

Unconventional Monetary Policy and International Risk Premia

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- Contribute to vast literature on empirical effects of UMP
 - Bond yields, exchange rates, financial market premia
 - Fed, BoE, ECB, BoJ policies
 - Examine cross-country spillovers
 - Focus on ZLB period

Foundation

- Use intra-daily data to identify MP surprises
 - change in U.S. 5-year yields from 15 minutes before to 1hr. 45 minutes after FOMC announcements (and few key other Fed announcements)
- “External Information”
 - Narrative Approach: Romer and Romer (1989, 2009, 2010), Ramey and Shapiro (1998)
 - Events Study literature: QE; macro announcements
 - Uncertainty Shocks: Bloom (2009)
 - Monetary Shocks: Kuttner (2001), Faust, Rogers, Swanson, and Wright (2003), Bernanke and Kuttner (2005), Gürkaynak, Sack, and Swanson (2005)

Smörgåsbord

- Pass-through regressions

- $\Delta y(t) = \beta \text{MPS}(t) + \varepsilon(t)$

- Carry Trade Portfolios (preliminary)

- Long foreign, short U.S. bond; sort on $(i^* - i)$
 - Lustig-Verdlehan risk premium patterns
 - Effect of MPS on carry trade returns

- VARs: External Instruments Identification

- Avoids recursive ident. Asset returns simultaneously determined. Identifying assumptions are quite mild.
 - Jump in 5-yr yields around FOMC announcement is an external instrument orthogonal to non-monetary policy shocks.
 - FOMC announcement event study => effect of MP surprise on asset prices; add this as extra information.

VAR Identification (1)

- VAR in monthly data: $A(L)Y_t = \varepsilon_t$
- Errors: $\varepsilon_t = R\eta_t$; $\eta_t = (\eta_{1t}, \eta'_{2t})'$; η_{1t} monetary policy shock
- Define Z_t as intraday change in five-year futures bracketing monetary policy announcements.
- Define X_t as daily (or intradaily) change in Y_t bracketing monetary policy announcements.
 - Set $X_t = \varepsilon_t$ for variables with only monthly data
- Assumption A1 (the “external instruments” assumption):
 - $E(\eta_{1t}Z_t) = \alpha$ and $E(\eta_{2t}Z_t) = 0$; $Z(t)$ relevant, uncorrelated with non-M policy shocks

VAR Identification (2)

- VAR in monthly data: $A(L)Y_t = \varepsilon_t$
- Errors: $\varepsilon_t = R\eta_t$; $\eta_t = (\eta_{1t}, \eta'_{2t})'$; η_{1t} monetary policy shock
- Define Z_t as intraday change in five-year futures bracketing monetary policy announcements.
- Define X_t as daily (or intradaily) change in Y_t bracketing monetary policy announcements.
 - Set $X_t = \varepsilon_t$ for variables with only monthly data
- Assumption A2 (Tightens inference, only A1 needed (OSW)):
 - $E(Z_t(\varepsilon_t - X_t)) = 0$; shocks to $Y(t)$ that occur away from the policy announcement cannot be correlated with jump associated with monetary policy news.

VAR Identification (3)

- Assumption A1: $E(\eta_{1t}Z_t) = \alpha$ and $E(\eta_{2t}Z_t) = 0$
- Assumption A2: $E(Z_t(\varepsilon_t - X_t)) = 0$; imply
- $E(Z_tX_t) = E(Z_t\varepsilon_t) = \alpha R_1 \Rightarrow$ trace out effects of MP shocks

Also examine

- Compare with period of conventional monetary policy
- Non-US monetary policy shocks
- Disentangle effects of LSAP vs. forward guidance
- Asymmetry
- Crisis vs. non-crisis subsamples
- Alternative identification strategy: IDH

Data

- Data in VAR:
 - ▶ 3-month, 5-year and 10-year zero coupon US yields.
 - ▶ 3-month and 10-year foreign zero coupon yields (UK, Germany, Japan).
 - ▶ Log exchange rate.
 - ▶ Log employment and core CPI.
 - ▶ BAA-Treasury spread.
- Monetary policy instrument Z_t : change in five-year Treasury futures rate from 15 minutes before to 1hr. 45 minutes after announcement.
- Announcements are all FOMC meetings and some other events, updating RSW (2014).

The Panel of Experts



Implementation

- Estimate the VAR parameters and get residuals.
 - ▶ Sample Period: January 1990-March 2015.
- Regress X_t on Z_t to get R_1 up to scale and sign.
 - ▶ Sample period: October 2008-March 2015.
 - ▶ “External instrument” would set X_t to be the residuals.
- Compute impulse responses to shock that lowers five-year ZC yield by 25 basis points.
- Estimation and inference by bias-adjusted bootstrap of Kilian (1997).

