Macroeconomic and Financial Interactions in Chile: An Estimated DSGE Model

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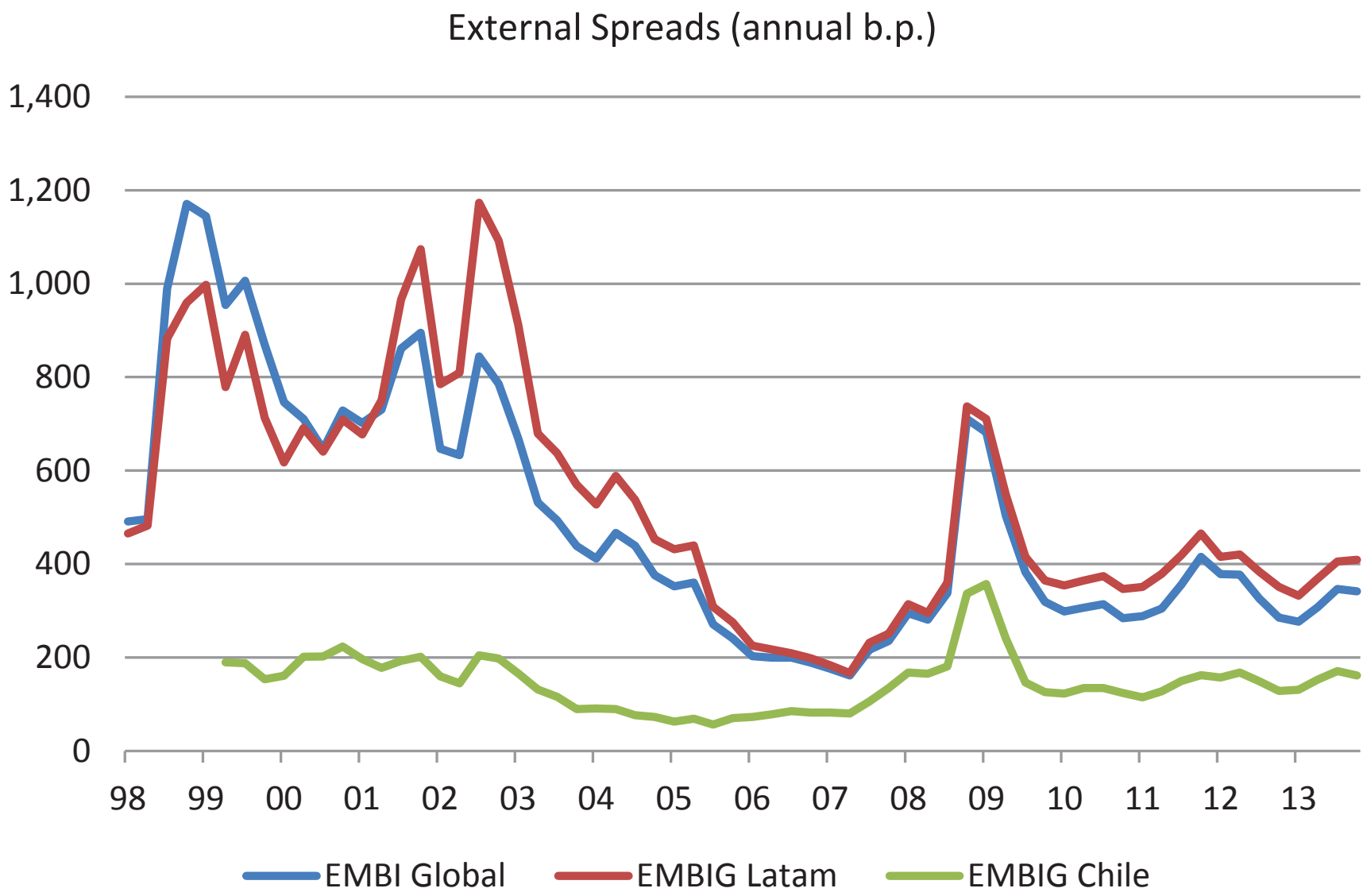
*The views and conclusions presented are exclusively those of the authors and do not necessarily reflect the position of the Central Bank of Chile or its Board members.

