

STAT J520: Forecasting and Time Series

Fall 2015

Live class T-Th 8:30-9:45 am in Wardlaw 116

Instructor: Dr. Tim Hanson

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Office Hours: officially T/Th 11:30am-12:30pm; call first if coming from any distance. Also by appointment.

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Course description: The purpose of this course is to introduce you to the analysis of time series data. This course requires a strong familiarity with statistical methods such as confidence intervals, hypothesis tests, and regression (topics covered in STAT 515-516). Additional knowledge of probability, distribution theory, and mathematical statistics (e.g., STAT 511-513) will help; Prof. Josh Tebbs has excellent notes for these courses posted on his webpage if you need review.

Learning Outcomes: We will cover Chapters 1-10 in Cryer and Chan. We will discuss 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. After completing this course, you should have a firm understanding of these topics and be comfortable with modeling and forecasting time series data.

Expectations: All students are expected to:

- Attend or view all class sessions. Live class attendance, for those who can do so, is highly appreciated – this includes distant students calling in with live questions during the lecture. I understand that this is not possible for some of you. You are encouraged to use a computer during class to “play along” as we go.
- Review lecture required reading and/or notes before class. Handouts (if any) will usually be posted on the course webpage the day before each class.
- Attempt all of the assigned homework problems and email them to the GA by noon on the due date. Start homework **SOON** after it is assigned; this is especially true in a class involving computing. Do not email me about the assignment the night before it is due.

Required Texts:

(1) Cryer, J. and Chan, K. (2008). *Time Series Analysis with Applications in R* (2nd edition). Springer.

(2) STAT 520 course notes, created by Prof. Josh Tebbs. **Free, thanks to Dr. Tebbs!**

Course Web Page / Email: All homeworks, reading assignments, etc. will be posted to the course webpage at <http://people.stat.sc.edu/hansont/stat520/stat520.html>. Please keep up to date with the webpage as we go along. I will not use Blackboard except to post your homework and exam grades and occasionally email you as a group. Please only use the email address hansont@stat.sc.edu when emailing me.

Lectures: You may (a) attend the live class in person, or (b) watch it live via web-streaming from any remote site, with call-in or instant-message capability for real-time questions, and/or (c) watch the recorded class later with rewind, pause, and fast-forward tools. Recordings will be posted within 24 hours of the class as files which can be viewed at <http://video.sc.edu>. The ID is statistics (lowercase) and the password is ARTS#2015 (uppercase, no space). If you want to watch live at home during class time through web conferencing via Adobe Connect the link is <https://breeze.sc.edu/stat520fall2015/>

Computing: Computing: R is the computing environment used in this course. You are expected either to know R or to learn it quickly (by example during the course). The R package is available for free from www.r-project.org. Read carefully the “Introduction to R” Appendix in Cryer and Chan (starts on p. 423).

Accommodations for disabilities: If you require special accommodations for a disability, these must be arranged in advance through the Office of Student Disability Services in room 112A LeConte (777-6142, TDD 777-6744, sasds@mailbox.sc.edu).

Homework: Homework will be posted on the class website at least one week in advance of the due date; there will be about 5 or 6 homeworks total. Send your homework solutions by e-mail as a single file in MS Word or PDF format to the graduate assistant Yawei Liang (yliang@email.sc.edu) with “STAT 520 Homework” in the subject line (do not cc this email to me) by noon on the due date. Use only one side of each page, put your name on every page, and use page numbers. Any handwriting on papers must be clearly legible on the received paper after scanning - do not use soft pencil.

Exams and Project: There will be one midterm and a final exam, both take-home. There will also be a final project where you will find a time series data set of your choice and analyze, model, and forecast the series using methods learned in this course. Your analysis will be written up in a final report with abstract, body, conclusions, and appendices. Further information about the project will be given later, but you should start looking for an interesting, potential data set right away.

Grading: Your final course grade is weighted as homework 50%, project 10%, midterm 20%, and final 20%. The minimum percent needed for each grade is:

A 85% B+ 80% B 70% C+ 65% C 60% D 50%

Undergraduates will have their final grade % multiplied by the factor 1.2 (i.e. receive a 20% increase).

Honor Code: The official honor code is the *Carolinian Creed* in the *Carolina Community: Student Handbook & Policy Guide*. If you violate the honor code, I am required to report the case to the University's academic integrity office. If you are "found responsible" in the ensuing deliberations, the penalty will be at least a letter grade in the course, and I often fail students who cheat on exams.

Examples of honor code violations include but are not limited to: copying, or allowing someone else to copy, solutions to assignments or exams; posing as another student to do assignments or exams; hiring or persuading someone else to do assignments or exams in your place, etc. The whole point of this is to learn! Do not treat the course as an "obstacle" to overcome; treat it as an opportunity to develop new, powerful tools for analyzing sequential data and deepening your understanding of statistics.

Some additional comments:

- Working together on homework problems is permitted and encouraged, but each student should write up his/her solutions independently of others (this will help you develop understanding). Naturally, cheating on exams is a serious offense and will be dealt with harshly. The grading scale is purposefully generous to discourage any form of dishonesty and allow you to concentrate on the course material rather than worrying about your GPA.
- Many students find this course to be challenging, especially at the beginning where there is a large amount of theory needed. As the course progresses, students generally come to realize that this theory aids in applying statistical techniques with real time series data. Most students find the computing component (with R) to be not overwhelming.
- The distance aspect of this course affords you the flexibility to attend class at your own convenience. However, I have found that students who are not disciplined will fall behind in attendance. Stay current with the lectures! Attending live (in class) or streaming is preferred. If you watch lecture later, it helps to have a set schedule, e.g. watch at the same times each week. Re-watching portions of a lecture can help with difficult concepts. If you have questions, attend office hours, make an appointment to meet me, or email me. I can also make a Skype appointment if you live far away from campus.