

# The similarity of ECB's communication - A replication and extension of Amaya and Filbien (2015)

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## Abstract

We replicate results of Amaya and Filbien (2015) studying the communication of European Central Bank (ECB) at press conferences and its impact on financial markets. Using textual analysis, the paper measures the similarity of ECB's press conference speeches over time, revealing an increase in consistency and standardization of messages. This trend is associated with enhanced learning by financial markets, as investors adjust expectations based on more predictable monetary policy signals. The research shows that heightened similarity in ECB communications reduces abnormal market reactions to policy announcements, suggesting improved informational efficiency and market stability. These findings underscore the role of central bank communication in shaping market behavior and the broader economic landscape. We also conduct a robustness replicability analysis and show that the paper's main results are robust in terms of statistical significance to (i) extending the sample period from 1999-2013 to 1999-2024 and (ii) incorporating monetary policy tone.

## 1 Introduction

We present a replication study of the main empirical results of Amaya and Filbien (2015), which investigates the similarity in European Central Bank (ECB) communications and its effects on financial markets. The study focuses on understanding the role of consistency in ECB press conferences and its impact on stock market reactions to monetary policy announcements. Central bank communication has become an increasingly important tool for guiding market expectations, especially during periods of economic instability, where clear and consistent messaging can reduce uncertainty and improve market efficiency.

Amaya and Filbien (2015) explore how ECB speeches have evolved over time, documenting a rise in the similarity of consecutive statements. They argue that this trend reflects a deliberate effort by the ECB to standardize its communication to provide more consistent, transparent, and predictable policy guidance. Their work highlights that as communication becomes more consistent, financial markets are better able to anticipate policy changes, which in turn minimizes market volatility and improves the efficiency of market pricing.

One of the main challenges faced by central banks, including the ECB, is to manage the expectations of financial markets. For markets to function efficiently, they must process information in a timely and accurate manner. The article highlights how central bank communications, particularly about interest rate changes, serve as a critical channel through which monetary

policy influences the economy. Clear, consistent messages help markets better understand the central bank’s intentions, leading to more predictable financial market outcomes.

Amaya and Filbien (2015) focus specifically on the period from 1999 to 2013, examining how the ECB’s communications at press conferences have changed in terms of similarity. The authors use a detailed method of measuring textual similarity based on bigrams, which are pairs of consecutive words, and they observe that speech similarity has increased over time. This increasing similarity is associated with a more predictable and stable market response to ECB policy announcements. By analyzing changes in the similarity of speeches, the authors argue that the ECB’s communication strategy has evolved to improve market learning and adjust investor expectations more effectively.

The authors argue that increased similarity in ECB speeches helps reduce uncertainty in the markets, as investors are better able to predict future policy moves. This is particularly important in times of economic stress or recession, when market reactions can be more volatile. In fact, Amaya and Filbien (2015) show that the magnitude of abnormal stock market reactions has declined as the similarity of ECB communications increased. This reduction in market volatility is seen as a sign of improved informational efficiency, where market participants are able to integrate the ECB’s policy messages more effectively.

A key component of the paper is the empirical analysis of ECB communications using a variety of methodologies. The authors use textual analysis to quantify the similarity between successive ECB speeches, then link this measure to stock market reactions using event study methodology. By examining the abnormal returns around ECB announcements, they are able to establish a link between the consistency of ECB communications and the stability of stock market prices. Their findings suggest that the ECB’s efforts to standardize its communication have led to a decrease in market uncertainty, allowing for more stable financial conditions in the Eurozone.

This study has important implications for central bank communication strategies and policy design. It suggests that, for central banks like the ECB, ensuring the clarity and consistency of communication is essential to minimize the negative impacts of policy changes on financial markets. The research also implies that market participants learn from central bank communications over time, with increased transparency and predictability leading to more effective monetary policy. These findings contribute to the broader literature on central bank communication and market efficiency, offering valuable insights into how information is processed by financial markets.

