SØK2010 Final Exam
Spring 2024

Question 1 (30 points)

Please write or type your answers clearly for the following questions.

1. Explain the problems created by "asymmetry of information" in the loan market. How can banks help to reduce the impact of this problem? (10 points)

   Answer:

   Two main problems created by asymmetric information in the loan market:

   - Moral hazard - the risk of one party taking advantage of the situation between two parties at the cost of the other party, so called "hidden action". This could be for example a bank taking high risk by leveraging its assets to obtain a higher ROE (return on equity) with their own customers money, expecting to be bailed out by the central bank/government in case anything goes wrong.
   - Adverse selection - problem of distinguishing between different "types" of borrowers. For example, a bank may find it hard to determine if the borrower is a risky or a safe type and may be uncertain of what the loan is going to be used for.

   Solutions to both problems include: monitoring, collateral, signaling, screening and etc. Briefly explain each of the term is needed to get full credit.

   - Monitoring: The bank can monitor the borrower, to make sure that he/she use the money as indented.
   - Collateral: Collateral is a valuable asset that the borrower pledges as security for obtaining the loan. An easy example is when you buy a house, the bank may take collateral in the house, in case you fail to pay down on your mortgage.
   - Signaling: The borrower can signal that they have gotten loans earlier from another bank, to show that they can be trusted, and that the bank will not lose money when they issue a new loan or finance a project. Furthermore, the borrower can show the bank their former projects, to convince the other banks that the project they have taken before are safe, and not likely to default.

- Screening: The banks who are unsure on whether or not they should finance the borrower/project, can screen for example by acquiring credit information by credit bureaus, to see their financial status, and if they are more prone to making risky choices.

2. What are mortgage backed securities(MBS) and explain their role in creating interest rate risk of banks. (10 points)

   Answer:

   Mortgage-backed securities (MBS) are financial instruments that are created when a financial institution bundles together a large number of individual mortgage loans into a single security. MBS represent an ownership interest in a pool of mortgage loans. The cash flows from the underlying mortgages, including principal and interest payments made by borrowers, are passed through to investors in the MBS.

   MBS are sensitive to changes in interest rates. When interest rates rise, the value of existing MBS tends to fall because the fixed-rate mortgages underlying the securities become less attractive compared to newly issued mortgages with higher interest rates. Conversely, when interest rates fall, the value of existing MBS tends to rise as the fixed-rate mortgages become more valuable.

   Banks typically hold a mix of assets and liabilities with different durations. MBS often have longer durations than the liabilities (e.g., deposits) of banks. If interest rates rise, the value of MBS held by the bank declines, leading to losses. Longer duration of MBS means that their prices are more sensitive to changes in interest rates compared to shorter-term liabilities.

3. Explain in words what is "securitized banking". (10 points)

   Answer:

   Securitized banking is the business of packaging and reselling loans, with repo agreements as the main source of funds. Repo transactions are collateralized, frequently with securitized bonds and used by banks as short-term finance. Often a bank will bundle a large number of loans together and sell the package to a Structured Investment Vehicle set up by the bank to administer the loans. The outputs of this securitization are often used as collateral in repo.

   The combination of securitization plus repo finance is often referred to as "securitized banking" and these activities grew rapidly preceding the global financial crisis of 2007-09. Securitized-banking activities were central to the operations of firms formerly known as investment banks (e.g. Bear Stearns, Lehman Brothers, Morgan Stanley, and Merrill Lynch), but they also play a role at commercial banks, as a

supplement to traditional-banking activities of firms such as Citigroup, J.P. Morgan, and Bank of America.

Question 2 (30 points)

Consider a borrower with zero capital who needs to raise \$1 million from 10,000 smaller lenders, and each lender has capital of \$100. Lenders do not observe the borrower's return directly, but can monitor the information by paying a cost. The borrower can retain any unreported return. Monitoring the borrower costs $c = \$200$. The value of the borrower's project will be $y = \$1.4$ million with probability $p = 0.8$ and $y = \$1$ million with probability $1 - p = 0.2$. The lenders have a required return of 5%.

