Linking net foreign portfolio debt and equity to exchange rate movements

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5th SUERF/UniCredit & Universities Foundation Workshop

25.1.2018

Introduction

- Many currencies, especially those of countries with negative net foreign assets, depreciate during global financial turbulence
  - Large exchange rate swings generally disliked by central banks
- Different types of foreign assets respond differently to global financial market distress
- Do all types of net foreign assets make the exchange rate vulnerable to changes in global risk tolerance?

Aim

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- Does the composition of net foreign assets matter for the exchange rate (or excess return) sensitivity to global risk sentiment changes?

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Research questions

- How are exchange rates affected by the interaction of global financial sector risk intolerance and net portfolio debt, equity, FDI and other investments?
  - Does negative net portfolio debt make the exchange rate more sensitive to financial market uncertainty than portfolio equity?
- Does public or private net foreign asset ownership matter for the exchange rate sensitivity?

Contribution

Empirical evidence that exchange rate sensitivity is influenced by:

1. The composition of net foreign liabilities
   - Net portfolio debt positions make the currency more vulnerable to changes in international risk tolerance, whereas portfolio equity liabilities even decrease it slightly
2. The ownership structure of the net foreign assets
   - Private net indebtedness increases exchange rate sensitivity more than public
3. Banking sector uncertainty important only since the credit crisis

Relevance

The findings are relevant and important for:

- Policy makers trying to limit excessive exchange rate fluctuations
- The evaluation of the exchange rate impact of potential future financial market liberalizations
- The impact evaluation of financial asset tax policy changes

Outline

- Theoretical underpinnings
- Relation to the literature
- Different types of foreign assets
- Method & Data
- Results
- Conclusion

Theoretical underpinnings: Gabaix & Maggiori (2015)

Exchange rate determination based on capital flows in imperfect financial markets

- 2 country model, countries trade and run imbalances
- International financiers with limited risk bearing capacity
  - Financiers absorb the resulting currency risk but demand a currency risk premia
- Demand & supply of assets and financial sector risk intolerance determines the exchange rate s_t, with s = foreign/home currency

Theoretical underpinnings

- A drop in risk bearing capacity $\rightarrow$ financiers change the required compensation for holding currency risk

GM (2015) Proposition 2

Higher risk intolerance ($RI \uparrow$) $\rightarrow$ currencies of countries with $NFA_0 < 0$ depreciate

$$\frac{\partial s_0}{\partial RI} = \frac{NFA_0}{2 + RI} \tag{1}$$

- Approximation by differentials considering eq. (1) as a function of RI only:

$$\Delta s_0 = \frac{NFA_0}{2 + RI} \Delta RI \tag{2}$$

Previous literature

Investors demand currency risk premias for investing in net debtor currencies

- Brunnermeier, Nagel & Pedersen (2009), Lustig, Roussanov & Verdelhan (2011), Menkhoff,Sarno, Schmeling & Schrimpf (2016)
- Della Corte, Riddiough & Sarno (2016)

