

University of Pennsylvania  
The Wharton School

FNCE 911:  
Foundations for Financial Economics

Prof. Jessica A. Wachter

Fall 2020

Classes: Mondays 1:30–4:30

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Office hours: Wednesday 4:00–5:00

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## 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 website for this course can be accessed through Canvas:  
<https://canvas.upenn.edu>.  
On this website you can find lecture notes, sample problems, announcements.
- All readings are optional, but may be helpful. The textbook is  
C.F. Huang and R. Litzenberger, 1988, *Foundations for Financial Economics*,  
Prentice Hall.

On the syllabus, readings from the textbook are prefaced by HL. This textbook is out of print. You can find the chapters on the course website.

- Following each topic, there is a list of recommended articles which can also be found on the website.

## Other reading

Some excellent texts that cover material related to this course are:

- K. Back, 2010, *Asset Pricing and Portfolio Choice Theory*, Oxford University Press.
- J. Y. Campbell, 2018, *Financial Decisions and Markets*, Princeton University Press. (See especially chapters 1–6)
- J. Cochrane, 2005, *Asset Pricing* Revised Edition, 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)

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

All times below are Eastern Time.

There will be two midterms, a final, and a class presentation. The midterms are each worth 20% of the grade. The presentation is worth 10%, and the final 50%.

- Midterm 1: available 8am on 10/7, due 8am on 10/8
- Midterm 2: available 8am on 11/4, due 8am on 11/5
- Final: available 8am on 12/17, due 8am on 12/18

All exams are open book/notes. They are to be taken under adherence to the University's honor code. Midterms are designed for a prepared student to complete them in 1 hour. The final is designed for a prepared student to complete in 2 hours.

For each topic, there will be sample questions and answers posted on Canvas. There will also be exams from previous years. Students are highly encouraged to work through these problems without looking at the answers as preparation for the quizzes and the final exam, and as the best way to learn the material.

To further enhance participation, and to further preparation for the exams, each student will be asked to give a 10 minute presentation (with 5 additional minutes for questions, thus for a total of 15 minutes) on a problem from a problem set, or a previous exam question of their choosing. Students will be graded based on accuracy and clarity of these presentations (this is worth 10% of the total grade). Please seek approval of the question preparing it.

## **Teaching Assistant**

The teaching assistant for this course is Maria Gelrud. She can be reached by email at [mgelrud@wharton.upenn.edu](mailto:mgelrud@wharton.upenn.edu). Her office hours will be announced on canvas the first week of class.

## Course Outline and Readings

Note: Dates are approximate. On 10/2 (the first quiz), there will be a lecture for the second half of class. There will be no class on 10/9 due to the Yom Kippur holiday. Following the University schedule, there will not be class the Wednesday before Thanksgiving.

### I Decision Making under Uncertainty 9/14

- Outline
  - Expected utility representations
  - Risk aversion
  - Insurance premium
  - Portfolio choice
  - Important utility functions
  - Stochastic dominance
- Readings:
  - (a) HL Chapters 1, 2.1–2.10
  - (b) 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.
  - (c) Pratt, J., 1964, Risk aversion in the small and in the large, *Econometrica* 32, 122-136.
  - (d) Ross, S., 1981, Some stronger measures of risk aversion in the small and large with applications, *Econometrica* 49, 621-638.
  - (e) HL Chapters 2.1–2.10
  - (f) Rothschild, M., and J. Stiglitz, 1970, Increasing risk I: a definition, *Journal of Economic Theory* 2, 225-243.

## II Mean-Variance Portfolio Analysis 9/21

- Outline
  - Notation and definitions
  - Characterization of minimum variance portfolios
  - Properties of minimum variance portfolios
  - The case with a riskless asset
- Readings
  - (a) 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)

## III The Capital Asset Pricing Model (CAPM) Online class (9/28 cancelled)

- Outline
  - Statement of the CAPM
  - 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) Fama, F., and K. French, 2004, The capital asset pricing model: Theory and evidence, *Journal of Economic Perspectives* 18, 25-46.
  - (e) Ross, S., 1978, Mutual fund separation in financial theory: the separation distributions, *Journal of Economic Theory* 17, 254-286.
  - (f) Sharpe, W., 1964, Capital asset prices: a theory of capital market equilibrium under conditions of risk, *The Journal of Finance* 19, 425-442.

