Macroprudential Policy and the Sovereign-Bank Nexus in the Euro Area[1]

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- Euro area (EA) banking sector has proven resilient in course of COVID-19 crisis also thanks to macroprudential regulation that strengthened regulatory standards (ESRB, 2021). At the moment, many EA countries are thinking about tightening macropru to build up resilience.

    - Central in macropru policies since 2007/08: capital-based measures (e.g. Galati and Moessner, 2018).
    - Capital-based measures often address risk-weighted assets; but: government debt receives blanket risk weight of zero

- $\Rightarrow$ potential unintended consequence: tightening of capital-based macropru might incentivize bank to hold more domestic government debt and thus strengthen the "sovereign-bank nexus" (e.g. Basel Committee on Banking Supervision, 2017; IMF, 2014, 2018; Altavilla et al., 2017).

We assess the effects of unsystematic changes in **capital-based macropru policy** on **banks' sovereign-bond holdings** in the EA from a macro perspective.

- **Main contributions:**

  - **macroeconomic perspective**: Existing studies on the topic are microeconometric in nature.[2]
  - quantify the average effect over a **long period of time** of sudden macropru changes. Acharya et al. (2014) and Gropp et al. (2019) focus on a single event.

- **Our approach:** Bayesian Panel VAR for EA countries

  - macropru-policy indicator derived from the MaPPED database (Budnik and Kleibl, 2018)
  - identification of macroprudential-policy shocks: macro effects of unsystematic changes in macropru policy
  - two separate country groups: *"core"* and *"periphery"* countries

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[2]See Acharya et al. (2014), Acharya and Steffen (2015), Bonner (2016) and Gropp et al. (2019).

We differentiate **6 core** countries (AT/BE/DE/FR/FI/NL) and **4 periphery** countries (ES/IE/IT/PT):

1. panel approach improves inference in our rather short sample
2. very different macro developments during our sample:

   - economic slack and fiscal response after GFC
   - loan losses and bank capital positions (financial distress)
   - sovereign-bank nexus (as fiscal policies required tapping the domestic capital market)

Results of a sudden **regulatory tightening** in capital-based macroprudential policy:

- **Periphery**: significant increase in banks' domestic government bond holdings ⇒ **stronger sovereign-bank nexus**.

- The opposite happens in the **core**, i.e. the **nexus weakens**.

- MaPPED by Budnik and Kleibl (2018):
  - constructed by ECB experts and national authorities based on survey
  - **1,925 policy actions** in 27 EU countries plus UK **for period 1995-2018**
  - capital-based measures include CCyB, G-SII & O-SII buffers, CCoB, SyRB, plus changes in level & definition of risk weights and minimum cap. requirements

- Detailed characterization of each policy action, e.g.
  - **tightening**, **loosening**, or *ambiguous*
  - **legally binding** vs. a mere *recommendation/guidance*
  - **activation date**, announcement date and previous/subsequent adjustments

- Advantages relative to other macropru databases (e.g. IMF iMaPP): More detailed information on each measure and better coverage of EA (and EU) over sample 1999-2018.

MaPPED: Descriptives

Type of policy change[3]	Number of policy changes		Rel. frequency of each policy type		Fraction of **tightenings** within each policy type	
	core	periphery	core	periphery	core	periphery
Capital-based:						
(1) Capital buffers	17	10	**12.9%**	**13.7%**	**100%**	**100%**
(2) Loan-loss provisioning	2	5	**1.5%**	**6.9%**	**50%**	**80%**
(3) Min. cap. requirements	26	22	**19.7%**	**30.1%**	**100%**	**100%**
(4) Risk weights	16	12	**12.1%**	**16.4%**	**56.3%**	**75%**
Borrower-based:						
(5) Lending standards restr.	19	1	14.4%	1.4%	94.7%	0%
Liquidity:						
(6) Liquidity requirements	16	8	12.1%	11.0%	100%	87.5%
Other:						
(7) Tax on fin. instit.	15	2	11.4%	2.7%	73.3%	100%
(8) Limits on exposures	14	9	10.6%	12.3%	64.3%	77.8%
(9) Other measures	7	4	5.3%	5.5%	71.4%	100%
Sum:						
(10) All measures	132	73	100%	100%	84.8%	89.0%
(11) Capital-based	**61**	**49**	**46.2%**	**67.1%**	**86.9%**	**91.8%**
(12) Non-capital-based	71	24	53.8%	32.9%	83.1%	83.3%

[3] Pure *recommendations* and measures with *ambiguous* impact are excluded.

