Macroeconomic Theory **V.V. Chari**
Econ. 8106 **Fall 2008**
Due Thursday, November 6, 2008

Assignment 1

1. Exercises 2.1, 2.2 and 3.1 through 3.8 in SLP.

2. Consider the following "Edgeworth-box" economy with two commodities (say apples and bananas). There are two (types of) households (labeled 1 and 2). The preferences of both households are the same and are given by

$$u(c_A, c_B) = \log c_A + b \log c_B$$

Household 1 is endowed with w_A units of apples and 0 units of bananas and household 2 is endowed with 0 units of apples and w_B units of bananas.

   a. Define a competitive equilibrium.

   b. Suppose $w_A = w_B = 1$ and $b = 1$. Compute the competitive equilibrium (or equilibria, if there is more than one).

   c. Define a Pareto-optimum.

   d. What conditions do the set of Pareto-optima have to satisfy?

   e. Suppose $w_A = w_B = 1$ and $b = 1$ as in part (b). What prices and transfers support the following allocation: $\left(c_A^1, c_B^1\right) = \left(\frac{3}{4}, \frac{3}{4}\right)$ and $\left(c_A^2, c_B^2\right) = \left(\frac{1}{4}, \frac{1}{4}\right)$.

3. Consider the following 2-period economy. There is a single consumption good in each period. There are 2 households who have identical preferences over consumption given by:

$$u(c_1, c_2) = \log c_1 + b \log c_2 .$$

Household 1 has endowments given by $(w_1, 0)$ and household two has endowments given by $(0, w_1)$.

a. Define an Arrow-Debreu competitive equilibrium.

b. Suppose households attempt to smooth their consumption over time by borrowing and lending. Define a sequential markets competitive equilibrium. Show that a sequential market's equilibrium and an Arrow-Debreu equilibrium give identical allocations.

c. Suppose $w_1 = w_2 = 1$ and $b = 1$. Calculate the competitive equilibrium.

d. Interpret the price of second period consumption as an interest rate. How does the interest rate vary as the distribution of endowments across households varies?

e. Suppose households cannot borrow or lend from each other. Try to define a competitive equilibrium in this case. Show that a policy which transfers goods from the rich to the poor in each period is Pareto-improving.

4. Consider the Solow growth model. The economy lasts forever. There is a single good in each period which can be consumed or invested. The production function for producing this good is $f(k_t)$ where f is strictly increasing, differentiable and satisfies $\lim_{h \to 0} f'(k) = \infty$ and $\lim_{h \to \infty} f'(k) = 0$ $f(0) = 0$.

   Consumption decisions are summarized by $c_t = (1-s) f(k_t)$ where s (the savings rate) is a fixed number. The law of motion for capital accumulation is $k_{t+1} = f(k)_t + (1-d)k_t - c_t$. A steady-state is a capital stock such that $k_{t+1} = k_t = k^*$.

   a. Show that a steady state exists. Give a formula for the steady state.

   b. Suppose that the economy starts at some arbitrary $k_0 \neq k^*$. Show that it converges monotonically to the steady state.

5. Obtain national income account data from the bureau of Economic Analysis (BEA) website .

   a. Real GDP against time from 1952 to 2005 (annual data).
   b. Ratio of the components of the product side of real GDP (such as personal consumption expenditures) to GDP. What trends do you see?
   c. Plot the ratio of the components of national income such as wages and salaries to national income?

6. How would you make sense of the findings in Question 5 in terms of the growth model?