Deciphering Monetary Policy Shocks

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EEA-ESEM 2022

August 25, 2022

Motivation

Leap in scope and intensity of central bank communication over last decades

- Key tool for expectations management
- Broad range of topics

How does communication on different topics impact financial market prices?

Policy makers

- Prerequisite for optimal design of policy communication

Academic researchers

- Large literature measures MP news from high-frequency asset price changes
- Several market-based shock measures have been proposed to capture different aspects of monetary policy news ('black box')
- Little evidence on economic drivers of these shocks

This paper

1. Build comprehensive set of market-based high-frequency monetary policy shocks:

   Market-based measurement of MP news

2. Quantify the *stance* of the ECB communication regarding different topics:

   Text-based measurement of MP news

3. Combine these two sets of measures to address key questions
   - *Which* topics matter?
   - *How* do different topics move different assets?
   - *Validation* of market-based shock measures proposed in the literature

★ 'What the ECB says and what the market hears'

Main results

- Communication surprises move a broad range of financial market prices
- Most important: 'rate guidance', 'economic activity', 'financial conditions'
- Each topic has a **distinct pattern** of market reactions
  - different regions of yield curve and/or co-movement with stocks
- Some shock measures proposed in the earlier literature correspond quite closely with actual communication ('validation')
- However, most shock measures based on a single price reaction relate to **more than one** topic
  $\rightarrow$ Need for shock measures based on **multiple** price reactions!

Literature

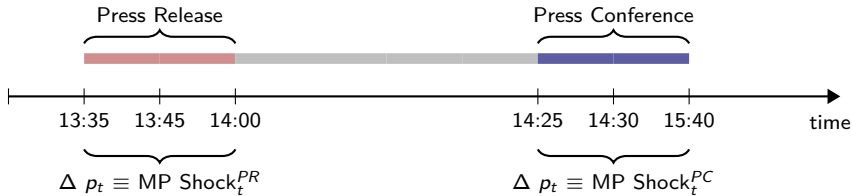
- Large literature on measuring market-based high-frequency monetary policy shocks
  Kuttner (2001), Cochrane and Piazzesi (2002), Bernanke and Kuttner (2005), Gürkaynak et al. (2005), Hanson and Stein (2015), Altavilla, Carboni, et al. (2015), Nakamura and Steinsson (2018), Jarociński (2020), Jarociński and Karadi (2020), Cieslak and Schrimpf (2019), Bauer and E. T. Swanson (2021), Leombroni et al. (2021), E. T. Swanson (2021), Bauer and E. Swanson (2022),...

- Empirical literature identifying shocks and/or measuring different dimensions of monetary policy using text data
  C. Romer and D. Romer (1989, 1990), Ehrmann and Fratzscher (2007, 2009), Hansen and McMahon (2016) Hansen, McMahon, and Prat (2018) and Hansen, McMahon, and Tong (2019), Jegadeesh and Wu (2017), Schmeling and Wagner (2019), Hubert and Labondance (2021),...

Agenda

1. **Market-based measures of monetary policy news**
2. Text-based measures of monetary policy news
3. Deciphering monetary policy shocks

Measuring monetary policy news at high frequencies



- Exploit staggered timing of Press Release and Press Conference
- All data based on the **EA-MPD** (Altavilla, Brugnolini, et al. 2019): **2002/01 – 2020/07**
- Changes in OIS rates and stock prices
  - Basis for market-based shock measures established in literature
  - Consistent sample period, timing, and set of instruments

High-frequency monetary policy shocks

- Simple yield changes in one tenor
- Shocks extracted from term structure of risk-free yields

Market-based shock measure	Identification	Shock ↑
	Interest rate shocks	
3M	change in the 3M OIS rate	rates ↑
2Y	change in the 2Y OIS rate	rates ↑
10Y	change in the 10Y OIS rate	rates ↑
	Term structure shocks	
Leombroni et al. (2021)	PCA of yield changes: 1M to 10Y	
Interest rate factor (IR)	1^{st} PC	yield level ↑
Altavilla, Brugnolini, et al. (2019)	PCA of yield changes: 1M to 10Y	
Timing factor (TIM)	1^{st} PC, rotated	short-term rates ↑
Forward guidance factor (FG)	2^{nd} PC, rotated, $\perp$1M	medium-term rates ↑
Quantitative easing factor (QE)	3^{rd} PC, rotated, $\perp$1M	long-term rates ↑

High-frequency monetary policy shocks (continued)

- Shocks based on joint response of yields and stock returns
- Policy shock (reaction function) versus news about economic conditions