MPI as cumulative sum over tightenings (+1) and loosenings (-1)
⇒ dummy-type indicator as in e.g. Claessens et al. (2013); Cerutti et al. (2017); Altunbas et al. (2018); Akinci and Olmstead-Rumsey (2018)
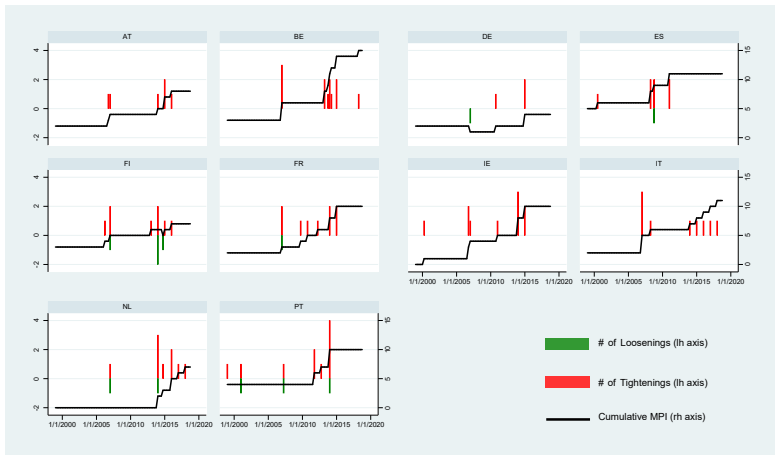
Econometric setup

- Bayesian Panel VAR: $y_{k,t} = \sum_{j=1}^{4} B_j y_{k,t-j} + c_k + \varepsilon_{k,t}$

- **uninformative** Normal-Wishart prior; 4 lags; 10,000 draws

- System includes 5 quarterly variables for **sample 2005q1 to 2018q4**:
    - Macroprudential Policy Indicator (MPI);
    - credit-to-GDP gap ("Basel Gap");
    - lending spread (vol.-weighted average of NFC loan and mortgage, minus 3-month EURIBOR rate);
    - financial stress (Country-Level Index of Financial Stress – CLIFS);
    - "nexus" variable: MFIs' domestic gov. bond holdings over total assets

- one panel for core and one for periphery countries

- **Identification via recursive ordering** of $y_{k,t}$ (MPI ordered first):
    - assumption: MPI slow-moving, not affected within a quarter
    - justified e.g. by inaction bias, implementation lags, still incomplete/underdeveloped systemic-risk indicators, political economy factors (see e.g. Lim et al. 2011; Knot 2014; Arslan and Upper 2017; Dagher 2018; Edge and Liang, 2020a, 2020b)
    - results **robust** to ordering MPI last or in-between

