Bond risk premia and the exchange rate

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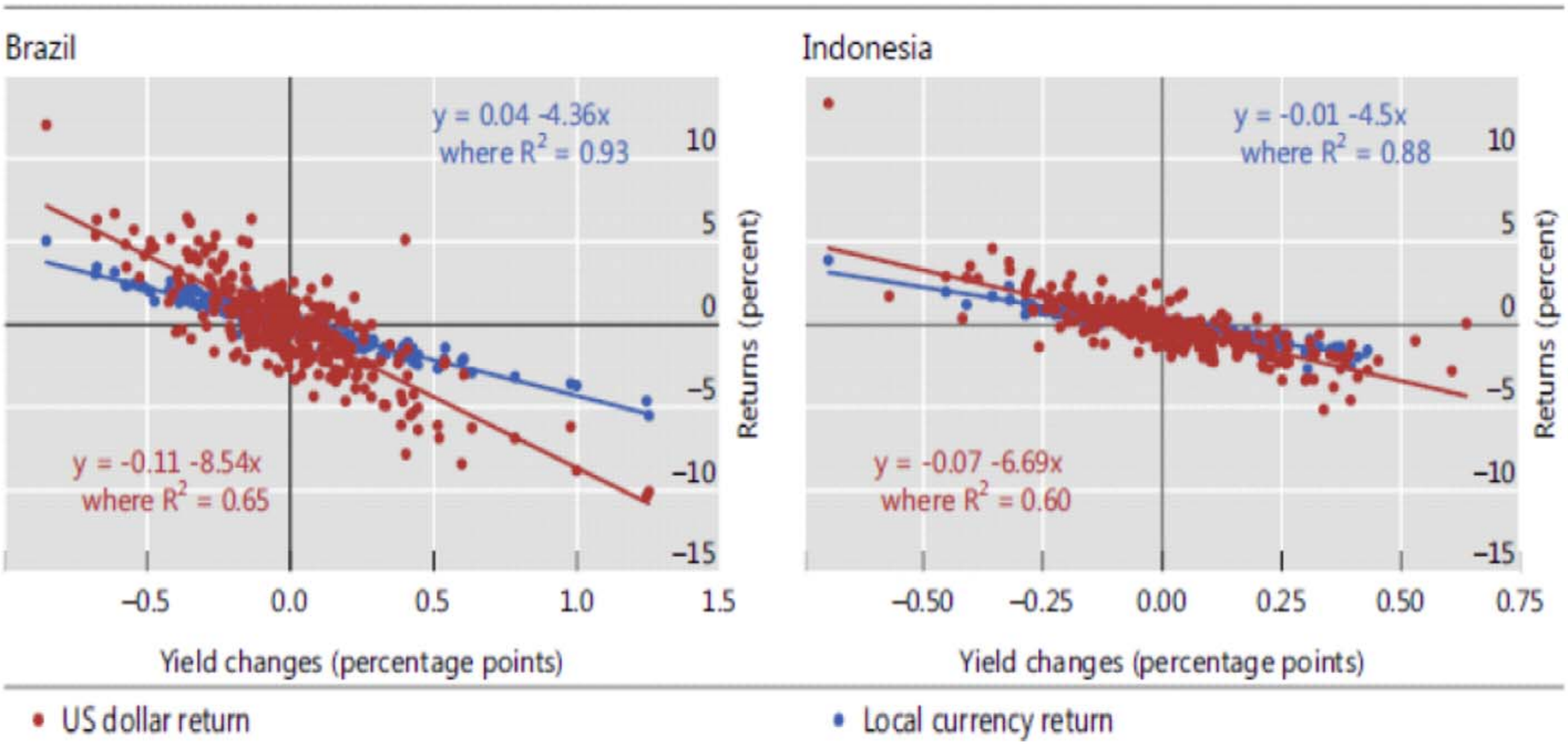
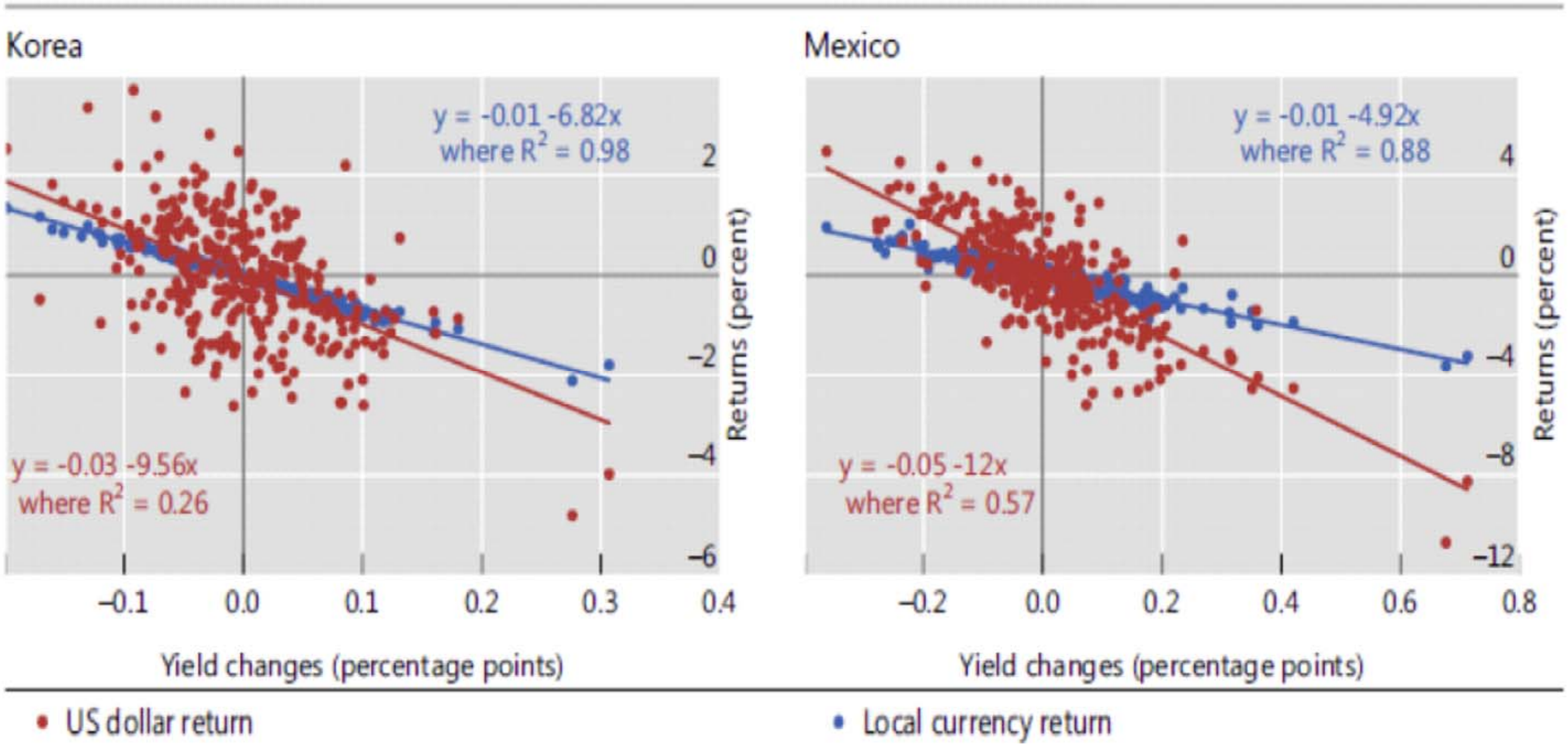
Motivation

