**Home Work 3**

1. The data file us\_macro\_quarterly, which contains quarterly data on several macroeconomic series for the United States; the data are described in the file us\_macro\_quarterly\_description. The variable PCEP is the price index for personal consumption expenditures from the U.S. National Income and Product Accounts. In this exercise you will construct forecasting models for the rate of inflation, based on PCEP. For this analysis, use the sample period 1963:Q1–2012:Q4 (where data before 1963 may be used, as necessary, as initial values for lags in regressions).
2. i. Compute the inflation rate,. What are the units of ? (Is measured in dollars, percentage points, percentage per quarter, percentage per year, or something else? Explain.)

ii. Plot the value of from 1963:Q1 through 2012:Q4. Based on the plot, do you think that  has a stochastic trend? Explain.

1. i. Compute the first four autocorrelations of .

ii. Plot the value of from 1963:Q1 through 2012:Q4. The plot should look “choppy” or “jagged.” Explain why this behavior is consistent with the first autocorrelation that you computed in part (i).

1. i. Run an OLS regression of  on  . Does knowing the change in inflation this quarter help predict the change in inflation next quarter? Explain.

ii. Estimate an AR(2) model for . Is the AR(2) model better than an AR(1) model? Explain.

iii. Estimate an AR(p) model for . What lag length is chosen by BIC? What lag length is chosen by AIC?

iv. Use the AR(2) model to predict the change in inflation from 2012:Q4 to 2013:Q1—that is, predict the value of .

v. Use the AR(2) model to predict the level of the inflation rate in 2013:Q1—that is,  .

1. i. Use the ADF test for the regression in Equation  with two lags of  to test for a stochastic trend in  .

ii. Is the ADF test based on Equation  preferred to the test based on Equation for testing for stochastic trend in ? Explain.

iii. In (i) you used two lags of . Should you use more lags? Fewer lags? Explain.

iv. Based on the test you carried out in (i), does the AR model for contain a unit root? Explain carefully. (Hint: Does the failure to reject a null hypothesis mean that the null hypothesis is true?)

1. Use the QLR test with 15% trimming to test the stability of the coefficients in the AR(2) model for . Is the AR(2) model stable? Explain.
2. i. Using the AR(2) model for with a sample period that begins in 1963:Q1, compute pseudo out-of-sample forecasts for the change in inflation beginning in 2003:Q1 and going through 2012:Q4. (That is, compute  ,,  , .)

ii. Are the pseudo out-of-sample forecasts biased? That is, do the forecast errors have a nonzero mean?

iii. How large is the RMSFE of the pseudo out-of-sample forecasts? Is this consistent with the AR(2) model for  estimated over the 1963:Q1–2002:Q4 sample period?

iv. There is a large outlier in 2008:Q4. Why did inflation fall so much in 2008:Q4? (Hint: Collect some data on oil prices. What happened to oil prices during 2008?)