Central bank communication and the yield curve

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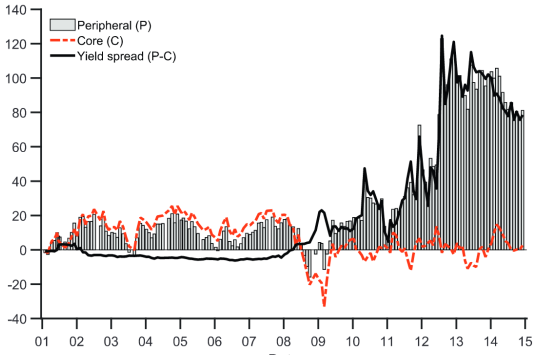
Motivation

- The financial turmoil of 2007–2008 and the subsequent European debt crisis
- yield spread between peripheral(Italy,Spain) & core(Germany,France) country

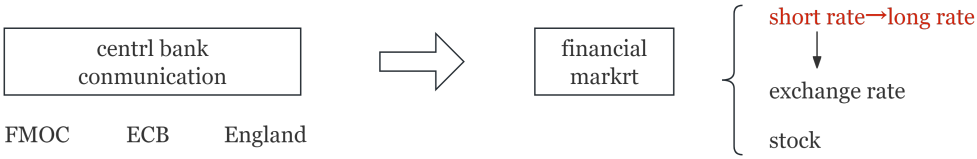


- European debt crisis leading to a huge yields diverged on communication days.

Question

- How Does Central Bank Communication Affect Long-term Interest Rates?
  - ECB's regular communications raised credit risk premia, affect pattern in Fig. 1
  - ECB president's speeches outside regular announcements reduced the peripheral-core spread and yield spread alongside unconventional policies.

脉络



focus： 央行沟通背后的意图，是否合意实现?

· simple: event study——price vol(Kohn & Sack，2004)

· direction: tightening→short rate↑，easing→rate↓（Ehrmann & Fratzscher，2007)

subjective、ex post measures、maybe not actual perception→

· Markets should solely react to theunexpected component.Kuttner(2001) Federal Funds Rate

· Gurkaynak et al. (2005) used PCA 1+ PCA2(orthogonal to rate),“target”& “path” factor,

·this paper: swap rate PCA + orthogonal to stock futures.“forward guidance ”& “risk premium” shock

Contribution

- contributes to literature on monetary policy affect assets and market variable.
  - prior: US Federal Reserve's monetary policy on long-term real, nominal interest rates, equity returns, volatility, mortgage issuance(Hanson et al.,2020···)
  - extend:
    - highlight influence beyond the usual: affects credit risk premia, not term premia.
    - eurozone setting: study central bank communication separately from policy action

- contributes to literature on ECB's action during the European debt crisis.
  - prior: unconventional policies eased financial conditions in peripheral countries
  - extend: focus on the different dimensions of central bank communication.

Contribution

- contributes to literature on signaling channel of monetary policy
  - prior: Policymakers' actions reveal private knowledge to market, affecting economy.(Campbell et al.,2016)
  - extend:
    - extracting two distinct policy shocks:standard interest rate, credit risk shocks.
    - credit risk shocks could capture macroeconomic and unconventional policies signal

Design-Theoretical framework

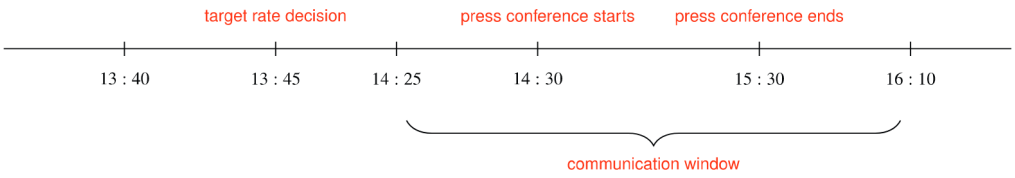
- The central bank (the ECB) has two roles: set the target short rate and communicates to market participants.
- central bank communication provides information about:
  - IR: future short rates (forward guidance)
  - U: additional policies signal (eg: implementation of asset purchase programs).
- Investors adjust economic outlook based on central bank communications:
  - Core vs. peripheral: Peripheral have higher credit risk and greater risk premiums
  - Bond yield: future expected risk-free rate + risk premium.

