Bank Capital Regulation, Lending Channel and Business Cycles

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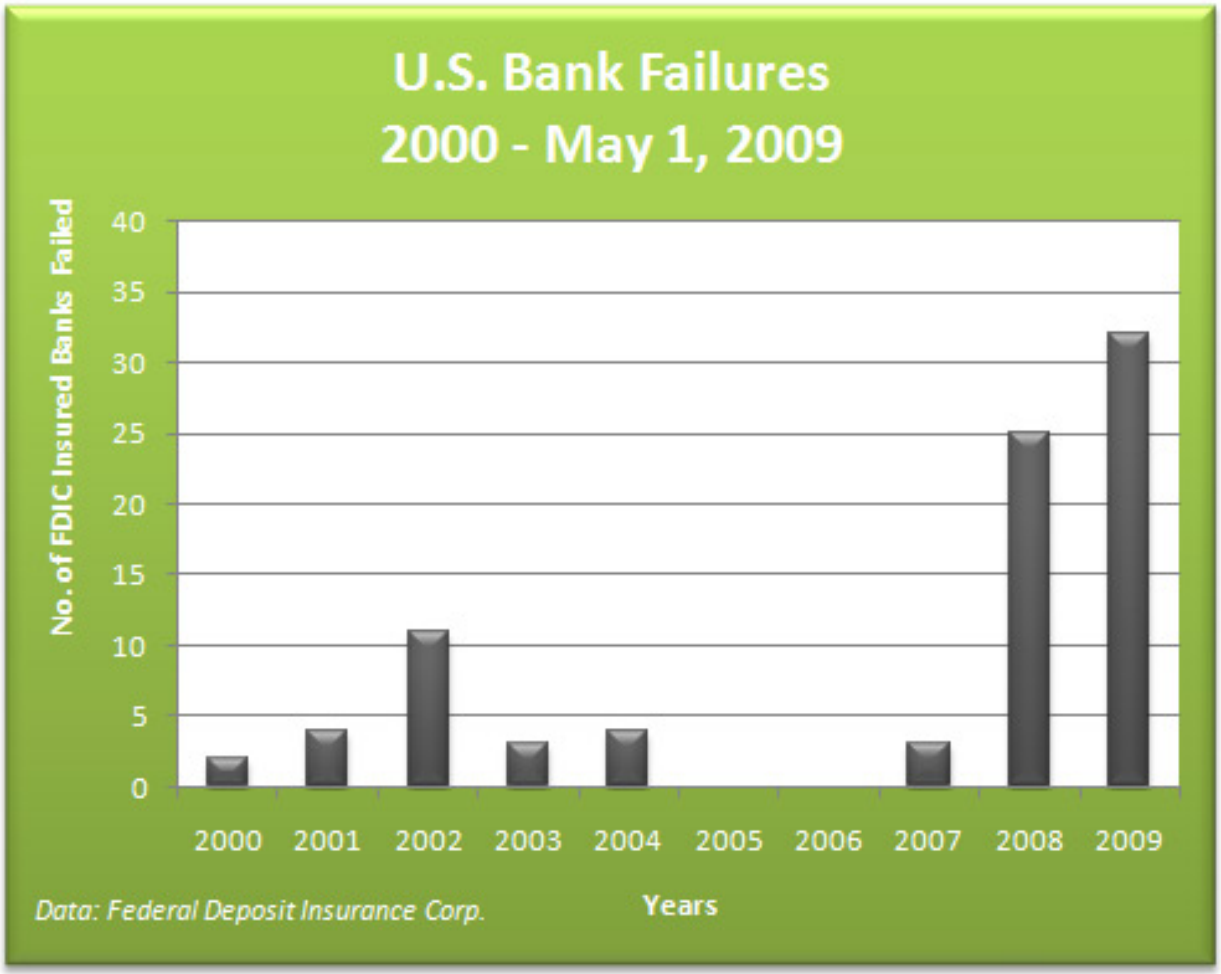
Motivation



More to Come: FDIC, August, 2009 "416 Banks on endangered list."

