# Vague Talk in ECB Press Conference: News or Noise?

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# Motivation

Investors are becoming more attentive than ever to the textual information released by central bank

Policymakers are also becoming increasingly cautious about the framing of their statements

Implied by theoretical studies on the optimal communication design, central banks are heading towards higher precision in their statements, but there is no empirical evidence on whether the imprecise information released by central banks is harmful or beneficial

Theoretical and empirical studies in finance shows that imprecise information released by private firms are usually treated as noises that are negatively correlated with returns and can lead to higher volatility; Is it the same story for central bank?

# Overview

Question: How does the market perceive the vague signal released by central bank?

Approach: Quantify the vague talk in ECB press conference, and examine its impact on the return and volatility of the stock market of the Eurozone

Key findings: Vague talks are news that lead to higher returns and lower volatility in the market, and further decomposition shows that

- When policymakers use more vague language to describe uncertain economic conditions, the market sees it as signs of accommodative policy moves, which raises the market returns
- When policymakers use more vague language to explain policy considerations, investors will gain a better understanding of ECB's policy strategies, which reduces the market volatility

# Relation to literature: monetary policy shocks

- How to identify monetary policy shocks?

Directly through CB announcements, indirectly through variation in high-frequency asset prices, or through other conventional approaches

- What are the sources of monetary policy shocks?

Conventional policy decisions, Unconventional policy decisions, and other information contained in CB announcements

- What can be influenced by monetary policy shocks?

Real economy, financial markets, individual's expectations, etc.

Main references: Kuttner (2001); Bernanke and Kuttner (2005); Guerkaynak et al. (2005); Ehrmann and Fratzscher (2007); Born et al., (2014); Lucca and Moench (2015); Hansen and McMahon (2016); Campbell et al. (2017); Rossi (2018); Nakamura and Steinsson (2018); Jarocinski and Karadi (2018); Altavilla et al. (2019); Cieslak and Schrimpf (2019); Schmeling and Wagner (2019)

# Relation to literature: other topics

- Vagueness in financial markets

Epstein and Schneider (2008); Illeditsch (2011); Loughran and McDonald (2013)

- Optimal communication strategy

Morris and Shin (2002); Angeletos and Pavan (2007); Stein (1989); Kellner and Quement (2018)

- Methodology: Natural language inference (NLI) in central bank statements

Tobback et al. (2017); Hansen et al. (2017); Jegadeesh and Wu (2017)

# Measuring the vague talk

We focus on ECB presidents' talks on the press conference, which is held on the same day when ECB's monetary policy decisions are released

On each press conference, the ECB president first reads out a previously prepared introductory statement to explain policy decisions that are announced 45 minutes earlier, and then answers questions from journalists

We restrict our discussion only in answers, which contains many of examples of vague language discussing economic environments and policy considerations

# Measuring the vague talk

To measure the amount of vague talks, we count the appearance of words from a pre-defined uncertainty word list (Loughran and McDonald, 2011), which is also used to quantify the vague tone in other economic and financial contexts

These words "*denot[e] uncertainty, with emphasis on the general notion of imprecision*"; Examples are

