

# Problem Set 7

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## 7 Problem Set 7

### Another overlapping-generations model with government debt

In this exercise, we consider the same problem as in lecture 10, except that lifetime utility is logarithmic with  $\beta = 2$  (that is, people are patient instead of impatient, so they tend to save a lot):

$$U = \log(c_t^y) + 2\log(c_{t+1}^o)$$

We denote the (net) real interest rate by  $r_t$  so that the intertemporal budget constraint is:

$$c_t^y + \frac{c_{t+1}^o}{1 + r_t} = w_t.$$

Other than that, we still assume a Cobb-Douglas production function with  $\alpha = 1/3$ , so that:

$$Y_t = K_t^{1/3} L_t^{2/3}.$$

We assume that the labor force is constant so that  $L_t = 1$ . The depreciation rate is still  $\delta = 1 = 100\%$ .

1. Compute  $c_{t+1}^o$  and  $c_t^y$  as a function of the wage  $w_t$ .
2. What is the law of motion for the capital stock?
3. Compute the steady-state capital stock  $K^*$ , the (net) steady-state real interest rate  $r^*$ , the steady-state output  $Y^*$ , the steady-state wage  $w^*$ , and the steady-state consumption of the young  $(c^y)^*$  and of the old  $(c^o)^*$ .
4. Compute the Golden Rule (net) interest rate  $r_g^*$ , the Golden Rule capital stock  $K_g^*$ , the Golden Rule output  $Y_g^*$ , the Golden Rule wage  $w_g^*$ , and the Golden Rule consumption of the young  $(c^y)_g^*$  and of the old  $(c^o)_g^*$ .
5. Compare the Golden Rule and steady-state levels, and give an economic intuition.
6. What level of government debt  $B_g^*$  brings the capital stock to the Golden Rule level ?
7. Starting from the steady-state situation of question 3, assume that the government gives this money to retirees, taking on government debt. How much is this (lucky) generation of retirees able to consume ?
8. Why is national debt a Ponzi scheme here? Is it bad ?
9. Assume that the government puts in place a pay-as-you-go system, such as Social Security (think of OASDI), giving retirees an amount  $B_g^*$  each period (where  $B_g^*$  is the same level of government debt as the one found in question 6), and taxing the young an equal amount  $B_g^*$ . Compare this situation to question 7. What are the differences and similarities?
10. What is the difference between pay-as-you-go financing and deficit financing ? Explain why government debt is not a very meaningful statistic.