The risk-taking channel of international financial flows

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The views expressed in this presentation are those of the authors and do not necessarily reflect those of the Bank of Italy.

Research question

We re-investigate the **role of foreign financial flows** into the US markets **during the run-up** to the great financial crisis

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1. Descriptive analysis of the dynamics of portfolio flows
2. Evaluate their effects on US variables in a VAR framework

Motivation

Two hypotheses point on foreign inflows as **drivers of the increased risk-taking**

Global Saving Glut (GSG) figure

- Mid 90s: East Asia accumulated foreign currency reserves (flight to safety)
- Their massive purchases of US public bonds compressed long-term yields

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Global Banking Glut (GBG) figure

- Early 2000s: non-US banks expanded their funding in dollars (search for yield)
- Part of it was reinvested in US private bonds as ABS, compressing yields

Motivation - cont'd

Why re-investigating these issues?

1. relevance of the two hypotheses **still an open question**
   - GSG inflows twice as large, known effects of CA imbalances on credit growth
   - fall in corporate spreads speaks for a bigger role of GBG
   - effect of the gluts behond interest rates? lack of complete picture

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   - effect of the gluts behond interest rates? lack of complete picture
2. post-crisis: (maybe) **new saving and banking gluts**
   - Asian surplus has not disappeared figure
   - Dollar funding of non-US banks now at the crisis peak figure

Literature

- on the saving and banking glut hypotheses:

  Bernanke 2005, Warnock and Warnok 2009, Brender and Pisani 2010, Acharya and Schnabl 2010, Bernanke et al 2011, Borio and Disyatat 2011, Shin 2011, Bertaut et al 2012, Bruno and Shin 2015, McCauley 2018

- on global capital flows

  Gourinchas and Rey 2014, Rey 2015, Jorda et al 2018, Wang 2018, Miranda-Agrippino and Rey 2019

- on global safe assets

  Caballero 2006, Gourinchas and Jeanne 2012, Caballero et al 2017, Aizenman Cheung and Qian 2019

This paper

Part1: Test effects of **foreign US bonds purchases** on risk-taking

- Broader market perspective: corporate spread, VIX and US banks' leverage
- Disentangle the impact on the risk premium components

Part2: Estimation of the **effects of the gluts** before the crisis

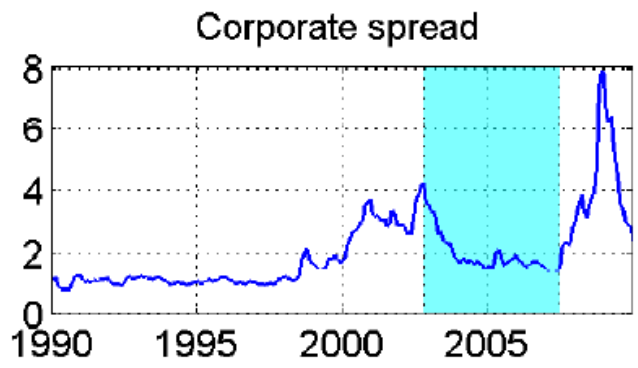
- Identify saving and banking glut flows
- Look at real effects

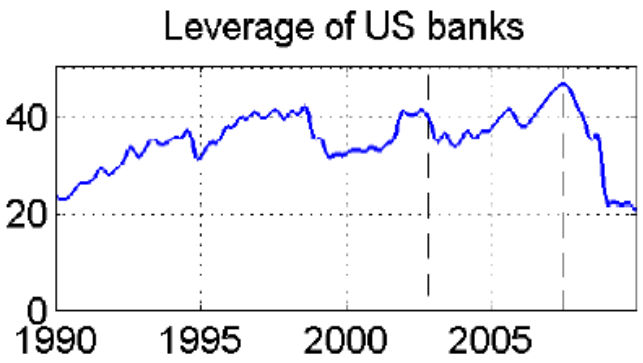
Contribution

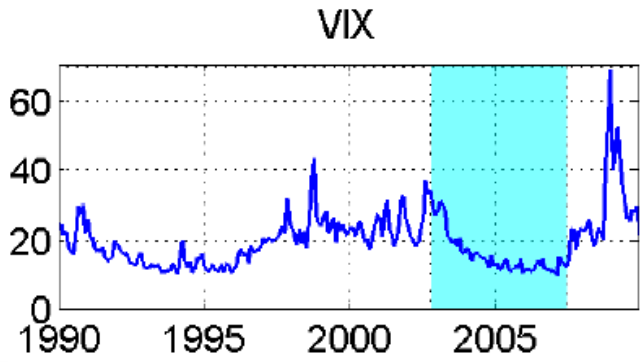
- Improve understanding of drivers of risk appetite and credit boom
- Propose a way to characterize GSG and GBG in a VAR
- Highlight an autonomous risk-taking channel of financial inflows

Risk-taking indicators in the US

Since mid 90s: Asian inflows. Since 2000s: banking inflows







Risk taking increases the most when **both** flows were present (Sep2002 – Jun2007)

Part1: data and specification

- Construct gross inflows, data from Bertaut and Judson 2014
  - 12-month cumulated (net) purchases as % of US GDP
  - two variables: inflows to public and to private bonds
- Target variables
  - credit spread = expected default + bond premium (Gilchrist-Zakraysek 2012)
  - VIX = expected variance + variance premium (Bekaert and Hoerova 2014)
  - leverage of US banks (Adrian and Shin 2012)

Part1: results

Regressions on the full sample (94-07) and two subsamples (99-07 and 02-07)

Main takeaways:

- Foreign inflows significantly affect US markets and bank leverage
- Only **inflows on private bonds** significant on VIX and bank leverage
- Mainly channeled through **lower risk premiums**

LONG RATES CREDIT SPREAD VIX US BANK LEVERAGE

Part1: issues

- reverse causality to inflows? of inflows with each other?
- endogeneity not addressed in the saving-banking glut literature
- no standard way in the literature to identify shocks to capital flows

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- no standard way in the literature to identify shocks to capital flows

We go one step further

- Inspect Granger causality: confirms direction inflows $\rightarrow$ US markets tests
- Construct GSG and GBG to identify shocks in a VAR

Part2

Pre-crisis period has unique characteristics

- 2nd half 90s: preference shocks were dominant drivers of outflows from Asia
- then: overseas bank activity started with the Euro and Basel II preparation

Main concerns for identification:

1. part of GBG "recycled" from GSG: need to **disentangle** non-recycled GBG
2. endogeneity w.r. to US monetary policy (especially after 2001)

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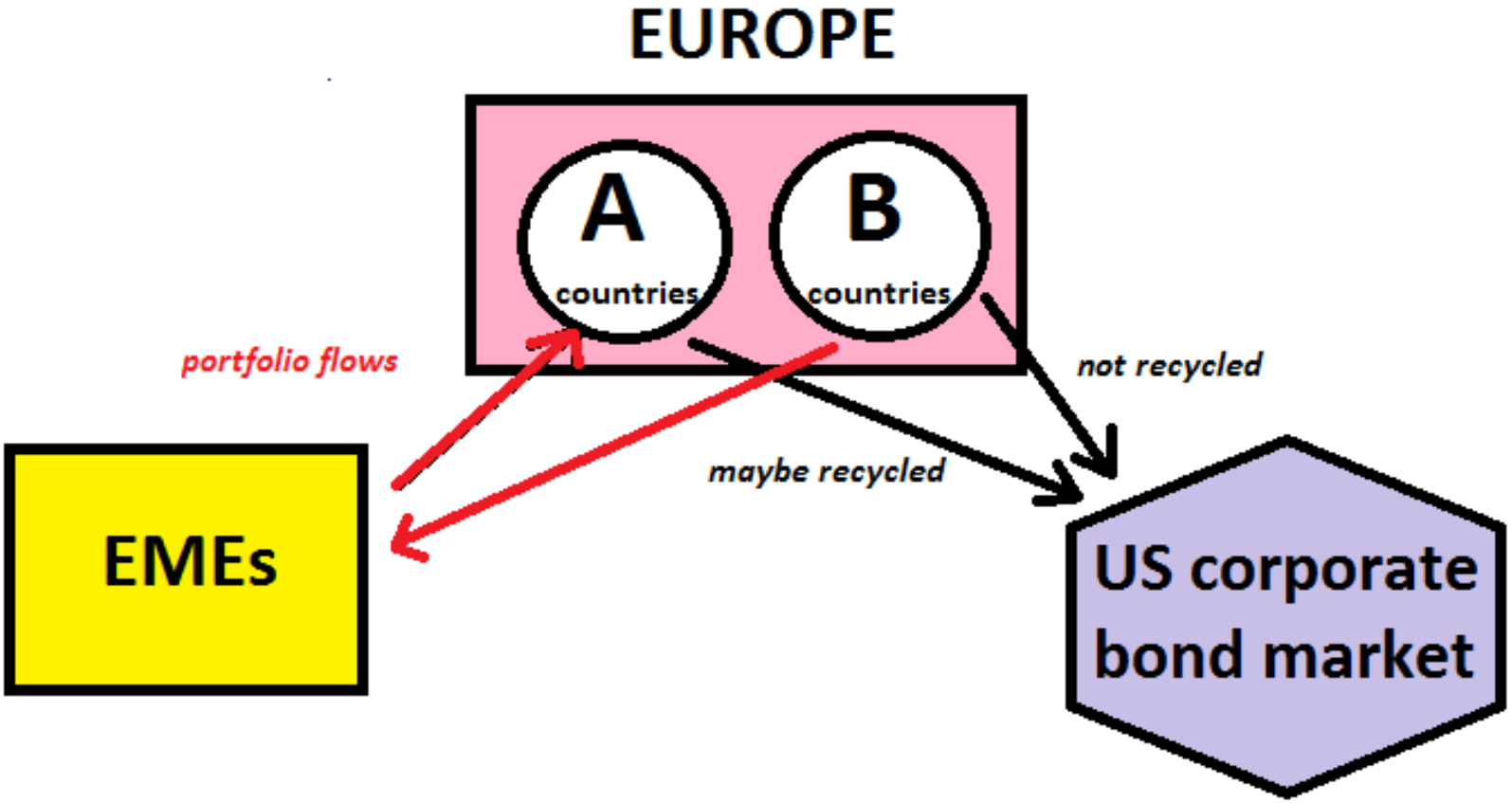
2. endogeneity w.r. to US monetary policy (especially after 2001)

We address first concern, then verify the second ex-post

Part2: GBG country selection

When GBG started, Europe at the top of a **triangle of portfolio flows**



not all EU received EME inflows: B countries made *outflows*

Part2: GBG country selection - cont'd

Country selection

- Red arrows: **bilateral portfolio flow database** (Hobza-Zeugner 2014 JIMF)
- Black arrows: purchases of US corp bonds from EU (Bertaut-Judson data)
- We compare the two and select B countries COUNTRY TABLES

Part2: GBG country selection - cont'd

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GSG and GBG variables

- GSG: public bond flows from EME Asia. GBG: flows from B to private bonds
- GSG placed first and GBG second in the VAR
- fin variables and FFrate after inflows and leverage (as in Bruno ad Shin 2015)

Part2: VAR

Three specifications

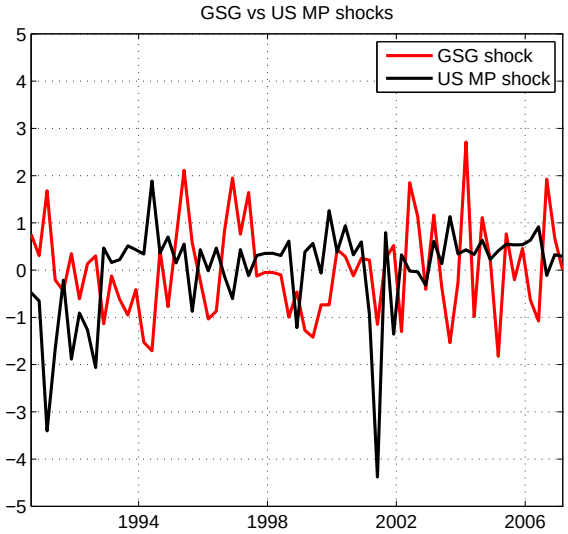
- baseline: GSG, GBG, banklev, bond premium, VIX, REER, real FF rate
- alt1: add US household debt
- alt2: add US house prices

