Central Bank Communication and the Yield Curve

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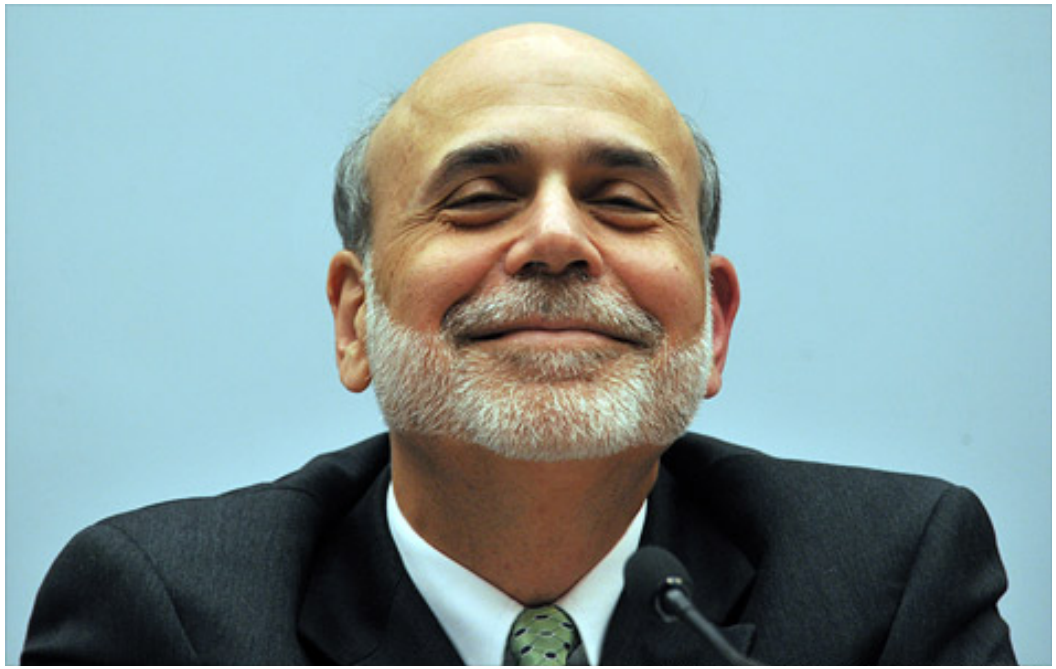
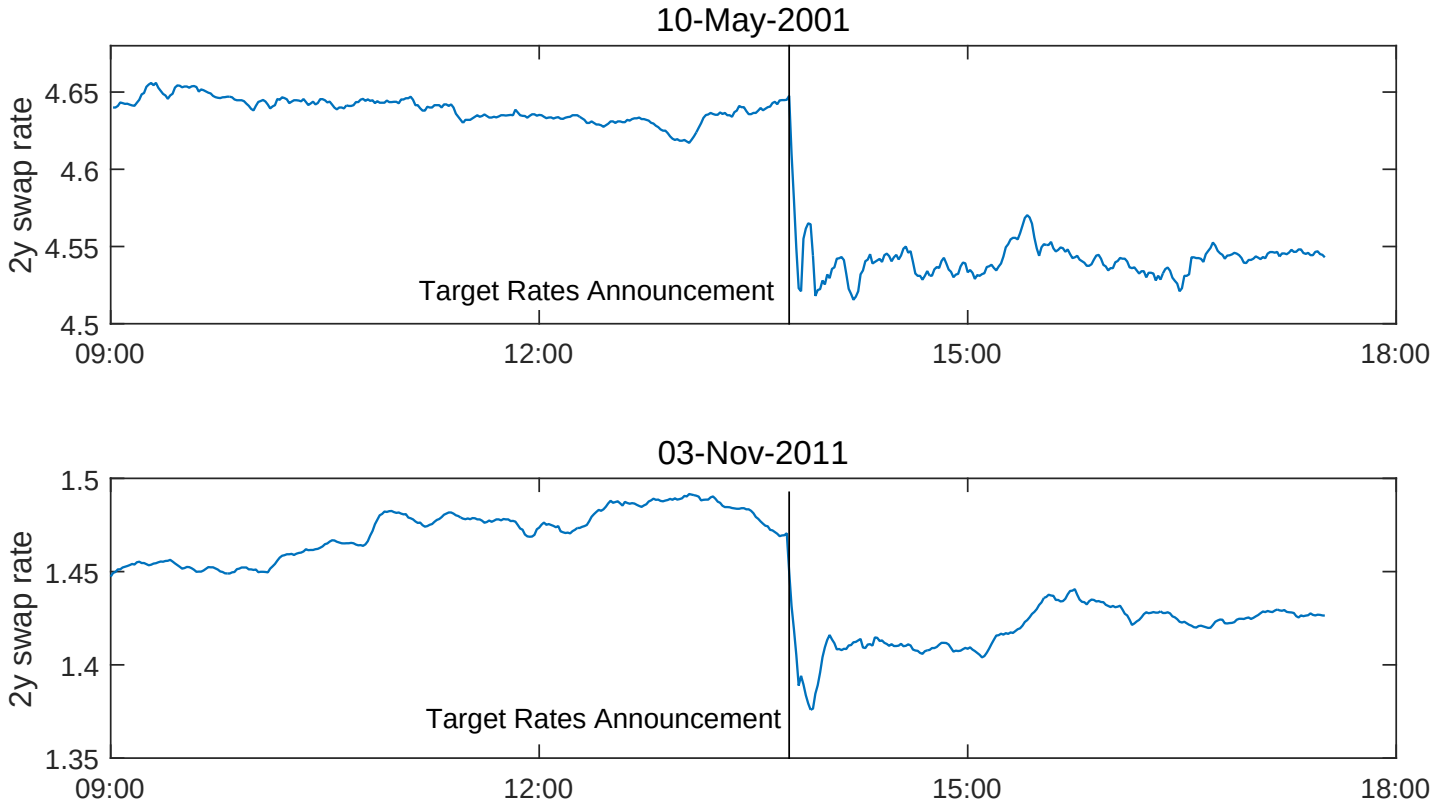
Central bank communication matters



"[...] monetary policy is 98 percent talk and only 2 percent action." Ben Bernanke

- Conventional (and unconventional) MP has a significant impact on mid- and long-term interest rates and asset prices,
- but debate about the importance via short rate expectations or risk premia, and about persistence.

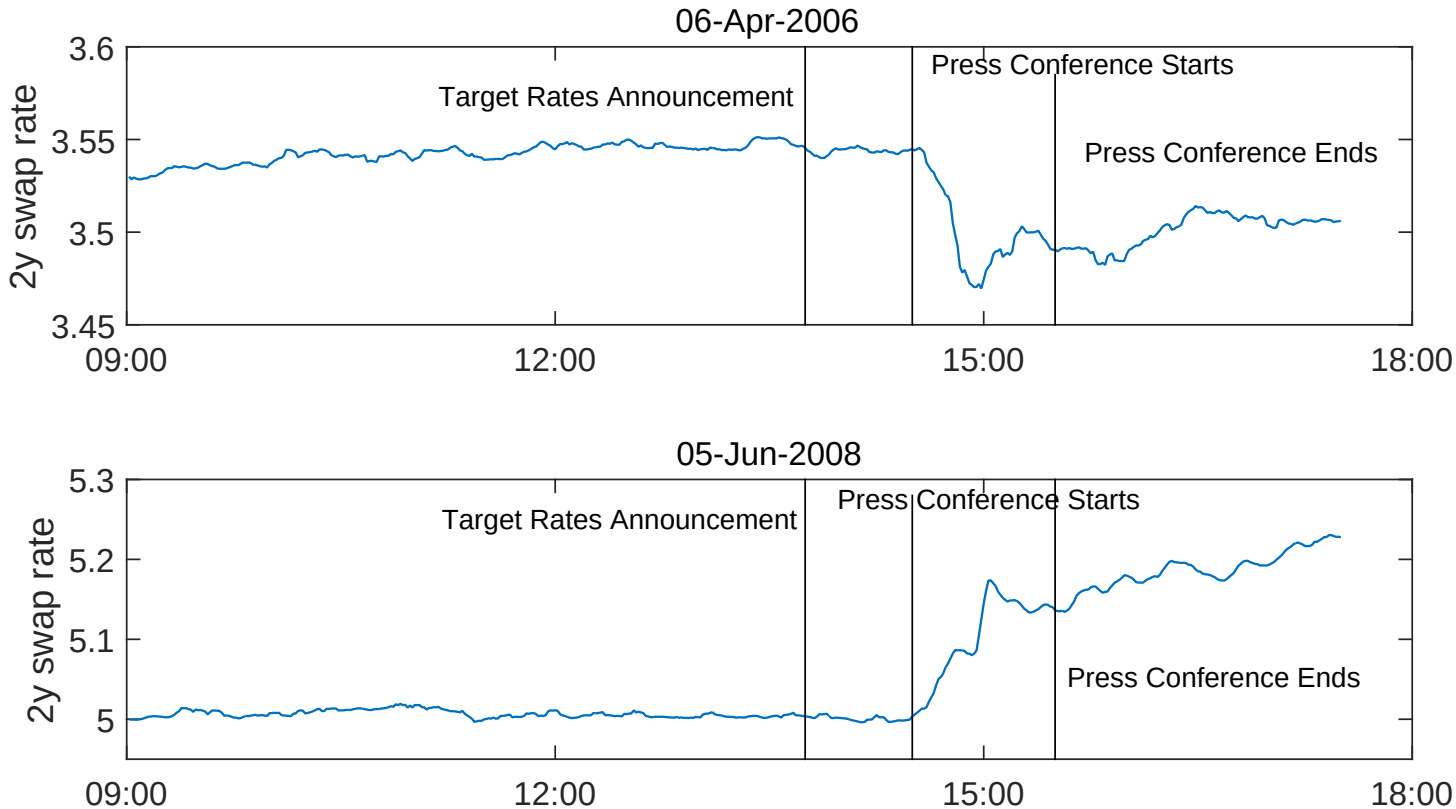
Monetary policy action moves asset prices



- 10/05/2001: "The Governing Council conducted its regular examination of monetary and economic developments and [...] decided to lower the key ECB interest rates by 25 basis points."

- 03/11/2011: Surprise 25bp cut at President Draghi's first meeting.

...but prices can move without any action taken



- 06/04/2006: rate hike "does not correspond to the current sentiment of the Governing Council."
- 05/06/2008: "we could decide to move our rates [by] a small amount in our next meeting."

What we do

- Theoretical framework in which monetary policy (communication), interpreted as news about the perceived probability of credit event / break-up, affects required returns on sovereign bonds

  $\rightarrow$ bond yields are affected not only via expectation but also a risk premium channel.

- Identify European Central Bank target and communication shocks.
- Using these shocks, we find that

  1. Pre 2009, communication has strong impact and the effect is the same across countries.
  2. After 2009, there are dramatic differences: for core countries it is the same as before, for peripheral countries it declines to zero.
  3. We link this empirically to an emergence of credit and break-up risk premia.

Literature review

Impact of monetary policy on asset prices: Kuttner (2001), Rigobon and Sack (2004), Gürkaynak, Sack, and Swanson (2005), Piazzesi (2005), Boyarchenko, Haddad, and Plosser (2017), Hanson and Stein (2015), Nakamura and Steinsson (2018), Swanson (2018), Hanson, Lucca, and Wright (2018), Boguth, Grégoire, and Martineau (2018).

$\longrightarrow$ Disentangle target from comm, evidence for the risk premium channel of comm.

Monetary policy and bond net supply: Vayanos and Vila (2009), Greenwood and Vayanos (2014), Greenwood, Hanson, and Vayanos (2016), Malkhozov, Mueller, Vedolin, and Venter (2016), Greenwood, Hanson, and Liao (2018).

$\longrightarrow$ Communication shocks have an impact on yields via the risk premium channel.

Monetary policy shock identification: Brand, Buncic, and Turunen (2010).

$\longrightarrow$ Cross-sectional difference in the Eurozone and risk premia.

Effect of ECB announcements on asset prices: Altavilla, Giannone, and Lenza (2014), Krishnamurthy, Nagel, and Vissing-Jorgensen (2017), Acharya, Eisert, Eufinger, and Hirsch (2015).

$\longrightarrow$ Focus on conventional monetary policy.

