Statistics 956 Homework No. 2
Due Monday January 24. (Archive Version)

Reading

This is a sort week, so we will have a short homework. You should skim Chapter1-3 of ZW. You should read pages 57–66 more carefully, but there are still some things there that we will not have touched in class. Read about the function par() and the argument mfrow=c(2,2).

Experience with AR(2) and Stability Simulation

- Write a function mySimAR2() which takes parameters phi1, phi2, sigma, and N and which generates an AR(2) series of length N with the associated parameters. Since we have not yet derived a formula for the stationary distribution of an AR(2) series and since we want to explore the possibility of nonstationarity, you will need to take advantage of the idea of a "burn-in period." For this exercise, a short burn-in period may be most instructive, say one with twenty steps.
- The triangle determined by the points $(0, 1), (2, -1)$ and $(-2, -1)$ contains the values (ϕ_1, ϕ_2) for which the AR(2) model is stationary. Explore this assertion by simulation. Specifically,
  1. Generate 4 series of length 60 which explore the interior of the stability triangle. Plot these on one page by using par() and mfrow=c(2,2).
  2. Repeat this process with four parameter choices that fall slightly outside of the "stationarity triangle." Report on your results, and provide plots — if possible. Note: You may need to reduce the size of the burn-in period to get nice pictures.
- Make any further explorations that interest you, and summarize your observations in a few "bullet points." Try to be clear in your declarations, but try not to over step the bounds of your evidence.

Some Perspective

The point of this exercise is to build your intuition into the behavior of AR(p) processes. More generally, it should also add to your intuition about the notions of "stability" and stationarity. Finally, it should reinforce your understanding of an "initial distribution" and the "burn-in method."