CENTRAL BANK COMMUNICATION AND THE YIELD CURVE

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Matteo Leombroni[1] Andrea Vedolin[2] Gyuri Venter[3] Paul Whelan[3]

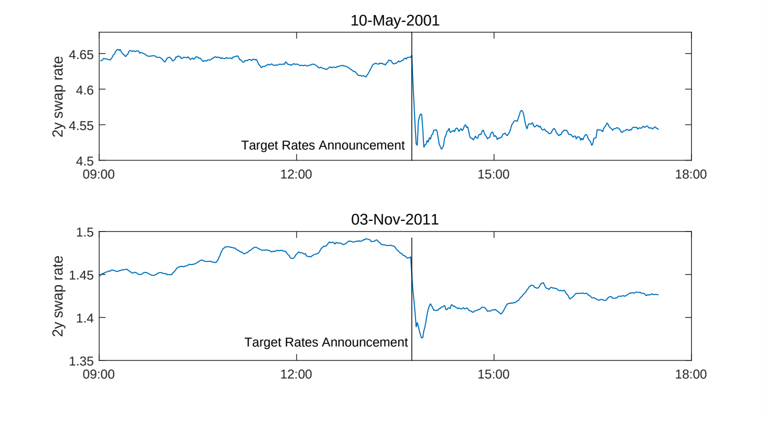
[1]Stanford University

[2]Boston University & CEPR

[3]Copenhagen Business School

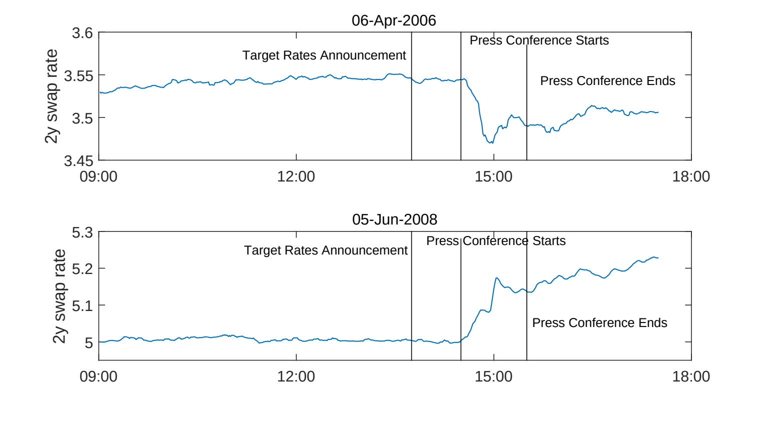
MOTIVATION

Monetary policy action moves asset prices ...



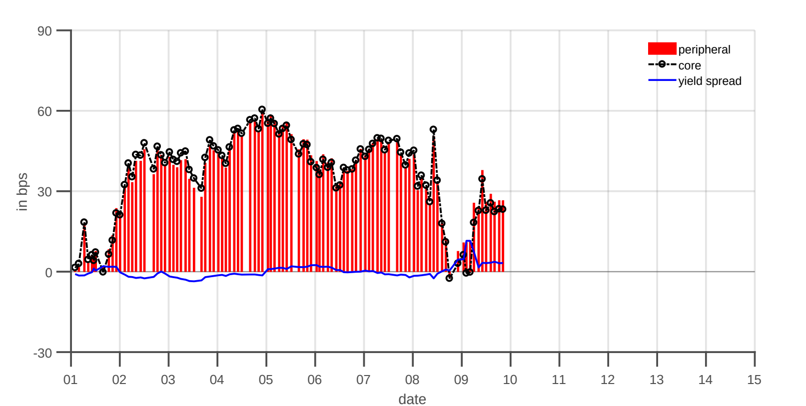
- 10/05/2001: "The Governing Council conducted its regular examination of monetary and economic developments and [...] decided to lower the key ECB interest rates by 25 basis points."
- 03/11/2011: Surprise 25bps cut at President Draghi's first meeting.

.. 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."

Bond Yield Changes on ECB Days



- Core bond yields move one-for-one with peripheral bond yields on **ECB announcement days**.