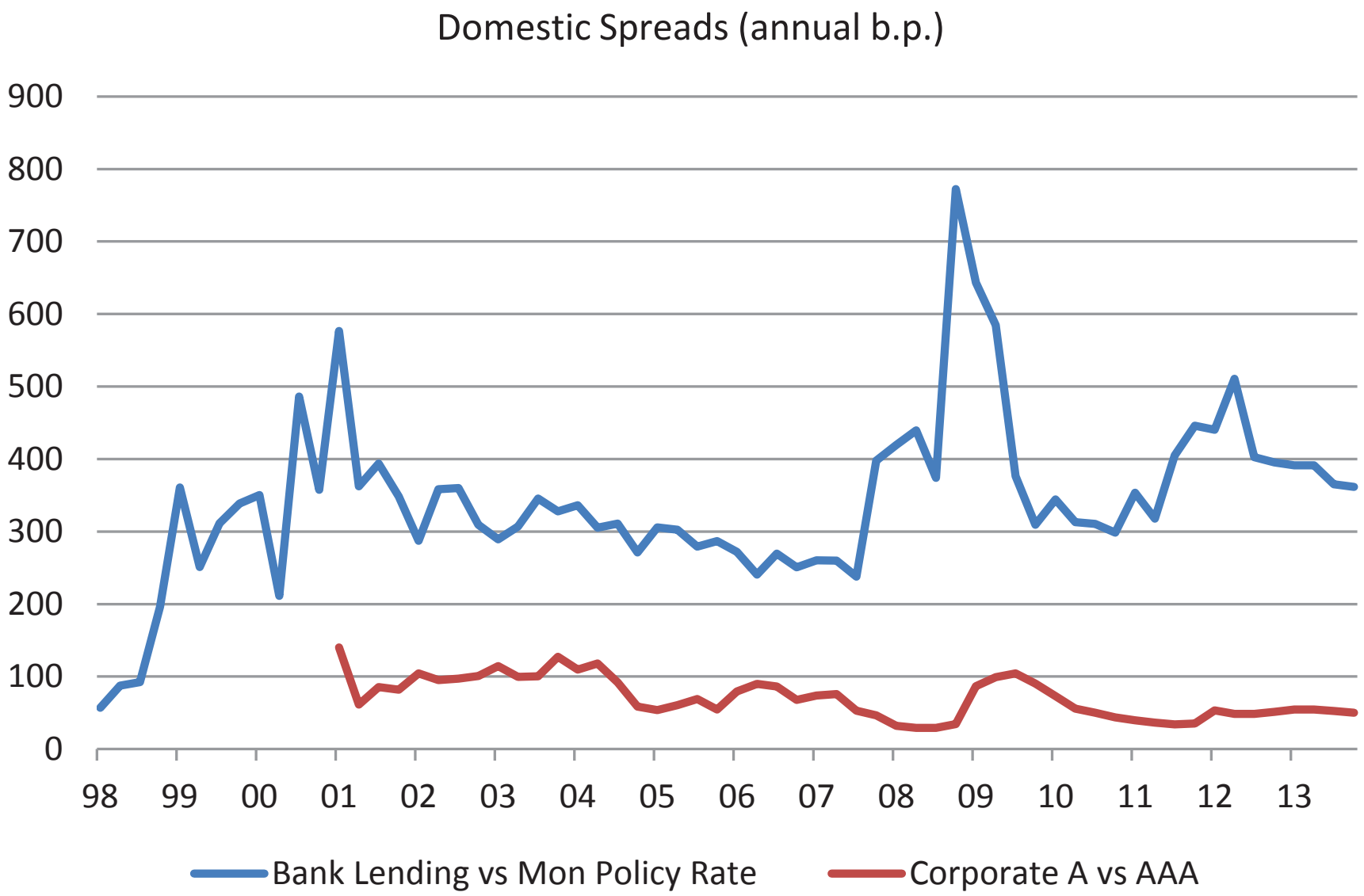
Motivation: Financial frictions & business cycles in emerging countries

- The literature on fluctuations in emerging countries has focused on financial frictions between domestic and foreign agents:
  - Endogenous country premia (e.g. Neumeyer and Perri, 2005; Uribe and Yue, 2008; Garca-Cicco *et al.*, 2010; Mendoza, 2010).
  - Sovereign defaults (e.g. Arellano, 2008; Yue, 2010; Mendoza and Yue, 2012).
  - Dollarization and currency mismatches (e.g. Céspedes *et al.* 2004; Devereux *et al.* 2006; Gertler *et al.* 2007).
- However, in the new century, the picture has significantly changed for many emerging countries:
  - Fiscal situation seems under control (some governments are even net foreign lenders).
  - Dollarization has been reduced dramatically.
  - Country premia have not displayed the high levels they used to show years ago.

