Traditional and matter-of-fact financial frictions in a DSGE model for Brazil: the role of macroprudential instruments and monetary policy

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The views expressed in this work do not necessarily represent those of the Central Bank of Brazil or its members

BANCO CENTRAL DO BRASIL

Purpose

- Investigate and assess the full-blown effects of macroprudential policies on the Brazilian economy
  - Reserve requirements
  - Capital requirement
  - Sectoral risk weights on banks' assets for capital adequacy computation
  - Basel III (countercyclical buffer)

Motivation

- Banks are responsible for most of the financial intermediation in Brazil.
- Reserve Requirements have been actively used as a policy instrument in recent years
  - Existing studies based on partial-equilibrium analysis
- Brazilian agenda of convergence to Basel-3 regulation
- Mainstream literature focuses on advanced economies
  - Full collateralization of loans through capital or housing
  - Monopolistic competition in time deposits (GK)
  - Unremunerated reserve requirements

The theoretical model

Households (similar to Gerali et. al.)

- Savers
- Borrowers

Entrepreneurs (as in BGG)

Firms

- Intermediate goods
- Retailers/Distributers
- Final goods: private consumption, government consumption, investment, capital and housing

Government (monetary, fiscal and macroprudential policies)

Investment fund

Bank conglomerate

- Treasury department
- Deposit branches (time deposits, savings accounts, demand deposits)
- Lending branches (retail loans, investment loans, housing loans)

“Traditional” Features

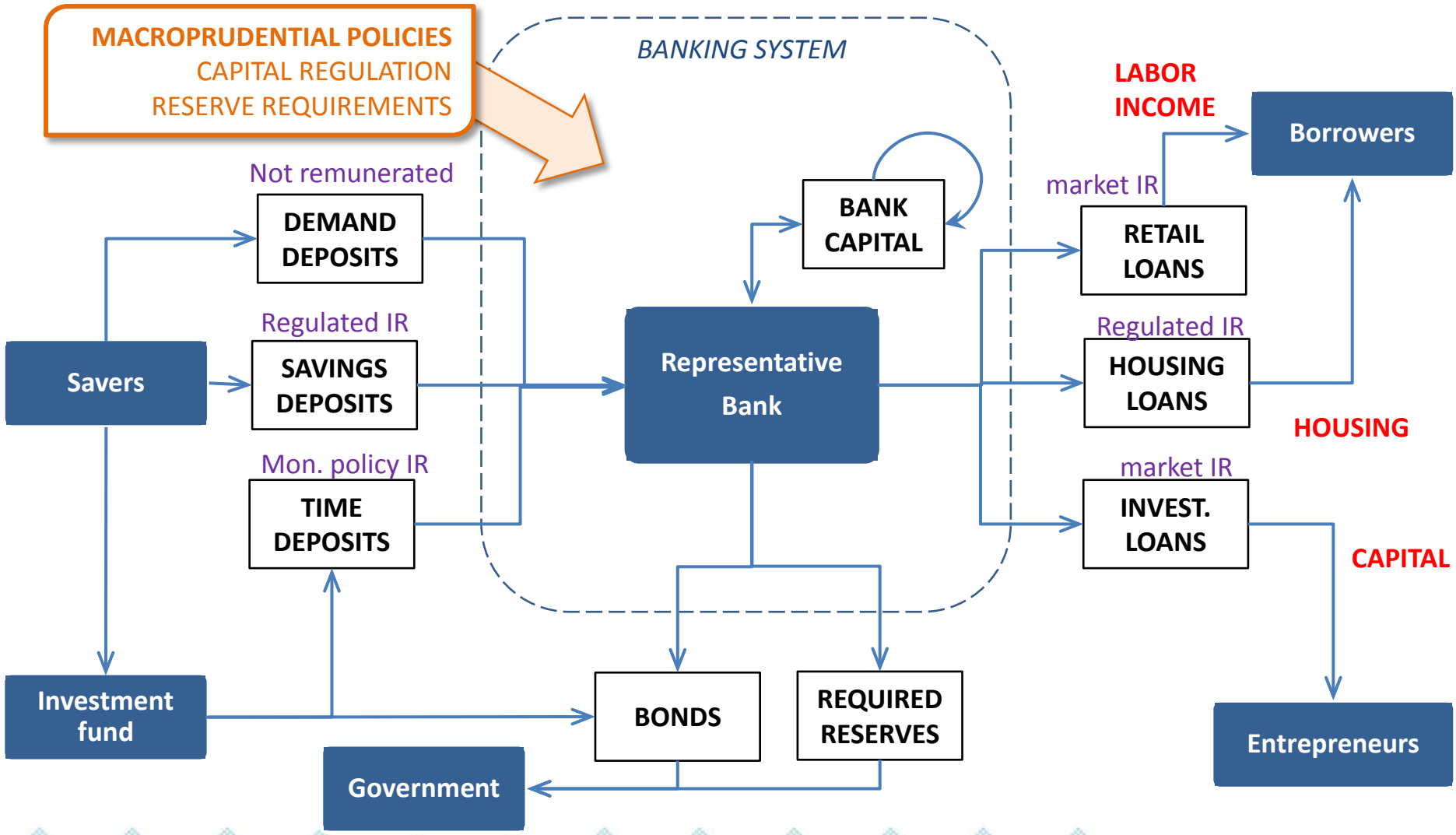
- Habit formation in consumption.
- Prices and wages setting with Calvo rigidity.
- Corporate credit: Bernanke, Gertler and Gilchrist (BGG) financial accelerator, with slight modification (partial colateralization);
- Two types of representative households: patient and impatient (as in Gerali et al. and Palenzuela et al., for instance). Patient households save by means of government bonds and deposits. Impatient households borrow from banks.
- As in Gerali et al., a representative bank collects deposits and lends to firms and households. Monopolistic competition in credit markets (staggered interest rates).
- One-period loans.
- Passive fiscal policy, with constant distortionary taxation.
- Closed economy (to keep things simple…)
- ESTIMATED model with Bayesian techniques.

