BANK FOR INTERNATIONAL SETTLEMENTS

Should monetary policy lean against the wind? An analysis based on a DSGE model with banking

by

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The topic of the paper

Clear **policy question**: can *leaning-against-the-wind* (LATW) improve CB's performance in terms of macroeconomic stabilization?

- LATW defined as: *CB following a rule where the policy rate is adjusted not only in response to fluctuations of inflation and output but also to changes of financial variables (asset prices, credit...)*

Motivation

The global financial crisis has reaffirmed the importance of financial factors in business cycle fluctuations

- Credit conditions important in both bulding-up and post-Lehman phase (Adrian and Shin 2010, Ciccarelli et al 2010, Gilchrist et al 2009)
- In 2011 fears of a credit crunch in connection with Euro sov crisis

Motivation

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...challenging the view that MP **should not** respond to financial variables over and above their effect on inflation

- This view was part of the "Jackson Hole consensus"(Mishkin 2010)...
- ...and was based on models with frictions only on the borrowers's side (Bernanke and Gertler 2000, Iacoviello 2005)
- Recent work has shown it may no longer be valid if frictions on the lenders'side arise

What do we do?

- We build a DSGE model with a broad credit channel
  - Balance-sheet channel *à la* Kiyotaki-Moore (1997)
  - Bank-lending channel due to the presence of bank capital
- We construct a wide range of MP simple instrument rules...
  - where the CB is allowed to respond to some financial variables in addition to output and inflation
- ...and compare the stabilization performance of standard Taylor rule *vs* "augmented" rules, after macroeconomic shocks (tech and cost-push)
- We test whether LATW is more effective in economies with some more procyclical characteristics

NB1: We focus on output and inflation stability, not consider financial stability issues. Our model is for "normal" times
NB2: Positive perspective, no optimal policy

Contribution and related literature

- Cùrdia and Woodford (2009): normative analysis in a model with essential financial sector
  - We corroborate their results in a richer model, with a broad credit channel
  - We analyze different financial variables
- Lambertini *et al*. (2011) and Christiano *et al*. (2011)
  - They do not have financial frictions in banking
  - They do not perform a full grid-search analysis but fix some parameters of the rule
  - They only consider shocks to future productivity
- Literature on the pre-crisis debate on leaning vs cleaning (Bernanke and Gertler 2001, Gilchrist and Leahy 2002; Cecchetti et al 2000)
  - We use a similar methodology, but expanding to some other financial variables
  - Used BGG model, with no frictions on the lenders side

Overview of main results

1. Rules involving LATW do improve upon a standard TR whenever the CB assingns a non-zero weight on output stabilization
   - gains are up to 20%-30%, depending on the shock considered and CB's preferences
2. Under standard Taylor rule, MP is too procyclical, reinforcing the amplification effects of the balance-sheet and credit-supply channels...
3. ...while LATW helps counteracting this effect
4. In our calibration asset prices are somewhat more important
5. The case for LATW is stronger in economies with highly indebted borrowers

Outline of the talk

1. Sketch of the model
2. An intuitive graphical description of the results
3. Simulations

The model: households and credit demand

- Simplified version of Gerali *et al*. 2010
- Patient households (savers) and Impatient entrepreneurs (borrowers)
  - Collateral constraint like in Iacoviello (05) but tied to the level of capital: $B_t = \chi_t K_t$
- Entrepreneurs' consumption and investment can be rewritten as function of net worth NW_t^E (Andres *et al* 2010) $c_t^E = \left(1 - \beta^E\right) NW_t^E$ and $K_t = \frac{\beta^E}{q_t^k - \chi_t} NW_t^E$
- Combining with the borrowing constraint, we can derive a loan demand schedule

$$\tilde{r}_t^b = -(1-\chi)\widehat{B}_t + E_t \widehat{q}_{t+1}^k - \delta^k \widehat{q}_t^k + \Phi \widehat{Y}_t + \Theta_{t-1} \qquad (1)$$

  - Negatively sloped wrt $\widehat{B}_t$
  - Shifts up with future asset prices $E_t \widehat{q}_{t+1}^k$, current output $\widehat{Y_t}$
  - Shifts down with current asset prices $\widehat{q}_t^k$

$\Rightarrow$ Collateral or Balance-sheet channel

The model: Banks and credit supply

- Banks collect deposits D_t, issue loans B_t, equity K_t^b accumulated out of reinvested earnings
  - Target a leverage ν and pay a cost for deviating from it (θ)
  - Profits are given by $r_t^b B_t - r_t^{ib} D_t - \frac{\theta}{2}\left(\frac{K_t^b}{B_t} - \nu\right)^2 K_t^b$
  - Perfect competition in deposit markets, $\Rightarrow r_t^d = r_t^{ib}$
  - Imperfect competition in loans market $\Rightarrow$ profit maximization implies loan rate set as a mark-up over marginal cost of funding:

$$\tilde{r}_t^b = \frac{\theta\nu^3}{1+r^{ib}}\widehat{B}_t - \frac{\theta\nu^3}{1+r^{ib}}\widehat{K}_t^b + \tilde{r}_t^{ib} \qquad (2)$$

- The above equation can be interpreted as a loan supply schedule
  - Positively sloped in $\{\widehat{B}_t, \tilde{r}_t^b\}$.
  - Elasticity is a function of ν and θ
  - Shifts with bank capital $\widehat{K}_t^b$, which in turn depends on (procyclical) bank profits
  - Shifts also with the policy rate $\tilde{r}_t^{ib}$

