Ricardian Equivalence
Exercises

Modern Macroeconomics — ISCTE–IUL, April 2014

Exercise 1

Use the two-period model of the representative household discussed in the slides. Consider now that the government, in order to finance its expenditures, imposes a proportional tax on the level of income in each period (wich is exogenously determined). This proportional tax is given by τ in each period. The intertemporal decision making problem for our representative agent can be written down as

$$\begin{aligned} U &= u(c_0) + \beta u(c_1) \\ c_1 + a_1 + \tau_1 y_1 &= y_1 + (1 + r_0)a_0 \\ c_2 + a_2 + \tau_2 y_2 &= y_2 + (1 + r_1)a_1 \end{aligned}$$

where U is life-time utility, β is the subjective discounting rate of future utility, c_t is consumption in period ($t = 1, 2$) of the agent's life, y_t is the (exogenous) income in period t, and a_t is financial assets possessed by the household in period t.

Assume that the household saves in the first period of life in order to enjoy a pleasant retirement in the second period of life. Assume furthermore that the utility (or "felicity") function takes the following form

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

1. Interpret the model and derive the lifetime budget equation. Explain what you assume about a_2.

2. Introduce the government and demonstrate Ricardian equivalence.

3. Compute the expressions for optimal consumption and savings plans (i.e. c_1, c_2, and $s_1 \equiv a_1 - a_0$).

4. Assume that there is a broad income tax (which also taxes interest income). Redo part (3). Show how consumption and saving depend on the income tax rate.

Exercise 2

Consider an economy that lasts for 2 periods $t = 1, 2$.The economy is populated by a large amount of households, all equal, each one 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 the two periods. Each household is endowed with income (y_1, y_2) and can save/borrow an amount a_1 between time 1 and 2 at the interest rate r. They face taxes on capital income τ_2 in the second period but they do not pay any tax in the first period. Thus, the households' budget constraints in the two periods are

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

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. At the end of the two periods, the Government has to pay back its debt, gross of interests, only through taxes.

1. Write the first and second period budget constraint for the government and the intertemporal budget constraint for the government .
2. 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?
3. State the meaning of Ricardian Neutrality in this economy.
4. Does Ricardian Neutrality hold in this economy? Explain your answer, possibly proving your result.