STAT 510: Applied Time Series Analysis

Instructor: Stephen Rathbun

Office: 421A Thomas Building
Office Hours: T,Th 1:30-2:30
Phone: 863-7395
Email: rathbun@stat.psu.edu
Web Page: www.stat.psu.edu/~rathbun/stat510/index04.html

Text:

Shumway, R.H., and Stoffer, D.S. (2000). *Time Series Analysis and its Applications.* Springer, New York.

Prerequisites:

A course on regression.

Grades and Exams:

Midterm 1	20%	February 15
Midterm 2	20%	March 29
Final Exam	30%	
Homework	30%	

All Penn State and Eberly College of Science policies regarding academic integrity apply to this course.

Homework assignments are designed to give you an opportunity to assimilate the course material, to understand statistical software required for multivariate statistical analyses, and to demonstrate your understanding of the results of those analyses. For all assignments requiring the use of the computer, attach a copy of your SAS program and output to the end of those assignments. However, all answers are to be given on a **separate** sheet of paper. All homework assignments are due at the beginning of the class period on the date on which they are due. Homework data sets will be available on the web.

Computing

SAS shall be used for all in-class demonstrations of statistical analyses, homework assignments, and exams.

Course Outline:

1. Intruduction
    a. General time series model.
        i. Trend
        ii. Autocorrelation
    b. Eploratory Data Anlaysis
        i. Graphical Display of Time Series data
        ii. Exploring Trends
        iii. Exploring Temporal Correlation
    c. Estimating temporal autocorrelaiton.
2. Time Series Models: For each of the following models, we shall consider model properties, parameter estimation, forecasting, and model building.
    a. Autoregressive Model
    b. Moving Average Model
    c. Autoregressive Moving Average Model
    d. Autoregressive Integerated Moving Average Model
    e. Seasonal Models
    f. Regression with Autocorrelated Errors
3. Spectral Analysis
    a. Periodic Time Series
    b. Power Spectrum
    c. Fourier Transform and the Periodogram
4. State Space Models
    a. Kalman Filter
    b. Maximum Likelihood Estimation
    c. Signal Extraction and Forecasting