Market-based shock measure	Identification	Shock ↑
	Joint interest rate and equity shocks	
Jarociński and Karadi (2020)	structural shocks: 2Y, ESX50	
Policy shock (POL)	2Y ↑, ESX50 ↓	hawkish news
Information shock (INF)	2Y ↑, ESX50 ↑	good economic news
Cieslak and Schrimpf (2019)	structural shocks: 2Y, 10Y, ESX50	
Monetary shock (MON)	2Y ↑↑, 10Y ↑ , ESX50 ↓	hawkish news
Growth shock (GRO)	2Y ↑↑, 10Y ↑ , ESX50 ↑	good economic news
Risk Premium shock (RP)	2Y ↓ , 10Y ↓↓, ESX50 ↓	risk premium ↑

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Quantifying ECB communication: Overview

- Use transcripts of ECB press conferences after ECB Governing Council meetings
- Goal is to identify different topics and to quantify how ECB communication about these topics changes over time (2002/01 – 2020/07)
- Two key steps:
  1. **Classify** paragraphs in the press conference statement into **different topics**
  2. Use **dictionary-based tone** measures to score communication on different topics
- Result: Measures of *topic-specific* ECB stance for each press conference

Quantifying ECB communication: Topics

Consistent structure of *pre-scripted* monetary policy statement

- MP decision + forward guidance + summary
- Economic activity
- Inflation outlook
- Financial and monetary conditions
- Fiscal policy and structural reforms

We directly adopt the ECB's *own* topic structure and classification

- **Five topics:** 'rate guidance', 'economic activity', 'inflation', 'financial & monetary conditions', 'fiscal policy'

Quantifying ECB communication: Topic-specific stance

We compute the tone τ for each topic i in press conference t

- Loughran and McDonald (2011): dictionary of negative words in a financial context

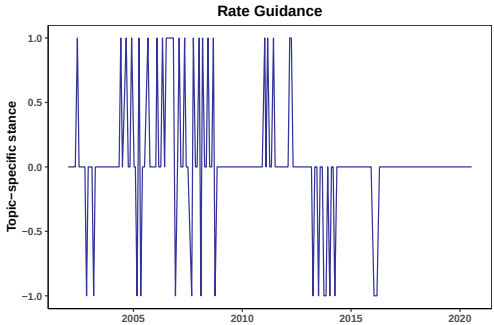
$$\tau_{i,t} = 1 - \frac{\#\text{ negative words in topic } i \text{ at press conference } t}{\#\text{ words in topic } i \text{ at press conference } t}. \quad (1)$$

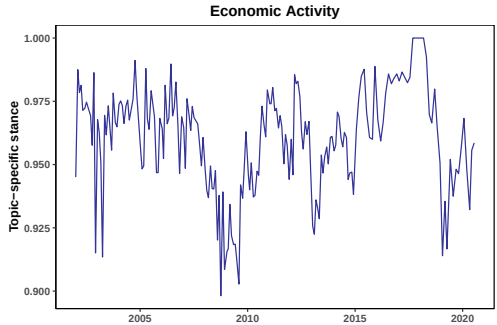
Exception: Rate guidance

- Manual classification as in Hansen and McMahon (2016)
- Distinguish indications of tighter monetary policy ($+1$), no indications regarding future monetary policy (0), or monetary easing (-1)
- Same procedure for control variable 'UMP'

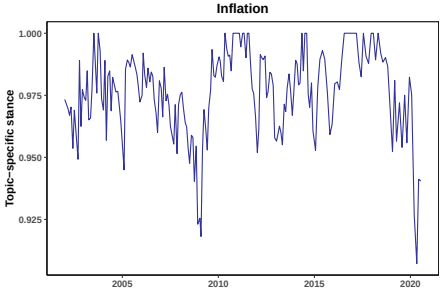
▸ Tone measure ▸ Classifying Rate Guidance

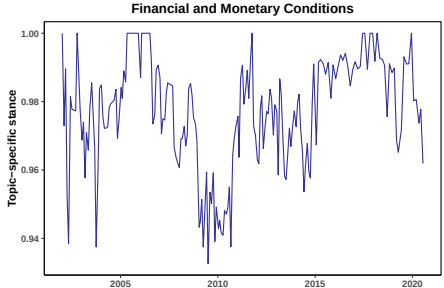
Quantifying ECB communication: Topic-specific stance

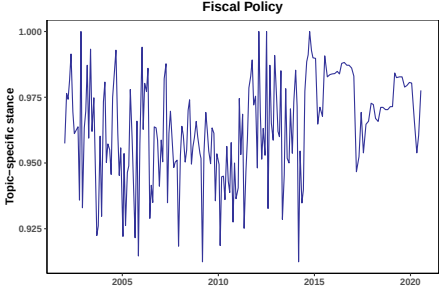




Quantifying ECB communication: Topic-specific stance







Agenda

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Communication stance and high-frequency shocks

