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# Narratives in ECB Press Conferences: A Textual Analysis\*

## KEY MESSAGES

- **Topic analysis of the European Central Bank (ECB) press conferences reveals meaningful communication patterns**
- **Similar press conferences are clustered in time**
- **The revisions to the ECB narrative accompany the changes in policy direction**
- **Market volatility increases when the ECB substantially updates its wording in the monetary analysis section as compared to keeping it rather static relative to the previous period**
- **Shifts in ECB communication introduce incremental volatility above and beyond that created by a change in policy stance**

Communication is essential for central banks. As Ben Bernanke, former chairman of the Federal Reserve (Fed), famously said, „monetary policy is 98 percent talk and 2 percent action.“ Providing clear and consistent explanations to monetary policy decisions can significantly improve the efficiency of monetary policy (Blinder et al. 2008). Communication has become a monetary policy tool on its own because it has the power to improve the alignment of market expectations with policymakers' intentions.

Many central banks release statements after monetary policy decisions. Often policy statements are updated only marginally from meeting to meeting. Even small updates are scrutinized by financial market participants. There are various tools to „track changes“ with side-by-side statement comparisons, such as the Wall Street Journal's Fed statement tracker. Recent examples include the Fed's narrative of „transitory inflation“ in 2021 that generated substantial media attention. The Federal Reserve Chair eventually abandoned the keyword in November 2021.



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\*The underlying paper is „Shifts in ECB Communication: A Textual Analysis of the Press Conferences“ by Justyna Klejdysz and Robin Lumsdaine, forthcoming in *International Journal of Central Banking*.

For the European Central Bank (ECB), the press conference immediately after the Governing Council meeting is the primary communication device. It consists of a prepared statement explaining the decision, followed by a Questions and Answers session with journalists.

Our paper quantifies ECB communication on the Governing Council meeting days. The key questions we address are as follows: What are the main communication patterns in the ECB press conference? Do shifts in communication patterns affect stock market volatility on the Governing Council meeting days? Using the algorithms for text data, we link the press conference text features to financial market reactions. Here we show that topic models can be used to identify different phases in ECB communication and that transition to a different phase in communication increases market uncertainty. This holds for the substantial updates to the prepared introductory statement, specifically in the section dedicated to monetary analysis. We also analyze the changing topical composition of the Q&A session; however, we do not find that changes in topics in this section on its own affect the market uncertainty.

## DATA

We analyzed 156 press conferences from January 2004 to April 2018, spanning Trichet and Draghi's tenure. The press conference had a standardized structure over this time and consisted of six major parts: (1) summary of the ECB's monetary policy decision; (2) economic analysis; (3) monetary analysis; (4) cross-check paragraph; (5) fiscal policy and structural reforms; (6) questions-and-answers (Q&A) session. We treated sections as separate documents.

To decrease the vocabulary size, we applied standard preprocessing steps. First, we removed common introductory sentences. Then, we lowercased each word, and removed punctuation and stop words (i.e., words like „the“ or „and“) and words containing non-alphabetic characters, with some exceptions, such as money aggregates (M1, M2, M3). All terms were then lemmatized; that is, reduced to their dictionary form. Finally, we constructed a dictionary of n-grams, which are multi-word expressions consisting of words that often co-occur, such as „covered bond.“ The text after preprocessing was converted to a document-term matrix, where each row represented

a single document (a section on a given press conference day), each column corresponded to a unique term, and the frequency of a term in a document was in a cell.

We used daily closing values of the VSTOXX index to measure investors' reaction to ECB communication patterns on press conference days. The VSTOXX index represents the implied volatility of the Euro Stoxx 50 index and reflects market expectations of near-term volatility.

## TOPIC MODELING

Topics are latent dimensions underlying texts. The idea behind topic modeling is to find the underlying topics in a set of documents based on the frequency of terms used in each document (encoded in the document-term matrix). We used Latent Dirichlet Allocation (LDA) developed by Blei et al. (2003) to find the latent topics in the ECB press conferences. We estimated LDA separately for each section to track the topics within sections and compare the changes across sections.

LDA models the distribution of latent topics in documents. Topics are represented by probability distributions over words. An optimization algorithm finds underlying topics and the associated word probabilities. The more often two words co-occur in a document, the more likely those two words are under the same underlying topic. The implementation of LDA requires the following two hyperparameters: The first hyperparameter controls how many topics can be in one document, the second hyperparameter controls how many words can be in one topic. In a standard implementation, these hyperparameters are selected in advance. Our improvement over this baseline specification was estimating them in a fully Bayesian manner using Metropolis-within-Gibbs sampling.

Another important modeling decision is how many topics to choose. We selected the number that yields the highest coherence and exclusivity (Roberts et al. 2014). Coherence measures the extent to which the most probable words in a topic co-occur within the same document, whereas exclusivity measures the extent to which the most probable words in a topic are not the most probable in other topics.

