

**In the Name of God**  
**Sharif University of Technology**  
**Graduate School of Management and Economics**  
Macroeconomics 2 - 2023  
Problem Set 1

## 1 Simulating an Infinite-Period Model

Consider the infinite-period model of consumption choice, where the social planner solves:

$$\max_{\{c_t, k_{t+1}\}} \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\sigma} - 1}{1-\sigma}$$

subject to

$$c_t + k_{t+1} = Ak_t^\alpha + (1 - \delta)k_t$$

for all  $t = 0, 1, 2, \dots$ . Again  $\beta < 1$ .

1. Write down the Euler Equation.
2. Solve for the steady state allocation.
3. Write a Matlab code to find the optimum  $c_0^*$  for a given  $k_0$ .
4. How do the steady state values of consumption, production, capital and investment depend on  $\beta, \sigma, \delta, \alpha$ .
5. Plot the time series of  $c_t$  and  $k_t$ .
6. How does the speed of convergence depend on  $\beta, \sigma, \delta, \alpha$ .
7. Calibrate four parameters to Iran's Macro data. You can use The Ebrahimian- Madanizadeh paper to answer this question.
8. Suppose the initial capital drops by 10%. Determine the new steady state and plot the transition paths for  $y_t, k_t, i_t, c_t, v_t$ . Explain how the results make sense.

9. Suppose the parameter  $A$  rises by 10%. Determine the new steady state and plot the transition paths for  $y_t, k_t, i_t, c_t, v_t$ . Explain how the results make sense.
10. Now setup the Dynare code to solve the problem.
11. Suppose the initial capital drops by 10%. Plot the impulse responses for  $y_t, k_t, i_t, c_t, v_t$  for three values of  $\beta$ . Explain how the results make sense.
12. Suppose the productivity  $A$  drops by 10%. Plot the impulse responses for  $y_t, k_t, i_t, c_t, v_t$  for three values of  $\sigma$ . Explain how the results make sense.