Design-Theoretical framework

- Impact of 2 Types of Shocks on Sovereign Bond Yields:
  - IR shock(forward guidance):
    - Expectation channel:low future short rate signal,bond yield decrease in all country
    - Risk premium channel:longer low rate lead concern about future economy
  - U shock（negative news about ECB policies）<0:
    - Risk Premium Channel:increase the perceived probability of the credit event
- Hypothesis:
  1. In normal times, IR shocks positively impact all yields; in crisis times, they affect core yields positively and peripheral yields less even negatively.
  2. In normal times, U shocks have little effect on yields; in crisis times, they negatively impact all yields, with a larger effect on peripheral yields.

Design-shock measure

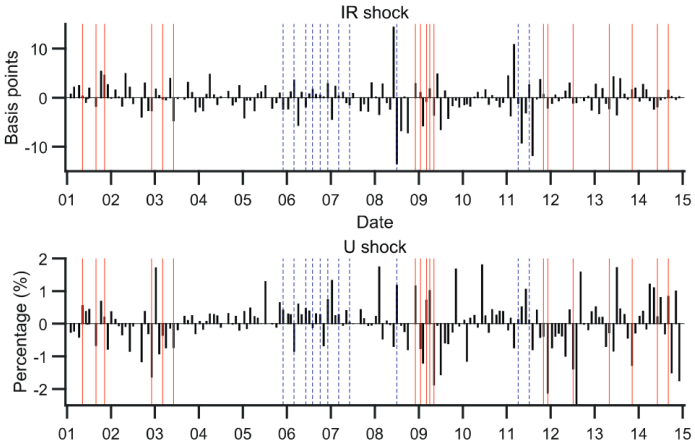
- extracts monetary policy shocks:ECB conducts the target rate announcement and the press conference at different points in time. 图 1



- IR shock: one month and ten years swap rates——liq,future rate
  1. 161 (number of announcements) Œ 21 (maturities)
  2. PCA1:86%, PCA2:93%
  3. regress zero-coupon rate changes, bootstrapped from swap rate changes-PCA1

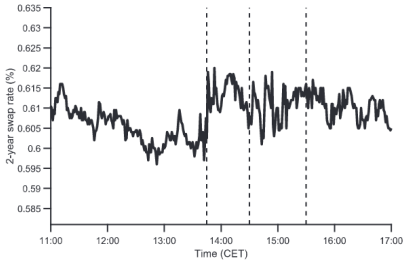
Design-shock measure

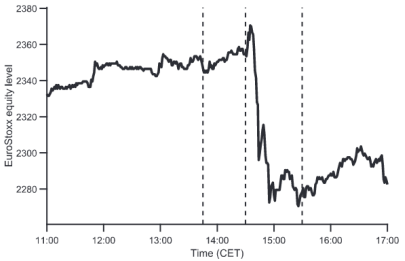
- U shock: $EQ_t = a + b \cdot IR_t + \epsilon_t$, $U_t \equiv EQ_t - \hat{a} - \hat{b} IR_t$
  - equity response, EQ:most liquid EuroStoxx 50 futures contract



Design-shock measure

- eg 1: 2011.8.4, ECB: keep interest rates on hold after previous hike in July
  - IR = -11bps
- eg 2: 2012.8.2, after "whatever it takes" speech, ECB: undertake outright open market operations adequate to reach objective
  - U = -247bps





Design:Central bank communication and sovereign yields

- Core versus peripheral yields:

$$\Delta y_{i,t}^{\tau} = a_i^{\tau} + b_i^{\tau} IR_t + c_i^{\tau} U_t + \varepsilon_{i,t}^{\tau}$$

  - $\Delta y_{i,t}^{\tau}$ are daily zero-coupon yield changes
  - $i = c, p$ (core and periphery), with maturities $\tau = 3, ..., 120$ months

- Credit risk channel:

$$\Delta CDS_{i,t} = a_i + b_i IR_t + c_i U_t + \varepsilon_{i,t}$$

  - $\Delta CDS_{i,t}$ change in the five-year CDS rate of country i.

