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Who's Right and Who has the Right to speak?

- Predictability of ECB Communication

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*"Communication does not substitute for action. But it can help to fill the information gap on which the need for action is sometimes predicated". (Jean-Claude Trichet)*

# 1 Introduction

Central banking has experienced some significant changes during the last decades. While conveying the information to the public, many central banks (CB's) favor nowadays transparency. Increasing weight of transparency, with a help of new technologies like internet, has expanded the amount of information CB's produce. At the same time transparency has got bigger role as a feature of monetary policy: CB's in Sweden, New Zealand, Canada and U.K has increased transparency by publishing the explicit inflation targets and inflation forecasts, ECB organizes press conferences after the monthly meetings and Fed started to publish its short-term interest-rate target forecasts in January 2012. These actions demonstrate the new, transparency-oriented, conventions of the monetary policy. As citation of the governor of the European Central Bank (ECB) indicates in the front page, communication discussion has become a part of the everyday decision-making process in central banks.

Transparency is defined in various ways (see Faust and Svensson (2001), Eijffinger and Geraats (2006)), but in its simplest form it improves openness, clarity and general public's understanding of central bank's policies (Winkler (2000)). Transparency is closely linked to discussion about central bank credibility, which according to Blinder (2000) means simply matching the deeds to words. The role of communication as a requirement for credible monetary policy is also emphasized among the central bankers. Jean-Claude Trichet (Trichet (2007)) has argued that: "Central banks are prudent in their communication to always preserve their credibility in all circumstances". In that context a central bank is credible only if people believe what it says, that is, in addition to publish understandable information (transparency) central bank must also commit to its words (credibility).

These two topics, transparency and credibility, are the main motivators in this thesis. Various studies have earlier proved that CB communication matters, or it can be used to change the financial market expectations and affect the stock and bond prices. Literature on the efficiency of communication is quite new but already rather wide. Still, there is a research gap especially in the empirical communication studies, which have focus on the crisis communication. Geraats (2002) writes that the role of communication is emphasized under uncertainty because of the innumerable sources of incomplete information. Nevertheless, especially under uncertainty about future policy path CB should communicate the uncertainty clearly if it has effect on the monetary policy decisions. In that perspective CB communication should be as clear as possible on individual but also on group level during the unstable economic situation.

This thesis examines, how well The European Central Bank succeeded in improving transparency and credibility in terms of predictability in central bank talk. Predictability in this context means, how well communication forecasts the forthcoming policy decisions. It has focus on the international news, and the research material is collected from the worldwide known news agency Reuters' archive.

Focus of this paper is on the communication of the ECB policy-makers in 2007-2010. It examines the content of the CB communication and possible asymmetry in information among the central bankers, i.e. the members of the Governing council. The purpose is to find, how is the communication constructed in a quantitative way, i.e. which countries has the best access to public via media compared to others. After that qualitative aspects are taken into account to test, how the stances of individual policy-makers differ and how consistent they are with the actual decisions concerning monetary pol-

icy. Evaluation of the predictability of communication is made by comparing the performance of communication variables and Taylor-type macroeconomic variables in target rate setting. The main hypotheses are following:

*Hypothesis 1. Communication contains information about the future changes in ECB monetary policy.*

*Hypothesis 2. Information was asymmetric among the policy-makers in the ECB: central bankers of the big economies had statements, which predicted the future changes in monetary policy better than statements by other members.*

Articles written by Jansen and de Haan (2006), Jansen and De Haan (2009) and Hayo and Neuenkirch (2010) are closest to this study. Jansen and de Haan (2006) and Jansen and De Haan (2009) examine the consistency of the ECB communication during the first years after establishment of EMU, in 1999-2002. They used Taylor rule as a methodological framework, and added communication as one explanatory variable in regression. The conclusion is that decisions are most closely linked to changes in forward-looking macroeconomic indicators: inflation expectations and economic sentiment. Communication, however, is additional help in modelling target rate decisions in the ECB, but it didn't perform better than Taylor-type variables in the estimations.

Hayo and Neuenkirch (2010) studied communication conventions in Federal Reserve in 1998-2006, also using forward-looking Taylor rule as an econometric framework. In their study compared to Jansen and De Haan (2009), communication had bigger role in predicting target rate decisions: their results suggest that especially the more informal part of Fed communication, like speeches of policy-makers, contain valuable information about future

monetary policy changes.

This study has focus on the consistency of the communication with upcoming target rate decisions in 2007-2010, and its contribution is twofold. Special feature of the time period is that from 2007 onwards financial crisis had significant weight on world economy and Euro zone monetary policy decisions. Therefore, the paper examines communication strategy under high economic instability, which has not been introduced in the earlier literature. Secondly, this paper has exceedingly individualistic approach. It discusses communication strategies at collegial *and* individual level and examines communication of selected individual central bankers separately. Earlier studies have taken the Governors of the CB's into consideration<sup>1</sup>, but the individual opinions of other central bankers have been ignored.

This study assumes that communication is asymmetric between CB and public but also among policy-makers in the European Central Bank. Theory of asymmetric information in CB decision-making is discussed by Weber (2010) and Tang and Yu (2009). This paper follows Weber's research, where asymmetric or imperfect information is divided into two parts: asymmetry concerning the economic outlook and asymmetry related to policy preferences of the policy-makers. The paper emphasizes the latter aspect by focusing on the preferences of individual policy-makers. It assumes that although ECB has collegial decision-making process<sup>2</sup>, individuals' preferences may vary, which

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<sup>1</sup>see for instance Ehrmann and Fratzscher (2007b)

<sup>2</sup>The decisions are based on majority consensus rule. Every governor and Board Member has one vote and in case of a tie president makes the final decision. Based on the consensus rule, decision-making process in the ECB is closed in a way that individual votes with possible dissents are not published, which has a significant difference to the Federal Reserve in United States. Despite the different voting structures in the CB's, it seems that quality of decisions is equal. Blinder and Morgan (2005) find that group decisions are on average better than individual decisions, regardless of whether the groups

can be seen through the communication process. The differences in policy-makers communication lead to differences in the predictive power of the information they reveal to the public. The asymmetry among the preferences was a focus also in the study by Heinemann and Huefner (2002). Their results gave some weak support for the impact of regional differences in the ECB decisions making process and that national perspective of the policy-makers may cause some bias in the ECB reaction functions. This study has a different perspective and it assumes that in the ECB some policy-makers has information advantage over others, which causes differences in the communication process.

The main finding is that ECB communication included information about the future changes of ECB main refinancing rate during the crisis period, in 2007-2010. In addition to that the study showed that by following the representatives of the big economies of the Euro zone in the ECB communication, it is easier to predict the changes in the target rate than following communication of the central bankers of smaller economies. In that sense the results suggest that different sources of ECB communication are not equally informative, and representatives of bigger economies has information advantage or they are more willing to present their views in the public compared to the members of smaller economies.

## **1.1 Earlier literature**

Blinder, Ehrmann, Fratzscher, de Haan, and Jansen (2008) divide the goals of the communication policy studies into two: they concentrate on topics, how communication can be used to manage expectations by creating news  

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make decisions by unanimity or majority rule.

and secondly by reducing noise. Creating news relates to effectiveness of communication, i.e. how CB announcements affect expectations and move financial markets by revealing new information about the monetary policy developments or the economy outlook.

Although influence of communication causes some disagreements among researchers, main contribution of earlier communication studies is that CB communication is effective, i.e. it enables market movements. Evidence suggests that communication is effective and financial markets react to information that central banks provide to private sector agents (e.g. Andersson, Dillen, and Sellin (2006), Ehrmann and Fratzscher (2007b))<sup>3</sup>. Still, though the effects of communication are acknowledged in the literature, they may vary widely according to who's speaking and which market is in focus.

In classification of Blinder, Ehrmann, Fratzscher, de Haan, and Jansen (2008) reducing noise means that the higher predictability of monetary policy decisions has advantages in form of decreased uncertainty in the market. Poole (2001) argues that market participants make more efficient decisions when they can correctly predict central bank actions. This means market participants have all the information they need to assess the developments of the economy, which decreases the uncertainty in the market. Although both topics, creating news and reducing noise, have been studied widely, surprisingly few empirical studies have been written about the content of CB communication and its predictability, i.e. the consistency between communication and actual monetary policy decisions. Figure 1 shows the distinction between predictability literature and efficiency literature: in the latter, the words get even more weight than the actual monetary policy decisions through the com-

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<sup>3</sup>see also Rosa and Verga (2007), Bernanke and Kuttner (2005) and Bomfim (2003) about efficiency.

munication process. Here market participants follow the CB's assessment of the economy closely and make their own evaluation based on those assessments. The information comes across to the market participants, despite the monetary policy decisions (lower row). Kohn and Sack (2003) focused on Fed's communication in 1989-2003. They discussed FOMC statements, Alan Greenspan's testimony and speeches by Alan Greenspan and compared these news effects to different market indicators. They argued that Treasury forward rates, which has maturity more than one year, are driven more by what the FOMC says than what it does, but the effects were conditional on the topic of statements.

On the other hand, markets are also interested in the forthcoming changes in the monetary policy. Therefore, communication must be assessed based on, how well it predicts the future stance of monetary policy. When market participants can anticipate the changes in the monetary policy, it reduces uncertainty in the market. In this theory the first step is to assess, how well the communication contains information about the monetary policy changes (first upper row) and after that study, how well market participants can anticipate the policy changes based on the communication (second row).

Although CB communication has been in scope of recent research, broad

Figure 1: Effectiveness of communication



understanding of the role of CB communication especially under the crisis is still limited. Main conclusion of the studies has been that CB communication is effective in terms of enhancing market movements. It is widely argued, that communication matters especially in interest rate markets. That is because CB has monopoly over the monetary policy decisions, which is the main driver to future interest rate path. Because of the CB's position it is inevitable that it knows more about its own thinking than the public does. Communication is meant to fill the gap of asymmetric information between CB and public. In addition, CB may have superior information on the economic outlook compared to other information providers, like commercial banks and research institutions. That is because CB usually devote more resources than private sector to forecasting (Blinder, Ehrmann, Fratzscher, de Haan, and Jansen (2008), see also Romer and Romer (2000)). Various studies find that financial markets react to the information on the economic outlook and inflation that CB provides. For instance Andersson, Dillen, and Sellin (2006) argued that inflation forecasts had significant effect on the term structure of interest rates in the case of Swedish Riksbank.