$\Rightarrow$ Credit-supply or Bank-lending channel

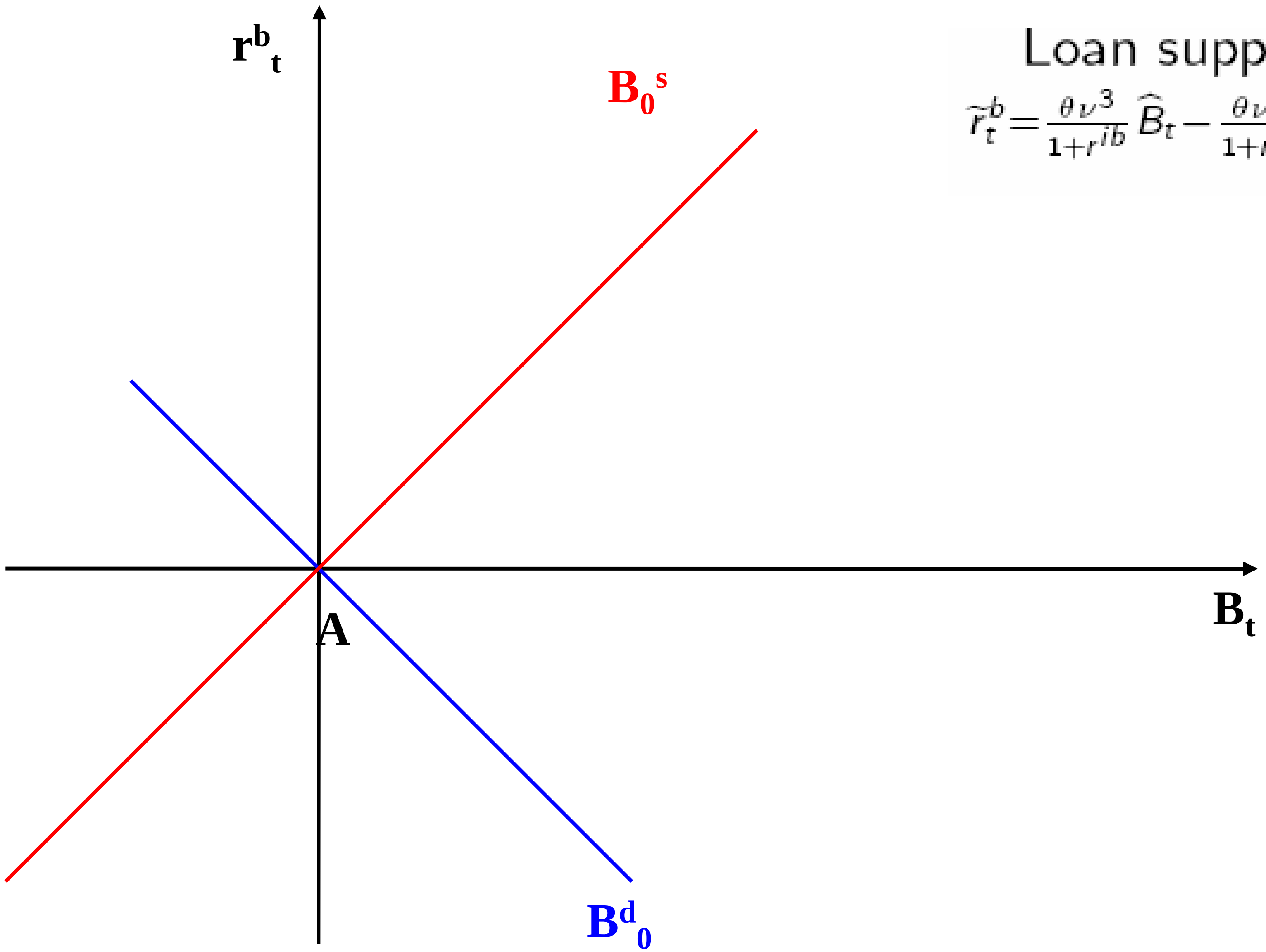
A positive tech shock: an intuition of how the model works

We can provide an intuition of how the 2 channels work by a graphical representation of partial equilibrium in the credit market and the interaction with different policy rules

- Assume that initial equilibrium is the steady state, so $\widehat{x}_t = 0$ for any variable
- Simulate a (permanent) positive technology shock
- Assume 3 cases
    1. No central bank reaction, i.e., $\widetilde{r}_t^{ib} = 0$
    2. TR responding to inflation, i.e., $\widetilde{r}_t^{ib} = \phi_\pi \widehat{\pi}_t$
    3. TR responding to inflation and asset prices, i.e., $\widetilde{r}_t^{ib} = \phi_\pi \widehat{\pi}_t + \phi_q \widehat{q}_t^k$

NB. Assume "other things being equal": purpose is illustrative!

Case 1. No action: $r_t^{ib} = 0$



Loan supply

$$\widetilde{r}_t^b = \frac{\theta\nu^3}{1+r^{ib}}\widehat{B}_t - \frac{\theta\nu^3}{1+r^{ib}}\widehat{K}_t^b$$