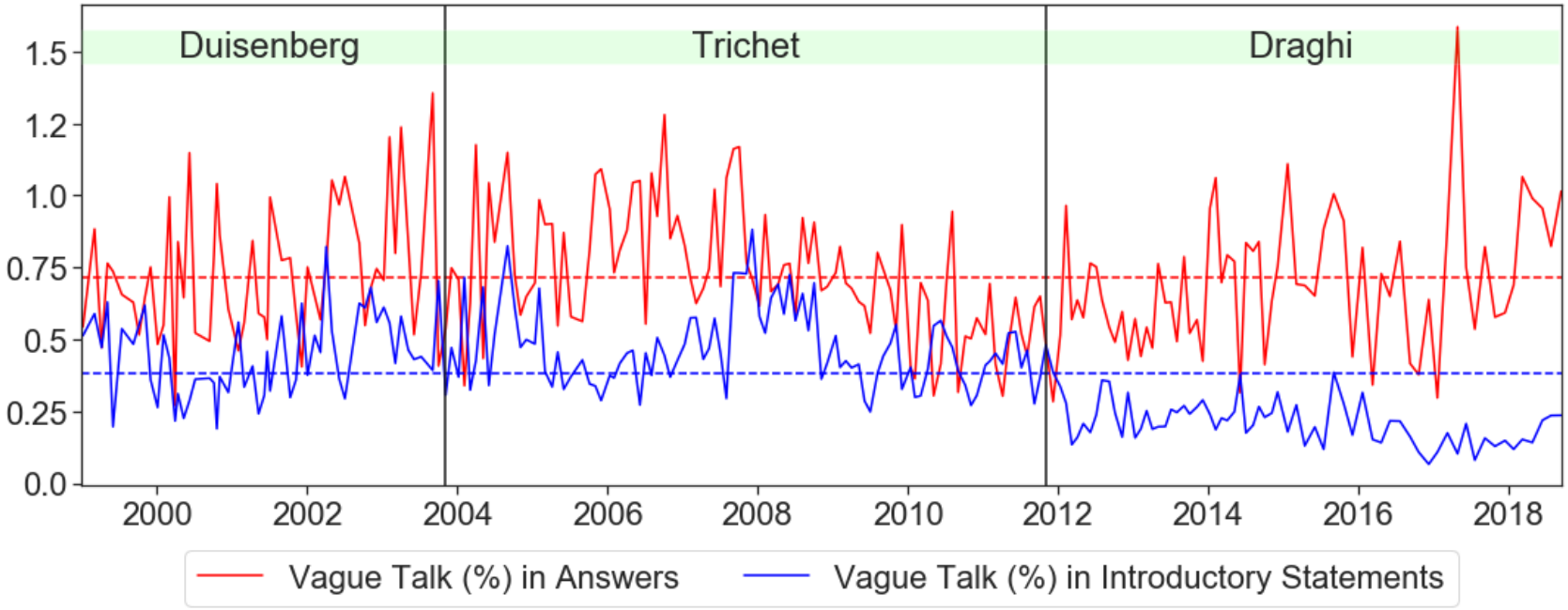
| | |
|---|---|
| Duisenberg<br>April 03, 2003<br>On Policy Strategies | Maybe that will be final, maybe we will need another discussion two weeks later … but I can assure you that I will be in a position to answer all your questions, possibly before the end of May. |
| Trichet<br>August 07, 2008<br>On Financial Market | … it's an ongoing, very important market correction with episodes of turbulence and high levels of volatility, and that it is absolutely no time for complacency. |
| Draghi<br>July 26, 2018<br>On Forward Guidance | Then you have the uncertainty component in the term structure; this of course tends to be more variable and shifts with risk perceptions. |

# Measuring the vague talk

For a conference at date t, the amount of vague talk ("vague tone") is defined as

$$UncAnswer_t = \frac{\#(Uncertainty\ words\ in\ answers)}{\#(All\ words\ in\ press\ conference\ transcript)} \times 100$$

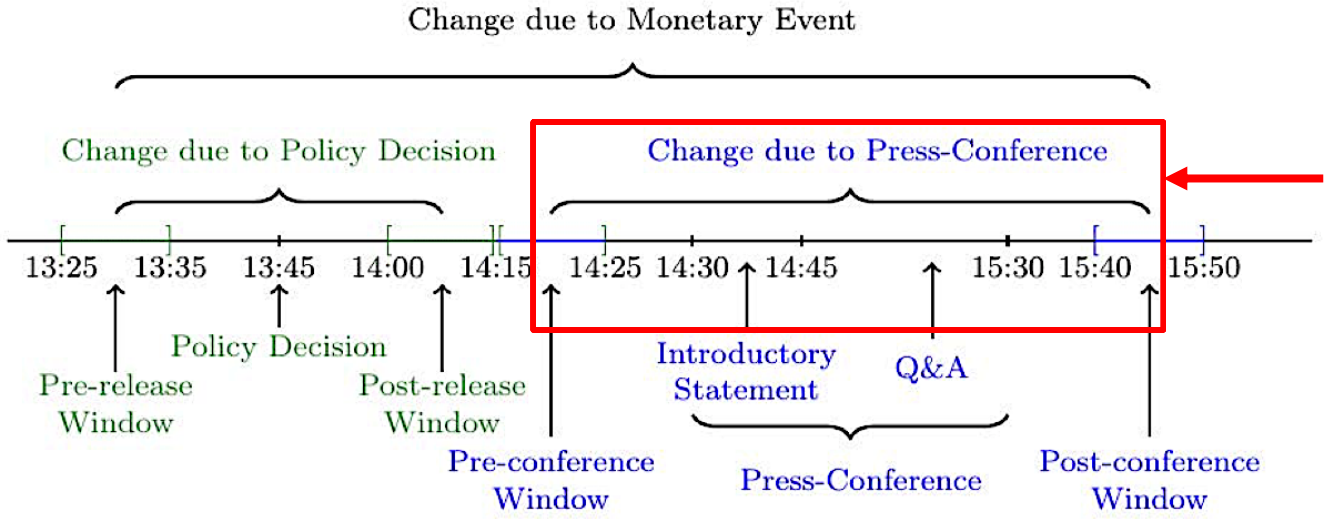
On average 31.3 uncertainty words appear in answers, taking up to 0.72% of all words in a transcript