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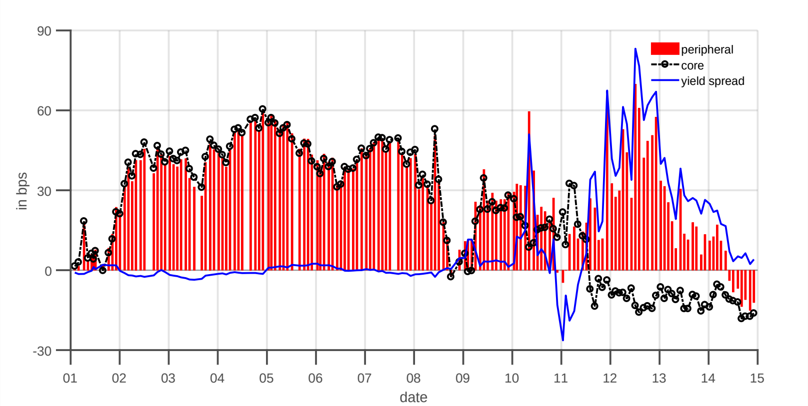

- Core bond yields move <u>one-for-one</u> with peripheral bond yields on **ECB announcement days**.
- Since late 2009: Yield spread **increases** dramatically.

This Paper

- Euro-area is a **unique laboratory** to study the effect of central bank communication on asset prices for the following reasons:
  1. Disentangle target from communication
  2. Rich cross-section of asset prices: Direct evidence for **risk premia**

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- Euro-area is a **unique laboratory** to study the effect of central bank communication on asset prices for the following reasons:
  1. Disentangle target from communication
  2. Rich cross-section of asset prices: Direct evidence for **risk premia**
- In this paper, we argue that **central bank communication** (via an information channel) can increase **risk premia**
- Effect of monetary policy on bond yields:

$$\text{bond yield}_t^{\tau} = \text{constant} + \beta \times \text{monetary policy shock}_t + \epsilon_t$$

where

$$\text{bond yield}_t^{\tau} = \underbrace{\text{average expected future short-rate}}_{\text{Nakamura \& Steinsson, etc}} + \underbrace{\text{risk premium}}_{\textbf{Our paper}}$$

- How?

$$\Delta\text{yield}_t^{P} - \Delta\text{yield}_t^{C} = \Delta\text{risk premium}_t^{P} - \Delta\text{risk premium}_t^{C}$$

Main Finding

- Most of the variation of bond yields on monetary policy announcement days is driven by communication shocks (not target shocks).
- **Dovish** monetary policy lowered core yields but peripheral yields are **insensitive**: Yield spread **increases**!
- We argue that this is due to an emergence of a **risk premium** in peripheral yields: credit + break up risk.
- Central bank communication can signal “bad news” going forward.

Literature review

Information Effect of Monetary Policy: Campbell, Evans, Fisher, and Justiniano (2012), Campbell, Fisher, Justiniano, and Melosi (2017), Melosi (2017), Nakamura and Steinsson (2018), Paul (2018).

$\longrightarrow$ Risk premium channel.

Effect of ECB announcements on asset prices: Altavilla, Giannone, and Lenza (2014), Acharya, Eisert, Eufinger, and Hirsch (2015), Krishnamurthy, Nagel, and Vissing-Jorgensen (2018).

$\longrightarrow$ Focus on conventional monetary policy.

Monetary policy and bond net supply: Vayanos and Vila (2009), Greenwood and Vayanos (2014), Greenwood, Hanson, and Vayanos (2018).

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

MODEL

Setup

- World economy with two countries (core and periphery) in a currency union.
- Two-period OLG model ($t = 0, 1, 2$). Agents can invest into four assets:
  ① global risk-free asset (short-term),
  ②+③ local sovereign bonds (long-term),
  ④ world equity index
- Exogenous **monetary policy**:

$$\begin{aligned} r_{t+1} &= r_t + \kappa_r \left(\theta_t - r_t\right) + Z_{r,t+1}, \\ \theta_{t+1} &= \theta_t + \kappa_\theta \left(\bar{\theta} - \theta_t\right) + Z_{\theta,t+1}, \end{aligned}$$

  where r_t is the **target** rate set by the central bank and θ_t the **future path of interest rates**.