Communication effectiveness depends not only on the content, but also on the source of information and timing of communication. Ehrmann and Fratzscher (2007b) compared the communication effectiveness of the ECB and Federal Reserve (Fed) in 1999-2004. In the case of the ECB financial markets react to statement by all policy makers in a similar way, but in Fed governors' statements are watched more closely than other policy makers. In their other article, Ehrmann and Fratzscher (2007) concluded that not only policy makers status matters, but also statements which are line with the current monetary policy stance, or which are so called neutral stances, weigh more in financial markets. Thirdly, the timing of communication may be crucial. Ehrmann

and Fratzscher (2009) found that communication, which is expressed during the silent period before the monetary policy committee meetings, has powerful effects on the market compared to communication outside the silent period.

Although many researchers have noticed the CB's powerful role as a market mover, deep understanding of the content of communication has been ignored in most studies. The interest to the subject has arisen quite lately, and for instance Bulir, Cihak, and Jansen (2012), Bulir, Cihak, and Smidkova (2012) have assessed the clarity of content of the CB communication also in the ECB. Their analysis stated that written communication (press releases, monthly bulletins) is clear in about 85-95 % of instances. By using methods of qualitative research it is possible to create new aspects to theories of CB communication. This thesis combines theories of communication studies (content analysis) and central banking theories to develop the understanding of communication policy and its evaluation.

## **1.2 Monetary policy actions during the crisis**

Before the empirical analysis, it is essential to distinguish the words and deeds of monetary policy decision makers. As communication is often seen as a tool to prepare markets for forthcoming changes in the monetary policy, it is crucial to introduce briefly the decisions made during the crisis.

Several studies have concluded that especially unanticipated CB actions have significant consequences in the market. Bernanke and Kuttner (2005) found that market reactions were larger to target rate cuts compared to hikes. In their research an unexpected 0.25 % reduction in federal funds rate leads to 1.3 % increase in S&P500 composite index. Bomfim (2003) concentrated on

the intra-day surprise effects as well and found that positive surprises with relation to monetary policy tend to have larger effect than negative surprises. Under transparent monetary policy CB actions should be *predictable*. Predictability is synonym to the ability of market participants to anticipate the upcoming monetary policy decisions. It means that the unexpected component of the monetary policy meetings should be low on the meeting days of monetary policy committees. The presumption is that market participants make more efficient decisions when markets can correctly predict central bank actions (Poole (2001)). Increased predictability is naturally in central bankers' interests, although it has main focus in its mandate. As former ECB Governing Council member Mario Draghi has said: *Central banks take account of (market) expectations but they do not loose sight of the fundamentals. Avoiding surprising the markets is preferable, it may not always be possible; it is essential for price stability that it is the actions of the authorities that drive the market, not vice versa* (Factiva 11.7.2007).

Predictability consists of two measures: the first is that market participants can forecast the change in CB target rate in scheduled meetings. Second measure, which was emphasized especially at the time of crisis, is that market participants can expect when there are changes coming, i.e. that all the decisions are scheduled beforehand.

Here predictability is based on the median and range of market forecasts of target rates before monetary policy decisions. Predictability improves if consensus expectations are equal to actual decisions concerning target rates and if the range in expectations is as low as possible. Table 1 introduces the forecasts and actual decisions of changes in the ECB main refinancing rate, which is the main instrument of monetary policy.

In forecasts median and range represent the expectations of market partic-

Table 1: Monetary policy meetings and expectations in 2007-2010

ECB			
Date	Median forecast	Range	Actual
January 2007-June 2008	Equal to actual	No range	
3.7.2008	4.25%	4.0%/4.25%	4.25%
7.8.2008	4.25%	4.25%/4.25%	4.25%
4.9.2008	4.25%	4.25%/4.25%	4.25%
2.10.2008	4.25%	4.25%/4.25%	4.25%
8.10.2008 (unscheduled*)			
6.11.2008	3.25%	3.0%/3.5%	3.25%
4.12.2008	2.75%	2.25%/3.0%	2.5%
15.1.2009	2.0%	2.0%/2.5%	2.0%
5.2.2009	2.0%	1.5%/2.0%	2.0%
5.3.2009	1.5%	1.25%/1.75%	1.5%
2.4.2009	1.0%	1.0%/1.5%	1.25%
7.5.2009	1.0%	1.0%/1.0%	1.0%
4.6.2009	1.0%	0.5%/1.0%	1.0%
2.7.2009	1.0%	0.75%/1.0%	1.0%
August 2009-December 2010	no changes		no changes

\*=0.5% reduction in target rate

ipants, and they are computed from the Reuters consensus figures. The research period was 2007-2010. Predictability is measured by firstly comparing the expectations, i.e. median forecast from Reuters consensus before the target rate decisions, to actual rate decisions. Secondly, range of the forecast is included to find out, if there is deviation among the consensus expectations<sup>4</sup>.

<sup>4</sup>forecast figures are usually collected from the biggest commercial banks in the Euro zone. Number of pollers was approximately 80 in the Euro zone.

The key conclusion is that in this simple comparison of market expectations and realized monetary policy decisions it seems that financial crisis had negative effects on the predictability of monetary policy decisions. In pre-crisis period January 2007-June 2008, the market forecasts were equal to actual target rate decisions and there was no range in expectations, i.e. the monetary policy was very predictable in this context. Situation changed rapidly in July 2008, when ECB started its target rate reductions. The range of forecasts was unequal to zero in 9 meetings, which is 18 % of all meetings. In euro zone, the period with increased range of forecasts lasted one year until July 2009, and after that actions were again predictable with no policy surprises or ranges in forecasts. The crisis period included two monetary policy surprises and one unscheduled interest rate decision, which was made with the Federal Reserve in October 2008.

The results indicate that monetary policy decisions were less predictable during the financial crisis compared to pre-crisis time. In ECB, policy was very predictable during the pre-crisis periods, before target rate reductions began in the euro area. Decreased predictability of monetary policy decisions indicates that there were some bias also in monetary policy communication, which gives market participants information about the future changes in the monetary policy.

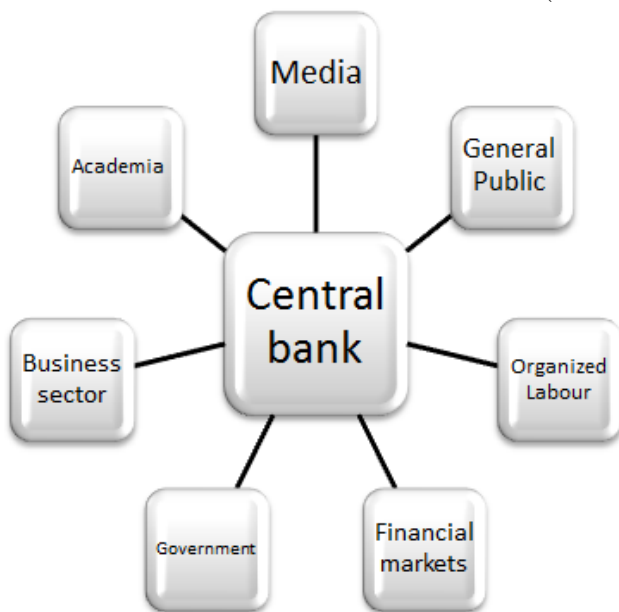
### **1.3 Forms of Central Bank communication**

This thesis uses *CB communication strategy* as a framework to communication analysis. Communication strategy simply includes all the official and unwritten rules which policymakers follow when communicating in public. Official part of communication strategy is easy to observe, because it in-

cludes all the scheduled communication in the CB. Unwritten rules are more complicated: they are principles, what policymakers are allowed to say and what not, and the only way to observe it to read between the lines, or interpret the content if the communication.

Smart (2006) defines communication strategy as:”a complex, technology-mediated collaborative activity through which the (Central) Bank orchestrates its discursive interactions with the outside groups–”(p.140). Communication strategy includes all the conventions and habits, which are applied to external communication with CB’s interest groups and internal communication within CB personnel. The chief of the Communications Department in the Bank of Canada concludes in book by Riffe, Lacy, and Fico (2005) that external communication is the most visible part of CB communication strategy. External communication includes conveying CB information to main interest groups, which are listed in Figure 2.

Figure 2: Central Bank’s external communication (Smart 2006, p: 140)



Designing communication to financial market participants is very different than designing communication to general public or media. Communication strategy designer must keep in mind that general public is not expert on monetary policy, and there are limitations, how much information people are able to receive, as Kahneman (2003) has showed. The professional status of CB brings new challenges to the communication design and adds special features into the communication. That is why the range of different sources of external communication is wide. Extensive list of communication sources is found in Appendix.

The amount of published written communication is greater than oral communication. Usage of written texts is usually high in highly specialized institutions like central banks, where the knowledge must be stored. According to Smart (2006), "a written genre (text) can be viewed as a communal rhetorical strategy encompassing texts, composing processes, reading practices, and social interactions, a strategy that allows a professional organization to regularize writer/reader transactions in ways that ensure (or at least encourage) the reliable, consistent production of specialized knowledge" (p.201). Written communication is CB's main tool to convey specialized information about monetary policy to public using the most convenient way.

Although the amount of published oral communication is still low, it will most likely expand in the future, as technological improvements and CB's increased interests towards improving transparency make new communication channels, for instance live webcasts of policy makers speeches, more available to the public.

## 2 Empirical part

Recent years, especially from 2008 onwards, have been challenging for the economies around the world and forced central banks (CB's) to choose unconventional monetary policy tools in apart from the common instruments. After the collapse of Lehman Brother, which was consequence of the burst of the housing bubble in the U.S, financial crisis developed and spread rapidly to the real economy and financial sector by freezing the international banking system. The housing market in the U.S crashed, which had significant effects on real economy in U.S and globally.

The financial crisis was realized in European banking system in November 2008 as the banking and insurance giant Fortis was partly nationalized. Already before that, in December 2007, the European Central Bank (ECB) started to add the funding in the banking system but the target rate reductions started not before October 2008: the ECB cut its policy rate by 3.25 percentage points to 1.0 percent between October 2008 and May 2009.

The second wave of the crisis, debt crisis in Europe, began in October 2009, when Georg Papandreou, Prime Minister of Greece, told that his country's finances are in "a state of emergency". A few months later, in May 2010, Greece became the first Euro zone country to receive a bailout. During the same month, ECB announced program to buy government bonds of Euro zone members from the secondary markets. The threat of collapse in European banking sector urged the ECB to support banks by using short and longer-term financial operations to ensure liquidity in the system.

