

# The Macroeconomic Effects of Reserve Requirements

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The usual disclaimer applies.

# The Use of Reserve Requirements

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- Use of RR in the past vs. nowadays
- RR play a minor role as a policy tool in industrialized countries
- In EME, RR are an important instrument for various objectives:
  - Seen as an alternative to tighten policy when interest rate is constrained by other objectives (exchange rate, capital inflows)
  - Turkey has raised RR, and lowered interest rates at the same time (~ policy response to foreign capital inflows).
  - In 2010, China has raised RR six times, while raising interest rates once.

# Previous Literature

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- Broad literature concerning theoretical aspects (~1980's)
- Empirical Studies:
  - RR as a driver for interest rate spreads (Cardoso, 2003, de Souza Rodrigues & Takeda, 2004, Souza-Sobrinho, 2010, Carvalho & Azevedo, 2008, Gelos, 2009, ...)
  - RR and Macroeconomic Effects [GDP & Investment] (Loungani & Rush 1995)

# Our Contribution

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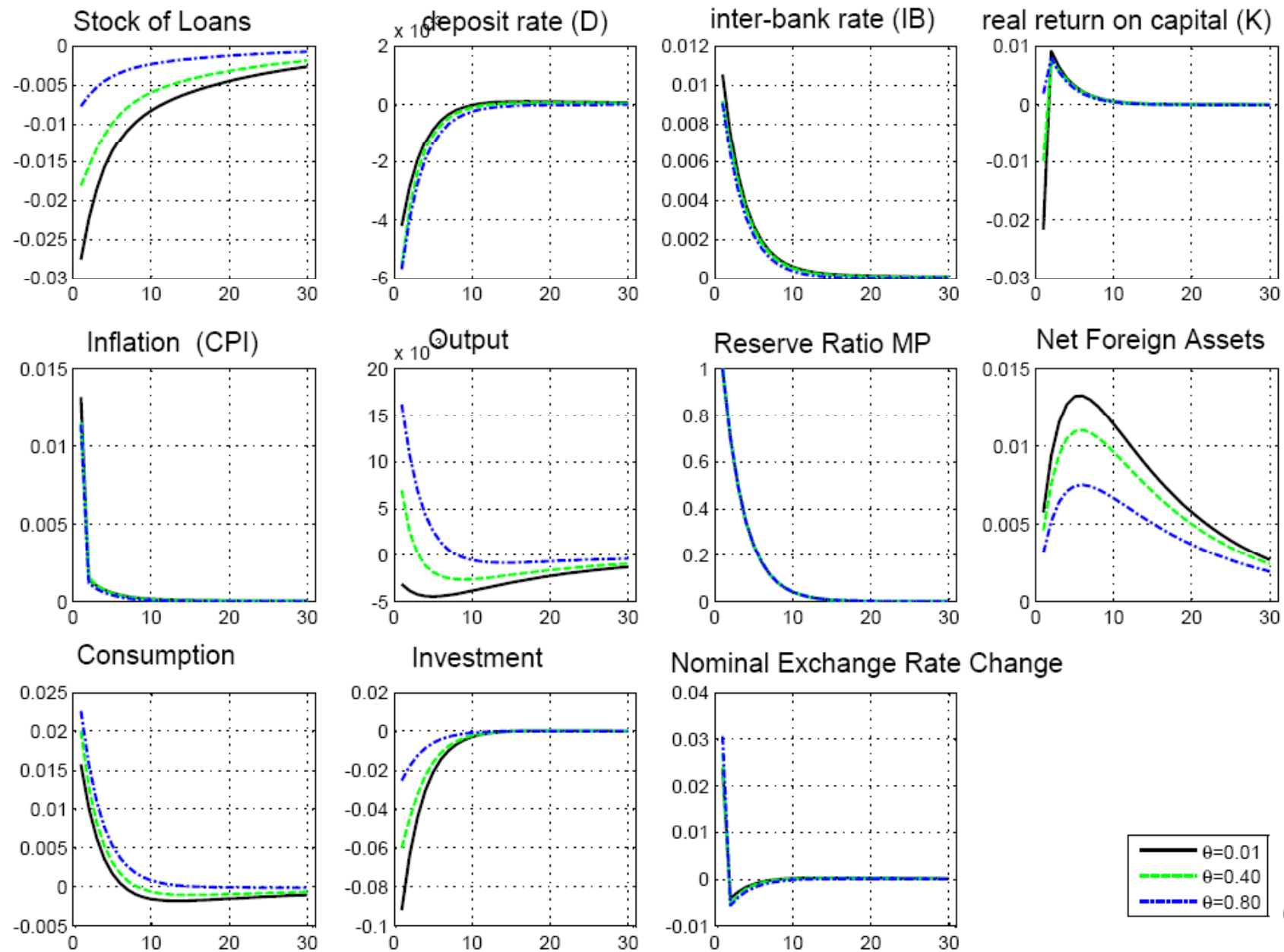
- Empirical evaluation of the effects of RR changes on:
  1. Domestic credit conditions
  2. External balance and the exchange rate
  3. Domestic inflation and the overall macroeconomic activity
- Background:
  1. RR provide a potential way to curb credit growth without appreciating the exchange rate
  2. Even though higher RR trigger increases in unemployment, RR are an inappropriate tool for price stability

