

Economics 8185
Advanced Topics in Macroeconomics–Computation
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Homework 1.

1. Compute equilibria of the following growth model:

$$\begin{aligned} \max_{\{c_t, x_t, \ell_t\}} E \sum_{t=0}^{\infty} \beta^t \{ \log(c_t) + \psi \log(\ell_t) \} N_t \\ \text{subj. to } c_t + x_t &= k_t^\theta \left((1 + \gamma_z)^t z_t h_t \right)^{1-\theta} \\ N_{t+1} k_{t+1} &= [(1 - \delta) k_t + x_t] N_t \\ \log z_t &= \rho \log z_{t-1} + \epsilon_t, \quad \epsilon \sim N(0, \sigma^2) \\ h_t + \ell_t &= 1 \\ c_t, x_t &\geq 0 \quad \text{in all states} \end{aligned}$$

where $N_t = (1 + \gamma_n)^t$ using the following methods:

- a. Iterate on Bellman's equation;
 - b. Map it to a linear quadratic problem;
 - c. Apply Vaughan's method.
2. Discuss the properties of the solution (e.g., value and decision functions) for the parameter sets below and evaluate the computational procedures in light of these properties:
- a. $\psi = 0, \delta = 1, \gamma_n = 0, \gamma_z = 0$
 - b. $\psi = 0, \gamma_n = 0, \gamma_z = 0$
 - c. $\psi = 0, \gamma_n = 0$
 - d. $\psi = 0, \gamma_z = 0$
3. (Optional) Modify the preferences so that

$$U(c_t, \ell_t) = \left(c_t \ell_t^\psi \right)^{1-\sigma} / (1 - \sigma)$$

and add two more variations on the parameter set:

- e. $\sigma = 0$
- f. σ large.