Name: _____. Code: _____

**Nova School of Business and Economics**
**Macroeconomics 1103, 2013-2014, 1st Semester**
**Prof. André C. Silva**
**TAs: João Vaz, Paulo Fagandini, and Pedro Freitas**

**Problem Set 3**
Due Date: October 18, 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.** Obtain the effects of the following changes. Make predictions about the effects on consumption, output, labor, wages, and welfare. Use diagrams to explain. Use pages 169-177 of the book.

   a. An increase in government expenditures, $G$.

   b. An increase in total factor productivity, $z$.

   c. Fluctuations in $G$ or in $z$ cause fluctuations in $Y$. Which source of fluctuations, $G$ or $z$, could be more plausible to explain economic cycles? Why?

**2.** An economy has consumers with preferences

$$u\left(c, l\right) = \log c + \log l,$$

where $c$ and $l$ denote consumption and leisure. The consumers obtain $c$ with

$$y = zN,$$

where $y$ is the quantity of consumption goods produced, $N$ denotes work and $z$ denotes productivity. Total time available is $h$. The consumers choose $N$ and obtain $c = y = zN$. To simplify, government consumption and taxes are equal to zero.

   a. Make a prediction about the choices of consumption and labor in this economy.

   b. Suppose that $z$ increases to $z' > z$. In a graph, show the substitution and income effects. Be clear. Which effect is stronger, the substitution or the income effect? Explain

   c. Suppose that $z$ grows at a constant rate $g$. That is, $\dfrac{z_{t+1}}{z_t} = 1 + g$. What will be the growth rate of consumption and labor?

   d. Suppose now that the consumers do not own the firm. What will be the equilibrium wage in each period $t$? What will be the growth rate of wages?

3. Suppose that consumers pay taxes proportional to income. The budget constraint of consumers assumes the form

$$c = w\left(1 - \tau\right)N + \pi,$$

instead of $c = wN + \pi - T$, when taxes are lump sum. The production function is

$$Y = zN.$$

Compare the choices of consumers in this economy with another one in which the consumers pay lump sum taxes. What will be the effect on labor supply if $\tau$ increases? Use the discussion on pages 184-190 of the book.

4. A consumer has preferences

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

where $c_1$ and $c_2$ refer to consumption at $t = 1$ or $t = 2$. $\beta$ is a discount applied to utility on period 2, $0 < \beta < 1$. The closer to zero $\beta$ is, the more impatient the consumer is. The consumer can borrow or lend at the rate $r$. Given income at periods 1 and 3, $y_1$ and $y_2$, the consumer 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. Given $(y_1, y_2)$, show in the diagram $c_1 \times c_2$ the regions where the consumer will be a borrower and where the consumer will be a lender.

b. Find the optimal levels of consumption and savings.

c. Suppose that $y_1 = 0$. Show in another diagram the optimal decision of the consumer. Is the consumer a borrower? Does it make sense?

d. Suppose that $y_1$ increases. What is going to happen with savings? Does consumption at time 2 increases? For which level of $y_1$ the consumer switches from a borrower to a lender? Justify.

5. Obtain data on the interest rate of government bonds. It can be for any country. For Portugal, in particular, look for BPstat on the webpage of the Bank of Portugal and then monetary and financial statistics, securities markets, secondary markets, yield on treasury bonds (Obrigações do Tesouro). Choose a series for bonds of 5 years and 10 years, for example. Make a graph and a short analysis.