Candidate information

ECON4335 – The Economics of Banking – Open book, home exam

Exam date and time: Thursday, 26 November, 2020 from 09.00 – 14.00 (five hours)

Language: The examination text is given in English. You may submit your response in Norwegian, Swedish, Danish or English.

Guidelines: You should answer Question 1a)-e) verbally in Inspera. For questions 2a)-c) and 3a)-c) applies: You should upload your text in pdf format - **one pdf per problem.** You can scroll back and forth in the problem set.

You should familiarize yourself with the rules that apply to the use of sources and citations.

The answers to your exams are not expected to meet the formal requirements for references and citations in the fall 2020 exam. However, you should make references by indicating the source in the text. Creating a bibliography is not required. Whether you choose to do so, or not has no impact on your grade. The purpose of a reference is that the examiner should be able to look up the source him/herself, either to read it or to evaluate your interpretation. If you are referring to a limited part of the source, the reference should indicate which part of the source you refer to by using page numbers. If you are quoting directly from a source, follow the normal citation practice – with quotations marks and references to the source.

The exam lasts for only five hours. We recommend that you use the available time to work on the problem set, as well as allocate time to scan attachments with graphs and/or equations.

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.

Digital hand drawings/graphs/equations: You will find information about options for hand drawings on this website: https://www.uio.no/english/studies/examinations/submissions/options-for-hand-drawings.html

Submission in Inspera

- Read more about exam and submission in Inspera. https://www.uio.no/english/studies/examinations/submissions/.
- Remember: It is your responsibility to upload the **correct version of the correct answer**. Tips & Warnings: Use the course code in the file name to avoid uploading the wrong answer.
- When your answer is uploaded, you will see that the exam is uploaded and saved.
- To submit your answer, please see https://www.uio.no/english/studies/examinations/submissions/submit_answer/. You can either choose the “submit now” or the “Automatic submission”.
- You can make changes in your exam until the deadline.
- You will find the answer under Archives (Check that this is the right answer).

Do you need technical support, or do you have any questions during the exam?

Please send an e-mail, titled “ECON4335” to hjemmeeksamen@sv.uio.no from your university email.

Grading: The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.
Grades are given: 16 December 2020

1

Question 1(a)

Weight: 10 points
Is the following statement true, false, or uncertain? Briefly explain verbally

"A fixed capital ratio shall be required for a bank at all times to avoid its bankruptcy."
Fill in your answer here

2

Question 1(b)

Weight: 10 points
Is the following statement true, false, or uncertain? Briefly explain verbally

"As long as deposits are fully guaranteed by deposit insurance, depositors will have no incentive to run on banks so that bank runs can be completely avoided."
Fill in your answer here

3

Question 1(c)

Weight: 10 points
Is the following statement true, false, or uncertain? Briefly explain verbally

"Central bank as the lender of last resort shall commit to provide infinite lending at lowest possible interest rate to banks during crises to avoid bank failure."
Fill in your answer here

4

Question 1(d)

Weight: 10 points
Is the following statement true, false, or uncertain? Briefly explain verbally

"If a liquidity crunch is anticipated, rational banks will prepare enough liquidity buffer to avoid it."
Fill in your answer here

5

Question 1(e)

Weight: 10 points
Is the following statement true, false, or uncertain? Briefly explain verbally

"Tighter competition in the loan market leads to a fall in loan rate; this lowers borrowers' risk-taking incentive and reduces banks' credit risk."
Fill in your answer here

6 # Question 2(a)

Weight: 5 points

Consider an economy with a production sector populated by firms. The production of firms follows a production function $f(x)$, with x being the input of the firm. Function $f(x)$ is increasing and strictly concave such that $f'(x) > 0$, and $f''(x) < 0$.

Each firm has a small initial wealth W which is identical for all firms. Assume W is so small that firms always would like to borrow an extra amount L at a constant gross interest rate R from banks. Note that $R = 1 + r$ if you want to use the net interest rate r. Therefore, a firm's input is $x = W + L$. After production, the firm will repay its bank loan out of its output.