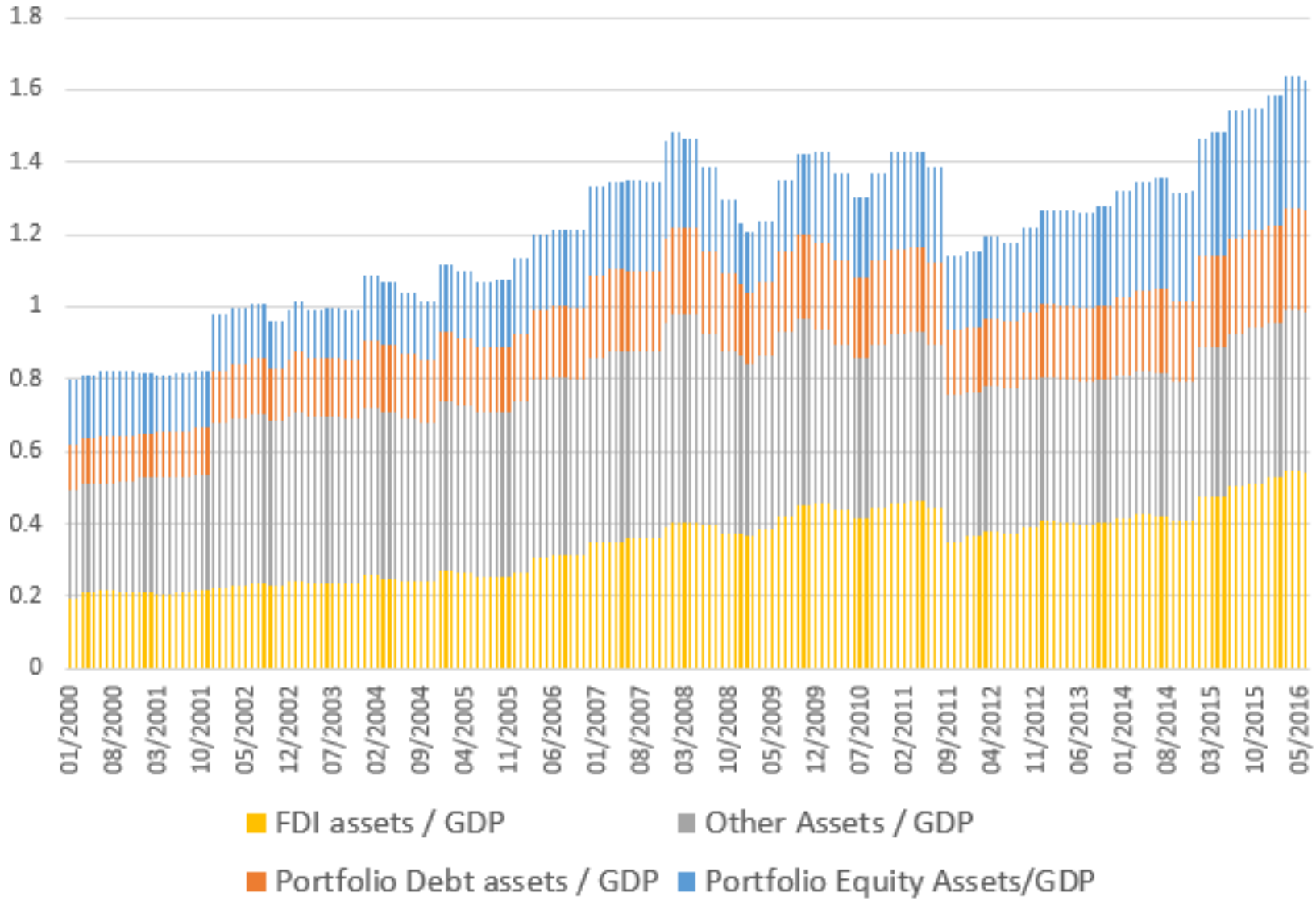
Exchange rate impact of international capital flows

- Gourinchas & Rey (2007), Alquist & Chinn (2008), Della Corte, Sarno & Sestieri (2012), Aizenmann & Binici (2015) Ricci, Milesi-Ferretti & Lee (2013)

Net foreign liabilities make the currency more sensitive to changes in international financial market risk intolerance

- Habib & Stracca (2012)

