

If the Fed sneezes, who gets a cold?

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*Spillovers of conventional and unconventional monetary policy:
the role of real and financial linkages
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***The views expressed here are our own and do not reflect those of the
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Motivation

- Transmission abroad of US monetary policy topical issue in view of interest rate normalization.
- Does a monetary tightening result in tail- or headwinds for other countries?
- What are the effects on short- and long-term interest rates and financial conditions?
- Does it lead to capital inflows or outflows?
- What are the implications of closer trade and financial links for the sign and size of spillovers?
- Do the exchange rate regime and degree of capital mobility affect the macroeconomic and financial transmission of US monetary policy?

Trilemma or dilemma?

- Conventional view (**Trilemma**): Domestic stabilization can be pursued by monetary policy (e.g. in the face of foreign monetary developments) either giving up exchange rate stability or free capital mobility.
- Rey (2013) **Dilemma**: EMEs can exercise monetary autonomy from US monetary policy (and the “global financial cycle”) only imposing capital controls.
- Obstfeld (2015): EMEs able to float are far better positioned than those that peg, but exchange rate alone not enough.
- **Our paper** looks at the spillovers of US monetary policy shocks – many others, e.g. Canova 2005; Mackowiak 2007, Miniane and Rogers 2007,...
- Estimates effects on AEs and EMEs looking at macroeconomic and financial impact – Better understanding of macroeconomic and financial stability trade-offs.

Preview of key results

- The question we ask is really: “If the Fed makes the US sneeze, who catches the cold?”
- “Everybody, but with different macroeconomic and financial symptoms.”
- Fed tightening depresses real activity everywhere, despite widespread dollar appreciation – Aggregate demand/interest rate channel, little expenditure switching effects.
- Interest rates respond more in AEs than EMEs, inflation falls in AEs and rises in EMEs – Different pass-through too.
- Housing prices, domestic credit decline only in EMEs, which also experience capital (banking and portfolio) outflows.
- EMEs with more flexible exchange rates and lower capital mobility are better insulated from some of the financial repercussions of US monetary policy.

Some related literature

- Interest rates more closely linked in pegs and under open capital markets, than in floats and less open capital markets – Frankel, Schmukler and L. Servén (2004), Shambaugh (2004), Obstfeld, Shambaugh and Taylor (2005), Klein and Shambaugh (2010, 2013).
- Di Giovanni and Shambaugh (2008): effect of foreign interest rate on domestic growth is larger in pegs.
- Financial spillovers larger under more stable exchange rates and higher financial openness – Aizenmann, Chinn, Ito (2010, 2015).
- Miniane and Rogers (2007): Exchange rate flexibility does insulate domestic interest rates from US monetary policy shocks, capital controls don't – but macroeconomic effects remarkably similar despite exchange rate regime.

Econometric approach

- **Two-step** approach:
 - (i) Recover US monetary policy shocks in a large BVAR using sign restrictions based on Gertler and Karadi (2015);
 - (ii) Project a number of variables in countries other than the US on estimated shocks and own lags.
- We then group countries according to their cross sectional characteristics, such as exchange rate regime, financial openness, dollar financial exposure...

First stage estimation: Large BVAR

- VAR with 13 variables:
 - US variables: IP, CPI, FFR, 1Y GBY, Corporate bond spread, Mortgage spread, Commercial paper spread, Stock prices, NEER
 - International Variables: CRB index of commodity prices, OECD industrial production, Global stock prices (ex US), Difference between G7 short-term interest rate and the US 3-month T-bill rate.
 - Control for global drivers of fluctuations in countries other than the USA.

- Technical details:

Giannone, Lenza and Primiceri (2015): large BVAR with empirical determination of informativeness of prior on hyperparameters governing distribution of VAR parameters.

Identification of US monetary policy shocks

- Impose sign restrictions so that shocks have domestic effects consistent with theoretical and empirical literature.
- Focus on empirical results in Gertler and Karadi (2015):
 - Useful as we want to consider the responses of several asset prices.
 - Deal with the zero bound by modelling the response of a range of interest rates.
- In addition restrictions on interest rate differential and exchange rate to isolate shocks with stronger US specific component.
- Especially a concern over recent period as ultra low rates in all major currency blocs.

Issues with ZLB

- Approach similar to estimation of a “shadow rate”.
- A contractionary shock not only increases the short-term rate (relative to its normal level in line with macroeconomic conditions), but that also the 1-year rate and interest rate spreads.
- Any lack of accommodation in short-term rates over the more recent period will be interpreted as a contractionary shock only if associated with increases in all these other longer-dated interest rates, and appreciation.
- Key is also the assumption that G7 rates should be lower, for similar reasons – VAR fairly robust to inclusion of post-2008 data.