## FINDINGS

### Finding 1: Topic model reveals different phases in ECB communication

We find that document-topic distributions are generally sparse in all sections. Usually, a single „topic“ dominates a section, suggesting that change in topics over time indicates substantial updates to the section's content. We interpret the topics as different phases of ECB communication.

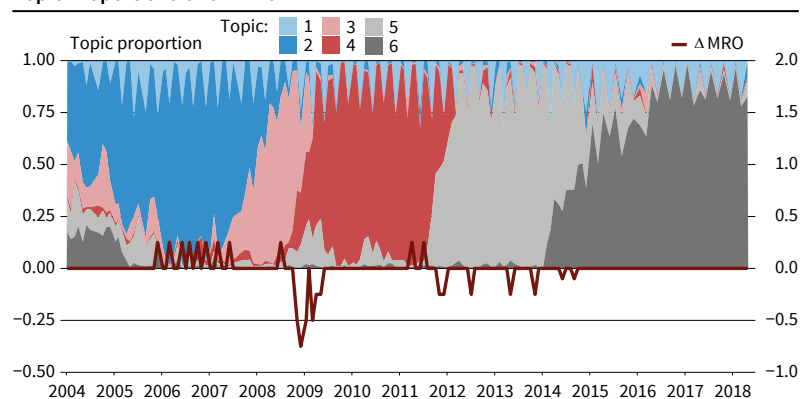
Historically, the ECB has relied on „two pillars“ for decision-making: the „economic analysis“ and the „monetary analysis.“<sup>1</sup> These two analytical perspectives are discussed in the corresponding sections of the press conference. Here, we take a closer look into the discourse in these two sections. In the analysis of the economic analysis section, we interpreted the topics by comparing them to changes in the ECB monetary policy stance. In the analysis of the monetary analysis section, we focused on the differences between topics before and after the turning points in communication.

Figure 1 shows how the proportions of topics in the economic analysis section evolved over time, along with the changes in the Main Refinancing Operations Rate (MRO). Specifically, there are the following topics:

- Topic 1: Macroeconomic projections, which are discussed quarterly. This is indicated by top terms such as „macroeconomic projection,“ „range,“ and „revise.“
- Topic 2: Positive economic outlook is emphasized during the tightening phase 2005–2007. The topic is mostly characterized by terms such as „robust,“ „favorable,“ and „efficiency.“ It declines shortly after the sequence of the rate hikes.
- Topic 3: The wage-price spiral, about which concerns appear during the first phase of policy responses to the financial turmoil, but in general, the fundamentals of the euro area economy were described as „sound.“
- Topic 4: Financial system stimulus discussion surged in November 2008; at the first press conference, the ECB announced cutting its key interest rate by 50 basis points after the Lehman collapse. Distinctive for this phase is a discussion about „financial system“ and „stimulus.“ This phase ended with two interest rate increases in April and July 2011.

<sup>1</sup> The new communication strategy, which started in 2021, refrains from this explicit division into two pillars and presents an integrated analysis.

Figure 1  
Economic Analysis Section and the ECB Interest Rate Decisions:  
Topic Proportions Over Time



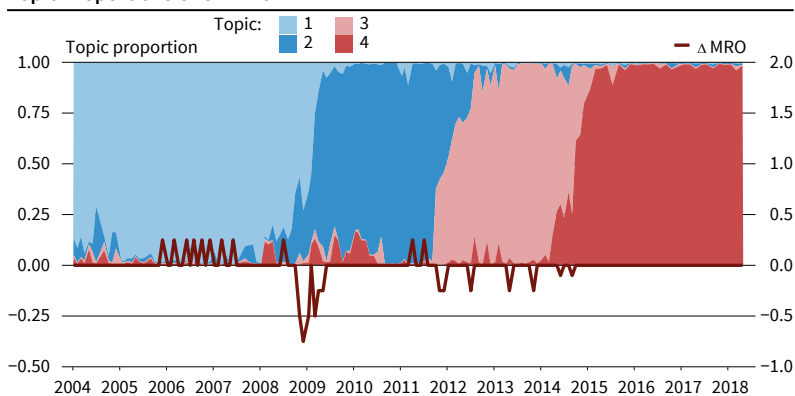
Note: ΔMRO denotes a change in the Main Refinancing Operations Rate

Source: Author's calculations (2022).

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Figure 2

### Monetary Analysis Section and the ECB Interest Rate Decisions: Topic Proportions Over Time



Note:  $\Delta$ MRO denotes a change in the Main Refinancing Operations Rate

Source: Author's calculations (2022).

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- Topic 5: Negative economic outlook phase, which marks the start of the recession in the third quarter of 2011. It is characterized by the words „weak,“ „low level,“ „modest,“ „insufficient,“ and „slow.“ This phase is associated with the easing cycle.
- Topic 6: The recovery theme emerged gradually as the interest rates approached the zero lower bound. The predominant keyword is „monetary policy measure.“

Figure 2 shows topics in the monetary analysis section. This section's turning points in narratives are October 2, 2008, November 3, 2011, and May 8, 2014. Specific sentences repeatedly appear before the shift and are replaced by different commentaries after the turn.