Outline

Setup

- Two-country currency union (Eurozone), core and peripheral ($i = c, p$). Focus on three dates: $t = 0$, 1 and 2.
- At $t = 0$, agents can invest at riskless rate r_0 or trade 2-period (long-term) bonds, both "safe" (swap) and "risky" (sovereign).
- At $t = 1$, bonds are also riskless $\longrightarrow$ agents invest at rate r_1.
- OLG of myopic investors, are competitive, and have mean-variance preferences over next period (terminal) wealth:

$$\max_{\{x_{i,t}\}_{i=c,p,s}} \mathrm{E}_t\left[w_{t+1}\right] - \frac{\alpha}{2}\mathrm{Var}_t\left[w_{t+1}\right],$$

where

$$w_{t+1} = \sum_{i=c,p,s} x_{i,t}\left(r_{i,t+1} - r_t\right).$$

- Bonds are in constant net supply S_i, $i = s, c, p$.

Setup (cont'd)

- Bonds are risky because (i) risk-free rate is stochastic:

$$r_{t+1} = r_t + \kappa_r \left(\theta_t - r_t\right) + Z_{r,t+1},$$

where

$$\theta_{t+1} = \theta_t + \kappa_\theta \left(\bar{\theta} - \theta_t\right) + Z_{\theta,t+1}$$

  - $Z_{r,t+1}$: target (short) rate changes unexpected by market participants
  - $Z_{\theta,t+1}$: communication shocks that provide new information about the future path of interest rates (among other things)

- (ii) and because of a credit event or Eurozone break-up: a binary variable $Z_{b,1}$, agents assign a probability of the credit event:

$$\pi_0 = \bar{\pi} - Z_{\pi,0} - \eta_r Z_{r,0} - \eta_\theta Z_{\theta,0},$$

  - If $\eta_r, \eta_\theta \neq 0$, MP provides information about the state of the economy.
  - Have $\mathrm{E}[Z_{b,1}] = \pi_0 \approx \mathrm{Var}[Z_{b,1}]$

Setup (cont'd)

- If credit event, sovereign bonds' terminal payoff drops from 1 to $e^{-\gamma_i}$.
  - Search/transaction costs, lower liquidity, redenomination, or different monetary policy.
  - E.g., after sovereign default, bond price determined at a CDS auction (Du & Zhu (2017)).
- Interpretation:
  - Post-financial crisis: $\gamma_p > \gamma_c > 0 = \gamma_s$ and at least one $\eta_j > 0$.
  - Pre-crisis: $\gamma_p = \gamma_c \geq 0 = \gamma_s$ and/or $\eta_r, \eta_\theta = 0$.

Equilibrium

Theorem

In the model described above, date-0 equilibrium bond yields are given by

$$y_{i,0} = \underbrace{\frac{1}{2}\left[\left(2-\kappa_r\right) r_0 + \kappa_r \theta_0\right]}_{\text{expectation component}} + \underbrace{\frac{1}{2}\alpha\sigma_r^2\left(S_s + S_c + S_p\right) + \frac{1}{2}\gamma_i \lambda_\pi \pi_0}_{\text{risk premium components}}, \tag{1}$$

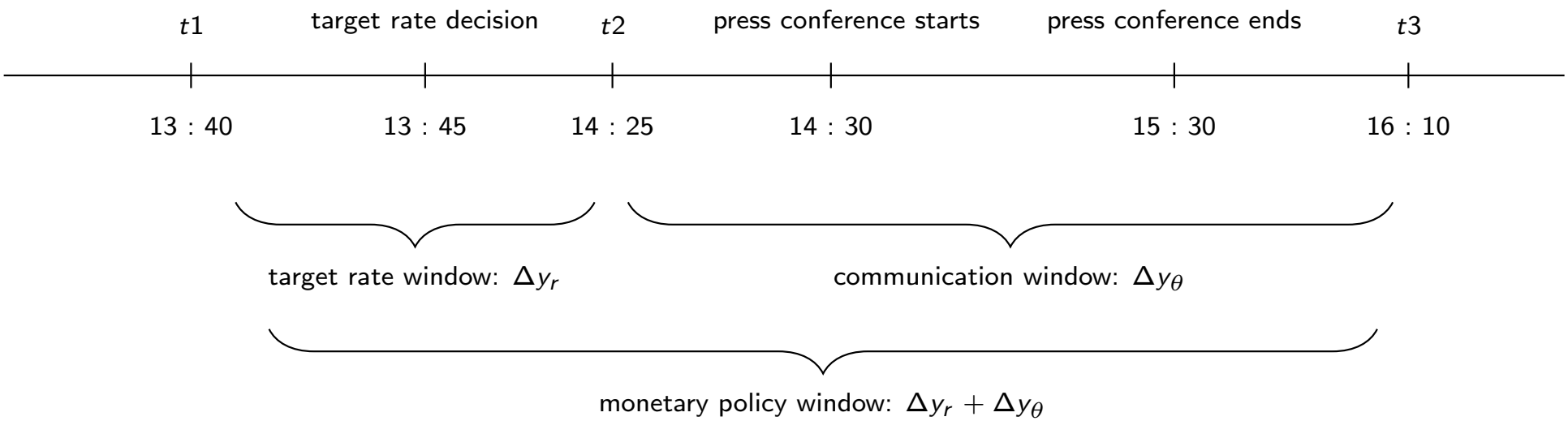
with $\lambda_\pi \equiv 1 + \alpha\left(\gamma_c S_c + \gamma_p S_p\right) > 0$.

- Yields are the average short rates over maturity + average 1-period risk premia.
- Two-fold effect of shocks through the expectation and risk premium channels.
- Expectation component is same across countries due to common short rate,
- negative communication generates higher risk premia through default probability signalling.
- This effect is stronger for credit risky peripherals.
- Overall peripheral yields are less responsive to communication shocks.

Outline

ECB Days

- Earlier literature (focus on US) uses daily data on Fed funds futures, Eurodollar futures or swap rates to identify target rate shocks (Kuttner (2001), Hanson and Stein (2015)),...
- or high-frequency data to extract target and path shocks via PCA (Gürkaynak, Sack, and Swanson (2005)).
- PCA: Factors are not identified, so GSS cannot give structural interpretation.
- We exploit the ECB institutional feature:



Data

- Tick-by-tick data on
  - OIS rates with maturities ranging between 1 and 12 months, and
  - swap rates (written on 6-month Euribor) with a 2-year maturity.
- Sample period is Jan 2001 to Dec 2014
  - 177 announcements, from which we exclude 14 that were not followed by a press conference and two when other central banks made announcements almost simultaneously.
  - Leads to a 161 (# of announcements) $\times$ 13 (# of maturities) matrix.
- Shocks are computed from swap yield changes straddling target and communication windows.
- In addition: daily zero-coupon sovereign bond yields:
  - Core countries: Germany, France (Netherlands, Belgium)
  - Peripheral countries: Italy, Spain (Portugal, Ireland)
- 2-year bid-ask spreads, daily real rates, Eurostoxx returns, Consensus Economics forecasts (unemployment, inflation, output), USD- & EUR-denom 2-year CDS.

Shocks

- PCA based on the 13 short-term swap OIS rates.
- The first PCs from each window explain most of the swap variation during the entire monetary policy window.
- Exploiting our windows, we identify these two components as:
  - Target shocks Z_r:

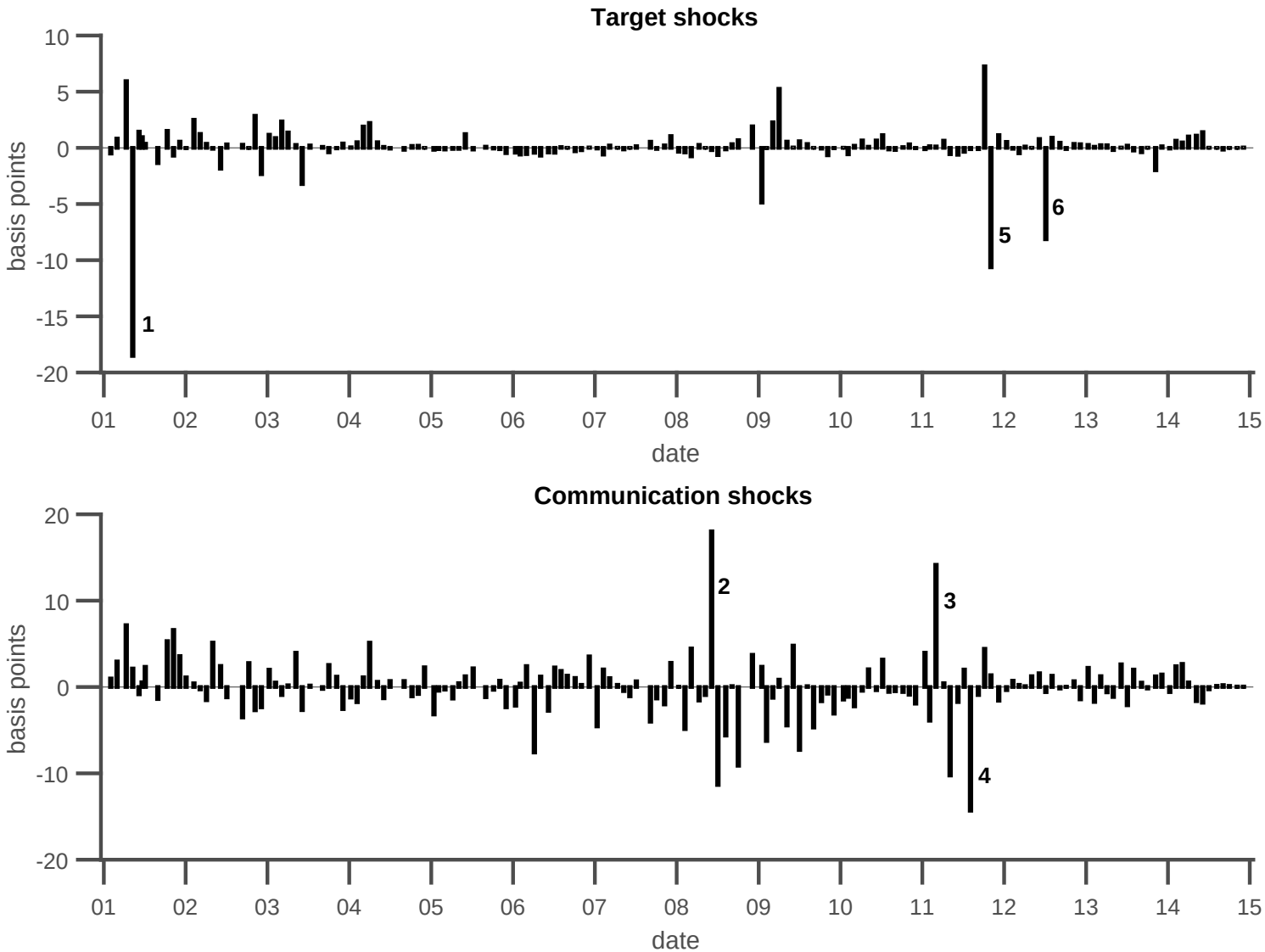
$$Z_{r,t+1} = r_{t+1} - E_t[r_{t+1}]$$

  - Communication shocks Z_θ:

$$Z_{\theta,t+1}\text{: info about } E_{t+1}[r_{t+\tau}] - E_t[r_{t+\tau}]\text{, plus else}$$

- The estimation strategy gives us a clear interpretation of the factors.

Shocks (cont'd)



1. May 10, 2001: surprise 25bp cut after bad German IP numbers.
2. June 5, 2008: Trichet announces rate hike for next meeting.