Risk Premia

- Main objective is to measure effects of monetary policy shocks on risk premia, defined as follows:
- Domestic Term Premium

$$TP_t(m) = r_t(m) - E_t\left(\frac{1}{m/3} \sum_{i=0}^{m/3-1} r_{t+3i}(3)\right).$$

- Foreign Term Premium

$$TP_t^*(m) = r_t^*(m) - E_t\left(\frac{1}{m/3} \sum_{i=0}^{m/3-1} r_{t+3i}^*(3)\right).$$

- Foreign Exchange Risk Premium

$$FP(m) = \frac{1}{m/3} \sum_{i=0}^{m/3-1} [E_t r_{t+3i}^*(3) - E_t r_{t+3i}(3) + 400(E_t s_{t+3i+3} - E_t s_{t+3i})].$$

Generalized Carry Trade Return

- Can consider impact of monetary policy shock on portfolio that is long an m - month foreign ZC bond and short corresponding US bond:
 - ▶ Generalized carry-trade return (Lustig et al. (2013)).
 - ▶ $\frac{m}{12}(\Delta r_t(m) - \Delta r_t^*(m)) + \Delta s_t$.

Also examine (likely won't discuss)

- Compare with period of conventional monetary policy
- Non-US monetary policy shocks
- Disentangle effects of LSAP vs. forward guidance
- Asymmetry
- Crisis vs. non-crisis subsamples
- Alternative identification strategy: IDH

Effects of Surprises: Narrow Window

	Fed		BOE		ECB		BOJ	
<i>Intradaily</i>								
Two-year Treasury	-0.11***	(0.01)	-0.01***	(0.00)	0.00	(0.00)	0.03	(0.04)
Five-year Treasury	-0.22***	(0.01)	-0.03***	(0.00)	0.00	(0.00)	-0.08	(0.05)
Ten-year Treasury	-0.25		-0.03***	(0.00)	-0.01	(0.00)	-0.04	(0.03)
30-Year Treasury	-0.16***	(0.01)	-0.03***	(0.00)	0.00	(0.00)	-0.02	(0.02)
UK Gilt	-0.12***	(0.01)	-0.25		0.02***	(0.00)	-0.03	(0.02)
Italian 10 Year	-0.04***	(0.01)	-0.02***	(0.01)	-0.20***	(0.00)	0.01	(0.03)
German 10 Year	-0.09***	(0.01)	-0.05***	(0.00)	0.05***	(0.00)	-0.01	(0.02)
Ten-year JGB	-0.05***	(0.01)	-0.01	(0.01)	0.00	(0.01)	-0.25	
GBP	0.66***	(0.07)	-0.82***	(0.12)	0.14***	(0.04)	-0.13	(0.20)
EUR	0.86***	(0.11)	-0.02	(0.07)	0.28***	(0.05)	-0.28	(0.24)
JPY	1.21***	(0.09)	0.10**	(0.05)	0.09**	(0.04)	-0.94***	(0.32)
Stock Returns	0.86***	(0.15)	0.23*	(0.12)	0.92***	(0.06)	-0.18	(0.83)
<i>Daily</i>								
Corp: Higher Grade	-0.14***	(0.04)	-0.14***	(0.04)	0.11***	(0.02)	-0.06**	(0.03)
Corp: Lower Grade	-0.14***	(0.04)	-0.13***	(0.04)	0.11***	(0.02)	-0.06	(0.04)
MOVE Index	-0.02	(0.03)						
Spanish 10 Year					-0.37***	(0.04)		
French 10 Year					0.01	(0.02)		

