Effects of Changing Monetary and Regulatory Policy on Money Markets

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Disclaimer

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Motivation

- The financial crisis and the policy response changed the landscape for monetary policy implementation in the U.S.
- Money market rates at the Effective Lower Bound (ELB) for 7 years
- Fed expanded its toolkit to enhance monetary control
- Changing regulatory environment created new incentives money market participants

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- Traditional approach: Adjust reserve balances through OMOs and move the effective federal funds rate (FFR) toward the target
  - Worked seamlessly before the global financial crisis
- Reserve balances increased above $800 billion by the end of 2008 from an average of $10 billion in 2007
  - Reserves around $2.5 trillion now

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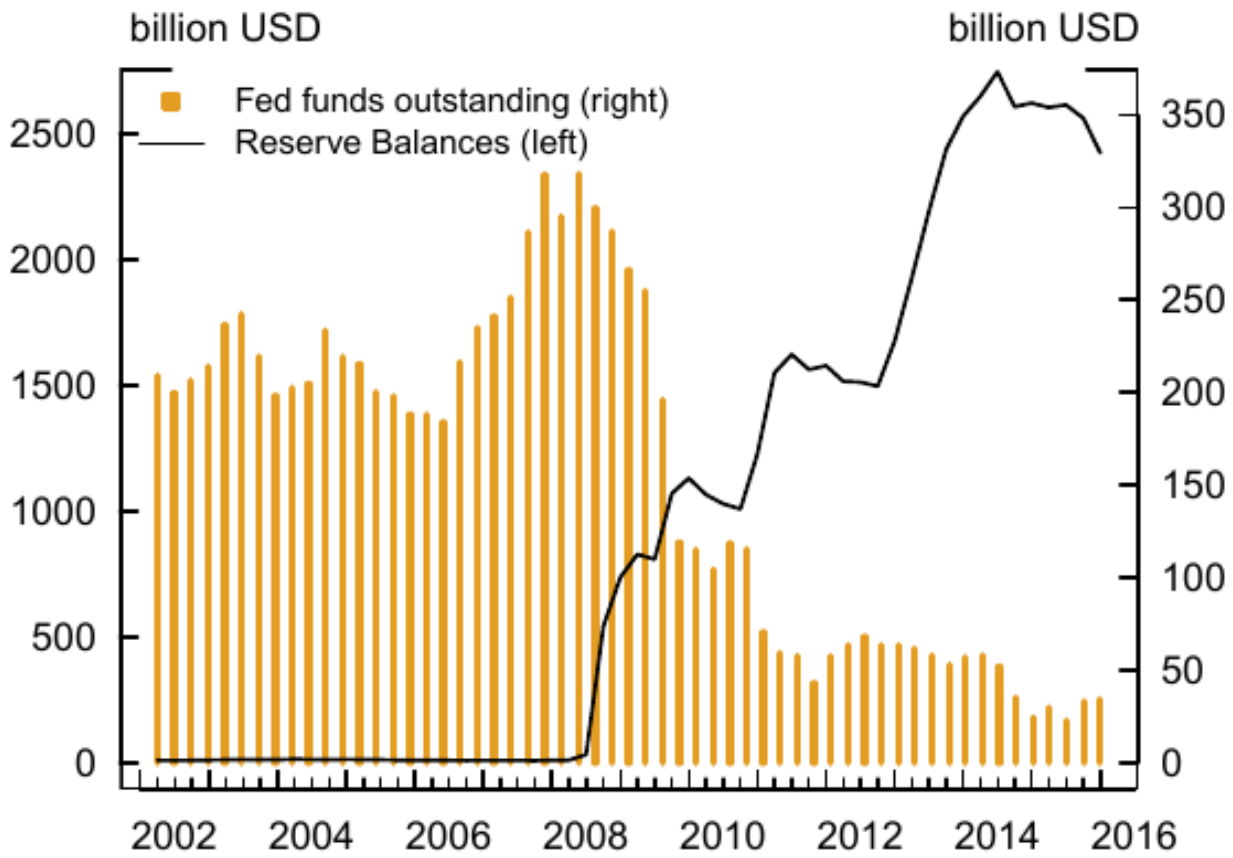
Bank Reserves and Federal Funds