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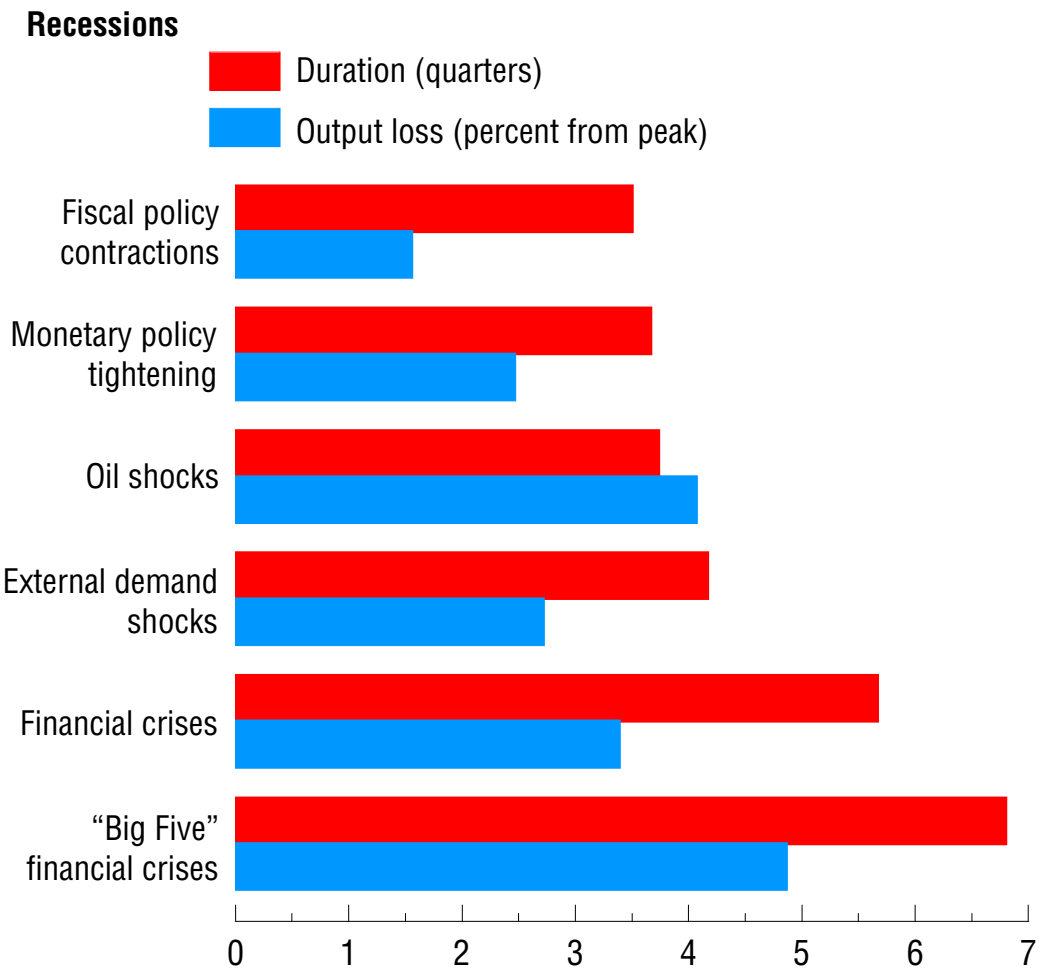

IMF, WEO(2009),"*Recessions associated with financial crises tend to be unusually severe and their recoveries typically slow.*"

Motivation

Macroeconomic Questions:

- How are the effects of macroeconomic shocks amplified and propagated through the financial system when the financial system itself is not stable?
- What are the macroeconomic costs of banking instability?

Selective Literature Review

What has been done...

- Credit Demand (Financial accelerator): Bernanke,Gertler and Gilchrist (1999), Carlstrom and Fuerst (1997)
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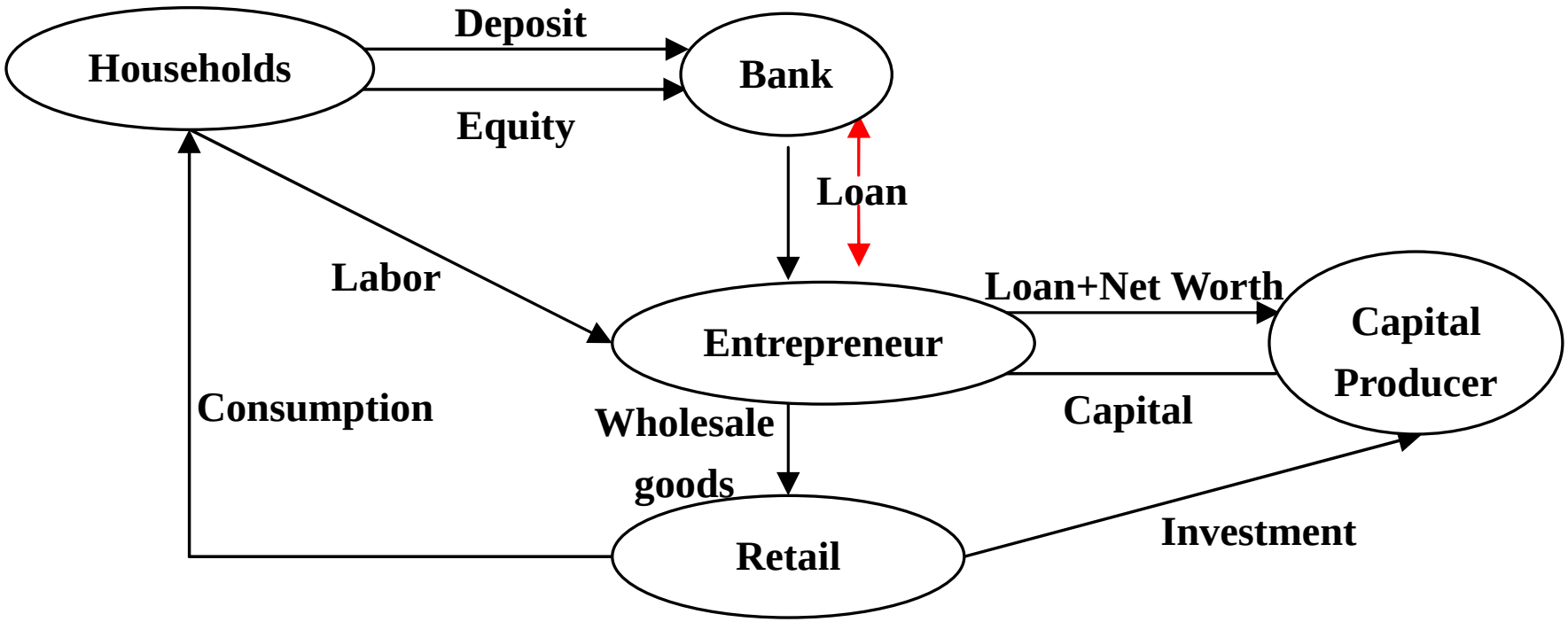
What is missing...

- No instability in the banking sector. No uncertainty in bank's loan default rate and portofolio return.
- No variation of bank capital ratio.

Contribution

- Financial contract that pins down the optimal capital structure of firms and banks in a realistic setting: namely full deposit insurance and bank capital regulation.
- Endogenously derive uncerntainy in bank's loan portfolio.
- Introduce bank capital position as an additional state variable that amplifies and propagates business cycles.