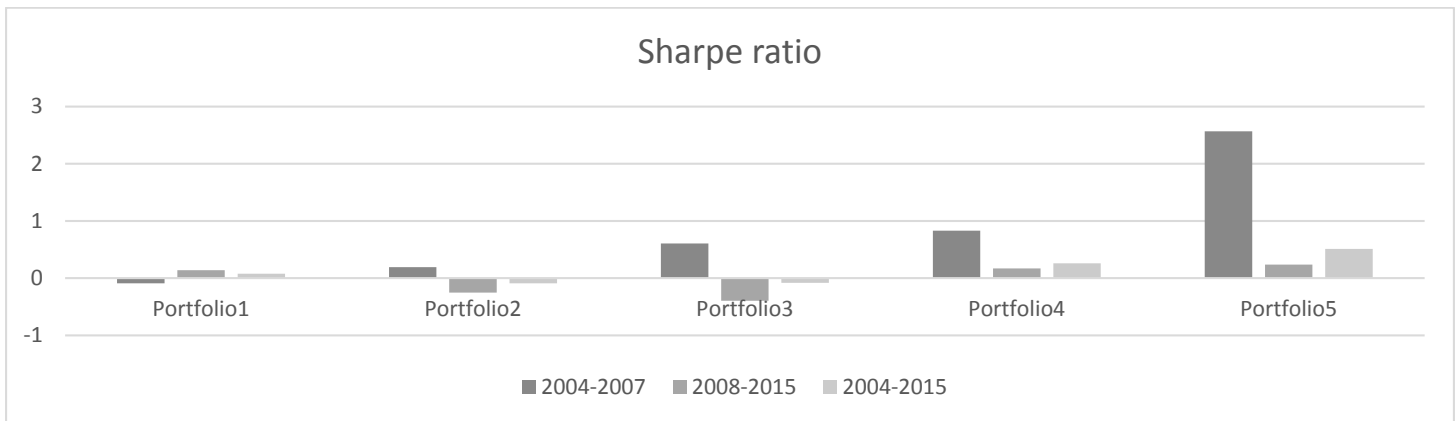
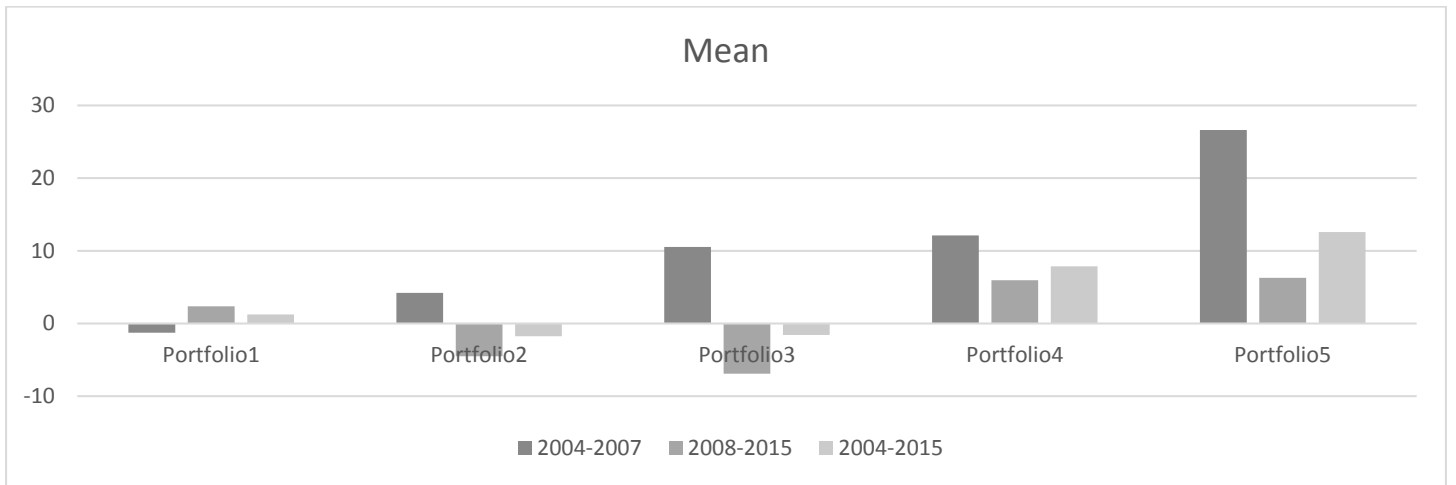
Portfolio Allocation by Country; 3-month T-bill Rates (2004-2015)

Country	Portfolio1	Portfolio2	Portfolio3	Portfolio4	Portfolio5	Total
Australia	0	0	0	1686	1040	2726
Belgium	516	1430	780	0	0	2726
Brazil	0	0	0	0	2726	2726
Canada	455	455	1816	0	0	2726
Chile	1040	195	65	910	516	2726
France	260	2141	325	0	0	2726
Germany	1426	1040	260	0	0	2726
Indonesia	0	0	0	390	2336	2726
Italy	520	1491	715	0	0	2726
Japan	2015	711	0	0	0	2726
Korea	0	0	516	2210	0	2726
Mexico	0	0	0	61	2665	2726
Netherland	1101	1235	390	0	0	2726
Norway	65	195	1556	910	0	2726
New Zealand	0	0	195	1430	1101	2726
Philippine	0	65	1040	1101	520	2726
Sweden	780	646	1300	0	0	2726
Switzerland	2596	130	0	0	0	2726
Thailand	0	390	910	1426	0	2726
United Kingdom	195	780	971	780	0	2726
Total						54520

