Problem Set 1

Econometric Theory
Posted: Friday, March 6,   Due: Friday, March 13

March 6, 2015

Q1

Consider the following AR(3) process

$$y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \epsilon_t, \quad \epsilon_t \sim WN(0, \sigma^2).$$

Find conditions on the parameters $\{\phi_1, \phi_2\}$ such that the process is covariance stationary.

Q2

Consider the following AR(2) process

$$y_t = 0.7 y_{t-1} + 0.6 y_{t-2} + \epsilon_t, \quad \epsilon_t \sim WN(0, \sigma^2).$$

1. Calculate the autocorrelation function of the process.

2. Is the AR(2) invertible? If yes, give its $MA(\infty)$ representation.

Q3

Consider the following MA(2) process

$$y_t = \epsilon_t + 0.9 \epsilon_{t-1} + 0.6 \epsilon_{t-2}, \quad \epsilon_t \sim WN(0, \sigma^2).$$

1. Calculate the autocorrelation function of the process.

2. Is the MA(2) invertible? If yes, give its $AR(\infty)$ representation.

Q4

The file CPIUSALL.xls contains quarterly data for inflation (more precisely, quarterly log-changes of the Consumer Price Index CPIAUCSL) from 1947:1 to 2014:4.

1. Fit an $AR(p)$ model the the series using all the observation choosing p using AIC and BIC.

2. On a rolling window of 20 years (80 observations) fit an $AR(p)$ choosing p using both AIC and BIC and produce one and two-step ahead forecast of the inflation. Assess the quality of the forecast on the resulting series of forecasts.