# Theoretical Aspects

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- Bank lending channel is important
  1. Bank deposits cannot be substituted with other sources of funding easily.
  2. Firms cannot substitute bank credit with other financing sources easily.
- Monetary Policy (monetary aggregates vs. interest rate policy)
  1. Effect on money multiplier
  2. Tax effect
- “Reserve Requirements for Price and Financial Stability – When are They Effective?” (IJCB)

# Theoretical Aspects: RR Shock



# RR Policy in Brazil

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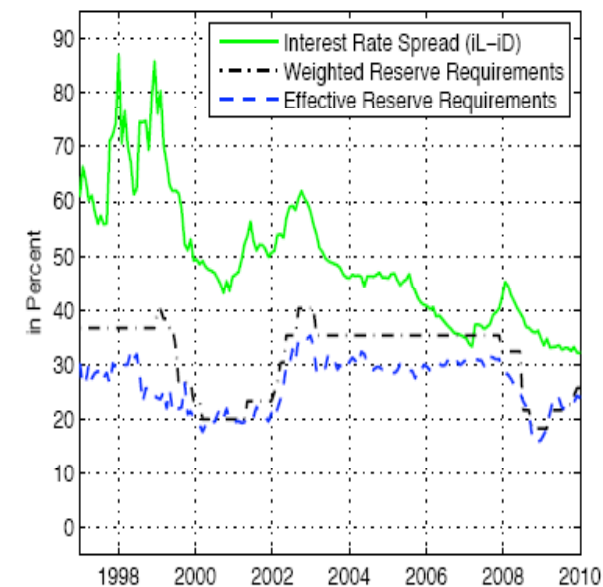
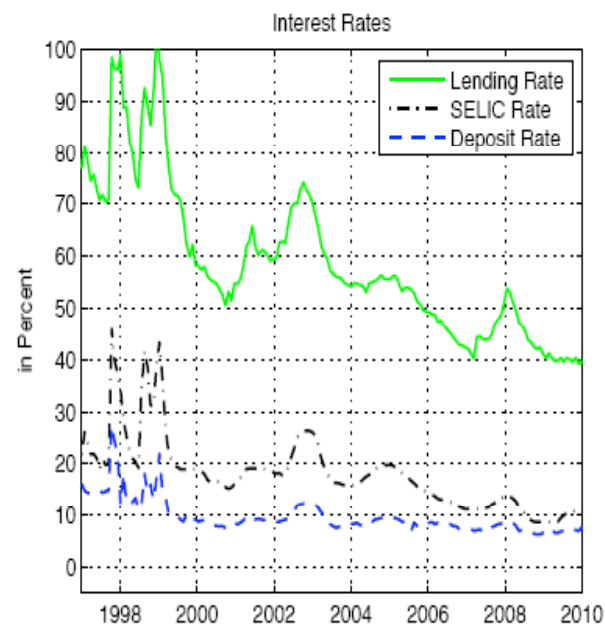
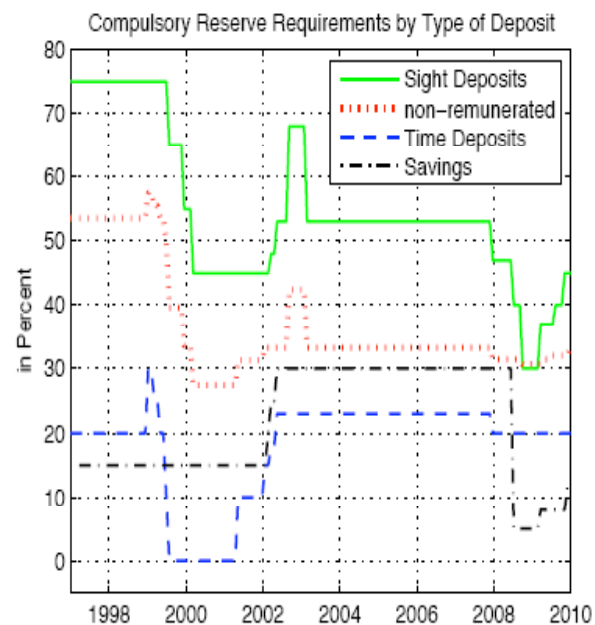
- Empirical evaluation using Brazilian data
  - Sufficient variation in RR
  - Homogeneous MP (since mid 1999)
  - Great data coverage (monthly)
- Historically RR had many different objectives:
  - Instrument to tax bank profit that accrued with high inflation
  - Instrument for distributional purposes
  - With the *Plano Real* (1994), RR had a sole monetary purpose
- Recent Usage of RR
  - RR have been communicated as a tool to achieve financial stability (*Relatório de Inflação*, 2011)
  - During the 2008/2009 recession heterogeneous RR have been used in order to increase liquidity in the banking sector

