Stat 510, Lab 5

February 23, 2007

1 Homework

1. Create a function in R to simulate and $ARMA(p, q)$ time series. This function should take four arguments, a vector of length p, a vector of length q, the variance of the white noise process (σ^2), and the length of the simulation T.

   Explore the behavior of the ACF and PACF. Simulate a single path of 10,000 observations for each of the following models:

   (a) $x_t = 0.6x_{t-1} - 0.8x_{t-2} + w_t$

   (b) $x_t = w_t + 0.8w_{t-1} + 1.1w_{t-2}$

   (c) $x_t = 0.8x_{t-1} + w_t + 0.8w_{t-1}$

   Plot the ACF and PACF (use the command `pacf()`) for each path. Discuss what you see in the plots and if it is what you would expect.

2. Load the Berkeley and Santa Barbara temperature data using the following commands

```
berk=scan("berkeley.dat", what=list(double(0),double(0),double(0)))
time=berk[[1]]
berkeley=berk[[2]]
stbarb=berk[[3]]
```

   Create ACF and PACF plots for `berkeley` and `stbarb`. Repeat this for the differenced data. Do you have an opinion on possible models based only on these plots?

3. Load the global average temperature using the command

```
temperature=scan("globtemp.dat")
```

Create ACF and PACF plots for `temperature` and the differenced data. Do you have an opinion on possible models based on these plots?

4. Verify example 3.4 from the book. Simulate the two MA models of length 10,000 using your newly created function and the two sets of parameters in this example. Now, fit those two MA models using the command `arima(x,c(0,0,1))` where `x` is the name of your time series. (We'll talk more about this command later; just trust the output for now.) Also, make ACF plots of your two simulated series. Does this confirm what was shown in theory?