The Emotions of Monetary Policy

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Victor Smirnov, 28.08.2025

Agenda

Introduction

Research design

Findings

Discussion

I. Introduction

Our goal: examine the impact of ECB statements on intraday market movements

How does the **European Central Bank (ECB**) influence the **financial markets** via the ECB **press conferences**?

- Economic variables
- Hawkishness/dovishness in spoken word
- Emotions displayed via vocal expression
- Emotions displayed via facial expression

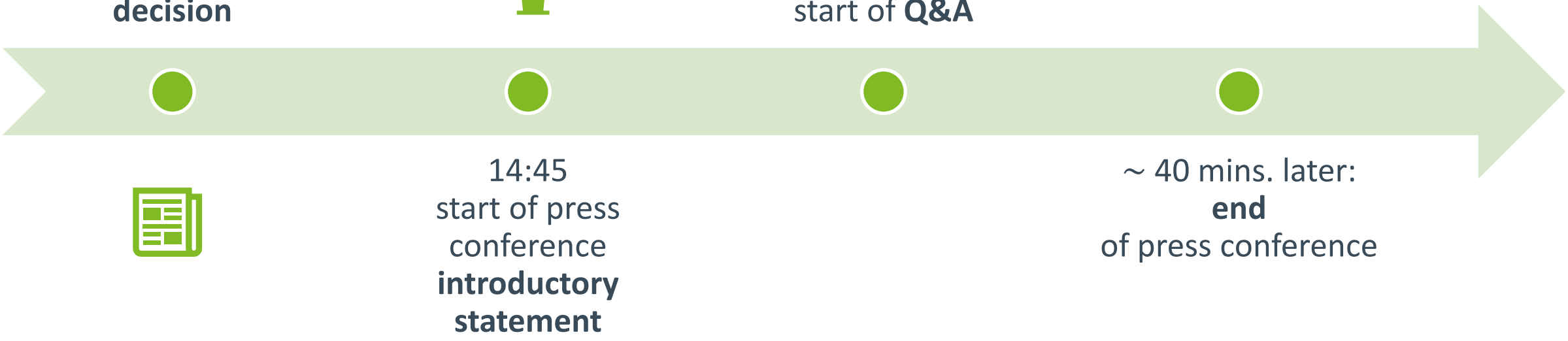
We are interested in the relation between those

- **10-year government bonds**: Germany, France, Italy, Spain, Netherlands
- **Eurozone stock market:** Euro Stoxx 50
- EUR/USD exchange rate
- futures on stock index and exchange rate

We also want to explore and understand the so far unique and novel data we managed to obtain

Timeline of ECB press conferences

- Eight regular **Meetings of the Governing Council** of the ECB held per year
- Those are succeeded by **press conferences**, which follow a scheduled and regular timeline.
- **Our dataset**: 100 press conferences from May 3, 2012, to July 27, 2023.



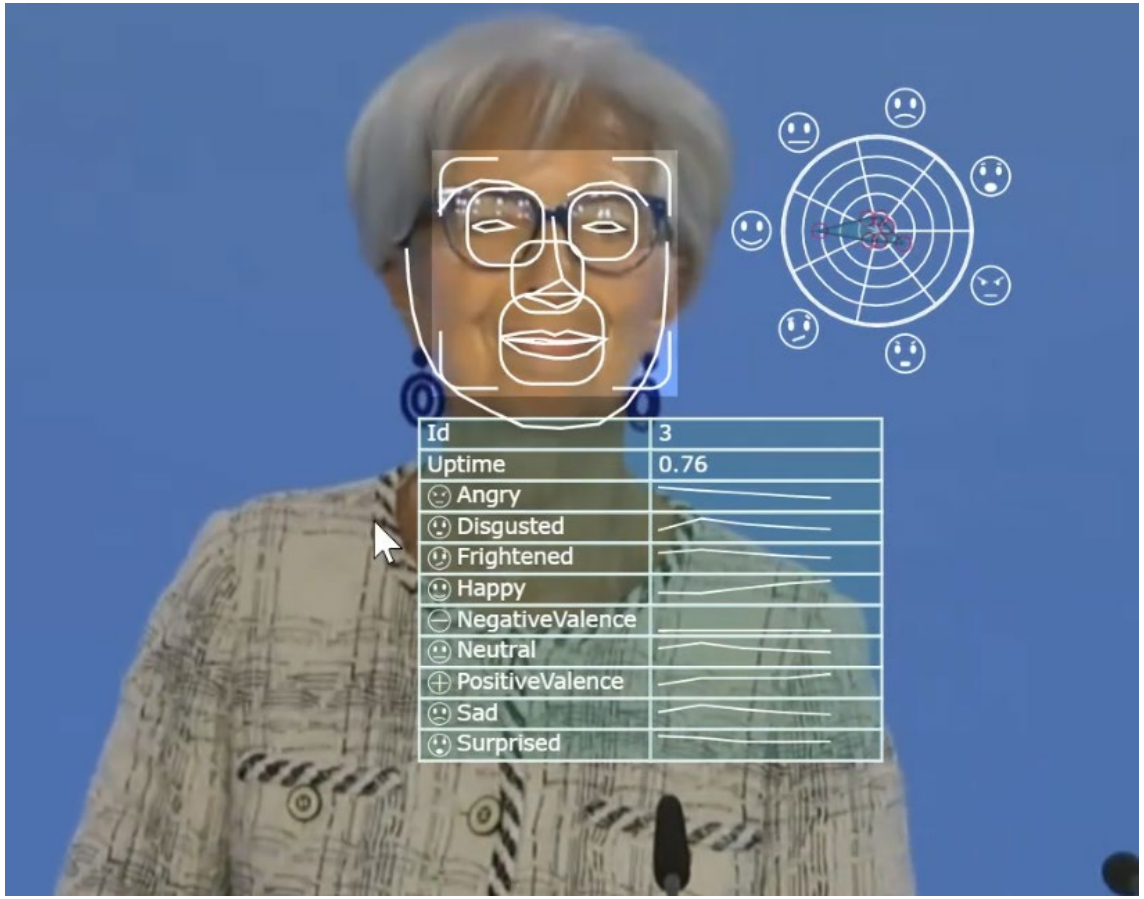
Key findings

1. **Structural diferences** between …
   - … introductory statement and Q&A part of the press conferences
   - … President Draghi & President Lagarde
2. If **inflation** increases, facial expressions turn more angry.
3. A higher level of **hawkishness** coincidces with higher vocal arousal and sad facial expression for President Draghi.
4. **Interaction** between emotions and policy stance:
   - Display of happiness by ECB presidents tends to reduce bond yields.
   - Happiness for Draghi amplifies the impact of hawkishness on bond yields.
   - So does anger for Lagarde
5. A happy expression of President Draghi supports the expansionary effects of a **forward guidance** statement.