# RR Regulation in Brazil

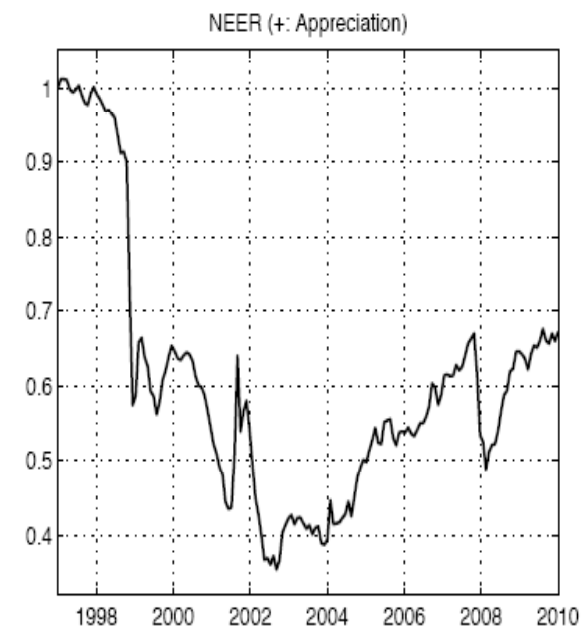
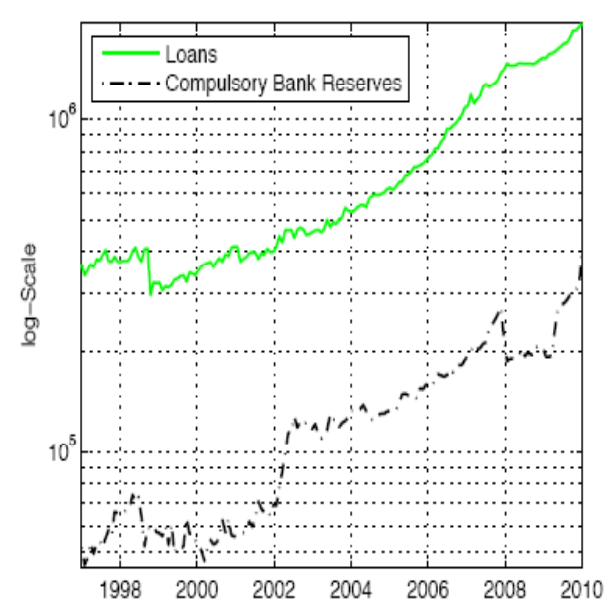
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- Brazilian RR System is rather complex
  - RR on sight, time and saving deposits + additional requirements (*exigibilidade adicional*)
  - Different rates of Remuneration
  - Varying exemption thresholds and deductibles
- How to measure RR policy?
  - We employ three different measures





## Macroeconomic Overview: Brazil



# The BVAR

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$$\mathbf{y}_t = \Psi \mathbf{x}_t + \sum_{i=1}^p \mathbf{A}_i \mathbf{y}_{t-i} + \mathbf{e}_t, \quad \text{with} \quad \mathbf{e}_t \sim N(\mathbf{0}, \Sigma) \quad \forall t = 1, \dots, T$$

- Monthly data from 1999:7 – 2010:12
- Endogenous variables:
  - Unemployment, CPI-inflation, current account
  - RR, SELIC rate, Interest rate spread
  - NEER, Loans, CB Reserves
- Exogenous variables:
  - Constant term, trend, dummy variable for 2002:7 – 2003:7
  - US federal funds rate, commodity price index

