Problem Set II

Quant Macro II

January 30, 2024

Deadline: February 5. Please send the Matlab codes plus a PDF (made with Latex) to both Eustache and me by February 5, 12pm. One submission per team of 2.

Exercise 2. Starting from Version 1.6 of your Problem Set. We want to compute some measures of wealth and income inequality.

1. If you were using `interp2`, please update your code to get rid of it. Discretize your income process with more points. For instance, $N = 7$, or $N = 9$ if your code is fast enough. Optional (but strongly recommended): you may want to get rid of the loop on (s, k) and vectorize your code. Optional (2): you may want to switch to Rouwenhorst instead of Tauchen.
2. Sort households by wealth, and compute the share of total wealth hold by each wealth quintile. Compute mean income by wealth quintile. What can you say about the correlation of wealth and income?
3. Now decrease the autocorrelation parameter of the income process, from 0.9 to 0.8. What can you say about wealth inequality? About the correlation between wealth and income?

Exercise 3. Starting from Exercise 2 of your Problem Set, go back to $N = 5$, but replace the Value Function Iteration block by an Endogenous Grid Method, starting with a guess on the policy function for c.

Exercise 4. We add a government to the economy of Problem Set I. The government has to finance some spending G, non-valued by the consumer, with a flat tax τ on total income.

1. Add the government in your code. Find the equilibrium interest rate $r^\star$ and tax rate $\tau^\star$ when $G = 0.1$. Hint: you need only one loop.
2. Now, calibrate the government spending to target a government-to-output ratio of 15%. Hint: you need only one loop.

Note: you can use VFI or EGM.

Exercise 5. We want to extend the economy (without a government) to incorporate endogenous labor supply. Let $\varphi = 1/0.4$. The preferences of the household are:

$$u(c, n) = \frac{c^{1-\mu}}{1-\mu} - B\frac{n^{1+\varphi}}{1+\varphi}.$$

1. We first solve for endogenous labor supply when we solve for a' using a grid search (that is, version 1.4 of Problem Set I). For each guess of prices, use bissection to compute, for each (a, ε, a') on your grid for assets and productivity, a function $\hat{n}(a, \varepsilon, a')$ which finds the optimal labor supply given assets a, productivity ε and new asset position a'. Then, use this function $\hat{n}$ and find the optimal asset policy function; compute the measure; and solve for your equilibrium. Find a value for B such that average hours worked are approximately equal to 0.3. Plot policy function for labor as a function of a and ε.

2. Starting from your code with a Golden search (version 1.6 of Problem Set I), now interpolate in your Golden code not only the value function (or continuation value) but also the policy function for labor (use the $\hat{n}$ that you computed above to interpolate).