Research Record for the Project "Large vs Small Banks"

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1. Main Idea

This project aims to study the relation between the size of a bank in terms of its balance sheet and the probability of the bank run occurring. And, if the larger the bank, the more can a bank immune itself from the bank run, then what is the implication of this result?

Suppose that the banking market is oligopolistic, then there is a dead weight loss in the market (under some kind of oligopolistic competition), and the larger the bank, the more oligopolistic the market is. However, if the size also prevents the bank from the crisis, then the limitation of the size of the bank can increase the financial fragility of the banking system. This is the trade-off between the oligopoly and the financial fragility. Consider the limitation of the size of the bank and the federal deposit insurance.

2. To Do

- See how to incorporate the bank run from Diamond and Dybvig (1983).
- Evidence of the bank size-bank run relation.

3. Model

3.1. Household

The time is continuous, $t \in [0, \infty)$. There is a unit mass of households. Each household solves the following problem:

$$\rho V dt = \max_{c,\theta,e} u(c)dt + \mathrm{E}_t\left[dV\right] \tag{1}$$

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subject to

$$da = \left[a \left(\sum_{n=1}^{N} \theta_n dr_n + e_n dr_n^e \right) \right] - c dt \tag{2}$$

$$a \geq 0 \tag{3}$$

where θ_0 is the asset proportion holding on hand, θ_n is the asset proportion as deposits and e_n is the proportion as equity.

Derive deposit supply.

Think about the information shocks.

3.2. Bank

There are N banks, competing in the deposit market in Cournot's fashion.

What makes the depositors choosing different banks?

The banks have two type of assets. One is a risk-free bond B_t with fixed return rate r^f. The others are risky assets k_t that require costs to build. A risky asset cannot be held by different banks so the single bank can only hold $k_t \in \{0, 1, \ldots\}$. The risky assets arrive at rate λ_k, requiring cost C, and pays off R stochastically at rate λ_R. After R arrives, the risky asset is destructed. Total asset value is

$$A_t = q_{B,t} B_t + q_{k,t} k_t. \tag{4}$$

d and e are the proportion of asset purchasing financed by deposit and equity.

$$\begin{aligned} \mu_e E dt = \max_{d,e,B,k} \; & r^f B dt + \mathrm{E}\left[dA\right] - \mathrm{E}\left[Ad \cdot dr + (Ae - E) dr^e\right] \\ & + \lambda_k \int \mathbf{1}\left\{C \leq q_B B\right\} \max\left\{E(k+1, q_B B - C) - E, 0\right\} dF(C) \\ & + \lambda_R k (E(k-1, q_B B + R) - E) \end{aligned} \tag{5}$$

Bank run and competition.

A bank falls when its net worth becomes negative. When a bank falls, the rest of the banks can buy the failed bank's asset and the depositors can take their deposits back according to the proportion.

A new bank enters the market with rate ψ.

References

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, *91*(3), 401–419.