Data

- Announcement dates: 2001.1-2014.12, >2015 unconventional policy measures.
  - Monthly， 2001(22),2008(13 meetings)=179announcement days
  - -18 not followed by a press conference or were unscheduled=161
  - 18 refinancing rate was cut, 11 days raised, 132 meetings no change.
- Sovereign bond yields:
  - daily zero-coupon bond yields , 3m-10y-Bloomberg
  - Germany, France, Italy, Spain, GDP76%
- Interest Rates Swaps:
  - overnight index swap rates: 1 - 12 months and swap rates
  - written on the 6-month Euribor, 2-10 years.-Reuters Datascope
- Equity: high-frequency data on EuroStoxx 50 futures-Reuters
- Credit risk:credit default swaps-Markit

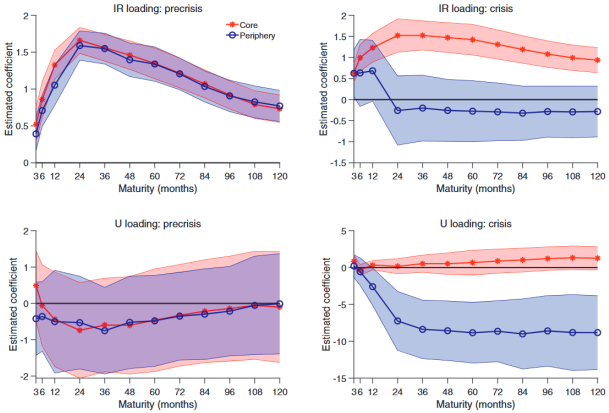
Results：shock measure

	Mean	Std	Min	Max	Skew	Kurt	AR(1)
			Full sample				
IR	0.20	3.19	13.43	14.34	0.11	8.01	0.24
U	0.00	72.73	247.32	180.24	0.31	4.20	0.09
			Precrisis				
IR	0.19	3.29	13.43	14.34	0.03	7.78	0.26
U	2.76	64.71	187.37	173.79	0.04	4.15	0.15
			Crisis				
IR	0.20	3.03	11.77	10.79	0.41	8.35	0.20
U	4.53	84.64	247.32	180.24	0.42	3.70	0.02

- risk premium shocks become more negative as well as more volatile over time.

Results: Core versus peripheral yields

$$\Delta y_{i,t}^{\tau} = a_i^{\tau} + b_i^{\tau} IR_t + c_i^{\tau} U_t + \varepsilon_{i,t}^{\tau}$$



- pre crisis: IR dominant, no delta spread, 8 bp,2 year
- crisis: core :same , peripheral:IR small, -U shock increase yield spread

Results: Core versus peripheral yields

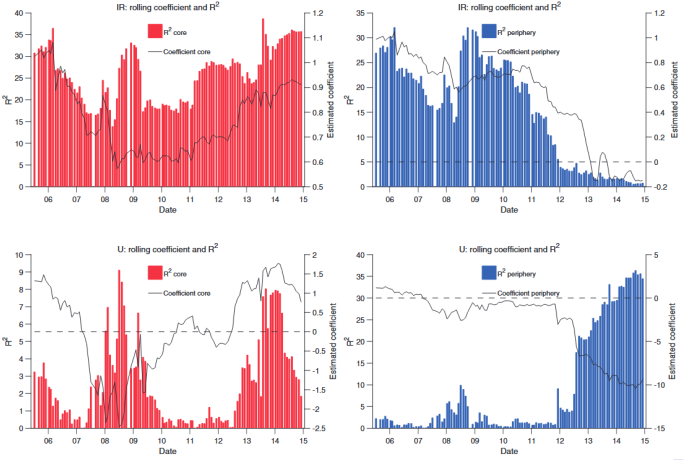
- ΔR^2 is the change in the adjusted R2 when adding U