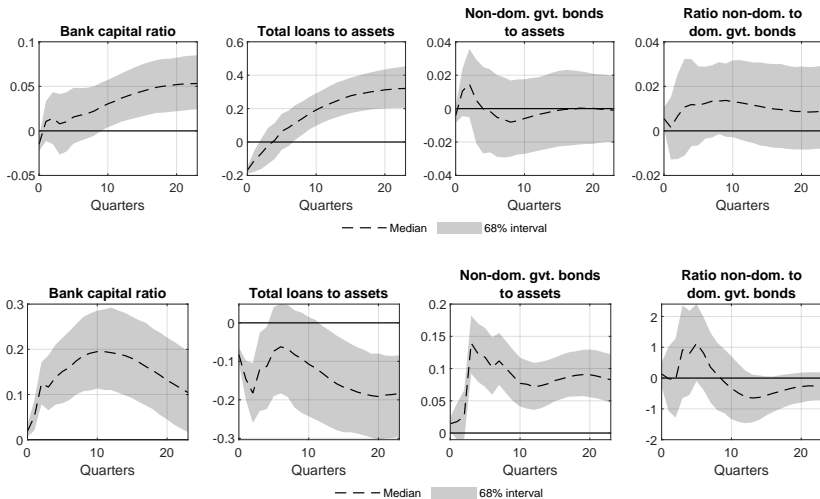## Baseline results: Core countries
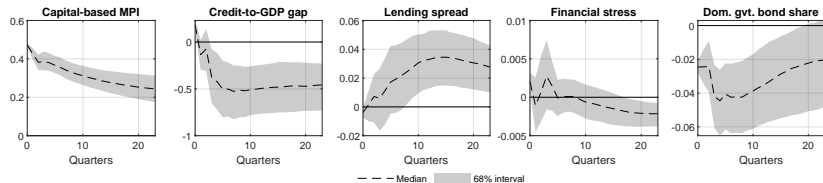
Notes: Dashed-dotted lines: median impulse responses. Shaded areas: 16th / 84th percentile of posterior distribution.

Baseline results: Core (top) vs. periphery countries (bottom)
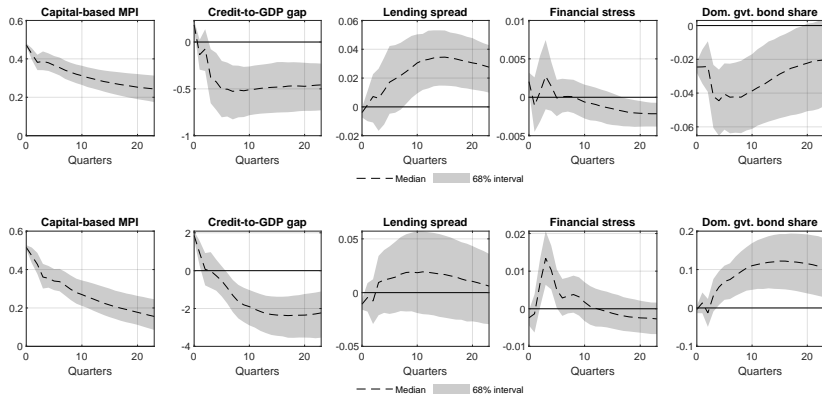
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Bank balance sheet items: Core (top) vs. periphery (bottom)

Notes: Dashed-dotted lines: median impulse responses. Shaded areas: 16th / 84th percentile of posterior distribution.

1. Home bias

- e.g. Dell'Ariccia et al. (2018); Acharya and Steffen (2015)

3. Theortical models on sovereign-bank nexus

- Crosignani (2021): in equilibrium with low capital requirements, banks will have incentives to tie their fate to that of the sovereign and to increase holdings of domestic sovereign debt

- Farhi and Tirole (2018):
  - banks focus on domestic sovereign debt in a situation of either weak bank balance sheets or public finances.
  - reason: return on sovereign debt increases for the no-bailout case, but is unchanged in the case of a bailout

2. Moral hazard

- e.g. Kahane (1977); Kim and Santomero (1988); Jeitschko and Jeung (2005)
- Less risk-averse banks increase risk to offset regulatory tightening.
- Fits our observations if banks in core countries were less risk-averse after onset of GFC in 2007 (true?).

4. Capital buffer theory

- e.g. Shrieves and Dahl (1992), Heid et al. (2004), Jokipii and Milne (2011)
- Banks' optimal capital choice includes buffer that exceeds regulatory requirements (costly!). After regulatory tightening:
  - Weakly capitalized banks reduce riskiness ($\rightarrow$ more gov. debt).
  - Better capitalized banks increase riskiness (loans!) to gain market share / profits.

