Lab 6
Due: 4/27/2010 (at the beginning of lab)
Data: HydroMiss.zip

The primary objective of this lab is to replicate and extend a study Pegg, et al. (2003) examining the daily mean flow rates from different gauges along the Missouri River before and after major human alteration. The authors use a very complex method for comparing pre- and post-alteration periods, so we’re going to skip that. But I want you to be able to replicate the model fitting portion of the article. The data for this lab consist of three separate time series for gauges located at Fort Benton, MT, Bismarck, ND and Hermann, MO along the Missouri River. Each file has two columns: the first is the date in YYYY/MM/DD (they are daily data) and the second is the flow gauge reading (in cubic feet per second). The data do not have headers. There is no missing data to interpolate. Each data set has a different start date.

Lab Assignment
This lab consists of 2 parts: questions on the article and replication/extension analysis.

Part 1: Questions on the Article
In Part 1 of the lab, you will be asked to answer a set of questions about the two articles. Answer the following questions with one well-constructed paragraph each. Each paragraph really shouldn’t be more than about 200 words.

1. What is the primary research objective of the study? What is the rationale for this objective (i.e., the reason(s) that it is important to achieve the objective(s) or to answer the research question(s))?  
2. Did the authors need any transformations on the data before applying a time series model? Did they apply the same time series model to each gauge? Why do you think they chose to do this?  
3. Do you think the authors left out critical information about the model building process? If so, what?  
4. Do you feel the authors should have presented any additional data in the paper? If so, why would this have made their results easier to interpret? If not, why not?  
5. Do the author’s results support their conclusions? Explain.

Part 2: Study Replication and Extension
In part 2 of the lab, you will be asked to replicate and extend the author’s analysis. Answer the following questions using figures and prose. Also, remember to turn in your R code via email to Ling.

1. Replicate the analysis done in the Pegg, et al. paper. Turn in 12 Figures (your attempt at Figure 2, pre- and post-alteration for the MT, ND, and MO gauges and Figure 3, pre- and post- alteration for the MT, ND, and MO gauges), and provide a complete summary of the results you found in no more than 3 paragraphs. Please including answers to the following questions:  
   a. Provide output that shows the coefficients, intercepts, AIC, etc. for the model you chose to use. Interpret this output. Can you provide an equation for the final model(s)?  
   b. Were you able to replicate these results? Can you tell? If not, explain why your results are different.  
2. Run one additional time series analysis of your choosing. You may choose to account for seasonality differently, or take your analysis one step further. With up to 2 paragraphs, summarize and interpret the results of your analysis.