Problem Set 7

ECON 30020: Intermediate Macroeconomics

Professor Sims

University of Notre Dame, Spring 2018

Instructions: You may work on this problem set in groups of up to four people. Should you choose to do so, please make sure to legibly write each group member's name on the first page of your solutions. This problem set is due in class on Thursday March 22.

1. **Labor Supply Elasticity and Amplification of Productivity Shocks:** Consider the basic neoclassical model as presented in class, but with one twist. The equations summarizing the equilibrium of the model are given below:

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$
$$N_t = N^s(\theta_t)$$
$$N_t = N^d(w_t, A_t, K_t)$$
$$I_t = I^d(r_t, A_{t+1}, f_t, K_t)$$
$$Y_t = A_t F(K_t, N_t)$$
$$Y_t = C_t + I_t + G_t$$

These equations differ from the model presented in class in that labor supply is not a function of the real wage – i.e. labor is supplied inelastically, and only depends on the exogenous variable θ_t.

(a) What are the exogenous variables in the model? What are the endogenous variables? What do we mean when we say that we treat Y_{t+1} as "pseudo-exogenous"?

(b) Graphically depict the equilibrium of the economy using the five part graph. Suppose that there is an increase in A_t. Show how Y_t, N_t, r_t, and w_t react to the increase in A_t when labor is inelastically supplied.

(c) Compared to the standard model from class in which labor supply is increasing in the real wage, do the endogenous variables react more or less to the increase in A_t? Explain briefly.

2. **Intertemporal Labor Supply:** Consider the basic neoclassical model as presented in class, but with one twist. The equations summarizing the equilibrium of the model are given below:

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$
$$N_t = N^s(w_t, \theta_t, r_t)$$
$$N_t = N^d(w_t, A_t, K_t)$$
$$I_t = I^d(r_t, A_{t+1}, f_t, K_t)$$
$$Y_t = A_t F(K_t, N_t)$$
$$Y_t = C_t + I_t + G_t$$

The twist relative to the model in class is that labor supply is a function of the real interest rate. We assume that the partial derivative of labor supply with respect to the real interest rate is positive – i.e. $\frac{\partial N^s(w_t, \theta_t, r_t)}{\partial r_t} > 0$.

(a) Can you provide any intuition for why it might be reasonable to assume that labor supply is increasing in the real interest rate? Explain briefly.

(b) Graphically derive the Y^s curve under the assumption that labor supply is an increasing function of the real interest rate. How does the Y^s curve look different than the version of the model considered in class?

(c) Suppose that the economy initially sits in an equilibrium. Then A_t increases. Graphically show how Y_t, r_t, N_t, and w_t will react to the increase in A_t in the model where labor supply is an increasing function of the real interest rate.

(d) Compared to the baseline model presented in class in which labor supply is independent of the real interest rate, do these endogenous variables move more or less after an increase in A_t? Explain briefly.