Measuring Euro Area Monetary Policy

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The opinions in this presentation are those of the authors and do not necessarily re‡ect the views of the European Central Bank and the Eurosystem.

Research Question

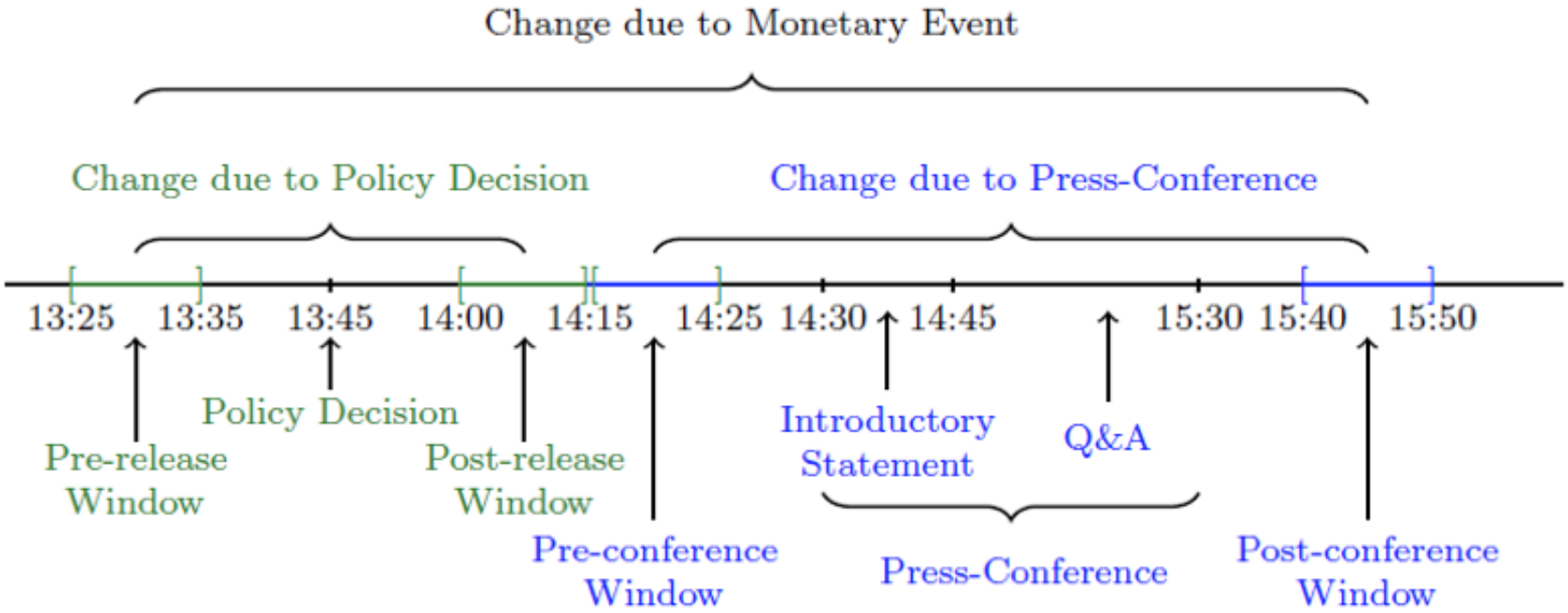
- How to measure the effects of monetary policy in the EA?
- How to account for multi-dimensionality?
  - Rate change
  - Forward guidance Gürkaynak et al. (2005)
  - Quantitative easing Swanson (2018)
- How asset prices respond to different monetary policy dimensions?
- How to answer these questions without a dataset?

This paper

- Contributions:
  1. Build the Euro Area Monetary Policy Database (EA-MPD)
     - Regularly updated and freely available by authors
     - Diligently checking with data providers (BBG, TR)
     - Ex-ante filtering procedure ▸ Filter
     - Ex-post multi-step consistency check ▸ IJC
     - Expect to boost monetary policy studies on the EA
  2. Provide framework to extract multidimensional surprises
     - Based on Gürkaynak et al. (2005); Swanson (2018)
     - Accounting for ECB multi-step revealing structure
     - Estimate the number of policy factors and what these are
     - Find two types of forward guidance and QE after 2014
     - QE measured for the first time in the EA
     - Suggest communication have changed, no responses
  3. Assess the effects of the surprises
     - Financial variables
     - Persistence
     - Nonlinearities

