BANK FOR INTERNATIONAL SETTLEMENTS

The shifting drivers of international capital flows

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The Big Picture

- International capital flows grew dramatically in the couple decades preceding the Global Financial Crisis.
  - Strong international co-movement
  - Broad-based growth in bank lending

- The post-crisis period has seen sharply different patterns of international capital flows (Bussiere et al, 2016).
  - Cross-border bank lending has retrenched
  - International bond market financing has grown in importance ("*The Second Phase of Global Liquidity*", Shin 2013)

Main Questions

- What are the **main drivers** of international capital flows?
- Do the **sensitivities** of the various flow types to the main drivers differ?
  - If so, how?
- Have the above relationships **changed since the crisis**?
  - Are international capital flows more or less responsive to global factors?
- **What explains** the changes since the crisis?

Preview of main results

- Considerable post-crisis changes in sensitivities to global drivers
  - A shift in the **transmission of global liquidity**
    - Away from loan flows
    - Towards bond flows
  - Stronger international **monetary policy spillovers**
  - **Altered sensitivity** to global **risk** conditions
    - **Loan** flows: **less** risk sensitive
    - **Bond** flows: **more** risk sensitive
    - **Total** flows: **remain** highly risk sensitive
  - **Convergence** in sensitivities between loan and bond flows

- Potential explanations may be related to:
  - Intensive margin: **Prudential policy actions**
  - Extensive margin: **Shifting composition** of lenders

Existing Literature

- Recent contributions
  - Forbes and Warnock (2012)
  - Fratzscher (2012)
  - Cerutti, Claessens and Ratnovski (2014)
  - Bruno and Shin (2015)
  - Correa, Paligorova, Sapriza and Zlate (2015)
  - Miranda-Agrippino and Rey (2015)
  - McCauley, McGuire, Sushko (2015)

add to long literature concentrated on EM capital flows

- Main drivers of the "Global financial cycle":
  - **Global Risk** Conditions (VIX)
  - **Monetary policy** in advanced economies

Our Approach

- **First stage**
  - Focus on the two main international components of the BIS **Global Liquidity Indicators** (CGFS, 2011):
    - Cross-border **loans** (from the BIS LBSR dataset)
    - International **debt securities** (from the BIS IDSS dataset)
  - Estimate the impact of global and local drivers of capital flows using
    - quarterly data from 2000:Q1 to 2013:Q4
    - 64 destination countries
- **Second stage**
  - Introduce the lending **bank nationality** dimension (using the BIS CBS data)
  - Control for **heterogeneity across lenders**

