for developing economies in our sample, or are quite poor representatives of the market situation.

The second step of our procedure is a statistical analysis. With a Kruskal-Wallis test we checked if our series ($tone_{i,n}$) originated from the same distributions in subsamples of the three monetary policy decisions ($dec_{i,n}$). The null hypothesis assumes that the samples are from identical populations, and thus no relationship exists between the decision and minutes' tone. After finding it justified to search for associations between series, we calculated the eta-squared coefficient (η^2). This can be interpreted as a proportion that reflects the extent to which variability in the tone variable is associated with the variation in the decision levels. This is also expressed as the ratio of the between-group sum of squares (σ^2_{group}) to the total sum of squares (σ^2_{total}) in the analysis of variance (ANOVA), as displayed in the following Equation 2:

$$\eta^2 = \frac{\sigma^2_{group}}{\sigma^2_{total}} \tag{2}$$

We find η^2 as a compelling alternative for capturing the correlation. In our case, this is not a trivial task, as one series is expressed as a categorical variable and the other is on a continuous scale. The coefficient η^2 is

a common measure of the effect size applicable to this situation (Adams & Conway, 2014). Among the two variables, it is only interpreted as the strength of association.

Cohen and Cohen (1983) estimated the magnitude of an effect size for the social sciences: threshold values for these effects are interpreted as small (0.01), medium (0.06), and large (0.14). In this examination, we anticipate low values of η^2. Further, our $dec_{i,n}$ variable is subject to a number of changes during the research period compared to the *no-change* decision. This situation occurred for all CBs, and is quite specific for monetary policy settings; the *no change* decision is typically the most frequent. We also hypothesize that the associations between words and actions are stronger for economies that have a longer experience in IT implementation.

Results

Our results demonstrate that the three dictionaries return slightly different tone assessments. For visualization, we present the tone for only three economies, with one representative of each group of countries: the UK for the EIT group, GE for MIT, and KZ for LIT (Figure 1, 2, 3 respectively). The descriptive statistics for $tone_{i,n}$ are presented in the Table 2. A clear difference exists between the LM lexicon and the others. The LM captures the most dovish tone or worst economic stance, as both the mean and median are negative. The BN's average assessment of tone is more balanced; the median is still negative, and the average values of $tone_{i,n}$ are approximately zero. While the ABG results reveal that the average tone of minutes was quite neutral, this was due to how the dictionary classifies phrases as negative or positive. In contrast, the BN lexicon uses single keywords that capture more hawkish or dovish situations. The ABG proposes a combination of nouns and adjectives that jointly indicate room for accommodation or contraction. One adjective could be positive when combined with a noun, and negative when presented jointly with the other. For example, 'high inflation' would be hawkish, while 'high unemployment' would be dovish. Such an approach requires pairs of words to classify the phrases; the algorithm detects fewer phrases than individual keywords. The ABG tone values were also lower. Except for the most neutral tone, the ABG dictionary returns the lowest variability of the tone as compared to the standard deviations in the series.

Table 3 provides the full sample correlation among dictionaries. While a stronger correlation between monetary policy-specific dictionaries seems

obvious, most of the sample economies demonstrate statistically significant correlations between dictionaries.

The results of the statistical examination of $tone_{i,n}$ and monetary policy $dec_{i,n}$ (Table 4) suggest the existence of an expected association, and capture statistically significant associations for a majority of countries regardless of the dictionary applied for the tone assessment.

The associations for different lexicons are visualised in the boxplots. We present three panels for three dictionaries respectively (Figure 4 — for ABG, Figure 5 for BN, and Figure 6 for LM). Each boxplot in the panel presents associations for three policy decisions. We attribute the differences between associations depending on the ABG and BN choices to the procedure of qualifying expressions as monetary policy-relevant, and then positive or negative. We have already explained the lower values and volatility of the $tone_{i,n}$ variables quantified with the ABG dictionary. While a significant variation in tone exists in the LM lexicon, the tone in this instance represents more general issues in the case of ABG and BN.

