Ph.D. Core Exam – Macroeconomics

18 August 2008 – 8:00 am to 3:00 pm

Part A: Answer <u>both</u> of the following two questions.

A1. Fix-Price Macro Models

1. Consider the following fix-price model of aggregate demand for a closed economy with static inflationary expectations ($\pi^e = d\pi^e = 0$) and a wealth effect. Real wealth (V), which affects the goods market through consumption, is held in the form of money balances and government bonds, i.e., $V = (M + B)/P$.

$$Y = E(Y - T, r, V, G) \tag{IS}$$

$$M/P = L(Y, R) \tag{LM}$$

where $r = R,\ 0 < E_{Y-T} < 1,\ 0 < E_V < 1,\ E_r < 0,\ E_G = 1$, and $L_Y > 0,\ L_R < 0$.

Analyze the effects of a debt-financed fiscal expansion on the endogenous variables.

a) Calculate and sign the relevant partial derivatives using Cramer's Rule.

b) Show graphically and explain in words why and how the economy adjusts to this change.

c) Discuss how your answer changes if government bonds are not considered wealth.

2. Now suppose the economy opens up to trade in goods, services, and assets with the rest of the world. Assume that the economy is small and adopts a flexible exchange rate regime.

a) Write out the equations for the open-economy version of the IS-LM model and explain the reasoning behind them.

b) Show graphically and explain in words why and how the small open economy adjusts to a debt-financed fiscal expansion.

c) Discuss how your answer to part (b) depends on the degree of international capital mobility.

A2. Ramsey-Cass-Koopmans Growth Model

Consider the Ramsey model of an economy in competitive equilibrium. There is a representative household and a representative firm. Assume there is no population growth $(n = 0)$, and capital does not depreciate $(\delta = 0)$. The household's utility function is

$$\lim_{\theta \to 0} \int_0^\infty \frac{c_t^{1-\theta} - 1}{1-\theta} e^{-\rho t} dt,$$

and the firm has a constant-returns-to-scale production function $Y_t = \phi K_t^\alpha, L_t^{1-\alpha}$, where ϕ is a constant.

a) Write down representative household's maximization problem and derive the 4 equations that characterize the solution.

b) Write down firm's maximization problem and the first-order conditions for this problem. Translate these conditions into intensive form.

c) What are the equilibrium conditions for this economy?

d) Combine your answers to parts (a) - (c) and derive a pair of differential equations for the variables c and k.

e) Carefully draw the phase diagram, labelling the steady states on the graph and finding them algebraically (careful).

f) Do the following comparative dynamics exercise: $\phi' > \phi$. As usual, the baseline economy starts in its steady state at time $t = 0$. The modified economy starts at time $t = 0$ with the same amount of capital as the baseline economy. Draw (i) the phase diagram for both cases, indicating what is different, and (ii) the time paths of c and k for both cases. Assume that the substitution effect dominates the income effect.

g) What would happen if instead of ϕ being constant, we had ϕ_t, with $\dot{\phi}_t/\phi_t = g$ and $g > 0$ constant?

Part B: Answer any <u>two</u> of the following four questions.

B1. Macro-Adjustment with "Speed Limits"

Suppose that a closed-economy aggregate demand-aggregate supply model is in full equilibrium. (Graphically, this implies that the aggregate price and real output levels are simultaneously on the long- and short-run AS curves and on the AD curve in *P, y* space.) Suppose also that financial markets adjust much more rapidly than do product markets, which in turn adjust more rapidly than do labor markets.

a) Write out the equations for equilibrium in the product and financial markets and use them to derive the AD curve.

b) Explain the determinants of the long-run AS curve.

c) Suppose there is a monetary expansion. Explain how the differences in the adjustment speeds of the financial, product, and labor markets result in specific time paths for the interest rate, real output, employment, and the real wage in the transition from the original full AD-AS equilibrium to a new full equilibrium. (You may find it helpful to graph each of these variables over time.)

B2. Optimal Policy

Consider the following version of the Barro-Gordon model:

$$y = y_n + b(\pi - \pi^e) \qquad \text{where } b > 0 \qquad \text{(Lucas supply curve)}$$

$$L = \frac{1}{2}(y - y^*)^2 + \frac{1}{2}(\pi - \pi^*)^2 \qquad \text{where } y^* > y_n \qquad \text{(Social loss function)}$$

The variables are: y = real output, y_n = natural level of output, y^* = target level of output, π= inflation, π^e = expected inflation, and π^* = target level of inflation. The policymaker directly chooses inflation so as to minimize the social loss due to output and inflation deviations from their target levels. Expectations are formed rationally.

a) Suppose the policymaker, who is concerned about the upcoming elections, announces a zero inflation rule. Explain whether or not this policy announcement is credible. Calculate the (time-consistent) equilibrium inflation rate and the corresponding value of the social loss function.

b) Now suppose that a structural change in the economy increases the impact of unexpected inflation on output relative to its natural level. Compared to part (a), is society made better or worse off by this change? Explain intuitively and support your explanation mathematically.

c) Describe a modified version of the model with repeated interactions between the policymaker and the public. Compared to part (a), explain intuitively how reputation effects lead to a lower equilibrium inflation rate.

B3. Financial Intermediation

Consider the Diamond-Dybvig model with two assets. There are three periods: $t = 0, 1, 2$. Agents are ex-ante identical. They are endowed with one unit of a single good at $t = 0$, and nothing at $t = 1, 2$. At the beginning of $t = 1$, a fraction π of agents learn that they prefer to consume only at $t = 1$, while the remaining fraction $(1-\pi)$ of agents prefers to consume only at $t = 2$. There is a linear production technology whereby one unit of the good invested in period 0 yields $R>1$ units of the good at time 2. This technology is illiquid, in the sense that an investment that is interrupted in period 1 generates $r<1$ units of consumption. In addition, there is a liquid storage technology, whose return is equal to 1 in both periods. Agents preferences are given by

$$u(c) = \ln c$$

a) Write down the problem of an agent in autarky.

b) Now suppose that in period 1, after agents learn their idiosyncratic consumption preference shock, a financial market opens where agents can trade claims for the returns on the illiquid production technology. Write down the problem of an agent in this setting. What will the equilibrium price of a bond be in this case? What is the consumption vector? Discuss.

c) Now, instead of a financial market, suppose agents form coalitions, which they call banks, and pool their resources. Write down the problem of the bank, the FOC, and the optimal consumption vector. Can multiple equilibria arise in this setting?

d) Compare and contrast the autarky, market and banking environments. Discuss.

B4. Statements

Pick any three (3) of the following statements and explain why each is either true or false. (Statements for which a counterexample can be produced should be considered "false.") You are expected to use graphical and/or mathematical analysis to support your arguments. Your score depends on the quality and completeness of your explanations.

1. Labor-augmenting technological progress in the basic Solow model would increase the steady-state capital-labor ratio.

2. In a stochastic IS-LM world, it doesn't matter whether the central bank targets the money supply or the interest rate in order to stabilize the economy in the face of shocks that hit the goods or money markets.

3. A full Fisher effect can only be observed in a classical world.

4. Bank runs are always explained rationally by the deterioration of fundamental macroeconomic variables.

5. In a standard endogenous growth model with human capital, a one-time increase ("gift") of physical capital will have the same long-run effect as a one-time increase ("gift") of human capital.