

ISCTE — INSTITUTO UNIVERSITÁRIO DE LISBOA

BA in Economics

Modern Macroeconomics

Final test

04 June– 2012

Duration: 2 hours

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

Problem A (Ricardian Equivalence). Consider an economy that lasts for 2 periods $t = 1, 2$. The economy is populated by a representative household with preferences

$$u(c_1, c_2) = \ln c_1 + \beta \ln c_2$$

where $\beta = 1$ is the discount factor, (c_1, c_2) is consumption in each period. Households are endowed with income (y_1, y_2) and can save/borrow an amount a_1 at time 1 at the interest rate r_1 . They face taxes on capital income τ_2 in the second period but do not pay any taxes in the first period. Thus, the households' budget constraints in the two periods are

$$\begin{aligned} c_1 + a_1 &= y_1 \\ c_2 + \tau_2(r_1 a_1) &= y_2 + (1 + r_1)a_1 \end{aligned}$$

from which one can obtain the intertemporal consolidated budget constraint of the representative household as

$$c_1 + \frac{c_2}{1 + (1 - \tau_2)r_1} = y_1 + \frac{y_2}{1 + (1 - \tau_2)r_1}$$

The government has expenditures (g_1, g_2) in the two periods, financed with capital income taxes τ_2 in the second period and debt b_1 in the first period, and no default is allowed.

1. State the meaning of Ricardian equivalence.
2. Write the first and second period budget constraint for the government and its consolidated intertemporal budget constraint.
3. Solve the problem of the household and derive the first-order conditions for consumption in both periods (c_1, c_2) . Use these conditions to derive the Euler equation. Does the Euler Equation depend on taxes τ_2 ?
4. Does Ricardian Neutrality hold in this economy? Explain your answer, using the optimal levels of consumption and savings.

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Problem B (OLG and social security). Consider the following overlapping generations growth model. In period $t = 1, 2, \dots$ there are L_t two-period-lived generations alive, where $L_1 = (1 + n)^1 L_0$, with L_0 given and $n > 0$.

Each member of the young generation receives y wage income which is 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 invested in period t in the financial markets pay back $1 + r$ in period $t + 1$.

The government, in period t , collects a lump-sum tax of τ_t^y from each young consumer, and the government imposes no taxes upon each old consumer.

A consumer born in period t has preferences given by

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

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 such investment. In this case the government sets τ_t^y for $t = 1, 2, \dots$. With this information, we can obtain the following two budget constraints for the private agents

$$\begin{aligned} c_t^y + s_t &= y_t - \tau_t^y \\ c_{t+1}^o &= (1 + r)s_t + (1 + r)\tau_t^y \end{aligned}$$

For this fully-funded system, determine the effects of an increase in τ_t^y on (c_t^y, c_{t+1}^o) .

1. Determine also the Pareto optimal level of τ_t^y and explain your results.
2. 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_t^y on the welfare of each generation.
3. 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:

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

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:

$$u - u^* = -k - \alpha(\pi - \pi^e)$$

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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 discussion, 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.