Banking Competiotion Research Record

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1. Literature

1.1. Bank Run and Banking Competition

- Diamond and Dybvig (1983).
- Goldstein and Pauzner (2005).
- M. Egan, Hortaçsu, and Matvos (2017).
- Gertler and Kiyotaki (2015).
- Wang, Whited, Wu, and Xiao (2022).
- M. L. Egan, Hortaçsu, Kaplan, Sunderam, and Yao (2025).

1.2. Computation with Aggregate Distribution as State

- Krusell and Anthony A. Smith (1998).
- Maliar, Maliar, and Winant (2021).
- Gu, Laurière, Merkel, and Payne (2024).

2. Monopolistic Bank with Liquidity Motive

2.1. Household

Time is continuous, starting from $t = 0$ and going on forever. Following Moreira and Savov (2017), we model the households with liquidity needs. There is a unit measure of identical

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households solving the following probelm

$$V_t = \max \mathrm{E}_t \left[\int_t^\infty e^{-\rho t} \log(W_t(\psi dC_t + dc_t)) \right]. \tag{1}$$

where C_t is the consumption fraction in liquidity event, $\psi > 1$ is the marginal utility of liquidity event consumption and c_t is the consumption fraction outside of the liquidity event.

A liquidity event comes with rate h with size $d\overline{C}_t$. That is, $dC_t \le d\overline{C}_t$. Conditional on the occurence of a liquidity event, the size follows $\mathrm{Exp}(\eta)$.

There are two type of securities issued by the bank, money m and equity e. The money can be used to finance both consumptions while the equity can only finance c_t. The constraints are

$$\frac{dW_t}{W_t} = m_t dr_t^m + e_t dr_t^e - dC_t - dc_t \tag{2}$$

$$dC_t \le \min \left\{ m_t, d\overline{C}_t \right\} \tag{3}$$

$$m_t + e_t = 1. \tag{4}$$

Recursify equation (1),

$$\rho V_t(W_t) dt = \log(W_t) + \max_{m_t, e_t, dC_t, dc_t} \mathrm{E}_t \left[\log(\psi dC_t + dc_t) \right] + \mathrm{E}_t \left[dV_t \right]. \tag{5}$$

where

$$dV_t = V_t dt + V_W dW_t + \frac{1}{2} V_{WW} (dW_t)^2. \tag{6}$$

Given m_t, e_t, conditional on the liquidity event, the household decides (dC_t, dc_t):

$$\begin{aligned} &\max_{dC_t, dc_t} \log(\psi dC_t + dc_t) + \theta_t (\min \left\{ m_t, d\overline{C}_t \right\} - dC_t) \\ &\quad + V_t dt + V_W \mathrm{E} \left[m_t dr_t^m + e_t dr_t^e - dC_t - dc_t \right] + \frac{1}{2} V_{WW} \mathrm{E} \left[W_t^2 (m_t dr_t^m + e_t dr_t^e - dC_t - dc_t)^2 \right] \end{aligned} \tag{7}$$

The first order condition with complementary slackness is

$$\frac{\psi}{\psi dC_t + dc_t} - \theta_t - V_W W_t - V_{WW} \mathrm{E} \left[W_t^2 (m_t dr_t^m + e_t dr_t^e - dC_t - dc_t) \right] = 0 \tag{8}$$

$$\frac{1}{\psi dC_t + dc_t} - V_W W_t - V_{WW} \mathrm{E} \left[W_t^2 (m_t dr_t^m + e_t dr_t^e - dC_t - dc_t) \right] = 0 \tag{9}$$

$$\theta_t (\min \left\{ m_t, d\overline{C}_t \right\} - dC_t) = 0. \tag{10}$$

Thus

$$\theta_t = \frac{\psi - 1}{\psi dC_t + dc_t} > 0$$

and the liquidity constraint always binds.

$$dC_t = \min \left\{ m_t, d\overline{C}_t \right\}.$$

Now,

$$dc_t$$

3. Monopolistic Bank with Full Information

3.1. Households

Time is continuous, starting from $t = 0$ and going on forever. The households can buy deposit from the bank to save. There is a unit measure of households solving the problem:

$$V_t = \max \mathrm{E}_t \left[\int_t^\infty e^{-\rho(s-t)} \frac{c_s^{1-\gamma}}{1-\gamma} dt \right]$$

subject to the budget constraint

$$dD_t = D_t d\tilde{r}_t - c_t dt$$

where D_t is the deposit, $d\tilde{r}_t$ is the realized deposit rate.

3.2. Bank

The bank issues deposits and equities to finance the investment. There are two types of investment: a risk free investment b_t and a risky investment k_t.

$$db_t = (\mu_b - i_{b,t}) b_t dt \tag{11}$$

$$dk_t = \mu_k k_t dt - k_t \kappa dZ_t + i_{k,t} k_t dZ_{\lambda,t} \tag{12}$$

The bank's problem is

$$\begin{aligned}\rho_b E_t(k_t)dt = \max_{dr_t, \theta_\lambda} & -D(dr_t)dr_t + \mu_b D(dr_t)dt - (\mu_b - i_{b,t})b_t dt + \phi dt \int k_t x + (E_t(k_t(1-x), b_t) - E_t(k_t, b_t))dF_\phi \\ & \lambda dt(-i_{k,t}k_t + E_t(i_{k,t}k_t, b_t) - E_t(k_t, b_t)) - D(dr_t)dr_t\end{aligned}$$

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