Economics 8185

Advanced Topics in Macroeconomics–Computation

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Homework 2.

1. Compute equilibria of the following growth model:

$$\max_{\{c_t,x_t,\ell_t\}} E\sum_{t=0}^{\infty}\beta^t\left\{\log\left(c_t\right)+\psi\log\left(\ell_t\right)\right\}N_t$$

$$\begin{aligned}\text{subj. to}\quad & c_t+\left(1+\tau_{xt}\right)x_t=r_tk_t+\left(1-\tau_{ht}\right)w_th_t+\kappa_t\\ & N_{t+1}k_{t+1}=\left[\left(1-\delta\right)k_t+x_t\right]N_t\\ & h_t+\ell_t=1\\ & S_t=PS_{t-1}+Q\epsilon_t,\quad S_t=[\log z_t,\tau_{ht},\tau_{xt},\log g_t]\\ & c_t,x_t\geq 0\quad\text{in all states,}\end{aligned}$$

   where $N_t=(1+\gamma_n)^t$ and firm technology is $Y_t=K_t^{\theta}(Z_tL_t)^{1-\theta}$. Factors are paid their marginal products r and w, and revenues in excess of government purchases of goods and services, N_tg_t, are lump-sum transferred to households in amount κ_t. The stochastic shocks hitting this economy affect technology, tax rates, and government spending and the stochastic processes are modeled as a VAR(1) process. The resource constraint in this economy is $Y_t=N_t(c_t+x_t+g_t)$. Notice that this is the same as Homework 1 except that now the economy is distorted and cannot (except in a few special cases) be mapped to a concave programming problem. Use the following methods to compute the equilibrium for general parameters:

   a. Iterate on Bellman's equation;
   b. Map it to a linear quadratic problem;
   c. Apply Vaughan's method.

2. Simulate time series for all variables listed above assuming $\epsilon\sim N(0,\Sigma)$. In addition, construct time series for dividends, accounting profits, and stock valuations. Construct some interesting examples, explaining in detail why you think they are interesting.