



EUROPEAN CENTRAL BANK

EUROSYSTEM

Working Paper Series

Andrea Pavelkova **The ECB press conference:
a textual analysis**

No 2742 / October 2022

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Abstract

The aim of central bank communication is to provide information on monetary policy and the economic outlook in a timely manner to the public. While research on central bank communication and specifically the European Central Bank's press conference has shown that it has the potential to move markets, in-depth textual analysis of key communication tools creates room for further analysis. Focusing on the press conferences of the ECB, this paper employs structural topic modelling (STM) and finds that topics within the introductory statement and the Q&A are significantly different, with a nearly equal split of topics unique to both parts. The split of topics suggests that the Q&A does not only provide clarification of what has been said in the introductory statement, but also allows journalists to enquire about the discussion within the Governing Council as well as the ECB's stance on broader economic issues.

JEL codes: E50, E52, E58

Keywords: ECB press conference, central bank communication, text analysis, natural language processing, structural topic model

Non-technical summary

Communication of monetary policy decisions by central banks has significantly increased in clarity since the 1990s as a result of a gradual shift towards greater transparency. Managing expectations about the future course of policy is crucial, especially in times of economic uncertainty. With the introduction of non-standard measures, communication came to serve both as a vehicle for explaining policy decisions and a policy instrument in itself.

One such key vehicle of ECB communication is the press conference. The ECB's press conference typically consists of an introductory statement where the President reports on the outcomes of the preceding Governing Council meeting, followed by a Q&A session which serves as a space for journalists to request clarification on the Governing Council's decisions as well as other topics.

Research on the ECB's press conferences has shown that what is said by the President during the event has the potential to move markets, providing a strong incentive to study the content of central bank statements as they have a significant effect on real economic variables.

This paper analyses the textual content of ECB press conferences and seeks to answer the question: can differences in topics addressed in the introductory statement and the Q&A be identified via structural topic modelling?

Results of this analysis can be summarised as follows. Topics prevalent in the introductory statement vary significantly from those present in the Q&A. This topic modelling approach successfully identified concrete topics which persist throughout introductory statements, as well as topics which emerge solely from the Q&A.

Furthermore, the first six most prevalent topics within this sample of press conference transcripts are predominantly prominent within the Q&A segments, suggesting that the added value of a press conference is in providing the public with further information on the ECB's decisions which were not presented in the introductory statement. Providing the space for a broader discussion in this manner contributes to transparency around monetary policy communication, enhancing its effectiveness.

1. Introduction

The aim of central bank communication is to provide information on monetary policy and the economic outlook in a timely manner to the public. Until the 1990s, monetary policy decisions by central banks were low profile events and sometimes shrouded in mystery, if not deemed entirely secret. Central banks now communicate more clearly as a result of a gradual shift towards greater transparency, which enhances the effectiveness of monetary policy and an independent central bank's accountability.

Managing expectations about the future course of policy is crucial, especially in times of uncertainty. An important change to how central banks communicate came with the economic crisis in 2007-2008. With the introduction of non-standard measures such as negative policy rates, quantitative easing, forward guidance, or macro-prudential tools came an increased need for policies to be explained in more detail than before. Ultimately communication came to serve both as a vehicle for explaining policy decisions and a policy instrument in itself (Blinder et. al., 2017).

The communication objective of a central bank can be distilled down to “creating news” and “reducing noise”. On one hand, by “creating news” central bank statements influence expectations which ultimately move markets. On the other hand, by “reducing noise” through communication efforts, a central bank can reduce volatility in markets through improved predictability of monetary policy decisions (Blinder et. al., 2008).

One such key vehicle of ECB communication is the press conference. It has now become the standard among central banks to announce monetary policy decisions immediately after policy meetings via a press release and subsequently elaborate on these decisions to bring greater transparency to the monetary policy decision-making process.

The ECB's press conference typically consists of an introductory statement,¹ followed by a Q&A session, providing a space for journalists to request clarification on monetary policy decisions. While the impact of the ECB's press conference on market movements has been studied before, further in-depth analysis of topics discussed within the press conference may provide additional insight on this communication channel.

¹ The introductory statement is now called Monetary Policy Statement after the ECB strategy review finalised in July 2021.

This paper analyses the textual contents of ECB press conferences and seeks to answer the question: can differences in topics addressed in the introductory statement and the Q&A be identified via structural topic modelling?

