Fall 2019 - ECON 634 - Advance Macroeconomics - Problem Set 3

Elisa Taveras Pena*
Binghamton University

October 12, 2019

1. We can write the budget constraint in recursive form as $c = y(s) + a - qa'$

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

   Therefore, the Bellman equation:

$$V(a,s) = \underset{a' \in \Gamma(a,s)}{\text{Max}} \left\{ \frac{(y(s) + a - qa')^{1-\sigma}}{1-\sigma} + \beta \sum_{s' \in S} \Pi(s'|s) V(a', s') \right\}$$

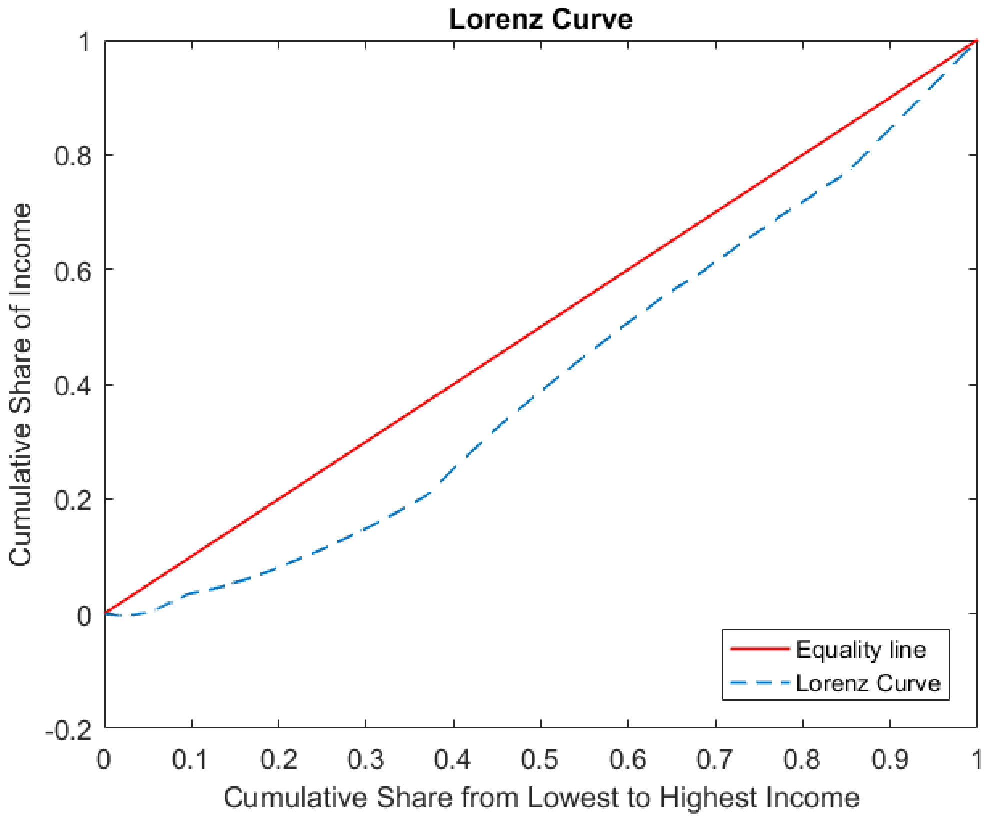
subject to

$$\Gamma(a,s) \in [0, f(k)] \tag{1}$$

2. The Risk free price is **0.9950**.

3. The Lorenz curve looks as follows:

*E-mail address: etavera2@binghamton.edu



4. Extra credit:

- If everyone started out with zero assets, and there was perfect insurance against all income shocks, what would the allocation be? What would be expected utility of that allocation?

  If everyone can perfectly insurance against all the shock, and because there is no aggregate uncertainty, they will consume the same in each period (consumption smoothness). This means that in each period, they consume their probability ratio. This means that:

$$\hat{c}_e = \frac{\pi_{ee}}{\pi_{eu}} = \frac{.97}{.03} = 32.33 \qquad \forall t$$
$$\hat{c}_u = \frac{\pi_{uu}}{\pi_{ue}} = \frac{.5}{.5} = 1 \qquad \forall t$$

Then, the expected Utility of this consumption is:

$$U(\hat{c}_e) = \sum_{t=0}^{\infty} \beta^t \frac{\hat{c}_e^{1-\sigma}}{1-\sigma} = \frac{32.33^{-.5}}{-.5} \sum_{t=0}^{\infty} \beta^t = -0.352 \times \frac{1}{1-\beta} = -58.62$$

$$U(\hat{c}_u) = \sum_{t=0}^{\infty} \beta^t \frac{\hat{c}_u^{1-\sigma}}{1-\sigma} = \frac{1^{-.5}}{-.5} \sum_{t=0}^{\infty} \beta^t = -2 \times \frac{1}{1-\beta} = -333.34$$