Brigham Young University Department of Economics

Economics 581 – Advanced Macroeconomics

Homework #7
due 10/22

Solving and Simulating Hansen's Model

1. Consider a version of Hansen's basic model with no utility from leisure and with the following functional forms.
$u(c_t) = \frac{1}{1-\gamma}({c_t}^{1-\gamma} - 1)$; $f(k_t, z_t) = A{k_t}^{\theta}(e^{z_t}\bar{h})^{1-\theta}$
$z_t = \rho z_{t-1} + \varepsilon_t,\ \varepsilon_t \sim N(0, \sigma^2)$

Write down a Bellman equation for this model's households.
Write down the first-order and envelope conditions.
Write down the Euler equation.

What are the exogenous state variables?
What are the endogenous state variables?
List your endogenous non-state variables.

Write down the set of behavioral equations that define this model.

Set the parameters of the model to the following values:
$\gamma = 2.0, \beta = 0.995, \delta = 0.025, \theta = 0.33, \bar{h} = 0.3, A = 1, \rho = 0.9, \sigma = 0.02$

Use the behavioral equations to find the steady state values of:
capital (*k*), output (*y*), investment (*i*), consumption (*c*), the interest rate (*r*), the wage rate (*w*).
Did you find the solution analytically or numerically?

Log-linearize the behavioral equations analytically and write each next to the equation from which it was derived. Given the parameter values above, write down the numerical values of the coefficient matrices **A** through **N**, which come from the log-linearized equations. Did you find the values analytically or numerically?

Write down values of the policy coefficient matrices **P** through **S**.

Simulate this model with 1000 Monte Carlos of 250 observations each.
For *k*, *y*, *i*, *c*, *r*, *w*, λ (the level of technology, Ae^z) & *u* (within period utility) report the following moments: mean, standard deviation, coefficient of variation, correlation with *y*, correlation with λ, and autocorrelation.

2. Repeat the analysis above using the basic Hansen model with utility from leisure. Use the following functional forms.
$u(c_t) = \frac{1}{1-\gamma}({c_t}^{1-\gamma} - 1) + B\frac{1}{1-\mu}[(1-h_t)^{1-\mu} - 1]$; $f(z_t, k_t, h_t) = A{k_t}^{\theta}(e^{z_t}h_t)^{1-\theta}$
Let $B = 2.5$ & $\mu = 1$ in your simulation. Use the same values as in part 1 for the other parameters.
Include hours worked in the list of variables for which you find steady state values and moments.