

Statistics
Course Number: 26:960:576
Course Title: Financial Time Series

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 (canvas.rutgers.edu) and your official Rutgers email account regularly.

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.

ACADEMIC INTEGRITY

I do NOT tolerate cheating. Students are responsible for understanding the RU Academic Integrity Policy <http://academicintegrity.rutgers.edu/>

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 *SafeAssign* or *Turnitin*, plagiarism detection services that compare the work against a large database of past work. Don’t let cheating destroy your hard-earned opportunity to learn. See business.rutgers.edu/ai for more details.

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.

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 by class time if not specified otherwise.

EXAMS

There will be two exams. Both exams will be in-class and closed book. No makeup exam will be given in general. The tentative dates for the exams are () and ().

GRADING POLICY

- 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.
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COURSE SCHEDULE

- () Introduction to time series, review of basic probability and statistics methods.
- () Regression, decomposition and smoothing techniques.
- () Basic stochastic models.
- () ARIMA models.
- () ARIMA models and seasonal ARIMA models.
- () Seasonal ARIMA models, regression with TS errors.
- () Exam one.
- () ARCH and GARCH models.
- () No class.
- () GARCH models. Value at Risk.
- () Classification techniques.

- () High frequency models and market microstructure.
- () Vector AR models and pairs trading.
- () Exam two.
- () Presentation.

SUPPORT SERVICES

If you need accommodation for a *disability*, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law Against Discrimination. More information can be found at ods.rutgers.edu.

[Rutgers University-New Brunswick ODS phone (848)445-6800 or email dsoffice@echo.rutgers.edu]

[Rutgers University-Newark ODS phone (973)353-5375 or email ods@newark.rutgers.edu]

If you are *pregnant*, the Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy.

[Rutgers University-New Brunswick Title IX Coordinator phone (848)932-8200 or email jackie.moran@rutgers.edu]

[Rutgers University-Newark Office of Title IX and ADA Compliance phone (973)353-1906 or email TitleIX@newark.rutgers.edu]

If you seek *religious accommodations*, the Office of the Dean of Students is available to verify absences for religious observance, as needed.

[Rutgers University-New Brunswick Dean of Students phone (848)932-2300 or email deanofstudents@echo.rutgers.edu]

[Rutgers University-Newark Dean of Students phone (973)353-5063 or email DeanofStudents@newark.rutgers.edu]

If you have experienced any form of *gender or sex-based discrimination or harassment*, including sexual assault, sexual harassment, relationship violence, or stalking, the Office for Violence Prevention and Victim Assistance provides help and support. More information can be found at <http://vpva.rutgers.edu/>.

[Rutgers University-New Brunswick incident report link: <http://studentconduct.rutgers.edu/concern/>. You may contact the Office for Violence Prevention and Victim Assistance at (848)932-1181]

[Rutgers University-Newark incident report link: https://cm.maxient.com/reportingform.php?RutgersUniv&layout_id=7 . You may also contact the Office of Title IX and ADA Compliance at (973)353-1906 or email at TitleIX@newark.rutgers.edu. If you wish to speak with a staff member who is confidential and does **not** have a reporting responsibility, you may contact the Office for Violence Prevention and Victim Assistance at (973)353-1918 or email run.vpva@rutgers.edu]

If students who have experienced a temporary condition or injury that is adversely affecting their ability to fully participate, you should submit a request via <https://temporaryconditions.rutgers.edu> .

If you are a military *veteran* or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. <http://veterans.rutgers.edu/>

If you are in need of *mental health* services, please use our readily available services.

[Rutgers University-Newark Counseling Center: <http://counseling.newark.rutgers.edu/>]

[Rutgers Counseling and Psychological Services–New Brunswick: <http://rhscaps.rutgers.edu/>]

If you are in need of *physical health* services, please use our readily available services.

[Rutgers Health Services – Newark: <http://health.newark.rutgers.edu/>]

[Rutgers Health Services – New Brunswick: <http://health.rutgers.edu/>]

If you are in need of *legal* services, please use our readily available services: <http://rusls.rutgers.edu/>

Students experiencing difficulty in courses due to *English as a second language (ESL)* should contact the Program in American Language Studies for supports.

[Rutgers–Newark: PALS@newark.rutgers.edu]

[Rutgers–New Brunswick: eslpals@english.rutgers.edu]

If you are in need of additional *academic assistance*, please use our readily available services.

[Rutgers University-Newark Learning Center: <http://www.ncas.rutgers.edu/rlc>]

[Rutgers University-Newark Writing Center: <http://www.ncas.rutgers.edu/writingcenter>]

[Rutgers University-New Brunswick Learning Center: <https://rlc.rutgers.edu/>]

[Optional items that many faculty include:

- Students must sign, date, and return a statement declaring that they understand the RU Academic Integrity Policy.

- Students must sign, date, and return a statement declaring that they understand this syllabus.]