Changing Monetary Policy Framework

- The Fed introduced interest on reserves (IOR) as a new policy tool in 2008
- Incentives for banks to lend federal funds at rates below IOR were largely eliminated
  - Fed funds volume declined substantially
  - Government sponsored enterprises (GSEs) lending to foreign banks at rates below IOR

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- To enhance monetary control, the Fed introduced the ON RRP facility as a supplementary tool in September 2013
  - Fed borrows cash from eligible counterparties in exchange for Treasury securities in its portfolio
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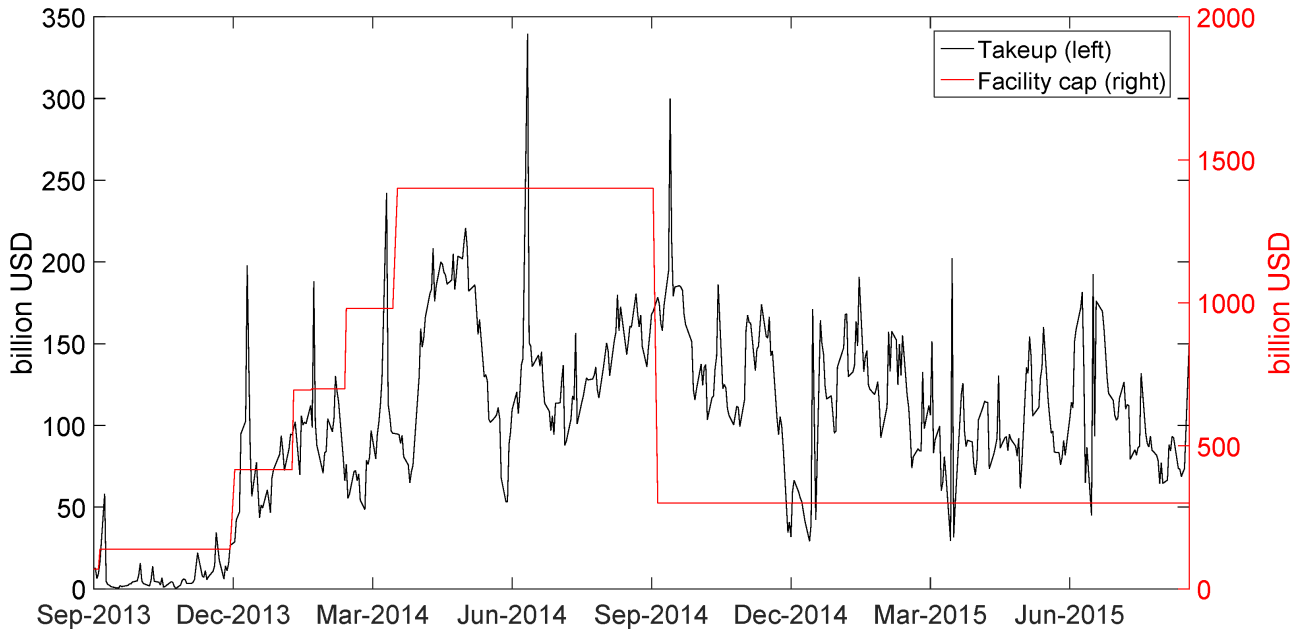

Changing Regulatory Landscape

- Declining leverage of securities broker-dealers and increased risk aversion (Adrian et al. (2013))
- Basel III capital and liquidity reforms
  - Liquidity Coverage Ratio (LCR) and Leverage Ratio requirements
- FDIC assessment base change
  - Reduced incentives for domestic banks to engage in IOR arbitrage

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- Does the FFR continue to provide an anchor in the money market?
- How are the new regulations affecting market dynamics, especially on financial reporting days?
- What are the effects of the ON RRP facility on comovement and volatility of rates?

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Related Literature

- Afonso et al. (2011) on fed funds market; Copeland et al. (2014), Gorton and Metrick (2012) on repo market.
- Yoldas and Senyuz (2015) focus on a longer horizon including the crisis and identify funding pressure points.
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Data