Capturing the sentiment of central bank press conferences

Measuring facial expressions

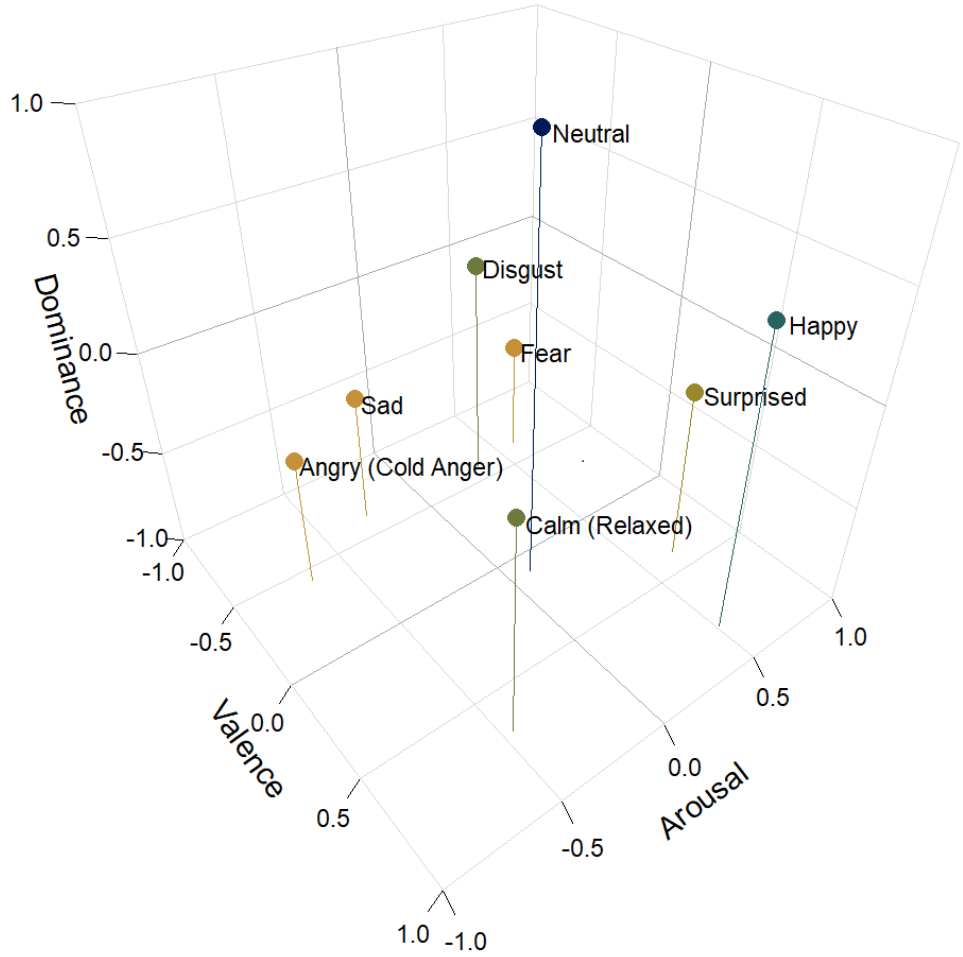
- SHORE – Sophisticated High-speed Object Recognition Engine
- Software tool developed by the Fraunhofer institute
- **measures emotions** in two ways:
  - **Discrete emotions –** *"Neutral", "Angry", "Happy", "Sad", "Surprised", "Frightened"* and *"Disgusted"* each are assigned values between 0 and 1
  - **Emotional valence** – "positive" or "negative" (between 0 and 1)
- The measures are assigned to video frame rates, so that we calculate **probabilities**



Capturing the sentiment of central bank press conferences

Measuring vocal expressions

- We extract the audio from each video and split the audio file into one-minute segments.
- We apply the fine-tuned **w2v2-L-robust-12** model for the classification of vocal emotions.
- **Valence-Arousal-Dominance (VAD)** framework
  - **valence:** the degree of pleasure or displeasure, indicating how positive or negative an emotion is
  - **arousal:** the level of mental and physical engagement, indicating the intensity of the emotional state
  - **dominance:** the degree of control over one's affective state.



Capturing the sentiment of central bank press conferences

Step 1 – transcription of the press conferences

- The published transcripts of the press conferences from the ECB's website are **not sufficient** for our purposes
- We generated our own transcriptions using an extension for the **Whisper** Python package
- Quality check: a doc2vec model, which compares the similarity between the Whisper transcription and the official transcripts available on the ECB website.

Step 2 – measuring sentiment in the transcripts

- We quantify the actual political content of the spoken word within each minute.
- We use an improved version of **BERT-CBSI**, which provides ***hawkish***, ***dovish***, and ***neutral*** labels.
- We assign each classified sentence that concludes within a specific minute to that corresponding minute:
  - For each minute and label, we calculate the mean probability
  - Then, for each minute, we compute the net hawkishness as
    $net\ hawkishness := p_{hawkish} - p_{dovish}$

III. Results

Insights obtained from econometric analysis of our data

Summary statistics on meeting frequency

	hawkish	facial			vocal
		happy	sad	angry	arousal
	(a) Introductory Statement: Draghi				
mean	0.084	0.017	0.622	0.046	0.535
median	0.099	0.009	0.636	0.038	0.536
std. dev.	0.290	0.025	0.073	0.026	0.042
max	0.788	0.227	0.770	0.263	0.782
min	-0.999	0.001	0.145	0.019	0.397
	(b) Introductory Statement: Lagarde				
mean	0.095	0.101	0.156	0.172	0.477
median	0.095	0.081	0.107	0.141	0.473
std. dev.	0.294	0.070	0.129	0.114	0.039
max	0.995	0.414	0.675	0.617	0.753
min	-0.999	0.002	0.027	0.032	0.393
	(c) Q&A part: Draghi				
mean	0.018	0.072	0.379	0.110	0.495
median	0.003	0.052	0.373	0.095	0.497
std. dev.	0.149	0.062	0.113	0.060	0.054
max	0.740	0.560	0.719	0.589	0.780
min	-0.713	0.003	0.027	0.026	0.238
	(d) Q&A part: Lagarde				
mean	0.044	0.101	0.176	0.195	0.533
median	0.012	0.088	0.146	0.171	0.528
std. dev.	0.155	0.059	0.106	0.107	0.057
max	0.993	0.428	0.710	0.679	0.795
min	-0.749	0.003	0.028	0.031	0.357