#### IV Arbitrage Pricing Theory 10/5

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

#### V State-Contingent Claims 10/12, 10/19

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

## VI State Prices and Arbitrage 10/26

- Outline
  - Definitions
  - Fundamental theorem of asset pricing
  - Complete markets
  - Option pricing in two periods
- Readings
  - (a) HL Chapters 6.1–6.9
  - (b) Dybvig, P., S. Ross, 2003, Arbitrage, state prices, and portfolio theory, in *Handbook of the Economics of Finance*, G. Constantinides, M. Harris, and R. Stulz (eds.), North-Holland, Amsterdam, The Netherlands.

## VII Multi-Period Securities Markets 11/2

- Outline
  - Description of the economy
  - Pareto optimal allocations and complete markets
  - Rational expectations equilibrium
  - Dynamic completeness
  - Securities market equilibrium
- Readings
  - (a) HL Chapters 7.1–7.8, 7.11-7.15
  - (b) Kreps, D., 1982, Multiperiod securities and the efficient allocation of risk: A comment on the Black-Scholes option pricing model, in *The Economics of Uncertainty and Information*, J. McCall (ed.), University of Chicago Press, Chicago, Illinois.

## VIII Characterizing Optimal Consumption and investment policies: Dynamic Programming 11/9, 11/16

- Outline
  - Markov property
  - Value function
  - Euler equation
  - Example: logarithmic utility
  - Infinite horizon recursive formulation
- Readings
  - (a) HL Chapters 7.9, 7.10, 7.16, 7.19, 7.20, 7.22
  - (b) Campbell, J., and L. Viceira, 1999, Consumption and portfolio decisions when expected returns are time-varying, *Quarterly Journal of Economics* 114, 433–495.
  - (c) Epstein, L., and 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.
  - (d) Grossman, S., and R. Shiller, 1982, Consumption correlatedness and risk measurement in economies with non-traded assets and heterogeneous information, *Journal of Financial Economics* 10, 195–210.
  - (e) Levhari, D., and T. N. Srinivasan, 1969, Optimal savings under uncertainty, *The Review of Economic Studies* 36, 153–163.
  - (f) Samuelson, P., 1969, Lifetime portfolio selection by dynamic stochastic programming, *Review of Economics and Statistics* 51, 239–246.



## IX The Fundamental Theorem Revisited 11/23, 11/30

- Outline
  - Notation and definitions
  - Martingale property of prices and no-arbitrage
  - Market completeness
  - Characterizing optimal consumption and investment policies: Martingale method
  - Example: The binomial model
- Readings
  - (a) HL Chapter 8
  - (b) Cox, J., and S. Ross, 1976, The valuation of options for alternative stochastic processes, *Journal of Financial Economics* 3, 145-166.
  - (c) Cox, J., S. Ross, and M. Rubinstein, 1979, Option pricing: a simplified approach, *Journal of Financial Economics* 7, 229-263.
  - (d) Duffie, D., 2003, Intertemporal asset pricing theory, in *Handbook of the Economics of Finance*, G. Constantinides, M. Harris, and R. Stulz (eds.), North-Holland, Amsterdam, The Netherlands.
  - (e) Harrison, M. and D. Kreps, 1979, Martingales and arbitrage in multi-period securities markets, *Journal of Economic Theory*, 20, 381-408.

## X Representative Agent Asset Pricing 12/7, 12/10

- Outline
  - The iid lognormal model
  - The consumption CAPM
  - The yield curve
  - Equity strips
  - Rare events
- Readings
  - (a) Barro, R., 2006, Rare disasters and asset markets in the twentieth century, *Quarterly Journal of Economics* 121, 823–866.
  - (b) van Binsbergen, J., M. Brandt, and R. Koijen, On the timing and pricing of dividends, *American Economic Review* 102, 1596–1618.
  - (c) Campbell, J., 2003, Consumption-based asset pricing, in *Handbook of the Economics of Finance*, G. Constantinides, M. Harris, and R. Stulz (eds.), North-Holland, Amsterdam, The Netherlands.

- (d) Lettau, M., and J. Wachter, 2007, Why is long-horizon equity less risk? A duration-based explanation of the value premium, *Journal of Finance* 62, 55–92.
- (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) Tsai, J., and J. Wachter, 2015, Disaster risk and its implications for asset pricing, *Annual Review of Financial Economics* 7, 219–252.