ℹ Information

ECON4335 – The Economics of Banking

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

Date of exam: Wednesday, November 21, 2018

Time for exam: 09.00 a.m. – 12.00 noon

The problem set: The problem set consists of three questions – with sub-questions. They count as indicated.

Sketches: You may use sketches on question 2 and 3, with sub-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 on your desk. You will NOT be given extra time to fill out the "general information" on the sketching sheets (the code for each problem, candidate number etc.) **Do NOT hand in sketches on other questions than question 2 and 3**. Sketches handed in for question 1 will not be included in the assessment.

Access: You will not have access to your exam right after submission. The reason is that the sketches with equations and graphs must be scanned in to your exam. You will get access to your exam within 2-3 days.

Resources allowed: No written or printed resources - or calculator - 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.

Grades are given: Monday 10 December 2018, at 4 p.m.

1(a) Question 1(A)

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

"There is no bubble in the rational expectation equilibrium, because rational people would never invest in bubbles as long as they know the prices for bubbles are higher than their fundamental values and bubbles will burst someday. " (12 points)

Fill in your answer here

> This is false. There may apear a bubble in the expectation equilibrium. A bubble appears when the value of an object exceeds the fundamental value. Even though there are full information AND the agents know that they invest in a bubble, they will still invest in a bubble only due to the belief of an increase in the value of the bubble to profit from it. However, the bubble can not grow forever as it is constrained by the size of the economy and will likely burst one day. Though in reality it is hard to spot a bubble, the main indicator of a bubble is an increase in the debt of the population.

Answered.

Attaching sketches to this question?
Use the following code: **9 6 1 9 3 6 2**

1(b) Question 1(B)

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

"If each individual bank is financially sound, the stability of entire banking system is guaranteed." (12 points)

Fill in your answer here

> The stability of the entire banking system can't be guaranteed. I would claim this false. Yes, banking is in the market to decrease market frictions, increase welfare and with some aid of regulation, stabilize the financial market. But banks are intrinistically fragile in the sense of e.g. a bank run. When a bank run appears, they do not care whether or not the bank is healthy (or financially sound). Only the belief of a bank run could trigger a bank run, hence intrinistically fragile. Agents do not care neither the bank is healthy or financially sound, hence a bank run will then destabilize the system such that you can not guarantee the stability of the banking system.

Answered.

Attaching sketches to this question?
Use the following code: **7 1 3 8 4 4 4**

1(c)   Question 1(C)

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

"Tighter competition in the banking sector reduces stability in the financial system." (12 points)

Fill in your answer here

> Well, this is uncertain as it depends on which hypothesis you look at. First of all you have the franchise value hypothesis. The franchise value hypothesis says that increased competition decreases a banks profit as the total profit in the economy needs to be split among more banks. Knowing this, the bank will invest on more risky assets to increase their profit again. Hence more risky assets actually increases the instability of the banking sector. On the other hand, if you look at the moral-hazard hypothesis, we know that the banks compete in two markets, first of all the deposit market and second the loan market. By increasing the competition in the banking sector, the banks has to reduce the interest rates which makes the entrepreneurs invest in less risky projects, hence increasing stability in the banking sector.

Answered.

Attaching sketches to this question?
Use the following code: **2 7 8 5 1 8 1**

1(d)   Question 1(D)

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

"For a central bank that conducts monetary policy using corridor system, reducing discount rate implies a rise in monetary base, or, the central bank is moving towards expansionary monetary policy." (12 points)

Fill in your answer here

> I would assume it is in fact moving towards expansionary monetary policy. By reducing the discount rate, it implies a reduction in the interbank offer rate, i.e., the interest rate the banks pay to borrow from other banks. When the interbank rate falls, it implies a reduction in the financing cost for banks, hence they will reduce their market interest rate which agents in the market borrow from. A relatively cheaper market interest rate generates the incentives for firms and households to invest and decrease savings, hence an expansionary monetary policy.

Answered.

