

MASTER THESIS

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# **Does European Central Bank Tone Embedded In Speeches Move Asset Prices?**

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## Abstract

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# 1 Introduction

*Research Question: How do asset prices react to monetary policy and economic outlook sentiment in European Central Bank speeches?*

In this paper I will answer the following questions:

1. How do Euro area bonds of different maturities 3 months 1-, 2-, 5-, 7-, 10-, 20- and 30 years react to sentiment in ECB's speeches?
2. How do stock returns react to sentiment in ECB's speeches?
3. How does the credit spread between Italian and German sovereign bonds react to sentiment in ECB's speeches?
4. How do inflation expectations react to sentiment in ECB's speeches?
5. How do asset prices react to sentiment in speeches by ECB representatives of different ranks? (e.g. president, vice-president and board members)

## 2 ECB's Communication Overview

### 2.1 Why ECB's Communication Matters?

The primary objective of the ECB is to maintain price stability. The main tool to achieve this is by manipulating short-term overnight interest rates. However, the ECB understands that market agents do not make decisions based on these short-term interest rates. Instead, what matters is the ECB's signals to the market via alteration of these rates. These signals affect market expectations regarding the future path of short-term interest rates, which then impact long-term interest rates as shown by expectations hypothesis of the term structure of interest rates in Equation 1 (Blinder et al., 2008).

$$R_t = \alpha_n + (1/n)(r_t + r_{t+1}^e + r_{t+2}^e + \cdots + r_{t+n-1}^e) + \varepsilon_{1,t} \quad (1)$$

where  $R_t$  is long-term interest rate,  $r_t$  is current short-term interest rate of  $n - 1$  days in the future and  $\alpha_n$  is the term premium, assumed to be stochastic ( $\varepsilon_t$ ). Long-term interest rates matter because they influence private agents' investment decisions, which drive the economy.

Since the financial crisis, the overnight rate is stuck near zero. Therefore the ECB introduced unconventional monetary policy tools and intensified its communication efforts to deliver its signals. With its communication, the ECB sends signals about the future short-term interest rates, and through these rates, it can influence the long-term rates as seen in Equation 1. This form of communication is called "forward guidance".

If agents are rational and are fully aware of the economic conditions and the ECB's reactions to them, the ECB's communication would be redundant (Woodford, 2005). Agents would not react to the signals of the ECB as they already incorporated them into their expectations once the new information came out. However, in reality ECB's communication matters for several reasons. First, the ECB updates its economic model. It incorporates new parameters, updates its policy strategy, etc., which take time for the market agents to learn about. Second, agents sometimes may act irrational. Third, the ECB specialises in analysing the economy, therefore it may have more and better knowledge. In addition, the ECB's communication becomes especially important during recessions as crises can make it difficult for the market agents to interpret the information and anticipate monetary policy responses (Coenen et al., 2017). For all these reasons above it is evident that the ECB's communication has an influence on agents behaviour and hence the economy.

Recognizing this influence, the ECB continuously aims to improve how it conducts its communication as it is of the utmost importance that the market participants correctly understand the ECB's signals. The ECB notes on its website: "how people spend and invest

today, and expect the economy to develop tomorrow, can affect our job of keeping prices stable" (Bank, 2021). Therefore, the ECB continuously simplifies its communication, stresses its commitment to what it says, and increases its communication frequency to help people better understand its decisions and build trust. Today the ECB uses a large number of tools to communicate with the public. These are press releases, press conferences, the blog, monetary policy accounts, speeches, interviews, and listening events.

## **2.2 The Informativeness in the Speeches vs. Other Means of the ECB's Communication**

One of the ECB's communication means that gained recent attention is speeches. The number of speeches over the years has been gradually increasing (see Figure 2). The ECB uses speeches to explain its monetary policy decisions and address other topics related to central banking, the financial system, and the economy. Therefore, speeches do not necessarily contain new information but instead clarify the information delivered through other communication means, mainly press conferences. Press conferences provide the public with updated monetary policy decisions and economic outlook projections. Therefore, one may think of speeches as a complement to the press conferences.

Unlike press conferences which are held every six weeks immediately after new monetary policy decisions, speeches are flexible in their timing. Also, in comparison to press conferences that represent the Governing Council's view as a whole, speeches are given by the members of the Executive Board and represent individual views of the speakers. Moreover, press conferences have a standardized format and language, whereas speeches do not follow strict guidelines. Other communication tools such as interviews, the blog, and listening events are primarily used for public relations; therefore, I will not address them further.

The role of the press conferences as a monetary policy tool is well understood in practice and the academic literature. However, not many researchers have spent time analyzing speeches,



given that they are significantly less structured than the monetary policy press conferences. Regardless, provided that the ECB's representatives go through the effort of giving these speeches, one expects them to align with the bank's overall objective - price stability through manipulating the interest rates. Therefore, it is interesting whether speeches contain unique signals to the market agents and hence can be declared as another monetary policy tool to manage market expectations like press conferences or is it just a public relations tool like the interviews. I test this empirically.

### **3 Literature Review**

My paper relates to two strands of literature on central bank communication: i) its impact on financial markets, and ii) its quantification through textual analysis. The academic literature investigating the impact of the ECB's communication and especially speeches on financial markets is scarce. For this reason, to have sufficient evidence in constructing hypotheses I also include papers exploring communication of other central banks where needed.

#### **3.1 Central Bank Communication and Asset Prices**

There is substantial evidence that central bank communication moves asset prices, suggesting that the central bank communication conveys relevant information to market participants, i.e., it contains news. For example, see the evidence on interest rates for the ECB (Brand et al., 2010; Ehrmann and Fratzscher, 2007; Lamla and Lein, 2011; Rosa, 2011; Rosa and Verga, 2007; Schmeling and Wagner, 2019), the FED (Gürkaynak et al., 2004; Kohn and Sack, 2003; Lucca and Trebbi, 2009), the Bank of England (Reeves and Sawicki, 2007), the central banks of Czech Republic, Hungary and Poland (Rozkrut et al., 2007), the central bank of New Zealand (Guthrie and Wright, 2000) and the Swedish central bank (Andersson et al., 2006). Also, several papers discovered that central banks' communication can steer the interest rates in the intended direction, implying that the communication is a monetary policy tool that allows the central banks to manage the expectations of the market participants. For

instance, Guthrie and Wright (2000) found that following the Reserve Bank's of New Zealand tightening announcements, interest rates of all maturities increased. They showed that this increase is not caused by the simultaneous changes in the open market operations. In the same vein, Rosa and Verga (2007) investigated the ECB press conferences and discovered that when the ECB's communication is dovish (hawkish), the interest rates decrease (increase). Some studies even showed that central bank communication has a more significant impact on the bond market than the changes in the policy rate (see, e.g., Gürkaynak et al., 2004; Rosa, 2011). Gürkaynak et al. (2004) explained that the policy rate changes in the US and Eurozone are rarely a surprise. For this reason, the tone used to explain the monetary policy decisions is the primary driver of the financial markets because the tone reveals the information regarding the path of the future policy expectations. Precisely, through this channel, the central banks guide the private sector's expectations.

Most of the literature on central bank communication analyzed press conferences that are used to convey monetary policy decisions and the reasons behind them. The speeches of central banks, on the other hand, have been overlooked. Kohn and Sack (2003) are the first that studied the impact of speeches on interest rates. They investigated the speeches of FED that took place between 1989 and 2003 but did not find any influence on the interest rates. The researchers argue that speeches are too noisy, as they are given about a broad spectrum of topics, and some may have little to do with monetary policy or the economic situation. Nevertheless, more recent papers investigating the speeches of the ECB and other central banks found a significant impact on interest rates (Andersson et al., 2006; Ehrmann and Fratzscher, 2007; Rozkrut et al., 2007). Furthermore, Reeves and Sawicki (2007) and Connolly and Kohler (2004) found somewhat significant results. Across the total sample, they found very little influence on the interest rates. However, several speeches appear to have a significant impact on the volatility of the interest rates. As Kohn and Sack (2003) they argue that the inclusion of all the speeches in the dataset hides the effect of speeches that are deliberately designed to influence expectations. For this reason, I intend to augment this approach by performing a pre-selective filter based on keyword frequency per speech to

exclude the less relevant speeches. In doing so, I hope to minimize the noise experienced by the researchers above. Moreover, speeches, among other communication tools of the ECB, have become more critical for the conduct of monetary policy in the current low-inflation environment (Bernoth and Dany-Knedlik, 2020). Therefore, based on the above mentioned arguments, I hypothesize that:

**Hypothesis 1a:** The tone of the ECB speeches has an impact on interest rates.

**Hypothesis 1b:** When the tone of the ECB speeches is dovish (hawkish) the interest rates decrease (increase).

Delving deeper into the ECB's communication, the impact of speeches on different maturities of interest rates is a natural area to investigate next. The ECB's communication has a more substantial impact on the interest rates with the shorter-term maturities. For example, Lamla and Lein (2011) found that the tone in the ECB's press conferences only affects the interest rates of 4-12 months. They argue that given a communication signal today, financial markets expect the ECB to alter interest rates the soonest four months later, but not earlier. This indicates that the ECB prepares the market well in advance for the changes in the policy rates. Similarly, Musard-Gies (2006) and Rosa and Verga (2007) discovered that the short end of the yield curve specifically yields with maturities of 6 and 12 months, react the most to the tone of the ECB's press conferences. On the other hand, Ehrmann and Fratzscher (2007) found that the tone of the ECB's speeches affects the interest rates with maturities even up to five years. It seems intuitive that the ECB's communication mainly impacts short-term interest rates. The ECB cannot provide meaningful policy intentions more than several years ahead because future monetary policy decisions depend on the future economic environment. Also, the longer the maturity of interest rates, the less control the ECB can exercise because longer-term interest rates depict exogenous factors such as global interest rate trends and changing term premia (Lucca and Trebbi, 2009). This leads to my following hypothesis to be tested:

**Hypothesis 1c:** The tone in the ECB's speeches has a stronger impact on the short end of the yield curve than on the long end.

During the press conference meeting of 12 March 2020, the ECB President Christine Lagarde mentioned that it is not the ECB's role to "close the spread" referring to the gap between Italian and German bond yields. Immediately after her statement, Italy's bond yields rose from 117bps to 174 bps, whereas Germany's bonds remained at -74bps, indicating a 35% increase in the spread (Leombroni et al., 2021). It was the biggest single-day increase in Italian government bonds in a decade. The market interpreted that the ECB will no longer be the lender of the last resort to Italy, which triggered Italy's bond market sell-off. Lagarde immediately corrected this perception and apologized for her "botched" communication (Arnold, 2020). Recent academic literature explored the role of the ECB's communication on yield spreads. For example, Schmeling and Wagner (2019) found that the yield differential of BBB- and AAA-rated corporate bonds decreases (increases) when the tone in the press conferences of the ECB becomes more positive (negative). The researchers argue that the tone of the central bank communication influences the risk aversion of the market participants. For this reason, the default spread changes. Beaupain and Girard (2020) also investigated the impact of the press conferences of the ECB on the yield spread. They provide supporting evidence that the ECB's communication complements its actions in reducing the yield spread between the ten euro countries and Germany. The ECB's communication was especially effective in reducing the yield spread for "distressed" countries such as Italy, Spain, Greece, Portugal, and Ireland. Following this, I am curious to explore whether the spread between Italian and German sovereign bonds changes due to sentiment in speeches. Therefore, based on the arguments above, my next hypotheses are accordingly:

**Hypothesis 2a:** The tone in the ECB's speeches impacts the spread between Italian and German sovereign bonds.

**Hypothesis 2b:** When the tone is dovish (hawkish) the spread between Italian and German sovereign bonds decreases (increases).

In 2005 former ECB president Jeane-Claude Trichet in his speech, said, “I will argue that under some conditions the central bank can regain control of private expectations without necessarily changing interest rates, but by being visibly and credibly “alert”, explaining and stressing its commitment to maintaining inflation at levels consistent with the price stability objective” (Bank, 2005). Unfortunately, very little research is done on the effects of the ECB’s communication on inflation expectations to support his statement. Ehrmann and Fratzscher (2007) are the first to investigate whether the inflation expectations react to the tone in the ECB’s speeches. However, they do not find any statistically significant results. The findings of Jansen and de Haan (2007), to some extent, support Trichet’s statement. They found a significant relationship between the tone in press conferences and changes in break-even inflation but only during October and November 2005. The researchers argued that communication works in steering inflation expectations when the central bank credibly commits to a particular inflation goal, i.e. when the deeds support the communication. Ullrich (2008) also provides somewhat supporting evidence to Trichet’s statement but again stresses the importance of credible commitment. She investigated the influence of the tone in the ECB’s press conferences on the inflation expectations of experts. She found that a hawkish tone, i.e., addressing the concern about inflation risks, induced financial market experts to adjust inflation expectations with a 6-month horizon upwards. This is caused by the experts’ disbelief in the ECB’s ability to act against this rising inflation in the upcoming six months. However, inflation expectations eventually adjust downward, as shown by Hubert (2017). He found that a hawkish tone in the ECB’s speeches has a negative effect on the long-horizon inflation expectations, but only if they are considered alone, without the ECB’s inflation projections. Following this, I aim to expand this scarce literature on inflation expectations by investigating the tone of the ECB’s speeches. I do not expect to find a strong relationship since the tone only indirectly impacts inflation expectations. My study is closest to Ehrmann and Fratzscher (2007); however, given that a more recent study by Hubert (2017) found somewhat significant results, my hypotheses are as follows:

**Hypothesis 3a:** The tone in the ECB’s speeches impacts inflation expectations.

**Hypothesis 3b:** When the tone is dovish (hawkish) there is an upward (downward) change in inflation expectations.

Besides the ECB's communication impact on interest rates and inflation expectations, some studies also explored the relationship between the ECB's communication and stock markets. For example, Ehrmann and Fratzscher (2007) found that when the ECB's speeches carried tightening (loosening), monetary policy sentiment the Euro Stoxx 50 index decreased (increased). This is consistent with Schmeling and Wagner (2019) who investigated the tone in the press conferences of the ECB. Picault and Renault (2017) also found that the Euro Stoxx 50 index reacts to the tone in the ECB's press conferences. In addition, Apergis and Pragidis (2019) explored the impact of ECB's announcement wire news on the major international stock indexes, i.e., S&P500, FTS100, CAC40, DAX, and Nikkei225. Specifically, when the tone in the ECB's messages was positive, the stock returns were positive, whereas the volatility was negative and vice versa. Schmeling and Wagner (2019) explained that the positive sentiment surrounding monetary policy reduces peoples' risk aversion resulting in higher willingness to invest in equity markets. For this reason, the stock prices increase. Following this I also aim to explore the relationship between the tone in the speeches and the stock market returns. Based on the evidence above I hypothesize:

**Hypothesis 4a:** The tone in the ECB's speeches impact the stock returns.

**Hypothesis 4b:** When the tone is dovish (hawkish) the stock returns increase (decrease).

Thus far I looked at studies investigating the sentiment surrounding the monetary policy talk. However, a large portion of the ECB's communication is also dedicated to provide the economic outlook prospects in the Eurozone. Ehrmann and Fratzscher (2007) is the only study that investigated the economic outlook tone of the ECB's speeches. They discovered significant relationship between the economic outlook sentiment and financial assets such as Euro Stoxx 50 and short-term interest rates. However, no impact was found on inflation expectations. Similarly, Picault and Renault (2017) explored the economic outlook tone

embedded in ECB's press conferences and found a significant impact on the stock market. Both papers found that a positive economic outlook tone led to an improvement in asset prices. I intend to expand this scarce literature on the economic outlook tone for the ECB's speeches. Based on the evidence above, my hypotheses are accordingly:

**Hypothesis 5a:** The tone surrounding economic outlook in the ECB's speeches matters for interest rates, credit spread, stock market, but not inflation expectations.