Explore relationship between market-based monetary policy shocks ($S_{k,t}$) and text-based communication shocks ($\Delta\tau_{i,t}$):

$$S_{k,t} = \alpha + \sum_i \beta_i \Delta\tau_{i,t} + \sum_j \gamma_j C_{j,t} + \epsilon_t \tag{2}$$

$C_{j,t}$: market's **information set** *prior* to press conference

1. Press release shocks ($S_{k,t}$ but measured over press release window)
2. UMP announcement dummy $(-1, 0, +1)$
3. Dummy and interaction term for inflation currently being above or below target
4. $\Delta\tau_{i,t-1}$ and changes in inter-meeting communication
   (inter-meeting topic-level stance for $> 2,000$ speeches given by ECB Executive Board members)
5. Δ financial market conditions since last meeting (EuroStoxx50, VSTOXX, Δi^{2Y})
6. Δ numerical GDP and inflation projections released during press conference

Communication stance and shocks in single rates

	Baseline			With Controls		
Δ*Stance*	OIS 3M	OIS 2Y	OIS 10Y	OIS 3M	OIS 2Y	OIS 10Y
Rate Guidance	1.096***	1.601**	0.307	0.932***	1.475**	0.277
	(0.350)	(0.704)	(0.356)	(0.297)	(0.634)	(0.400)
Economic Activity	0.198	0.673**	0.519**	0.213	0.812**	0.423
	(0.125)	(0.296)	(0.224)	(0.142)	(0.351)	(0.267)
Inflation	0.050	0.064	0.156	0.014	0.183	0.243
	(0.100)	(0.243)	(0.197)	(0.197)	(0.537)	(0.322)
Financial & Monetary Cond.	0.240	0.407	0.584***	0.228	0.290	0.522**
	(0.152)	(0.311)	(0.207)	(0.148)	(0.330)	(0.226)
Fiscal Policy	0.043	−0.043	0.164	0.100	0.158	0.217
	(0.140)	(0.264)	(0.193)	(0.165)	(0.347)	(0.219)
Press Release Shock & UMP				✔	✔	✔
Inflation Interaction				✔	✔	✔
Prev. Stance & inter-PC Comm.				✔	✔	✔
Financial Market Cond.				✔	✔	✔
Macroeconomic Projections				✔	✔	✔
Observations	196	196	196	196	196	196
Adjusted R^2	0.067	0.045	0.069	0.008	0.009	0.013
Note:						*p<0.1; **p<0.05; ***p<0.01

Communication stance and term structure shocks

	Baseline				With Controls			
Δ*Stance*	IR (LVVW)	Timing (ABGMR)	FG (ABGMR)	QE (ABGMR)	IR (LVVW)	Timing (ABGMR)	FG (ABGMR)	QE (ABGMR)
Rate Guidance	1.783**	1.162***	0.688	−0.355	1.691***	0.925***	0.977*	−0.337
	(0.726)	(0.377)	(0.541)	(0.219)	(0.651)	(0.344)	(0.571)	(0.277)
Economic Activity	0.647**	0.088	0.487*	0.240	0.657**	0.139	0.535*	0.029
	(0.287)	(0.142)	(0.249)	(0.166)	(0.333)	(0.167)	(0.322)	(0.189)
Inflation	0.107	0.086	−0.072	0.166	0.179	−0.040	0.131	0.228
	(0.228)	(0.115)	(0.217)	(0.159)	(0.489)	(0.200)	(0.462)	(0.197)
Financial & Monetary Cond.	0.506*	0.330*	−0.058	0.409**	0.385	0.337*	−0.230	0.419***
	(0.303)	(0.183)	(0.281)	(0.159)	(0.327)	(0.175)	(0.294)	(0.158)
Fiscal Policy	0.043	0.064	−0.123	0.185	0.209	0.097	0.001	0.146
	(0.266)	(0.152)	(0.194)	(0.151)	(0.343)	(0.182)	(0.295)	(0.160)
Press Release Shock & UMP					✔	✔	✔	✔
Inflation Interaction					✔	✔	✔	✔
Prev. Stance & inter-PC Comm.					✔	✔	✔	✔
Financial Market Cond.					✔	✔	✔	✔
Macroeconomic Projections					✔	✔	✔	✔
Observations	196	196	196	196	196	196	196	196
Adjusted R^2	0.059	0.061	0.003	0.053	0.026	0.010	0.019	0.041

Note: *p<0.1; **p<0.05; ***p<0.01

Communication stance and Jarociński and Karadi (2020)