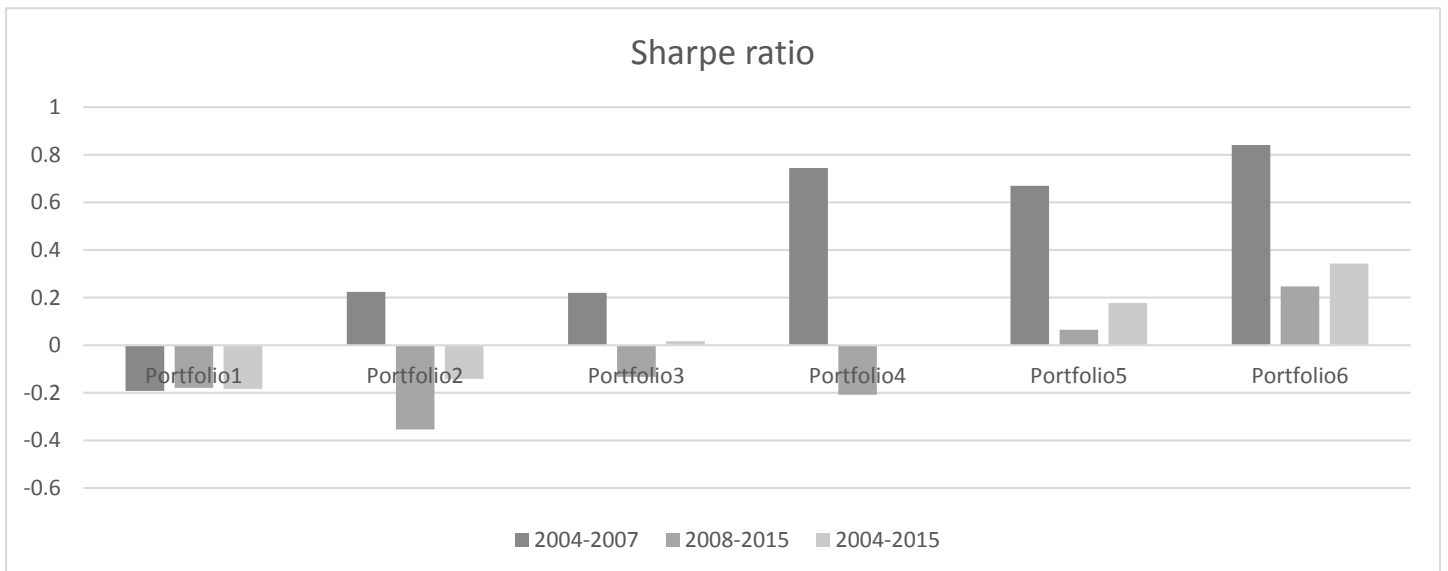
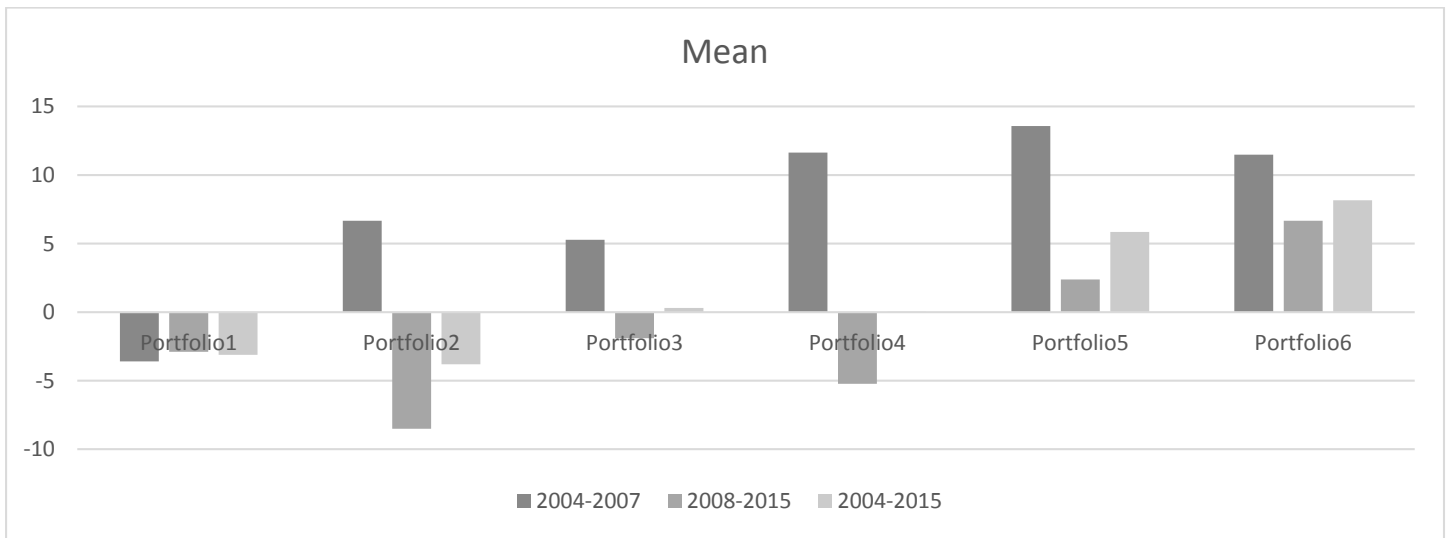
Portfolio Allocation by Country; 10-year Bond Yields (2004-2015)

