I. Consider the same environment as Huggett (1993, JEDC) except assume that there are enforceable insurance markets regarding the idiosyncratic shocks to earnings and that there are no initial asset holdings. Solve for a competitive equilibrium. What are prices? What is the allocation? (Hint: think about the planner's problem and then decentralize).

Answer: Under the assumptions of enforceable insurance markets + locally non-satiated preferences, the basic first and second welfare theorems hold. Hence, we will solve the planner's problem for allocations and then decentralize by setting asset prices that support the allocations as a CE.

The planner's problem can be written as

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t [\pi(e)u(c_{e,t}) + \pi(u)u(c_{u,t})] \quad \text{s.t.} \quad \pi(e)c_{e,t} + \pi(u)c_{u,t} \leq \pi(e)y_t(e) + \pi(u)y_t(u), \ \forall t$$

The first order conditions are

$$[c_{e,t}] : \beta^t \pi(e)u'(c_{e,t}) = \lambda\pi(e) \qquad\qquad [c_{u,t}] : \beta^t \pi(u)u'(c_{u,t}) = \lambda\pi(u)$$

Combined, we have that $u'(c_{e,t}) = u'(c_{u,t}) \Leftrightarrow c_{e,t} = c_{u,t} = \bar{c}$.

Plugging into the BC, we get $\bar{c} = y_t(u) + \pi(e)[y_t(e) - y_t(u)]$. For instance, in Part II, we are given $\pi(e) = 0.94$, $y_t(e) = 1$ and $y_t(u) = 0.5$, which would imply $\bar{c} = 0.97$.

The decentralized EE for an individual i is $\beta^t u'(c_t^i) = \lambda q_t \Leftrightarrow q_{t+1} = \beta q_t = \beta^{t+1} q_0$. ▪

II. Now compute Huggett (1993, JEDC) with incomplete markets. The following takes you through the steps of solving a simple general equilibrium model that generates an endogenous steady state wealth distribution. The basic algorithm is to: 1) taking a price of discount bonds $q \in [0, 1]$ as given , solve the agent's dynamic programming problem for her decision rule $a' = g_\theta(a, s; q)$ where $a \in A$ are asset holdings, $s \in S \subset R_{++}$ is exogenous earnings, and θ is a parameter vector; 2) given the decision rule and stochastic process for earnings, solve for the invariant wealth distribution $\mu^*(A, S; q)$; 3) given μ^*, check whether the asset market clears at q (i.e. $\int_{A,S} g_\theta(a, s; q)\mu^*(da, ds; q) = 0$). If it is, we are done. If not (i.e. it is not within an acceptable tolerance), then bisect $[0, 1]$ in the direction that clears the market (e.g. if $\int_{A,S} a'\mu^*(da, ds; q) > 0$), then choose a new price $\hat{q} = q + [1 - q]/2$ and go to step 1.

4. After finding fixed points of the T and T^* operators, answer the following questions:

   a. Plot the policy function $g(a, s)$ over a for each s to verify that there exist $\hat{a}$ where $g(\hat{a}, s) < \hat{a}$ as in Figure 1 of Huggett. (Recall this condition establishes an upper bound on the set A necessary to obtain an invariant distribution).

   Answer:

   ▪

   b. What is the equilibrium bond price? Plot the cross-sectional distribution of wealth for those employed and those unemployed on the same graph.

   Answer:

   ▪

   c. Plot a Lorenz curve. What is the gini index for your economy? Compare them to the data. For this problem set, define wealth as current earnings (think of this as direct deposited into your bank, so it is your cash holdings) plus net assets. Since market clearing implies aggregate assets equal zero, this wealth definition avoids division by zero in computing the Gini and Lorenz curve.

   Answer:

   ▪

III. (a) Plot $\lambda(a, s)$ across a for both $s = e$ and $s = u$ in the same graph.

Answer:

▪

(b) What is W^{FB}? What is $W^{INC} = \sum_{(a,s)\in A\times S} \mu(a, s)\nu(a, s)$? What is WG?

Answer:

▪

(c) What fraction of the population would favor changing to complete markets? That is $\sum_{(a,s)\in A\times S} \mathbb{1}_{\lambda(a,s)\geq 0}(a, s)\mu(a, s)$.

Answer:

▪