**Hypothesis 5b:** The positive (negative) economic outlook tone in the ECB's speeches leads to an increase (decrease) in stock returns and decrease (increase) in interest rates and credit spread.

Ehrmann and Fratzscher (2007) assessed the communication strategies of the Fed and the ECB. They found that the US financial markets respond significantly more strongly to communication by Greenspan and less to statements by other FOMC members whereas Euro area markets react similarly to communication by the President and other Governing Council members. Unlike in the FED, the decision making in the ECB is collegial. For this reason, financial market agents react the same to the communication by the policy makers of different ranks in the Euro area. My obtained speech dataset is sorted into speeches by President, Vice-President and the remaining Board Members. Therefore, I also aim to explore whether my results support the findings of Ehrmann and Fratzscher (2007). Given the evidence above, I hypothesize:

**Hypothesis 6:** Financial markets respond the same to the speeches by President, Vice-President and Board members.

### 3.2 Quantifying Central Bank Communication

Two main methods have been used in literature to quantify qualitative information. One is *manual content analysis*, which involves reading a text, classifying it based on its content, and then coding it on a numerical scale. For example, Musard-Gies (2006) and Rosa and

Verga (2007) hand-coded the ECB's press conferences based on the tone of the content into a grid-scale from -2 (very dovish) to +2 (very hawkish). Although manual classification is easy to carry out, it is labor-intensive and subjective. For instance, Rosa and Verga (in Rosa and Verga, 2007) disagreed on 22.58% of classified statements.

More recent literature considered the drawbacks of manual content analysis and instead used an *automated approach*. Specifically, a computer program is used to count how frequently certain words appear based on a pre-specified word list or dictionary. In dictionaries, words are allocated under specific topics and sentiments. For example, "unemployment" would be considered a negative word under the dictionary of Loughran and McDonald (2011). If a text contains a lot of negative words like "unemployment" (other examples "uncertainty", "crisis", etc.) the text will likely convey a pessimistic message. Therefore, a central assumption is that the frequency of the words reflects the tone of the text. The score is then computed for example as the number of positive words minus the number of negative words scaled with total words in the text (see e.g., Baranowski et al., 2021; Picault and Renault, 2017). The benefits of dictionaries are two-fold, convenience and robustness. Convenient because prebuilt lexicons are developed by NLP experts with certain classifications and/or types of source data in mind. If available, they are easily applied to one's dataset and require relatively little programming for classification. Robust because the developers of most lexicons attempt to develop their lexicon so that it applies across as many datasets as possible without losing the predictive power of classifications.

Schmeling and Wagner (2019), in their study, used Loughran and McDonald (2011)'s (LM) financial dictionary to quantify the press conferences of the ECB. They verify that the dictionary indeed captured how the ECB frames its macroeconomic fundamentals. Baranowski et al. (2021) also identified the LM dictionary as appropriate to measure the ECB's monetary policy stance. However, Picault and Renault (2017) are skeptical about the LM dictionary as it is a single-word dictionary and is not precisely designed for the ECB's talk. The LM dictionary does not capture the monetary policy or the economic outlook sentiment speci-



cally. It simply assigns words into either having positive or negative sentiment. Therefore, it may fail to capture the true ECB's tone. However, if my speeches are too noisy to extract monetary policy or economic outlook sentiment as argued by Kohn and Sack (2003), then the LM dictionary is more appropriate as it derives a general tone of the communication – positive or negative. Given the discussion above, I intend to apply the LM dictionary to my speech dataset.

Baranowski et al. (2021) also identified Bennani and Neuenkirch (2017)'s (BN) dictionary as another potential dictionary that correctly depicted the tone of the ECB's communication. The BN dictionary is developed from the speeches of the members of the ECB's Governing Council; therefore, the dictionary may closely reflect the context of my speech data set. However, the ECB's speeches that I investigate are given only by the Executive Board members. Hence, there may be a mismatch in the structure and style of the communication between the BN dictionary and my speeches dataset. Also, the BN dictionary is a single-word dictionary. Therefore, there is a high chance of misclassifying certain words as it does not consider the context. Despite this, I believe the BN dictionary may be able to depict the tone in the ECB's speeches to some extent. Therefore, I intend to apply it for robustness.

Finally, the most suitable to my speeches' data is Picault and Renault (2017)'s (PR) dictionary. The dictionary is constructed from the ECB's press conferences and is divided into monetary policy and the economic outlook topics. In addition, the lexicon consists of a sequence of words, from 1-gram to 10-gram, where gram refers to a word. PR lexicon is likely to have only a small share of misclassifications because a sequence of 10 words can greatly capture the context of the text, at least much better than a single- or two-word dictionaries identified above. Picault and Renault (2017) showed that its dictionary outperformed all of the above identified dictionaries. However, the potential incompatibility between the PR-lexicon's source data and the ECB's speech dataset used in this paper should not go unnoticed. Two possible limitations come to my mind, different types of speeches and different speakers. First, the PR-lexicon is based on the often structured and standardized ECB monetary policy

decisions press conferences. In contrast, this paper's dataset contains a broader array of speeches, some of which have little to do with monetary policy or economic outlook. Second, as the PR-lexicon was developed over the 2006-2014 timespan, the vocabulary was based on a smaller set of speakers. For example, given the switch in ECB presidents from Mario Draghi to Christine Lagarde, potential nuances in their different speech styles may be lost using the PR-lexicon. Furthermore, my dataset includes speeches given by not only the ECB president but also by its vice president and executive board members. Despite these mismatches, the PR tone is likely to capture the tone well in my speeches' data set.

Given that the PR dictionary is the most compatible with my speech data set, I will use it as my leading dictionary. The remaining two - the BN and the LM are for robustness. In addition, I am the first to apply all the three identified dictionaries to the ECB's speech data set.

## **4 Data**

### **4.1 Speeches**

For this study I have collected 2486 speeches covering a time period from 2003 to 2021 (see Table 1). Speeches' data set was downloaded from the ECB website<sup>1</sup>. Speeches are divided according to a policy makers role - President, Vice-President and the remaining executive Board Members. All the speeches given by the ECB's Presidents since the ECB's establishment is recorded under the President category, etc. Table provides a summary of speakers that my speech data comprises.

### **4.2 Asset Prices**

I look at bond yields, credit spread, equity returns, and inflation expectations for the Euro area. For these asset prices, I take daily data, which is necessary for matching these with the

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<sup>1</sup>See speeches data set here

Table 1: Sample Size: Dates

Indicator	Min date	Max date
Interest Rates	2004-09-09	2021-07-01
Credit Spreads	2012-08-03	2021-07-19
Inflation Expectations	2010-07-22	2021-07-19
Euro Stoxx 50	1997-01-06	2021-07-28
Speeches	2003-03-03	2021-05-29
Eonia	2003-01-03	2021-07-01
CESI	2003-01-03	2021-07-01
Financial Crisis dummy	2007-06-01	2009-12-31
Covid-19 Crisis dummy	2020-03-01	2021-07-01

speech data. For the bond yields, I take triple AAA-rated Euro area government bonds which are readily available on the ECB's website<sup>2</sup> at the daily frequencies. The composition in terms of specific Euro area countries varies accordingly with the updated ratings by Fitch (see Table 8 in Appendix A). My yield data spans from 2004 to 2021 (see Table 1) and includes bonds with maturities of 3 months, 1-, 2-, 5-, 7-, 10-, 20-, 30-years.

The Euro area credit spread is the difference between Italian and German sovereign bonds. I retrieve Italian and German government bond yields from the Refinitiv database. However, due to many missing observations I only have credit spread data spanning from 2012 to 2021 (see Table 1), with maturities of 3 months, 1-, 2-, 5-, 7-, 10-, 15-, 20- and 30-years.

For the equity returns, I use the Euro Stoxx 50 index returns covering the period from 1997 to 2021 (see Table 1). This data is obtained from FactSet.

I did not have access to the daily inflation expectations for the Euro area. For this reason, I take German 5-year breakeven inflation as a proxy for the Euro area's inflation expectations. The German 5-year breakeven inflation is constructed as the difference between the 5-year nominal bond and an inflation-linked bond of the same maturity and is retrieved from Refinitiv. 5-year maturity is chosen due to its data completeness. My final inflation expectations data spans from 2010 to 2021 (see Table 1).

<sup>2</sup>See Euro area yield data here

### 4.3 Control Variables

To isolate the effect of the speeches, I control for the day-of-the-week effects, the monetary policy shocks, and the surprises of the various macroeconomic news as recommended by the literature (see, e.g., Ehrmann and Fratzscher, 2007; Rozkrut et al., 2007). I use the change in the Eonia rate as a measure of monetary policy shocks. I obtain daily data for the Eonia rate from the ECB website covering the period from 2003 to 2021 (see Table 1). To control for the macroeconomic surprises, I use the Euro area Citigroup Economic Surprise Index (CESI), which is the weighted moving average of all macroeconomic news surprises relevant to the Euro area. CESI is compiled by Bloomberg and a positive (negative) reading of the CESI suggests that economic news have on balance beaten (fall back) consensus expectations. I gathered CESI from Refinitiv. My Euro area CESI data covers the period from 2003 to 2021 (see Table 1).

## 5 Methodology

### 5.1 Speech Data Set Preparation

### 5.2 Measuring the Tone in ECB Speeches

#### 5.2.1 The Picault and Renault dictionary

The measure of the monetary policy sentiment of each speech when using the PR dictionary is expressed as follows:

$$Tone_{PR_{MP}} = \frac{\#Dovish - \#Hawkish}{\#Dovish + \#Hawkish} \quad (2)$$

Similarly, the measure of the economic outlook sentiment:

$$Tone_{PREC} = \frac{\#Positive - \#Negative}{\#Positive + \#Negative} \quad (3)$$

### 5.2.2 The Bennani and Neuenkirch dictionary

$$Tone_{BNMP} = \frac{\#Dovish - \#Hawkish}{\#Dovish + \#Hawkish} \quad (4)$$

### 5.2.3 The Loughran and McDonald dictionary

The LM dictionary was constructed from the 10-K reports, and it consists of 354 (2355) words that convey a positive (negative) tone in financial and economic contexts. I used *pysentiment2* package available in python to apply the LM dictionary on the ECB's raw speeches. This package is specifically designed for the LM dictionary, and it has an integrated tokenization function. Therefore, no manual text preparation was required. The specific code used can be viewed under the *pysentiment2* documentation<sup>3</sup>. Table 2 shows the output returned. The first six columns are speech data set that I provided to the Python. Column seven and eight shows the count of positive and negative words within a particular speech. For example, on May 27th 2021, Isabel Schnabel's speech is counted to have 67 positive and 111 negative words. In the last column *pysentiment2* package even calculates the tone of each speech and it does so according to the following formula:

$$Tone_{LM} = \frac{\#Positive - \#Negative}{\#Positive + \#Negative} \quad (5)$$

This is the same tone measure that I selected for the PR and BN dictionaries. Therefore, the interpretation of the tone score in Table 2 is analogous to the interpretation of the tone scores under the PR and BN dictionaries. The LM tone scores are used to test my hypotheses.

<sup>3</sup>See *pysentiment2* documentation here

Table 2: LM Dictionary Python Output

Date	Speakers	Title	Subtitle	Contents	Role	Positive	Negative	Tone
2021-05-27	Isabel Schnabel	Societal responsibility and central bank independence	Keynote speech by Isabel Schnabel, ...	SPEECH Societal responsibility and central ...	Board Members	67	111	-0.25
2021-05-27	Luis de Guindos	Climate change and financial integration	Keynote speech by Luis de ...	SPEECH Climate change and financial ...	Vice-President	67	73	-0.04
2021-05-19	Fabio Panetta	At the edge of tomorrow: preparing the future of European retail payments	Introductory remarks by Fabio Panetta, ...	SPEECH At the edge of ...	Board Members	16	7	0.39
2021-05-06	Christine Lagarde	Towards a green capital markets union for Europe	Speech by Christine Lagarde, President ...	SPEECH Towards a green capital ...	President	50	25	0.33
2021-04-29	Frank Elderson	All the way to zero: guiding banks towards a carbon-neutral Europe	Keynote speech by Frank Elderson, ...	SPEECH All the way to ...	Board Members	52	64	-0.10
2021-04-26	Philip R. Lane	Maximising the user value of statistics: lessons from globalisation and the pandemic	Speech by Philip R. Lane, ...	SPEECH Maximising the user value ...	Board Members	70	64	0.04
2021-04-26	Fabio Panetta	Monetary autonomy in a globalised world	Welcome address by Fabio Panetta, ...	SPEECH Monetary autonomy in a ...	Board Members	50	105	-0.35
2021-04-14	Fabio Panetta	A digital euro to meet the expectations of Europeans	Introductory remarks by Fabio Panetta, ...	SPEECH A digital euro to ...	Board Members	42	39	0.04
2021-04-14	Luis de Guindos	Presentation of the ECB Annual Report 2020 ...	Introductory remarks by Luis de ...	SPEECH Presentation of the ECB ...	Vice-President	21	50	-0.41
2021-04-08	Christine Lagarde	IMFC Statement	Statement by Christine Lagarde, President ...	SPEECH IMFC Statement Statement by ...	President	32	58	-0.29
...	...	...	...	...	...	...	...	...

