Final Homework Assignment

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Stat 248 Spring 2003

DUE DATE: Tuesday April 8th

The focus of your final homework assignment is to apply some of the different time series techniques to which you have been exposed over the course of the semester. While you are welcome to use any techniques to address the underlying data set, you must justify/explain every step you take. A general analytic structure is outlined below, and it is recommended that in your analysis you at least address the issues raised by these questions. This assignment should not turn into an epic tale, but rather touch upon the main questions in clear and concise english. Thus, it should not exceed five pages of written text and figures.

DATA INFO:
The data you'll be working with was compiled between 1966 and 1988. It consists of monthly water consumption in London, Ontario as measured in Ml/ Day. The data set can be found on the class site:

www.stat.berkeley.edu/ brill/Stat248/london.html.

Bonus Question: What is the connection between the phrase "Going to London to Get Blitzed" and our concern with water consumption?

A. Basic Data Analysis and Removing Trends

(a) Load the initial data into your program of choice and focus your analysis on the data available from 1970 to 1985. Plot the original data. Briefly comment on what you see.

(b) Your next goal is to try different basic techniques, as outlined in Ch. 1, in order to reasonably remove any general or seasonal trends. Before taking action, you should plot the sample autocorrelation function for the data showing $\pm\frac{1.96}{\sqrt{n}}$ confidence bounds. Does it make sense to introduce these bounds presently?

B. Modeling Stationary Processes

(a) At this stage, you should only have a stationary process left on your hands. Now, apply the techniques in Ch. 3 in order to correctly model your process.

Why are you considering ARMA processes?

(b) Plot the sample autocorrelation function of your stationary process and explain what characteristics it presently has that makes you believe you've reasonably removed all trends.

(c) Use the sample ACF and the sample PACF in order to fit the correct ARMA (n,p) process to your data. Briefly explain how you used these functions in your analysis. Plot your final sample ACF and sample PACF after you feel you have found the correct model.

C. Forecasting

You are now going to forecast water consumption for the year 1986. In so doing you may want to consider the residual tests available to you at the end of Ch. 1 (p. 35-40). Clearly specify what assumptions you need to make in order to create confidence intervals for your estimates, and explain why residual tests are relevant. Compare your estimates to the true values with the use of a figure.

D. Repeat parts A. and B. using Spectral Density Analysis

Namely, here you are clearly looking at the spectral density function in your analysis rather than the autocovariance. Ch. 4 is a good guide to this type of analysis.