Homework 8

Eco 5316 Time Series Econometrics
Spring 2019
Due: Sunday, May 18, 11.55pm

Problem 1

Obtain monthly time series for Crude Oil Prices: West Texas Intermediate (WTI), MCOILWTICO, and the monthly time series for US Regular Conventional Gas Price, GASREGCOVM.

(a) Create a single time series plot with two log prices $\log p_t^{GAS}$ and $\log p_t^{OIL}$ for the sample 1995M1-2017M4.

(b) Perform unit root tests to verify that $\log p_t^{GAS}$ and $\log p_t^{OIL}$ are $I(1)$.

(c) Determine the number of lags to include in cointegration analysis using Schwarz information criterion. Run the Johansen's trace and maximum eigenvalue cointegration tests for $(\log p_t^{GAS}, \log p_t^{OIL})$ using the sample 1995M1-2017M12. Use time series plots from (a) as a guide to determine the specification of the deterministic components in the cointegration test (i.e. whether to use Case 2, Case 3, of Case 4 cointegration test).

(d) Perform the test for the presence of a restricted constant rather than unrestricted constant in the model.

(e) Use the 1995M1-2017M12 sample to estimate a bivariate VEC model for $(\log p_t^{GAS}, \log p_t^{OIL})$.

(f) Are the adjustment parameters α_1 and α_2 in the estimated VEC model statistically significant? Are their signs consistent with error correction mechanism that moves the system back to the long run equilibrium, whenever there is a disruption and $z_{t-1} \neq 0$?

(g) Test the restriction $\alpha_2 = 0$ using the likelihood ratio test.

(h) What is the intuition for imposing the restriction in (f), what does it imply for the response of $\log p_t^{GAS}$ and $\log p_t^{OIL}$ to a disruption such that $z_{t-1} < 0$?

(i) Bonus: perform a rolling cointegration analysis with 180 month window. Create a time series plot for max eigenvalue test statistic. Create a time series plot for the coefficient oin the VEC model. Is the cointegrating relatioship stable over time?