Structure of Economy



Financial Contract

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- Entrepreneurs maximize their profit subject to the participation constraint of banks, $\overline{\omega}$ is pinned down.

Financial Contract

- Credit demand derived from optimal contract

$$E_t R^k_{t+1} = S(\frac{q_t K_{t+1}}{N_{t+1}}) R^f_{t+1}$$

- Cost of bank fund R^f_{t+1}:
  In BGG, risk free rate.
  In Bank Capital Channel literature, linear combination of cost of bank equity and deposit.

$$R^f_{t+1} = \Delta_t R^e_{t+1} + (1 - \Delta_t) R^d_{t+1}$$

  Δ_t is bank capital ratio.

Financial Contract

Major difference compared to BGG conract:

- BGG (1999): state-contigent contract. entrepreneurs undertake all the aggregate risk. (All the aggregate shocks are absorbed by firm's net worth) Bank has safe loan portfolio.
- In this model, entrepreneurs and banks share aggregate risk. Contract has fixed loan rate. Ex-post default rate may deviate from ex-ante default rate, banks face uncertainty in loan portfolio. (Aggregate shocks hit both the firm and bank's balance sheet)

$$\overline{\omega}^b = \frac{\overline{\omega}^a E_t R^k_{t+1}}{R^k_{t+1}}$$

$\overline{\omega}^a$ - ex-ante default

$\overline{\omega}^b$ - ex-post default

State variables

- Evolution of Bank capital:

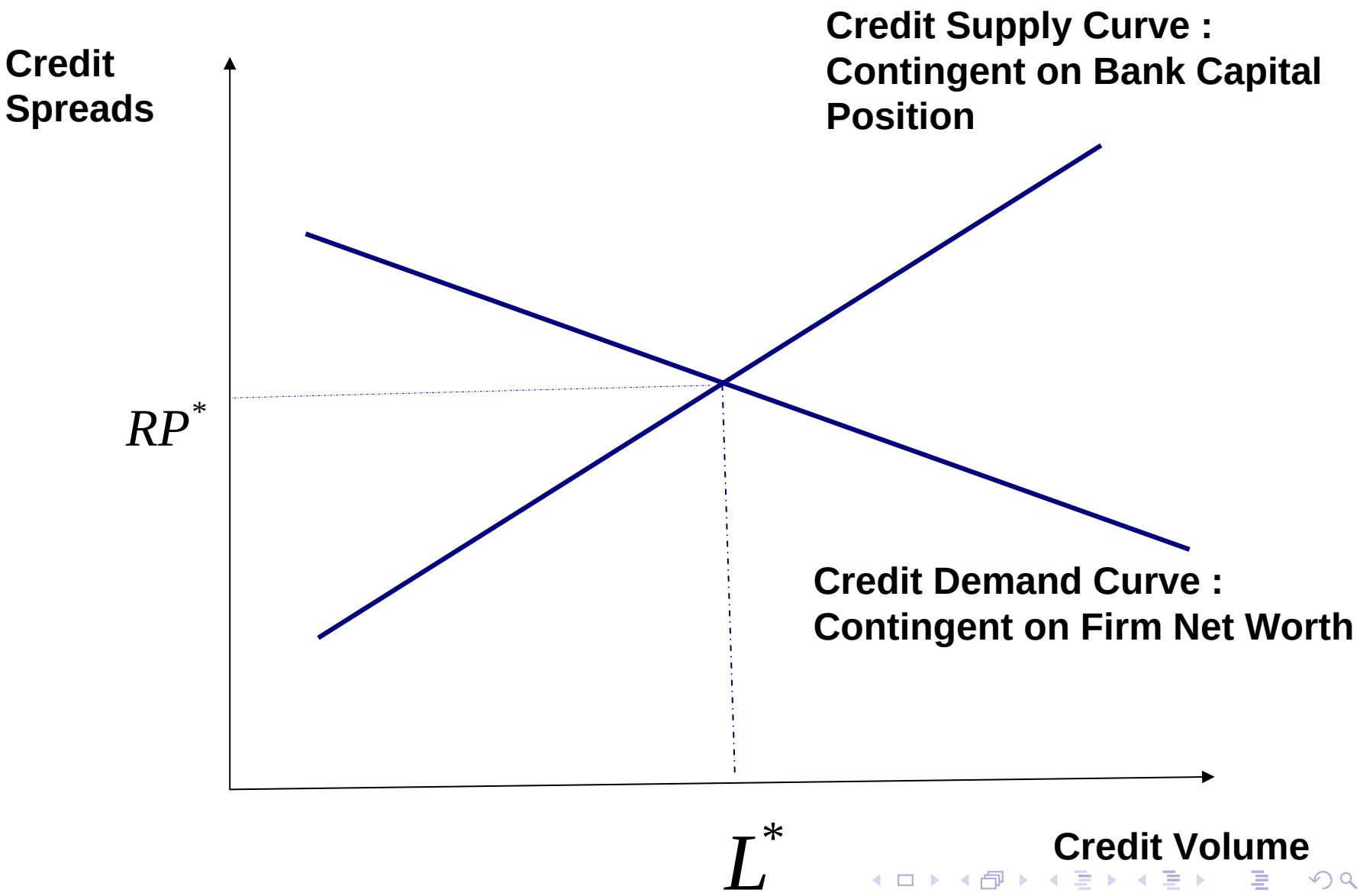
$$e_{t+1} = (1-\Phi_t)e_t + R^L_{t+1}L_{t+1}(F(\overline{\omega}^a) - F(\overline{\omega}^b)) + (1-\mu)\int_0^{\overline{\omega}^b} \omega R^k_{t+1} q_t K_{t+1} f(\omega) d\omega - (1-\mu)\int_0^{\overline{\omega}^a} \omega E_t R^k_{t+1} q_t K_{t+1} f(\omega) d\omega + w^e_t$$

