

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

**Nova School of Business and Economics**  
**Macroeconomics, 1103 - 1st Semester 2012-2013**  
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**TA: João Morgado**

### **Midterm 1**

Maximum points: 20. Time: 1h. Pages: 10.

The exam is closed books, closed notes. No calculators are allowed. Answer the questions on the spaces provided. Indicate if you need to use the back of the pages.

1. (2 pts) The interest rates on government bonds for Portugal for 5 and 10 years are much higher today than six months ago. True or False? Explain.

2. (2 pts) State the behavior of consumption, investment, employment, and labor productivity over the business cycles. How do they fluctuate as compared to output? That is, write if each variable is procyclical or countercyclical.

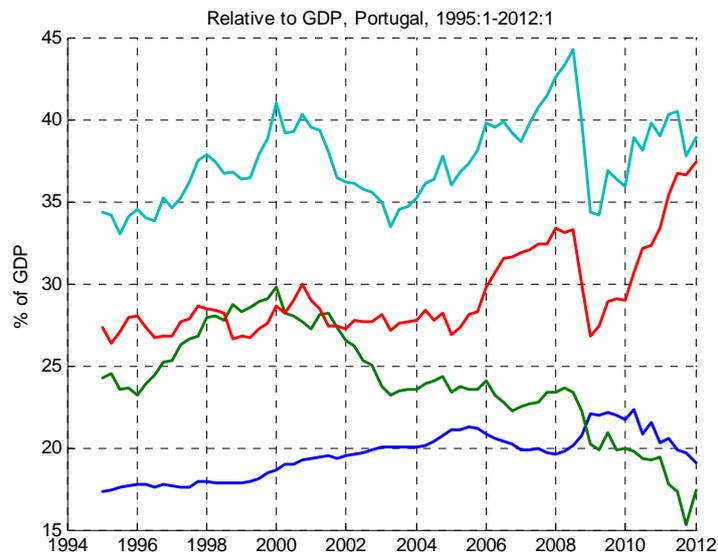
Consumption: \_\_\_\_\_

Investment: \_\_\_\_\_

Employment: \_\_\_\_\_

Labor productivity: \_\_\_\_\_

3. (2 pts) The figure below shows the evolution of Investment, Government Consumption, Exports and Imports as a percentage of GDP for Portugal. Indicate in the graph to which component each curve refers. Use I, G, X and M respectively for Investment, Government Consumption, Exports and Imports.



4. (6 pts) A natural disaster destroyed a considerable quantity of the installed capital in a region. Following this fact, the interest rate increased.
- a. (4 pts) Is the increase in interest rates an expected consequence of the decrease in capital? Explain. Use graphs.

b. (2 pts) Some politicians propose setting regulations to decrease the interest rate. They argue that this will encourage investment, accelerate the reconstruction, and increase welfare. Do you agree? Explain.

4. (8 pts) An economy has consumers with preferences

$$\log c_1 + \beta \log c_2,$$

where  $c_1$  and  $c_2$  refer to consumption at periods 1 and 2, and  $0 < \beta < 1$ .  $\log$  is the logarithm in the base  $e$ . The consumers may borrow and lend at the rate  $r$ . Given income at periods 1 and 2,  $y_1$  and  $y_2$ , the budget constraints are

$$c_1 + s = y_1,$$

for the first period, and

$$c_2 = y_2 + (1 + r) s,$$

for the second period.  $r$  is the real interest rate and  $s$  are savings.

a. (2 pts) Obtain  $c_1$  and  $s$ , given the interest rate,  $y_1$  and  $y_2$ .

b. (2 pts) Consider an increase in  $y_2$ . What happens to savings? Justify.

c. (2 pts) Suppose that all consumers in the economy have the same endowments  $y_1$  and  $y_2$ . Let  $S$  denote aggregate savings. That is, the sum of all individual savings  $s$  in the economy. Make a graph for interest rates and aggregate savings,  $(1 + r) \times S$ , with  $(1 + r)$  in the vertical axis. Justify.

d. (2 pts) Suppose that  $y_2$  increases for all consumers. How will this increase affect the curve for savings? Explain.