Emotions and inflation

	facial expression			vocal
	happy	sad	angry	arousal
	(a) inflation level			
inflation	0.001 (0.002)	−0.008 (0.005*)	0.009 (0.004**)	−0.002 (0.001*)
Lagarde	0.039 (0.006***)	−0.242 (0.036***)	0.069 (0.014***)	0.019 (0.005***)
R^2	0.25	0.78	0.50	0.12
# obs.	100	100	100	100
	(b) absolute inflation deviation from target			
|inflation − 2%|	0.004 (0.003)	−0.011 (0.008)	0.013 (0.006**)	−0.003 (0.001*)
Lagarde	0.033 (0.007***)	−0.240 (0.042***)	0.066 (0.014***)	0.020 (0.005***)
R^2	0.30	0.78	0.50	0.12
# obs.	100	100	100	100

Hawkishness and emotions

	facial			vocal
	happy	sad	angry	arousal
	(a) Introductory Statement: Draghi			
hawkish	−0.005 (0.002**)	0.015 (0.005***)	−0.003 (0.002)	0.021 (0.003***)
FE	yes	yes	yes	yes
# obs	887	887	887	887
	(b) Introductory Statement: Lagarde			
hawkish	0.002 (0.005)	−0.007 (0.005)	−0.010 (0.008)	0.005 (0.004)
FE	yes	yes	yes	yes
# obs	495	495	495	495
	(c) Q&A: Draghi			
hawkish	−0.002 (0.006)	0.025 (0.012**)	−0.014 (0.007**)	0.021 (0.006***)
FE	yes	yes	yes	yes
# obs	3164	3164	3164	3165
	(d) Q&A: Lagarde			
hawkish	−0.003 (0.0009)	−0.028 (0.011**)	0.012 (0.013)	−0.003 (0.0007)
FE	yes	yes	yes	yes
# obs	1258	1258	1258	1259

	facial			vocal
	happy	sad	angry	arousal
	(a) Introductory Statement: Draghi			
$(\text{hawkish})^2$	−0.016 (0.004***)	0.037 (0.011***)	−0.002 (0.004)	0.026 (0.008***)
FE	yes	yes	yes	yes
# obs	887	887	887	887
	(b) Introductory Statement: Lagarde			
$(\text{hawkish})^2$	−0.010 (0.010)	0.013 (0.010)	−0.035 (0.016**)	−0.019 (0.008**)
FE	yes	yes	yes	yes
# obs	495	495	495	495
	(c) Q&A: Draghi			
$(\text{hawkish})^2$	−0.070 (0.021***)	0.127 (0.038***)	−0.078 (0.022***)	−0.007 (0.020)
FE	yes	yes	yes	yes
# obs	3164	3164	3164	3165
	(d) Q&A: Lagarde			
$(\text{hawkish})^2$	−0.045 (0.026*)	0.025 (0.033)	−0.050 (0.036)	−0.030 (0.020)
FE	yes	yes	yes	yes
# obs	1258	1258	1258	1259

The market impact of emotions

- Dependent variable: yield or log price of asset i in minute t, y_t^i:

$$y_t^i = c + \mu_m + \beta_1 hawkish_t + \delta_1 facial_t + \delta_2 arousal_t + \gamma_1 (hawkish_t \times facial_t) + \gamma_2 (hawkish_t \times arousal_t) + e_t^i.$$

- The vector of facial expressions includes the series of happy, sad, and angry expressions.

- Meeting fixed effects, μ_m, account for all differences across meetings.

- Separate models for the presidencies of Mario Draghi and Christine Lagarde and for the introductory statement, the Q&A part and the full press conference.

The effect on financial markets: introductory statement

	DE10y	FR10y	IT10y	ES10y	BundF	Stocks	USDEUR
				(a) Introductory Statement: Draghi			
hawkish	−0.001	0.002	−0.022	0.010	−0.010	0.371	−0.010
	(0.024)	(0.025)	(0.048)	(0.042)	(0.224)	(0.762)	(0.494)
facial happy	−0.054***	−0.047**	−0.039	−0.031	0.444**	0.641	−0.862**
	(0.020)	(0.021)	(0.040)	(0.035)	(0.184)	(0.639)	(0.414)
facial sad	−0.022**	−0.018*	−0.021	−0.021	0.181**	0.512	−0.391*
	(0.010)	(0.010)	(0.020)	(0.017)	(0.090)	(0.313)	(0.202)
facial angry	−0.044*	−0.030	−0.006	0.012	0.358	0.716	−0.135
	(0.024)	(0.026)	(0.050)	(0.044)	(0.229)	(0.798)	(0.516)
vocal arousal	0.017*	0.026***	0.015	0.009	−0.265***	−0.786	0.510**
	(0.009)	(0.010)	(0.019)	(0.017)	(0.088)	(0.798)	(0.198)
facial happy × hawkish	0.316***	0.332***	0.629***	0.533***	−2.782***	−7.879***	4.617***
	(0.078)	(0.083)	(0.160)	(0.141)	(0.733)	(0.254)	(1.646)
facial sad × hawkish	−0.001	−0.018	−0.010	−0.046	−0.024	0.298	−0.175
	(0.025)	(0.026)	(0.050)	(0.044)	(0.227)	(0.788)	(0.510)
facial angry × hawkish	−0.071	−0.081	−0.098	−0.154	0.200	0.149	−0.423
	(0.059)	(0.062)	(0.118)	(0.103)	(0.541)	(1.868)	(1.210)
vocal arousal × hawkish	0.002	0.015	0.051	0.035	0.104	−0.920	0.127
	(0.026)	(0.027)	(0.052)	(0.046)	(0.245)	(0.827)	(0.535)
fixed effects	yes	yes	yes	yes	yes	yes	yes
# obs.	853	871	873	875	863	887	887