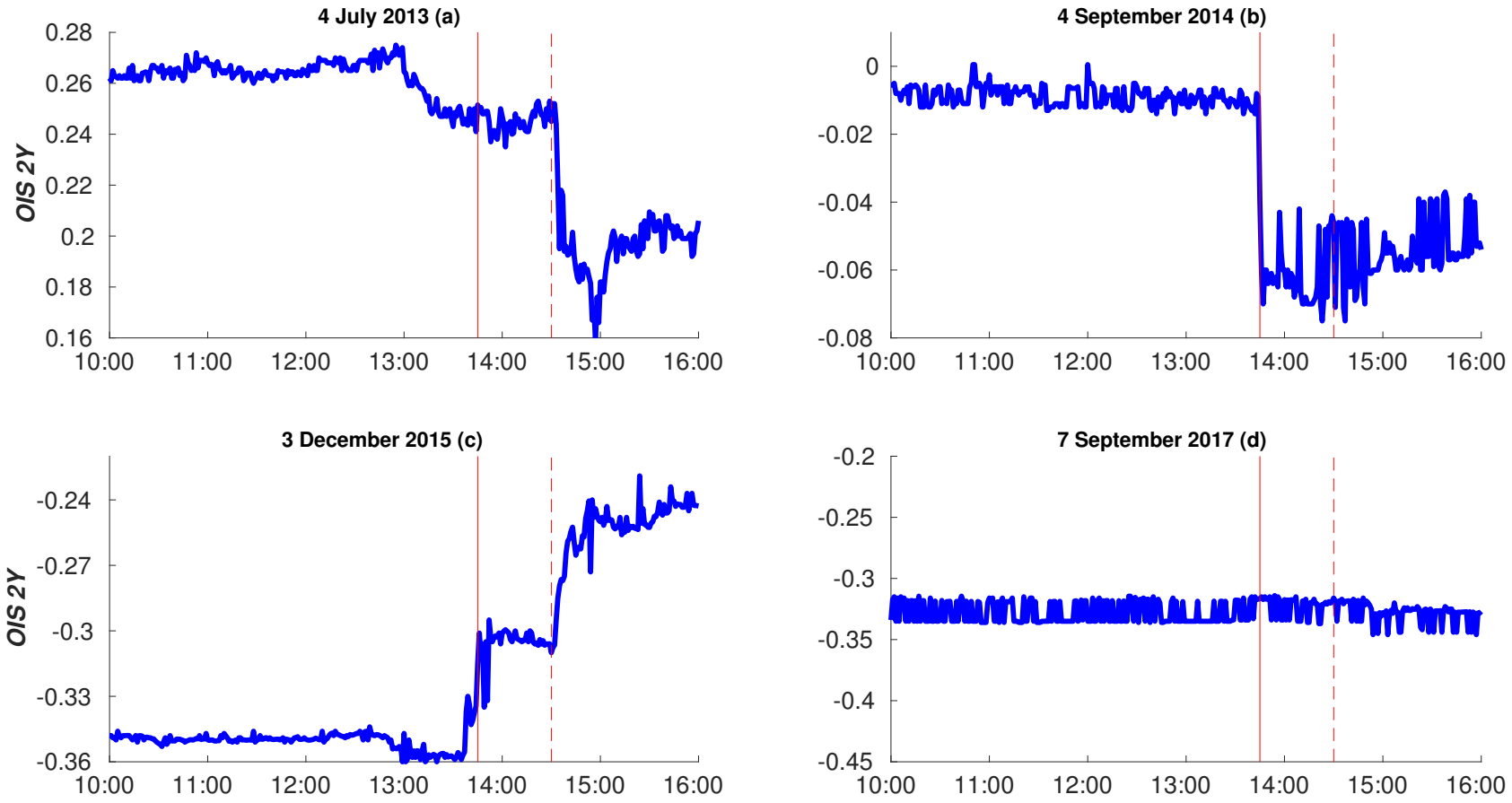
ECB Governing Council

Communication structure and derivation of asset changes



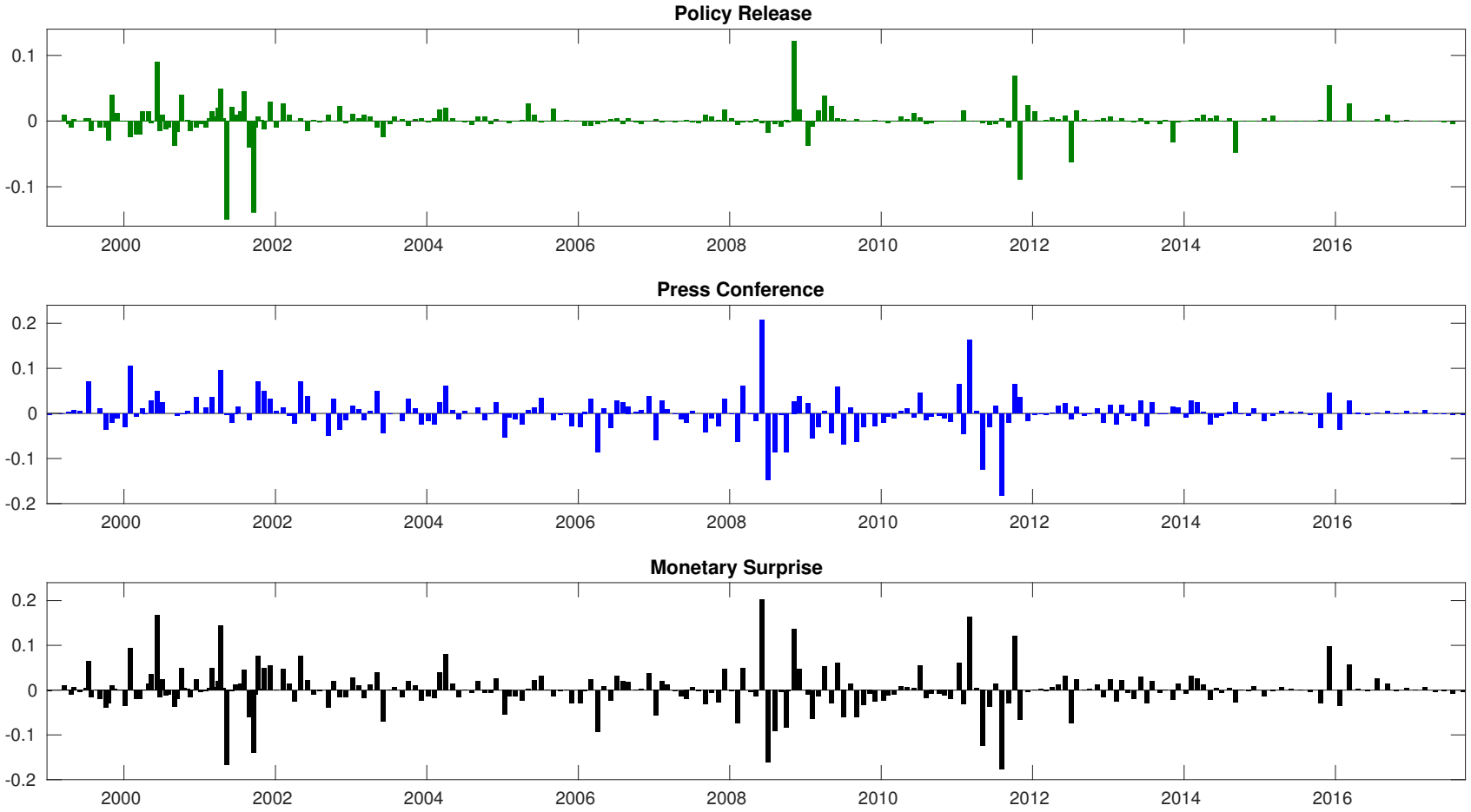
Example of market reactions

OIS2Y changes around selected GC dates



Actual Data – Time-series

OIS2Y changes



Euro Area Moneatry Policy Database

EA-MPD Overview

Asset price categories and maturities

- Overnight Index Swap (OIS) 1W, 1M, 3M, 6M, 1 to 10Y, 15Y, 20Y
- German gov. bond 3M, 6M, 1 to 10Y, 15Y, 20Y, 30Y
- Franch, Italian, Spanis gov. bond 2Y, 5Y, 10Y
- Exchange rates USD,GBP,JPY
- Stock indexes STOXX50E, SX7E

Extracting Market-Based Surprises

Methodology

- We have a large dataset of asset changes (EA-MPD)
- We need interpretability—i.e., names
- How many dimensions of policy do the market reactions suggest?
  - Cragg and Donald (1997)'s test

