Homework 7

April 20, 2024

- You are required to use Jupyter notebook to finish this quantitative exercise. You may refer to QuantEcon for help. Use university computer lab if you do not have a personal computer.
- This homework must be finished independently!
- You must submit your solution before the end of Apr 24. Submit your notebook file (**the .ipynb file**) to the following URL https://yunbiz.wps.cn/c/collect/cM6QwsGqkmL.

The deterministic representative consumer's problem

Consider the following problem

$$\max_{c} \sum_{t=0}^{\infty} \beta^t \ln c_t,$$

subject to

$$c_t + a_{t+1} = (1 + r_t)\, a_t + w_t \cdot 1.$$

1. Write down the associated Bellman equation.
2. Let $\beta = 0.95$. Given the following parameters, modify the code from your previous homework to solve the model numerically. Plot the policy function $a_{t+1} = g(a_t)$.
   (a) (warming up) Let $w_t = 1$, $r_t = 0.03$, $a_t \in [0, 5]$.
   (b) (consumption path) Let $w_t = 1$, $a_t \in [0, 5]$. Report and compare your result for different interest rate: $r = 0.03, 0.052631, 0.07$.
   (c) (borrowing constraint) Let $w_t = 1$, $r_t = 0.03$. Report and compare your result for different asset ranges: $a_t \in [0, 5]$, $[-5, 5]$, $[-35, 5]$. Why are they different? Explain.
   (d) (different interest rate for borrowing) Let $w_t = 1$ and $a_t \in [-5, 5]$. Suppose the interest rate for saving is $r_1 = 0.03$ and the interest rate for borrowing is $r_2 = 0.1$. Report and explain your result.
   (e) (cake eating) Let $w_t = 0$, $r = 0$, $a_t \in [10^{-2}, 5]$.