Different types of foreign assets



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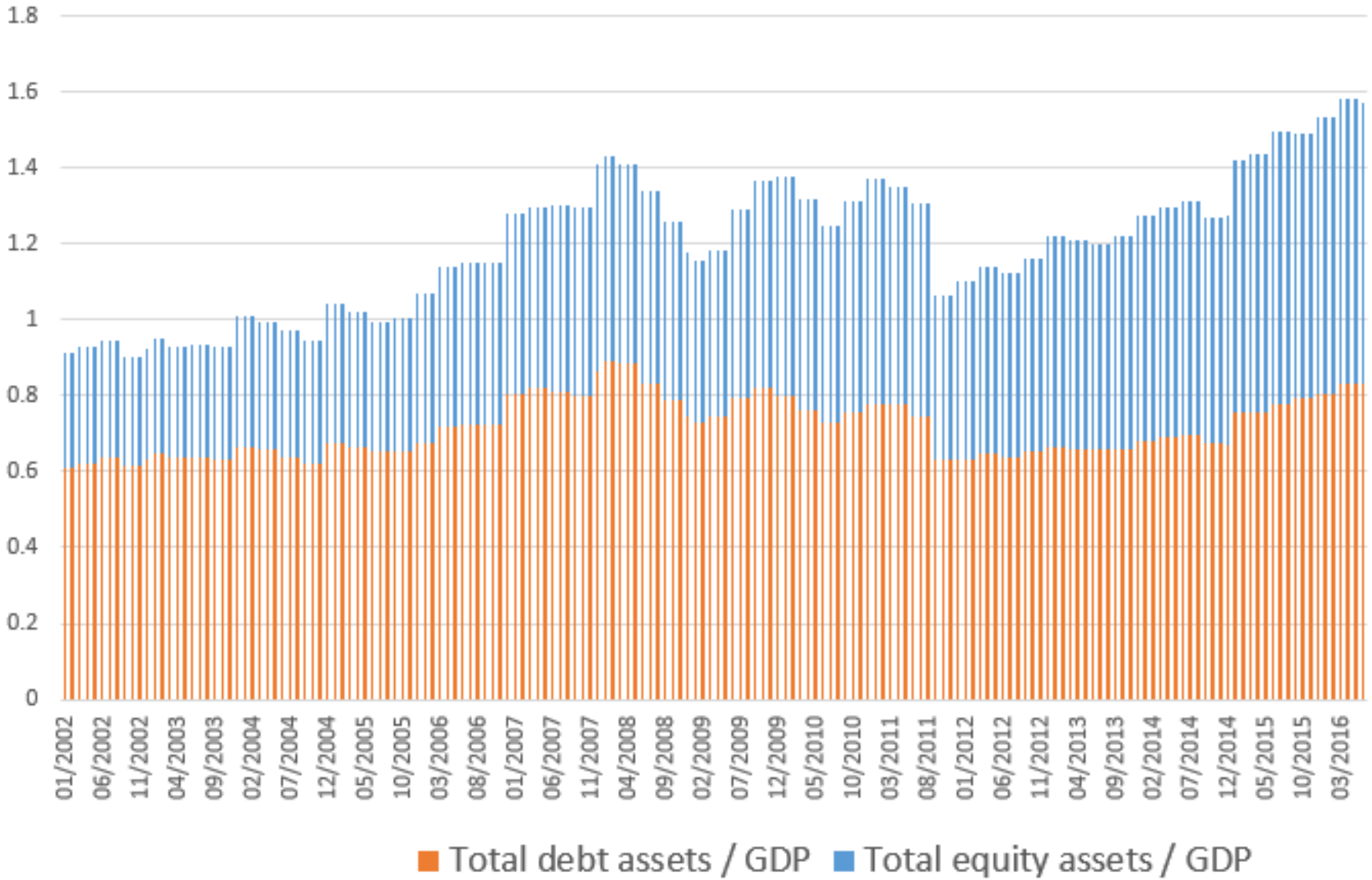

Different types of foreign assets

Not all types of international capital flows are equally influenced by global risk (Brunnermeier et al. (2012), Araujo et al. (2015))

- Debt (esp. portfolio debt) highly influenced by global financial business cycle
  - Large share of debt inflows intermediated by foreign banks
  - Bank lending and debt issuance responds both to project credit worthiness and to the financier's balance-sheet capacity
  - Roll over risk
- Portfolio equity and FDI less sensitive
  - Valuation losses discourages portfolio equity outflows in a crisis
  - FDI often long term and less liquid, investors less leveraged

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$\Rightarrow$ Does the composition of net foreign assets matter for the exchange rate sensitivity to global risk sentiment changes?

Method

A panel model to look at the relationship between

1. Δs, ΔRI and Net Foreign Assets
2. Δs, ΔRI, Net Total Debt and Net Total Equity
3. Δs, ΔRI, Net Portfolio Debt, Net Portfolio Equity, Net FDI and Net Other investment

where s =ln(USD/ currency$_i$)

and RI=Global Risk Intolerance proxied by:

a) Financial market uncertainty: VIX index

b) Banking sector uncertainty: TED spread (3m Libor - 3m T-bill)

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Method

1. Relationship between Δs, ΔRI and net foreign assets (nfa)

$$\Delta s_{t,i} = \beta_0 + \beta_1 \Delta RI_t + \beta_2 (nfa_{t,i} \Delta RI_t) + \beta_3 nfa_{t,i} + \delta x_{t-1,i} + \gamma_i + \varepsilon_{t,i} \quad (3)$$

Total effect of $\Delta RI = \hat{\beta}_1 + \hat{\beta}_2 \overline{nfa}$

Method

2. Δs, ΔRI and net total debt ($nTotDebt$) and net total equity ($nTotEquity$)

$$\Delta s_{t,i} = \beta_0 + \beta_1 \Delta RI_t + \beta_2 (nTotDebt_{t,i} \Delta RI_t) + \beta_3 (nTotEquity_{t,i} \Delta RI_t) + \beta_4 nTotEquity_{t,i} + \beta_5 nTotDebt_{t,i} + \delta x_{t-1,i} + \gamma_i + \varepsilon_{t,i} \quad (4)$$