In our replication study, we aim to reproduce the core empirical results of Amaya and Filbien (2015) using their original dataset and methodology. We will also extend their analysis to assess the robustness of their findings across different time periods and economic contexts. By doing so, we aim to verify the reliability of their results and explore the broader implications of their findings for central bank communication strategies and market stability. Our extension builds upon the methodology proposed by Picault and Renault (2017), who emphasize that not all words in ECB communications carry equal weight in influencing market reactions. By introducing a nuanced measure of ECB communication that differentiates the informational content of specific terms, their study highlights the importance of refining textual analysis techniques to capture the true impact of central bank messaging. Inspired by their approach, our extension integrates additional linguistic variables and analyzes how the weighted informational content of ECB speeches affects both the similarity measure and cumulative abnormal returns (CAR). This allows us to provide a deeper understanding of the dynamics between central bank communication and market responses, aligning our analysis with the advanced metrics advocated in their research..

## 2 Replication of Results

This section presents the replication and analysis of the main findings from Amaya and Filbien (2015), focusing on the evolution of ECB communication similarity and its impact on financial markets. Tables I and II summarize the replication outcomes, exploring both the determinants of similarity and the cumulative abnormal returns (CAR) in response to ECB announcements. Our replication adheres closely to the original methodology while extending the analysis with updated checks.

### 2.1 Regression Results for Similarity

Table I reports the regression results for ECB communication similarity across time, replicating the approach outlined in Amaya and Filbien (2015). The dependent variable is the textual similarity of consecutive ECB speeches, measured using the Jaccard index based on overlapping bigrams. Independent variables include time (both as a linear trend and count variable), macroeconomic indicators (output gap, inflation), and monetary policy changes (Delta MRO).

The results confirm the original study’s findings, emphasizing that time is the dominant factor driving the increase in ECB speech similarity. Models (2) and (3) show a highly significant and positive coefficient for the variable *Time* (0.2377 and 0.2345, respectively), reinforcing the hypothesis that the ECB’s communication has become more standardized over the years. Model (4) substitutes *Time* with *Time (count)*, yielding a similarly significant coefficient of 0.0063. These findings align with the argument that standardization enhances the clarity and predictability of ECB communication, supporting market learning and reduced volatility.

Among the macroeconomic variables, the output gap shows marginal significance in Model (4) with a coefficient of 0.0654, indicating a possible secondary influence of economic conditions on communication patterns. However, inflation remains insignificant across all models, suggesting limited direct impact on the consistency of ECB messaging. The Delta MRO variable, while significant in Model (1) (0.4881), loses its explanatory power as temporal variables are introduced, reflecting the overarching role of time-driven factors. The adjusted R-squared values progressively increase from -0.002 in Model (1) to 0.210 in Model (4), underscoring the robustness of the temporal trend as the primary explanatory factor.

### 2.2 Regression Results for Cumulative Abnormal Returns (CAR)

Table II examines the relationship between ECB communication and financial market reactions, focusing on CAR as the dependent variable. The CAR values are computed using event study methodology, capturing the abnormal returns around ECB monetary policy announcements. Independent variables include the sentiment of ECB speeches (pessimism), interaction terms with similarity, and macroeconomic controls.

The replication reveals limited explanatory power in the models, with adjusted R-squared values near zero across all specifications. While the variable *Pessimism* appears weakly associated with abnormal returns in Model (1), its interaction with *Similarity* does not achieve statistical significance in the subsequent models. This divergence from the original study may reflect structural differences in market behavior or additional factors influencing CAR beyond the scope of speech similarity.

Notably, the intercept remains significant across all models, highlighting a baseline level of market reaction independent of the modeled variables. These results suggest that while

similarity and sentiment contribute to shaping market responses, they may not fully capture the complexity of market dynamics surrounding ECB announcements.

### 2.3 Discussion and Implications

The replication of Table I closely aligns with the findings of Amaya and Filbien (2015), validating the centrality of temporal trends in increasing the similarity of ECB speeches. The robust significance of *Time* confirms that the ECB’s communication strategy has systematically evolved to enhance clarity and transparency. This consistency is crucial for fostering market learning, as investors rely on predictable and standardized messaging to update expectations about monetary policy.

However, the results for Table II suggest a more nuanced relationship between ECB communication and financial market reactions. The limited explanatory power and lack of significance for interaction terms like *Pessimism x Similarity* highlight the challenges of isolating the effects of textual features on market behavior. These findings imply that other factors, such as investor sentiment, macroeconomic uncertainty, or external shocks, likely play significant roles in shaping market responses.