Attaching sketches to this question?
Use the following code: **7 9 3 9 5 4 1**

1(e)   Question 1(E)

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

"Credit rationing implies there is a systematic shortage of credit supply in the credit market. Therefore, optimal policy shall aim for market clearing such that 100% of the demand from those borrowers who can afford the banks' loan rates is fulfilled." (12 points)

Fill in your answer here

The first sentence is true, credit raitoning do mean that the supply of credit in the market is less than demand. On the other hand, the last sentence is false, it is not optimal to meet 100% of the demand. Credit rationing is first of all that banks intentionally do not meet all demand, even though they are willing to pay higher interest rates. The reason for this is that it will attract too many crazy people (risky investors) where supply is equal demand.

Answered.

Attaching sketches to this question?
Use the following code:

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2   Consider a one-period economy with a monopoly profit-maximizing bank that can invest in either of the following two types of assets:

(1) Good assets: One unit of safe asset yields a gross return G with probability p_G and 0 otherwise at the end of the period;

(2) Bad assets: One unit of bad asset yields a gross return B with probability p_B and 0 otherwise at the end of the period.

It is known that $G < B, p_G > p_B$ and $p_G G > p_B B > 1$. The bank has no capital and totally relies on deposits for its investment.

There is no deposit insurance available in this economy. Depositors are risk neutral and they take deposit contracts from the bank at the beginning of the period. Depositors get repaid at the end of the period with a gross interest rate R if the bank's assets return, otherwise depositors get nothing. There is no asymmetric information. To ease the computation, we further assume that the bank's participation constraint is always fulfilled.

(a)   ## Question 2(A)

(A) Provide a graphical illustration of how the payoffs of the two types of assets vary with R, and compute the critical value of R, denoted by $\hat{R}$, below which the bank only invests in the good assets and above which the bank only invests in the bad assets. Compute $\hat{R}$. (15 points)

Give your answer here, or you can hand in sketches. Use the sketching paper handed to you in the examination venue. See instructions on your desk.
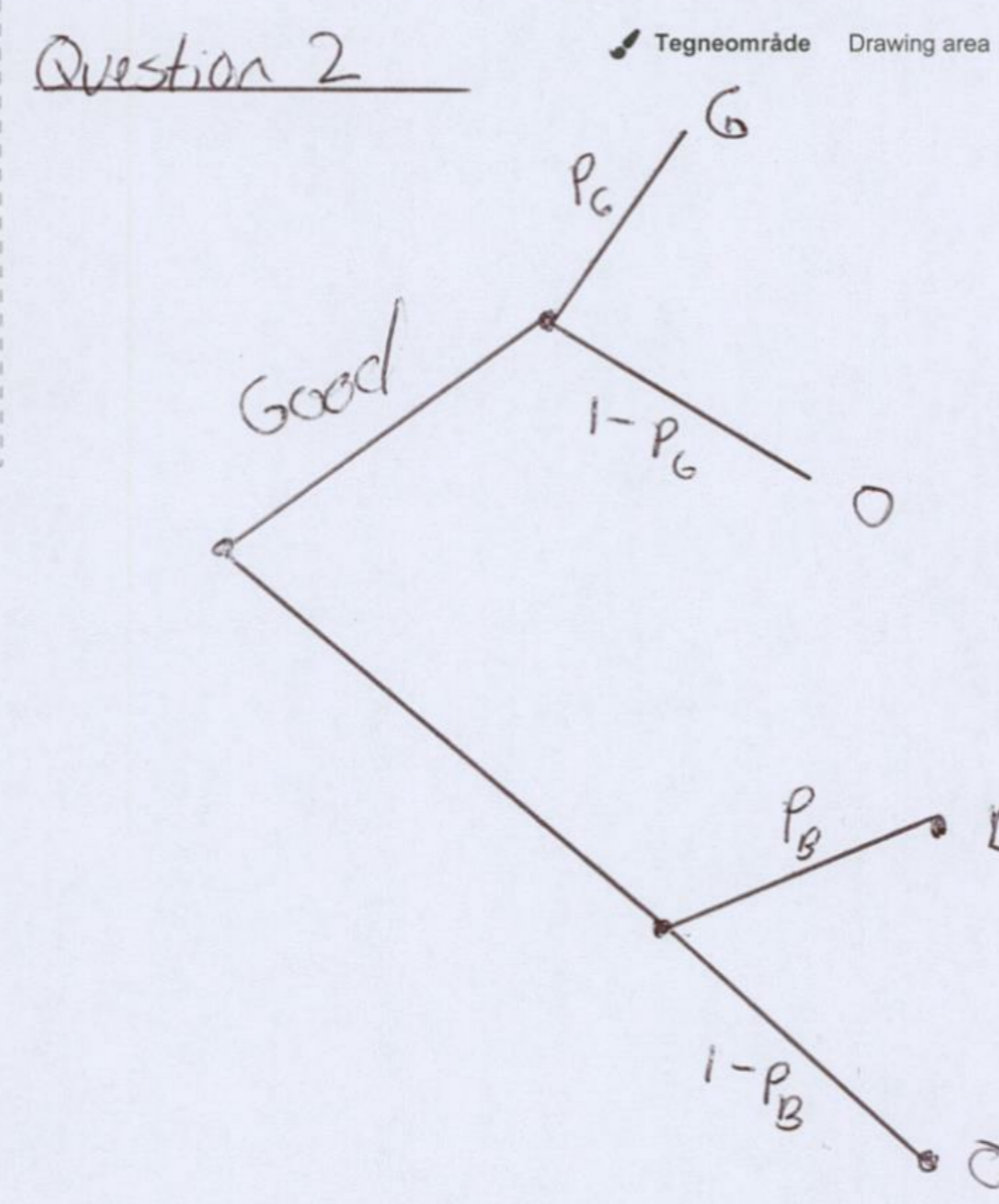

