

Computational Methods: Task list 2

To be handed in by February 14, 2020

- 1) Write a Dynare file that solves the model in (Greenwood, Hercowitz, and Huffman 1988). Use the parameters values given in the paper.
 - a) Before you start programming, write down the list of all variables and all equations in the model, make sure that the number of variables equals the number of equations, and that all the variables in your equations are contained in the list of variables!
 - b) To compute the steady state, write a matlab file that takes as input a guess for the wage, computes the steady state values of all other variables and returns a vector for residual that is zero if the wage guess is right.

Use the Matlab function "fzero" to find the equilibrium wage.

- c) Write the Dynare file with all the model equation. Give the steady state that you have computed as starting values for the model variables. Solve the model with first order approximation.

Check whether the steady state that Dynare find corresponds to your own steady state calculation.

Compare the impule responses produced by Dynare with the ones in the paper.

2) Dynamic programming

- a) Start from the file lcstoch.m, and modify it so as to solve a model with indivisible labor, that means, households have the choice of either not working at all ($h = 0$) or working full time ("eight hours", $h = 1/3$) or part time ($h = 1/6$). The value function satisfies

$$V_t(k, z) = \max_{k', h \in \{0, 1/6, 1/3\}} \{ u(c, h) + \beta E_t V_{t+1}(k', z') \} \quad (1)$$

subject to

$$c = z_t h y_t + (1 + r)k - k' \quad (2)$$

$$k' \geq \bar{k} \quad (3)$$

$$(4)$$

with the utility function $u(c, h) = \log(c) + 1.5 \log(1 - h)$.

Stochastic productivity z_t follows a Markov process as in lcstoch.m. Age-specific productivity y_t is given by

$$y_t = \begin{cases} 1 & \text{if } t \leq 40 \\ 1 - \frac{t-40}{20} & \text{if } t > 40 \end{cases} \quad (5)$$

- b) Plot the labor supply function along several dimension
 - as a function of assets k , given age and productivity z
 - as a function of age, given assets k and productivity z

- as a function of productivity z , given age and assets k .

Check that the decision function has the properties that you expect it to have.

- c) After solving the model, simulate a household for many periods (at least 10000), and compute the frequency at which it switches between different employment states.

References

Greenwood, J., Z. Hercowitz, and G. W. Huffman (1988, June). Investment, capacity utilization, and the real business cycle. *American Economic Review* 78(3), 402–17.