Outline

Sovereign bond yields and monetary policy

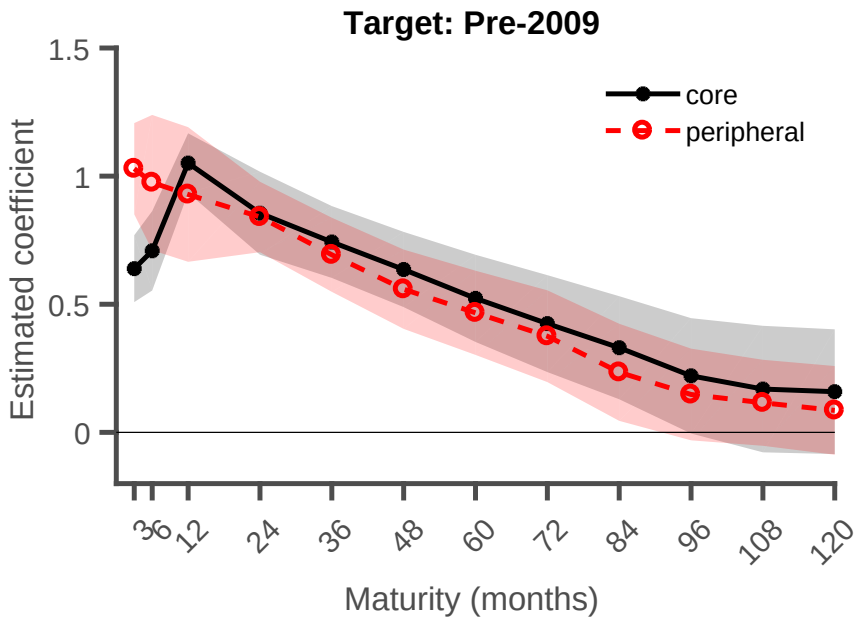
- Sovereign yield curves:
  - core = average of Germany and France
  - periphery = average of Italy and Spain.
- We regress zero-coupon yields on our monetary policy shocks:

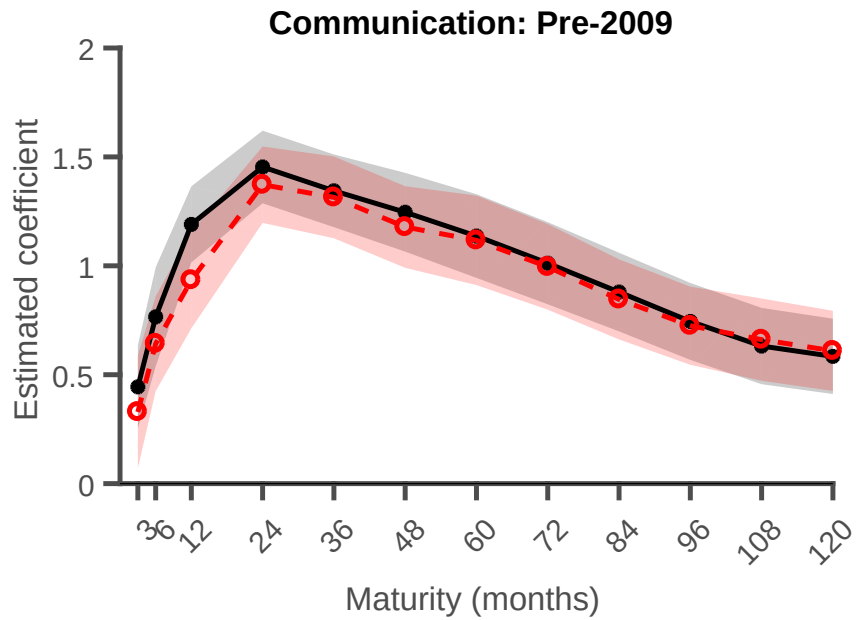
$$\Delta y_{i,t}^{\tau} = \beta_{i,r}^{\tau} Z_{r,t} + \beta_{i,\theta}^{\tau} Z_{\theta,t} + \epsilon_{i,t}^{\tau},$$

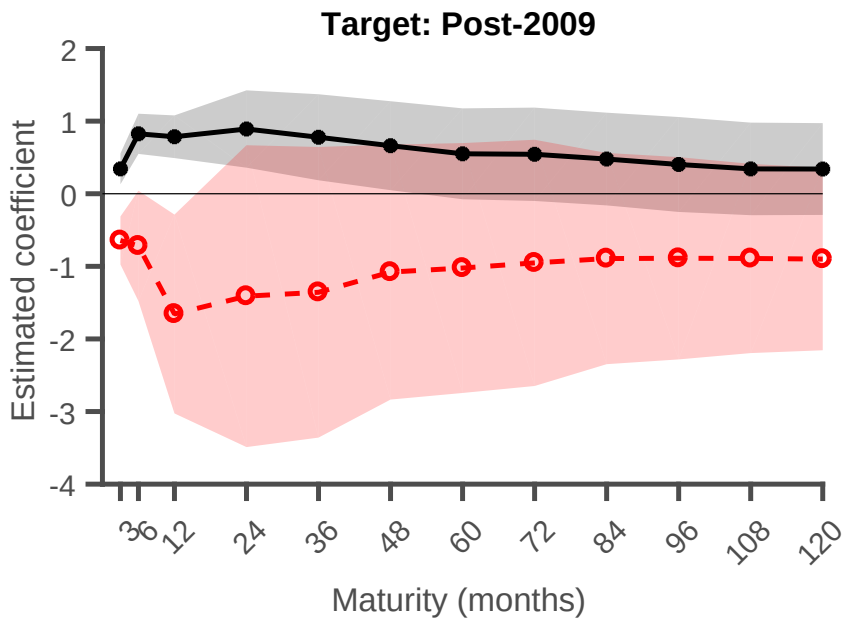
  where $\Delta y_{i,t}^{\tau}$ is the daily yield change of core or peri with maturity τ.

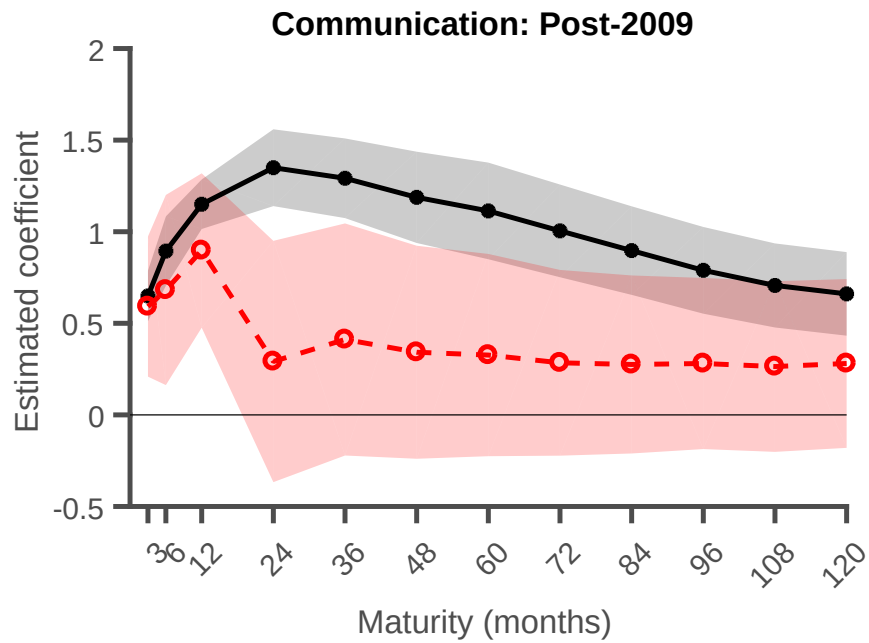
- We estimate how the sensitivity has changed over time for core and periphery:
  - splitting the sample to pre- and post-crisis (March 2009)
  - using rolling regressions.
- Propositions 1-2 suggested $\beta_{c,j} \geq \beta_{p,j}$ for $j = r, \theta$.