- Two sub-samples
  - Pre-crisis: January 2, 2001 - July 31, 2007
  - ELB: December 17, 2008 - August 28, 2015
- Four overnight money market interest rates
  - Effective Federal Funds Rate (EFFR) - FRBNY
  - Eurodollar Rate (EDR) - FRBNY and Wrightson ICAP
    - Substituted with Libor by the prescribed policy in Bloomberg
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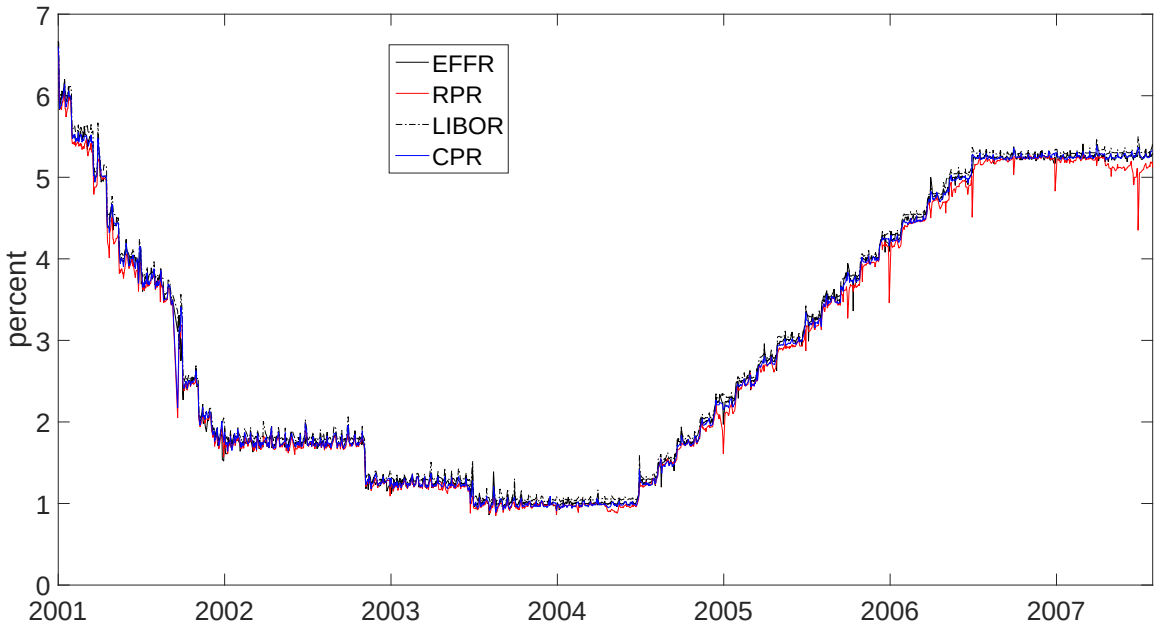
Overnight Money Market Interest Rates: 2001-2007



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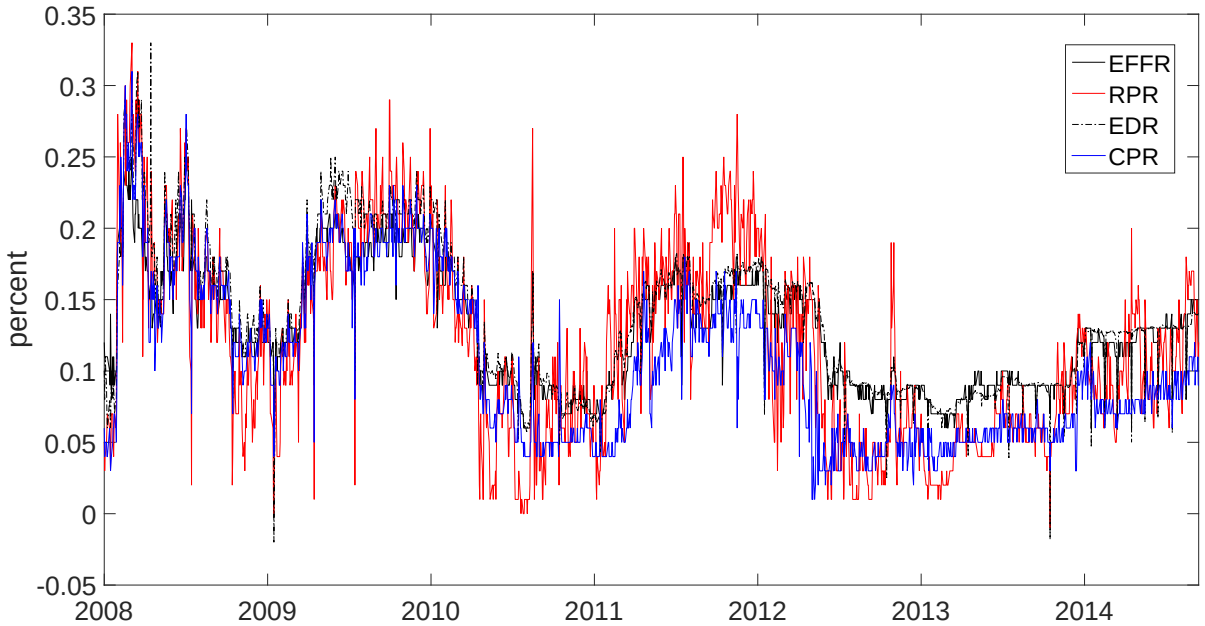