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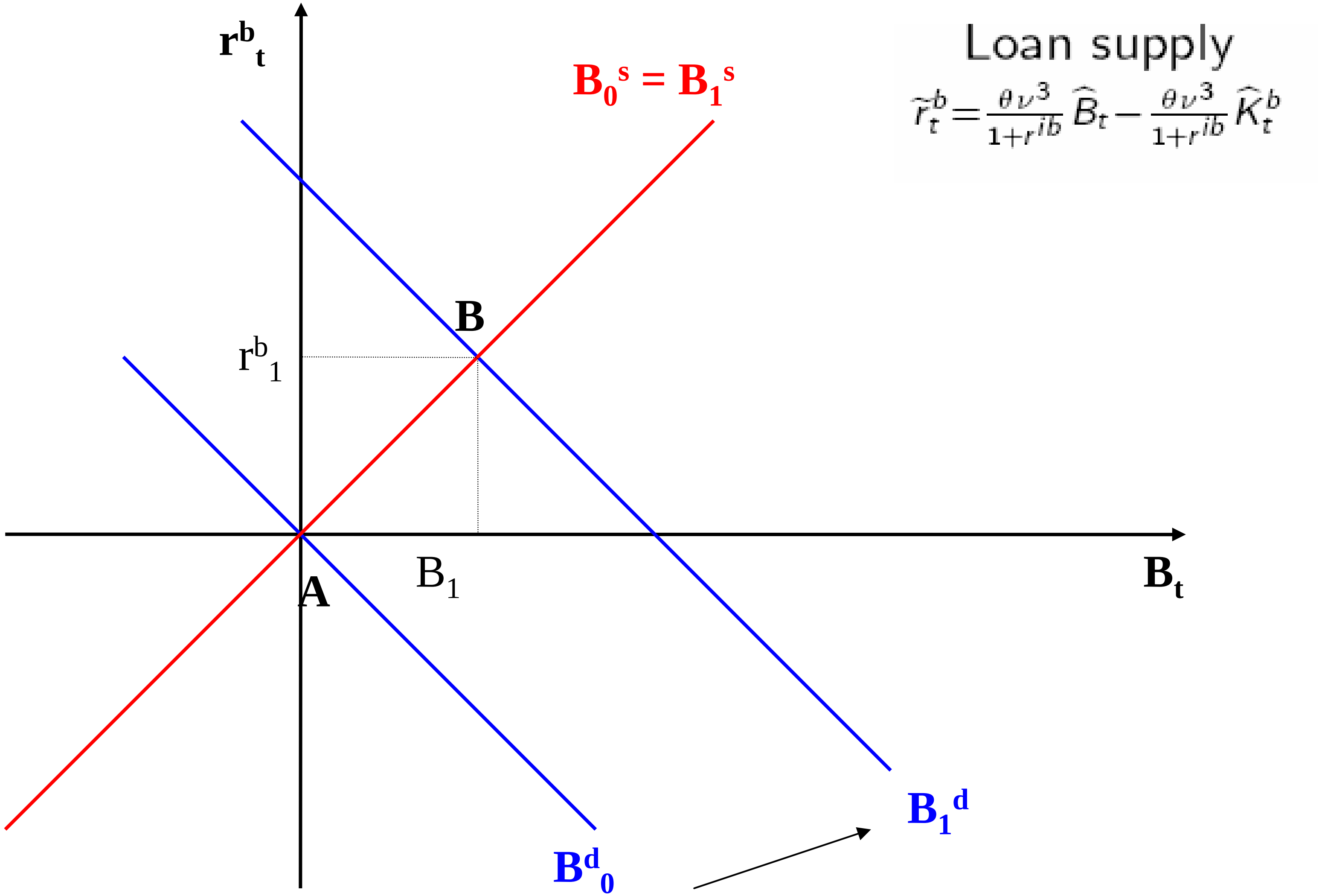
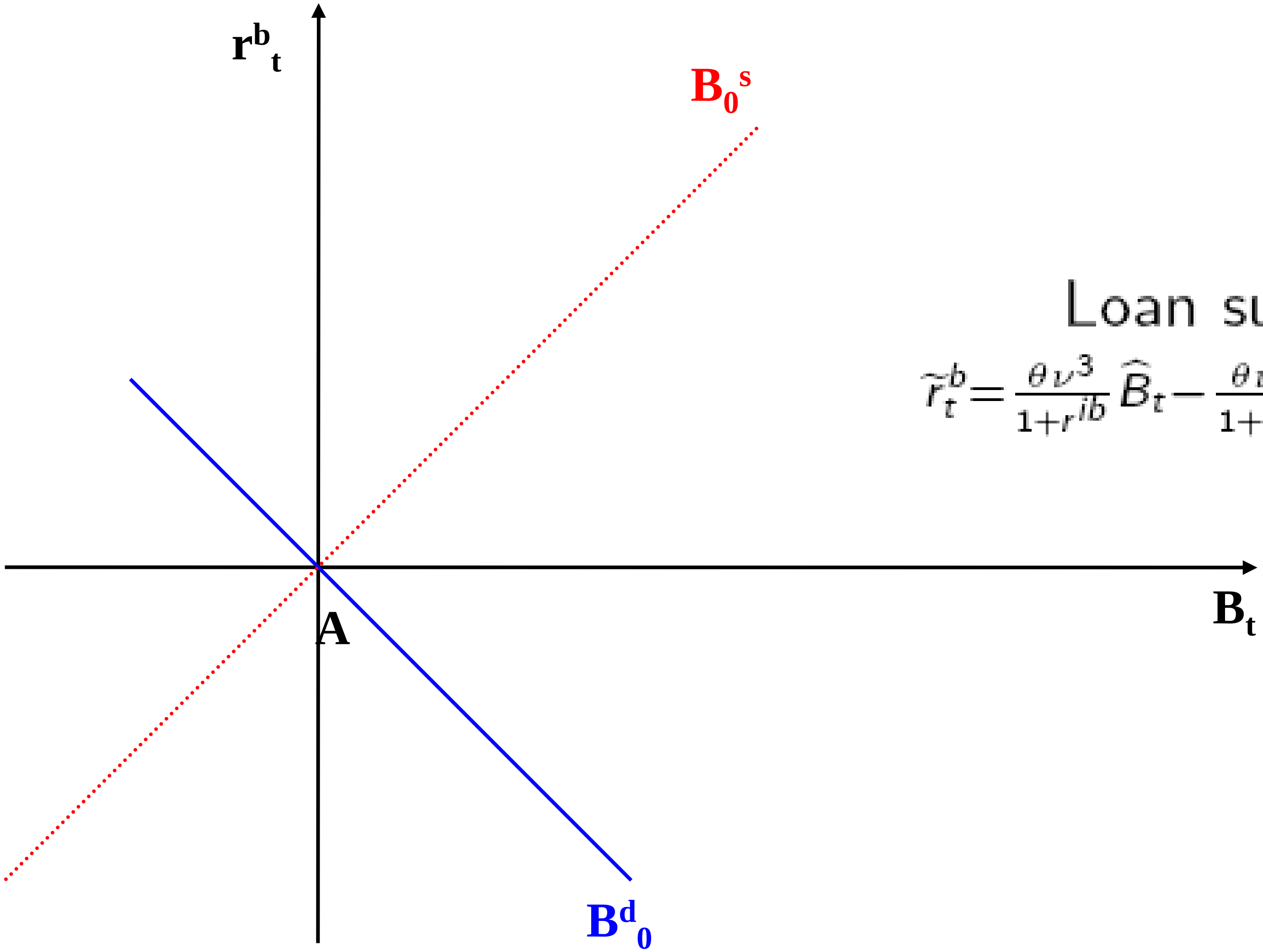


