Problem Set 1
Intermediate Macroeconomics, Fall 2012
The University of Notre Dame
Professor Sims

Instructions: You may work on this problem set in groups of up to four people. Should you choose to do so, please make sure to legibly write each group member’s name on the first page of your solutions. This problem set is due in class on Thursday, September 6.

(1) Measuring GDP (Williamson, 4th edition, problem 2.4): In years 1 and 2, there are two products produced in an economy, computers and bread. In year 1, 20 computers are produced and sold at $1000 each, and in year 2, 25 computers are sold at $1500 each. In year 1, 10,000 loaves of bread are sold for $1 each, and in year 2, 12,000 loaves are sold at price $1.10.

(a) Calculate nominal GDP in each year.

(b) Calculate real GDP in both years using year 1 as the base year. Back out the implicit price deflator for both years. What are the implied growth rates of real output and prices (inflation)?

(c) Now calculate real GDP in both years using year 2 as the base year. Back out the implicit price deflator for both years. What are the implied growth rates of real output and prices (inflation)?

(d) Are your answers for (b) and (c) the same or different? Why?

(2) Playing with data: Download quarterly, seasonally adjusted data on US real GDP, personal consumption expenditures, and gross private domestic investment for the period 1960q1 - 2012q2. You can find these series in BEA Table 1.1.6, “Real Gross Domestic Product, Chained Dollars.”

(a) Take the natural logarithm of each series (“=ln(series)” in Excel) and plot each against time. Which series appears to move around the most? Which series appears to move around the least?

(b) The growth rate of a random variable, $x$, between dates $t - 1$ and $t$ is defined as:

$$ g_t^x = \frac{x_t - x_{t-1}}{x_{t-1}} $$

Calculate the growth rate of each of the three series (using the raw series, not the logged series) and write down the average growth rate of each series over the entire sample period. Are the average growth rates of each series approximately the same?

(c) We argued in class that the first difference of the log is approximately equal to the growth rate:

$$ g_t^x \approx \ln x_t - \ln x_{t-1} $$
Compute the approximate growth rate of each series this way. Comment on the quality of the approximation.

(d) The standard deviation of a series of random variables is a measure of how much the variable jumps around about its mean (Excel command “=stdev(series)”). Take the time series standard deviations of the growth rates of the three series mentioned above and rank them in terms of magnitude.

(e) The National Bureau of Economic Research (NBER) declares business cycle peaks and troughs (i.e. recessions and expansions) through a subjective assessment of overall economic conditions. A popular definition of a recession – not the one used by the NBER – is a period of time in which real GDP declines for at least two consecutive quarters. Use this consecutive quarter decline definition to come up with your own recession dates for the entire post-war period. Compare the dates to those given by the NBER (just google “NBER recession dates” to find those dates).

(f) The most recent recession is dated by the NBER to have begun in the fourth quarter of 2007, and officially ended after the second quarter of 2009, though the recovery in the last three years has been weak. Compute the average growth rate of real GDP for the period 2003q1 - 2007q3. Compute a counterfactual time path of the level of real GDP if it had grown at that rate over the period 2007q4-2010q2. Visually compare that counterfactual time path of GDP, and comment (intelligently) on the cost of the recent recession.