The effect on financial markets: introductory statement

	DE10y	FR10y	IT10y	ES10y	BundF	Stocks	USDEUR
			(b) Introductory Statement: Lagarde				
hawkish	−0.042*	−0.044*	−0.058	−0.033	0.395*	−0.567	−0.154
	(0.024)	(0.024)	(0.044)	(0.027)	(0.217)	(0.483)	(0.163)
facial happy	−0.029**	−0.031**	−0.024	−0.035**	0.242*	−0.779***	−0.250
	(0.014)	(0.015)	(0.026)	(0.016)	(0.131)	(0.292)	(0.163)
facial sad	−0.025*	−0.016	−0.005	−0.021	0.157	0.527**	−0.251***
	(0.013)	(0.013)	(0.024)	(0.015)	(0.120)	(0.266)	(0.090)
facial angry	0.000	−0.002	0.017	−0.003	0.057	0.082	−0.028
	(0.008)	(0.009)	(0.016)	(0.009)	(0.079)	(0.175)	(0.059)
vocal arousal	−0.040**	−0.024	−0.029	−0.019	0.257	−0.739**	−0.204*
	(0.017)	(0.018)	(0.032)	(0.019)	(0.160)	(0.357)	(0.121)
facial happy × hawkish	0.013	0.012	0.028	0.025	−0.106	0.008	−0.040
	(0.022)	(0.023)	(0.041)	(0.025)	(0.204)	(0.454)	(0.154)
facial sad × hawkish	−0.001	−0.001	0.003	−0.005	0.016	0.144	0.046
	(0.013)	(0.013)	(0.024)	(0.014)	(0.119)	(0.264)	(0.089)
facial angry × hawkish	0.031**	0.040***	0.049**	0.041***	−0.309***	−0.103	0.111
	(0.013)	(0.013)	(0.023)	(0.014)	(0.114)	(0.255)	(0.086)
vocal arousal × hawkish	0.084*	0.087*	0.113	0.059	−0.785*	1.088	0.288
	(0.048)	(0.048)	(0.087)	(0.052)	(0.429)	(0.955)	(0.323)
fixed effects	yes	yes	yes	yes	yes	yes	yes
# obs.	490	495	492	455	495	495	495

Forward Guidance

- When interest rates hit the ELB, the ECB adopted forward guidance as an unconventional policy tool.
- To be effective, guidance on the future interest rates requires clear and consistent communication.
- We search the text for forward guidance expressions such as „for an extended period of time“ or „well past the horizon of our net asset purchases“.
- Construct a dummy variable that is one for each minute with a forward guidance statement and zero otherwise.

The effect on financial markets: interaction with forward guidance

	DE1oy	FR1oy	IT1oy	ES1oy	BundF	Stocks	USDEUR
			(a) Introductory Statement: Draghi				
hawkish	−0.000	−0.000	0.003	−0.000	0.003	−0.021	−0.012
	(0.001)	(0.001)	(0.002)	(0.002)	(0.009)	(0.030)	(0.020)
forward guidance (FG)	−0.035*	−0.044**	−0.081**	−0.073**	0.388**	0.938	−0.704
	(0.020)	(0.021)	(0.039)	(0.035)	(0.184)	(0.618)	(0.413)
facial happy	−0.048**	−0.039*	−0.028	−0.019	0.397**	0.542	−0.821*
	(0.020)	(0.021)	(0.040)	(0.035)	(0.186)	(0.628)	(0.420)
facial sad	−0.029***	−0.029***	−0.042**	−0.039**	0.253***	0.840***	−0.534**
	(0.010)	(0.011)	(0.020)	(0.018)	(0.093)	(0.315)	(0.211)
facial angry	−0.060**	−0.051*	−0.040	−0.019	0.481*	1.005	−0.291
	(0.025)	(0.026)	(0.050)	(0.044)	(0.231)	(0.779)	(0.520)
vocal arousal	0.014	0.025**	0.016	0.008	−0.224**	−0.821***	0.480**
	(0.010)	(0.010)	(0.019)	(0.017)	(0.089)	(0.301)	(0.201)
facial happy × FG	−0.150**	−0.298***	−0.547***	−0.529***	1.745***	4.347**	−1.977
	(0.067)	(0.079)	(0.135)	(0.119)	(0.628)	(2.124)	(1.420)
facial sad × FG	0.037*	0.055**	0.121***	0.103***	−0.366*	−1.717**	0.861*
	(0.021)	(0.023)	(0.043)	(0.038)	(0.199)	(0.672)	(0.449)
facial angry × FG	0.123*	0.200**	0.329**	0.312***	−1.393**	−3.172	1.615
	(0.068)	(0.072)	(0.135)	(0.119)	(0.630)	(2.124)	(1.420)
vocal arousal × FG	0.014	0.008	−0.003	0.003	−0.226	0.411	0.240
	(0.022)	(0.023)	(0.044)	(0.039)	(0.209)	(0.692)	(0.462)
fixed effects	yes	yes	yes	yes	yes	yes	yes
# obs.	853	871	873	875	863	887	887

IV. conclusion

Conclusion

- We studied the facial and vocal emotions of the ECB presidents during the post-meeting press conferences at a high frequency.
- **Three main findings**:
  1. The **nature** and the **intensity** of **emotions differ** between President Draghi and President Lagarde as well as between the introductory statement and the Q&A.
  2. Facial expressions are **correlated with inflation**.
  3. Facial expressions and vocal arousal can **moderate or amplify** a policy measure, including forward guidance statements
- Lessons for the interpretation of ECB communication:
  - Monitoring the president‘s language should pay off.
  - At the same time, ECB officials will optimize their communication in light of technological advances.

Thank You!

Extra Slides

Introduction – the role of central banks

- The **central bank shapes a country's monetary policy** by …
  - … determining the amount of money (currency) in the economy by setting the **monetary base,**
  - … setting the baseline **refinancing conditions** for **banks**,
  - … thus, indirectly influencing the **financing conditions** for **enterprises**, **consumers,** and the **government**
  - … keeping **inflation** stable and **low**.
  - … safeguarding the **stability** of the **financial system**.
- Hence it has a **powerful impact on the business environment of financial market participants**.
- While the activities of the central bank are regulated by legal frameworks, it can decide between many policy options.
- The central bank meticulously regulates any information about its decision making going to the public. Any information is provided in a highly structured setting, most prominently via **press conferences**.

➢ Institutional **financial market participants** therefore **pay very close attention to these announcements** and try to get as much information as possible.

The research gap – multidimensional high-frequency analysis for the Euro area

- Substantial research has been done in this area in the recent years (Gorodnichenko et al. 2023, Alexopoulos et al., 2024; Curti et al., 2024; Kanelis et al., 2022)
- Our project takes the existing literature as starting point and thrives to contribute to it by introducing the following **novel features**:
  - Focus on **Euro area**
  - Create an **immersive data set** – join multiple measurement approaches
  - Provide insight on **intraday level**
  - Capture **immediate** market responses