The contribution of this research is to provide insight into the structure of one of the most important elements of the ECB's communication policy on the outcome of its deliberations.

Structural topic modelling allows for identification of topics as well as the prevalence of every topic within each press conference in the sample. Observing differences and similarities between topic proportions reveals whether introductory statements follow a set pattern over a long period of time, and whether these topics appear also in the Q&A segment or not. Additionally, the STM captures topics unique to the Q&A which emerge from the need for clarification on issues not addressed in the introductory statement.

The findings of this analysis show that topics prevalent in the introductory statement of the ECB's press conference vary significantly from those present in the Q&A. In terms of content, the topics in the introductory statement reflect the different aspects of the Governing Council's assessment such as economic and monetary analysis, supporting the finding by Ehrmann and Fratzscher (2007) that the introductory statement is informative in nature. The Q&A topics reflect the broad range of questions posed by attending journalists, such as inquiries on the discussion within the Governing Council, the ECB's stance on global issues or the impact of monetary policy decisions on individual euro area banks.

2. Related literature

Research on central bank communication and specifically ECB communication has grown substantially in the past two decades.

A relatively thin strand of literature has focused on the press conference day and on activities around it. Ehrmann and Fratzscher (2007) stress the informational importance of ECB press conferences, focusing on the perception of markets. Their analysis shows that markets react more to a press conference than to the preceding press release, especially if the decision made has been less anticipated. Furthermore, they find that information obtained from the Q&A exerts directional change on markets, and these movements tend to be long lasting.

Similarly, Altavilla et al. (2019) study ECB communication through two elements; the policy decision press release and the press conference as a whole. By examining high frequency data, they are able to identify responses of asset prices to monetary policy surprises. They conclude that the information conveyed through the policy decision press release and press

conference differs, with the first affecting the short end of the yield curve and the second affecting intermediate as well as longer maturities. As such, information extracted from the press conference by markets relates to different topics, which have their own informative value in addition to a press release.

While the ECB's press conference as a whole has been shown to have a market-moving impact, another strand of literature employs methods of computational linguistics to study this influence in greater detail (e.g. Berger et al. (2011), Heinemann and Ullrich (2007), Rosa and Verga (2007), Sturm and De Haan (2011)).

Most recently, the impact of what is said during a press conference on markets is shown by Tillman (2021) who used the President's answers to journalists during the Q&A session to proxy for dissent in the preceding Governing Council meeting, showing that dissent weakens the response of long-term interest rates to policy surprises.

Focusing on the receiving side of communication, Tobback, Nardelli and Martens (2017) developed the Hawkish-Dovish (HD) indicator which measures the tone of the ECB's press conferences as perceived by the media. By including the HD-index in the specification of the ECB's Taylor rule, they confirm that communication plays a significant role in enhancing the predictability of the policy rate.

Nevertheless, research which specifically makes use of machine learning to identify topical content within ECB press conferences is sparse. This paper aims to bridge this gap by employing a structural topic model on the content of ECB press conferences differentiating between the introductory statement and the Q&A.

3. Data and methodology

The dataset consists of a sample of transcripts of the ECB's press conferences between January 2001 and December 2021. All transcripts were obtained from the ECB website and stored in plain text format with the introductory statement and the Q&A in separate documents, totalling 440 individual documents. The main tools used for this analysis were the *quanteda* package (Benoit et al. 2018) for text pre-processing and the *stm* package (Roberts, Stewart & Tingley, 2019) for structural topical modelling.

As a first step of the analysis, raw text data underwent several pre-processing steps to match the input requirements for a structural topic model, including conversion to lower case, stemming, removal of punctuation, numbers and stop-words. While not usually considered stop words, additional words commonly used in speech such as "mention" or "wonder" were

removed from the data to improve the coherence of topics and eliminate noise. Repetitive phrases were also removed from the text files, such as the pre-ambles at the start of the introductory statement². The list of removed phrases and words is available in Appendix A.

Text documents of each press conference were split at paragraph level to aid the model in identifying coherent topics, as transcripts of introductory statements to press conferences are already pre-structured in paragraphs when uploaded to the ECB website. In this form each paragraph roughly corresponds to a particular topic explaining the Governing Council's decision. The transcript of the Q&A follows a similar style, with every question and subsequent answer represented in a new paragraph. Once the model has been estimated, each paragraph can be linked to a topic it is most representative of.