Total effect of $\Delta RI = \hat{\beta}_1 + \hat{\beta}_2 \overline{nTotDebt} + \hat{\beta}_3 \overline{nTotEquity}$

Method

3. Δs, ΔRI and net portfolio debt ($nPDebt$), net portfolio equity ($nPEquity$), net FDI ($nFDI$) and net other investment ($nOther$)

$$\begin{aligned}\Delta s_{t,i} = \beta_0 + \beta_1 \Delta RI_t + \beta_2 (nPDebt_{t,i} \Delta RI_t) + \beta_3 (nPEquity_{t,i} \Delta RI_t) \\ + \beta_4 (nFDI_{t,i} \Delta RI_t) + \beta_5 (nOther_{t,i} \Delta RI_t) + \beta_6 nPDebt_{t,i} \\ + \beta_7 nPEquity_{t,i} + \beta_8 nFDI_{t,i} + \beta_9 nOther_{t,i} + \delta x_{t-1,i} + \gamma_i + \varepsilon_{t,i}\end{aligned} \tag{5}$$

Total effect of
$\Delta RI = \beta_1 + \hat{\beta}_2 \overline{nPDebt} + \hat{\beta}_3 \overline{nPEquity} + \hat{\beta}_4 \overline{nFDI} + \hat{\beta}_5 \overline{nOther}$

Data

Sample

- 27 currency pairs against the USD, 9 G-10 and 18 EM
- Monthly data for 1/1997-6/2016
- Spot, RI and control data from Bloomberg (end of period)
- External assets and liabilities (beginning of period)
  - IMF's Balance of Payments & International Investment Position

Control variables

- PPP, inflation differentials, 3m interest rate differentials, stock market yield difference, carry trade reversals, changes in CB reserves (and LDV)

Total net foreign assets, RI and FX

	(i)	(ii)
ΔVIX	-4.111***	
	(0.249)	
ΔTED		-1.291***
		(0.191)
ΔVIX*nfa	2.354***	
	(0.369)	
ΔTED*nfa		0.698**
		(0.279)
Avg. ΔRI impact	-4.403***	-1.378***
	(0.26)	(0.20)
N	27	27
T	234	234
Obs	5,218	5,218
$\bar{R}^2$	0.113	0.054

Note: Dep. var: Δs. White SE in parentheses. ***, ** and * denote significance at 1%, 5% and 10 % levels. Constituent terms, controls and currency fixed effects included. Avg. ΔRI impact=$\hat{\beta}_1 + \hat{\beta}_2 \ \overline{nfa}$.

Table 1: Panel regression of model (1)

Total net debt and equity, RI and FX

	Full sample		G10		EM	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
ΔVIX	-3.450***		-2.300***		-5.349***	
	(0.281)		(0.472)		(0.579)	
ΔTED		-1.200***		-0.539*		-1.548***
		(0.211)		(0.314)		(0.489)
ΔVIX*nTotDebt	4.021***		4.622***		3.312***	
	(0.597)		(0.923)		(0.780)	
ΔVIX*nTotEquity	0.316		-0.366		-4.570**	
	(0.797)		(1.184)		(1.967)	
ΔTED*nTotDebt		1.033**		1.050*		0.521
		(0.408)		(0.571)		(0.591)
ΔTED*nTotEquity		0.815		-2.289		0.813
		(0.740)		(1.505)		(1.522)
Avg. ΔRI impact	-4.339	-1.503	-3.332	-1.055	-4.929	-1.859
N	27	27	9	9	18	18
Obs	5,059	5,059	1,935	1,935	3,124	3,124
$\bar{R}^2$	0.114	0.053	0.099	0.049	0.134	0.067

Dep. var: Δs. White SE in (). ***, ** and * denote significance at 1%, 5% and 10 % levels. T=234. Constant, constituent terms, controls and currency fixed effects incl.

