Macroeconomics Comprehensive Examination: June 2007

Instructions. There are two parts to this exam. Part A consists of a series of 3 short answer questions, each are worth 10 points. Part B consists of three multi-part questions: each multi-part question is worth 50 points. The exam is designed to take three hours to complete and the total points on the exam are 180, so that there is one point per minute. Budget your time carefully.

A. Short Answer Questions (30 minutes: 30 points)

Instructions. Each of the following statements contains one or more assertions that are either True, False or Uncertain. Classify each assertion as either True, False or Uncertain and **defend** your choice. Be as specific (this means support your words with at least the outline of a model) as possible in defending your choice as your success is largely determined by how well you defend your choice. Each statement is worth 10 points for a total of 30 points.

1. A researcher can understand the effects of real wages on labor supply from the first-order condition relating the marginal rate of substitution between consumption and leisure to the real wage as long as the researcher knows the elasticity of intertemporal substitution.

2. In the overlapping generations model of Lucas, the neutrality of money depends on the fact that agents' have rational expectations and **not** how newly created money is introduced into the economy.

3. In a stationary rational expectations equilibrium, even if the state vector does not change, endogenous variables can change simply due to the passage of time.

B. Multipart Questions (2.5 hours: 150 points)

Instructions. Do all of the multi-part questions below. Each question is worth 50 points in total, but the subcomponents are not weighted equally. Start each of these questions on a new page with your name and question # on each page.

Question 1.

Consider an economy with two sectors, rural and urban. Agents live forever and discount the future at rate β.

In the rural sector, think of a farm, agents produce output and consume it each period. There is no saving. You can assume that output is just exogenous so that labor supply is fixed.

In the urban sector, there are jobs which pay a real wage, in terms of consumption goods. There is no distribution of wages, all employed workers earn ω. Employed workers (a worker with a job) earn this wage, which is their consumption as they too cannot save. An employed worker will keep the job with probability $(1-\delta)$. But, with probability δ an employed worker will lose his job and join the unemployed in the next period.

An unemployed worker receives (and consumes) unemployment insurance (or value of leisure) equal to b. With probability λ, an unemployed worker finds a job in the next period. Else, that worker remains unemployed.

(i) Write down the functional equations for employed and unemployed workers in the urban sector assuming that unemployed workers prefer to be in the urban sector rather than the rural sector. Provide a

graph which shows the determination of the values of employed and unemployed workers. Use this graph to show how a change in λ affects the values of employment and unemployment. (15)

(ii) Under what condition is the value of being employed bigger than the value of being unemployed? Under what condition is an unemployed worker willing to stay in the urban sector rather than go to the rural sector? (10)

(iii) Suppose that λ falls as the number of workers in the urban sector increases. Suppose that workers can move freely between the urban and rural sectors. Show how you would solve for the equilibrium values of λ, the value of being employed and the value of being unemployed. As the level of unemployment insurance increases, what happens to the equilibrium levels of λ, the value of being employed and the value of being unemployed? (25)

Question 2.

The representative consumer maximizes a CRRA utility function:

$$E_t \sum_{t=j}^{\infty} \beta^j \left(\frac{C_{t+j}^{1-\sigma}}{1-\sigma} \right).$$

The environment is an exchange (endowment) economy as in Mehra and Prescott (1985, JME) and for simplicity you can take the growth rate of the endowment stream to follow a Markov process.

(i) Carefully define a recursive competitive equilibrium for this economy. (10)

(ii) Calculate the price (denote by P_t^e) of a claim that entitles its owner to the endowment stream in this economy. Show that with log utility, P_t^e/D_t is constant. (15)

(iii) Suppose that there is news at time t that the average future endowment growth rate will be higher. (For example, to put the question in the context of the Mehra-Prescott model, suppose that the average growth rate of endowment is initially μ_1 and all individuals anticipate it to remain at that level forever. At time t news arrives that from that date on the average growth rate will be $\mu_2 > \mu_1$) For $\sigma < 1, \sigma = 1$ and $\sigma > 1$ evaluate the effect of this news on the price P_t^e at time t. (25)

Question 3.

Consider an overlapping-generations model with a single perishable good. The representative agent of generation t has preferences over consumption in youth and old age given by $u(c_t^y) + v(c_t^o)$. Assume both $u(\cdot)$ and $v(\cdot)$ are strictly increasing and strictly concave. Each generation is of size N.

Agents are endowed with ω units of the single good in youth and nothing in old age. The level of the endowment in youth is random and is determined at the start of the period. Thus young agents of generation t know ω prior to making any decisions. Money is the only store of value.

(i) Present the representative generation t agent's optimization problem. What are the first-order conditions. Explain. (10)

(ii) Assume ω is an iid random variable. Characterize the stationary rational expectations equilibrium with valued fiat money. Show that in **this equilibrium**, both the level of real money demand and period 1 consumption are increasing in ω. (20)

(iii) Show that if the money supply is random and transfers are proportional to money holdings, money is neutral in this economy. (20)