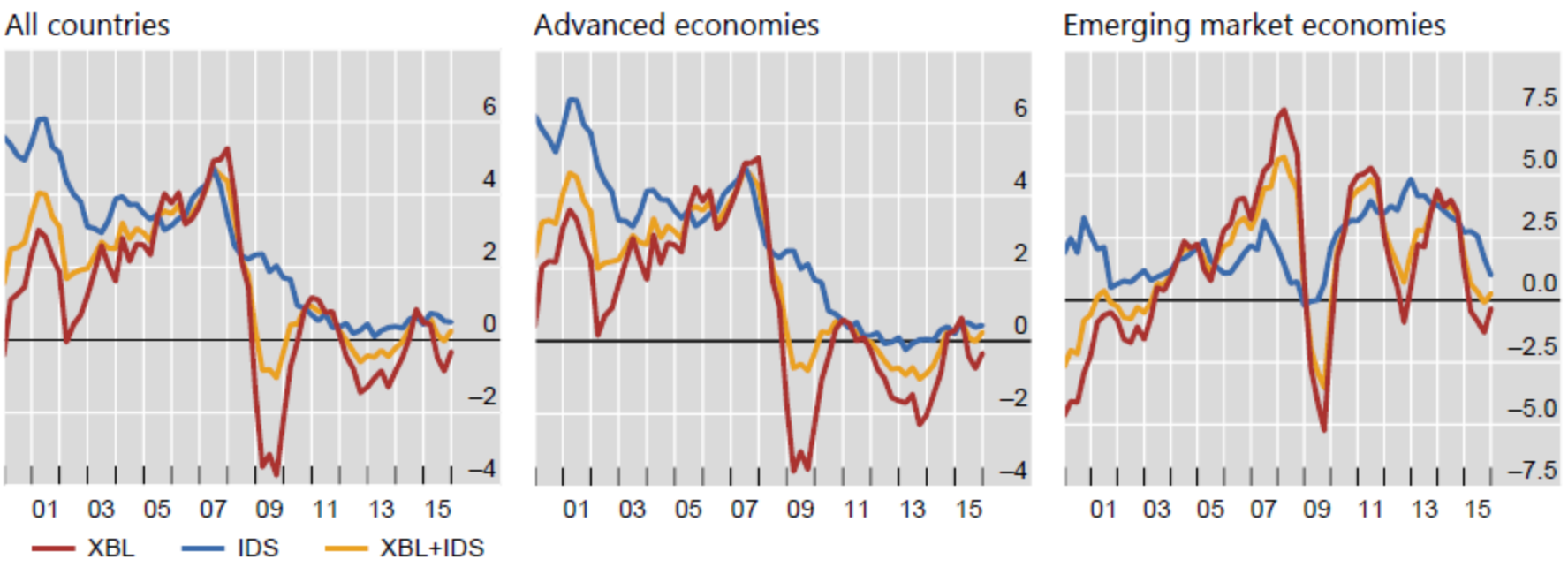
Broad Patterns in the Data

- International bank lending
  - Declined considerably since the Global Financial Crisis
  - The contraction in interbank lending has been especially notable
    - Intra-bank lending held up better than inter-bank lending (Reinhardt and Riddiough (2015))

- International debt securities issuance
  - remained (relatively) stable during the crisis
  - IDS issuance by EME non-bank borrowers has picked up considerably during the post-crisis period

External debt flows, all borrowers

Four-quarter moving average of quarterly growth rates, in per cent



XBL = Cross-border loans: Quarterly Growth Rate$_t$ = Adjusted Flows$_t$ / Outstanding Stock$_{t-1}$; IDS = International Debt Securities: Quarterly Growth Rate$_t$ = Net Issuance$_t$ / Outstanding Stock$_{t-1}$.

Sources: BIS Locational Banking Statistics by residence; BIS International Debt Securities Statistics.

Empirical Methodology

- Baseline estimation :
  - $GrRateY_t^j = \beta_1 \Delta FFR_t + \beta_2 logVIX_t + \beta_3 \Delta logGDP_t^j + \beta_4 \Delta SovRating_t^j + \beta_5 ChinnIto_t^j + \beta_6 \Delta logGlobalGDP_t + \mu^j + \varepsilon_t^j$

- Endogenously identify potential **structural break points** and test for their significance (Bai (1997) and Kurozumi (2002))
  - Strong evidence of a structural break in Q1/2009 for both:
    - Cross-border loans
    - International debt securities

- Benchmark estimation with structural breaks:
  - $GrRateY_t^j = \beta' X_t^j + \mu^j + I\left(t \geq T_{break}^Y\right)\left(\kappa + \gamma' X_t^j\right) + \varepsilon_t^j$

Baseline model

	Dependent variable: ΔCross-border loans †			Dependent variable: ΔInternational debt securities ‡		
Explanatory variables	All	to banks	to non-banks	All	by banks	by non-banks
ΔFed funds rate (1)	-1.876***	-2.074***	-2.108***	-1.348*	-1.336	-1.051
Log(VIX)	-4.455***	-4.294***	-4.895***	-3.275***	-7.260***	-2.488***
ΔReal GDP	0.565***	0.597***	0.524***	0.187*	0.246	0.182
ΔSovereign rating (2)	2.491**	4.207***	-0.567	1.459*	-1.830	1.146
Chinn-Ito index (3)	-0.118	-1.079	1.337	8.705***	13.45***	5.191
ΔReal global GDP	0.215	0.465*	0.100	-0.317	-0.618	-0.477
Observations	2,903	2,903	2,903	2,903	2,572	2,902
R-squared	0.124	0.082	0.080	0.060	0.031	0.038

Notes: The sample includes quarterly data on cross-border flows (loans and debt securities) for 64 recipient countries over the period 2000:Q1 - 2013:Q4. The regressions include a full set of country fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. † to borrowers in country j. ‡ issued by borrowers in country j. (1) Effective federal funds rate for the period 2001:Q1 – 2008:Q4, Wu-Xia Shadow rate for the period 2009:Q1 – 2013:Q4. (2) LT foreign currency, average across 3 agencies. (3) Chinn and Ito (2006) measure of financial openness.