Country	P1	P2	P3	P4	P5	P6	Total
Australia	0	0	0	780	1946	0	2726
Belgium	0	451	1040	1170	65	0	2726
Canada	0	1040	1036	650	0	0	2726
Columbia	0	0	0	0	455	2271	2726
Denmark	390	1296	910	130	0	0	2726
Finland	256	1430	1040	0	0	0	2726
France	0	1101	1560	65	0	0	2726
Germany	516	2210	0	0	0	0	2726
Greece	0	0	130	780	520	1296	2726
Hong Kong	1495	260	325	581	65	0	2726
Hungary	0	0	0	0	711	2015	2726
Italy	0	0	390	1426	910	0	2726
Japan	2726	0	0	0	0	0	2726
Korea	0	0	0	1166	1560	0	2726
Malaysia	260	195	65	1430	776	0	2726
Mexico	0	0	0	0	910	1816	2726
Netherland	256	1430	1040	0	0	0	2726
Norway	0	126	780	1560	260	0	2726
New Zealand	0	0	0	325	2336	65	2726
Portugal	130	65	390	780	646	715	2726
Sweden	325	2141	130	130	0	0	2726
South Africa	0	0	0	0	0	2726	2726
Singapore	2015	325	260	126	0	0	2726
Spain	0	520	646	780	780	0	2726
Switzerland	2726	0	0	0	0	0	2726
Taiwan Province	2535	130	61	0	0	0	2726
Thailand	0	390	390	906	1040	0	2726
United Kingdom	0	520	776	780	650	0	2726
Total	13630	13630	10969	13565	13630	10904	76328

Excess returns on 3-month T-bill investment (annual avg.)



Excess returns on 10-yr. bond investment (annual avg.)



Effect of US Monetary Policy Surprises on Carry Trade Returns

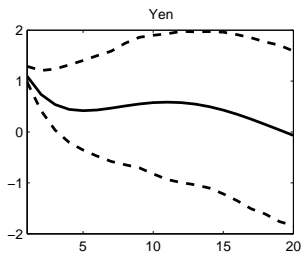
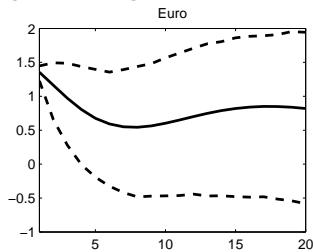
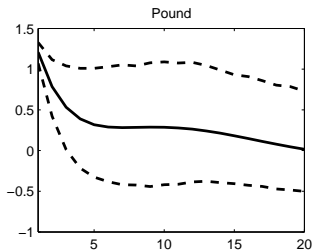
surprise	P1	P2	P3	P4	P5	All 20
2004-07	-0.019 (-1.65)	-0.023 (-1.80)	-0.016 (-1.59)	-0.020* (-1.99)	-0.033* (-2.91)	-0.022* (-2.40)
2008-15	-0.064* (-8.87)	-0.066* (-8.35)	-0.038* (-5.31)	-0.040* (-5.23)	-0.035* (-4.14)	-0.049* (-7.59)
2004-15	-0.055* (-9.03)	-0.057* (-8.58)	-0.033* (-5.68)	-0.036* (-5.79)	-0.034* (-4.99)	-0.043* (-8.16)