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### Tier1 Capital Ratios for our sample fit the bill!
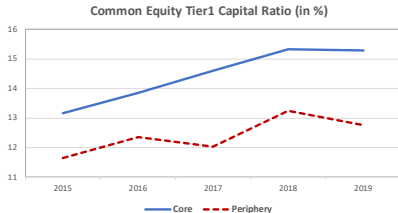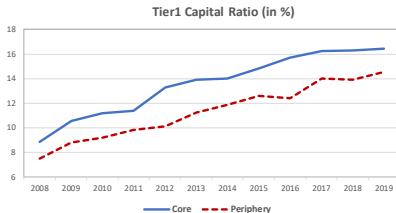
Regulatory capital ratios (in percent of risk-weighted assets). Averages across countries in periphery and core are weighted by total bank assets. Time series is restricted by data availability. Source: ECB Statistical Data Warehouse.

Robustness checks

Results are robust to the following changes:

- different orderings of the variables

- different sample periods (1999-2018 and 2007-2018) and lag length (2 and 6 lags)

- Macroprudential Policy Indicator linearly de-trended

- first differences instead of levels

- inclusion of additional variables: real house prices, lending rates, government bond yields, government CDS spreads, bank equity index

- alternative MPIs:
  - only tightenings
  - all incremental steps / only final step of same measure enter MPI throughout
  - different databases: IMF's iMaPP

Robustness: Policy announcements (shown: domestic gov. bond share)
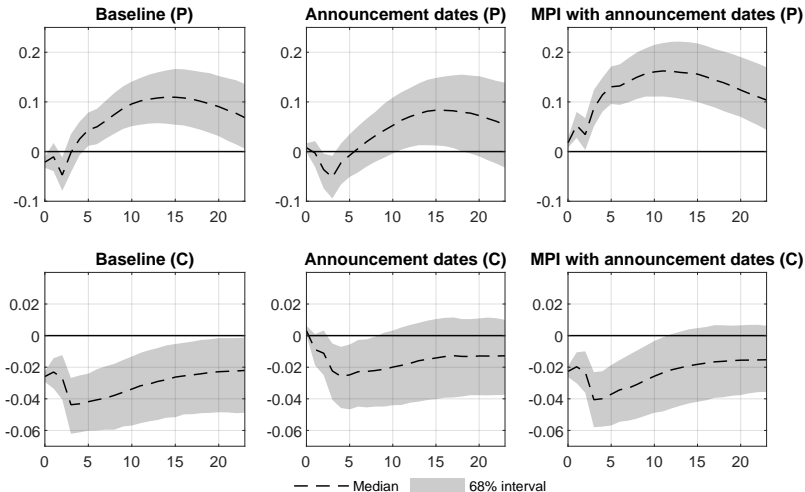
Notes: Dashed-dotted lines: median impulse responses of variable "domestic government-bond share". Shaded areas: 16th / 84th percentile of posterior distribution. (P) and (C): reponses for "periphery" and "core" countries. "Announcement dates" uses MaPPED announcements instead of implementation dates. "MPI with Announcement dates" estimates baseline with MaPPED announcements as an additional variable.

- We investigate role of capital-based macroprudential regulation on EA banks' holdings of domestic goverment debt:

  - macro perspective: capture general-equilibrium effects
  - include all policy changes 2005-2018 (MaPPED database)
  - differentiate EA between periphery and core countries

  $\Rightarrow$ A macroprudential tightening increases the sovereign-bank nexus in EA periphery countries, but not in core countries.

- Results are highly robust to changes in the sample, model specification and macroprudential indicator used.

- **Policy-makers should take account of potential unintended side-effects of capital-based policies.**

Thank you for your attention!

Appendix

- **Macroprudential news/foresight**: Many macroprudential interventions - even if surprising - are announced in advance.
    - News/foresight about future state variables (or shocks) likely leads to non-invertible VAR representations (Leeper et al. 2011).[4]
    - However, Sims (2012) shows that the problem is strongly mitigated if (sufficient) forward-looking variables are included in the VAR.