# Identification

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- We identify a RR shock and an interest rate (SELIC) shock with a combination of timing and sign restrictions
- 2 Blocks: fast & slow moving variables
- Multiply  $V = \text{chol}(\Sigma)$  with  $Q$

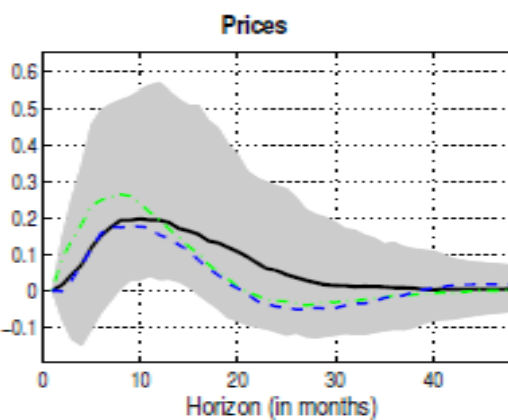
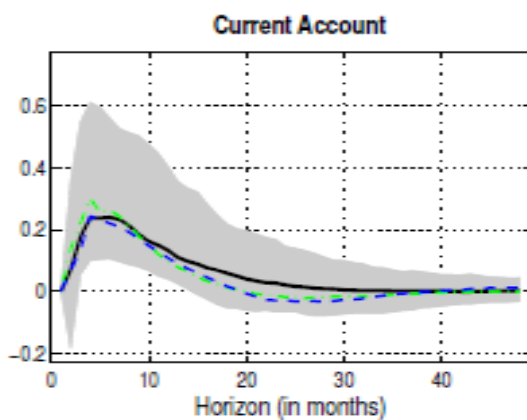
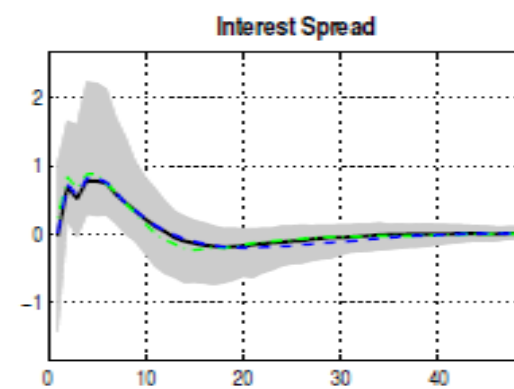
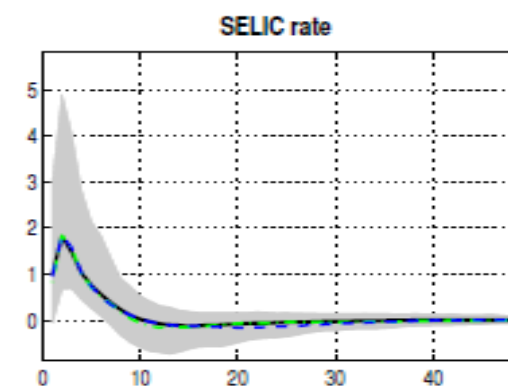
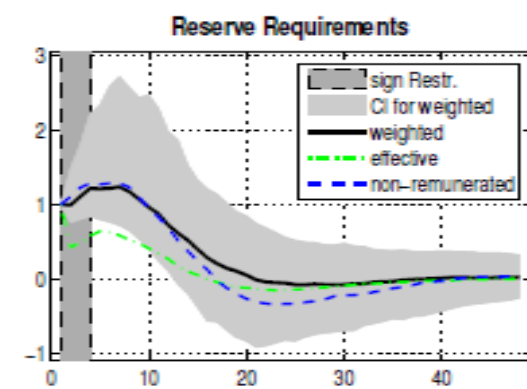
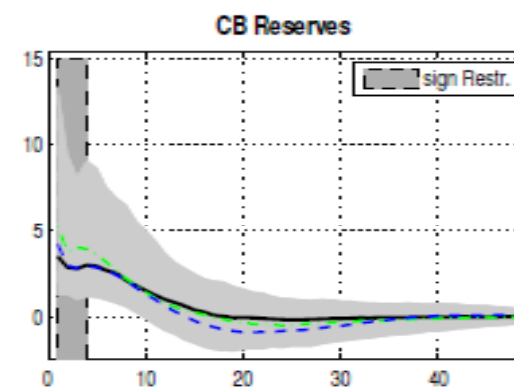
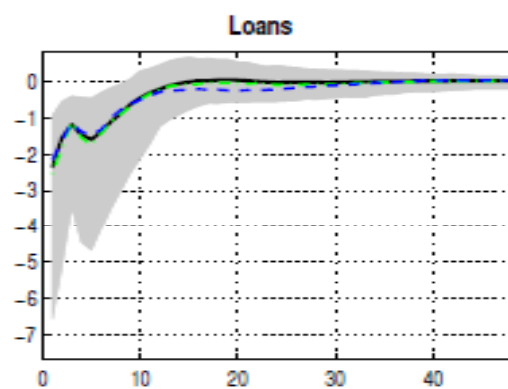
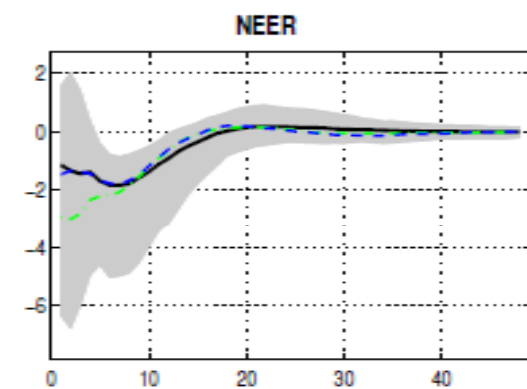
$$Q = \begin{bmatrix} \mathbf{I}_{N_S \times N_S} & \mathbf{0}_{N_S \times N_{F,P}} \\ \mathbf{0}_{N_S \times N_{F,P}} & Q_2_{N_{F,P} \times N_{F,P}} \end{bmatrix}$$