# Stock market response

To study the effect of vague talks, we focus on its impact on the return and volatility of the STOXX50 index in the approximate 90-minute window around each ECB press conference from 1999-2018

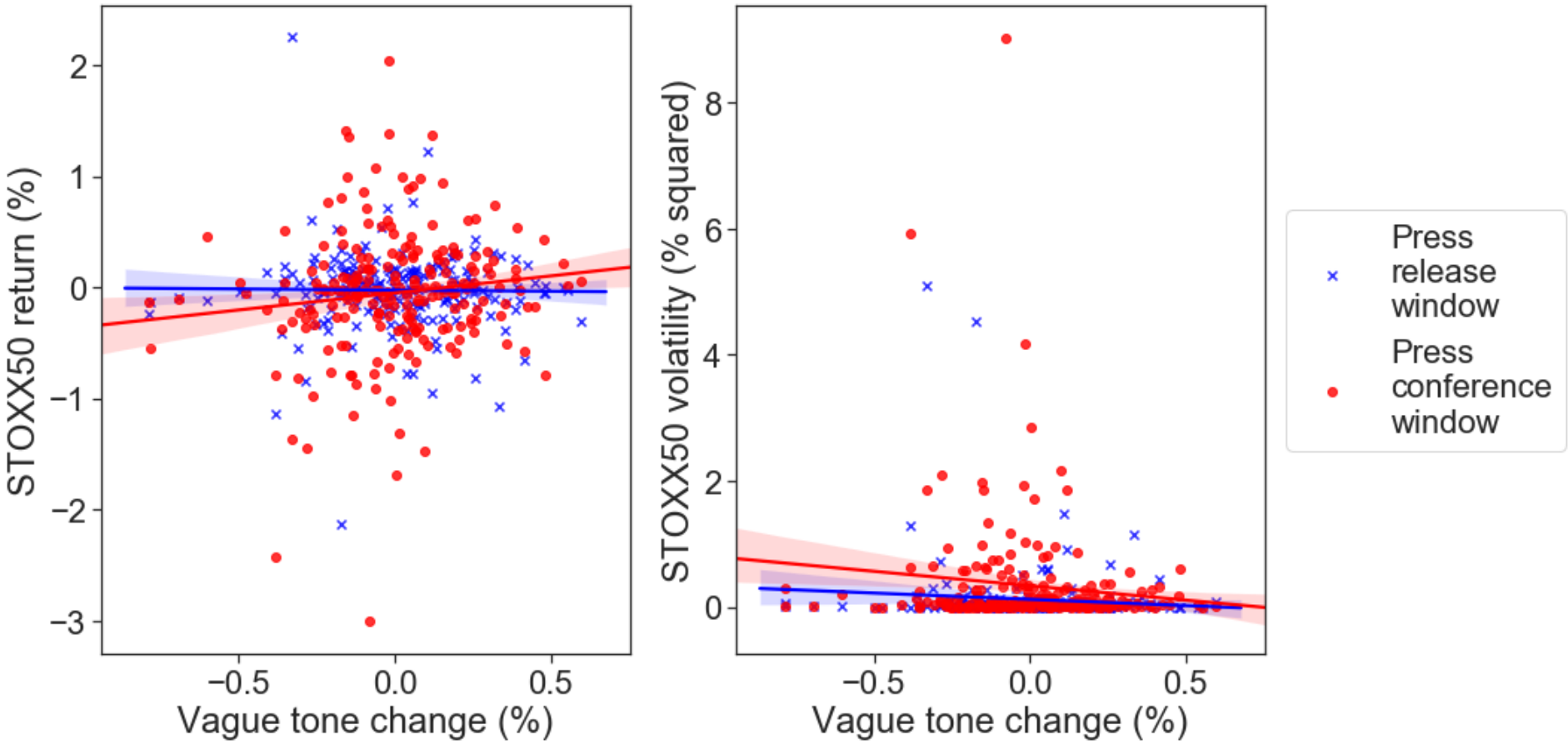
ECB policy communication timeline (Altavilla et al., 2019)