t statistics in parentheses; 3-month t-bill rates * $p < 0.05$

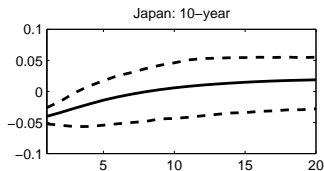
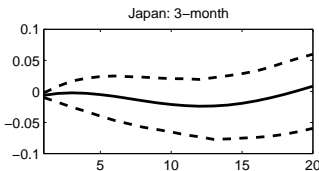
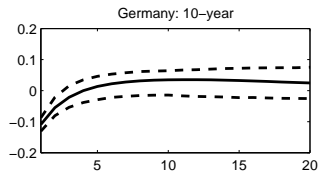
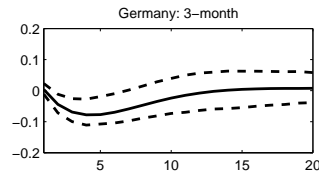
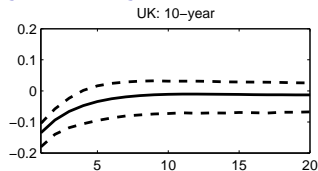
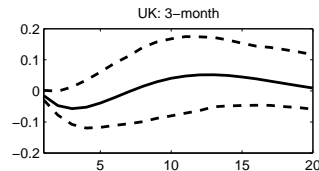
surprise	3-Month Bill				10-Year Bond			
	Germany	Italy	Japan	UK	Germany	Italy	Japan	UK
2004-07	-0.024 (-1.86)	-0.024 (-1.82)	-0.009 (-0.57)	-0.022 (-1.73)	-0.024 (-1.82)	-0.024 (-1.82)	-0.008 (-0.55)	-0.022 (-1.69)
2008-15	-0.069* (-7.86)	-0.070* (-7.85)	-0.067* (-7.30)	-0.044* (-5.33)	-0.067* (-7.65)	-0.067* (-7.57)	-0.065* (-7.10)	-0.042* (-5.06)
2004-15	-0.060* (-8.22)	-0.060* (-8.20)	-0.056* (-7.11)	-0.039* (-5.71)	-0.058* (-8.00)	-0.058* (-7.94)	-0.054* (-6.92)	-0.038* (-5.44)

t statistics in parentheses * $p < 0.05$

Effects of US monetary policy shock at ZLB

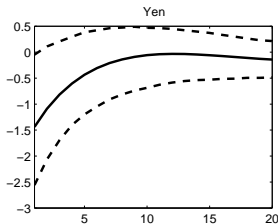
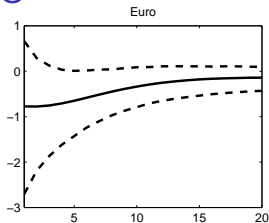
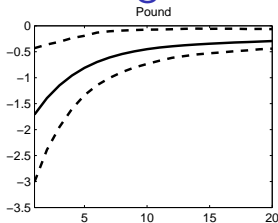


Effects of US monetary policy shock at ZLB



Effects of US monetary policy shock at ZLB

Foreign Exchange Risk Premia



Effects of US monetary policy shock at ZLB

Domestic Term Premia

	Point Estimate	Confidence Interval
Five-year	-21.5	(-27.0,-12.6)
Ten-year	-20.5	(-25.8,-10.8)

Effects of US monetary policy shock at ZLB

Foreign Term Premia

	Point Estimate	Confidence Interval
UK	-13.6	(-22.6,-7.1)
Germany	-10.3	(-13.8,-7.1)
Japan	-5.4	(-10.0,-1.0)

Effects of US monetary policy shock at ZLB

Long Foreign/Short US Ten-Year Returns

	Point Estimate	Confidence Interval
UK	12.9	(-28.5,78.0)
Germany	1.7	(-23.8,32.4)
Japan	-93.2	(-113.9,-54.2)

Foreign Exchange Risk Premia

- We find that US monetary policy easing surprises may **lower** foreign exchange risk premium.
- Opposite direction to the failure of conditional UIP found by EE (1995) and others.
- IMF (2013) argues that unconventional monetary policy easings shift risk-reversals in the direction of skewness towards dollar depreciation.
- If policy easings give the dollar more “crash risk”, then risk premium on foreign asset should fall.

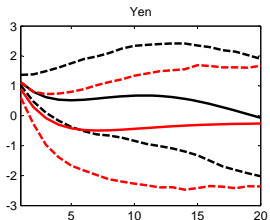
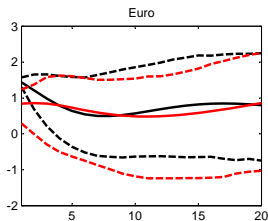
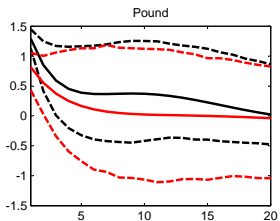
Regression of 2-day change in risk reversals on US monetary policy surprises

Risk Reversal Maturity	Euro	Pound	Yen
1 month	1.18*** (0.32)	0.80** (0.34)	1.60** (0.69)
3 months	1.07*** (0.30)	0.64** (0.28)	1.52** (0.72)
6 months	0.85*** (0.23)	0.54** (0.24)	1.07** (0.51)
1 year	0.70*** (0.20)	0.47** (0.24)	0.83* (0.44)