Evolution of emerging country spreads



Domestic financial spreads in Chile



What we do

- Hence, *external* financial frictions seem less important today, while *domestic* financial frictions seem more relevant.
- Such frictions may have implications for monetary policy, and might introduce a rationale for "complementary" policies.
- To address this issue, we set up a DSGE model of a small open economy with two types of domestic financial frictions:
  - Between depositors and banks, as in Gertler and Karadi (2011, GK).
  - Between banks and firms, as in Bernanke *et al.* (1999, BGG).
- We estimate the model with Chilean data from 2001 to 2012 following a Bayesian approach, and evaluate two roles for financial frictions:
  - To understand the dynamics of macroeconomic and financial variables (in particular, domestic financial spreads).
  - To analyze the role of complementary policies (in particular, reserve requirements) and their interaction with normal-times monetary policy.

Summary of the model

- Fairly standard NK model of a small open economy. ▸ Details
- Conceptual approach to financial frictions:
  - Different interest rates (real rates in steady state):
    - r^*, international rate; r^D, domestic deposit rate.
    - r^L, rate at which banks are willing to lend risk-free (not observable).
    - r^{Le}, interest rate paid on loans (linked to return on capital).
  - Frictionless models: $r^* = r^D = r^L = r^{Le}$.
  - External financial frictions: $r^* < r^D = r^L = r^{Le}$.
  - Domestic frictions between banks and firms: $r^* = r^D = r^L < r^{Le}$.
  - Domestic frictions between depositors and banks: $r^* = r^D < r^L = r^{Le}$.
  - Our model: $r^* \approx r^D < r^L < r^{Le}$.
- Bank spread emanates from a moral hazard problem, as in GK (2011), while firm spread (i.e. external finance premium) emanates from a costly state verification problem, following BGG (1999).
- Our model thus includes two different financial accelerators, with feedbacks from bank and firm leverage on firms' financing costs.

Summary of results from policy exercise

- Use the model to simulate a spread compression and credit boom.
- The underlying financial shock is a "risk shock" (Christiano *et al.*, 2014) to the cross-sectional SD of entrepreneurs' productivity ($\sigma_{\omega,t}$).
- According to the estimated model, this shock is an important driver of corporate and, to a lesser extent, bank lending spreads in Chile.
  ▸ HD Corp Spread ▸ HD Bank Spread
- The baseline monetary policy through a Taylor rule for the short-term interest rate is not sufficient to contain expansion of GDP, investment and (asset price) inflation due to the credit boom.
- However, a feedback rule for the required reserves ratio (with feedbacks from credit and bank lending spreads) can contain the credit boom and complement interest rate policy. ▸ RR policy ▸ IRFs