Effect of MP shocks before and after 2009

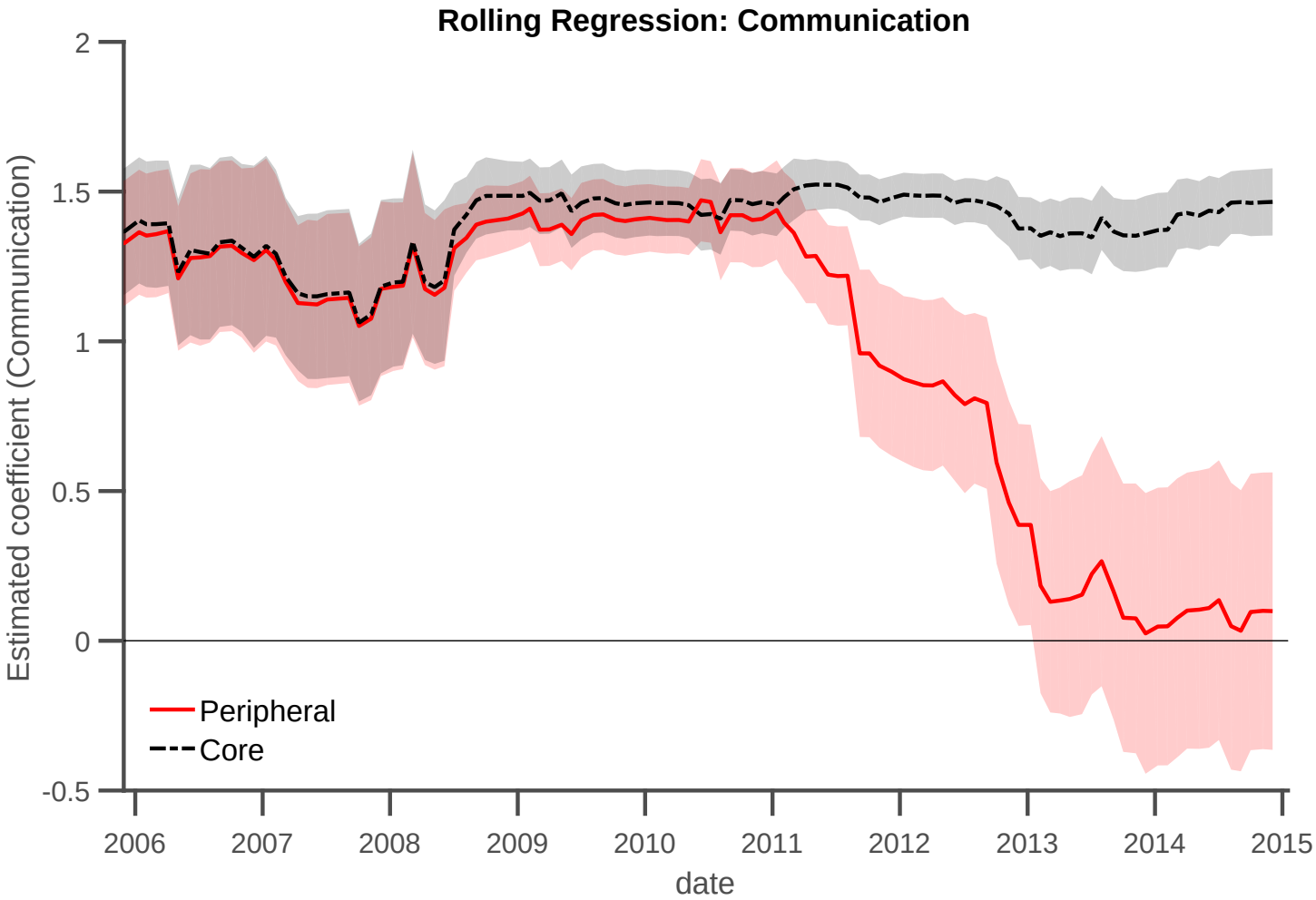






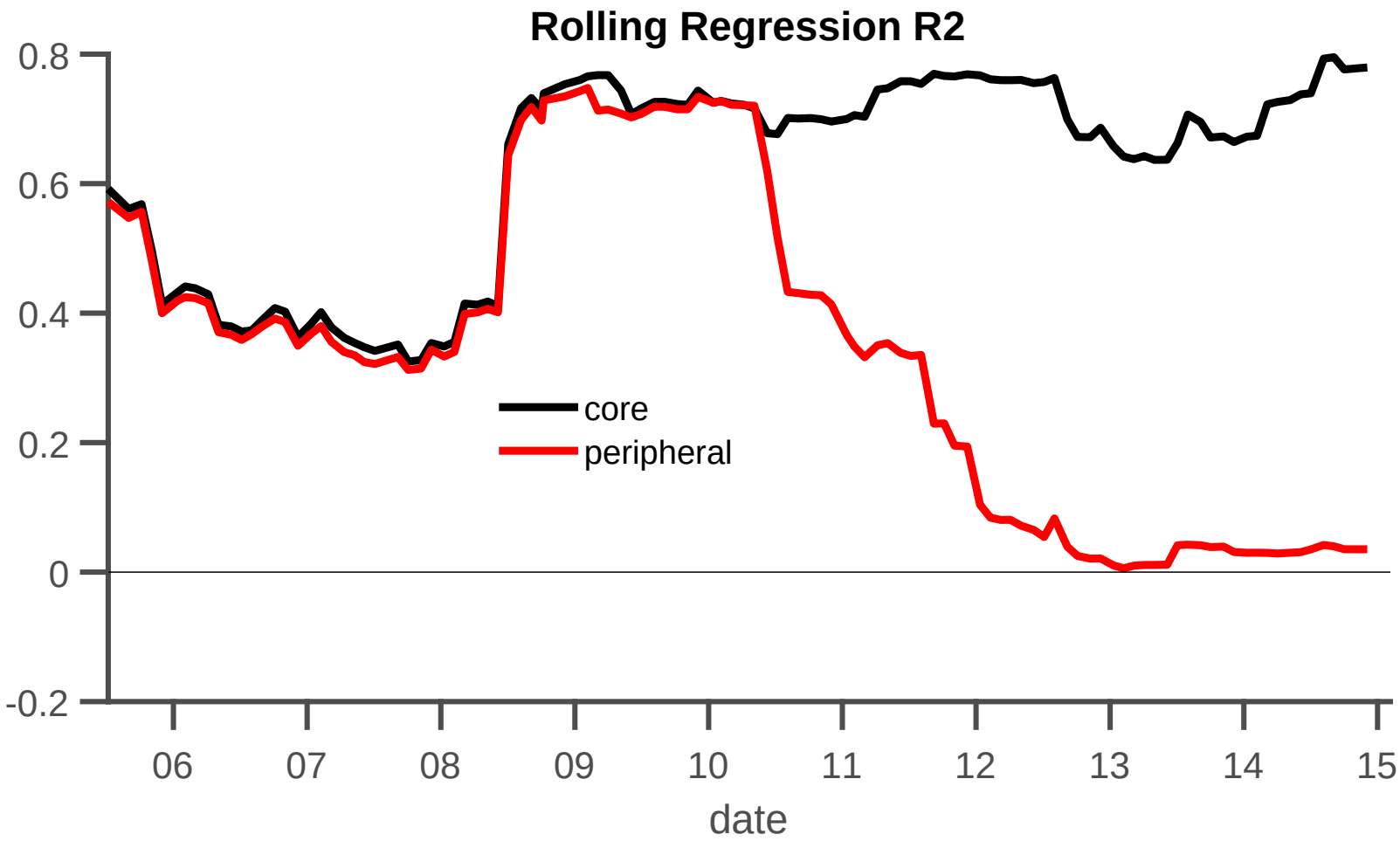


Effect of MP shocks over time

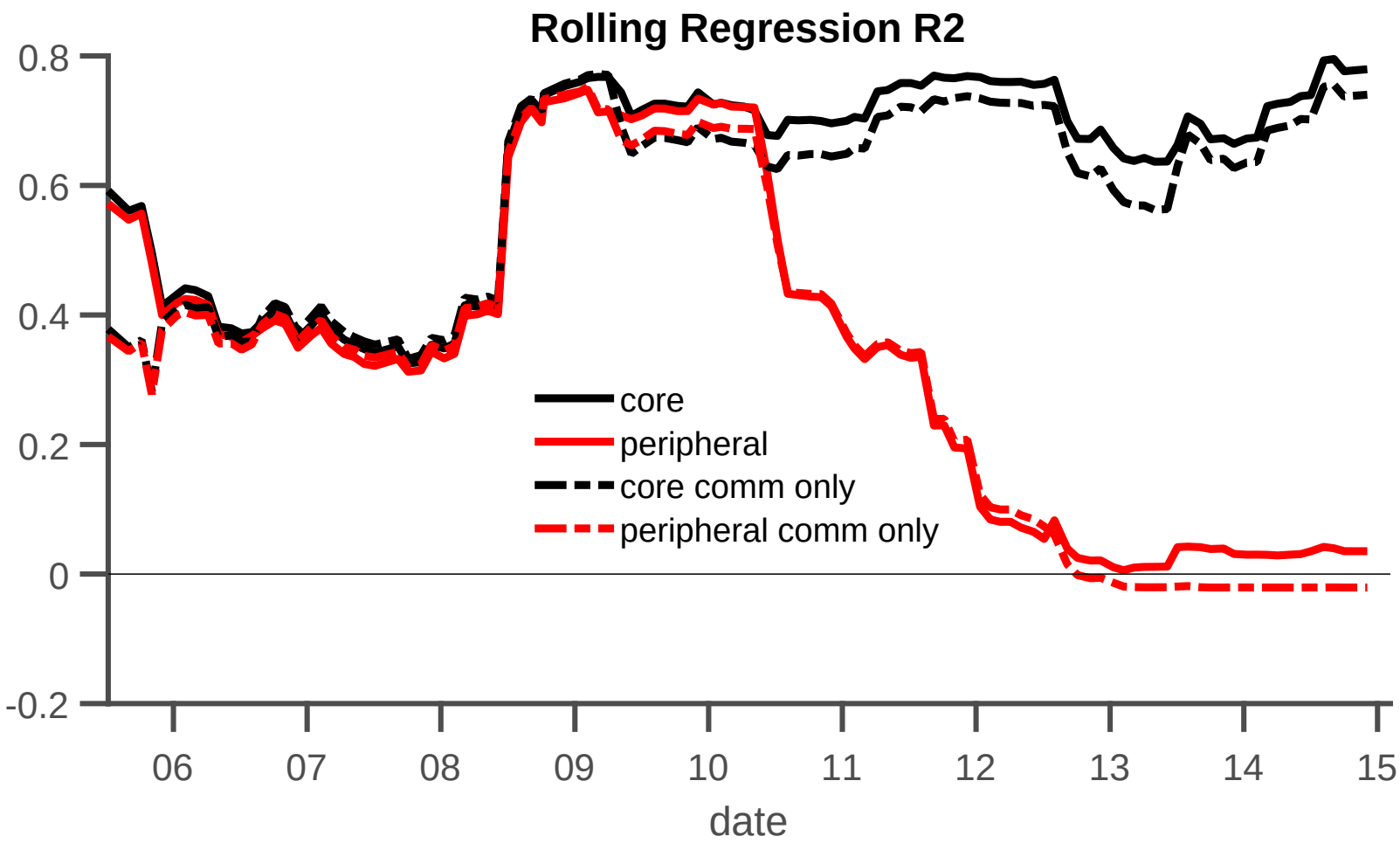


- These results suggest a structural change around 2009-2010.
- Propositions 1-2: MP contains news about the state of the economy/prob of credit event, and peri countries are more vulnerable than core.

Effect of MP shocks over time (cont'd)

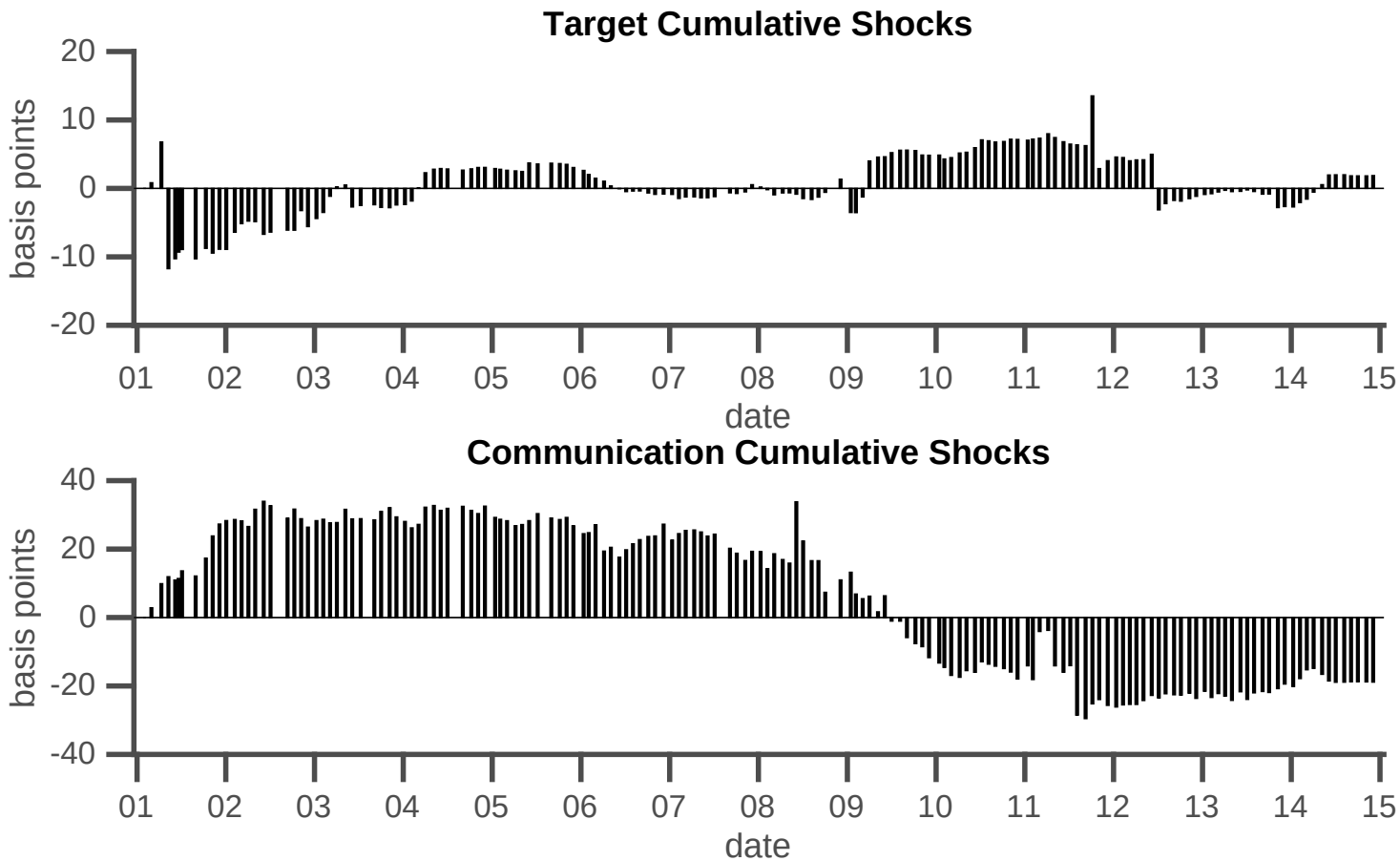


Effect of MP shocks over time (cont'd)

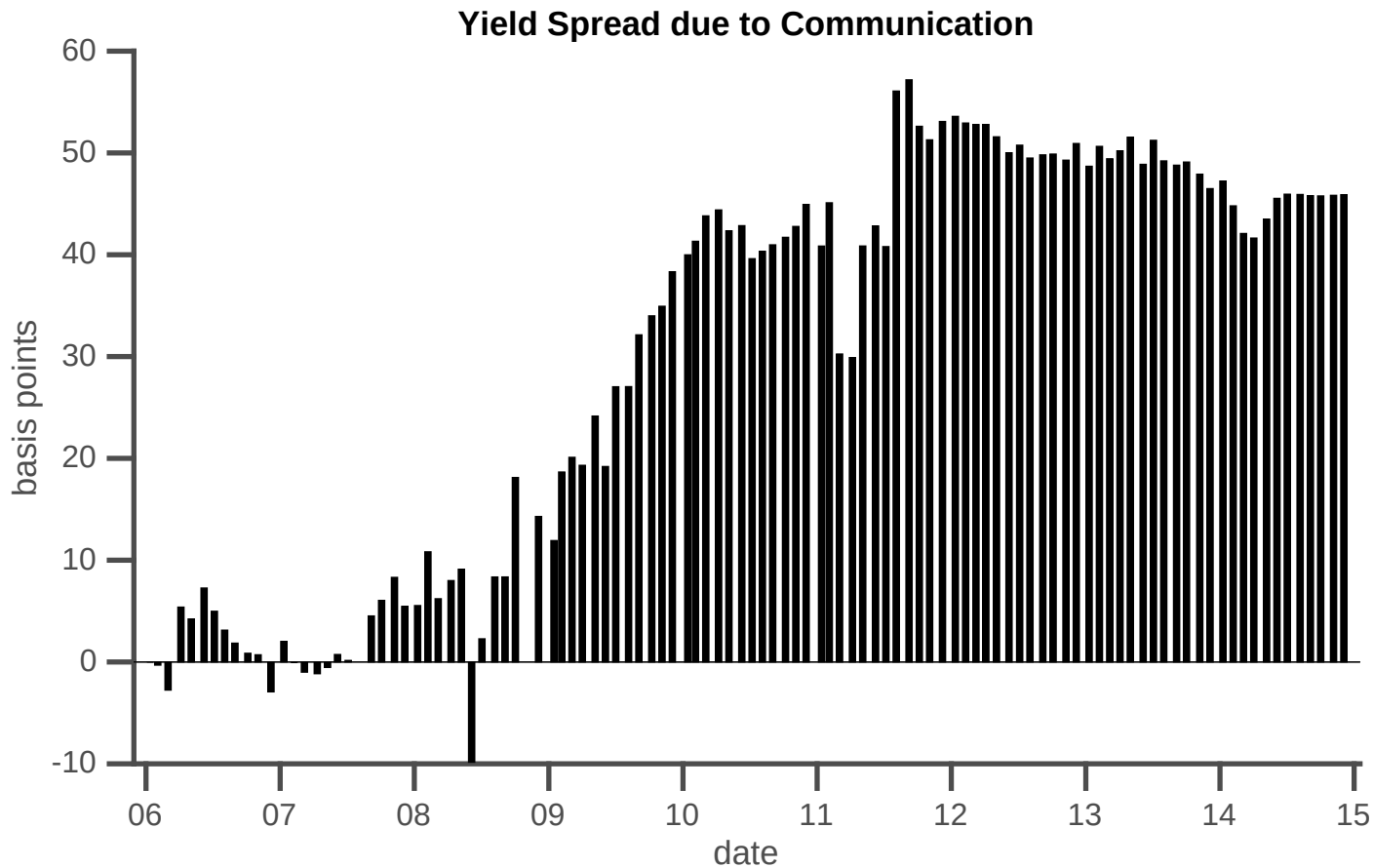


- Target effects are negligible.

