

Homework 8

Eco 5316 Time Series Econometrics

Spring 2018

Due: Sunday, April 29, 11.55pm

Problem 1

Obtain monthly time series for Crude Oil Prices: West Texas Intermediate (WTI), [FRED/MCOILWTICO](#), and the monthly time series for US Regular Conventional Gas Price, [FRED/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 in the VEC model. Is the cointegrating relationship stable over time?