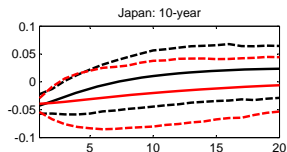
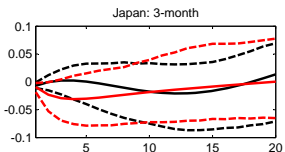
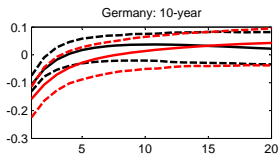
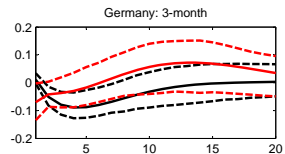
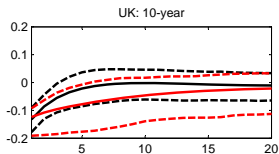
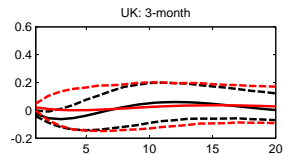
Two dimensions to monetary policy

- This paper generally considers a one-dimensional monetary policy surprise.
- But could take two external instruments (Z_t):
 - ▶ Change in two-year futures.
 - ▶ Orthogonal change in ten-year futures.
- Can interpret as forward guidance and asset purchase shocks.

Two-dimensional monetary policy shock

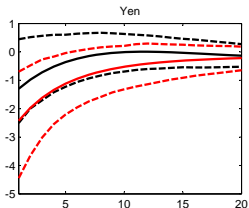
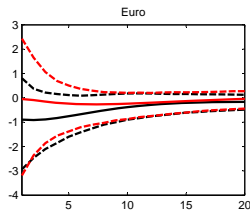
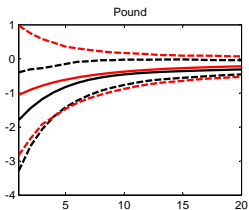


Two-dimensional monetary policy shock



Two-dimensional monetary policy shock

Foreign Exchange Risk Premia



Two-dimensional monetary policy shock

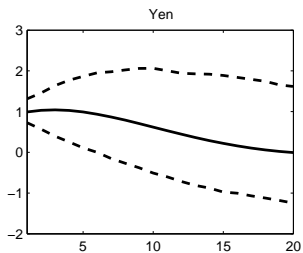
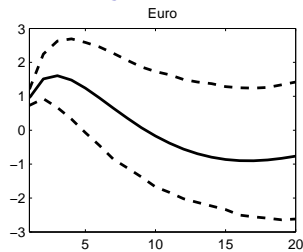
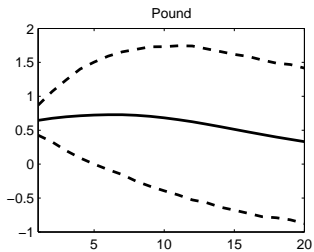
Long Foreign/Short US Ten-Year Returns

	Forward Guidance		Asset Purchase	
	Estimate	CI	Estimate	CI
UK	30.8	(-15.9,105.3)	-102.5	(-158.1,-49.9)
Euro Area	20.2	(-8.3,61.9)	-65.0	(-102.7,-39.2)
Japan	-75.8	(-97.7,-22.8)	-179.7	(-239.0,-146.8)

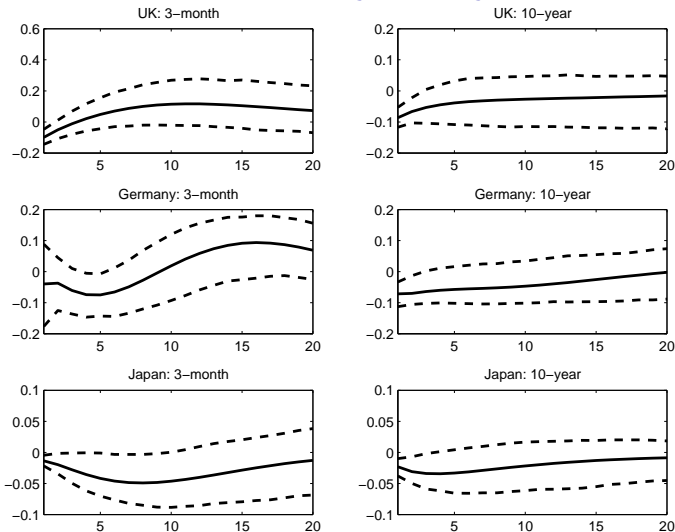
Monetary Policy Shocks before the ZLB

- Can apply methodology to monetary policy shocks before the ZLB.
- Monetary policy surprise Z_t is change in fourth eurodollar contract.
- R_1 estimated over Feb 1994-Oct 2008.

