A Macroeconomic Model with Financially Constrained Producers and Intermediaries

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This paper

- Quantitative macroeconomic model with final borrowers and financial intermediaries
- Incorporate stochastic credit risk (defaults) and maturity mismatch (maturity transformation)
- Compare the effects of normal recessions with financial recessions
- Use model to evaluate macro-prudential policy

The model

- Savers make short-term safe deposits at banks (deposit insurance)
- Banks make long-term risky loans to borrowers:

$$A_t,\ \delta A_t,\ \delta^2 A_t, ... \qquad \text{market value } q_t^m$$

  - idiosyncratic default risk is diversified
  - but default rate is stochastic
  - interest rate risk (maturity mismatch)
  - leverage constraint

- Borrowers buy risky capital and hire labor to produce goods and new capital
  - stochastic default rate
  - leverage constraint

- Aggregate shocks to TFP growth and idiosyncratic risk

Borrower risk sharing and default

- Each borrower has a time-independent idiosyncratic shock that affects their profits. He defaults if profits are negative this period (more on this later). Banks seizes everything they can, but some is wasted

- But at the end of the period borrowers share everything; next period everyone gets the same capital and debt

- $\Longrightarrow$ Representative borrower, no need to keep track of distribution, no misallocation

Borrower Default

- Borrowers default if their current profit is negative

$$\pi_{i,t} = g_{i,t} K_t^{1-\alpha} (Z_t L_t)^{\alpha} - \sum w_t^j L_t^j - A_t$$

  where $g_{i,t}$ is the idiosyncratic shock (including effort) and A_t is the debt coupon due today.

- Bank seizes not only profits but also capital worth $p_t K_t$, and reduces debt by $q_t^m A_t$.
  - why would a borrower default as soon as debt coupon is above current operating profits?
  - housing crisis: low house values $\implies$ defaults and foreclosures
  - policy of keeping asset prices high to avoid defaults?

- High idiosyncratic risk $\sigma_{t,\omega}$ or high debt payments A_t $\implies$ more defaults
  - Representative borrower has stochastic default rate
  - does it internalize the effect of A on q^m?

Bank default

- Banks default when the value of assets (loans) is less than value of liabilities (deposits)
  - $+$ random utility cost to smooth things out

- Depositors are bailed out by government $\implies$ risk-shifting
  - "heads we win, tails the government loses"
  - deposit insurance fee κ, and leverage constraint:

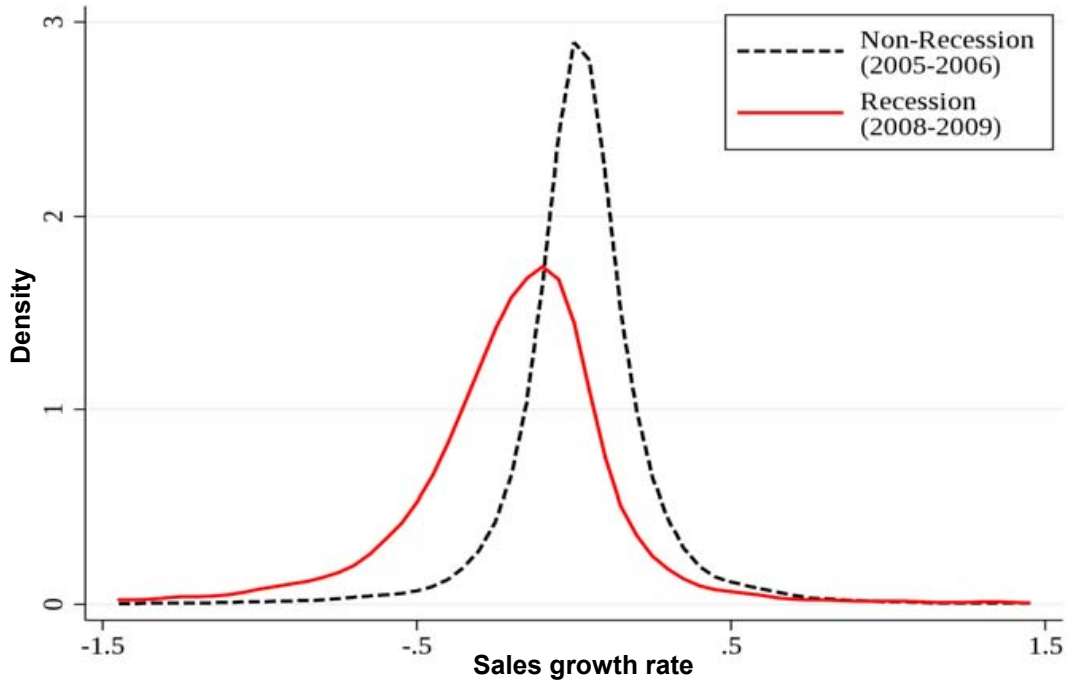
$$\text{deposits} \leq \xi \times \text{assets}$$

  - why is the government providing bailouts in this environment? (bailouts are ultimately paid by savers)

Financial recessions and risk shocks

- Non-financial recessions: negative shock to TFP growth ("growth shock")
- Financial recession: growth shock + higher idiosyncratic risk