“Matter-of-Fact” Features

- Households face debt-to-income credit constraint instead of LTV constraints with housing collateral. We implemented a variation of BGG financial accelerator associated do debt-to-income constraint to allow for endogenous default.
- Tight regulation on savings accounts and housing loans (very peculiar to Brazilian credit market)
- Ample and realistic set of reserve requirements on demand, saving and time deposits, which calls for:
  - Target for liquidity buffer
  - Targets and adjustment costs for time deposits
- Return on time deposits is equal to the policy interest rate (no Gertler and Karadi deposit spreads)
- Internal cost of bank capital as function of bank capital buffer (as in Van den Heuvel)

Financial flows

Selected economic segments



The bank's program (simplified)

$$\max E_0 \left\{ \sum_{t \geq 0} \beta_{Bank}^t \left[\frac{1}{1-\sigma_B} \left(\frac{C_{B,j,t}}{\epsilon_t} \right)^{1-\sigma_B} \right] \varepsilon_t^{\beta,B} \right\}$$

Balance sheet: $L_{j,t} + Bonds_{j,t} + RR_{j,t} = D_{j,t} + Bankcap_{j,t}$

Capital Accumulation: $Bankcap_{j,t} = Bankcap_{j,t-1} + FC_{j,t}^b - P_{C,t} C_{B,j,t} + Bankcap_{j,t} \varepsilon_t^{bankcap}$

Reserve Requirement: $RR_{j,t} = \tau_{RR,T,t} D_{j,t}$

Loan Demand (plus Calvo rigidity in interest rates): $L_{j,t} = \left(\frac{R_{j,t}^L}{R_t^L} \right)^{-\frac{\mu_L^R}{\mu_L^R - 1}} L_t$

Cash flow:

$$\begin{aligned} FC_{j,t}^b = \; & R_{j,t-1}^L L_{j,t-1} - L_{j,t} \\ & + R_{RR,t-1} RR_{j,t-1} - RR_{j,t} + R_{t-1} Bonds_{j,t-1} - Bonds_{j,t} \\ & - R_{t-1}^T D_{j,t-1} + D_{j,t} - \Gamma_T \left(\frac{D_{j,t}}{D_{j,t-1}} \right) D_{j,t} \end{aligned}$$

Bank Capital Cost

$$- \Gamma_{bankK} \left(\frac{BI_{j,t}}{\gamma_t^{BankK}} \right) Bankcap_{j,t}$$

Liquidity Preference

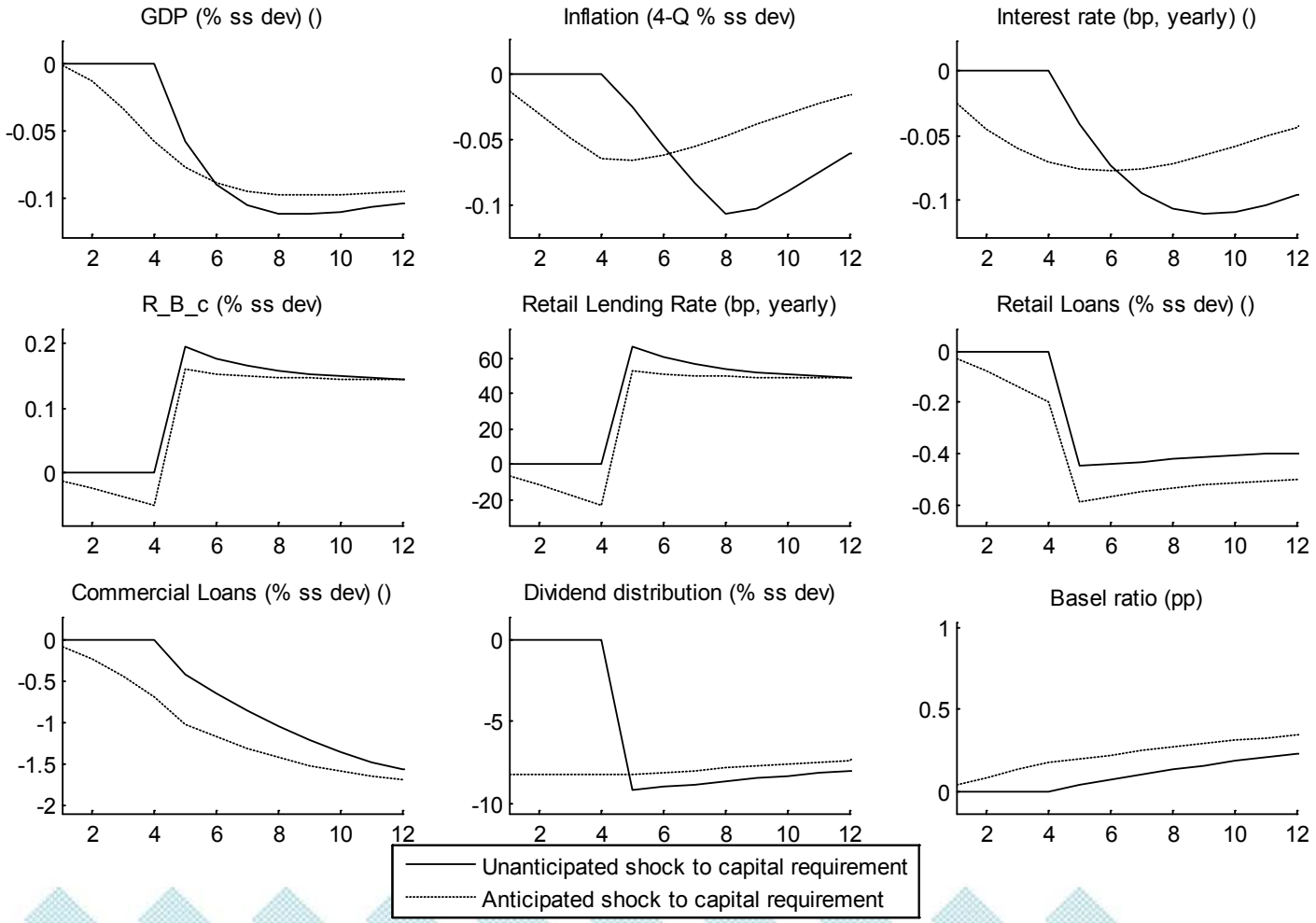
$$- \frac{\chi_{OM}}{2} \left(\frac{Bonds_{j,t}}{D_{j,t} + Bankcap_{j,t}} - \nu_t^{OM} \right)^2 (D_{j,t} + Bankcap_{j,t})$$

