STAT 520 (=MGSC 520), Forecasting and Time Series -- Fall 2021

Instructor:
David Hitchcock, associate professor of statistics
4010G Carolina Coliseum
Phone: 777-5346
Email: hitchcock@stat.sc.edu
Course Web Page: http://people.stat.sc.edu/hitchcock/stat520.html
(Also accessible via Blackboard – go to course page in Blackboard
And then click on "Course Web Page" link on left of page)

Class Meeting Times: MWF 9:40 am-10:30 am, Carolina Coliseum 3020D (COL 3020D) **or via distance by Blackboard Collaborate Ultra**

Office Hours: Mon, Tues, Wed, Fri 10:45-11:45 a.m., or **please feel free** to make an appointment to see me at other times.

Textbook: Main textbook: *Time Series Analysis with Applications in R* (2nd Edition), by J.D. Cryer and K. Chan, Springer, 2008.
Optional textbook: *Time Series: A Data Analysis Approach*, by R.H. Shumway and D.S. Stoffer, 2019.
The Shumway and Stoffer textbook is available at
https://www.stat.pitt.edu/stoffer/tsda/
That site also has all the R code used in the Shumway and Stoffer book.

Prerequisite: STAT 516 or MGSC 391, or equivalent, or permission of department

Course Outline: Chapters 1-10 of the Cryer and Chan textbook. Topics covered include: models for stationary and nonstationary time series, analysis of trends using regression methods, ARIMA model specification, transformations, parameter estimation, model diagnostics, forecasting, and seasonal ARIMA models, and (time permitting) relationships between time series, interventions and outliers (Chapter 11), and ARCH and GARCH models (Chapter 12).

Learning Outcomes: By the end of the term successful students should be able to do the following:

☕ Understand how fundamental measures such as mean, variance, and autocovariance and autocorrelation relate to time series data
☕ Understand the common models used in time series analysis
☕ Specify and estimate appropriate models for real time series data
☕ Undertake model validation and remedial action to improve models
☕ Perform advanced time series data analyses such as forecasting and inference

Exams:
There will be two take-home midterm exams (exact dates to be announced, around late September and early to mid-November). There will be an in-class final exam on Friday, December 10 at 9:00 a.m. : If you are not able to come to campus for the final exam, you must contact Shannon Carson at distributed learning (scarson@mailbox.sc.edu or 803-777-2189) to set up a proctor. See https://sc.edu/dl/ss/testsite.html for information about approved testing sites in the state of South Carolina. If you are on campus and not able to attend the final exam time because of a conflict with another class, you may either contact the distributed learning office to set up a proctor, or may arrange with me to take it at some other time.

Homework: Homework will be assigned on the course web page. Due dates will be posted given on the course web page. Late homework will be penalized and will not be accepted after solutions are posted. You must do each homework problem independently. You may not look at another student's work while doing the homework. You may ask me for help on the homework problems. If homework is found to have been copied, all students involved will receive a 0. [To be clearer, students can ask each other informal ORAL questions about homework, but **cannot look at or copy each other's homework papers**. All submitted homework must be the student's **own work** and **NOT come from any other person or external source**.]

Project: All students must do a data-analysis project. The project will contain the analysis of a real time series data set of interest using methods we have learned in this class, and a typed report detailing the findings of the analyses. The details about the project will be announced about a month into the course.

Graduate Students: Any students enrolling in the course for graduate credit will do some extra homework problems during the semester.

Grading: The course grade will be based on homework average (15%), project grade (20%), the two midterm exams (20% each), and a final exam (25%). The overall course average will result in the following grades: 90-100 = A, 87-89 = B+, 80-86 = B, 77-79 = C+, 70-76 = C, 67-69 = D+, 60-66 = D, 59 and below = F.

Computing: Some problems in this course involve significant computations, and for these, we will learn to use the free software package R. This is available in the labs and also as a free download for your home computer (see course web page for details). It is not assumed that you have much/any previous experience with R. Example code in R is given on the course web page.

During Class: No cell phones may be on during class. In the classroom where class is recorded, laptops and tablets (e.g., iPads) may be used only for note-taking and other course-related activities. Students may not use laptops and tablets to look at unrelated web pages, play games, etc.

Disabilities: Any student with a documented disability should contact the Student Disability Resource Center at 777-6142 to make arrangements for appropriate accommodations.

Exam Schedule:
Late September: Exam 1
Early- to mid-November: Exam 2
Friday, December 10, 9:00 a.m.: Final Exam