Benchmark model with structural breaks

Explanatory variables	Dependent variable: ΔCross-border loans to banks	Dependent variable: ΔCross-border loans to non-banks	Dependent variable: ΔInternational debt securities by banks	Dependent variable: ΔInternational debt securities by non-banks
ΔFed funds rate				
Pre-break	-3.36***	-3.39***	-1.19	-0.94
Post-break	-8.36***	-5.19***	-14.67	-6.37***

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Pre-break	-4.36***	-4.32***	-5.58**	-0.23
Post-break	-0.22	-2.52***	-3.39	-2.31*

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Changes in sensitivities, pre- vs post-crisis

Fed Funds rate	**Borrower**	
	Banks	Non-banks
Loans (LBS)	Strengthens	Strengthens
Bonds (IDS)	Strengthens	Strengthens

VIX	**Borrower**	
	Banks	Non-banks
Loans (LBS)	Weakens	Weakens
Bonds (IDS)	Weakens	Strengthens

What could account for the post-crisis changes in sensitivities?

- **Compositional Shifts**
  - Lenders:
    - Across lending sectors: Bank to Non-Bank
    - Within lending sectors:
      - Banks: reducing exposures to certain borrowers
      - Non-Bank: new lenders entering the market
  - Borrowers:
    - New bank regulation: impossible for certain higher-risk borrowers to get loans from banks
    - New borrowers joining the bond market (extensive margin)
    - Existing borrowers issuing more bonds (intensive margin)

- **Prudential Policy Actions**

- **Risk taking channel of currency appreciation** (Bruno and Shin, 2015)

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Explanatory variables	Dependent variable: ΔCross-border loans to non-banks	Dependent variable: ΔInternational debt securities by non-banks
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Pre-break	-3.39***	-0.94
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Convergence between XBL and IDS

Coefficients(XBL)-Coefficients(IDS)	Borrower sector		
	All	Banks	Non-banks
Pre-break			
Log(VIX)	-2.817**	1.215	-4.093**
ΔFed funds rate (1)	-1.699*	-2.172*	-2.456**
Post-break			
Log(VIX)	1.408	3.174	-0.211
ΔFed funds rate (1)	0.074	6.307	1.189

Baseline model with structural breaks, aggregated flows

Explanatory variables	Dependent variable: ΔTotal cross-border flows (loans and debt securities) to banks	to non-banks
ΔFed funds rate		
Pre-break	-2.75***	-2.10***
Post-break	-7.69***	-5.67***

Explanatory variables	Dependent variable: ΔTotal cross-border flows (loans and debt securities) to banks	to non-banks
Log(VIX)		
Pre-break	-3.24**	-2.69***
Post-break	-0.84	-2.26***

Examining the role of prudential actions

- IBRN Database on Changes in Prudential Policy Instruments
  - Cerutti, Correa, Fiorentino and Segalla (2015)
- We focus on three types of prudential instruments:
  - Capital requirements
  - Loan-to-value ratio limits
  - Reserve requirements (local currency)
- Two types of prudential action variables:
  - Impulse
  - Cumulative
- Main results remain qualitatively the same
  - Some evidence of LTV caps impacting sensitivity to VIX
- **Interacting** the prudential variables with the global drivers yields several interesting results:
  - Increasing **capital requirement** levels **reverses** the **negative** post-break effect of a hike in the **federal funds rate**
  - Higher local currency **reserve requirement** levels **increase** the **negative** effect of a spike in the **VIX** on cross-border loans to non-banks

Controlling for heterogeneity among lending banking systems

- The BIS Consolidated Banking Statistics (CBS) contains bilateral data which has information on both:
  - The country of the borrower
  - The nationality of the lending banking system

