Macro Prelim

August 9th, 2017

Instructions: This question tests your ability to write out MATLAB code as you used on your three assignments (and *not* any other computer language or pseudo code). Make sure that your writing is *legible*. **GOOD LUCK!**

Consider the problem of the infinitely-lived Robinson Crusoe whose momentary utility function is given by

$$U(c - G(h)) = \frac{[c - h^{1+\theta}/(1+\theta)]^{1-\gamma}}{(1-\gamma)}, \text{ with } 0 < \beta < 1 \text{ and } \gamma, \theta > 0,$$

where c is his consumption and h is his hours worked. Robinson-Crusoe discounts the future at rate β.

Robinson Crusoe produces output, o, according to the following production function:

$$o = zF(k,h) = zk^{\alpha}h^{1-\alpha}, \text{ with } 0 < \alpha < 1,$$

where k is Robinson's capital stock and h is his work effort. The technology shock z follows a two-state Markov chain where

$$z \in \mathcal{Z} \equiv \{z_1, z_2\},$$

with

$$z_1 = 1 - z, z_2 = 1 + z \text{ and } z > 0,$$

$$\Pr[z_{t+1} = z_s | z_t = z_r] = \pi_{rs},$$

and

$$\pi_{rs} = \pi_{sr}.$$

In any period Robinson Crusoe can use some of his output for consumption and the rest for capital accumulation. Capital depreciates at rate δ over time. In a period Robinson knows the current value of the technology shock z.

1. Write out the MATLAB code for solving the above problem using discrete state space dynamic programming.

2. Write out the MATLAB code for computing the Markov chain solution for the invariant distribution over (k, z). Show how would you compute the standard deviation for k and the correlation between k and z.

3. Although, there is no need to get this specific, set $\alpha = 0.3$, $\beta = 1/(1.04), \delta = 0.08, \theta = 0.6$, and $\gamma = 1.5$. How would you pick z and π_{rs}?