- Topic 1 plummeted on October 2. Before this date, the ECB repeatedly pointed at prevailing upside risks to price stability, underlying strong

monetary expansion, and temporary factors which may overstate its impact.

- Topic 2 emerged as the financial market turmoil intensified. The ECB spent more time explaining substitution effects, discussing the diminishing impact of upside risks to price stability, and the impact of financial market tensions.
- Topic 3 emerged, starting with the statement from November 3, 2011. It was also the first statement under Draghi. Several statements before this date described the moderate monetary expansion and ample monetary liquidity that can accommodate price pressures. After this date, the ECB focused more on factors related to the increased financial market tensions related to the European sovereign debt crisis and their adverse effects on monetary developments.
- Topic 4 emerged in May 2014, which was the last month of positive deposit rates. Before May 8, 2014, the ECB repeatedly expressed its concerns about the transmission of monetary policy to the financing conditions in euro-area countries, the fragmentation of euro-area credit markets, and the resilience of the banking sector. Starting in June, a comprehensive package of non-standard policy measures was gradually introduced to improve credit conditions.

### Finding 2: Shifts in ECB communication influence market volatility

The analysis of the topics in different sections over time reveals different communication regimes. Transitions between those regimes are sharp and often occur at approximately the same time in different sections. Do the transition periods increase market uncertainty?

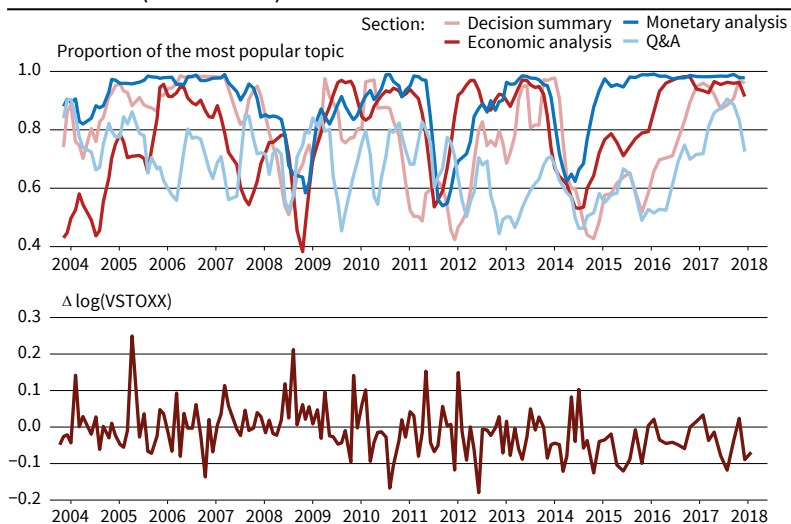
We exploited the shifts in the topics and constructed a measure of changes in communication which is the proportion of the most dominant topic on a given press conference day in a section. Figure 3 shows our topic-based measure of the homogeneity of discussion in a given section. High values of this score imply high homogeneity of discussion; lower values imply transition periods between different communication phases. The advantage of our measure of discussion homogeneity is that it does not rely on subjective topic interpretations.

We used an event-based regression framework where we focused on press conference days. We regressed VSTOXX changes on the homogeneity of discussion in different sections, controlling for surprises in the main refinancing operations rate (MRO), announcements about non-standard monetary policy measures, tone of the statements (positive/negative), and other variables.

We show that the major transitions in ECB communication regarding monetary analysis contain new and/or additional information about monetary policy

Figure 3

### Homogeneity of Topic-based Communication Measures in ECB Press Conference (Top Panel) and the Daily Percentage Change (Close to Close) of the VSTOXX (Bottom Panel)



Source: Author's calculations (2022).

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decisions. The uncertainty proxied by the VSTOXX index is on average lower when the ECB sends a homogeneous message (single topic dominates) than in times of transitions to a different topic. The implied volatility on the press conference day decreases by approximately 1.16 percentage points when the proportion of the most dominant topic in the monetary analysis section increases by ten percentage points. For reference, the standard deviation of the percentage change in VSTOXX over the analyzed period was 6.6 percent.

## POLICY CONCLUSION

Our model of the ECB press conferences demonstrates that specific sentences, phrases, and themes are persistent over time and repeated from statement to statement. This persistence reflects the effort to make communication simpler and predictable; however, the statement is updated more substantially at some points. These shifts are informative for the market beyond policy decisions because they point to a new economic or monetary policy challenge or a change in market environment. In particular, the revisions to the monetary analysis section, which describes the current course of the monetary policy, increase market uncertainty. The finding is reminiscent of that

of Ehrmann and Talmi (2020), who found that market volatility decreases when consecutive central bank communications are semantically similar or similar in wording. The reaction may indicate that new content is more difficult to digest for market participants. However, this paper focuses on within-statement coherence and does not explicitly consider cross-statement similarity. Our findings also demonstrate the ability of topic models to detect new policy narratives.

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