## 5.3 The Econometric Model

### 5.3.1 Baseline Model

### 5.3.2 Extended Model for Speaker Rank

I modify my model to determine whether the yield curves are affected differently to speeches by different groups of policy makers within the Executive Board of ECB. I extract three roles - president, vice-president and the remaining policy makers which I simply denominate as board members.

President vs Vice-president

President vs Board members

Vice-president vs Board members

## 6 Descriptive Statistics

### 6.1 First Look into Raw Speeches

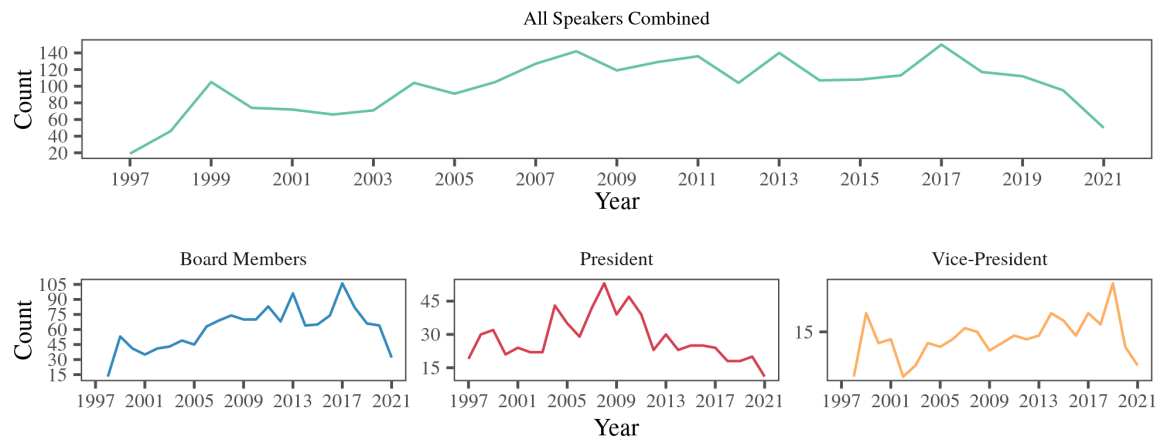


Figure 1: Total Number of Speeches over the Years

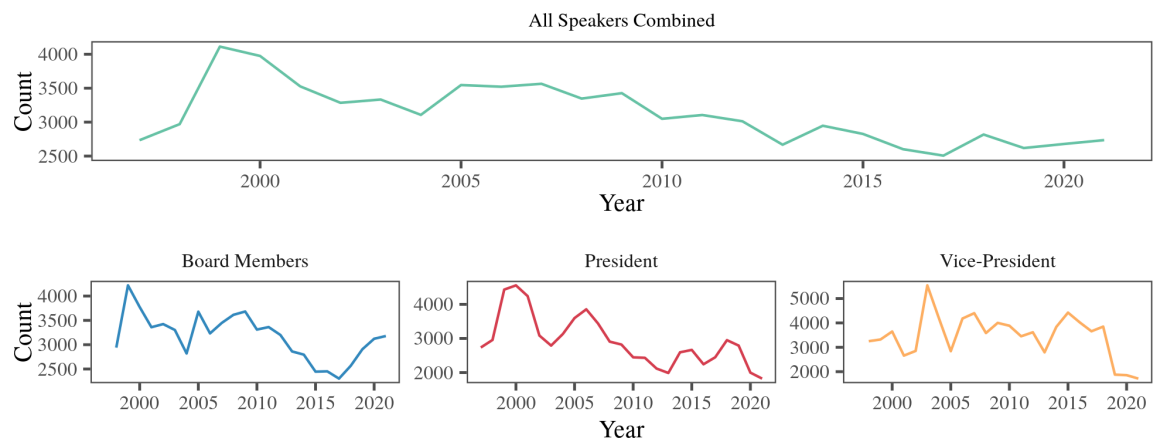


Figure 2: Average Number of Words in a Speech over the Years

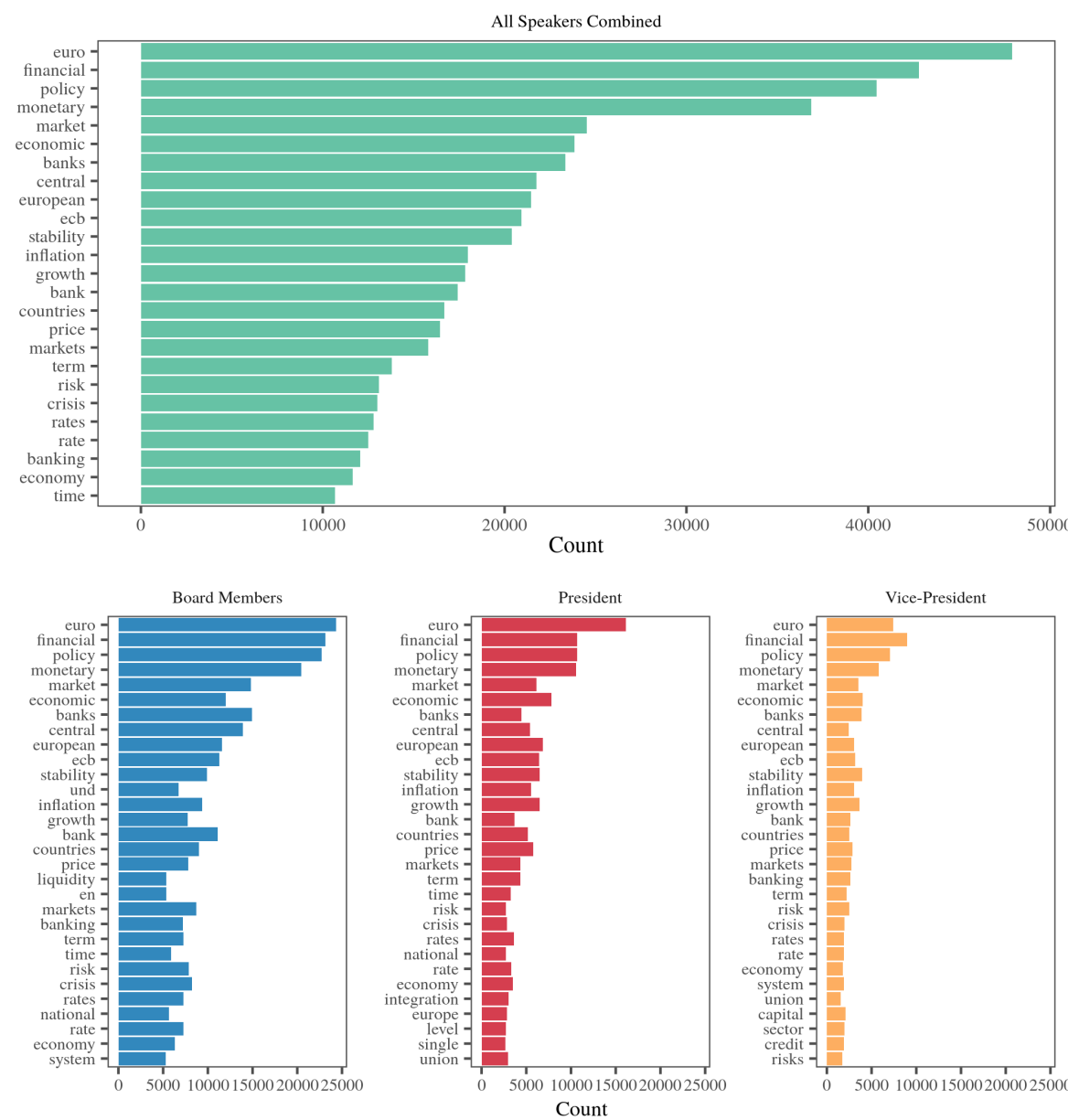


Figure 3: Most Common Words in the Speech Data Set



## 6.2 Dictionary Sentiments

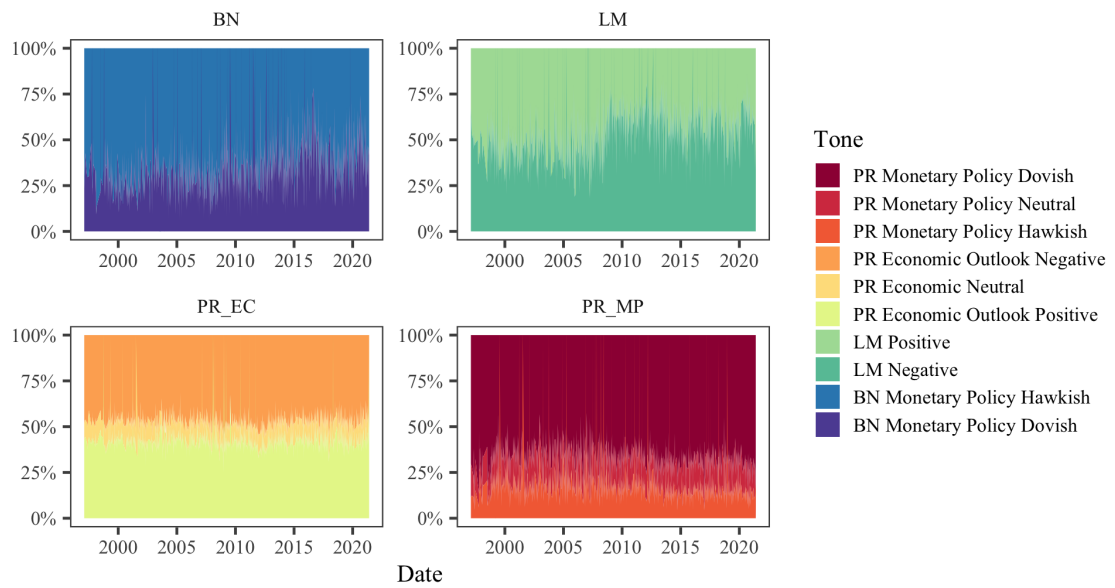


Figure 4: Speeches Sentiment Probabilities under PR, BN & LM Dictionaries

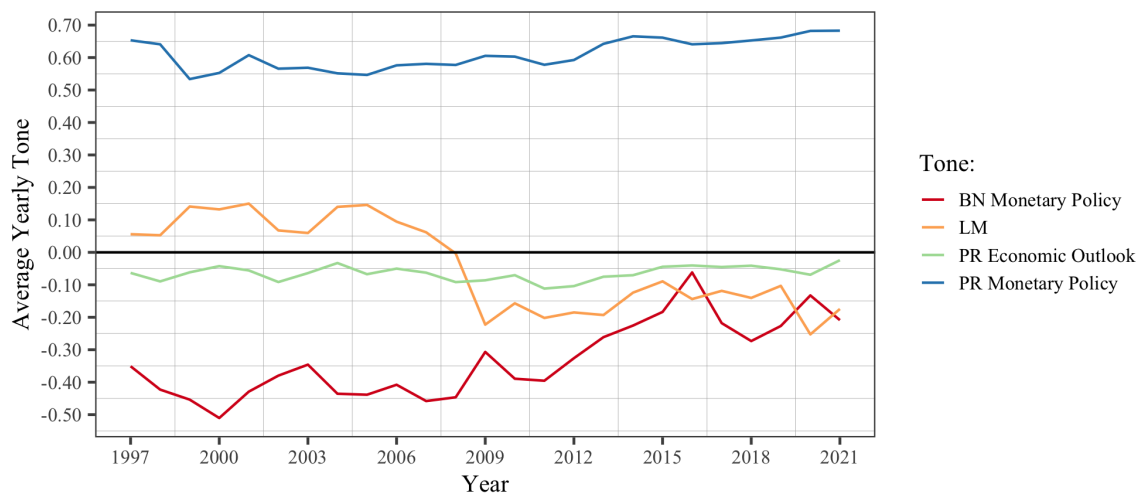


Figure 5: Average Tone of Speeches per Year under PR, BN & LM Dictionaries

### 6.3 Dictionary Sentiments vs. Asset Prices

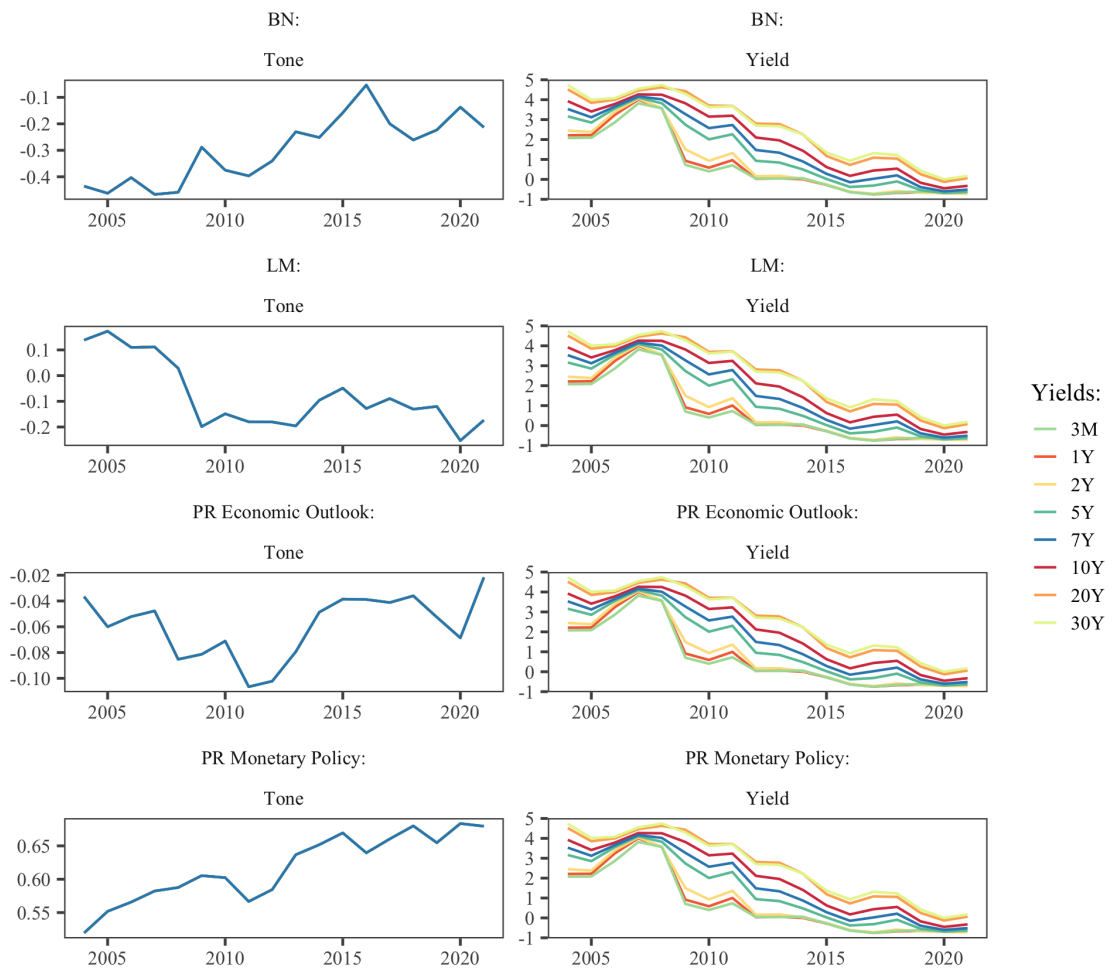


