Final
Econ 205B, Winter 2015

- *You have 90 minutes to complete the exam. The maximum points possible is 100.*
- *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. We consider an RBC model with "capitalists" and "workers". A fraction s of the population are capitalists and a fraction $1-s$ of the population are workers.

   The capitalist's problem is to choose c_t^c, h_t^c, i_t^c to maximize the discounted-sum of utility:

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

   and the worker's problem is to choose c_t^w, h_t^w to maximize the discounted-sum of utility:

$$\max_{c_t^w, h_t^w} E\sum_{t=0}^{\infty} \beta^t u(c_t^w, h_t^w), \qquad 0<\beta<1$$
$$s.t. \quad c_t^w \le w_t h_t^w$$

   Thus, the capitalists have access to investment in capital but workers do not. Both capitalists and workers' utility function are the same:

$$u(c_t, h_t) = \ln c_t - \frac{h_t^{1+\eta}}{1+\eta}$$

   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.). The resource constraint is $C_t + I_t = Y_t$.

   Finally note that $K_t = sK_t^c, H_t = sH_t^c + (1-s)H_t^w, C_t = sC_t^c + (1-s)C_t^w, I_t = sI_t^w$.

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

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

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

(d) (10 points) When there is a positive technology shock, what happens to worker's labor supply? State briefly and explain intuition.

2. Consider a money-in-the utility model. Representative household takes prices as given and maximizes

$$E_t \sum_{i=0}^{\infty} \beta^i U(C_{t+i}, m_{t+i}, H_{t+i})$$

subject to the budget constraint

$$P_t C_t + P_t K_t + B_t + M_t = P_t w_t H_t + (r_t + 1 - \delta) P_t K_{t-1} + (1 + i_{t-1}) B_{t-1} + M_{t-1} + P_t \tau_t$$

where τ_t are real lump-sum transfers and $m_t = M_t/P_t$. i_t is the nominal interest rate. Assume that the utility function is given by

$$U = \frac{[C_t + m_t]^{1-\sigma}}{1-\sigma} - \frac{H_t^{1+\eta}}{1+\eta}$$

and the production function is given by

$$Y_t = z_t K_{t-1}^{\alpha} H_t^{1-\alpha}$$

where z_t is an AR(1) productivity shock.

(a) (10 points) Rewrite the budget constraint in real terms.

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

(c) (10 points) Is money neutral in this economy? Explain.

3. We consider a New Keynesian model with a preference shock. Household's utility is given by

$$E_t \sum_{i=0}^{\infty} \beta^{t+i} d_{t+i} \left[\frac{C_{t+i}^{1-\sigma}}{1-\sigma} + \frac{\gamma}{1-b} \left(\frac{M_{t+i}}{P_{t+i}} \right)^{1-b} - \chi \frac{N_{t+i}^{1+\eta}}{1+\eta} \right]$$

where $\ln d_t$ follows an AR(1) process:

$$\ln d_{t+1} = \rho_d \ln d_t + \epsilon_{d,t+1}, \qquad \epsilon_{d,t+1} \sim N(0, \sigma_d^2).$$

The budget constraint is

$$C_t + \frac{M_t}{P_t} + \frac{B_t}{P_t} = \left(\frac{W_t}{P_t} \right) N_t + \frac{M_{t-1}}{P_t} + (1 + i_{t-1}) \left(\frac{B_{t-1}}{P_t} \right) + \Pi_t,$$

where Π_t are profits from intermediate-goods firms.

(a) (5 points) The pricing side of the economy is characterized by

$$\pi_t = \beta E_t \pi_{t+1} + \tilde{\kappa}\hat{\varphi}_t.$$

Explain intuitively the driving force of inflation dynamics according to this equation.

(b) (15 points) Derive the log-linearized Euler equation and express it in terms of the output gap.

(c) (5 points) Holding interest rate and expected output and inflation constant, what happens when d_t increases? Explain.

(d) (5 points) Suppose the monetary policy is given by

$$\hat{i}_t = \delta \pi_t + v_t$$

where $\delta > 1$ and v_t is a monetary policy shock. What happens to output and inflation when v_t increases? Explain.