The Models

- Pre-crisis VEC Model:

$$\Delta y_t = Ad_t + \beta \Delta TFFR_t + \sum_{j=1}^{p} \Phi_j \Delta y_{t-j} + \Theta z_{t-1} + \epsilon_t, \quad (1)$$

- d_t is a vector of calendar effects
- z_t is a vector of error correction terms
- ϵ_t is a zero-mean martingale difference vector process
- Mapping from the VEC system to a VAR to directly compare the results from the two periods

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Modeling Volatility and Correlation

- Let $E(\epsilon_t \epsilon_t' | \Omega_{t-1}) = H_t$

$$H_t = D_t R_t D_t, \tag{3}$$

$D_t = diag\left\{\sqrt{h_{it}}\right\}$, $h_{it} = Var(\epsilon_{it}|\Omega_{t-1})$ and
$R_t = Corr(\epsilon_t|\Omega_{t-1})$.

$$h_{it} = \omega_i + \tau_i \epsilon_{i,t-1}^2 + \delta_i h_{i,t-1} + \lambda_{i,1} I_{m,t} + \lambda_{i,2} I_{q,t}, \; i = 1, \ldots, 4, \tag{4}$$

- The correlation matrix R_t

$$R_t = I_{m,t} R_m + I_{q,t} R_q + (1 - I_{m,t} - I_{q,t}) R_n, \tag{5}$$

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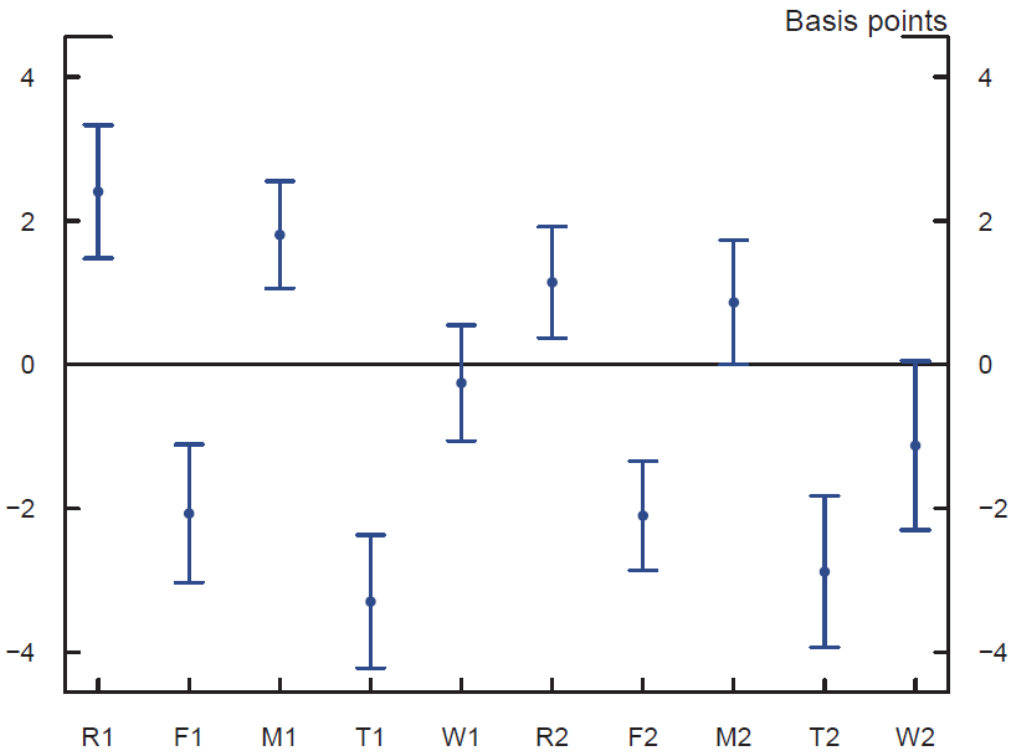
VEC: Precrisis