	Baseline		With Controls	
Δ*Stance*	Policy (JK)	Information (JK)	Policy (JK)	Information (JK)
Rate Guidance	0.319**	0.240*	0.372**	0.137
	(0.157)	(0.142)	(0.154)	(0.146)
Economic Activity	0.054	0.189***	0.063	0.231***
	(0.073)	(0.070)	(0.086)	(0.081)
Inflation	−0.010	0.035	0.001	0.081
	(0.065)	(0.072)	(0.114)	(0.112)
Financial & Monetary Cond.	0.040	0.106	0.012	0.092
	(0.074)	(0.073)	(0.079)	(0.077)
Fiscal Policy	−0.072	0.063	−0.055	0.112
	(0.077)	(0.075)	(0.083)	(0.070)
Press Release Shock & UMP			✔	✔
Inflation Interaction			✔	✔
Prev. Stance & inter-PC Comm.			✔	✔
Financial Market Cond.			✔	✔
Macroeconomic Projections			✔	✔
Observations	196	196	196	196
Adjusted R^2	0.008	0.044	-0.016	0.032
Note:				*p<0.1; **p<0.05; ***p<0.01

Communication stance and Cieslak and Schrimpf (2019)

	Baseline			With Controls		
Δ*Stance*	Monetary (CS)	Growth (CS)	Risk Premium (CS)	Monetary (CS)	Growth (CS)	Risk Premium (CS)
Rate Guidance	0.256*	0.362**	0.119	0.327**	0.271*	0.155
	(0.149)	(0.148)	(0.099)	(0.152)	(0.142)	(0.135)
Economic Activity	0.032	0.140*	−0.175**	0.030	0.221***	−0.106
	(0.076)	(0.072)	(0.075)	(0.090)	(0.086)	(0.090)
Inflation	−0.010	0.004	−0.075	−0.005	0.041	−0.105
	(0.069)	(0.068)	(0.081)	(0.107)	(0.113)	(0.104)
Financial & Monetary Cond.	0.042	0.024	−0.233***	0.016	0.006	−0.227***
	(0.074)	(0.075)	(0.073)	(0.080)	(0.075)	(0.080)
Fiscal Policy	−0.073	0.008	−0.115	−0.065	0.067	−0.118
	(0.078)	(0.059)	(0.087)	(0.080)	(0.069)	(0.077)
Press Release Shock & UMP				✔	✔	✔
Inflation Interaction				✔	✔	✔
Prev. Stance & inter-PC Comm.				✔	✔	✔
Financial Market Cond.				✔	✔	✔
Macroeconomic Projections				✔	✔	✔
Observations	196	196	196	196	196	196
Adjusted R^2	-0.001	0.025	0.083	-0.022	0.024	0.048
Note:						*p<0.1; **p<0.05; ***p<0.01

Additional results

Non-result for inflation

- Robust across alternative specifications
- Inflation-implications likely subsumed by explicit discussion of policy actions

Fiscal policy

- Moves core-periphery spreads during sovereign debt crisis

Exchange rates

- Responsive to 'financial & monetary conditions'

Conclusion

- Different topics, different market reactions
- Most important: ‘rate guidance’, ‘economic activity’, ‘financial conditions’
- Hard to isolate certain topics with yield curve moves alone

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APPENDIX

Tone measure: Details

Back

- Common approach in the literature: Use negative words only as these words are less frequently negated Loughran and McDonald (2011).
- Excerpt from January 15, 2009 on the topic of "Economic activity":
  "They relate mainly to the potential for a stronger impact on the real economy of the turmoil in financial markets, as well as to concerns about the emergence and intensification of protectionist pressures and to possible adverse developments in the world economy stemming from a disorderly correction of global imbalances."

Rate Guidance topic

Back

- To indicate possible future policy action, the Governing Council uses subtle changes in language hard to detect for an algorithm.
- In many instances, such changes only affect a single sentence in the statement and a human observer has a clear edge in noticing such nuances.
- Example: ECB changes formulations from 'monitor closely' certain risks to 'we will remain vigilant', to 'strong vigilance is warranted' or to 'strong vigilance is of the essence'.
- We follow Hansen and McMahon (2016) in hand-coding the CB's guidance on rates and distinguish introductory statements with indications of tighter monetary policy ($+1$), no indications regarding future monetary policy (0), or monetary easing (-1).

Rate Guidance topic: Examples

Back

Discussion of rate cuts in the introduction paragraph (-1):

Press conference November 11, 2002

'In view of the high uncertainty on future growth, and its implication for medium-term inflationary developments, the ***Governing Council has discussed extensively the arguments for and against a cut in the key ECB interest rates****. The view has prevailed to keep interest rates unchanged.'*

At the next meeting the ECB announced a rate cute of 50bp.

Discussion of strong vigilance to ensure price stability $(+1)$:

Press conference May 04, 2006

'Against this background, the Governing Council will exercise ***strong vigilance*** *in order to ensure that risks to price stability over the medium term do not materialise.'*

At the next meeting on June 08, 2006 a 25bp rate hike followed.