The differences across the EIT, MIT and LIT groups do not fully parallel our expectations. Experienced inflation targeters register stronger associations between the variables in question regardless of the dictionary applied. Nonetheless, we identify a comparable strength of associations among moderately experienced inflation targeters because the MIT CBs had enough time to learn how to communicate consistently. Moreover, the CBs could mimic the practices applied by other CBs to smooth their communications. A qualitative examination of the minutes reveals the copying of best practices, while a certain degree of individualised communication is maintained. The variability in tone is explained by the variability of decisions, or specifically, medium to large for both groups of economies. The LM's application results in the absence of an association between HU and NO (the EIT group) and RO and RS Serbia (the MIT group).

The weakest associations captured for new IT joiners could be explained by central banks' low experience in creating monetary policy communications that reflect actions. However, this could be a consequence of a more inconsistent monetary policy as a whole or a transition period to inflation targeting, which always occurs in a learning phase for policymakers. Moreover, this result could be explained by the length of time series we could collect for this group of economies.

If policy communication is linked to CB actions, it is worth to consider it as the first step to CB credibility. Credibility is commonly understood as the alignment of words and actions in terms of the ability to achieved announced goals. The room to create consistency starts much below the main goal achievement.

Regarding the choice of dictionaries for further research, we conclude that all of them apply to similar studies. However, we recommend monetary policy-tailored lexicons for monetary policy studies. Moreover, the ABG is more suitable for narrow-sampled, qualitative examinations of minutes. We appreciate the idea of combining nouns and adjectives for a monetary policy analysis, in that increasing a variable does not necessarily mean a positive or hawkish meaning.

Discussion

We could not compare our results directly to other studies, as the sample we cover is unique. However, the message of this paper has confirmed previous works as by Rosa and Verga (2007) and Baranowski *et al.* (2021), which suggest a relationship between CBs tone and actions.

We discuss the results of this study against existing papers referring to the study's caveats and our choices. First, this examination did not capture effects, but only associations. This is how we avoid the discussion on what goes first: the decision or its rationale. The former perspective was presented by Bennani *et al.* (2020), who concluded that communications contain useful additional information about policy decisions. The latter option was applied by Neuenkirch (2013) — he took the tone of statements as given by the ECB while taking the interest rate decision.

Second, even if the application of computational linguistics and dictionary methods is less arbitrary than the qualitative tone assessment, authors made decisions about the dictionaries. The comprehensive comparison of existing dictionaries and their application for monetary policy purposes is missing in the literature. Our study provides the first statistical comparison of dictionaries' outcomes. Studies applying this method condition the choice of the dictionary on the significance and robustness of the results. Quite often, results for multiple dictionaries, as presented by Baranowski *et al.* (2021), or different tone indicators, as presented by Sturm and De Haan (2011), are elaborated. Different dictionaries do not return the same. Nonetheless, the conclusions are similar. The alignment of results for different lexicons applies also in this study.

Eventually, we realise that the results are provided for the English versions of minutes, while the central banks in 13 of the 15 studied economies provide their primary communication in their respective national languages. Thus, we cannot discern the effects of translations on the minutes' content. Nonetheless, there are other studies that face the same challenge. They provide meaningful results for CBs that do not use English as a primary

language for communication as by Montes *et al.* (2016) for Brasil and Baranowski *et al.* (2021) for Poland. As only few countries are English-speaking, we might expect the expansion of studies that used English translations of documents. Such an approach is a standard one if transparency is discussed (see Dincer *et al.,* 2022, for the most recent example).

The other reason that supports our confidence towards results for non-English speaking countries is presented by Apel and Blix Grimaldi (2014). These authors elaborated the dictionary for Sveriges Riksbank minutes and then translated it into English. Thus, language consistency is ensured.

Conclusions

This study quantified minute tones using dictionary methods and juxtaposed them with CB decisions. The sample coverage was more extensive than what has been previously presented in literature, with a discussion of 15 economies at various stages of IT implementation. First, we conclude that differences in lexicons transform into different but not contradictory results. Second, statistically significant associations between variables exist for the EIT and MIT economies. LIT CBs need to strengthen the consistency of monetary communication.

This study's limitations are mostly linked to some arbitrary choices we need to make when designing our examination. They are about the lexicon used or the tone variable definition. We also realise that the English version of minutes does not capture nuances of national languages. Finally, we are aware that our methods allow for concluding on dependencies, not causality. As other authors face similar challenges, we presented our choices referring to previous research in the Discussion section.