# Sign Restrictions

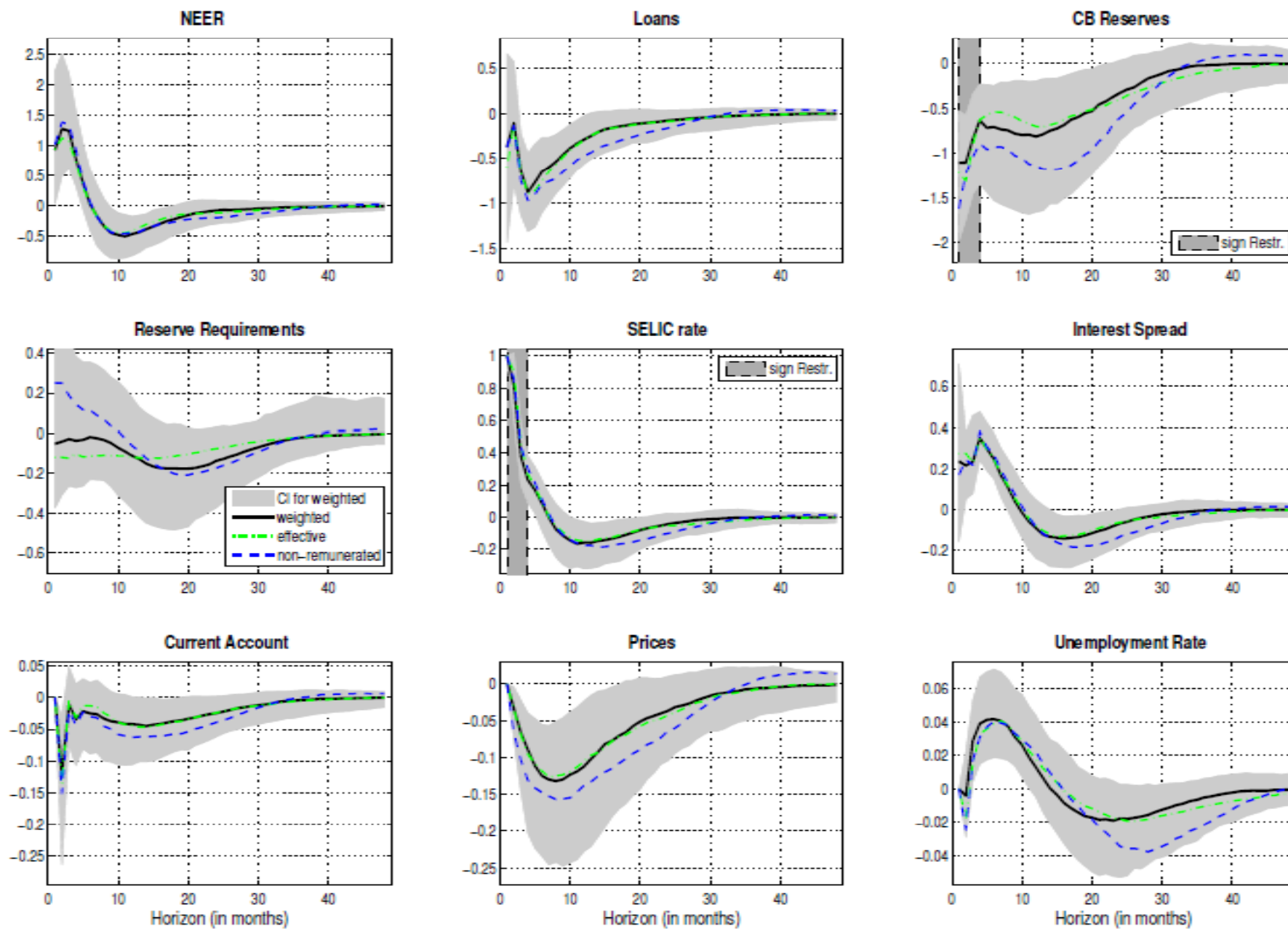
	RR Shock	SELIC Shock
U	0	0
CPI	0	0
CA	0	0
Spread	0	0
RR	$\geq 0$	•
SELIC	•	$\geq 0$
Loans	•	•
NEER	•	•
CB Res	$\geq 0$	$\leq 0$