  ⇒ $Z_{r,t+1}$: **target** rate shocks

  ⇒ $Z_{\theta,t+1}$: **communication** shocks

Credit and Breakup Risk

- At $t = 1$, credit event can happen: **default** of the peripheral country or breakup of currency union.
- Event is triggered by random variable $Z_{b,1}$ that takes value of 1 with probability π_0 and is zero otherwise.
- Probability of credit event evolves as follows:

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

  hence probability depends on monetary policy shocks Z_r and Z_θ.
- Assume that $\eta_r, \eta_\theta \neq 0$: Monetary policy affects state of the economy.

Credit and Equity

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

$$d_1 = g_1 - \gamma_s Z_{b,1}, \tag{1}$$

where $\mathrm{E}_0[g_1] = \bar{g} + \phi_r Z_{r,0} + \phi_\theta Z_{\theta,0}$ and $\mathrm{Var}_0[g_1] = \sigma_g^2$.

$\Rightarrow$ **Cash flow news**: ϕ_r and/or $\phi_\theta < 0$: Bernanke and Kuttner (2005).

$\Rightarrow$ **Risk premium news**: $\gamma_s > 0$ and at least one $\eta_j > 0$.

Equilibrium Asset Prices

Investors' maximization problem:

$$\max_{\{x_{i,0}\}_{i=c,p,s}} \sum_{i=c,p,s} x_{i,0} \left(\mathrm{E}_0 \left[R_{i,1} \right] - r_0 \right) - \frac{\alpha}{2} \mathrm{Var}_0 \left[\sum_{i=c,p,s} x_{i,0} R_{i,1} \right]$$

Theorem

*Date-*0 **equilibrium bond yields** *are given by*

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

*and the date-*0 **equilibrium stock price**

$$p_{s,0} = \underbrace{\bar{g} + \phi_r Z_{r,0} + \phi_\theta Z_{\theta,0}}_{\text{expected dividend } E_0[d_1]} - \underbrace{\left(r_0 + \overbrace{\alpha \sigma_g^2 S_s + \gamma_s \lambda_\pi \pi_0}^{\text{risk premium components}} \right)}_{\text{expected stock return } E_0[r_{s,1}]},$$

Model Predictions

We run the following type of regressions:

$$\Delta y_{i,0} = \alpha_i + \beta_{i,r} Z_{r,0} + \beta_{i,\theta} Z_{\theta,0} + \varepsilon_{i,0}, \tag{2}$$

Regression coefficients

$$\begin{aligned} \beta_{i,r} &= \frac{1}{2}\left[(2-\kappa_r) - \eta_r \gamma_i \lambda_\pi\right], \\ \beta_{i,\theta} &= \frac{1}{2}\left[\kappa_r - \eta_\theta \gamma_i \lambda_\pi\right], \end{aligned}$$

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

Proposition

The impact of communication shocks in regression (2) is uniform across countries, $\beta_{c,\theta} = \beta_{p,\theta}$, as long as the signalling channel **is absent**, *$\eta_\theta = 0$, and/or there is no heterogeneity in losses, $\gamma_c = \gamma_p$. For $\gamma_p > \gamma_c$ and $\eta_r > 0$, we have $\beta_{c,r} > \beta_{p,r}$ and $\beta_{pc,r} < 0$.*

Bond Yields and Risk Premia

Monetary policy affects bond yields via two different channels:

① **Expectation channel:** Uniform across countries because short-rate is the same.

- $\rightarrow$ Negative communication shock implies that future target rates are lower than expected, this will decrease all yields. $\Downarrow$

② **Risk premium channel:** By signaling about probability of credit event, monetary policy shocks manifest themselves as **demand shocks** of risk-averse agents.

- $\rightarrow$ Negative communication shock makes investors less willing to hold long-term bonds because they are risky. Risk-averse agents who hold them in equilibrium want to be compensated. $\Uparrow$

Heterogeneity in impact across countries: Larger losses on peripheral long-term bonds than core bonds.

