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It's not only WHAT is said, it's also WHO the speaker is. Evaluating the effectiveness of central bank communication

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Contents

List of tables and figures

Abstract

On the basis of a unique database of policy makers' comments, we find that central bank communication does influence behavior of financial markets. This effect is asymmetric and depends on the contents and direction of the statements. Moreover, we investigate whether individual characteristics of MPC members may influence their ability to affect the asset prices. We find that market participants are most vigilant to the comments made by policy makers who are relatively reticent, usually win voting and match their words with deeds. Moreover, the impact of statements on financial market behavior depends on whether a speaker represents a hawkish, dovish or neutral faction within the committee. Finally, we provide evidence that central bank communication affects the predictability of monetary policy decisions.

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Introduction

Since the beginning of the 1990s central banking practice has shifted from secrecy towards more transparency about monetary policy strategy and objectives.[1] The survey conducted by Fry et al. (2000) indicated that in 1998 three out of four central banks considered transparency as a vital or very important component of their monetary policy framework. Recent studies confirm that this trend continues. Indeed, as evidenced in Dincer and Eichengreen (2007), over the 1998–2005 period in 89 out of 100 analyzed central banks the value of the transparency index increased and in no country the transparency was reduced (!).

One factor behind the movement towards more transparency is related to the accountability requirement. In particular, without explaining to the public the rationale of their decisions independent central banks would suffer from a 'democratic deficit' (see, e.g., Blinder et al. 2001).

The case for transparency is also, and even more importantly, based on policy effectiveness. It is directly linked with an increased awareness of the critical role of private sector expectations in the monetary policy conduct. Indeed, the short-term interest rate, which constitutes the main instrument of monetary policy in most industrialized economies, matters very little for the future inflation outlook and for prospective economic activity (Svensson, 2005). Central bank power may thus seem to be limited. Efficiency of monetary policy, however, may greatly be improved through its impact on private sector expectations. Expectations about the entire future path of interest rate shape the yield curve and thus determine longer-term rates, which, in turn, largely affect private sector consumption and investment decisions. In this respect, monetary policy is an art of managing private sector expectations.

An attempt to influence private sector expectations simply by revealing more information may not suffice, however, for people face both quantitative and complexity limits to process information effectively (Kahnemann 2003). In other words, too much information may kill information (Fracasso et al. 2003). It is clarity and common understanding, and thus better transparency rather than more transparency that conditions the central bank's power to manage private sector expectations. Achieving that, in turn, depends on the policy makers' ability to communicate their intentions in an intelligible manner. Therefore, the effectiveness of monetary policy should benefit from transparency the most, when it is accompanied by good communication policy (Issing, 2005; Winkler, 2000). In this sense, good communication is an indispensable element of transparency.

The role of communication has been reinforced by the fact that central bank independence has often gone in tandem with delegating the monetary policy decision from a single person to a committee of individuals. Indeed, moving to a committee decision-making body would be pointless in a central bank that simply takes orders from the government. However, in a central bank that conducts monetary policy independently, the benefits of the committee-based decision making process, discussed e.g. in Blinder (2007), could finally be materialized. Notwithstanding the advantages that this process has entailed, explaining the interest rate decision made by a group of individuals may not be that straightforward as in the case of a single person.

[1] The role of transparency in monetary policy has been examined, *inter alia*, by Canzoneri (1985), Faust and Svensson (2001), Eijffinger et al. (2000), Jensen (2002). A comprehensive overview of theoretical studies on central bank transparency is presented by: Geraats (2002), Hahn (2002), Carpenter (2004), Dincer and Eichengreen (2007).

Depending on the structure of a committee,[2] different communication strategies should be adopted. It may be particularly challenging in an *individualistic committee*, where each policy-maker votes individually and decisions are made by majority vote. In these circumstances, distinct views uttered by different mouths may help the markets to learn about the group dynamics, that is what majority is to prevail over the next meetings, and thus which decisions are to be made (Rozkrut et al. 2007). Such heterogeneous communication, however, is subject to the risk of speaking with too many voices, which would result in cacophony rather than clarity (Blinder 2007). The question that then arises is whether more "talkative" policy makers help to dispel doubts or rather add to confusion as regards prospective interest rate decisions?

The answers to the above, as well as to other queries on the effectiveness of central bank communication require empirical testing. The results obtained may play a critical role in the assessment of whether the recent movement towards greater transparency and central bank communication will prove durable.

In this study, we investigate the effectiveness of the communication of the National Bank of Poland (NBP). Motivation for the choice of this central bank is at least twofold. First, the NBP has for many years conducted monetary policy under inflation targeting, which is a framework that emphasizes the critical role of the communication channel in the monetary transmission mechanism. Second, very few attempts have been made to assess the effectiveness of central bank communication in emerging market economies. Focusing on Poland helps to fill this gap.

For the purpose of this paper a unique database of policy makers' verbal comments has been built, which required the examination of nearly 40,000 newswire reports. It is analyzed whether central bank "talk" provides relevant information for economic agents, and – consequently – whether it influences their behavior. Benefiting from the contribution of Bernanke et al. (2004) we have not confined ourselves to a general conclusion whether statements of the policy makers do influence the market-based indicators. It is also examined whether central bank "talk" affects expectations of future decisions in the desired direction and whether and when this impact varies with the horizon of the potential interest rate movements. Moreover, the potential asymmetric impact of communication is investigated by splitting statements into separate categories depending on the direction of the comments made. It allows us to check whether the asymmetric effects of central bank communication found for some countries are also present in Poland.

Whereas the above-outlined approach is not entirely new in the empirical literature, this study – to our knowledge – pioneers an in-depth empirical research on the effectiveness of central bank communication in other areas. First of all, it distinguishes as many as four different categories of verbal statements depending on whether their contents have been deemed relevant for the monetary policy inclination, the economic outlook, exchange rate behavior, or fiscal policy assessment. Moreover, the impact of central bank communiqués is analyzed separately. The rationale behind such an approach is that one might expect that the impact of central bank "talk" on financial markets should vary with the form and contents of its communication.

Next, since the interpretation of policy-makers' comments is not always straightforward, distinct categories of ambiguous vs. clear-cut statements (communiqués) have been distinguished. Such classification helps to find out whether market participants are sensitive to a particular kind of statements and react to them even if their meaning is not unambiguous.

Furthermore, the effectiveness of central bank "talk" is analyzed not only in terms of *what* is communicated, but also *who* communicates with the public. Since the Polish MPC

[2] Blinder (2007) distinguishes different categories of committees, including *genuinely collegial*, *autocratically-collegial*, and *individualistic committees*.

is an example of an individualistic committee comprising heterogeneous policy makers, it could be expected that communication effectiveness may vary with individual MPC members. One way to investigate this issue is based on distinguishing between hawkish, neutral and dovish speakers. The other approach separates statements made by MPC members who win majority of voting from those made by policy-makers who are usually outvoted.

Moreover, for each individual decision-maker a *consistency ratio* is built, which serves to answer the question of whether it pays to match words with deeds, or whether a *consistent* MPC member is more influential than a *non-consistent* one. Yet another classification aims at investigating if the impact of an individual MPC member's "talk" varies with the frequency of his or her statements.

Finally, the paper investigates to what extent the predictability of monetary policy decisions has been influenced by central bank communication. This relationship is of critical importance, for it is through increased predictability that central bank "talk" is argued to make monetary policy more effective in achieving its objectives (Winkler 2000; Blinder et al. 2001). To this end, we apply the method similar to that of Rozkrut et al. (2007) and Ehrmann and Fratzscher (2005) that allows examining whether frequency and dispersion of central bank statements affects the unexpected component of a monetary policy decision.

The results are as follows. First, we find that central bank "talk" influences market expectations of future policy decisions and it does so in the desired direction. The strength and significance of this effect vary with the horizon of potential interest rate movements and largely depend on the adopted form of communication.

Second, the analysis indicate that if market participants react to ambiguous central bank signals, it is only in the case of communication conveying information on monetary policy inclination, whereas other statements are effective only when made in a clear-cut manner.

Third, we provide the empirical evidence that central bank communication influences financial asset prices in an asymmetric manner. In particular, market participants react more to tightening than easing MPC statements.

Fourth, we find that the impact of policy-makers' comments on asset prices depends on whether they represent a hawkish, dovish or neutral faction within the MPC.

Fifth, the results obtained show that market participants pay much more attention to the comments made by policy makers who usually win voting than to the statements made by the often outvoted MPC members.

Sixth, the study indicates that decision makers who vote in line with their previous statements influence asset prices more than those who do not match their words with deeds.

Seventh, we provide the evidence that the more "talkative" the MPC speakers are, the less powerful are their statements.

Finally, we find that not only central bank communication affects financial asset prices, but it also influences the predictability of monetary policy decisions. This predictability increases with more frequent statements and with comments approaching unanimity.

The paper is organized as follows. Section 1 reviews the empirical literature on central bank communication. In Section 2 the methodology of measuring communication is discussed. Section 3 then presents some basic statistics on the NBP communication. The next two sections provide the empirical analysis of the effectiveness of central bank communication in Poland. Section 4 includes the assessment of the impact of policy-makers' statements on financial asset prices and Section 5 – on the predictability of central bank decisions. The final section concludes.

1

Empirical literature on the effectiveness of central bank communication

There is a vast literature that extols the virtues of a good central bank communication. Its seminal role for the effectiveness of monetary policy has been stressed, *inter alia*, by Bernanke (2004), Blinder (1998), Buiter (1999), Issing (2005), King (1997), and Woodford (2005).

Contrary to these authors, another strand of literature points to the double-edged nature of public information. An important work of Morris and Shin (2002), and Amato, Morris and Shin (2003) indicated that central bank communication may be welfare reducing. The reason is that central bank "talk" is not only a source of information, but also a focal point that coordinates expectations of market participants. Central bank communication may, therefore, suppress the private information of individual agents and thus crowd out an important source of information. In such circumstances the disclosure of public information that is imprecise and noisy may coordinate actions away from fundamentals and reduce welfare. Welfare-reducing effects of central bank communication are also discussed in Gosselin, Lotz and Wyplosz (2006) and Cornand and Heinemann (2006). Moreover, different situations when release of information is not desirable are analyzed in Mishkin (2004) and Cukierman (2007).

Findings of Amato, Morris, and Shin, however, have been put into question by Woodford (2005) and Svensson (2006). In particular, the latter indicates that the results of Amato et al. (2003) have been misinterpreted as antitransparency, whereas – he argues – they are actually pro transparency. Svensson stresses that except in very special circumstances, which are highly unlikely in the real world, more public information is always good. This debate has not yet been resolved, however, as evidenced, *inter alia*, by the response of Morris, Shin and Tong (2006) to Svensson's arguments.

The answers to the above, as well as to other queries on the effectiveness of central bank communication require empirical testing. However, despite the recent proliferation of literature on transparency and communication, including the way these concepts are measured and their role in monetary policy effectiveness, the topic is far from being exhausted in the field of empirical research.

