Macroeconomics Comprehensive Examination: June 2009

Instructions. There are two parts to this exam. Part A consists of three 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. In the non-stochastic growth model, an increase in the curvature of the representative agent's utility function will change the steady state but will not change the transitory dynamics of the model.
2. In both the overlapping generations model and the search model of money, there is a steady state where money has no value. This steady state is always Pareto sub-optimal.
3. Banking crises are a consequence of irrationality and always costly to fix.

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 overlapping generations model, with an infinite horizon and two period lived agents. There is no population growth. As in the Diamond model, agents inelastically supply labor in youth and consume in both youth and old age. Output is produced by competitive firms who use labor time and capital as inputs into the constant returns to scale production process. Households earn income from supplying labor in youth and have two stores of value: capital and money. The capital is supplied to firms to use as an input into the production process but depreciates at $\delta = 1$. Money is obtained in youth is used to buy goods in old age.

1. Assume the aggregate stock of money is constant. Fully characterize a steady state equilibrium in which **both** money and capital are held. To do so, specify the household's optimization problem, the firm's optimization problem and conditions for market clearing. [20 points]
2. Again assume the aggregate stock of money is constant. Further, assume the government levies a lump sum tax on agents in youth and transfers the revenues to old agents. What happens to the equilibrium of this economy? [10 points]
3. What would happen to the steady state level of the capital stock if the money supply grew at a rate $\sigma > 0$? [20 points]

Question 2.

Consider the dynamic optimization problem of an infinitely-lived household. Each period the household consumes goods and supplies up to 1 unit of time to the labor market. The utility function within a period is given by $u(c, n + \gamma n_{-1})$. Here c is consumption, n is hours worked this period and n_{-1} is hours worked last period. Assume that $u(\cdot)$ is strictly increasing in both of its arguments and it strictly quasi-concave.

Suppose that the hourly wage of the household is a random variable, following an AR(1) process. The household can borrow or lend at a real rate of R, which also follows an AR(1) process.

1. Write down the dynamic optimization of this household as a dynamic programming problem. What are the state variables? What are the control variables? What are the policy functions? How would you guarantee that the problem is bounded? [10 points]

2. What are the first-order and Euler conditions? How would you interpret them? In what sense is the labor supply problem a dynamic choice. [15 points]

3. For this part of the question, use your intuition about this model. How do you think the household will respond to an increase in the wage? How will that response depend on the amount of serial correlation in the wage process? In particular, compare the response of the household to a temporary increase in the wage to one in which the wage change is more permanent. How does your response to these questions depend upon γ? [20 points]

4. A researcher regresses hours worked on the wage. Using this model, what is wrong with that regression? How would you fix it? [5 points]

Question 3.

Consider the following risk sharing problem. There are two type of people denoted $i \in \{1, 2\}$. They have the same preferences given by

$$E_t \sum_{j=0}^{\infty} \beta^j \ln(c^i_{t+j})$$

where $\beta \in [0, 1)$. Each period there are two equally likely states of the world $\theta_t \in \{\theta^1, \theta^2\}$. In state 1, agent 1's income is $y^1(\theta^1) = 1 + \varepsilon$ while agent 2's income is $y^2(\theta^1) = 1 - \varepsilon$. In state 2, agent 1's income is $y^1(\theta^2) = 1 - \varepsilon$ while agent 2's income is $y^2(\theta^2) = 1 + \varepsilon$ where $\varepsilon > 0$. Thus, aggregate income is 2 in each state while agents' individual incomes fluctuate.

1. In any period before the realization of their income shock, what is an agent's expected utility in autarky? [5 points]

2. State and solve a planner's problem of choosing $\left\{c^i_{t+j}\right\}_{j=0}^{\infty}$ to maximize societal welfare where the planner weights each agent equally. [15 points]

3. Suppose that there is a commitment problem on the part of agents. In particular assume that the planner cannot enforce them to make transfers required to support the first best allocation you found in part 2. Suppose that if an agent deviates from making a transfer, they are punished with autarky. State the individual rationality constraint for any agent i at time t in state θ_t. [10 points]

4. Under what conditions on parameters β and ε is it possible to implement the first best allocation in part 2? Discuss. [12.5 points]

5. If the first best allocation is not implementable, then discuss what is implementable and how it might be tested using individual consumption data. [7.5 points]