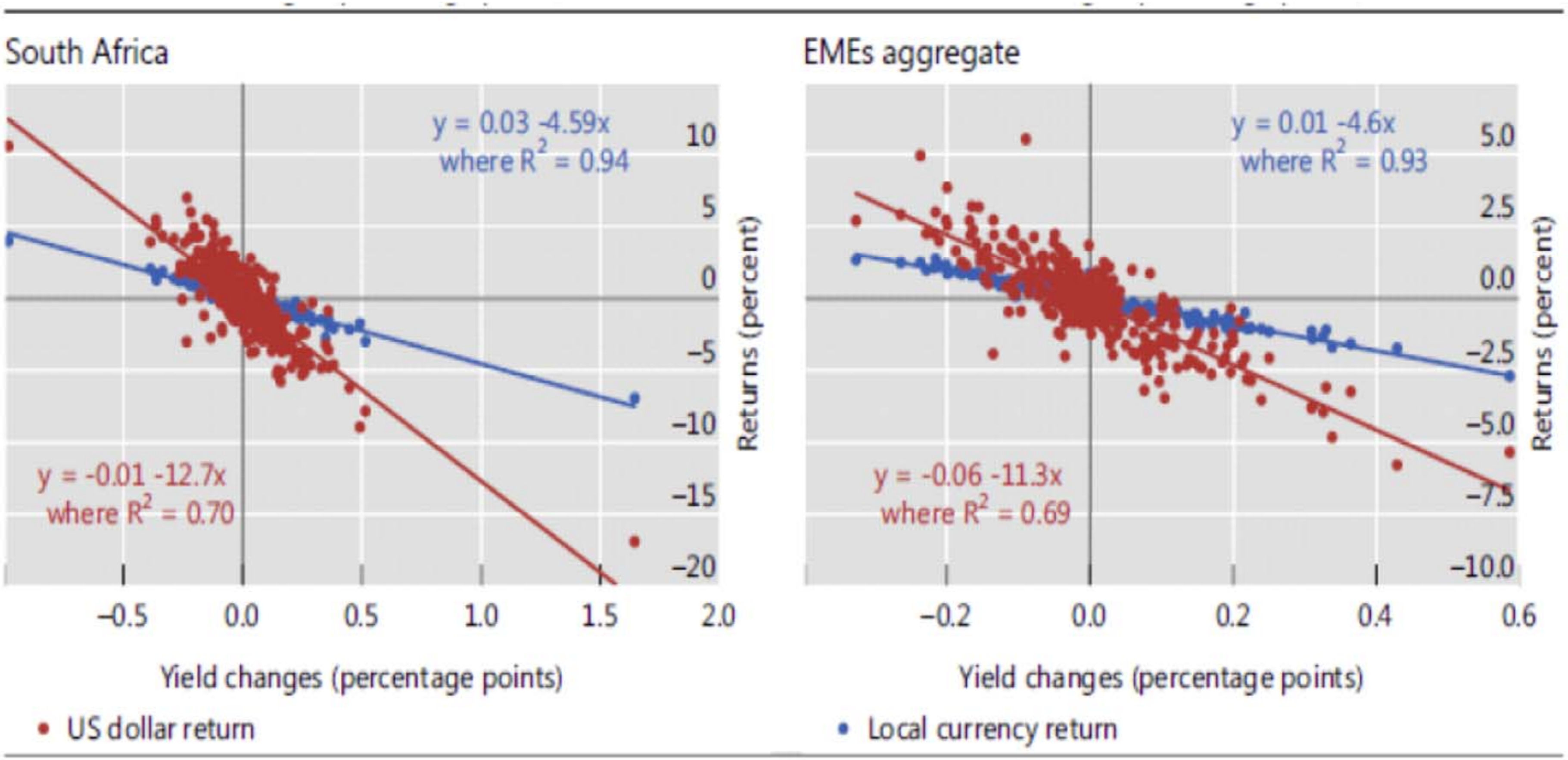
- After EME crises of the 1990s, policy efforts on reducing vulnerabilities stemming from foreign currency debt.
  - Most notable has been the growth of local currency bond markets in many EMEs to overcome "original sin"
- Many EME borrowers now routinely borrow in their local currency, while global investors increasingly hold a large share of EME bonds that are denominated in local currency.
- Global investors measure their returns in terms of USD or other major currencies, so FX movements amplify their gains and losses, and magnify the risks they face in meeting obligations at home in the investors' home currency.
- The currency mismatch has migrated to the holders of the EME bonds: "original sin redux" (Carstens and Shin 2019).

Focus and contribution of the paper

- EME exchange rates and market interest rates closely related.
  - Stronger (weaker) EME currency is associated with lower (higher) interest rates and looser (tighter) fin conditions.
  - USD return on EME local currency bond is more sensitive to local currency yield changes than local currency return.
- The empirical part of the paper shows how EME bond yield spread fluctuates with the exchange rate, how important is credit risk premium, and which exchange rate matters.
  - Use three bond spread data on 14 EMEs over 2005-17 and "exchange rate shocks" measured as the change in exchange rates on days of MP news from Fed and ECB
- The paper lays out a theoretical model where the exchange rate affects domestic local currency bond interest rates through investment decisions of local and global investors.


Brazil
y = 0.04 -4.36x
where R2 = 0.93
y = -0.11 -8.54x
where R2 = 0.65
Returns (percent)
Yield changes (percentage points)
Indonesia
y = -0.01 -4.5x
where R2 = 0.88
y = -0.07 -6.69x
where R2 = 0.60
Returns (percent)
Yield changes (percentage points)
US dollar return
Local currency return


Korea
y = -0.01 -6.82x
where R2 = 0.98
y = -0.03 -9.56x
where R2 = 0.26
2
0
–2
–4
–6
–0.1
0.0
0.1
0.2
0.3
0.4
Yield changes (percentage points)
Returns (percent)
Mexico
y = -0.01 -4.92x
where R2 = 0.88
y = -0.05 -12x
where R2 = 0.57
4
0
–4
–8
–12
–0.2
0.0
0.2
0.4
0.6
0.8
Yield changes (percentage points)
Returns (percent)
US dollar return
Local currency return


South Africa
y = 0.03 -4.59x
where R2 = 0.94
y = -0.01 -12.7x
where R2 = 0.70
Returns (percent)
Yield changes (percentage points)
EMEs aggregate
y = 0.01 -4.6x
where R2 = 0.93
y = -0.06 -11.3x
where R2 = 0.69
Returns (percent)
Yield changes (percentage points)
US dollar return
Local currency return