(Additional Space)

## SOLUTION SKETCH

1. (2 pts) The interest rates on government bonds for Portugal for 5 and 10 years are much higher today than six months ago. True or False? Explain.

**Answer.**

True. The interest rates on these assets have been decreasing since January 2012. See the slides discussed in class.

2. (2 pts) State the behavior of consumption, investment, employment, and labor productivity over the business cycles. How do they fluctuate as compared to output? That is, write if each variable is procyclical or countercyclical.

**Answer.**

Consumption: Procyclical.

Investment: Procyclical.

Employment: Procyclical.

Labor productivity: Procyclical.

3. (2 pts) The figure below shows the evolution of Investment, Government Consumption, Exports and Imports as a percentage of GDP for Portugal. Indicate in the graph to which component each curve refers. Use I, G, X and M respectively for Investment, Government Consumption, Exports and Imports.

**Answer.**

At the value for 2012, from top to bottom, the curves are Imports, Exports, Government Consumption, and Investment. See also the slides discussed in class.

4. (6 pts) A natural disaster destroyed a considerable quantity of the installed capital in a region. Following this fact, the interest rate increased.

a. (4 pts) Is the increase in interest rates an expected consequence of the decrease in capital? Explain. Use graphs.

**Answer.**

Yes, it is an expected consequence of the decrease in capital. A fall in capital makes the marginal productivity of capital higher. This shifts the investment curve to the right ( $I \uparrow$ ) and makes interest rates increase.

The most relevant figure is the part of figure 10.24, on page 379 of the book, relative to  $r \times Y$ . The figure is reproduced in figure 1. You may use other related figures to answer this question.

b. (2 pts) Some politicians propose setting regulations to decrease the interest rate. They argue that this will encourage investment, accelerate the reconstruction, and increase welfare. Do you agree? Explain.

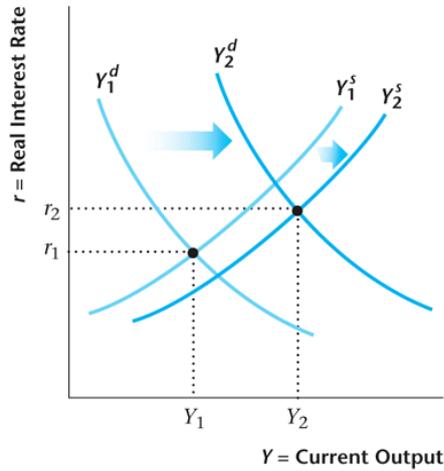


FIG. 1.

**Answer.**

No. The results of the previous figure already take into account the maximizing behavior of firms and consumers. Firms and consumers already do their best given the decrease in  $K$ . The additional measures will probably discourage investment, make the reconstruction slower and decrease welfare. (Other answers are possible. The point is that this kind of measures will decrease welfare.)

4.

a. (2 pts) Obtain  $c_1$  and  $s$ , given the interest rate,  $y_1$  and  $y_2$ .

**Answer.**

Writing the budget constraint in present value implies that the problem of the consumer is given by

$$\max \log c_1 + \beta \log c_2$$

s.t.

$$c_1 + \frac{1}{1+r}c_2 = y_1 + \frac{1}{1+r}y_2.$$

As discussed in the problem sets, the solution of this problem for  $c_1$  and  $s$  are given by

$$c_1 = \frac{1}{1+\beta} \left( y_1 + \frac{1}{1+r}y_2 \right),$$

and, as  $s = y_1 - c_1$ ,

$$s = \frac{1}{1+\beta} \left( \beta y_1 - \frac{1}{1+r}y_2 \right).$$

b. (2 pts) Consider an increase in  $y_2$ . What happens to savings? Justify.

**Answer.**

There are three ways to answer this question. All of them are fine.

1. From  $s = \frac{1}{1 + \beta} \left( \beta y_1 - \frac{1}{1 + r} y_2 \right)$ , we have  $\frac{\partial s}{\partial y_2} = -\frac{1}{1 + \beta} \frac{1}{1 + r} y_2 < 0$ . So, savings decrease.
2. With a diagram such as figure 8.8 on page 277 of the book, reproduced in figure 2. There must have an explanation that the increase in  $y_2$  makes  $c_1$  increase. So, savings decrease.