Table 2: Panel regression of model (2)

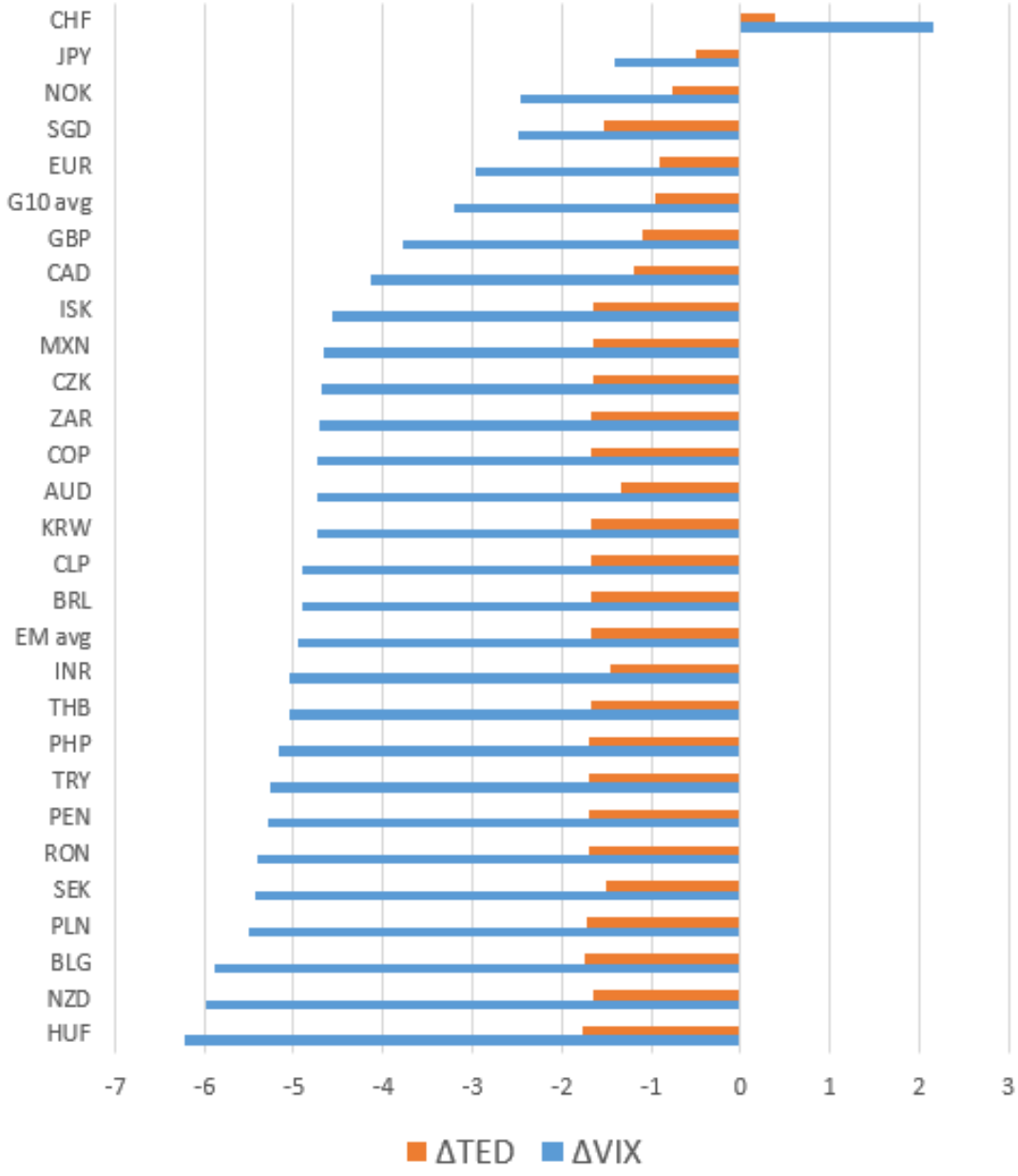

Figure 1: Total effect of ΔRI accounting for impact of nTotDebt

Net Portfolio Debt & Equity, net FDI and net Other investments

	Full sample (i)	G10 (ii)	EM (iii)
ΔVIX	-3.025***	-3.032***	-4.783***
	(0.364)	(0.784)	(0.732)
ΔVIX*nPDebt	3.269***	2.921**	3.686**
	(0.692)	(1.382)	(1.615)
ΔVIX*nPEquity	-2.421**	-1.090	-4.679*
	(1.063)	(1.358)	(2.701)
ΔVIX*nFDI	0.723	4.030	-1.747
	(1.101)	(4.135)	(1.698)
ΔVIX*nOther	11.065***	8.348	2.669
	(2.978)	(8.568)	(2.789)
Avg. ΔRI impact	-4.58	-3.37	-4.79
N	25	9	17
Obs	4770	1935	3061
$\bar{R}^2$	0.117	0.104	0.128

Note: Dep. var: Δs. White SE in parentheses. Constant, constituent terms, controls and currency fixed effects included. T=234.