Further research paths could involve the consistency of words and deeds, which specifically involve an econometric analysis of the associations. Our future research will consider this and exclude late IT joiners. It is worth noting that distracted results for late adopters can be an effect of a small sample size. Moreover, the language of monetary policy communication has changed since the pandemic arrival. Therefore, the existing lexicons need to be slightly modified to tackle the post-pandemic language.

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Annex

Table 1. Sample

Country	ISO code	IT adoption	No. of minutes
Experienced inflation targeters (EIT)			
Czechia	CZ	1998	207
Hungary	HU	2001	191
Iceland	IS	2001	86*
Norway	NO	2001	143
Poland	PL	1999	210
Sweden	SE	1995	145
UK	UK	1993	252
Moderately experienced inflation targeters (MIT)			
Albania	AL	2008	106
Georgia	GE	2009	99
Romania	RO	2005	133
Serbia	RS	2009	90
Turkey	TR	2007	151
Late IT joiners (LIT)			
Kazakhstan	KZ	2015	27
Moldova	MD	2013	69
Russia	RU	2015	47

Note: * The Central Bank of Iceland's website only presents minutes dated back to 2009.

Table 2. Descriptive statistics of the $tone_{i,n}$ variable for the three dictionaries

	ABG				
	Min.	**Median**	**Mean**	**S.D.**	**Max.**
			EIT		
CZ	-0.05	-0.01	-0.01	0.02	0.06
HU	-0.08	-0.01	-0.01	0.02	0.06
IS	-0.01	0.00	0.00	0.01	0.02
NO	-0.07	0.00	0.00	0.02	0.06
PL	-0.10	0.00	0.00	0.03	0.07
SE	-0.02	0.00	0.00	0.01	0.03
UK	-0.03	0.00	0.00	0.01	0.02
			MIT		
AL.	-0.05	-0.01	-0.01	0.02	0.03
GE	-0.07	0.00	-0.01	0.02	0.06
RO	-0.03	0.00	0.00	0.01	0.02
RS	-0.10	-0.01	-0.01	0.03	0.07

Table 2. Continued

			ABG		
	Min.	**Median**	**Mean**	**S.D.**	**Max.**
TR	-0.04	0.00	0.00	0.01	0.04
			LIT		
KZ	-0.05	0.00	0.00	0.01	0.04
MD	-0.01	0.00	0.00	0.01	0.02
RU	-0.05	-0.02	-0.02	0.02	0.02
			NB		
	Min.	**Median**	**Mean**	**S.D.**	**Max.**
			EIT		
CZ	-0.04	-0.32	0.01	0.02	0.08
HU	-0.07	-0.27	0.02	0.02	0.08
IS	-0.02	-0.28	0.01	0.01	0.04
NO	-0.10	-0.17	0.01	0.04	0.12
PL	-0.08	-0.19	0.01	0.03	0.10
SE	-0.05	-0.31	0.02	0.02	0.07
UK	-0.04	-0.30	0.01	0.02	0.05
			MIT		
AL.	-0.04	-0.18	0.01	0.02	0.05
GE	-0.09	-0.20	0.00	0.04	0.07
RO	-0.02	-0.26	0.01	0.01	0.03
RS	-0.05	-0.18	0.01	0.02	0.06
TR	-0.04	-0.22	0.02	0.02	0.09
			LIT		
KZ	-0.02	0.00	0.00	0.01	0.07
MD	-0.03	-0.13	0.01	0.01	0.04
RU	-0.03	-0.40	0.00	0.02	0.05
			LM		
	Min.	**Median**	**Mean**	**S.D.**	**Max.**
			EIT		
CZ	-0.67	-0.32	-0.30	0.15	0.18
HU	-1.00	-0.27	-0.24	0.25	1.00
IS	-0.53	-0.28	-0.29	0.11	0.00
NO	-1.00	-0.17	-0.23	0.30	1.00
PL	-0.82	-0.19	-0.19	0.26	0.75
SE	-1.00	-0.31	-0.29	0.16	0.15
UK	-0.59	-0.30	-0.30	0.11	-0.09
			MIT		
AL.	-0.78	-0.18	-0.14	0.22	0.39
GE	-1.00	-0.20	-0.20	0.39	0.67
RO	-1.00	-0.26	-0.31	0.36	1.00
RS	-0.88	-0.18	-0.18	0.23	0.29
TR	-0.57	-0.22	-0.20	0.13	0.21
			LIT		
KZ	-0.58	0.00	-0.01	0.10	0.75
MD	-0.39	-0.13	-0.14	0.12	0.11
RU	-0.74	-0.40	-0.36	0.17	0.33