Leverage

$$- \frac{\chi_{d\_T}}{2} \left(\frac{D_{j,t}}{D_{j,t} + Bankcap_{j,t}} - \nu_t^{d\_T} \right)^2 (D_{j,t} + Bankcap_{j,t})$$

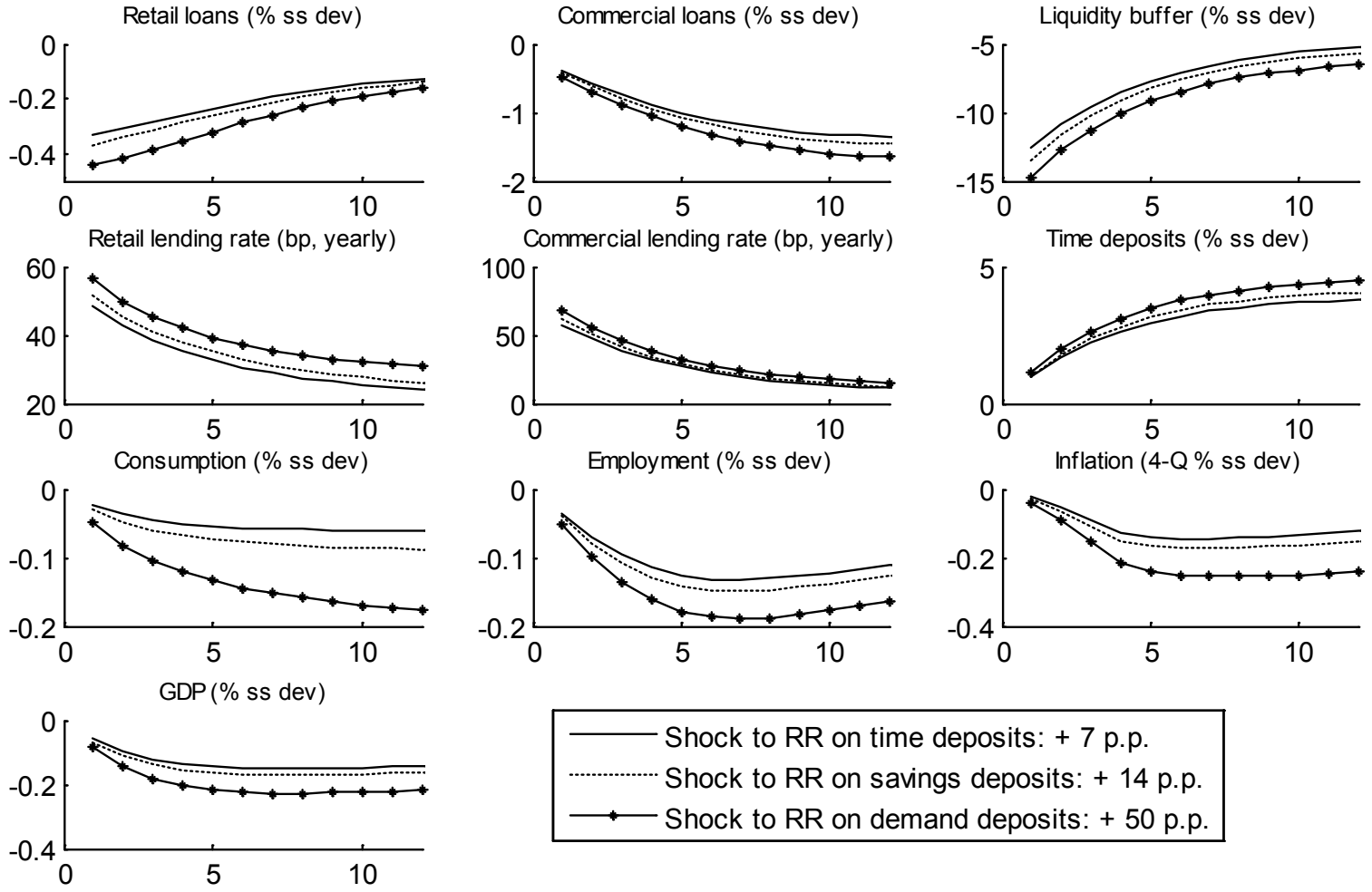
$$+ \Pi_{j,t}^L + \Xi_{j,t}^b$$

IRFs to a 1p.p. Capital Requirement Shock



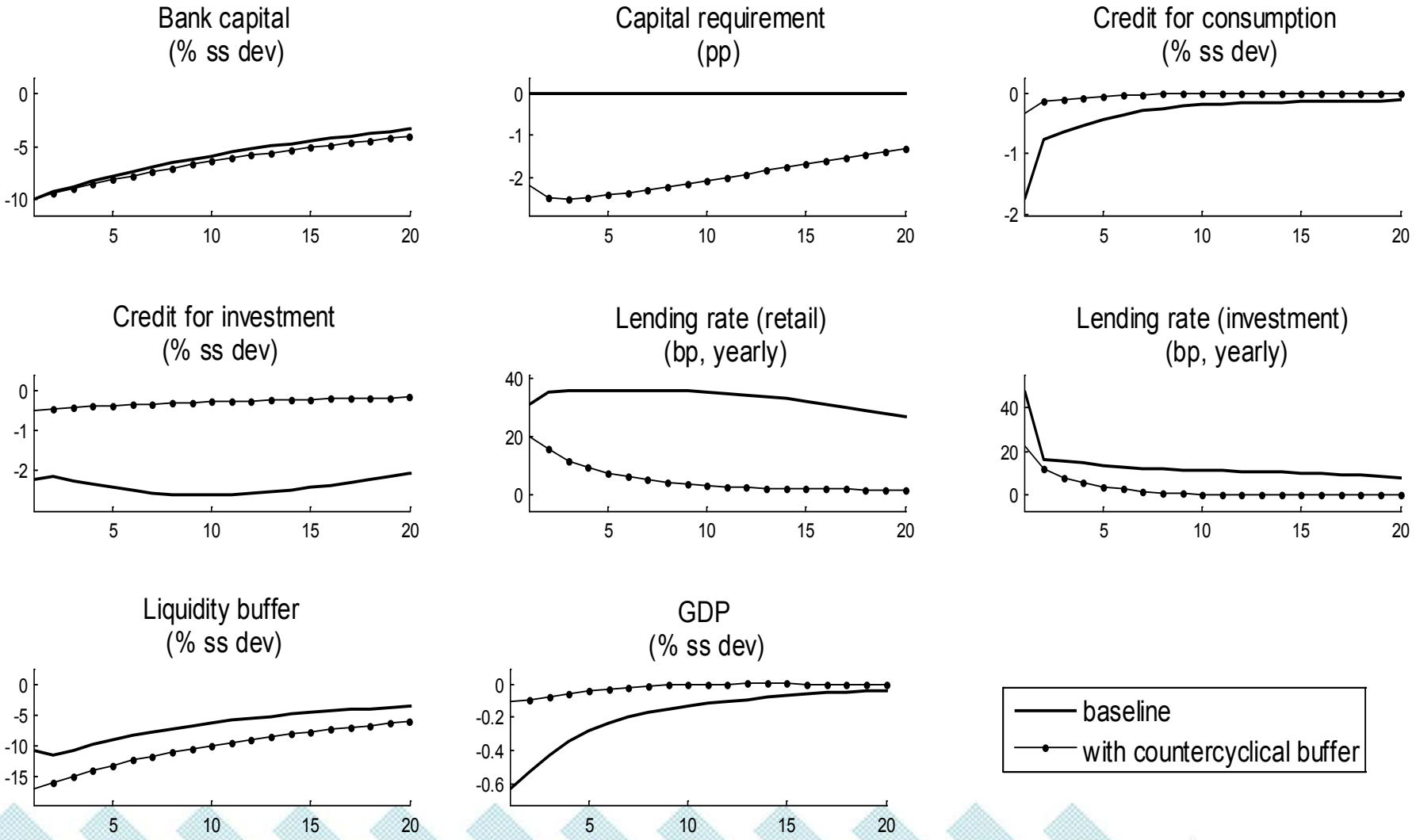
Reserve Requirement: scaling the size of the shocks

(nonresponsive MP)



Counter-cyclical capital buffer

IRFs to a 10% loss of bank capital



Concluding remarks

- Model with financial frictions both on the demand and the supply side of the banking sector
  - Theoretical set-up tailored to Brazil
  - Transmission mechanism of macroprudential policy
  - Endogenous lending spread: matter-of-fact decomposition

- Changes in reserve requirement ratios
  - Impact banks' liquidity buffer, affecting lending rates and credit
  - Affect the real economy
  - Impact of remunerated RR (base-effect)

Concluding remarks

- Changes in capital requirement have a smaller yet more prolonged effect on credit-to-GDP with milder impact on output compared to MP shock

- Shocks on sectoral risk weight on CAR induce banks to reshuffle their credit portfolio towards less risky loans.

Caveats, Challenges and Next Steps

A considerable share of total credit consists of “earmaked credit”, with compulsory funding sources and government regulated interest rates:

- 60% of all bank saving deposits must be used to fund housing loans, at regulated low interest rates.
- 34% of all bank demand deposits must be channeled to farm loans, at regulated low interest rates.
- The Brazilian Development Bank (BNDES) provides loans to firms at low interest rates to finance investment projects.

As of dec/2012, these three credit categories accounted for 11%, 5% and 20% of total credit supply, respectively.

