Problem Set 6

Due Wednesday February 19, 4pm

Data Exercises

(1) The file "realgdpgrowth.xlsx" contains quarterly observations on the real growth rates of the components of U.S. gdp. Pick two of the series. Graph their autocorrelation functions. Comment and discuss.

(2) This question concerns "housing starts", which is the number of new homes where construction has started, monthly from 1959m1 to current. The FRED labels for the US south region, seasonally adjusted, is HOUSTS and seasonally unadjusted is HOUSTSNSA. The labels for the US midwest region are HOUSTMW and HOUSTMWNSA. Graph the autocorrelation functions for the series. Comment and discuss.

(3) The file "s&p.csv" has stock price and transaction volume data. Estimate a trend model for the natural log of volume. That is, take the log of the volume and regress it on a time trend. Take the residuals of that regression. (You can use the command mdl.Residuals.Raw after estimating the regression mdl). Graph a time-series plot of the residuals. Graph the autocorrelation function of the residuals. Comment and discuss.

Theoretical Questions

(4) Rewrite the following expressions without using the lag operator

(a) $(1 - \rho L)y_t = \varepsilon_t$

(b) $(1 - 0.2L - 0.3L^3)y_t = \varepsilon_t$

(c) $y_t = (1 + \theta L)\varepsilon_t$

(d) $y_t = (1 + 0.3L - 0.5L^2)\varepsilon_t$

(5) Rewrite the following expressions in lag operator form

(a) $y_t = 0.7y_{t-2} + \varepsilon_t$

(b) $y_t = 0.2y_{t-1} + 0.3y_{t-2} - 0.7y_{t-5} + \varepsilon_t$

(c) $y_t = \varepsilon_t - 0.3\varepsilon_{t-10}$

(6) Suppose that $Z_t \sim$ independent$(0, \sigma^2)$. Let $Y_t = Z_t Z_{t-1}$. Is Y_t mean stationary? Is Y_t variance stationary? Is Y_t covariance stationary?

(7) Suppose that Z_t is a white noise processes and $c \in \mathbb{R}$. Is $Y_t = c + Z_t$ a white noise process? Is $X_t = cZ_t$ a white noise process?