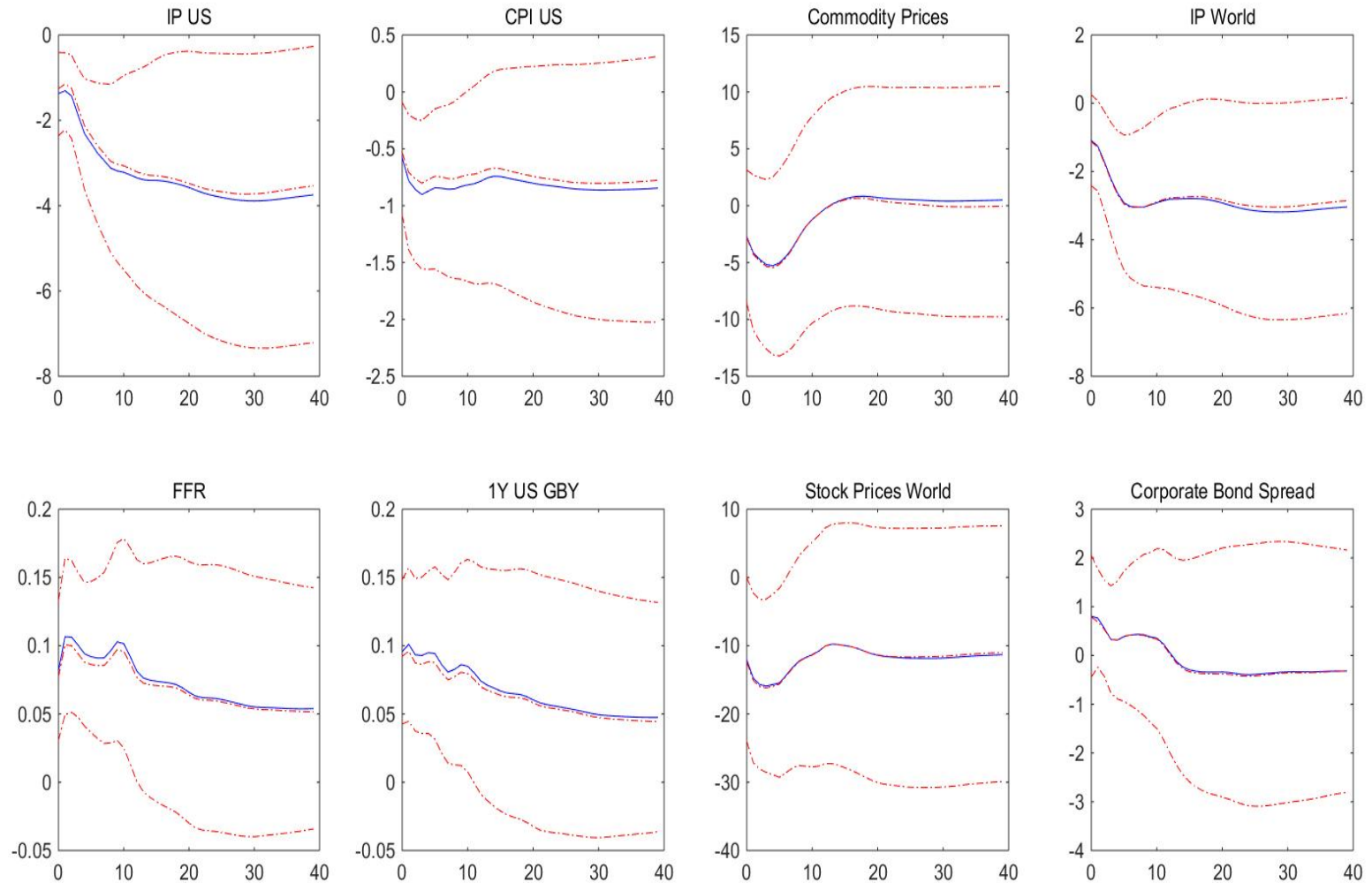
Why we don't use GK instruments

- We could use directly GK shocks, or their external instruments in our VAR – anyway our shocks correlated with theirs.
- Or even better in IV regressions of country variables on US interest rates.
- But we are not interested in (re)-assessing the overall effects of US monetary policy.
- We are interested in its global repercussions conditional on plausible “textbook” domestic effects.
- We then prefer to impose a “tighter” prior to make sure we recover shocks with the desired features.
- This includes restricting the interest rate differential and dollar exchange rates – even if it could go against finding large spillovers.

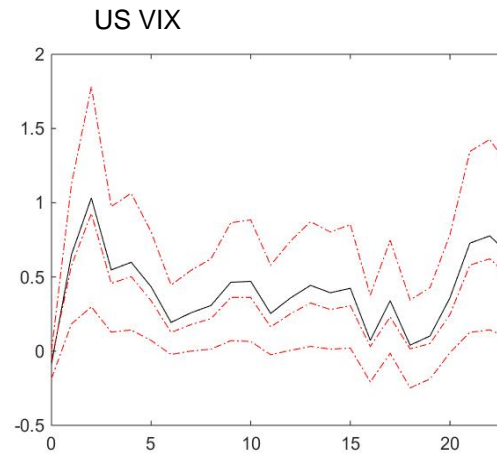
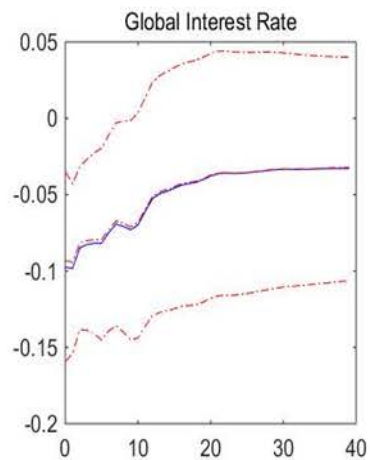
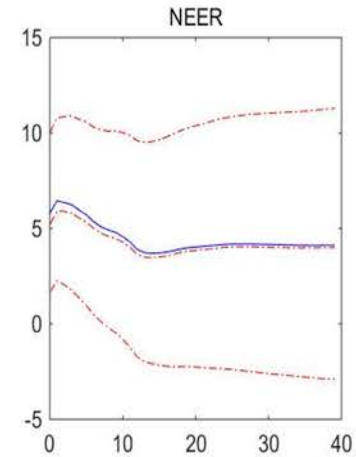
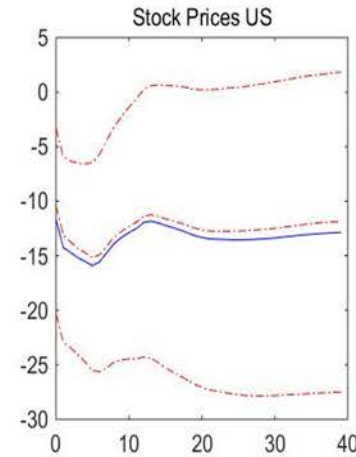
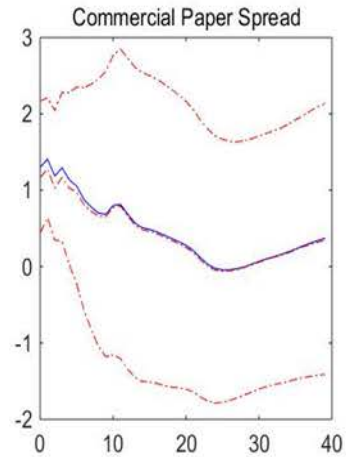
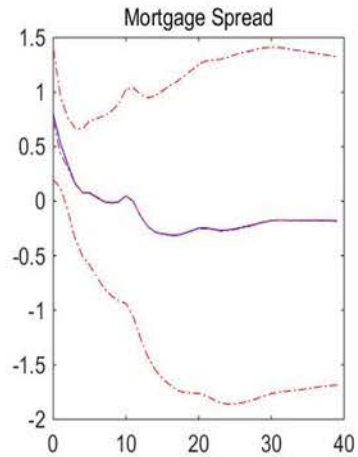
Identification of US monetary policy shocks

- Sign restrictions on
 - FFR >0 $t=1-6$
 - US IP <0 $t=2-6$
 - CPI US <0 $t=4$
 - US 1-year rate >0 $t=1-4$
 - Mortgage spread >0 $t=2$
 - Commercial paper spread >0 $t=1-3$
 - Stock prices US <0 , $t=1$
 - G7 interest differential <0 $t=1$
 - NEER >0 $t=1$
- For each draw from the BVAR posterior distribution evaluate 1000 random orthogonalizations of the variance-covariance matrix, keeping those that satisfy sign restrictions (Uhlig, 2005).
- At least one suitable orthogonalization for more than 99% of the draws from the reduced form posterior – Restrictions do not implausibly constrain the BVAR.

The effect of a US monetary policy shock: 1980-2013



The effect of a US monetary policy shock: 1980-2013



Robustness and validation

- BVAR estimated up to the end of 2008:
 - IRFs are similar to the baseline specification, except a smaller response of financial spreads
 - But some very large shocks estimated at end of 2008
- Exclude the global interest rate differential from the BVAR:
 - Very persistent response of interest rates
 - Larger response of international variables

=> Key for robustness to inclusion of recent ZLB sample
- Shocks significantly affect US variables not included in VAR:
 - VIX increases – Comparison with Rey (2013), Obstfeld (2015).
 - Quarterly macro and financial variables including GDP, unemployment, capital (portfolio and banking) flows.

Second-stage regressions

- Each variable regressed on MP shocks and own lags.
- *Specification:* $y_{j,i,t} = \alpha_{i,j} + \phi_{i,j}(L) y_{j,i,t-1} + \beta_{i,j}(L) \varepsilon_{US,t}^{MP} + \varepsilon_t$
 - Lags of the dependent variable (12 if monthly, 4 if quarterly);
 - Contemporaneous MP shock + lags (24 if monthly, 8 if quarterly);
 - Constant + Trend + Dummy variables (for seasonality).(In quarterly regressions MP shocks aggregated taking the quarterly mean)
- Shocks estimation uncertainty taken into account (but not sampling uncertainty for now).