$$Return = \frac{PostPC - PrePC}{PrePC} \times 100$$

$$Volatility = Return^2$$

# Vague talk and stock market response



# Regression: Set-up

We treat the unanticipated ECB vague tone change as an exogenous shock

Identification assumption: conference talks do not respond to asset price changes within the window, hence the reverse causality does not exist

$$y_t = b_0 + b_1 \Delta UncAnswer_t + \gamma_b' x_t + \varepsilon_{bt}$$

where $y_t$ is the return or volatility of STOXX50; $\Delta$UncAnswer$_t$ is the vague tone change; and $x_t$ is a vector of control variables

The Newey–West variance estimator is used to produce consistent standard errors

# Regression: Control variables

Variables change within the same window

- Market-based monetary policy shocks – target and path factors (Altavilla et al., 2019)
- Textual features such as the negative tone (Schmeling and Wagner, 2019) and readability

Variables change within the same day

- Conventional and unconventional monetary decisions
- ECB staff macroeconomic projections

Other variables

- Economic policy uncertainty index measured from news articles (Baker et al., 2016)
- Speaking style of individual presidents as a dummy

## Reaction of the returns of the Euro STOXX 50 index in the 90-minute press conference window

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| ΔUncAnswer | 0.266**<br>(2.118) | 0.245*<br>(1.768) | 0.267**<br>(2.136) | 0.387***<br>(3.256) | 0.269**<br>(2.143) | 0.370***<br>(2.847) |
| ΔUncIntro | | -0.048 | | | | 0.080 |
| ΔTextLengthIntro | | 0.000 | | | | -0.000 |
| ΔTextLengthAnswer | | -0.000 | | | | -0.000 |
| ΔNegAnswer | | 0.136 | | | | -0.563*** |
| ΔNegIntro | | -0.463** | | | | 0.094 |
| ΔMRO | | | -0.027 | | | -0.025 |
| ForwardGuidance | | | 0.341*** | | | 0.331** |
| TargetFactor | | | -0.0150 | | | -0.0139 |
| PathFactor | | | 0.0008 | | | 0.0002 |
| ΔGDPforecast | | | | 0.039 | | 0.030 |
| ΔHICPforecast | | | | -0.195* | | -0.224** |
| ΔEPU | | | | | 0.001 | 0.001 |
| P=Draghi | | | | | -0.014 | 0.156* |
| P=Duisenberg | | | | | -0.100 | 0.005 |
| Const | -0.051 | -0.052 | -0.201* | -0.083** | -0.014 | -0.208 |
| Observations | 214 | 214 | 213 | 192 | 214 | 191 |
| Adj R2 | 1.20% | 2.63% | 1.99% | 2.91% | 0.46% | 4.43% |

Newey-West standard errors are in parentheses; ***, **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

## Reaction of the volatility of the Euro STOXX 50 index in the 90-minute press conference window

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| ΔUncAnswer | -0.425**<br>(-1.967) | -0.372**<br>(-1.786) | -0.424**<br>(-1.979) | -0.459*<br>(-1.884) | -0.439**<br>(-2.073) | -0.399*<br>(-1.838) |
| ΔUncIntro | | -0.434 | | | | -0.479 |
| ΔTextLengthIntro | | 0.000 | | | | 0.000 |
| ΔTextLengthAnswer | | -0.000 | | | | -0.000 |
| ΔNegAnswer | | 0.233 | | | | 0.197 |
| ΔNegIntro | | -0.089 | | | | -0.112 |
| ΔMRO | | | -0.001 | | | 0.450 |
| ForwardGuidance | | | -0.750** | | | -0.823*** |
| TargetFactor | | | 0.1188 | | | 0.0937 |
| PathFactor | | | 0.0087 | | | 0.0074 |
| ΔGDPforecast | | | | -0.303** | | -0.348** |
| ΔHICPforecast | | | | 0.074 | | 0.052 |
| ΔEPU | | | | | -0.004 | -0.004 |
| P=Draghi | | | | | -0.034 | -0.116 |
| P=Duisenberg | | | | | 0.388* | 0.187 |
| Const | 0.339*** | 0.338*** | 0.783*** | 0.355*** | 0.233*** | 0.690** |
| Observations | 214 | 214 | 213 | 192 | 214 | 191 |
| Adj R2 | 1.37% | 0.10% | 7.12% | 3.26% | 6.59% | 11.08% |