	EFFR	RPR	LIBOR	CPR
Autoregressive terms (sum)				
EFFR	0.947	0.449	0.345	0.521
	(0.00)	(0.00)	(0.00)	(0.00)
RPR	0.033	0.694	0.010	0.001
	(0.39)	(0.00)	(0.72)	(0.98)
LIBOR	0.016	-0.125	0.546	-0.091
	(0.91)	(0.41)	(0.00)	(0.43)
CPR	0.005	-0.021	0.099	0.570
	(0.97)	(0.92)	(0.21)	(0.00)

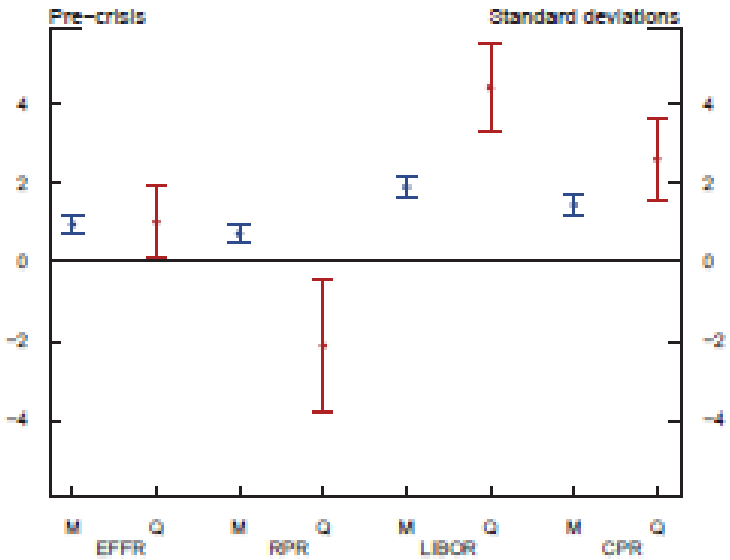
VAR: ELB

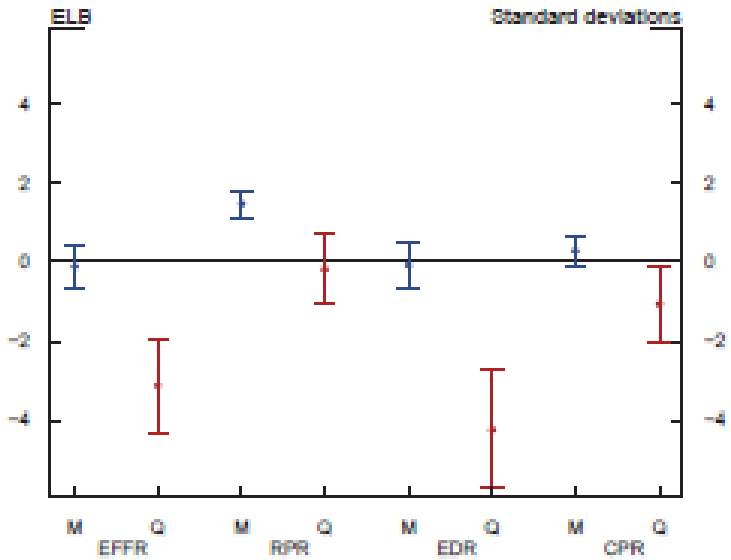
	EFFR	RPR	EDR	CPR
Autoregressive terms (sum)				
EFFR	0.911	0.107	0.223	0.153
	(0.00)	(0.21)	(0.00)	(0.02)
RPR	0.032	0.809	0.014	-0.011
	(0.00)	(0.00)	(0.29)	(0.47)
EDR	-0.024	0.048	0.705	0.000
	(0.53)	(0.50)	(0.00)	(1.00)
CPR	0.036	0.054	0.069	0.881
	(0.01)	(0.14)	(0.00)	(0.00)