Cragg and Donald test

	Press Release Window		Conference Window	
	Pre-QE	Full sample	Pre-QE	Full sample
$H_0 : k = 0$	46.20	49.12	105.49	108.438
	(0.001)	(0.000)	(0.000)	(0.000)
$H_0 : k = 1$	18.77	22.54	33.73	39.63
	(0.173)	(0.068)	(0.002)	(0.000)
$H_0 : k = 2$			14.86	17.44
			(0.061)	(0.025)
$H_0 : k = 3$				3.97
				(0.263)

Rotated factors

Identification assumptions

- Press release — one factor
  1. First factor is unrestricted
- Press conference — three factors, rotate such that:
  1. First factor is unrestricted
  2. Second and third factors do not load to 1-month OIS Gürkaynak et al. (2005),
  3. Third factor has minimal variance in pre-crisis period Swanson (2018)
- Factors normalized to aid interpretation

Rotated factors

Interpretation

- In Press Release window:

Rotated factors

Interpretation

- In Press Release window:
  1. Target

Rotated factors

Interpretation

- In Press Release window:
  1. Target
- In Press Conference window:

Rotated factors

Interpretation

- In Press Release window:
  1. Target
- In Press Conference window:
  2. Forward Guidance

Rotated factors

Interpretation

- In Press Release window:
  1. Target
- In Press Conference window:
  2. Forward Guidance
  3. QE

Rotated factors

Interpretation

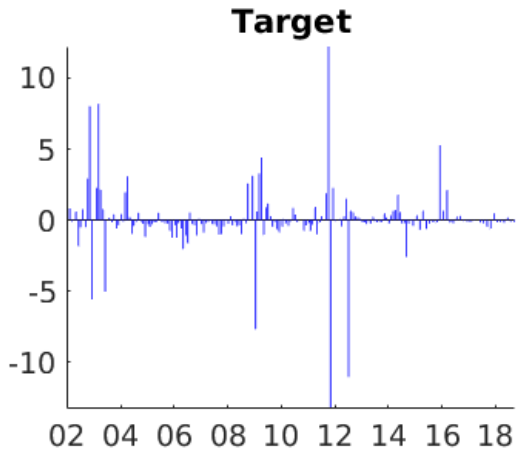
- In Press Release window:
  1. Target
- In Press Conference window:
  1. Timing
  2. Forward Guidance
  3. QE

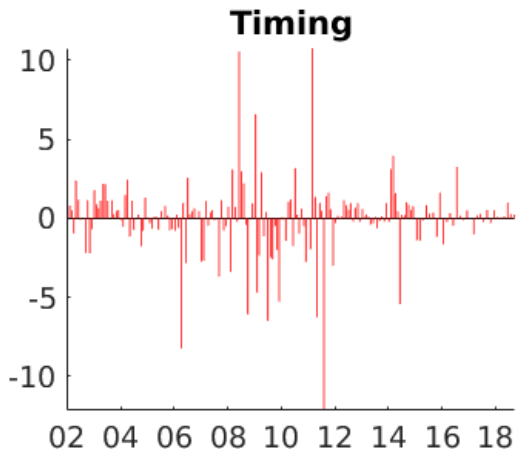
Rotated factors

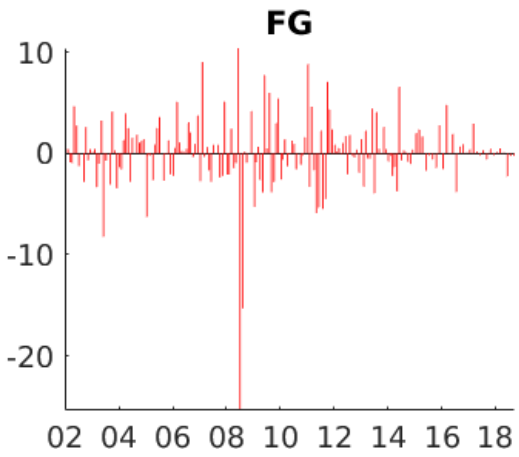
Interpretation

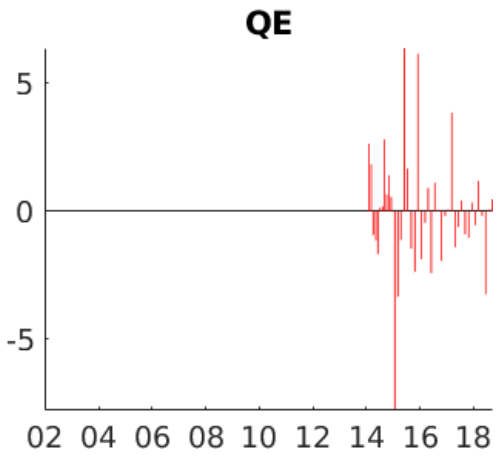
- In Press Release window:
  1. Target
- In Press Conference window:
  1. Timing
  2. Forward Guidance
  3. QE
- No information in the conference on the setting of rates.