Effects of US monetary policy shock pre-ZLB

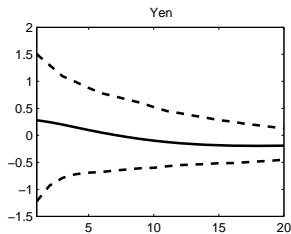
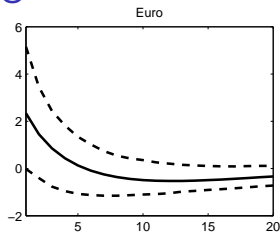
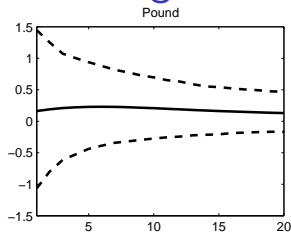


Effects of US monetary policy shock pre-ZLB



Effects of US monetary policy shock pre-ZLB

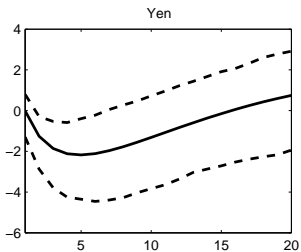
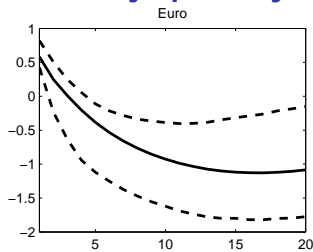
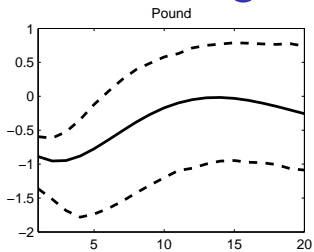
Foreign Exchange Risk Premia



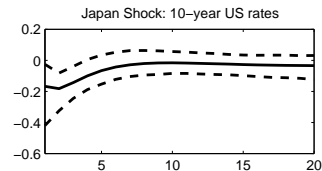
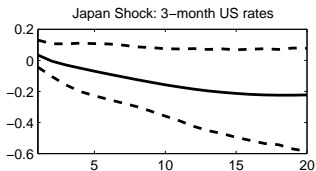
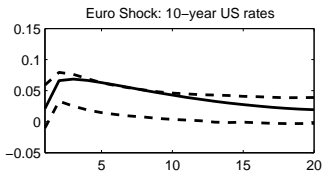
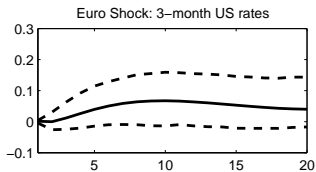
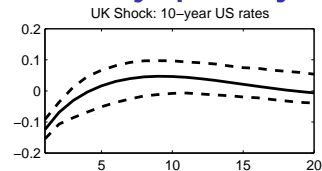
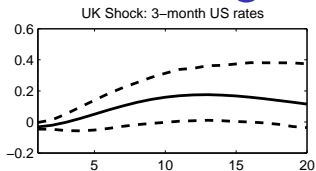
Non-US Monetary Policy Shocks

- Can redo the same analysis for BOE, ECB and BOJ monetary policy shocks.
- External instrument is change in ten-year yields for UK and Japan and change in ten-year Italian/German spread for ECB.

Effects of foreign monetary policy shocks

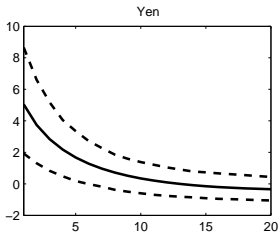
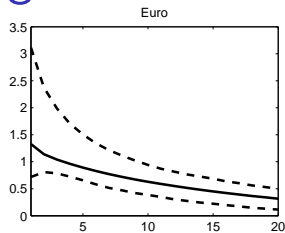
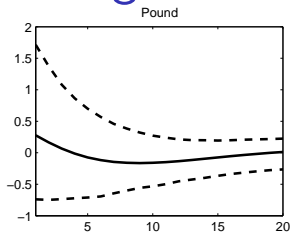


Effects of foreign monetary policy shocks



Effects of foreign monetary policy shocks

Foreign Exchange Risk Premia



Breakdown by announcement types

- Methodology so far assumes that there is a one-dimensional monetary policy surprise
- Blends forward guidance, LSAPs etc.
- Assembled a **panel of experts** to split announcements into different types
- Ran regression for each type of announcement separately

Conclusions

- Proposed approach for identifying unconventional monetary policy shock in a VAR in domestic and foreign interest rates and exchange rates.
- Monetary policy easing shocks:
 - ▶ Depreciate exchange rate.
 - ▶ Lower interest rates globally.
 - ▶ Lower term premia globally.
 - ▶ May lower foreign exchange risk premia.