Identifying Signalling

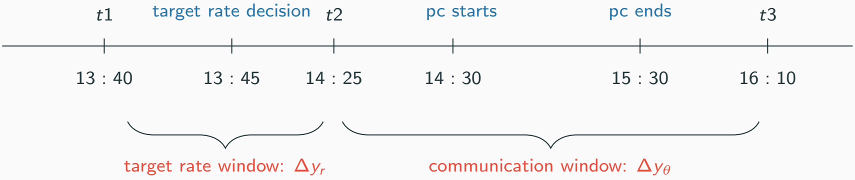
How can we identify whether signalling is present or not? Use effect of monetary policy shocks on stock returns

- When signalling is **absent**, i.e. $\eta_r = \eta_\theta = 0$, then $\text{Cov}[p_{s,0}, Z_{r,0}] < 0$ and $\text{Cov}[p_{s,0}, Z_{\theta,0}] = 0$
  - $\rightarrow$ Bernanke & Kuttner (2005): An increase in policy rates decreases contemporaneous stock returns.
- If there is **signalling**, then, $\text{Cov}[p_{s,0}, Z_{\theta,0}] > 0$
  - $\rightarrow$ Jarociński & Karadi (2018): Contraction in output

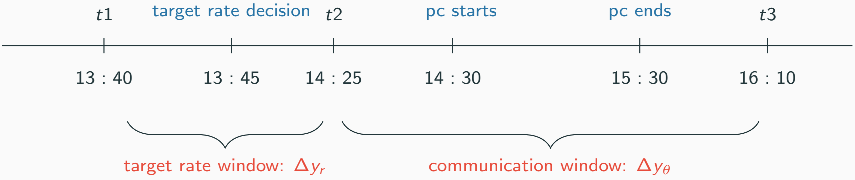
We can use this identification to disentangle **risk premium** from **no risk premium days** in the data.

EMPIRICAL ANALYSIS

Monetary Policy Shocks



Monetary Policy Shocks



PCA on swap changes to extract two shocks:

- ⋆ **Target** shocks (1^{st} PC in target window)
- ⋆ **Communication** shocks (1^{st} PC in communication window)

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
  - Peripheral countries
- Daily real rates, stock index returns, USD- & EUR-denominated 2-year CDS.