Unanswered.

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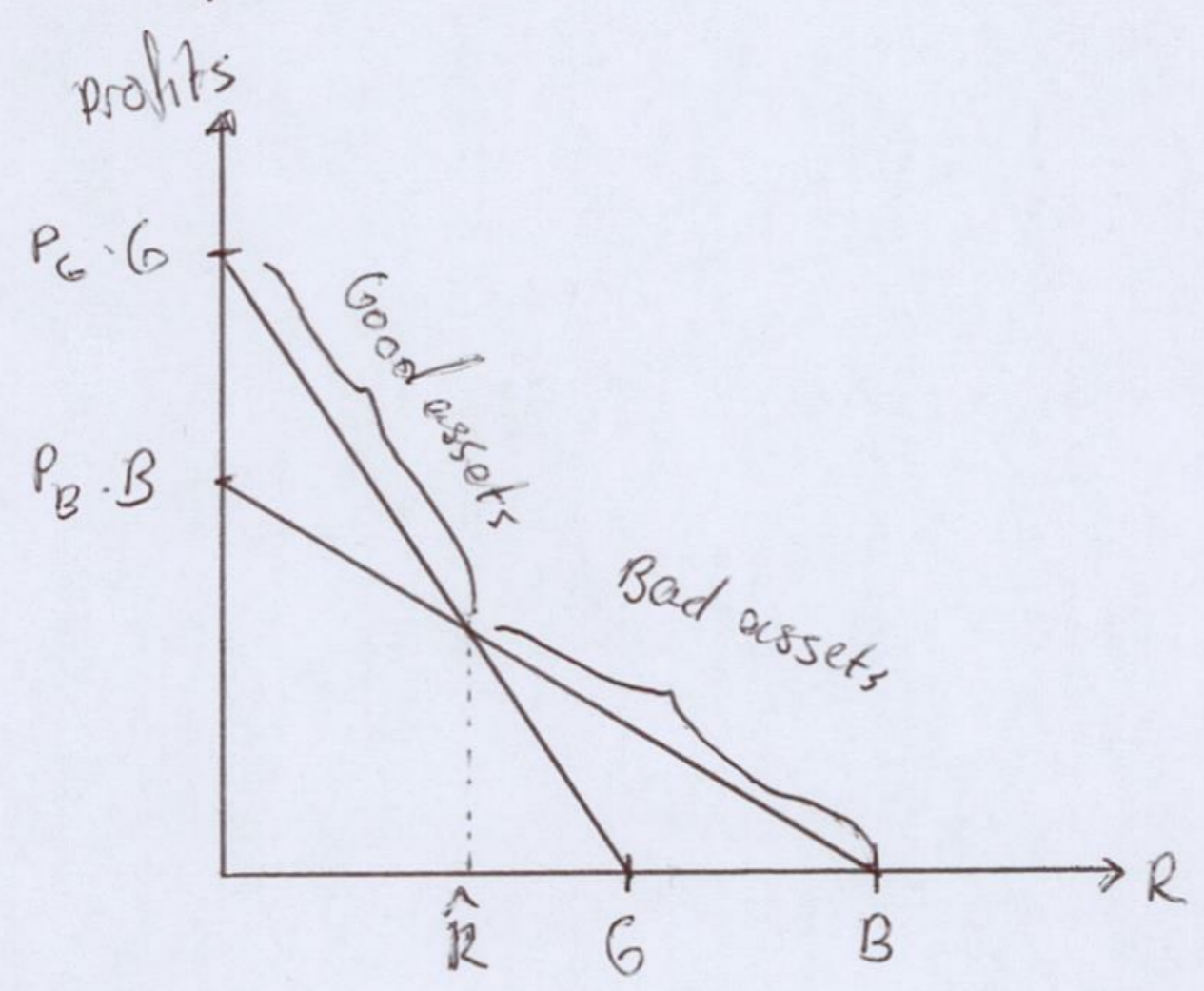Use the following code: **7 5 9 2 9 9 9**

