University of Pennsylvania
The Wharton School

FNCE 911:
Foundations for Financial Economics

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Fall 2004
Classes: Tu/Th 1:30-3:00
Office Hours: Wed 2:30-4:00

Course Description

The objective of this course is to undertake a rigorous study of the theoretical foundations of modern financial economics. The course will cover the central themes of modern finance including individual investment decisions under uncertainty, stochastic dominance, mean-variance theory, capital market equilibrium and asset valuation, arbitrage pricing theory, option pricing and the potential application of these themes. Upon completion of this course, students should acquire a clear understanding of the major theoretical results concerning individuals' consumption and portfolio decisions under uncertainty and their implications for the valuations of securities.

Prerequisites

The prerequisites for this course are graduate level microeconomics (Economics 681 or Economics 701), matrix algebra, and calculus. The microeconomics courses may be taken concurrently.

Course Material

The required textbook for this course is:

- HL: C.F. Huang and R. Litzenberger, 1988, *Foundations for Financial Economics*, Prentice Hall.

A recommended complementary text is:

- LW: S. LeRoy and J. Werner, 2001, *Principles of Financial Economics*, Cambridge University Press.

Other excellent texts that cover related material are:

- J. Campbell, A. Lo, A. MacKinlay, 1996, *The Econometrics of Financial Markets*, Princeton University Press. (See especially chapters 5-11)
- J. Cochrane, 2001, *Asset Pricing*, Princeton University Press. (See especially chapters 1-9, 17-21)
- D. Duffie, 2001, *Dynamic Asset Pricing Theory* 3rd edition, Princeton University Press. (See especially chapters 1-4)
- J. Ingersoll, 1987, *Theory of Financial Decision Making*, Rowman and Littlefield.

For background reading, the following textbooks may be useful:

- A. Mas-Colell, M. Whinston, and J. Green, 1995, *Microeconomics Theory*, Oxford University Press, New York.
- W. Rudin, 1976, *Principles of Mathematical Analysis*, McGraw Hill, New York.

Course Work and Grading

Homework assignments will be handed out every Tuesday (starting on Sept. 21) and will be due in class the following Tuesday. While you may work on the homework in groups, you must hand in your own answers. Homework assignments will be graded on a three point scale.

There will be a closed-book final during the final exam period. Students are expected to come to class and to actively participate in class discussion. Final grades will be determined by 20% homework and 80% final exam. Class participation will count for students on the margin between grades.

Course Outline and Readings

Note: Dates are approximate

1. **Decision Making under Uncertainty** (Sept. 9, 14, 21)

   - Outline
     - Expected utility representations
     - Risk aversion
     - Insurance premium; certainty equivalent wealth
     - A simple portfolio choice problem and its comparative statics
     - Some important utility functions
     - Global risk aversion
   - Readings:
     (a) HL Chapter 1
     (b) LW Chapters 8, 9, 11, 12.1–12.3
     (c) Cass, D., and J. Stiglitz, 1970, The structure of investor preferences and asset returns, and separability in portfolio allocation: a contribution to the pure theory of mutual funds, *Journal of Economic Theory* 2, 122-160.
     (d) Pratt, J., 1964, Risk aversion in the small and in the large, *Econometrica* 32, 122-136.
     (e) Ross, S., 1981, Some stronger measures of risk aversion in the small and large with applications, *Econometrica* 49, 621-638.

2. **Stochastic Dominance** (Sept. 23, 28)

   - Outline
     - Motivation
     - First order stochastic dominance
     - Second order stochastic dominance
     - A definition of risk; mean-preserving spreads
   - Readings
     (a) HL Chapters 2.1–2.10
     (b) LW Chapters 10, 12.4, 12.5
     (c) Rothschild, M., and J. Stiglitz, 1970, Increasing risk I: a definition, *Journal of Economic Theory* 2, 225-243.

3. **Mean-Variance Portfolio Analysis** (Sept. 30, Oct. 5)

   - Outline
     - Motivation
     - Notation and definitions
     - Characterization of minimum variance portfolios
     - Properties of minimum variance portfolios
     - The case with a riskless asset
   - Readings
     (a) HL Chapter 3
     (b) Roll, R., 1977, A critique of the asset pricing theory's tests, *Journal of Financial Economics* 4, 129-176. (Pay special attention to the Appendix)

4. **Portfolio Separation and the Capital Asset Pricing Model (CAPM)** (Oct. 12, 14)

   - Outline
     - First derivation of the CAPM
     - One and two-fund separation
     - Second derivation of the CAPM
   - Readings
     (a) HL Chapters 4.1–4.17
     (b) Black, F., 1972, Capital market equilibrium with restricted borrowing, *Journal of Business* 45, 444-454.
     (c) Brennan, M., 1971, Capital market equilibrium with diverged borrowing and lending rates, *Journal of Financial and Quantitative Analysis* 1971, 1197-1205.
     (d) Ross, S., 1978, Mutual fund separation in financial theory: the separation distributions, *Journal of Economic Theory* 17, 254-286.
     (e) Sharpe, W., 1964, Capital asset prices: a theory of capital market equilibrium under conditions of risk, *The Journal of Finance* 19, 425-442.