Case 2. Std TR: $r_t^{ib} = \varphi_\pi \pi_t$



Loan supply

$$\tilde{r}_t^b = \frac{\theta\nu^3}{1+r^{ib}}\widehat{B}_t - \frac{\theta\nu^3}{1+r^{ib}}\widehat{K}_t^b + \phi_\pi\,\widehat{\pi}_t$$

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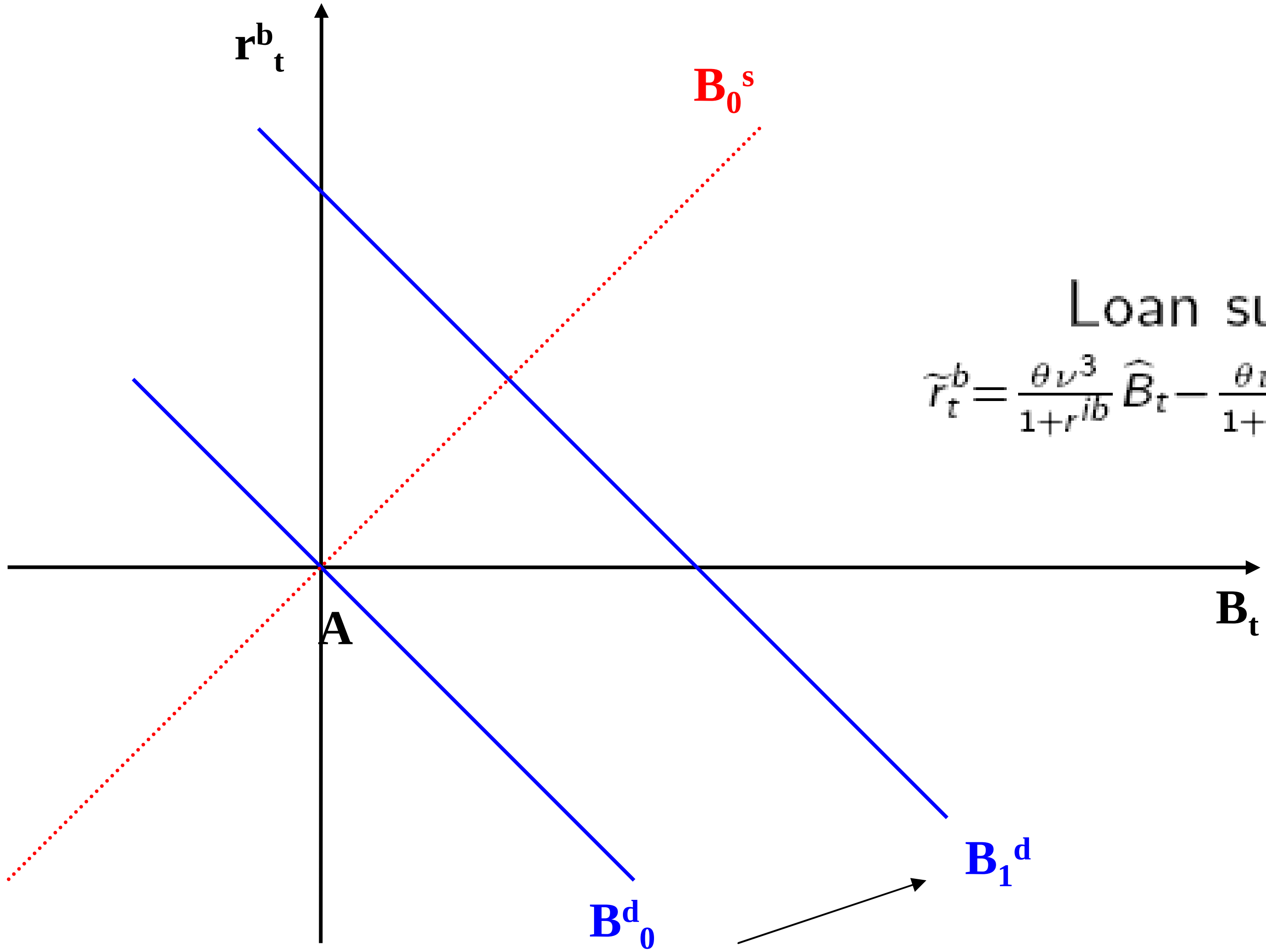