Moreover, studies that do investigate the reaction of financial markets to central bank communication focus predominantly on developed economies. Kohn and Sack (2004) analyze the effectiveness of statements released by the FOMC and congressional testimony by Chairman Greenspan. Ehrmann and Fratzscher (2007a) compare the effects of communication between the Federal Reserve, the Bank of England and the ECB (henceforth *G3 central banks*). Gürkaynak et al. (2005) investigate the effects of U.S. monetary policy on asset prices, including FOMC statements. Andersson et al. (2006) analyze the impact of the Swedish Riksbank communication on the yield curve. Conolly and Kohler (2004) apply the framework similar to that suggested by Kohn and Sack to a panel of six economies: Australia, Canada, the euro area, New Zealand, the United Kingdom and the United States. Reeves and Sawicki (2007) investigate the reaction of asset prices to Bank of England communication. A recent study by Ehrmann and Fratzscher (2007b) makes an interesting attempt to test empirically the Morris-Shin hypotheses, yet it is done again for the Federal Reserve only. Moreover, research focusing on explanation of central bank decisions via its

communication instruments include: Gerlach (2007), Heinemann and Ulrich (2005) and Rosa and Verga (2007), all for the ECB.

Contrary to the research done for developed economies, very few attempts have been made to assess central bank transparency in emerging markets. Those include the studies of Matousek (2001), Jarmużek et al. (2004), Czogała and Kot (2007), and Łyziak et al. (2007). Still less has been done to investigate the effects of central bank communication in this group of countries. To our knowledge, it is only Gabriel and Pinter (2006) and Rozkrut, Rybiński, Sztaba and Szwaja (2007) that have analyzed in depth the impact of central bank "talk" on asset prices in transition economies. The former has been done for Hungary (for the period: August 2001 – September 2005), whereas the latter for the Czech Republic, Hungary and Poland (for 2001-2004). This paper aims to fill this gap, as well as to contribute to the literature on the effectiveness of central bank communication in a number of other aspects.

2

Measuring communication

2.1 Communication variables

In order to assess the effects of central bank "talk" individual statements of the policy makers (ST) and central bank communiqués (C) are investigated. These have been found mostly in the newswire services, such as Reuters News, Dow Jones News, PAP, ISI Securities, as well as in the NBP website. The statements have been split into different categories, depending on whether their contents have been deemed relevant for the monetary policy inclination (*MP*), the economic outlook (EC), exchange rate behavior (FX), or fiscal policy assessment (FP).[3] Central bank "talk" has been dropped when it has concerned other topics.

All the reports that include the name of the policy maker, which has been the search command employed, have been analyzed, which totaled *36 696*. However, while picking relevant reports and assigning to them the exact time they were made public, following Ehrmann and Fratzscher (2007a) and Rozkrut et al. (2007) only the first report in the newswire service has been chosen, whereas subsequent reports and comments on the same statement have been passed over. Using this source of information allows obtaining statements, as well as other analyzed events (e.g. monetary policy decisions, release of macroeconomic news) with the exact time they are released. Finally, the following values has been assigned to the distinguished statements:

$$ST_t^{MP} = \begin{cases} +1 & \text{inclination of tightening monetary policy} \\ -1 & \text{inclination of easing monetary policy} \end{cases}$$

$$ST_t^{EC} = \begin{cases} +1 & \text{improved economic outlook} \\ -1 & \text{weaker economic outlook} \end{cases}$$

$$ST_t^{FX} = \begin{cases} +1 & \text{indication of undervalued exchange rate} \\ -1 & \text{indication of overvalued exchange rate} \end{cases}$$

$$ST_t^{FP} = \begin{cases} +1 & \text{statement criticizing fiscal situation} \\ -1 & \text{statement favoring fiscal situation} \end{cases}$$

The same procedure has been applied while assessing the contents of central bank communiqués.

It needs to be emphasized that the assessment of communication variables is made *in relation* to the expectations or appraisal that have prevailed so far. For example, a tightening statement does not have to correspond with an indication of the interest rate hike. Contrary to that, it may even point to the interest rate reduction, but *smaller than* reflected in market expectations, and thus result in the upward movement of the yield curve.

Since the assessment has had to involve some degree of subjectivity, an attempt to reduce it has been made by looking at the analysts' comments and opinions on the MPC statements and communiqués. These are found in the newswire services, as well as in commercial banks' dailies. Moreover, in the case of many statements, not least those ambiguous, an independent assessment has been made by up to four economists. When

[3] In the case of communiqués, only monetary policy inclination and economic outlook categories have been distinguished. It is due to a very small number of communiqués whose contents would be deemed relevant in terms of the exchange rate or fiscal policy assessment.

differences have arisen, the "problematic" statements have been scrutinized once again and cross-checked with the assessment made by financial analysts. This procedure sometimes resulted in reaching a consensus on the value assigned to a particular statement, but on other occasions ended up in dropping it. Moreover, when majority of views prevailed towards one direction, yet the contents of the statement could not be deemed unambiguous, a separate category of *ambiguous* (ST^{amb} or C^{amb}), in contrast to *clear-cut* (ST^{clear} or C^{clear}) statements or communiqués has been distinguished. Differentiating between these two categories may also help to find out whether market participants are sensitive to a particular kind of statements and react to them even if their meaning is not unambiguous.

2.2 Asymmetric impact of communication

Another issue of interest is whether the influence of statements on financial markets depends on the direction they are made. Therefore, it may be useful to distinguish separate categories of tightening (ST^{MP_tight}) and easing (ST^{MP_ease}) statements (for ST^{MP} equal *+1* and *-1*, respectively), positive (ST^{EC_pos}) and negative (ST^{EC_neg}) economic outlook statements, statements suggesting appreciation (ST^{FX_appr}) and depreciation (ST^{FX_depr}) of the exchange rate, and, finally, statements critical (ST^{FP_bad}) and favorable (ST^{FP_good}) of fiscal policy situation.

Such an approach may be useful in answering the question of whether the effects of central bank communication are asymmetric, for example, whether hawkish statements are more influential than dovish comments. This asymmetry is also investigated in the case of NBP communiqués.

2.3 Hawks and doves

Moreover, one might presume that the impact of a particular statement should depend on the individual by whom this statement is made. In other words, an attention should be paid not only to what is being communicated, but also to who is the speaker.

Therefore, one approach is to distinguish between hawkish (ST^{MP_hawk}), neutral ($ST^{MP\_neutral}$) and dovish (ST^{MP_dove}) policy-makers. In this study, such classification has been made on the basis of the survey results. Moreover, since the perception of a particular MPC member may have changed over time (e.g., he or she could now be perceived as a neutral and no longer as a hawkish speaker), the evolution of the survey results had to be accounted for. Such surveys used to be regularly published by *Reuters News*. However, since they are not available for the whole sample period, for the purpose of this study, an additional questionnaire has been prepared and distributed among international economists that cover the Polish economy. Moreover, ad-hoc survey results published by different newspapers have also been used. Since the findings of different sources have not always been unanimous (though it has occurred on very rare occasions), different classifications have been applied in order to check for the robustness of this study's conclusions.

2.4 Majority and minority speakers

The availability of individual voting records in the whole sample period enables us to distinguish yet additional categories of speakers. First, we may differentiate between these MPC members who win majority of voting and those who are often outvoted, i.e. are usually in minority. For each individual MPC member the:

$$majority\_ratio_t = \frac{\text{(number of voting won over the last 12 months)}}{\text{(number of committee days with interest rate decisions voted on over the last 12 months)}}$$

has been calculated. Here, again, in order to check for the robustness of the results, different approaches to measure *majority_ratio* have been adopted, including weighted average of voting records with the weight declining with the time distance that a particular voting took place.

When more than one proposal on the interest rate level was voted on during the same meeting and some MPC members did not gain enough support for their first choice, but won voting on their second best option, these decision-makers were treated as if they won 0.5 of voting. The *majority_ratio* ranges between *0* (always in minority) and *1* (always in majority of voters) and varies over time. Moreover, since voting records are not published immediately after the MPC meeting, *majority_ratio* does not vary with each voting, but with the release of information about it. Therefore, the one-year period over which the ratio is calculated covers these votes and decisions on interest rate that the public could learn about over the last 12 months, rather than those actually made during the period.

After creating a time series with majority ratios assigned to each MPC member, statements on monetary policy inclination are grouped into those made by decision-makers with a majority ratio of at most 0.5 (ST^{MP_min}) and those with a ratio exceeding that value (ST^{MP_maj}).

2.5 Consistent and inconsistent speakers

The second benefit that we can draw from the release of voting records is the possibility to distinguish decision-makers that usually vote in the same way as they previously communicated from those whose voting records are not consistent with their prior statements. In other words, such classification would allow us to answer the question whether, from the perspective of an individual MPC member, it pays to match words with deeds. For the purpose of this task, for each decision-maker the *consistency_ratio* is calculated. The way this measure is constructed is as follows.

First, it is assessed whether a particular decision on interest rates came as a surprise to market participants. If the absolute value of the *monetary surprise component*[4] equaled 0.1 percentage point or more, it has been classified as an either hawkish or dovish surprise, depending on the sign of the change in the one-month money market rate. Once more, in order to check for the robustness of the results, alternative classifications of the hawkish and dovish surprises have been created for the positive and negative values of the monetary surprise component, respectively. Those included fixed-level thresholds of 0.05, 0.15 and 0.2 percentage points as well as time-varying measures of ¼ or ½ of the average absolute change in the level of the NBP reference rate over the last three (or five) MPC meetings during which the interest rate level was changed (or, alternatively, over the preceding 12-month period).

In the second step, voting of each MPC member is compared with the outcome of the central bank ultimate decision. For example, if the interest rate hike of 50 basis points turned out to exceed market expectations, then votes supporting such a decision should be classified as hawkish. Or, if the interest rate reduction of 25 basis points was in line with the expectations of market participants, then votes favoring a decrease in interest rate by 50 points would be assessed as dovish.

Next, the way a particular MPC member voted is set against the last statement that he or she made in the inter-meeting period preceding that decision. For example, every time a tightening statement corresponded with a hawkish vote, the decision-maker was rewarded with a "consistent speaker" mark of *+1*, whereas in the opposite case the MPC member was punished with an "inconsistent speaker" grade of *-1*. A mark was not given

[4] Change in the one-month money market rate. For more details on this measure, see sections 4 and 5.

when a decision-maker did not make a statement in the inter-meeting period or when an assessment was not possible.[5]

Finally, the *consistency_ratio* is calculated as follows:

$$consistency\_ratio_t = \frac{\sum_{k=1}^{t} consistent\_speaker\_mark_k + \sum_{k=1}^{t} inconsistent\_speaker\_mark_k}{\sum_{k=1}^{t} consistent\_speaker\_mark_k - \sum_{k=1}^{t} inconsistent\_speaker\_mark_k}$$

It is thus a time-varying measure with a maximum value of *+1* (for a speaker who always matches his/her words with deeds) and the lower limit of *-1* (for a decision-maker who never votes in line with his/her preceding statements). After a time series with consistency ratios for each MPC member has been built, statements on monetary policy inclination have been grouped into those made by decision-makers with the consistency ratio not exceeding *0* (ST^{incons}) and those with the ratio above that value (ST^{cons}).

2.6 "Talkative" and "reticent" MPC members

Yet another classification of communication aims at investigating whether the impact of statements depends on how active a particular speaker is. Ehrmann and Fratzscher (2005; 2007b) and Rozkrut et al. (2007) provide the evidence that more frequent communication may be beneficial in helping markets anticipate future decisions of the central bank.