Monetary policy after 2009



Monetary policy after 2009 (cont'd)



- Comm increases the yield spread until middle/end of 2011.
- In Sept 2011, spread was 270bp $\longrightarrow$ about 18% is due to communication.

Outline

Policy shocks and yield decomposition

- Definition:

$$\text{bond yield} = \text{average expected short rate} + \text{risk premium}$$

- So,

$$\Delta(y_p - y_c) = \Delta(RP_p - RP_c) = \Delta(IRP_p - IRP_c) + \Delta(RRP_p - RRP_c)$$

$\Longrightarrow$ the DID nature of our exercise suggests a risk premium story.

- Alternatives:
  a. inflation risk
  b. illiquidity
  c. country-specific credit risk
  d. Eurozone-wide breakup risk

Alternatives: Inflation

- We test

$$\Delta(y^{\tau}_{i,t} - y^{r,\tau}_{i,t}) = \alpha_i + \beta_i \, Z_{\theta,t} + \epsilon_{i,t},$$

  where $y^{\tau}_{i,t} - y^{r,\tau}_{i,t}$ is break-even inflation.

  - Captures expected inflation + inflation RP that cannot be separated.

	BE Inflation 5y			BE Inflation 10y		
	Ger	Ita	Spread	Ger	Ita	Spread
β_i	0.55	-1.74	-2.28	-0.01	-1.14	-1.13
t-stat	(4.86)	(-0.83)	(-1.05)	(-0.04)	(-1.06)	(-1.31)
R^2	17.02	-0.92	-0.11	-1.00	-0.32	-0.28

Sample Period = Aug 2010 - Dec 2014

Alternatives: Illiquidity, CDS & Quanto

- We test

$$\Delta X_{i,t} = \alpha_i + \beta_i \, Z_{\theta,t} + \epsilon_{i,t},$$

where $X_{i,t}$, $i = c, p$, is

a. bid-ask spread on 2-year bond

b. 2-year CDS in USD

c. 2-year CDS quanto spread$_i$ = CDS$_i$ (USD) − CDS$_i$ (EUR)

	Illiquidity			Credit risk			Breakup risk		
	Core	Peri	Spread	Core	Peri	Spread	Core	Peri	Spread
β_I	-0.42	0.44	**0.87**	-0.27	-0.77	-0.50	0.04	-0.15	**-0.19**
	(-8.99)	(2.04)	**(4.39)**	(-2.34)	(-1.94)	(-1.71)	(0.64)	(-2.48)	**(-2.94)**
R^2	32.43	3.90	13.17	5.30	2.06	1.25	0.39	3.90	4.33

Sample Period = Aug 2010 - Dec 2014

Outline

Monetary policy news channels and equity

- Let's add equity to the model! Log dividend is

$$d = g_1 - \gamma_s Z_{b,1}, \tag{2}$$

with $\mathrm{E}_0[g] = \bar{g} + \phi_r Z_{r,0} + \phi_\theta Z_{\theta,0} \longrightarrow$ CF news: ϕ_r and/or $\phi_\theta > 0$, and RP news: $\gamma_s > 0$ and at least one $\eta_j > 0$.

- The date-0 equilibrium stock price is

$$p_{s,0} = \underbrace{\bar{g} + \phi_r Z_{r,0} + \phi_\theta Z_{\theta,0}}_{\text{expected dividend } \mathrm{E}_0[d_1]} - \underbrace{(r_0 + \overbrace{\alpha\sigma_g^2 S_s + \gamma_s \lambda_\pi \pi_0}^{\text{risk premium components}})}_{\text{expected stock return } \mathrm{E}_0[r_{s,1}]}, \tag{3}$$

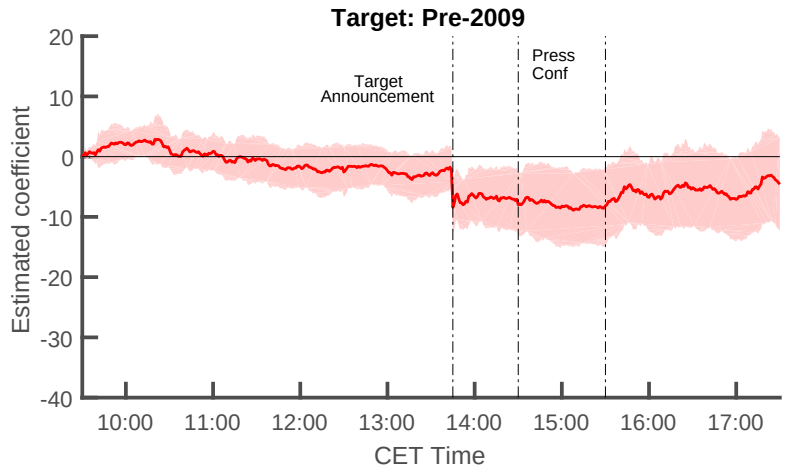
- Equity is affected by shocks and can be informative for explaining yield spread:

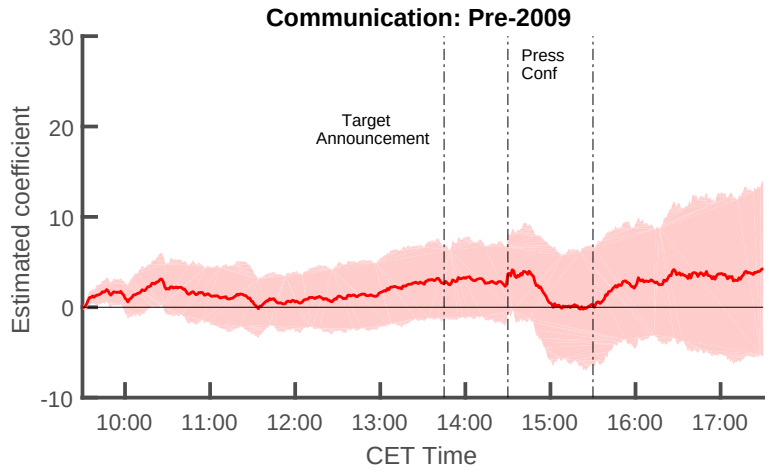
$$\Delta p_{s,0} \equiv p_{s,0} - \mathrm{E}\left[p_{s,0}\right] = \alpha_s + \beta_{s,r} Z_{r,0} + \beta_{s,\theta} Z_{\theta,0} + \varepsilon_{s,0},$$

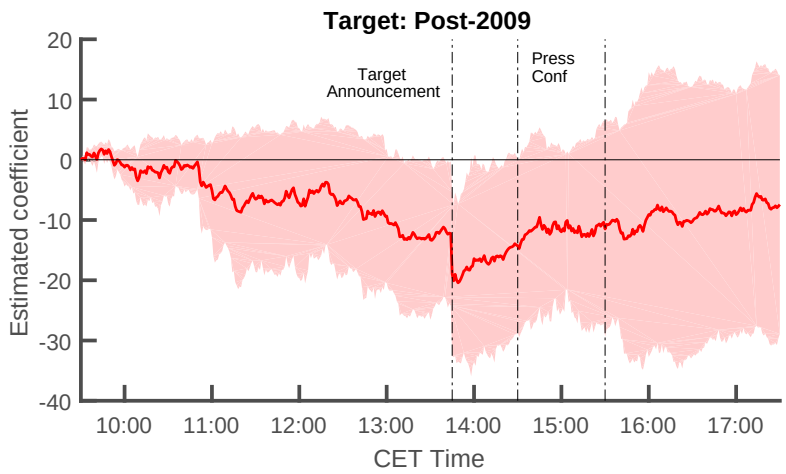
- Propositions 3-4: $\beta_{s,r} = -1 < 0$ if only SR channel, but can increase if CF / RP effect, and

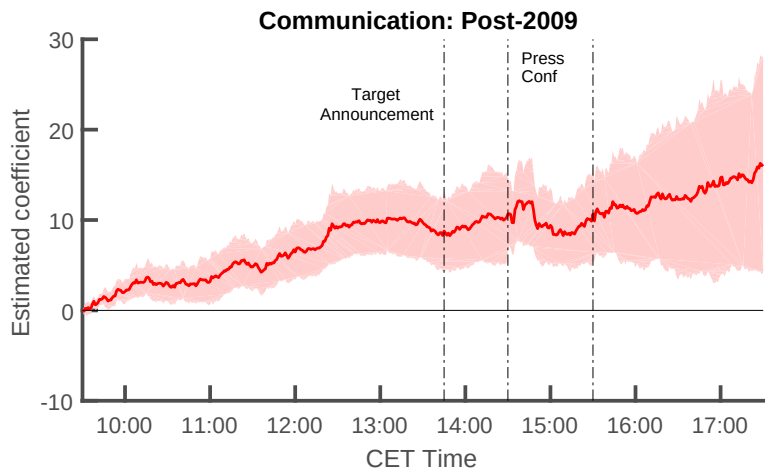
- $\beta_{s,\theta} = 0$ if only SR channel, but > 0 if CF / RP effect.

Equity response









- Around announcements, target effect is negative, comm insignificant both before and after 2009.
- Slow travel of news + information leakage: comm post-2009 is significantly positive.

Equity RP days

- So let us separate days based on sign$[\Delta\tilde{p}_{s,t}, \tilde{Z}_{\theta,t}]$: negative sign means a weak/no RP $\longrightarrow$ channel likely through only short-rate expectations.
  - Jarocinski and Karadi (2018)
- Note that if only CF effect, there should be no relation.
- For this to work, a risk premium channel must be present.

Alternatives: Illiquidity, CDS & Quanto Revisited

- We test

$$\Delta X_{i,t} = \alpha_i + \beta_i \, Z_{\theta,t} + \gamma_i \, \text{Dummy}_{s,t} \times Z_{\theta,t} + \delta_i \, \text{Dummy}_{s,t} + \epsilon_{i,t},$$

where $X_{i,t}$, $i = c, p$, is

a. bid-ask spread on 2-year bond

b. 2-year CDS in USD

c. 2-year CDS quanto spread$_i$ = CDS$_i$ (USD) − CDS$_i$ (EUR)

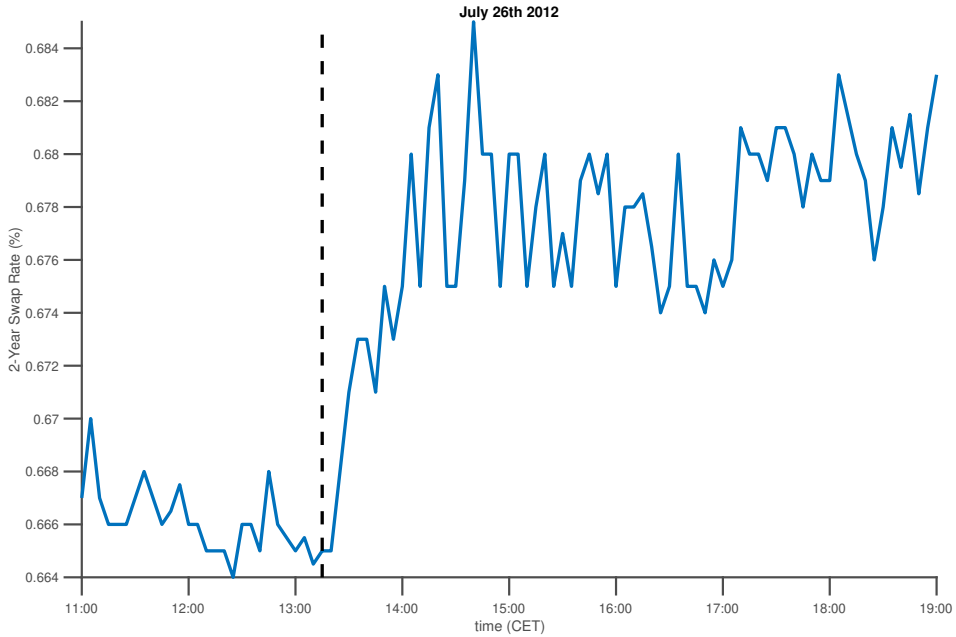
	Illiquidity			Credit risk			Breakup risk		
	Core	Peri	Spread	Core	Peri	Spread	Core	Peri	Spread
β_1	-0.36	0.22	**0.58**	-0.10	0.04	0.13	0.10	-0.05	**-0.14**
	(-10.83)	(0.97)	**(2.83)**	(-2.04)	(0.09)	(0.37)	(3.94)	(-0.83)	**(-1.93)**
γ_i	-0.25	1.99	**2.24**	-1.42	-6.35	**-4.93**	-0.46	-0.89	**-0.43**
	(-2.36)	(2.05)	**(2.46)**	(-2.03)	(-3.70)	**(-3.86)**	(-1.94)	(-5.07)	**(-1.93)**
δ_i	-0.01	-0.02	-0.01	0.01	0.03	0.02	0.00	0.01	0.00
	(-1.96)	(-0.82)	(-0.43)	(1.28)	(0.92)	(0.74)	(1.05)	(1.34)	(0.55)
R^2	36.81	7.43	17.85	15.92	11.92	8.00	-0.11	14.03	0.95

Sample Period = Aug 2010 - Dec 2014

Outline

Speeches by the ECB President

- Same pattern around speeches by ECB President: insignificant peripheral reaction to comm shocks backed out from ST swap rates.