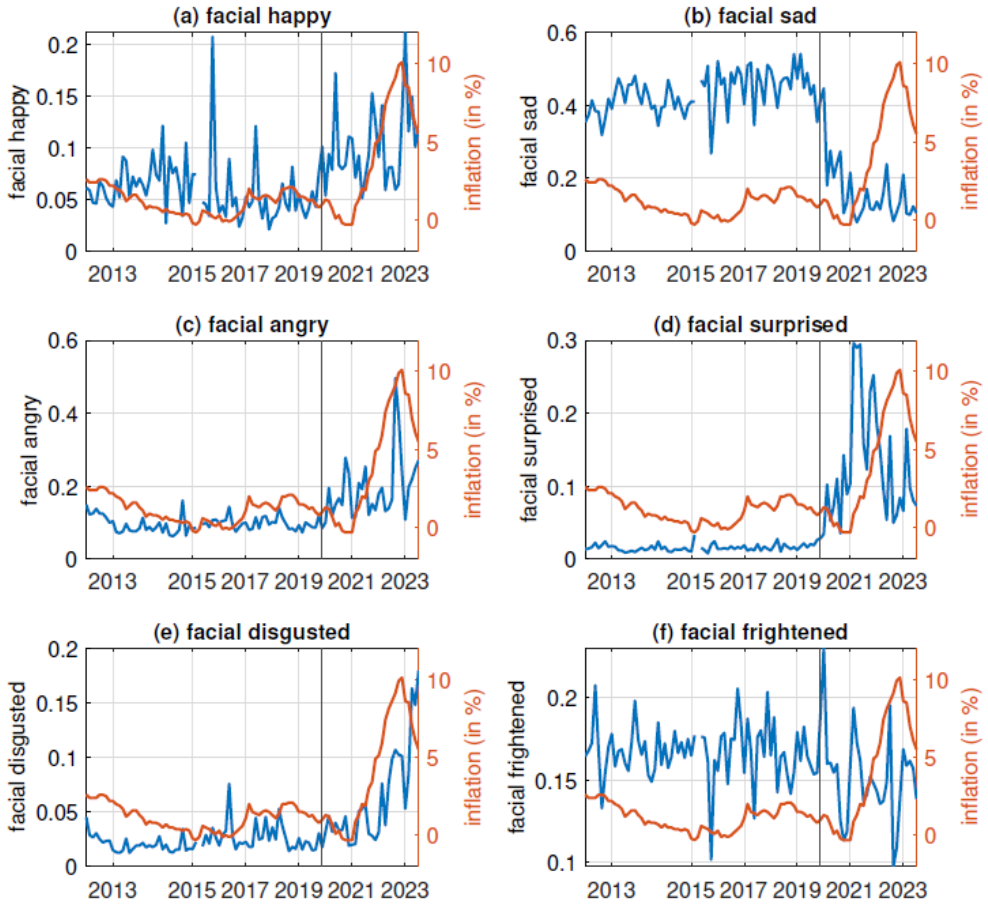
➢Aim: explain **prices and/or returns** of financial assets **during ECB press conferences** by the parameters of the ECB's **communication signals** using **econometric modelling.**

The literature leaves certain questions unanswered

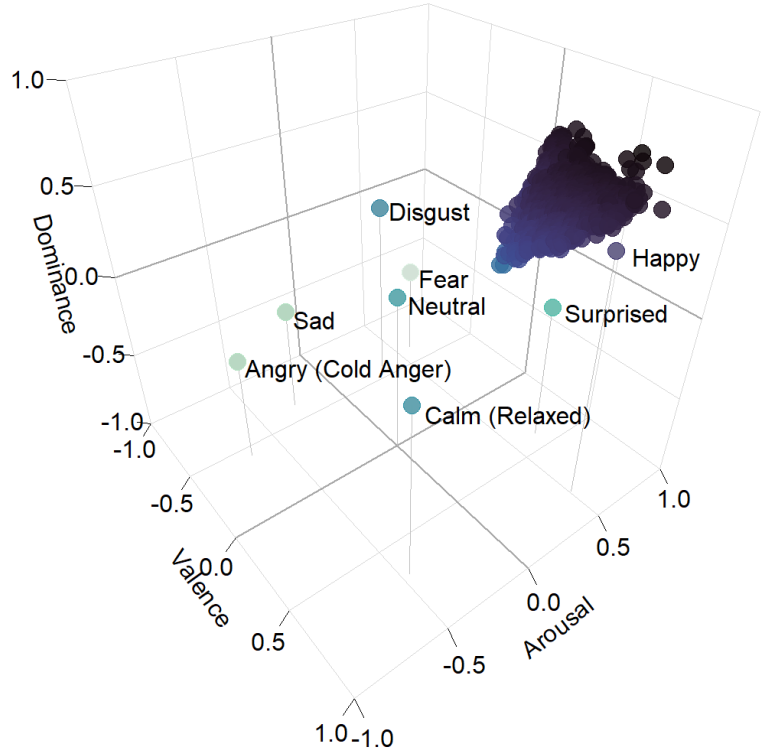
- US-context – impact of Fed communication beyond the spoken word: research shows that sentiment expressed through **words**, **voice pitch** and **facial expression** by Fed officials **impacts** the **US**-American **stock market**. Expressed positive emotion raises the S&P500 index and lowers the VIX (Gorodnichenko et al. 2023, Alexopoulos et al., 2024). The markets react adversely to expressions of negative emotion (Curti et al., 2024).
- Similar effects have been shown for the ECB: **Negative emotion** expressed by the **ECB** president during press conferences **increases risk premium** in European 10-year bonds immediately after the conference ends (Kanelis et al., 2022).

