Financial Time Series

Rutgers Business School 26:960:576

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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 so prior knowledge of it is welcome, but not required.

Recommended textbook:

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

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

Lecture notes will also be provided.

Exams:

There will be one midterm and one final exam. Both exams will be in-class. There will also be a term project. If you have a conflict for the exam, notify me at least one week ahead.

Course Materials:

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

Grading:

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

Tentative Course Outline:

- Introduction to basic statistical methods, visual descriptors, numerical descriptors, simple and multiple regression, and diagostic 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 time series models (Vector AR, Vector ARMA, Multivariate GARCH).

- Multivariate analysis of financial returns, including pair trading.

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.