

STAT 4840/5084

Time Series



Spring 2025

Course Information

Meetings

STAT 4840/5084 meets TTh 11:00-12:15 in Ritter 323

Instructor

Dr. Bryan Clair

bryan.clair@slu.edu

Office hours in Ritter 109: T 12:30-1:30, W 2:10-3, Fri 1:10-2, or by appointment.

Textbook

Hyndman & Athanasopoulos, *Forecasting: Principles and Practice*, 3ed. <https://otexts.com/fpp3>

Other useful sources:

- Cryer & Chan, *Time Series Analysis With Applications in R*
- Cowpertwait & Metcalfe, *Introductory Time Series with R*.

Catalog Description

Applied time series. Topics include exploratory data analysis, regression, ARIMA. Spectral analysis, state-space models. Theory and applications, taught using statistical software.

Prerequisite: STAT 3850 Foundations of Statistics.

Learning Outcomes

At the completion of this course, students will be able to:

- Visualize time series, including trend, seasonal and random components
- Model dependence in stationary time series with MA, AR or mixture
- Build models of time series for explanation and forecasting

Approximate Schedule

- Time series with R (1 week)
- Decompositions (1.5 weeks)
- Autocorrelation (1 weeks)
- Forecasting and validation (2 weeks)
- Regression models (2 weeks)
- Exponential smoothing (2 weeks)
- ARIMA models (2 weeks)
- Advanced topics and final project.

Grading

Grading is on a straight scale (uncurved), with 90%,80%,70%,60% guaranteeing A,B,C,D respectively. Grading is weighted as follows:

- Group labs: 20%
- Homework: 20%
- Quizzes: 15%
- Midterm Exam: 15%
- Final Project: 30%

Attendance

Attendance is required, as we will be doing in-class group work on most days. Excessive absences will result in loss of group lab scores, and stricter treatment with course policy - especially with assessment due dates.

Homework

Homework will be a mix of R programming and by-hand work. You will hand in your work through our course Canvas site. I encourage you to work together on homework, but write up results separately. Write your own R scripts, even if you are helping each other.

Homework grades are on a 10 point scale, although you cannot get less than 6 for a good faith effort handed in on time:

- 10 All concepts well understood, at most a few minor mistakes.
- 9 Most important concepts understood.
- 8 Some conceptual issues. Important problems incorrect or missing.
- 7 Lack of understanding of some key points. Many problems incorrect or missing.
- 6 Serious difficulty understanding the material.
- 5 Late

Late written homework is always accepted for half credit, but will not receive comments.

Graduate Assignments

Over the course of the semester, there will be a handful of problems assigned specifically for students taking the graduate STAT 5084 course. For credit, half of these problems must be completed with a satisfactory grade. Unsatisfactory work will receive comments and you may re-submit with revisions.

For STAT 5084 students, failure to complete this work will result in a reduction of up to a full letter grade.

Important Dates

- Midterm Exam: Thursday, March 6
- Spring break: March 10-14
- Easter break: No class Thursday, April 17
- Last day of class: Thursday, May 1.
- No final exam. Final project due Tuesday, May 13 at 1:50pm.

Honesty

SLU's official academic integrity policy appears later. This section gives guidelines specific to this course.

- **Homework and Group Work:** You are allowed to use most available resources to help you complete your homework, including help from your fellow classmates and internet resources. The only exception is for tutoring or homework help websites sites that allow you to post questions and receive answers. Do not use these sites – you need to understand what you're doing!
- **Exams and quizzes:** These must be your own work. No communication with others is allowed. You may use your notes and textbook. You may use the internet, but only as a reference. If you find one of our test problems posted on the internet with a solution, notify your instructor. Using such a solution in your own work violates academic integrity.

In cases when two or more students collaborate on an exam, all will be subject to penalties.

- **Generative AI:** You are allowed to use generative AI in a limited capacity in this course. Tools such as ChatGPT and similar assistants can be used on Homework assignments and Group Labs for assistance with concepts and with programming syntax. You may not use generative AI for Take Home Quizzes, Exams, or the Final Project. If you plan to use AI, have a conversation with me about whether you are using it appropriately, and document that you have used it on each assignment. Failure to discuss and disclose is grounds for an academic honesty violation.

AI will not consistently provide help using the specific tools and techniques we are learning in this class, so don't lean on it heavily. If it's not helping you learn, it's not helping you at all.

Official SLU Policies

Academic Integrity Policy

Academic integrity is the commitment to and demonstration of honest and moral behavior in an academic setting. Since the mission of the University is “the pursuit of truth for the greater glory of God and for the service of humanity,” acts of integrity are essential to its very reason for existence. Thus, the University regards academic integrity as a matter of serious importance. Academic integrity is the foundation of the academic assessment process, which in turn sustains the ability of the University to certify to the outside world the skills and attainments of its graduates. Adhering to the standards of academic integrity allows all members of the University to contribute to a just and equitable learning environment that cultivates moral character and self-respect. The full University-level Academic Integrity Policy can be found on the Provost’s Office website at:

<https://www.slu.edu/provost/policies/academic-and-course/academic-integrity-policy.pdf>

Specific instructions for this course are indicated earlier in the syllabus.

Disability Accommodations

Students with a documented disability who wish to request academic accommodations must formally register their disability with the University. Once successfully registered, students also must notify their course instructor that they wish to use their approved accommodations in the course.

Please contact the Center for Accessibility and Disability Resources (CADR) to schedule an appointment to discuss accommodation requests and eligibility requirements. Most students on the St. Louis campus will contact CADR, located in the Student Success Center and available by email at accessibility_disability@slu.edu or by phone at 314.977.3484. Once approved, information about a student’s eligibility for academic accommodations will be shared with course instructors by email from CADR and within the instructor’s official course roster. Students who do not have a documented disability but who think they may have one also are encouraged to contact to CADR. Confidentiality will be observed in all inquiries.

Title IX

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you speak with a faculty member about an incident that involves a Title IX matter, that faculty member must notify SLU’s Title IX Coordinator that you shared an experience relating to Title IX. This is true even if you ask the faculty member not to disclose the incident. The Title IX Coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you are pregnant or experiencing a pregnancy related condition, the Title IX Coordinator can assist you in understanding your rights and options as well as provide supportive measures.

Anna Kratky is the Title IX Coordinator at Saint Louis University (DuBourg Hall, room 36; anna.kratky@slu.edu; 314-977-3886). If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK or make an anonymous report through SLU’s Integrity Hotline by calling 1-877-525-5669 or online at [SLU.EDU/INTEGRITYHOTLINE](https://www.slu.edu/integrityhotline). To view SLU’s policies, and for resources, please visit the following web addresses: <https://www.slu.edu/about/safety/sexual-assault-resources/index.php>.