Syllabus

AUG
2019

Overview

This course is an introduction to empirical methods in high-frequency financial econometrics. Its focus is on understanding the core theory and applying its theorems to observed high-frequency financial data. Students will work with high-frequency data on different financial assets and create weekly project reports. The course is designed for students interested in obtaining a general understanding of high-frequency financial econometrics.

Textbook

The course is mainly based on lecture notes. However, a more in-depth coverage of the topics we will discuss are available in the books:

- High-frequency Financial Econometrics by Ait-Sahalia and Jacod
- Discretization of Processes by Jacod and Protter

Readings

- Lecture Notes
- Papers from the literature (indicated in the lecture notes)

Prerequisites

- This course is intended for Duke MA and PhD students.
- Undergraduate econometrics or advanced statistics is required. Specifically, students should be comfortable with the notions of asymptotic approximations.
- Programming skill in Matlab is required.
- Students must have the latest version of Matlab (2019a) installed, which is freely available via Duke OIT services.
- Students using the Windows operating system must have installed Git for Windows.
- Students must have installed the appropriate version of Latex for their operating system (Tex Live for Windows, Mactex for Mac).
- The following software packages can be learned over the semester: Latex, Bash and Git.

Grades

- Final grade will be based on weekly projects, a midterm and a final examination.

- Exams can be either 36-hour take home or in-class closed book with a note sheet allowed.
- Grade Division:
  - Projects: 40%
  - Midterm: 30%*
  - Final: 30%
- *If a student misses the midterm for any reason, then its weight is placed on the final examination. If a student attempts the midterm but fails to turn it in, then this student's midterm score is recorded as zero.

Projects

- Projects will be assigned on a weekly basis.
- Problem sets are individual. Each student must do the entire problem set. This includes: writing your own code, making your own plots, interpreting the results, and preparing a `pdf` report with Latex.
- The best way to learn the contents of the course and obtain an excellent grade is to do the hard work yourself.
- Grading of Projects:
  - Projects are due by midnight of the announced due date (usually a week after the project was posted).
  - No late projects are accepted (no exceptions).
  - Grading is done on a 0-10 scale.
  - Projects with excessive overlap with other student's answers will receive a zero grade. Students must uphold the Duke Community Standard.

Topics and Exam Schedule

We will cover the following topics:

- Simulation of jump diffusion processes
- Implied volatility
- Volatility signature plot
- Separating jump returns
- Truncated variance
- Inference for integrated variance
- Realized beta
- Bootstrapping standard errors
- Local variance estimator
- Jump regression
- Variance forecasting with AR, HAR and RQ models
- Black-Scholes options pricing
- Microstructure noise effects on realized variance
- Two-scale realized variance

The exams will take place on the following days:

- **Midterm Date: October 1st**

- **Final Exam Date: November 26th**