Newey-West standard errors are in parentheses; ***, **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

# Robustness

The effects remain statistically significant and the magnitudes are similar when we

- Employ an alternative set of controls (forward guidance – QE, forecasts – nowcasts, etc.)
- Choose different vagueness measures (percentage of words – number of words)

The regression based on daily data (including more control variables, such as lagged dependent variables) shows the same results

The placebo test shows that the vague tone in the introductory statement or questions cannot significantly move stock market prices

Further regression confirm that the price change in the press release window cannot affect the amount of vague talks in the press conference, nor the other way around

# Breaking down the vague talk

Uncertainty words all express some degree of vagueness, but their exact meanings and usages are different

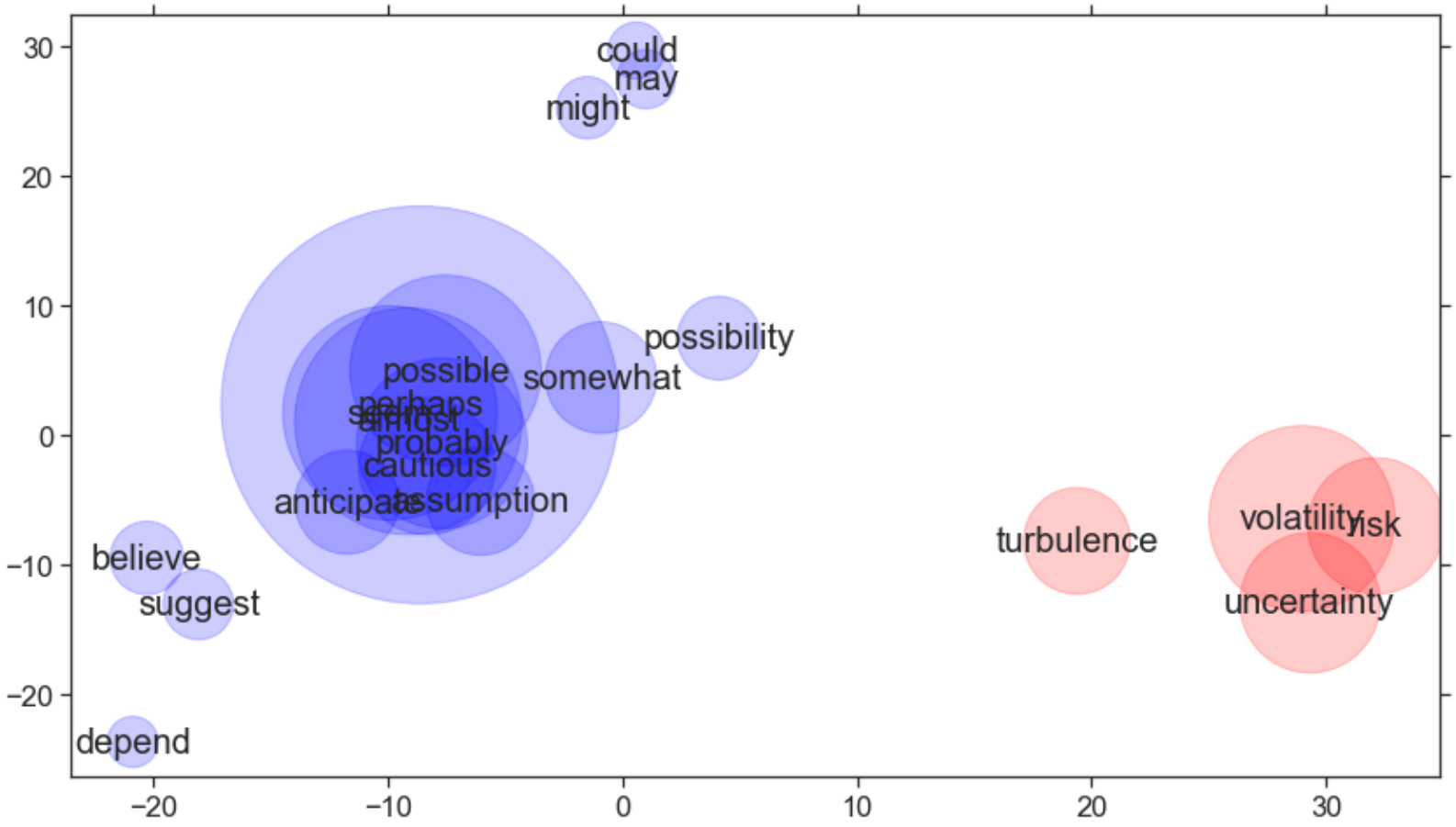
To understand the result, we classify the uncertainty words into two sub-groups by their meanings, thus decomposing the overall vague talks into two parts