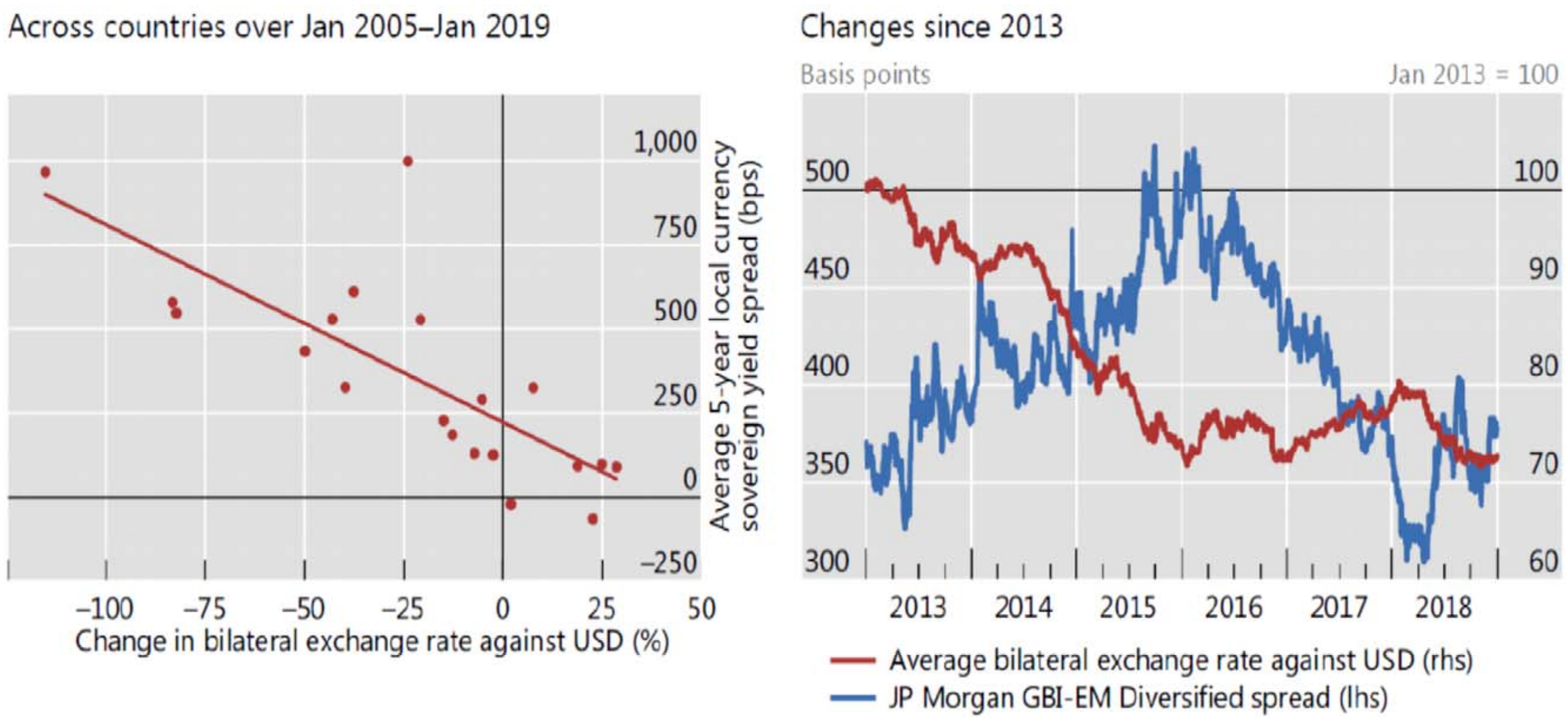


Figure 2. **Changes in the bilateral exchange rate against the US dollar and local currency sovereign spreads in EMEs.** A decrease in the exchange rate is a depreciation of the domestic currency against the US dollar. In the right-hand panel, the average bilateral exchange rate against the US dollar is calculated by using the country weights in the JPMorgan GBI-EM Diversified index. Sources: Bloomberg; Datastream; JPMorgan Chase; national data.

Key findings

- An EME currency appreciation against USD compresses both local currency and foreign currency EME sov bond spreads.
  - The relevant exchange rate is bilateral USD exchange rate (BER), not trade-weighted effective exchange rate (NEER).
  - Compression driven by decrease in LC credit risk premium.
- An appreciation of EME BER unrelated to NEER significantly increases EME domestic credit and output.
  - An appreciation of EME NEER isolated from BER has contractionary effects (in line with trade-channel effects).
- When we use exchange rate shock rather than actual change, results are qualitatively similar, but quantitatively stronger.
- A theoretical model shows a negative correlation between local currency yield and the dollar strength, which arises endogenously from the portfolio choice of global investors.

Literature

- International asset pricing: Lewis (2011)
- Exchange rate determination via b/s costs of fin intermediary
  - Gabaix & Maggiori (2005), Bruno & Shin (2015a, 2015b)
- Exchange rates and financial market outcomes
  - Della Corte et al (2015)
  - Avdjiev et al (2016), Engel and Wu (2018)
- Currency mismatch on EME corporate balance sheets
  - Krugman (1999), Cespedes et al (2004), Aghion et al (2000/04)
  - Kaminsky and Reinhart (1999), Borio and Lowe (2002), Reinhart and Reinhart (2009)
  - Blanchard et al (2015), Bussiere et al (2015), Avdjiev et al (2018)
- USD exchange rate vs effective exchange rate
  - Kearns and Patel (2016)

Sketch of the model

- An EME's local investors invest in their local currency bonds.
- Local investors measure returns in local currency terms and are subject to a risk constraint expressed in local currency.
- Global bond investors invest in the same EME local currency bonds without hedging for currency risk.
- Global investors measure returns in dollar terms and are subject to a risk constraint also expressed in dollar terms.
- Their assets are in local currency, while liabilities in dollars, so currency mismatch on the balance sheets of investors.
  - As dollar depreciates, their risk-taking capacity increases and they can buy more bonds, while bond supply is fixed.
- Thus, local currency yields fall as local currency appreciates.
- Currency movements amplify gains and losses of dollar-based investors and may generate second-round effects.

Data for daily regressions on bond spread

- Daily data on exchange rates and bond spreads for 14 EMEs from Jan 2005 to Dec 2017
- Three bond spread measures
  - FC spread = 5y USD gov bond yield – 5y UST yield
  - LC spread = 5y LC gov bond yield – 5y UST yield
  - LC credit risk premium (ie Du-Schreger (2016) spread) = 5y LC gov bond yield – synthetic LC 5y yield*

    * 5y UST yield + 5y cross-currency swap rate achievable by a USD investor
- Exchange rate shocks: change in exchange rates on days of scheduled and unscheduled monetary policy news from Fed and ECB; 455 out of 3,300 working days (Ferrari et al 2017)
  - BER^S: shock to the bilateral exchange rate against USD
  - $NEER^S$: shock to nominal trade-weighted exchange rate
- Common factors (controls): VIX, domestic short-term rate

Appendix Table 1: 14 EMEs for which the Du-Schreger spread is available

Africa and the Middle East (3)	Israel, Turkey, South Africa
Emerging Asia (5)	Indonesia, Korea, Malaysia, the Philippines, Thailand
Emerging Europe (2)	Hungary, Poland
Latin America and the Caribbean (4)	Brazil, Colombia, Mexico, Peru

Appendix Table 2: 13 EMEs for which foreign currency bond yield is available

Africa and the Middle East (3)	Israel, Turkey, South Africa
Emerging Asia (4)	Indonesia, Korea, Malaysia, the Philippines
Emerging Europe (2)	Hungary, Poland
Latin America and the Caribbean (4)	Brazil, Colombia, Mexico, Peru

	Mean	Std. Dev	Observations	Countries
Foreign currency spread	2.62	1.37	40,504	13
Local currency spread	4.19	3.25	43,515	14
Local currency risk premium	1.02	1.06	38,191	14
Shock to bilateral USD exchange rate				
All observations (absolute values)	0.07	0.29	45,940	14
Non-zero observations (absolute values)	0.50	0.62	6,271	14
Shock to trade-weighted exchange rate				
All observations (absolute values)	0.06	0.24	45,940	14
Non-zero observations (absolute values)	0.44	0.52	6,271	14

Table 1. **Descriptive statistics for bond spreads and exchange rate shocks.** In per cent.

- LC spread is considerably larger than FC spread.
- Du-Schreger spread accounts for less than ¼ of LC spread.
- Average size of exchange rate shock is about 0.5%p.
- Mean and stan. dev. of BER and NEER shocks are similar.
  - Correlation of two shocks is 0.7 (not perfectly correlated).