	3	6	12	24	36	48	60	72	84	96	108	120
Core												
IR	0.64	0.99	1.23	1.52	1.52	1.47	1.42	1.31	1.19	1.08	0.99	0.94
	(5.90)	(6.14)	(7.09)	(7.55)	(8.61)	(8.18)	(7.66)	(7.39)	(7.16)	(6.75)	(6.43)	(6.18)
$U(\times 10^{-2})$	0.87	0.34	0.33	0.18	0.53	0.53	0.67	0.88	1.03	1.22	1.33	1.27
	(2.04)	(0.89)	(1.04)	(0.35)	(0.87)	(0.71)	(0.78)	(1.05)	(1.24)	(1.50)	(1.63)	(1.58)
$\bar{R}^2$	17.40	27.16	63.07	60.08	59.00	54.40	48.09	46.95	44.63	41.91	38.74	36.30
ΔR^2	0.09	2.18	0.87	1.26	0.82	0.97	0.88	0.10	0.76	2.17	3.23	2.93
Periphery												
IR	0.60	0.66	0.74	−0.21	−0.25	−0.29	−0.31	−0.31	−0.35	−0.33	−0.34	−0.34
	(2.09)	(1.54)	(1.83)	(0.50)	(0.59)	(0.75)	(0.82)	(0.87)	(1.06)	(1.04)	(1.08)	(1.08)
$U(\times 10^{-2})$	0.66	0.83	2.45	7.50	8.77	9.04	9.27	8.90	9.53	9.15	9.43	9.17
	(0.88)	(0.67)	(1.74)	(3.42)	(4.08)	(4.06)	(4.08)	(4.02)	(3.65)	(3.54)	(3.35)	(3.38)
$\bar{R}^2$	15.93	12.48	5.60	16.43	20.92	23.65	25.14	25.49	29.25	28.91	30.22	29.79
ΔR^2	1.59	1.79	0.31	16.41	20.91	23.61	25.09	25.41	28.85	28.30	29.41	28.90
Periphery-core spread												
IR	0.04	0.33	0.49	1.74	1.77	1.77	1.73	1.62	1.55	1.41	1.34	1.27
	(0.18)	(0.64)	(1.20)	(4.27)	(4.46)	(4.36)	(4.14)	(3.88)	(3.88)	(3.73)	(3.55)	(3.47)
$U(\times 10^{-2})$	0.21	0.49	2.78	7.68	9.29	9.57	9.95	9.78	10.55	10.37	10.76	10.44
	(0.32)	(0.41)	(2.09)	(3.85)	(4.64)	(4.29)	(4.08)	(4.02)	(3.54)	(3.47)	(3.28)	(3.30)
$\bar{R}^2$	0.85	0.59	2.18	24.67	29.21	31.74	33.11	34.12	37.30	37.50	38.18	37.44
ΔR^2	3.23	3.09	0.84	15.12	20.59	22.90	24.82	26.30	30.31	31.28	32.81	32.29

- -11bp IR shock increases 2Y (10Y) yield spread by 19bps (14bps),
- 247bp U shock increases 2Y (10Y) yield spread 19bps (26bps).

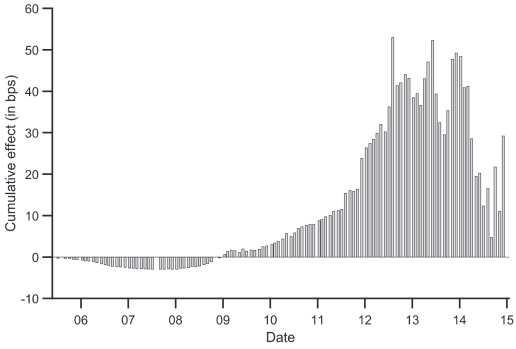
Results: Core versus peripheral yields

- rolling regression is set to 50 months:



Results: Core versus peripheral yields

- Economic significance(10Y core-periphery yield spread):



- 2013,total 213bps,the spread due to communication represented around 1/4

Results: Core versus peripheral yields

- whether communication drives yield spread through credit risk channel:

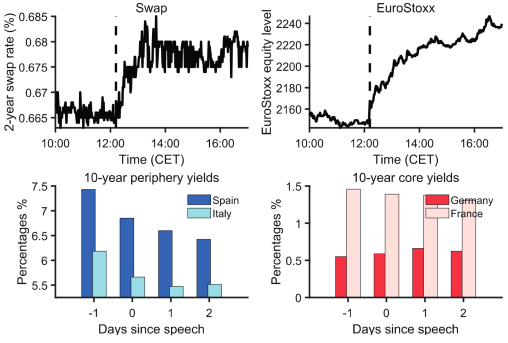
$$\Delta CDS_{i,t} = a_i + b_i IR_t + c_i U_t + \varepsilon_{i,t}$$