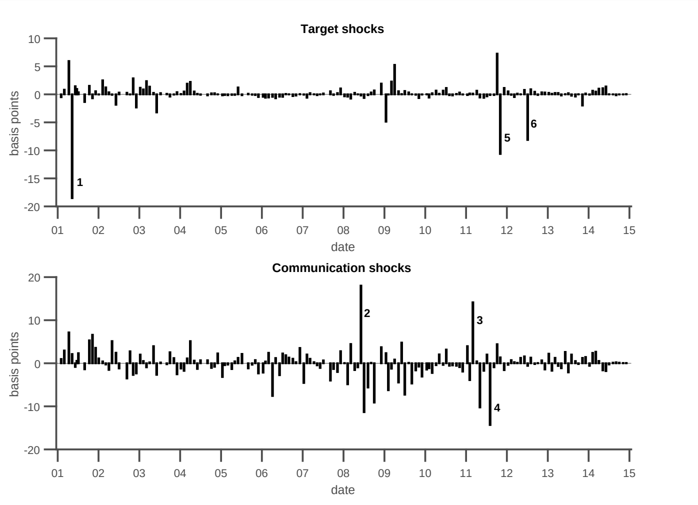
Monetary Policy Shocks

- 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	89.86%	4.15%	2.90%

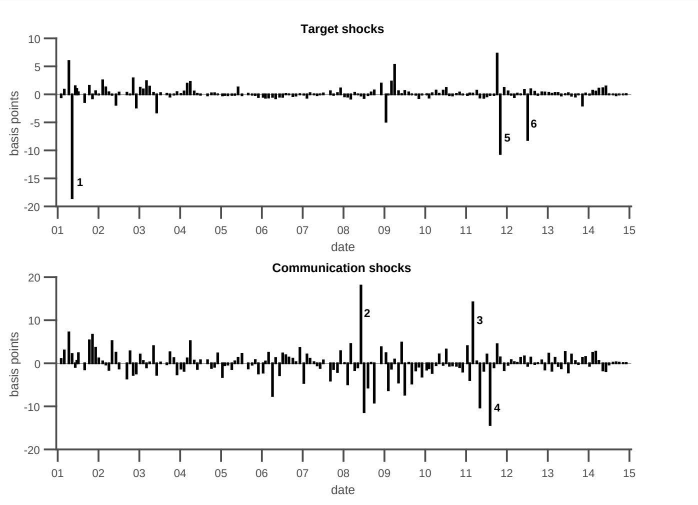
- PCA over whole MP window concludes that 2 PCs explain the vast majority of event day variation:
  - 2 shocks do matter for asset pricing,
  - but still unidentified.

Shocks Time-Series



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

Shocks Time-Series (cont'd)



3. March 3, 2011: Trichet announces interest rate hike at next meeting.
4. August 4, 2011: Rates unchanged but market had expected peri bond purchase.

Bond yields sensitivity in the cross-section and over time ...

1. Bond yield curves for **Core** (France and Germany) and Periphery (Italy and Spain)

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2. Regress zero-coupon yields on our monetary policy shocks:

$$\Delta y^{\tau}_{i,t} = \beta^{\tau}_{i,r} \underbrace{Z_{r,t}}_{\text{target shock}} + \beta^{\tau}_{i,\theta} \underbrace{Z_{\theta,t}}_{\text{comm shock}} + \epsilon^{\tau}_{i,t},$$

where $\Delta y^{\tau}_{i,t}$ is the daily yield change of country i with maturity τ.

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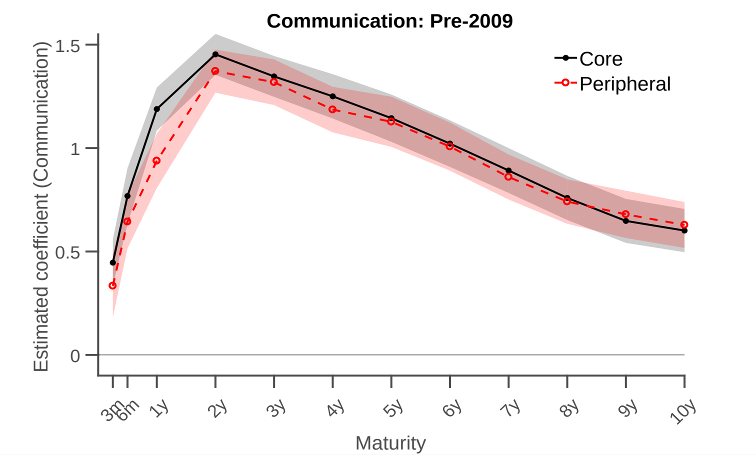
   where $\Delta y^{\tau}_{i,t}$ is the daily yield change of country i with maturity τ.
3. Estimate how the sensitivity has changed over time
   (i) splitting the sample in pre- and post-crisis and...
   (ii) ... using rolling regressions.

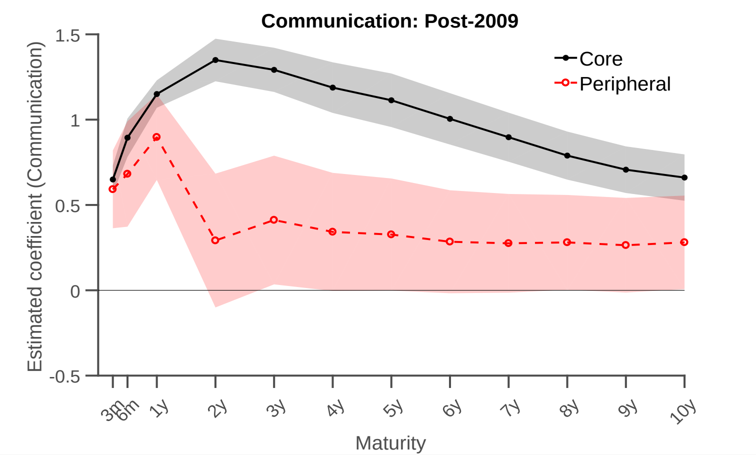
While pre-crisis sensitivities were identical ...