- **In our case, the problem is likely mitigated**:
    - We include forward-looking variables: CLIFS, spread and in extensions also bank equity index, CDS spreads and bond yields.
    - The endogenous variables are chosen such that the systematic component of current and future macropru policy is captured.
    - The model is also estimated based on announcement dates of macropru policy actions (robustness check).
    - MPI can be interpreted as internal instrument within a proxy-VAR: if instrument is ordered first – as in our baseline – the corresponding shock can be recovered even under non-invertibility (Plagbørg-Moller and Wolf, 2020).

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[4]Non-invertibility: VAR innovations on a set of observable variables may not be sufficient to uncover the underlying structural shocks (spanning/missing-information problem). News shocks are typically unobservable.
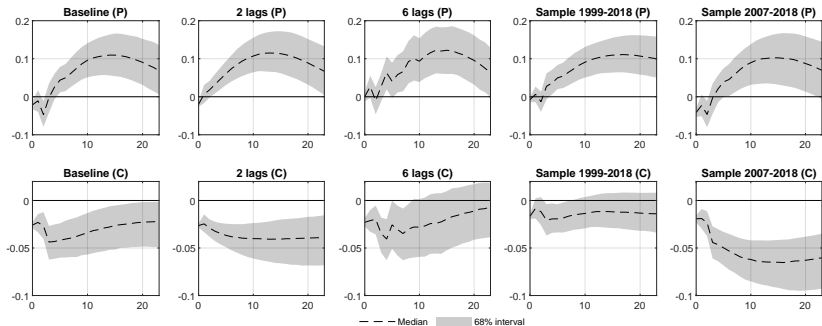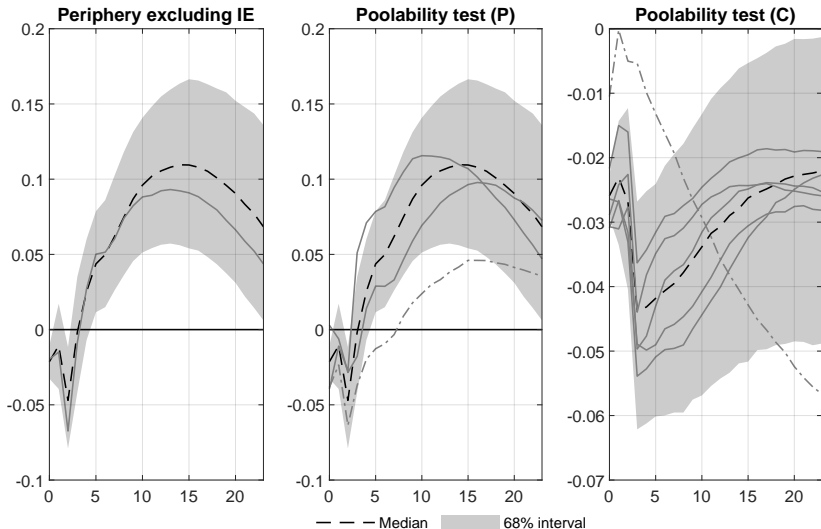
Notes: Dashed-dotted lines: median impulse responses of variable "domestic government-bond share". Shaded areas: 16th / 84th percentile of posterior distribution. (P) and (C): reponses for "periphery" and "core" countries.