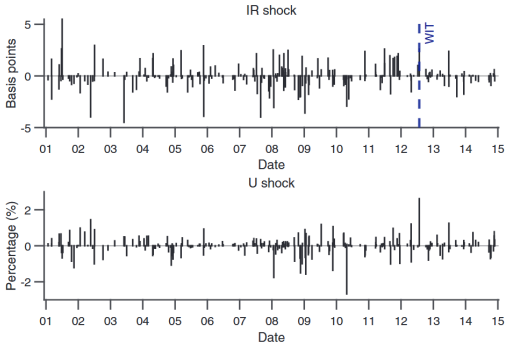
	Germany	France	Italy	Spain	Core	Periphery	P-C
IR	−0.28	−0.50	−1.55	−1.48	−0.39	−1.52	−1.12
	(−2.32)	(−3.85)	(−4.42)	(−3.69)	(−3.73)	(−4.16)	(−3.61)
$U(\times 10^{-2})$	−1.11	−2.59	−10.72	−11.23	−1.85	−10.97	−9.12
	(−2.63)	(−3.19)	(−4.20)	(−3.86)	(−3.16)	(−4.04)	(−3.90)
$\bar{R}^2$	16.06	28.36	36.01	36.48	25.91	36.87	36.29
ΔR^2	8.21	20.51	28.16	28.62	18.05	29.01	28.43

- communication drive belief about future interest rates & perceived credit risk.
- U shocks -main drivers of credit risk premia-can be interpreted as sovereign credit risk premium shocks of ECB communication.

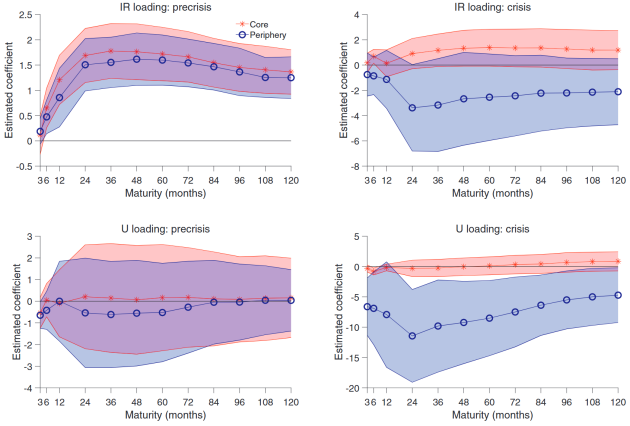
Results: ECB president speeches

- "whatever it takes" on 2012.7.26





Results: ECB president speeches



- IR shock:2.63bp, U shock:261bp——decrease 9bp+15bp = half of total 40bps

Results: Quantitative easing and reconnecting monetary policy

$$Altavillaetal.(2019): \Delta y^{\tau}_{i,t} = a^{\tau}_{i} + b^{\tau}_{i} IR_t + c^{\tau}_{i} U_t + d^{\tau}_{i} QE_t + \varepsilon^{\tau}_{i,t}$$