- "Whatever it takes speech" moves 2-year swap only by 2bp,...
- but equity jumps up by $\sim 5\%$, and $\sim 2.5\%$ in the first hour.
- EQ as a separate RP shock affects only LT sovereign yields, suggesting communication has a ST and a LT dimension, too.

Outline

Conclusions

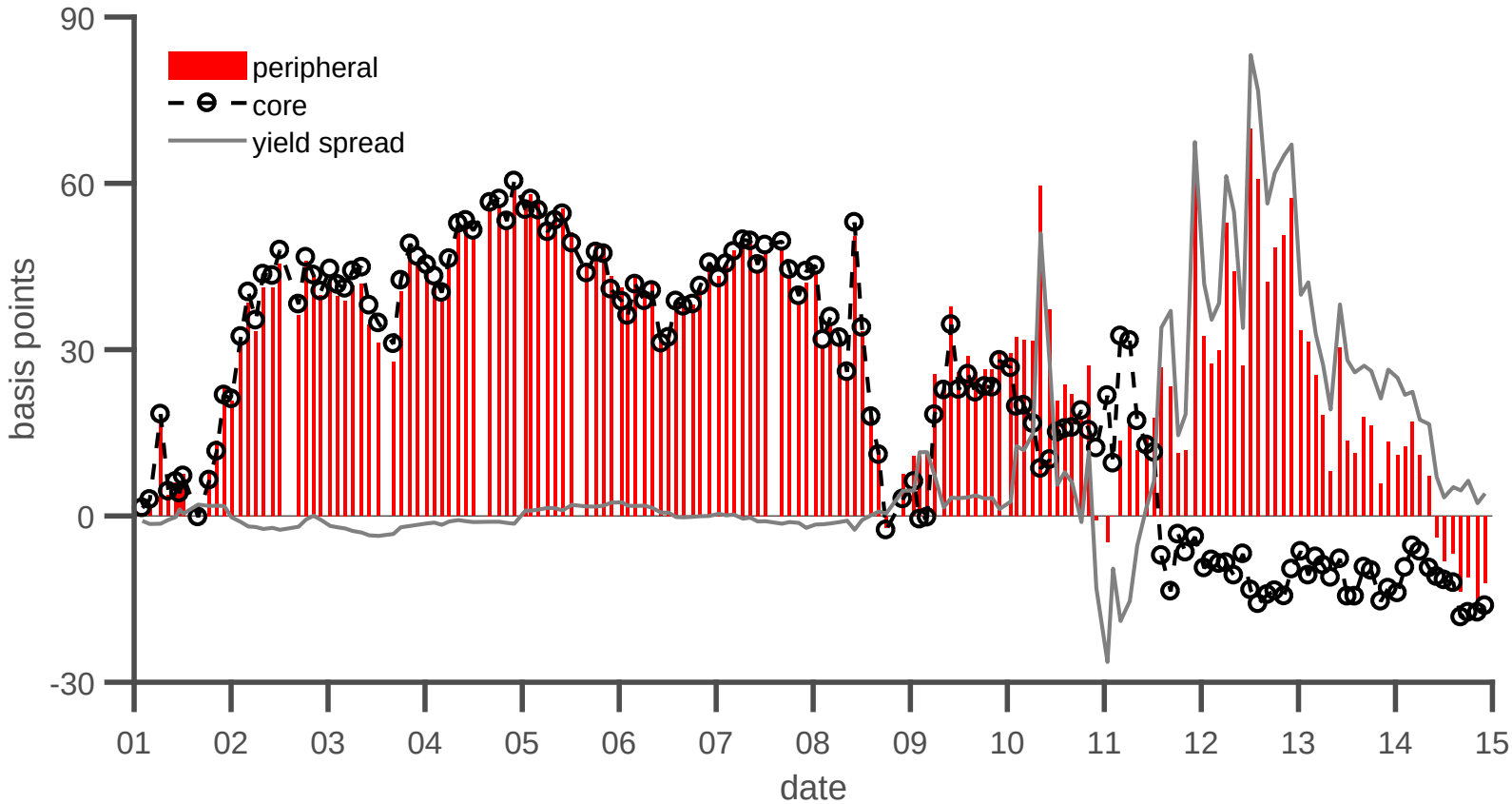
Focusing on ECB policy decision days, we identify target and communication shocks in high frequency and find:

- Most of the variation in bond yields is driven by communication shocks.
- Pre-crisis there is no differential effect between core and peripheral, whereas post-crisis we observe dramatic differences.
- ECB communication reveals information to the market about the future path of the economy.
- We show this is related to an illiquidity, credit and break-up risk premium and develop a model to understand this channel.

Thank you!

Outline

Sovereign yield changes on ECB days

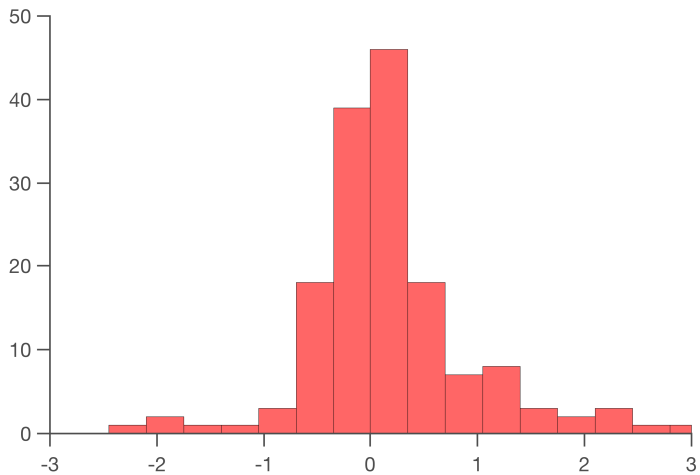


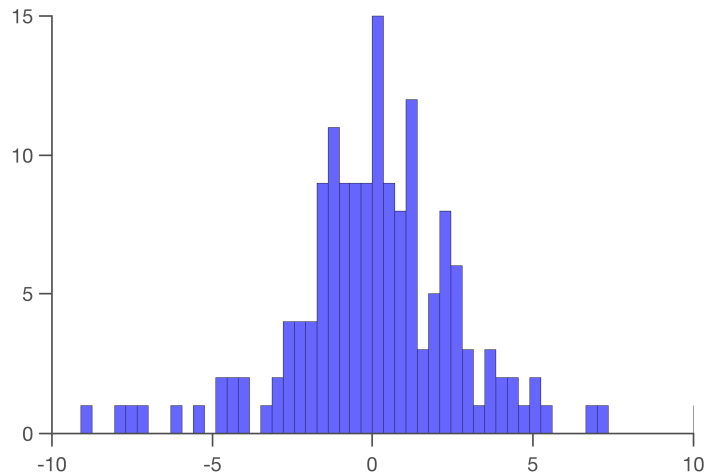
- Eurozone sovereign yield divergence from 2009, but also on ECB days.

Summary statistics (bp)

	Target	Comm
Mean	0.01	−0.11
Std Dev	2.18	3.51
Min	−18.52	−14.44
Max	7.27	17.91
Skew	−4.49	0.34
Kurtosis	39.13	10.12
AR(1)	−0.29	−0.16

Histogram of shocks





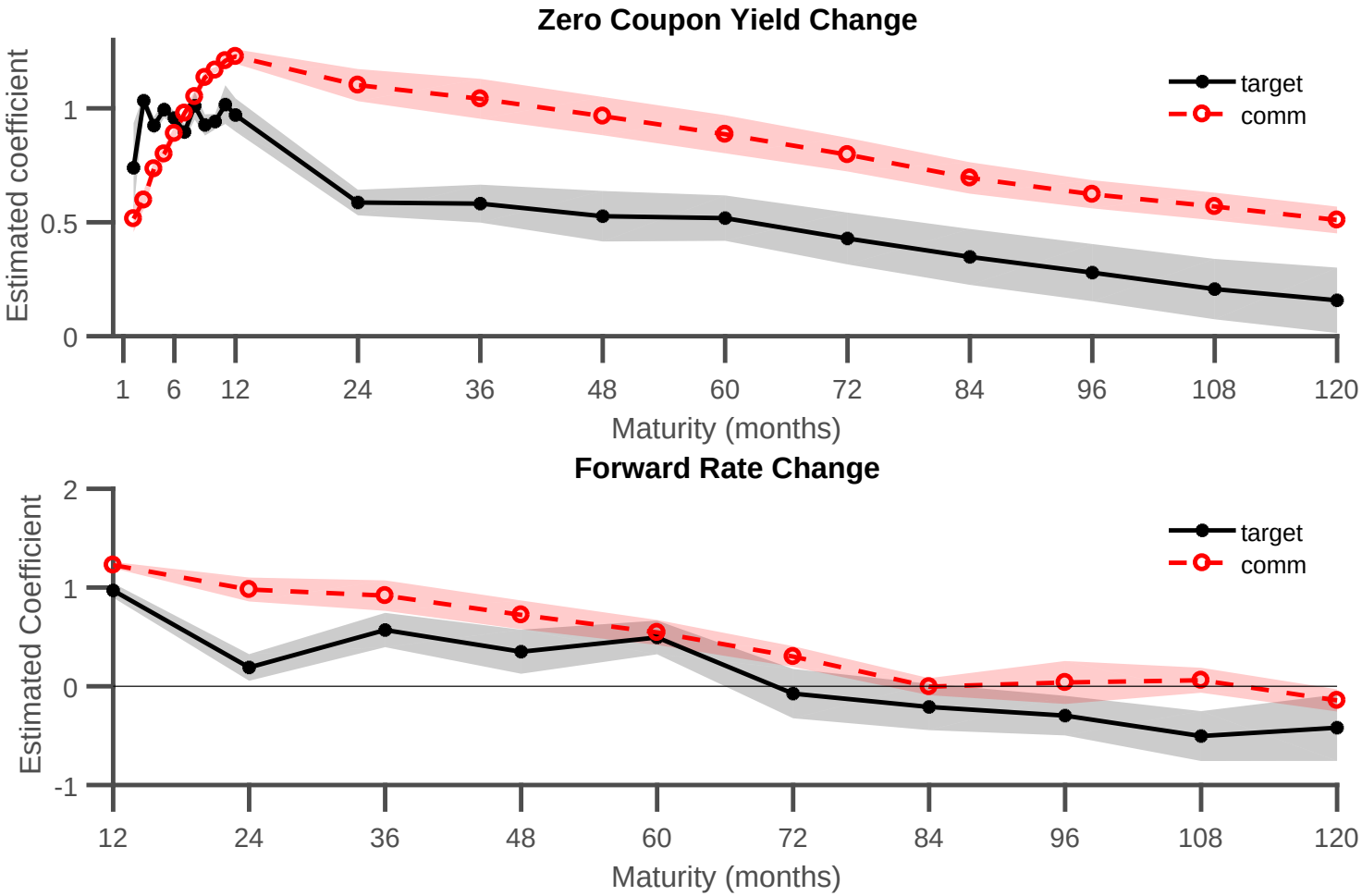
- Left panel is target shocks, right panel is communication shocks.

