STAT 5511 Fall 2023

Time Series Analysis

University of Minnesota – Twin Cities

1 Instructor and TA Information

Professor:	Charles Doss [he/him]
Email:	cdoss@umn.edu
Office:	Ford Hall 389; [Zoom Meeting: 958 9836 6246 Passcode: *dzU05a*]
Hours:	3:30–4:30pm M & F (after class)

TA:	Difan Ouyang [he/him]
Email:	ouyan146@umn.edu
location:	Ford Hall 495
Hours:	1–3pm Tues

2 Basic Course Information

Class Time:	MWF 2:30pm–3:20pm.
Location:	Peik xxx accidentally deleted
Description:	This course will cover elements of time series analysis, including ARIMA models (chap. 3 of the text [see 'Course Materials' below]), state space models, forecasting, frequency domain methods and other topics (time permitting). The course covers basic theory, methodology, and data analysis (using the statistical software R).
Prerequisites:	Basic statistics courses that cover basic probability and linear regression (STAT 5101–2 (4101–2), STAT 3032, 3302, 5302; STAT 5021). Basic matrix/vector manipulations, linearity of expectation with matrices, covariance matrices, multivariate normal distribution. Familiarity programming in the R language. Basic understanding of complex numbers is helpful. There is a *pre-requisite practice quiz* publicly available on my website at `http://users.stat.umn.edu/~cdoss/5511.shtml`. (A variation on this will be given early in the semester.)

3 Grading, Exams, Schedule

3.1 Homework

Overview: There will be on the order of 7 homeworks of varying lengths. The first ("zeroth") homework is assigned on the first day of class. The lowest HW score is automatically dropped.

Content: Assignments will require you to do basic derivations, and to write R code, analyze real data, and *clearly* summarize your results.

Submission: Homeworks may be submitted either online or may be printed out (stapled together) and submitted in class. However, homeworks submitted online will generally receive less feedback than those submitted by hard copy. You cannot submit part of a homework by hand and part electronically, it must be all one or all the other.

Policy: Assignments are **due at the beginning of class on the due date.** There is a grace period: hard copies of homework will be accepted until the end of class ("end of class" is at the professor's discretion and could be different than 3:20pm). Electronic hand-ins generally will have the turn-in option closed by the beginning of class. The lowest homework score is automatically dropped. **Thus, late submissions and resubmissions will not be accepted!** You may also drop homework off in the professor's mailbox on the 3^{rd} floor of Ford Hall (room 337). If a hard copy is being turned in early, it **must** be dropped off *two hours before class begins* on the day they are due (so I have time to pick them up). You may discuss the homework problems but you should write up the solution independently.

3.2 Exams/quizzes

Quizzes: There will be quizzes, especially in the earlier part of class. (They somewhat substitute for a first midterm, and mostly just provide motivation (together with HW's) for you to be on top of the material.) Their timing will be announced in advance (not pop quizzes). Quizzes will be short and timed. Lowest quiz score dropped. Quiz questions are generally/on average intended to be easier than midterm questions. The quiz questions will often be 0 points or full credit (especially when graded by computer). The first quiz will likely be Friday of the second week. (This quiz provides guidance on whether this course is a good fit.)

Midterms: One midterm exam in the second half of the class; the midterm exam is a takehome exam. It will probably be due on November 29th and assigned the week before that, although this is subject to change.

Final: The 'final exam' is a takehome exam that will be assigned on the last day of class or the day after, and due a few days later.

(Here is some schedule information for the semester, which you may ignore but which is sometimes helpful for scheduling context: the last day of instruction: Weds, Dec 13. Final exam period is Dec 15–22; Also, here is the university's policy on exam scheduling. Native American heritage / Thanksgiving break is Nov 24 and 25.)

3.3 Grading

- Weighting: Homework is 20%; Quizzes are 10%; The midterm is 35%; The final is 35%.
- A student taking the class P/F needs a C- or higher to earn a P.
- The lowest homework score is dropped automatically. The lowest quiz score is dropped automatically.
- The lowest quiz is dropped. Therefore, there is no makeup quiz possible. I prefer students not miss the midterm and no makeup exams will be administered; in case of illness including COVID or other excused absence, the final exam will count for the midterm exam. A missed exam for any unexcused absence will get a 0 (and may result in failing the course).