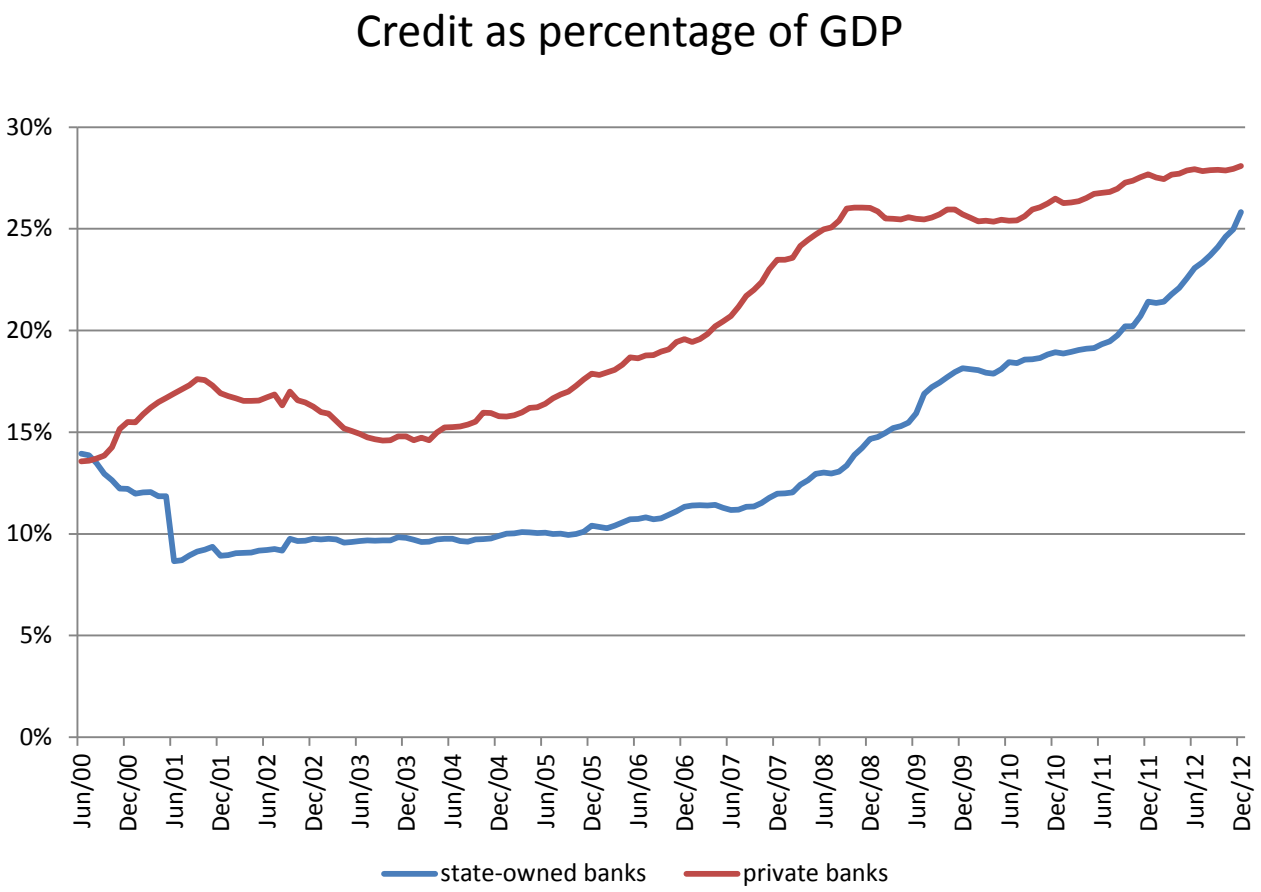
As their interest rates are not determined in a market equilibrium, they are not properly represented in the model.

Caveats, Challenges and Next Steps

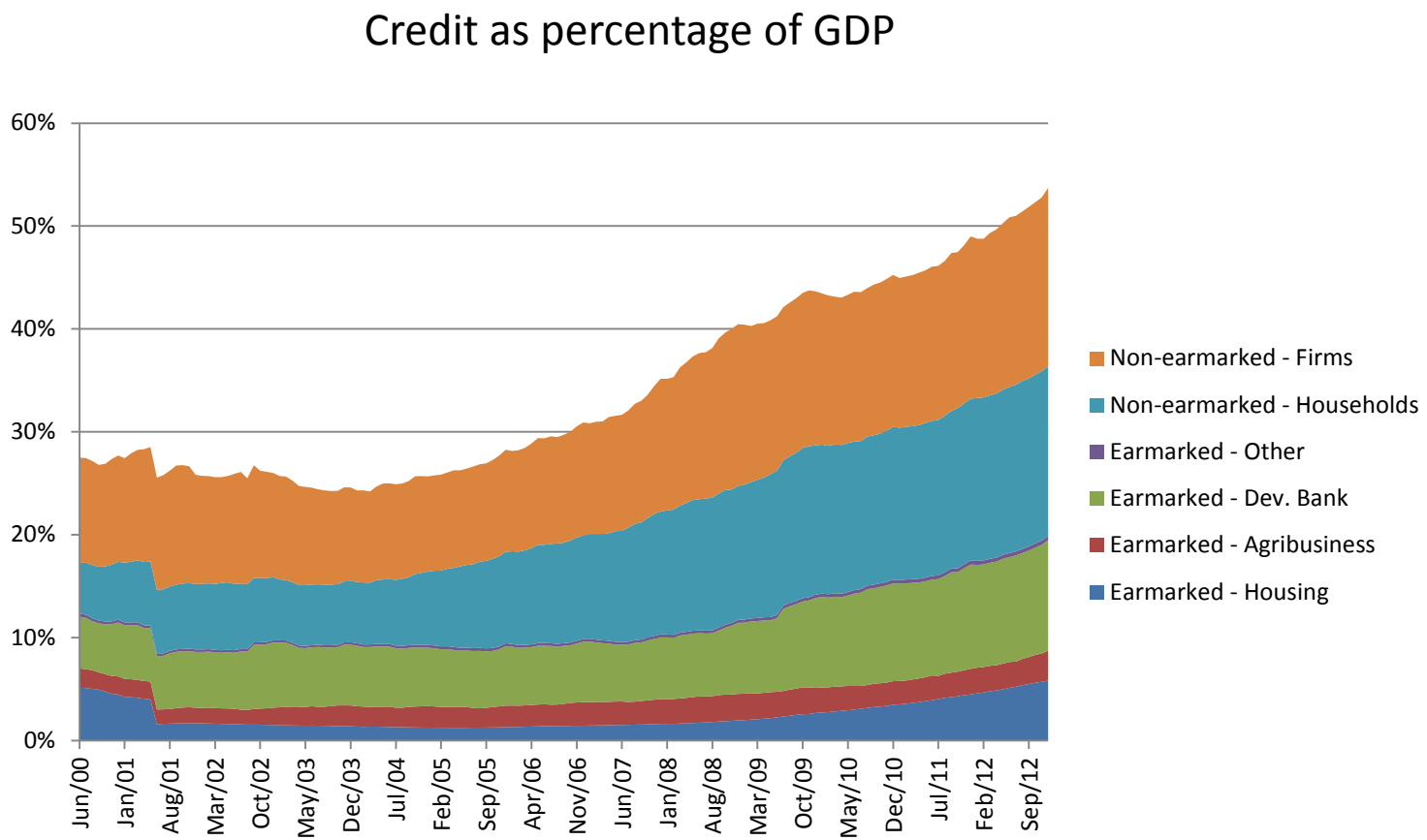
- Sensitivity of internal cost of bank capital to capital requirement is hard to estimate (and subject to Lucas Critique).
- Short sample (jun/2000 onwards) with noticeable trends.
- Considerable bank heterogeneity (specially private vs. state-controlled banks) may render representative bank unrealistic.
- Still a closed economy model.