Shocks (cont'd)

$$\Delta y^{\tau}_{r,t} + \Delta y^{\tau}_{\theta,t} = \beta_1 PC1_t + \beta_2 PC2_t + \varepsilon^{\tau}_t$$

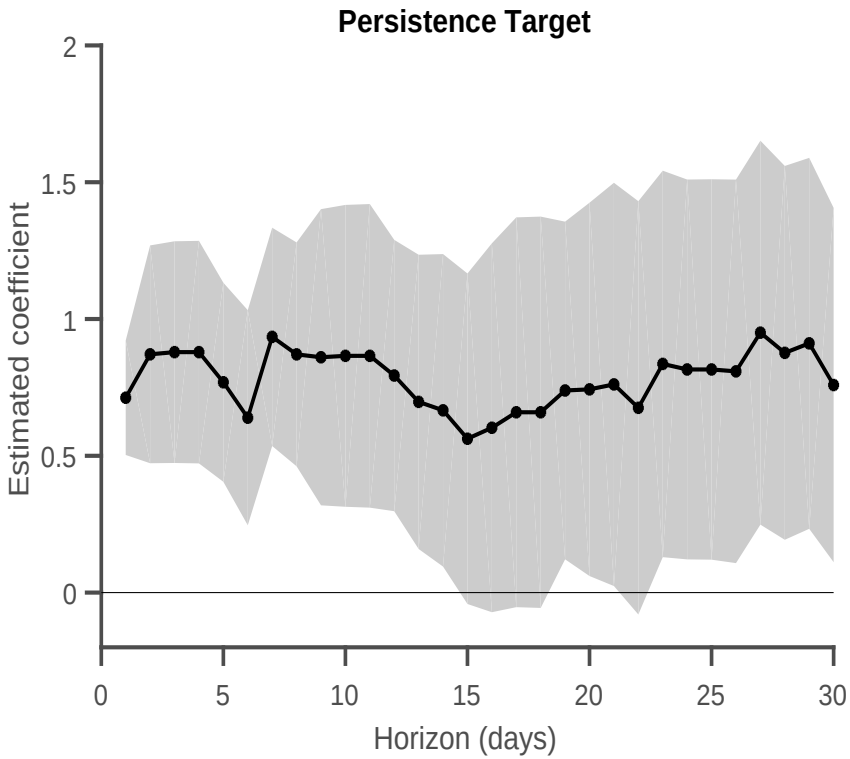
	3m	6m	12m	24m	60m	120m
			Target Window			
PC1	0.77	1.05	1.09	1.05	0.59	0.24
t-stat	(4.26)	(18.75)	(16.30)	(15.91)	(3.90)	(1.55)
R^2	38.92%	36.79%	22.87%	20.84%	9.65%	3.91%
PC2	0.18	0.09	−0.06	−0.05	−0.17	−0.11
t-stat	(3.09)	(1.46)	(−0.78)	(−0.66)	(−2.23)	(−1.70)
ΔR^2	4.96%	0.49%	−0.27%	−0.33%	1.45%	1.16%
			Communication Window			
PC1	0.53	0.82	1.23	1.25	0.98	0.57
t-stat	(10.48)	(19.55)	(44.86)	(41.15)	(24.82)	(9.09)
R^2	44.37%	58.24%	78.36%	81.20%	75.84%	56.67%
PC2	0.15	0.02	−0.23	−0.29	−0.59	−0.42
t-stat	(1.95)	(0.23)	(−2.03)	(−2.86)	(−7.06)	(−7.20)
ΔR^2	2.33%	−0.22%	2.04%	3.17%	17.05%	16.89%

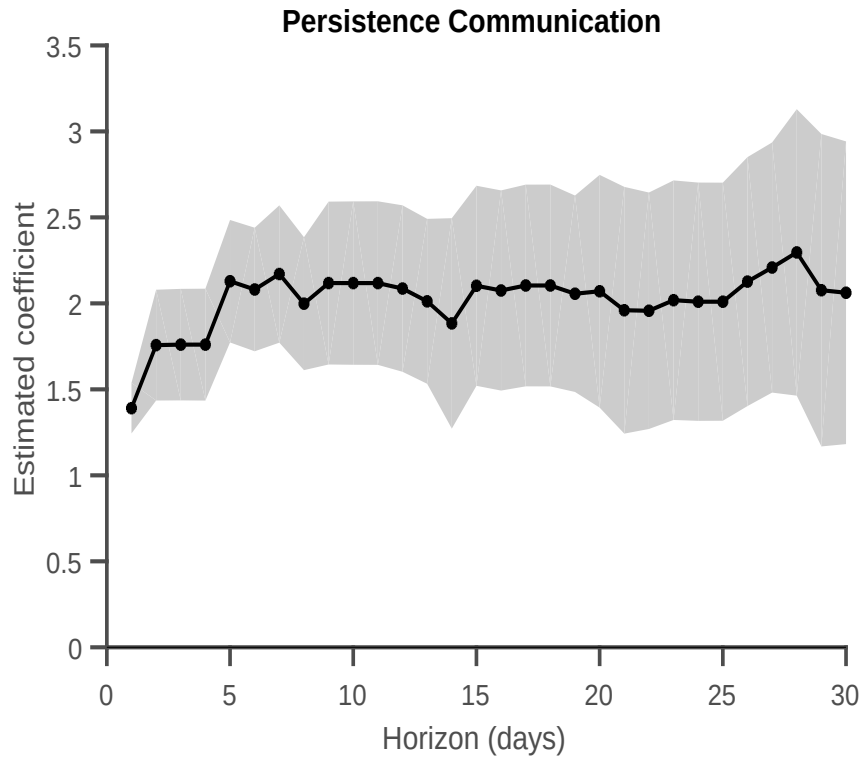
Shocks – Zero-coupon swap yield reaction



- Cochrane and Piazzesi (2002): 100bp increase in 1m Eurodollar at FOMC meeting ↑ 52bp in 10y nominal Treasury
- Hanson and Stein (2015): 100bp ↑ in 2y nom yield ↑ 42bp in 10y forward real interest rate

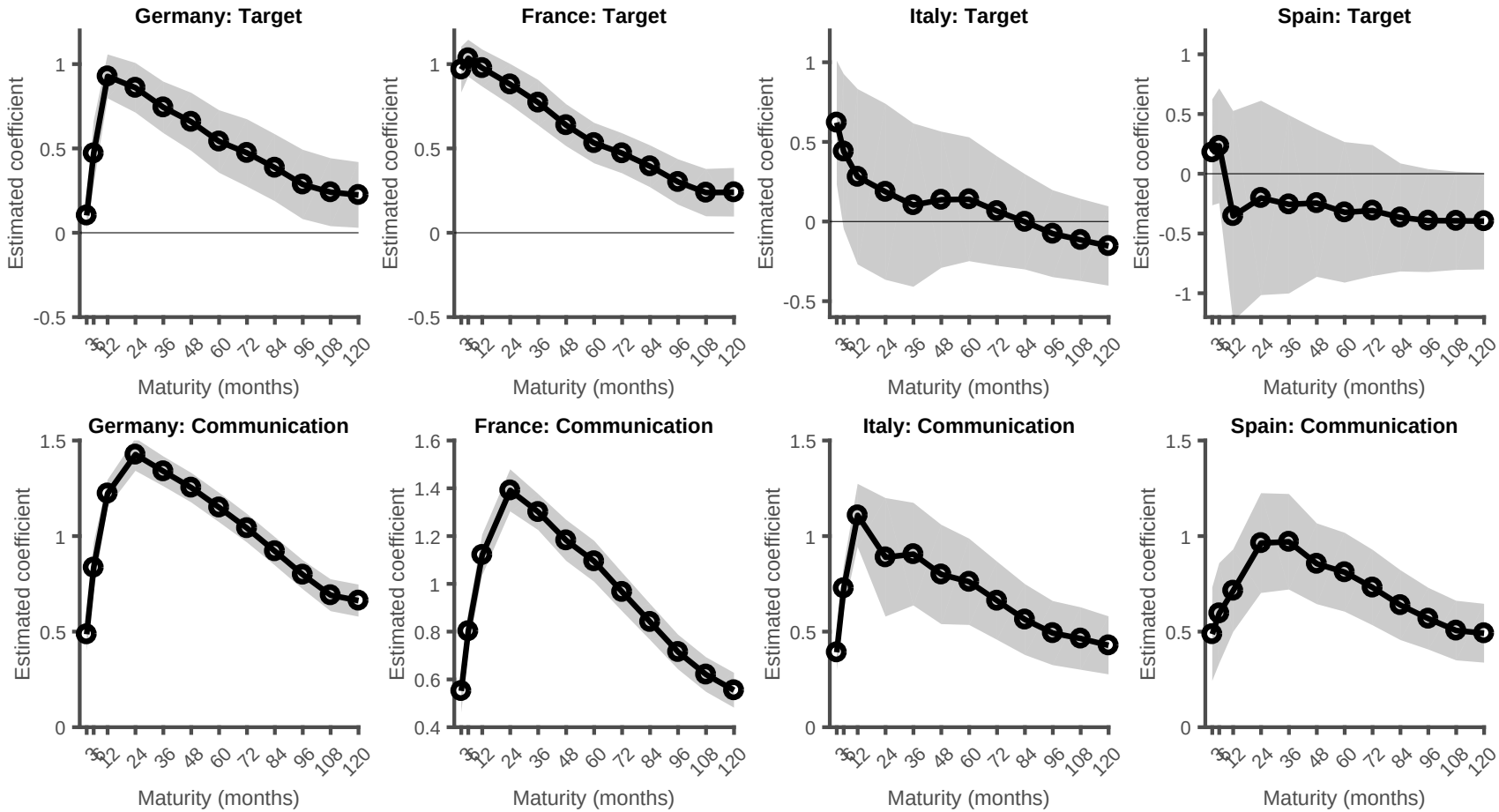
Shocks – Zero-coupon swap-yield reaction persistence



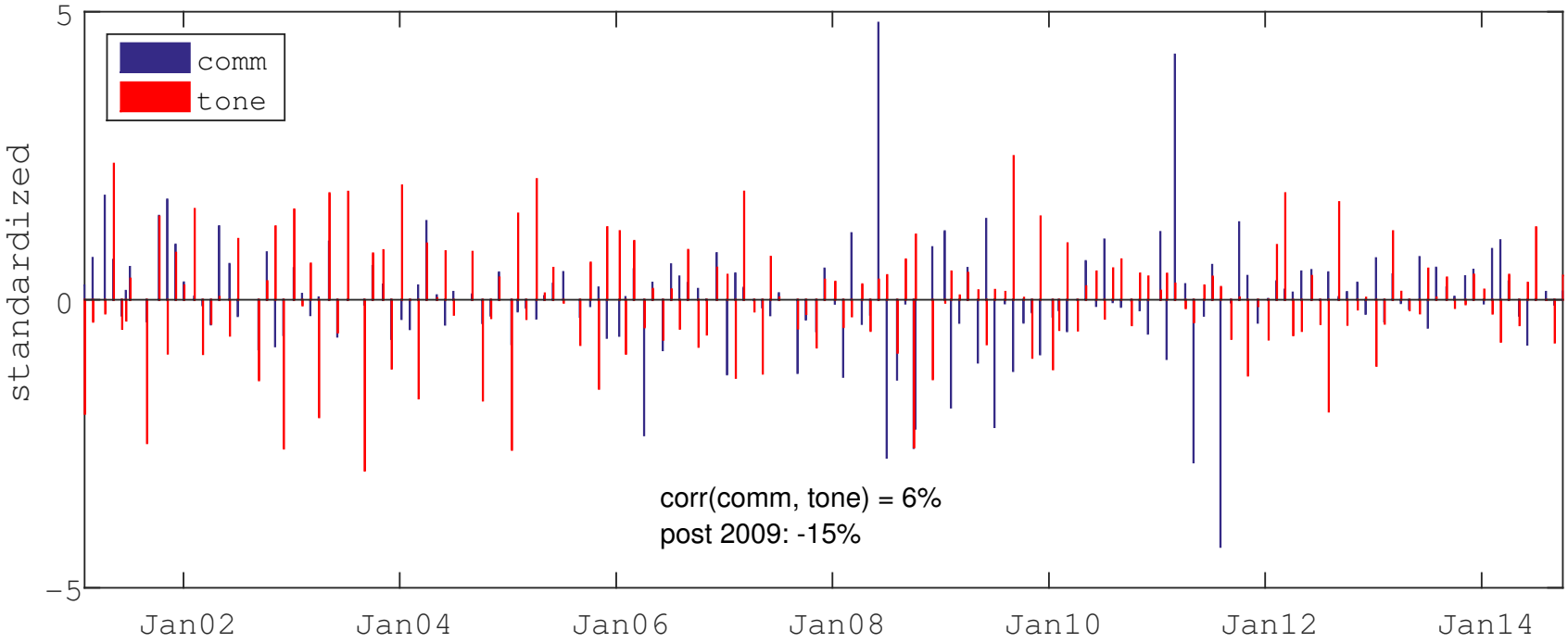


- Persistence:
  - Woodford (2012) vs Swanson (2018) on asset purchase forward guidance
  - Hanson, Lucca, and Wright (2018): high-frequency analysis faulty as excess vol due to slow-moving capital
  - Brooks, Katz, and Lustig (2018): permanent via driving fund flows

Sovereign results country-by-country (full sample)



Communication and textual analysis



- Use "tone measure" of Schmeling and Wagner (2017) which is defined as tone $= 1 - N/T$, where N is the number of negative words and T the total number of words.
- Correlation with our communication shock is very low and even negative post-2009.