$$\Delta y^{\tau}_{i,t} = \beta^{\tau}_{i,r} \underbrace{Z_{r,t}}_{\text{target shock}} + \beta^{\tau}_{\mathbf{i},\theta} \underbrace{Z_{\theta,t}}_{\text{comm shock}} + \epsilon^{\tau}_{i,t},$$



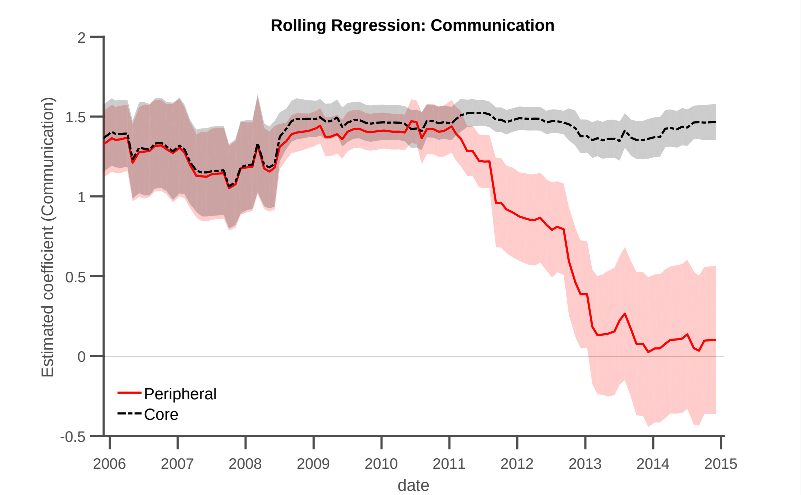
… sensitivities dramatically diverge post-crisis

$$\Delta y^{\tau}_{i,t} = \beta^{\tau}_{i,r} \underbrace{Z_{r,t}}_{\text{target shock}} + \beta^{\tau}_{\mathbf{i},\theta} \underbrace{Z_{\theta,t}}_{\text{comm shock}} + \epsilon^{\tau}_{i,t},$$