- Evolution of Entrepreneur net worth:

$$N_{t+1} = \gamma V_t + w^e_t$$

$$V_t = \int_{\overline{\omega}^b}^{\infty} \omega R^k_{t+1} q_t K_{t+1} f(\omega) d\omega - (1 - F(\overline{\omega}^b)) R^L_{t+1} L_{t+1} - \int_0^{\overline{\omega}^b} \mu\omega R^k_{t+1} q_t K_{t+1} f(\omega) d\omega$$

Intuition

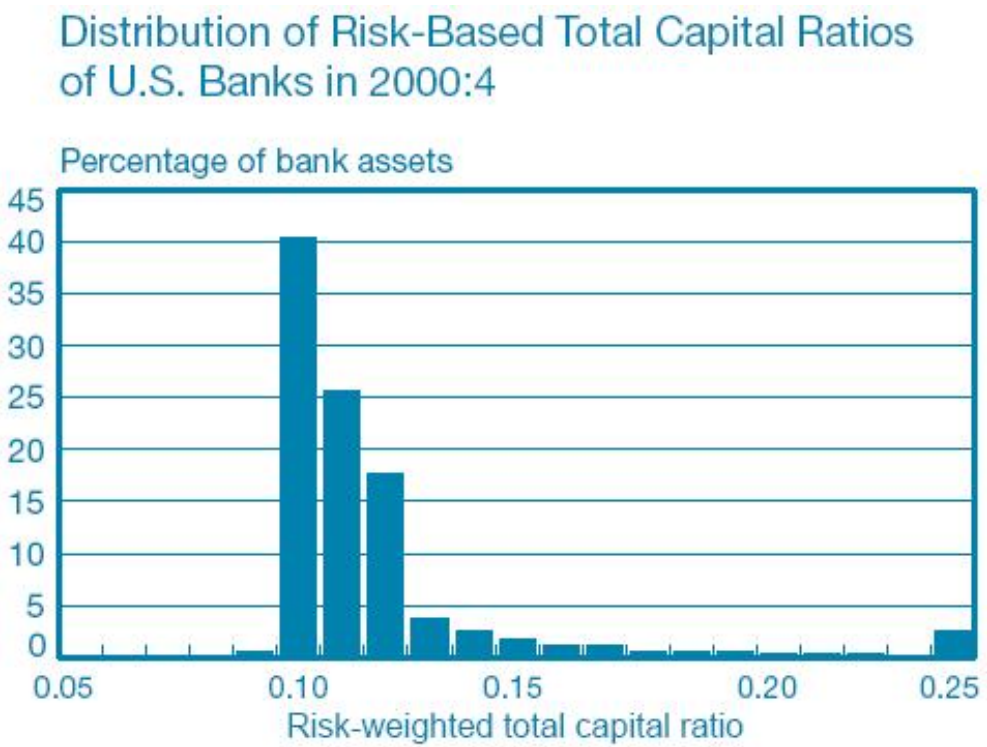

Credit Supply Curve :
Contingent on Bank Capital Position
Credit Spreads
RP^*
Credit Demand Curve :
Contingent on Firm Net Worth
L^*
Credit Volume

Banking regulation

- Basel Accord: Risk adjusted capital to asset ratio minimum 8 percent.

$$\Phi_t = cdf(\Delta_t, \sigma)$$

- $\Delta_{i,t}$ is lognormal distributed with mode of Δ_t, standard deviation of σ).



source:" Does bank capital matter for monetary transmission", Van den Heuvel, Federal Researve Bank of New York

- Household:

$$\max E_t \sum_{k=0}^{\infty} \beta^k [\ln(c_{t+k}) + \frac{d_{t+k}^{1+\varphi}}{1+\varphi} + \rho \ln(1 - l_{t+k})]$$

subject to

$$d_{t+1} + e_{t+1} + c_t = w_t l_t + R_{t+1}^d d_t + R_{t+1}^e (1 - \Phi_{t+1}) e_t + \Pi_t$$

Φ_t is bank default rate.

- Aggregate production function:

$$Y_t = A_t K_t^{\alpha_k} h_t^{\alpha_h} (h_t^e)^{\alpha_e} (h_t^b)^{\alpha_b}$$

- Capital supply curve:

$$q_t = 1 + \chi(\frac{i_t}{k_t} - \delta)$$

- Retail Sector (Monopolistic Competition and Calvo Pricing)

$$\beta E_t \pi_{t+1} = \pi_t - (1 - \beta\theta)\frac{1-\theta}{\theta}\hat{mc}_t$$

- Monetary Policy

$$r_t^n = \rho_r r_{t-1}^n + \rho_\pi \pi_{t-1} + \epsilon_t$$

Calibration

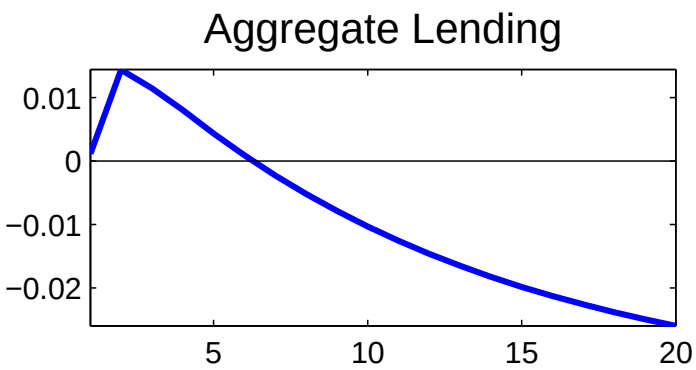
Parameters are calibrated to match following steady states:

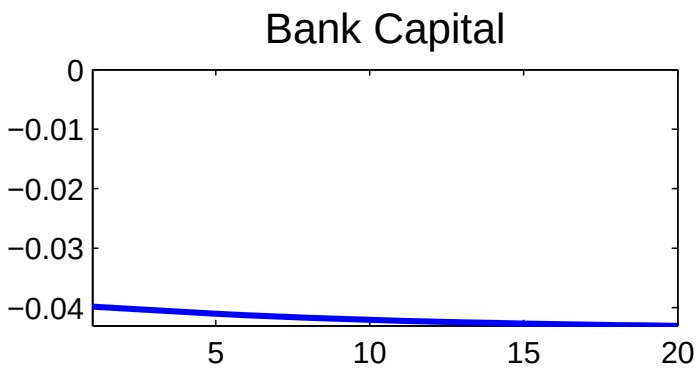
- Leverage ratio 50 percent
- Bankrupty rate of entrepreneur 2.6 percent
- external finance premium 180bp
- Bank capital ratio 10 percent
- Bank default rate 1 percent
- Bank equity premium 480bp
- mark-up 20 percent

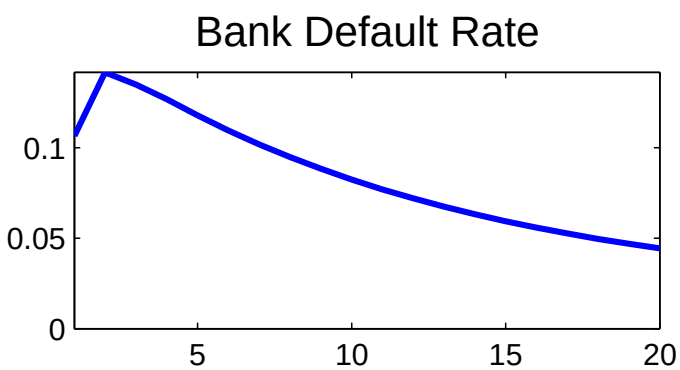
Other parameters important for dynamics:

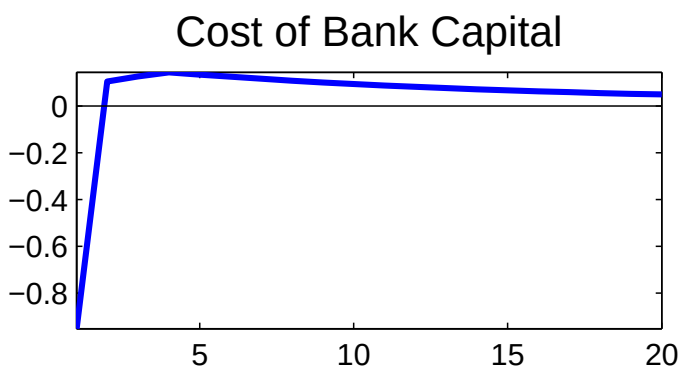
- Calvo probability 0.75
- Capital adjustment parameter 2 (King and Wolman (1996), Chirinko (1993))

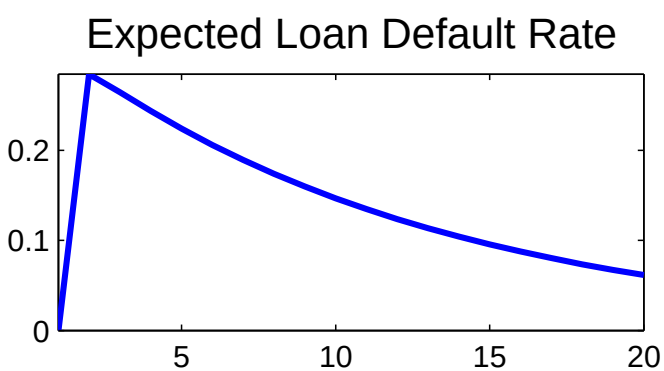
Impulse Responses to Monetary Policy Shock

