ECON 145 Howell, Spring 2009
Assignment #4 Due: Mon., 3/9/2009

Regression Analysis

Okun's Law is an empirical relationship between the change in the unemployment rate and the percentage growth in real output. Define the following variables:

- Y_t = *change in* the unemployment rate (year-to-year difference in percentage points)
- X_t = percentage growth rate in real output (year-to-year percent change)

Arthur Okun estimated the following relationship between these two variables:

$$Y_t = -0.4(X_t - 2.5)$$

The expression above can be rewritten as a more traditional linear regression:

$$Y_t = \beta_0 + \beta_1 X_t$$

$$Y_t = 1 - 0.4\, X_t$$

The basic question you have to answer is whether or not this relationship holds using U.S. economic data. Please complete/answer the following:

1. Download all available quarterly data on *real* GDP, *real* GNP, and the civilian unemployment rate.[1] Put this data into an Excel spreadsheet.

2. Construct the variables X and Y, taking care to define them as written above.[2] Create a scatter plot of X and Y, add a trendline to your graph, and print out the resulting chart.

3. Use regression to estimate the parameters in the equation above (β_0, β_1). Print out the regression output from Excel.

4. Clearly set up two hypothesis tests to answer the following questions:
   a. Based on your output in (3), are the parameters that you estimate statistically different from zero?
   b. Do you get parameter estimates which are significantly (in a statistical sense) different from the ones predicted by Arthur Okun?

5. Does it make a difference whether or not you use real GNP or real GDP in the regression?

6. Does Okun's Law hold for some time periods but not others?

7. Does Okun's Law do a reasonable job of explaining changes in the unemployment rate?

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[1] You can get these data from various sources. Real GDP and GNP are generated by the Bureau of Economic Analysis (www.bea.gov) and the unemployment rate by the Bureau of Labor Statistics (www.bls.gov). You can go straight to these primary sources or you can find the data from a secondary source like the St. Louis Fed, for example (https://research.stlouisfed.org/fred2/). Note that the unemployment rate is a monthly data series, but it is available quarterly or you can just average the three monthly values in each quarter.

[2] Hint: your data should continue to be quarterly. The year-to-year percent change can be calculated for 1960Q3 by comparing it to 1959Q3.