Empirical methodology and specifications

- Local linear projection regressions due to Jorda (2005)
  - More robust to misspecification than VARs
  - Horizons up to 50 working days
- "Individual" regressions: for $h = 1, \ldots, 50$

$$s_{i,t+h} - s_{i,t-1} = \alpha_{h,i} + \rho_h \Delta s_{i,t-1} + \beta_h \Delta BER^S_{i,t-1} + \Gamma_h Z_{i,t-1} + \eta_{i,t+h}$$

$$s_{i,t+h} - s_{i,t-1} = \alpha_{h,i} + \rho_h \Delta s_{i,t-1} + \beta_h \Delta NEER^S_{i,t-1} + \Gamma_h Z_{i,t-1} + \eta_{i,t+h}$$

s: spread; ΔBER^S: log change in BER^S; $\Delta NEER^S$: log change in $NEER^S$

- "Horse-race" regressions

$$s_{i,t+h} - s_{i,t-1} = \alpha_{h,i} + \rho_h \Delta s_{i,t-1} + \beta_h \Delta BER^{S\perp}_{i,t-1} + \delta_h \Delta NEER^S_{i,t-1} + \Gamma_h Z_{i,t-1} + \eta_{i,t+h}$$

$$s_{i,t+h} - s_{i,t-1} = \alpha_{h,i} + \rho_h \Delta s_{i,t-1} + \beta_h \Delta BER^S_{i,t-1} + \delta_h \Delta NEER^{S\perp}_{i,t-1} + \Gamma_h Z_{i,t-1} + \eta_{i,t+h}$$

$\Delta BER^{S\perp}$: the component of ΔBER^S that is orthogonal to $\Delta NEER^S$ obtained as the residual of country-level regressions of ΔBER^S on $\Delta NEER^S$

$\Delta NEER^{S\perp}$: the component of $\Delta NEER^S$ that is orthogonal to ΔBER^S obtained as the residual of country-level regressions of $\Delta NEER^S$ on ΔBER^S

Individual regressions on daily bond spread

- An appreciation shock to BER is followed by significant decreases in all three EME bond spreads.
  - 1% appreciation shock to BER => FC spread ↓ by 10bps, LC spread ↓ by 9bps, and LC risk premium ↓ by 7bps over the 50-day horizon.
  - The negative impact on LC spread is largely driven by LC credit risk premium
  - Strong support to a risk-taking channel of the exchange rate
- The effects of an appreciation shock to NEER qualitatively similar, but quantitatively smaller and stat. less significant.
  - Reflects the close correlation between two exchange rate shock measures

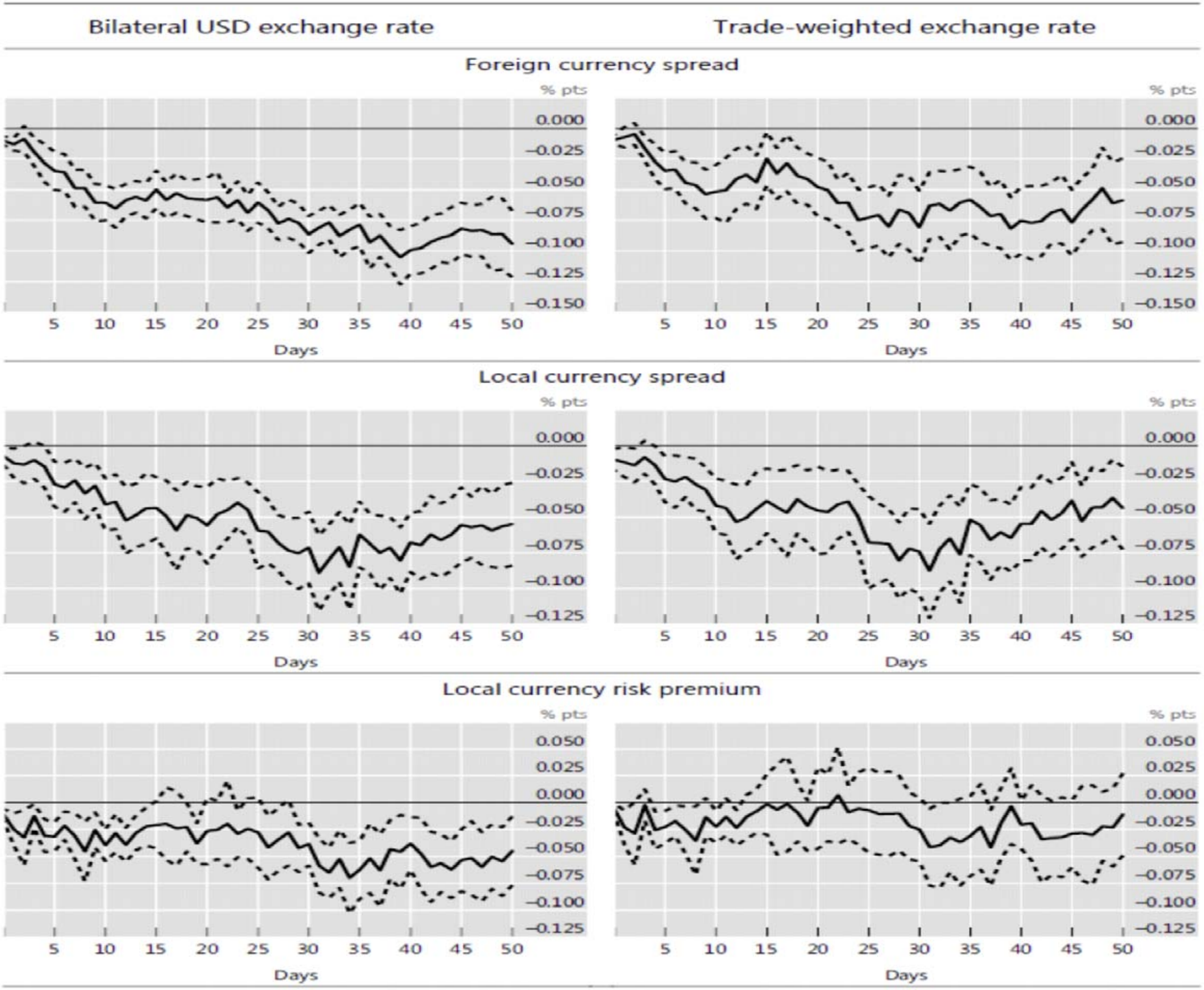


Figure 3. **Impact of exchange rate appreciation on EME bond spreads.** The figure shows the impact of a 1% appreciation shock to the exchange rate (log exchange rate changes on days of US and euro area monetary policy news) over the 50-day horizon. Control variables are the log change in the VIX index and the change in the domestic 3-month money market rates. The 90% confidence bands are based on cross-section and period cluster robust standard errors.

Horse-race regressions on daily bond spread

- An isolated appreciation of BER reduces EME bond spreads.
  - 1% isolated appreciation shock to BER => FC spread ↓ by 20bps, LC spread ↓ by 10bps, and LC risk premium ↓ by 10bps over the 50-day horizon.
  - The negative impact on LC spread is entirely driven by the drop in LC credit risk premium
  - Supports the notion that an exchange rate risk-taking channel drives LC bond spreads
- An isolated appreciation of NEER has an insignificant or even a positive effect.
  - Consistent with trade channel-type effects
  - An NEER appreciation slows macroeconomic activity, which may in turn adversely affect sovereign credit risk and hence increase bond spreads.

