

Fall 2019 - ECON 634 - Advance Macroeconomics - Problem Set 4

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1. Based on the information in the firm maximization problem, and because of constant return to scale, the firm's FOC are given by:

$$w_t = F_N(K_t, 1) \quad (1)$$

$$r_t = F_K(K_t, 1) \quad (2)$$

2. For the household, we can write the budget constraint in recursive form as $c = zw\bar{l} + ra - a'$

- **State variable:** a, z
- **Control variable:** a'

Therefore, the Bellman equation:

$$V(a, z) = \max_{a' \in \Gamma(a, z)} \left\{ \frac{(zw\bar{l} + ra - a')^{1-\sigma}}{1-\sigma} + \beta \sum_{z' \in Z} \Pi(z'|z) V(a', z') \right\}$$

subject to

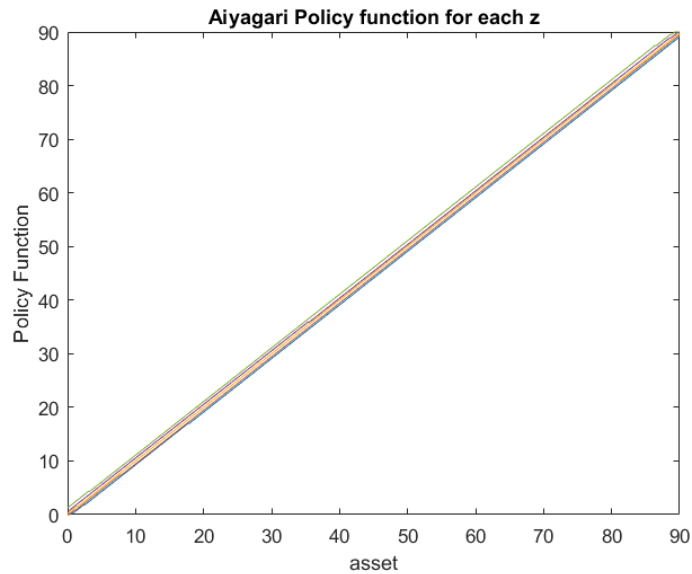
$$\Gamma(a, z) \in [0, zw\bar{l} + ra] \quad (3)$$

3. The aggregate labor is equal to $N^s = 1$ using the Rouwenhorst's method.
4. See code.

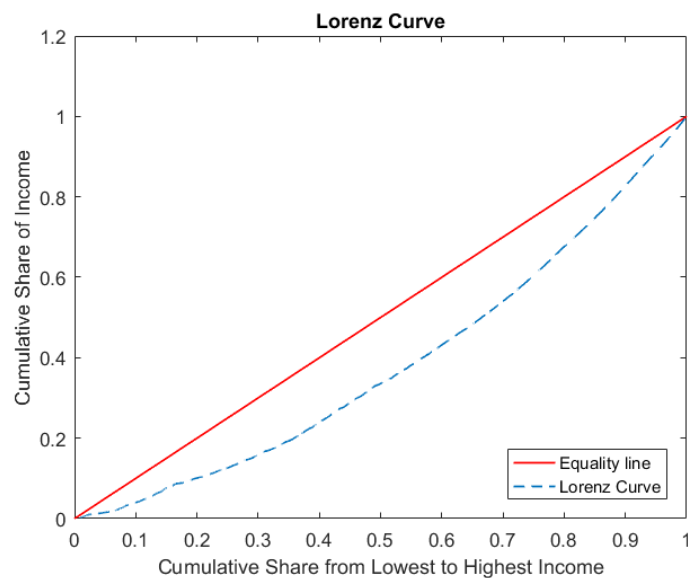
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5. See code.
6. My code does not finish and get stuck in one interest rate. I decide to add a limit in the iteration and the final (gross) interest rate is: 1.0099. Compare with the complete equilibrium solution, $\frac{1}{\beta} = 1.010101$, which means that the interest rate is -0.02% in the incomplete market.

The policy functions are as follows:



The Lorenz curve is like in the second picture:



The Gini value is:

From the Lorenz curve we can see that the distribution seems more realistic because there the share of the inequality is more convex.

7. I tried the different possibility with various degrees of success.

- **Coarse grid:** Solve the problem and the (gross) interest rate is the same as before. It does use less iterations than the regular VFI method
- **Policy function:** The code seems right but it doesn't converge to anything
- **Interpolation:** I tried this but couldn't figure out how to make it work. I added what I tried but it is both wrong and it does not work.