Compared with other text analysis models, such as the Latent Dirichlet Allocation (LDA) approach (Blei, Ng & Jordan, 2003), the advantage of the STM is that it incorporates meta-data into the topic modelling framework. Assigning meta-data categories such as the date, the president in office for a given press conference and whether the text is the transcript of an introductory statement or a Q&A allows the model to estimate how topic proportions vary across all those categories. For example, estimating the model using president meta-data would show how topic proportions vary across each ECB President in office.

An additional variable labelled *interaction* was included in the meta-data, combining the date and type indicators into one³. Estimating the model using the *interaction* variable allows for separation of topic proportions between introductory statements and Q&A segments, giving detailed insight into topic proportions for every single press conference.

Before initialising STM estimation, a set number of topics must be specified by the researcher. While a priori there is no ideal number of topics selectable for any given set of texts, there are several data-driven approaches to aid in identifying a suitable number of topics.

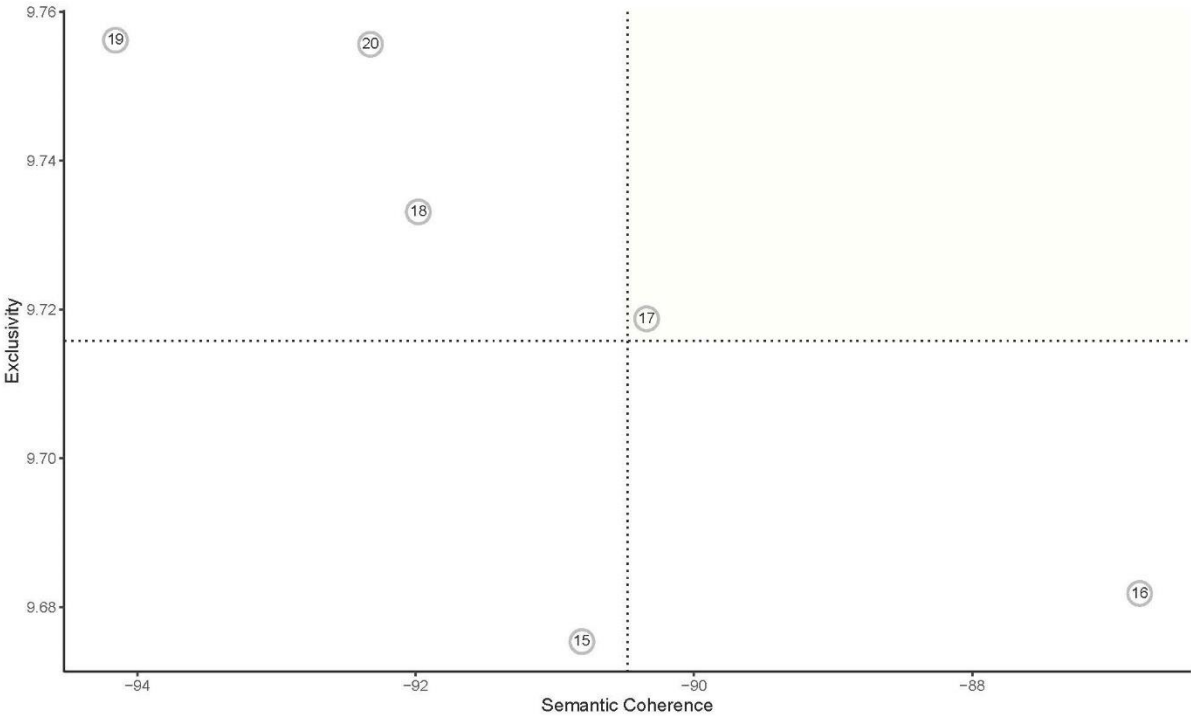
For this analysis, the number of topics was selected based on the semantic coherence and exclusivity dimensions. Semantic coherence is a metric developed by Mimno et al. (2011) which represents how well an estimated topic can be interpreted by a researcher and is maximised when the most likely words present in a topic co-occur together frequently. High semantic coherence is more likely to be attained with a lower number of topics populated by

² For example “*Ladies and gentlemen, the Vice-President and I will now report on the outcome of today’s meeting of the Governing Council of the ECB*”, or “*We are now at your disposal for questions.*”

³ Each text document was labelled to indicate its date and type in the “yyyy-mm-dd-xx” format, for example “2002-01-03-IS” or “2002-01-03-QA” for the transcript of the IS and Q&A segments respectively.

common words. Exclusivity of a topic is measured through FREX (Bischof & Airoldi, 2012), which indicates whether there is clear divide between the content of each topic, or if topics overlap.

