MTHSTAT 564/564G/764–Time Series Analysis
Spring 2024
Homework Assignment 3: Due Wednesday, 13 March in Lecture

This homework consists of three problems, none of which require R. You may feel free to work with classmates, but please be sure to turn in your own work via the Canvas dropbox. Be sure to submit your solutions as one single .pdf file. I do not need to see your code.

Reading

Chapter 4

Problems

1. Consider an MA(7) model with $\theta_1 = 1$, $\theta_2 = -0.5$, $\theta_3 = 0.25$, $\theta_4 = -0.125$, $\theta_5 = 0.0625$, $\theta_6 = -0.03125$, and $\theta_7 = 0.015625$. Find a much simpler model that has nearly the same ψ-weights.

2. Consider the model $Y_t = e_{t-1} - e_{t-2} + 0.5e_{t-3}$.

    (a) Find the autocovariance function for this process.

    (b) Show that this is a certain ARMA(p,q) process in disguise. That is, identify the values for p and q and for the θs and ϕs such that the ARMA(p,q) process has the same statistical properties as $\{Y_t\}$.

3. Show that the statement "The roots of $1 - \phi_1 x - \phi_2 x^2 - \ldots - \phi_p x^p = 0$ are greater than one in absolute value" is equivalent to the statement "The roots of $x^p - \phi_1 x^{p-1} - \phi_2 x^{p-2} - \ldots - \phi_p = 0$ are less than one in absolute value." (Hint: If A is a root of one equation, is $1/A$ a root of the other?)