Shocks

- Calculate PCs in overall, target, and communication windows:

	PC1	PC2	PC3
Monetary Policy	87.68%	6.56%	2.48%
Target	86.36%	5.66%	1.71%
Communication	89.14%	4.15%	2.90%

- PCA over whole MP window concludes that 2 PCs explain the vast majority of event day variation:
  - 2 shocks do matter for asset pricing,
  - but still unidentified.

Unconventional Monetary Policy Dates

Date	Program	What
May 5, 2010	SMP	Government debt purchase of distressed countries (Greece, Ireland, and Portugal)
August 8, 2011	SMP	Extension of first round of SMP to include Italy and Spain
December 1, 2011	LTRO	Draghi's speech at European parliament
December 8, 2011	**LTRO**	**Announcement of 3-year loan scheme for European banks.**
July 26, 2012	OMT	Draghi's "whatever it takes" and "believe me, it will be enough" speech at investors' conference
August 2, 2012	**OMT**	**OMT mentioned at press conference**
September 6, 2012	**OMT**	**Official announcement**
June 5, 2014	LTRO	Operations that provide financing to credit institutions for periods of up to four years.
August 22, 2014	APP	Draghi's speech at Jackson Hole
September 4, 2014	**APP**	**Asset-backed securities purchase programme (ABSPP) and third covered bond purchase programme (CBPP3)**
October 2, 2014	**APP**	**ABSPP and third covered bond purchase programme (CBPP3)**
November 6, 2014	**APP**	**Draghi expresses commitment to using additional unconventional instruments within its mandate.**
November 21, 2014	APP	President Draghi's speech at the Frankfurt European Banking Congress "ECB will do what it must"

Monetary Policy on UMP Days

		Z_r	Z_θ
LTRO	December 8, 2011	0.01	-0.02
OMT	August 2, 2012	0.01	0.01
OMT	August 2, 2012	0.01	0.01
APP	September 4, 2014	0.00	0.00
APP	October 2, 2014	0.00	0.00
APP	November 6, 2014	0.00	0.00

Model extension 1: Multi-period model

- Suppose trading at $t = ..., -1, 0, 1, ...$ and bonds with maturities $\tau = 1, ..., T$ available.

- The target rate follows

$$r_{t+1} = r_t + \kappa_r \left(\theta_t - r_t\right) + Z_{r,t+1},$$

where

$$\theta_{t+1} = \theta_t + \kappa_\theta \left(\bar{\theta} - \theta_t\right) + Z_{\theta,t+1},$$

and $Z_{r,t+1}$ and $Z_{\theta,t+1}$ are interpreted as target and communication shocks.

- Finally,

$$\pi_{t+1} = \pi_t + \kappa_\pi \left(\bar{\pi} - \pi_t\right) - Z_{\pi,t+1} - \eta_r Z_{r,t+1} - \eta_\theta Z_{\theta,t+1}.$$

Theorem

In the term structure model described above, there exists an equilibrium in which yields are affine and given by

$$y_{i,t}^{\tau} = \frac{A_i(\tau)}{\tau} + \frac{B(\tau)}{\tau} r_t + \frac{C(\tau)}{\tau} \theta_t + \frac{D_i(\tau)}{\tau} \pi_t. \tag{4}$$

Model extension 1: Multi-period model (cont'd)

Theorem

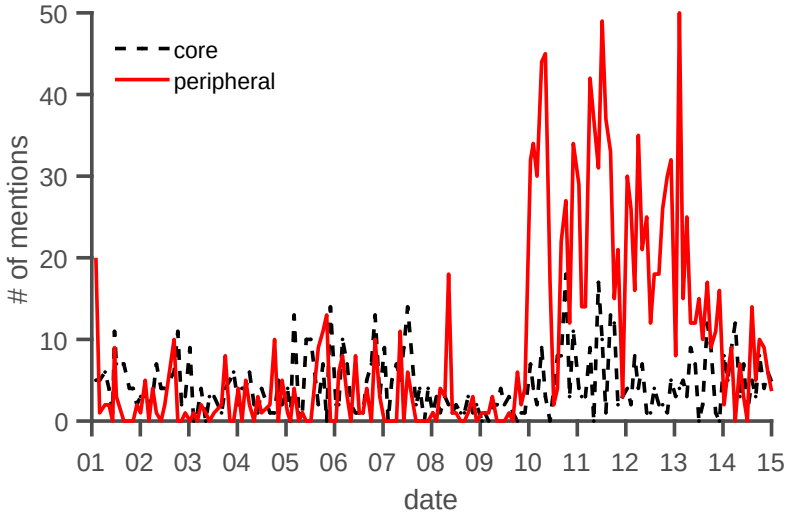
Theoretical coefficients in the $Z_{r,t+1}$ and $Z_{\theta,t+1}$ regression are

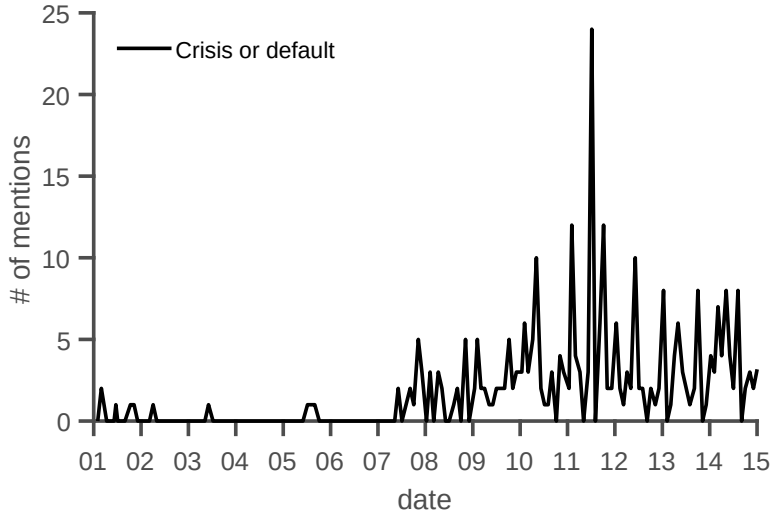
$$\beta_{i,r}^{\tau} = \frac{B(\tau)}{\tau} + \eta_r \frac{D_i(\tau)}{\tau} \text{ and } \beta_{i,\theta}^{\tau} = \frac{C(\tau)}{\tau} + \eta_\theta \frac{D_i(\tau)}{\tau}.$$

Theorem

The impact of target rate shocks satisfies $\beta_{c,\theta}^{\tau} > \beta_{p,\theta}^{\tau}$; moreover, as long as $\eta_r < \bar{\eta}_r$, it is positive and decreasing across maturities, otherwise negative and increasing. The impact of communication shocks satisfies $\beta_{c,\theta}^{\tau} > \beta_{p,\theta}^{\tau}$; moreover, as long as $\eta_\theta < \bar{\eta}_\theta$, it is positive and hump-shaped across maturities, otherwise negative and V-shaped.

Model extension 2: Home bias





- Suppose banks face heterogeneous losses if break-up:

	c bond	p bond
c bank	$\gamma_{c,c}$	$\gamma_{c,p}$
p bank	$\gamma_{p,c}$	$\gamma_{p,p}$

- Peripheral bond loss given default is higher than bonds issued by core countries: $\gamma_{c,p} > \gamma_{c,c}$ and $\gamma_{p,p} > \gamma_{p,c}$,
- and more so for core banks: $\gamma_{c,p}/\gamma_{c,c} > \gamma_{p,p}/\gamma_{p,c}$.

Model extension 2: Home bias (cont'd)

Lemma

There exists an equilibrium in which risk premia on the two bonds are given by

$$E_t\left[R_{c,t+1}\right] - r_t = \psi_c h\left(\pi_t\right) \text{ and } E_t\left[R_{p,t+1}\right] - r_t = \psi_p h\left(\pi_t\right),$$

where

$$0 < \psi_c < \psi_p \text{ and } h'\left(.\right) > 0.$$

Moreover, $x_{c,c,t}$ *and* $x_{p,p,t}$ *increase in* π_t.

- All agents would like to sell peripheral bonds if break-up probability increases.
- Peripheral agent portfolios end up tilted towards peripheral bonds (home bias).
- They do so only if ex-ante compensated (risk premium increases).
- Regression coefficients are $\beta_{c,r} > \beta_{p,r}$ and $\beta_{c,\theta} > \beta_{p,\theta}$.

Alternatives: Inflation

- We test

$$\Delta(y^{\tau}_{i,t} - y^{r,\tau}_{i,t}) = \alpha_i + \beta_i \, Z_{\theta,t} + \gamma_i \underbrace{\text{Dummy}_{pc,t} \times Z_{\theta,t}}_{\text{interaction}} + \delta_i \, \text{Dummy}_t + \epsilon_{i,t},$$

  where $y^{\tau}_{i,t} - y^{r,\tau}_{i,t}$ is break-even inflation.

  - Captures expected inflation + inflation RP that cannot be separated.

	BE Inflation 5y			BE Inflation 10y		
	Ger	Ita	Spread	Ger	Ita	Spread
β_i	0.91	-11.12	-12.03	-0.89	-4.12	-3.23
	(1.70)	(-1.33)	(-1.49)	(-1.65)	(-0.98)	(-0.80)
γ_i	-0.38	10.60	10.98	0.99	3.24	2.24
	(-0.66)	(1.30)	(1.40)	(1.49)	(0.81)	(0.56)
δ_i	-0.01	-0.13	-0.12	-0.01	0.03	0.04
t-stat	(-1.36)	(-1.28)	(-1.10)	(-0.86)	(0.39)	(0.50)
R^2	18.58	0.58	1.31	-4.35	-2.92	-3.14

Sample Period = Aug 2010 - Dec 2014

Alternatives: Inflation with YS + equity RP days

- We test

$$\Delta(y^{\tau}_{i,t} - y^{r,\tau}_{i,t}) = \alpha_i + \beta_i\, Z_{\theta,t} + \gamma_i\, \text{Dummy}_{pc+s,t} \times Z_{\theta,t} + \delta_i\, \text{Dummy}_{pc+s,t} + \epsilon_{i,t},$$

where $y^{\tau}_{i,t} - y^{r,\tau}_{i,t}$ is break-even inflation.

  - Captures expected inflation + inflation RP that cannot be separated.

	BE Inflation 5y			BE Inflation 10y		
	Ger	Ita	Spread	Ger	Ita	Spread
β_i	0.51	-0.89	-1.40	0.10	-0.46	-0.56
	(4.16)	(-0.51)	(-0.80)	(1.09)	(-0.64)	(-0.86)
γ_i	0.28	-6.32	-6.60	-1.23	-9.95	**-8.72**
	(0.51)	(-0.54)	(-0.58)	(-0.65)	(-3.53)	**(-2.15)**
δ_i	0.00	-0.01	-0.01	0.02	0.25	0.23
	(0.08)	(-0.04)	(-0.04)	(0.93)	(1.86)	(1.58)
R^2	14.20	-3.35	-2.33	-3.51	17.43	14.43

Sample Period = Aug 2010 - Dec 2014

Alternatives: Illiquidity, CDS & Quanto with YS + equity RP days

- We test

$$\Delta X_{i,t} = \alpha_i + \beta_i \, Z_{\theta,t} + \gamma_i \, \text{Dummy}_{pc+s,t} \times Z_{\theta,t} + \delta_i \, \text{Dummy}_{pc+s,t} + \epsilon_{i,t},$$

where $X_{i,t}$, $i = c, p$, is

a. bid-ask spread on 2-year bond

b. 2-year CDS in USD

c. 2-year CDS quanto spread$_i$ = CDS$_i$ (USD) − CDS$_i$ (EUR)

	Illiquidity			Credit risk			Breakup risk		
	Core	Peri	Spread	Core	Peri	Spread	Core	Peri	Spread
β_i	-0.38	0.20	**0.58**	-0.10	0.01	0.12	0.08	-0.04	-0.12
	(-10.22)	(0.86)	**(2.75)**	(-2.35)	(0.03)	(0.33)	(2.83)	(-0.77)	(-1.69)
γ_i	-0.17	2.46	**2.63**	-1.82	-7.80	**-5.98**	-0.50	-1.05	**-0.55**
	(-0.84)	(2.05)	**(2.57)**	(-1.95)	(-3.28)	**(-3.58)**	(-1.87)	(-5.68)	**(-2.93)**
δ_i	-0.01	-0.03	-0.03	0.03	0.09	0.06	0.01	0.01	0.00
	(-1.10)	(-0.90)	(-0.81)	(1.49)	(1.28)	(1.19)	(1.82)	(1.80)	(0.04)
R^2	32.40	10.97	20.25	27.34	18.21	13.54	2.90	17.59	2.45

Sample Period = Aug 2010 - Dec 2014