Figure 6: Speeches Sentiment vs Yields under PR, BN & LM Dictionaries

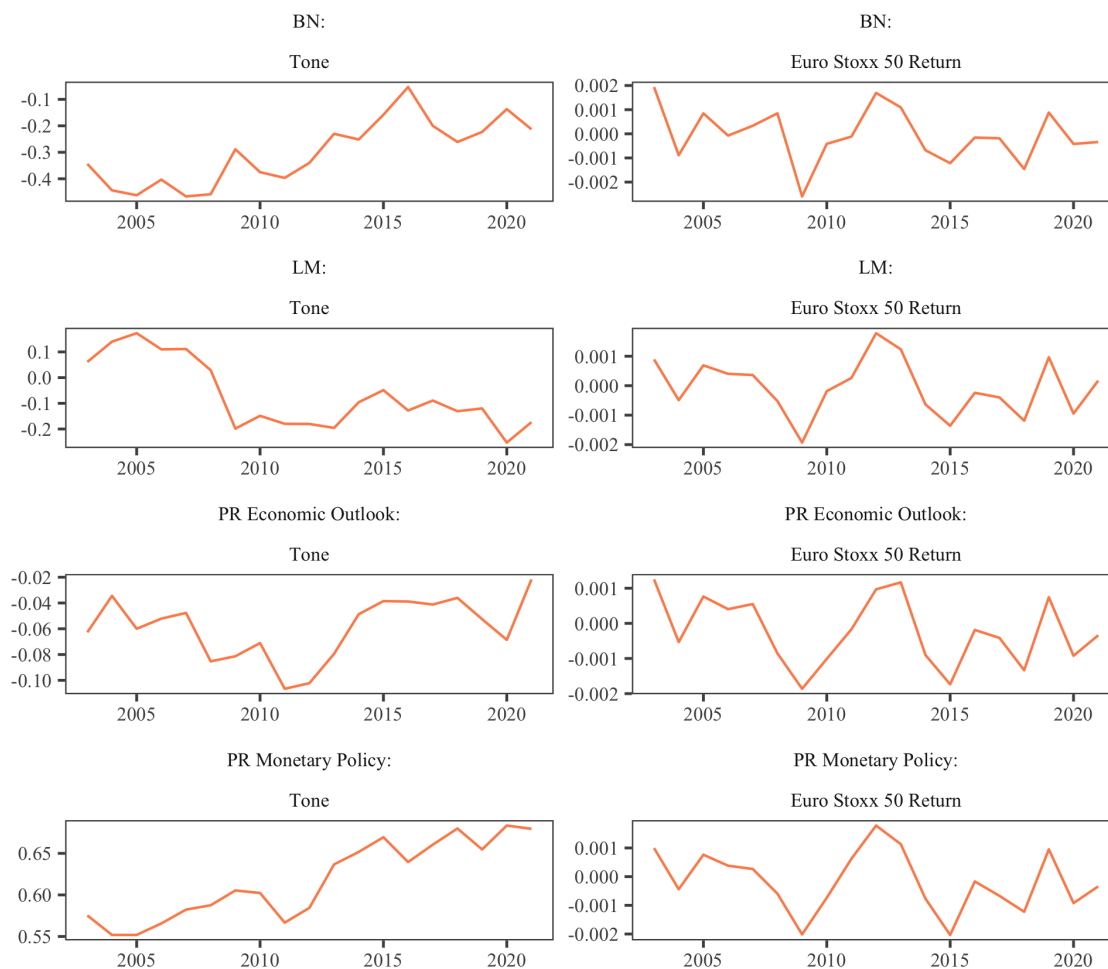


Figure 7: Speeches Sentiment vs. Stock Returns under PR, BN & LM Dictionaries

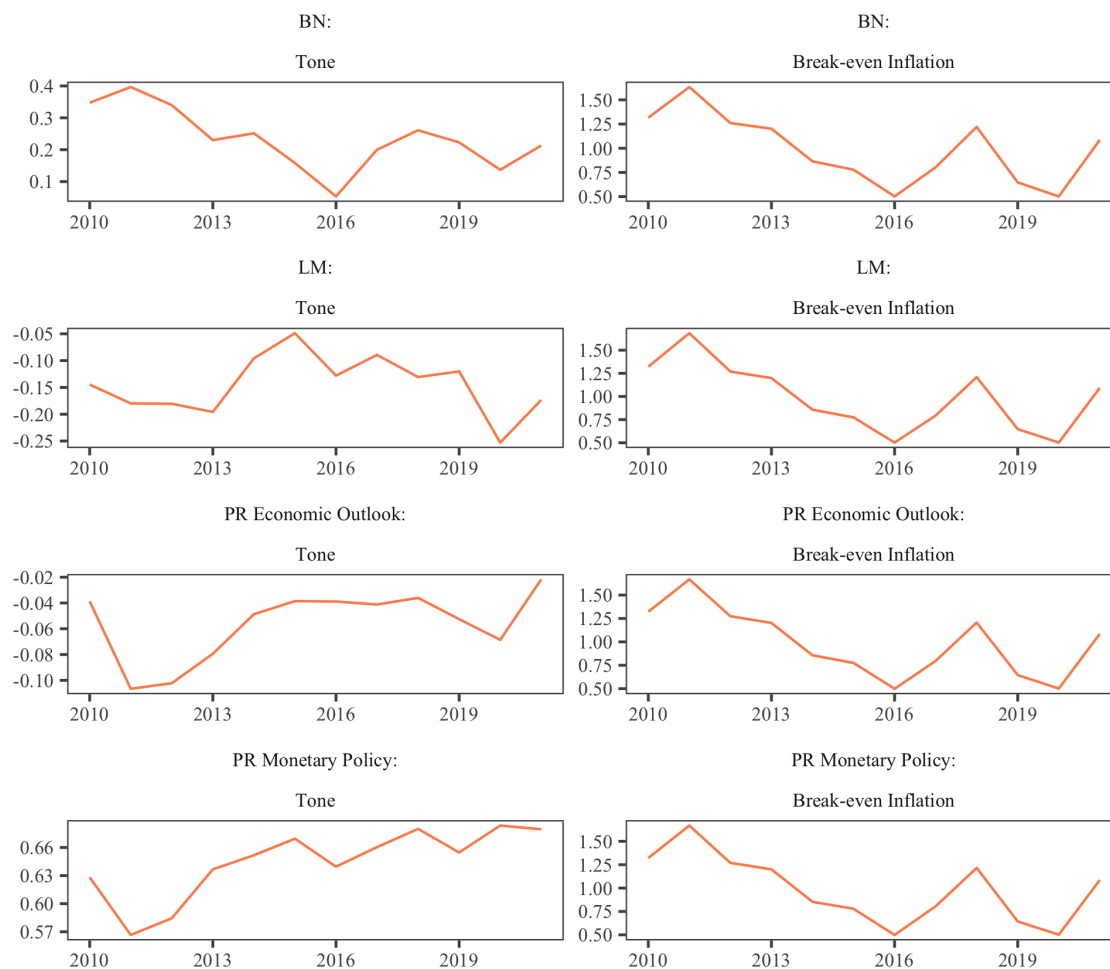


Figure 8: Speeches Sentiment vs. Inflation Expectation under PR, BN &amp; LM Dictionaries

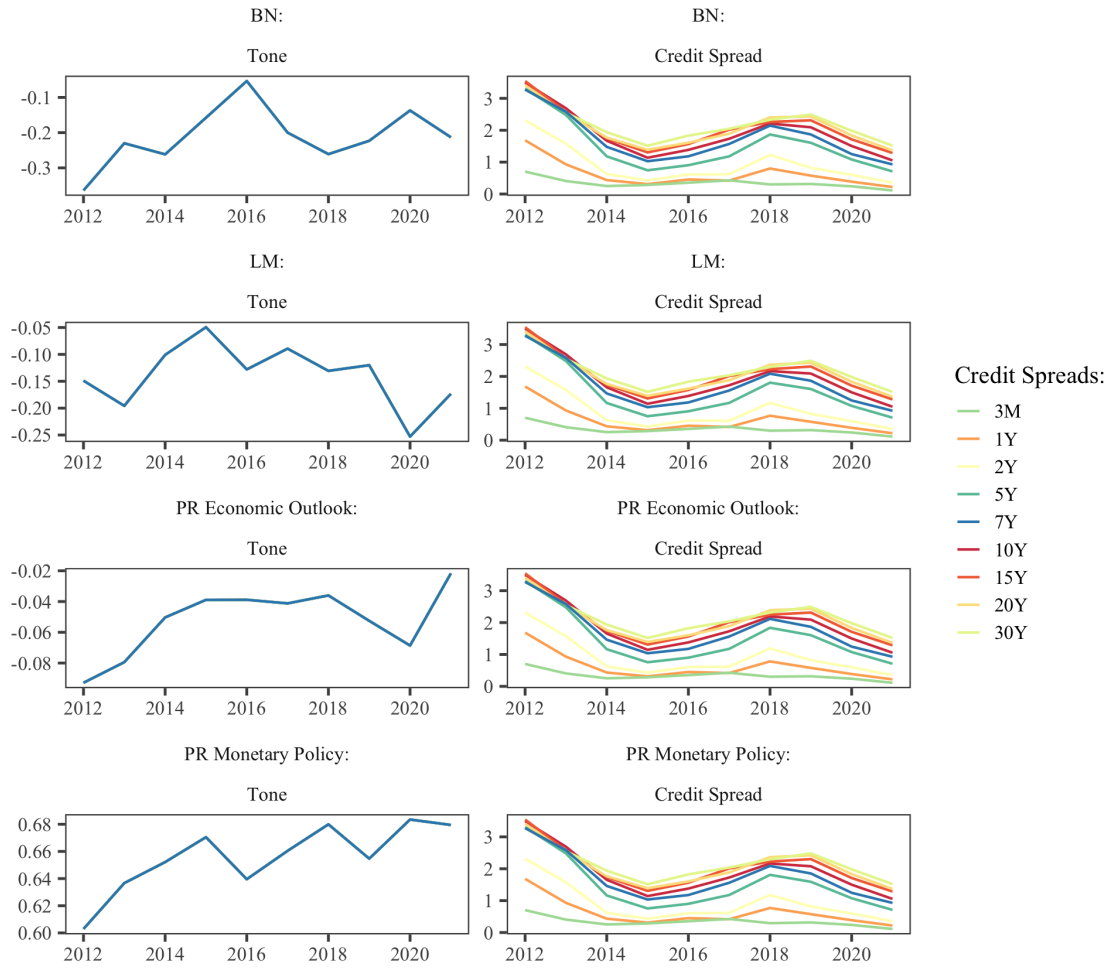


Figure 9: Speeches Sentiment vs. Credit Spread under PR, BN &amp; LM Dictionaries

## 6.4 Speaker Sentiment

Table 3: Speakers' Sentiment proportions under PR, BN &amp; LM Dictionaries

Speaker Rank	BN		LM		PR Economic Outlook			PR Monetary Policy		
	Dovish	Hawkish	Positive	Negative	Positive	Neutral	Negative	Dovish	Neutral	Hawkish
Board Members	0.388	0.612	0.423	0.577	0.413	0.106	0.481	0.699	0.156	0.145
President	0.338	0.662	0.497	0.503	0.421	0.101	0.477	0.665	0.160	0.176
Vice-President	0.337	0.663	0.491	0.509	0.411	0.101	0.488	0.639	0.163	0.199

## **7 Empirical Results**

### **7.1 Interest Rate Reaction to Speeches**

### **7.2 Inflation Expectation Reaction to Speeches**

### **7.3 Stock Returns Reaction to Speeches**

Table 4: Interest rates, stock returns and inflation expectations reaction to the **monetary policy** tone embedded in the ECB's speeches under the **PR dictionary**

