Statistics 565 Applied Time Series Analysis Spring 2019

Homework 4

Due: Mon 02/25/19 @ 6:00pm rutgers.instructure.com/courses/21204

1. Problem 4.11. For both parts of the problem, do not plug in formulas directly. Instead, derive the results starting with $Cov(Y_t, Y_{t-k})$. Here, σ_e^2 is the variance of the white noise series $\{e_t\}$.

2. Problem 4.12.

3. Problem 4.21. For part (a), start with $Cov(Y_t, Y_{t-k})$ for $k = 0, 1, 2, \cdots$.

4. Consider the following ARMA processes:

   (i) $Y_t + 0.2Y_{t-1} - 0.48Y_{t-2} = e_t$.

   (ii) $Y_t + 0.6Y_{t-1} = e_t + 1.2e_{t-1}$.

   (iii) $Y_t + 1.8Y_{t-1} + 0.81Y_{t-2} = e_t$.

   (iv) $Y_t + 1.6Y_{t-1} = e_t - 0.4e_{t-1}$.

   (a) Which of these are are stationary, and which of them are invertible?

   (b) For those processes that are stationary, graph the autocorrelation function.

   (c) For those processes that are stationary, compute the first four coefficients ψ_0, ψ_1, ψ_2 and ψ_3 in the linear process representation $Y_t = \sum_{j=0}^{\infty} \psi_j e_{t-j}$.

5. Problem 5.1. Hint: start by assuming $\{Y_t\}$ as an ARMA(p, q) model and examine its stationarity/invertibility. If either is violated, consider $\{\nabla Y_t\}$, and so on.

6. Problem 5.4. Note that B in this question is **not** the backshift operator.

Some useful commands in R

- The `ARMAacf` command computes the theoretical ACFs of ARMA processes.
- The `polyroot` command finds roots of polynomials.