Graph 1: Exclusivity and Semantic Coherence plot



Graph 1 plots the average value of semantic coherence and exclusivity for topic models with different number of topics, labelling the model with the number of topics estimated in it. A model with the most desirable properties will gravitate towards the upper right corner of the plot. Based on this Coherence-Exclusivity graph, the structural topic model with 17 topics has been selected as best suited for this analysis.

The resulting 17 topics of the STM model do not have pre-assigned themes. It is therefore the task of the researcher to evaluate every topic and assign a label based on which theme it represents. Topic interpretation is aided by examining the most frequent words present in a topic, the most representative documents of each topic, the time period in which they are most prominent and the estimated relationship between meta-data and topic content.

While words with the highest frequency are a good indication of what a topic is about, it is helpful to also consider words with the highest FREX and Lift. FREX assigns weights to words based on their frequency and exclusivity in the topic which is especially useful when topics share highest probability words, while Lift assigns higher weights to words which appear less

frequently in other topics. As an example, if the word “analysis” appears in two topics with equally high frequency, one topic can have “economic” under its highest FREX words while the other topic could have “monetary”.

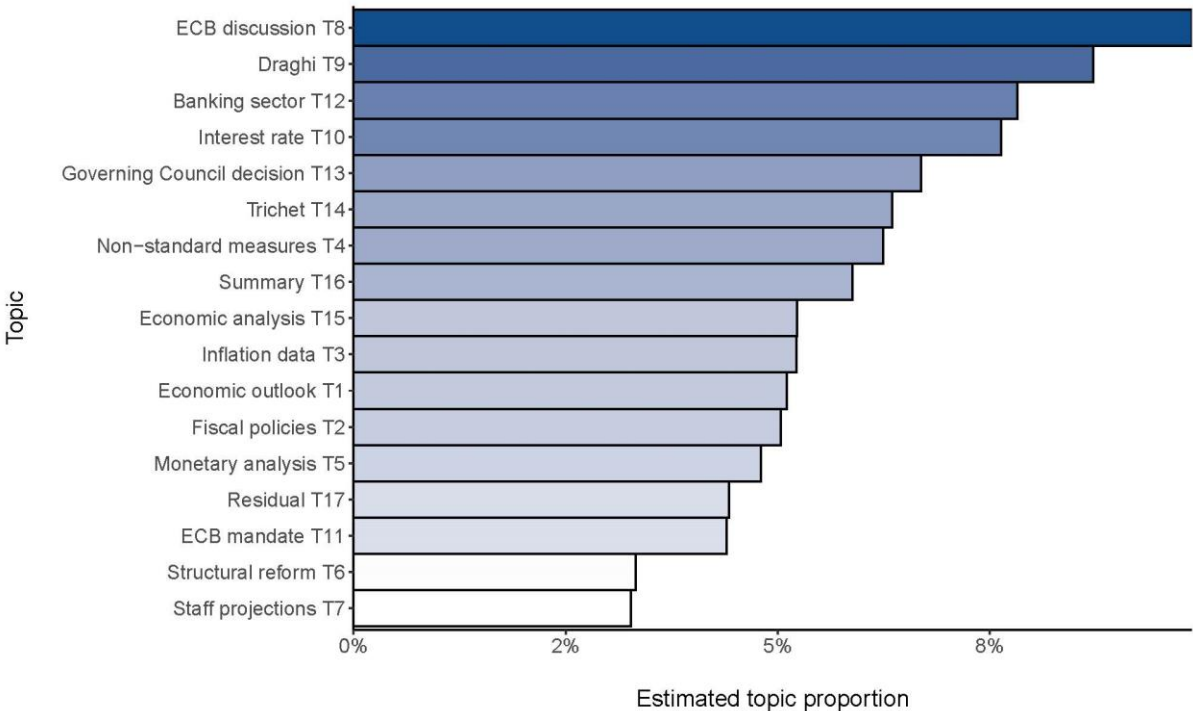
The STM model also estimates the share of a document that can be attributed to each topic. Through qualitative inspection, it can be concluded that documents with a theta value of 0.7 and above can be considered 70% representative of a topic. Exploring the most representative documents for each estimated topic then provides further insight into what themes a given topic encompasses.