Second-stage regressions

- Results displayed computing the distribution of mean IRFs across countries grouped according to given characteristics:
 - Advanced vs Emerging
 - Floaters vs Pegs vis-à-vis US \$ -- Klein-Shambaugh (2010)
 - Financially Open vs Less Open – Chinn-Ito
 - Dollar Exposed vs Less Dollar Exposed (Benetrix, Lane, Shambaugh)
 - Overall and bilateral (US) trade openness

Results with the last two features so far not very significant, not shown here.

Countries groups: AEs and EMEs

ECONOMY	
ADVANCED	EMERGING
Australia	Brazil
Austria	Chile
Belgium	China
Canada	Colombia
Denmark	Czech Republic
Finland	Estonia
France	Hungary
Germany	India
Greece	Latvia
Italy	Lithuania
Japan	Malaysia
Korea	Mexico
Netherlands	Philippines
Norway	Poland
Portugal	Russia
Spain	South Africa
Sweden	Thailand
UK	Turkey

Monthly results:

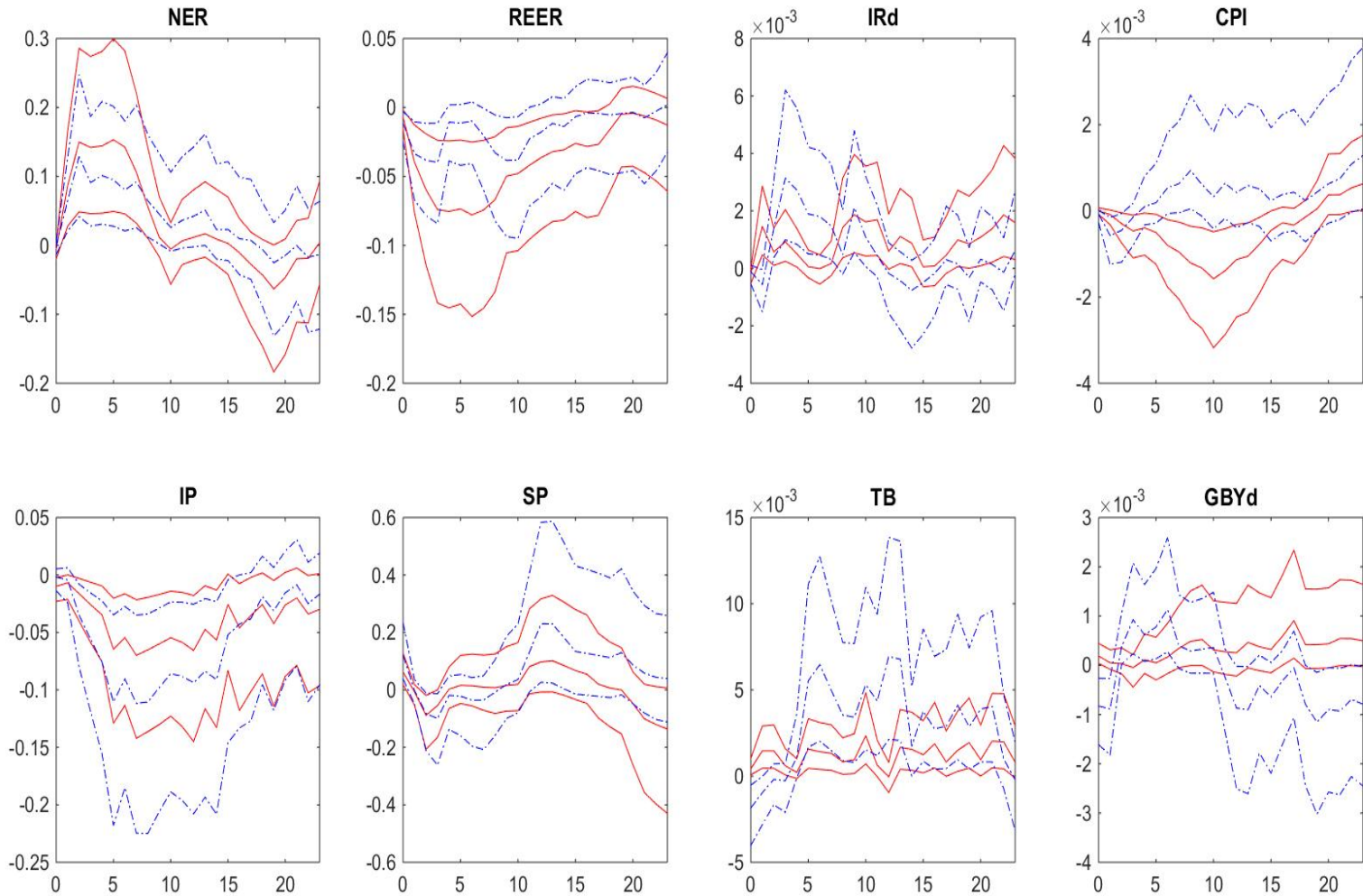
- CPI rises (**declines**) significantly in EMEs (**AEs**), while the trade balance falls (**rises**) on impact in EMEs (**AEs**).

Quarterly results:

- Negative capital inflows in EMEs, falling real house prices, real domestic credit, portfolio inflows (notably bank inflows): Higher macro and financial volatility.
- These variables barely affected in **AEs**.

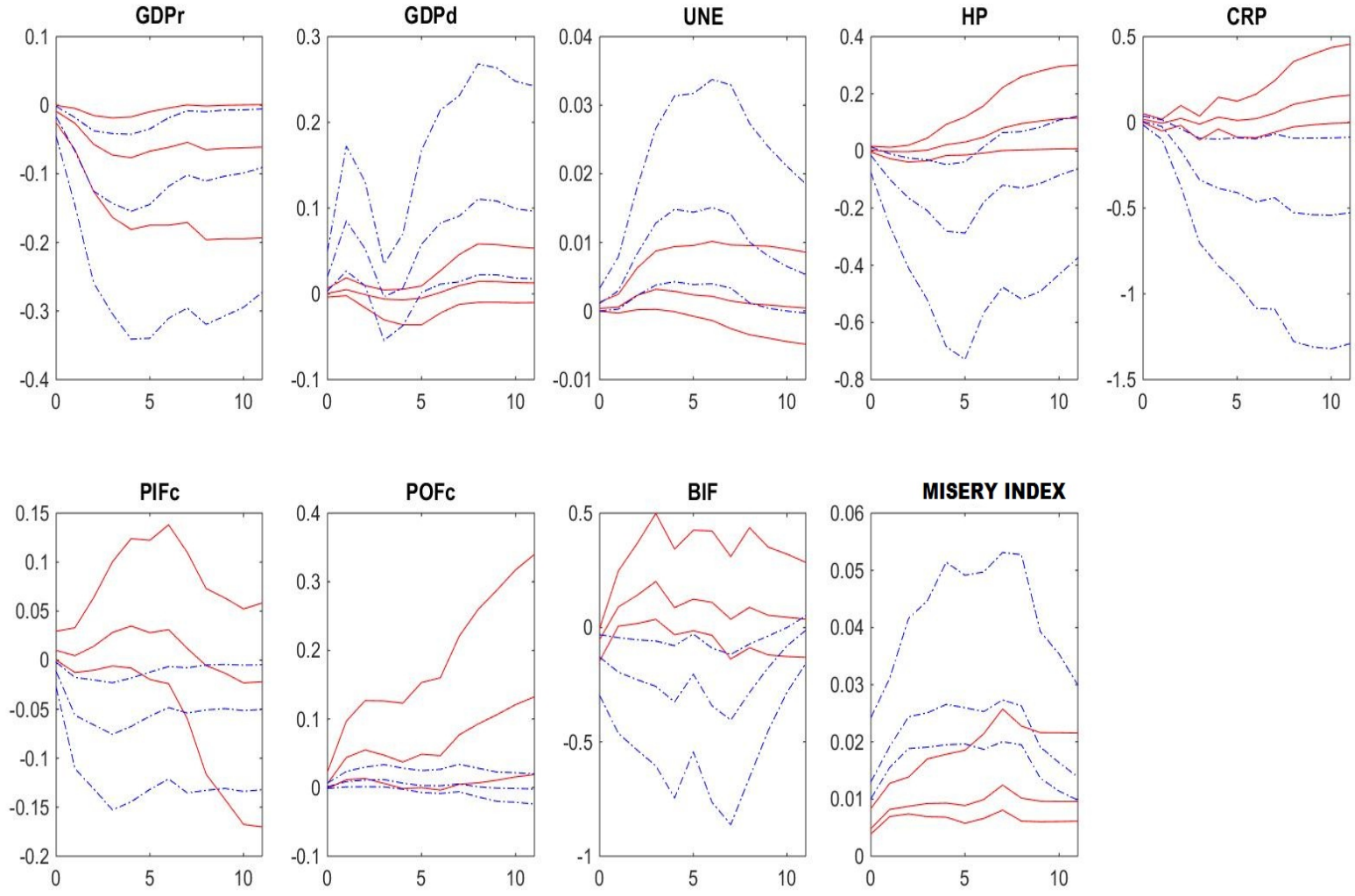
Advanced (red) vs Emerging (blue) countries