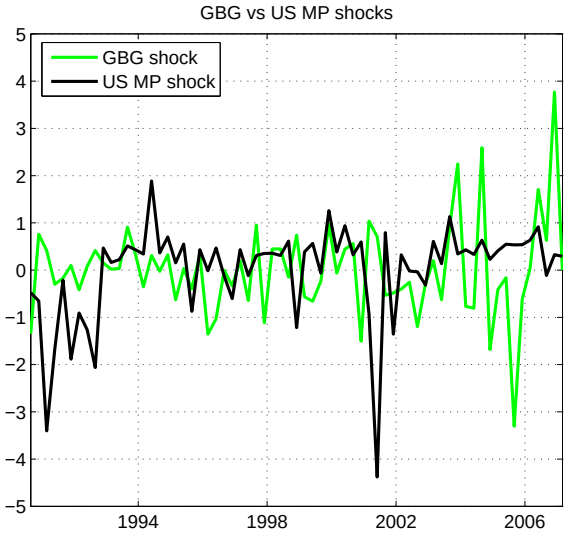
Other details:

- Recursive identification, improved with GBG country selection
- Bayesian estimation with Minnesota priors, one std bands
- Sample: 1990 Q1 – 2010 Q3

Part2: monetary policy

- Check identified GSG and GBG shocks' vs. US monetary shocks
- Construct them from baseline specification
- Compare to Gertler and Karadi's monetary policy surprise

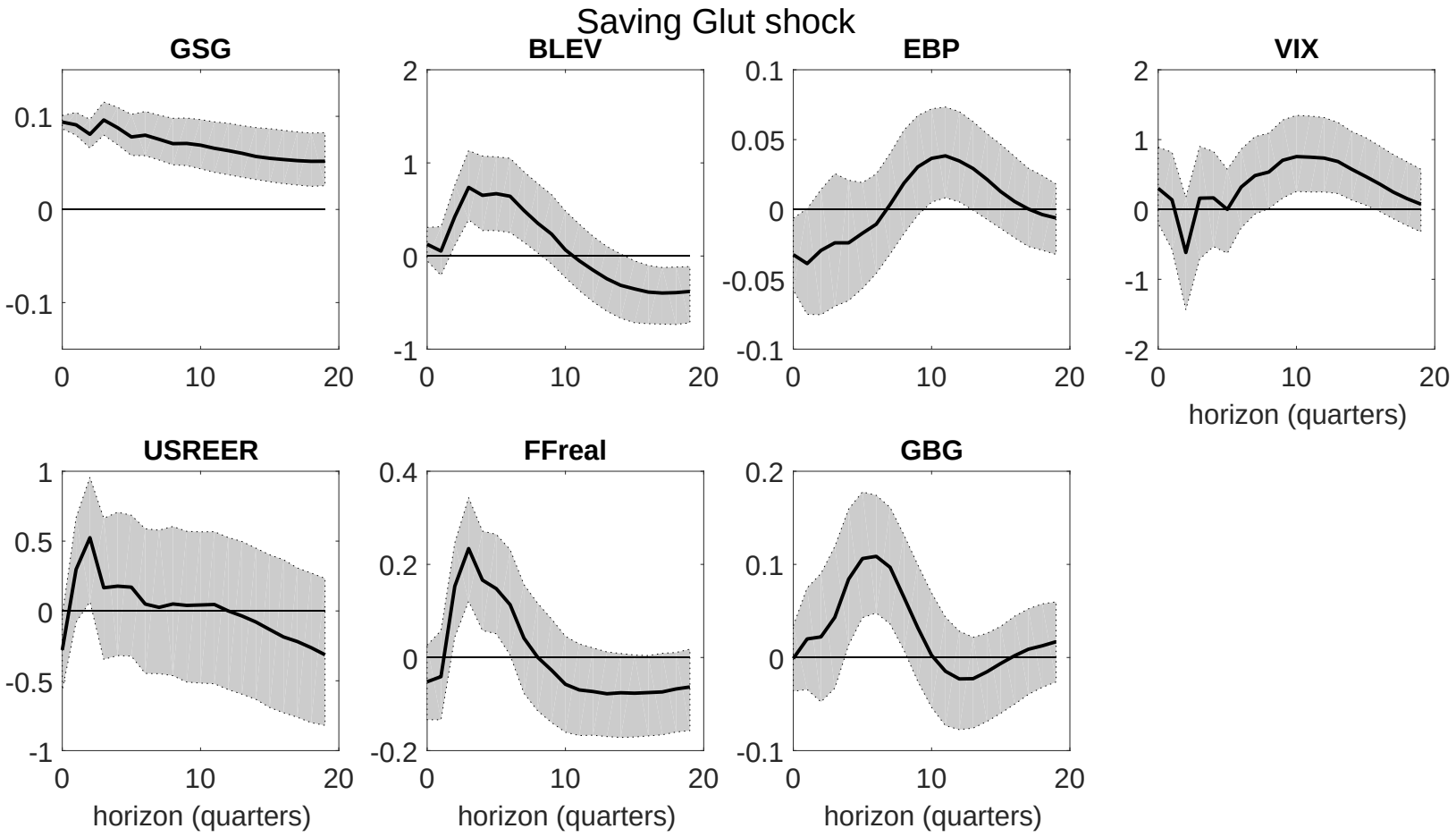




Correlation with US monetary policy close to 0 for both shocks

Results hold for all other MP shock measures in GK and all our VAR specifications