The monetary policy actions of the ECB were introduced earlier, and the conclusion was that the communication of the ECB was well predictable before the crisis period in terms of consensus forecasts and range of forecasts. Predictability, which is closely linked to communication transparency, belongs

also to central bankers' interest:

”Bouts of economic and financial market turbulence over the past 25 years have shown policymakers that transparency is the best protection against contagion from such events– lucid analysis, speedy action, and consensus between experienced heads will also help minimize contagion.” (Trichet (2007))

In the citation, the ECB governor mentions consensus-seeking policy as one of the turbulence minimizers. Furthermore, collegial decision-making strategy functions well, when the communication strategy is collegial, too. Ehrmann and Fratzscher (2007b) have examined the communication strategies of the ECB, Bank of England and Fed in 1999-2004 (ECB and Fed) and 1997-2004 (BoE). They defined the communication strategy in the context of decision-making process and wrote that ”when designing a communication strategy, a central bank has to decide how the individual committee members should communicate with the public, in particular how and whether they should communicate their personal views” (p.510). While defining the strategy classification was made into two: *collegial* strategy and *individualistic* strategy. In collegial communication strategy policymakers' opinions are consistent with each others, whereas under individualistic communication strategy these opinions may conflict. One of the main conclusion was that communication was collegial among ECB policy-makers.

In this thesis I assume that especially under the crisis communication strategy tends to change into more individualistic direction in the ECB, which follows collegial communication strategy otherwise. The argument gets support from the study by Bulir, Cihak, and Jansen (2012), who argued that global financial crisis made the communication less clear (in terms of decreased unanimity) in a wide set of CB's.

Under individualistic communication strategy also the predictability in the communication of each individual must change, and it is possible to find differences among the central bankers when it comes to predictability of communication. The consensus-seeking policy is most predictable, when communication is as collegial, i.e. consensus-seeking, as possible, as Ehrmann and Fratzscher (2007b) have suggested. In this part of the thesis I examine whether the predictability of communication is unequal among the policy-makers.

Measuring central bank communication requires the *content analysis* of the communication. In examination CB communication patterns using content analysis is crucial, because we cannot observe the predictability or effects of monetary policy communication without knowing its content. Content analysis is a method where the main goal is to improve the quality of the inferences we make. Neuendorf (2002) defines the content analysis broadly as "a summarizing, quantitative analysis of messages that relies on the scientific method – and is not limited as to the types of variables that may be measured or the context in which the messages are created or represented" (p.10).

As a scientific method content analysis must meet some scientific requirements, as objectivity, reliability, replicability and validity. Special feature of content analysis is that most content analyses start with data that are not intended to be analyzed specific research questions. They are texts which are meant to be read, interpreted and understood by general public, other than the analyst. Depending on the context, the interpretation can differ.

Because of the monopoly in the interpretation, definition and explaining of research process is crucial before the actual analysis to ensure the scientific requirements of the results. Neuendorf (2002) uses term a priori design to en-

sure the scientific sufficiency. She advises researchers to make precise preparations before analysis concerning all measurements of definitions, variables and coding rules. These aspects are focus of the next section with research material description.

## **2.1 Research material**

To measure communication, this research adopts the financial markets perspective to collect the information that market participants receive from the CB. From the CB interest groups, financial market participants receive the information which is shown immediately as a market reactions if the communication is efficient. This study assumes that financial crisis made CB communication even more important information source of market participants, because economic conditions changed rapidly and new information was needed desperately to reduce the information gap between CB and the market participants. Paper by Ehrmann and Fratzscher (2007) suggests that the response of financial markets to CB communication is significantly larger under increased uncertainty than under "normal" times, which gives support to the argument.

Speeches and interviews reported by international news agencies provide well updated frequent information and help to fill the information gap between the monetary policy meetings, which are held monthly in the ECB. Stories produced by news agencies, like Bloomberg and Reuters, were right to fill the information gap in changing economic environment. Because of their high frequency and real-time content the news concerning statements of policy-makers are widely followed in financial markets. Producing information was also in CB's interest, as financial markets is one of the interest groups in communication. In this thesis, the news material was collected from Reuters

archive Factiva.

When using the content analysis as a scientific method, reliability issues are crucial. Reliability answers to the question: "How can the quality of the data be maximized?". It is very significant element in content analysis, because if one cannot trust the measures, one cannot trust analysis that used those measures either (Riffe, Lacy, and Fico (2005)). To improve reliability in content analysis, it is essential to clearly define the categories and subcategories that are relevant to the goals of the study. Clear definitions enhance the repeatability of the results. Definitions are presented following protocol, which "sets down the rules governing the study, rules that bind the researcher in the way they define and measure the content of interest" (Riffe, Lacy, and Fico (2005)).

Like communication strategy was manual of CB communication, coding protocol is manual of content analysis: it shows how the analysis was made, what was included in it and which were the key words in coding. Simple coding protocol of this study, is following (organization of the protocol follows Riffe, Lacy, and Fico (2005)):

### ***Coding of CB statements***

The news story protocol is aimed at assessing the stances of central bankers (governors, members of Governing Council, Board of the ECB) by Reuters News. It examines the topics discussed and defines central bankers' stances/opinions on these topics. The following definitions are important in selecting and analyzing the content under study.

#### *News Story*

News stories are defined as all non-advertising material in a news product.

While collecting the sample from Reuters archive, it included only news stories.

### *Source*

A source is a person, who gives information to news reporters. Source is explicitly identified as such, when news reporters quote or paraphrase information from them in news. A source must be identified in some way, i.e. he/she must have a name. An anonymous source can be considered a source provided anonymity is explicitly granted in the story (e.g. central bank official, central bank decision-maker). These kind of sources are excluded from the analysis, i.e. it includes only identified sources.

### *Story source*

Story source is the context, from where the story is picked for analysis. Potential story sources in the study were speeches, interviews and other media quotations.

### *Primary story topic*

Primary topics are:

Monetary policy: topic is direction of future CB target rate path.

Inflation : topic is future inflation developments/risks.

Economic outlook: topic is economic outlook of the central bank or future risks to economic growth.

### *Primary message of the story*

Identify the message of the policy-maker by using classification into "dovish", "hawkish", "strongly dovish", "strongly hawkish" and "neutral" according to

the stance of the policy-makers in the news. Classification of the key message in story is done by using following coding<sup>5</sup>.

+1 hawkish monetary policy stance

0 neutral view of monetary policy

-1 dovish monetary policy stance

Identifying stances in policy-makers statements requires strong interpretation. Classifications +1 and -1 include two separate categories, which are combined in this thesis. First, the news were coded as -1 or +1 if the policy-makers tell that they are willing to raise/cut the monetary policy target rate, but the action might be *conditional* on some other action or economic condition. Usually in these news there is word *if* included in the text, for example "Fed will lower interest rates, if inflation risks diminish". Alternatively, the text was coded as +1 if policy-maker mentioned inflation threat or inflation risks in the statement, or -1 if the policy-maker said that risks to economic growth were risen.

Secondly, same classes also describe strongly hawkish or dovish stances. They included policy-makers strong appetite towards the change in monetary policy direction, i.e. raise/lower target rate, and word *want* was often presented in these statements. In addition to that, news classified as +1 or -1 might simply include the information about future monetary policy action, like "target rate will increase".

The neutral classification, 0, included stories which referred to *appropriate* monetary policy level, or that there are monetary policy changes expected

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<sup>5</sup>Similar classification methods are used by Ehrmann and Fratzscher (2007b) and Jansen and de Haan (2006)

in the economy. Basically classification included all the statements that included a monetary policy signal and were not classified as hawkish or dovish introduced above. Alternatively, neutral stance included statements about lower threats to inflation or economic growth. More examples of news stories and classifications are shown in Appendix.

*Classification codes with examples:*

:

**About monetary policy**

1: *"Hikes will come sooner or later"*

*"Next rate move is up"*

*"Raise rates as quickly as possible"*

*"More tightening may be needed"*

*"Rate hikes possible"*

*"rate hike could come sooner or later"*

*"doesn't rule out rate hikes"*

*"Possible that low rates feed bubbles"*

*"Cannot push exit off to never-never"*

-1: *"ready to act if turmoil hits economy"*

*"response needed if conditions worsen"*

*"open minded on need for more rate cuts"*

*"gives breathing room for more rate cuts"*

*"Weighing needed for more rate cuts"*

*"policy outlook leans more to cuts"*

*"more cuts may be needed"*

### **About inflation**

1: *"Inflation remains challenge"*

*"inflation risks remain"*

*"wants inflation under xx %"*

*"wary on inflation"*

*"inflation still biggest worry"*

*"more worried by inflation than growth"*

*"lower inflation expectations needed"*

*"not there yet on inflation"*

*"inflation fight not over"*

:

### **About economic growth**

-1: *"..poses risks to growth"*

*"economy weaker than expected"*

*"down turn in economy possible"*

*"Economy weathering the storm"*

*"Systemic economic risk still a worry"*

*"Weak housing has curbed GDP"*

*"economic uncertainty very high"*

## 2.2 Who has the right - Frequency of communication and descriptive statistics

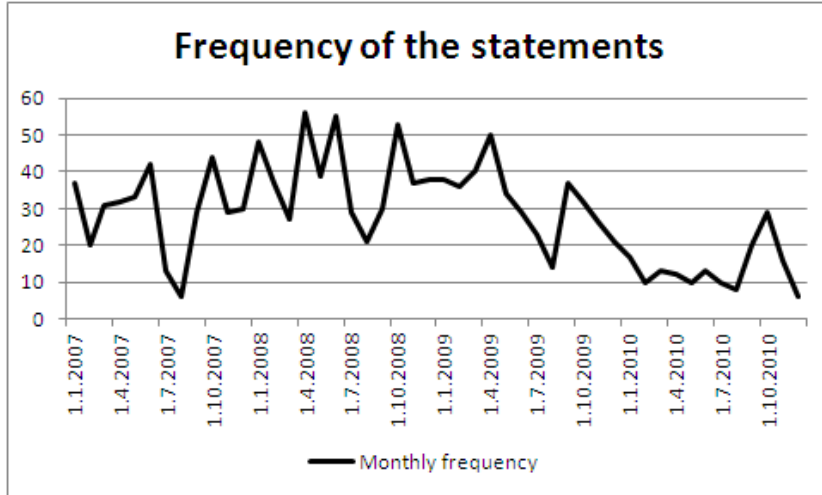
As a result of data collection was 1249 news from the time period 2007-2010, covering all policy-makers in the ECB (Governing Council members). Classified by the topic, 537 news about monetary policy stance (direct comment about the future changes of main refinancing rate), 348 news about inflation risks and 364 about economic outlook were included. As Figure 3 shows, frequencies were highest in 2008 and 2009, when financial crisis hit the real economy, whereas the lowest amount of news was posted before the crisis. Lowest frequency was under 10 statements per month, and highest over 50 per month <sup>6</sup>. The highest amounts of monetary policy news are linked to reductions in ECB main refinancing rate, which decreased 3.25 percent between October 2008 and May 2009, from 4.25 % to 1.0 %.