	<i>Dependent variable:</i>									
	Interest rates, stock returns and inflation expectations									
	3M	1Y	2Y	5Y	7Y	10Y	20Y	30Y	Eurostoxx	Breakeven-inflation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
polarity	−0.002 (0.004)	0.003 (0.004)	0.007 (0.006)	0.011* (0.006)	0.010* (0.006)	0.009 (0.006)	0.009 (0.007)	0.013* (0.007)	0.003 (0.002)	0.001 (0.008)
dependent_l1	−0.010 (0.021)	0.199*** (0.029)	0.130*** (0.029)	0.109*** (0.028)	0.115*** (0.028)	0.122*** (0.028)	0.138*** (0.027)	0.122*** (0.026)	−0.705*** (0.024)	−0.073** (0.037)
dependent_l2	0.110*** (0.031)	−0.0005 (0.028)	0.015 (0.029)	0.032 (0.028)	0.026 (0.028)	0.013 (0.028)	−0.017 (0.027)	−0.017 (0.024)	−0.321*** (0.025)	0.006 (0.023)
eonia	−0.018** (0.008)	0.021** (0.009)	0.020 (0.013)	0.009 (0.014)	−0.001 (0.014)	−0.011 (0.014)	−0.012 (0.015)	0.002 (0.016)	0.011* (0.005)	0.033 (0.027)
eonia_l1	0.007 (0.007)	0.004 (0.009)	0.010 (0.012)	−0.007 (0.013)	−0.015 (0.013)	−0.021 (0.013)	−0.018 (0.014)	0.001 (0.015)	−0.002 (0.005)	0.029 (0.027)
cesi_eur	0.0001 (0.0001)	0.0003*** (0.0001)	0.0004*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0002)	0.001*** (0.0002)	0.00001 (0.0001)	−0.00004 (0.0002)
cesi_eur_l1	−0.00001 (0.0001)	−0.0002** (0.0001)	−0.0004*** (0.0001)	−0.001*** (0.0001)	−0.001*** (0.0001)	−0.001*** (0.0001)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.00001 (0.0001)	0.00002 (0.0002)
financial_crisis_dummy	−0.004*** (0.002)	0.0001 (0.002)	0.003 (0.003)	0.005* (0.003)	0.005* (0.003)	0.005** (0.003)	0.006** (0.003)	0.007** (0.003)	0.001 (0.001)	
covid_crisis_dummy	−0.004 (0.002)	−0.001 (0.003)	0.0001 (0.004)	0.0003 (0.004)	0.001 (0.004)	0.001 (0.004)	0.003 (0.004)	0.002 (0.005)	−0.001 (0.002)	−0.004 (0.004)
polarity:financial_crisis_dummy	−0.006 (0.007)	−0.009 (0.009)	−0.006 (0.012)	−0.003 (0.013)	−0.004 (0.013)	−0.006 (0.013)	−0.012 (0.014)	−0.016 (0.015)	−0.005 (0.005)	
polarity:covid_crisis_dummy	−0.004 (0.019)	0.010 (0.022)	0.010 (0.030)	−0.007 (0.033)	−0.011 (0.033)	−0.016 (0.033)	−0.028 (0.035)	−0.037 (0.039)	−0.031** (0.014)	0.016 (0.034)
Constant	−0.0001 (0.001)	−0.001 (0.001)	−0.002 (0.001)	−0.003** (0.001)	−0.003*** (0.001)	−0.003*** (0.001)	−0.004*** (0.001)	−0.004** (0.001)	0.00002 (0.0005)	0.001 (0.001)
Observations	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,249	1,355	790
R <sup>2</sup>	0.052	0.062	0.031	0.032	0.037	0.040	0.049	0.048	0.407	0.019
Adjusted R <sup>2</sup>	0.040	0.050	0.019	0.020	0.025	0.028	0.038	0.037	0.400	0.002
Residual Std. Error	0.021	0.024	0.033	0.036	0.035	0.036	0.038	0.042	0.015	0.037

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 5: Interest rates, stock returns and inflation expectations reaction to the **economic outlook** tone embedded in the ECB's speeches under the **PR dictionary**

	<i>Dependent variable:</i>									
	Interest rates, stock returns and inflation expectations									
	3M	1Y	2Y	5Y	7Y	10Y	20Y	30Y	Eurostoxx	Breakeven-inflation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
polarity	0.002 (0.005)	0.002 (0.006)	0.002 (0.008)	0.004 (0.009)	0.004 (0.009)	0.002 (0.009)	−0.001 (0.010)	−0.003 (0.011)	0.004 (0.004)	0.002 (0.010)
dependent_l1	−0.009 (0.021)	0.194*** (0.028)	0.130*** (0.029)	0.117*** (0.028)	0.123*** (0.027)	0.130*** (0.027)	0.149*** (0.027)	0.131*** (0.025)	−0.691*** (0.023)	−0.065* (0.036)
dependent_l2	0.122*** (0.031)	0.031 (0.028)	0.046 (0.029)	0.050* (0.028)	0.038 (0.028)	0.022 (0.027)	−0.012 (0.027)	−0.012 (0.024)	−0.316*** (0.025)	0.010 (0.023)
eonia	−0.017** (0.008)	0.017* (0.009)	0.015 (0.012)	0.004 (0.014)	−0.005 (0.014)	−0.015 (0.014)	−0.015 (0.015)	−0.002 (0.016)	0.009 (0.005)	0.027 (0.027)
eonia_l1	0.006 (0.007)	0.007 (0.009)	0.013 (0.012)	−0.005 (0.013)	−0.013 (0.013)	−0.020 (0.013)	−0.017 (0.014)	0.001 (0.015)	−0.003 (0.005)	0.025 (0.027)
cesi_eur	0.00005 (0.0001)	0.0002** (0.0001)	0.0004*** (0.0001)	0.0005*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0002)	0.001*** (0.0002)	0.00001 (0.0001)	−0.0001 (0.0002)
cesi_eur_l1	−0.00001 (0.0001)	−0.0002** (0.0001)	−0.0004*** (0.0001)	−0.0005*** (0.0001)	−0.001*** (0.0001)	−0.001*** (0.0001)	−0.001*** (0.0002)	−0.001*** (0.0002)	−0.00001 (0.0001)	0.00002 (0.0002)
financial_crisis_dummy	−0.004*** (0.002)	0.001 (0.002)	0.004* (0.002)	0.006** (0.003)	0.006** (0.003)	0.006** (0.003)	0.007** (0.003)	0.008** (0.003)	0.001 (0.001)	
covid_crisis_dummy	−0.003 (0.002)	−0.001 (0.003)	0.0002 (0.004)	0.001 (0.004)	0.001 (0.004)	0.002 (0.004)	0.003 (0.004)	0.003 (0.005)	−0.001 (0.002)	−0.003 (0.004)
polarity:financial_crisis_dummy	0.011 (0.012)	−0.040*** (0.013)	−0.039** (0.018)	−0.031 (0.020)	−0.031 (0.020)	−0.032 (0.020)	−0.037* (0.021)	−0.040* (0.023)	−0.020** (0.008)	
polarity:covid_crisis_dummy	−0.004 (0.018)	−0.013 (0.020)	−0.015 (0.027)	−0.023 (0.030)	−0.025 (0.030)	−0.027 (0.030)	−0.031 (0.033)	−0.030 (0.036)	−0.018 (0.013)	−0.013 (0.032)
Constant	−0.0003 (0.001)	−0.001 (0.001)	−0.002* (0.001)	−0.003** (0.001)	−0.003*** (0.001)	−0.004*** (0.001)	−0.004*** (0.001)	−0.004*** (0.001)	−0.0001 (0.0005)	0.001 (0.001)
Observations	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,375	803
R <sup>2</sup>	0.057	0.072	0.036	0.034	0.038	0.042	0.052	0.049	0.401	0.018
Adjusted R <sup>2</sup>	0.046	0.061	0.025	0.023	0.027	0.030	0.041	0.038	0.394	0.002
Residual Std. Error	0.021	0.023	0.032	0.035	0.035	0.035	0.038	0.042	0.015	0.037

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01



Table 6: Interest rates, stock returns and inflation expectations reaction to the **monetary policy** tone embedded in the ECB's **President** speeches under the **PR dictionary**

	<i>Dependent variable:</i>									
	Interest rates, stock returns and inflation expectations								Eurostoxx	Breakeven-inflation
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	20Y (7)	30Y (8)	(9)	(10)
polarity	−0.003 (0.008)	0.009 (0.008)	0.016 (0.011)	0.024* (0.012)	0.022* (0.012)	0.016 (0.012)	0.007 (0.012)	0.015 (0.013)	0.003 (0.005)	−0.039** (0.019)
dependent_l1	−0.033 (0.054)	0.250*** (0.047)	0.169*** (0.047)	0.111** (0.047)	0.112** (0.048)	0.122** (0.049)	0.164*** (0.047)	0.142*** (0.043)	−0.697*** (0.039)	−0.146** (0.069)
dependent_l2	0.251*** (0.057)	0.010 (0.047)	−0.028 (0.051)	0.006 (0.049)	0.030 (0.047)	0.040 (0.046)	−0.014 (0.044)	−0.047 (0.036)	−0.410*** (0.042)	0.057 (0.056)
eonia	−0.015 (0.013)	0.043*** (0.014)	0.038** (0.018)	0.017 (0.020)	0.003 (0.020)	−0.013 (0.020)	−0.020 (0.021)	−0.009 (0.022)	0.010 (0.008)	0.033 (0.043)
eonia_l1	0.021 (0.013)	−0.003 (0.014)	0.008 (0.019)	0.003 (0.021)	−0.001 (0.021)	−0.006 (0.021)	−0.009 (0.022)	0.007 (0.023)	−0.008 (0.009)	−0.042 (0.045)
cesi_eur	−0.0001 (0.0002)	0.0001 (0.0002)	0.0001 (0.0003)	0.0003 (0.0003)	0.0003 (0.0003)	0.0003 (0.0003)	0.0005* (0.0003)	0.001** (0.0003)	−0.0002* (0.0001)	−0.0001 (0.0004)
cesi_eur_l1	0.0001 (0.0002)	−0.0001 (0.0002)	−0.0001 (0.0003)	−0.0003 (0.0003)	−0.0003 (0.0003)	−0.0003 (0.0003)	−0.0005* (0.0003)	−0.001** (0.0003)	0.0002** (0.0001)	0.0001 (0.0004)
financial_crisis_dummy	−0.005* (0.003)	−0.004 (0.003)	−0.001 (0.004)	0.001 (0.005)	0.001 (0.005)	0.002 (0.005)	0.004 (0.005)	0.004 (0.005)	−0.002 (0.002)	
covid_crisis_dummy	−0.002 (0.006)	−0.009 (0.007)	−0.011 (0.009)	−0.012 (0.010)	−0.012 (0.010)	−0.012 (0.010)	−0.010 (0.010)	−0.007 (0.011)	−0.007* (0.004)	−0.008 (0.011)
polarity:financial_crisis_dummy	0.004 (0.014)	−0.002 (0.015)	0.021 (0.021)	0.015 (0.023)	0.004 (0.022)	−0.005 (0.022)	−0.020 (0.023)	−0.035 (0.025)	−0.022** (0.009)	
polarity:covid_crisis_dummy	−0.064 (0.067)	0.092 (0.073)	0.128 (0.099)	0.079 (0.108)	0.071 (0.107)	0.071 (0.107)	0.026 (0.111)	−0.033 (0.118)	0.014 (0.045)	0.070 (0.117)
Constant	−0.001 (0.001)	−0.002 (0.002)	−0.002 (0.002)	−0.003 (0.002)	−0.004 (0.002)	−0.004* (0.002)	−0.005** (0.002)	−0.004* (0.002)	0.001 (0.001)	−0.0002 (0.003)
Observations	440	440	440	440	440	440	440	440	481	238
R <sup>2</sup>	0.111	0.151	0.077	0.042	0.035	0.032	0.050	0.056	0.423	0.051
Adjusted R <sup>2</sup>	0.079	0.121	0.044	0.009	0.0004	−0.002	0.016	0.023	0.405	−0.004
Residual Std. Error	0.023	0.025	0.034	0.038	0.037	0.037	0.039	0.041	0.016	0.040

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

## **7.4 Credit Spread Reaction to Speeches**

Table 7: Credit spread reaction to the **economic outlook** tone embedded in the ECB's **President** speeches under the **PR dictionary**

	<i>Dependent variable:</i>								
	Credit Spreads								
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	15Y (7)	20Y (8)	30Y (9)
polarity	0.064** (0.028)	−0.063* (0.033)	−0.040 (0.034)	−0.034 (0.041)	−0.041 (0.040)	−0.024 (0.039)	−0.040 (0.037)	−0.036 (0.035)	−0.026 (0.034)
dependent_l1	−0.399*** (0.088)	−0.068 (0.087)	0.030 (0.077)	0.035 (0.086)	0.007 (0.088)	−0.045 (0.089)	−0.059 (0.093)	−0.077 (0.089)	−0.112 (0.090)
dependent_l2	0.029 (0.043)	−0.079*** (0.027)	−0.046** (0.021)	−0.056*** (0.019)	−0.073*** (0.019)	−0.106*** (0.019)	−0.148*** (0.018)	−0.153*** (0.019)	−0.144*** (0.019)
eonia	−0.319 (0.327)	−0.116 (0.352)	0.103 (0.358)	−0.024 (0.439)	−0.188 (0.424)	−0.192 (0.411)	0.085 (0.391)	−0.209 (0.371)	−0.140 (0.358)
eonia_l1	−0.010 (0.375)	0.113 (0.434)	−0.546 (0.430)	−0.358 (0.529)	0.210 (0.513)	0.220 (0.498)	0.576 (0.472)	0.294 (0.449)	0.505 (0.433)
cesi_eur	0.0002 (0.001)	0.001 (0.001)	0.001 (0.001)	0.0001 (0.001)	0.0004 (0.001)	0.0002 (0.001)	−0.0002 (0.001)	−0.0002 (0.001)	−0.0002 (0.001)
cesi_eur_l1	−0.0002 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.00002 (0.001)	−0.0003 (0.001)	−0.0001 (0.001)	0.0003 (0.001)	0.0003 (0.001)	0.0003 (0.001)
covid_crisis_dummy	0.006 (0.019)	0.015 (0.022)	0.008 (0.022)	0.009 (0.027)	−0.001 (0.026)	−0.001 (0.026)	−0.004 (0.024)	−0.010 (0.023)	−0.011 (0.022)
polarity:covid_crisis_dummy	0.096 (0.135)	0.115 (0.160)	0.036 (0.163)	−0.003 (0.204)	0.057 (0.193)	0.009 (0.187)	0.075 (0.178)	0.073 (0.169)	0.069 (0.163)
Constant	−0.003 (0.004)	−0.006 (0.005)	−0.001 (0.005)	0.002 (0.006)	0.003 (0.006)	0.004 (0.006)	0.006 (0.005)	0.004 (0.005)	0.004 (0.005)
Observations	180	183	184	183	184	184	184	184	184
Adjusted R <sup>2</sup>	0.100	0.029	−0.001	−0.0001	0.052	0.119	0.275	0.271	0.236
Residual Std. Error	0.050	0.059	0.060	0.074	0.071	0.069	0.066	0.062	0.060