However, to the best of our knowledge, no study has so far analyzed whether the impact of an individual MPC member's "talk" varies with the frequency of his or her statements. This issue is approached by comparing how active a policy-maker was over the last three months with the average number (median) of statements (per head) made in this period by all MPC members. Statements on monetary policy inclination have subsequently been grouped into those made by decision-makers who have been more "talkative" than a "median MPC member" (ST^{MP_talk}) and those who have been relatively reticent (ST^{MP_retic}).

The above-outlined different categories of statements may be combined in order to get still more insight into how central bank communication works. For example, one might investigate whether MPC members who match their words with deeds, but usually lose voting, are more or less influential than "majority speakers" who vote in a way that is not consistent with their preceding statements. In addition, it may be checked if the effects of these statements vary with monetary policy inclination (tightening vs. easing), and so on.

The analysis covers the period between 1 January 2001 and 31 December 2006 and this choice may be justified on several grounds. First, the monetary policy had then already been conducted under inflation targeting, which is a framework that emphasizes the critical role of the communication channel in the monetary transmission mechanism. Second, at the beginning of the sample period the analyzed segments of financial markets in Poland were already liquid enough to draw reliable conclusions on the obtained results. Finally, prior to 2001, there is a shortage of data for many variables used in this study.

The period under analysis includes 72 committee days,[6] 72 communiqués, and 982 verbal statements.[7] The number and structure of observations concerning policy-maker statements are discussed in Section 3.

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5 The latter applies to some of the situations when a decision on interest rates turned out to be in line with market expectations. If that decision was voted for by an MPC member whose last statement, classified as tightening (easing), was followed by a rise (fall) in the short-end of the yield curve, then it cannot be excluded that that statement helped to steer market expectations and thus avoid the surprise caused by the central bank decision. Such a statement should then be deemed consistent with the subsequent vote of the MPC member. However, since in these circumstances an assessment of such statement is far from ambiguous, it was skipped and the mark was not given.

6 I.e. the days when the MPC holds the meeting during which the decision on interest rates is made. No change in the level of central bank interest rate is also classified as a decision.

7 This number relates only to those statements that have been found relevant for this study.

3

Some statistics on the NBP communication

Before moving on to a more technical analysis, we look at central bank communication divided into four categories, i.e. statements and quotes related to (1) monetary policy inclination, (2) to economic outlook, (3) to the strength or weakness of domestic currency, and (4) to the assessment of the fiscal policy (Table 1). In addition, governor's statements have been distinguished, as one might expect that his voice carries more weight than that of other MPC members. In order to facilitate the assessment of the NBP communication, some figures have also been quoted for the Czech and Hungarian central banks, though for the 2001–2004 sample only.

Table 1
Communication on monetary policy inclination, economic outlook, foreign exchange (FX) view and fiscal policy assessment

	Monetary policy inclination					Economic outlook				
	Tightening	Easing	Tightening/Easing ratio			Positive	Negative	Positive/Negative ratio		
				CNB*	MNB*				CNB*	MNB*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
(1) All MPC members	318 *49%*	337 *51%*	**0.9**	0.8	1.5	74 *54%*	62 *46%*	**1.2**	0.8	–
(2) Governor	72 *79%*	19 *21%*	**3.8**	0.3	1.3	21 *91%*	2 *9%*	**10.5**	0.5	–
(3) Decisions	*4%*	*38%*	**0.1**	0.3	0.3					
(4) Industrial output						*53%*	*47%*	**1.1**	2.2	0.6
	FX view					**Fiscal policy assessment**				
	Appr.	Depr.	Appr./Depr. ratio			Critical	Favorable	Critical/Favorable ratio		
				CNB*	MNB*					
(5) All MPC members	57 *53%*	51 *47%*	**1.1**	0.0	2.3	72 *87%*	11 *13%*		**6.5**	
(6) Governor	7 *70%*	3 *30%*	**2.3**	0.0	2.3	30 *88%*	4 *12%*		**7.5**	
(7) FX change	*51%*	*49%*	**1.1**	1.5	1.2					

* Data for the CNB and MNB (the Czech and Hungarian central banks, respectively) based on Rozkrut et al. (2007) and calculated for 2001–2004 sample.
The table groups central bank comments regarding monetary policy inclination (into tightening/easing), economic outlook (positive/negative), exchange rate level (appreciation/depreciation), and fiscal policy assessment (critical/favorable) and compares these distributions with the actual outcomes (excluding fiscal policy assessment). For example, the frequency of tightening decisions refers to the observations on increase in the official interest rate as a share of all interest rate decisions. The frequency of 'positive economic outlook' reflects the share of the observations on industrial output that exceeded the market expectations (approximated by the median from the Bloomberg survey). The figure on the foreign exchange appreciation relates to the percentage of months with zloty strengthening in the period under analysis.

The preliminary assessment of the NBP communication starts with setting the ratio of tightening to easing statements (Table 1, rows 1–2, column 3) against the ratio of interest rate increases to interest rate reductions (row 3, column 3). This simple comparison suggests that in the sample period the MPC communication was biased towards tightening statements, which is particularly evident in the case of the NBP Governor. The tentative findings hold after quoting similar statistics on the CNB and MNB communication (rows 1–3, columns 4–5), though the Hungarian central bank also seems to be characterized with a significant "tightening bias". Among the three central banks

it is the CNB – its governor in particular – that seems to have provided the best guidance on interest rate decisions.

The analysis of comments on the economic outlook[8] (rows 1–2 and 4, columns 6–8) indicates that in this area the NBP communication has been well balanced, but the Governor's statements were dominated by overly optimistic economic growth perspectives. On the other hand, the CNB comments were relatively conservative.

In the case of communication on exchange rate developments, the NBP comments again were well balanced and seem to have corresponded with the actual development in the FX market.[9] In the presence of the currency appreciation trend, all of the CNB statements on the koruna level indicated its overvaluation or suggested that it should weaken. Contrary to the CNB stance, the Hungarian central bank tended to indicate that the forint should appreciate.

Concerning the NBP communication on fiscal policy,[10] it was dominated by very critical comments, with 72 statements indicating deterioration in the fiscal policy against only 11 pointing to improved situation in the general government sector.

Table 1 provides yet another interesting insight into the NBP communication, namely the level of Governor's activity in public communication. As a Chairman of the 10-member Council, the Governor made 14 per cent of all MPC statements on monetary policy inclination, 17 per cent on economic outlook, and 9 per cent on the exchange rate behavior. Therefore, he did not dominate the NBP communication. The only exception were the Governor's comments on fiscal policy situation, which accounted for 41 per cent of all MPC statements on this topic. Indeed, fiscal policy played a very important role in the NBP communication, which diminished only after new nine MPC members were elected in the early 2004. The involvement of the Governor in this area is reflected in the number of his comments on fiscal policy situation exceeding the amount of his statements on the economic outlook and exchange rate behavior.

The tentative finding, based on the statistics presented in Table 1, suggests that in the period under analysis the NBP communication was biased towards too hawkish statements. An explanation behind such a behavior might be that during the disinflation period the MPC might have preferred to err on the tightening side in order to secure that the process was not reversed. The Polish MPC might thus have valued deviations below and above the target differently, i.e. its loss function was asymmetric. If deviations above the target level were considered more costly by the policy-makers, it was probably reflected in the way the central bank conveyed its intentions and information to the public.

However, the above analysis based on the average ratio of tightening to easing statements is not free of drawbacks. It does not take into account that frequency of statements vary over time and, consequently, that the analyzed ratios are also time-varying. Moreover, it interprets all, for instance, tightening statements as indicating interest rate increases, whereas in some situations they simply point to a more moderate rate cut than expected by the markets. Last but not least, the Polish MPC is an example of an individualistic committee (see Section 5) with the majority of its members deciding on the interest rate level, but those who lose voting can also present their views in public. Therefore, some proportion of statements represent the views of minority members and not the central bank decision that is likely to be taken.

One way to cope with these shortcomings is to construct the above-described *consistency indicator*, which aims to measure whether policy makers' words match their deeds. The findings based on the use of this indicator, as well as of other communication measures, are presented in sections 4 and 5, where the effectiveness of central bank "talk" is investigated.

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[8] Economic performance relative to market expectations has been approximated by comparison of industrial output releases relative to market consensus forecast (row 4, column 8).

[9] For the purpose of this analysis the percentage of months with currency appreciation is set against the percentage of months with exchange rate weakening (row 7, column 3) – see also footnote 11.

[10] In the case of communication on fiscal policy, the data is available only for the NBP.

4

The impact of central bank communication on financial asset prices

Central bank power to manage private sector expectations depends on the policy makers' ability to communicate their intentions in an intelligible manner. However, if a central bank is to steer those expectations as intended, policy makers must first possess the skills to guide the markets through effective communication. To assess the effectiveness of central bank "talk", it is investigated whether MPC statements provide relevant information for economic agents and – consequently – influence their behavior.

To this end, the reaction of financial variables to monetary policy statements is measured. It is examined how yields with different maturities, the exchange rate (XR)[11] and the stock market index (*WIG*) react to central bank "talk" in terms of both their level and volatility.[12] Lack of intra-day data for Poland in the sample period limits the analysis to daily movements of financial variables.

As each communiqué is preceded by a decision on interest rates, which may have a significant impact on the financial asset pricing, this effect has to be controlled for.[13] It is achieved by allowing each financial variable to respond to an unexpected component of the monetary policy decision, approximated by the change in the one-month money market rate on that day.[14] For all other non-committee days the measure of the surprise component has been set to zero.

Release of macroeconomic news is another factor that may significantly influence the movements of financial variables. The need to control for this effect is particularly important when one takes into account the fact that data releases often take place on the same day or even in the short-time window surrounding a central bank decision or a policy maker statement. In order to cope with this issue, firstly, a number of macroeconomic variables that are important to decisions of financial market participants are selected.[15] The relevance of these economic data seems to be supported by their inclusion in the most popular analysts forecast polls. Secondly, similarly to Kohn and Sack (2004), for each macroeconomic news we calculate the surprise component, measured as the difference between the expected value less the realized value, the former corresponding to the median from the Bloomberg and – where necessary – Reuters and PAP surveys. Finally, we allow each financial variable to respond to the surprise component normalized by its standard deviation. For all days with no data release that component has been set to zero.

[11] Until mid-2004 the zloty exchange rate movements against the US dollar and from then onwards against the euro have been taken into account. The reason is that in the former period it was the US dollar and in the latter it was the euro that played the role of the "reference currency" for the Polish FX market participants.

[12] One cannot exclude, however, that on some occasions policy-makers' comments, rather than being the source of movements in various asset prices, are in fact induced by the current situation in financial markets. In particular, such an endogeneity problem may arise during financial market turmoil that creates high demand for the central bank "talk", which may (but does not have to) simply reflect the market developments.

[13] No interest rate change on the committee day has also been classified as a *decision*.

[14] For the yields whose quotations are set before an announcement, a respective figure from the following day is taken into account.

[15] For the Polish economy it gives a total of 603 macro releases over the analyzed period, which include the data on: CPI, net-inflation, food prices, PPI, current account, GDP, industrial output, retail sales, wages, money supply, and unemployment.