- Next steps:
  - Open economy
  - Phase-in implementation of Basle 3
  - Bank heterogeneity (public vs. private, small vs. big)

Trends in Credit Series



Trends in Credit Series



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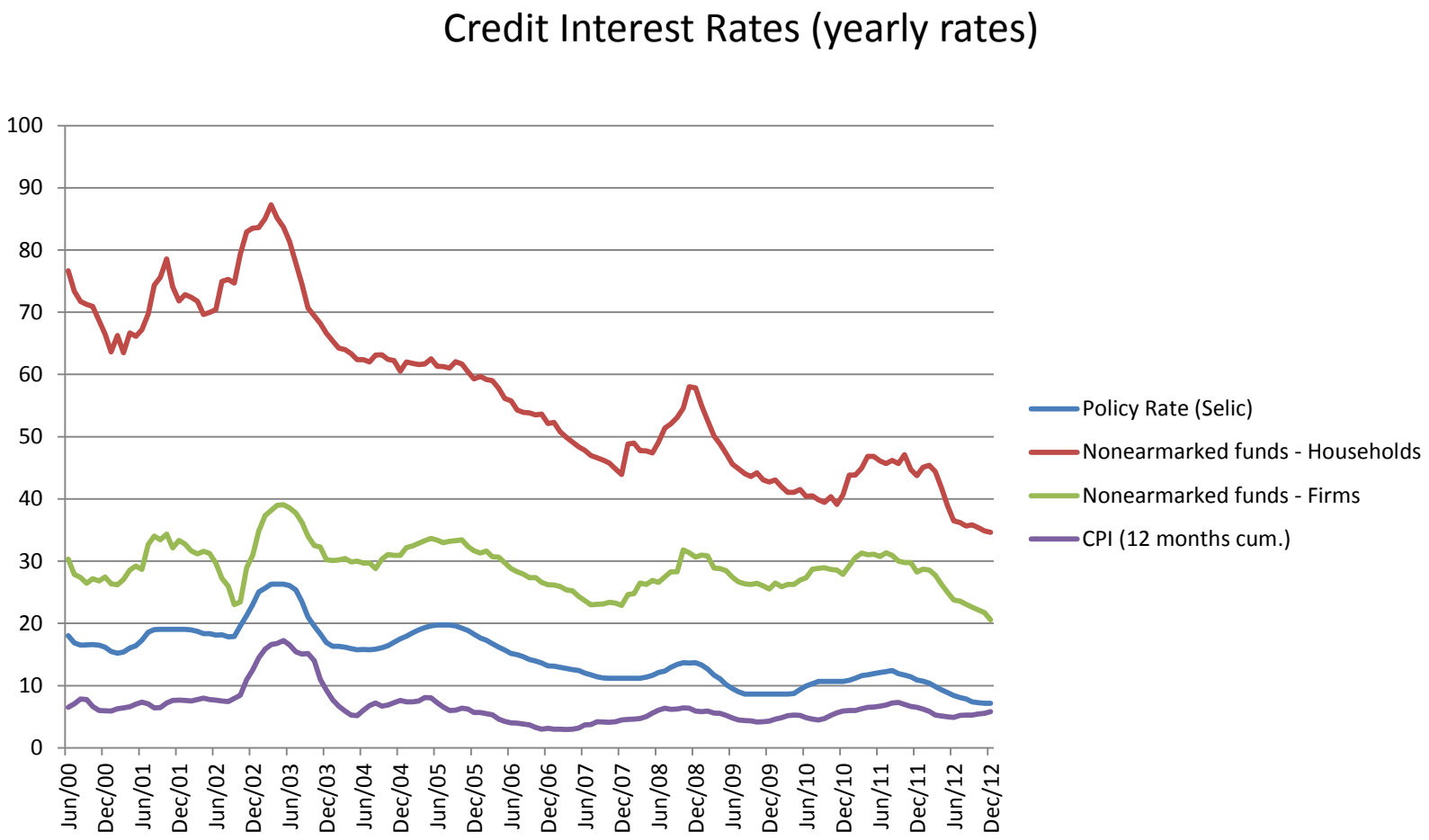


Annex

Borrowing Constraint: Counterfactual Exercise

Comparing debt constraints dependent on wage income and housing.

