

Instructor: *Professor Griffy*

Due: *Apr. 13th, 2023*

AECO 701

Problem Set 5: The RBC Model

Problem 1. RBC Model with Labor-Leisure Choice. The RBC model with an intensive margin is given by the following:

$$\max_{C_t, K_{t+1}} \sum_{t=0}^{\infty} \beta^t U(C_t, 1 - L_t) \quad (1)$$

subject to

$$C_t + K_{t+1} = z_t F(K_t, L_t) + (1 - \delta)K_t \quad (2)$$

$$z_t \sim \text{Markov} \quad (3)$$

1. Write the recursive formulation of this problem.
2. Assume the following calibration:

Parameter	Value
$U(C, 1 - L)$	$\ln(C) + \theta \ln(1 - L)$
$F(K, L)$	$K^\alpha L^{1-\alpha}$
β	0.99
ρ	0.9
δ	0.04
α	0.3
θ	2
K Grid	[4, 9]

$$\pi_t = \begin{bmatrix} 0.9 & 0.1 \\ 0.7 & 0.3 \end{bmatrix} \quad (4)$$

$$z_t = \begin{bmatrix} 12 \\ 8 \end{bmatrix} \quad (5)$$

Solve the model using grid search. Note that you will need to solve the model each time for each possible state.

- c Start the model in the “high state,” and run the model forward for 100 periods. In period 101, a highly persistent recession starts (10 periods); simulate the response of labor to this recession. Discuss the response of hours as a result of this shock.

Problem 2. Solving for Consumption. Now, assume the following about the economy:

$$U(C, 1 - L) = \ln(C) + \theta(1 - L) \quad (6)$$

1. Write the recursive formulation of this problem.
2. Using the calibration above, solve this version of the model. Use a K Grid of [7, 13].
3. Simulate the model for 100 periods and then use the same shock as above. Discuss the response of hours and compare with the results from the model with an intensive margin.