Table 3: Panel regression of model (3)

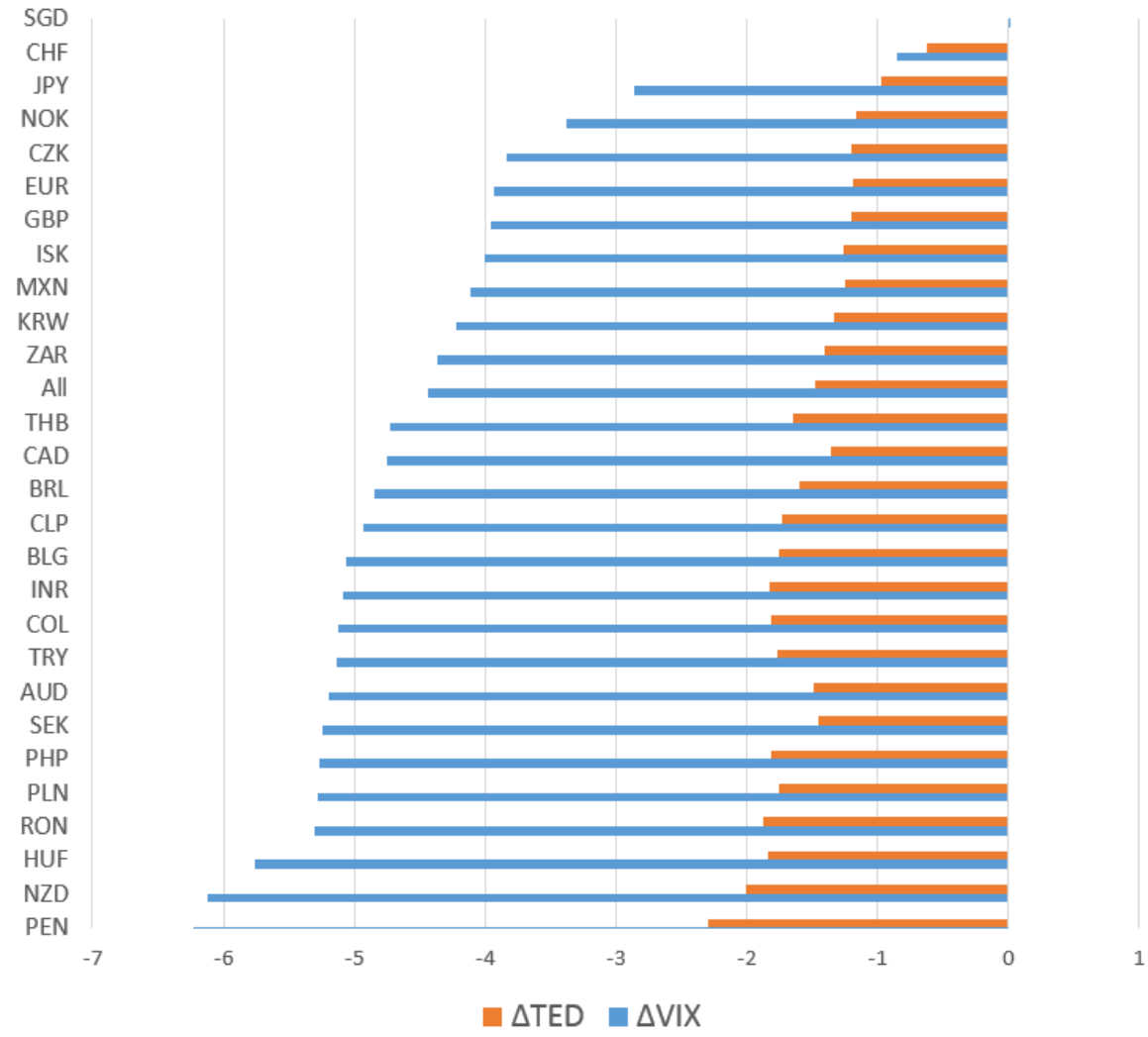

Figure 2: Total effect of ΔRI on Δs accounting for net portfolio debt and net other investments