- We re-estimate all specifications from the previous section using the bilateral CBS data.
  - $GrRateY_t^{ij} = \beta_1 \Delta FFR_t + \beta_2 logVIX_t + \beta_3 \Delta logGDP_t^j + \beta_4 \Delta SovRating_t^j + \beta_5 ChinnIto_t^j + \beta_6 \Delta logGlobalGDP_t + \theta^i + \mu^j + \varepsilon_t^{ij}$
  - $GrRateY_t^{ij} = \beta' X_t^j + \delta^{i\prime} Int_t^i + \delta^{j\prime} Int_t^j + \theta^i + \mu^j + I\left(t \geq T_{break}^Y\right)(\kappa +$

Benchmark model (LBS and CBS) with structural breaks

Explanatory variables	Dependent variable: Bank lending (LBS)		Dependent variable: Bank lending (CBS)		
	to banks	to non-banks	to banks	to non-banks (private)	to the public sector
ΔFed funds rate					
Pre-break	-3.36***	-3.39***	-0.31	-1.82***	0.87*
Post-break	-8.36***	-5.19***	-5.72***	-4.35***	-8.51***

Explanatory variables	Dependent variable: Bank lending (LBS)		Dependent variable: Bank lending (CBS)		
	to banks	to non-banks	to banks	to non-banks (private)	to the public sector
Log(VIX)					
Pre-break	-4.36***	-4.32***	-4.99***	-2.96***	-1.30
Post-break	-0.22	-2.52***	-3.57***	-2.67***	-4.77***

Changes in sensitivities, pre- vs post-crisis

Fed Funds rate	**Borrower**	
	Banks	Non-banks
Bank lending (LBS)	Strengthens	Strengthens
Bank lending (CBS)	Strengthens	Strengthens
Bonds (IDS)	Strengthens	Strengthens

VIX	**Borrower**	
	Banks	Non-banks
Bank lending (LBS)	Weakens	Weakens
Bank lending (CBS)	Weakens	Constant
Bonds (IDS)	Weakens	Strengthens

CBS regressions – main results

- Most of the main results remain qualitatively the same as the ones obtained using the LBS data

- Nevertheless, there is one important difference:
  - The post-break coefficient on the **VIX** in the CBS estimates (for non-banks), is virtually **equal** to its **pre-break** counterpart
    - in contrast to the LSB estimates.
  - Could be interpreted as evidence that the **composition** of bank **lenders** has **shifted** since the crisis

Third stage of the project – Using the enhanced BIS IBS data

1. BIS LBSR (historical) data
   - Country of borrower
2. BIS CBS (historical) data
   - Country of borrower
   - Nationality of lending banks
3. BIS LBSN (enhanced) data
   - Country of borrower
   - Nationality of lending banks
   - Location of lending banks

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   - Location of lending banks

	Location Country	Location Nationality	Nationality Country	Location Nationality Country
	LBSR	LBSN	CBS	LBS enhanced
Fed funds	**-1.86***	**-2.10****	**-2.49****	**-3.85*****
VIX	**-0.64**	**-1.01**	**-0.54**	**-2.96*****

Conclusions

- The aftermath of the global financial crisis has been characterized by a shift in the composition of international capital flows
  - **away** from **bank** lending
  - **toward** direct **market** financing.
- The **sensitivity** of all major types of international financial flows to US **monetary policy** has **increased** dramatically since the Global Financial Crisis.
- The post-crisis **sensitivity** to **global risk** conditions has:
  - **increased** significantly for international **bonds** flows
  - **declined** for cross-border **loan** flows.
- Possible explanations for the shifts in sensitivities:
  - **Compositional shifts** within the set of bank lenders
  - Pattern of **prudential policy** changes
  - Risk-taking channel of FX appreciation (Bruno and Shin, 2015)

Thank you!

