

Financial Time Series

Rutgers Business School 26:960:576 – Spring 2025. Session two.

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Lecture: Friday 2pm-4:50pm *Office hour:* Friday 12-2 pm or by appointment.

Objectives

This course covers methodologies pertaining to financial time series, with an emphasis on model building, accurate prediction and evaluation. Completion of this course will equip students with insights and modeling tools to analyze real world financial and business time dependent data. Students are expected to have basic working knowledge of probability and statistics including linear regression, estimation and testing from the applied perspective. We will use R throughout the course.

Course materials

Textbooks:

Analysis of Financial Time Series, by Ruey S. Tsay (John Wiley, 2010), 3rd Edition.

Forecasting: Principles and Practice, by Rob J Hyndman and George Athanasopoulos.

<https://otexts.com/fpp2/>

Reference: *Time Series Analysis and Its Applications: With R examples*, by Robert Shumway and David Stoffer.

Lecture notes

Lecture notes will be posted on canvas.

Other materials

Homework assignments, announcements, sample codes, data, and other supplemental materials will be posted on canvas.

Check canvas and your official Rutgers email account regularly.

Exams:

There will be two exams. No makeup exam will be given in general. The tentative dates for the exams are March 7th and April 25th.

Homework assignments:

Homework assignments will be given regularly. For large assignments and the final project, you are expected to work in groups of 4 students. These assignments will be graded as a group. Late homework will NOT be accepted. Credit for homework is given based on HOW the problems are solved instead of a numerical answer. Homework are due Friday by class time if not specified otherwise.

Attendance:

Attendance to each class meeting is required. Students are responsible for all announcements and supplements given within each lecture and/or via course email/canvas.

Grading:

- Homework 20%, Term project 20%, Exam one 30%, Exam two 30%
- There will be no extra credit for the course.
- Your grade is not subject to negotiation. If you feel I have made an error, submit your written argument to me within one week of receiving your grade. Clarify the precise error I made and provide all due supporting documentation. If I have made an error, I will gladly correct it. But I will adjust grades only if I have made an error. I cannot and will not adjust grades based on consequences, such as hurt pride, lost scholarships, lost tuition reimbursement, lost job opportunities, or dismissals.

Tentative Course Schedule:

- Week 1. Introduction to time series, review of basic probability and statistics methods.
- Week 2. Regression, decomposition and smoothing techniques.
- Week 3. Basic stochastic models.
- Week 4. ARIMA models.
- Week 5. ARIMA models and seasonal ARIMA models.
- Week 6. Seasonal ARIMA models, regression with TS errors.
- Week 7 Exam one.
- Week 8 ARCH and GARCH models.
- Week 9 Spring break.
- Week 10 GARCH models. Value at Risk.

- Week 11 High frequency models, Vector AR models and pairs trading.
- Week 12 Deep learning models for time series.
- Week 13 Deep learning models for time series.
- Week 14 Exam two.
- Week 15 Presentation.

Learning Outcomes

A student graduating this course will gain knowledge in the following topics:

1. The ability to approach and analyze financial time series, including high frequency data.
2. The ability to differentiate between various time series models.
3. The ability to perform cross-validation of the model developed.
4. The ability to forecast future observations of the time series.
5. The ability to assess risk and to study methods for calculating value at risk.
6. A running knowledge of R for applied time series analysis.

Disability Services

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with a Letter of Accommodations. Please share this letter with me and discuss the accommodations as early as possible. To begin this process, please complete the Registration form on the ODS web site.

Academic Integrity and Honor Code

I do NOT tolerate cheating. Students are responsible for understanding the Academic Integrity policy at <https://business.rutgers.edu/ai>. I will strongly enforce this policy and pursue all violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, "On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment." I will screen all written assignments through Turnitin, plagiarism detection services that compare the work against a large database of past work.