Private vs. Public net Total Debt

	(i)	(ii)	(iii)
ΔVIX	-2.566***	-2.888***	-3.531***
	(0.466)	(0.532)	(0.349)
ΔVIX*nTotDebt^{PRIV}	9.560***		
	(1.832)		
ΔVIX*nTotDebt^{GOVT}	4.364**	4.122**	
	(2.020)	(2.021)	
ΔVIX*nTotDebt^{OSEC}		15.13***	11.79***
		(3.576)	(2.713)
ΔVIX*nTotDebt^{BANK}		7.148***	7.896***
		(2.542)	(2.218)
Avg. ΔRI impact	-4.23	-3.95	-4.2
N	13	13	21
Obs	1,882	1,882	3,582
$\bar{R}^2$	0.139	0.139	0.127

Note: Dep. var: Δs. White SE in parentheses. ***, ** and * denote significance at the 1%, 5% and 10 % levels. Constant, constitutive terms, controls and currency fixed effects included.

Table 4: Panel regression of model (2) for the full sample

Evolution over time

	Before crisis 1/1997-3/2007		Crisis 4/2007-12/2009		After crisis 1/2010-6/2016	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
ΔTED	-0.632***	-0.620***	-1.799***	-1.789***	-3.002***	-2.286***
	(0.212)	(0.236)	(0.341)	(0.383)	(0.575)	(0.699)
ΔTED*nfa	0.022		0.575		1.688*	
	(0.381)		(0.385)		(0.885)	
ΔTED*nTotDebt		-0.211		1.111*		3.713**
		(0.469)		(0.620)		(1.634)
ΔTED*nTotEquity		1.999**		-0.451		-0.321
		(0.995)		(1.129)		(1.622)
Avg. ΔRI impact	-0.63	-0.78	-1.86	-1.93	-3.19	-3.22
N	27	26	27	26	27	27
T	130	130	33	33	78	78
Obs	2,344	2,226	878	845	2,031	2,016
$\bar{R}^2$	0.034	0.039	0.133	0.124	0.151	0.150

Note: Dep var: Δs. White SE in parentheses. ***, ** and * denote significance at 1%, 5% and 10 % levels. Constant, constituent terms, controls and currency fixed effects included.

Table 5: Models (1) and (2) for different time periods

Robustness

The results are robust to

- Change in base currency
  - Trade weighted currency basket
  - EUR, GBP, SEK, KRW... as base currency
  - Exclusion of USD and the other "safe haven" currencies, CHF and JPY, from the sample
- Inclusion of a time trend
- Exclusion of outliers
- Using nfa positions not normalized by gdp
- The exclusion of the financial crisis
- Looking at gross foreign assets and liabilities

Conclusion

The NFA Composition matters

- Negative net total debt and especially net portfolio debt increases the exchange rate sensitivity to financial market risk intolerance, whereas net portfolio seems to reduce it a bit
- Interaction effect stronger for G-10 currencies than for EM

Ownership matters

- Private negative net foreign assets have a larger destabilizing effect than public ones

Relationship dynamic

- Impact of banking sector uncertainty stronger and significant since the financial crisis

Exchange rate sensitivity could be lowered by reducing reliance on debt financing and shifting towards more equity financing

Thank you for your attention!