Assume that there is no financial friction. Show that a firm will borrow so much that its marginal output equals R.

7 # Question 2(b)

Weight: 5 points

From now on, suppose that borrowing firms are subject to a moral hazard problem that they may run away with their bank loans. To avoid potential losses, now banks are only willing to issue loans to firms that can provide collateral. Suppose each firm has K machines that can be used as collateral, and the market price for each machine is P.

K, P are identical for all firms. Assume $P \cdot K$ is small so that the borrowing constraint is always binding.

Show that under the borrowing constraint, a firm's output is lower than the firm in the frictionless economy, characterized in Question 2(a).

8 # Question 2(c)

Weight: 5 points

Keep all settings of Question 2(b). Suppose the economy is hit by an unexpected pandemic. Before anything happens, the first observation in the economy is that the price of machines P falls.

Show that, in response to the price fall, firms' output is lower than the output level in Question 2(b).

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Question 3(a)

Weight: 10 points

Consider an economy in three periods, $t = 0, 1, 2$. There is a bank and a group of depositors (whose population is normalized to 1). Each depositor is endowed with one unit of wealth in $t = 0$, then they deposit in the bank. In $t = 2$ depositors withdraw and consume.

After collecting deposits in $t = 0$, the bank can choose between two projects, project G and project B. The two projects are identical in their payoff structures, that either of them

- Gives a gross return R_H in $t = 2$ with probability p;
- Gives a gross return R_L in $t = 2$ with probability $1 - p$;
- The bank can choose the value of p in $t = 0$, with $0 < p < 1$. Assume that $R_H > R_L > 1$.

The two projects are only different in whether the realized returns can be observable to depositors:

- If the bank chooses project G in $t = 0$, then in $t = 1$, depositors can perfectly forecast whether the project will return R_H or R_L in $t = 2$;
- If the bank chooses project B (which is a moral hazard project) in $t = 0$, then in $t = 1$, the bank can hide the information on the project's true return, that is, although the bank knows how much the project will return in $t = 2$, depositors are not able to forecast the project's return. The only thing that depositors know in $t = 1$ is the bank's choice on p. Only in $t = 2$, depositors know the project's true return.

The time line goes as follows:

- In $t = 0$ depositors deposit in the bank, and the bank chooses which project to invest in, and also p of the chosen project;
- In $t = 1$: if the bank chooses project G, depositors know exactly the project's return in $t = 2$; if the bank chooses project B, depositors know nothing about its return in the future, except the value of p . Depending what they know about the project, depositors now have the chance to set the gross interest rate R on their deposits;
- In $t = 2$, the return of the project is revealed. If the return is no less than R, depositors withdraw R and consume, the bank retains the remaining return as its profit; if the return is lower than R, depositors will panic and run on the bank, each demanding R. If bank run happens, the bank has to liquidate the project. If a project is liquidated, the depositors can only collect βR_i (i is either H or $L, 0 < \beta < 1$). Assume that $\beta R_H > R_L$.

Suppose that the bank chooses project G in $t = 0$. Then in $t = 1$, to maximize their return, what will be depositors' choice on R? What will be the bank's profit in $t = 2$?

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Question 3(b)

Weight: 10 points

Suppose that the bank chooses project B in $t = 0$. Then (1) If depositors set $R = R_H$ in $t = 1$, will there be a bank run in $t = 2$? What is depositors' expected return in $t = 2$? What is the bank's expected profit in $t = 2$? (2) If depositors set $R = R_L$ in $t = 1$, will there be a bank run in $t = 2$? What is depositors' expected return in $t = 2$? What is the bank's expected profit in $t = 2$?

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Question 3(c)

Weight: 15 points

Based on your results in Questions 3(a) and 3(b), show that project B is the bank's optimal choice in $t = 0$, and compute the bank's optimal choice on p .