Moreover, while explaining the behavior of domestic interest rates, the euro area interest rate of the corresponding maturity has been included into regressions. The reason is that market participants focus on spreads between converging countries' yield curves and the euro yield curve, and thus the latter's movements are reflected in the local interest rate changes. In the equation with a change in the exchange rate level as a dependent variable, a change in the interest rate disparity (the difference of three-month money market rates in Poland and the United States or the euro area – see footnote 11) has been added as a regressor. Finally, in the case of the WIG change as a dependent variable, a percentage change in the MSCI index[16] has been included into regression. These additional explanatory variables help to reduce the omitted variable bias and to capture the influence of external developments on the prices of domestic financial assets.

As already mentioned, this paper aims to measure the influence of communication on both the level and volatility of financial asset prices. In order to test both and account for the interaction between the two the Exponential GARCH (EGARCH) model, proposed by Nelson (1991) has been used. This approach has already been applied in several research studies on the reaction of financial variables to monetary policy communication (Connolly and Kohler 2004; Jansen and De Haan 2005; Ehrmann and Fratzscher 2007a). In this paper, the conditional mean equation for the asset price return and the equation for the conditional variance are specified in the EGARCH (1,1) framework as follows:

$$r_t = \beta_0 + \sum_i (\delta_i r_{t-i}) + \beta_1 MSC_t + \phi X_t + \beta^{EC} ST_t^{EC} + \beta^{MP} ST_t^{MP} + \beta^{FX} ST_t^{FX} + \beta^{FP} ST_t^{FP} + \lambda^{EC} C_t^{EC} + \lambda^{MP} C_t^{MP} + \varepsilon_t \quad (1)$$

$$\varepsilon_t \mid \Psi_{t-1} \sim N(0, h_t) \quad (2)$$

$$\ln(h_t) = \gamma_0 + \gamma_1 \left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \gamma_2 \left(\frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right) + \gamma_3 \ln(h_{t-1}) + \gamma_4 \left| MSC_t \right| + \gamma^{voting} Voting_t + \gamma^{ROI} ROI_t + \varphi Y_t + \gamma^{EC} \left| ST_t^{EC} \right| + \gamma^{MP} \left| ST_t^{MP} \right| + \gamma^{FX} \left| ST_t^{FX} \right| + \gamma^{FP} \left| ST_t^{FP} \right| + \chi^{EC} \left| C_t^{EC} \right| + \chi^{MP} \left| C_t^{MP} \right| + \chi^{FX} \left| C_t^{FX} \right| \quad (3)$$

where:

- r_t – daily change in the domestic interest rate (in percentage points); change in the zloty exchange rate (XR) or stock market index – WIG (in per cent),
- MSC_t – the unexpected component of policy decisions, approximated by the change in the one-month money market rate on the committee day, zero otherwise,
- X_t – the vector of controls that includes: day-of-the-week effects, surprise component of macroeconomic news and change in the euro interest rate of the corresponding maturity (for the domestic interest rate as a dependent variable) or change in the interest rate disparity (for XR) or change in the MSCI index (for WIG),
- Ψ_{t-1} – the information set at time *t–1*,
- h_t – the conditional variance,
- $Voting_t$ – dummy variable equal *1* on the day of publication of MPC voting records and *0* otherwise,
- ROI_t – dummy variable equal *1* on the day of publication of the Inflation Report and *0* otherwise,
- Y_t – vector that includes absolute values of variables included in the vector X_t.

As the left-hand side of Eq. (3) is the *ln* of the conditional variance, there is no need to impose non-negativity restrictions on the conditional variances. The model has been estimated with the method of maximum likelihood and the heteroskedasticity consistent covariance matrix has been applied (Bollerslev and Wooldridge, 1992).

[16] An index created by Morgan Stanley Capital International (MSCI) that is designed to measure equity market performance in global emerging markets.

For each dependent variable a separate regression is run on the variables chosen. Subsequently, unless it leads to the increase in the information criteria (not least the Schwarz criterion), each regression is gradually reduced by eliminating those variables (one by one) that have turned out not to be significant in either mean or variance equation. As a result, a different specification of the model for every dependent variable is arrived at.

In the first step, statements and communiqués that enter the estimated equations are divided into four and two categories, respectively, related to (1) monetary policy inclination, (2) economic outlook, (3) the strength or weakness of domestic currency, and (4) the assessment of the fiscal policy.

Results reported in Table 2 suggest that NBP communication does influence the asset prices and it always works in the "desired" direction. It means that MPC statements that, for example, reveal information on likely monetary policy tightening lead to an increase in market interest rates and a decrease in the WIG index. Moreover, central bank "talk" conveying a positive economic outlook leads to a rise in the yield curve, as improved economic prospects should result in an upward revision of the expected interest rate path.

Table 2
Market reaction to central bank communication

	WIBOR3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
ST^{MP}	**0.003***** *0.000*	**0.004***** *0.000*	**0.004***** *0.000*	**0.005***** *0.005*	**0.004** *0.107*	(–)	**-0.077**** *0.025*
ST^{EC}	**0.007***** *0.006*	(–)	(–)	(–)	(–)	(–)	(–)
ST^{FX}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
ST^{FP}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
C^{MP}	(–)	(–)	(–)	**0.019***** *0.005*	**0.026***** *0.010*	(–)	**-0.321**** *0.036*
C^{EC}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
LR test	**36.002*****	**23.328*****	**25.236*****	**12.861*****	**12.997*****	–	**10.410*****

P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.
The LR (likelihood ratio) test is a test whether model with communication variables has a higher explanatory power than the model without these variables.

However, the effectiveness of NBP communication seems to be limited almost exclusively to the statements and communiqués conveying information about monetary policy inclination, with the former affecting the yield curve at maturities up to two years.[17] The likely explanation why MPC communication is most influential and highly statistically significant in this case is that it is the future interest rate path, not least in the short-term, that belongs to the area where information asymmetry between the central bank and the public is the largest. Therefore, the public signal issued by a central bank should in these circumstances be particularly influential.

The impact of the NBP statements and communiqués on the yield curve ranges in absolute value from 0.3 to 0.7 and from 1.9 to 2.6 basis points, respectively. In addition, they influence the stock market index – WIG (from 0.08 per cent to 0.32 per cent). However, no communication instruments affect the exchange rate behavior.

Table 3 compares the effectiveness of monetary policy inclination and economic outlook statements in the group of four countries. It shows that statements on monetary policy inclination influence financial asset prices both in Poland and developed economies,

[17] In addition, statements on the economic outlook also seem to impact on financial asset prices. However, they influence only the short-end of the yield curve, i.e. three-month money market rate.

though the yield curve reacts much stronger to central bank communication in the latter.[18] At the same time, however, NBP statements are much more influential in affecting stock market quotations. Interestingly, there is no central bank whose statements on monetary policy inclination would affect the exchange rate behavior.

Table 3
Market reaction to central bank communication in Poland, the United Stated, the United Kingdom and the euro area

	3M	6M	12M	Yield 2Y	Yield 5Y	XR	Equity
ST^{MP}							
NBP	**0.003*** **	**0.004*** **	**0.004*** **	**0.005*** **	(–)	(–)	**-0.077** **
FED	**0.010*** **	(–)	**0.009** **	**0.010***	**0.011***	(–)	**-0.003*** **
BoE	**0.005*** **	**0.008*** **	**0.009** **	(–)	(–)	(–)	**-0.003** **
ECB	**0.021*** **	**0.016*** **	**0.025*** **	**0.025*** **	**0.020*** **	(–)	**-0.004*** **
ST^{EC}							
NBP	**0.007*** **	(–)	(–)	(–)	(–)	(–)	(–)
FED	**0.006*** **	**0.011*** **	**0.018*** **	**0.020*** **	**0.022*** **	**-0.002*** **	**0.003*** **
BoE	(–)	**-0.006***	(–)	(–)	(–)	**0.002** **	**0.004*** **
ECB	**0.003*** **	**0.002*** **	**0.004*** **	(–)	(–)	(–)	**0.002***

**, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant. Data for FED, BoE and ECB based on: Ehrmann and Fratzscher (2005).

Figures reported in Table 3 also indicate that NBP statements on economic outlook exert much less influence on financial asset prices compared to the effectiveness of comments made by policy-makers in developed economies.

As already mentioned, using EGARCH model allows us to measure the influence of central bank communication not only on the level, but also on volatility of financial asset prices.

Table 4 reports interesting results that the communication variables that have been found to be highly statistically significant in the mean equation, hardly increase volatility of the asset prices. By contrast, comments on the fiscal policy situation, while ineffective in the mean equation, are highly statistically significant in the variance equation and increase volatility of financial markets. This finding may suggest that the MPC communication on the fiscal policy situation was counterproductive in the sense that it did not provide clear signals as to the future interest rate path and only added to market uncertainty, as reflected in the increased volatility of financial asset prices.

Table 4
Market reaction to central bank communication – volatility equation

Volatility	WIBOR3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
$\lvert ST^{MP} \rvert$	(–)	**0.078** ***0.049***	(–)	(–)	(–)	**-0.076*** ***0.074***	(–)
$\lvert ST^{EC} \rvert$	(–)	(–)	(–)	(–)	(–)	(–)	(–)
$\lvert ST^{FX} \rvert$	(–)	(–)	**0.120*** ***0.075***	(–)	(–)	(–)	(–)
$\lvert ST^{FP} \rvert$	**0.214** ***0.038***	**0.193*** ** ***0.003***	**0.172*** ** ***0.009***	(–)	**0.137** ***0.049***	**0.234*** ** ***0.007***	(–)
$\lvert C^{MP} \rvert$	(–)	(–)	(–)	(–)	(–)	(–)	(–)
$\lvert C^{EC} \rvert$	(–)	(–)	(–)	(–)	(–)	(–)	(–)

P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.

[18] This may be due to more frequent NBP communication translating into lower impact of individual statements, which is the issue that is analyzed in subsection 4.6.

4.1 Ambiguous vs. clear-cut statements

In subsection 2.1 it has been mentioned that due to difficulties that arise during the assessment of some communication variables, separate categories of *ambiguous* (ST^{amb} or C^{amb}) and *clear-cut* (ST^{clear} or C^{clear}) statements or communiqués have been distinguished. After including them in the regression and re-running the whole estimation procedure, the new estimation results have been obtained, which are presented in Table 5.

Table 5
Market reaction to central bank ambiguous and clear-cut communication.

	WIBOR3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
ST^{MP_clear}	**0.002**** *0.021*	**0.003**** *0.015*	**0.005***** *0.000*	**0.006***** *0.002*	(–)	(–)	(–)
ST^{MP_amb}	**0.003*** *0.0632*	(–)	(–)	(–)	(–)	(–)	**-0.133**** *0.021*
ST^{EC_clear}	**0.009***** *0.000*	**0.007**** *0.029*	(–)	(–)	(–)	(–)	(–)
ST^{EC_amb}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
ST^{FX_clear}	(–)	(–)	(–)	**0.016**** *0.021*	**0.013*** *0.057*	(–)	(–)
ST^{FX_amb}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
ST^{FP_clear}	(–)	**0.008**** *0.027*	(–)	(–)	(–)	(–)	(–)
ST^{FP_amb}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
C^{MP_clear}	**0.018***** *0.004*	**0.023***** *0.003*	**0.028**** *0.046*	**0.021**** *0.041*	**0.033**** *0.019*	(–)	**-0.556***** *0.000*
C^{MP_amb}	(–)	(–)	(–)	**0.019**** *0.041*	**0.017*** *0.072*	**-0.285***** *0.003*	(–)
C^{EC_clear}	(–)	(–)	(–)	**0.020*** *0.092*	(–)	(–)	**0.289*** *0.070*
C^{EC_amb}	(–)	(–)	(–)	(–)	(–)	(–)	(–)

P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.