Monthly data full sample



Advanced (red) vs Emerging (blue)

Quarterly data full sample



Countries groups: EMEs, \$ Pegs and Floats

EXCHANGE RATE REGIME	
FLOATERS	PEGGERS
Australia	China
Austria	India
Belgium	Malaysia
Brazil	Mexico
Canada	Philippines
Chile	Thailand
Colombia	
Czech Republic	
Denmark	
Estonia	
Finland	
France	
Germany	
Greece	
Hungary	
Italy	
Japan	
Korea	
Latvia	
Lithuania	
Netherlands	
Norway	
Poland	
Portugal	
Russia	
South Africa	
Spain	
Sweden	
Turkey	
UK	

Monthly results:

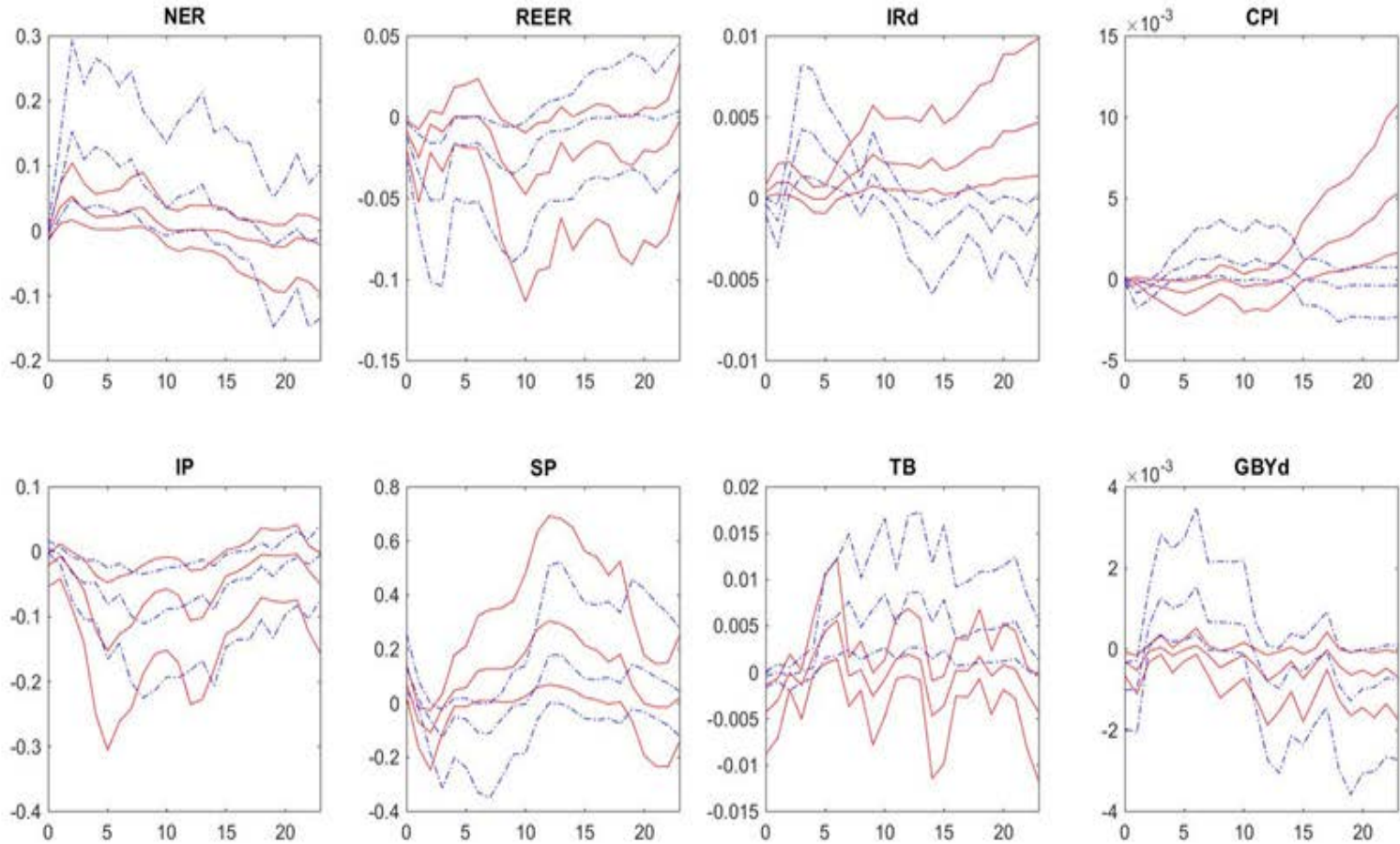
- Short-term rates respond **more** (less) than one-to-one to US rates in **Pegs** (Floaters), but **persistent** (temporary) CPI increase.

Quarterly results:

- Floaters (**Pegs**) experience higher (**lower**) unemployment,
- Capital outflows are smaller (**larger**) in Floaters (**Pegs**), with banking inflows and real credit turning positive (**negative**).