Table 3. Correlations between the tone derived from different dictionaries

	cor_ABG_BN	p_ABG_BN	cor_ABG_LM	p_ABG_LM	cor_BN_LM	p_BN_LM
			EIT			
CZ	0.55	0.00	0.14	0.04	0.49	0.00
HU	0.44	0.00	0.27	0.00	0.26	0.00
IS	0.46	0.00	0.42	0.00	0.61	0.00
NO	0.39	0.00	0.19	0.02	0.44	0.00
PL	0.74	0.00	0.56	0.00	0.63	0.00
SE	0.75	0.00	0.43	0.00	0.54	0.00
UK	0.70	0.00	0.53	0.00	0.72	0.00
			MIT			
AL	0.75	0.00	0.61	0.00	0.76	0.00
GE	0.70	0.00	0.26	0.01	0.53	0.00
RO	0.46	0.00	-0.11	0.21	0.38	0.00
RS	0.61	0.00	0.09	0.37	0.29	0.01
TR	0.68	0.00	0.36	0.00	0.67	0.00
			LIT			
KZ	0.41	0.00	0.41	0.00	0.08	0.30
MD	0.24	0.04	0.16	0.17	0.58	0.00
RU	0.73	0.00	0.45	0.00	0.67	0.00

Table 4. Association analysis

	ABG			BN			LM		
	KW	η2	ANO	KW	η2	ANO	KW	η2	ANO
					EIT				
CZ	0.00	0.10	0.00[2]	0.00	0.25	0.00[12]	0.02	0.04	0.02
HU	0.00	0.07	0.00[12]	0.00	0.20	0.00	0.08	0.02	0.15
IS	0.01	0.10	0.01[2]	0.00	0.21	0.00[2]	0.05	0.07	0.04
NO	0.00	0.13	0.00	0.00	0.30	0.00	0.95	0.01	0.66
PL	0.00	0.15	0.00[2]	0.00	0.21	0.00[2]	0.10	0.03	0.06
SE	0.00	0.15	0.00[2]	0.00	0.19	0.00[12]	0.00	0.06	0.01[2]
UK	0.00	0.07	0.00[2]	0.00	0.24	0.00[2]	0.00	0.21	0.00
					MIT				
AL	0.00	0.15	0.00[2]	0.00	0.11	0.00	0.09	0.06	0.05
GE	0.00	0.29	0.00[2]	0.00	0.30	0.00	0.00	0.18	0.00
RO	0.00	0.11	0.00[2]	0.00	0.21	0.00[2]	0.67	0.01	0.69[2]
RS	0.00	0.25	0.00	0.00	0.21	0.00	0.43	0.02	0.38
TR	0.00	0.08	0.00	0.05	0.08	0.00[1]	0.00	0.12	0.00
					LIT				
KZ	0.01	0.01	0.36[12]	0.00	0.30	0.00[12]	0.00	0.11	0.00[12]
MD	0.72	0.01	0.65	0.00	0.41	0.00	0.00	0.14	0.01
RU	0.27	0.08	0.17	0.48	0.07	0.21	0.23	0.08	0.17[2]

Notes: 'KW' denotes the Kruskal-Wallis test's *p*-value; 'ANO' denotes the ANOVA *p*-value. Gray cells denote that there is no statistically significant association. [1]denotes that for this data series the assumption of homogeneous variance is not fulfilled [2] denote that for this data series the assumption of normal distribution is not fulfilled.