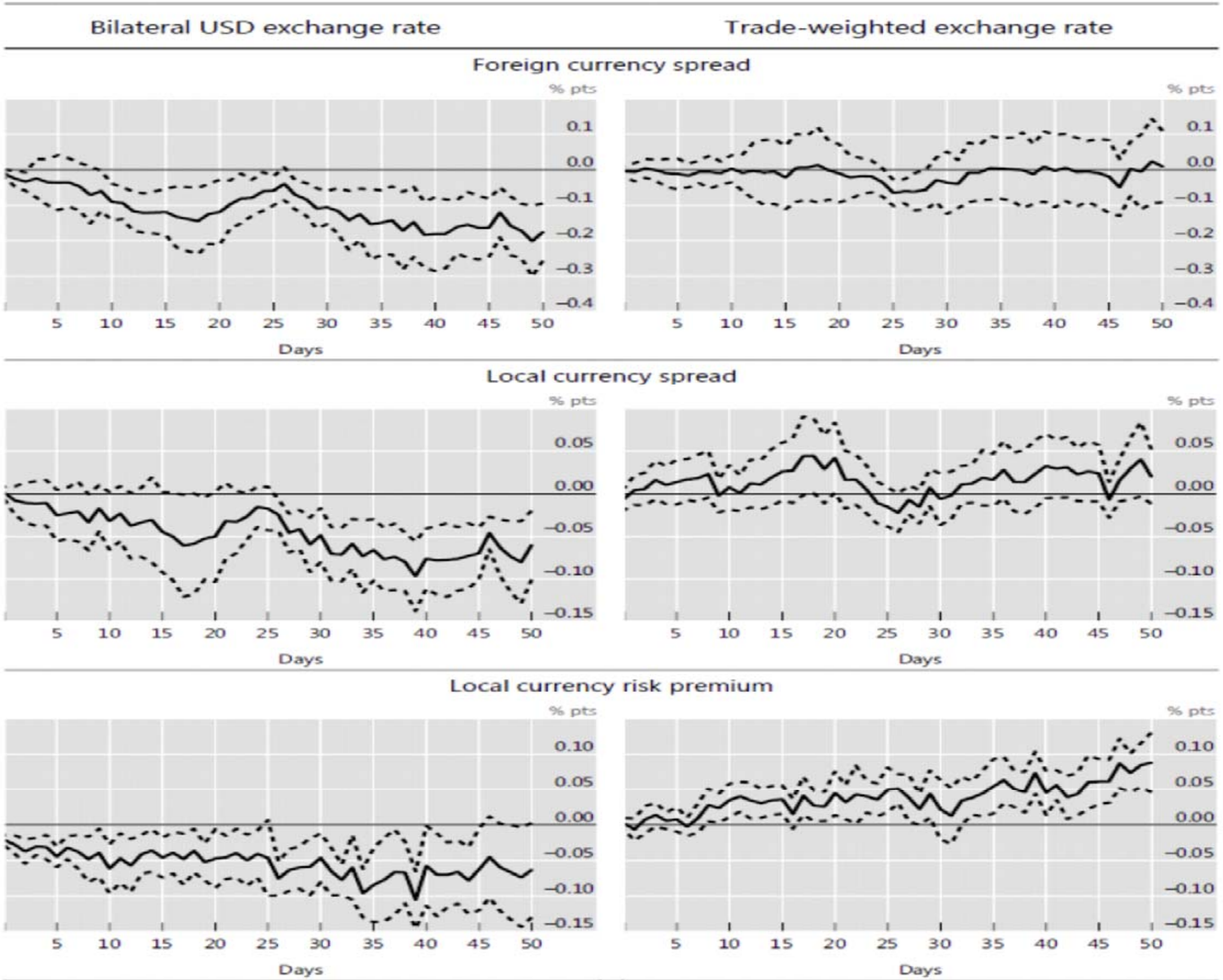
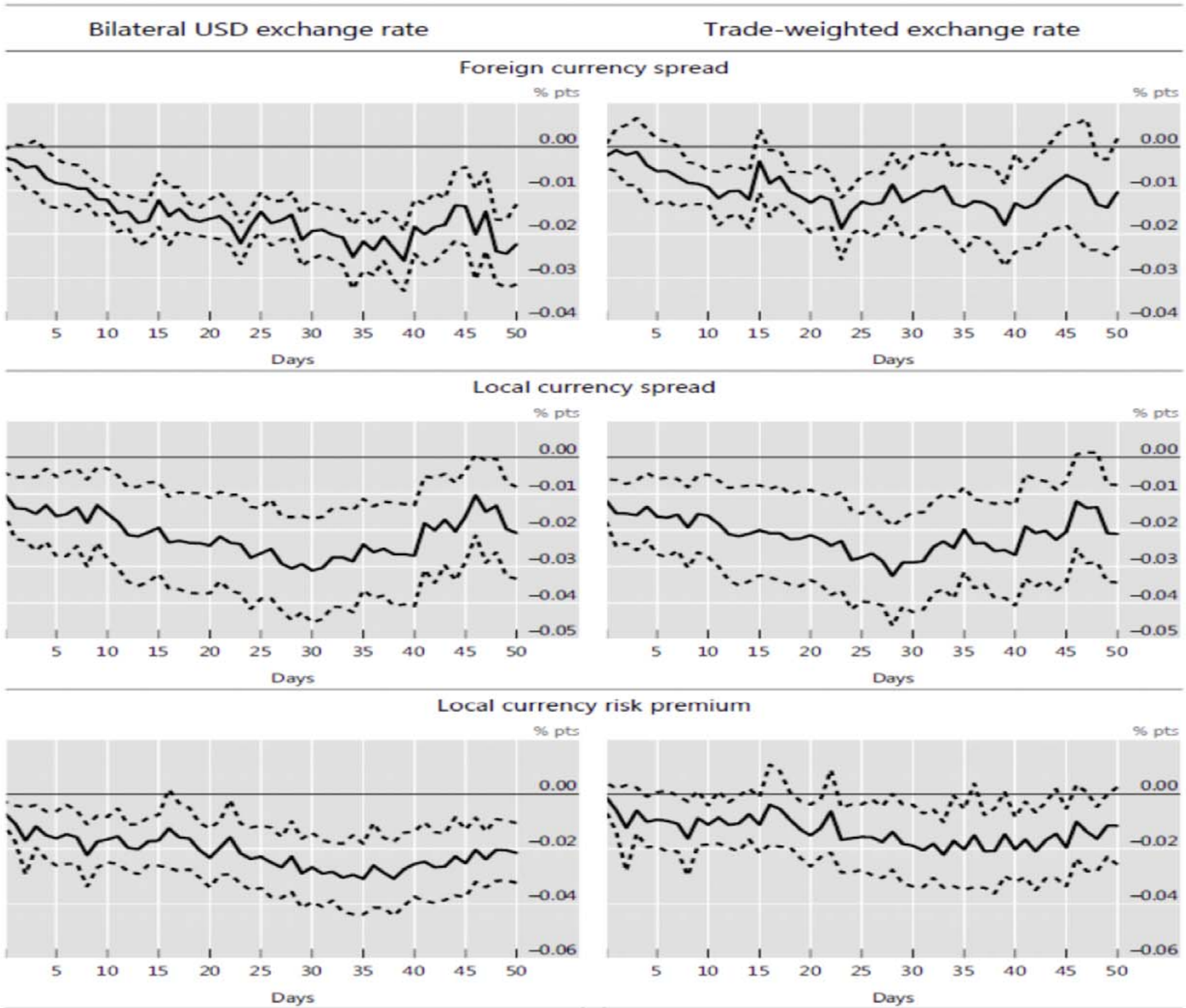
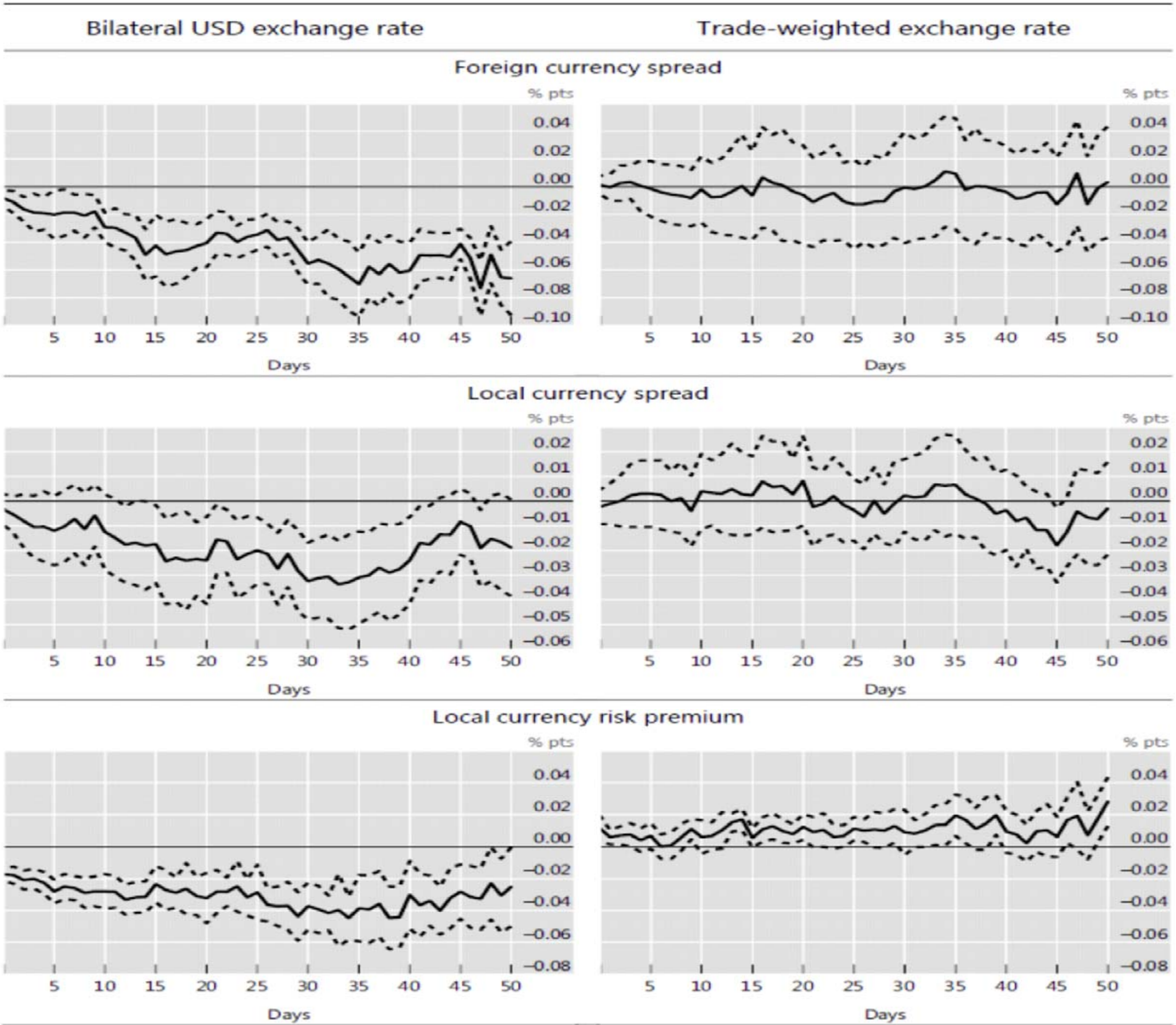


