

# Econ 5110 Practice Questions for the Midterm Exam

Spring 2012

Real Business Cycle Theory. Consider a simple neoclassical growth model (notation similar to class) where all agents are identical and a representative agent maximizes

$$\sum_{t=0}^{\infty} \beta^t \{\ln(C_t) + \ln(l_t)\}$$

by choosing  $\{C_t, N_t\}_{t=0}^{\infty}$  subject to

$$C_t + K_{t+1} \leq s_t K_t^{1-\alpha} N_t^\alpha$$

where  $l_t = 1 - N_t$ ,  $s_t = s_{t-1}^\rho \exp(\epsilon_t)$ ,  $\epsilon_t \sim iid(0, \sigma^2)$  and  $(s_0, K_0)$  given. Notice the 100 percent capital depreciation and perfect foresight.

1. (10 pts) Calculate the Euler equation for consumption ( $C_t$ ) and provide some economic intuition.
2. (10 pts) Calculate the Euler equation for leisure ( $l_t$ ) and provide some economic intuition.
3. (10 pts) Assume  $N_t = 1$  for #3 - #7. Solve for the steady-state values of  $K$  and  $C$ .
4. (10 pts) Linearize the system.
5. (10 pts) Solve for the reduced-form solution for the state variables.
6. (10 pts) Solve for the reduced-form solution for  $C_t$  and  $Y_t (= s_t K_t^{1-\alpha} N_t^\alpha)$  as function of the state variables.
7. (10 pts) Contrast the economic incentives and responses of the representative agent when she faces a positive transitory ( $\rho = 0$ ) technology shock versus a permanent ( $\rho = 1$ ) one.
8. (10 pts) Assume that all variation in hours worked happens at the extensive margin. Find the Euler equation for leisure (or hours worked) for the representative agent and discuss how it will tend to amplify hours worked responses to technology shocks.
9. (10 pts) Now assume that government spending is exogenous and is a pure resource drain (i.e., does not have any positive impact on agents' well being). Find the Euler equation for hours worked and discuss how this may act to resolve the Dunlop-Tarshis puzzle in the standard RBC model.
10. (10 pts) Now assume a two-country extension of the simple RBC model above where capital is perfectly mobile and technology shocks are contemporaneously uncorrelated but gradually spillover to the other country. Discuss (in words) how a positive technology shock in the foreign country would impact  $C_t$ ,  $Y_t$  and  $K_t$  in the domestic country.

Modified Cobweb Model. Let the demand for a good ( $d$ ) be given by

$$d_t = \alpha_0 - \alpha_1 p_t + \alpha_2 y_t + \alpha_3 E_t y_{t+1} + \epsilon_t^d; \quad (\text{Demand})$$

supply ( $s$ ) be given by

$$s_t = \beta_0 + \beta_1 E_{t-2} p_t + \epsilon_t^s, \quad (\text{Supply})$$

where  $p$  is price; income ( $y$ ) is exogenous and follows a mean-zero first-order autoregressive process with persistence parameter  $\lambda_y$ ;  $E_{t-j}$  is the expectations operator conditional on time  $t-j$  information;  $\epsilon_t^d$  and  $\epsilon_t^s$  are mean-zero, mutually independent white-noise error terms; all  $\alpha$ 's and  $\beta$ 's are positive; and the market clears (i.e.,  $d_t = s_t$ , for all  $t$ ).

1. (10 pts) Provide an economic interpretation for the two modifications to the basic cobweb model.
2. (10 pts) Find the steady state.
3. (10 pts) Find the equilibrium under naïve expectations. Describe the transition dynamics in words and using a diagram.
4. (10 pts) Find the fundamental rational expectations equilibrium (REE).
5. (10 pts) Is a rational bubble possible in equilibrium?
6. (10 pts) Under what conditions is the REE stable under least squares learning?