4. Results

Results of the structural topic model with 17 estimated topics show that topics prevalent in the introductory statement of the ECB’s press conference vary significantly from those present in the Q&A.

Graph 2 visualises topic proportions in order of prominence across the entirety of the dataset, with insight into the content of each topic provided by words with the highest frequency, FREX and Lift scores available in Appendix B. Chart 1 shows whether a particular topic is more prominent within the introductory statement or in the Q&A.

Graph 2: Estimated proportions of 17 STM topics



Looking at differences in topic prominence in Chart 1, eight topics can be seen as representative of introductory statements and eight dominate Q&A segments, with the topic labelled “Non-standard measures” being prevalent in both nearly equally.

Topic 8 labelled “ECB discussion” has the highest estimated proportion over all documents, encompassing all questions directed at the discussion surrounding the ECB, its standing on European as well as international issues. Being the most prominent topic and nearly exclusive to the Q&A, it suggests that aside from topics related to monetary policy, journalists show interest in the stance of the institution on a wide variety of issues.

Similarly, topics 10 “Interest rate” and 13 “Governing Council decision” are fourth and fifth in terms of coverage. Their estimated prominence shown in Chart 1 suggests that a large part of the Q&A is dedicated to questions directed at the discussion within the ECB’s Governing Council and especially on decisions behind the setting of the ECB’s interest rate.

Topic 12 “Banking sector” is the third most prominent topic, reflecting that what is decided during the Governing Council’s meeting has a significant impact on banks within the euro area as well as having a market moving impact, with such effects being discussed within the Q&A segments. A major contributor to this topic are questions from journalists specifically about the eligibility of Greek bonds in the ECB’s asset purchase programmes, with this topic spiking in 2010 around the introduction of the Securities Markets Programme and again in 2015 when Greece experienced further economic turmoil. Aside from major mentions of Greece, questions surrounding assistance to the Spanish banking sector in 2012 and 2013 contribute to this topic.

Topics 15 “Economic analysis” and 5 “Monetary analysis” capture specific portions of the introductory statement which explain the assessment of the Governing Council in greater detail. As these topics do not appear within the Q&A, they lend support to the assumption that the introductory statement of a press conference is informative and relatively self-contained.

From all topics identified in this analysis, topic 4 labelled “Non-standard measures” is the only topic which is prominent nearly equally in the introductory statement and Q&A. This topic prominently appears for the first time in the [05 February 2009](#) Q&A, as journalists already posed questions to President Trichet on whether the ECB would consider embarking on additional alternative measures, such as quantitative easing in light of significant economic downturn. The topics then became increasingly prominent following the [07 May 2009](#) press conference, where the Governing Council announced the Eurosystem’s first covered bond purchase programme (CBPP1). This topic labelled “Non-standard measures” is the only topic to significantly carry over to Q&A segments, where further clarification is requested.

Chart 1: Estimated prominence of topics by segment

Topic number	Topic label	IS	Q&A	Difference
Topic 1	Economic outlook	0.102***	0.042	-0.060***
Topic 2	Fiscal policies	0.081***	0.052	-0.029***
Topic 3	Inflation data	0.109***	0.044	-0.065***
Topic 4	Non-standard measures	0.068***	0.062	-0.006*
Topic 5	Monetary analysis	0.125***	0.038	-0.087***
Topic 6	Structural reform	0.060***	0.032	-0.028***
Topic 7	Staff projections	0.056***	0.034	-0.022***
Topic 8	ECB discussion	0.007**	0.114	0.108***
Topic 9	Draghi	0.002*	0.092	0.090***
Topic 10	Interest rate	0.017***	0.086	0.069***
Topic 11	ECB mandate	0.011***	0.053	0.042***
Topic 12	Banking sector	0.019***	0.090	0.070***
Topic 13	Governing Council decision	0.010***	0.075	0.065***
Topic 14	Trichet	0.006***	0.073	0.067***
Topic 15	Economic analysis	0.146***	0.033	-0.113***
Topic 16	Summary	0.161***	0.036	-0.125***
Topic 17	Residual	0.021***	0.044	0.023***

Note: The table reports the significance level for the topic proportions in the introductory statement and for the difference in the topic proportions between the Q&A and the introductory statement. Significance at 0.001%, 0.01% and 1% is denoted by ***, ** and * respectively.