Figure 4 indicates that the disagreements in the communication of the individual policy-makers was high under the financial crisis, which signals that variety of messages reached public and made forecasting monetary policy changes more difficult. Measure for disagreements were formulated simply by calculating standard deviation of all the statements published in each period month. The standard deviation was approximately 0,6 before the crisis, but peaked notably in 2009 (maximum monthly standard deviation was 1), when the Governing council of the ECB decided to ease the monetary policy rapidly. These developments of growing disagreements lowered the clarity of

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<sup>6</sup>Frequency and the content of the news is controlled in this study by choosing only one statement concerning each topic by each decision-maker per each day. That means only one statement concerning monetary policy is taken into account at the daily level for each policy-maker. By restricting the amount of statements content and frequency bias can be avoided.

Figure 3: Total frequency of the ECB communication in 2007-2010



communication. Ehrmann and Fratzscher (2005) have argued that contradictory comments among policy-makers may increase the short-term interest rate volatility as a source of uncertainty.

Although both frequency of the news and disagreements among the news were linked to the timing of changes in the main refinancing rate, the communication was fairly neutral. Table 2 shows the descriptive statistics and amount of news according to the topic. Neutral stance was dominating during the sample period, and almost half of all statements were neutral (classified as 0). Neutral stance is unequal to no policy signal in the news. It is included in the analysis, because it could have an effect if positive or negative signal was anticipated in the market. High amount of neutral signals is expected, as most central bankers must weigh their assessment carefully. Andersson, Dillen, and Sellin (2006) argue that investors are often judged to have neutral monetary policy expectations because changes in the monetary policy are smooth and therefore also most neutral speeches deliver expected monetary policy signals. However the situation was different during the crisis, when the changes in the monetary policy actions were fast and opinions of

Figure 4: Dispersion of the ECB communication in 2007-2010

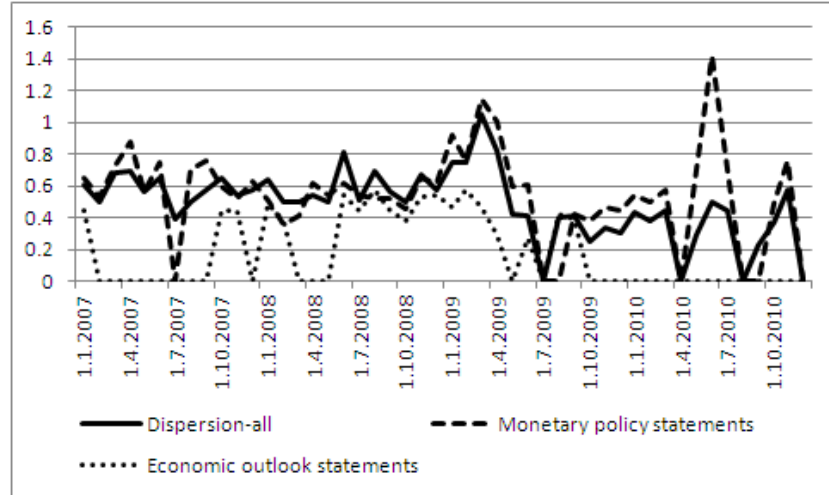


Table 2: Classification statistics

ECB				
Topic	Mean	Median	Standard deviation	n
Monetary policy	0.078	0	0.713	537
Inflation	0.402	0	0.491	348
Economic Outlook	-0.140	0	0.355	364

Amounts of statements			
Classification	Monetary policy	Inflation	Economic Outlook
-1	115		52
0	264	208	312
1	158	140	

the policy makers included also non-neutral signals. In the ECB, hawkish classification +1 was more dominating than dovish classification when comparing the amounts of classified statements (hawkish 298 vs. dovish 167).

When it comes to the predictability of the communication, also actual monetary policy actions must be taken into account. The probability distributions of ECB communication (where all the statements are included)<sup>7</sup>(tables 3 and 4) and target rate changes show that the probability of neutral communication ( $C = 0$ ) is the highest, and over all target rate changes, communication

<sup>7</sup>later only median stance is used to measure the communication

Table 3: Joint distributions of communication C and target rate R

	$C = -1$	$C = 0$	$C = 1$	Total
$Pr(C   R = -1)$	0.08	0.13	0.01	0.22
$Pr(C   R = 0)$	0.02	0.52	0.17	0.71
$Pr(C   R = 1)$	0.00	0.03	0.04	0.07
Total	0.10	0.68	0.22	1.00

Table 4: Conditional distributions of communication C given target rate R

	$C = -1$	$C = 0$	$C = 1$	Total
$Pr(C   R = -1)$	0.35	0.62	0.03	1.00
$Pr(C   R = 0)$	0.03	0.73	0.24	1.00
$Pr(C   R = 1)$	0.00	0.45	0.55	1.00

is neutral 68 % of the time. Overall the communication was biased towards both directions, hawkish and dovish. Hawkish opinions have share of 22 % and dovish statements 10 %. However the conditional distributions show that when the target rate was cut ( $R=-1$ ), the communication was biased towards neutral stance  $Pr(C = 0 | R = -1) = 0.62$  and on the other hand when there was a target rate hike, the communication was also biased towards neutral stance  $Pr(C = 0 | R = 1) = 0.45$ , but with no target rate changes there are least incorrect statements ( $Pr(C = 0 | R = 0) = 0.73$ ).

The description of all published statements is necessary to describe the sample, but in this study the main focus is in the median stances between two monetary policy meetings. As table 2 shows, the median stance over the sample period was neutral in every communication topic. However, there exist significant monthly changes in the data, which are illustrated in figure 5, where primary axis shows the changes in the main refinancing rate and secondary axes describes the median stance of policy-makers. Also median stance of the statements concerning only monetary policy communication

(excluding topics of inflation and economic outlook) is added to the graph. It shows that compared with actual main refinancing rate decisions, there is a bias toward target rate hike in the communication especially in 2007 and 2008. Alternatively, the median of monetary policy communication seems to be biased also in 2010, when there were no changes in the monetary policy actions. The bias is a consequence from the fact that ECB policy-makers often give too optimistic outlook for the economy during the times when the monetary policy has not changed. Also Jansen and de Haan (2005) and Hayo and Neuenkirch (2010) found similar results. Before the crisis, the bias towards target rate hike might have increased because the economic outlook changed very fast and policy-makers couldn't forecast the future changes. The governing council decided to increase the main refinance rate on July 2008, but only three months later on October 2008 the rate cut began, which indicates the quick change in the monetary policy stance, too.

Further comparison of the median of the statements with the target rate

Figure 5: ECB main refinancing rate and median stances in communication

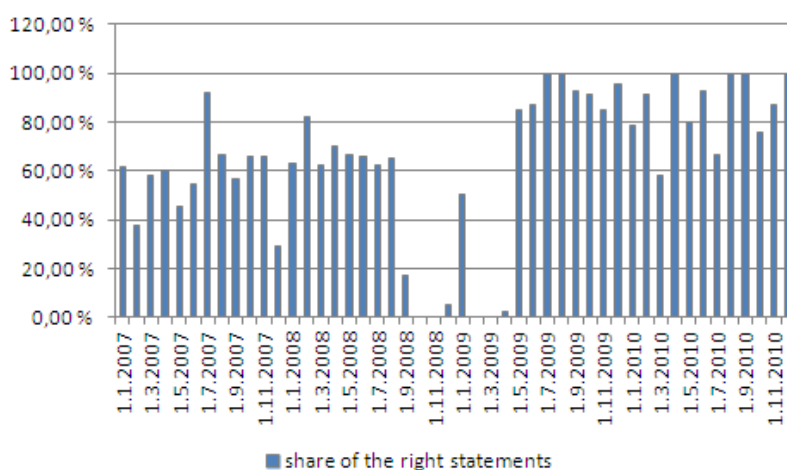


changes show that the communication was biased especially during the target rate cuts. Figure 6 shows that share of the right statements (calculated

from the median) was lowest in September 2008- April 2009, when the ECB changed its monetary policy very aggressively. During this period the share of the right statements was mostly 0 or close to 0. On the other hand, the predictability of communication increased in May 2009 and was 100 % in July 2009.

The figures describing stances of each individual over time can be found in

Figure 6: Monthly share of the right statements



Appendix and Table 2.2. They show that hawkish stance was dominating in 2007 and 2008, which is in line with the target rate increases in March 2007, June 2007 and July 2008. In this respect communication was consistent. Significant change in the stance occurred between October 2008 and May 2009, at the same time with sharp reductions in target rate. The most interesting time period was year 2010, when policy-makers' stances fluctuated, which meant that target rate increase was already in some central bankers' interest. Rate was increased later in May 2011.

News frequencies and individual stances are collected in Table 2.2, where average stances of policy-makers are defined by calculating a mean of the statements for every inter-meeting period of Governing Council (later me-

dian is used to describe the policy-makers' views)<sup>89</sup>. It shows that the governor of the ECB, Jean-Claude Trichet, presented his views most often in public. The representatives of Germany, Jrgen Stark and Axel Weber, were also very active in communicating their stances. That means German policy-makers and the ECB Governor had most of the communicative power during the crisis. Above average frequency, which was 65 during the research period, were also representatives of Italy, Austria and Finland, which indicates that the representatives of some smaller Euro area economies had also relatively good changes to express their views in media.

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<sup>8</sup>e.g. Jansen and De Haan (2006) use similar definition

<sup>9</sup>In Austria and Greece the CB governor was changed during the research period. In that case, names of both governors is mentioned. Board members are mentioned separately. Central Banks of Slovakia and Malta were excluded, because in both CB's amount of statements was relatively low: only 17 for two Central Bankers, Ivan Sramko and Jozef Makuch from Slovakia and for Michael Bonello from Malta. Low frequency is reported because Slovakia became Euro zone member not until January 2009, and Malta in January 2008. Somehow surprisingly, also Italy's CB Governor Mario Draghi was left outside because of low frequency, only 14 statements during the research period. Italy was still represented in the Board of Governors, where Lorenzo Bini Smaghi was one of the members.