Figure 1. Tone assessment according to three dictionaries—the UK

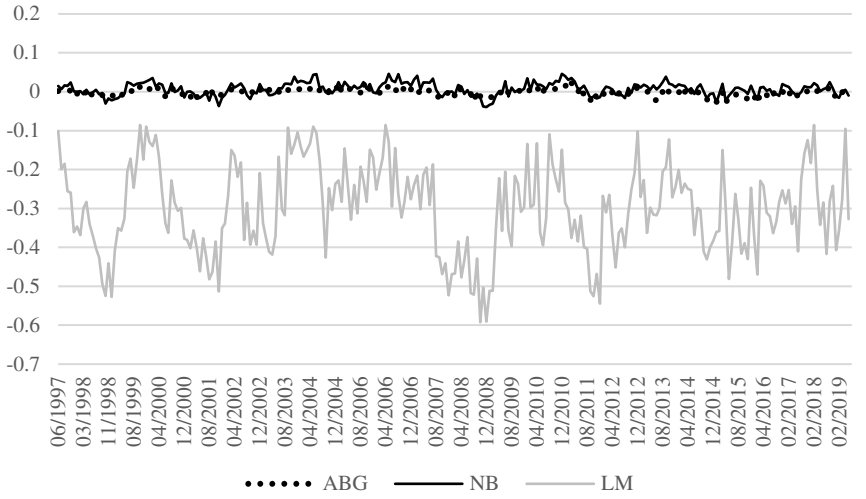

Figure 2. Tone assessment according to three dictionaries—Georgia

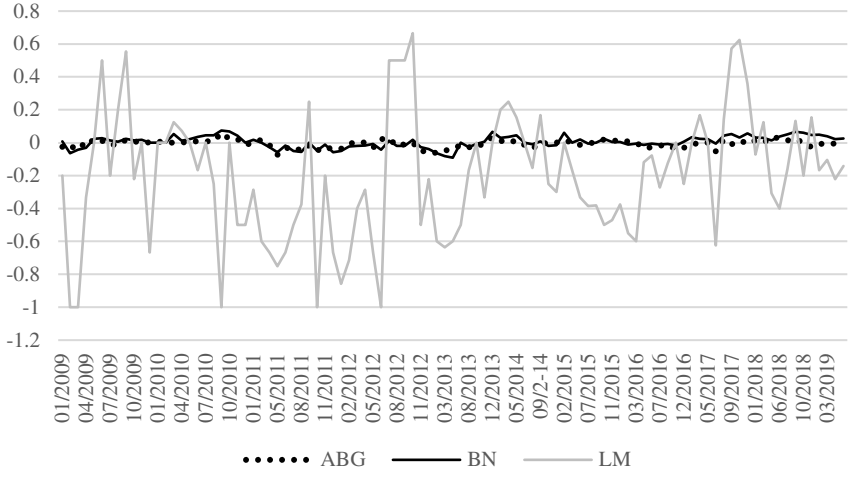

Figure 3. Tone assessment according to three dictionaries—Kazakhstan

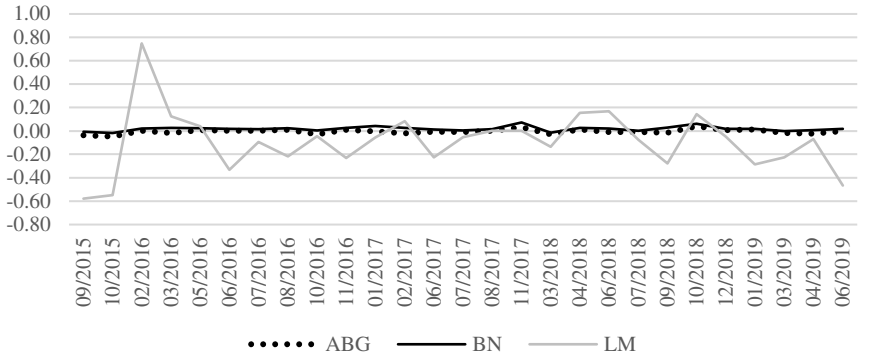

Figure 4. Visualisation of associations for ABG dictionary and different monetary policy actions

