Midterm
Econ 205B, Winter 2015

- *You have 80 minutes to complete the exam. The maximum points possible is 75.*
- *No question can be asked during the exam. If you are unsure about the question, state clearly your interpretation and answer appropriately.*
- *Be concise. Long answers with redundant statements, even if they contain correct answers, will likely be heavily penalized.*

1. Consider an RBC model with subsistence level of consumption. The household's problem is to choose c_t, h_t, i_t to maximize the discounted-sum of utility:

$$\max_{c_t,h_t,i_t} E\sum_{t=0}^{\infty}\beta^t u(c_t,h_t), \qquad 0<\beta<1$$
$$s.t. \quad c_t + i_t \le w_t h_t + r_t k_{t-1}$$
$$k_t = (1-\delta)k_{t-1} + i_t$$

where we specify

$$u(c_t,h_t) = \ln(c_t - \underline{c}) - \varphi\frac{h_t^{1+\eta}}{1+\eta}, \qquad \bar{c} > 1$$

where $\varphi, \underline{c}$, and η are parameters. You can think of $\underline{c}$ as a minimum level of consumption that has to be met each period (for example, the minimum amount of calorie intake). The production side is the same as in the baseline RBC model (Perfectly competitive firms with production function $Y_t = z_t K_{t-1}^{\alpha} H_t^{1-\alpha}$ with aggregate technology shock $\ln z_t = \rho \ln z_{t-1} + \epsilon_t$, etc.).

(a) (10 points) Define the sequential market equilibrium, including the household's problem and the firm's problem.

(b) (10 points) State the recursive social planner's problem for this economy.

(c) (10 points) Derive the equilibrium conditions of this economy.

(d) (10 points) Suppose now $\underline{c}$ is time-varying. Assume

$$\underline{c}_{t+1} = (1-\rho_c)\underline{c} + \rho_c \underline{c}_t + \epsilon_{c,t+1}, \qquad \epsilon_{c,t+1} \sim N(0,\sigma_c^2).$$

Define the recursive competitive equilibrium, including the household's problem and the firm's problem.

(e) (5 points) Continue to assume $\underline{c}$ is time-varying. What happens to consumption when $\underline{c}$ increases? Briefly explain.

2. We consider an RBC model where government spending, g_t, is used as capital stock in production. Think, for example, infrastructure such as highways or airports. The production function is $Y_t = z_t(K_{t-1} + g_{t-1})^\alpha H_t^{1-\alpha}$ and the capital accumulation equation is $K_t = (1 - \delta)K_{t-1} + I_t$. For simplicity we assume g_t completely depreciates within a period and that g_t follows an exogenous AR(1) process:

$$g_{t+1} = (1 - \rho_g)g + \rho_g g_t + \epsilon_{g,t+1}.$$

Household maximizes utility

$$E \sum_{t=0}^{\infty} \beta^t \left[\ln c_t - \varphi \frac{h_t^{1+\eta}}{1+\eta} \right]$$

subject to

$$c_t + i_t \leq r_t k_{t-1} + w_t h_t + \xi_t$$

where ξ_t is the government transfer.

(a) (5 points) Assuming that the government balances its budget period-by-period, derive the amount of per-capita transfer ξ_t.

(b) (10 points) Define the recursive competitive equilibrium, including the household's problem and the firm's problem.

(c) (10 points) Derive the equilibrium conditions of this economy.

(d) (5 points) Assume g_t is smaller than the equilibrium household investment in a model where there is no government spending. What are the effects of an increase in g_t to output, investment, and hours? Briefly explain.