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Question 2

Tegneområde Drawing area

a) Graphical illustration of how the two types of assets vary with R.

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Tegneområde   Drawing area

the computation of $\hat{R}$: First of all,
$\hat{R}$ is the point where the total payoff
for banks on good assets are equal bad assets.

$$P_G(G-R) = P_B(B-R)$$

$$P_G \cdot G - P_G \cdot R = P_B \cdot B - P_B \cdot R$$

$$P_G \cdot R - P_B \cdot R = P_G \cdot G - P_B \cdot B$$

$$R(P_G - P_B) = P_G \cdot G - P_B \cdot B$$

$$\hat{R} = \frac{P_G \cdot G - P_B \cdot B}{P_G - P_B}$$

(b) ## Question 2(B)

(B) Recall that there is no deposit insurance available in this economy; this implies that depositors are

happy to deposit as long as their expected gross return from deposits is no lower than 1. As the bank is a monopoly, depositors earn zero profit from deposits. For the values of p_G, G, p_B, B, find a condition under which depositors are willing to deposit and the bank invests only in the bad project. (10 points)

Give your answer here, or you can hand in sketches. Use the sketching paper handed to you in the examination venue. See instructions on your desk.

Unanswered.

Attaching sketches to this question?
Use the following code: **2 9 1 8 4 6**

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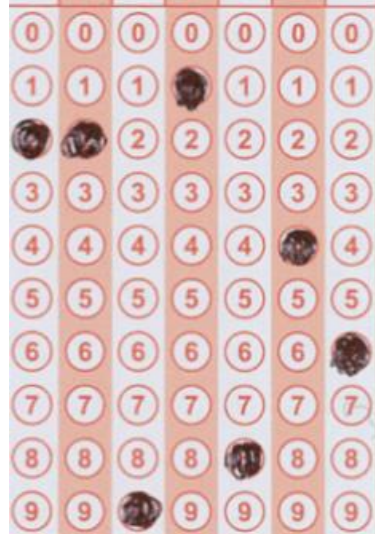
B) Repositors wants to maximize their return.

Good: Bad:

$P_G \cdot R - 1 \geq 0$ and $P_B \cdot R - 1 \geq 0$.

Lets see how the investment varies with R.

$$\text{(A)} \qquad \text{(B)} \qquad \text{(C)} \longrightarrow R$$
$$\underset{G}{\;\;\;|\;\;\;} \qquad \underset{B}{\;\;|\;\;}$$
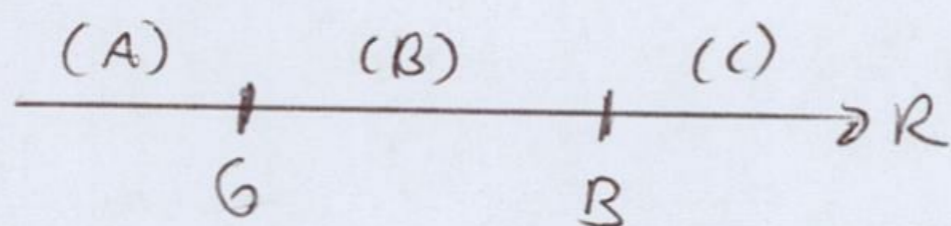
If the return is (A), $R \leq G$, which satisfies both the good and the bad asset for the depositor.