Figure 4. **Impact of exchange rate appreciation on EME bond spreads based on orthogonalised exchange rate shocks.** The figure shows the impact of a 1% appreciation shock (log exchange rate changes on days of US and euro area monetary policy news) to the bilateral exchange rate against the US dollar and to the nominal effective exchange rate. Each shock is respectively orthogonal to the other exchange rate shock (the residuals of a linear regression on the other exchange rate shock) over the 50-day horizon. Control variables are the log change in the VIX index and the change in the domestic 3-month money market rates. The 90% confidence bands are based on cross-section and period cluster robust standard errors.



Appendix Figure 1: Bond spread impact of actual exchange rate appreciation.



Appendix Figure 2: Bond spread impact of orthogonal exchange rate appreciations.

Monthly regressions on credit and output

- Monthly data on exchange rates and macro variables (credit and output) for 14 EMEs from Jan 2005 to Dec 2017
  - Domestic credit to the private non-financial sector
  - Industrial production as proxy for output
- Now dependent variable is log(domestic credit) or log (IP).
- Monthly measures of ΔBER^S and $\Delta NEER^S$ are obtained by summing over the daily shocks in a given month.
- Common factors (controls):
  - % change in VIX; change in domestic 3-month rate
  - US IP growth and domestic IP growth
  - US CPI inflation and domestic CPI inflation
- Local projections with horizons up to 36 months
- Same specifications as in daily regressions

Individual regressions on monthly macro variables

- Results are broadly consistent with the idea that financial conditions fluctuate with shifts in BER.
  - An appreciation of domestic currency against the dollar is associated with subsequent boosts to credit and output.
    - A 1% appreciation shock against the US dollar raises real domestic credit in a persistent way, reaching around 0.75% after 36 months.
    - After a 1% appreciation shock, real output increases significantly by up to 0.4% during the first 12 months after the shock, before the effect fades out.
- The effects of an appreciation shock to NEER are similar, but quantitatively smaller.