1. Assume each lender monitors the borrower separately, in other words, the monitoring effort is duplicated. What is the total cost of monitoring by all lenders? (5 points)

   Answer:

   Total cost of monitoring = amount of lenders × cost of monitoring each lender = 10,000 ×\$200 = \$2 million

2. Because duplicated monitoring is very expensive and the lenders decide not to monitor the borrower, but instead, the lender now impose a penalty for low payments from the borrower which work as follows: if the borrower offers a payment lower than $\$f$ million, liquidation will occur. If the borrower offers a payment of at least f, the liquidation can be avoided. If liquidation occurs, the borrower and the lenders both get nothing. Would the lenders accept the contract if $f = 1$? Explain your answers. (5 points)

   Answer:

   No, the lenders would not accept the contract.

   If $f = 1$, the borrower would just pay 1 to avoid liquidation and has no incentive to pay any amount great than 1, regardless of the realized return. However, from the lenders' prospective, receiving only 1 is unacceptable because it falls short of the required payment of 1.05 (required return of 5%).

   Thus, this contract fails to provide effective incentives for the lenders, leading to lenders rejecting the contract.

3. Calculate the value of f in this unmonitored debt situation that gives the lender her required return of 5%. Show your steps. (5 points)

   Answer:

   Expected return of the lender $= 0.8 \times f + 0.2 \times 0 = 1.05$
   $f = 1.3125$

4. Now suppose delegated monitoring can occur through the bank and the bank monitor two loans from two borrowers, whose returns are independently and identically distributed, the same as the return specified above. The bank now takes $2 million in deposits from 20,000 lenders and lends it out to two different borrowers. The bank gives each borrower a debt contract with face $F million and collects full amount F when the borrower has $1.4 million. If the borrower has $1 million, she will default by paying back only $1 million because of being monitored by the bank.

   Calculate and complete the below table on borrowers' payments to the bank and the corresponding probabilities under 3 different scenarios: one loan defaults, two loan default and no loan defaults. (5 points)

   Borrowers' payment to the bank and related probabilities

Payment	Probability	Probability that payment is >= this value	Scenarios
			no loan defaults
			one loan defaults
			two loan default

   Answer:

   It is important to note that the probability of both borrowers making their payments is considered as an independent event.

   Borrowers' payment to the bank and related probabilities

Payment	Probability	Probability that payment is >= this value	Scenarios
2F	$0.64 = p^2$	0.64	no loan defaults
F+1	$0.32 = 2p(1-p)$	0.96	one loan defaults
2	$0.04 = (1-p)^2$	1.00	two loan default

5. Let B denotes the face value of bank deposits per loan, which means that the two-loan bank has total deposits of $2B$ and each deposit of $100 has a face value $\frac{1}{10,000}B$. Assume the bank can pay its deposits when just one loan defaults (the bank will default on the deposits when both loan default).

   Calculate the expected payment received by all depositors. Based on your answer, what would the promised interest rate on bank deposits be? (5 points)

   Answer:

   Expected payment to depositors is when at most one loan defaults = 0.96 × 2B

   The initial capital needed to make two loans is 2 ($2 million), which requires a 5% return: 0.96×2B = 2×1.05, or 2B = 2.1875

This is the promised payment to 2 ($2 million) in deposits. The promised interest rate on the bank deposit is: $2B = 2 \times (1 + i)$, so $i = 9.375\%$

6. Based on the answer you got in (5), what should the face value of each loan F be? (5 points)

   Answer:

   If the bank is able to pay 2.1875 when one loan defaults (paying 1) and the other does not default (paying F), then 1+F must be at least 2.1875, and the face value of each loan must satisfy $F >= 1.1875$.

Question 3 (40 points)

Choose **one** correct answer for each of the following questions. Note that more than one choices, incorrect choice, or no choice will get zero point.

1. Which of the following statements is *not* true based on the model of Diamond and Dybvig (1983, Journal of Political Economy) discussed in class? (5 points)

   (A) Banks play the role of liquidity creation, converting illiquid assets into liquid asset

   (B) By issuing deposit contracts, banks can improve risk sharing among individuals that need to consume at different time horizons

   (C) For a fundamentally solvent bank, bank runs will not occur if depositors exhibit heard behaviors to withdraw from the bank

   (D) Regulatory measures, such as deposit insurance and lender-of-last-resort facilities, are important in mitigating the risk of banking panics

   Answer: C.
   The model emphasizes the role of expectations and coordination among market participants: if depositors expect other depositors to withdraw their funds, they may act preemptively, even if the bank is fundamentally sound, leading to a self-fulfilling bank run.