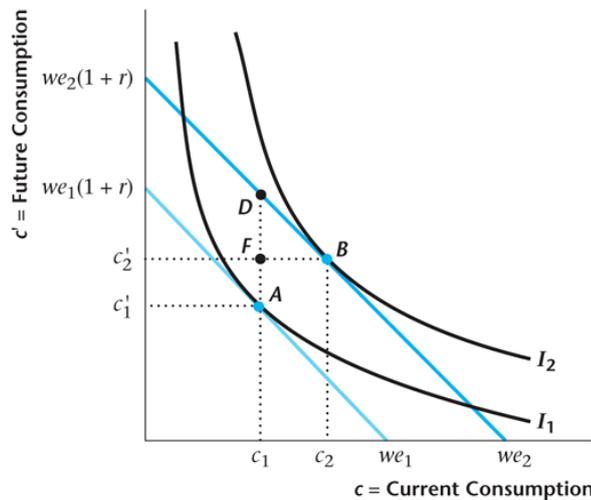


FIG. 2.

3. With an explanation. Stating that, as agents smooth consumption, they will use the increase in  $y_2$  to increase  $c_1$  and  $c_2$ . As  $c_1$  increases for the same income at  $t = 1$  and  $s = y_1 - c_1$ , savings decrease.

c. (2 pts) Suppose that all consumers in the economy have the same endowments  $y_1$  and  $y_2$ . Let  $S$  denote aggregate savings. That is, the sum of all individual savings  $s$  in the economy. Make a graph for interest rates and aggregate savings,  $(1 + r) \times S$ , with  $(1 + r)$  in the vertical axis. Justify.

**Answer.**

If there are  $N$  consumers in this economy, aggregate savings will be given by  $S = Ns$ , where  $s = \frac{1}{1 + \beta} \left( \beta y_1 - \frac{1}{1 + r} y_2 \right)$ . Therefore, an increase in  $r$  implies an increase in savings. The graph is in figure 3.

- d. (2 pts) Suppose that  $y_2$  increases for all consumers. How will this increase affect the curve for savings? Explain.

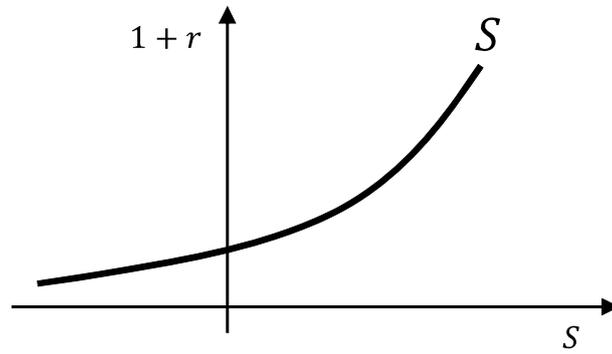


FIG. 3.

**Answer.**

We saw that an increase in  $y_2$  decreases  $s$  for each interest rate. Therefore, the curve for  $S$  will shift to the left, as shown in figure 4.

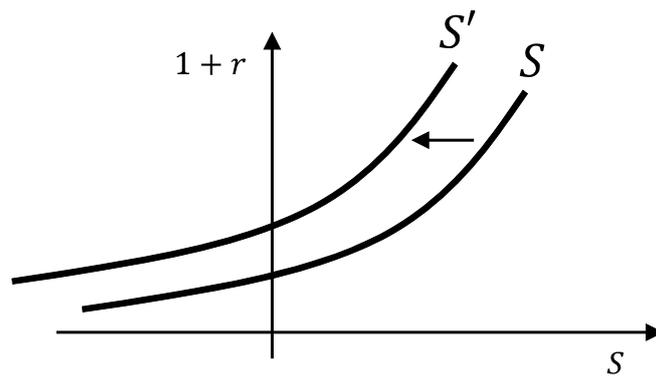


FIG. 4.