The findings are generally in line with the intuition in that clear-cut communication exerts much more influence on market expectations than vague statements.[19] This is particularly evident in the case of the NBP communiqués that – if conveying an unambiguous message – affect the yield curve at maturities up to five years and the stock market index. In addition, statements on the exchange rate level and fiscal policy assessment may sometimes influence financial asset prices, but only when made in a clear-cut manner.

Interestingly, the results indicate that when ambiguous signals influence the markets, it is only in the case of statements or communiqués on monetary policy inclination, whereas other statements are effective only when made in a clear-cut manner. This seems to confirm the previously expressed view that market participants are most vigilant to central bank communication when it is related to the future interest rate path and, in this case only, react even to vague signals.

[19] The only exceptions are the impact of ambiguous monetary policy inclination statement on the WIG index and the effect of ambiguous communiqués related to monetary policy inclination on the exchange rate level.

4.2 Asymmetric effects of central bank communication

In this subsection an attempt is made to answer the question whether the effects of central bank communication are asymmetric. For that purpose communication variables have been split into different categories, as described in subsection 2.2, depending on the direction the statements have been made.

The results presented in Table 6 are striking. First, they show that tightening statements are more influential than easing ones. This is in line with findings of Andersson et al. (2002) who show that speeches given by the Riksbank Executive Board members with an unexpected message of tighter monetary policy have had a much stronger influence on the yield curve than speeches with an expansionary monetary policy message. Gabriel and Pinter (2006) also provide the evidence that the Hungarian central bank is more successful in signaling monetary policy tightening than easing. The likely explanation that they come up with for this finding is that market participants assume that the central bank has an asymmetric reaction function and reacts quicker if the monetary conditions have to be tightened and slower if it considers the monetary conditions to be too strict.

Table 6
Asymmetric effects of central bank communication on financial markets behavior

	WIB0R3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
ST^{MP_tight}	**0.004*** *0.000*	**0.004*** *0.007*	**0.005*** *0.002*	**0.005** *0.018*	(–)	(–)	**-0.119** *0.013*
ST^{MP_ease}	(–)	**0.003*** *0.097*	**0.004*** *0.010*	(–)	(–)	(–)	(–)
ST^{EC_pos}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
ST^{EC_neg}	**0.016*** *0.000*	**0.010** *0.014*	(–)	**0.014*** *0.009*	**0.015** *0.030*	(–)	(–)
ST^{FX_appr}	(–)	(–)	(–)	(–)	(–)	(–)	**0.213** 0.046
ST^{FX_depr}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
ST^{FP_bad}	(–)	**0.006*** 0.052	(–)	(–)	(–)	(–)	(–)
ST^{FP_good}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
C^{MP_tight}	(–)	(–)	(–)	(–)	(–)	(–)	**-0.653*** 0.009
C^{MP_ease}	**0.015** *0.029*	**0.015** *0.028*	**0.024** *0.016*	**0.030** *0.015*	**0.040*** *0.002*	**-0.303*** *0.001*	(–)
C^{EC_pos}	(–)	(–)	(–)	(–)	(–)	(–)	**0.349** 0.049
C^{EC_neg}	(–)	(–)	(–)	(–)	(–)	(–)	(–)
MSC_tight	**0.953*** *0.000*	**0.893*** *0.0000*	**0.781*** *0.000*	**0.533*** *0.000*	**0.309*** *0.009*	(–)	**-1.394*** 0.066
MSC_ease	**0.713*** *0.000*	**0.421*** *0.000*	**0.301** *0.011*	(–)	(–)	(–)	(–)
LR test	**47.442***	**42.687***	**32.734***	**17.059***	**18.430***	**7.873***	**14.898***

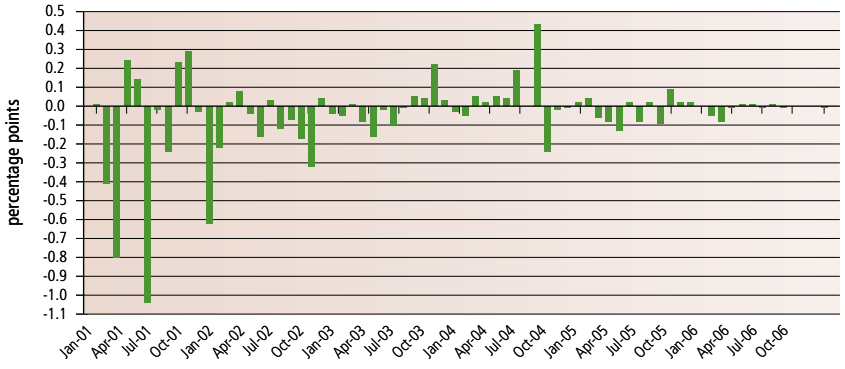
P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.
The LR (likelihood ratio) test is a test whether model with communication variables has a higher explanatory power than the model without these variables.

Applying the above explanation to the Polish case would suggest that the NBP has an asymmetric inflation target, i.e. that it has more tolerance for inflation deviations below than above the target level. However, the Figure 1 illustrates that majority of MPC decisions have in fact undershot market expectations and that easing surprises have been

on average twice as large as tightening ones.[20] More precisely, in the period under analysis the monetary surprise component was 37 times negative, with an average value of -15.4 basis points, and 30 times positive, with an average value of 8.2 basis points.

Although we cannot exclude that the NBP reacts asymmetrically to inflation developments, the above findings indicate that market participants tend to overestimate that effect. One source of this market inefficiency might be too hawkish a communication of the Polish central bank that misguides the markets; the other explanation could be too strong a market reaction to tightening statements made by the MPC members.

Figure 1
The unexpected component of policy decisions, approximated by the change in the one-month money market rate on the committee day



Interestingly, Table 6 shows that financial asset prices react much stronger not only to tightening statements but also to tightening surprises (MSC_tight) on the committee days than to decisions that turned out to be unexpectedly dovish (MSC_ease). This might suggest that easing surprises are largely the result of the shift in the expected timing of policy actions, as opposed to shifts in the near-term path of policy expectations, and as such have much less consequence for the expected course of monetary policy beyond a few-month horizon. For example, an interest rate reduction may have come as a surprise to market participants only because they were unsure as to whether that decision would be made at the current or the next MPC meeting. Although surprising due to its timing, such a decision would not affect the general level of policy expectations reflected in the longer-term interest rates.

In order to investigate that issue, we apply the Gürkaynak et al. (2006) methodology. It distinguishes two sources of the surprise component of the monetary policy decision: one that represents the change in the timing of policy actions (the "timing" factor) and the other that influences the general level of policy expectations (the "level" factor). Therefore:

$$MSC_t = timing_t + level_t$$

Whereas the "timing" factor would not affect the level of the interest rate expected after the subsequent MPC meeting, the "level" factor would be reflected in the near-term path of the interest rate. Due to the lack of futures contracts for the NBP rates in the sample period, we approximate the shift in the expected level of interest rates going forward by the change in the FRA contracts.[21] Therefore:

$$\Delta FRA_{t,\,nxk} = \alpha\, level_t$$

stands for a reaction of the expected (k–n)-month interest rate after n months

[20] Large unexpected components of policy decisions at the beginning of the sample period are the result of the significant changes in the level of the NBP reference rate at that time. It is not, however, the consequence of poor liquidity of the money market and, therefore, does not affect the obtained estimation results, whose robustness has been additionally checked by running regressions for the sample period starting in 2002.

[21] For the same reason, the *monetary surprise component* is approximated by the change in the one-month money market rate and not the appropriately scaled change in the current-month NBP rate futures contract (for the latter measure – see: Gürkaynak et al. 2006).

from today to the "level" factor. We thus decompose monetary policy shocks in the following way:[22]

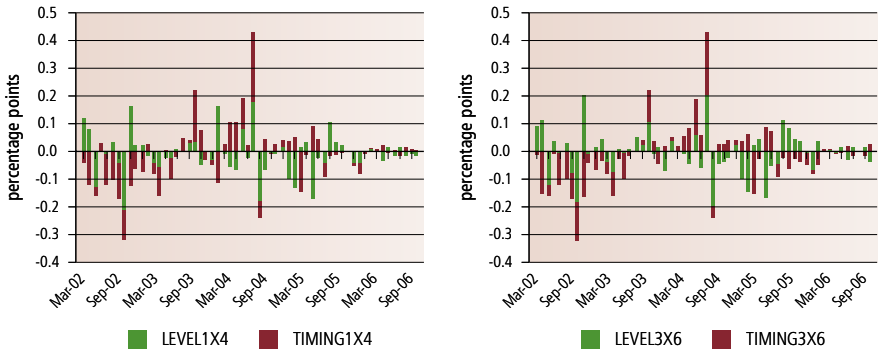
$$\begin{bmatrix} MSC_t \\ \Delta FRA_{t,nxk} \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ \alpha & 0 \end{bmatrix} \begin{bmatrix} level_t \\ timing_t \end{bmatrix}$$

The size of the current monetary policy shock may be influenced by both the "timing" and "level" factors. By contrast, the change in the FRA contracts is not affected by the timing component. Assuming that the two factors are orthogonal, we follow Gürkaynak et al. (2006) and solve the above decomposition based on the variance-covariance matrix from the observed policy shocks, which gives us: $\alpha = \frac{var(\Delta FRA)}{cov(MSC, \Delta FRA)}$, and thus: $level_t = \frac{\Delta FRA_{t,nxk}}{\alpha}$ and $timing_t = MSC_t - \frac{\Delta FRA_{t,nxk}}{\alpha}$.

Figure 2 illustrates a time series of that decomposition and shows that a large share of the surprise component has often been due to the timing rather than the scale of the decision on the interest rate level.[23] The decomposition also indicates that in case of easing surprises, the absolute size of the "timing" factor on average exceeded that of the "level" factor, whereas the opposite happened in the case of tightening surprises. It is in line with the findings that the yield curve reacts more to tightening than easing monetary policy surprises.

Moreover, since on some occasions the "timing" and "level" factors go in the opposite direction, which is particularly evident in November 2002 or June 2005, this indicates that there must be other than "level" factors influencing market expectations. These would most likely include policy-makers' statements and central bank press releases following the decision on interest rates. Therefore, the assumption made in the above decomposition that it is only the "level" factor that influences the change in the FRA contracts on the committee day seems to be to strong.

