ECON 4335 Economics of Banking, Fall 2021

Postponed Exam: Grading Guidance

Working Draft *2 January 2022*

1. Are the following statements true, false, or uncertain? Briefly explain (40 points)

(a) (10 points) False. Although securitization does not change asset return, it does create securities with different risk profiles that meet investors' different risk appetites: Through pooling and tranching during securitization, financial institutions are able to distribute asset return among investors, according to their individual consumption demand under different contingencies, improving investors' welfare.

(b) (10 points) False. Costly bank run is a discipline device that forces banks to conduct proper management of liquidity and credit risks, in order to avoid bank run in the first place. Committing to always bail out trouble banks will destroy such discipline and reduce banks' incentive on risk management, making bank failure more likely to happen. Particularly, such commitment also encourages banks' moral hazard on excess risk-taking ex ante, as the materialized bankruptcy cost ex post will always be shifted to the central bank and eventually borne by taxpayers; therefore, such commitment will simply lead to excess burden for taxpayers and become detrimental to social welfare.

(c) (10 points) False. Rational investors can still invest in a bubble, as long as they believe that the price growth rate of the bubble is no less than the risk-free rate in the economy. This holds even if rational investors believe that the bubble will burst with a positive probability and become worthless afterwards, so long as investors believe that the price growth rate of the bubble is sufficiently high so that the expected return rate from the bubble is no less than the risk-free rate.

(d) (10 points) Uncertain. Banks are highly leveraged financial firms with limited liabilities; therefore, they always have the incentive to gamble for the head and neglect the bankruptcy cost in the tail, as most of the bankruptcy cost will be borne by bank creditors. Although being more prudent reduces the likelihood of bank failure and ensures banks to profit for longer, if gambling in the short run makes sufficiently high profit (compared to making less profit by being prudent for longer) and/or banks discount future profit too much, short-run benefit from gambling still encourages banks to take excess risks.

2. Shorter Analytical Questions: Adverse Selection and Bank Lending (20 points)

(a) (10 points) Under the bank's lending rate R, the good entrepreneur makes a profit of

$$0.8 \times (2 - R)$$

while the bad entrepreneur makes a profit of

$$0.3 \times (3 - R).$$

By participation constraint, entrepreneurs must make non-negative profit. As a result, the highest lending rate that the bank can charge from the good entrepreneur is

$$R_G = 2$$

and the highest lending rate that the bank can charge from the bad entrepreneur is

$$R_B = 3.$$

This implies that, without being able to observe the type of an entrepreneur, the bank's lending rate can determine who will be the bank's borrower(s):

- For $1 \leq R \leq 2$, both entrepreneurs will borrow from the bank;
- For $2 < R \leq 3$, only the bad entrepreneur will borrow from the bank;
- For $3 < R < +\infty$, no entrepreneur will borrow from the bank.

(b) (10 points) By participation constraint, the bank must make non-negative profit. Given that the bank is a monopoly, it will charge the highest possible lending rate. As for those three regions characterized in Question 2(a),

- For $1 \leq R \leq 2$, both entrepreneurs will borrow from the bank, and the bank will charge $R = 2$. The bank's profit will be

  $$0.8 \times 2 - 1 + 0.3 \times 2 - 1 = 0.2 > 0.$$

  That is, the bank will be willing to lend;
- For $2 < R \leq 3$, only the bad entrepreneur will borrow from the bank, and the bank will charge $R = 3$. The bank's profit will be

  $$0.3 \times 3 - 1 = -0.1 < 0.$$

  That is, the bank will not be willing to lend;
- For $3 < R < +\infty$, no entrepreneur will borrow from the bank. Independent on the lending rate, the bank makes zero profit.

Overall, the bank's optimal lending rate is $R = 2$ and its profit is 0.2.

3. Longer Analytical Questions: Bank Run in a Banking Equilibrium (40 points)

(a) (15 points) A bank's optimization problem in $t = 0$ is characterized by

$$
\begin{aligned}
\max_{\alpha,c_1,c_2} \ & \pi (c_1)^{\frac{1}{2}} + (1-\pi)(c_2)^{\frac{1}{2}}, \\
s.t. \ & \pi c_1 = \alpha, \\
& (1-\pi)c_2 = (1-\alpha)R, \\
& c_1 \le c_2. \text{ (5 points)}
\end{aligned}
$$

Solve to get $c_1 = \frac{1}{\pi+(1-\pi)R}$, $c_2 = \frac{R^2}{p+(1-\pi)R}$, $\alpha = \frac{\pi}{\pi+(1-\pi)R}$. (5 points)

To make the deposit contract implementable, the incentive compatibility constraint $c_1 \le c_2$ must hold: Should a truly patient consumer mimic an impatient one, she would only receive a lower payoff c_1 in $t = 1$ which makes her worse off. (5 points)

(b) (10 points) Given that $R > 1$, we can see that $\pi+(1-\pi)R > 1$. Therefore, $c_1 = \frac{1}{\pi+(1-\pi)R} < 1$.

Given that the return from the investment technology is higher than the storage technology ($R > 1$), the return-maximizing bank has the incentive to reduce α, which increases c_2. However, the risk aversion of consumers prevents c_2 from being too much higher than c_1, which prevents α from being too low. In this question, the risk aversion of consumers is not high, as the coefficient of relative risk aversion is

$$
-\frac{c_t \left(c_t^{\frac{1}{2}}\right)''}{\left(c_t^{\frac{1}{2}}\right)'} = 0.5 < 1.
$$

That is, the consumers here can tolerate a large gap between c_1 and c_2, even if the banks offer $c_1 < 1$.

(c) (15 points) To see that the bank run solution is an equilibrium outcome, it is sufficient to show that early withdrawers exhaust all resources so that any deviator (any patient consumer who chooses waiting instead of running in $t = 1$) is worse off.

If everyone except the deviator demands repayment in $t = 1$, total demand for withdrawal is c_1, while the maximum supply of liquidity with liquidating all illiquid assets is

$$
\begin{aligned}
\alpha + (1-\alpha)c &= \frac{\pi}{\pi+(1-\pi)R} + \left(1 - \frac{\pi}{\pi+(1-\pi)R}\right)c \\
&< \frac{\pi}{\pi+(1-\pi)R} + \left(1 - \frac{\pi}{\pi+(1-\pi)R}\right)\frac{1}{R} \\
&= \frac{1}{\pi+(1-\pi)R} \\
&= c_1
\end{aligned}
$$

using the assumption that $0 < c < \frac{1}{R}$. Therefore, the maximum supply of liquidity is not sufficient to meet the total demand for withdrawal c_1, so that banks have to distribute the maximum supply of liquidity among all withdrawers

$$c_1^r = \frac{\pi}{\pi + (1-\pi)R} + \left(1 - \frac{\pi}{\pi + (1-\pi)R}\right) c$$

and become bankrupted after $t = 1$. This implies that the deviator can only get $c_2^r = 0$ if she waits until $t = 2$, which is definitely worse off because $c_2^r < c_1^r$.