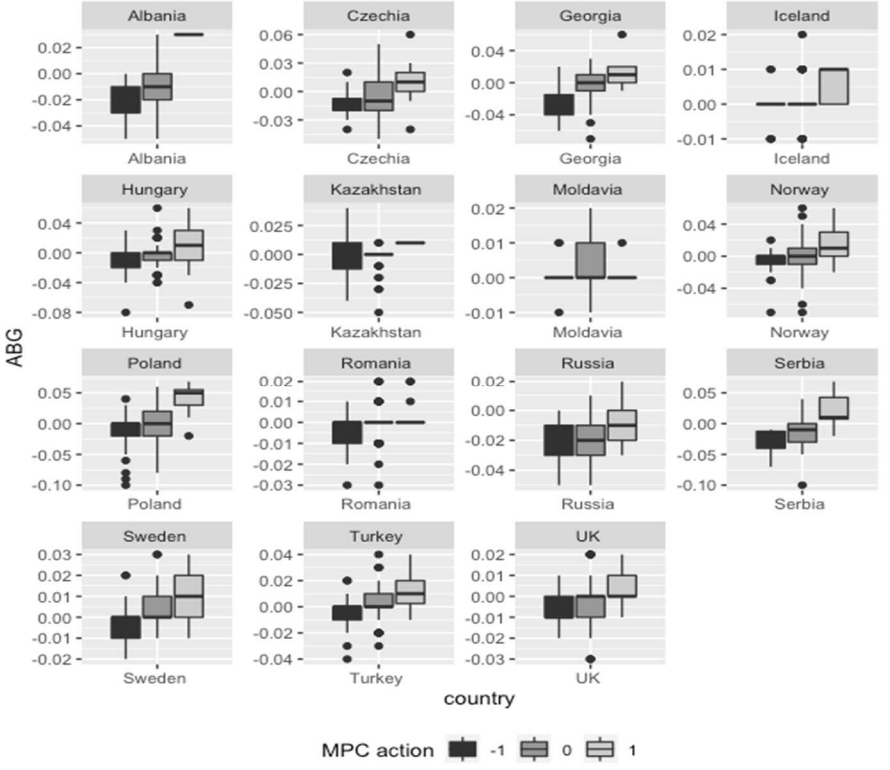

Figure 5. Visualisation of associations for BN dictionary and different monetary policy actions

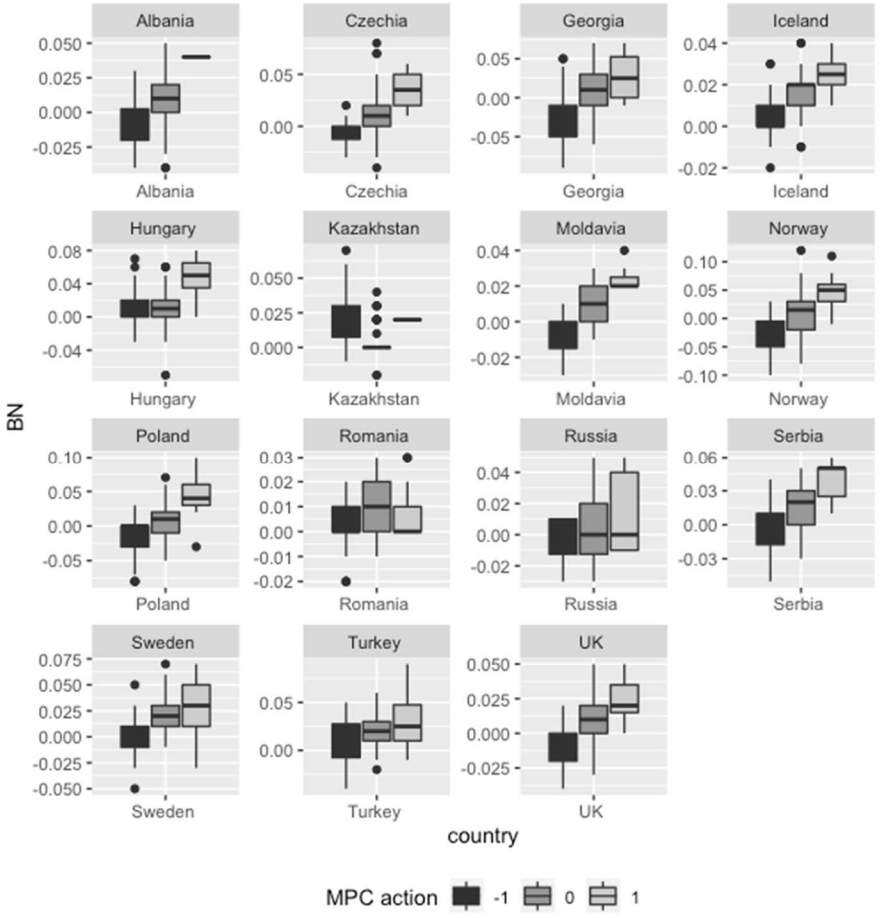

Figure 6. Visualisation of associations for LM dictionary and different monetary policy actions