Reserve Maintenance Effects on EFFR:Pre-Crisis

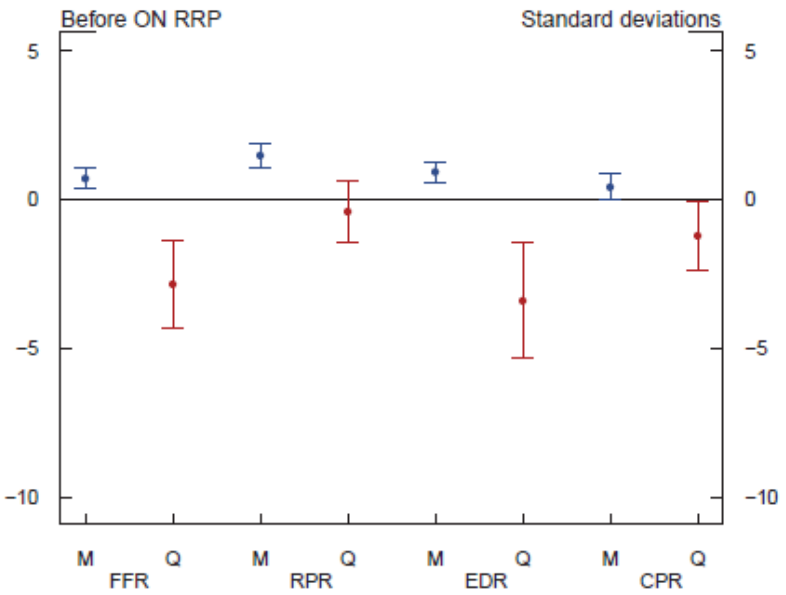


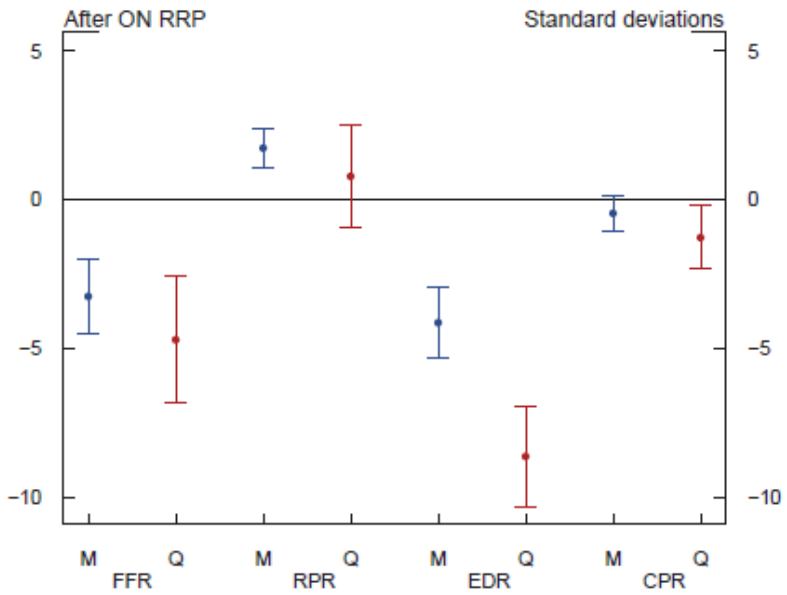
Calendar Day Effects on Money Market Rates