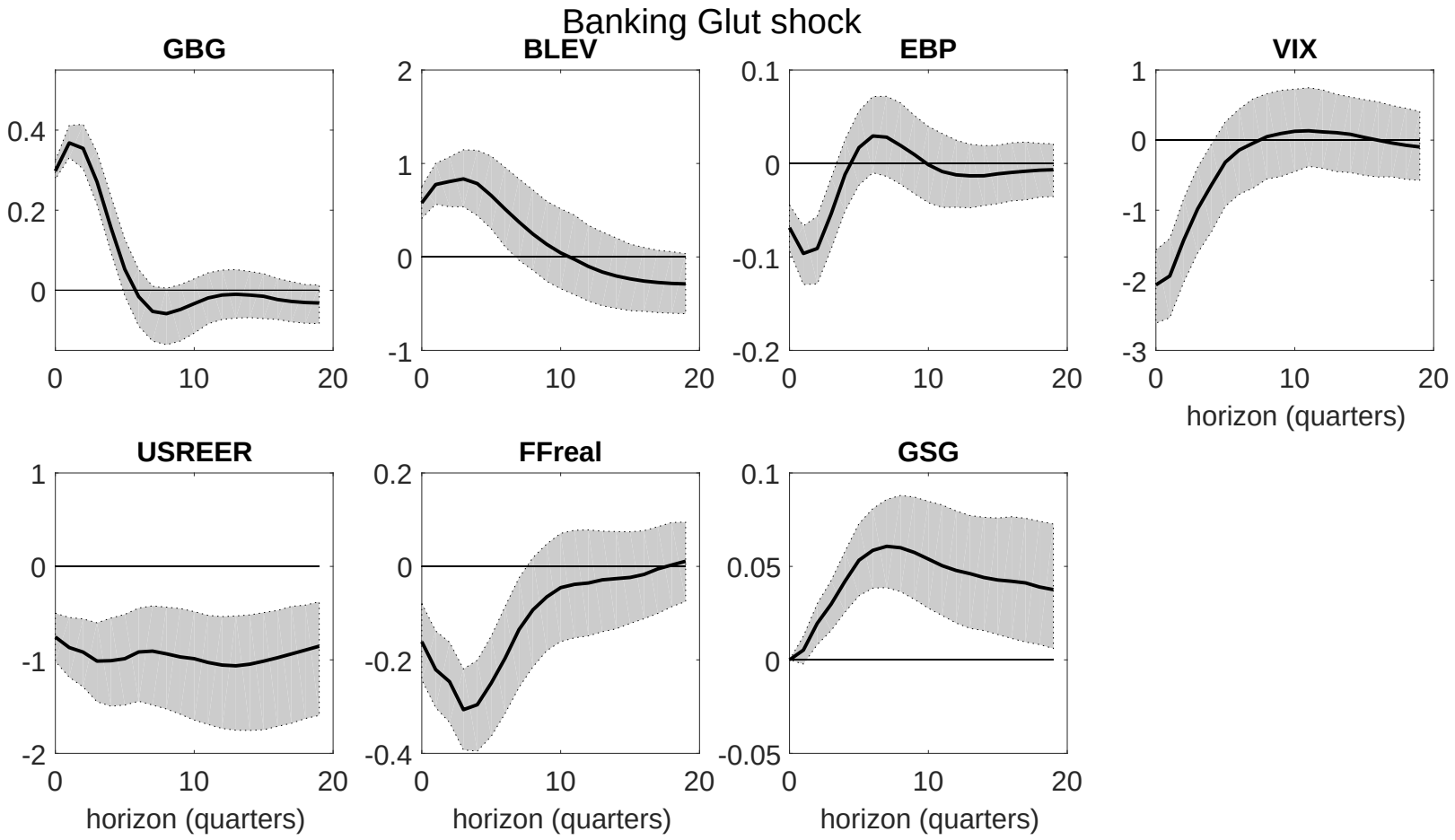
Impulse response functions (1)



Sign of the response as expected

Stimulate bank leverage and GBG, but opposite effects on risky assets

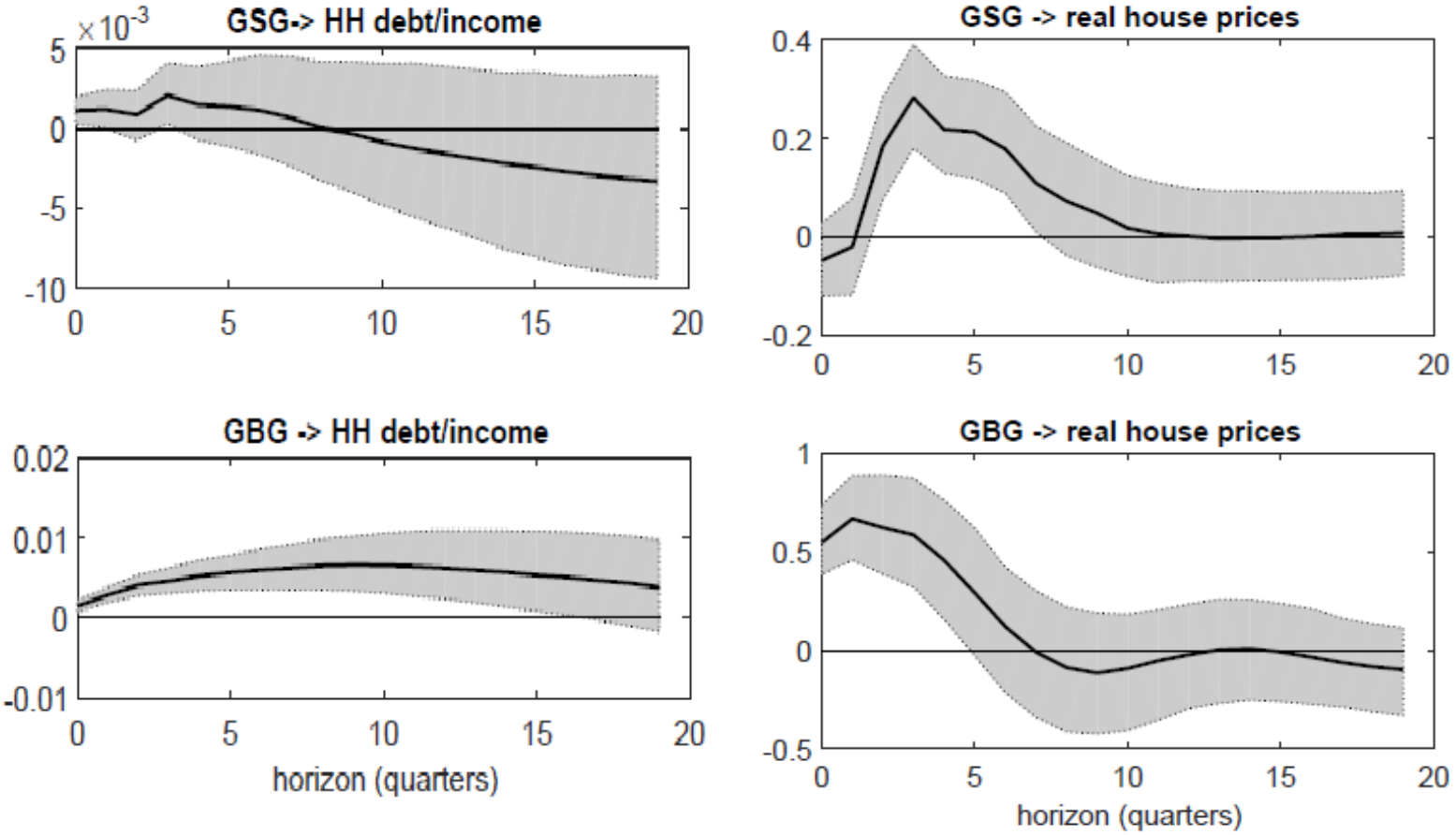
Impulse response functions (2)



All responses point to an effect of GBG on risk-appetite

Effects on FF rate and the exchange rate less clear

Impulse response functions (3)



Only GBG affects household debt.

