Assignment 2
Due 2/25/19

1 Empirical Exercise

1. **Unit Root Test (Lothian and Taylor, 1996)**

   Read Lothian and Taylor (1996, pp. 488-509) before answering. The file lt.txt has annual data on the following:

   Column 1: year

   Column 2: dollar / sterling exchange rate (call it S_t)

   Column 3: U.S. WPI (wholesale price index), normalized to 100 for 1914 (P_t)

   Column 4: U.K. WPI, normalized to 100 for 1914 (P_t^*)

   The sample period is 1791 to 1990 (200 observations). These are the same data used by Lothian and Taylor (1996). For data sources and how the authors combined them to construct consistent time series, see the Appendix of Lothian and Taylor (1996).

   Calculate the dollar/sterling real exchange rate as

   $$z_t = \ln(S_t) - \ln(P_t) + \ln(P_t^*)$$

   Since S_t is in dollars per pound, an increase implies sterling appreciation.

   (a) Plot z_t. Does the real exchange rate exhibit a clear time trend?

   (b) (ADF with automatic lag selection) For the entire sample period of 1791 - 1990, apply the AIC, and the BIC to select the lag order p in a Dickey-Fuller regression with constant only. Verify that the value of the t-statistic (if estimated on the maximum sample)

matches the value reported in Table 1 of Lothian and Taylor (1996) as τ_μ. What do you conclude?

(c) (ADF test on the floating period) Apply the ADF test to the floating exchange rate period of 1974 - 1990. Because of the lagged dependent variable z_{t-1}, the first equation is for t = 1975 and the sample size is 16. Can you reject the random walk null at 5 percent?

(d) (ADF test on the gold standard period) Apply the ADF test to the gold standard period of 1870 - 1913. Take t = 1 for 1871, so the sample size is 43. Can you reject the random walk null at 5 percent? Is the estimate of (the z_{t-1} coefficient in the regression of z_t, on a constant and z_{t-1}) closer to zero than in (3)?

(e) Repeat the above steps with (b-d) with Phillips-Perron unit root test.

(f) Repeat the above steps with (b-d) with Elliott-Rothenburg-Stock (ERS) point optimal unit root test.

2. **Structural Break Test**

Taylor rule describes how the central bank changes interest rate in response to fluctuations in inflation and output gap. Orphanides (2001) used the following regression to estimate the Taylor rule:

$$FFR_t = \beta_0 + \beta_1 GAP_t + \beta_2 INFL\_GB_t + \beta_3 FFR_{t-1} + e_t$$

where β_1 and β_2 measure the response coefficient of interest rate to output gap and inflation. Note that GAP is output gap, INFL_GB is Fed's forecast of inflation. Take a look at orphanides.csv data for this problem and perform the following exercise

(a) Plot CUSUM stat. Is there any evidence of instability in this relationship using CUSUM test?

(b) Plot Sup-F statistic. Is there any evidence of structural break using Sup-F statistic?

(c) Now perform Bai and Perron multiple structural break point test. How many breaks are identified using Bai and Perron test?

(d) Report the estimated coefficients for different regimes identified by breakpoint tests.

(e) Report the confidence interval associated with the identified break points.

References

[1] Lothian, James R., and Mark P. Taylor. "Real exchange rate behavior: the recent float from the perspective of the past two centuries." Journal of Political Economy (1996): 488-509.

[2] Orphanides, A. (2001). Monetary policy rules based on real-time data. American Economic Review, 91(4), 964-985.