As well requires the bank that

$P_G (G - R) \geq 0$ and $P_B (B - R) \geq 0$;   which are

also satisfied.

✏ Tegneområde   Drawing area

In point (B) $G < R \leq B$, satisfies both good and bad asset as $P_G \cdot G > P_B \cdot B > 1$, but the banks condition does not.

The bank require that

$$P_G (G - R) \geq 0 \quad \text{and} \quad P_B (B - R) \geq 0,$$

where only bad asset is satisfied as is the solution for this question. In the last point, (C), where $R > B$, neither of the assets are satisfied.

(c)   Question 2(C)

(C) Now the bank has a choice to hold an amount of capital k for each unit of asset. Therefore, for

each unit of the bank's asset, the bank has to raise k from the shareholders and $1 - k$ from the depositors. The bank has to guarantee a return to equity (ROE) of ρ $(\rho > 0)$ for the shareholders, and we assume that the bank pays a gross return R for each $1 - k$ unit of deposit.

(C1) Suppose there is an R under which depositors are willing to deposit and the bank invests only in the bad assets. Compute R and the optimal level of capital for the profit-maximizing bank. (10 points)

(C2) Suppose, instead, there is an R under which depositors are willing to deposit and the bank invests only in the good assets. Compute R and the optimal level of capital for the profit-maximizing bank. (10 points)

(C3) Show there exists a threshold $\hat{\rho}$, such that for any $\rho < \hat{\rho}$, the profit-maximizing bank chooses an optimal capital level k^* and invests only in the good assets. Compute $\hat{\rho}$ and k^*. (15 points)

Give your answer here, or you can hand in sketches. Use the sketching paper handed to you in the examination venue. See instructions on your desk.
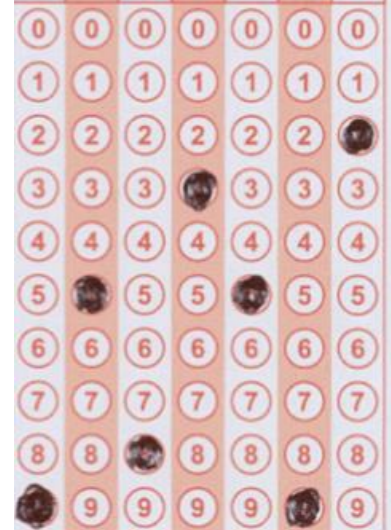
Unanswered.

Attaching sketches to this question?
Use the following code:

9 5 8 3 5 9 2

Oppgavekode	Dato	Emnekode	Kandidatnummer	Oppgavenummer	Sidetall
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✏ Tegneområde   Drawing area

1) c) I would assume banks profits are

$$\Pi^{bank} = P_G \cdot G + P_B \cdot B - PK - R(1-K) \geq 0$$

Participation
constraint

revenue
good assets

revenue
bad assets

shareholders

depositors

Only bad assets

$$\Pi^{bank} = P_B \cdot B - PK - R(1-k) \geq 0$$

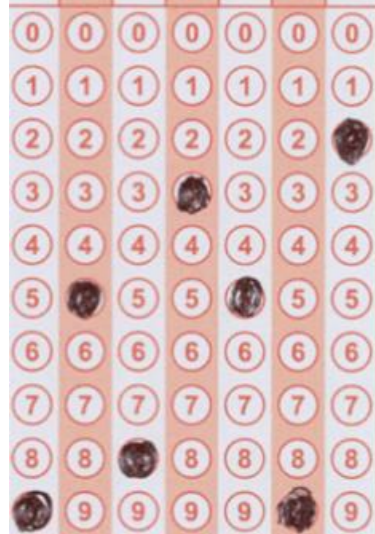$$\hookrightarrow R \leq \frac{P_B \cdot B - PK}{(1-k)}$$

~~capital decreases profits, as credit assumes optimally implies K≤P~~

Optimal k I would assume

$$\frac{\partial \Pi^{bank}}{\partial k} = -P + R = 0$$

$$\hookrightarrow \underline{P = R}$$

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(2)