Do factors make sense?









- Yes.
- We check correspondance with known events

What do factors capture?

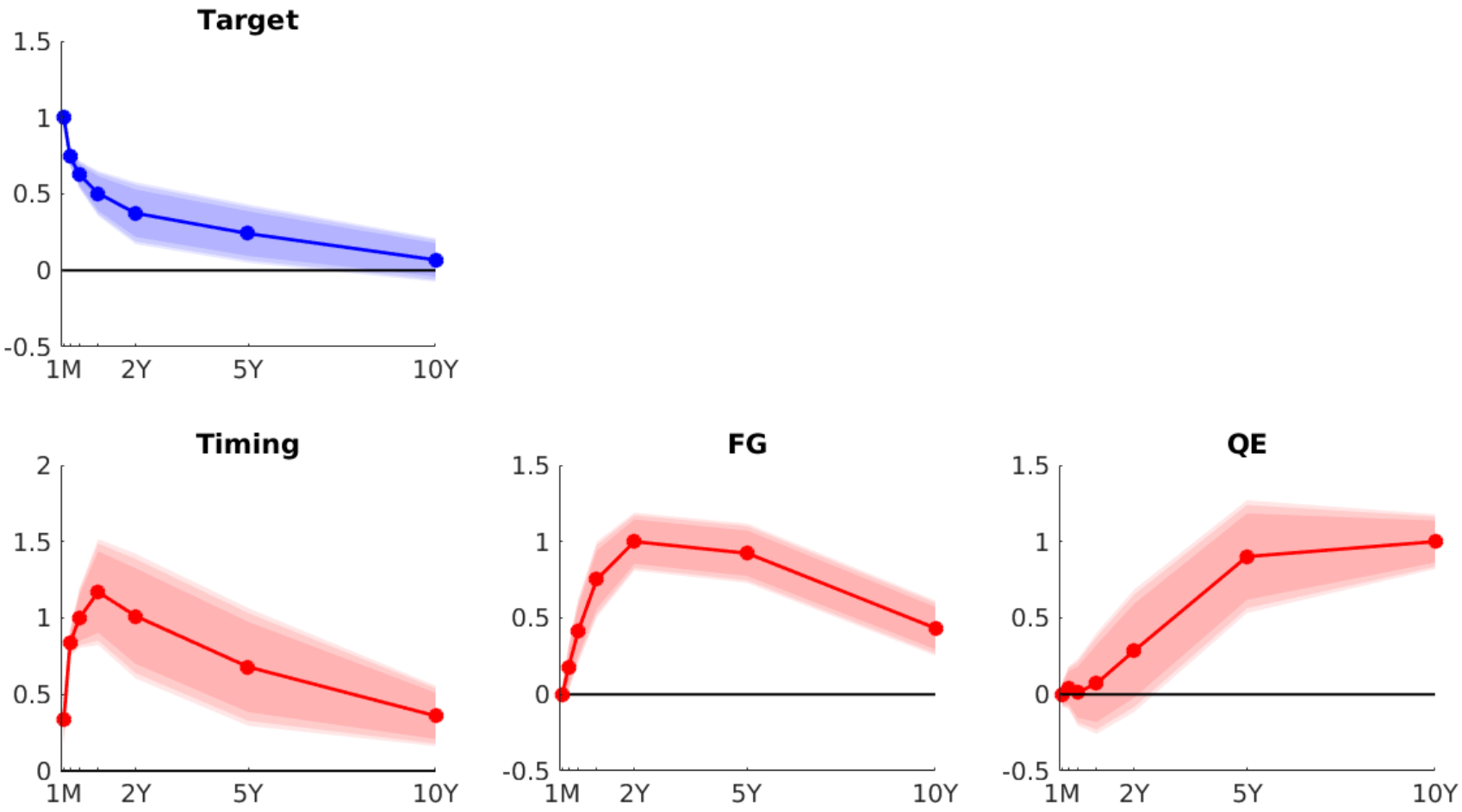
	1-month	3-month	6-month	1-year	2-year	5-year	10-year	SD Factor
Press release								
Target	97.8	91.3	82.7	60.4	32.9	11.9	1.5	2.2
Residual	2.2	8.7	17.3	39.6	67.1	88.1	98.5	
SD OIS	2.2	1.7	1.5	1.4	1.4	1.5	1.2	
Conference								
Timing	54.7	86.6	70.3	50.1	29.5	14.8	9.7	2.3
Forward Guidance	0.0	9.0	28.1	48.9	68.0	64.2	33.2	3.6
QE	0.0	0.2	0.0	0.1	1.7	18.7	53.8	2.0
Residual	45.3	4.2	1.6	0.9	0.8	2.3	3.3	
SD OIS	1.1	2.1	2.8	3.9	4.4	4.1	2.7	