Appendix

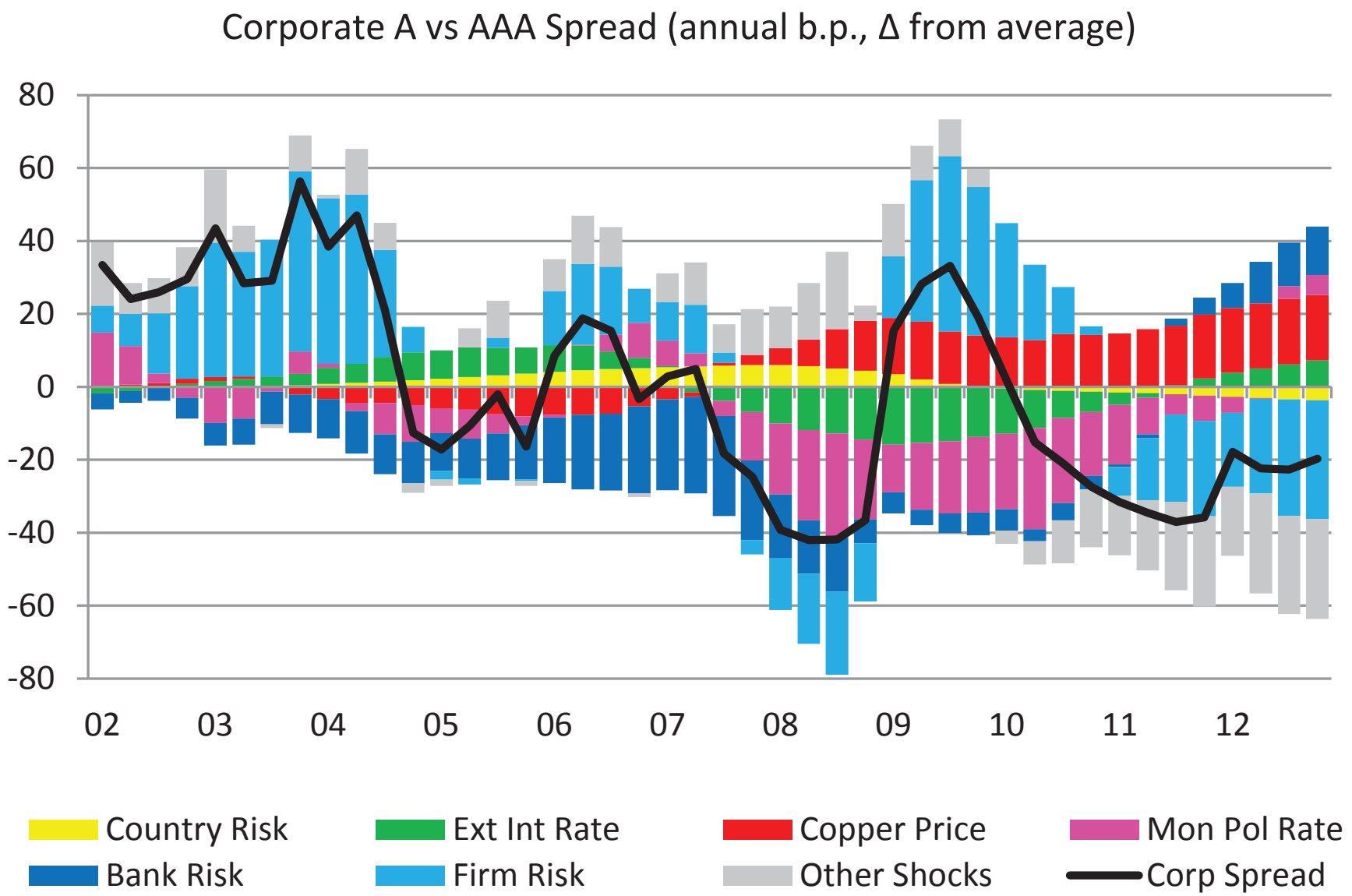
Details of the model and references

◂ Return

- See García-Cicco, J., M. Kirchner, and S. Justel, 2014, "Financial Frictions and the Transmission of Foreign Shocks in Chile," *Working Papers Series* 722, Central Bank of Chile.
- Simplified version of Medina and Soto (2007) model used for policy analysis and forecasting at the Central Bank of Chile. Basic structure similar to Adolfson *et al.* (2007) model.
- Main elements of the real side:
  - Consumption of home goods and imported goods.
  - Staggered price-setting à la Calvo with indexation both for domestic producers and importers (i.e. delayed pass-through).
  - Sticky wages à la Calvo with indexation.
  - Labor-augmenting productivity growth.
  - Commodity sector (endowment, exogenous world price).
  - Habits in consumption, investment adjustment costs.
  - Non-Ricardian households.
  - Elastic country premium.
  - Taylor rule (smoothing, inflation and GDP growth).
  - Exogenous government expenditure (Ricardian equivalence).