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

**7.5 Differences by Policy Makers Rank****8 Comparison among Dictionaries****9 Discussion****10 Conclusion**

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## A Data Descriptives

Table 8: AAA-rated Euro Bonds Composition

2004	2005	2006	2007	2008
Austria	Austria	Austria	Austria	Austria
Finland	Finland	Finland	Finland	Finland
France	France	France	France	France
Germany	Germany	Germany	Germany	Germany
Ireland	Ireland	Ireland	Ireland	Ireland
Luxembourg	Luxembourg	Luxembourg	Luxembourg	Luxembourg
Netherlands	Netherlands	Netherlands	Netherlands	Netherlands
Spain	Spain	Spain	Spain	Spain
2009	2010	2011	2012	2013
Austria	Austria	Austria	Austria	Austria
Finland	Finland	Finland	Finland	Finland
France	France	France	France	Germany
Germany	Germany	Germany	Germany	Luxembourg
Ireland*	Luxembourg	Luxembourg	Luxembourg	Netherlands
Luxembourg	Netherlands	Netherlands	Netherlands	
Netherlands				
Spain				
2014	2015	2016	2017	2018
Austria	Finland	Germany	Germany	Germany
Finland	Germany	Luxembourg	Luxembourg	Luxembourg
Germany	Luxembourg	Netherlands	Netherlands	Netherlands
Luxembourg	Netherlands			
Netherlands				
2019	2020	2021		
Germany	Germany	Germany		
Luxembourg	Luxembourg	Luxembourg		
Netherlands	Netherlands	Netherlands		

*Note:* This table is constructed from the ratings on Fitch website: <https://www.fitchratings.com>

\* AAA-rated only until 06/03/2009

## B Results

Table 9: Credit spread reaction to the **economic outlook** tone embedded in the ECB's speeches under the **PR dictionary**

	<i>Dependent variable:</i>								
	Credit Spreads								
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	15Y (7)	20Y (8)	30Y (9)
polarity	0.004 (0.015)	−0.021 (0.020)	−0.012 (0.025)	−0.016 (0.030)	−0.021 (0.028)	−0.021 (0.026)	−0.021 (0.025)	−0.022 (0.024)	−0.015 (0.022)
dependent_l1	−0.320*** (0.039)	0.001 (0.036)	0.299*** (0.031)	0.252*** (0.045)	0.230*** (0.048)	0.192*** (0.051)	0.166*** (0.055)	0.164*** (0.055)	0.088 (0.054)
dependent_l2	−0.035 (0.023)	−0.075*** (0.017)	−0.037** (0.016)	−0.053*** (0.015)	−0.072*** (0.014)	−0.104*** (0.013)	−0.149*** (0.013)	−0.154*** (0.014)	−0.142*** (0.014)
eonia	0.011 (0.080)	0.015 (0.105)	0.081 (0.135)	0.077 (0.162)	0.088 (0.150)	0.087 (0.140)	0.108 (0.132)	0.091 (0.129)	0.093 (0.119)
eonia_l1	0.045 (0.142)	0.195 (0.187)	0.037 (0.238)	0.113 (0.287)	0.230 (0.264)	0.191 (0.246)	0.241 (0.233)	0.138 (0.228)	0.202 (0.210)
cesi_eur	0.0001 (0.0003)	−0.0004 (0.0004)	−0.0001 (0.0005)	−0.0005 (0.001)	−0.0003 (0.001)	−0.0002 (0.001)	−0.0004 (0.0005)	−0.001 (0.0005)	−0.0003 (0.0004)
cesi_eur_l1	−0.0001 (0.0003)	0.001 (0.0004)	0.0001 (0.0005)	0.001 (0.001)	0.0005 (0.001)	0.0004 (0.001)	0.001 (0.0005)	0.001 (0.0005)	0.0004 (0.0004)
covid_crisis_dummy	0.002 (0.006)	0.010 (0.008)	0.015 (0.010)	0.016 (0.013)	0.013 (0.011)	0.011 (0.011)	0.014 (0.010)	0.013 (0.010)	0.012 (0.009)
polarity:covid_crisis_dummy	0.039 (0.043)	0.026 (0.058)	−0.002 (0.073)	0.0004 (0.089)	0.008 (0.081)	0.003 (0.076)	0.002 (0.072)	0.005 (0.070)	0.003 (0.064)
Constant	−0.001 (0.002)	−0.004 (0.003)	−0.003 (0.003)	−0.003 (0.004)	−0.004 (0.004)	−0.003 (0.004)	−0.002 (0.003)	−0.002 (0.003)	−0.004 (0.003)
Observations	670	673	681	679	681	681	681	681	681
Adjusted R <sup>2</sup>	0.084	0.035	0.133	0.070	0.084	0.115	0.200	0.191	0.166
Residual Std. Error	0.049	0.065	0.084	0.101	0.093	0.087	0.082	0.080	0.074

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 10: Credit spread reaction to the **monetary policy** tone embedded in the ECB's speeches under the **PR dictionary**

	<i>Dependent variable:</i>								
	Credit Spreads								
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	15Y (7)	20Y (8)	30Y (9)
polarity	0.012 (0.013)	0.018 (0.017)	0.024 (0.021)	0.026 (0.025)	0.013 (0.023)	0.007 (0.022)	0.009 (0.021)	0.007 (0.020)	0.006 (0.019)
dependent_l1	-0.321*** (0.039)	0.003 (0.036)	0.301*** (0.031)	0.254*** (0.045)	0.231*** (0.048)	0.194*** (0.051)	0.168*** (0.055)	0.167*** (0.056)	0.090 (0.055)
dependent_l2	-0.035 (0.023)	-0.075*** (0.017)	-0.036** (0.016)	-0.052*** (0.015)	-0.072*** (0.014)	-0.104*** (0.013)	-0.149*** (0.013)	-0.154*** (0.014)	-0.142*** (0.014)
eonia	0.012 (0.081)	0.017 (0.106)	0.082 (0.135)	0.079 (0.162)	0.089 (0.150)	0.087 (0.140)	0.107 (0.132)	0.089 (0.130)	0.091 (0.119)
eonia_l1	0.036 (0.144)	0.194 (0.188)	0.031 (0.238)	0.100 (0.286)	0.219 (0.264)	0.189 (0.248)	0.236 (0.233)	0.138 (0.230)	0.201 (0.211)
cesi_eur	0.0001 (0.0003)	-0.0004 (0.0004)	-0.0001 (0.0005)	-0.001 (0.001)	-0.0003 (0.001)	-0.0003 (0.001)	-0.0004 (0.0005)	-0.001 (0.0005)	-0.0003 (0.0004)
cesi_eur_l1	-0.00005 (0.0003)	0.0005 (0.0004)	0.0001 (0.0005)	0.001 (0.001)	0.0005 (0.001)	0.0004 (0.001)	0.001 (0.0005)	0.001 (0.0005)	0.0005 (0.0004)
covid_crisis_dummy	0.001 (0.006)	0.010 (0.008)	0.015 (0.010)	0.015 (0.013)	0.013 (0.011)	0.011 (0.011)	0.014 (0.010)	0.012 (0.010)	0.012 (0.009)
polarity:covid_crisis_dummy	0.004 (0.047)	-0.011 (0.063)	-0.073 (0.079)	-0.068 (0.095)	-0.058 (0.088)	-0.060 (0.082)	-0.061 (0.077)	-0.074 (0.076)	-0.075 (0.070)
Constant	-0.001 (0.002)	-0.004 (0.003)	-0.003 (0.004)	-0.003 (0.004)	-0.003 (0.004)	-0.003 (0.004)	-0.002 (0.003)	-0.002 (0.003)	-0.004 (0.003)
Observations	660	663	671	669	671	671	671	671	671
Adjusted R <sup>2</sup>	0.084	0.035	0.137	0.072	0.085	0.115	0.204	0.193	0.167
Residual Std. Error	0.050	0.066	0.084	0.101	0.093	0.087	0.082	0.081	0.074

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 11: Interest rates, stock returns and inflation expectations reaction to the **economic outlook** tone embedded in the ECB's **President** speeches under the **PR dictionary**

	<i>Dependent variable:</i>									
	Interest rates, stock returns and inflation expectations									
	3M	1Y	2Y	5Y	7Y	10Y	20Y	30Y	Eurostoxx	Breakeven-inflation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
polarity	−0.004 (0.010)	0.003 (0.011)	0.004 (0.015)	0.009 (0.016)	0.009 (0.016)	0.008 (0.016)	0.002 (0.017)	−0.006 (0.018)	0.004 (0.006)	−0.017 (0.020)
dependent_l1	−0.026 (0.053)	0.254*** (0.045)	0.167*** (0.046)	0.116** (0.046)	0.122*** (0.047)	0.133*** (0.049)	0.174*** (0.047)	0.146*** (0.042)	−0.685*** (0.039)	−0.109 (0.070)
dependent_l2	0.263*** (0.056)	0.018 (0.046)	−0.010 (0.051)	0.020 (0.050)	0.041 (0.048)	0.051 (0.046)	0.002 (0.044)	−0.029 (0.037)	−0.414*** (0.042)	0.079 (0.057)
eonia	−0.014 (0.013)	0.033** (0.013)	0.022 (0.018)	0.002 (0.020)	−0.009 (0.020)	−0.022 (0.020)	−0.026 (0.020)	−0.016 (0.022)	0.009 (0.008)	0.026 (0.044)
eonia_l1	0.018 (0.013)	0.007 (0.014)	0.017 (0.020)	0.007 (0.022)	0.003 (0.021)	−0.001 (0.021)	−0.003 (0.022)	0.014 (0.023)	−0.006 (0.009)	−0.052 (0.046)
cesi_eur	−0.0001 (0.0002)	0.0001 (0.0002)	0.0001 (0.0002)	0.0002 (0.0003)	0.0003 (0.0003)	0.0003 (0.0003)	0.0004 (0.0003)	0.001** (0.0003)	−0.0002** (0.0001)	−0.0002 (0.0004)
cesi_eur_l1	0.0002 (0.0002)	−0.00002 (0.0002)	−0.00001 (0.0002)	−0.0002 (0.0003)	−0.0002 (0.0003)	−0.0003 (0.0003)	−0.0004 (0.0003)	−0.001** (0.0003)	0.0002** (0.0001)	0.0002 (0.0004)
financial_crisis_dummy	−0.005* (0.003)	−0.002 (0.003)	0.001 (0.004)	0.003 (0.005)	0.003 (0.004)	0.004 (0.004)	0.006 (0.005)	0.007 (0.005)	−0.002 (0.002)	
covid_crisis_dummy	−0.002 (0.008)	−0.005 (0.009)	−0.009 (0.012)	−0.015 (0.013)	−0.018 (0.013)	−0.021 (0.013)	−0.020 (0.013)	−0.018 (0.014)	−0.004 (0.006)	−0.007 (0.015)
polarity:financial_crisis_dummy	0.026 (0.019)	−0.083*** (0.021)	−0.078*** (0.029)	−0.061* (0.031)	−0.060* (0.031)	−0.059* (0.031)	−0.057* (0.032)	−0.055 (0.034)	−0.034*** (0.013)	
polarity:covid_crisis_dummy	−0.013 (0.062)	−0.002 (0.066)	0.025 (0.090)	0.076 (0.100)	0.101 (0.098)	0.123 (0.098)	0.118 (0.101)	0.117 (0.108)	−0.029 (0.041)	−0.003 (0.109)
Constant	−0.001 (0.001)	−0.002 (0.001)	−0.003 (0.002)	−0.004** (0.002)	−0.005** (0.002)	−0.005** (0.002)	−0.005** (0.002)	−0.006** (0.002)	0.0003 (0.001)	0.004 (0.003)
Observations	447	447	447	447	447	447	447	447	489	241
R <sup>2</sup>	0.122	0.184	0.078	0.037	0.038	0.044	0.067	0.065	0.411	0.034
Adjusted R <sup>2</sup>	0.091	0.156	0.046	0.003	0.004	0.011	0.034	0.032	0.392	−0.021
Residual Std. Error	0.023	0.025	0.034	0.038	0.037	0.037	0.038	0.041	0.016	0.041

Note:

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 12: Credit spread reaction to the **monetary policy** tone embedded in the ECB's **President** speeches under the **PR dictionary**

	<i>Dependent variable:</i>								
	Credit Spreads								
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	15Y (7)	20Y (8)	30Y (9)
polarity	−0.010 (0.030)	−0.001 (0.034)	−0.016 (0.035)	−0.043 (0.043)	−0.033 (0.041)	−0.007 (0.040)	−0.005 (0.038)	−0.009 (0.036)	−0.004 (0.035)
dependent_l1	−0.396*** (0.090)	−0.089 (0.087)	0.042 (0.077)	0.041 (0.087)	0.012 (0.089)	−0.038 (0.090)	−0.054 (0.094)	−0.069 (0.090)	−0.109 (0.091)
dependent_l2	0.027 (0.044)	−0.081*** (0.027)	−0.046** (0.021)	−0.057*** (0.019)	−0.073*** (0.019)	−0.106*** (0.019)	−0.147*** (0.018)	−0.152*** (0.019)	−0.143*** (0.020)
eonia	−0.305 (0.334)	−0.077 (0.354)	0.141 (0.358)	−0.002 (0.439)	−0.158 (0.425)	−0.174 (0.413)	0.101 (0.394)	−0.195 (0.373)	−0.127 (0.360)
eonia_l1	−0.069 (0.383)	0.177 (0.435)	−0.535 (0.430)	−0.363 (0.528)	0.217 (0.514)	0.222 (0.497)	0.612 (0.474)	0.323 (0.450)	0.527 (0.434)
cesi_eur	0.0003 (0.001)	0.001 (0.001)	0.001 (0.001)	0.00000 (0.001)	0.0003 (0.001)	0.0001 (0.001)	−0.0003 (0.001)	−0.0003 (0.001)	−0.0003 (0.001)
cesi_eur_l1	−0.0003 (0.001)	−0.001 (0.001)	−0.001 (0.001)	0.00005 (0.001)	−0.0002 (0.001)	−0.00003 (0.001)	0.0004 (0.001)	0.0005 (0.001)	0.0004 (0.001)
covid_crisis_dummy	0.016 (0.015)	0.013 (0.017)	0.004 (0.017)	0.003 (0.021)	0.001 (0.020)	−0.006 (0.020)	−0.003 (0.019)	−0.008 (0.018)	−0.008 (0.017)
polarity:covid_crisis_dummy	0.135 (0.150)	0.314* (0.175)	0.228 (0.177)	0.236 (0.218)	0.157 (0.212)	0.174 (0.205)	0.127 (0.196)	0.150 (0.185)	0.085 (0.180)
Constant	−0.003 (0.004)	−0.007 (0.005)	−0.002 (0.005)	−0.001 (0.006)	0.001 (0.006)	0.003 (0.006)	0.005 (0.006)	0.003 (0.005)	0.004 (0.005)
Observations	179	182	183	182	183	183	183	183	183
Adjusted R <sup>2</sup>	0.064	0.028	0.004	0.006	0.052	0.120	0.272	0.269	0.233
Residual Std. Error	0.051	0.059	0.060	0.074	0.072	0.069	0.066	0.063	0.060