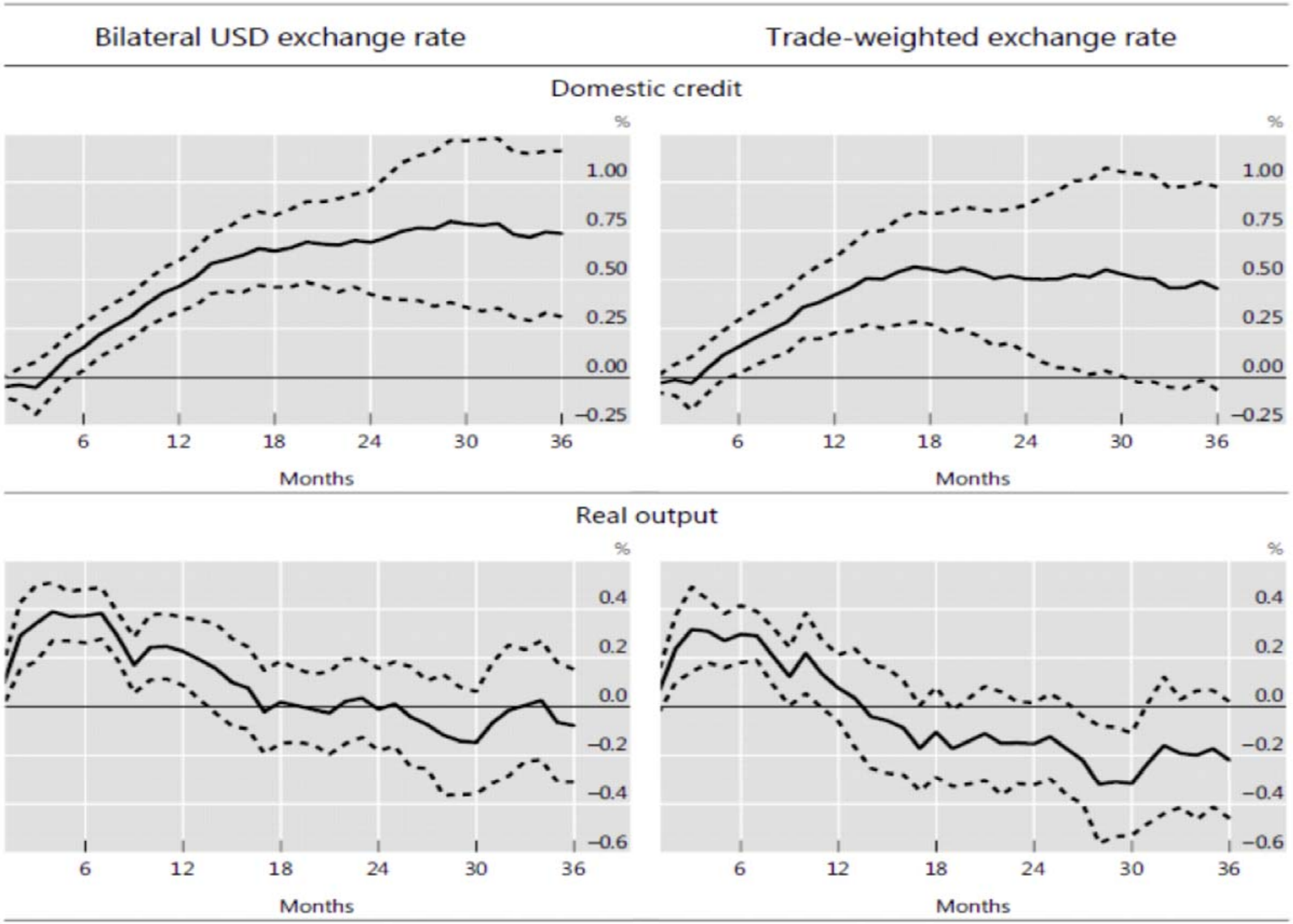


Figure 5. **Impact of exchange rate appreciation on EME macroeconomic conditions.** The figure shows the impact of a 1% appreciation shock to the bilateral exchange rate against the US dollar and to the nominal effective exchange rate (log exchange rate changes on days of US and euro area monetary policy news) over the 36-month horizon. Control variables are the percent change in the VIX index, the change in the domestic 3-month money market rates, the growth of US and domestic industrial production and US and domestic CPI inflation. The 90% confidence bands are based on cross-section and period cluster robust standard errors.

Horse-race regressions on monthly macro variables

- Results reinforce the asset pricing results.
  - An appreciation shock to BER that is orthogonal to NEER shock has significant expansionary effects on credit and output.
  - An appreciation shock to NEER that is orthogonal to BER shock have a dampening macroeconomic impact.

