

## A Deposit Insurance

Weight 2/3

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. Table 1 shows the balance sheets of the bank in period 0 and period 1. Please use the same symbols in your answer. The

Table 1: Balance sheets

Period 0		Period 1	
Assets	Liabilities	Assets	Liabilities
Loans $L$	Deposits $D$	Loan repayments $\tilde{L}$	Deposits $D$
Insurance premium $P$	Equity $E$	Insurance payments $\tilde{S}$	Net value $\tilde{V}$

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,  $E \geq P$ .

1. Assume that at time 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

$$D = \frac{L - E}{1 - \phi} \quad (1)$$

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

2. The payout from the insurance fund is

$$\tilde{S} = \begin{cases} 0 & \text{if } \tilde{L} \geq D \\ D - \tilde{L} & \text{if } \tilde{L} < D \end{cases} \quad (2)$$

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

$$L^C = \frac{E}{1 - (1 - \phi)(R - \Delta)} < L^{max} \quad (3)$$

4. Given the same distribution of  $\tilde{L}$  as in the question 3, what is the expected net profit of the bank's owners? How does it depend on  $\Delta$  and  $L$ ? What general principle(s) does this example illustrate?

5. Suppose the bank can choose the level of risk,  $\Delta$ , 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? Is the net rate of return positive?
6. Will the size of  $\phi$  influence risk taking? If so, in what way?
7. So far we have considered only one bank. Discuss briefly how the model may be adapted to take into account that several banks compete in the markets for deposits and loans at  $t = 0$ .

## **B**

Weight 1/3

Banks seem to get more attention from governments than most other industries. What makes banks special?