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

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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:

   $$V(a, s) = \underset{a' \in \Gamma(a,s)}{\text{Max}} \left\{ \frac{(y(s) + a - qa')^{1-\sigma}}{1 - \sigma} + \beta \sum_{s' \in S} \Pi(s'|s) V(a', s') \right\}$$
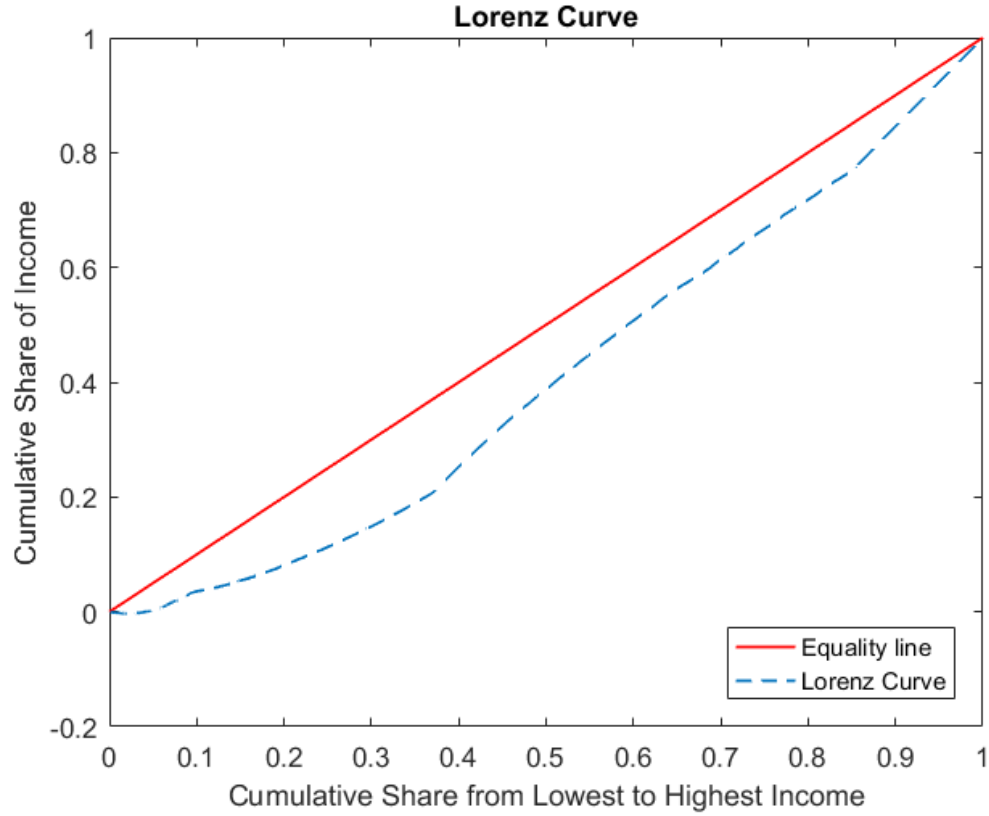
   subject to
   $$\Gamma(a, s) \in [0, f(k)] \tag{1}$$

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

3. The Lorenz curve looks as follows:

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Lorenz Curve

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 the expected value of their endowment (expected wages). This means that:

$$\hat{c}_e = \pi_{ee}y(e) + \pi_{eu}y(u) = .97(1) + .03(.5) = 0.9850 \qquad \forall t$$

$$\hat{c}_u = \pi_{ue}y(e) + \pi_{uu}y(u) = .5(1) + .5(.5) = .75 \qquad \forall t$$

Then, the expected Utility of this consumption is:

$$W^{FB}(\hat{c}_e) = \sum_{t=0}^{\infty} \beta^t \frac{\hat{c}_e^{1-\sigma}}{1-\sigma} = \frac{\hat{c}_e^{1-\sigma}}{1-\sigma}\frac{1}{1-\beta} = -2.0152 \times \frac{1}{1-\beta} = -335.8618$$

$$W^{FB}(\hat{c}_u) = \sum_{t=0}^{\infty} \beta^t \frac{\hat{c}_u^{1-\sigma}}{1-\sigma} = \frac{0.75^{-.5}}{-.5}\sum_{t=0}^{\infty} \beta^t = -2.3094 \times \frac{1}{1-\beta} = -384.9002$$

- Which fraction of households would benefit from that plan?

  The fraction of household that has a higher increment on their value function with the goverment plan are 94.34%.

- Welfare Gain?

  There is complete economic welfare gain which is equal to 0.0024.