ECON 222

Macroeconomic Theory I

Fall Term 2009

Assignment 3

Due: Drop Box 2nd Floor Dunning Hall by ***noon November 20th*** *2009*

No late submissions will be accepted
(One assignment per person)

Remarks: Write clearly and concisely. Devote some time to give the graphs, plots and tables a format easy to understand. The way you present your answers also matters for the final grade. Even if a question is mainly analytical, ***briefly*** *explain what you are doing, stressing the economic meaning of the various steps. Being able to convey your thoughts effectively is an asset also in real life.*

Question 1: Neoclassical Growth Model (25 Marks)

Springfield's aggregate production function has the Cobb-Douglas form:

$$Y = AK^{a_k}N^{1-a_k}$$

(a) Set $A = 1$. Following the notation of the text, demonstrate how this production function can be written in per-worker terms as $y = f(k) = k^{a_k}$ (show all necessary steps). So, for instance, when $a_k = 1/2$, we have $y = f(k) = k^{\frac{1}{2}}$. (3)

(b) Springfield workers save a fraction, s, of their incomes, so aggregate savings is given by $S = sY$. In a steady-state, the per-worker savings equals per-worker (break-even) investment given by: $sf(k^*) = (n+d)k^*$. If the savings rate, population growth and depreciation rate are: $s = 0.2$, $n = .05$, $d = .05$, then when $a_k = 1/2$, what is the steady-state capital-labour ratio, k^*? Given k^*, what are steady-state output per-worker, y^*, steady-state consumption per-worker, c^*, and steady-state investment per-worker, i^*? (*Hint*: solving for k^* as a function of the other variables (n, s, d) makes solving changes in parameters quicker for later questions.) (8)

(c) There is a shift in consumer sentiment as Springfield society suddenly decides it should save/invest more: s doubles from .2 to .4. Solve for the new long-run steady-state values of k^*, y^*, c^*, i^* and compare with (b). Depicting the old and new steady-state values in a figure (or figures) to help confirm the direction of the changes. (6)

(d) Professor John Frink, Jr. realizes that storing the equipment indoors during the cold winters fully maintains the life of the equipment: d falls to zero. For $s = 0.2$, solve for the new long-run steady-state value of k^*. Compare this to the steady-states solutions in (b) and (c). (4)

(e) If you were advising Mayor Joe Quimby when Springfield was in steady-state (b) and he could only implement one change of these two, would you argue for increased savings or better equipment storage? i.e. which gives a bigger increase in long-run consumption, for a given percent change? Are there any short-run considerations? (4)

Question 2: Money Demand and Velocity (20 Marks)

Let's go back in time more than 20 years ago, when the Berlin wall was still up. Suppose estimates of real money demand for West Germany were given by the following equation.

$$\frac{M_W^d}{P_W} = \frac{\sqrt{Y_W}}{4i_W^{\frac{2}{3}}}$$

where M_W^d is demanded nominal money balances, P_W is the price level, i_W the nominal interest rate on non-monetary assets. Note that money has a nominal return of zero here ($i_W^m = 0$).

(a) Find the income and interest elasticities of money demand. (4)

(b) Assume that $Y_W = 36$, $i_W = 0.10$, $M_W^s = 100$ and the money market is in equilibrium. Find the price level in West Germany. (4)

(c) Calculate the velocity of money in this economy and discuss whether the quantity theory of money holds or not. (4)

Similar estimates were made in East Germany, where it was found that the interest rate does not seem to affect the level of real money demanded.

$$\frac{M_E^d}{P_E} = 0.7 + 0.8Y_E$$

(d) Was the quantity theory of money holding in East Germany? (3)

(e) Suppose the income elasticity of money demand in 1980 was estimated at 0.4 ($\eta_{Y,E}$) and in 1981 at 0.35 ($\eta_{Y,E}$). Assume a yearly inflation rate (π_E) of 2%. What was the growth rate of money demand (M_E^d) between 1980 and 1981? (5)

Question 3: Business Cycles and Consumption (20 Marks)

For this question, you will need to retrieve these series:

- **v1992067** "Gross domestic product (GDP)"
- **v1992045** "Personal expenditures of durable goods"
- **v1992046** "Personal expenditures of semi-durable goods"
- **v1992047** "Personal expenditures of non-durable goods"
- **v1992048** "Personal expenditures of services"

(a) Macroeconomists use sophisticated filters (such as the Hodrick-Prescott filter) to extract trends from series in order to compare the characteristics of the business cycles. For this question, we will use another method which is called the log first-differences. First take the logs of all five series, and then take the first difference in time (e. g. if we have the variable X_t, then the log first-difference corresponds to $\ln X_t - \ln X_{t-1}$). Plot all four new series of consumption and GDP from January 1962 to December 2007. (You should get four graphs.) (8)

(b) Calculate contemporaneous correlations of all consumption series to the real GDP and discuss the direction of these macroeconomic variables. (8)

(c) Simply proceeding by eye-balling the graphs, discuss the timing of the consumption series. (4)

Question 4: Monetary and Fiscal Policies (20 Marks)

Consider the Keynesian version of the IS-LM model, where policymakers truly believe in the benefits of having stabilization policies.

$$\begin{aligned} C &= 200 + 0.25(Y - T) \\ I &= 150 + 0.25Y - 1,000i \\ G &= 250 \\ T &= 200 \\ \frac{M^d}{P} &= 2Y - 8,000i \\ \frac{M}{P} &= 1,600 \end{aligned}$$

(a) Derive the equation for the IS curve. (*Hint*: You want an equation with Y on the left hand side.) (3)

(b) Derive the equation for the LM curve. (*Hint*: It will be convenient for later use to write this equation with i on the left side.) (3)

(c) Solve for equilibrium real output and interest rate. (3)

(d) Solve for the equilibrium values of C and I and verify the value you obtained for Y by adding up C, I, and G. (3)

(e) Now suppose that the money supply increases to $\frac{M}{P} = 1,840$. Solve for Y, i, C and I, and explain in words the effects of expansionary monetary policy. (4)

(f) Set $\frac{M}{P}$ equal to its initial value of $1,600$. Now suppose that government spending increases to $G = 400$. Summarize the effects of expansionary fiscal policy on Y, i, and C. (4)

Question 5: The IS-LM model in Diagrams (15 Marks)

(a) Use the IS-LM model and any necessary graphs to explain what happens to the general equilibrium values of real wage, employment, output, the real interest rate, consumption, investment and the price level when the expected rate of inflation rises. (6)

(b) Use the IS-LM model and any necessary graphs to explain what happens to the general equilibrium values of real wage, employment, output, the real interest rate, consumption, investment and the price level when immigration has increased, increasing the labour supply. (9)