

## Homeworks 11–12

1. Suppose that the real demand for money is positive and constant. Show that, under this assumption, the inflation rate has to equal the rate of growth of the money stock.
2. Derive an individual's demand for real money balances under the following assumptions: (i) the individual can save in real assets at a net real rate of  $r$ ; (ii) the individual has income  $w$  when young and nothing when old; and (iii) the individual's utility function is  $u(c_y, c_o, m/p) = c_y^{\theta_1} c_o^{\theta_2} (m/p)^{1-\theta_1-\theta_2}$ , with  $\theta_1$ ,  $\theta_2$ , and  $\theta_1 + \theta_2$  strictly between 0 and 1. Does the demand for money depend on the real interest rate, the nominal interest rate, or both?
3. Suppose that the monetary authority does not print new money and that there is one person per cohort. Under the same assumptions as in the previous question, and the additional assumption that the production function is  $AK^\beta L^{1-\beta}$ , derive the value of the long-run capital stock (assume that the real value of money becomes constant in the long run). Also, find the steady-state price level. Make sure that your formula reproduces the steady-state formula for capital from the chapter on growth in the book when  $\theta_1 + \theta_2 = 1$ .
4. With the same utility function as above but with  $\theta_1 = 0$ , and for a production function  $AK + BL$ , find maximizing behavior (how much is saved in capital and how much in money) and derive an equation determining the evolution of prices over time. This equation should only have prices in it, as well as parameters of the model. Plot  $P_{t+1}$  as a function of  $P_t$  (with the former on the  $y$  and the latter on the  $x$  axis). Make sure you know how to plot it properly: is the function concave or convex (recall that you can tell by whether its derivative is increasing or decreasing). Also plot a 45-degree line:  $P_{t+1} = P_t$ . Use this line and techniques like those you used for capital accumulation to see what the solution for  $P_t$ ,  $P_{t+1}$ , and so on, might be. Can there be more than one solution?
5. If the government prints money and uses it to buy goods and services (say that it buys real gold paint and hires painters to paint all the inside walls of the White House), who is taxed? That is, who pays for the gold color and the painting services?
6. If the government prints money and buys government bonds in an open-market operation, is there a tax on anybody? If it prints money and gives it for free to the population in equal amounts per person, is there a tax on anybody? If the government decides by decree to increase the money stock by adding a zero to every note and coin (a nickel becomes 50 cents, a \$20-bill becomes a \$200-bill, etc.), is there a tax on anybody? Explain, in all cases.