Both affect house prices, effect of GBG twice as large

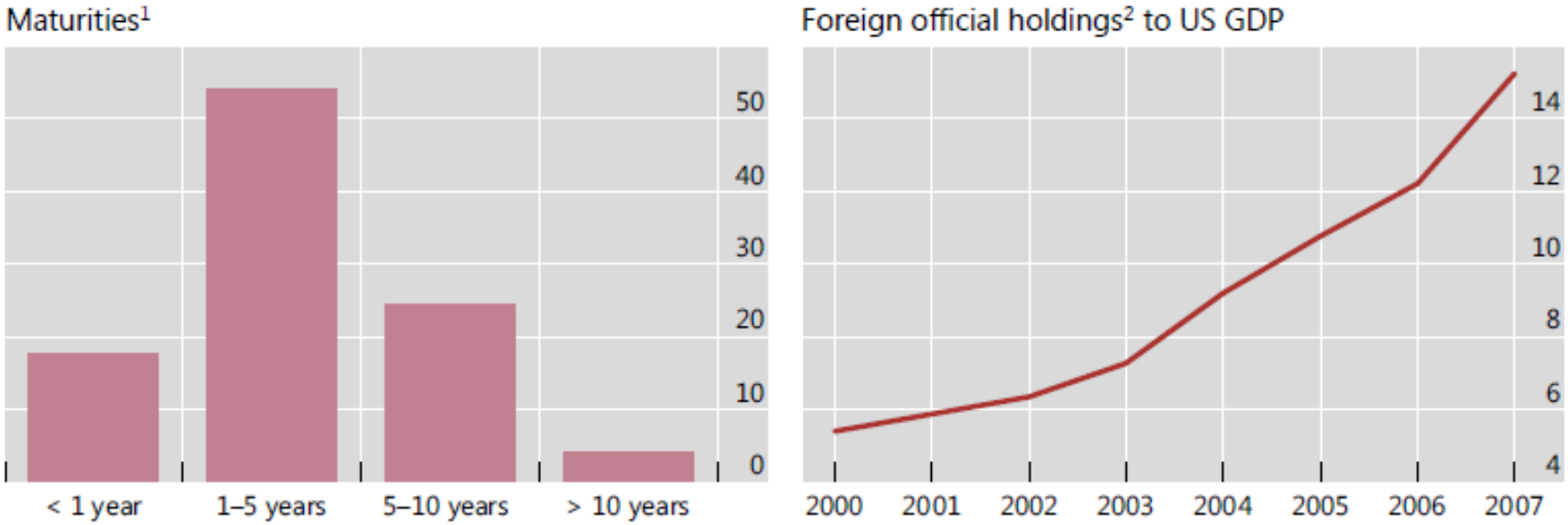
Conclusions

- During the run-up to the crisis, foreign inflows had significant, autonomous effects on US financial and credit markets
- Inflows on corporate bonds had a prominent role in fueling the risk-on phase
- GBG shocks driver of US risk appetite; GSG and GBG self reinforcing

Global saving glut

Foreign official holdings of US Treasury securities

In per cent — Graph 2



[1] 30 June 2007. [2] Comprises long-term US Treasury debt and agency debt.

Source: US Treasury et al (2008), p 11, p 21.

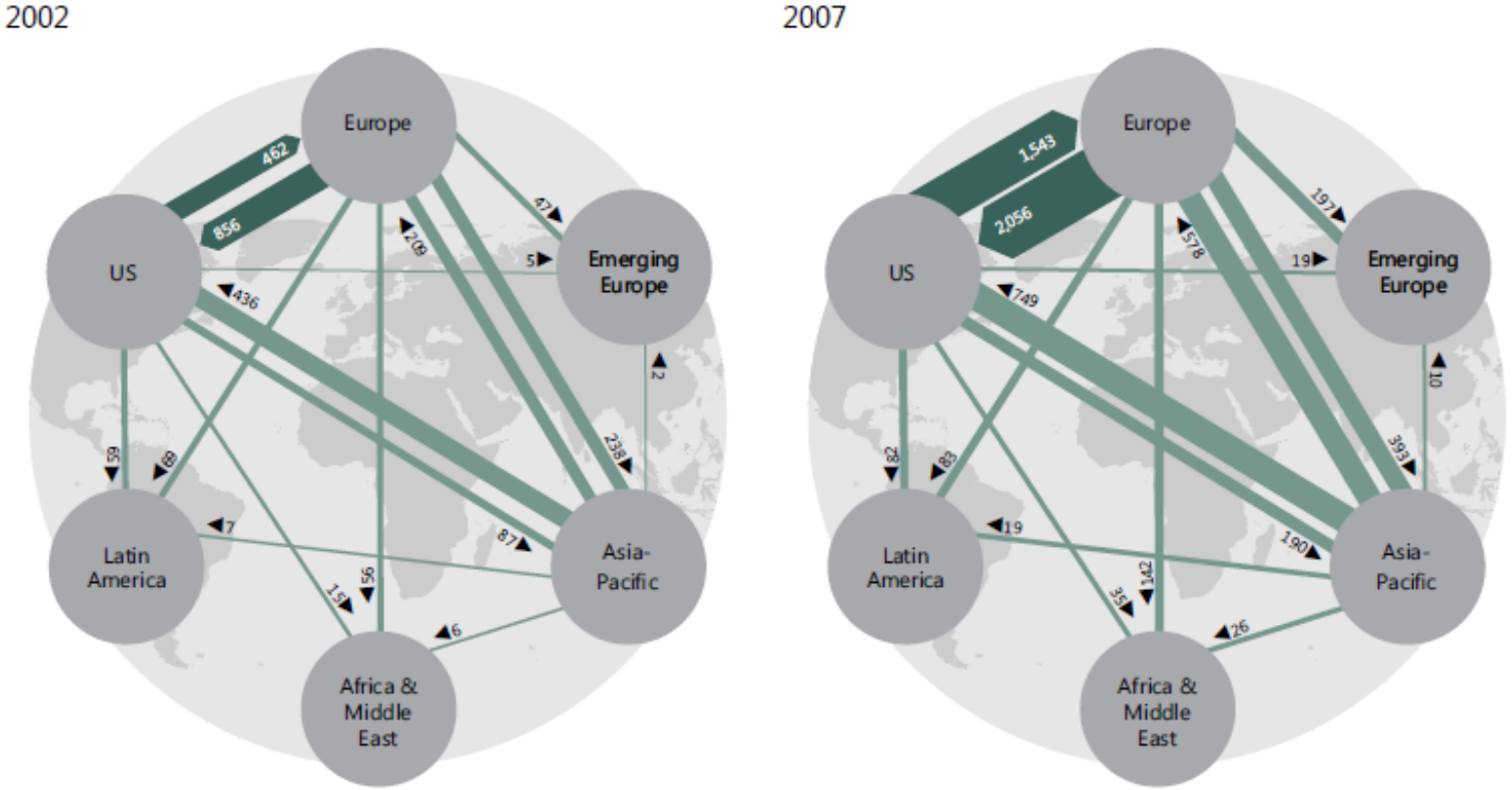
Source: McCauley (2018)