Figure 2: The variance of establishment-level sales growth rates increased by 152% in the Great Recession

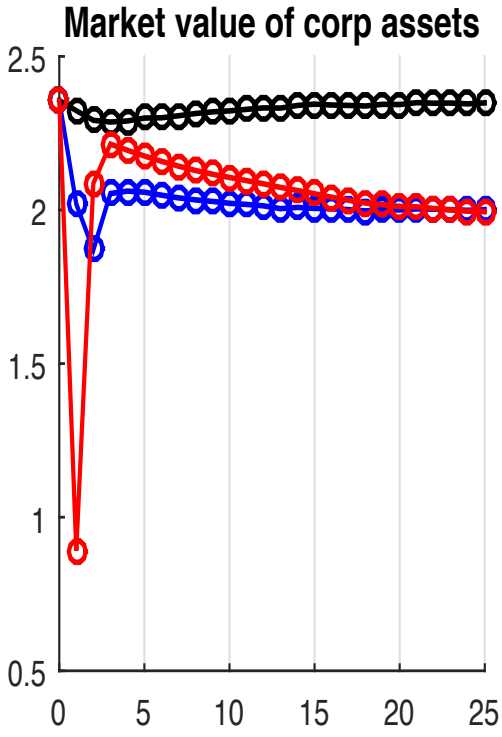


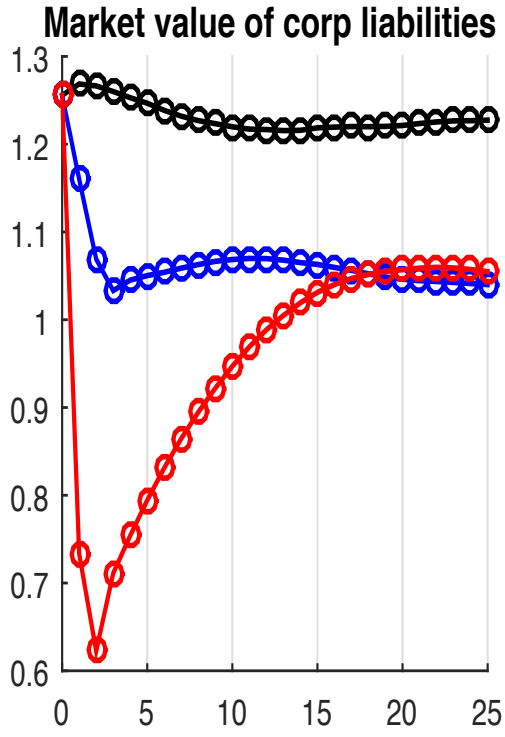
Notes: Constructed from the Census of Manufactures and the Annual Survey of Manufactures using a balanced panel of 15,752 establishments active in 2005-06 and 2008-09. Moments of the distribution for non-recession (recession) years are: mean 0.026 (-0.191), variance 0.052 (0.131), coefficient of skewness 0.164 (-0.330) and kurtosis 13.07 (7.66). The year 2007 is omitted because according to the NBER the recession began in 12/2007, so 2007 is not a clean "before" or "during" recession year.

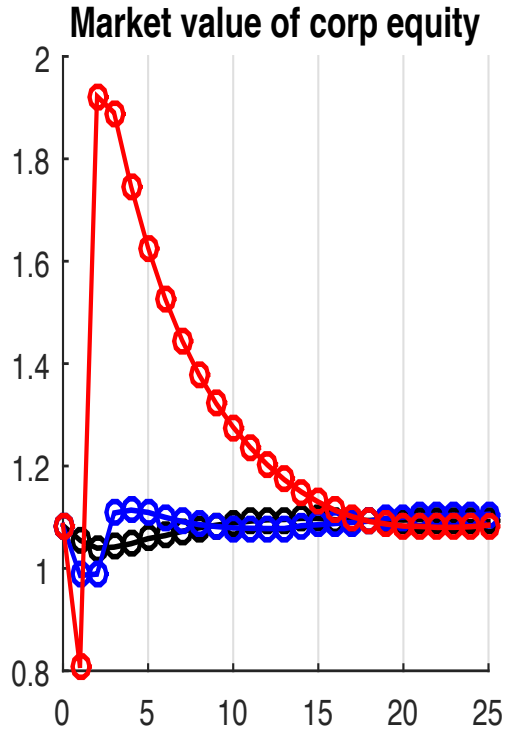
- Bloom et al. [2012]

Borrowers' risk

- borrowers are exposed to aggregate shocks through the value of capital $p_t K_t$
- ... but default reduces their debt
- their equity is initially hit very hard... but then it rebounds and overshoots! (why?)