Figure 2
Monetary surprise component decomposed into the "level" and "timing" factors
Figure 2a – decomposition based on FRA_{1x4} contracts
Figure 2b – decomposition based on FRA_{3x6} contracts



Another explanation behind the asymmetric communication effect may be related to the term-structure of banks' assets and liabilities which – in the case of the surprising interest rate increase – would typically lead to their balance-sheet deterioration. Therefore, following a hawkish statement, market operators demand a premium and sell their assets to guard against capital losses in connection with a previously not envisaged upward movement of the yield curve. The reason why dealers are not equally, or *symmetrically*,

[22] Due to low liquidity of FRA contracts at the beginning of the period under analysis, the decomposition has been done for the data from March 2002 onwards.
[23] The estimated values of α=1.22 for FRA1x4 and α=1.31 for FRA3x6 contracts are close to the result obtained by Gürkaynak et al. (2006) of α=1.11. They indicate that since α is close to *1*, it corresponds very closely to the "rule of thumb" definition of level and timing components of monetary policy announcements used by Bernanke and Kuttner (2005).

willing to capture new profit opportunities by buying new assets after policy makers' easing comments is that *losses loom larger than gains* – a key idea of Kahnemann and Tversky's (1979) Prospect Theory.

Yet another explanation behind the stronger impact of tightening statements than easing signals might be that central bank communication increases the uncertainty, and thus a risk premium, which – by raising the yield curve – reinforces the effect of hawkish statements and softens the impact of dovish comments. However, the results reported in Table 4 do not support this hypothesis, because monetary policy inclination statements do not seem to lead to increased market uncertainty.

The asymmetric impact of central bank communication is not limited to monetary policy inclination statements only. In the case of the comments on the economic outlook, they affect financial asset prices only when conveying the unfavorable view and exert no impact at all when they are optimistic.

Statements with a negative economic outlook indicate that economic conditions may alter (or have already changed) in a way that would result in a decline of the yield curve. This, in turn, create conditions favorable to the rise in T-bills or bond prices, which has actually been reflected in the market behavior, as evidenced in Table 6. The question then arises why market participants do not react in a similar manner to positive economic outlook statements.

The likely explanation is related to the fact that in the period under analysis market interest rates in Poland were much more often in a downward rather than in an upward trend. Therefore, an attempt to benefit from the just heard policy maker's comment on the favorable economic outlook, which could signal monetary policy tightening, would on many occasions require speculating against the trend, which is a rare phenomenon.[24] This, however, may seem to be in contrast with the previous finding on the relatively strong reaction of market participants to monetary policy tightening statements. The explanation could lie in the already-discussed information asymmetry between the central bank and the public that is the largest in the area of the future interest rate path. Therefore, market participants are particularly vigilant to comments conveying information on monetary policy inclination and follow policy-makers' tightening signals in order to guard against potential capital losses, even if it requires running against the trend.

The results reported in Table 6 indicate that apart from asymmetric effects of statements about monetary policy inclination and economic outlook, still more significant differences arise between tightening and easing communiqués. The latter influence the whole yield curve and the exchange rate level, whereas the former only the WIG index.

4.3 Hawks and doves

In the next step it is investigated whether the impact of communication depends not only on what is being communicated, but also on *who* is the speaker. For this purpose, hawkish (ST^{MP_hawk}), neutral ($ST^{MP\_neutral}$) and dovish (ST^{MP_dove}) MPC members have been distinguished in a way described in subsection 2.3.

The results presented in Table 7 are at first glance puzzling. Contrary to the intuition, both hawks' easing and doves' tightening statements have hardly any effect on financial asset prices. On balance, however, these findings may not be that surprising.

[24] One reason why speculation against the trend is risky is that trend reversal is hardly predictable (De Grauwe 1996; Soros 1994).

Table 7
Market reaction to statements made by hawkish, neutral and dovish policy makers

	WIB0R3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
$ST^{MP\_dove\_tight}$	**0.009**** *0.029*	(–)	(–)	(–)	(–)	(–)	(–)
$ST^{MP\_dove\_ease}$	(–)	**0.005**** *0.038*	**0.004**** *0.028*	(–)	(–)	(–)	(–)
$ST^{MP\_neutral\_tight}$	(–)	**0.007**** *0.030*	**0.009***** *0.008*	(–)	**0.018**** *0.047*	(–)	**-0.183*** *0.066*
$ST^{MP\_neutral\_ease}$	(–)	(–)	(–)	**0.008** *0.104*	**0.012*** *0.074*	(–)	(–)
$ST^{MP\_hawk\_tight}$	**0.003***** *0.009*	**0.005***** *0.003*	**0.004***** *0.007*	**0.006**** *0.015*	(–)	(–)	**-0.106*** *0.072*
$ST^{MP\_hawk\_ease}$	(–)	(–)	**0.006*** *0.052*	(–)	(–)	(–)	(–)

P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.

4

It needs to be reminded that the Polish MPC is an *individualistic committee* which decides on interest rates through majority voting. Therefore, one might imagine that when a dovish MPC member makes a tightening statement, in most cases he or she simply joins the already-formed, and known to the markets, majority supporting a tightening decision. In this case that majority would probably comprise hawkish and neutral policy-makers, who have most likely already gone public with a tightening statement ahead of the dovish MPC member. In these circumstances, a hawkish comment given by a "dove" would hardly influence the expected future interest rate path. One should expect that such a comment should be very powerful only when market participants are uncertain as to the forthcoming central bank decisions, i.e. when a majority favoring a particular decision is not yet known to the public. If the latter situation accounts for a relatively small proportion of doves' hawkish statements, then results reported in Table 7 should not come as a surprise to anyone. The same logic applies to the explanation why hawks' dovish comments exert so little influence on financial markets.

In addition, Table 7 confirms the previous findings that tightening statements influence financial asset prices more than easing comments made by MPC members and that exchange rate behavior is immune to policy makers' "talk".

4.4 Majority and minority speakers

The availability of individual voting records in the whole sample period enables us to distinguish the MPC members who win majority of voting from those who usually do not get enough support for their proposal (the construction of the respective communication variables has been discussed in subsection 2.4). The results reported in Table 8 show that markets pay much more attention to what "majority" speakers say (ST^{MP_maj}) than to statements made by the often outvoted MPC members (ST^{MP_min}).

Table 8
Market reaction to statements made by "majority" and "minority" MPC members

	WIB0R3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
ST^{MP_maj}	**0.003***** *0.002*	**0.004***** *0.004*	**0.004***** *0.000*	**0.005**** *0.017*	**0.006*** *0.067*	(–)	**-0.092**** *0.027*
ST^{MP_min}	**0.002*** *0.071*	(–)	**0.004**** *0.011*	(–)	(–)	(–)	(–)

P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.

Moreover, we investigate whether the previously-outlined asymmetric communication effects are also present in the case of "majority" and "minority" speakers. Table 9 confirms that it is mostly tightening statements made by majority speakers that influence financial market behavior. Both tables once again indicate that policy makers' comments do not affect the exchange rate level.

Table 9
Asymmetric impact of "majority" and "minority" MPC members on financial markets behavior

	WIB0R3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
$ST^{MP\_maj\_tight}$	**0.008***** *0.000*	**0.009***** *0.000*	**0.008***** *0.001*	**0.008**** *0.042*	**0.010*** *0.066*	(–)	**-0.123**** *0.045*
$ST^{MP\_maj\_ease}$	(–)	(–)	**0.003*** *0.096*	(–)	(–)	(–)	(–)
$ST^{MP\_min\_tight}$	(–)	(–)	(–)	(–)	(–)	(–)	(–)
$ST^{MP\_min\_ease}$	(–)	(–)	**0.008***** *0.004*	(–)	(–)	(–)	(–)

P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.

4.5 Consistent vs. inconsistent speakers

The second benefit that we can draw from the release of voting records is the possibility to answer the question of whether it pays to match one's words with deeds. For the purpose of this task, for each decision-maker the *consistency_ratio* is calculated, as outlined in subsection 2.5. The estimation results, reported in Table 10, suggest that market participants do distinguish MPC members whose voting behavior is consistent with their previous statements from those policy-makers who usually do not match their words with deeds. In particular, it is tightening statements of consistent MPC members that influence financial asset prices the most, which provides yet another evidence supporting the asymmetry hypothesis.

Table 10
Market reaction to consistent and inconsistent central bank communication

	WIB0R3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
$ST^{MP\_tight\_cons\_maj}$	**0.007***** *0.000*	**0.008***** *0.000*	**0.008***** *0.000*	**0.007*** *0.095*	(–)	(–)	**-0.163**** *0.019*
$ST^{MP\_tight\_cons\_min}$	**0.003**** *0.045*	(–)	**0.004**** *0.022*	(–)	(–)	(–)	**-0.176**** *0.019*
$ST^{MP\_tight\_incons\_maj}$	**0.009**** *0.029*	**0.014***** *0.005*	(–)	(–)	**0.017*** *0.058*	(–)	(–)
$ST^{MP\_tight\_incons\_min}$	(–)	(–)	(–)	(–)	(–)	(–)	(–)
$ST^{MP\_ease\_cons\_maj}$	(–)	(–)	**0.003*** *0.083*	(–)	(–)	(–)	(–)
$ST^{MP\_ease\_cons\_min}$	(–)	(–)	**0.006**** *0.049*	(–)	(–)	(–)	(–)
$ST^{MP\_ease\_incons\_maj}$	(–)	(–)	(–)	**0.016**** *0.037*	(–)	(–)	(–)
$ST^{MP\_ease\_incons\_min}$	(–)	(–)	**0.026**** *0.014*	(–)	(–)	(–)	(–)

P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.

Table 10 also combines communication variables based on the *consistency_ratio* criterion with majority-minority classification. The results are in line with previous findings and indicate that consistent speakers who usually win voting exert the most powerful impact on the behavior of market participants. These MPC members who rarely match their words with deeds may influence financial asset prices, though to a lesser degree, only when they belong to "majority" speakers. Similarly, policy makers who in most cases lose voting may affect financial markets only when their actions are usually consistent with their decisions on interest rates. Consequently, market participants do not pay attention to statements made by inconsistent minority MPC members.

4.6 "Talkative" and "reticent" MPC members

In Section 4, it has been pointed out that the influence of statements made by NBP policy makers on financial asset prices is on average weaker than that of central bankers in most developed economies. One explanation might be that Polish MPC members are much more active in giving public comments on their monetary policy inclination, as evidenced in Section 5 (Table 14). The intuition is that the more often one speaks, the less attention market participants pay to what he or she says.

Ehrmann and Fratzscher (2005; 2007b) and Rozkrut et al. (2007) provide the evidence that more frequent communication may be beneficial in helping markets anticipate future decisions of the central bank. However, to the best of our knowledge, no study has so far analyzed whether the impact of an individual MPC member's "talk" varies with the frequency of his or her statements.

In order to deal with this issue, statements on monetary policy inclination have been grouped into those made by relatively "talkative" (ST^{MP_talk}) and "reticent" (ST^{MP_retic}) decision-makers, as described in subsection 2.6. The results reported in Table 11 suggest that the more active the MPC speakers are, the less powerful are their statements.[25] These findings may thus at least partly explain the difference between the impact of the NBP and G3 central bank communication on financial asset prices.

Table 11
Market reaction to "talkative" and "reticent" policy makers' statements

	WIBOR3M	WIBOR6M	WIBOR12M	Yield 2Y	Yield 5Y	XR	WIG
ST^{MP_talk}	**0.002** *0.020*	**0.003*** *0.056*	**0.003***** *0.004*	**0.006***** *0.005*	(–)	(–)	(–)
ST^{MP_retic}	**0.004***** *0.008*	**0.008***** *0.000*	**0.006***** *0.000*	(–)	(–)	(–)	**-0.120**** *0.027*

P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
(–) means that a variable has not been statistically significant and, on the basis of information criteria, excluding it from the regression has proved to be desirable.