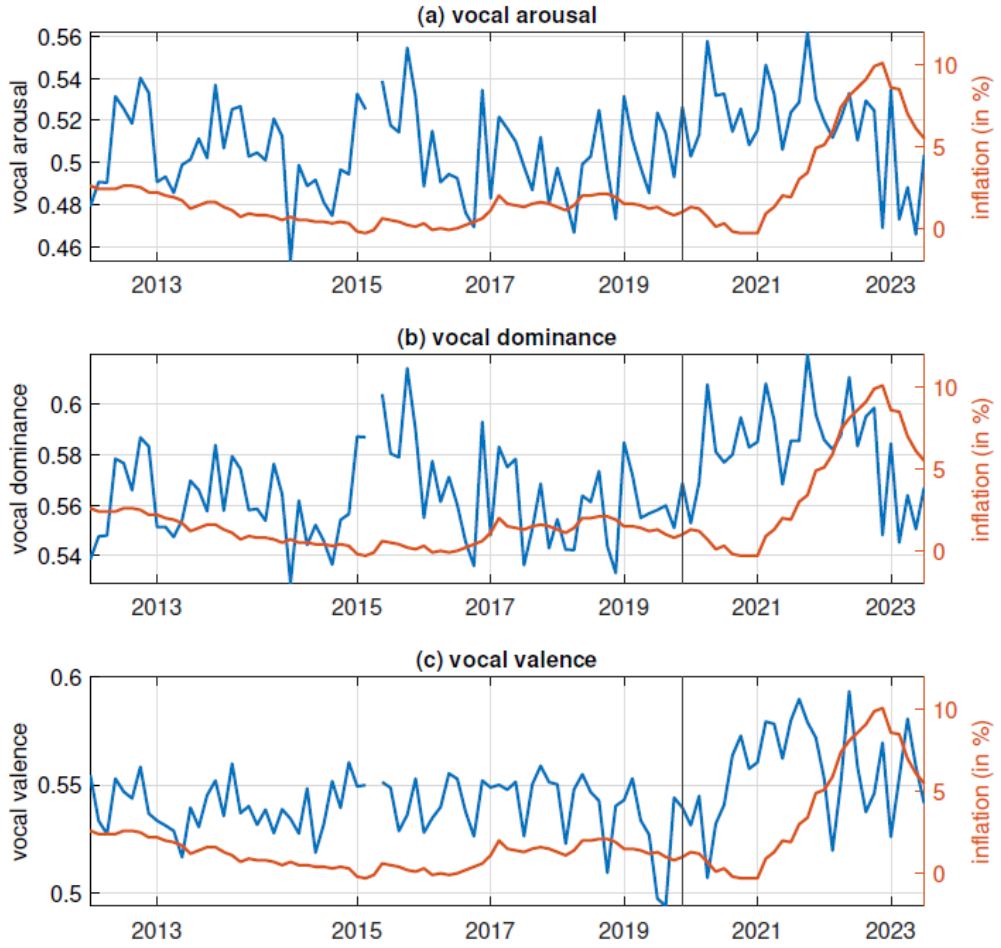
➢ There is evidence for the markets reacting to emotional components in textual and vocal aspects of the ECB's statements. There is still **no data on** the meaning of the **facial expressions** of the speakers. No analysis on a **high-frequency level** (minute-wise effects) was so far conducted.

Facial expressions at the meeting frequency



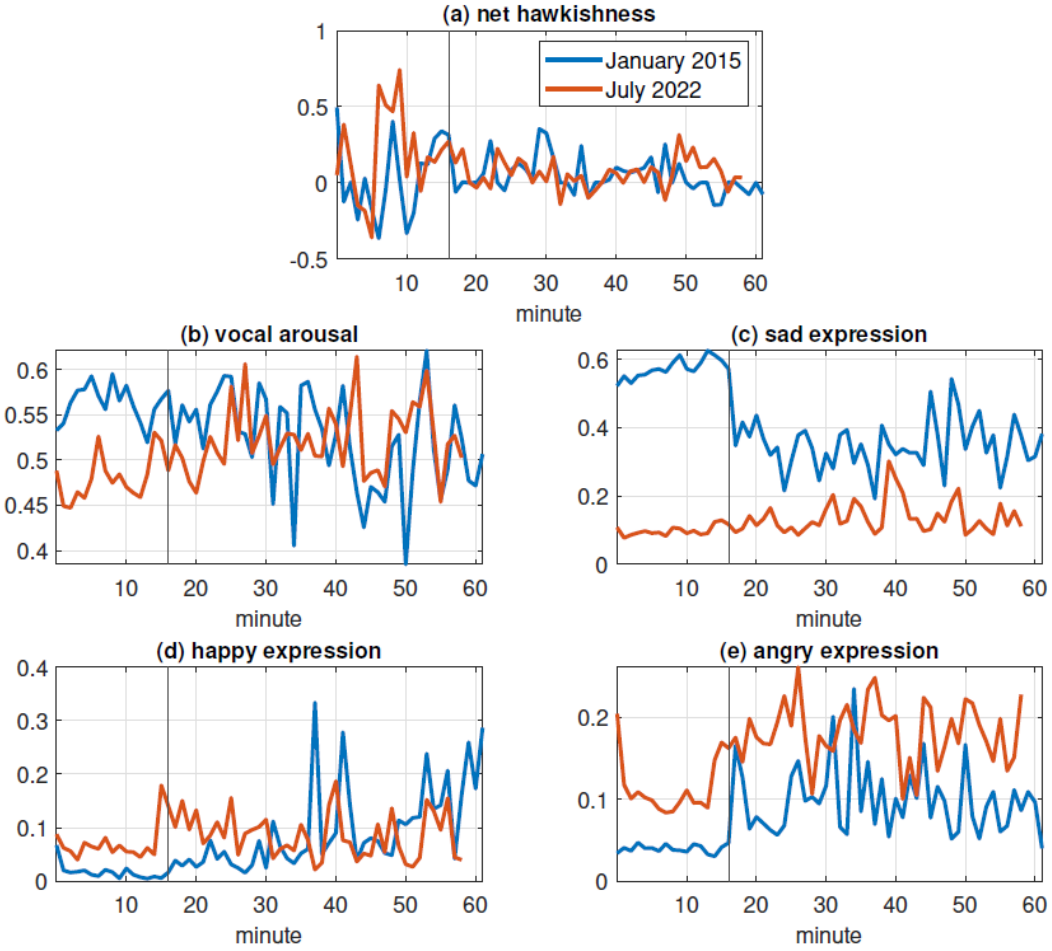
The spatial and temporal distributions of average vocal emotions