Table 5: Communication statistics, individuals

	Freq.	Hawkish	Neutral	Dovish	MP	EC	INF	Average stance
France (President) Trichet	178	13,5 %	70,1 %	17,4 %	42,4 %	32,6 %	25,0 %	0,06
Germany (Board) Stark	93	38,7 %	54,8 %	6,4 %	40,9 %	29,0 %	30,1 %	0,35
Italy (Board) Bini Smaghi	77	26,0 %	63,6 %	10,4 %	48,0 %	29,9 %	22,1 %	0,21
Spain (Board) Gonzalez-Paramo	60	16,7 %	63,3 %	20,0 %	50,0 %	28,3 %	21,8 %	-0,07
Austria (Board) Tumpell-Gugerell	38	13,1 %	78,9 %	8,0 %	31,6 %	47,3 %	21,1 %	0,08
Portugal (Board) Constancio	55	3,6 %	81,8 %	14,6 %	23,6 %	36,4 %	40,0 %	-0,11
France Noyer	53	17,0 %	73,6 %	9,4 %	34,0 %	43,3 %	22,6 %	0,08
Germany Weber	146	38,4 %	52,7 %	8,9 %	48,6 %	24,0 %	27,4 %	0,32
Spain Ordonez	40	17,5 %	57,5 %	25,0 %	52,5 %	20,0 %	27,5 %	-0,10
Austria Liebscher/Nowotny	136	22,8 %	62,5 %	14,7 %	42,6 %	32,4 %	25,0 %	0,09
Finland Liikanen	84	15,5 %	69,0 %	15,5 %	42,6 %	32,4 %	25,0 %	-0,01
Belgium Quaden	38	15,8 %	65,8 %	18,4 %	50,0 %	21,0 %	29,0 %	-0,03
Ireland Hurley/Honohan	20	15,0 %	70,0 %	15,0 %	30,0 %	40,0 %	30,0 %	0
Greece Garganas/Provopoulos	49	28,6 %	59,2 %	12,2 %	32,6 %	34,7 %	53,7 %	0,14
Luxemburg Mersch	53	22,6 %	71,7 %	5,7 %	35,8 %	41,5 %	22,7 %	0,23
Netherlands Wellink	46	23,9 %	54,3 %	21,7 %	39,1 %	34,8 %	23,9 %	0,04
Greece Papademos	33	30,3 %	54,5 %	15,2 %	36,4 %	27,2 %	36,4 %	0,15
Slovenia Kranjec	20	20,0 %	75,0 %	5,0 %	25,0 %	35,0 %	40,0 %	0,2
Cyprus Orphanides	30	10,0 %	70,0 %	20,0 %	50,0 %	15,0 %	30,0 %	-0,1

<sup>a</sup>Papademos was Vice President of the ECB until 2010, and Constancio from

2010 onwards

### **2.3 Who's Right - Econometric analysis**

This section examines, how good forecasting tool CB communication was during the financial crisis. In the econometric part I apply partly the methodology of the famous central bank interest setting rule introduced by Taylor (1993). That simple monetary policy rule has become very popular among researchers, and the formula has been applied to evaluate the monetary policy behavior of several central banks. Also the ECB has been in interest of earlier studies (see for example Fourcans and Vranceanu (2004), Gerlach and Schnable (2000), Clausen and Hayo (2005)). To my knowledge, only the study by Jansen and De Haan (2009) has had focus on the Taylor rule with communication as an additional variable in the regressions in the case of the ECB.

To evaluate the predictive power of ECB communication I formulate three different regressions, and some of them include Taylor-type variables. One model is with macroeconomic indicators, one with communication only and one with macroeconomic indicators and communication combined. Main goal is to compare Taylor-type and communication variables and to find if there are differences in the performance of communication variable and more traditional Taylor-type variables in predicting future changes in the target rate. The regressions are formulated by using nonlinear ordered probit regressions as a methodological framework.

In formulating Taylor-type macroeconomic variables I used real-time data, which was available to central bankers at the time when the interest rate decisions were made. Advantages of forward-looking data series are introduced by Orphanides (2001). Also Jansen and De Haan (2009) have compared the backward- and forward-looking Taylor rule and concluded that forward-looking rules have the best explanatory power.

Furthermore, I used survey data to describe the expectations in price developments  $\pi_t^e$  and output gap expectations  $y_t$ . For this purpose Euro zone Economic Sentiment Indicator (ESI) was used. It is published by European Commission and it collects the expectations of consumer sector, industrial sector, service sector, construction firms and retail traders<sup>10</sup>. When collecting output gap expectations I used the confidence index of the ESI. To calculate the difference, I used the particular month and the long-term average, which was calculated by using a moving average of the preceding 12 years (144 months). Same method was used in paper by Jansen and De Haan (2009). The data describing inflation expectations are also collected from the European Commission data base. I collected the ESI sub-index, which is an indicator of consumers' expectations of the price trends over next 12 months. To ensure the stationarity of the series, first differences are taken.

Output gap and inflation are the basic Taylor-type variables, but one extra variable is needed to describe the explanatory power of ECB communication. Therefore third variable in the regression is *comm*, which is the median of all the ECB decision-makers' stances over the period between two monetary policy meetings. In the research period, the median had only five values: -1, -0.5, 0, 0.5 or 1. Again, negative values described the dovish stance, i.e. signaled decreasing target rate before the monetary policy meetings and positive values hinted to target rate increases in the communication. Because the main interest in this study was not in the level of dovishness or hawkishness of the policy-makers, the values -0.5 and +0.5 were rounded to +1 and -1.

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<sup>10</sup>The weights in the ESI are: confidence indicator (40 %), the service confidence indicator (30 %), the consumer confidence indicator (20 %), the construction confidence indicator (5 %), and the retail trade confidence indicator (5 %)

After adding the third variable and lagged variable  $\alpha i_{t-1}$  to capture interest rate smoothing in one regression, the three sets of rules were ready, with  $i_t^*$  being the latent variable and representing the change in the ECB main refinancing rate:

$$i_t^* = \beta_1 \Delta(\pi_t^e) + \beta_2(y_t) + \varepsilon_t \quad (1)$$

$$i_t^* = \alpha i_{t-1} + \gamma_1 comm + \varepsilon_t \quad (2)$$

$$i_t^* = \beta_1 \Delta(\pi_t^e) + \beta_2(y_t) + \gamma_1 comm + \varepsilon_t \quad (3)$$

The actual changes in the interest rate are represented as ternary variable (+1 means a rate hike; 0 represents unchanged monetary policy and -1 is a rate cut). During the sample period, ECB raised its target rate 3 times and lowered it 7 times, and majority, 38, of meetings were with unchanged monetary policy decisions. In ordered probit model, the changes in the main refinancing rate occur only if the value of index function is below the lower threshold value  $\tau_1$  or above the upper threshold value  $\tau_2$ . Both thresholds are unobservable. Finally, if the residuals  $\varepsilon_t$  follow standard normal distribution, we can write the probabilities of different outcomes (hawkish, neutral or dovish monetary policy) in following way:

$$Pr[i_t^* = -1 | z_t] = \Phi(\tau_1 - z_t' \beta)$$

$$Pr[i_t^* = 0 | z_t] = \Phi(\tau_2 - z_t' \beta) - \Phi(\tau_1 - z_t' \beta)$$

$$Pr[i_t^* = +1 | z_t] = \Phi(\tau_2 - z_t' \beta)$$

here  $\Phi$  denotes the cumulative standard normal distribution and  $z_t'$  is a vector of explanatory variables. The three ordered probit models are estimated using maximum likelihood and the the threshold variables  $\tau_1$  and  $\tau_2$  are estimated at the same time with the  $\beta$ -vector.

## 2.4 Results

In this section I introduce the results of the different models. First I estimated the regression (1) with forward-looking macroeconomic variables ( $\pi_t^e$ ,  $y_t$ )<sup>11</sup>. In the second regression only lagged target rate decision and communication were used as explanatory variables, and the third model was joint with both macroeconomic indicators, and communication as explanatory variables. The estimation coefficient are represented in the Table 6.

When using a pseudo  $R^2$  as an indicator, it seems that joint model (column 3) has clearly the best fit in both ordered probit model and linear probability model, whereas the the second model with only communication and lagged rate decisions as explanatory variables fits worst in the ordered probit estimations. It seems that both "normal" Taylor-type regression with only macroeconomic explanatory variables and joint model with macroeconomic variables and communication predicts equally well target rate decisions (number of correct predictions is 40/47). Regression with only communication and lagged interest rate had higher  $R^2$  than Taylor-type model 1, but the number of correct predictions is slightly lower (39/47). However, the differences between the models are very small.

It turns out that the coefficient of communication variable is significant in all models, which suggest that we can reject the null hypothesis where communication variables are jointly zero, which indicates that communication adds informations about the future policy changes. Also output gap has significant coefficients in all models, but surprisingly inflation coefficient is insignificant in both regressions. The results suggest that under the crisis the large shocks to the Euro zone economy got more attention in monetary

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<sup>11</sup>lagged rate decision which captured interest rate smoothing was added to first regressions but the coefficients were not significant in models 1 and 3

Table 6: Estimation results, ordered probit

Model	(1)	(2)	(3)
Previous target rate decision $i_{t-1}$	-	1.138 (0.527)**	-
Output gap $y_t$	0.089 (0.026)***	-	0.080 (0.028)***
$\Delta$ Inflation expectations $\pi_t^e$	0.034 (0.081)	-	-0.016 (0.096)
Communication variable $comm$	-	2.089 (0.671)***	1.948 (0.699)***
LR statistics	21.411	24.182	30.043
Pseudo log-likelihood	-18.345	-20.334	-15.414
Pseudo $R^2$	0.352	0.397	0.494
Correct predictions	40/47	39/47	40/47

policy decision-making process. According to Gerlach and Schnable (2000), central banks react to the output gap because it contains information about future price pressures. This might also be one explanation to bigger coefficients in output gap. The results also show that the coefficient of previous target rate decisions is significant only in the communication model, which suggests that assumption of interest rate smoothing doesn't always hold. To analyze the predictability more specifically the changes of the independent variables to the explanatory variables, marginal are calculated by following way:

$$\begin{aligned} \frac{\partial[P(y_i = -1)]}{\partial(x_{ji})} &= \Phi(\tau_1 - x'_i\beta)\beta_j \\ \frac{\partial[P(y_i = 0)]}{\partial(x_{ji})} &= -[\Phi(\tau_2 - z'_i\beta) - \Phi(\tau_1 - z'_i\beta)]\beta_j \\ \frac{\partial[P(y_i = 1)]}{\partial(x_{ji})} &= \Phi(\tau_2 - z'_i\beta)\beta_j \end{aligned}$$

