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Sunspot bank runs in competitive versus monopolistic banking systems

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ABSTRACT

This paper extends the Diamond and Dybvig (1983) model to compare two banking economies: one with a competitive banking system and another with a monopolistic one. It is shown that a competitive banking system is more fragile than a monopolistic one in the sense that the parameter set stipulating that a bank run equilibrium exists in the competitive banking system dominates the set in the monopolistic one.

1. Introduction

The relationship between competition in banking and financial fragility is a serious concern for both policymakers and academic researchers. A large body of literature concludes that an increase in bank competition erodes banks' rents and reduces their incentives to behave prudently. In these models, banking crises are triggered by low asset returns resulting from the gambling strategies adopted by banks. However, recent studies show that the relationship between bank competition and stability is complex, both theoretically and empirically. That is, competition in banking sometimes leads to better financial stability (see Allen and Gale (2004), and Boyd and De Nicolo (2005)).

The purpose of this paper is to study the different conditions for the existence of a bank run equilibrium under two banking systems: competitive and monopolistic. This paper focuses on bank competition in the deposit market. In the model, there are no risky assets, and bank runs are caused by a wave of agents' pessimistic beliefs as in Diamond and Dybvig (1983). It is shown that the parameter set stipulating that a bank run equilibrium exists in the competitive banking system dominates the set in the monopolistic one. This result suggests that the competitive banking system is more fragile than the monopolistic one.

In a similar paper, Boyd et al. (2004) construct an overlapping generations model with random relocation and analyze banking crises in competitive and monopolistic banking systems. They show that a monopolistic banking system faces a higher probability of crises when the inflation rate is below some threshold, while a competitive system is more fragile otherwise. However, crises in the Boyd et al. model are indicated by banks' illiquidity, not insolvency, while my model assumes the converse case.

The rest of the paper is organized as follows. Section 2 presents the model and compares the bank run equilibrium conditions under both banking systems. Section 3 presents the conclusion of the study.

2. The model

The basic structure of my model directly follows Cooper and Ross (1998) which generalizes the Diamond and Dybvig (1983) model.

2.1. The environment

There are three periods, indexed by $t = 0, 1, 2$. There is a $[0, 1]$ continuum of ex-ante identical agents. Each agent has an endowment only in period 0. The agents' time preferences are subject to a random shock at the beginning of period 1. With probability π, an agent is an early consumer, who only values consumption at period 1; with probability $1 - \pi$, he is a late consumer, who only values consumption at period 2. Let c_E and c_L denote the consumption levels for early and late consumers, respectively, and $u(c)$ be their utility function satisfying neoclassical properties (increasing, strictly concave, twice continuously differentiable).

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Assets are of two types: short and long. One unit of the good invested in short asset at period t yields one unit at period $t+1$, for $t = 0, 1$. One unit of the good invested in long asset at period 0 yields $1-\tau$ units at period 1, or $R > 1$ units at period 2, where $\tau \in [0, 1]$ represents a liquidation cost. There is a trade-off between liquidity and returns; long-term investments have higher returns but take longer to mature.

The timing of events is as follows. In period 0, agents deposit all their endowments, and banks divide these resources between short and long assets. In period 1, depositors receive payments from the banks after their types have been realized. I follow Wallace (1988) in assuming that early consumers must consume immediately after contacting the bank in period 1, called *the sequential-service constraint*.

2.2. A competitive banking economy

Let us first consider the case where the number of banks exceeds one. Since the banks are Nash competitors, they make portfolios to maximize the expected utility of a representative depositor in a standard manner. Let i denote the amount of long assets held by a bank. Then, the banks' maximization problem is as follows:

$$\max_{c_E, c_L, i} \pi u(c_E) + (1-\pi)u(c_L)$$

subject to

$$\begin{aligned} &\pi c_E = 1 - i, \\ &(1-\pi)c_L = Ri, \\ &c_E, c_L \geq 0 \quad \text{and} \quad 0 \leq i \leq 1. \end{aligned} \tag{1}$$

The optimal allocation (c_E^*, c_L^*, i^*) satisfies

$$u'(c_E^*) = Ru'(c_L^*). \tag{2}$$

Note that since $R > 1$, the strict concavity of u implies that $c_E^* < c_L^*$. As is well known, this allocation is identical to the first-best allocation and can be achieved as a Nash equilibrium in which all depositors are honest in reporting their true preferences. However, there may also exist an equilibrium in which all late consumers misrepresent their preferences.