🖌 Tegneområde   Drawing area

If banks only invest in good assets,

$$\pi^{bank} = P_G \cdot G - Pk - R(1-k) \geq 0$$

$$\Rightarrow R \leq \frac{P_G \cdot G - Pk}{(1-k)}$$

(3) From (2), the bank only invest in good assets.

$$\pi^{bank} = P_G \cdot G - Pk - R(1-k) \geq 0.$$

$$\Rightarrow P \leq \frac{P_G \cdot G - R(1-k)}{k} = \hat{P}.$$

3 Consider a one-good, three-date economy: There are infinitely many ex ante identical consumers (whose population is normalized to 1), each endowed with one unit of resource at $t = 0$. Consumption may take place either at $t = 1$ or $t = 2$, while each consumer's timing preference of consumption only gets revealed at $t = 1$: With probability p $(0 < p < 1)$ a consumer is an impatient one (type 1 consumer), who only values consumption at $t = 1$, while with probability $1 - p$ a consumer is a patient one (type 2 consumer), who only values consumption at $t = 2$. A consumer's type is private information and only known to herself.

Let c_i denote the consumption of a type $i = 1, 2$ consumer. At $t = 0$, without knowing her type, a consumer's expected utility from consumption is $u = p\sqrt{c_1} + (1 - p)\sqrt{c_2}$.

The economy has two technologies of transferring resources between periods: Storage technology with gross return equal to 1, and a long-term investment technology with a constant gross return $R > 1$ at $t = 2$ for every unit invested at $t = 0$. If necessary, an on-going long-term project can be liquidated or stopped prematurely at $t = 1$, with a return $0 \leq \delta < 1$.

(a) ## Question 3(A)

(A) Suppose at $t = 0$ a social planner allocates all resources in this economy to maximize each consumer's expected utility: At $t = 0$ the planner collects $0 \leq \alpha \leq 1$ from each consumer and invest in the storage technology, and the rest --- $1 - \alpha$ from each consumer --- will be invested in the long-term technology. At $t = 1$ the total proceeds from the storage technology will be evenly distributed among impatient consumers (whose population is p), and at $t = 2$ the total proceeds from the long-term technology will be evenly distributed among patient consumers (whose population is $1 - p$). Show that the optimal solution to type $i = 1, 2$ consumer's consumption is $c_1^* = \frac{1}{p + (1-p)R}$, $c_2^* = \frac{R^2}{p + (1-p)R}$, and the resource invested in storage technology is $\alpha^* = \frac{p}{p + (1-p)R}$. (15 points)

Give your answer here, or you can hand in sketches. Use the sketching paper handed to you in the examination venue. See instructions on your desk.

Unanswered.

Attaching sketches to this question?
Use the following code:

3 7 3 4 3 1 2

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Question 3

a) Max $p\,u(c_1) + (1-p)\,u(c_2)$

s.t. $p c_1 = x \longrightarrow$ short asset

$(1-p)c_2 = (1-x)\cdot R \longrightarrow$ long asset

Combined:

$(1-p)c_2 = (1-pc_1)R$

Lagrangian:

$$\mathcal{L} = p\,u(c_1) + (1-p)\,u(c_2) - \lambda\big((1-p)c_2 - (1-pc_1)R\big)$$

F.O-C

$$\frac{\partial \mathcal{L}}{\partial c_1} = p\,u'(c_1) - \lambda p R = 0 \longrightarrow \frac{u'(c_1)}{R} = \lambda$$
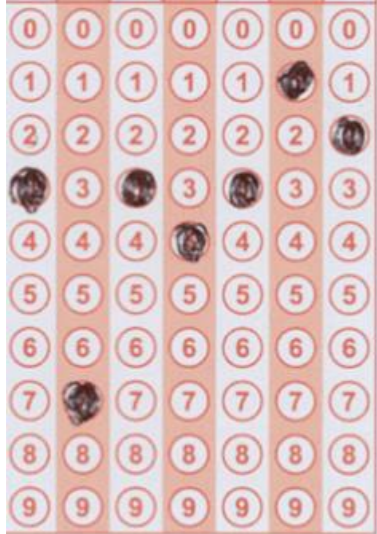
$$\frac{\partial \mathcal{L}}{\partial c_2} = (1-p)\,u'(c_2) - \lambda(1-p) = 0 \longrightarrow u'(c_2) = \lambda$$