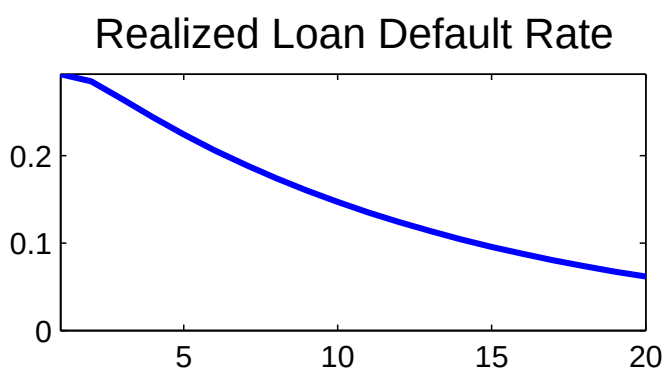






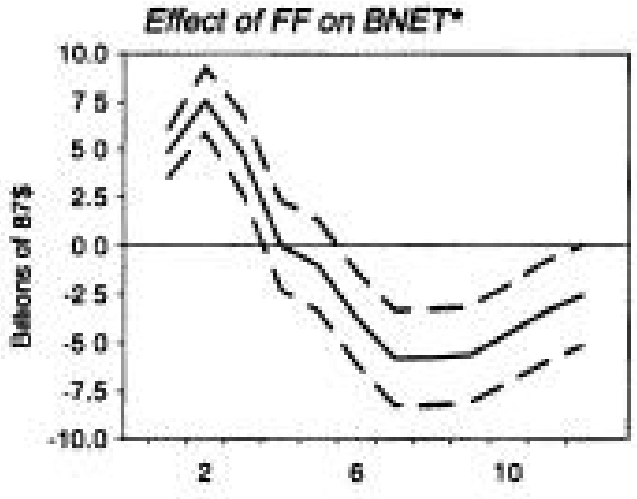




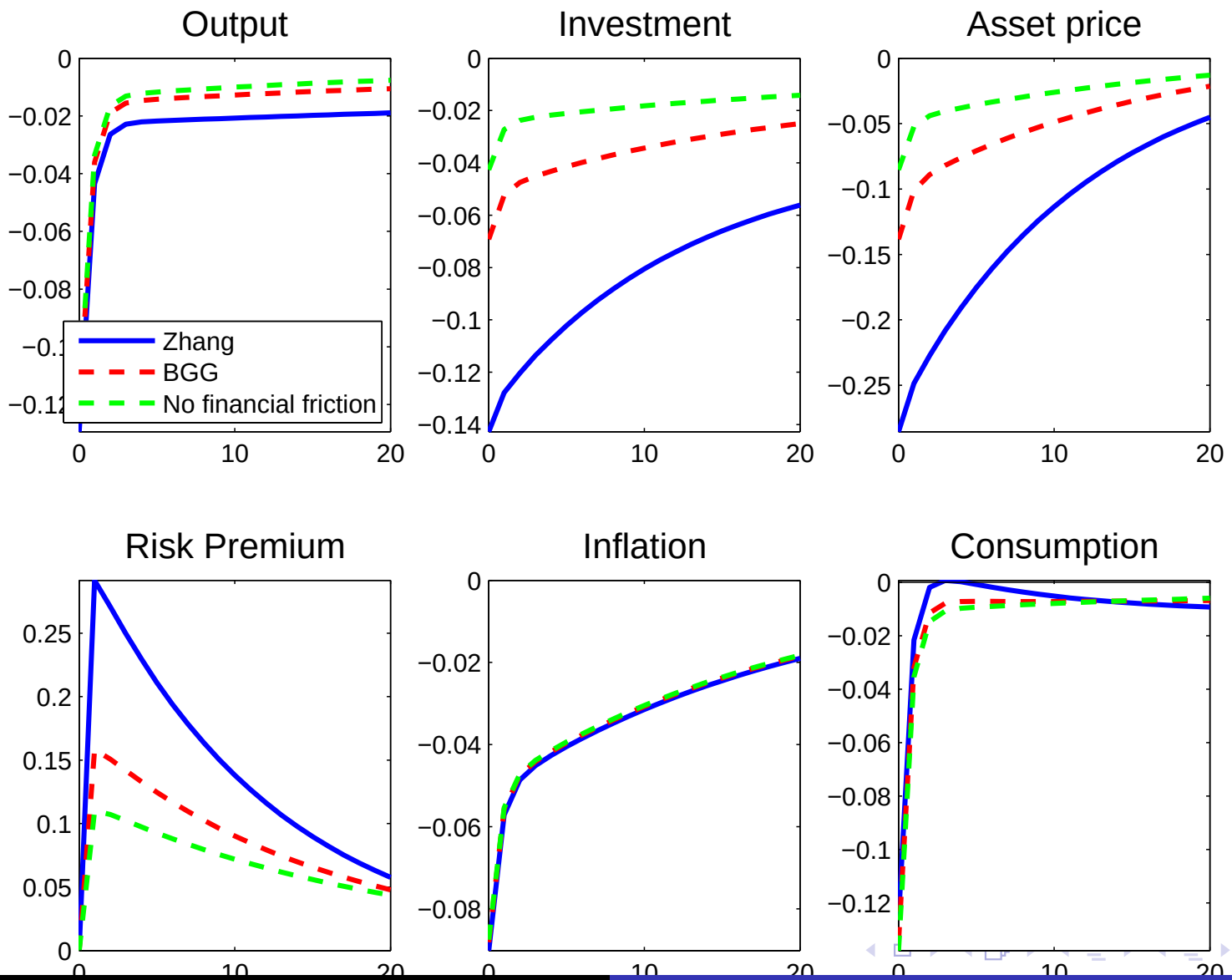


Empirical Evidence

Christiano, Eichenbaum and Evans (JPE, 2005) 'Following a contractionary monetary shock, net funds raised by the business sector increase for roughly a year, after which it falls.'