Robustness: Choleski ordering (shown: domestic gov. bond share)
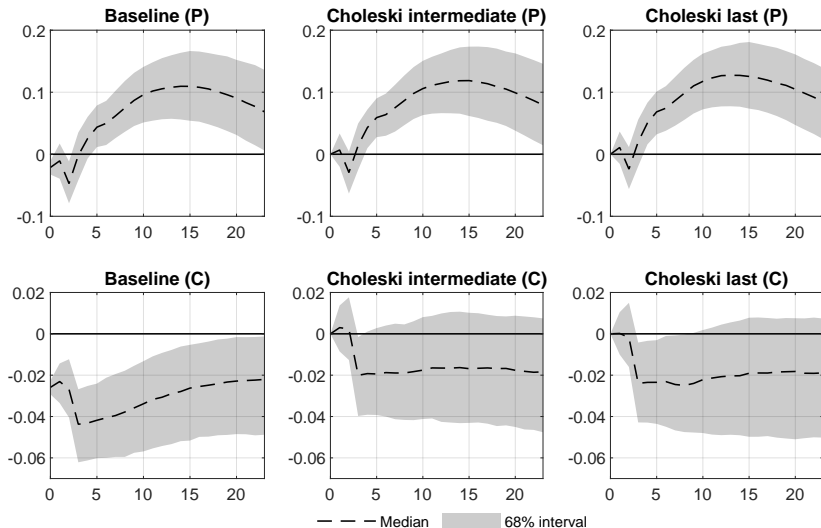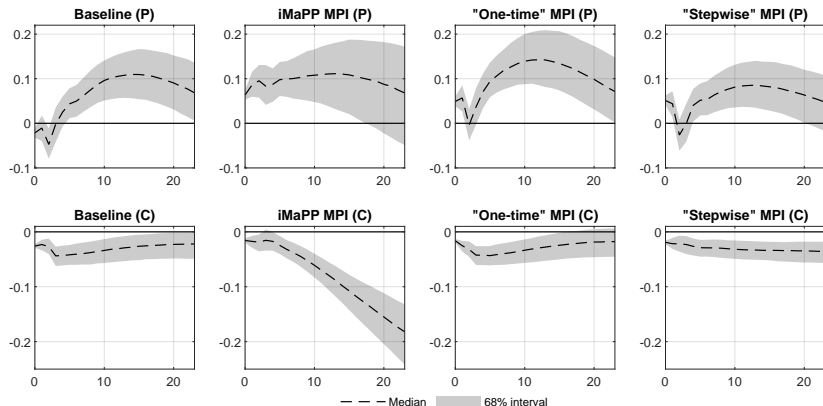

Notes: Dashed-dotted lines: median impulse responses of variable "domestic government-bond share". Shaded areas: 16th / 84th percentile of posterior distribution. (P) and (C): reponses for "periphery" and "core" countries.

Robustness: Poolability test (shown: domestic gov. bond share)

Notes: Dashed-dotted lines: median impulse responses of variable "domestic government-bond share". Shaded areas: 16th / 84th percentile of posterior distribution. (P) and (C): reponses for "periphery" and "core" countries.

Other macropru indicators considered

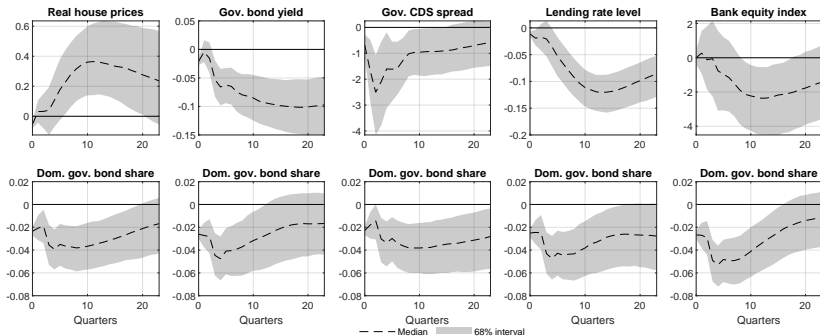We also consider the following alternative MPI measures

1. MPI based on iMaPP: The IMF "Integrated Macroprudential Policy" database by Alam et al. (2019) provides data for wider set of countries, but in less detail. Also, number of capital-based policy interventions before 2013 is much smaller than in MaPPED.

2. (MaPPED) MPI adjusted for Basel-III meaures. Phase-in of Basel III is reported inconsistently in MaPPED: Some countries report only final step, while others report each increase as individual tightening. We thus create two consistent MPIs:

   2.1 "One-time": Only final step reported as individual tightenings, for all countries.
   2.2 "Stepwise": All incremental steps reported as individual tightenings, for all countries.

