ⓘ Candidate instruction

ECON4335 – Economics of Banking

This is some important information about the postponed written exam in ECON4335. Please read this carefully before you start answering the exam.

Date of exam: Monday, 16 January 2023

Time for exam: 09.00 – 12.00 (3 hours)

Language: The examination text is given in English, and you submit your response in English.

The problem set: The problem set consists of three questions, with several sub-questions. They count as indicated. Start by reading through the whole exam, and make sure that you allocate time to answering problems you find easy.

Sketches: In this exam, you may submit sketches on all questions. You are to use the sketching sheets handed to you. You can use more than one sketching sheet per question. See instructions for filling out sketching sheets below. It is very important that you make sure to allocate time to fill in the headings (the code for each problem, candidate number, course code, date etc.) on the sheets that you will use to add to your answer. You will find the code for each problem under the problem text. **You will NOT be given extra time** to fill out the "general information" on the sketching sheets (codes for each problem, candidate number etc.)

Access to your answer: You will not have access to your exam answer right after the exam. The reason is that the sketches must be scanned into your answer. You will have access to the answer after approx. 2-3 days.

Resources allowed: No written or printed resources is allowed (except if you have been granted use of a dictionary from the Faculty of Social Sciences).

Grading: The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

¹ Question 1(a)

Weight: 10 points

Is the following statement true, false, or uncertain? Briefly explain verbally.

"If banks compete in deposit market and take risks by themselves, stronger competition in the deposit market will make the banks less stable, because the competition will increase banks' funding cost so that they have to take more risks to maintain their profit."

Fill in your answer here

Maximum marks: 10

2 # Question 1(b)

Weight: 10 points

Is the following statement true, false, or uncertain? Briefly explain verbally.

"Banks are funded by both debt and equity capital, and a profit-maximizing bank is able to make an optimal decision on the combination of debt and equity fundings. Therefore, regulators shall not set any requirement on the share of equity capital in a bank's total liabilities."

Fill in your answer here

Maximum marks: 10

3 # Question 1(c)

Weight: 10 points

Is the following statement true, false, or uncertain? Briefly explain verbally.

"For a central bank that conducts monetary policy under the corridor system, as long as the interbank market rate is within the corridor (that is, neither on the floor nor on the ceiling), requiring banks to raise the required reserve ratio leads to monetary tightening."

Fill in your answer here

Maximum marks: 10

⁴ Question 1(d)

Weight: 10 points

Is the following statement true, false, or uncertain? Briefly explain verbally.

"Regulators should discourage borrowers from borrowing up to their binding borrowing constraints in normal times. Because under binding borrowing constraints in normal times, borrowers will be forced to reduce their debts when it comes to economic downturn, which further exacerbates the recession."

Fill in your answer here

Maximum marks: 10

5 Question 2(a)

Suppose there are three entrepreneurs, A, B, and C; each of them has one project -- denote their projects as asset A, asset B, asset C, respectively. To generate payoffs, asset A requires 400 initial investment, asset B requires 250, and asset C requires 300. If a project receives the required investment today, it will yield a payoff tomorrow depending on the state of the world tomorrow. There are four states of the world for tomorrow, 1, 2, 3, and 4, and each state is materialized with a probability of 25%. Tomorrow's state of the world is not known today. The following table summarizes the payoff structure of the assets: The first three columns shows the payoff of each asset under each state, as well as the mean payoff of each asset; the fourth column shows the total payoff of all three assets under each state (if all three are financed), as well as the mean total payoff of all three assets.

	Asset A	Asset B	Asset C	Sum
State 1	1000	800	0	1800
State 2	800	200	400	1400
State 3	200	200	600	1000
State 4	0	0	400	400
Mean	500	300	350	1150

There are also three creditors 1, 2, and 3. Each of them has money to invest today, as well as individual requirement on tomorrow's payoff of the investment. Creditor 1 has 400 to invest, she wants tomorrow's payoff of her investment to be at least as much as 400 under any state; creditor 2 has 200 to invest, and she does not have any specific requirement on the payoff; creditor 3 has 350 to invest, and she wants a payoff no lower than 100 if state 1 is revealed tomorrow.

Furthermore, assume that **all information is public**, and all contracts are enforceable. Suppose entrepreneurs make zero profit, i.e., if an entrepreneur borrows from a creditor today, tomorrow the entrepreneur has to pay the entire payoff of her project to the creditor.

Today, the entrepreneurs want to invest in their projects by borrowing from creditors, while a creditor will only lend to an entrepreneur if the entrepreneur's project's payoff structure meets the creditor's requirement. Suppose there is a matching market today where entrepreneurs and creditors meet each other directly and see if they can make borrowing-lending contracts, and an entrepreneur can only borrow from one creditor.