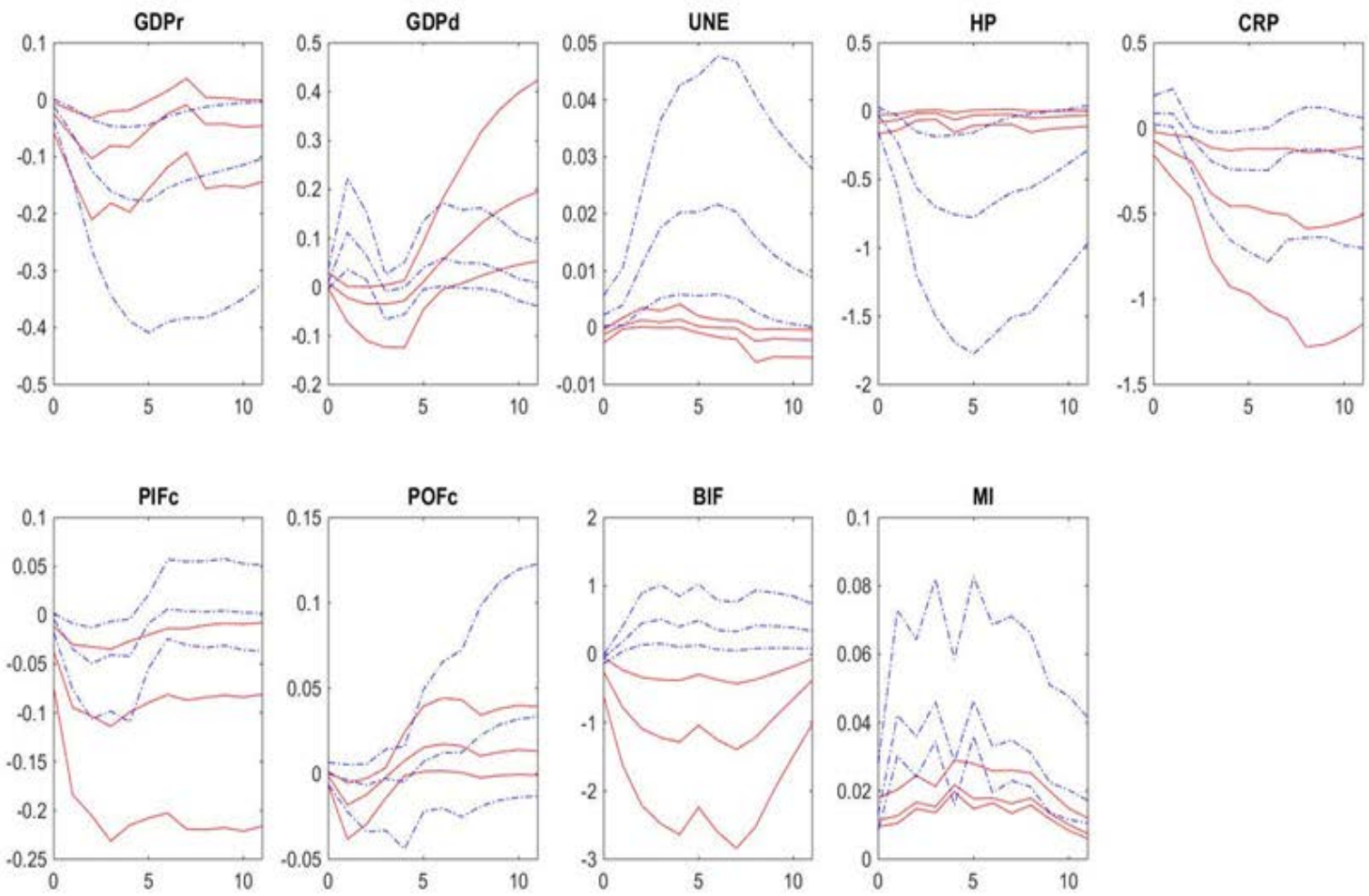
EMEs \$ Pegs (red) vs Floaters (blue)

Monthly data full sample



EMEs \$ Pegs (red) vs Floaters (blue)

Quarterly data full sample



Country groups: Financial openness (Chinn-Ito)

OPEN	LESS OPEN
Australia	Brazil
Austria	Chile
Belgium	China
Canada	Colombia
Czech Republic	Greece
Denmark	Hungary
Estonia	India
Finland	Korea
France	Malaysia
Germany	Mexico
Italy	Norway
Japan	Philippines
Latvia	Poland
Lithuania	Portugal
Netherlands	Russia
Spain	South Africa
Sweden	Thailand
UK	Turkey

Monthly results:

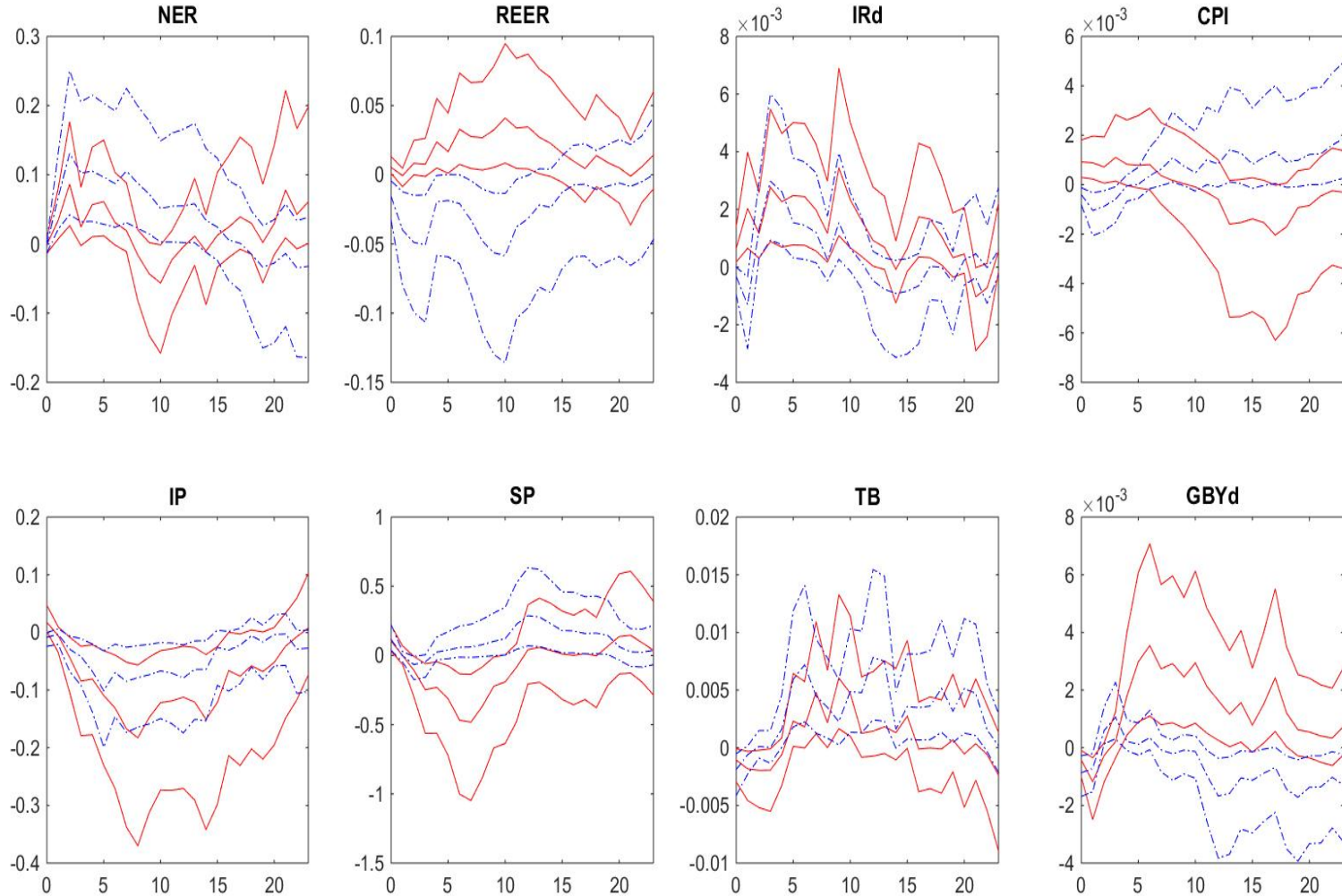
- In **open EMEs** (only from Europe), interest differential **increases** (falls), RER **appreciates** (depreciates), CPI rises **temporarily** (persistently).
- IP similar, but stock prices **fall** (rise).