Go Back

Global banking glut

US dollar-denominated cross-border claims: the transatlantic round trip[1]

In billions of US dollars — Graph 1

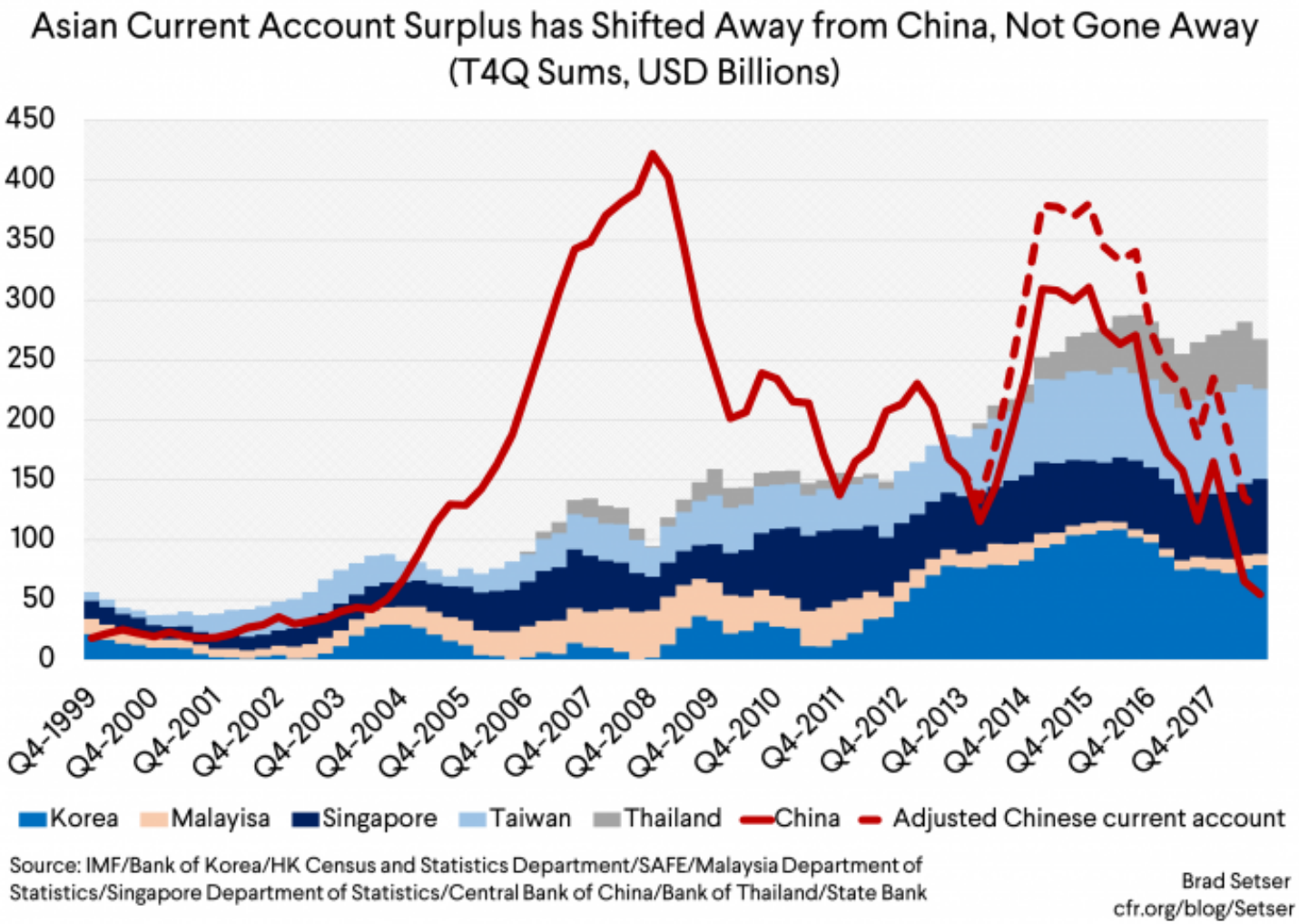


[1] The thickness of the arrows indicates the size of the outstanding stock of claims. The direction of the arrows indicates the direction of the claims: arrows directed from region A to region B indicate lending from banks located in region A to borrowers located in region B.

Source: Avdjiev et al (2016)