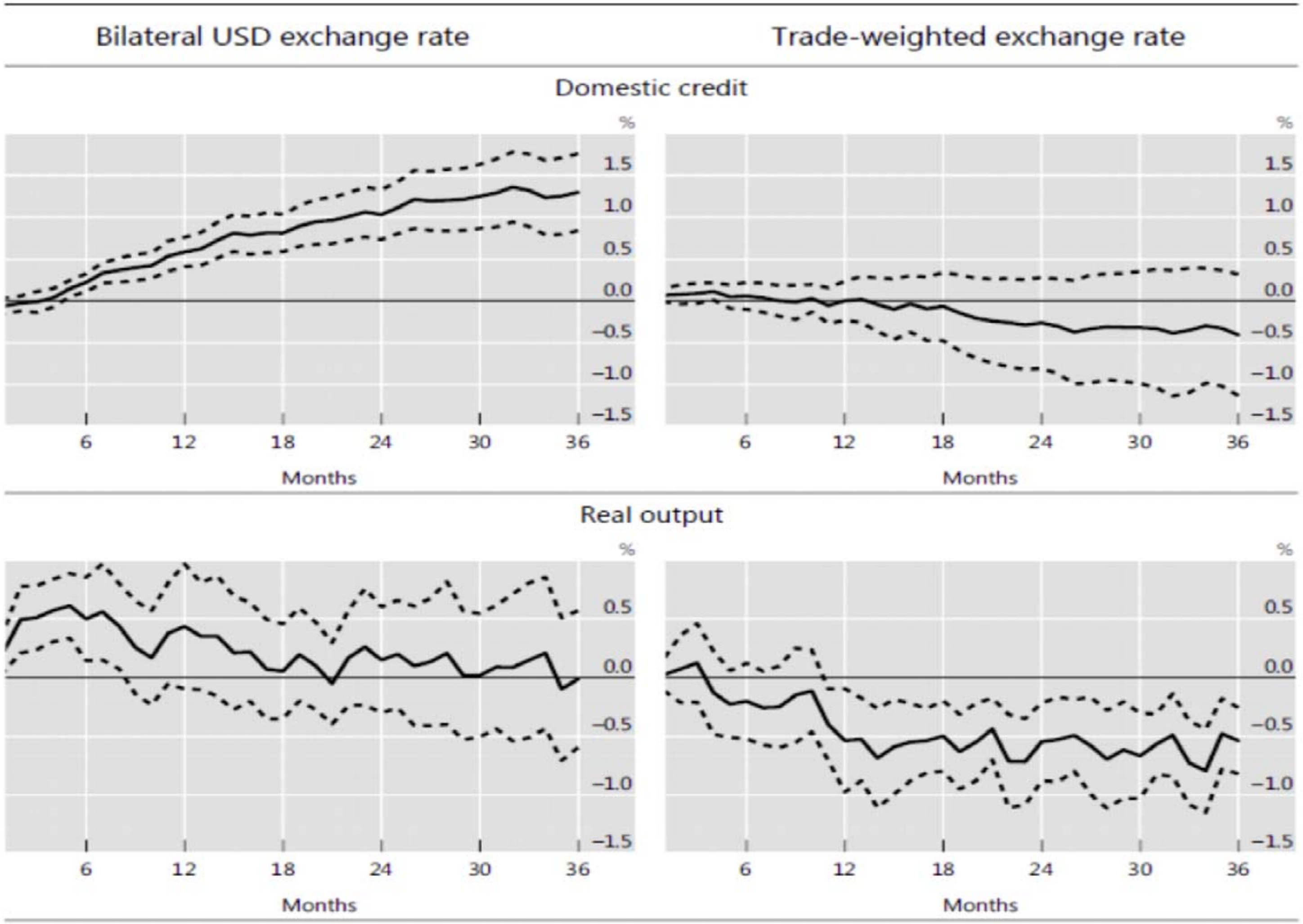
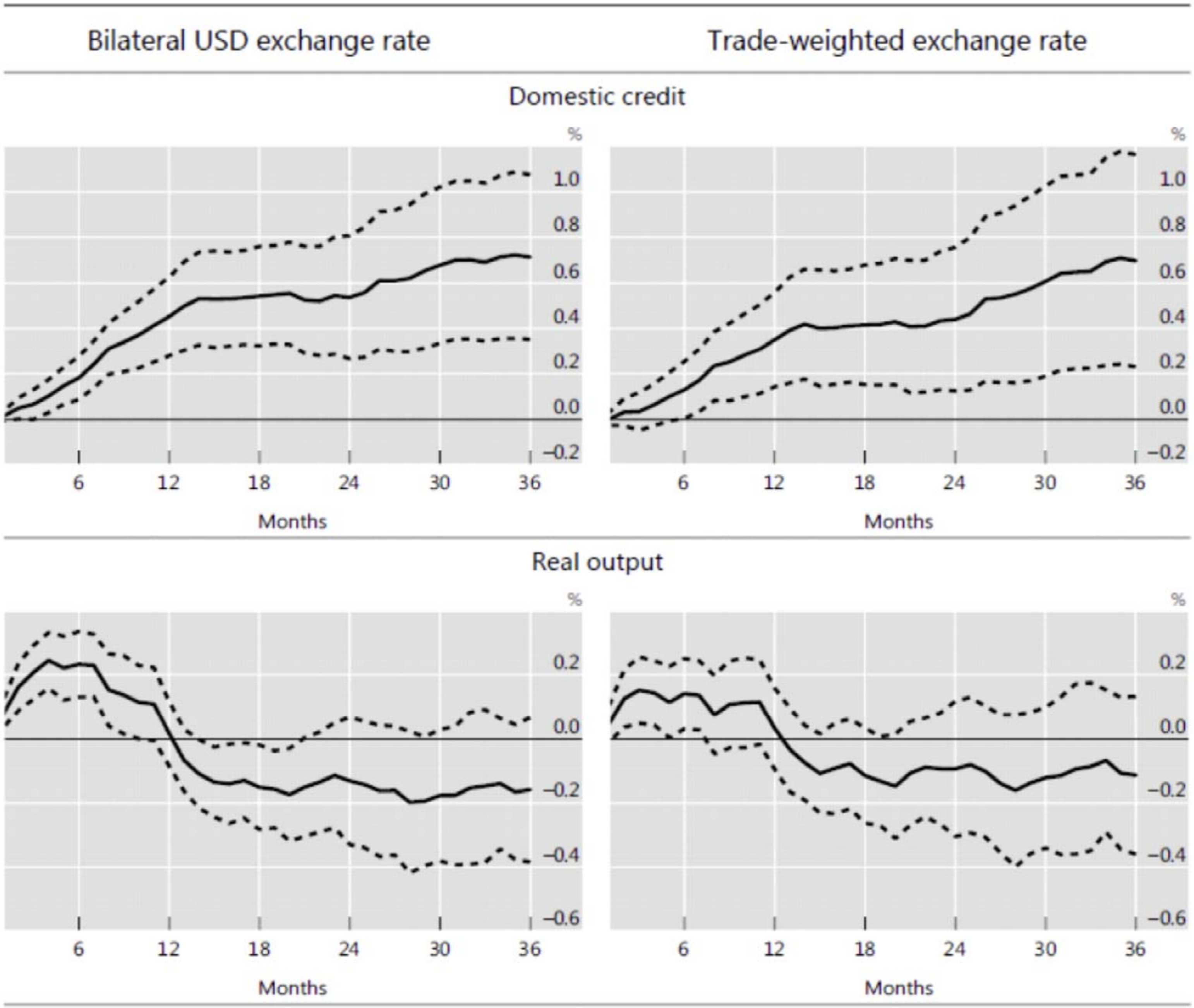
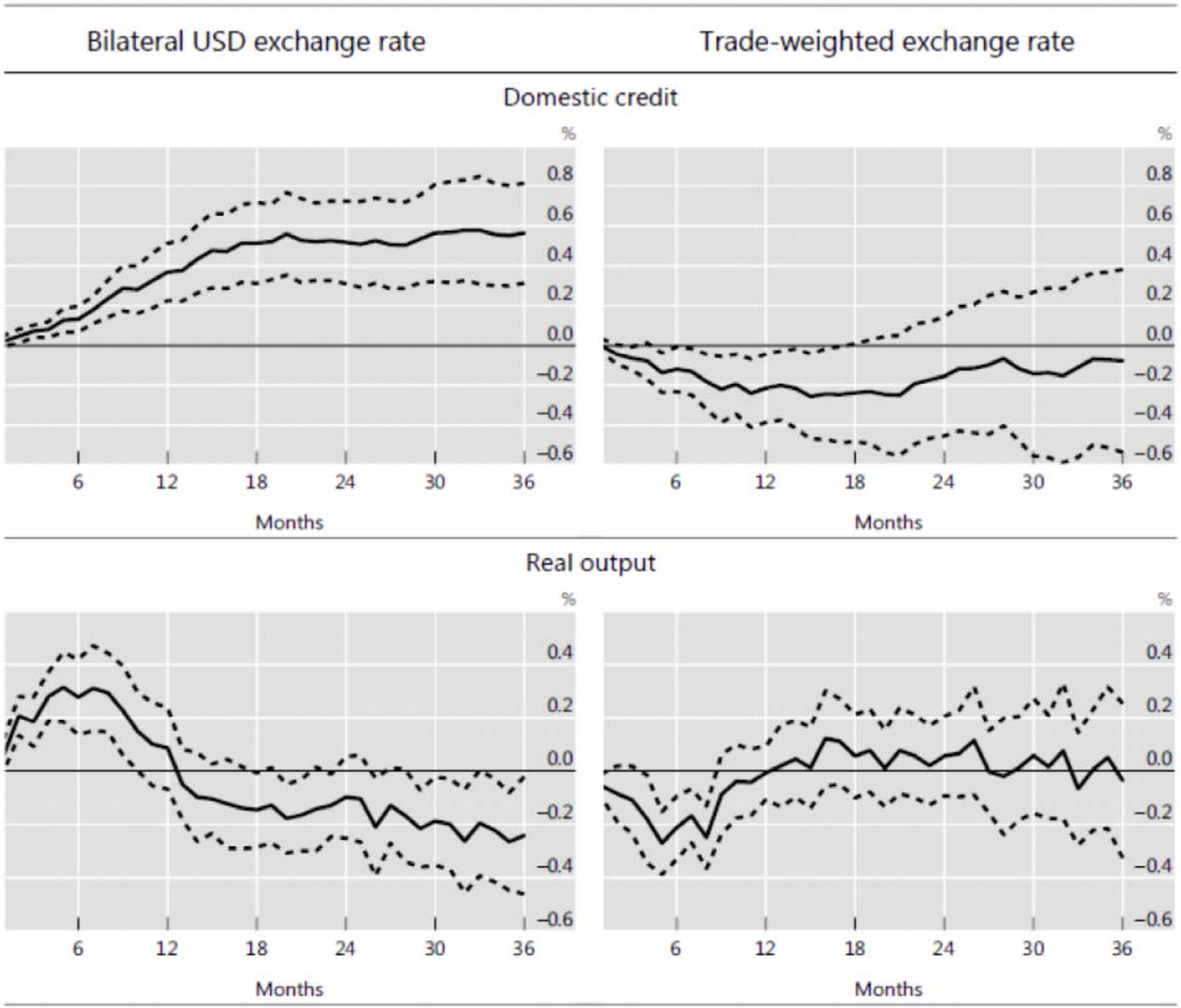


Figure 6. **Impact of exchange rate appreciation on EME macroeconomic conditions based on orthogonalised exchange rate shocks.** The figure shows the impact of a 1% appreciation shock to the bilateral exchange rate against the US dollar and to the nominal effective exchange rate (log exchange rate changes on days of US and euro area monetary policy news) over the 36-month horizon. Each shock is respectively orthogonal to the other exchange rate shock (the residuals of a linear regression on the other exchange rate shock). Control variables are the percent change in the VIX index, the change in the domestic 3-month money market rates, the growth of US and domestic industrial production and US and domestic CPI inflation. The 90% confidence bands are based on cross-section and period cluster robust standard errors.



Appendix Figure 3: Macroeconomic impact of actual exchange rate appreciation.



Appendix Figure 4: Macroeconomic impact of orthogonal exchange rate appreciations.

Conclusion

- Unlike the traditional trade channel, the risk-taking channel can render a currency appreciation expansionary.
  - An appreciation of an EME currency against USD (BER) lowers LC bond spreads and loosens financial conditions.
  - Lower LC spread driven by lower LC credit risk spread
  - An appreciation shock to BER (NEER) has expansionary (contractionary) macro effects on EMEs.
- Currency movements alter the risk-taking capacity of global investors in EME bonds, affect EME domestic fin conditions.
- Policy implications
  - Reduce the excessive volatility of exchange rates
  - Use prudential measures to slow down bond inflows
  - Develop a domestic long-term institutional investor base