Quarterly results:

- In **open** (closed) **EMEs**, domestic credit **falls** (rises), but bank inflows increase (decline).
- Domestic capital outflows and foreign inflows are both **positive** (negative).

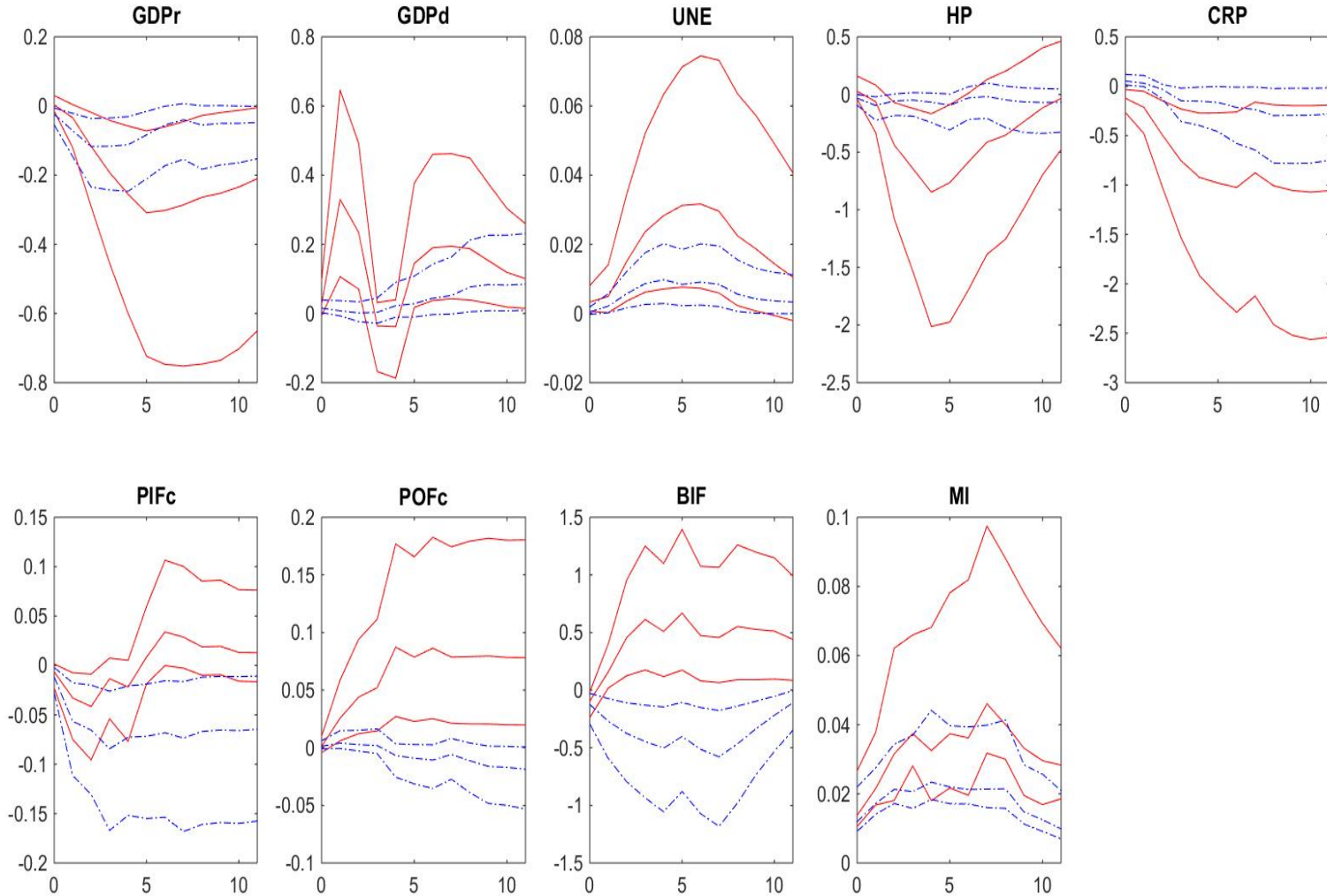
EMEs Open (red) vs. Closed (blue)

Monthly data full sample



EMEs Open (red) vs. Closed (blue)

Quarterly data full sample



Country groups: Financially closed EMEs

\$ Pegs vs Floaters

OPEN	LESS OPEN
Australia	Brazil
Austria	Chile
Belgium	China
Canada	Colombia
Czech Republic	Greece
Denmark	Hungary
Estonia	India
Finland	Korea
France	Malaysia
Germany	Mexico
Italy	Norway
Japan	Philippines
Latvia	Poland
Lithuania	Portugal
Netherlands	Russia
Spain	South Africa
Sweden	Thailand
UK	Turkey

Monthly results:

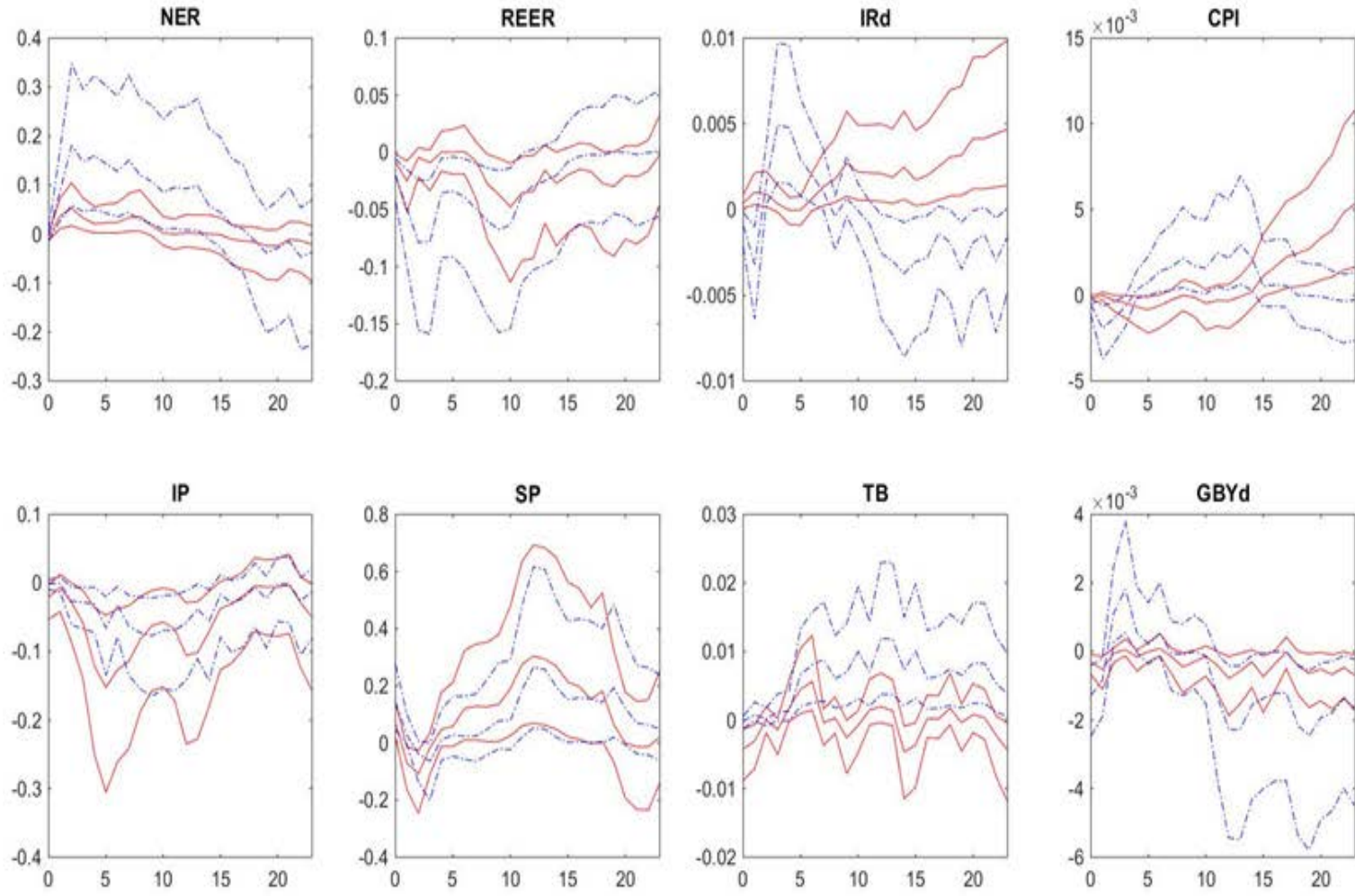
- In closed Floaters (**Pegs**) interest differentials fall (**increase**) on impact, CPI rises **temporarily** (persistently).
- IP similar, trade balance improves (**deteriorates**).