XBL and IDS, typical lenders and borrowers

	Typical Lenders	Typical Borrowers	*Notes*
XB loans to banks	Internationally-active banks	Banks (all sizes)	*Interbank market (unsecured and repo)*
XB loans to nonbanks	Internationally-active banks	Large non-financial corporates; exporting/importing firms; Leveraged non-bank financials	*Syndicated loan market; trade credit; project financing*
IDS issued by banks	Pension funds; Insurance companies; Money Market Mutual Funds; Hedge funds	Large and mid-sized banks	*Smaller investor base than for IDS issued by non-banks*
IDS issued by non-banks	Pension funds; Insurance companies; Mutual Funds; Hedge funds	Non-financial corporates; governments; Insurance companies	*Broader investor base than for IDS issued by banks*

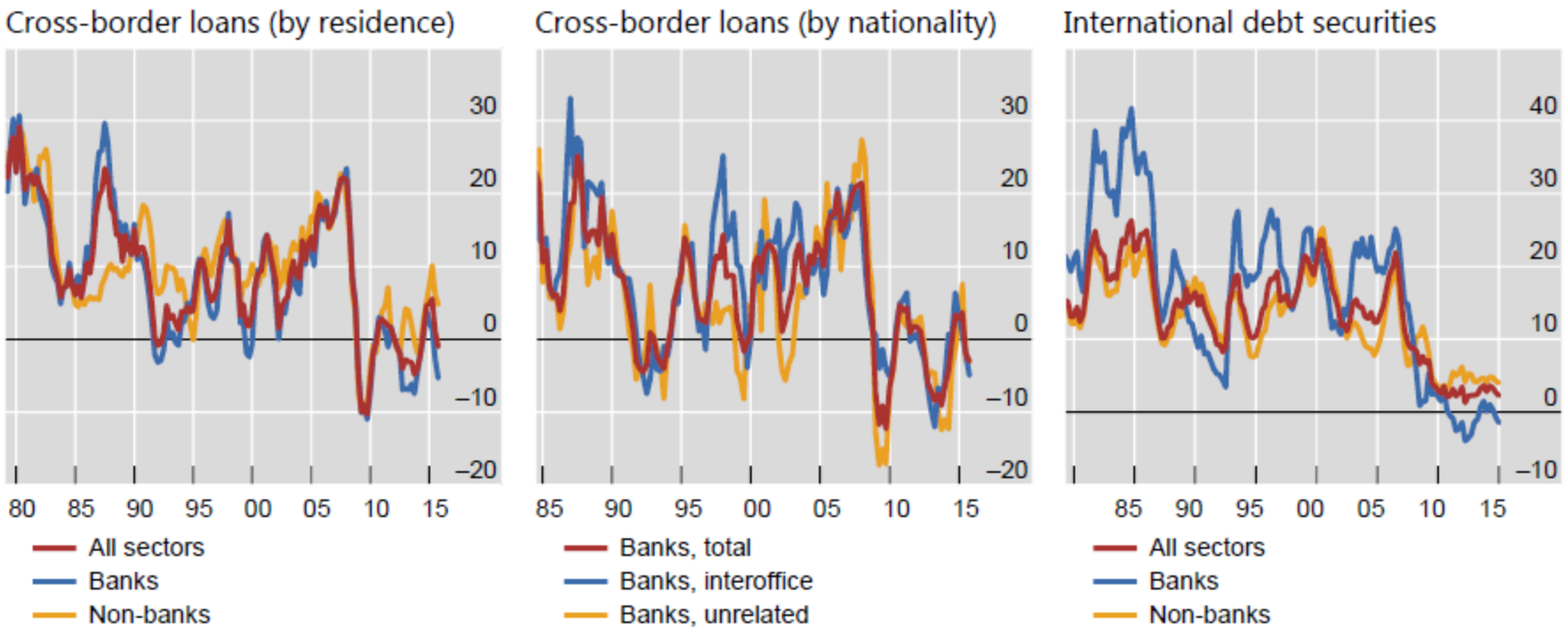
Summary statistics

		Mean			Standard deviation		
	Region	XBL	IDS	XBL+IDS	XBL	IDS	XBL+IDS
Pre-crisis	All	2.33	3.79	2.87	3.32	1.48	2.08
	AE	2.47	4.02	3.06	3.49	1.62	2.18
	EME	1.40	1.42	1.43	4.13	1.68	2.95
Post-crisis	All	–0.61	0.72	0.04	1.72	0.84	0.91
	AE	–1.12	0.52	–0.28	1.68	0.92	0.91
	EME	2.19	3.47	2.56	3.85	1.23	2.79