Robustness: Other macropru indicators (shown: domestic gov. bond share)
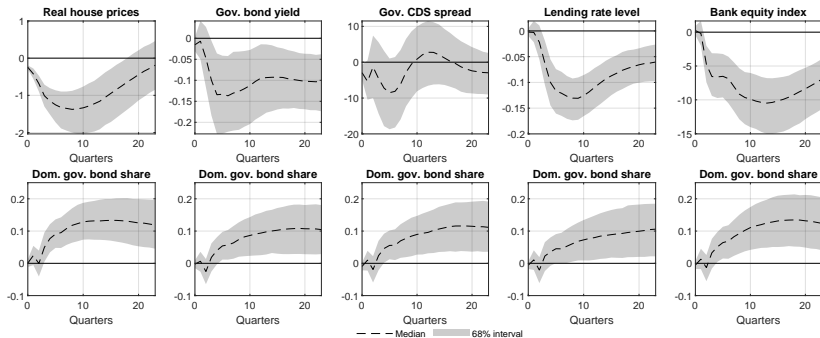

Notes: Dashed-dotted lines: median impulse responses of variable "domestic government-bond share". Shaded areas: 16th / 84th percentile of posterior distribution. (P) and (C): reponses for "periphery" and "core" countries. "iMaPP" uses an indicator based on the "Integrated Macroprudential Policy" database collected by Alam et al. (2019). "One-time MPI" and "Stepwise MPI" uses our capital-based baseline MPI with adjustments for the phase-in of Basel-III measures.
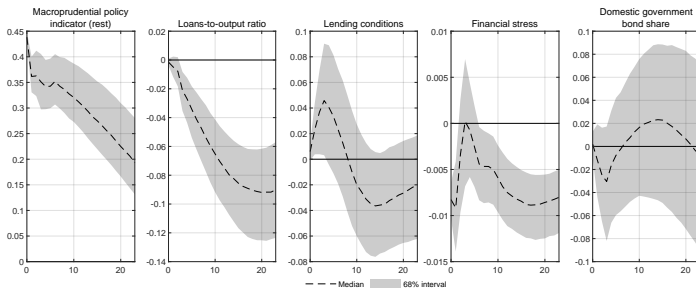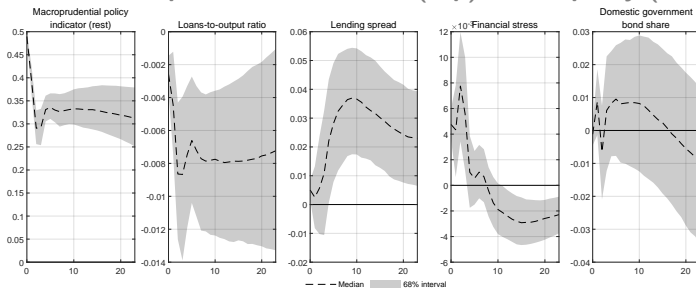
Notes: Impulse responses to a shock to capital-based macroprudential policy in a VAR with six variables for core countries. The figure shows the responses of the sixth variable and the corresponding domestic government bond share below. The median impulse responses are depicted by the dashed-dotted lines. The shaded areas reflect the 16th and 84th percentiles of the posterior distribution.

(Extension) Panel VAR with various sixth variables – Periphery

Notes: Impulse responses to a shock to capital-based macroprudential policy in a VAR with six variables for periphery countries. The figure shows the responses of the sixth variable and the corresponding domestic government bond share below. The median impulse responses are depicted by the dashed-dotted lines. The shaded areas reflect the 16th and 84th percentiles of the posterior distribution.

Results for non-cap.-based MPI: Core (top) vs Periphery (bottom)

Notes: Dashed-dotted lines: median impulse responses. Shaded areas: 16th / 84th percentile of posterior distribution.