Quarterly results:

- In closed Floaters (**Pegs**) unemployment increases persistently (**temporarily**), while GDP deflator tracks CPI.
- Domestic credit and bank inflows increase (**decline**).

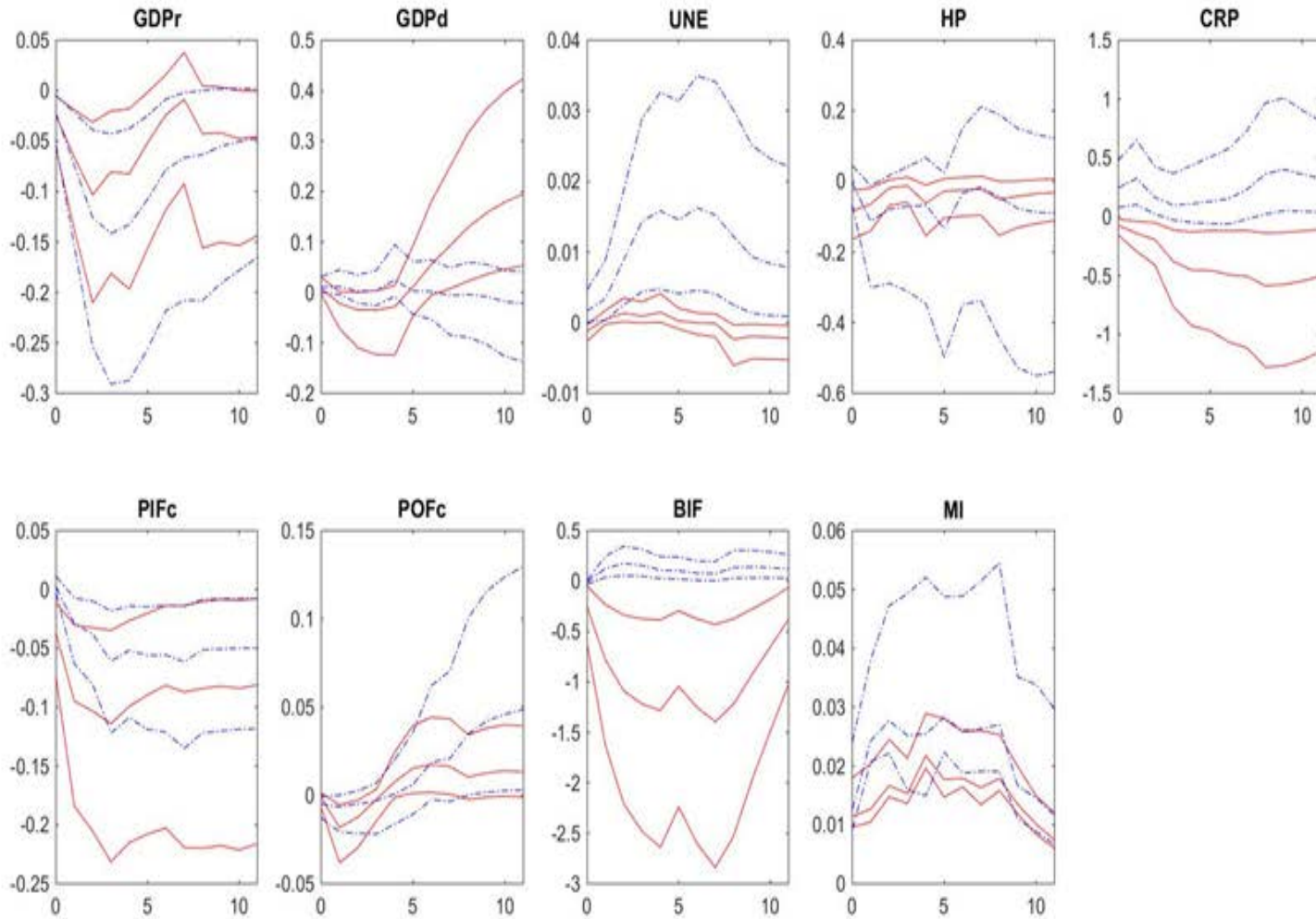
Closed EMEs, \$ Pegs (red) vs Floaters (blue)

Monthly data full sample



Closed EMEs, \$ Pegs (red) vs Floaters (blue)

Quarterly data full sample



Concluding remarks

- Study of the effects of US monetary policy shocks on a large set of countries and variables.
- Main differences in macroeconomic and financial effects across AEs and EMEs.
- EMEs with more flexible exchange rates and lower capital mobility are better insulated from some of the financial repercussions of US monetary policy.
- EMEs pegs suffer larger effects on interest rates, portfolio and banking flows, even with similarly low capital mobility.
- Caveat: Focus on monetary transmission, silent on normative implications of systematic US monetary policy for the rest of the world.

Paper still work in progress

- Many things to do:
 - Sampling uncertainty
 - Robustness to different measures of capital mobility,...
 - Other country characteristics: currency invoicing,..
 - More than a few country characteristics together
 - ...