Factors and yields

- Press release yield volatility curve is downward sloping
  - Target captures the short-end volatility
  - Long-end is idiosyncratic noise
- Press conference yield volatility curve is hump-shaped
  - Peak is at 2 to 5 years
  - FG and QE both affect these maturities
  - Timing related to shorter (but not 1-month) maturities
  - We capture all of the variance of the high-vol. maturities

Monetary Policy Surprises

Factor loadings



Findings

- These factors make us understand:
  1. Isolating different signals is key to response interpretation
  2. The yield curve response to ECB monetary policy
- Explanatory power of factors have not changed over time
  1. Keeping the definitions of policy surprises constant
  2. We explain about all of the variance in the OIS curve
  3. But the variance shares change over time
- Communication heterogeneity is crucial
  1. Without differentiating the signals (release/conference)
  2. Market responses cannot be interpreted

Assessing the Effects on Assets

Due to market-based surprises

$$y_t^i = \alpha^i + \beta_1^i T_t^i + \beta_2^i FG_t + \beta_3^i QE_t + \gamma^i IJC_t + \epsilon_t^i \tag{1}$$

- y_t^i is the intraday or daily asset change
- $i = \{Release, Conference\}$
- T_t^i is Target or Timing depending on the window
- FG_t stands for Forward Guidance
- QE_t stands for Quantitative Easing
- IJC_t stands for initial jobless claim surprise

Sovereign bond

We studied the effects on IT and ES sovereign bonds:

- QE narrow spreads
  - Works as expected...
  - ...and desired
  - This is a very robust finding
- Also, notice that:
  - QE is extracted from OIS curve only
  - It is not defined as factor that makes spreads narrower
  - This is a finding, not an assumption

Exchange rates

We studied the effects on the EUR/USD exchnage rate:

- Euro appreciates in response to surprise tightenings
- UIP is alive and kicking
- We do not find a “saving the euro” effect

