Macroeconomic Theory: Assignment 4

Please attach your code at the last page of your solutions.

Question 1. Transitional Dynamics

We apply the approach of numerical linearization to study transitional dynamics of the neoclassical growth model when a technology shock arrives. Let the production function be $f(k) = Ak^{\alpha}$, and the utility function be CRRA:

$$u(c) = \begin{cases} \frac{c^{1-\theta}-1}{1-\theta} & \text{if } \theta \neq 1 \\ \ln(c) & \text{if } \theta = 1 \end{cases}, \theta \geq 0$$

Part 1. Let $A = 1$, $\delta = 0.5$, $\theta = 0.8$, $\beta = 0.95$, $\alpha = 0.5$. Suppose that the economy was initially at the steady state (For $t = -5, -4, -3, -2, -1$). At time $t = 0$, the productivity A increases from 1 to 1.1 unexpectedly and permanently. Follow the instructions to plot the dynamics of the economy.

1. Solve for the steady states before and after the shock
2. Find the Linear approximates of the system at the new steady state
3. Find the eigenvalues and eigenvectors of the linearized system
4. Plot the time series of capital, consumption, output, and investment from $t = -5$ to $t = 30$

Part 2. Let $A = 1$, $\delta = 0.5$, $\theta = 0.8$, $\beta = 0.95$, $\alpha = 0.5$. Suppose that the economy was initially at the steady state (For $t = -5, -4, -3, -2, -1$). At time $t = 0$, the time discount factor β decreases from 0.95 to 0.9 unexpectedly and permanently. Plot the time series of capital, consumption, output, and investment from $t = -5$ to $t = 30$