It must be noted that not all topics can be considered informative per-se. Topic 17 has been labelled as “Residual” and does not fundamentally encompass a specific topic. Also, topics 9 and 14, labelled after their respective ECB Presidents in office, show that speech patterns and preferred phrases make up a substantial part of communication.

Overall, it can be concluded that a topic modelling approach on central bank communication can successfully identify concrete topics which persist throughout introductory statements, as well as topics which emerge solely from the Q&A.

5. Conclusions

Looking at any introductory statement of the ECB's press conference, several broad categories of topics can be inferred at first glance. It is structured to have a brief summary of the Governing Council's monetary policy stance, followed by details of non-standard measures, inflation data, staff macroeconomic projections as well as monetary, economic and fiscal policy analyses.

The structural topic model presented in this paper successfully captures the above-mentioned themes present in the introductory statement and several additional topics only found in the Q&A, showing that the two segments differ substantially in content.

Eight topics are representative of introductory statements and eight topics dominate the Q&A segments, with the topic labelled "Non-standard measures" being prevalent in both nearly equally. Topics prevalent in the introductory statement often deal with analysis results, numbers or figures, which is especially evident when looking at topics such as "Inflation data", "Staff projections" and "Monetary analysis". This lends support to the assumption that the introductory statement of a press conference is informative in nature, as shown by Ehrmann and Fratzcher (2007).

The first six most prevalent topics are mostly present within the Q&A segments, suggesting that the press conference adds value to the ECB communication by providing the public with further information on the ECB's decisions on a broader set of topics, which were not touched upon in the introductory statement.

Overall, the process and results of this working paper have made advancements in combining advanced methods of topic modelling with central bank communication. As a suggestion for future research, the estimated topics could be compared to market movements to follow in the vein of related research (e.g. Altavilla et al. 2019) and potentially estimate whether certain topics have stronger effects on markets than others.

Appendix A: Phrases and words removed from text files

"\\(translation\\)", "\\(translation from French\\)", "\\(translation from Greek\\)", "\\(Translation\\)",
"Bonnici", "Caruana", "Chair", "Coene", "Constancio", "De Guindos", "Fazio", "Garganas",
"Georghadji", "Graeff", "Hansson", "Hurley", "Ignazio Visco", "Korber", "Kranjec", "Liebscher",
"Liikanen", "Luis de Guindos", "Nowotny", "Noyer", "Papademos", "Tumpel-Gugerell",
"Vasiliauskas", "Vice-President", "Weber", "Weidmann", "Mr", "Ms", "Mrs", "Madame",
"Draghi", "President", "Trichet", "Duisenberg", "Lagarde", "First question", "Second question",
"Question*", "QUESTION"

"one", "two", "first*", "second*", "third", "last*", "next", "point*", "question*", "answer*", "ask*",
"say*", "said", "mention*", "talk*", "tell*", "told", "suggest", "think*", "wonder*", "mean*",
"understand*", "know*", "maybe", "perhaps", "seem*", "see*", "look*", "consider*", "regard*",
"includ*", "hear*", "going", "go", "goes", "come*", "came", "giv*", "use*", "using", "get*", "can",
"could", "should", "may", "might", "way", "yes", "no", "lot", "bit", "also", "case*", "fact*", "like*",
"want*", "believe*", "feel*", "actual*", "well", "kind*", "moment", "time*", "now", "current*",
"back", "ago", "mak*", "made"

