

## Homework 2: Heterogenous Agents under Aggregate Uncertainty. Due: 2/28

Implement a simple version of the Krusell/Smith methodology to solve the Aiyagari model with aggregate uncertainty: discretize the state space (individual and aggregate capital) and force the consumer's choices to lie on a grid. Roughly, the algorithm would look as follows:

1. Guess on two linear laws of motion for aggregate capital, i.e., four numbers.
2. For each  $(k, \bar{k})$  on your grid, solve the dynamic programming problem for the consumer: guess on a  $V$ , find out what the best choice is on each grid point (a comparison of a finite number of alternatives for  $k'$ —the set of grid points), update  $V$ , and proceed until the decision rule and  $V$  converge. When you evaluate next period's value for the different values of  $k'$  (i.e., the different  $V(k'_i, \bar{k}')$  values, where  $i$  refers to grid point  $i$ ), you need to use the linear law of motion for aggregate capital to know what  $\bar{k}'$  is. That will imply a  $\bar{k}'$  which is not on the grid; to find an appropriate value for  $V(k'_i, \bar{k}')$ , then, use a linear interpolation in the  $\bar{k}'$  dimension.
3. Simulate a large number of agents: distribute an initial capital stock among the agents, distribute the individual shocks (force the law of large numbers to hold in your population), draw the aggregate shock, and find the agents' savings decisions using the rule you previously computed (if the total capital is not a grid point, pick the closest one). Now you will be able to find total capital next period by summing up across individuals. Draw individual shocks (again subject to forcing the LOLN), an aggregate shock, and proceed to get a long sequence of total capital stocks.
4. Run linear regressions on the two data sets (classified according to the current aggregate shock) for total capital: you obtain four numbers. Compare to the initial four numbers and iterate until convergence.
5. When you are done, report accuracy statistics.

Assume two aggregate and two individual shock values and employ the calibration in the paper, except for the following: assume that the aggregate and the individual shocks are uncorrelated (so that the unemployment rate is constant over time (independent of the productivity shock)).