**Notes:** Zero restrictions apply to the first month, sign restrictions to the first quarter. The variables are: nominal effective exchange rate (NEER), total aggregate credit (Loans), central bank reserves (Res), the SELIC rate, reserve requirements (RR), the interest rate spread between lending and deposit rates (Spread), the current account over GDP (CA), the price level as measured by the CPI and finally the unemployment rate (U).

## RR shock - IRFs



## SELIC shock - IRFs



# Comparing the 2 Shocks

	SELIC Shock		RR Shock	
Loans	-1	Percent	-1	Percent
NEER	0.59	Percent	-1.14	Percent
CB Res	-2.51	Percent	2.09	Percent
RR	-0.09	Percentage Points	1.03	Percentage Points
SELIC	0.43	Percentage Points	0.23	Percentage Points
Spread	0.19	Percentage Points	0.46	Percentage Points
CA	-0.05	Percentage Points	0.12	Percentage Points
CPI	-0.18	Percentage Points	0.10	Percentage Points
U	0.09	Percentage Points	0.04	Percentage Points

**Notes:** The numbers shown refer to the reaction of the variables at the initial stage of the shock (one year). The variables are: nominal effective exchange rate (NEER), total aggregate credit, central bank reserves (Res), the SELIC rate, reserve requirements (RR), the interest rate spread between lending and deposit rates (Spread), the ratio of the Current Account (CA) to GDP, the price level as measured by the CPI and finally the unemployment rate (U).

# Forecast Error Variance Decomposition

Horizon	4	12	24	4	12	24
	SELIC Shock			RR Shock		
NEER	5.2	6.1	5.6	5.8	5.7	4.1
Loans	8.2	7.9	9.4	11.9	13.2	13.8
Res	9.7	10.1	11.0	26.7	24.6	23.2
RR	1.8	2.1	1.6	42.3	39.3	37.7
SELIC rate	19.7	17.3	14.8	2.2	1.7	0.6
Spread	3.2	3.5	3.2	8.7	9.4	9.7
CA	2.9	3.9	4.3	5.4	6.3	6.8
CPI	7.2	9.8	13.7	4.1	5.0	5.2
U	3.9	4.6	5.3	2.3	2.9	3.5

**Notes:** The numbers are in Percent. The numbers in smaller font size are standard errors. The variables are: nominal effective exchange rate (NEER), total aggregate credit, central bank reserves (Res), the SELIC rate, reserve requirements (RR), the interest rate spread between lending and deposit rates (Spread), the ratio of the Current Account (CA) to GDP, the Consumer Price Index CPI and finally the unemployment rate (U).



# Robustness Checks

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- Changes in inflation target
- Subsample instability
- Omitted variables

# Conclusion

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- RR have real effects – bank lending channel is operative (banks rely on deposits funding, firms rely on bank loans)
- *RR provide a potential way to curb credit growth without appreciating the exchange rate*
- *Even though higher RR trigger increases in unemployment, RR are an inappropriate tool for price stability*

Thank you for your attention!