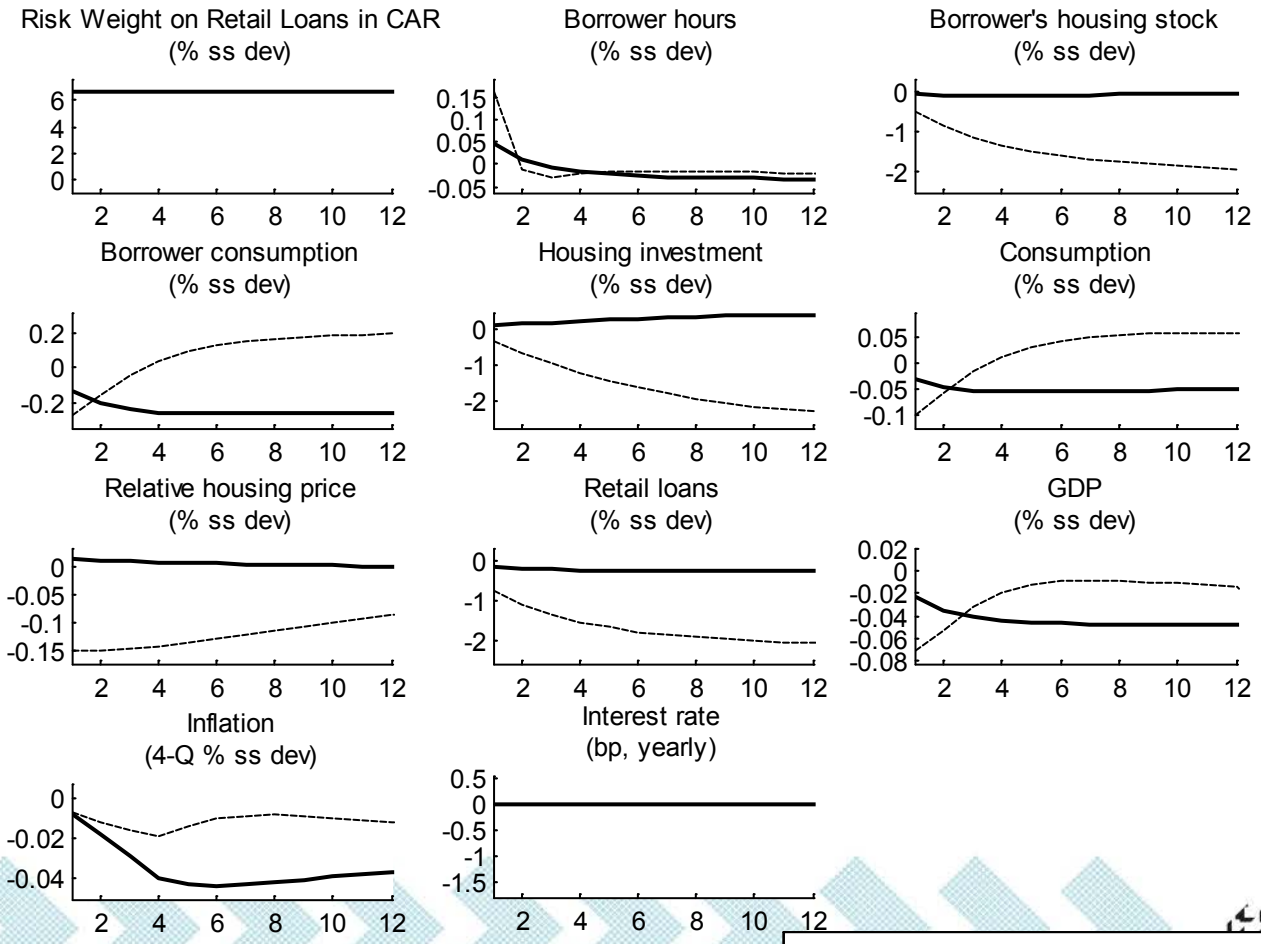
- If housing stock is good as collateral, borrowers have an additional reason to own houses.
- If there is debt-to-income constraint, borrower will have more incentive to work.

Exercise: increasing risk weight of retail loans in the computation of Capital Adequacy Ratio (CAR)

$$BI_t = \frac{BankCap_t}{\sum \tau_k B_{k,t}}$$

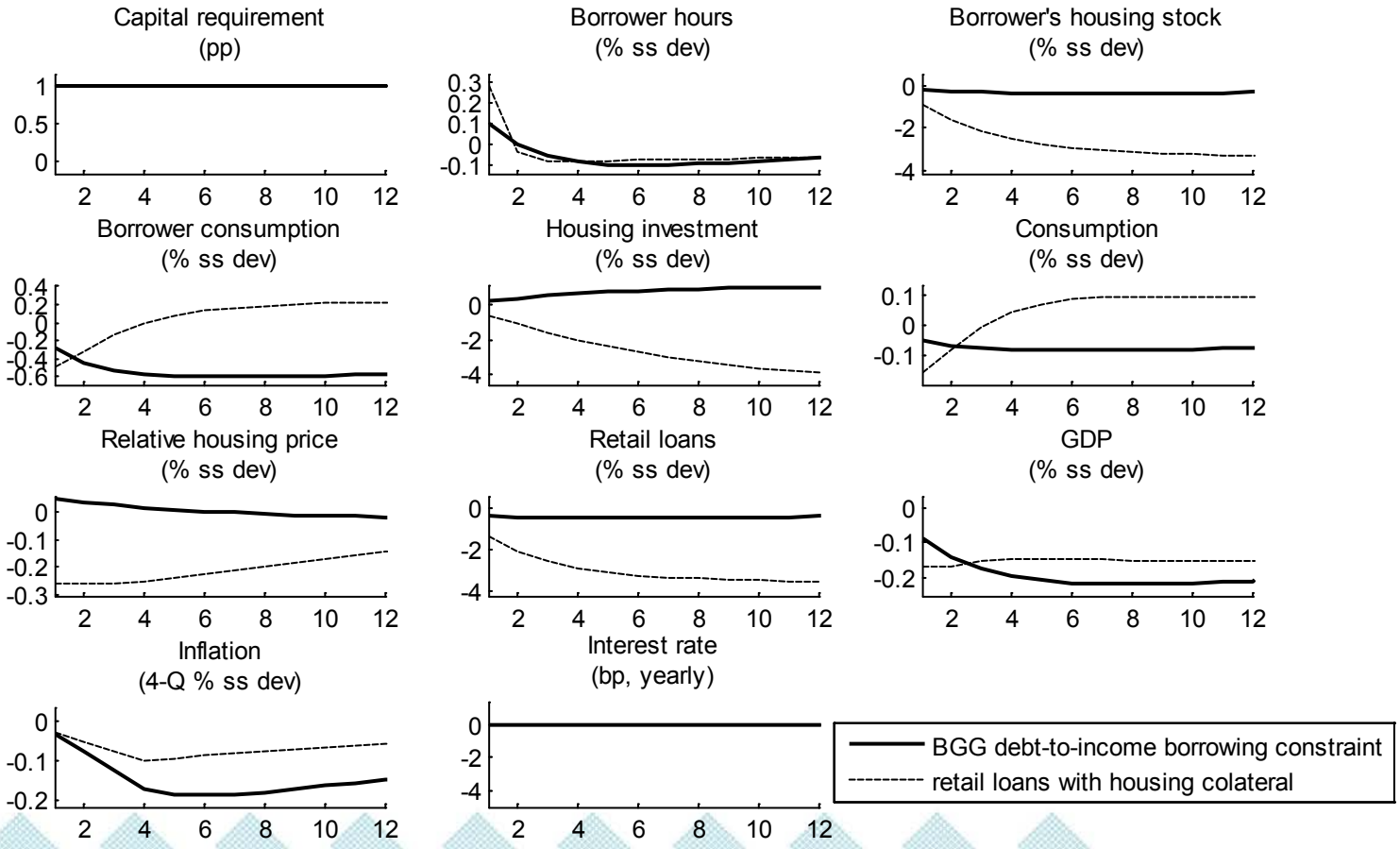
Borrowing Constraint: Counterfactual Exercise