Combined:

$$u'(c_1^*) = u'(c_2^*)\,R$$

Hence, $u'(c_1) > u'(c_1) \longrightarrow c_2 > c_1.$

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✎ Tegneområde Drawing area

$$u = P \cdot c_1^{1/2} + (1-P) c_2^{1/2}$$

$$\rightarrow u'(c_1) = u'(c_2)R \longrightarrow \frac{P}{2 \cdot \sqrt{c_1}} = \frac{(1-P)}{2\sqrt{c_2}}R$$

Solve for c_2

$$c_2^{1/2} = \frac{\sqrt{c_1}(1-P)}{P}R \longrightarrow c_2 = \frac{c_1(1-P)^2}{P^2}R^2$$

Insert into budget constraint.

$$\frac{c_1(1-P)^3 R}{P} = 1 - Pc_1 \longrightarrow c_1\left[\frac{(1-P)^3 R + P^2}{P}\right] = 1$$

$$c_1 = \frac{P}{c(1-P)^3 R + P^2} \quad \cdots$$

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Tegneområde   Drawing area

Given that $\quad c_1^a = \dfrac{1}{P+(1-P)R}$

and $\quad c_2^* = \dfrac{R^2}{P+(1-P)R}$,

we can insert into e.g. our short asset constant,

$$P(c_1^a) = \alpha^*$$

$$\alpha^* = \dfrac{P}{P+(1-P)R}.$$

(b)   **Question 3(B)**

(B) Suppose that the economy is in autarky such that every consumer has to allocate her endowments

between two technologies by herself at $t = 0$. Show that consumers cannot achieve the optimal solution defined in (A). (10 points)

Give your answer here, or you can hand in sketches. Use the sketching paper handed to you in the examination venue. See instructions on your desk.

Unanswered.

Attaching sketches to this question?
Use the following code: **0 7 3 9 5 0 2**

B)

In autarky, the consumer allocate their endowments

Impatient consumers:

$$e_1^A = \alpha + (1-\alpha)\delta \leq 1$$

$\hookrightarrow$ they liquidate some of their own assets.

$$c_2^A = \alpha + (1-\alpha)R \leq R.$$

Since $1 < c_1^a < c_2^* < R$,

while $c_1^A \leq 1$ and $c_2^A \leq R$, they can not achieve the optimal solution, hence

$$(c_1^A, c_2^A) \neq (c_1^*, c_2^*).$$

(c) **Question 3(C)**

(C) Suppose there is a competitive banking sector in the economy, in which banks take consumers'

endowments as deposits at $t = 0$ and allocate between the two technologies. Consumers withdraw c_i at $t = i$ according to their type i. Show that banks can implement the optimal solution achieved in (A) in the following way: (1) Banks invest α^* of deposits in storage technology, $1 - \alpha^*$ of deposits on long-term technology; (2) consumers who withdraw at $t = 1$ get c_1^* each, and consumers who withdraw at $t = 2$ get c_2^* each; (3) impatient consumers all withdraw at $t = 1$ and patient consumers all withdraw at $t = 2$. (10 points)

Give your answer here, or you can hand in sketches. Use the sketching paper handed to you in the examination venue. See instructions on your desk.
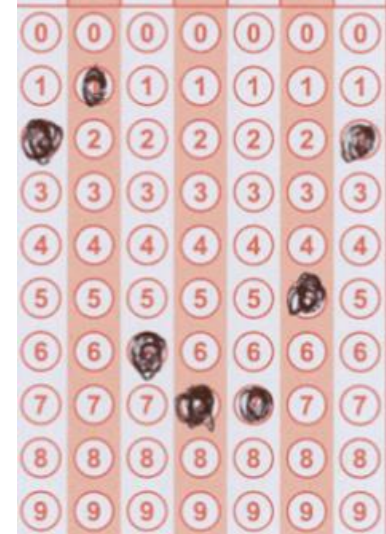
Unanswered.