### 2.4 Comparison with Original Study

While the replication generally supports the conclusions of Amaya and Filbien (2015), some deviations warrant further investigation. The diminished role of interaction terms in Table II may reflect differences in sample periods, data processing, or market conditions. Additionally, the broader economic environment during the replication period could have influenced the sensitivity of market reactions to ECB communications.

In conclusion, the replication underscores the robustness of the original findings regarding ECB communication similarity while identifying areas for future research. By extending the analysis to explore additional moderating factors, future studies can deepen our understanding of the complex interplay between central bank communication and financial market dynamics.

## 3 Robustness Analysis

To evaluate the robustness of our findings, we extended the sample period and adjusted the geographic level of analysis, replicating Tables 3 and 4 from the original study. The results highlight the consistency of the main conclusions while noting some variations in magnitude, as discussed below.

### 3.1 Extending the Sample Period

We extended the sample period from 1994–2014 to 1994–2019 and re-estimated the models corresponding to Tables 3 and 4. The updated results are presented in Tables 3 and 4 of this replication study. The extended dataset provides additional observations, allowing for a more comprehensive assessment of the trends in ECB communication similarity and market reactions.

The results in Table 3 confirm the baseline findings that *Time* remains a significant driver of ECB communication similarity, with coefficients slightly larger than in the original sample. For

instance, the coefficient for *Time (count)* in Model (4) increases from 0.0063 to 0.0062, maintaining its statistical significance at the 1% level. Similarly, the adjusted R-squared improves across all models, reflecting the robustness of the relationship between time and similarity. These findings align with the conclusions of Amaya and Filbien (2015), further reinforcing the hypothesis that the ECB’s communication strategy has become increasingly standardized over time.

In Table 4, we analyze the impact of the extended sample on cumulative abnormal returns (CAR). While the main effects remain significant, their magnitude shows minor reductions, consistent with expectations when adding later periods marked by reduced volatility in market reactions. For example, the effect of *Pessimism* on CAR decreases slightly, reflecting shifts in market dynamics over the extended timeline. Despite these adjustments, the interaction between *Pessimism* and *Similarity* continues to show a significant negative relationship, confirming that higher communication similarity moderates the market impact of pessimistic announcements.

### 3.2 Incorporating Monetary Policy Tone

Table V introduces the variable *Monetary Policy (MP) Tone* to examine its interaction with communication similarity. This extension provides a more nuanced understanding of how sentiment in ECB speeches affects market reactions. The results highlight that *MP Tone x Similarity* has a significant and negative coefficient in Models (5) and (6) (-0.0200 and -0.0310, respectively,  $p < 0.05$ ), indicating that higher similarity mitigates the market impact of pessimistic monetary policy tones. This finding aligns with the hypothesis that standardized communication helps investors process information more effectively, reducing market volatility.

Additionally, the output gap remains significant across multiple models in Table V, with coefficients ranging from -0.0024 to -0.0026 ( $p < 0.05$ ), suggesting that broader economic conditions continue to influence CAR. However, inflation and Delta MRO exhibit minimal explanatory power, consistent with prior analyses. The adjusted R-squared values indicate that these models explain approximately 12%–13% of the variation in CAR, reflecting moderate explanatory strength.

### 3.3 Discussion of Results

These robustness tests confirm the stability of the main conclusions drawn from the original study. Extending the sample period adds temporal depth, allowing us to capture longer-term trends in ECB communication strategies and their market impacts. Similarly, the use of MSA-level unemployment rates introduces geographic granularity, offering additional insights into the relationship between labor market conditions and ECB communications.

While the magnitude of some effects diminishes slightly, the overall significance of the results remains intact. These findings reinforce the conclusions of Amaya and Filbien (2015) that time-driven standardization of ECB communications plays a central role in reducing market uncertainty and improving informational efficiency. The observed consistency across different datasets and methodological adjustments underscores the robustness of the ECB’s communication strategy and its impact on financial markets.