The Table 7 with average marginal effects of ordered probit estimations shows that in the second model with communication, a one-point change in the median of statements increases the probability of rate hike by 14.1 % whereas it lowers the probability of rate cut by 30.1 %. In the joint model estimated with ordered probit, upward change in the median makes a rate hike 13.0 % more and rate cut 20.3 % less likely. On the other hand, the marginal effects of the other variables are smaller also in ordered probit model: in the

Table 7: Average marginal effects

Effects on:	$Pr[\Delta i_t = -1]$	$Pr[\Delta i_t = 0]$	$Pr[\Delta i_t = 1]$
Model (1) Macro vars			
Output gap	-0.011**	0.001	0.010*
$\Delta$ Inflation expectations	-0.004**	-0.000	0.004*
Model (2) communication			
Previous target rate decision	-0.163***	-0.087***	0.077***
Communication variable	-0.301***	-0.159***	0.141***
Model (3) Macro vars + communication			
Output gap	-0.008***	-0.003*	0.005**
$\Delta$ Inflation expectations	0.001*	0.001*	-0.001***
Communication variable	-0.203***	0.073*	0.130*

joint model one point increase in the Economic Sentiment indicator increases the probability of rate hike by 0.5 % and decreases the probability of rate cut by 0.8 %. The change in inflation expectations has relatively small, less around 0.1 % probability, to target rate changes.

In the second model lagged interest rate decisions are included to capture interest rate smoothing. The marginal effects show that decision to rise target rate in the previous meeting increases the change of a rate hike by 7.7 % and decreases the probability of rate cut by 16.3 %.

To evaluate the predictability of the individual communication I estimated the regression with the best fit (calculated by pseudo  $R^2$ ) with the communication variable (inter-meeting median of stances) of some individual members of the Governing Council. The chosen model was joint model with macroeconomic variables, lagged rate decisions and communication variable as explanatory variables. The communication indicators of the following members were chosen as separate explanatory variables: Jean-Claude Trichet (Governor), Axel Weber (Governing Council, Germany), Lorenzo Bini Smaghi (Bord of Governors, Italy), Christian Noyer (Governing Council, France) and Nout Wellink (Governing Council, Netherlands). In this sample, Wellink is repre-

sentative of a smaller Euro zone economy and Weber, Bini Smaghi and Noyer representatives of the large euro zone economies. As a result, five separate regressions were formed.

The estimation results and marginal effects are collected to tables 2.4 and 9. They show that the first four models with the communication of the central bankers of large economies have highest values for pseudo  $R^2$ , which suggests that those regressions might have the best fit. The differences become bigger in evaluation of the correct target rate predictions: in the model, where governor Trichet's communication is explanatory variable, the share of correct predictions is the highest, 88.6 %, whereas lowest share was in the regression with Wellink's communication, 75.0 %. Furthermore, the increasing explanatory power of large economies communication is shown also in table 9 with average marginal effects. Governor Trichet and Germany's representative Weber have the biggest effects in predicting target rate hikes. A one-point change in the median of statements by Trichet increases the probability of rate hike by 11.1 % whereas it lowers the probability of rate cut by 19.9 %. Equivalent coefficients of Weber are 15.9 % (rate hike) and 18.7 % (rate cut). Representatives of the other countries have smaller or insignificant coefficients for communication variable.

The estimation results indicate that monetary policy decision-makers of the large economies publish statements, which reveal more information about future monetary policy decisions compared to representatives of the smaller Euro area countries. This feature was emphasized especially under crisis, when uncertainty was high in the economy.

However, the comparison between committee communication (median of all statements) and individual communication shows that communication by individuals doesn't exceed the explanatory power of the committee commu-

nication, when it comes to the rate hikes.

The robustness of the results was tested by using sub-sample estimations and dividing the communication indicator into smaller groups (by using the median of only monetary policy stances, and excluding topics of inflation and economic outlook from the sample). All these tests showed that the coefficients are robust.

Table 8: Estimation results of the communication of individuals

Model:	Ordered probit	Trichet	Weber	Bini Smaghi	Noyer	Wellink
Output gap	0.080 (0.028)***	0.061 (0.025)**	0.078 (0.026)***	0.089 (0.038)**	0.107 (0.035)***	
$\Delta$ Inflation expectations	0.107 (0.084)	0.025 (0.088)	0.034 (0.089)	0.028 (0.111)	0.169 (0.122)	
Communication variable	1.764 (0.804)**	1.699 (0.764)**	1.117 (0.623)*	1.537 (0.663)**	0.243 (0.450)	
LR statistics	25.6	27.1	19.7	21.4	17.1	
Pseudo log-likelihood	-14.2	-15.0	-14.6	-10.2	-10.7	
Pseudo $R^2$	0.47	0.46	0.40	0.51	0.44	

<sup>a</sup>Standard errors are shown in the parentheses below the coefficients. \*\*\*, \*\*, \* indicates the significance at the 99%, 95 % and 90 % level. Hubert-White robust covariances are used in all estimations.

Table 9: Average marginal effects

Effects on:	$Pr[\Delta i_t = -1]$	$Pr[\Delta i_t = 0]$	$Pr[\Delta i_t = 1]$
Trichet			
Output gap	-0.009**	-0.003	0.005***
$\Delta$ Inflation expectations	-0.012**	-0.005	0.007***
Communication variable	-0.199**	-0.088	0.111***
Weber			
Output gap	-0.007**	-0.001	0.006**
$\Delta$ Inflation expectations	-0.003*	0.000	0.002**
Communication variable	-0.187**	-0.027	0.159**
Bini Smaghi			
Output gap	-0.007***	-0.006*	0.013*
$\Delta$ Inflation expectations	0.000***	0.000*	0.000*
Communication variable	-0.179	0.026*	0.153**
Noyer			
Output gap	-0.007***	0.006	0.013***
$\Delta$ Inflation expectations	-0.002***	0.002	0.004
Communication variable	-0.118***	0.099	0.217
Wellink			
Output gap	-0.009**	0.008	0.017
$\Delta$ Inflation expectations	-0.014	0.012	0.026
Communication variable	-0.021**	0.012	0.038

### 3 Conclusions

In this thesis, I studied the ECB communication during the sample period 2007-2010. I focused on the predictability of the communication, which was examined by comparing Taylor-type variables and median of the published statements and using ordered probit as an econometric method.

The research showed that Euro zone member countries have different access to the public concerning CB communication: the Governor and the representatives of Germany had more active communication than other. In that sense CB communication is a source of power: decision-maker's access to the public is limited, which restricts the most smaller economies' central bankers' appearance in international news. In addition to that, the representatives of the smaller Euro zone economies had more neutral stance when communicating their views about the economic and price risk developments or the future direction of monetary policy.

Furthermore, I found that target rate decisions are mostly linked to changes in economic sentiment and ECB communication. The communication variable provided a significant explanation to decisions concerning the main refinancing rate of the ECB and performed even better than Taylor-type variables in the estimations when comparing the marginal effects. My results differ from the study by Jansen and De Haan (2009), which concluded that the target rate decisions are most closely related only to the Taylor-type macroeconomic variables. Their sample period was 1999-2002, the early years of the monetary union. Compared to the results by Jansen and De Haan (2009) it seems that there has been development in the predictability of ECB communication. In addition to that the results suggest that the ECB communication performed relatively well also during the periods of high uncertainty in the financial market, i.e.. financial crisis.

Regarding the speeches on individuals the results suggest that communication has not equal-sized effect in predicting future changes in monetary policy. According to the findings, more relevant information about ECB future policy changes would be received by following the statements by committee level but also statements of the CB's in major economies. The results emphasize the fact that by following individual communication it is possible to do new findings about the CB communication policy compared to group communication, which has been the traditional focus in the communication studies.

## 4 Plans for the future research

The research material offers various chances for future studies. Using new measures of CB communication research would open new scopes to content analysis. Bulir, Cihak, and Jansen (2012) focused on studying textual characters in CB announcements. Adopting the more sophisticated methods of content analysis would increase the objectivity and improve reliability of the research.

An interesting method would be discovering the usage of specific words in CB communication instead of interpreting the whole news content. That is important, because market participants seek continuously certain code words from the CB communication. These predefined words give the participants information about upcoming decisions of the central banks. For instance press conferences after ECB's meetings are widely followed by markets. One of the code phrases for ECB is "strong vigilance". If governor of the ECB uses these words while talking about inflation risks, then markets usually predict higher target rates in the next meeting. For instance Bloomberg reported on 28.6.2011: "European Central Bank President Jean-Claude Trichet said policy makers are in "strong vigilance mode", signaling they intend to raise interest rates next week – As far as we are concerned, we're in strong vigilance mode", he said, repeating the phrase ECB uses to indicate a rate increase is imminent".

Rosa and Verga (2007) have collected a wording indicator for ECB's official statements. They introduce the most important keywords and have ranked them into hawkish and dovish, ranging from -2 to +2. Examples of those standardized keywords or phrases repeated in official statements are: appropriate, favorable, downward risks, consistent, in line, carefully monitor. Also word vigilant is presented with coding +2, describing very hawkish stance.

Naturally the keywords must be tied strictly to the context.

Rosa and Verga (2007) had focus on formal communication, but collecting and studying these kinds of widely known and used keywords in different contexts, like in informal communication and published news, would be worth of studying. Naturally coding of news texts would differentiate from coding of official statements. Creating new, complete coding system and database for the keywords would give a basis to form completely new methods for CB content analysis.

This thesis already introduced a basis of usage for that kind of coding system. Still, as language is dynamic and new words are introduced in CB communication, research would cover also the extended period language of Fed introduced in 2011 and language covering unconventional measures in both ECB and Fed. Gathering extensive data base would give a rich basis in examining the effects of communication more widely, because it enables variety of content analysis classifications.

Also objectivity of media interpretations of texts would be a topic worth studying. For instance, comparing the written speeches of policy-makers and news concerning those speeches would answer to question about the subjectivity of the journalists. In this thesis I noticed that there was a chance of subjectivity but the topic was overridden because of its complexity and large scope. Still, by focusing on the contents of the speeches and comparing them with "the voice of journalist" the subjectivity problem would be possible to observe. Media, and the journalists beyond it, has significant effect on market as many studies have showed, and subjectivity issue would obviously bring new aspects to CB communication studies.