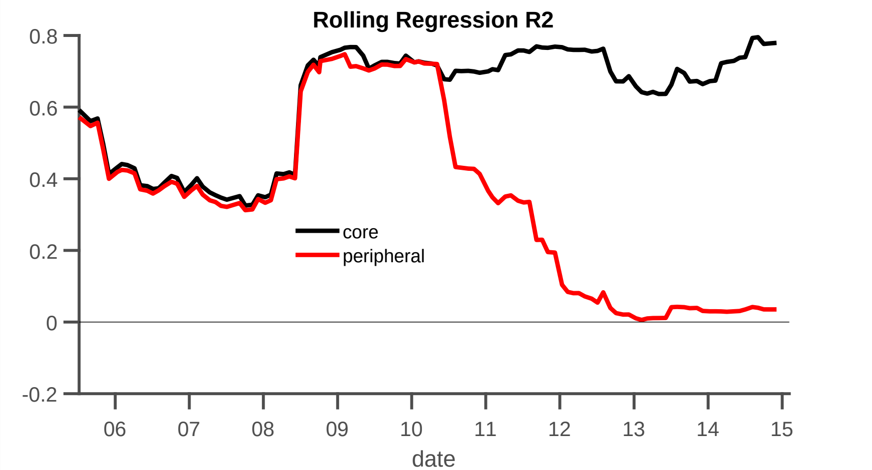


Regression Coefficients

- Rolling regression: Coefficient on the 2y Bond yield

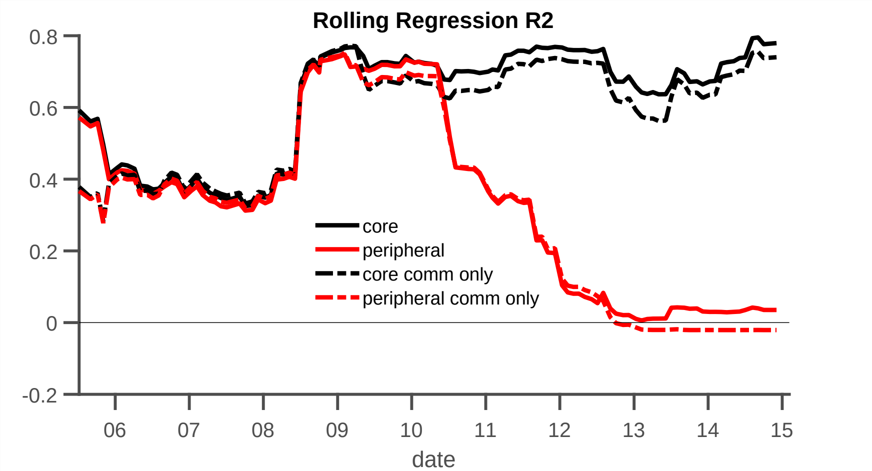


Effect of MP shocks over time (cont'd)



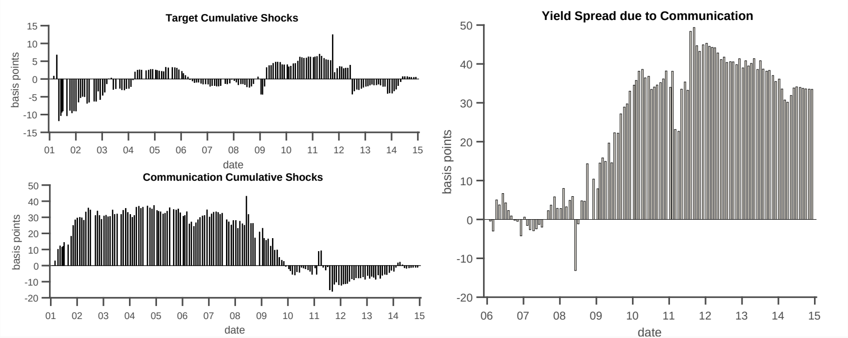
$\Rightarrow$ Total breakdown in R^2 for peripheral bonds.

Effect of MP shocks over time (cont'd)



$\Rightarrow$ All driven by communication shocks.

Cumulative Monetary Policy Shocks



- **Hawkish** target rate and **dovish** communication shocks post crisis.
- Increase in yield spread ≈ 20% of total yield spread.

What happened?

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Hence, potential drivers of wedge are:

- Credit risk
- Liquidity risk
- Redenomination risk

THE INFORMATION CHANNEL OF CENTRAL BANK COMMUNICATION

Monetary Policy and Equity Returns

- Recall that communication shocks can induce a risk premium in the presence of signalling.
- We can disentangle signalling from non-signalling days by observing the correlation between communication shocks and equity returns around the announcement.
- We construct a **dummy variable** which takes the value of **one** if the correlation between Eurostoxx and communication shock is **positive** and **zero** otherwise.

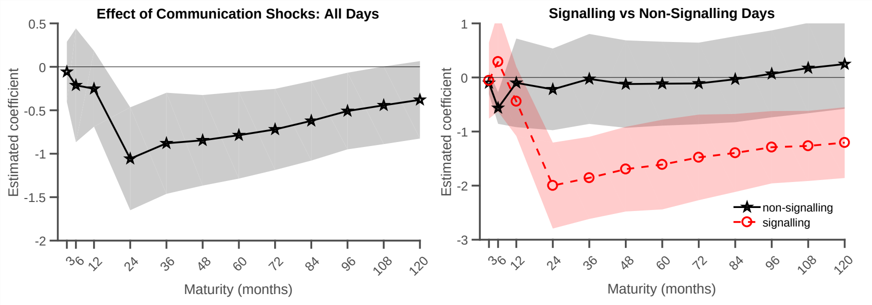
Risk Premium Channel Bond Yields

$$\Delta y_{i,t}^{2y} = \alpha_i + \beta_i \, Z_{\theta,t} + \gamma_i \, \text{Dummy}_t \times Z_{\theta,t} + \delta_i \, \text{Dummy}_t + \epsilon_{i,t},$$

- γ_i measures the effect of communication on signalling days vs non-signalling days.
- δ_i measures the average change in bond yields on signalling vs non-signalling days.

