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ECONOMICS 7344 – MACROECONOMIC THEORY II, Spring 2013

Homework 3. Wednesday January 30, due Monday February 4.

1. Romer 6.5.

2. (30% of midterm 1, 2008) Consider an economy with a large number of agents where the utility of agent i is determined by a utility function

$$U(C_i, L_i) \;=\; E \log C_i - \alpha L_i \;,$$

where L_i is labor supplied, C_i is agent i's consumption (a basket of goods in fixed proportions) and α is a positive parameter (E is the expectations operator). Assume that agent i supplies output Q_i produced by the production technology $Q = L$. The agent is a price taker and the price of the single good agent i produces is denoted P_i. The aggregate price index (price of consumption) is $P = 1$ so $C_i = P_i * Q_i$. Assume there are many goods so a change in P_i doesn't change P. Agent i faces a demand function

$$Q_i = Y\, P_i^{-1} Z_i,$$

where Y is aggregate output and Z_i is log-normally distributed with mean $e^{\sigma_z^2/2}$, where $\sigma_z^2 = 2$ is the variance of $\log(Z_i)$. Assume that the Z_i random variables are independent of each other and independent of Y. Assume that the agent has to decide on his labor supply *before* he or she knows Z_i (otherwise there will no uncertainty at all).

a) (15%) Find the equilibrium level of output in the economy. (You need to solve the model. Hint: If you consider the relation between normal and log-normal random variables, you can figure out what is the distribution of Z_i^{-1}.)
b) (5%) Explain intuitively why output goes up/goes down/stays the same, when α increases. You can get full points if you explain what must happen even if you couldn't solve part a).

Now assume instead that

$$U(C_i, L_i) \;=\; E\{\, C_i - \kappa \frac{1}{2} C_i^2 \} \;-\; \alpha L_i \;.$$

c) (10%) Find the level of output using this utility function (assume that the magnitudes of κ and α are such that a positive solution exists).

3. Derive the formula for "b" (the slope in the Lucas supply curve) in terms of the deep structural parameters, γ, η, Var(z) and Var(m).

4. (This was question 2 in the 2005 final with a weight of 20%) Consider the Lucas imperfect information model.
Assume that shock to individual demand (z_i in the text) have a variance σ_z^2. Now assume that demand follow one of the two following models

$$m_t = 1 + .2m_{t-1} + u_t \ ; \ var(u_t) = 4 \ , \ (A)$$

or

$$m_t = 3 + .6m_{t-1} + u_t \ ; \ var(u_t) = 2 \ . \ (B)$$

(The process for individual demand is the same in both cases.) Assume that agents observe m_{t-1} before making decisions in period t; i.e., at time t m_{t-1} is given. Then assume that the shock u_t takes the value 1. Now would the impact of the shock be larger if monetary policy is described by model A or by model B. (Explain the logic of your answer).