4 Course Materials

Textbooks:	Robert H. Shumway and David S. Stoffer. *Time Series Analysis & Its Applications: With R Examples (4th Edition)*, Springer. (PDF available at the UMN library website.) Additional reading materials may be posted to the course website.
Software:	*R* (available for free at http://www.r-project.org/)
Webpage/Notes:	*U of M Canvas* (https://canvas.umn.edu/). (Note: slides will be provided. But these are a supplement, *not* a replacement for lecture.)

5 Course Structure

The 'modality' for this course is 'in person'. This means I will deliver (in person) lectures in the assigned course room at the assigned time. Zoom may be used as a temporary backup option when/if it is helpful.

By default, my office hours will be by held in person in my office. If students do not wish to meet in person they may let me know and we can do a zoom meeting during the office hours period.

6 Miscellaneous

Incompletes:	Incompletes (I) are granted only in extraordinary circumstances and approval must be obtained from the instructor prior to the last day of class.
Integrity:	Students must abide by the campus regulations and student conduct code; see http://regents.umn.edu/policies/index
Disability:	Students with disabilities requiring accommodations should contact the instructor as soon as possible; see https://diversity.umn.edu/disability/.
Stress:	UMN provides services for you to help manage your mental health and stress levels; see http://www.mentalhealth.umn.edu.
Changes:	The content and requirements of this course and syllabus may be altered depending on the instructor's perception of the needs of the class. *See the course website for the current version of the course syllabus and schedule. Changes may be communicated by email so students are required to check their email.*

6.1 Recommendation Letter Policy

As a general policy, I do not write recommendation letters for any students who have not fully completed a course with me; once you have completed the course (and your final grade is available), it is then possible for me to evaluate whether I will be able to write a recommendation letter, based on your grade and our interactions in the class. (You are certainly free to ask about/discuss the possibility of my writing a letter before your grade is available, but I will not be able to offer any guarantees.)

6.2 On cell phones

I ask that you not have your cell phones out during lecture. Devices (laptops, tablets) that are needed for note taking may be used during lecture, but their use should be limited to taking notes; if I find you using them for other purposes I may ask you to put them away. (If a cell phone for some reason is needed for your note taking process or otherwise to follow along in class you may speak to me and individual exceptions can be made for phone usage during class.)

I ask this because I believe (1) that careful thinking and learning requires extended periods of focus without distraction (and we often use phones to distract ourselves precisely when material is challenging us and we would rather avoid than face the challenge) and (2) more than in other subjects, mathematical fields have many details (definitions, notation, indices, ...) that, even in the cases where they are conceptually as simple as possible, still require energy to learn and remember.

7 Academic Honesty and Dishonesty

The following definition of student academic integrity and scholastic dishonesty is slightly modified from the webpage of the University's Office for Student Conduct and Academic Integrity, http://www.oscai.umn.edu:

Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

All School of Statistics teaching faculty are instructed to refer students who violate the policy for academic honesty and dishonesty to the Office of Student Conduct and Academic Integrity. A student responsible for scholastic dishonesty can in addition be assigned a penalty up to and including an F or N for the course.

8 COVID-19 and Our Classroom

It is important to remember that there may be members of our community/society who are still in a state of vulnerability and it is good to communicate with those around us about their safety needs and take those into account in our behaviors.

9 Usage of LLMs / AI

You are allowed to use AI and Large Language Model chatbots, such as ChatGPT / Bing / etc., in the same way and sense you are allowed to use internet search (e.g. Google) or Wikipedia. You are solely responsible for all content you turn in. You need to be able to explain your work if asked about it.

You should not upload any course documents to any online platform of any type (whether Chegg or an LLM or other) since the documents do not intellectually belong to you.

10 University's SMART Learning Commons

The University's SMART Learning Commons is looking for tutors in statistics! The following is their informational blurb.

The peer tutor program hires undergraduate students with a minimum of a 3.0 gpa (3.20 is preferred). Tutors must also have earned an 'A' in all courses that they support. We have recently started our hiring process for fall. Students that are interested in applying for a tutor position should apply on UMN HR Website. Search job codes 339692 and 341556. Pang Yang (yang2901@umn.edu) is the Tutor Coordinator and is the contact for questions on application status.

Peer tutor pay starts at $12 per hour. Tutors can earn up to $15 based on the amount of training a student completes and the number of hours of tutor experience accumulated.

Peer tutors will be available in the SMART Learning Commons which are located in Walter, Wilson, and Magrath Libraries.

Some general information can be found at https://www.lib.umn.edu/spaces/smart

If you might be interested in tutoring please apply or inquire for more information!