	Full			Pre			Post		
	Core	Per	Spread	Core	Per	Spread	Core	Per	Spread
β_i	1.47	1.30	-0.16	1.49	1.36	-0.13	1.44	1.19	-0.25
t-stat	(14.58)	(6.95)	(-0.84)	(12.54)	(11.17)	(-2.89)	(8.94)	(2.82)	(-0.45)
γ_i	-0.11	-0.94	-0.84	-0.01	0.16	0.17	-0.08	**-1.84**	**-1.76**
t-stat	(-0.87)	(-1.84)	(-1.59)	(-0.05)	(0.85)	(2.26)	(-0.60)	**(-2.46)**	**(-2.28)**
δ_i	0.01	0.00	-0.00	-0.01	-0.01	-0.00	0.02	-0.00	-0.02
t-stat	(0.72)	(0.23)	(-0.41)	(-0.56)	(-0.85)	(-2.05)	(1.69)	(-0.19)	(-1.26)
R^2	58.53	11.24	4.11	61.08	57.80	11.95	55.33	1.45	8.04

Bond Yield Spread on Signalling vs Non-Signalling Days



- Signalling days: Accommodating monetary policy **increases** yields spread.
- Non-signalling days: No significant effect on yield spread on non-signalling days.

Break-Even Inflation

	Germany		Italy		Spread	
	60	120	60	120	60	120
Z_θ	0.47	0.13	-0.86	-0.43	-1.33	-0.57
t-stat	(3.22)	(0.86)	(-0.59)	(-0.60)	(-0.91)	(-0.91)
interaction	-0.09	-0.15	1.57	-0.22	1.66	-0.07
t-stat	(-0.45)	(-0.39)	(0.63)	(-0.13)	(0.64)	(-0.05)
dummy	0.02	-0.01	-0.00	0.11	-0.02	0.12
t-stat	(2.70)	(-0.63)	(-0.00)	(1.70)	(-0.16)	(1.81)
R^2	21.95	-5.30	-5.77	-0.88	-5.46	0.55

- Construct break-even rates from real and nominal bond yields at the five- and ten-year maturity.
- No significant effect of communication shocks on break-even rates.

Risk Premia on Signalling Days

	Core	Illiquidity Peripheral	Spread	Core	CDS Peripheral	Spread	Core	CDS quantos Peripheral	Spread
z_θ	-0.33	0.37	0.71	-0.09	0.44	0.53	0.07	0.09	0.03
t-stat	(-4.03)	(1.50)	(3.55)	(-1.47)	(0.91)	(1.22)	(1.76)	(2.64)	(0.40)
interaction	-0.70	-0.13	**0.57**	-1.43	-6.76	**-5.33**	-0.43	-1.03	**-0.60**
t-stat	(-2.40)	(-0.17)	**(0.70)**	(-2.11)	(-3.89)	**(-4.03)**	(-2.02)	(-5.77)	**(-3.64)**
dummy	-0.00	0.03	0.03	0.01	0.03	0.02	0.00	0.01	0.01
t-stat	(-0.10)	(0.94)	(0.83)	(1.28)	(1.02)	(0.87)	(0.95)	(1.56)	(0.76)
R^2	22.79	3.51	7.29	20.66	17.60	15.19	4.58	21.38	5.41

- Illiquidity: No significance.
- Credit risk: Accommodating monetary policy significantly **increases** credit spread.
- Break-up risk: Accommodating monetary policy significantly **increases** break up risk.

CONCLUSION

Conclusion

- Words speak louder than actions...
- ... but dovish monetary policy can signal "bad news" to the market.
- Core yields $\downarrow$ but peripheral yields showed no reaction because accommodating monetary policy ($\downarrow$) was reversed by increase in risk premium ($\uparrow$).

Thank you very much