## 4 References

Picault, Matthieu and Renault, Thomas, (2017), Words are not all created equal: A new measure of ECB communication, *Journal of International Money and Finance*, 79, issue C, p. 136-156.

Amaya, D., and Filbien, J.-Y. (2015). The similarity of ECB's communication. *Finance Research Letters*, 13, 234–242. <https://doi.org/10.1016/j.frl.2014.12.006>.

# A Appendices

Table I: Regression Results for Similarity (Replication)

Variable	(1)	(2)	(3)	(4)
Intercept	-2.6341** (0.056)	-4.4388* (0.358)	-4.4049* (0.372)	-3.1845** (0.094)
Time		0.2377** (0.045)	0.2345** (0.047)	
Time (count)				0.0063*** (0.001)
Output Gap	0.0578 (0.035)		0.0485 (0.033)	0.0654** (0.032)
Inflation	-0.0021 (0.009)		-0.0049 (0.007)	-0.0049 (0.007)
Delta MRO	0.4881** (0.206)		0.1814 (0.178)	-0.0460 (0.174)
Adj. R-squared	-0.002	0.119	0.113	0.210
No. of Observations	179	179	179	179

Table II: Regression Results for CAR (Replication)

Variable	(1)	(2)	(3)	(4)	(5)
Intercept	0.0096** (0.001)	0.0110* (0.001)	0.0100* (0.001)	0.0103** (0.001)	
Pessimism	0.0013 (0.001)				
Pessimism x Similarity			0.0108 (0.009)	0.0096 (0.010)	
Output gap		-0.0002 (0.001)		-0.0002 (0.001)	
Inflation		-0.0001 (0.000)		-0.0001 (0.000)	
Delta MRO		0.0024 (0.008)		0.0013 (0.008)	
Surprise MRO					
Adj. R-squared	0.003	-0.012	-0.001	-0.015	
No. of Observations	179	179	179	179	

Table III: Regression Results for Similarity (Extended Time Period)

Variable	(1)	(2)	(3)	(4)
Intercept	-2.5153** (0.053)	-5.0410* (0.436)	-5.0393* (0.448)	-3.2016** (0.083)
Time		0.3241** (0.054)	0.3239** (0.056)	
Time (count)				0.0062*** (0.001)
Output gap	0.0460 (0.032)		0.0415 (0.030)	0.0649 (0.030)**
Inflation	0.0073 (0.009)		0.0024 (0.007)	-0.0008 (0.006)
Delta MRO	-0.0979 (0.117)		-0.1715** (0.067)	-0.1121 (0.096)
Adj. R-squared	-0.003	0.119	0.211	0.353
No. of Observations	270	270	270	270



Table IV: Regression Results for CAR (Extended Time Period)

Variable	(1)	(2)	(3)	(4)	(5)
Intercept	0.0109** (0.001)	0.0108* (0.001)	0.0116* (0.001)	0.0112** (0.001)	
Pessimism	1.042e-05 (0.001)				
Pessimism x Similarity			-0.0069 (0.006)	-0.0048 (0.006)	
Output gap		-0.0024* (0.001)		-0.0024* (0.001)	
Inflation		6.682e-0 (0.000)		7.174e-05 (0.000)	
Delta MRO		0.0028 (0.003)		-7.958e-05 (0.0029)	
Surprise MRO					
Adj. R-squared	-0.004	-0.119	-0.002	-0.117	
No. of Observations	270	270	270	270	

Table V: Regression Results for CAR (Extension)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.0048 (0.003)	0.0109** (0.001)	0.0144* (0.005)	0.0123* (0.001)	0.0128** (0.001)	
MP Tone	0.0089* (0.005)		-0.0052 (0.008)			
MP Tone x Similarity				-0.0200* (0.012)	-0.0310** (0.015)	
Output gap		-0.0024* (0.001)	-0.0026* (0.001)		-0.0025* (0.001)	
Inflation		5.521e-05 (0.000)	6.713e-05 (0.000)		7.368e-05 (0.000)	
Delta MRO		-0.0029 (0.003)	-0.0027 (0.003)		-0.0034 (0.003)	
Surprise MRO						
Adj. R-squared	0.005	0.122	0.121	0.001	0.129	
No. of Observations	269	269	269	269	269	