Course Description. This course covers the empirical techniques used most often in the analysis of financial markets, i.e., financial econometrics, as well as the implementation of these techniques to financial datasets. The techniques covered in this course include: asymptotic statistical inference, continuous-time econometrics, nonparametric methods, Bayesian decision theory, discrete-choice models, Monte Carlo simulation, and numerical optimization techniques. Each of these methods is developed in the context of nine specific financial applications which are described below in the 15.442 List of Topics. Only a subset of these topics can be covered in a one-semester course, and registered students will have an opportunity to influence the particular topics covered in any given year. In the recent past, the most popular topics have been: predictability in asset returns, market efficiency, event-study analysis, market microstructure, static asset-market models, and derivative pricing models.

Pre-requisites. This course is intended for Sloan finance Ph.D. students. Therefore, the pre-requisites include 15.416 and all other requirements of the finance Ph.D. program, e.g., 14.381–14.383 (statistics and econometrics), 14.121–14.124 (microeconomics), etc. Recommended co-requisites include: 18.177 (Stochastic Processes) and 18.466 (Mathematical Statistics). This course is computationally intensive and some rudimentary programming and data analysis skills are necessary. Students without these pre-requisites may enroll only with the permission of the instructor.

Course Requirements and Grading. Course requirements include: regular attendance and class preparation in lectures and recitations, an empirical research paper (60 percent), and a final examination (40 percent). The empirical research paper is to be written in two parts: a preliminary draft with a complete literature review and an outline of the empirical work to be conducted is due at the end of the semester (Monday, December 11th, 2006), and the final draft with the completed empirical analysis is due at the end of IAP (Monday, February 5th, 2007). The final examination will be a take-home final, to be distributed at the end of class on Monday December 4th and collected on Monday December 11th at 4:00pm–please reserve these dates immediately and schedule your travel plans accordingly.

Course Materials. The following materials will be used in this course (required texts are indicated by asterisks):

- Lo*, 2006, 15.442 Lecture Notes, MIT Graphic Arts.
- Silvey, 1975, Statistical Inference, Chapman and Hall.
Class Preparation and Participation. Class preparation is an important component of this course (unlike most other Ph.D. courses). Students are expected to come to each class well prepared to discuss the materials assigned (a combination of textbook chapters and journal articles). In addition, there may be short assignments distributed in each class for discussion during the following class. These are to be treated like “case-study” assignments that require advance preparation, and students should expect to be “cold-called” in class to present their analyses.

Reading List. For each of the nine topics described below, the 15.442 Reading List lists at most five articles or books that will be most relevant to class discussion. These citations do not necessarily indicate the most important works in each literature, but either serve some specific pedagogical purposes or are biased towards more recent papers that are most relevant to doctoral students looking for thesis topics. The 15.442 Lecture Notes for each topic will contain more complete bibliographies.
15.442 List of Topics

1. Predictability of Asset Returns
   a. Economic Rationales for Predictability
   b. Rejecting the Random Walk Hypothesis
   c. Mean Reversion, Momentum, and Dynamic Trading Strategies
   d. Liquidity and Predictability
   e. Technical Analysis

2. Market Efficiency, Behavioral Finance, and Neuroeconomics
   a. Classical and Modern Notions of Market Efficiency
   b. Early Tests of Efficiency and Rationality
   c. Recent Tests of Present Value Relations, Arbitrage Relations, and Expectations
   d. An Empirical Perspective on Behavioral Finance
   e. Evolutionary Psychology, Sociobiology, and Neuroeconomics

3. Hedge Funds
   a. Overview of the Hedge Fund Industry
   b. Empirical Properties of Hedge-Fund Returns
   c. Risk Analytics for Hedge Funds
   d. Asset-Pricing Implications of Hedge-Fund Performance
   e. Systemic Risk and Hedge Funds

4. Market Microstructure
   a. Overview of Market Structures
   b. Statistical Aspects of Market Microstructure
   c. Economic Aspects of Market Microstructure
   d. Measuring and Controlling Trading Costs
   e. Estimating Microstructure Models

5. Event Studies
   a. The Market Model and Multi-Index Models
   b. Statistical Inference for Event Studies
   c. Limitations and Extensions of the Methodology
   d. Example: Post-Earnings Announcement Drift
6. **Static Asset-Market Models**
   a. Estimating and Testing the CAPM
   b. Estimating and Testing the APT
   c. Recent Empirical Evidence
   d. Size, Power, and Data-Mining Issues
   e. Trading Volume and Asset-Market Models

7. **Dynamic Asset-Market Models**
   a. Dynamic General Equilibrium Models
   b. The Consumption CAPM and GMM
   c. Asset-Pricing Bounds
   d. The Equity Risk Premium
   e. MacroFinance

8. **Derivative Pricing Models**
   a. Continuous-Time Stochastic Processes
   b. Estimating Diffusions and Jump Processes
   c. Binomial Pricing Models
   d. Monte Carlo Methods for Pricing Derivatives
   e. Nonparametric Derivative Pricing Models

9. **Fixed-Income Markets**
   a. Empirical Properties of Real and Nominal Interest Rates
   b. Equilibrium and Arbitrage Models of the Term Structure
   c. Estimating Default Probabilities and Credit Ratings
   d. Credit Markets and Credit Derivatives

10. **Non-Standard Finance**
    a. Technical Analysis
    b. Econophysics
    c. Agent-Based Markets
    d. Evolutionary Models of Finance Markets
15.442 Reading List*

0. Introduction


1. Predictability of Asset Returns


2. Market Efficiency, Behavioral Finance, and Neuroeconomics


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* Asterisks denote readings that will be emphasized in lectures.
3. **Hedge Funds**


4. **Market Microstructure**


5. **Event Studies**


6. **Static Asset-Market Models**


7. **Dynamic Asset-Market Models**


8. **Derivative Pricing Models**


9. Fixed-Income Markets


10. Nonstandard Finance