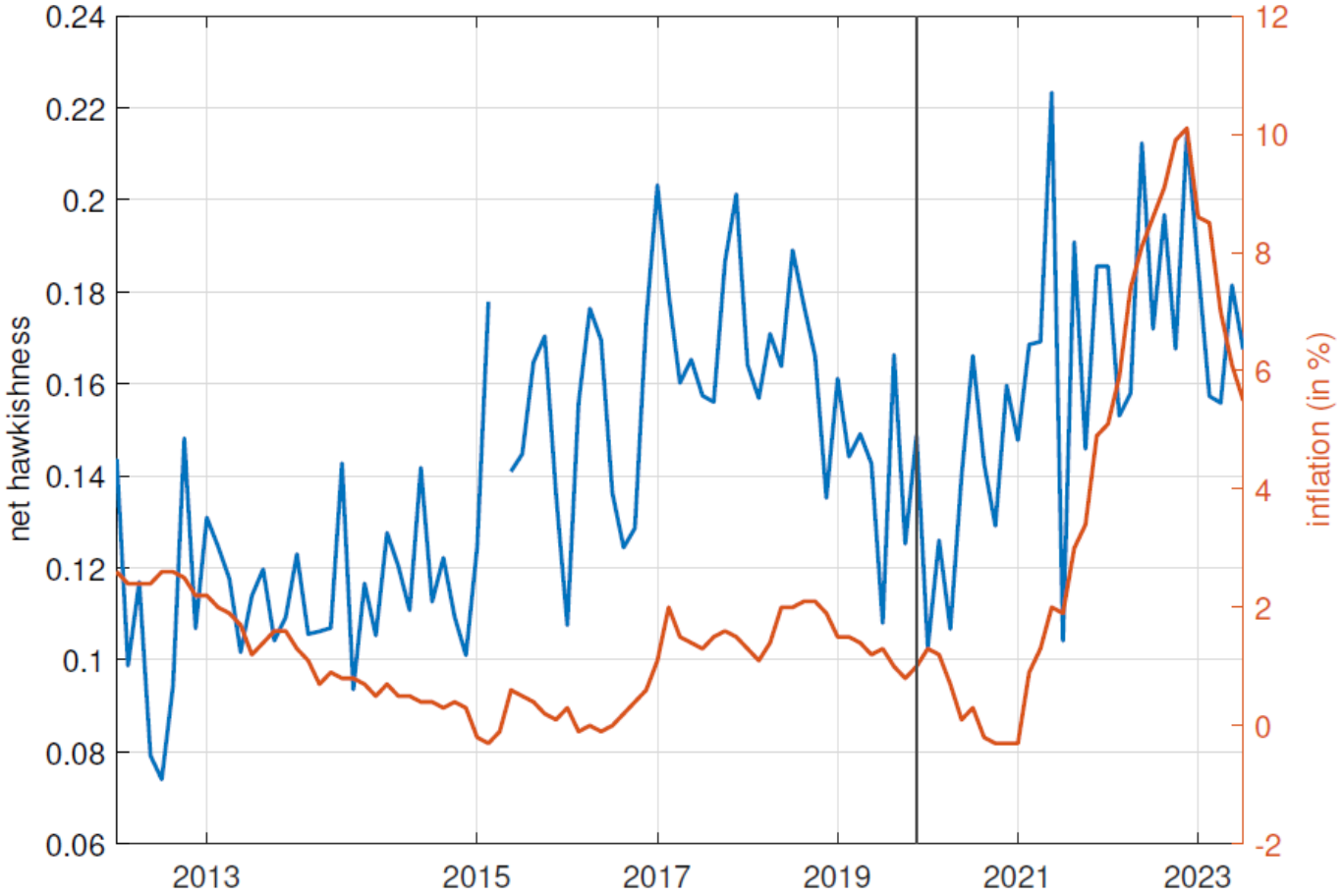


Emotions during two selected press conferences

- To highlight the behaviour of our key variables at a high frequency, let us look at two important meetings.
- January 22, 2015
  - The ECB fully endorses Large Scale Asset Purchases as a monetary policy tool.
  - Step was widely anticipated.
- July 21, 2022
  - The ECB raises interest rates for the first time after many years of zero or even negative rates.
  - Inflation is already far above the 2% target.



Net hawkishness at the meeting frequency



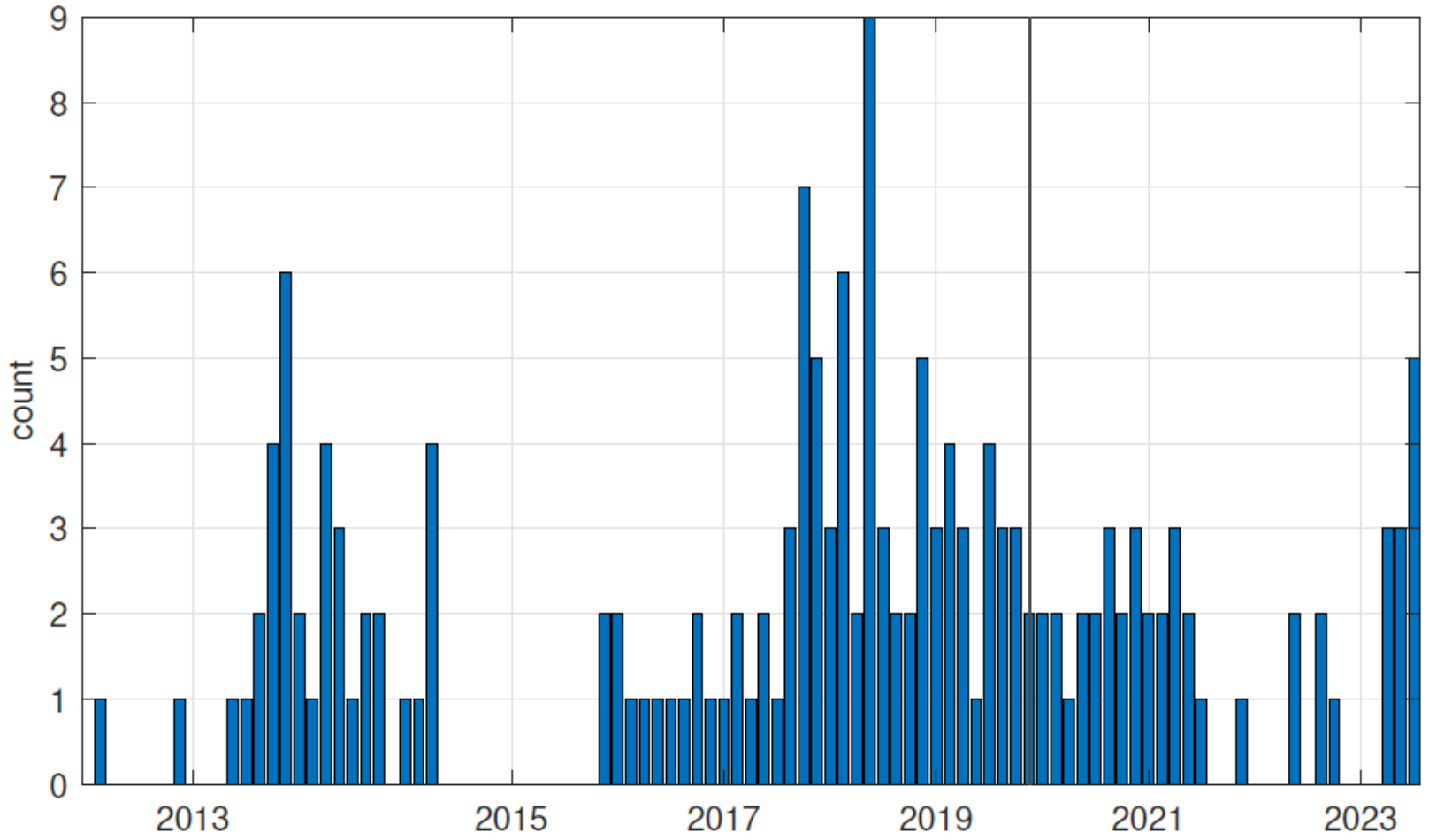
The effect on financial markets: Q&A part