As discussed in this section, there are several, ways to measure CB communication. This thesis gave promising results in combining communication

theory with econometric framework, which emphasizes the relevance of the topic and opens new doors to central bank communication research.

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## 5 Appendix

### *Written communication of ECB (published)*

1. Press releases of monetary policy decisions
2. Monthly bulletin
3. Statistics pocket book
4. Weekly financial statements
5. Press releases about monetary developments in the euro area, balance of payments etc. (every month)
6. Documented speeches of policy makers
7. Annual Report
8. Convergence Report (at least every two years)
9. Financial stability review (twice a year)
10. Other press releases
11. Working paper series describing research process of ECB staff
12. Other research-related publications
13. Interviews published by news agencies (informal)

### *Oral communication of ECB (published)*

1. ECB webcasts: Introductory statements, questions and answers in press conference following monetary policy meetings
2. ECB webcasts: Committee on Economic and Monetary Affairs (ECON) meetings with hearings of the President of the ECB
3. Fed: Recorded version of Chairman's press conference (from 2011 onwards)
4. Public seminars

Reuters News 23.11.2007: *ECB's Ordóñez sees deeper-than-expected slowdown.*

*World financial turmoil will cause a stronger-than-expected slowdown in the euro zone, the ECB's Miguel Angel Fernandez Ordóñez said on Friday.*

*But there are still medium-term inflation risks, the Bank of Spain governor and ECB governing council member told a Spanish parliamentary budget committee.*

Classified as -1

Reuters News 22.3.2009: *ECB rates are heading down - ECB's Weber.*

*European Central Bank interest rates are "at 1.5 percent and heading down", ECB Governing Council member Axel Weber said on Sunday.*

*Speaking at a conference in Brussels, Weber also said that real interest rates in the euro zone were no different than in the United States.*

*"The difference you keep forgetting is that whilst rates are at 1.5 percent in the euro area and heading down, short term rates are way below policy rates by now," Weber said.*

*"Short term rates are below one percent and actually inflation in Europe is just coming down to one percent – it is not at zero like in the United States. So the real rates are no different neither in the short-term nor in the medium-term," Weber said.*

Classified as -1

Reuters News 10.10.2010: *Title: Low ECB rates for too long a risk-Stark.*

*Keeping euro zone interest rates low for too long poses serious risks to the*

*economy and price stability, European Central Bank Executive Board Member Juergen Stark was quoted as saying in an interview on Sunday.*

*"We are fully aware that maintaining an accommodative monetary policy stance for too long can pose serious risks to our economy and, ultimately, to price stability over the medium term," Stark said according to the online version of Emerging Markets magazine.*

*Inflation rates in the euro zone were likely to remain moderate but the risks to the outlook were "slightly tilted to the upside," he added.*

Classified as 1

Reuters News 25.6.2008: *Title: Trichet plays down serial hikes, cements July bets*

*European Central Bank President Jean-Claude Trichet played down the chances of a series of interest rate rises but cemented expectations on Wednesday for a small hike in July. Giving testimony to European Union parliamentarians, Trichet said the ECB was in a state of heightened alertness about inflation and saw an "acute" risk of a wage-price spiral.*

*Although Trichet did not explicitly confirm a July hike, he repeated that it was possible the ECB would raise rates by a small amount on July 3, as signalled at the June meeting.*

*"I have nothing to add and nothing to withdraw from what I said on behalf of the Governing Council on June 5," Trichet told the parliamentary economics committee.*

*"I said we could decide to move our rates by a small amount in our next meeting in order to secure this solid anchoring of inflation expectations. I said it's possible."*

*"I didn't say that we would envisage a series of increases. I didn't say that. That being said ... of course we never pre-commit. The observers, the market, know that pretty well."*

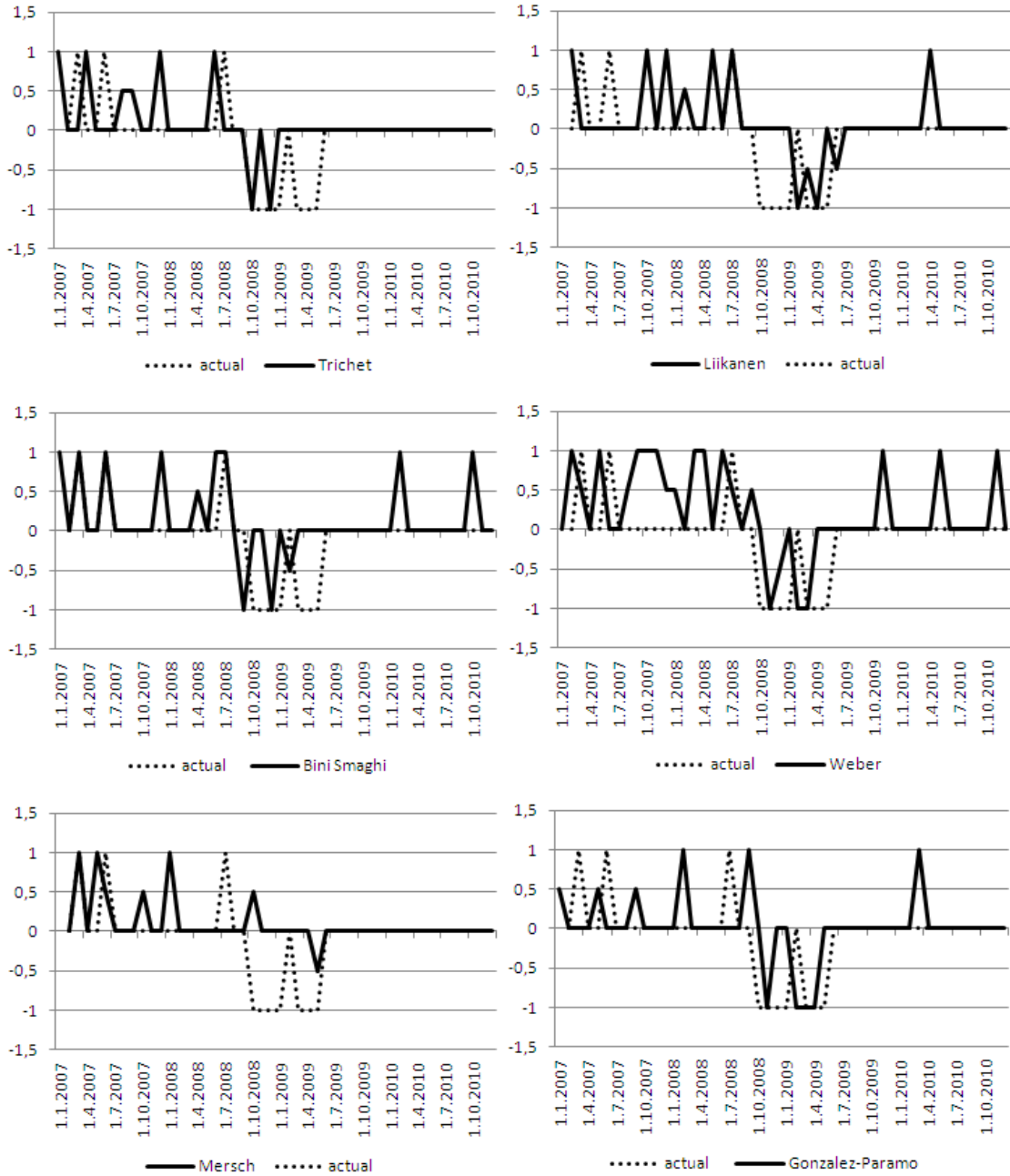
*With just over a week to go before the next rate meeting, other policymakers including France's Christian Noyer and the Netherlands' Nout Wellink also stressed inflation risks and said these must take precedence over slowing growth.*

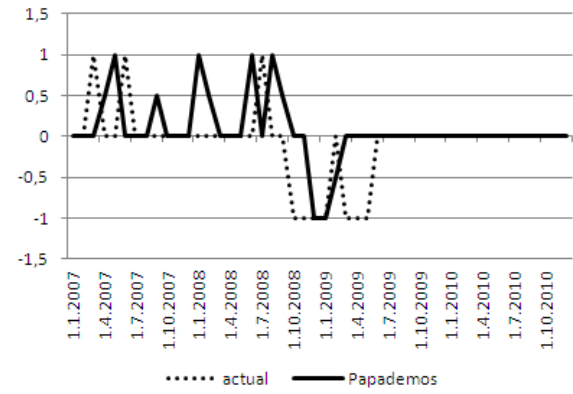
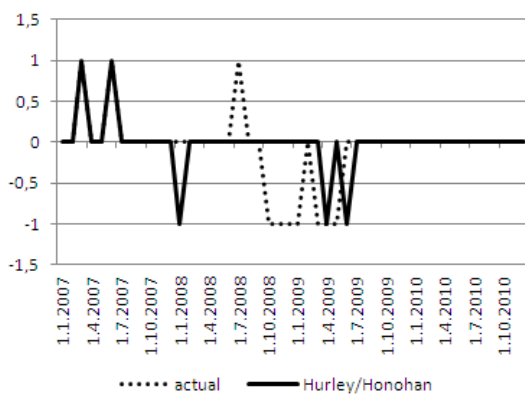
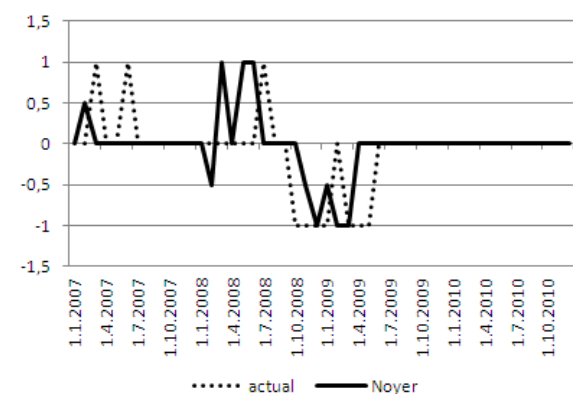
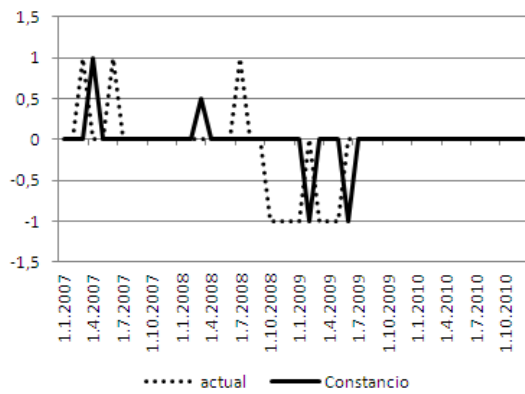
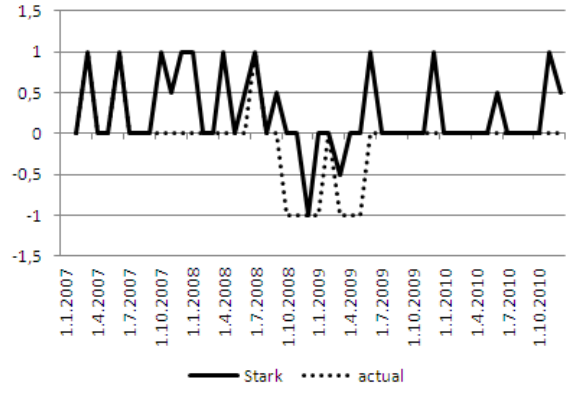
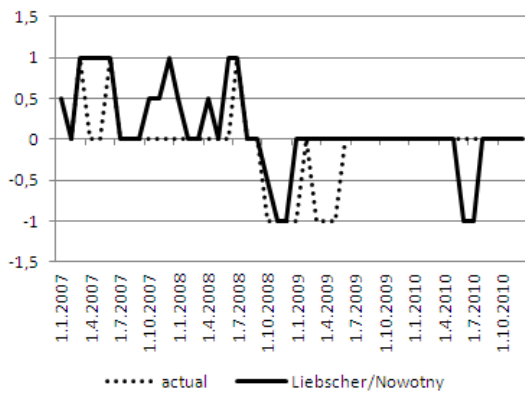
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Figure 7: Frequencies of the monthly individual stances

