TakeHomeMidterm

Econ 8 5 : Macroeconomics II

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Life cycle model.

Consider the problem of a retired person who decumulates a given amount of wealth W. He solves the following problem:

$$\sum_{t=1}^{T} {}^{t}u(c_t) \quad \rightarrow \max_{c \ ,k \ \ 1}$$

s.t.

total resources of the household:

$$res_t = k_t(1+r) + y_t \quad x_t$$

$$k_1 = W$$

Here k_t is savings, y_t is pension income, and x_t is medical expense shock. There is a means-tested support program that guarantees each household consumption at the level c_{min} if his resources are too low. If $res_t > c_{\min}$, then $c_t = res_t \quad k_{t \ \ 1}$, $k_{t \ \ 1} \geq 0$. Else, $c_t = c_{\min}$ and $k_{t \ \ 1} = 0$.

Solve the model using backward induction. Assume CRRA utility function with risk aversion σ: $u(c_t) = \frac{c_t^{1}}{1 \quad \sigma}$. Set $\quad = 0.95, r = 0.04, \sigma = 3, T = 40, c_{\min} = 0.1$. For income, set $y_t = 1$ for all t. For initial wealth set $W = 10$. Assume x_t can take two values with probability 0.8 and 0.2. Download the le containing the values for x_t from the course website (xpts40.in). Discretize k using 100 gridpoints, so that $k(1) = 0$ and $k(100) = 100$. Make sure the grid is more dense around 0. When looking for optimal $k_{t \ \ 1}$ do NOT restrict it to lie on the grid. Make sure you enforce the constraint $k_{t \ \ 1} \geq 0$. (When looking for a maximum you can use Matlab command *fminbnd*.) To nd value function outside the grid of k use linear interpolation. (When doing linear interpolation command *nd* can be useful.)

1. Solve the model and plot resulting policy functions for $k_{t\quad 1}$ and value function for ages 10 and 30   xing x_t at the 1st and 2nd grid.

Organize your graphs as follows: 2×2 matrix. Left column - savings, right column - value function. Top row - for age 10, bottom row - age 30. Each graph should have 2 lines (clearly labeled):   xing x_t at the 1st and 2nd grid (command subplot in Matlab can be useful).

2. Simulate $\{x_t\}$ for $t = 1 : 40$. Plot savings over the lifecycle using your policy function.

3. Increase c_{min} to 0.5 and resolve the model. Plot savings over the life cycle.

4. Go back to c_{min} equal to 0.1. Remove medical shok (set $x_t = 0$). Resolve the model and plot savings over the lifecycle.

5. Go back to the initial parametrization with medical shok and increase   to 0.99. Resolve the model and plot savings over the lifecycle.

6. Combine saving pro les from questions 2-5 on the same graph and compare. Make sure to clearly label each line. Provide economic intuition.