Let λ be the number of depositors receiving payment under a bank run. The resource constraint for banks at period 1 is

$$\lambda c_E = 1 - i + (1-\tau)i. \tag{3}$$

Given the bank contracts at period 0, the condition that a bank run equilibrium exists is summarized as follows.

Proposition 1. *The allocation (c_E^*, c_L^*, i^*) has a run equilibrium iff $\lambda^* = (1-\tau i^*)/c_E^* < 1$.*

The exact proof of Proposition 1 is in Cooper and Ross (1998). A run exists whenever the consumption promised to all depositors if they withdraw early is greater than the liquidation value of all assets if all patient and impatient depositors withdraw early.

2.3. A monopolistic banking economy

Next, consider a monopolist banking system. A monopolist bank has market power and can extract the maximum possible surplus from depositors. However, depositors always have the option of direct investing. Therefore, the availability of this option to depositors is a matter of concern for the bank, which faces an additional constraint: *the participation constraint*. For simplicity, it is assumed that agents can only invest in the short asset in an economy without financial intermediaries. Thus, autarkic agents' utility is $\pi u(1) + (1-\pi)u(1) = u(1)$.

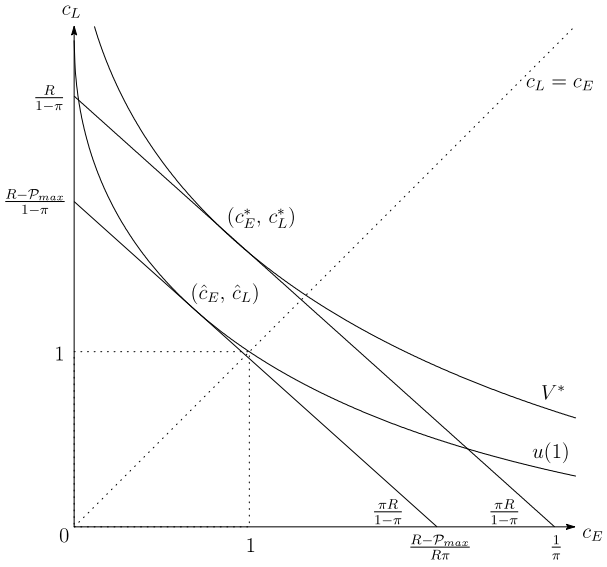

Fig. 1. The allocations in competitive and monopolistic banking.

Since the bank's profit comes from residual revenues after payments to late consumers have been made, a monopolist bank makes portfolios to maximize the ex-post profit. Then, the bank's maximization problem becomes

$$\max_{c_E, c_L, i} Ri - (1-\pi)c_L$$

subject to

$$\begin{aligned} &\pi c_E = 1 - i, \\ &\pi u(c_E) + (1-\pi)u(c_L) \geq u(1), \\ &c_E, c_L \geq 0 \quad \text{and} \quad 0 \leq i \leq 1. \end{aligned} \tag{4}$$

Note that the participation constraint holds with equality because of monopoly power. Let $(\hat{c}_E, \hat{c}_L, \hat{i})$ denote the solution to this problem, characterized by the condition

$$u'(\hat{c}_E) = Ru'(\hat{c}_L), \tag{5}$$

which is the same form as shown in (2). The wedge between the returns paid to early consumers and those paid to late consumers is the same under monopoly versus competition. A monopolist bank only makes profit on the difference between the return on the long assets and the return it pays to agents; therefore, it is important for a bank to attract agents in order to invest. This induces the bank to offer better returns on deposits even if the bank enjoys market power. Fig. 1 illustrates the solutions in both banking systems, where $V^* = \pi u(c_E^*) + (1-\pi)u(c_L^*)$ and $\mathcal{P}_{\max} = R\hat{i} - (1-\pi)\hat{c}_L$.

As in the case of a competitive banking economy, I can prove that the bank run equilibrium exists in the monopolistic banking system as follows.

Proposition 2. *The allocation $(\hat{c}_E, \hat{c}_L, \hat{i})$ has a run equilibrium iff $\hat{\lambda} = (1-\tau\hat{i})/\hat{c}_E < 1$.*

2.4. Monopoly versus competition in banking

Now, let us compare the amounts of long assets banks invest in under different banking systems.

Proposition 3. *The amount of long assets under a monopolistic banking system is higher than that under a competitive banking system (i.e., $\hat{i} > i^*$).*