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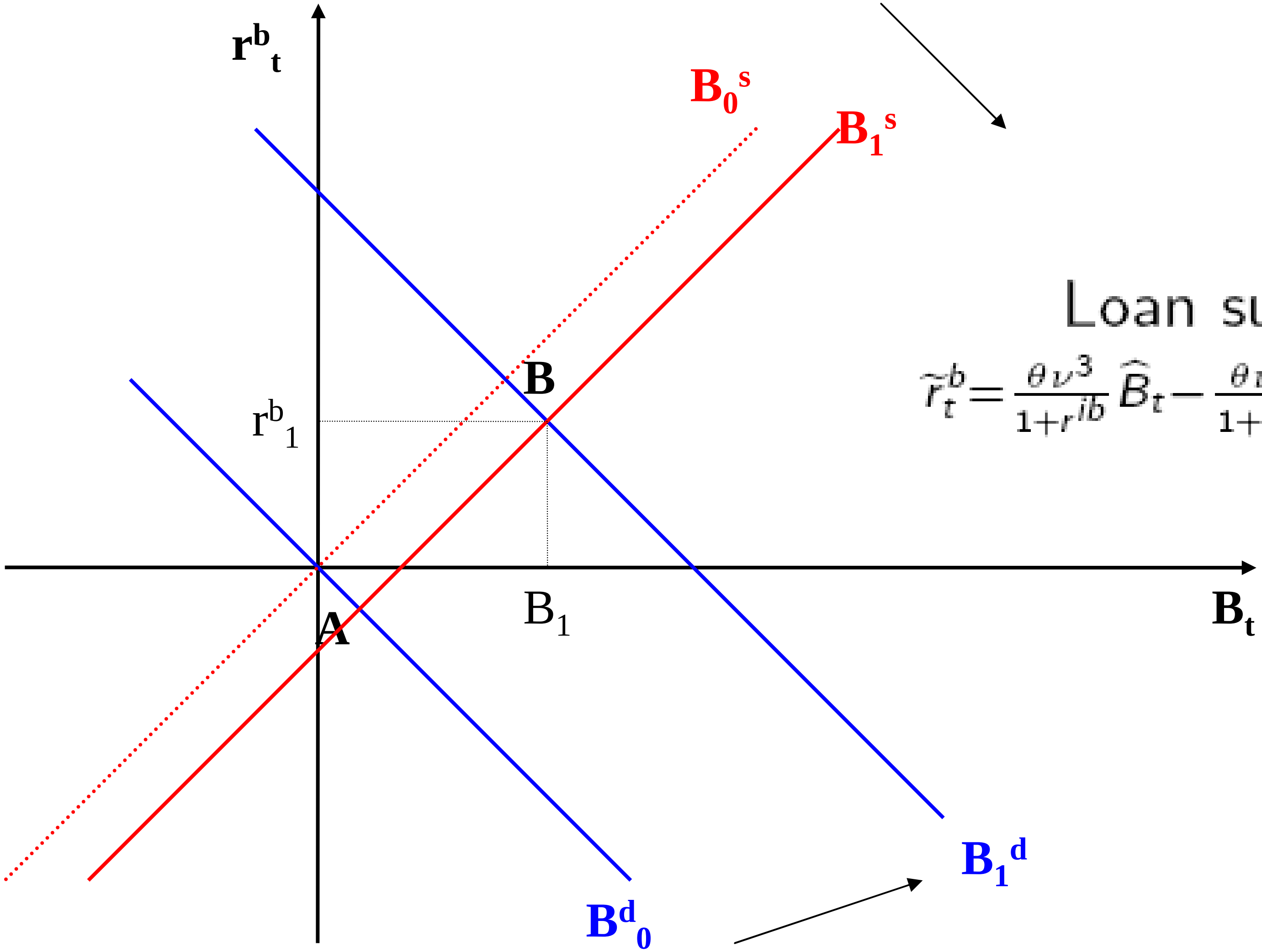

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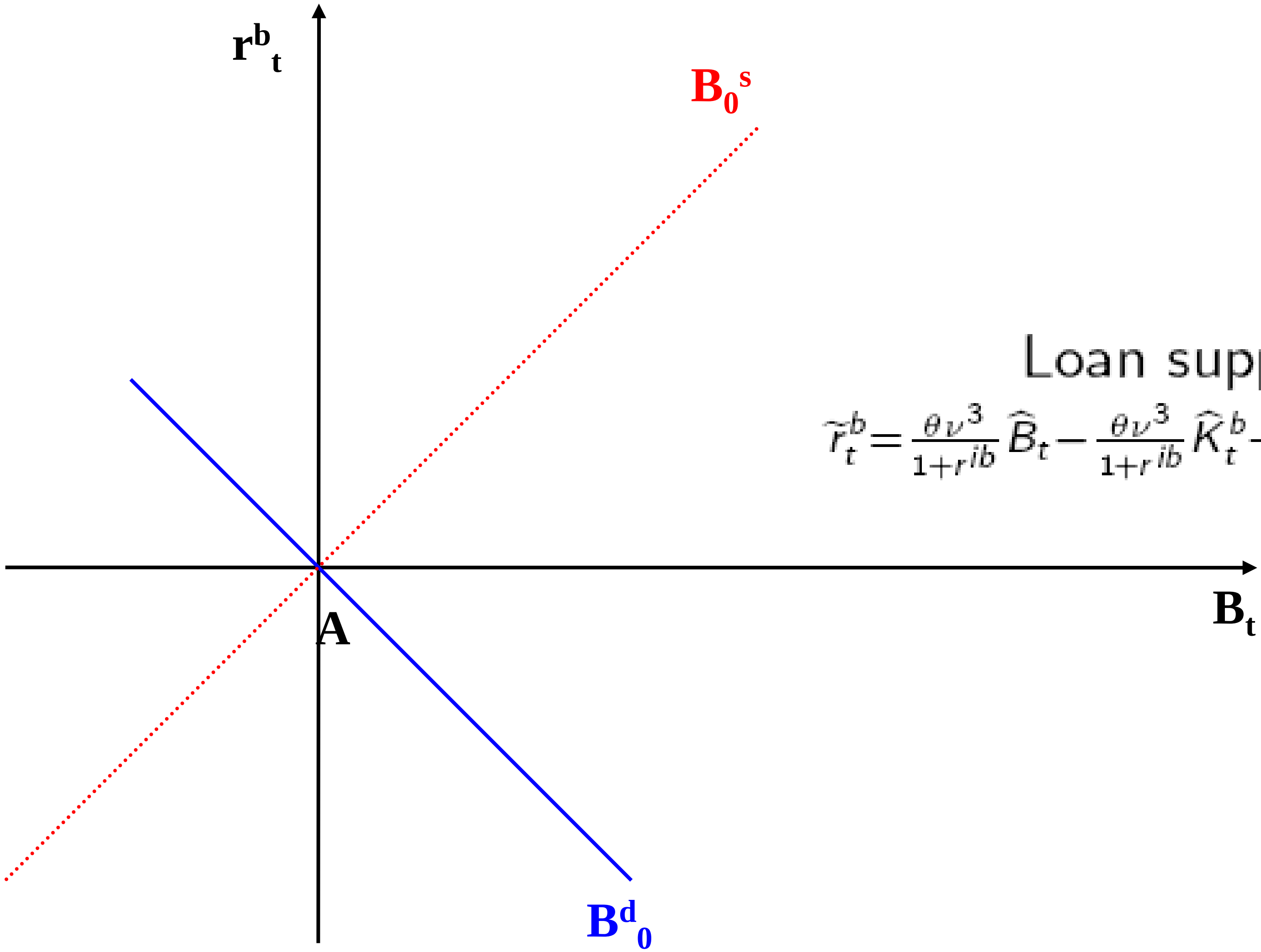
Case 3. Rule augm with APs: $r_t^{ib} = \varphi_\pi \pi_t + \varphi_q q^k_t$



