ISCTE–IUL, Final Exam, Modern Macroeconomics, BA in Economics, 04/06/2012.

ISCTE — INSTITUTO UNIVERSITÁRIO DE LISBOA

BA in Economics

Modern Macroeconomics

Final Exam

04 June– 2012   **Duration: 2 hours**

Answer all three problems below. Each one represents 33% of the grade of this final test.

Problem A (Fixed points and stability). Assume that a certain economic process can be explained by the following nonlinear difference equation:

$$x_{t+1} = f(x_t) = 2 + 5x_t - x_t^2$$

1. How many fixed points do we have in such a process? Explain.

2. Represent the expression that provides the linear approximation in the neighborhood of each fixed point.

3. Which of those fixed points are stable and unstable?

4. Imagine now that the process starts at the initial value: $x_0 = 2$. What would happens over time?

5. And what would happen if the initial value were $x_0 = -2$. What would happen over time?

Problem B (OLG and social security). .Consider the following overlapping generations growth model. In period $t = 1, 2, ...$ there are L_t two-period-lived consumers born, where $L_1 = (1 + n)^1 L_0$, with L_0 given and $n > 0$. Each young consumer receives y wage income which has to be allocated towards three alternative uses: consumption, savings and paying taxes. Each old consumer finances his consumption by collecting his financial investments and receiving benefits from a social security system.

The savings in period t invested in the financial markets return $1+r$ in period $t+1$. In period t, the government collects a lump-sum tax of τ_t^y from each young consumer, and no taxes are imposed upon each old consumer.

A consumer born in period t has preferences given by

$$u(c_t^y, c_{t+1}^o) = \ln c_t^y + \ln c_{t+1}^o$$

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1. Consider a *fully-funded* social security system where the government taxes the young in period t, puts the proceeds of the tax into a financial investment, and makes transfers to the old in period $t+1$ with the proceeds from period t investment. In this case the government sets τ_t^y for $t = 1, 2, \dots$. Determine the effects of an increase in τ_t^y on (c_t^y, c_{t+1}^o).

2. Determine also the Pareto optimal level of τ_t^y and explain your results.

3. Consider instead a *pay-as-you-go* social security scheme, where each period the government taxes the young so as to make transfers to the old. That is, the government sets τ_t^y for $t = 0, 1, 2, \dots$. Determine the effects of an increase in τ on the welfare of each generation.

4. Given your results in (1) and (3), can you explain what is the condition that should hold such that the PAYG system would be better for future generations than the fully-funded one? Explain your remarks.

Problem C (Rules vs discretion). Assume that the Central Bank's loss function is given by the function:
$$L = \phi\left(u - u^*\right) + \left(\pi - \pi^*\right)^2$$
u is the unemployment rate, π is the inflation rate, and $\phi = 0.4$ is a parameter. The asterisk represents the central bank's desired values for each variable.

The behavior of the supply side of the economy can be described by the following Phillips curve:
$$u - u^* = -k - \alpha(\pi - \pi^e)$$
where u^n is the natural level of unemployment, π^e is the level of expected inflation, and $k \equiv u^* - u^n$. It is known that $\alpha = 0.1$.

Finally assume that private agents have rational expectations
$$\pi^e = \pi.$$

1. Consider parameter ϕ. Present three different values for this parameter such that they would reflect different stances of the central bank regarding its behavior towards the two main targets?

2. Assume that the central bank desired level for inflation is 0%. Determine the level of optimal inflation in the case of discretionary behavior by the central bank.

3. Determine the same as in the previous question, but now having the central bank displaying commitment to maintain inflation at the level of its natural rate.

4. Assume that due to some internal judgement, the central bank considers that it should not be committed to any particular target or rule. What is the option available to the central bank in order to achieve zero inflation? Explain.