Objectives

This course covers applied statistical methodologies pertaining to financial time series, with an emphasis on model building and accurate prediction. Completion of this course will equip students with insights and modeling tools to analyze real world financial and business time series. 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.

Recommended textbook:


Lecture notes will also be provided.

Exams:

There will be two exams. Both exams will be in-class. No makeup exam will be given.

Homework:

Due Thursday in class. Late homework is NOT accepted. Credit for homework is given based on HOW the problems are solved instead of a numerical answer.

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/blackboard.

Course Materials:

Lecture notes, homework assignments, supplemental materials and announcements will be posted on blackboard.
Grading:

Homework 20%, Term project 20%, Exam one 30%, Exam two 30%

Tentative Course Outline:

- Introduction to time series data. Review of basic statistical methods, numerical descriptors, simple and multiple regression, and diagnostic checks.
- Introduction to data analysis using R.
- Financial returns and their empirical properties.
- Linear time series models (AR, MA, ARMA, ARIMA).
- Conditional heteroscedastic models for volatility modeling (ARCH, GARCH, EGARCH).
- High frequency data analysis and market microstructure.
- Value at Risk (VaR), expected shortfall and extreme value theory.
- Multivariate analysis of financial returns, including pair trading.
- Multivariate time series models (Vector AR, Vector ARMA, Multivariate GARCH) (if time permits).

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 VaR and expected shortfall.
6. A running knowledge of R for applied time series analysis.

Academic integrity

Students are expected to live up to the standards of academic integrity explained at http://academicintegrity.rutgers.edu/integrity.shtml. The minimum penalty for any cheating in an exam is the immediate failure of the course. The minimum penalty for any plagiarism in an assignment is a zero point for the assignment.