Loan supply

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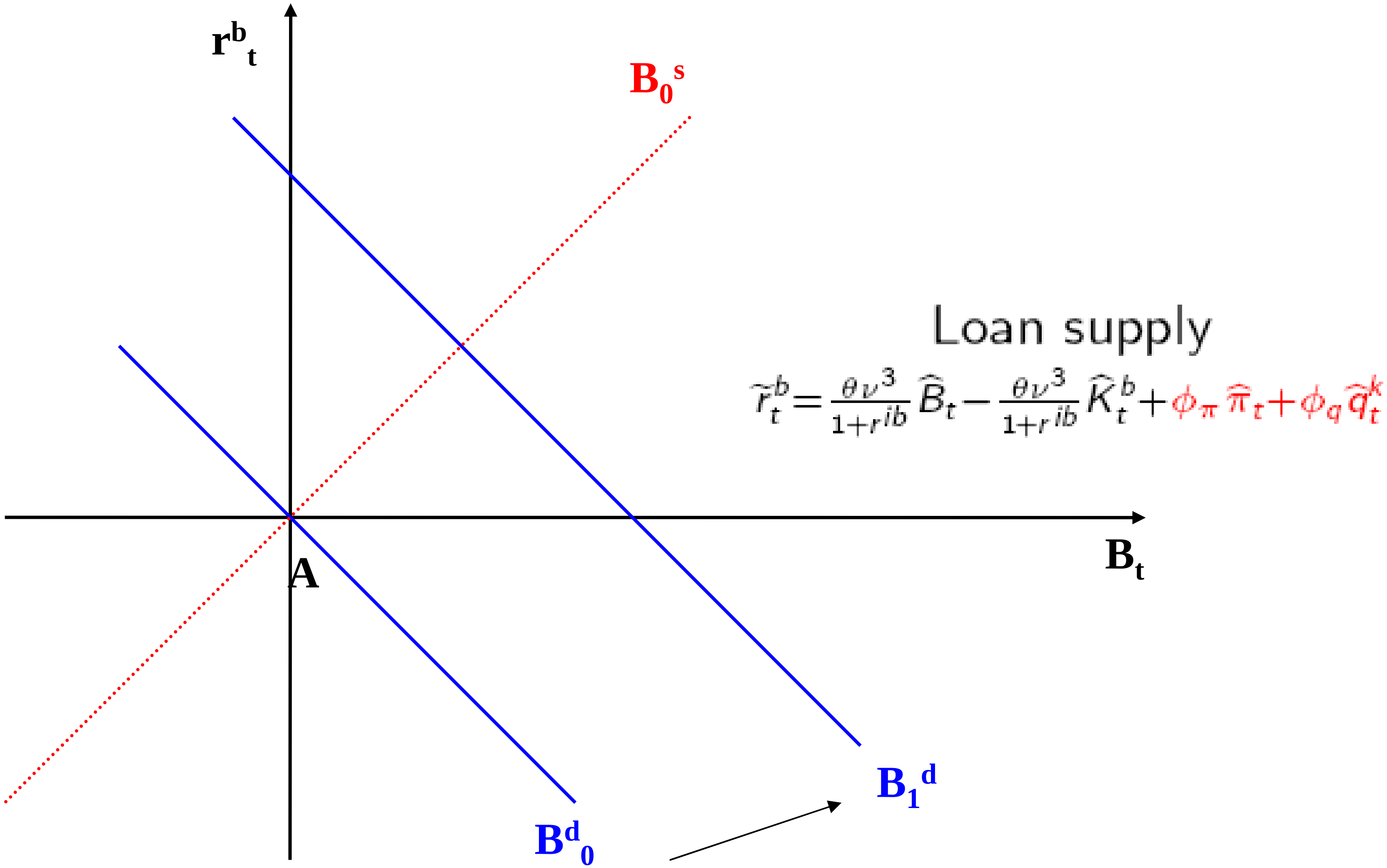

