

SØK2010 V21 Exam Suggested Solution

1. Securities, foreign reserves, discount loans to banks, gold and buildings belong on the assets side of a central bank balance sheet.

- 2.

Government deposit insurance means that the government guarantees deposit accounts, up to a specified amount. When the deposit is guaranteed by the government there is no reason to run on a bank. The depositors also lose their incentive to monitor the solidity of the bank, which can cause a moral hazard problem.

Capital and Reserves Requirements can be set by regulators to ensure the solidity of banks. If the banks have sufficient reserves, there is no reason to run on the bank. The downside is that excess requirements on capital and reserves is inefficient and costly for the banks.

A **lender of last resort** also guarantees that the bank will have access to sufficient funds to pay depositors, so they do not need to run on the bank. Such loans can be very risky and can introduce moral hazard.

Government bailouts is an alternative way to give struggling banks sufficient liquidity and suffers the same basic downsides as a lender of last resort.

Suspension of convertibility is temporarily closing the bank or artificially reducing access their services. If the depositors are unable to withdraw their money, they cannot run on the bank. However, denying people access to their money is very problematic, especially when almost all money is digital. Therefore, this is not often used today.

A **coalition of private banks** can guarantee each other's deposit accounts. This has been largely replaced by government deposit insurance. It has some of the same downsides and is considered less safe because the other banks in the coalition can be hit by the same downturn.

- 3.

- a)

This is a moral hazard problem. The risk-shifting is a hidden action performed by the banks after the bank deposits are insured by the government.

- b)

This is an adverse selection problem. The problem is for banks to determine which hidden type their customers are before they sign a loan contract.

4.

a)

The typical solution to mitigate a moral hazard problem is monitoring. Since the depositors no longer have an incentive to monitor the banks, it is up to the government or regulators. The regulators could monitor the banks' reserves and capital and set minimum requirements.

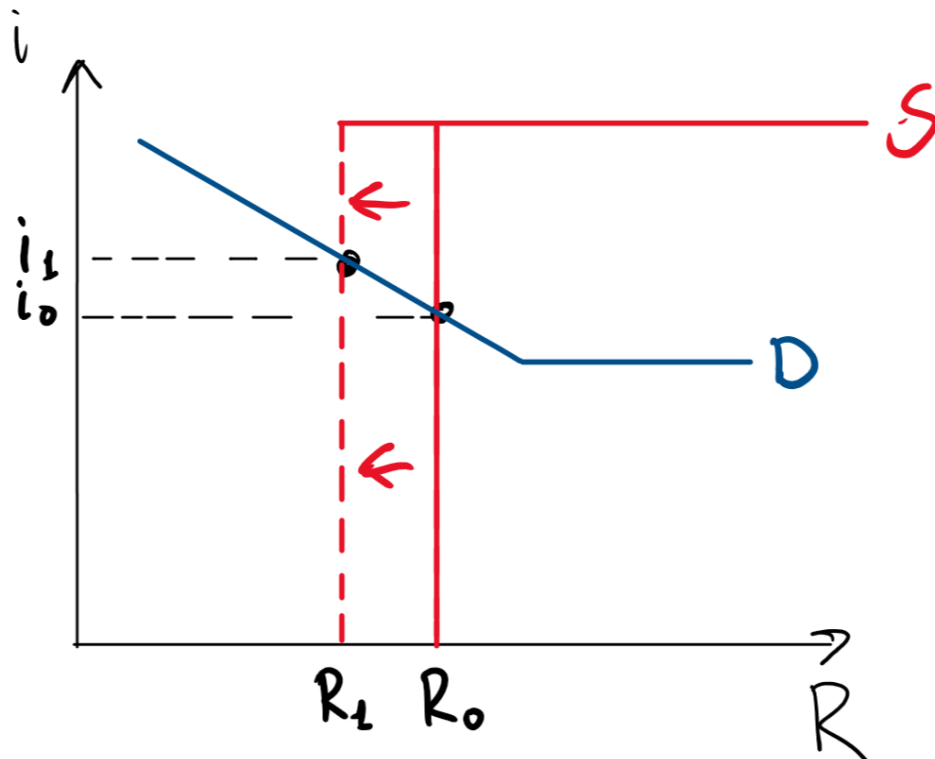
b)

The typical solutions to mitigate adverse selection problems is screening and signaling. The banks can use the borrowers' credit history or financial statements to screen out bad types. It is also in the interest of the good types of borrower to signal their type. They can make an effort to have a good credit score, for instance.

5.