Attaching sketches to this question?
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c) Yes, banks can replicate/mimic the optimal solution if they in period 0 gather deposits $d_0^* = (c_1^*, c_2^*)$. A typical balance sheet can look like:

A	L
$x^* = \rho c_1^*$	deposits $= 1$
$(1-x^*) = 1 - \rho c_1^*$	

Patient agents have no reason to mimic the impatient agent. The bank is able to achieve social planners allocation. This solution is utility maximization, feasible and implementable. Hence, introducing a bank increases welfare.

(d)   **Question 3(D)**

(D) Banking sector in this economy is fragile: Patient consumers may demand their deposits at $t = 1$,

which leads to bank run. However, whether this happens or not crucially depends on the value of δ. Show that there exists a threshold $\underline{\delta}$, such that as long as $\delta > \underline{\delta}$ and banks do the same as described in (C), there will never be bank runs. (15 points)

Give your answer here, or you can hand in sketches. Use the sketching paper handed to you in the examination venue. See instructions on your desk.

Unanswered.

Attaching sketches to this question?
Use the following code:

8 4 6 2 4 6 1

Tegneområde   Drawing area

D) In a run-equilibrium, if the bank is not able to get high enough liquidity by liquidation of long assets to meet the demand, they will be bankrupt.

In a run equilibrium, everyone demand c_1^*, but the bank only have $c_1^r = x + (1-x)\delta \leq 1$. I would assume the treshold is where the liquidation exactly meets demand.

bankruptcy   no bankruptcy.
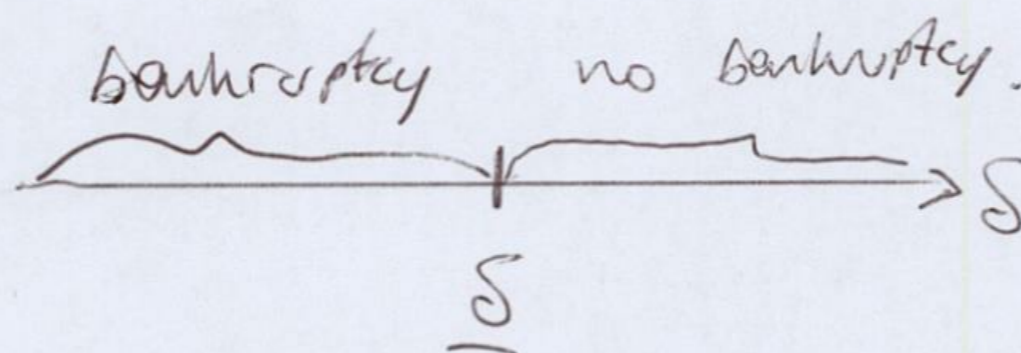
If everyone demand c_1^*, and the bank is able to achieve c_1^* through liquidation, we will end up both in the case C), as there are no fear of bankrupcy in crisis-state. as they will meet all demand.

$$c_1^r = x + (1-x)\delta \geq c_1^*$$

$$\underline{\delta} \geq \frac{c_1^* - x}{1 - x}$$

securities from the financial market, hoping to prevent the prices of long assets from falling too much. Using your finding in (D), explain why such unconventional policy helps eliminate panics in banking sector. (10 points)

Give your answer here, or you can hand in sketches. Use the sketching paper handed to you in the examination venue. See instructions on your desk.
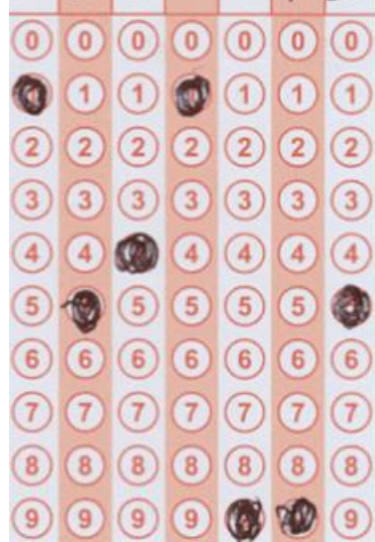
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Tegneområde   Drawing area

E) Such unconventionally monetary policy as buying huge volumes of securities, was to increase the demand of securities which pushes up the $S \rightarrow \underline{S}$ to avoid such bank-run liquidation bankrupcies. This might eliminate panics in banking-sector.

Other unconventional monetary policies coued be negative interest rates (as long as deposit-rate is not too low), credit easing with the focus on rishy assets or forward guidance.