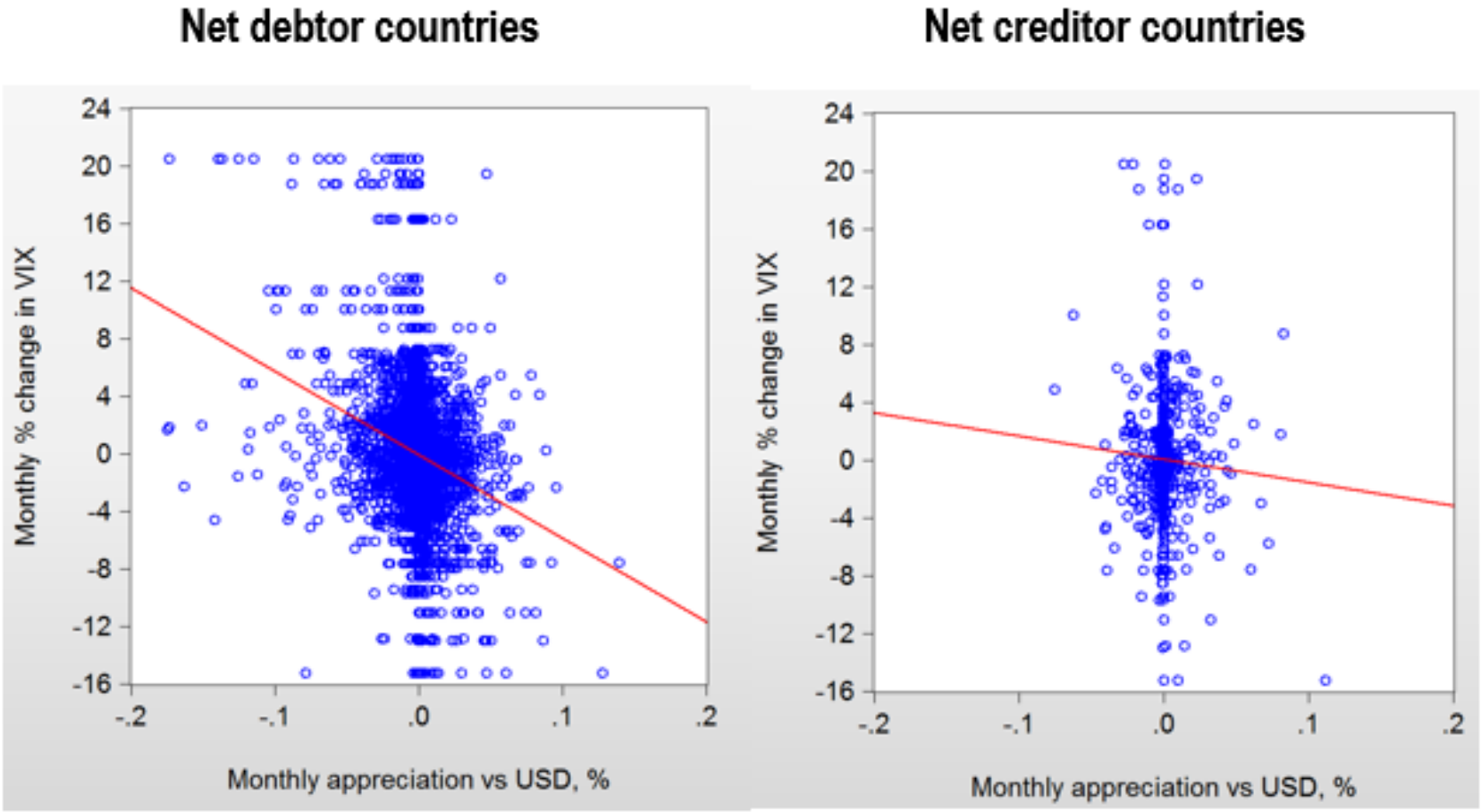

Figure 3: Net debtor countries seem to react stronger to changes in financial market uncertainty

Base currency:	SEK			KRW		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
ΔVIX	0.321	0.764***	0.728**	0.358	1.015***	1.169**
	(0.255)	(0.284)	(0.351)	(0.308)	(0.352)	(0.463)
ΔVIX*nfa	2.122***			2.411***		
	(0.406)			(0.440)		
ΔVIX*nTotDebt		3.823***			4.023***	
		(0.588)			(0.679)	
ΔVIX*nTotEquity		-0.758			-0.171	
		(0.657)			(0.778)	
ΔVIX*nPDebt			4.215***			3.958***
			(0.752)			(0.770)
ΔVIX*nPEquity			-3.700***			-3.333***
			(0.996)			(0.985)
ΔVIX*nOther			3.671*			6.156**
			(2.116)			(2.773)
N	26	26	25	26	26	25
T	234	234	234	234	234	234
Obs	5,011	4,852	4,789	5,076	4,917	4,854
$\bar{R}^2$	0.013	0.017	0.020	0.006	0.009	0.009

Note: Dep. var: Δs. White SE in parentheses, ***, ** and * denote significance at the 1%, 5% and 10 % levels. Constant, constitutive terms, control variables and currency fixed effects included. Avg. ΔRI impact=$\hat{\beta}_1 + \hat{\beta}_2\ \overline{nTotDebt} + \hat{\beta}_3\ \overline{nTotEquity}$, with RI proxied by VIX.

Table 6: Models (1) to (3) using SEK and KRW as base currency