Which entrepreneur(s) is financed today on the matching market? Explain why. (7 points)
Fill in your answer here

Maximum marks: 7

6   Question 2(b)

Now suppose that entrepreneurs cannot directly borrow from creditors today. Instead, entrepreneurs can only borrow from a bank who collects creditors' money as deposits. That is, the bank takes deposits from creditor(s) and lends to entrepreneur(s) today; tomorrow the bank collects **all** payoff(s) from the financed asset(s) to distribute among the depositor(s). **Assume the bank makes zero profit.**

If the bank has more than one depositor today, tomorrow under any state of the world, after collecting all payoff(s) from financed project(s), the bank distributes the total collected payoff among the depositors, in proportion to depositors' deposits in the bank.

Again, a creditor will only deposit in the bank today, if her payoff received from the bank tomorrow meets her requirement.

With the bank as financial intermediation, which creditor(s) is (are) willing to deposit today and which entrepreneur(s) is (are) financed? Explain why. (10 points)

Fill in your answer here

Maximum marks: 10

7 Question 2(c)

Now suppose, instead of the intermediation described in Question 2(b), today the bank issues three financial products, product 1, product 2, product 3 and tries to sell the products to creditors. **One product can only be sold to one creditor.** If a product is sold today, the product promises a certain payoff to the buyer under each state of the world tomorrow. The payoff structure of the products is presented in the following table.

	Product 1	Product 2	Product 3	Sum
State 1	400	600	800	1800
State 2	400	400	600	1400
State 3	400	200	400	1000
State 4	400	0	0	400
Mean	400	300	450	1150

The first three columns show the promised payoff of each product under each state tomorrow, as well as the mean promised payoff of each product. The fourth column shows the total payoff of all three products (if they are all sold) under each state, as well as the mean total payoff of all three products.

If a product is sold to a creditor, the creditor pays all her money today, and receives the promised payoff tomorrow according to the revealed state of the world, as is shown in the table. After selling the products, the bank uses the proceeds to lend to the entrepreneurs. In addition, note that the products are fully backed by the assets -- that is, if all three products are sold, all three entrepreneurs can be financed today, the total payoff of the assets tomorrow will be just enough to pay the total promised payoff of the products.

Again, a creditor will only buy a product today, if her payoff received from the product tomorrow meets her requirement.

Show that the bank is indeed able to sell all three products to all three creditors today, so that all three entrepreneurs' projects are financed. (8 points)

Fill in your answer here

Maximum marks: 8

8 Question 3(a)

Consider a risk-neutral firm, protected by limited liability, that wants to finance a project at a cost of 1 unit. The firm has no initial wealth; hence to undertake the project the firm has to borrow from somewhere. If the firm receives the funding from anywhere, it has two options: The first option is to take a safer project, which generates either a gross return of G with probability p, or a gross return of 0 otherwise; the second option is to take a riskier project, which generates either a gross return of B with probability q, or a gross return of 0 otherwise. Assume that $B > G$, $p > q$, and $pG > 1 > qB$. Which option is taken by the firm is the firm's private information, and it is not observed by anyone else.

There are many creditors in the economy, each has 1 unit of wealth. Suppose the firm can directly borrow from anyone of the creditors. A creditor requires a gross interest rate of R on her lending to the firm.

Provide a graphical illustration of how the payoffs of the two optional projects to the firm vary with R, and derive a critical value of R, denoted by $\hat{R}$, below which the firm chooses the safe project and above which the firm chooses the risky project. (10 points)

Fill in your answer here

Maximum marks: 10

9 Question 3(b)

Assume that the credit market is perfectly competitive so that a lender creditor makes zero profit. Show that the firm can only borrow directly from creditors if p is greater than a threshold value of $\hat{p}$. Compute the value of $\hat{p}$ as a function of q, G, and B. (10 point)

Fill in your answer here

Maximum marks: 10

^{10} Question 3(c)

Suppose there are also banks in the economy, that take creditors' wealth as deposits and lend to the firm. Banks have a monitoring technology. By incurring a monitoring cost, c, a bank is able to prevent the firm from undertaking the risky project, and to induce the firm to choose the safe project. A bank monitors whenever it finances a project. Suppose that the banking sector is perfectly competitive so that banks make zero profit. In addition, assume that creditors are happy to deposit in the banks as long as their expected gross return is 1.

Show that the firm can only borrow from banks if p is above a threshold $\overline{p}$ which is a function of c and G. Compute the threshold. (7 points)

Under which values of p will the firm only directly borrow from creditors? Under which values of p will the firm only borrow from banks? Are there any values of p under which the firm can never borrow? (8 points)

Fill in your answer here

Maximum marks: 15