	-1	0	1	Target rate
1.1.2007	0	21	13	0
1.2.2007	0	10	6	1
1.3.2007	0	18	13	0
1.4.2007	0	18	12	0
1.5.2007	0	18	15	1
1.6.2007	0	18	15	0
1.7.2007	0	12	1	0
1.8.2007	0	4	2	0
1.9.2007	0	17	13	0
1.10.2007	0	29	15	0
1.11.2007	2	19	8	0
1.12.2007	1	9	21	0
1.1.2008	2	27	14	0
1.2.2008	1	27	5	0
1.3.2008	1	20	11	0
1.4.2008	0	33	14	0
1.5.2008	1	28	13	0
1.6.2008	0	17	33	1
1.7.2008	0	15	9	0
1.8.2008	1	13	6	0
1.9.2008	2	27	6	-1
1.10.2008	12	33	0	-1
1.11.2008	15	20	0	-1
1.12.2008	16	22	2	-1
1.1.2009	9	20	0	0
1.2.2009	19	19	0	-1
1.3.2009	16	21	0	-1
1.4.2009	17	29	1	-1
1.5.2009	3	28	2	0
1.6.2009	2	20	1	0
1.7.2009	0	20	0	0
1.8.2009	0	13	0	0
1.9.2009	0	39	3	0
1.10.2009	0	21	2	0
1.11.2009	0	17	3	0
1.12.2009	0	22	1	0
1.1.2010	0	11	3	0
1.2.2010	0	10	1	0
1.3.2010	1	7	4	0
1.4.2010	0	11	0	0
1.5.2010	0	8	2	0
1.6.2010	1	13	0	0
1.7.2010	2	4	0	0
1.8.2010	0	7	0	0
1.9.2010	0	22	0	0
1.10.2010	0	19	6	0
1.11.2010	0	13	2	0
1.12.2010	0	5	0	0

Figure 8: Stance of the individuals vs. actual monetary policy changes





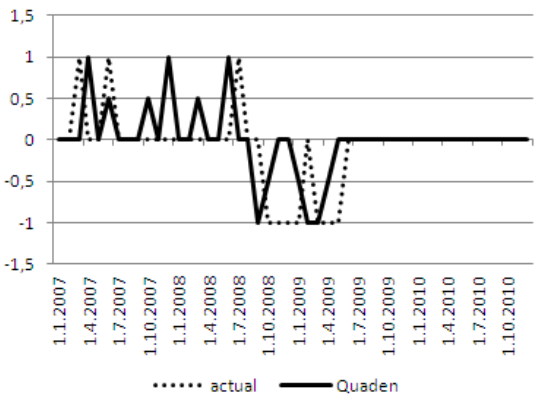
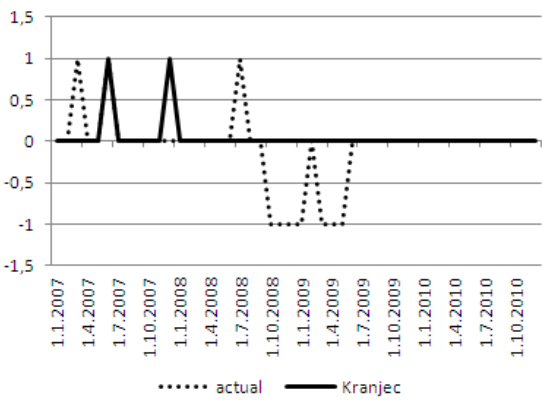
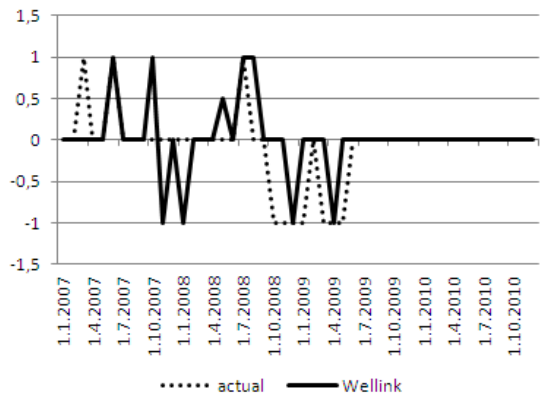
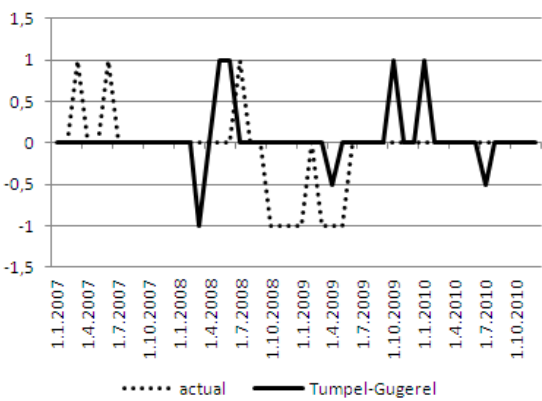
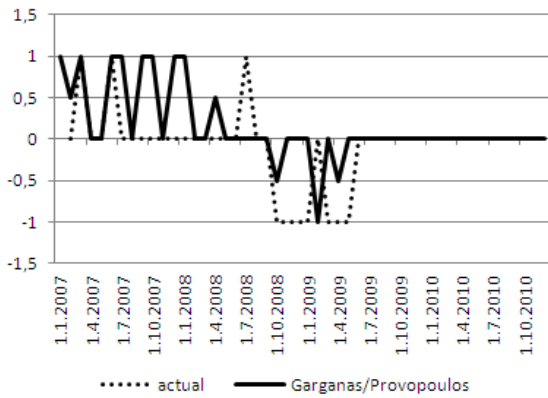
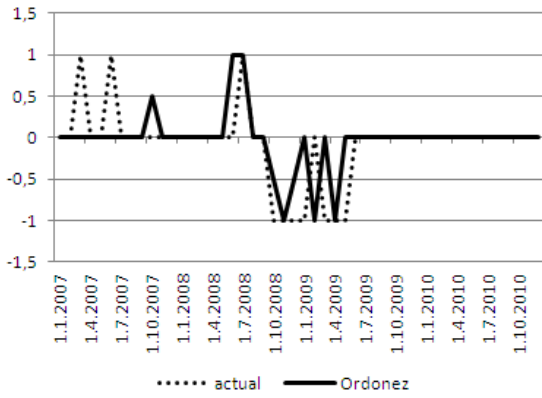


Figure 9: Model 1: Target rate changes, fitted vs. actual

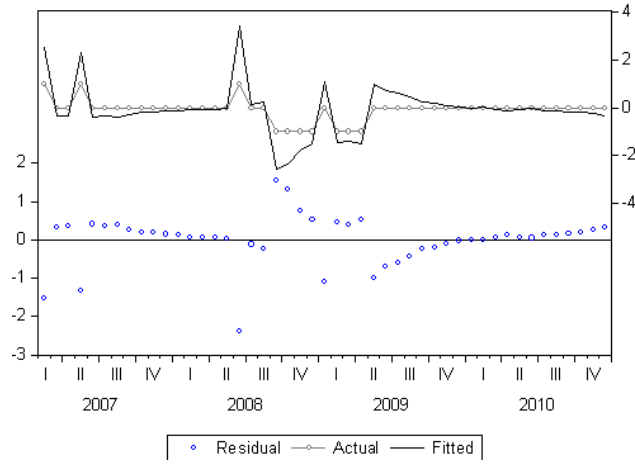


Figure 10: Model 2: Target rate changes, fitted vs. actual

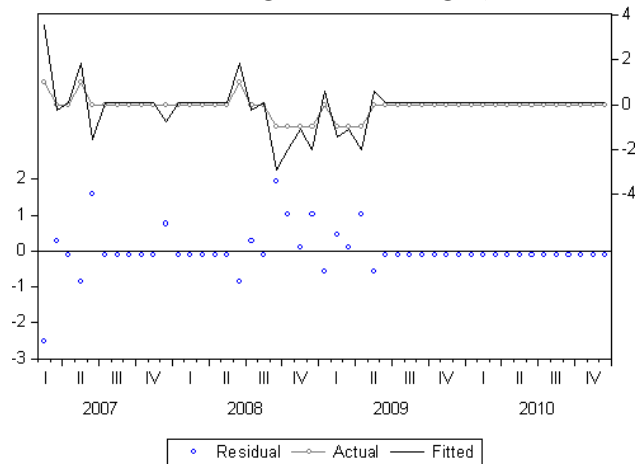


Figure 11: Model 3: Target rate changes, fitted vs. actual