Empirical evidence provided in this section shows that central bank communication does matter and influence asset prices in the desired direction indicated by policy makers' statements. The most powerful are statements conveying information on monetary policy inclination, followed by comments on the economic outlook. Contrary to that, communication on the exchange rate and fiscal situation turn out to be inefficient, with the latter only increasing the volatility of financial markets.

Moreover, we find that if market participants react to ambiguous central bank signals, it is only in the case of communication conveying information on monetary policy inclination, whereas other statements are effective only when made in a clear-cut manner. Furthermore, central bank communication influences financial asset prices in an asymmetric manner. In

[25] The only puzzling finding relates to the impact of a "talkative" member statement on the two-year interest rate.

particular, market participants react more to tightening than easing MPC statements and negative economic outlook comments are more influential than positive ones.

Moreover, this study contributes to the literature by investigating the impact of various individual characteristics of policy-makers on their ability to affect financial markets. We find that market participants pay much more attention to the comments made by policy makers who usually win voting than to the statements made by the often outvoted MPC members. Furthermore, policy-makers who are relatively "reticent" and match their words with deeds influence asset prices more than MPC members who are "talkative" and inconsistent, respectively. Additionally, we find that the impact of a policy-maker's comments on financial market behavior depends on whether he or she represents a hawkish, dovish or neutral faction within the MPC.

We have thus shown that central bank communication is a monetary policy instrument that can effectively influence the expectations of market participants and – consequently – financial asset prices. Therefore, one might expect that communication also helps to improve predictability of central bank decisions. This issue is examined in the section that follows.

5

Central bank communication and predictability of monetary policy decisions

Provided that monetary policy is communicated in a transparent manner and that there is no asymmetric information between the public and policy makers, central bank decisions should not come as a surprise to the market participants. Consequently, the monetary surprise component, approximated by changes in the one-month money market rate on the meeting day,[26] should be small.

Based on this criterion, the results reported by Ehrmann and Fratzscher (2005) indicate that decisions made by the ECB, the Federal Reserve, and the Bank of England have been relatively predictable. For these central banks the absolute surprise component (|MSC|) on average amounted to 3.0, 3.4, and 4.8 basis points, respectively. The figure obtained for the Czech Republic (5.9 basis points) might indicate that the CNB has almost caught up with the world leading central banks in terms of monetary policy predictability (Table 12, row 1). On the other hand, the results for Poland and Hungary would suggest that in these countries central bank decisions often surprise the markets. For the NBP the absolute unexpected component of the monetary policy decision over the 2001–2006 period averaged 11.3, whereas for Hungary (for 2001–2004) the respective figure amounted to 20.8 basis points.

Table 12
Basic statistics on monetary surprise component

Mean	NBP	CNB*	MNB*
(1) |MSC|	0.113	0.059	0.208
(2) $\|MSC_{dec}\|$	0.181	0.18	0.52
(3) $\|MSC_{nondec}\|$	0.065	0.015	0.074
(4) |ΔIR1M|	0.046	0.007	0.058
(5) |MSC/ΔIR1M|	2.48	8.11	3.58
(6) $\|MSC_{dec}/\Delta IR1M\|$	3.97	24.83	8.93
(7) $\|MSC_{nondec}/\Delta IR1M\|$	1.42	2.07	1.26
(8) |MSC|/IR1M	0.014	0.018	0.023
(9) $\|MSC_{dec}\|/IR1M$	0.023	0.055	0.053
(10) $\|MSC_{nondec}\|/IR1M$	0.008	0.005	0.011
(11) Dec/committee days	42%	27%	28%
(12) Nondec/committee days	58%	73%	72%

* Data for the CNB and MNB based on Rozkrut et al. (2007) and calculated for 2001–2004 sample.
MSC_{dec} – monetary surprise component after the central bank meeting with a change in interest rates.
MSC_{nondec} – monetary surprise component after the central bank meeting with no change in interest rates.
Dec/committee days – % of committee days with a change in interest rates.
Nondec/committee days – % of committee days with no change in interest rates.
IR1M – one-month money market rate.

However, as emphasized in Rozkrut et al. (2007), and evidenced in Table 12, differences in the surprise component of the analyzed central banks' decisions can also be explained by other factors than communication.

[26] However, when one-month WIBOR rate quotation was set before the central bank decision was made public, the following day figure for the change in the money market rate was taken into account.

One common finding for the analyzed central banks is that decisions on the change in interest rates produce, on average, more surprise to the market ($|MSC_{dec}|$ – rows: 2, 6, 9) than decisions on no change in the level of monetary instruments ($|MSC_{nondec}|$ – rows: 3, 7, 10).[27] This difference in the surprise component is much larger for the CNB and MNB than for the NBP. At the same time, the proportion of decision days in the total meeting periods for the Czech and Hungarian central banks is much lower than in the case of the NBP (rows 11–12).

The initially obtained picture of central bank predictability is also influenced by the varying degree of market interest rate *volatility*. Since absolute changes in one-month interest rates in Poland and Hungary are on average much higher than those in the Czech Republic (row 4), accounting for this factor in calculating the monetary surprise component brings about completely different results in terms of central bank predictability (rows 5–7). Finally, taking into account differences in the *level* of interest rates in the analyzed markets is another approach that reorders the initially obtained classification (rows 8–10).

It should thus be remembered that there are factors not related to central bank "talk" that explain the differences in the monetary surprise components in various countries. However, since the focus of this study is on the effectiveness of central bank communication, the key question is to what extent the statements of policy makers impact on the predictability of central bank decisions?

To this end, we investigate whether the frequency of statements and unanimity among policy makers matter for the effectiveness of central bank "talk". Following Rozkrut et al. (2007) the absolute monetary surprise component on the committee days is regressed on the *stock* and the absolute value of the *consensus ratio*, as stated in the Eq. (4):

$$|MSC_t| = \beta_0 + \beta_1 stock\_ratio_t + \beta_2 |consensus\_ratio_t| + \sum_{j=1}^{m} (\lambda_j^{mac} mac_{j,t}) + \varepsilon_t \quad (4)$$

$stock\_ratio_t = \sum_{i=1}^{n} (SUM_{t-1}^{ST^{MP}})$ – number of statements in the inter-meeting period, where:

$SUM_t^{ST^{MP}}$ – the number of statements on day t

n – the number of days that have gone by since the previous committee day

$consensus\_ratio_t = \dfrac{\sum_{i=1}^{n} (\sum_{j=1}^{k} (ST_{t-i,j}^{MP}))}{\sum_{i=1}^{n} (SUM_{t-i}^{ST^{MP}})}$ – the net-balance of monetary policy inclination statements in relation to the total number of statements in the inter-meeting period

$mac_{j,t}$ – the j^{th} macroeconomic data surprise

The absolute value of the *consensus ratio* increases with policy-makers' comments approaching unanimity. It takes the maximum value of *+1* when all statements in the inter-meeting period indicate the same monetary-policy inclination.

In addition, one might expect that news on macroeconomic data might also influence the predictability of policy decisions, as well as central bank communication. In order to deal with an omitted variable bias macroeconomic surprises have been included among the explanatory variables in Eq. (4). At the same time, contrary to Ehrmann and Fratzscher (2005), we do not build an index of macro-surprises, for the news releases for different data should be of different importance to market participants and central bank decisions.

Since the absolute monetary surprise component has to be a non-negative value, it requires the estimation of the Tobit model. The results reported in Table 13 (column 1) indicate that more frequent communication, or an increase in the *stock ratio*,

[27] Similar results have been reported in Ehrmann and Fratzscher (2007a) and Wilhelmsen and Zaghini (2005).

leads to increased predictability of central bank decisions. Moreover, the monetary surprise component decreases with the policy makers' statements approaching unanimity, or with the rise in the absolute value of the *consensus ratio*.

Table 13
The impact of central bank communication on the monetary policy predictability

Dependent variable	|MSC|		$\|MSC^{adj}\|$	
	(1)	*(2)*	*(3)*	*(4)*
β_0	**0.2547***** *0.0001*	0.0302 *0.7364*	0.1163 *0.1287*	-0.084 *0.4117*
β_1	**-0.0168***** *0.0028*	**-0.0158***** *0.0052*	**-0.0125**** *0.0423*	**-0.0121**** *0.0472*
β_2	**-0.1615**** *0.045*	**0.1933**** *0.0346*	**-0.1564*** *0.0903*	**0.1738*** *0.099*

In columns (1) and (3) explanatory variables as in Eq. (4). In columns (2) and (4) explanatory variables as in Eq. (5).
P-values are shown in italics below the coefficients. ***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.

The regression is also run for the absolute surprise component of the monetary policy decision adjusted for the average volatility of one-month interest rate over the last ten days preceding the meeting day. Since on some occasions that volatility was close to zero, putting it in the numerator would largely increase the value of the dependent variable. Therefore, the adjusted absolute MSC has been calculated as: $|MSC^{adj}|=\max(0;|MSC|-\overline{\Delta WIBOR1M})$, where $\overline{\Delta WIBOR1M}$ stands for the average absolute change in the one-month money market rate over the last ten days preceding the committee day.

The advantage of this approach is that it accounts for a change in money market rate on the committee day, being the result of interest rate volatility that simply reflects higher interest rate level or the period of increased market uncertainty caused by factors other than monetary policy statements. Adopting such a measure seems to be particularly justified in light of the fact that the large part of the sample period covers the NBP disinflation policy accompanied by the gradual interest rate reduction from double digit levels. The lack of scaling factor could therefore disturb the results.

The results of the regression run for the $|MSC^{adj}|$ (Table 13, column 3) confirm the previous findings that more frequent communication leads to increased predictability of central bank decisions and that the monetary surprise component decreases with the policy makers' statements approaching unanimity. One difference, however, is that the statistical significance of the β_1 and β_2 coefficients somewhat weakens.

Furthermore, the regression is run again with a *consensus ratio* replaced with an alternative measure of the *dispersion ratio* used in Jansen and de Haan (2006) and Ehrmann and Fratzscher (2005), which is reflected in the following equation:

$$|MSC_t|=\beta_0+\beta_1 stock\_ratio_t+\beta_2 dispersion\_ratio_t+\sum_{j=1}^{m}(\lambda_j^{mac} mac_{j,t})+\varepsilon_t \quad (5)$$

$$dispersion\_ratio_t=\frac{\sum_{p=1}^{N-1}\sum_{q=p+1}^{N}|ST_p^{MP}-ST_q^{MP}|}{\frac{1}{2}(N^2-D)}, \text{ where:}$$

$N=stock\_ratio_t$

$D=1$ if N is an odd number

$D=0$ if N is an even number

The value of this measure ranges between *0* (for unanimous communication) and *+1* (for totally dispersed statements).

On the one hand, properties of the *consensus ratio* seem to be superior to those of the *dispersion ratio*. For example, the latter measure does not differentiate between a situation when one tightening and one easing statements are made from a situation when policy makers make two tightening (easing) and one easing (tightening) comments in the inter-meeting period. In either case the *dispersion ratio* takes the value *+1*.

