Final Assignment

Haomin Wang
Department of Economics
University of Konstanz

February 5, 2019

Due: 7 March, 2019

Email: haomin.wang@uni-konstanz.de.

Search with Stochastic Ageing

* You may use either Matlab or Fortran for the numerical part of this problem.

Consider a random search model set in continuous time. Let there be a unit measure of workers who are either employed or unemployed. Workers can search on and off the job with equal efficiency. The worker's instantaneous utility function is

$$u(c, \lambda) = c - e(\lambda)$$

where $e(\lambda)$ is an increasing and convex cost of search function associated with choosing Poisson offer arrival rate λ.

Workers do not save or borrow; they consume whatever income is received at that point in time. Job offers are drawn from the exogenous offer distribution $F(w)$. Workers lose their jobs at rate δ. When unemployed, the worker receives flow income b. Workers' discount rate is r.

Workers are born at rate η with heath $h = 0$. Health evolves stochastically over time so that at Poisson rate α a worker's health status transitions from h to $h + \hat{h}$, where $\hat{h} < 1$ is a given increment. The worker faces a death rate $d(h)$ that is increasing in health status. Assume that $h \in [0, 1]$ and $\lim_{h \to 1} d(h) = \infty$.

1. Set up the worker's dynamic problem as a Bellman equation. Make sure that the functional equation has a unique solution and that it is a contraction mapping.

2. Write down the steady state conditions.

3. Solve the model assuming the wage offer distribution is a beta distribution with parameters (β_0, β_1), and $b = 0$. Furthermore, assume that $e(\lambda) = c_0 \lambda^{c_1}$ and $d(h) = \left(\frac{h}{1-h}\right)^{d_1}$. Write code so that it solves for a given specification of model parameters.

4. Report the value function and policy function, $V(h, w)$ and $\lambda(h, w)$, respectively for the following parameters: $r = 0.05$, $\delta = 0.2$, $(\beta_0, \beta_1) = (2, 5)$, $(c_0, c_1) = (0.5, 2)$, $\left(d_1, \hat{h}, \alpha\right) = (1, 0.2, 0.075)$.

5. Simulate data using the model. Report the steady state unemployment rate, job-finding rate, job-to-job transition rate, and the observed wage distribution by health status.

Bonus: Problem Set 2 Revisit

* Please use Fortran for this problem. Answer to this problem counts toward the grade of PS2.

Solve the stochastic growth model described in problem set 2.

Assume that agents have log preferences and a subjective discount rate $\beta = 0.99$, production technology satisfies $f(k) = zk^{\alpha}$ with $\alpha = 0.36$, and capital depreciates at rate $\delta = 0.025$. We assume that the technology shock $z \in \left\{z^g, z^b\right\}$ follows a two-state Markov Process. The transition matrix is

$$\Pi = \left[\begin{array}{cc} 0.977 & 0.023 \\ 0.074 & 0.926 \end{array} \right].$$

For example, $\Pr\left(z' = z^g | z = z^b\right) = 0.074$. Assume that $z^g = 1.05$ and $\bar{z} = 1$. Solve the model numerically using the projection method. You can modify the fortran program that I used in lecture 2. (Go to ILIAS, look for "valiter").