5. **Arbitrage Pricing Theory** (Oct. 19, 21)

   - Outline
     - The linear factor model
     - An economy with 1 factor and no residual risk
     - An economy with k factors and no residual risk
     - An economy with k factors and residual risk
   - Readings
     (a) HL Chapters 4.18–4.22
     (b) LW Chapters 20.1–20.5
     (c) Huberman, G., 1983, A simplified approach to arbitrage pricing theory, *Journal of Economic Theory* 28, 1983-1991.
     (d) Ross, S., 1976, Arbitrage Theory of Capital Asset Pricing, *Journal of Economic Theory*13, 341-360.

6. **State-Contingent Claims** (Oct. 28, Nov 2)

   - Outline
     - Pareto-optimal allocations
     - Complete markets economy and competitive equilibrium
     - Security markets economy
     - Using options to complete markets
     - Representative agent
     - Aggregation
   - Readings
     (a) HL Chapter 5
     (b) LW Chapters 1, 14, 15
     (c) Arrow, K., 1964, The role of securities in the optimal allocation of risk-bearing, *Review of Economic Studies* 31, 91-96.
     (d) Hansen, L., and S. Richard, 1987, The role of conditioning information in deducing testable restrictions implied by asset pricing models, *Econometrica* 55, 587-614.
     (e) Rubinstein, M., 1974, An aggregation theorem for securities markets, *Journal of Financial Economics* 1, 225-244.

7. **State Prices and Arbitrage** (Nov 4, 9)

   - Outline
     - Definitions of arbitrage
     - Fundamental theorem of asset pricing
     - Link to equilibrium pricing
     - Application to options
   - Readings
     (a) HL Chapters 6.1–6.9
     (b) LW Chapters 2, 3, 5, 6, 18

8. **Multi-Period Security Markets** (Nov. 11, 16)

   - Outline
     - Information structure
     - Pareto optimal allocations and rational expectations equilibria
     - Complete markets competitive equilibrium
     - Security market equilibrium and dynamic completeness
   - Readings
     (a) HL Chapters 7.1–7.8, 7.11-7.15
     (b) LW Chapters 21, 23
     (c) Radner, R., 1972, Existence of equilibrium of plans, prices, and price expectations in a sequence of markets, *Econometrica*, 40, 289-303.

9. **Characterizing Optimal Consumption and Investment Policies: Dynamic Programming** (Nov. 18, 23, 30, Dec 2)

- Outline
  - Dynamic programming
  - Characterization of optimal consumption and investment policies
  - Representative agent revisited
  - Consumption CAPM
  - Extensions to non-expected utility
- Readings
  (a) HL Chapters 7.9, 7.10, 7.16, 7.19, 7.20, 7.22
  (b) Campbell, J., 2002, Consumption-based asset pricing, forthcoming in *Handbook of the Economics of Finance*, G. Constantinides, M. Harris, and Rene Stulz (eds.), North-Holland.
  (c) Constantinides, G., 1987, Theory of valuation: overview and recent developments, in *Frontiers of Financial Theory*, G. Constantinides and S. Bhattacharya (eds.), Rowman and Littlefield, Totowa, New Jersey.
  (d) Epstein, L., S. Zin, 1991, Substitution, risk aversion, and the temporal behavior of consumption and asset returns: An empirical analysis, *Journal of Political Economy* 99, 263-286.
  (e) Lucas, R., 1978, Asset prices in an exchange economy, *Econometrica* 46, 1426-1446.
  (f) Mehra, R., and E. Prescott, 1985, The equity premium puzzle, *Journal of Monetary Economics* 15, 145-161.
  (g) Samuelson, P., 1969, Lifetime portfolio selection by dynamic stochastic programming, *Review of Economics and Statistics* 51, 239-246.
  (h) Sargent, T., 1987, *Dynamic Macroeconomic Theory*, Harvard University Press, Cambridge, MA, Chapter 1.

10. **Optimal Consumption/Investment Policies and Asset Pricing: The Martingale Representation Approach** (Dec 4, 9, 11)

- Outline
  - Definition of a martingale
  - Martingale property of prices and no-arbitrage
  - The martingale representation technology
  - Characterization of optimal consumption and investment policies
  - Asset pricing
  - The binomial model
  - Term structure models
- Readings
  (a) HL Chapter 8
  (b) LW Chapters 22–26
  (c) Backus D., S. Foresi, and C. Telmer, 1998, Discrete-time models of bond pricing, Working Paper, New York University.
  (d) Cox, J., and S. Ross, 1976, The valuation of options for alternative stochastic processes, *Journal of Financial Economics* 3, 145-166.
  (e) Cox, J., S. Ross, and M. Rubinstein, 1979, Option pricing: a simplified approach, *Journal of Financial Economics* 7, 229-263.
  (f) Harrison, M. and D. Kreps, 1979, Martingales and arbitrage in multi-period securities markets, *Journal of Economic Theory*, 20, 381-408.
  (g) Naik, V., 1995, Finite state securities market models and arbitrage, in *Handbooks in OR and MS*, Volume 9, R. Jarrow et. al (eds.), Elsevier, North-Holland.