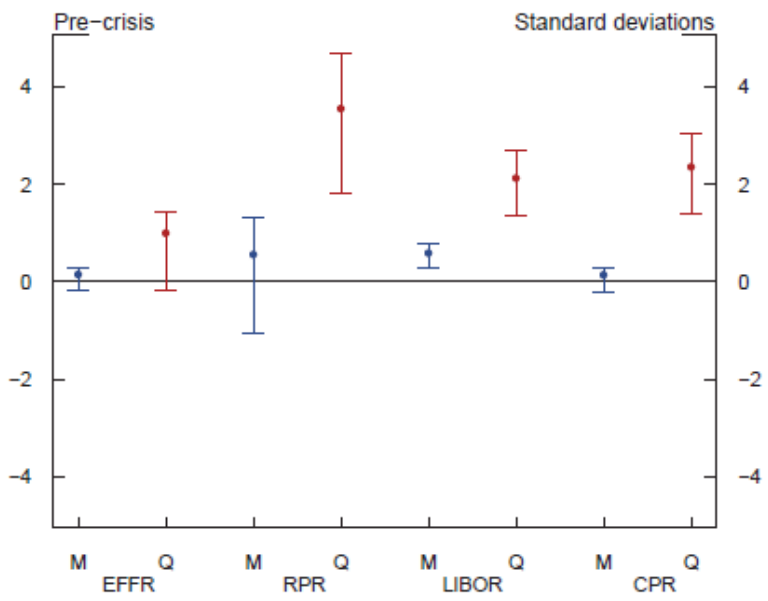


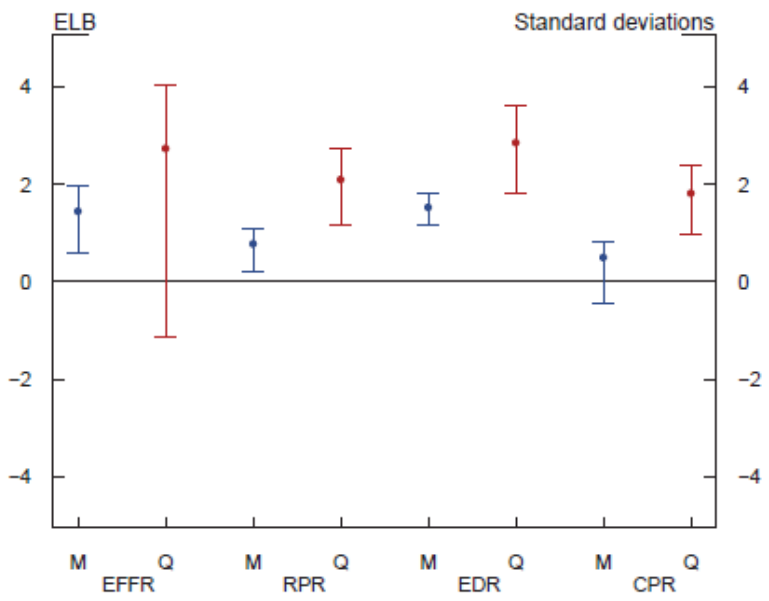
Calendar Day Effects on Money Market Rates: ELB