IRFs to a 10p.p. increase in retail loans risk weight in CAR



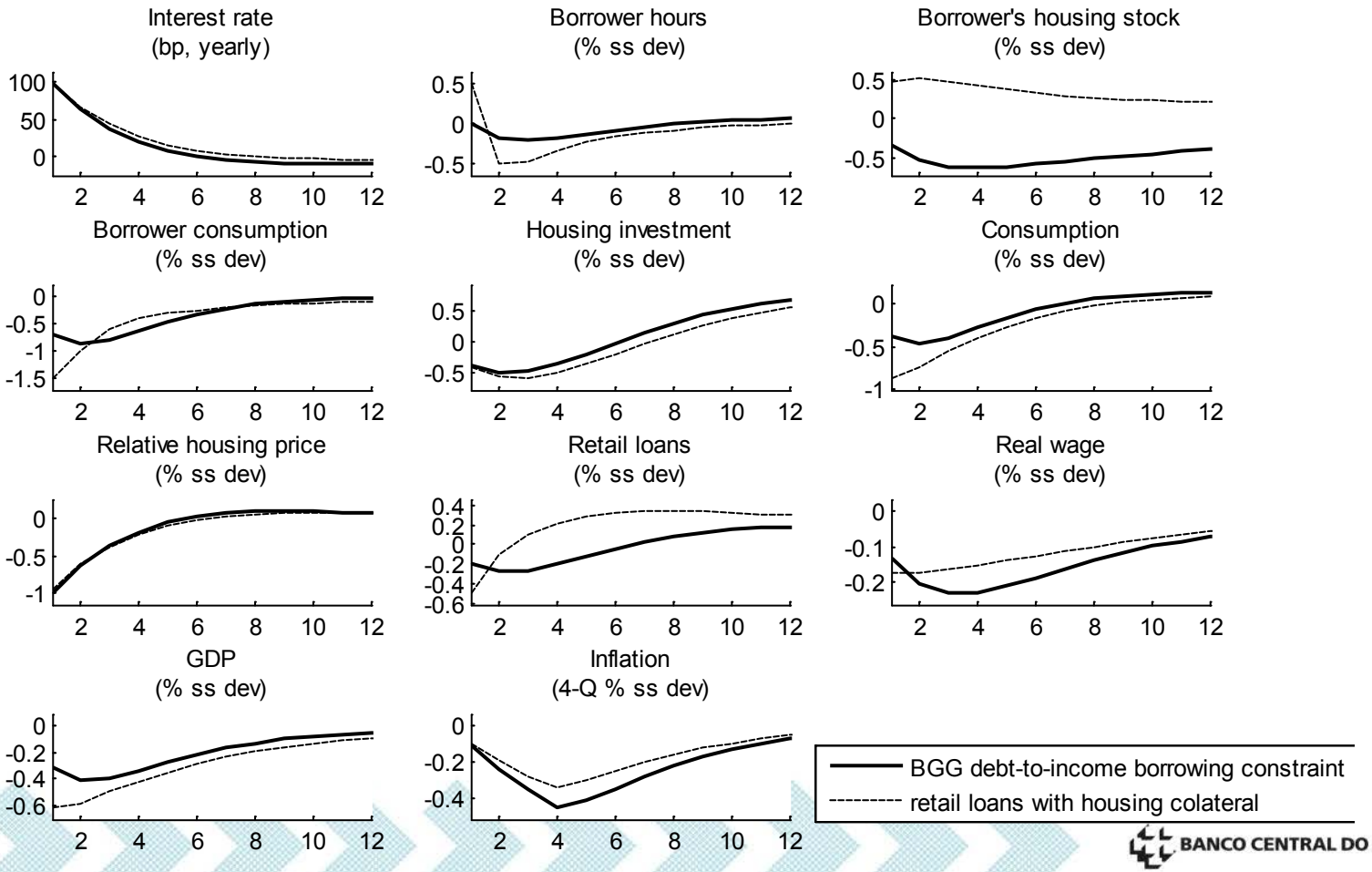
Borrowing Constraint: Counterfactual Exercise

IRFs to a 1p.p. increase in total capital requirement



Borrowing Constraint: Counterfactual Exercise

IRFs to a 1p.p. monetary policy shock



IRFs of a 10 p.p. shock to Loan Risk Weights

- Shocks in risk weights spill over to the other credit segments