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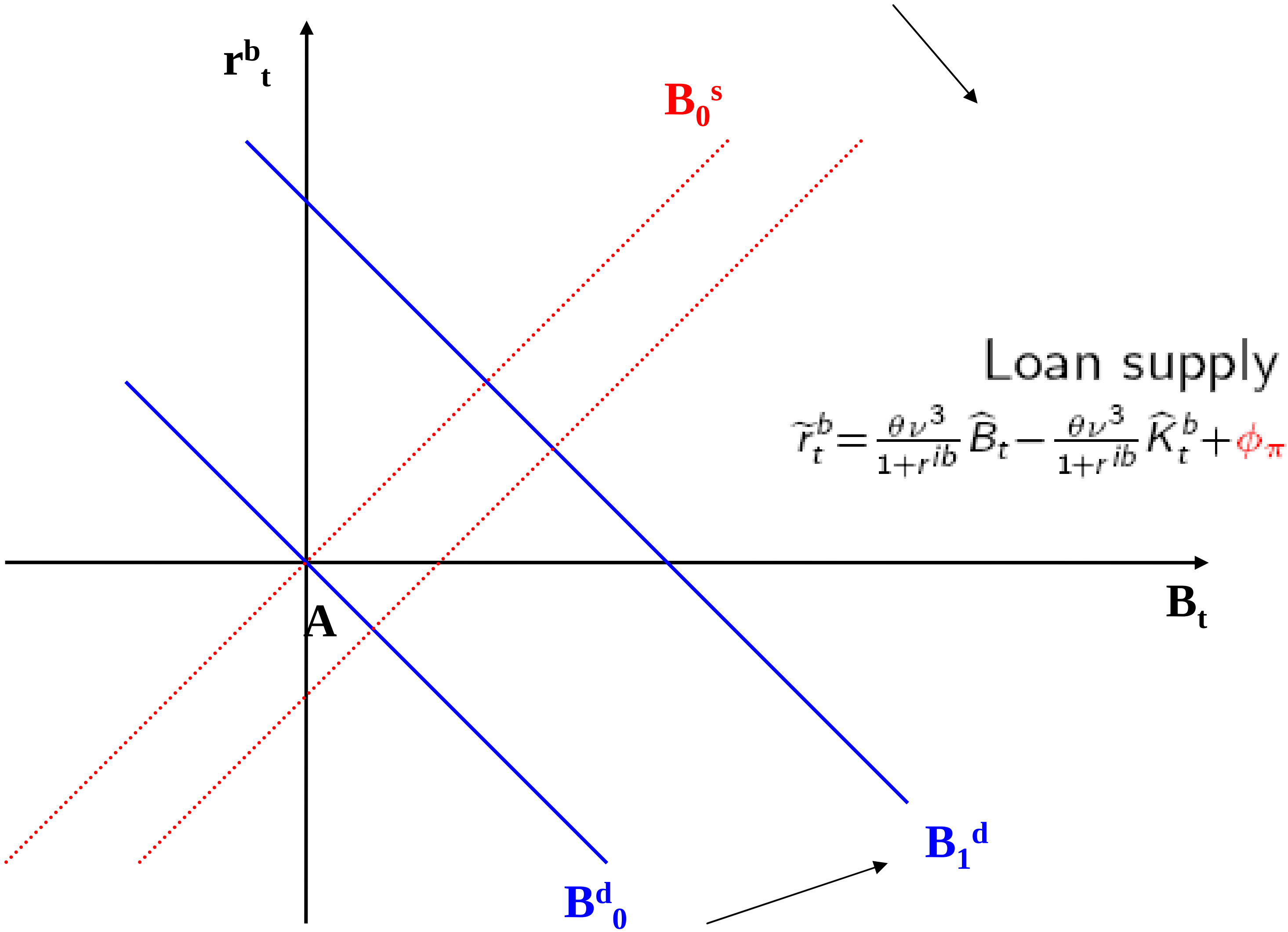

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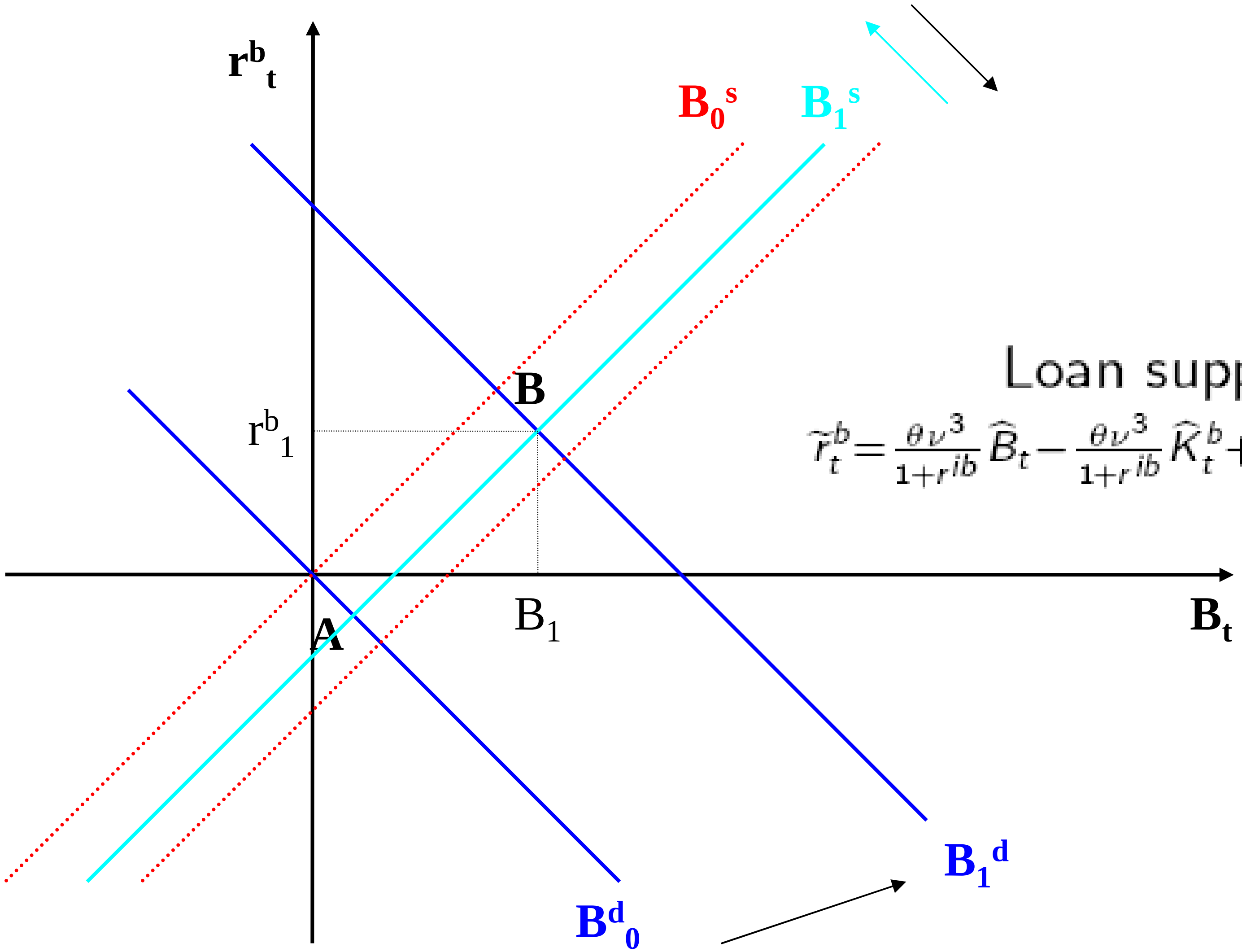

