ECON 210B

University of California, San Diego

Winter 2012

Problem Set I

(due on Wed, Jan 18$^{\text{th}}$)

Exercise 1: Real Business Cycle statistics

1. Download the following quarterly series (seasonally adjusted) from the FRED database[1]: Real GDP (GDPC1), Consumption Expenditures (PCECC96), Gross Private Domestic Investment (GDPIC1) and Government Consumption (GCEC1), Exports (EXPGSC1), Imports (IMPGSC1), Hours worked (HOANBS), Labor Productivity (OPHNFB), Labor Costs (ULCBS) for the period 1947:01-2011:3 (or the latest data available).

2. Take logs of the series and extract their cyclical components, using the Band-Pass filter (with periodicity of 6,32 quarters) and the HP filter (set the smoothing parameter $\lambda = 1600$) – you can download the m.files to compute the filtered series from the course webpage. Plot the log levels and cyclical components of all the series.

3. Compute the standard deviations of the cyclical components, the cross-correlations of the cyclical components of Real Private GDP and Real Government Purchases. Discuss the relative volatilities and lead-lag relationships of the series, in comparison to what we have discussed in class.

4. Discuss the differences (if any) in the statistics obtained using the Band-Pass filter and the HP filter.

Exercise 2: RBC model and Balanced Growth path

Consider the basic RBC model analyzed in class.

1. Derive the optimality conditions of the social planner problem.

2. Show that in a steady state with a constant interest rate, and where consumption grows at a constant rate, the intertemporal elasticity of substitution must be constant. (HINT, consider the consumption Euler equation along the balanced growth path).

3. Show that in order to have a steady state where leisure is constant, and consumption and wages grow at the same rate, the utility function must take the form $U(Cv(L))$. (HINT: show that it must be that $\frac{U_L(C,L)}{U_C(C,L)} = C\frac{U_L(1,L)}{U_C(1,L)}$).

[1] http://research.stlouisfed.org/fred2/

Exercise 3: Technology shocks in the AS-AD model

Consider the basic AS-AD model, that you may have studied as an undergraduate student. The model is described by the equations

$$\begin{array}{ll} \text{Wage Setting (WS):} & W = A^e P^e f(u) \\ \text{Price Setting (PS):} & P = (1+\mu)\frac{W}{A} \\ \text{Aggregate Demand (AD):} & Y = \mathcal{Y}(\frac{M}{P}) \end{array}$$

where W and P denote (nominal) wages and prices, u denotes the unemployment rate, M denotes (nominal) money balances, and the superscript e denotes expectations. Moreover, $f_u < 0$ and $\mathcal{Y}_{\frac{M}{P}} > 0$. Output is produced according to the production function $Y = AN$, where N indicate the number of workers, in proportion to the labor force. Thus, from the definition of unemployment rate we must have $u = 1 - N$.

Throughout the exercise, let's assume that $P^e = P$. In that case, the economy is said to operate at its "natural" level (this would be the case if prices are fully flexible).

Answer the following questions:

1. Explain the effect of an increase in A on unemployment, if (a) $A = A^e$, (b) $A > A^e$ or (c) $A < A^e$.

2. Combing the (WS) and (PS) equations (to eliminate the wage), and derive the aggregate supply (AS) relationship. Is there an equilibrium condition of the (microfounded) RBC model considered in class that closely resemble this AS relationship?

3. Plot the (AS) and (AD) curves in a diagram with prices (P) on the vertical axis and output (Y) on the horizontal axis. What happens to output and prices as A increases (assuming $A = A^e$)?

4. Suppose the central bank want to keep prices constant. How should it react to increases in technology?