To quantify word meanings, we adopt the unsupervised neural network algorithm to obtain a numeric vector for each word, which embeds the semantic and syntactic meanings of this word

Since these vectors are generated based on the textual data released by the ECB only, they also capture the unique language style of the ECB as well

By grouping word vectors with higher cosine similarities together, we are at the same time grouping words with similar meanings together

# Visualizing word vectors and clusters




Original word vectors are of the size 1x100; To visualize these vectors we employ a PCA algorithm to reduce its dimensionality to two

# Word clusters

| Cluster Name | Words |
|---|---|
| Risk | risk, uncertainty, volatility, turbulence |
| Could | could, may, believe, might, possible, perhaps, seem, depend, probably, assumption, possibility, suggest |

Words in Cluster *Risk* are used to describe uncertain, ambiguous, and in particular adverse economic conditions the ECB faces

Words in Cluster *Could* signify ECB presidents' vague explanation on monetary policy considerations, especially those that are dependent on unrealized or unobserved states beyond ECB's control

We run two independent regressions on the vague tone built on each word cluster

# Word clusters: Examples

## Sentences with words from the Cluster Risk

"It is clear that we see these upside risks to price stability augmenting."

"There are many uncertainties, but the risks have moved, let me say, in an upward direction. "

"This is part of the overall financial turbulence that we have to cope with."

## Sentences with words from the Cluster Could

"No, it could be a signal that markets have to listen more to me than to others."

"And I fully confirm we are conditional, we are depending on data, deep analysis and judgement."

"I am almost inclined to say: we continuously ask ourselves the same question."

## Reaction of the returns of the Euro STOXX 50 index

| Clusters | Cluster Risk | | Cluster Could | |
|---|---|---|---|---|
| Control Variables | No | Yes | No | Yes |
| ΔUncAnswer | 0.330**<br>(1.999) | 0.369**<br>(2.063) | 0.257<br>(1.275) | 0.321<br>(1.267) |
| Const | -0.051 | -0.214 | -0.051 | -0.210 |
| Observations | 214 | 191 | 214 | 191 |
| Adj R2 | 0.47% | 2.75% | 0.22% | 2.51% |

Newey-West standard errors are in parentheses; ***, **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

# Cluster *Risk* and market returns

Descriptions of vague economic environment raise the market returns

By using more words from the Cluster Risk, policymakers are showing a more uncertain and usually more gloomy picture to the public

This could affect the stock market in two opposite directions

- Learning that the state is worse than thought is bad (lowering expected dividends)
- But this could also mean more monetary accommodation which is good (lowering discount rates)

The result shows that the latter effect dominates: In central bank statements, market participants are more curious to learn how policymakers read the fact, rather than what the fact really is

## Reaction of the volatility of the Euro STOXX 50 index

| Clusters | Cluster Risk | | Cluster Could | |
|---|---|---|---|---|
| Control Variables | No | Yes | No | Yes |
| ΔUncAnswer | -0.137<br>(-0.893) | -0.034<br>(-0.194) | -0.559**<br>(-2.300) | -0.688**<br>(-2.432) |
| Const | 0.339*** | 0.691** | 0.340*** | 0.695** |
| Observations | 214 | 191 | 214 | 191 |
| Adj R2 | -0.40% | 9.71% | 0.94% | 11.52% |