2. Based on the reading material "Wholesale Funding Dry-Ups" discussed in class, please choose the *correct* statement from below. (5 points)

   (A) The articles explores the fragility of wholesale funding of banks using transaction level data on repos in the European market

(B) The article does not have a conclusive finding regarding the causes of market freeze in the wholesale funding market

(C) The articles finds that funding dry-ups are supply-driven, predominantly affecting low-quality banks, indicating the presence of informed lenders

(D) The articles finds that high-quality banks self-select out of the market due to severe adverse selection, causing dry-ups that are demand-driven

Answer: C.

3. Which of the following statements about "Suspension of Deposit Convertability" is *not* true? (5 points)

(A) It highlights the vulnerability of the banking system to liquidity crisis and the needs for interventions

(B) It is a theoretical concept derived in the banking model as a defense mechanism against bank runs and it has never been deployed in reality

(C) Banks can temporarily halt the conversion of deposits into cash when withdrawals exceed a certain threshold

(D) The suspension of convertibility is not optimal if it result in some depositors being unable to withdraw their funds when needed

Answer: B.
Occurred in Greece during the European debt crisis.

4. Based on the reading material "Managing the Balance Sheet through the Use of Repo 105" discussed in class, please select the *incorrect* statement from below. (5 points)

(A) The financing or the loan remains on the balance sheet in a standard repo transaction

(B) Lehman Brothers manipulated its leverage ratios by removing assets from its balance sheet

(C) Lehman Brothers disclosed the use of Repo 105 to the board and the public, however, investors and the market were overly optimistic about the true state of Lehman

(D) Lehman Brothers could not secure Repo 105 as sales by US law, so they relied on UK law to circumvent the regulation

Answer: C.

5. Which of the following statements is *incorrect* about the provisions made in Basel III? (5 points)

   (A) Under Basel III, banks must improve both the quantity and quality of their capital

   (B) Basel III introduces both new liquidity measures and capital reforms

   (C) The minimum ratio of common equity to RWA is increased in Basel III, but liquidity measures are not imposed due to banks' shrinking profit margin

   (D) Basel III establishes a leverage ratio for banks to maintain certain level of Tier 1 capital

   Answer: C.

6. From the reading material "Norwegian covered bond - a rapidly growing market" discussed in class, please choose the *correct* statement from below. how and through which channels a drop in house prices would affect OMFs. (5 points)

   (A) OMFs are more difficult to issue and trade because they are unsecured bank bonds

   (B) Multiple defaults in the OMFs during the financial crisis in 2007- 2009 due to the housing market turmoil

   (C) A drop in house prices will decrease mortgages' LTV which in turn reduces the eligible cover pool

   (D) OMFs are issued not only in NOK but also in other currencies

   Answer: D.

7. Using the model from Stiglitz and Weiss (1981) on credit rationing introduced in class, which of the following statements is *correct*? (5 points)

   (A) Credit rationing can arise as lenders cannot increase the interest rate charged to borrowers, in fear of losing potential good borrowers and profit

(B) Credit rationing cannot persist because lenders can clear the market by increasing interest rate

(C) Credit rationing can occur as lenders cannot increase the interest rate charged to borrowers, due to regulatory ceiling imposed to reduce market distortion

(D) Increased interest rates lead to higher cost of the loan, which gives less incentive to borrowers to invest in riskier projects

Answer: A.

8. Consider an Entrepreneur who invests in a project with 0.5 million of his own wealth and borrows a loan of 1.5 million from the bank with an annual interest rate of r. That is a total amount of 2 million will be invested in his project. The project lasts one one year and its payoff structure is the following: if the market condition is good, the project gets return of $x = 4$ or $x = 1.4$ if the market condition is bad, with equal probability. At the end of one year, the Entrepreneur needs to pay back the bank. Assume there is no information friction, and the Entrepreneur's project realized return is known to both parties. What is the expected net payoff of the project for the Entrepreneur? (5 points)

(A) 0.75 - 0.75r

(B) 1.50 - 0.25r

(C) 2.75 - 0.50r

(D) 0

Answer: A.
Expected net payoff for E is $\pi = 0.5 \times [4 - 1.5(1 + r)] + 0.5 \times 0 - 0.5 = 0.75 - 0.75r$