ECON 222 Winter 2009: Assignment 3

Due: March 13, 2009, Noon.

* SHOW ALL YOUR STEPS FOR FULL MARKS. Be precise yet concise in your answers.
* NO LATE SUBMISSIONS WILL BE ACCEPTED.
* NO GROUP SUBMISSIONS WILL BE ACCEPTED.

Question 1 – Large Open-Economy Goods Market (25 Marks)

Japan and the US are two large open economies interacting in the world's goods market. They have the following characteristics. In Japan, suppose that full-employment output is $Y_J = 2400$, government expenditures are given by $G_J = 100$, and desired consumption is given by:

$$C_j^d = 215 + 0.75Y - 450r^w$$

Japan's desired investment can be described by:

$$I_J^d = 250 - 300r^w$$

In the U.S., desired savings is given by:

$$S_{US}^d = 425 + 400r^w$$

and desired investment by:

$$I_{US}^d = 600 - 250r^w$$

a) [10 MARKS] Find equations for Japan's desired savings, and for each country's current account balance. Then, find the interest rate r^w that clears the world market, and each country's equilibrium current account balance. Represent the resulting equilibrium graphically.

b) [10 MARKS] Suppose that Japan pursues a contractionary fiscal policy. It thus decreases its expenditures to $G_J = 85$. *Ceteris paribus*, find its effect on the current account balance of both countries and on the equilibrium world interest rate, r^w. Represent the new equilibrium graphically, making sure to contrast it with the one found in a).

c) [5 MARKS] Suppose (counter-factually) that both economies are closed. Find the equilibrium interest rates in Japan and the US using the same numbers as in a). Policy changes then lead both economies to open up to trade with to each other, leading to the situation in a). Who benefits in each economy, lenders (savers) or borrowers? Explain.

Question 2 – Growth: Solow-Swan (35 marks)

Suppose that the United Kingdom's economy can be described in the following fashion. Its aggregate production function is:

$$Y_t = K_t^{\alpha}(A_t N_t)^{1-\alpha}$$

where Y_t is output (GDP) produced at time t, K_t is capital in use at time t, N_t is the number of workers employed at time t, and A_t is labour productivity measured at time t. (This is called a labour-augmenting technology.) In this economy, capital depreciates at rate d, and the population and labour force grow proportionately at rate $n \equiv \Delta N/N$. Moreover, the saving rate is s, and the economy is closed.

We seek to characterize growth in this economy in terms of the Solow-Swan growth model. However, in a departure from the textbook case, we want to explicitly include a measure of labour productivity growth, $g_A \equiv \Delta A/A$, in the steady-state calculations. You are therefore asked to do as follows:

a) [5 MARKS] Rewrite the production function so that you have output per effective worker (i.e. $y_t \equiv Y_t/(A_t N_t)$) on the left-hand side. Find thereafter aggregate investment I_t, and investment per effective worker $\iota_t \equiv I_t/(A_t N_t)$, in this economy.

b) [3 MARKS] In the steady state, required investment per effective worker in this economy is given by $\iota^* = (d + g_A + n)k^*$, where k^* is the steady state level of capital per effective worker (and where $k_t \equiv K_t/(A_t N_t)$). Basing yourself on the definition of the steady state and the function above, explain carefully why such a level of investment is needed in the steady state.

c) [12 MARKS] Now assume that $s = 0.24$, $g_A = 0.08$, $n = 0.09$, $d = 0.07$, and $\alpha = 1/4$. Using the information in a) and b), solve for the levels of capital per effective worker k^*, output per effective worker y^*, consumption per effective worker c^*, and investment per effective worker ι^*, in the steady state. Illustrate the steady-state graphically, with the help of curves representing output per effective worker, savings per effective worker, and required investment per effective worker.

d) [5 MARKS] The growth accounting equation for this economy can be written as:

$$\frac{\Delta Y}{Y} = \alpha\frac{\Delta K}{K} + (1-\alpha)\frac{\Delta A}{A} + (1-\alpha)\frac{\Delta N}{N}$$

Given the equation above and the usual characteristics of the Solow-Swan growth model, at what rate does capital grow in the steady state? At what rate does output grow in the steady state?

e) [10 MARKS] Find the golden rule saving rate s_g (the rate which maximizes consumption per effective worker in the steady state), ***either***:
(i) by maximizing consumption per effective worker with respect to k, finding the level of the steady state capital stock per effective worker k_g from the first order condition (FOC), and finally solving for the implied saving rate s_g;
or
(ii) by directly maximizing steady state consumption per effective worker, c^*, with respect to s, and by solving for s_g from the FOC;

As a benevolent policymaker concerned only with long run living standards, what would you recommend doing regarding savings? What effects would it have both in the short run and the long run?

Question 3 – Asset Market (15 Marks)

Consider the following equation, which describes an economy's real money demand:

$$\frac{M^d}{P} = 250 + 0.5Y - 1000(r + \pi^e)$$

where M^d is demanded nominal money balances, P is the price level, $i = r + \pi^e$ is the nominal interest rate on non-monetary assets, r is the real interest rate on non-monetary assets, and π^e is the expected inflation rate. Note that money has a nominal rate of return of zero in this economy, that is $i^m = 0$. Furthermore, we have that $Y = 500$, $r = 0.10$, $\pi^e = 0$, and $P = 1$.

a) [7 MARKS] Assuming that the asset market is in equilibrium at $r = 0.10$, find the nominal money balances in this economy, i.e. $M^d = M$. Proceed by finding the velocity of money in this economy, and the elasticity of money demand with respect to real output (at the equilibrium values).

b) [4 MARKS] Suppose that the central bank pursues a expansionary monetary policy, causing nominal money balances to increase by 10%. Keeping output and the real interest rate constant (as the latter is determined by the goods market equilibrium), what must happen to expected inflation if the price level stays constant in the short run? Find the new value of expected inflation. What about the reverse, i.e. what must happen to the price level today if expected inflation is to remain constant? Find that new price level.

c) [4 MARKS] State whether the quantity theory of money holds in this example, and for what reason(s).

Question 4 – Business Cycles, and the AS-AD model (25 marks)

Read Paul Krugman's article "The Hangover Theory" (*Slate*, Dec. 4, 1998), which can be found on the course webpage. Based on the article and on the course material, answer the following questions.

a) [10 MARKS] Summarize concisely (in a few lines), what Krugman means by "the hangover theory" of recessions, and what are its implications in terms of policy. Is it closer to either of the theories of business cycles discussed in class? If so, which one?

b) [5 MARKS] What is the link between fluctuations in investment and fluctuations in output outlined in the article? Use proper terminology. Basing yourself on the article and on class material, would you say that it is a leading or a lagging variable, or neither? Explain.

c) [10 MARKS] Find Krugman's explanation for why recessions occur. Based on this information and the AS-AD framework presented briefly at the end of chapter 8 (and later in chapter 9), show what Krugman describes with the support of a diagram, and what are its effects. Be sure to clarify whether Krugman describes a shock to aggregate demand or to aggregate supply. What policy response (if any) does Krugman advocate to bring the economy back to full employment? Illustrate its effects on the same diagram.