Go Back

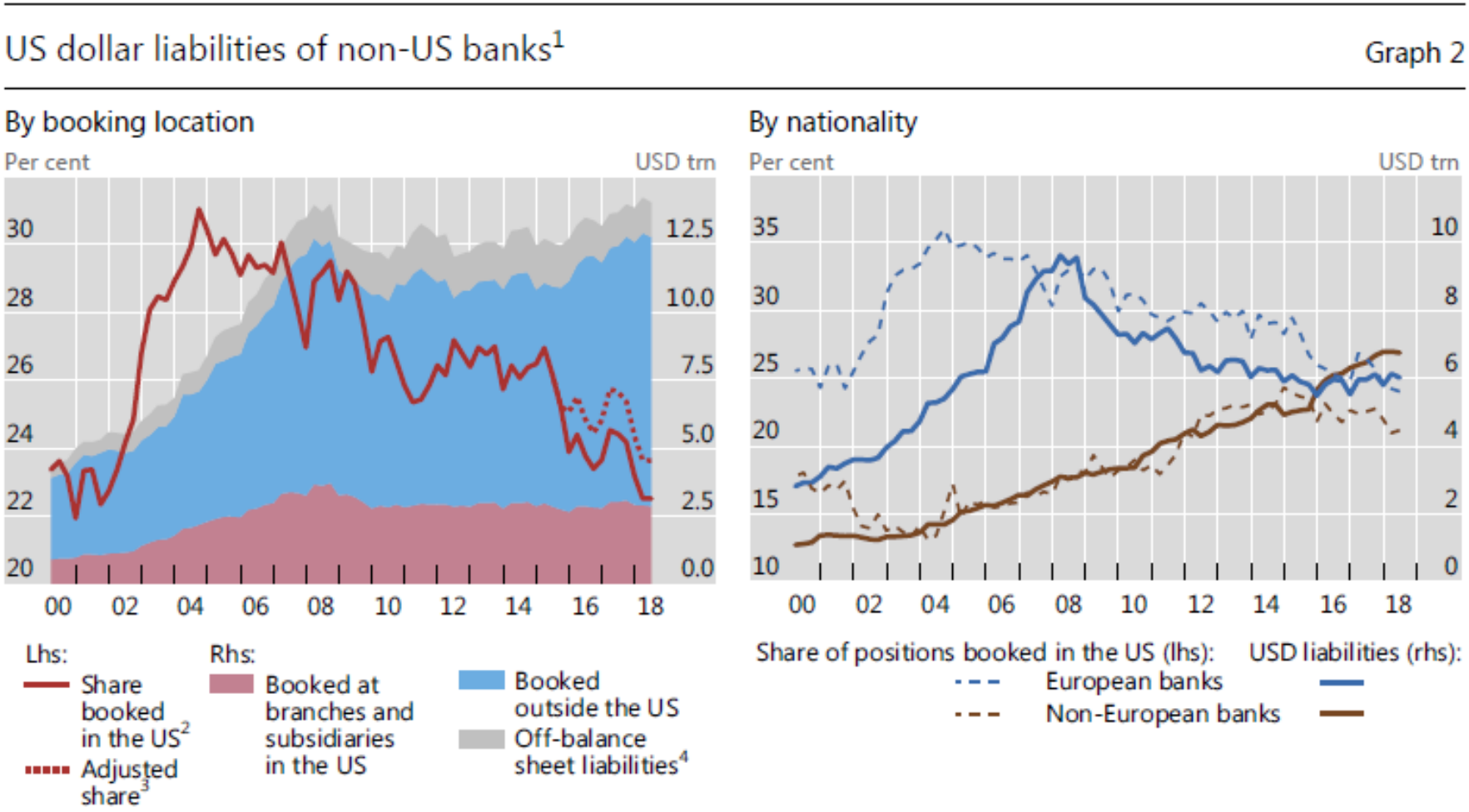
Asia's current account



Source: Council of foreign relations, blog post, March 2019

Go Back

Dollar funding of non-US banks



Source: BIS Quarterly Review December 2018

Go Back

Effects on long-term rates

	D.10-year	D.10-year	D.10-year	D.AAAyield	D.AAAyield	D.AAAyield
D.FFtarget	0.37***	0.37***	0.37***	0.20**	0.20**	0.20**
	(0.10)	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)
D.exp infl	−0.09	−0.11	−0.12	−0.02	−0.03	−0.04
	(0.08)	(0.09)	(0.08)	(0.06)	(0.06)	(0.06)
D.logreer	−0.73	−0.24	−0.98	−1.12	−0.61	−1.28
	(1.47)	(1.52)	(1.47)	(1.07)	(1.12)	(1.10)
dbg	−0.40***		−0.28***	−0.33***		−0.25***
	(0.09)		(0.10)	(0.07)		(0.08)
dsg		−0.29***	−0.23***		−0.21***	−0.15**
		(0.07)	(0.08)		(0.06)	(0.06)
Constant	0.00	−0.00	0.00	−0.00	−0.01	0.00
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
Observations	162	162	162	162	162	162
Adjusted R^2	0.15	0.17	0.20	0.12	0.11	0.15

Standard errors in parentheses. Sample: Jan 1994 – Jun 2007.
* $p < 0.01$, ** $p < 0.05$, *** $p < 0.01$

Effects on both public and private bonds, almost same size Go Back

Effects on the components of the credit spread

Panel C: Excess bond premium

	1994 – 2007			1999 – 2007		
D.FFtarget	−1.47***	−1.43***	−1.44***	−1.85***	−1.79***	−1.80***
	(0.19)	(0.19)	(0.19)	(0.21)	(0.20)	(0.20)
D.exp infl	0.37	0.24	0.24	0.44	0.21	0.22
	(0.29)	(0.30)	(0.28)	(0.33)	(0.35)	(0.34)
D.logREER	−0.66	1.10	−0.14	1.49	4.05	1.66
	(2.98)	(2.98)	(2.92)	(5.14)	(4.97)	(4.85)
D.Cinflows	−0.27		−0.48*	−0.32		−0.59**
	(0.23)		(0.24)	(0.25)		(0.26)
D.TAinflows		0.28*	0.40**		0.45*	0.63**
		(0.15)	(0.17)		(0.25)	(0.27)
Constant	−0.14***	−0.16***	−0.14***	−0.05	−0.08	−0.06
	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.05)
Adjusted R^2	0.22	0.23	0.24	0.27	0.29	0.32

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Opposite signs confirms argument in McCauley (2018)

Stronger effects on bond premium Go Back

Effects on the VIX

Panel A: logVIX

	1994 – 2007			1999 – 2007		
D.real FF target	−0.53***	−0.55***	−0.55***	−0.61***	−0.60***	−0.60***
	(0.10)	(0.10)	(0.10)	(0.11)	(0.11)	(0.11)
D.logREER	0.31	0.81	0.14	−1.32	0.35	−1.32
	(2.52)	(2.41)	(2.44)	(3.16)	(3.24)	(3.18)
D.Cinflows	−0.33**		−0.25*	−0.40***		−0.42***
	(0.15)		(0.15)	(0.15)		(0.16)
D.TAinflows		−0.21*	−0.15		−0.10	0.03
		(0.11)	(0.11)		(0.12)	(0.12)
Constant	2.92***	2.92***	2.93***	2.95***	2.94***	2.95***
	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Adjusted R^2	0.13	0.12	0.13	0.19	0.14	0.18

Significant effects of private bond inflows only

Lower both expected volatility and risk premium

Go Back

Effects on US banks' leverage

Did foreign inflows stimulate a leverage expansion of US banks?