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 13

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
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Table 14

	<i>Dependent variable</i>				
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)
polarity	−0.002 (0.002)	−0.002 (0.002)	−0.001 (0.003)	0.001 (0.003)	0.001 (0.003)
dependent_11	−0.006 (0.021)	0.181*** (0.029)	0.137*** (0.030)	0.125*** (0.029)	0.129*** (0.029)
dependent_12	0.110*** (0.032)	0.024 (0.029)	0.025 (0.031)	0.026 (0.029)	0.018 (0.029)
eonia	−0.011 (0.009)	0.009 (0.010)	0.018 (0.014)	0.010 (0.015)	−0.002 (0.015)
eonia_11	−0.0001 (0.008)	0.016* (0.009)	0.018 (0.012)	−0.004 (0.013)	−0.012 (0.013)
cesi_eur	0.00001 (0.0001)	0.0003** (0.0001)	0.0004*** (0.0001)	0.001*** (0.0002)	0.001*** (0.0002)
cesi_eur_11	0.00003 (0.0001)	−0.0002** (0.0001)	−0.0004*** (0.0001)	−0.001*** (0.0002)	−0.001*** (0.0002)
financial_crisis_dummy	−0.005*** (0.002)	0.002 (0.002)	0.006** (0.003)	0.007** (0.003)	0.007** (0.003)
covid_crisis_dummy	−0.003 (0.002)	−0.001 (0.003)	0.0001 (0.004)	0.0003 (0.004)	0.0005 (0.004)
polarity:financial_crisis_dummy	−0.007* (0.004)	−0.003 (0.005)	−0.003 (0.007)	−0.003 (0.007)	−0.002 (0.007)
polarity:covid_crisis_dummy	0.0001 (0.006)	0.004 (0.006)	0.006 (0.009)	0.007 (0.010)	0.008 (0.010)
Constant	−0.0002 (0.001)	−0.001 (0.001)	−0.002 (0.001)	−0.002** (0.001)	−0.003** (0.001)
Observations	1,163	1,163	1,163	1,163	1,163
R <sup>2</sup>	0.059	0.059	0.038	0.038	0.042
Adjusted R <sup>2</sup>	0.047	0.047	0.025	0.026	0.030
Residual Std. Error	0.020	0.023	0.032	0.035	0.035

*Note:*

Table 15: Credit spread reaction to the tone embedded in the ECB's speeches under the **BN dictionary**

	<i>Dependent variable:</i>								
	Credit Spreads								
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	15Y (7)	20Y (8)	30Y (9)
polarity	0.002 (0.005)	0.004 (0.007)	0.003 (0.009)	0.004 (0.011)	0.006 (0.010)	0.005 (0.009)	0.004 (0.009)	0.006 (0.008)	0.006 (0.008)
dependent_l1	-0.319*** (0.041)	0.005 (0.037)	0.309*** (0.032)	0.263*** (0.047)	0.240*** (0.050)	0.204*** (0.053)	0.182*** (0.057)	0.174*** (0.057)	0.098* (0.056)
dependent_l2	-0.037 (0.024)	-0.077*** (0.017)	-0.037** (0.017)	-0.053*** (0.015)	-0.073*** (0.015)	-0.104*** (0.014)	-0.150*** (0.013)	-0.155*** (0.014)	-0.143*** (0.014)
eonia	0.029 (0.083)	0.027 (0.109)	0.099 (0.139)	0.090 (0.168)	0.100 (0.155)	0.098 (0.144)	0.120 (0.136)	0.101 (0.133)	0.102 (0.122)
eonia_l1	0.098 (0.152)	0.225 (0.200)	0.054 (0.254)	0.156 (0.306)	0.236 (0.283)	0.204 (0.263)	0.251 (0.248)	0.144 (0.244)	0.193 (0.223)
cesi_eur	0.0001 (0.0003)	-0.0004 (0.0005)	-0.00001 (0.001)	-0.0005 (0.001)	-0.0003 (0.001)	-0.0002 (0.001)	-0.0003 (0.001)	-0.001 (0.001)	-0.0003 (0.0005)
cesi_eur_l1	-0.0001 (0.0003)	0.001 (0.0005)	0.0001 (0.001)	0.001 (0.001)	0.0004 (0.001)	0.0003 (0.001)	0.0005 (0.001)	0.001 (0.001)	0.0004 (0.0005)
covid_crisis_dummy	0.001 (0.006)	0.010 (0.008)	0.015 (0.011)	0.017 (0.013)	0.014 (0.012)	0.011 (0.011)	0.015 (0.010)	0.012 (0.010)	0.012 (0.009)
polarity:covid_crisis_dummy	0.004 (0.014)	0.001 (0.019)	-0.001 (0.024)	-0.0003 (0.029)	-0.004 (0.027)	-0.003 (0.025)	0.004 (0.023)	-0.002 (0.023)	-0.004 (0.021)
Constant	-0.001 (0.002)	-0.003 (0.003)	-0.002 (0.004)	-0.004 (0.005)	-0.004 (0.004)	-0.003 (0.004)	-0.002 (0.004)	-0.001 (0.004)	-0.003 (0.003)
Observations	622	626	633	631	633	633	633	633	633
Adjusted R <sup>2</sup>	0.081	0.035	0.140	0.071	0.083	0.115	0.203	0.192	0.167
Residual Std. Error	0.051	0.067	0.086	0.103	0.096	0.089	0.084	0.082	0.075

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01



Table 16: Interest rates, stock returns and inflation expectations reaction to the tone embedded in the ECB's **President** speeches under the **BN dictionary**

	<i>Dependent variable:</i>									
	Interest rates, stock returns and inflation expectations								Eurostoxx	Breakeven-inflation
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	20Y (7)	30Y (8)	(9)	(10)
polarity	0.007* (0.004)	0.001 (0.004)	−0.003 (0.005)	−0.003 (0.006)	−0.001 (0.006)	0.002 (0.006)	0.003 (0.006)	0.001 (0.007)	−0.0003 (0.002)	0.001 (0.007)
dependent_l1	−0.015 (0.053)	0.214*** (0.045)	0.195*** (0.048)	0.141*** (0.049)	0.140*** (0.050)	0.140*** (0.052)	0.164*** (0.048)	0.129*** (0.043)	−0.686*** (0.041)	−0.121* (0.072)
dependent_l2	0.251*** (0.059)	0.007 (0.047)	−0.061 (0.054)	−0.029 (0.050)	0.005 (0.048)	0.025 (0.047)	−0.022 (0.045)	−0.046 (0.036)	−0.425*** (0.044)	0.073 (0.056)
eonia	0.003 (0.014)	0.016 (0.015)	0.023 (0.021)	0.005 (0.023)	−0.013 (0.023)	−0.030 (0.023)	−0.036 (0.024)	−0.026 (0.025)	0.009 (0.010)	0.025 (0.067)
eonia_l1	0.012 (0.013)	0.016 (0.013)	0.021 (0.019)	0.010 (0.021)	0.005 (0.021)	−0.002 (0.021)	−0.010 (0.021)	0.004 (0.022)	−0.010 (0.009)	−0.060 (0.045)
cesi_eur	−0.0002 (0.0002)	0.0003 (0.0002)	0.0003 (0.0003)	0.0005* (0.0003)	0.001* (0.0003)	0.001** (0.0003)	0.001** (0.0003)	0.001*** (0.0003)	−0.0002 (0.0001)	−0.0004 (0.0004)
cesi_eur_l1	0.0002 (0.0002)	−0.0002 (0.0002)	−0.0003 (0.0003)	−0.0005 (0.0003)	−0.001* (0.0003)	−0.001** (0.0003)	−0.001** (0.0003)	−0.001*** (0.0003)	0.0002 (0.0001)	0.0004 (0.0004)
financial_crisis_dummy	−0.008*** (0.003)	0.001 (0.003)	0.005 (0.004)	0.006 (0.005)	0.005 (0.005)	0.005 (0.005)	0.005 (0.005)	0.006 (0.005)	−0.001 (0.002)	
covid_crisis_dummy	−0.004 (0.006)	−0.004 (0.006)	−0.005 (0.008)	−0.006 (0.009)	−0.007 (0.009)	−0.008 (0.009)	−0.008 (0.010)	−0.006 (0.010)	−0.006* (0.004)	−0.010 (0.010)
polarity:financial_crisis_dummy	0.001 (0.007)	0.007 (0.007)	0.008 (0.011)	0.008 (0.012)	0.005 (0.012)	0.001 (0.012)	0.002 (0.012)	0.014 (0.013)	0.001 (0.005)	
polarity:covid_crisis_dummy	−0.009 (0.014)	−0.005 (0.014)	−0.005 (0.020)	−0.012 (0.022)	−0.016 (0.022)	−0.021 (0.022)	−0.019 (0.023)	−0.012 (0.024)	0.007 (0.009)	−0.014 (0.024)
Constant	−0.001 (0.001)	−0.002 (0.001)	−0.002 (0.002)	−0.004* (0.002)	−0.004* (0.002)	−0.004** (0.002)	−0.005** (0.002)	−0.005** (0.002)	0.001 (0.001)	0.002 (0.003)
Observations	418	418	418	418	418	418	418	418	455	228
R <sup>2</sup>	0.125	0.121	0.074	0.042	0.038	0.041	0.061	0.062	0.402	0.044
Adjusted R <sup>2</sup>	0.093	0.088	0.040	0.006	0.002	0.006	0.026	0.027	0.381	−0.014
Residual Std. Error	0.023	0.023	0.034	0.037	0.037	0.037	0.038	0.041	0.016	0.039

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 17: Credit spread reaction to the tone embedded in the ECB's **President** speeches under the **BN dictionary**

	<i>Dependent variable:</i>								
	Credit Spreads								
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	15Y (7)	20Y (8)	30Y (9)
polarity	0.011 (0.010)	−0.015 (0.012)	−0.007 (0.012)	−0.003 (0.015)	−0.006 (0.014)	0.002 (0.014)	0.002 (0.013)	0.007 (0.012)	0.007 (0.012)
dependent_l1	−0.398*** (0.091)	−0.041 (0.088)	0.082 (0.076)	0.063 (0.087)	0.029 (0.091)	−0.033 (0.091)	−0.039 (0.095)	−0.057 (0.090)	−0.098 (0.091)
dependent_l2	0.031 (0.044)	−0.082*** (0.027)	−0.048** (0.020)	−0.057*** (0.019)	−0.074*** (0.019)	−0.106*** (0.019)	−0.149*** (0.018)	−0.152*** (0.019)	−0.143*** (0.019)
eonia	−0.305 (0.337)	−0.045 (0.355)	0.231 (0.352)	0.077 (0.440)	−0.091 (0.427)	−0.105 (0.414)	0.167 (0.394)	−0.135 (0.373)	−0.072 (0.361)
eonia_l1	−0.110 (0.386)	0.173 (0.437)	−0.596 (0.422)	−0.440 (0.530)	0.166 (0.516)	0.159 (0.500)	0.550 (0.474)	0.269 (0.450)	0.493 (0.435)
cesi_eur	0.0003 (0.001)	0.001 (0.001)	0.001 (0.001)	0.0001 (0.001)	0.0004 (0.001)	0.0002 (0.001)	−0.0002 (0.001)	−0.0003 (0.001)	−0.0002 (0.001)
cesi_eur_l1	−0.0003 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.0001 (0.001)	−0.0003 (0.001)	−0.0001 (0.001)	0.0003 (0.001)	0.0004 (0.001)	0.0003 (0.001)
covid_crisis_dummy	0.019 (0.014)	0.022 (0.016)	0.011 (0.016)	0.007 (0.020)	0.004 (0.019)	−0.001 (0.019)	0.001 (0.018)	−0.005 (0.017)	−0.006 (0.016)
polarity:covid_crisis_dummy	0.007 (0.031)	0.027 (0.036)	0.018 (0.036)	0.017 (0.049)	0.009 (0.043)	0.007 (0.042)	0.005 (0.040)	0.006 (0.038)	0.004 (0.037)
Constant	−0.001 (0.004)	−0.006 (0.005)	−0.001 (0.005)	0.002 (0.006)	0.003 (0.006)	0.004 (0.006)	0.006 (0.005)	0.005 (0.005)	0.005 (0.005)
Observations	176	179	180	179	180	180	180	180	180
Adjusted R <sup>2</sup>	0.066	0.019	0.008	−0.0004	0.047	0.117	0.273	0.270	0.233
Residual Std. Error	0.051	0.059	0.059	0.074	0.071	0.069	0.066	0.062	0.060

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 18: Interest rates, stock returns and inflation expectations reaction to the tone embedded in the ECB's speeches under the **LM dictionary**