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Simulations: methodology

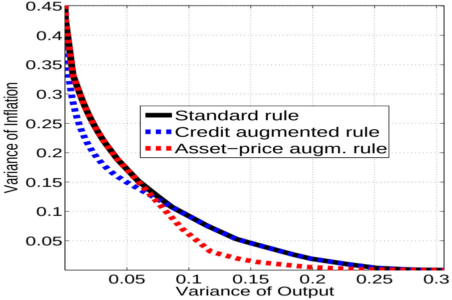
1. Take the general-form Taylor rule

$$\widetilde{r}_t^{ib} = \rho^{ib}\widetilde{r}_{t-1}^{ib} + (1-\rho^{ib})\left[\phi_\pi \widehat{\pi}_t + \phi_y \widehat{Y}_t + \phi_B \widehat{B}_t + \phi_q \widehat{q}_t^k\right] \quad (3)$$

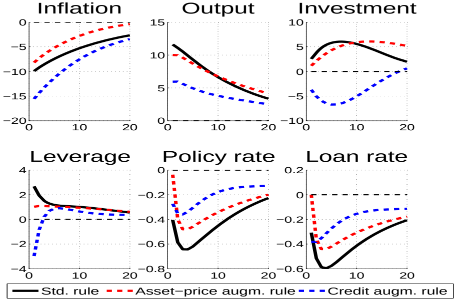
2. Construct grid of parameters
   - $\phi_\pi = [0 : 0.5 : 5]$
   - $\phi_y,\ \phi_B,\ \phi_q, = [0 : 0.25 : 2.5]$
   - other parameters calibrated as in GNSS
3. Simulate model (tech & cost-push shocks) for each rule and calculate σ_π, σ_y
4. Take the envelope $\Rightarrow$ Taylor frontiers, i.e. efficient outcomes
   - "Standard TR" $\Leftrightarrow \phi_B = \phi_q = 0$
   - "Augmented rules" $\Leftrightarrow \phi_B,\ \phi_q \neq 0$

Technology shock

Taylor frontiers



Impulse responses (TFP↑)



- MP is too procyclical under **std TR**, reinforcing the amplification effects of financial channels
- **Leaning against the wind** implies higher policy and loan rates ⇒ banks leverage expansion lower, and so is investment and output
- However, inflation volatility increases in some cases ⇒ tradeoff π/Y stabilization ⇒ "optimal response" depends on CB's preferences...

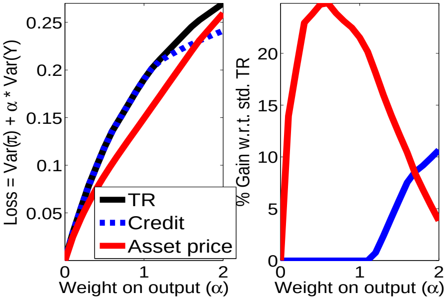
Technology shock (2)

Assuming an *ad-hoc* loss function

$$Loss = Var(\pi) + \alpha Var(Y)$$

we can calculate, for various weights on output stabilization α:

1. the value of the loss
2. the % reduction in loss wrt standard TR
3. the "optimal" coefficients on the financial variables



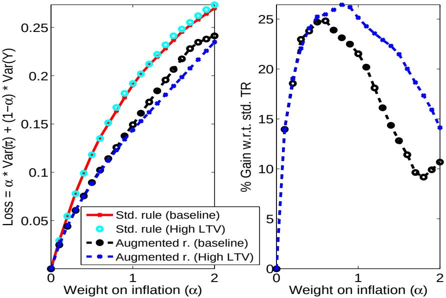
- Augmented rules improve $\forall \alpha \neq 0$
- Asset prices: good for low α, gains up to 25%
- Credit: smaller gains (up to 15%) for $\alpha > 1.25$

Is LATW more effective with high indebtedness?

We test whether leaning against the wind is more effective (for TS) in an economy where borrowers' are significantly more indebted (in steady-state)

- Obtained by doubling (from 0.25 to 0.50) the LTV ratio set by the banks (m^E) $\Rightarrow$ debt-to-income: $5 \rightarrow 13$; leverage (B/K): $25\% \rightarrow 45\%$
- The effects are to (i) reduce the slope of loan demand and (ii) magnify shifts in loan demand due to changes in past r_t^b.

We find gains from leaning against the wind in this economy as compared to the baseline (3% on average, up to 6% for some weights on output)



Conclusion

- We asked whether LATW may improve macroeconomic stabilization after macro shocks, in a DSGE model with a broad credit channel
- We found that LATW may reduce macroeconomic volatility by up to 20%-30%, depending on the shock and CB's preferences, by offsetting the amplification effects of financial channels
- The case for LATW is stronger in economies with highly indebted borrowers

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Caveats/work to be done:

- The results so far are only qualitative; a natural integration is to repeat the exercise with the estimated GNSS model, for quantitative relevance
- Results could be model-specific: extension to borrowing households and more importance to housing collateral
- Our model is for "normal" times. Co-operation between the CB and the macroprudential authority needs to be more deeply analyzed

Thank you!

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