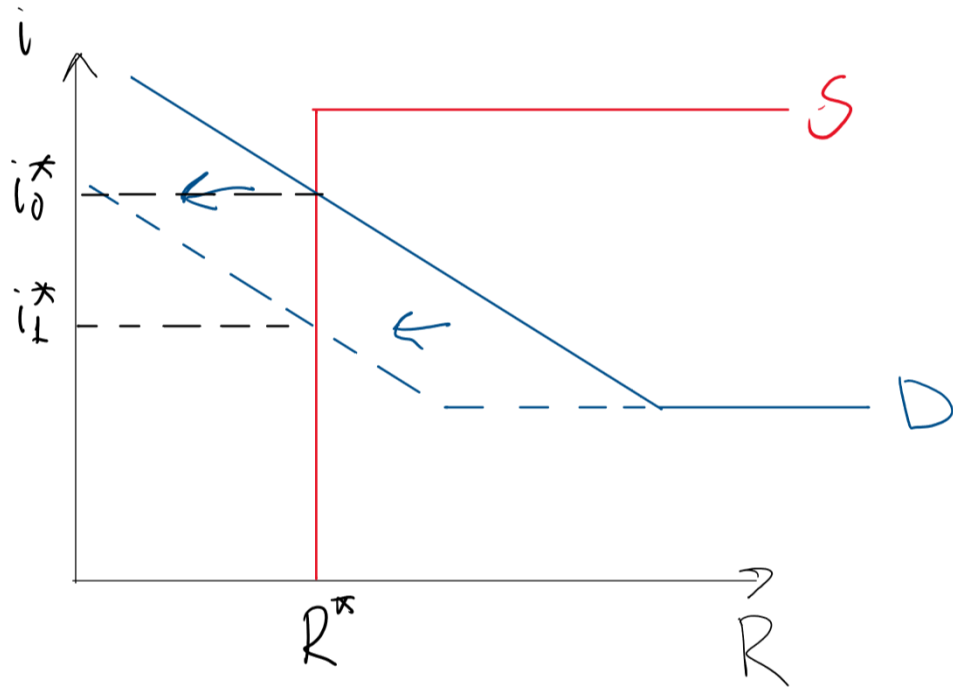
a)

When the central bank performs an open market sale of government bonds the supply of reserves decreases. The supply shifts to the left and the interest rate increases.

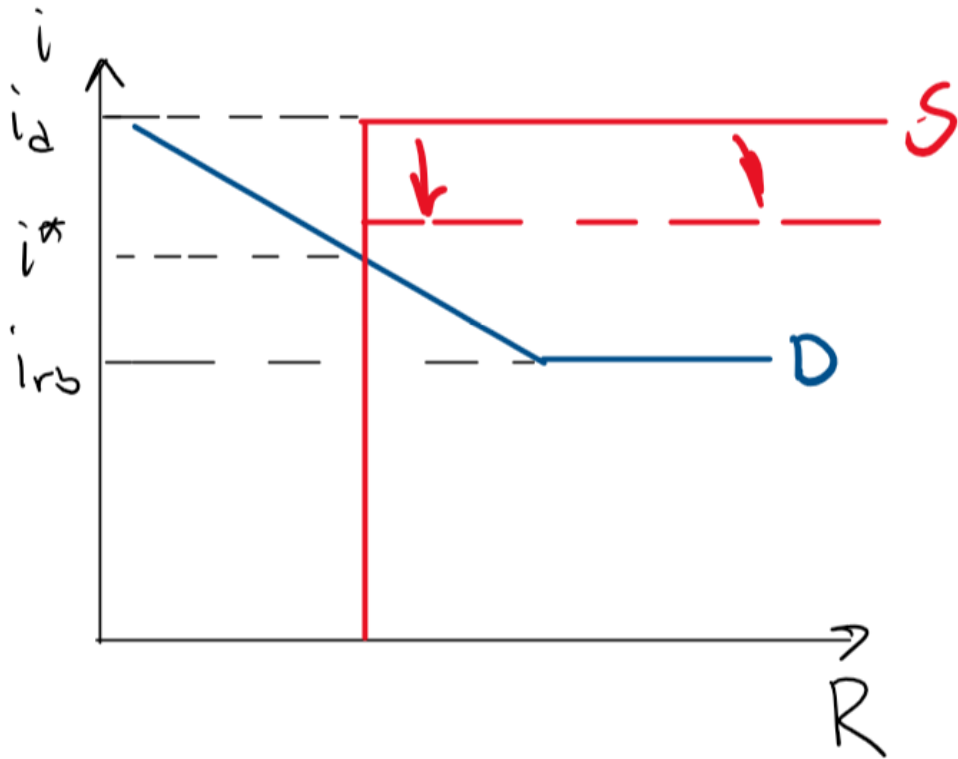


b)

When the central bank decreases the required reserves ratio, the commercial banks need less reserves, so the demand curve shifts to left and lowers the interest rate.