Notes: XBL = Cross-border loans: Quarterly Growth Rate$_t$ = Adjusted Flows$_t$ / Outstanding Stock$_{t-1}$; IDS = International Debt Securities: Quarterly Growth Rate$_t$ = Net Issuance$_t$ / Outstanding Stock$_{t-1}$.
Sources: BIS Locational Banking Statistics by residence; BIS International Debt Securities Statistics.

Cross-border loans and international debt securities

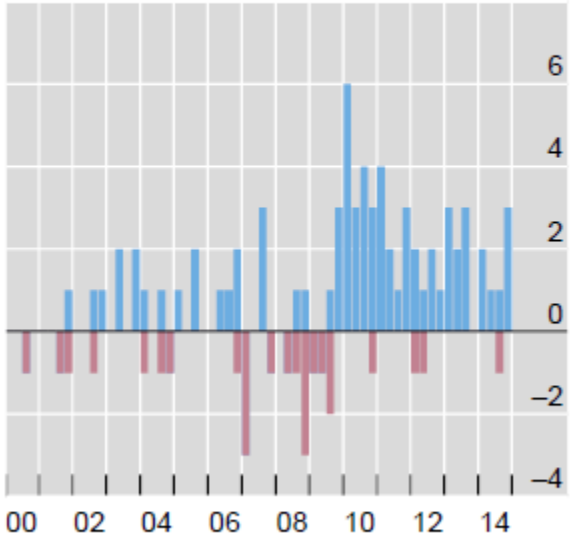
Annual growth rates, in per cent



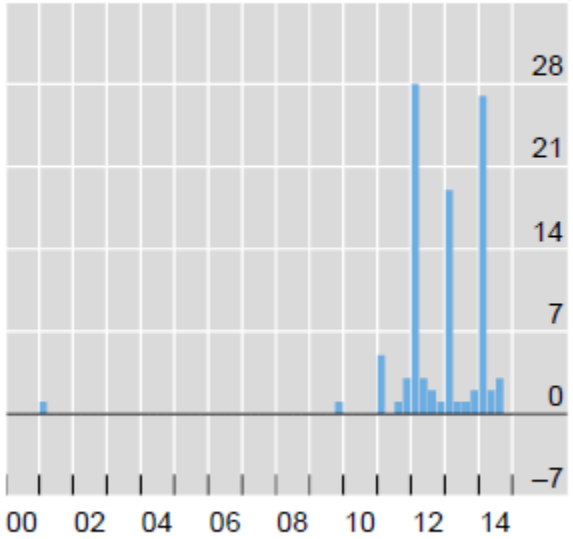
Sources: BIS locational banking statistics; BIS International Debt Securities Statistics.

Changes in prudential policies

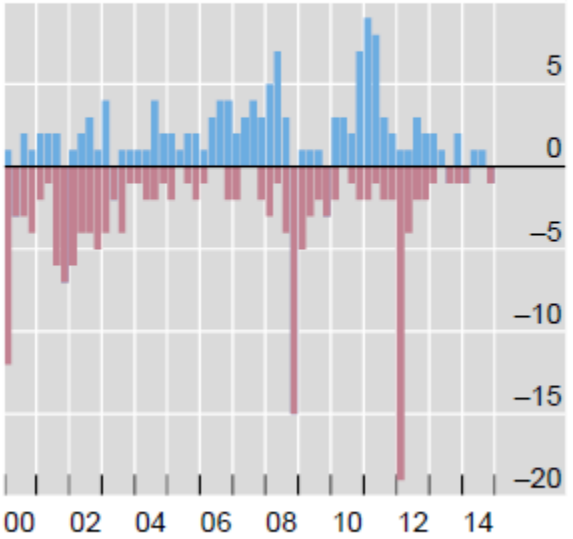
Loan to value ratio limits



General capital requirements



Reserve requirements (local)



Source: Cerutti et al (2015).