

Problem Set 2 (RBC)  
ECON 6002  
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Due date: Tuesday 11 October, 6pm

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**NOTE: Please only include Student ID number (no name or unikey) on your submitted answers. To receive full marks, show your workings for algebraic manipulations. If you get stuck on any point, please post a question on Ed.**

1. Abstracting from long-run growth by setting  $n = g = 0$  and from persistent shocks by setting  $\rho_A = \rho_G = 0$ , with  $\tilde{A}_t \equiv \ln A_t - \ln \bar{A}$  and  $\tilde{G}_t \equiv \ln G_t - \ln \bar{G}$ , and normalizing the population to  $N = 1$ , the following nine equations describe the “baseline” RBC model in Chapter 5:

$$Y_t = C_t + I_t + G_t \quad (1)$$

$$Y_t = K_{t-1}^\alpha (A_t L_t)^{1-\alpha} \quad (2)$$

$$K_t = K_{t-1} + I_t - \delta K_{t-1} \quad (3)$$

$$\tilde{A}_t = \epsilon_{A,t} \quad (4)$$

$$\tilde{G}_t = \epsilon_{G,t} \quad (5)$$

$$r_t = \alpha (A_t L_t / K_{t-1})^{1-\alpha} - \delta \quad (6)$$

$$w_t = (1-\alpha) (K_{t-1} / A_t L_t)^\alpha A_t \quad (7)$$

$$\frac{C_t}{\bar{C}} = \beta E_t \left[ \frac{1}{C_{t+1}} (1 + r_{t+1}) \right] \quad (8)$$

$$\frac{C_t}{\bar{C}} = \frac{w_t}{\bar{w}} \quad (9)$$

where  $e^{-\rho} = \beta$ .

- (a) Find the steady state for this economy under the following calibration:  $\alpha = 1/3$ ,  $\delta = 0.05$ ,  $\bar{r} = 0.025$ ,  $\bar{A} = 1$ , and  $\bar{L} = 0.5$  and  $\bar{G}$  such that  $\bar{G}/\bar{Y} = 0.2$ . In particular, find the remaining parameter values  $b$  and  $\rho$  that are consistent with steady state and determine steady-state values for the endogenous variables,  $\bar{Y}$ ,  $\bar{C}$ ,  $\bar{I}$ ,  $\bar{G}$ ,  $\bar{K}$ , and  $\bar{w}$ .
- (b) Log-linearize the seven equations above excluding equations (4) and (5) for  $\tilde{A}_t$  and  $\tilde{G}_t$ .
- (c) Write a Dynare .mod file to simulate this economy. Assume that  $\tilde{A}_t = \rho_A \tilde{A}_{t-1} + \epsilon_{A,t}$  and  $\tilde{G}_t = \rho_G \tilde{G}_{t-1} + \epsilon_{G,t}$  are the log-linearized shocks. Set  $\alpha = 1/3$ ,  $\delta = 0.05$ ,  $\rho_A = \rho_G = .8$ ,  $e^{-\rho} = 0.99$ ,  $\sigma_{\epsilon_A} = \sigma_{\epsilon_G} = 1$ , and  $b = 1$ . Provide a graph of the impulse response of one standard deviation shock to technology and government spending. (*Hint: This model is nearly identical to the one we went over in class. Rather than start from scratch try modifying the Dynare .mod I have provided on Canvas. Also, you need to use  $\bar{G}/\bar{Y} = 0.2$  to figure out the steady parameter values needed to do your simulation.*)
- (d) What is the effect of a positive government spending shock on the real wage? Explain.