Seminar Problem in ECON 4335 Economics of Banking, Fall 2016

Problem set 6 (October 21, 2016)

Question 1

Let the Central Bank determine the amount of notes and coins in circulation, M_0. Suppose banks keep a fraction k of deposits in reserves. Suppose the public keeps an amount of currency C^* that does not depend on deposits/loans.

1.1) Suppose there is only one bank and the economy is closed. Show that the maximum amount of deposits is equal to:

$$\frac{M_0 - C^*}{\kappa}.$$

1.2) What is the size of the bank's reserves?

1.3) Explain why can we say that the total supply of money is equal to:

$$\frac{M_0 - C^*}{\kappa} + C^*.$$

1.4) Suppose there are N banks and the economy is closed. What is the maximum amount of deposits?

Question 2

Consider a risk-neutral bank that makes loans at time 0. The loans mature at time 1. The bank has limited liability. Deposits are insured. The market for deposits is competitive. For simplicity we assume that the going interest rate on insured deposits is zero. Figure (1) shows the balance sheets of the bank in period 0 and period 1. The insurance premium is proportional to the level of deposits: $P = \phi D$ ($\phi > 0$). The premium has to be paid upfront, which means that equity must at least be sufficient to cover the insurance premium, $E \geq P$.

Period 0	
Assets	Liabilities
Loans L	Deposits D
Insurance premiums P	Equity E

Period 1	
Assets	Liabilities
Loan repayments $\tilde{L}$	Deposits D
Insurance payments $\tilde{S}$	Net Value $\tilde{E}$

FIGURE 1. Balance Sheets

2.1) Assume that in period 0 the bank has a given level of equity, E. Use the balance sheet for period 0 to show that a) if the bank lends L it needs to collect deposits

$$D = \frac{L - E}{1 - \phi}.$$

and b) the maximum amount that the bank can lend is $L^{max} = E/\phi$.

2.2) The payout from the insurance fund is

$$\tilde{S} = \begin{cases} 0 & \text{if } \tilde{L} \geq D \\ D - \tilde{L} & \text{if } \tilde{L} < D \end{cases} \tag{1}$$

Show how you can express the net profits of the bank's owners, $\Pi = \tilde{E} - E$, in terms of L, $\tilde{L}$ and E for each of the two cases in (1).

2.3) Suppose the gross repayment on the loans is $(R + \Delta)L$ with probability 1/2 and $(R - \Delta)L$ with probability 1/2. Assume $R > 1$ and $R - 1 < \Delta < 1$. Show that there is no risk that the bank needs to be bailed out by the insurance fund if it lends less than

$$L^C = \frac{E}{1 - (1 - \phi)(R - \Delta)} < L^{max}.$$

2.4) Given the same distribution of $\tilde{L}$ as in the question (2.3), what is the expected net profit of the bank's owners? How does it depend on Δ and L? What general principle(s) does this example illustrate?

2.5) Suppose the bank can choose the level of risk, Δ, and the volume of loans L, freely within the range permitted by the assumptions above. What levels would it choose if it starts with a given equity level E? What rate of return on equity would this choice result in? Show that the net rate of return is negative for some parameter values. Why do you think this can be the case?

2.6) Will the size of ϕ influence risk taking? If so, in what way?