Syllabus

Course Web Page: `edoras.sdsu.edu/~babailey/stat496`
and `blackboard.sdsu.edu`

Meeting Time: Lectures: MW 5:30 - 6:45 p.m. in GMCS 308

Instructor: Professor Barbara Bailey
GMCS 513
email: bbailey@mail.sdsu.edu
Office Hours: Tu 2:00-3:30 p.m.; by appointment

Reference: The textbook for the course is

Cryer, J.D. and Chan, K-S. (2008) *Time Series Analysis: With Applications in R*, 2nd Edition,

Springer.

Objectives: Time series data occur when a single experimental unit or process is observed repeatedly over time. Data of this type are common in many different fields including economics, finance, industrial process control, environmental monitoring, epidemiology, and experimental biology. Statistical methods that assume independence are inappropriate for time series data. This course will provide you with the basic theory and tools for the statistical analysis and interpretation of time series. The course is designed to satisfy the VEE (Validation by Educational Experience) requirement for Time series/forecasting component of the Applied Statistical Methods of the SOA (Society of Actuaries). Topics include: 1) Linear time series models, 2) moving average, regression-based and/or ARIMA models, 3) Estimation, data analysis and forecasting with time series models 4) Forecast errors and confidence intervals Other topics include methods for model-based estimation, model selection, diagnostics, and computing as they relate to time series analysis.

Learning Outcomes:

- Define time series data in an appropriate statistical framework.
- Summarize and carry out exploratory and descriptive analysis of time series data.
- Describe and conduct appropriate statistical modeling techniques and diagnostics for time series data.
- Use R competently to model and produce point and interval forecasts and interpret the results for time series data.
- Present and communicate, both orally and in written-form, the results of statistical analyses of time series data.

Homework: Homework assignments will be regularly available on the course web page as announced in class. The homework will contain a series of practice problems of which *selected problems* **will** be graded. The homework serves as a tool to review and practice the material covered in class. All material covered on the assignments can be questioned on the exams. Some problems may require computing and must include concise computer output with a clearly presented version of your code.

Late homework will not be accepted. You may drop your lowest percentage score.

Exams: There will be two in-class exams, Wednesday October 3 and Wednesday November 14. The in-class part of the exam will be closed book. A hand calculator is necessary for all exams. *No collaboration of any kind is allowed on the take-home part of the exam.*

No makeup exams are given - no exceptions.

The final exam will be given Friday, December 14 from 6:00 p.m. to 8:00 p.m. in GMCS 308. The final will be cumulative and comprehensive.

Project: As part of the course you will be asked to do an project. The project grade will be based in part on a brief 3-5 page written report in journal style format (i.e., 12 *pt* font, one inch margins, single-spaced, figures and tables clearly presented and labeled, page limit does not include figures, tables, nor bibliography) and a brief 5-10 minute presentation (depending on the size of the class) during the last full week of classes. You are required to attend *all* project presentations. Attendance at the presentations will be a part of your project grade.

The project will be done individually or in groups. You will illustrate and present the time series analysis concepts from class or literature. In consultation with me, you may may choose a time series dataset of interest to you. As part of the project, expect to read the appropriate literature, write a report, and give an oral presentation to demonstrate a thorough understanding of and to illustrate the techniques/methods used in the class and/or article.

Grading: The grade for the class is based on a score composed of the following.

Homework	30 %
Two Exams	40 %
Project	10 %
Final Exam	20 %

Prerequisites: STAT 551A or concurrent enrollment.

Topics to be covered: basic outline; topics may be added and/or dropped as the semester proceeds.

1. Fundamental Concepts of Stochastic Processes
   a. Means, Variances, and Covariances
   b. Autocovariance and Autocorrelation Functions
   c. Stationarity
2. Stationary and Nonstationary Time Series Models
   a. Autoregressive Processes
   b. Moving Average Processes

    c. ARMA Processes

    d. ARIMA Processes

    e. Seasonal ARIMA Models

3. Fitting Models to Data

    a. Model identification

    b. Parameter estimation

    c. Model diagnostics and model selection

4. Forecasting

    a. Point estimates for forecasts

    b. Forecast errors

    c. Forecast intervals

Tardiness and Early exits: The class time is from 5:30 - 6:45 p.m. As common courtesy to your fellow students, we would appreciate if you show up to class on time and leave when dismissed at 6:45. If you must leave early, please inform me and sit on the aisle near an exit so as not to disturb students listening to and trying to learn from the lectures.

Code of Academic Conduct on Examinations and Assignments: "At San Diego State University, students are invited to be active members of the educational community. As with any community, its members serve a vital role in determining acceptable standards of conduct, which includes academic conduct that reflects the highest level of honesty and integrity." The "Statement of Student Rights and Responsibilities clarifies for students their role as members of the campus community, setting forth what is expected of them in terms of behavior and contributions to the success of our university." "Inappropriate conduct by Students . . . is subject to discipline on all San Diego State University Campuses. The Center for Student Rights and Responsibilities coordinates the discipline process and establishes standards and procedures in accordance with regulations contained in Sections 41301-41304 of Title 5 of The California Code of Regulations, and procedures contained in Executive Order 628, Student Disciplinary Procedures for The California State University." See http://www.sa.sdsu.edu/srr/judicial for more information.

Other information: See course web page: https://edoras.sdsu.edu~babailey/stat496