Problem Set 4
Numerical Methods
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Deadline: 31/03/2023

This question will ask you to solve numerically a heterogeneou-agent economy. Suppose there is a continuum of individuals that are subject to endowment shocks. A person's endowment is e^z, where z follows the following stochastic process:

$$z' = \rho z + \epsilon,$$

where $\epsilon \sim N(0, \sigma^2)$. The individual's instantaneous utility function is given by

$$u(c) = \frac{c^{1-\gamma} - 1}{1 - \gamma}$$

and they discount the future with the factor $\beta \in (0, 1)$. Each person has access to a bond that pays interest rate r. Their budget constraint can then be written as:

$$c + a' = e^z + (1 + r)a$$

Let $\beta = 0.96$ and $\gamma = 1.0001$ for now.

The interest rate r is determined to clear the bond market. The bond is available in zero net supply.

a) Let $\rho = 0.9$ and $\sigma = 0.01$. Use the Tauchen method to discretize the stochastic process in a Markov chain with 9 states. (Use 3 standard deviations for each side)

b) Discretize the asset space using a grid and solve the individual's problem for each state variable.

c) Find the stationary distribution $\pi(z, a)$ and use it to compute the aggregate savings in the economy. Find the equilibrium interest rate.

d) Suppose $\rho = .97$. Redo the analysis. How does the interest rate compare now? Explain.

e) Suppose $\gamma = 5$. Redo the analysis. How does the interest rate compare now? Explain.

f) Suppose $\sigma = .05$. Redo the analysis. How does the interest rate compare now? Explain.

g) Relate your results with Table 2 in Aiyagari (1994).