

15.442J/14.442J Advanced Financial Economics III

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.
- Campbell, Lo, and MacKinlay*, 1997, *The Econometrics of Financial Markets*, Princeton University Press.
- Hamilton, 1993, *Time Series Analysis*, Princeton University Press.
- 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

Cox, D., 1990, “Role of Models in Statistical Analysis”, *Statistical Science* 5, 169–174.

* Leamer, E., 1983, “Let's Take the Con Out of Econometrics”, *American Economic Review* 73, 31–43.

* McCloskey, D. and S. Ziliak, 1996, “The Standard Error of Regressions”, *Journal of Economic Literature* 34, 97–114.

Silvey, S., 1975, *Statistical Inference*. London: Chapman and Hall.

1. Predictability of Asset Returns

* Boudoukh, K., Richardson, M. and R. Whitelaw, 2005, “The Myth of Long-Horizon Predictability”, SSRN Working Paper (<http://ssrn.com/abstract=862285>).

Kirby, C., 1998, “The Restrictions on Predictability Implied by Rational Asset Pricing Models”, *Review of Financial Studies* 11, 343–382.

Jegadeesh, N. and S. Titman, 2001, “Profitability of Momentum Strategies: An Evaluation of Alternative Explanations”, *Journal of Finance* 56, 699–720.

* Lo, A. and C. MacKinlay, 1990, “When Are Contrarian Profits Due to Stock Market Overreaction?”, *Review of Financial Studies* 3, 175–206.

Richardson, M. and J. Stock, 1990, “Drawing Inferences from Statistics Based on Multiyear Asset Returns”, *Journal of Financial Economics* 25, 323–348.

2. Market Efficiency, Behavioral Finance, and Neuroeconomics

* Camerer, C., Loewenstein, G. and D. Prelec, 2005, “Neuroeconomics: How Neuroscience Can Inform Economics”, *Journal of Economic Literature* 43, 9–64.

Boudoukh, K., Richardson, M., Shen, Y. and R. Whitelaw, 2003, “Do Asset Prices Reflect Fundamentals? Freshly Squeezed Evidence from the OJ Market”, NBER Working Paper No. 9515.

* Lo, A., 2004, “The Adaptive Markets Hypothesis: Market Efficiency from an Evolutionary Perspective”, *Journal of Portfolio Management* 30, 15–29.

Roll, R., 1984, “Orange Juice and Weather”, *American Economic Review* 74, 861–880.

Shefrin, H., 2005, *A Behavioral Approach to Asset Pricing*. Amsterdam: Elsevier.

* Asterisks denote readings that will be emphasized in lectures.

3. Hedge Funds

Fung, W. and D. Hsieh, 1997, "Empirical Characteristics of Dynamic Trading Strategies: The Case of Hedge Funds", *Review of Financial Studies* 10, 275–302.

- * Getmansky, M., Lo, A. and I. Makarov, 2004, "An Econometric Analysis of Serial Correlation and Illiquidity in Hedge-Fund Returns", *Journal of Financial Economics* 74, 529–609.

Gupta, A. and B. Liang, 2005, "Do Hedge Funds Have Enough Capital? A Value-at-Risk Approach", *Journal of Financial Economics* 77, 219–253.

Liang, B., 2000, "Hedge Funds: The Living and the Dead", *Journal of Financial and Quantitative Analysis* 35, 309–326.

Agarwal, V. and N. Naik, 2004, "Risks and Portfolio Decisions Involving Hedge Funds", *Review of Financial Studies* 17, 63–98.

4. Market Microstructure

- * Bertsimas, D. and A. Lo, 1998, "Optimal Control of Execution Costs", *Journal of Financial Markets* 1, 1–50.

- * Evans, M. and R. Lyons, 2005, "Understanding Order Flow", NBER Working Paper No. 11748.

Lo, A., MacKinlay, C. and J. Zhang, 2002, "Econometric Models of Limit-Order Execution Times", *Journal of Financial Economics* 65, 31–71.

Lo, A. and J. Wang, 2004, "Asset Prices and Trading Volume under Fixed Transactions Costs", *Journal of Political Economy* 112, 1054–1090.

- * Roll, R., 1984, "A Simple Implicit Measure of the Effective Bid–Ask Spread in an Efficient Market", *Journal of Finance* 39, 1127–1139.

5. Event Studies

- * Bernard, V. and J. Thomas, 1990, "Evidence That Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings", *Journal of Accounting and Economics* 13, 305–340.

Chandy, P., Davidson, W. and S. Garrison, 1985, "Bad News = Good News! Who Can Tell?", *Journal of Portfolio Management* 12, 24–27.

Holthausen, R. and R. Leftwich, 1986, "The Effect of Bond Rating Changes on Common Stock Prices", *Journal of Financial Economics* 17, 57–90.

