

ECON4335 Suggested Solutions for Problem set

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Question 1

1.1

Since there is no default risk, arbitrage should make all interest rates equal.

1.2

Define

$$R = D_{cb} + B_b = \phi D_h \quad (1)$$

R is shorthand for the total liquidity reserves of banks. Embedded in the column for banks in table 1 is the equation:

$$W_b = L + R - D_h - L_{cb} \quad (2)$$

Insert (1) in (2) and solve for D_h :

$$D_h = \frac{1}{1-\phi} [L - L_{cb} - W_b] \quad (3)$$

Insert this in (1)

$$R = \frac{\phi}{1-\phi} [L - L_{cb} - W_b] \quad (4)$$

1.3

Assume that that L is determined in advance (loans are long-term). Equation (4) gives the demand for reserves. From the balance sheet of the central bank its supply of reserves is

$$D_{cb} = L_{cb} + B_{cb} - W_{cb}$$

Insert this in on the left side of (4) and you get

$$L_{cb} + B_{cb} - W_{cb} + B_b = \frac{\phi}{1-\phi} [L - L_{cb} - W_b]$$

Solved for L_{cb} :

$$L_{cb} = \phi(L - W_b) + (1 - \phi)(W_{cb} - B_b) \quad (5)$$

This tells how much the central bank has to lend conditional on the level of B_b .

If the central bank lends less than this, the banks will buy t-bills from the households instead. Since the households are indifferent between bills and deposits, this can be done without any effect on interest rates. If the households have no more t-bills to sell, no equilibrium exists and prices of t-bills will spin out of control. central bank lends more than necessary this will just add to the deposits at the central bank. (The CBs lending rate may have to be slightly lower than its deposit rate.

Remark: If we insert (5) back in (3) we get

$$D_h = L - W_b - W_{cb} + B_b \quad (6)$$

Loans create deposits one for one. Buying treasury bills in the market is another way of making loans. Treasury bills also serve as liquidity reserves reducing the need for reserves at the central bank.

Question 2

2.1

From the information given in the text it follows that

$$\Delta L = I = S = \Delta W_h$$

and

$$\Delta W_g = \Delta W_b = \Delta W_f = 0$$

Assume that the central bank accommodates the demand for reserves at a given interest rate, and that nobody changes their demand for t-bills. Since lending creates deposits

$$\Delta D = \Delta L$$

and

$$\Delta D_{cb} = \Delta L_{cb} = \phi \Delta L$$

2.2

Assume that all interest rates change in line with the policy rate. The standard story: The direct impact is reduced investment demand, increased supply of savings, meaning reduced consumption demand. Output and income declines. This reduces savings, but (strangely) not investment. Output falls to the level where saving is equal to investment. It is the investment demand that determines savings.

2.3

If investments are 100 per cent financed by bank loans, the effects are as in 2.1 except that the sign is the opposite.

2.4

The effect on investment is the same as for an increase in the interest rate. However, there is no direct positive effect on savings. Hence, a smaller decline in output is sufficient to bring savings in line with investment. Output declines less. Stricter credit practice in banks, may make equity finance more attractive.

Question 3

3.1

The expression here is the same as equation (3) with the households demand function for deposits inserted. The statement that follows immediately after the equation is true only if L_{cb} is constant. This is another monetary policy than the one assumed so far, and less relevant (sorry!). The answers below are for the case where the central bank accommodates the demand for bank reserves.

If households shift from deposits to t-bills, the interest rates on t-bills will tend to go down. Banks will then sell t-bills and instead keep more reserves at the central bank, financed by loans from the same central bank. As long as banks have t-bills to sell and the central bank keeps on lending, the rate of return on t-bills will be kept at the policy rate. However, the assumption that $g(-x) = 0$ means that households will want to convert all their deposits to t-bills if the interest rates continue to be equal. The banks have only a fraction of that to sell. Hence, in the new equilibrium banks hold no t-bills, while households hold all t-bills except those in held by the central bank. The interest rate on t-bills has to be below that on deposits. Deposit rates will be equal to policy rates for the usual reasons, this means that banks will prefer to keep their reserves in the central bank rather than in t-bills. The equilibrium interest rate on bills is found by equalizing demand for bills with the amounts available for households to buy:

$$B_h = [1 - g(i - i_b - x)](D_h^0 + B_h^0) = B_h^0 + B_b^0 \quad (7)$$

or which is the same

$$D_h = g(i - i_b - x)(D_h^0 + B_h^0) = D_h^0 - B_b^0 \quad (8)$$

If x increases from 0, the deposit rate stays where it is, while the interest rate on t-bills goes down.

3.2.

The question does not specify which interest rate margin. Anyhow for an increase in ϕ to have effect on any margin, the interest rate on bank reserves

must differ from the interest on loans from the central bank..

Since different interpretations of the questions are possible, deviating answers are not necessarily wrong.