STAT 673, Midterm Exam Part II, Fall 2015

Due by 5:30PMPM, Wednesday October 21

This assignment is a take-home midterm exam. You **may not** collaborate with *any* other person (whether in the class or not). You **may** use any reading material (class notes, books, etc.) you wish. Professor Bailey *will* answer questions. For any parts that require R, please follow the lab report directions for Homework, i.e. include commands and output you used to answer the questions.

Show all work. 1 Problem. 25 points total.

1. Consider the ARMA(2,1) process,

$$(1 - 1.2B + .8B^2)Z_t = (1 - .8B)a_t$$

where a_t is a mean zero white noise process with constant variance σ_a^2.

(a) Find the ACF ρ_k for $k = 0, 1, 2, 3$.

(b) Plot the ACF ρ_k for $k = 0, 1, 2, 3$.

(c) Find the PACF ϕ_{kk} for $k = 0, 1, 2, 3$.

(d) Plot the PACF ϕ_{kk} for $k = 0, 1, 2, 3$.

(e) In R, simulate a series of 500 observations from the ARMA(2,1) process with $\sigma_a^2 = 1$. Be sure to use the `set.seed` function so that you can reproduce your results and use `set.seed(6)`. For the simulated series,

(i) Plot the series.

(ii) Plot the sample ACF $\hat{\rho}_k$ and sample PACF $\hat{\phi}_{kk}$.

(iii) Compare the sample ACF and PACF values for $k = 0, 1, 2, 3$ to the theoretical values from (a) and (c). You should give the sample values.

(f) Verify whether the ARMA(2,1) model is stationary or invertible, or both.

(g) Express the process in an MA representation. Give the first three ψ_j weights, $j = 1, 2, 3$.

(h) Express the process in an AR representation. Give the first three π_j weights, $j = 1, 2, 3$.