ISCTE–IUL, Midterm Test, Modern Macroeconomics, BA in Economics, 16/04/2015.

ISCTE — INSTITUTO UNIVERSITÁRIO DE LISBOA

BA in Economics

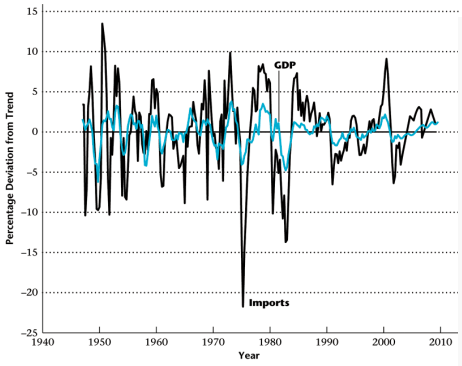
Modern Macroeconomics

Midterm test

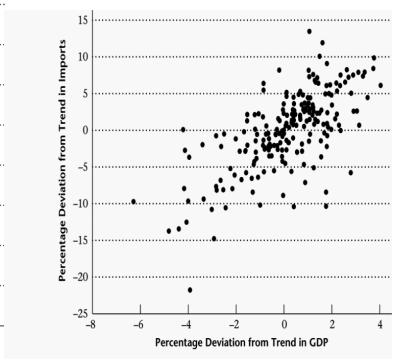
16 April– 2015 **Duration: 1h.30m**

Group I: Facts about business cycles (40 points)

1. Consider the next two figures. They represent the evolution of GDP and Imports with respect to the long term trend of each one, for the US economy in post World War II period.



Source: U.S. Department of Commerce, Bureau of Economic Analysis.



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

As far as the main stylized facts of the business cycles are concerned, what do you conclude about the behavior of these two macroeconomic variables? **(20 points)**

2. One of the mostly used tool in modern macroeconomics is the Hodrick–Prescott filter (HP filter), which is given by the following expression

$$\min_{\tau_t} \sum_{t=1}^{T} \{(y_t - \tau_t)^2 + \lambda[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2\}$$

where y_t is the original series, τ_t is the smooth trend and $(y_t - \tau_t)$ is the HP filtered series. λ is a parameter. Answer the following two questions:

   (a) Why is it usually argued that the HP filter has significant advantages over the log linear filter? **(10 points)**

(b) What are the main criticisms directed at the HP filter. **(10 points)**

Group II: Matlab (50 points)

1. Write a Matlab routine code in order to have in the same figure the following three functions represented:

$$\begin{aligned} y1 &= x^{0.5} \\ y2 &= x \\ y3 &= x^2 \end{aligned}$$

with x defined in the interval $[0, 1]$. **(15 points)**

2. Write a Matlab routine code in order to have the following function represented in a figure:

$$x_{t+1} = 20 - 0.5x_t + \varepsilon_t$$

where ε_t is a random variable, with mean equal to zero and variance equal to 1, $\varepsilon_t \tilde{} N(0, 1)$. In Matlab this random variable is written as: `randn(1)`. Simulate the dynamics of this process for $t = [1, 100]$. **(15 points)**

3. Suppose we have a file called *Data.txt*, which includes quarterly observations of the following three major macroeconomic variables: GDP (in column one), Money Supply (column 2), and the Inflation rate (column 3). The first observation is the first quarter of 2000, and the last one is the second quarter of 2014. Write a routine that graphically represents three panels in just one figure, each panel including the following: **(20 points)**

   (a) Panel one should include the time series of GDP and Money supply

   (b) Panel three should be a **yy** plot involving Money supply and the Inflation Rate.

   (c) Panel two should include a crossplot of GDP and the Money supply.

Group III: Introduction to dynamics (40 points)

Consider an economic process that can be described by the following system

$$\begin{aligned} x_{t+1} &= 0.5x_t + 2y_t \\ y_{t+1} &= 5 + 0.2y_t \end{aligned}$$

1. Does this system has a steady state (or a fixed point)? Explain. **(10 points)**

2. If there is a fixed point, is this unique or are there multiple equilibria? **(10 points)**

3. What is the type of stability in this process? Justify your answer. **(10 points)**

4. Assume now that the second equation is written as

$$y_{t+1} = 5 + 0.2y_t + \varepsilon_t$$

where ε_t is an external shock normally described as "white noise": $\varepsilon_t \tilde{} N(0,1)$. Does this shock produce any relevant changes to the previous results. Explain. **(10 points)**

Group IV: Intertemporal decision making (70 points)

Assume that the utility of a representative consumer is a function of the level of consumption (c_t)

$$u(c_t) = 2 \ln c_t.$$

Her/his objective is to maximize intertemporal utility discounted by a factor β

$$\max u(c_t) + \beta \cdot u(c_{t+1})$$

subject to the two usual constraints:

$$c_t + a_{t+1} = w_t$$
$$c_{t+1} = (1 + r_{t+1})a_{t+1} + w_{t+1}$$

1. Derive and represent graphically the consolidated intertemporal constraint. **(10 points)**
2. Derive the Euler equation associated with this type of utility function: **(20 points)**

$$c_{t+1} = \beta(1 + r_{t+1})c_t$$

3. Determine the optimal consumption levels for each period, as well as the optimal savings level, by considering the following parameter values: $w_t = 100, w_{t+1} = 150, r_{t+1} = 5\%$, and $\beta = 0.9$. **(20 points)**
4. Now take into account that this consumer is not allowed to borrow more that 10% of his/her wages at t. Do you consider this consumer to be financially constrained? Explain graphically. **(10 points)**
5. In terms of social welfare, which situation is better: the initial situation or the new one with the financial constraint? Explain. **(10 points)**