Countries characteristics

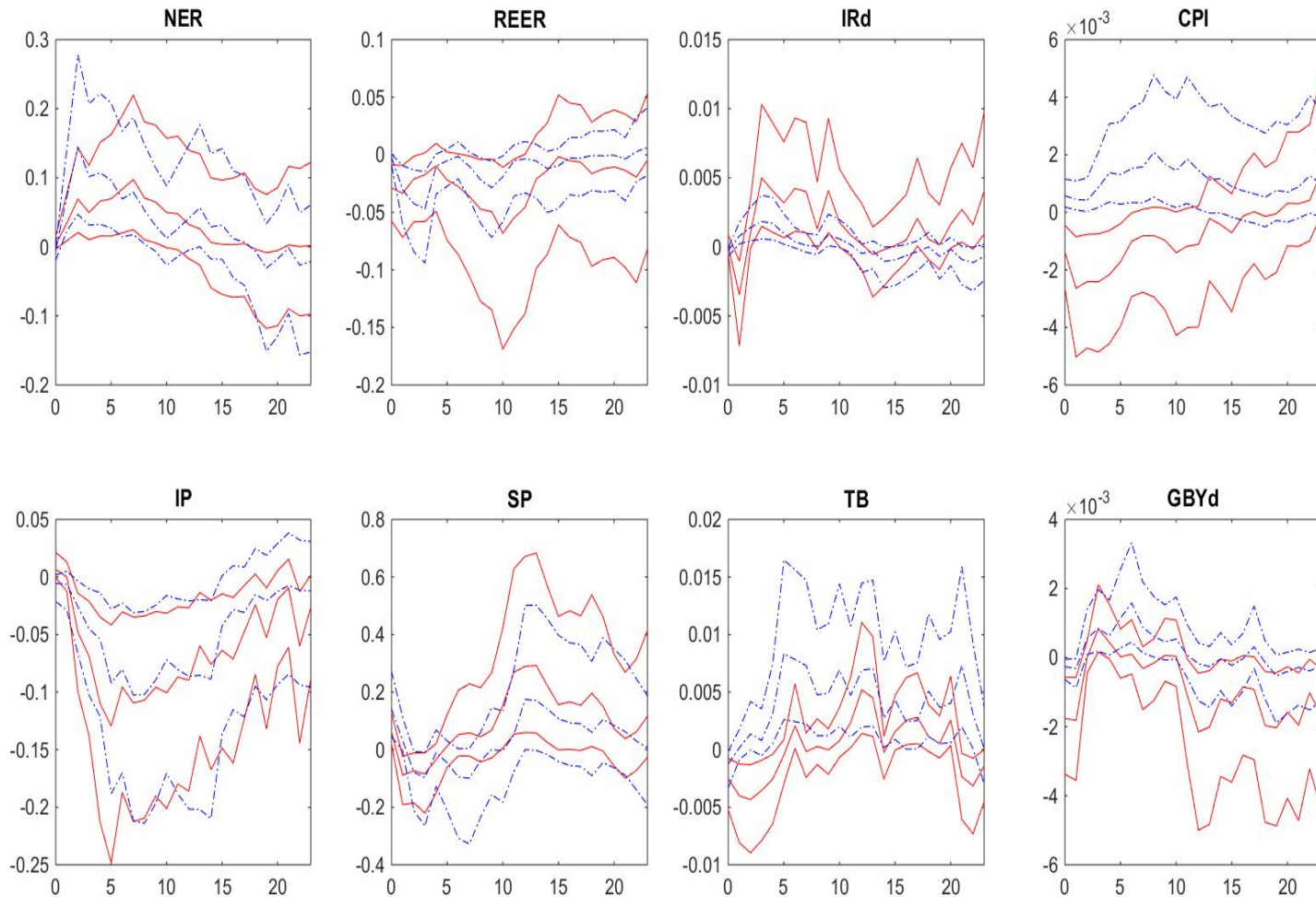
	Emerging (2014)	Reinhard and Rogoff FX regime	Base country (Klein and Shambaugh)	Average for US pegged countries (Klein and Shambaugh)	Euro Area member or pegged (2015)	Chinn-Ito financial openness	Capital inflow restrictions	Net total dollar exposure	Net debt dollar exposure	Gross total dollar exposure	Trade with US / GDP	Forex reserves / GDP	Trade Openness
Australia	0	3.8	US	0	0	1.4	0.3	23%	1%	52%	4%	4%	31%
Austria	0	1.0	Germany	-	1	1.9	0.1	5.4%	2%	42%	2%	6%	63%
Belgium	0	1.0	Germany	-	1	1.7	0.0	7%	3%	97%	9%	5%	159%
Brazil	1	3.9	US	0.03	0	-1.1	0.7	17%	-11%	34%	4%	11%	18%
Canada	0	2.3	US	0.22	0	2.4	0.1	30%	12%	97%	38%	3%	55%
Chile	1	2.8	US	0.06	0	-0.3	0.4	33%	-9%	76%	9%	17%	49%
China	1	2.0	US	0.47	0	-1.3	1.0	27%	-29%	35%	5%	19%	39%
Colombia	1	2.9	US	0	0	-1.1	0.7	21%	-9%	44%	10%	10%	18%
Czech Republic	0	2.2	-	-	0	1.6	0.1	-3%	-49%	33%	2%	22%	105%
Denmark	0	1.6	Germany	-	1	1.7	0.1	15%	17%	70%	3%	11%	54%
Estonia	0	1.4	-	-	1	2.4	-	10%	-11%	18%	3%	13%	130%
Finland	0	1.5	Germany	-	1	1.9	0.2	2%	-5%	47%	3%	5%	52%
France	0	1.2	Germany	-	1	1.4	0.0	8%	-1%	46%	3%	2%	39%
Germany	0	2.8	US	0	1	2.4	0.1	7%	-3%	40%	4%	3%	50%
Greece	0	1.4	Germany	-	1	0.5	0.0	10%	4%	15%	1%	4%	29%
Hungary	1	2.6	Germany	-	0	0.3	0.2	18%	-11%	24%	3%	22%	107%
India	1	1.9	US	0.24	0	-1.2	0.9	13%	-24%	24%	2%	8%	20%
Italy	0	1.6	Germany	-	1	1.4	0.0	4%	-1%	26%	2%	3%	49%

Countries characteristics

	Emerging (2014)	Reinhard and Rogoff FX regime	Base country (Klein and Shambaugh)	Average for US pegged countries (Klein and Shambaugh)	Euro Area member or pegged (2015)	Chinn-Ito financial openness	Capital inflow restrictions	Net total dollar exposure	Net debt dollar exposure	Gross total dollar exposure	Trade with US / GDP	Forex reserves / GDP	Trade Openness
Japan	0	4.0	US	0	0	2.3	0.0	12%	-4%	50%	5%	9%	21%
Korea	0	2.5	US	0.34	0	-0.3	0.4	23%	-2%	42%	11%	14%	60%
Latvia	0	3.1	-	-	1	2.3	0.1	-4%	-25%	25%	1%	17%	74%
Lithuania	1	2.1	-	-	1	2.2	-	1%	-26%	24%	2%	13%	94%
Malaysia	1	1.9	US	0.37	0	0.9	0.7	16%	-29%	69%	22%	31%	141%
Mexico	1	3.2	US	0.28	0	0.4	0.6	37%	-6%	44%	28%	8%	40%
Netherlands	0	1.1	Germany	-	1	2.4	0.0	12%	-2%	95%	6%	5%	97%
Norway	0	3.0	Germany	-	0	1.3	0.1	16%	16%	73%	3%	14%	51%
Philippines	1	2.4	US	0.31	0	-0.4	0.7	30%	18%	50%	13%	12%	59%
Poland	1	3.5	Germany	-	0	-1.2	0.7	10%	-3%	26%	1%	16%	53%
Portugal	0	1.5	Germany	-	1	1.1	0.1	10%	4%	18%	2%	7%	50%
Russia	1	3.4	-	-	0	-0.3	0.7	-5%	-43%	60%	2%	15%	38%
South Africa	1	4.4	US	0.09	0	-1.3	0.4	-16%	-62%	31%	4%	4%	44%
Spain	0	1.5	Germany	-	1	1.3	0.0	10%	2%	23%	2%	5%	35%
Sweden	0	2.6	Germany	-	0	1.8	0.1	12%	7%	69%	4%	6%	52%
Thailand	1	1.8	US	0.62	0	-0.3	0.6	25%	3%	42%	11%	23%	85%
Turkey	1	4.3	US	0.06	0	-0.8	0.3	-5%	-26%	31%	2%	8%	33%
UK	0	2.9	Germany	-	0	2.4	0.0	17%	14%	207%	5%	3%	39%

EMEs with high (red) low (blue) exposure to \$

Monthly data full sample



EMEs with high (red) low (blue) exposure to \$

Quarterly data full sample