Persistence

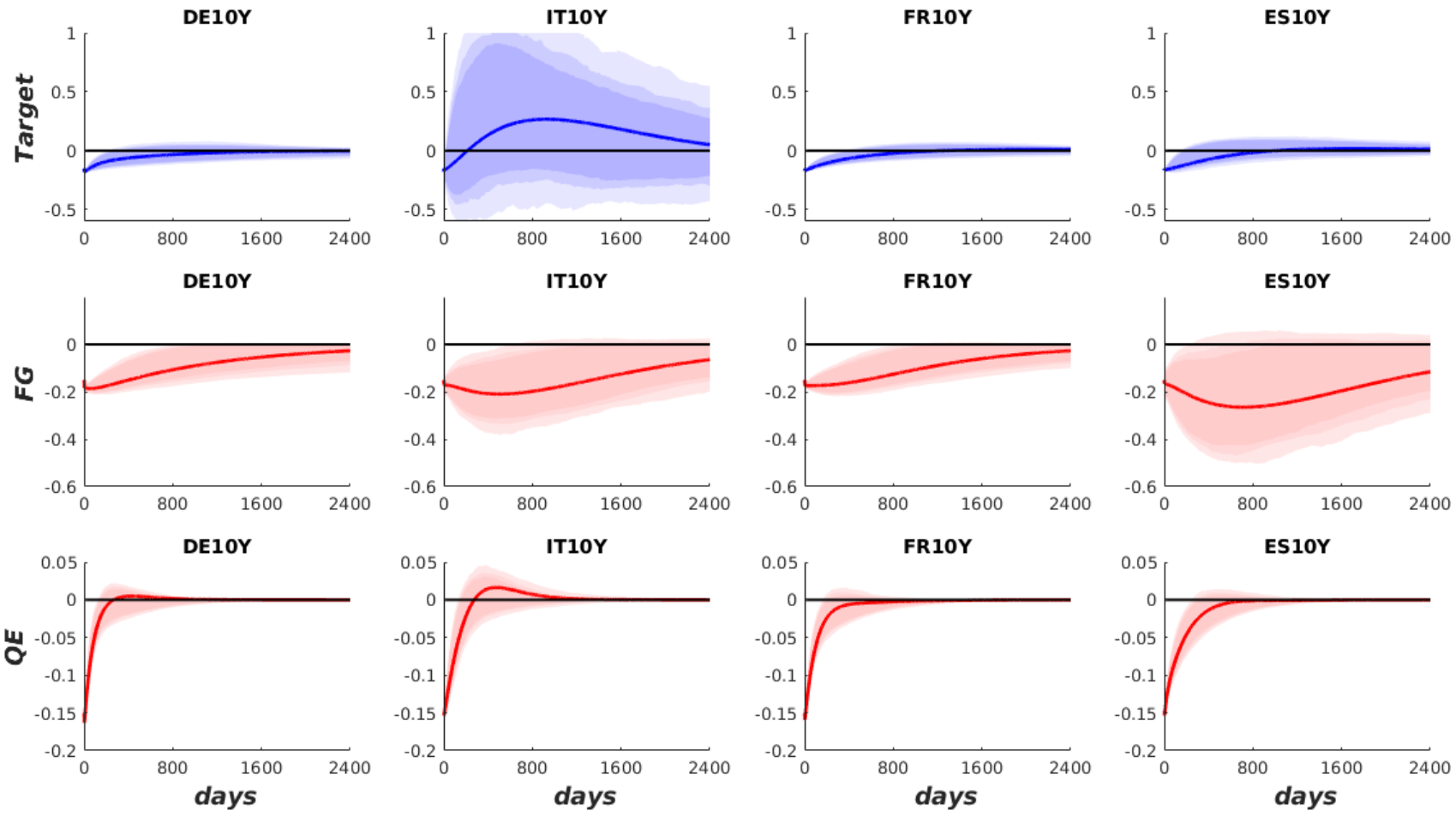
Structural Vector Autoregressive Model (SVAR)

$$AY_t = \sum_{j=1}^{p} C_j Y_{t-j} + \epsilon_t, \quad \epsilon_t \sim \mathbb{N}(0, \mathbb{I}) \tag{2}$$

- Based on a Daily VAR
- VAR Data: EA daily series Sep-2004 to Sep-2018
- Variables Y_t:
  - Sovereign 10Y, AAA and BB corporate yields, log-change EUR/USD, log-change STOXX50E, EA 5Y
- Factor used as instrument for identification (Stock and Watson, 2012; Mertens and Ravn, 2013; Gertler and Karadi, 2015)