	3	6	12	24	36	48	60	72	84	96	108	120
						Core						
IR	0.35	0.54	0.74	1.38	1.72	2.06	2.31	2.49	2.68	2.81	2.90	2.92
	(2.73)	(4.28)	(4.59)	(8.93)	(11.90)	(13.89)	(16.27)	(17.23)	(18.17)	(15.49)	(13.70)	(12.58)
$U(\times 10^{-2})$	−1.21	−1.53	−1.96	−2.59	−2.73	−2.82	−2.69	−2.56	−2.36	−2.11	−1.96	−1.78
	(−3.06)	(−4.61)	(−4.81)	(−9.23)	(−8.40)	(−7.32)	(−6.36)	(−5.98)	(−5.03)	(−4.18)	(−3.47)	(−3.11)
QE	−0.36	−0.39	−0.35	−0.47	−0.37	−0.24	−0.05	0.19	0.45	0.69	0.93	1.00
	(−3.10)	(−3.46)	(−2.86)	(−2.55)	(−1.65)	(−0.92)	(−0.16)	(0.61)	(1.39)	(1.84)	(2.16)	(2.23)
$\bar{R}^2$	46.94	65.01	64.51	70.74	71.80	73.50	74.52	75.79	77.60	76.10	74.11	73.09
ΔR^2	7.65	7.06	2.57	1.91	0.29	−0.55	−0.93	−0.70	0.18	1.27	2.63	3.07
						Periphery						
IR	0.36	0.43	0.66	1.51	1.98	2.39	2.63	2.77	2.91	3.09	3.31	3.30
	(4.34)	(4.58)	(5.08)	(7.08)	(7.98)	(7.85)	(7.47)	(7.55)	(7.38)	(7.58)	(7.82)	(7.36)
$U(\times 10^{-2})$	−0.08	−0.35	−0.98	−1.62	−1.98	−2.28	−2.58	−2.54	−2.34	−2.64	−2.89	−2.70
	(−0.59)	(−1.92)	(−1.81)	(−2.58)	(−2.76)	(−2.99)	(−3.04)	(−2.86)	(−2.49)	(−2.70)	(−2.87)	(−2.60)
QE	0.10	0.08	0.27	0.24	0.18	0.32	0.44	0.64	0.76	0.85	0.97	0.99
	(0.94)	(0.46)	(1.11)	(0.84)	(0.55)	(0.81)	(0.99)	(1.54)	(1.71)	(2.03)	(2.40)	(2.25)
$\bar{R}^2$	41.25	49.70	33.99	62.72	64.17	65.13	63.42	62.76	61.75	62.50	64.13	61.75
ΔR^2	−0.76	−1.22	−0.47	−0.77	−1.11	−0.80	−0.62	0.01	0.40	0.66	1.06	1.03
						Periphery-core spread						
IR	0.01	−0.11	−0.08	0.14	0.26	0.33	0.32	0.28	0.23	0.27	0.41	0.38
	(0.10)	(−0.75)	(−0.46)	(0.65)	(0.96)	(0.97)	(0.80)	(0.66)	(0.54)	(0.60)	(0.86)	(0.74)
$U(\times 10^{-2})$	1.13	1.18	0.99	0.97	0.74	0.54	0.11	0.02	0.02	−0.53	−0.93	−0.92
	(2.76)	(2.61)	(1.26)	(1.55)	(1.17)	(0.88)	(0.16)	(0.02)	(0.03)	(−0.66)	(−1.14)	(−1.07)
QE	0.46	0.47	0.61	0.71	0.55	0.57	0.49	0.45	0.31	0.16	0.04	−0.02
	(3.34)	(2.51)	(2.62)	(2.05)	(1.27)	(1.10)	(0.87)	(0.87)	(0.67)	(0.37)	(0.08)	(−0.03)
$\bar{R}^2$	39.67	34.39	11.62	27.71	21.39	24.44	20.20	19.91	19.13	18.82	19.07	14.94
ΔR^2	17.78	12.58	8.17	9.92	2.72	1.81	−0.06	−0.66	−1.84	−2.70	−2.98	−3.15

Conclusion

- 2 channels of central bank communication: interest rates and credit risk premia ,using interest rates and equity index during narrow window
- precrisis: IR shock uniform effect on core and peripheral; crisis:credit risk premia drive core-peripheral yield spread
- president speech & unconventional policy announcements managed to be effective

中国市场的债券-央行沟通研究

- 提取政策意图，评估有效性：
  1. 短期利率：央行沟通（松、紧）对短期利率走势有显著合意影响（冀志斌和宋清华,2012; 吴国培和潘再见, 2014）
  2. 预期/未预期的美联储政策影响资产价格，包括国债，中长期更显著（姜富伟等，2019）
  3. 未预期货币政策信息影响资产价格，包括国债，中长期更显著（董青马等，2023）
  4. 固浮利差分解预期/未预期货币政策，影响中长期企业信用利差（郭晔，2016）
  5. 未来：
     - 具体的渠道，类似信用风险溢价、流动性风险溢价，可对比国债、企业债、公司债；
     - 中国央行沟通与全球债券市场（特别美联储政策沟通）之间的联动效应

- 具体沟通内容的其他方面：
  - 沟通语调、文本相似度和文本复杂度对国债收益与波动的影响（张一帆等，2022）
  - 未来：
    - 其他文本内容如内容明确性；风险提示语言的影响：特别提到的经济金融风险（如全球经济放缓、通胀风险、金融系统性风险）如何影响债券市场；
    - 央行的绿色政策相关沟通是否影响绿债市场

Thanks!