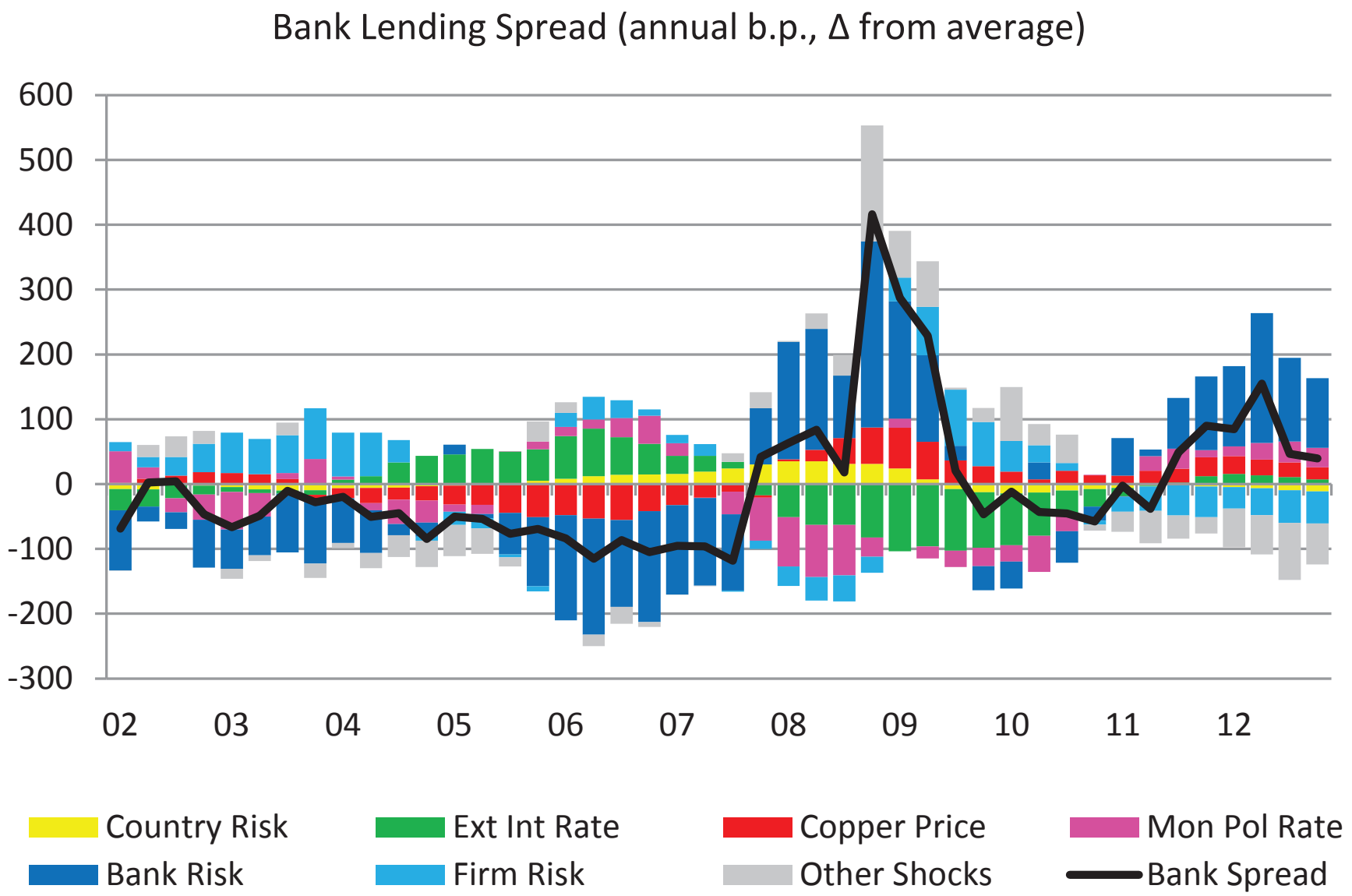
Historical decomposition of corporate spread / EFP

◂ Return



Historical decomposition of bank lending spread

◂ Return



Required reserves policy

◂ Return

Bank balance sheet at the end of period t:

$$L_t = (1 - \tau_t)D_t + N_t,$$

where τ_t is the fraction of deposits that the CB requires to hold as reserves, remunerated at $R_t^{RR} < R_t$.[1] Net worth evolves as:

$$N_{t+1} = r_{t+1}^L L_t - r_{t+1} D_t + r_{t+1}^{RR} \tau_t D_t = (r_{t+1}^L - r_{t+1}^D) L_t + r_{t+1}^D N_t,$$

where $r_t^D = (r_t - \tau_{t-1} r_t^{RR})/(1 - \tau_{t-1})$. The process for τ_t is:

$$\frac{1 - \tau_t}{1 - \bar{\tau}} = \left(\frac{1 - \tau_{t-1}}{1 - \bar{\tau}} \right)^{\rho_\tau} \left[\left(\frac{L_t}{L} \right)^{\alpha_l} \left(\frac{spr_t}{spr} \right)^{\alpha_{spr}} \right]^{1-\rho_\tau} \exp(\varepsilon_t^\tau).$$

with parameters $\rho_\tau \in [0, 1]$, $\alpha_l \leq 0$, $\alpha_{spr} \geq 0$.[2]

[1] In Chile, the CB pays a small interest of 50% of monthly inflation. As the CB has not used this interest rate as an active policy tool, we set $R_t^{RR} = 1$.

[2] The RR ratio is 9.0% for demand deposits and 3.6% for time deposits, so we set $\bar{\tau} = 6.3\%$. The CB has statutory authority to increase these percentages to as much as 40% for demand deposits and as much as 20% for time deposits.

Simulated dynamics under different policies

◂ Return

Impulse responses to a shock to $\sigma_{\omega,t}$, baseline monetary policy and policy with feedbacks on required reserves (Δ log from ss $\times$ 100, quarterly basis).