Calendar Day Effects on Rate Volatility





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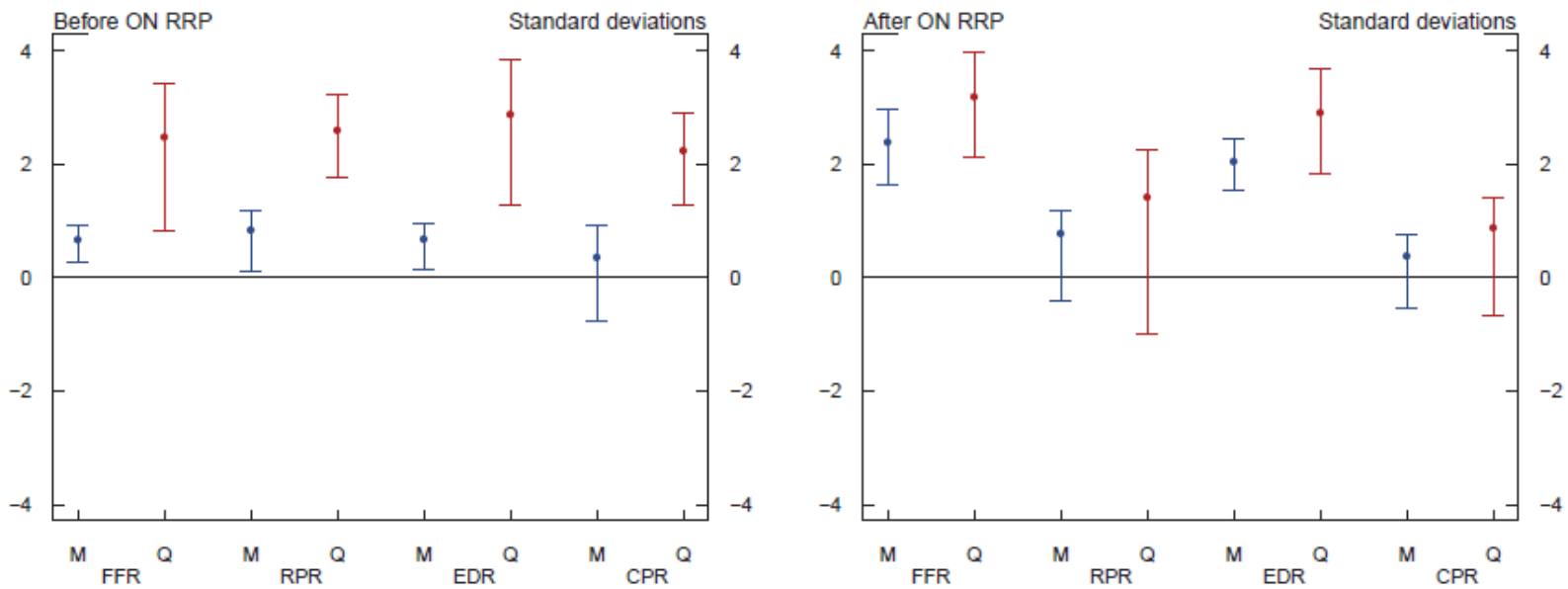
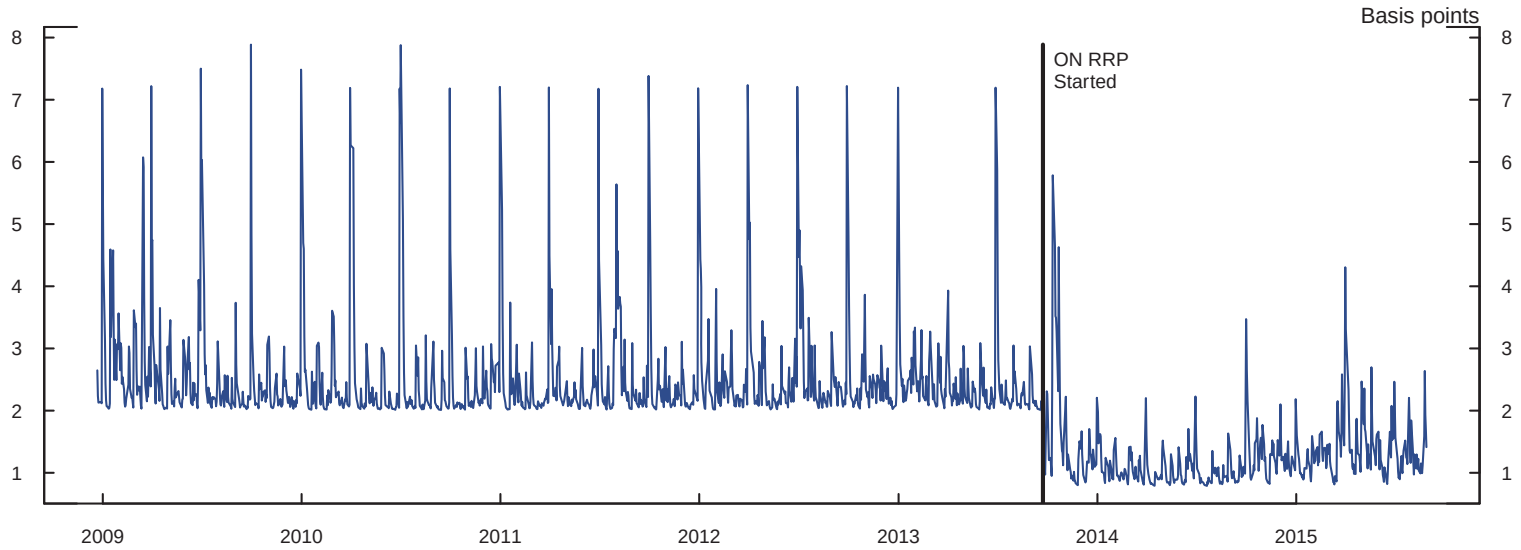


RP Volatility and ON RRP



Correlations of VAR Residuals

	Pre-crisis			ELB		
	RPR	LIBOR	CPR	RPR	EDR	CPR
Normal times	0.490	0.586	0.614	0.457	0.545	0.373
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Month-end	0.421	0.246	0.341	0.301	0.879	0.395
	(0.04)	(0.47)	(0.22)	(0.19)	(0.00)	(0.37)
Quarter-end	0.348	0.334	0.362	-0.056	0.564	0.360
	(0.30)	(0.23)	(0.32)	(1.00)	(0.03)	(0.29)

Concluding remarks

- At the ELB, FFR continued to be an anchor for the unsecured rates but transmission to RPR is hampered
  - Weaker co-movement of EFFR with other rates
  - Day-of-maintenance-period effects on the FFR have largely disappeared
- Volatility in the repo market has substantially dampened after the introduction of the ON RRP facility
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- Stronger calendar day effects on unsecured rates and their volatility

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