	<i>Dependent variable:</i>									
	Interest rates, stock returns and inflation expectations									
	3M	1Y	2Y	5Y	7Y	10Y	20Y	30Y	Eurostoxx	Breakeven-inflation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
polarity	0.002 (0.002)	0.003 (0.002)	0.002 (0.003)	0.001 (0.003)	0.001 (0.003)	0.001 (0.003)	0.002 (0.004)	0.001 (0.004)	0.001 (0.001)	0.004 (0.004)
dependent_l1	-0.010 (0.021)	0.193*** (0.028)	0.126*** (0.029)	0.107*** (0.028)	0.114*** (0.028)	0.123*** (0.028)	0.147*** (0.027)	0.125*** (0.026)	-0.701*** (0.024)	-0.057 (0.038)
dependent_l2	0.117*** (0.031)	0.035 (0.028)	0.052* (0.029)	0.050* (0.028)	0.037 (0.028)	0.021 (0.028)	-0.015 (0.027)	-0.016 (0.024)	-0.317*** (0.025)	0.011 (0.023)
eonia	-0.018** (0.008)	0.020** (0.009)	0.018 (0.012)	0.006 (0.014)	-0.003 (0.014)	-0.013 (0.014)	-0.014 (0.015)	-0.001 (0.016)	0.010* (0.005)	0.028 (0.027)
eonia_l1	0.005 (0.008)	0.006 (0.009)	0.014 (0.012)	-0.003 (0.013)	-0.013 (0.013)	-0.020 (0.013)	-0.020 (0.014)	-0.003 (0.015)	-0.004 (0.005)	0.026 (0.027)
cesi_eur	0.0001 (0.0001)	0.0002** (0.0001)	0.0004*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0001)	0.001*** (0.0002)	0.001*** (0.0002)	0.00002 (0.0001)	-0.0001 (0.0002)
cesi_eur_l1	-0.00002 (0.0001)	-0.0002** (0.0001)	-0.0004*** (0.0001)	-0.001*** (0.0001)	-0.001*** (0.0001)	-0.001*** (0.0001)	-0.001*** (0.0002)	-0.001*** (0.0002)	-0.00002 (0.0001)	0.0001 (0.0002)
financial_crisis_dummy	-0.004*** (0.002)	0.001 (0.002)	0.004* (0.002)	0.006** (0.003)	0.006** (0.003)	0.006** (0.003)	0.007** (0.003)	0.007** (0.003)	0.001 (0.001)	
covid_crisis_dummy	-0.004 (0.002)	-0.0004 (0.003)	0.001 (0.004)	0.001 (0.004)	0.002 (0.004)	0.002 (0.004)	0.003 (0.004)	0.003 (0.005)	-0.001 (0.002)	-0.003 (0.005)
polarity:financial_crisis_dummy	-0.003 (0.004)	-0.012** (0.005)	-0.010 (0.007)	-0.007 (0.007)	-0.007 (0.007)	-0.010 (0.008)	-0.011 (0.008)	-0.006 (0.009)	-0.004 (0.003)	
polarity:covid_crisis_dummy	-0.005 (0.008)	-0.007 (0.008)	-0.005 (0.012)	-0.005 (0.013)	-0.006 (0.013)	-0.008 (0.013)	-0.011 (0.014)	-0.010 (0.015)	-0.005 (0.006)	-0.013 (0.014)
Constant	-0.0002 (0.001)	-0.001 (0.001)	-0.002* (0.001)	-0.003** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.003** (0.001)	0.0001 (0.0005)	0.001 (0.001)
Observations	1,238	1,238	1,238	1,238	1,238	1,238	1,238	1,238	1,338	781
R <sup>2</sup>	0.057	0.070	0.036	0.033	0.036	0.040	0.050	0.045	0.400	0.017
Adjusted R <sup>2</sup>	0.046	0.058	0.024	0.021	0.024	0.028	0.039	0.033	0.393	0.0003
Residual Std. Error	0.021	0.023	0.032	0.035	0.035	0.035	0.038	0.042	0.015	0.037

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 19: Credit spread reaction to the tone embedded in the ECB's speeches under the **LM dictionary**

	<i>Dependent variable:</i>								
	Credit Spreads								
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	15Y (7)	20Y (8)	30Y (9)
polarity	0.005 (0.006)	−0.004 (0.008)	0.004 (0.010)	0.002 (0.012)	0.002 (0.011)	0.002 (0.011)	0.003 (0.010)	0.005 (0.010)	0.004 (0.009)
dependent_l1	−0.324*** (0.040)	0.003 (0.037)	0.305*** (0.032)	0.255*** (0.046)	0.234*** (0.048)	0.200*** (0.052)	0.174*** (0.055)	0.170*** (0.056)	0.094* (0.055)
dependent_l2	−0.038* (0.023)	−0.075*** (0.017)	−0.036** (0.016)	−0.052*** (0.015)	−0.072*** (0.014)	−0.103*** (0.014)	−0.149*** (0.013)	−0.154*** (0.014)	−0.142*** (0.014)
eonia	0.010 (0.081)	0.014 (0.106)	0.081 (0.136)	0.073 (0.163)	0.083 (0.151)	0.083 (0.141)	0.104 (0.133)	0.086 (0.131)	0.087 (0.120)
eonia_l1	0.057 (0.146)	0.212 (0.192)	0.067 (0.244)	0.163 (0.292)	0.242 (0.270)	0.213 (0.254)	0.254 (0.238)	0.153 (0.235)	0.200 (0.216)
cesi_eur	0.0002 (0.0003)	−0.0004 (0.0005)	−0.0001 (0.0005)	−0.0005 (0.001)	−0.0003 (0.001)	−0.0002 (0.001)	−0.0003 (0.0005)	−0.0005 (0.0005)	−0.0003 (0.0004)
cesi_eur_l1	−0.0001 (0.0003)	0.001 (0.0005)	0.0001 (0.001)	0.001 (0.001)	0.0005 (0.001)	0.0004 (0.001)	0.0005 (0.0005)	0.001 (0.0005)	0.0004 (0.0004)
covid_crisis_dummy	0.002 (0.006)	0.010 (0.008)	0.015 (0.010)	0.015 (0.013)	0.012 (0.012)	0.010 (0.011)	0.013 (0.010)	0.012 (0.010)	0.012 (0.009)
polarity:covid_crisis_dummy	0.013 (0.019)	0.002 (0.025)	−0.002 (0.032)	−0.015 (0.038)	−0.013 (0.035)	−0.015 (0.033)	−0.013 (0.031)	−0.016 (0.030)	−0.010 (0.028)
Constant	−0.001 (0.002)	−0.004 (0.003)	−0.002 (0.004)	−0.003 (0.004)	−0.003 (0.004)	−0.002 (0.004)	−0.001 (0.004)	−0.001 (0.003)	−0.003 (0.003)
Observations	652	655	663	661	663	663	663	663	663
Adjusted R <sup>2</sup>	0.085	0.034	0.138	0.071	0.084	0.115	0.203	0.192	0.165
Residual Std. Error	0.050	0.066	0.084	0.101	0.094	0.088	0.083	0.081	0.075

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 20: Interest rates, stock returns and inflation expectations reaction to the tone embedded in the ECB's **President** speeches under the **LM dictionary**

	<i>Dependent variable:</i>									
	Interest rates, stock returns and inflation expectations								Eurostoxx	Breakeven-inflation
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	20Y (7)	30Y (8)	(9)	(10)
polarity	0.005 (0.004)	0.005 (0.004)	0.004 (0.006)	0.002 (0.007)	0.003 (0.006)	0.004 (0.006)	0.006 (0.007)	−0.001 (0.007)	0.002 (0.003)	0.003 (0.009)
dependent_l1	−0.034 (0.053)	0.261*** (0.046)	0.179*** (0.046)	0.117** (0.047)	0.120** (0.048)	0.129*** (0.050)	0.176*** (0.047)	0.138*** (0.043)	−0.698*** (0.039)	−0.123* (0.072)
dependent_l2	0.253*** (0.056)	0.021 (0.045)	−0.005 (0.050)	0.018 (0.049)	0.038 (0.047)	0.049 (0.046)	−0.003 (0.044)	−0.040 (0.036)	−0.403*** (0.042)	0.078 (0.056)
eonia	−0.014 (0.013)	0.038*** (0.013)	0.028 (0.018)	0.007 (0.020)	−0.005 (0.020)	−0.020 (0.020)	−0.022 (0.020)	−0.010 (0.022)	0.010 (0.008)	0.025 (0.043)
eonia_l1	0.021 (0.013)	−0.001 (0.014)	0.010 (0.019)	0.003 (0.021)	−0.001 (0.021)	−0.004 (0.021)	−0.008 (0.021)	0.005 (0.023)	−0.006 (0.009)	−0.054 (0.045)
cesi_eur	−0.0001 (0.0002)	0.0001 (0.0002)	0.0001 (0.0002)	0.0003 (0.0003)	0.0003 (0.0003)	0.0003 (0.0003)	0.0005* (0.0003)	0.001** (0.0003)	−0.0002** (0.0001)	−0.0002 (0.0004)
cesi_eur_l1	0.0002 (0.0002)	−0.0001 (0.0002)	−0.0001 (0.0002)	−0.0002 (0.0003)	−0.0003 (0.0003)	−0.0003 (0.0003)	−0.0005* (0.0003)	−0.001** (0.0003)	0.0002** (0.0001)	0.0003 (0.0004)
financial_crisis_dummy	−0.005* (0.003)	−0.002 (0.003)	0.001 (0.004)	0.002 (0.004)	0.003 (0.004)	0.004 (0.004)	0.006 (0.005)	0.006 (0.005)	−0.002 (0.002)	
covid_crisis_dummy	−0.003 (0.007)	−0.003 (0.008)	−0.005 (0.010)	−0.010 (0.012)	−0.012 (0.011)	−0.014 (0.011)	−0.014 (0.012)	−0.013 (0.013)	−0.005 (0.005)	−0.002 (0.013)
polarity:financial_crisis_dummy	−0.005 (0.008)	−0.021** (0.009)	−0.018 (0.012)	−0.014 (0.013)	−0.017 (0.013)	−0.020 (0.013)	−0.015 (0.014)	0.002 (0.015)	−0.014** (0.005)	
polarity:covid_crisis_dummy	−0.010 (0.020)	−0.011 (0.021)	−0.005 (0.029)	0.012 (0.032)	0.017 (0.032)	0.021 (0.032)	0.022 (0.033)	0.027 (0.035)	−0.009 (0.013)	−0.031 (0.035)
Constant	−0.001 (0.001)	−0.003* (0.001)	−0.003* (0.002)	−0.005** (0.002)	−0.005** (0.002)	−0.006*** (0.002)	−0.006** (0.002)	−0.005** (0.002)	0.0005 (0.001)	0.002 (0.003)
Observations	441	441	441	441	441	441	441	441	479	236
R <sup>2</sup>	0.121	0.168	0.070	0.031	0.031	0.037	0.058	0.050	0.418	0.037
Adjusted R <sup>2</sup>	0.089	0.138	0.037	−0.003	−0.004	0.003	0.025	0.017	0.399	−0.019
Residual Std. Error	0.023	0.025	0.034	0.037	0.037	0.037	0.038	0.041	0.016	0.040

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

Table 21: Credit spread reaction to the tone embedded in the ECB's **President** speeches under the **LM dictionary**

	<i>Dependent variable:</i>								
	Credit Spreads								
	3M (1)	1Y (2)	2Y (3)	5Y (4)	7Y (5)	10Y (6)	15Y (7)	20Y (8)	30Y (9)
polarity	0.024* (0.012)	−0.030** (0.014)	−0.017 (0.015)	−0.016 (0.018)	−0.020 (0.017)	−0.012 (0.017)	−0.017 (0.016)	−0.006 (0.015)	−0.008 (0.015)
dependent_l1	−0.414*** (0.092)	−0.059 (0.087)	0.042 (0.077)	0.050 (0.087)	0.014 (0.089)	−0.042 (0.090)	−0.065 (0.094)	−0.079 (0.090)	−0.118 (0.090)
dependent_l2	0.033 (0.043)	−0.082*** (0.027)	−0.047** (0.021)	−0.056*** (0.019)	−0.073*** (0.019)	−0.106*** (0.019)	−0.149*** (0.018)	−0.153*** (0.019)	−0.144*** (0.019)
eonia	−0.364 (0.330)	−0.063 (0.353)	0.122 (0.359)	−0.014 (0.441)	−0.176 (0.424)	−0.195 (0.412)	0.094 (0.392)	−0.208 (0.372)	−0.145 (0.358)
eonia_l1	−0.049 (0.377)	0.154 (0.434)	−0.516 (0.431)	−0.339 (0.530)	0.236 (0.512)	0.237 (0.497)	0.613 (0.471)	0.336 (0.449)	0.538 (0.431)
cesi_eur	0.0003 (0.001)	0.001 (0.001)	0.001 (0.001)	−0.00002 (0.001)	0.0003 (0.001)	0.0001 (0.001)	−0.0003 (0.001)	−0.0003 (0.001)	−0.0002 (0.001)
cesi_eur_l1	−0.0003 (0.001)	−0.001 (0.001)	−0.001 (0.001)	0.0001 (0.001)	−0.0002 (0.001)	−0.00001 (0.001)	0.0004 (0.001)	0.0004 (0.001)	0.0004 (0.001)
covid_crisis_dummy	0.014 (0.016)	0.021 (0.019)	0.009 (0.020)	0.008 (0.025)	−0.002 (0.023)	−0.005 (0.023)	−0.007 (0.021)	−0.012 (0.020)	−0.015 (0.020)
polarity:covid_crisis_dummy	0.014 (0.044)	0.015 (0.052)	0.003 (0.053)	−0.006 (0.066)	0.022 (0.063)	0.014 (0.061)	0.035 (0.058)	0.028 (0.055)	0.040 (0.053)
Constant	−0.005 (0.004)	−0.003 (0.005)	0.001 (0.005)	0.004 (0.006)	0.006 (0.006)	0.006 (0.006)	0.008 (0.006)	0.005 (0.005)	0.006 (0.005)
Observations	178	181	182	181	182	182	182	182	182
Adjusted R <sup>2</sup>	0.094	0.033	−0.003	−0.001	0.054	0.120	0.277	0.270	0.238
Residual Std. Error	0.050	0.059	0.061	0.074	0.072	0.069	0.066	0.063	0.060

Note:

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01