Appendix B: Most frequent words, FREX and lift by topic

Topic 1 Top Words: Economic outlook

Highest Prob: risk, market, financi, relat, develop, outlook, uncertainti

FREX: risk, downsid, relat, uncertainti, financi, tension, upsid

Lift: protection, protectionist, surround, tilt, downsid, disord, pose

Topic 2 Top Words: Fiscal policies

Highest Prob: fiscal, polici, countri, govern, stabil, implement, euro_area

FREX: fiscal, pact, union, deficit, implement, stabil, budget

Lift: ambiti, budget, budgetari, deficit, pact, reap, union

Topic 3 Top Words: Inflation data

Highest Prob: inflat, price, expect, oil, rate, increas, effect

FREX: inflat, oil, energi, price, hicp, estim, wage

Lift: flash, food, headlin, energi, hover, market-bas, hicp

Topic 4 Top Words: Non-standard measures

Highest Prob: measur, purchas, condit, monetary_polici, oper, liquid, end

FREX: refinanc, purchas, non-standard, oper, pepp, instrument, transmiss

Lift: tender, app, asset_purchase_programm, envelop, iii, tltro, allot

Topic 5 Top Words: Monetary analysis

Highest Prob: credit, growth, loan, rate, monetari, m3, annual

FREX: loan, m3, credit, lend, non-financi, corpor, household

Lift: enterpris, non-financi, outstand, m3, loan, m1, mfi

Topic 6 Top Words: Structural reform

Highest Prob: reform, structur, euro_area, growth, market, labour, product

FREX: reform, competit, product, structur, labour, area, unemploy

Lift: lisbon, competit, innov, rigid, product, speed, reform

Topic 7 Top Words: Staff projections

Highest Prob: project, staff, forecast, growth, press, ecb, reflect

FREX: project, staff, forecast, press, revis, rang, confer

Lift: forecast, forese, rang, press, project, staff, baselin

Topic 8 Top Words: ECB discussion

Highest Prob: ecb, discuss, concern, member, view, european, work

FREX: board, imf, day, week, member, propos, minist

Lift: dialogu, articl, board, italian, join, law, letter

Topic 9 Top Words: Draghi

Highest Prob: differ, certain, much, countri, thing, realli, just

FREX: realli, thing, sens, differ, quit, zone, germani

Lift: zone, sens, one, went, varieti, wors, realli

Topic 10 Top Words: Interest rate

Highest Prob: rate, interest_r, month, chang, statement, exchang, monetary_polici

FREX: exchang, statement, cut, interest_r, move, introductor, deflat

Lift: deposit_r, zero, cut, exchang, hike, deflat, bias

Topic 11 Top Words: ECB mandate

Highest Prob: price_st, respons, mandat, deliv, import, europ, currenc

FREX: deliv, respons, messag, currenc, mandat, extrem, credibl

Lift: duti, fellow, saver, branch, deliv, deliveri, live

Topic 12 Top Words: Banking sector

Highest Prob: bank, central, bond, govern, programm, market, ecb

FREX: bond, greec, collater, greek, buy, bank, irish

Lift: smp, supervisor, agenc, collater, efsf, ela, haircut

Topic 13 Top Words: Governing Council decision

Highest Prob: decis, today, governing_council, take, market, us, taken

FREX: today, decis, unanim, never, communic, taken, took

Lift: pre-commit, con, pros, unanim, banknot, never, took

Topic 14 Top Words: Trichet

Highest Prob: level, observ, clear, particular, economi, number, situat

FREX: observ, judgement, figur, concept, number, element, draw

Lift: atlantic, pertin, concept, ant, communic, ex, standpoint

Topic 15 Top Words: Economic analysis

Highest Prob: econom, growth, euro_area, quarter, recoveri, continu, real

FREX: recoveri, quarter, demand, consumpt, domest, activ, export

Lift: export, consumpt, quarter-on-quart, vaccin, recov, recoveri, dispos

Topic 16 Top Words: Summary

Highest Prob: medium, term, price_st, monetari, remain, inflat, econom

FREX: medium, term, monetari, close, anchor, confirm, analysi

Lift: medium, cross-check, sum, vigor, warrant, prerequisite, analys

Topic 17 Top Words: Residual

Highest Prob: year, effect, economi, part, still, cours, signific

FREX: espec, basic, eurozon, show, part, extent, caus

Lift: brexit, gap, recess, espec, eurozon, worsen, caus

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Acknowledgements

This paper was made possible thanks to the expertise and valuable research insights provided by the Analytics and Research team in ECB Directorate General Communications. I would like to thank Siria Angino, Irene Germani, Francesco Paolo Mongelli and Federico Maria Ferrara for their helpful comments and discussions.

The views expressed here are those of the author and do not necessarily represent those of the ECB or the Eurosystem.

Andrea Pavelkova

European Central Bank, Frankfurt am Main, Germany; email: a.pavelkova@outlook.com

© European Central Bank, 2022

Postal address 60640 Frankfurt am Main, Germany

Telephone +49 69 1344 0

Website www.ecb.europa.eu

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ISBN 978-92-899-5390-0

ISSN 1725-2806

doi:10.2866/250437

QB-AR-22-107-EN-N