- * MacKinlay, C., 1997, "Event Studies in Economics and Finance", *Journal of Economic Literature* 35, 13–39.

Salinger, M., 1992, "Standard Errors in Event Studies", *Journal of Financial and Quantitative Analysis* 27, 39–53.

6. Static Asset-Market Models

Black, F., 1993, “Beta and Return”, *Journal of Portfolio Management* 19, 8–18.

Fama, E. and K. French, 1992, “The Cross-Section of Expected Stock Returns”, *Journal of Finance* 47, 427–465.

* Jagannathan, R. and E. McGrattan, 1995, “The CAPM Debate”, *Federal Reserve Bank of Minneapolis Quarterly Review* 19, 2–17.

* Lo, A. and J. Wang, 2000, “Trading Volume: Definitions, Data Analysis, and Implications of Portfolio Theory”, *Review of Financial Studies* 13, 257–300.

* MacKinlay, C., 1995, “Multifactor Models Do Not Explain Deviations from the CAPM”, *Journal of Financial Economics* 38, 3–28.

7. Dynamic Asset-Market Models

Cochrane, J., 2005, “Financial Markets and the Real Economy”, unpublished working paper, September.

* Hansen, L. and K. Singleton, 1982, “Generalized Instrumental Variables Estimation of Nonlinear Rational Expectations Models”, *Econometrica* 50, 1269–1286.

Heaton, J. and D. Lucas, 1996, “Evaluating the Effects of Incomplete Markets on Risk Sharing and Asset Pricing”, *Journal of Political Economy* 104, 442–487.

Mehra, R. and E. Prescott, 2003, “The Equity Premium in Retrospect”, in G. Constantinides, M. Harris, and R. Stulz, eds., *Handbook of the Economics of Finance*, Volume 1B. Amsterdam: Elsevier, North Holland,

* Lo, A. and J. Wang, 2005, “Trading Volume: Implications of an Intertemporal Capital Asset Pricing Model”, to appear in *Journal of Finance*.

8. Derivative Pricing Models

* Ait-Sahalia, Y. and A. Lo, 1998, “Nonparametric Estimation of State-Price Densities Implicit in Financial Asset Prices”, *Journal of Finance* 52, 499–548.

* Bertsimas, D., Kogan, L. and A. Lo, 2000, “When Is Time Continuous?”, *Journal of Financial Economics* 55, 173–204.

Lo, A. and J. Wang, 1995, “Option Pricing Models When Asset Returns Are Predictable”, *Journal of Finance* 50, 87–129.

* Pan, J., 2002, “The Jump-Risk Premia Implicit in Options: Evidence from an Integrated Time-Series Study”, *Journal of Financial Economics* 63, 3–50.

Rubinstein, M., 1994, “Implied Binomial Trees”, *Journal of Finance* 49, 771–818.

9. Fixed-Income Markets

- * Chan, K., Karolyi, A., Longstaff, F. and A. Sanders, 1992, “An Empirical Comparison of Alternative Models of the Short-Term Interest Rate”, *Journal of Finance* 47, 1209–1227.
- Cochrane, J. and M. Piazzesi, 2005, “Bond Risk Premia”, *American Economic Review* 95, 138–160.
- Cox, J., Ingersoll, J. and S. Ross, 1981, “A Re-examination of Traditional Hypotheses About the Term Structure of Interest Rates”, *Journal of Finance* 36, 769–799.
- * Dai, Q. and K. Singleton, 2003, “Term Structure Dynamics in Theory and Reality”, *Review of Financial Studies* 16, 631–678.
- Piazzesi, M., 2003, “Affine Term Structure Models”, to appear in Y. Ait-Sahalia and L. Hansen, ed.s, *Handbook of Financial Econometrics*. Amsterdam: Elsevier.

10. Nonstandard Finance

- * Farmer, D., 2002, “Market Force, Ecology and Evolution”, *Industrial and Corporate Change* 11, 895–953.
- Gopikrishnan, P., Plerou, V., Amaral, L., Meyer, M. and E. Stanley, 1999, “Scaling of the Distributions of Fluctuations of Financial Market Indices”, *Physical Review E* 60, 5305–5316.
- * LeBaron, B., 2005, “Agent-Based Computational Finance”, to appear in K. Judd and L. Tesfatsion, eds., *The Handbook of Computational Economics*, Vol. II. Amsterdam: Elsevier.
- Lo, A., Mamaysky, H. and J. Wang, 2000, “Foundations of Technical Analysis: Computational Algorithms, Statistical Inference, and Empirical Implementation”, *Journal of Finance* 55, 1705–1765.
- * Shyam Sunder, 2004, “Markets as Artifacts: Aggregate Efficiency from Zero-Intelligence Traders”, in M. Augier and J. March, eds., *Models of a Man: Essays in Memory of Herbert A. Simon*. Cambridge, MA: MIT Press,