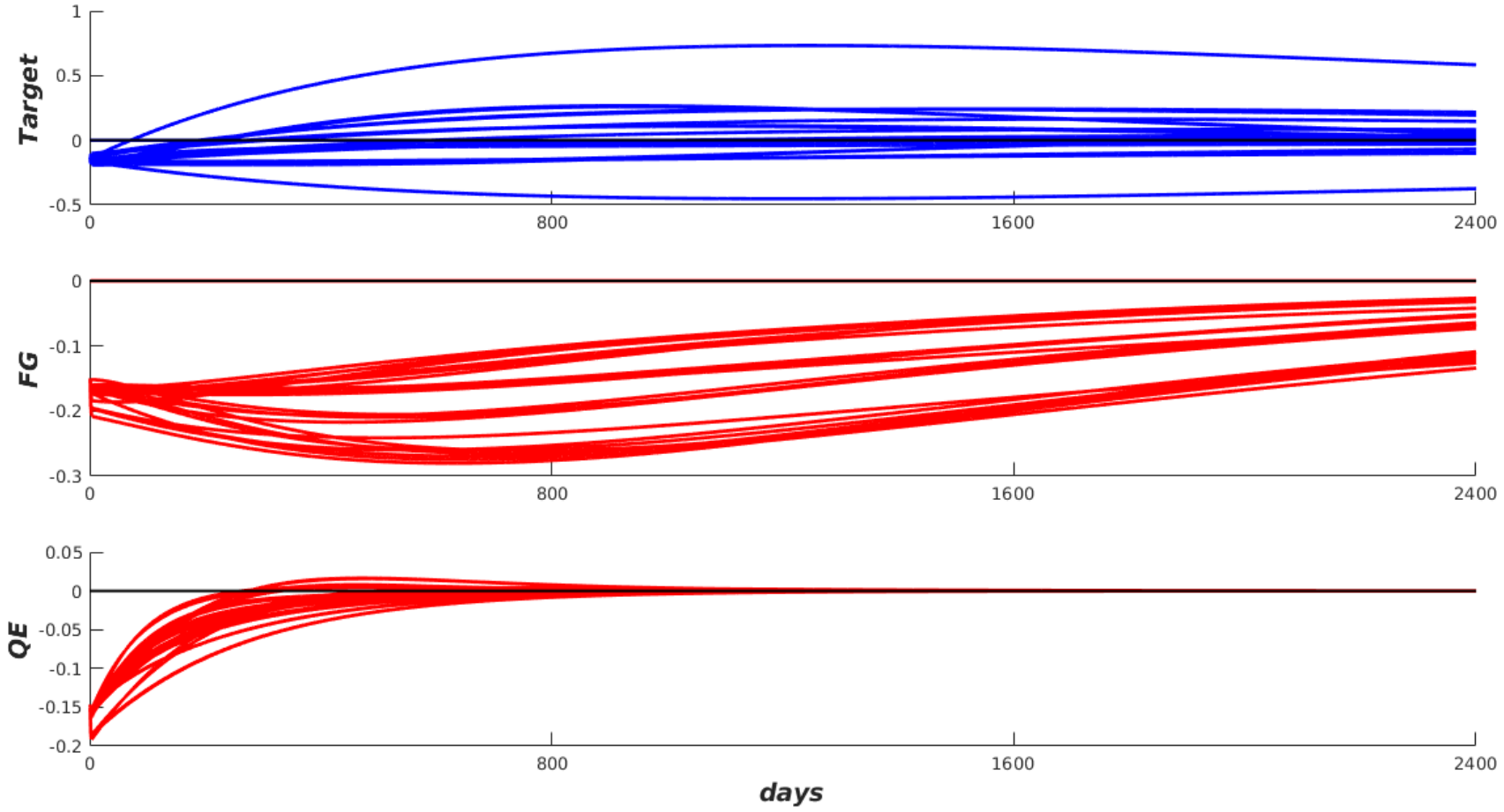
Persistence

Baseline



Persistence

Robustness



Persistence results

- Target is not very persistent
- FG effects very persistent
- QE also quite persistent
- Persistence present for IT and ES sovereign yields as well
- QE more persistent in EA than US
  - 2-3 months (Wright, 2012; Swanson, 2018)
- We find 6m (GE) to 18m (ES) half lives

Nonlinearity

Findings

We studied whether monetry policy has nonlinear effects:

- No evidence for nonlinearity
- Contradicts real effects literature for the US
- Important question about:
  - EA-US difference
  - Real economy disconnected from financial markets

Conclusion

- We build a standard database for the EA monetary policy
- We show that:
  1. Financial markets provide critical insights for the EA
  2. Financial markets differentiate between different signal
  3. ECB signals affect different points of the yield curve
  4. Differentiating between perceived signals is crucial
  5. QE worked – effects were persistent
  6. No sign of nonlinear effects
- Work in progress:
  - Other markets (stocks, corp. bonds, etc.)
  - Out-of-sample analysis on communication
- Much to do.
- That's why we make the data and code available

THANKS FOR LISTENING!

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Prefiltering

- For suspicious data points:
  1. Delete entries with missing *Bid* or *Ask*
  2. Delete entries with $Bid > c$ or $Ask > c$
  3. Delete entries with $Bid = 0$ or $Ask = 0$
  4. Delete entries with $Ask - Bid \geq 0$
  5. Delete entries with $Ask - Bid \geq 50\mu^{daily}_{spread}$
  6. Aggregate at minute level using last tick in a minute
  7. Carry forward the last observation

Back to research question

Considering contemporaneous releases

US Initial Jobless Claims

- Literature included dummies for contemporaneous events
  1. Not considering unexpected component of the release
  2. Not considering sign and magnitude
  3. Result is no significant effect
- What we do:
  - Consider the (standardized) release unexpected component

$$S_t = \frac{A_t - \mathbb{E}(A_t)}{\sqrt{VAR(A_t - \mathbb{E}(A_t))}} \tag{1}$$

  - $S_t \equiv$ Surprise, $A_t \equiv$ Actual Release, $\mathbb{E}(A_t) \equiv$ Exp. Release
  - $\mathbb{E}(A_t)$ is the Bloomberg forecaster survey median
  - Significant effects on all instrument – Low R^2

Back to research question