

Problem set 5

Buan 6340

Linear algebra

1. Real business cycles:

Consider the macroeconomic model for real business cycles taken from Dejong and Dave (2011) Chapter 3. In your last problem set you derived the nonlinear system:

$$\frac{1 - \phi}{\phi} \frac{c_t}{l_t} = (1 - \alpha) \frac{y_t}{n_t}$$
$$E_{t-1} \left[\beta \frac{u(c_t, l_t)}{c_t} \left(\alpha \frac{y_t}{k_t} + 1 - \delta \right) \right] = \frac{u(c_{t-1}, l_{t-1})}{c_{t-1}}$$

$$y_t = z_t k_t^\alpha n_t^{1-\alpha}$$

$$1 = n_t + l_t$$

$$y_t = c_t + i_t$$

$$k_t = i_{t-1} + (1 - \delta)k_{t-1}$$

$$u(c, l) = \frac{(c^\phi l^{1-\phi})^{1-\psi}}{1 - \psi}$$

$$\ln z_t = (1 - \rho) \ln \bar{z} + \rho \ln z_{t-1} + e_t$$

Your job is to log-linearize the above system around the steady state using first-order Taylor series approximations to find a model in the form:

$$Ax_t = Bx_{t-1} + Ce_t$$

Programming

2. Hierarchical clustering

Implement a hierarchical clustering procedure from scratch (without using sklearn or a similar package) in python.