- c)
- The commercial banks will only take discount loans if it is the lowest rate available. Therefore, the discount rate functions as a ceiling on the overnight interbank interest rate. Decreasing the discount rate below the current overnight rate will lower the interest rate and decreasing it to a level above the current overnight rate will not affect the overnight rate.



6.

a)

The net present value of the project is $\pi_p = pU + (1 - p)D - 1$

b)

When the bank is a monopolist, it will use its market power to set the interest as high as the borrower can bear. The borrower will only participate if their expected payoff is greater than or equal to their investment. If the project is successful, the firm will get $U - R$. If the project is a failure, the firm will not even be able to pay back the loan, since $D < 1$, and will get nothing. The firm has no initial investment, so their participation condition is:

$$p(U - R) \geq 0$$

Solve for R :

$$U \geq R$$

If the bank is a monopolist in the credit market the $R = U$.

In a competitive credit market the lenders will compete on price until it is as low as they can bear. If the project is successful, the bank will receive R , and if it fails, they will receive D . The bank's expected payoff must be greater than or equal to their investment. The lender's participation condition is therefore:

$$pR + (1 - p)D \geq 1$$

Solve for R :

$$R \geq \frac{1 - (1 - p)D}{p}$$

If the credit market is competitive, the interest rate will be pushed down so that $R = \frac{1-(1-p)D}{p}$.

c)

We assume that the credit market is competitive, so $R = \frac{1-(1-p)D}{p}$.

A small change in p will give a $\frac{\partial R}{\partial p}$ change in R .

$$R = \frac{1}{p} - \frac{D}{p} + D$$

$$\frac{\partial R}{\partial p} = -p^{-2} + Dp^{-2} = p^{-2}(D - 1) < 0$$

When the probability of success increases, there is less risk of default for the bank, and they can accept a lower interest rate.

A small change in U will give a $\frac{\partial R}{\partial U}$ change in R .

$$\frac{\partial R}{\partial U} = 0$$

If $U \geq R$, the bank will be repaid if the project is a success. Therefore, it does not affect the bank if U increases and the interest rate is unchanged.

If D increases:

$$\frac{\partial R}{\partial D} = \frac{p - 1}{p} < 0$$

This is because the more money the bank will get if the project fails, the less risky it is for the bank. The bank will accept a lower interest rate if they can get more if and when the project fails.

d)

If the borrower can pledge a collateral C the net profit of the bank becomes:

$$\pi_l = pR + (1 - p)(D + C) - 1$$

If the credit market is competitive we have that:

$$\pi_l = pR + (1 - p)(D + C) - 1 = 0$$

$$R = \frac{pD + pC - D - C}{p}$$

If C increases:

$$\frac{\partial R}{\partial C} = \frac{p - 1}{p} < 0$$

This is because the more money the bank will get if the project fails, the less risky it is for the bank. The bank will accept a lower interest rate if they can get more if and when the project fails.

e)

The payoff of the safe project for the borrower is $1.25 - 1(1 + 10\%) = 0.15$ and the payoff for the risky project is $0.4 * (1.5 - 1(1 + 10\%)) = .16$. The payoff of the risky project is greater and there is no initial investment for the borrower, so the firm will choose the risky project.

The NPV for the bank on the risky project is $0.4 * (1 + 10\%) + 0.6 * 0.6 - 1 = -0.20$ so the bank makes an expected loss.

f)

The payoff of the safe project for the borrower is $1.25 - 1(1 + 5\%) = 0.20$ and the payoff for the risky project is $0.4 * (1.5 - 1(1 + 5\%)) = 0.18$. The payoff of the safe project is greater and there is no initial investment for the borrower, so the firm will choose the safe project.

The NPV for the bank on the safe project is $1 * (1 + 5\%) - 1 = 0.05$, so the bank will make a profit.

g)

The firm will choose to undertake the safe project if the NPV is greater than or equal to the NPV of the risky project for them.

$$\begin{aligned} NPV_{safe} &\geq NPV_{risky} \\ 1.25 - (1 + r) &\geq 0.4(1.5 - (1 + r)) \\ r &\leq 8.33\% \end{aligned}$$

The firm will choose to undertake the safe project if the interest rate is less than or equal to 8.33%.