ISCTE–IUL, Final test, Macroeconomics, MSc Economics, 10/12/2015.

ISCTE — INSTITUTO UNIVERSITÁRIO DE LISBOA

Master in Economics

Macroeconomics

Final test

10 December 2015 **Duration: 2 hours**

Answer only to 3 exercises from the set: A,B,C,D. Group D is compulsory

Group A – 65 points

Rules versus Discretion. Assume that the Central Bank's loss function is given by the following function:

$$L = \beta (u - u^*) + \gamma (\pi - \pi^*)^2$$

u is the unemployment rate, γ and β are parameters, and π is the inflation rate. An asterisk is used to represent the central bank's desired values for each variable.
We know that the behavior of the supply side of the economy can be described by the following Phillips Curve with a supply a shock given by e_t:

$$u = u^n - a(\pi - \pi^e) + e_t$$

where u^n is the natural level of unemployment, π^e is the level of expected inflation, and $a = 15$. Finally assume that private agents have rational expectations

$$\pi^e = \pi.$$

1. Explain the logic behind the Loss function above, as far as the targets of the central bank are concerned.
2. Assuming that $u^* = 6\%, \pi^* = 0$, 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. Explain why the result in (3) is better than the result in (2).
5. Comment upon the following sentence by Paul Krugman:

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"My point is that when central bankers invoke "credibility", they're in effect saying something like this: Our most precious asset is our hypothetical ability — for which we have no evidence, but in which we nonetheless believe — to deal more easily with a hypothetical future problem. And rather than endanger this precious asset, we refuse to act on the intense problem we have right now. Serious!"Paul Krugman, The Credibility Fixation, New York Times, 8 May.

Group B – 65 points .

The Poole Model. Consider an economy characterized by an IS–LM model with Rational Expectations. The IS function is given by

$$y_t = -b(i_t - E_t\pi_{t+1}) + z_t$$

where y stands for output, i for the nominal interest rate, $E_t\pi_{t+1}$ is expected inflation, z is an exogenous shock and b is a parameter ($b > 0$).

The LM curve expresses the real money demand in log values ($m_t - p_t$) as dependent upon output, the interest rate and exogenous shocks (v_t) as follows:

$$m_t - p_t = y_t - \alpha i_t + v_t \quad , \quad \alpha > 0$$

For simplicity, assume that the price level is constant and equal to $P_t = 1$, which implies that $p_t = 0$.

Assuming that the main goal of the central bank is to minimize the variance of the percentage deviations of output with respect to its long term expected value — that is minimizing $E[y-y^*]^2$— one can obtain these results:

$$E[y - y^*]^2_{i^*} = \sigma_z^2$$

$$E[y - y^*]^2_{m^*} = \left(\frac{b}{2\alpha + b}\right)\sigma_v^2$$

1. Explain what factors determine whether i or m is the best policy instrument in order to reduce the volatility of short term business cycles.

2. Assume that $\alpha = 0$. What instrument looks better now? Explain your answer in terms of economic intuition.

3. Assume that σ_v^2 is three times larger than σ_z^2, and $\alpha = 5; b = 10$. What is the best policy instrument in this case? Explain.

4. And what about if $\alpha = 10; b = 5$ (and σ_v^2 continues to be three times larger than σ_z^2).Explain.

5. Given what you know about the Poole model, what is its main relevance for modern macroeconomics?

Group C – 65 points .

D. NKM's IS function. Consider the following Euler equation in the New Keynesian Model

$$u'(C_0) = \beta \cdot \left[u'(C_1) \frac{(1+r_0)}{(1+\pi_1)} \right]$$

where r_0 is the short term nominal interest rate, π_1 is the inflation rate between periods 0 and 1, and β is the subjective intertemporal discount factor. C stands for consumption.

1. Using the following utility function ($U(c_t) = \ln c_t$), and considering uncertainty in the model, determine the IS function in this model expressed in terms of percentage deviations from the long term trend.
2. Explain what happens in the current period if private agents expect the starting of an upturn of economic activity next year.
3. Explain what happens if there is an increase in expectations about inflation next year.
4. Assume that next year's inflation expectations go up by 1 percentage points. Taking into account that the Central Bank wants to control inflation, by how much should this bank change its short term interest rate, and when? Explain the logic of your answer.

Group D – 70 points

NKM and determinacy. Assume the New Keynesian Model represented by the usual structure: an Aggregate Supply function (AS), the demand side function (IS), and a simple rule for interest rate policy. The symbols are as follows: π_t is the inflation rate, x_t is the output gap, i_t is the nominal short term interest rate to be set by the central bank.

$$\begin{aligned} \pi_t &= \beta E_t \pi_{t+1} + \lambda x_t \\ x_t &= E_t x_{t+1} - a\left(i_t - E_t \pi_{t+1}\right) \\ i_t &= 1\% + v E_t \pi_{t+1} \end{aligned}$$

where (β, λ, a, v) are parameters.

1. Rewrite the model in matricial form, in order to study its stability.That is, write the model according to this expression

   $$\mathbf{A} \cdot \mathbf{E}_t \mathbf{z}_{t+1} = \mathbf{B} \cdot \mathbf{z}_t + \mathbf{C} \cdot \mathbf{v}_t$$

   where $\mathbf{z}_{t+1}, \mathbf{z}_t, \mathbf{v}_t, \mathbf{C}$ are vectors, while $\mathbf{A}$ and $\mathbf{B}$ are matrices.

2. For the following set of parameter values $\beta = 0.9$, $\lambda = 0.5$, $a = 2.7$, study the stability of this model for the scenario:

   Scenario A: $v = 0.2$

   knowing that $A^{-1} \times B = \begin{bmatrix} \frac{1}{\beta} & -\frac{1}{\beta}\lambda \\ -\frac{1}{\beta}(a - av) & \frac{1}{\beta}\lambda(a - av) + 1 \end{bmatrix}$

3. What would you conclude about the main message of the New Keynesian Model as far as the fight against inflation is concerned? Propose alternatives (no numerical support for these alternatives is required).

4. What kind of criticisms have been directed at the AS function? Do you agree with them? Explain.

The end of the test

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$$A = \begin{bmatrix} \beta & 0 \\ (a - av) & 1 \end{bmatrix}, inverse: \begin{bmatrix} \frac{1}{\beta} & 0 \\ -\frac{1}{\beta}(a - av) & 1 \end{bmatrix} = A^{-1}, \text{ inverse: } A$$

$$B = \begin{bmatrix} 1 & -\lambda \\ 0 & 1 \end{bmatrix}$$

$$A^{-1} \times B = \begin{bmatrix} \frac{1}{\beta} & 0 \\ -\frac{1}{\beta}(a - av) & 1 \end{bmatrix} \times \begin{bmatrix} 1 & -\lambda \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} \frac{1}{\beta} & -\frac{1}{\beta}\lambda \\ -\frac{1}{\beta}(a - av) & \frac{1}{\beta}\lambda(a - av) + 1 \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{0.9} & -\frac{1}{0.9}0.5 \\ -\frac{1}{0.9}(2.7 - 2.7 \times 0.2) & \frac{1}{0.9}0.5(2.7 - 2.7 \times 0.2) + 1 \end{bmatrix}, \text{ eigenvalues: } 2.125\,5, -0.203\,29$$