On the other hand, however, there are at least two advantages of using the *dispersion ratio*. One is that it allows us to check for the robustness of the initially obtained results; the other is that this ratio was used in Ehrmann and Fratzscher (2005) to explain central bank decisions predictability. Therefore, applying it in this study enables us to compare the findings obtained for the NBP with those for other central banks.

The results shown in Table 13 (columns 2 and 4) do not change the initial conclusions and confirm that the predictability of monetary policy decisions increases with more frequent communication and with statements approaching unanimity.

In addition, the figures reported in Table 14 compares the results obtained for the NBP with those for the Federal Reserve, Bank of England, and the ECB. They show that an increase in the frequency of NBP communication improves predictability of monetary policy decisions in a similar way as the statements made by the Bank of England and, to a lesser degree, the Federal Reserve policy makers. Contrary to that, a rise in the dispersion of statements made by the Polish MPC members increases the monetary surprise component by far more than in the case of the G3 central banks. Moreover, the average value of the dispersion ratio of the NBP communication exceeds significantly the figures reported for other countries, which might suggest that deviations from consensus-based communication accounts for a large share of the monetary surprise component in Poland.

Table 14
Central bank communication and monetary policy predictability in Poland, the United Stated, the United Kingdom and the euro area

Impact on |MSC|				
	NBP	FED	BoE	ECB
stock_ratio	-0.016***	-0.010*	-0.017***	(–)
dispersion_ratio	0.172**	0.041*	0.106***	0.029*
Average values				
	NBP	FED	BoE	ECB
av. stock_ratio	9.1	2.5	1.0	1.9
av. dispersion_ratio	0.810	0.278	0.074	0.145
av. |MSC|	0.113	0.034	0.048	0.030

***, **, * indicate significance at the 99%, 95% and 90% levels, respectively.
Data for the Fed, BoE and ECB based on Ehrmann and Fratzscher (2005) and calculated for 1999–May 2004 period.

However, relatively low average values of dispersion ratio in the G3 central banks may be simply due to their much less frequent statements compared with the number of comments made by the Polish MPC members. This is particularly evident in the case of the Bank of England, where the average value of the stock ratio equals *1*, and thus it is very likely that on many occasions there was only one statement made in the period between the BoE consecutive committee days. In such circumstances, dispersion ratio always equals *0*, which significantly affects the average value of this measure over the whole sample period. The frequency of the ECB and the Federal Reserve communication is on average also much lower than that of the NBP.

While analyzing the results reported in Table 13, one may also note that predictability of central bank decisions may be lower when interest rates are changed, as evidenced in this section. Therefore it cannot be excluded that such circumstances could influence communication in the period preceding the committee day. To test whether the

communication variables in Eq. (4) and Eq. (5) are endogenously determined with the absolute monetary surprise component, the Hausman test is applied. If the endogeneity were present, a communication variable, say, the *consensus ratio*, would be instrumented through various factors that might influence the degree of consensus between policy makers, but at the same time would be orthogonal to this ratio as well as to the forthcoming monetary policy decision. This procedure, however, has proved unnecessary in light of the endogeneity test results.

To sum up, irrespective of the modifications to the method originally applied, the results reported in Table 13 all indicate that the surprise component of the NBP decision decreases with the rise in the frequency of policy makers' statements. This seems to reflect an inherent feature of the sound communication policy, namely that providing the public with an increased stock of *useful* information should enhance monetary policy predictability.[28] Another finding is that the predictability of central bank decisions increases with policy makers' comments approaching unanimity. This, however, does not have to imply that some MPC members should abstain from going public with their opinions simply because they differ from views shared by the majority of policy makers.

In the *genuinely collegial committees*, which reach their decisions through a consensus and intend to build an aura of full agreement, presenting dissenting opinion would most likely be damaging to the effectiveness of central bank policy (Blinder, 2007). Contrary to that, in *individualistic committees* like the Polish MPC, where each policy maker votes individually and central bank decisions are taken by majority, providing the public with different views and opinions may in fact increase transparency of monetary policy. The reason is that this may help the markets to learn about the group dynamics, that is what majority is to prevail over the next meetings, and thus which decisions are to be made.

Therefore, going public with distinct groups of opinions, though at the cost of the communication consensus, may sometimes be more informative than unanimous statements made by a limited number of MPC members who represent only one side of the coin, and thus blur the actual majority dynamics. Clearly, if *different* policy makers speak with one voice, predictability of the central bank decision should be even higher. This, however, may not necessarily be the case when communication consensus is achieved at the cost of reduced MPC representativeness.

Notwithstanding the benefits stemming from "minority" comments, one should remember that the heterogeneous communication under individualistic committees is subject to the risk of speaking with too many voices, which would result in cacophony rather than clarity (Blinder, 2007). Confusing the markets and the public is likely especially when it is difficult to identify a particular policy maker with either a dovish or hawkish faction. Clearly, a tightening statement of the hawkish central banker has different meaning than that of the dovish policy maker. In this context, the minutes and voting records may constitute vital communication instruments. Therefore, publication of voting records by names may have greatly contributed to the ability of market participants to group the Polish MPC members into hawkish, neutral, and dovish policy makers, and thus to the more effective central bank communication.[29]

[28] The *usefulness* of an additional information released is emphasized in order to contrast with a situation of the simple increase in the stock of information, which does not necessarily enhance the public's understanding of monetary policy (see, e.g., Winkler 2000).

[29] Indeed, as pointed out in Rozkrut et al. (2007), the survey that they conducted among international investment banks proved that respondents had little difficulty to distinguish hawks, doves, or neutral policy makers in Poland and the Czech Republic, whose central banks published voting records and minutes, respectively. However, surveyed economists reported a lot of problems to produce such a classification for the Hungarian MPC members, for whom neither minutes nor voting records were available in the period under analysis. In May 2007, the NBP started to publish minutes. The analysis in this study, however, covers the 2001–2006 period, and thus does not include the events of the minutes release.

Conclusion

The paper presents an in-depth analysis of the effectiveness of central bank communication. It examines the impact of policy-makers' statements on financial asset prices as well as on the predictability of monetary policy decisions in Poland.

A simple frequency analysis points to a high inflation bias in the NBP communication. Moreover, it indicates that comments made by MPC members are highly critical of fiscal situation, with the Governor being particularly active in this area.

Applying the EGARCH (1,1) framework, we show that the central bank "talk" does influence the behavior of financial markets. The strength and significance of this effect differ among countries, vary with the horizon of the potential interest rate movements and largely depend on the adopted form of communication. The most powerful are statements conveying information on monetary policy inclination, followed by comments on the economic outlook. Contrary to that, communication on the exchange rate and fiscal situation turn out to be inefficient, with the latter only increasing the volatility of financial markets.

Moreover, we provide empirical evidence that if market participants react to ambiguous central bank signals, it is only in the case of communication conveying information on monetary policy inclination, whereas other statements are effective only when made in a clear-cut manner. The likely explanation behind this finding is that it is the future interest rate path, not least in the short-term, that belongs to the area where information asymmetry between the central bank and the public is the largest. Therefore, market participants should be most vigilant to central bank communication when it is related to the future interest rate path and react even to vague signals.

Furthermore, the obtained results indicate that central bank communication influences financial asset prices in an asymmetric manner. In particular, market participants react more to tightening than easing MPC statements and negative economic outlook comments are more influential than positive ones.

Moreover, this study contributes to the literature by investigating whether various individual characteristics of policy-makers may influence their ability to affect financial market behavior. In particular, we find that market participants pay much more attention to the comments made by policy makers who usually win voting than to the statements made by the often outvoted MPC members. Furthermore, policy-makers who are relatively "reticent" and match their words with deeds influence asset prices more than MPC members who are "talkative" and inconsistent, respectively. Additionally, we find that the impact of a policy-maker's comments on financial market behavior depends on whether he or she represents a hawkish, dovish or neutral faction within the MPC.

Finally, we provide empirical evidence that not only central bank communication affects financial asset prices, but it also influences the predictability of monetary policy decisions. One finding is that this predictability increases with the frequency of policy makers' statements. This seems to reflect an inherent feature of the sound communication policy, namely that providing the public with an increased stock of useful information should enhance monetary policy predictability. Another result is that the monetary surprise component decreases with MPC members' comments approaching unanimity. This, however, does not have to imply that some policy-makers should abstain from going public with their opinions because they differ from views shared by majority of the speakers. The reason is that in an individualistic committee, like the Polish MPC, providing the public with different views may help the market to learn about the group dynamics, that is what majority is to prevail over the next meetings, and thus which decisions are to be made. Communicating diversity of opinions may thus not necessarily run counter to transparency.

Appendix: Examples of the reports from newswire services and their classification

Polish Ctrl Bker: Nov Curr Acct Good, Future Less Bright

Dow Jones International News, 16:37,2 January 2001

WARSAW – (Dow Jones) – November's dramatic narrowing in the Polish current account deficit shouldn't blind markets to uncertainty about whether improvements in the payments balance can be sustained, or to increasing downside risk to the resurgent zloty, central bank Monetary Policy Council (RPP) member Boguslaw Grabowski said Tuesday.

"Despite the good (November) results, the chances for further current account improvement in 2001 are less than clear," Grabowski told Dow Jones Newswires in a telephone interview.

He said slowing growth in Western Europe, the stronger zloty, and an expected uptick in domestic demand early this year could diminish Poland's export performance and boost imports.

In addition, Grabowski warned that foreign investors' aggressive buying of Polish debt securities had pushed the Polish currency to unjustifiably high levels in recent days.

"My feeling is that the zloty exchange rate has significantly exceeded levels justified by the economic fundamentals. Investors should keep in mind the possibility of a market overshoot and remember to hedge currency risk," he said.

Evaluation: ST^{FX}=-1=ST^{FX_depr}

Polish Q3 growth may be sustainable-MPC member.

Reuters News, 10:05 GMT, 22 August 2003

WARSAW, Aug 22 (Reuters) – Poland's Monetary Policy Council member Grzegorz Wojtowicz said on Friday recent upbeat macroeconomic data showed that the country's economic recovery may be breaking through to sustainable high growth.

"These are clear signals showing that the third quarter should be a breakthrough. All implies that the growth is sustainable and may last for a longer time," Wojtowicz told Reuters.

Evaluation: ST^{EC}=+1=ST^{EC_pos}

Polish Ctrl Bk Slawinski: Policy Must Shift On Weak Data

Dow Jones International News, 14:04 GMT, 20 June 2005

WARSAW (Dow Jones)--Weak economic data over the past month show Poland's central bank must adjust its policies to combat slumping demand and growth, central banker Andrzej Slawinski told Dow Jones Newswires Monday.

Evaluation: ST^{MP}=-1=ST^{MP_ease}

Rising Polish debt burden a warning sign-Balcerowicz

Reuters News, 11:32 GMT, 22 November 2005

POZNAN, Poland, Nov 22 (Reuters) – Poland's public debt expanding faster than its economy as a whole is a cause for concern and underlines the need for public finance reform, central bank governor Leszek Balcerowicz said on Tuesday.

Evaluation: $ST^{FP}=+1=ST^{FP\_bad}$

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