Newey-West standard errors are in parentheses; ***, **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

# Cluster *Could* and market volatility

Vague explanations of policy consideration reduce the market volatility

The explanation relates to the *cheap talk* mechanism (Stein, 1989; Kellner and Quement, 2018)

By using more words from the Cluster Could, policymakers are sending more new messages about their policy strategies at a lower cost, which provides investors a better understanding of different kinds of considerations behind decisions

Thus, this type of vague talk

- helps market participants gain a better understanding of the rationales behind policy decisions,
- enhances the predictability of central bank's future actions, and
- diminishes the volatility factor in the market

# Predicting future monetary policy surprises

If vague talks on policy consideration really deepen investors' understanding of ECB's policy strategies, then it should narrow down the the (absolute) monetary policy surprises in future policy events

This argument can be tested in the following regression

$$|\Delta OIS_{t+1,j}| = c_0 + c_1 \Delta UncAnswer_{t,Cluster\ Could} + \gamma_c' x_t + \varepsilon_{ct}$$

where the dependent variable is (absolute) change of the EONIA-based OIS rate, which is frequently used as a market-based proxy of monetary policy surprises

If the above argument holds, then $c_1$ should be significantly lower than zero

Reaction of the time-(*t+1)* absolute OIS rate change to
the time-*t* vague tone change measured from the Cluster Could
in the press conference window

| Dependent Var. | \|ΔOIS 3M\| | \|ΔOIS 6M\| | \|ΔOIS 1Y\| | \|ΔOIS 2Y\| | \|ΔOIS 4Y\| | \|ΔOIS 6Y\| | \|ΔOIS 8Y\| | \|ΔOIS 10Y\| |
|---|---|---|---|---|---|---|---|---|
| ΔUncAnswer | -0.255<br>(-1.048) | -0.344<br>(-0.751) | -0.324<br>(-0.550) | -0.097<br>(-0.116) | -1.644**<br>(-2.327) | -1.849**<br>(-2.019) | -1.958***<br>(-2.793) | -1.837***<br>(-2.634) |
| Const | 0.625*** | 1.146*** | 1.635*** | 2.267*** | 2.142*** | 2.148*** | 2.054*** | 2.001*** |
| Observations | 183 | 183 | 183 | 183 | 72 | 71 | 71 | 72 |
| Adj R2 | 0.21% | 0.13% | 0.07% | 0.00% | 1.27% | 1.94% | 2.56% | 2.27% |

Newey-West standard errors are in parentheses; ***, **, and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

There are new information contained in vague talks on policy consideration, and such information do help investors gain a better understanding of central bank's long-run policy strategies

(At least true for central banks who have already reached high level of transparency)

# Conclusion

Vague talks in ECB press conference are news that lead to higher returns and lower volatility in the stock market

When policymakers use more vague language to describe uncertain economic conditions, the market sees it as precursors of monetary accommodation, which raises the market returns

When policymakers use more vague language to explain policy considerations, investors will gain a better understanding of ECB's policy strategies, which reduces the market volatility

Thank you!

# Appendix: Text Processing

- Decompose each press conference transcript into three sub components: the introductory statements, the questions, and the answers
- Tokenize each sentence using the Stanford CoreNLP package
- Convert all words into lowercase and lemmatize all words to their base form
- Remove the uncertainty word “possible” if it is in the expression “as … as possible”
- Remove those uncertainty words that appear after a negation word
- Remove several types of named entities and part-of-speeches
- Delete non-alphanum, single-letter words, foreign words, and other stop words

# Appendix: Word Vectors

Main idea: "A word is characterized by the company it keeps." – John Firth (1952)

Example: What is the meaning of the word "bank" in ECB statements?

The euro area bank lending survey for the fourth quarter …

The effect on banks of negative rates …

Generation: Fixed point iteration

First represent word meanings as randomized vectors, and then repeatedly update these vectors until they converge; In each iteration, make sure that the inner products of nearby words vectors are maximized compared with that of distant word vectors

Evaluation: Verbal analogies

V("germany") – V("bundesbank") = V("us") – V("fed")

V("inflation") – V("inflationary") = V("uncertainty") – V("uncertain")