Banks' risk

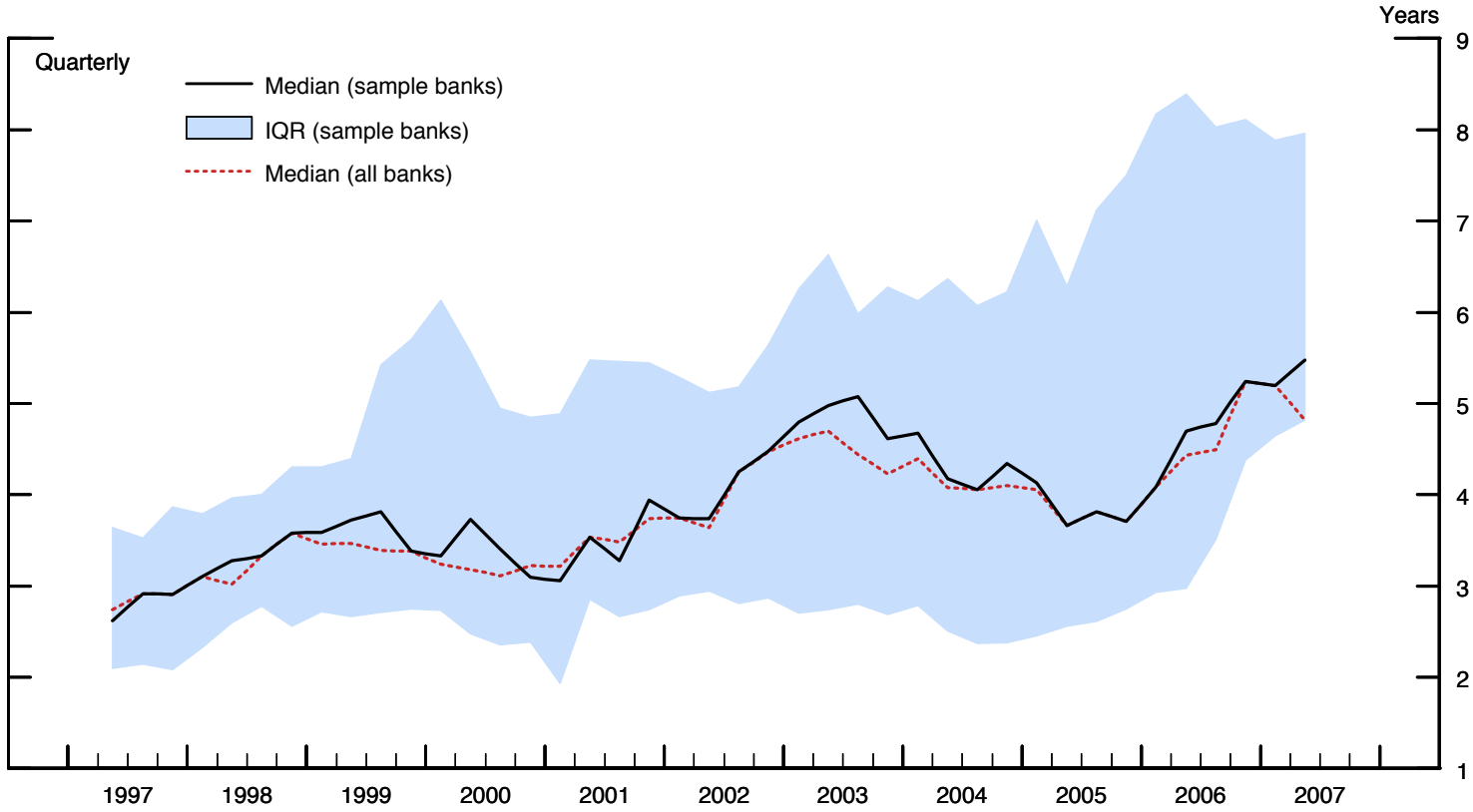
- Bank risk:
  - credit risk (higher defaults)
  - interest rate risk (maturity mismatch)
  - this is right: Begenau et al. [2013]

- But incomplete markets. In practice banks
  - use interest rate swaps to increase their exposure to interest rate risk (Begenau et al. [2013])
  - adjust the maturity of their assets (e.g. fixed vs. variable rate loans)
  - securitization strategy, CDS

- How would the model work with complete markets?
  - Di Tella [2013]: shocks to idiosyncratic risk produce financial crises even with complete markets

Banks' maturity mismatch

- Maturity mismatch = maturity of assets - maturity of liabilities



  - English et al. (2012)
- maturity mismatch goes up when interest rates are low

The role of financial frictions

- We have a model with EZ preferences, and savers have high EIS $= 4$, and really high RRA $= 20$.
- Then we hit it with shocks to growth rate and risk
  - Bansal et al. [2009, 2014], Bansal and Yaron [2004]
- How much of the effects come from this, and how much from the financial frictions, defaults, intermediaries?

Macro-prudential policy

- Three experiments:
  - raise deposit insurance fee κ
  - tighten banks' leverage constraint ξ

$$\text{deposits} \leq \xi \times \text{assets}$$

  - tighten firms' leverage constraint

- Tightening constraints benefits the agent getting regulated: monopoly power? Deposit insurance fee κ helps savers because it reduces risk shifting?

- But what is the optimal policy? We have several sources of inefficiency here:
  - bailouts $\implies$ risk shifting: use deposit insurance fee κ?
  - incomplete markets: redistribute via prices (Lorenzoni [2008])
  - price of capital appears in constraints: tax/subsidize capital?

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