

Name: \_\_\_\_\_ . Code: \_\_\_\_\_

**Nova School of Business and Economics**  
**Macroeconomics 1103, 2013-2014, 1st Semester**  
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**Problem Set 4**

Due Date: November 15, Friday

Turn in your problem set at Biblioteca 3, by 17:00

**Turning in the problem sets is optional.** The problem sets can be done in groups, but they have to be turned in individually.

To facilitate the organization of problem sets, please turn in your problem set with your name and code filled out as above, on the top of the first page. You may use this page as a cover page of your problem set.

1. A government concluded that savings are too low and decides to establish subsidies to savings. You were hired to predict the effects of the subsidy. The subsidy works in the following way. If someone saves  $s$  in period 1 then in period 2 this person receives  $(1 + r + a) s$ . That is, each person receives  $a$  in addition to the current interest rate  $r$ . The subsidy is financed only in period 2: in period 2, each agent pays a lump sum tax  $t_2$  to cover the subsidy.

a. Without the subsidy, the maximization problem of the agents in this economy is

$$\begin{aligned} \max_{c_1, c_2, s} \log c_1 + \beta \log c_2 & \quad (1) \\ \text{s.t. } c_1 + s = y_1, & \\ c_2 = y_2 + (1 + r) s. & \end{aligned}$$

Write the new problem with the subsidy. Also, write the new budget constraint of the government. To concentrate on the subsidy, suppose that all expenditures of the government are equal to zero, that  $t_1 = 0$ , and that the government does not issue bonds.

b. Suppose that problem (1) represents the problem of a representative agent in this economy and suppose that  $y_2 = 0$ . Discuss the effects of the subsidy. In your solution, suppose that  $r$  is an interest rate set internationally and, for this reason,  $r$  will not change with the subsidy. Specifically, discuss the following: Will savings increase? Will welfare increase? Support your arguments with a graph  $c_2 \times c_1$ .

c. If  $r$  is an international interest rate, then  $s > 0$  implies that exports are positive. That is,  $s = y_1 - c_1$  and the production that is not consumed is exported. Will exports increase with the subsidy?

d. You decide to obtain numerical results to support your argument. Suppose that  $1 + r = \frac{1}{\beta}$  and that  $\beta = 1$ . Write the values of consumption, savings, taxes, and welfare as a function of  $a$ . Compare the values with  $a = 0$  and  $a > 0$ . Is it worth implementing the subsidy?

2. Consider the same problem of consumption and savings, as above,

$$\begin{aligned} \max_{c_1, c_2, s} \log c_1 + \beta \log c_2 & \quad (2) \\ \text{s.t. } c_1 + s = y_1, & \\ c_2 = y_2 + (1 + r) s, & \end{aligned}$$

now with  $y_1 > 0$  and  $y_2 > 0$ . All consumers in the economy have the same endowments  $y_1$  and  $y_2$ .

a. Make a graph for interest rates and aggregate savings,  $1 + r \times S$ . Which will be

the equilibrium interest rate? Explain.

b. Obtain the equilibrium interest rate.

c. The interest rate during a certain period was 4 percent per year. During the same period, the output growth rate was 2 percent per year. What will be the value of  $\beta$  compatible with these observations?

3. Consider an increase in current government expenditures.

a. What will be the effect of the increase in  $G$  on real wages, hours worked, real interest rates, and GDP? Show the effects with the  $w \times N$  and  $r \times Y$ . Justify. Use pages 426-430 of the book (pages 372-377 of the previous edition).

The budget constraint of the government in the current period is  $G = T + B$ , where  $T$  are taxes, charged lump sum, and  $B$  are government bonds. Government savings are given by  $S^G = T - G$ . Initially,  $B = 0$ . Aggregate savings in this economy is given by  $S = S^P + S^G$ , where  $S^P$  denotes private savings.

b. Consider that the increase in government expenditures is entirely financed by an increase in taxes. That is,  $S^G = 0$  before and after the increase in government expenditures as  $B = 0$  and  $\Delta G = \Delta T$ . What should happen with private savings after the increase in expenditures? Show the effects with a graph  $r \times I, S$  (interest rate in the vertical axis).

c. Suppose now that the government keeps taxes constant and finances the increase in government expenditures with an increase in bonds. What will be the effect on private savings? Explain.

d. Do the ways of financing the increase in government expenditures affect the results in  $a$ ? Explain.

4. Obtain the effects of the following changes. Use pages 433-436 of the book.

a. An increase in current productivity,  $z$ .

b. An increase in future productivity,  $z'$ .

c. For the increase in current productivity in  $a$ , what are the predicted effects on the price level? Use the diagram  $P \times M$  to explain.