Bank leverage (first difference)

	1994 – 2007				2002 – 2007			
D.real FF target	−0.63	−0.50	−0.51	−0.44	−0.09	0.06	0.20	0.20
	(0.40)	(0.42)	(0.42)	(0.44)	(0.49)	(0.48)	(0.45)	(0.44)
L(3).logVIX	−0.61***	−0.52***	−0.56***	−0.50**	−0.96***	−0.81**	−0.94**	−0.80**
	(0.18)	(0.20)	(0.20)	(0.20)	(0.36)	(0.38)	(0.37)	(0.39)
L.D.Cinflows		0.55*		0.52*		0.69**		0.87***
		(0.29)		(0.29)		(0.31)		(0.31)
D.Cinflows		0.55*		0.40		0.62**		0.42
		(0.31)		(0.29)		(0.30)		(0.33)
L.D.TAinflows			0.18	0.06			−0.04	−0.35
			(0.22)	(0.22)			(0.30)	(0.30)
D.TAinflows			0.42	0.30			0.59*	0.35
			(0.29)	(0.30)			(0.35)	(0.39)
Constant	1.86***	1.55***	1.69***	1.50**	2.78***	2.26**	2.68**	2.23**
	(0.53)	(0.58)	(0.57)	(0.60)	(0.98)	(1.07)	(1.03)	(1.08)
Adjusted R^2	0.07	0.09	0.08	0.09	0.17	0.25	0.18	0.24

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Private bond inflows significant only since 2002 (lagged with respect to VIX)

Inflows on public bonds never significant Go Back

Granger causality tests

Three-variables VARs, target variables included one at a time

Result: Inflows Granger cause (GC) US markets

Sep 2002 – Jun 2007	
h0: x does not GC y	Prob > chi2
Cinflows → GZspread	0.018
TAinflows → GZspread	0.345
ALL → GZspread	0.073
GZspread → Cinflows	0.485
TAinflows → Cinflows	0.787
ALL → Cinflows	0.668
GZspread → TAinflows	0.256
Cinflows → TAinflows	0.234
ALL → TAinflows	0.296

Sep 2002 – Jun 2007	
h0: x does not GC y	Prob > chi2
Cinflows → log VIX	0.113
TAinflows → log VIX	0.995
ALL → log VIX	0.284
log VIX → Cinflows	0.279
TAinflows → Cinflows	0.655
ALL → Cinflows	0.479
log VIX → TAinflows	0.225
Cinflows → TAinflows	0.196
ALL → TAinflows	0.269

Sep 2002 – Jun 2007	
h0: x does not GC y	Prob > chi2
Cinflows → bank leverage	0.049
TAinflows → bank leverage	0.012
ALL → bank leverage	0.026
bank leverage → Cinflows	0.642
TAinflows → Cinflows	0.609
ALL → Cinflows	0.773
bank leverage → TAinflows	0.078
Cinflows → TAinflows	0.155
ALL → TAinflows	0.117

Corp inflows GC credit spread and bank leverage. it is never GC itself.

No evidence for public inflows (two-way GC with bank leverage) Go Back

EU purchases of corp bonds (Bertaut and Judson 2014)

Europe → US corporate bonds

billion USD	2002	2003	2004	2005	2006	**total 2002-2006**
EA:						
Austria	0.2	1.2	0.8	- 0.1	2.4	**4.5**
Belgium and Luxembourg	143.1	229.5	207.4	65.1	245.9	**891.0**
Germany	- 2.5	10.5	19.1	8.0	19.7	**54.8**
Spain	- 0.6	0.6	3.2	2.9	1.2	**7.4**
Finland	- 0.0	0.2	0.4	- 0.1	0.4	**0.9**
France	3.2	5.5	2.1	3.9	24.4	**39.0**
Greece	- 0.1	0.1	0.0	- 0.1	0.1	**0.0**
Ireland	8.0	10.8	9.3	10.1	45.8	**83.9**
Italy	- 0.3	1.7	- 0.8	0.1	1.4	**2.1**
Nederlands	2.5	9.2	20.8	21.8	16.1	**70.4**
Portugal	- 0.0	- 0.0	0.2	0.7	0.4	**1.3**
non EA:						
Switzerland	1.4	16.1	18.7	6.6	22.5	**65.4**
Denmark	0.5	1.0	2.5	- 0.6	- 0.5	**2.9**
Norway	3.5	5.5	4.1	3.5	12.3	**28.9**
Sweden	0.2	1.2	4.9	2.2	2.5	**11.1**
UK	- 24.1	61.7	54.2	27.4	97.2	**216.4**

Bilateral portoflio flows to EU (Hobza and Zeugner 2014)

Portfolio flows from RoW → Europe

billion EUR	2002	2003	2004	2005	2006	**total 2002-2006**
EA:						
Austria	- 2.4	1.1	3.6	- 0.4	2.2	**4.2**
Belgium and Luxembourg	- 528.9	104.6	- 9.6	109.8	- 20.1	**- 344.1**
Germany	2.4	154.4	- 23.0	- 1.5	7.3	**139.6**
Spain	27.1	- 2.2	6.9	- 19.5	51.2	**63.5**
Finland	- 2.2	2.9	- 4.8	5.4	9.6	**10.8**
France	1.0	3.9	45.8	61.3	- 60.3	**51.6**
Greece	- 3.9	13.3	1.0	- 0.1	1.2	**11.6**
Ireland	- 58.0	44.8	29.3	66.8	- 88.4	**- 5.5**
Italy	- 70.2	1.9	- 15.0	- 22.1	68.5	**- 36.8**
Nederlands	169.5	11.4	0.9	66.6	83.2	**331.6**
Portugal	4.7	2.7	9.1	3.2	- 18.4	**1.4**
non EA:						
Switzerland	- 11.6	- 5.3	0.0	18.0	- 21.4	**- 20.3**
Denmark	- 11.4	- 5.0	2.9	- 13.3	9.0	**- 17.8**
Norway	- 1.2	- 0.2	1.6	5.6	5.5	**11.3**
Sweden	- 24.4	2.5	- 2.0	- 8.7	5.1	**- 27.3**
UK	- 66.6	- 19.6	1.6	8.5	- 20.4	**- 96.5**

Go Back