

## ECON4335: Questions for seminar 6. Week 18

April 28, 2010

### Question 1

1. Explain what is meant by the "charter value" of a bank. Discuss briefly factors that may create charter value.
2. Consider a bank that can invest in two projects. Project  $A$ , if successful, yields a gross return  $R_A$ , if it fails it yields nothing. The probability of success is  $p_A$ . Similarly, project  $B$  yields  $R_B$  if successful, nothing if it fails and succeeds with probability  $p_B$ . Project  $A$  has the highest expected return ( $p_A R_A > p_B R_B$ ), while project  $B$  has the highest return in case of success ( $R_B > R_A$ ). What does this mean for the relationship between  $p_A$  and  $p_B$ ? Which project is the most risky?
3. Each project requires a loan of size  $L = 1$ . A share of this,  $k$ , is financed by equity, while the rest is financed by deposits. Deposits are insured. The gross interest rate on deposits,  $R_D$ , is determined in a competitive market. The alternative gross return that the owners of the bank forgo if they invest equity in the bank is  $R_E$ . You can disregard the insurance premium. Write down expressions for the expected profits of the bank from each of the two projects,  $\Pi_A$  and  $\Pi_B$  respectively. Show that project  $A$  will always be profitable for the bank if  $p_A R_A > R_E \geq R_D$ .
4. Explain why project  $B$  may be more profitable for the bank than project  $A$ . What is the condition on  $k$  and  $R_D$  for this to happen? Can project  $B$  be profitable even if project  $A$  is not?
5. Suppose that  $R_D < p_A R_A < R_E$ . Assume that project  $A$  is socially desirable, while project  $B$  is not. Can a regulator set the capital requirement in such a way that project  $A$  is profitable for the bank while project  $B$  is not? What information will be needed?
6. Suppose the two investment alternatives are available in every period. However, if the bank defaults, it is closed down and the owners banned from starting new banks. Discuss how this will affect the banks investment choice.

### Question 2

## Question 2

Consider an entrepreneur who must finance a project by borrowing part of the investment expenditure. Let  $K$  be the size of the investment, and  $L$  is the entrepreneur's own wealth (equity). The amount to be borrowed from a bank, operating in a competitive environment, is then  $D = K - L$ . The investment yields a random cash flow or profit as given by  $Y$ , which can take two values;  $Y = \{y_0, y_1\}$ , with  $y_1 > y_0$ , and  $\Pr(Y = y_0) = p$ , where  $y_0 < D$  and  $p \in (0,1)$ . Denote  $EY = \mu > 0$ . Let furthermore the rate of interest charged by the bank be  $r$ , whereas the bank's own funding is charged an exogenous rate of interest  $r_0$ , which is also the opportunity cost of equity. We assume  $\mu - (1 + r_0)K > 0$ .

The contract requires the borrower to repay  $D(1 + r)$  after one period when sufficient cash flow has materialized. If realized cash flow  $y$  exceeds  $D(1 + r)$ , the entrepreneur repays, and obtains a net profit as given by  $y - (1 + r)D > 0$ . If  $y < (1 + r)D$ , the firm goes bankrupt and nothing is left to the entrepreneur, but there is a bankruptcy cost of  $B$ . In that case the bank, having priority, gets  $y - B$ . Suppose  $y_0 > B$ .

- Show that the entrepreneur's expected profit can be written as  $v(D, r) = (1 - p) \cdot (y_1 - (1 + r)D)$  and that the lender's expected gross profit is  $w(D, r) = p \cdot (y_0 - B) + (1 - p) \cdot (1 + r)D$ .
- In the competitive banking industry we have a zero-profit condition for banks, as given by  $w(D, r) = (1 + r_0) \cdot D$ . What is the equilibrium-relationship between  $r$  and  $D$ ? What role does equity play?
- The entrepreneur's investment criterion is: Invest if and only if  $v(D, r) \geq (1 + r_0) \cdot L$ . Show that this condition can be written as:

$$\begin{aligned}\Phi(K, r, L) &:= v(K - L, r) - (1 + r_0)L \\ & (= py_0 + (1 - p)y_1 - py_0 - (1 - p)(1 + r)(K - L)) \\ & = \mu - (1 + r_0)(K - L) - pB\end{aligned}$$

What is being expressed by this relation?

- Suppose that the cash flow can be observed only by the entrepreneur/borrower, not by the bank/lender; hence the magnitude of cash

flows cannot be verified by a third party. Under what circumstances might the bank find it worthwhile not to grant a loan to the entrepreneur? What is the social loss from lack of symmetric information?

- e) Suppose next that the project is repeated over two periods (we ignore discounting), with cash flows being independently and identically distributed in the two periods. If the entrepreneur cannot repay after period 1, the loan will not be continued – no further funding. We suppose that if the entrepreneur repays  $(1 + r)D$  after period 1, the bank has made a prior commitment to grant a similar loan as the one granted in the first period, at the beginning of period 2 so that the entrepreneur can implement a similar project as above. How can the debt or loan contract be designed so as to provide incentives for the entrepreneur to repay in period 1? At the end of period 2 the borrower has no incentive to report a high cash flow if that should be the outcome; in that case, the low cash flow accrues to the bank. Also, you may assume that at the end of period 2, the bank will have no motive to claim bankruptcy; hence we ignore the bankruptcy cost in period 2.