Short Run Effect of Bank Capital Channel: Monetary Shock



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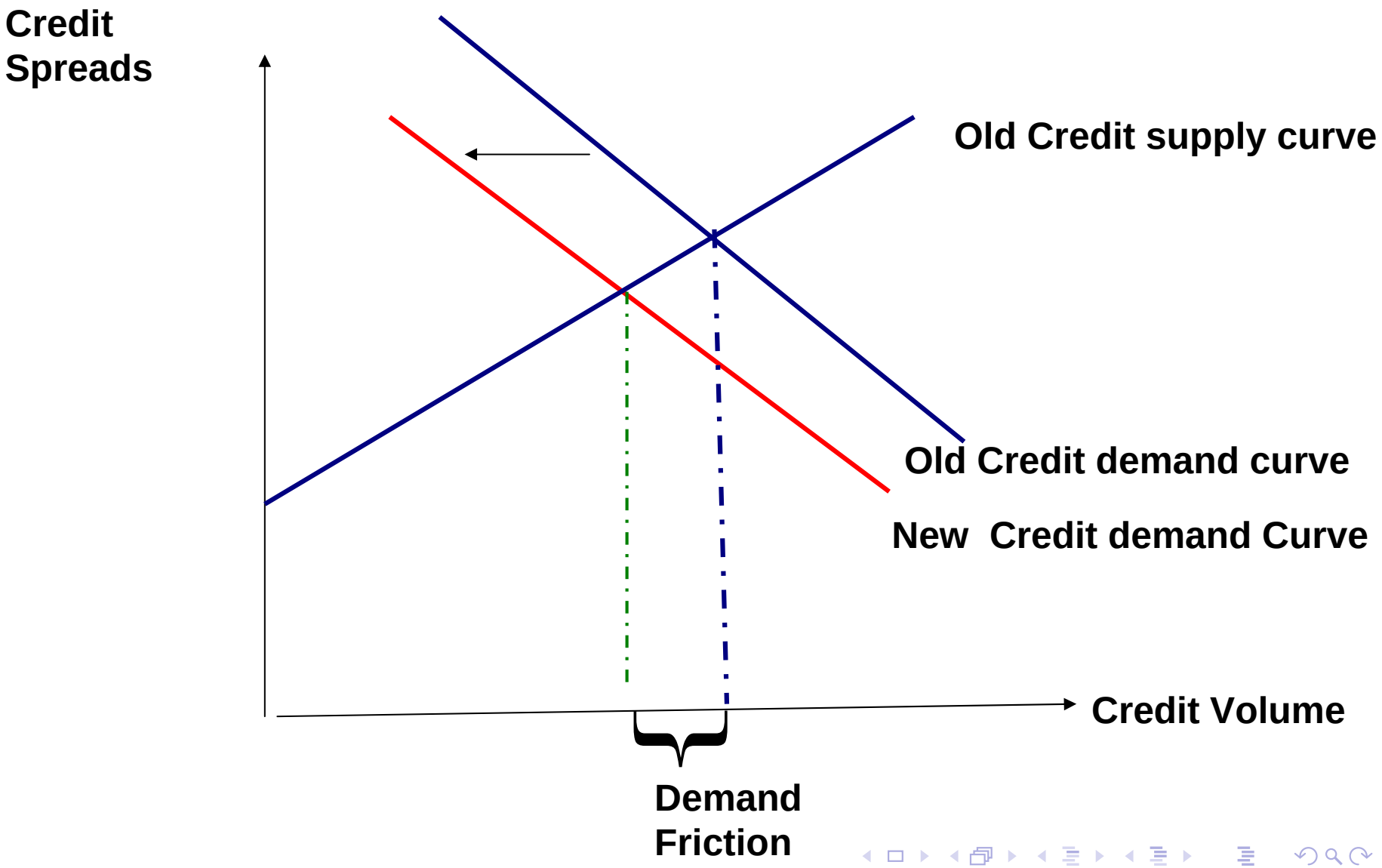
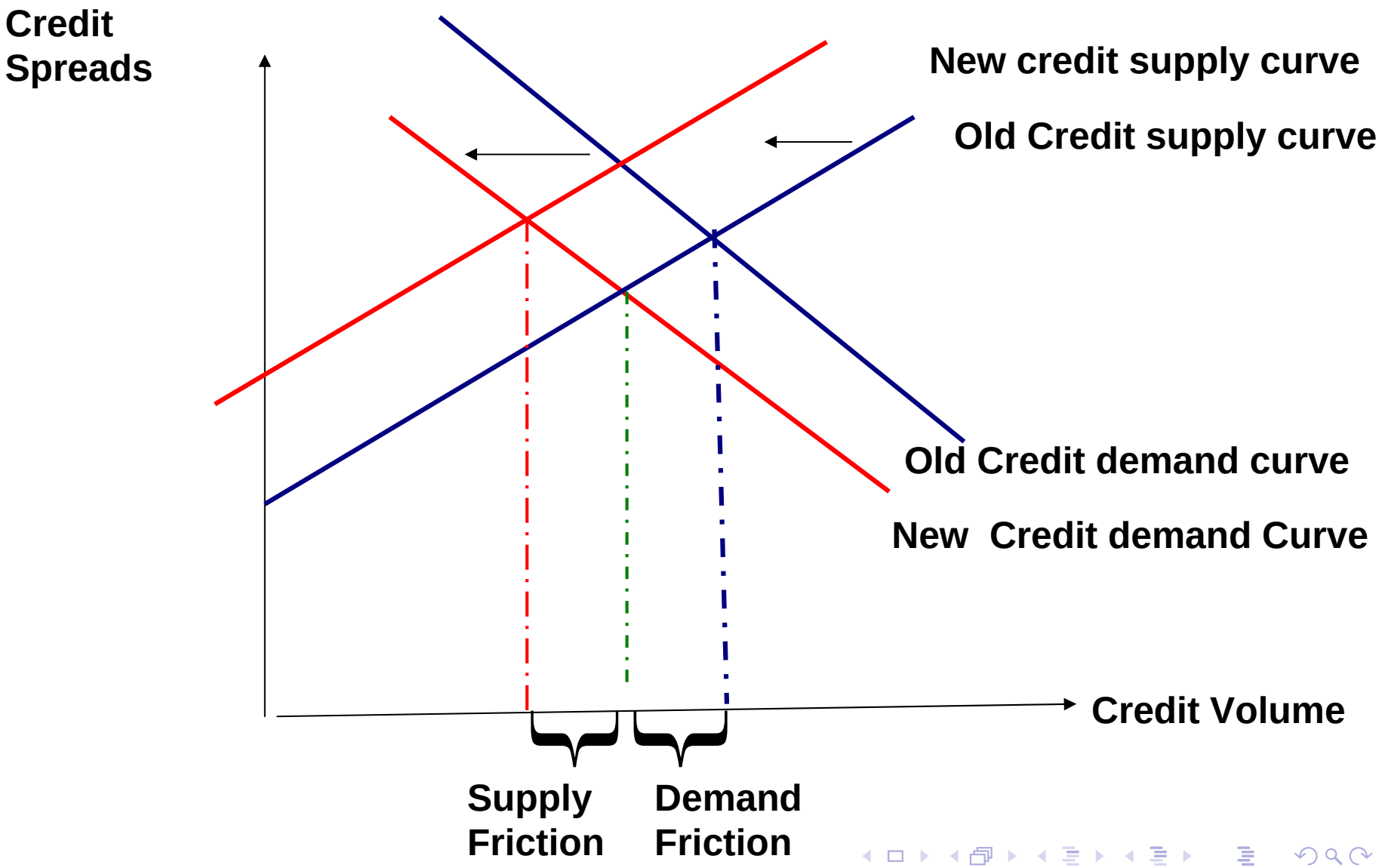
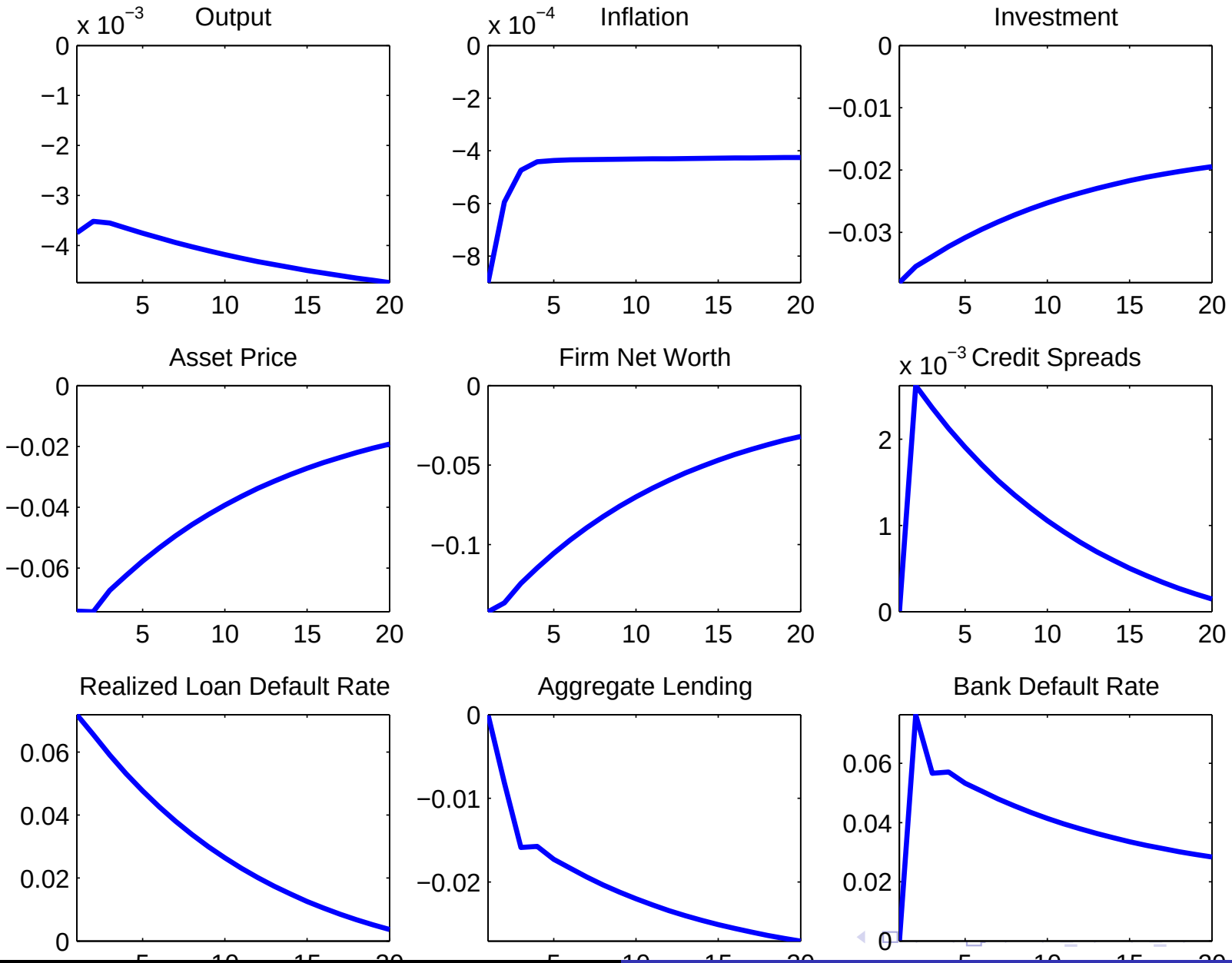

Credit Spreads
Old Credit supply curve
Old Credit demand curve
New Credit demand Curve
Credit Volume
Demand Friction

Intuition


Credit Spreads
New credit supply curve
Old Credit supply curve
Old Credit demand curve
New Credit demand Curve
Credit Volume
Supply Friction
Demand Friction

Financial Shock: Sudden decline in Bank Capital



Long Run Effect of Bank Capital Channel

Variable	ZHANG	BGG
Capital	7.1621	7.4116
Investment	0.17905	0.1853
Output	0.86509	0.875
Consumption	0.68604	0.68964

- Compared to BGG, additional banking capital channel leads to lower level of investment and output in the long run.

Conclusion

- Banking instability amplifies and propagates business cycles to a large extent in the short run.
- Banking instability leads to lower investment and output in the long run.
- Extend the model to consider consumer loan and to open economy.
- Use the model to give policy suggestions on banking regulation.