	DE1oy	FR1oy	IT1oy	ES1oy	BundF	Stocks	USDEUR
				(a) Q&A part: Draghi			
hawkish	−0.009	−0.011	−0.022	−0.013	0.066	0.267	−0.258
	(0.016)	(0.017)	(0.028)	(0.023)	(0.127)	(0.309)	(0.227)
facial happy	−0.007*	−0.011**	0.008	−0.006	0.047	0.063	−0.065
	(0.004)	(0.004)	(0.008)	(0.006)	(0.038)	(0.085)	(0.063)
facial sad	−0.011***	−0.011***	−0.007	−0.007*	0.094***	0.145***	−0.081**
	(0.003)	(0.003)	(0.005)	(0.004)	(0.024)	(0.055)	(0.040)
facial angry	0.000	−0.004	−0.001	−0.009	−0.002	0.272***	−0.114
	(0.005)	(0.005)	(0.008)	(0.007)	(0.042)	(0.094)	(0.069)
vocal arousal	0.003	0.002	0.004	−0.000	−0.010	−0.104	−0.061
	(0.004)	(0.004)	(0.007)	(0.006)	(0.035)	(0.080)	(0.059)
facial happy × hawkish	0.015	0.014	0.006	0.037	−0.183	−0.240	0.688*
	(0.028)	(0.029)	(0.048)	(0.039)	(0.239)	(0.539)	(0.396)
facial sad × hawkish	−0.001	0.008	0.026	0.027	−0.004	−0.468	0.258
	(0.016)	(0.017)	(0.028)	(0.023)	(0.138)	(0.311)	(0.229)
facial angry × hawkish	−0.013	−0.012	0.015	0.021	0.159	−0.632	0.624
	(0.028)	(0.028)	(0.047)	(0.038)	(0.232)	(0.523)	(0.384)
vocal arousal × hawkish	0.019	0.014	0.016	−0.008	−0.135	0.073	0.046
	(0.027)	(0.027)	(0.046)	(0.036)	(0.220)	(0.497)	(0.366)
fixed effects	yes	yes	yes	yes	yes	yes	yes
# obs.	3013	3067	3022	3073	3071	3164	3164

The effect on financial markets: Q&A part

	DE10y	FR10y	IT10y	ES10y	BundF	Stocks	USDEUR
			(b) Q&A part: Lagarde				
hawkish	0.027	0.027	−0.038	0.047	−0.205	0.520	0.311
	(0.028)	(0.039)	(0.064)	(0.036)	(0.244)	(0.389)	(0.315)
facial happy	0.004	−0.007	−0.034*	−0.001	−0.009	−0.015	0.125
	(0.008)	(0.011)	(0.018)	(0.010)	(0.068)	(0.109)	(0.088)
facial sad	−0.005	−0.012	−0.023*	−0.008	0.040	−0.066	0.028
	(0.006)	(0.008)	(0.014)	(0.008)	(0.053)	(0.085)	(0.068)
facial angry	−0.004	−0.018**	−0.024*	−0.006	0.049	−0.110	0.057
	(0.005)	(0.008)	(0.012)	(0.007)	(0.047)	(0.076)	(0.061)
vocal arousal	−0.013	−0.011	−0.012	−0.015	0.121	0.049	−0.298***
	(0.009)	(0.013)	(0.021)	(0.012)	(0.080)	(0.128)	(0.103)
facial happy × hawkish	−0.116***	−0.038	−0.088	−0.106*	0.894**	0.802	−1.141**
	(0.042)	(0.060)	(0.099)	(0.055)	(0.374)	0.597	(0.484)
facial sad × hawkish	−0.060**	−0.032	0.044	−0.053	0.587**	−0.572	−0.842***
	(0.026)	(0.037)	(0.060)	(0.033)	(0.227)	(0.362)	(0.294)
facial angry × hawkish	−0.071***	−0.050	−0.043	−0.075**	0.610***	0.262	−0.521*
	(0.025)	(0.035)	(0.057)	(0.032)	(0.215)	(0.344)	(0.279)
vocal arousal × hawkish	0.015	−0.010	0.089	−0.018	−0.182	−0.924	0.085
	(0.051)	(0.072)	(0.119)	(0.066)	(0.448)	(0.716)	(0.580)
fixed effects	yes	yes	yes	yes	yes	yes	yes
# obs.	1238	1258	1241	1166	1258	1258	1258

Number of forward guidance statements per press conference



The effect on financial markets: interaction with forward guidance

	DE10y	FR10y	IT10y	ES10y	BundF	Stocks	USDEUR
			(b) Introductory Statement: Lagarde				
hawkish	0.003**	0.005***	0.007***	0.004***	−0.038***	−0.046*	0.006
	(0.001)	(0.001)	(0.003)	(0.002)	(0.013)	(0.028)	(0.010)
forward guidance (FG)	−0.051	−0.025	−0.019	−0.057	0.187	0.087	−0.096
	(0.033)	(0.034)	(0.061)	(0.036)	(0.305)	(0.655)	(0.225)
facial happy	−0.030**	−0.034**	−0.028	−0.035**	0.265**	0.677**	−0.272***
	(0.014)	(0.015)	(0.026)	(0.016)	(0.132)	(0.284)	(0.097)
facial sad	−0.029**	−0.020	−0.009	−0.026*	0.192	0.541**	−0.266***
	(0.013)	(0.013)	(0.024)	(0.015)	(0.120)	(0.258)	(0.088)
facial angry	0.000	−0.002	0.017	−0.002	0.059	0.006	−0.027
	(0.008)	(0.009)	(0.016)	(0.009)	(0.079)	(0.169)	(0.058)
vocal arousal	−0.039**	−0.019	−0.024	−0.018	0.203	−0.563	−0.163
	(0.017)	(0.018)	(0.032)	(0.019)	(0.160)	(0.343)	(0.118)
facial happy × FG	−0.031	−0.019	0.023	−0.031	0.174	−0.555	−0.213
	(0.037)	(0.039)	(0.069)	(0.042)	(0.346)	(0.743)	(0.255)
facial sad × FG	0.007	0.005	−0.044	0.009	−0.028	−0.318	0.162*
	(0.014)	(0.014)	(0.025)	(0.015)	(0.127)	(0.273)	(0.094)
facial angry × FG	0.024	0.010	0.003	0.015	−0.067	−0.064	0.015
	(0.015)	(0.015)	(0.027)	(0.017)	(0.137)	(0.294)	(0.101)
vocal arousal × FG	0.099	0.044	0.023	0.112	−0.347	0.047	0.141
	(0.067)	(0.069)	(0.123)	(0.075)	(0.619)	(1.330)	(0.457)
fixed effects	yes	yes	yes	yes	yes	yes	yes
# obs.	490	495	492	455	495	495	495

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