FINS 5574
FINANCIAL DECISION-MAKING UNDER UNCERTAINTY

Instructor

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Consultation hours: Friday 14:00 – 17:00
Appointments can be taken outside consultation hours

Course description

Objectives of the course

- Provide the foundations for analyzing investment and other key financial decisions
- Introduce fundamental concepts (e.g., risk aversion, marginal utility, risk neutral pricing, diversification, equilibrium pricing, moral hazard, adverse selection, etc.)
- Present some important analytical tools in finance (e.g., optimization, dynamic programming, stochastic analysis, game theory, etc.)
- Analyze theoretical implications in asset pricing (e.g., CAPM) and institutional behavior of financial and non-financial organizations (e.g., credit rationing, securities underpricing, managers' performance remuneration, etc.)

Approach of learning

- Emphasize the logical steps in developing the concepts and results
- Insist on the intuition rather than the technical details
- Pay special attention to the similarities and differences between different results
- Stress the link between the assumptions and the implications
- Combine formal lectures with exercises and paper presentations

In this respect, the exercises and reading materials have been carefully selected
Participants are especially advised to

- Familiarize themselves with the course contents,
- Read the indicated articles before attending classes
- Work out the exercises

Position of the course in finance curriculum

- No prior exposure to finance theory is required
- However, general understanding of the organization and role of capital markets and financial institutions, and investment management (portfolio management) and corporate financial management (funding) will be useful
- Basic knowledge of calculus, functional analysis, and probability is assumed

This course is not directly concerned with

- Empirical testing of asset pricing theory (see, advanced asset pricing)
- Practical investment applications (see, portfolio management)
- Valuation of specific derivative securities (see, options and futures)
- Practical financial management (see, advanced corporate finance)

Course assessment

Home assignment/ Paper presentation	30
Mid Session	30
Final Exam	40
Total	100

Reference Textbooks

Huang and Litzenberger, *Foundations for Financial Economics*, Prentice Hall, 1988 Cochrane, *Asset pricing*, Princeton University Press, 2000

Merton, *Continuous time finance*, Blackwell, 1990

Rasmussen, *Games and information*, Oxford University Press, 1989

PART I – ASSET RISK, ASSET ALLOCATION & ASSET PRICING

Week 1. --- Expected Utility Theory

Objective: provide a framework for understanding how risk influences investor decisions; explain investors' risk taking behavior; in particular, their demand for risky assets

The structure of investor preferences
Axiomatic foundations of utility
Examples of utility functions
Measures of risk aversion
Certainty equivalence, risk premium
Risk aversion and the demand for risky assets

Readings: Huang & Litzenberger, chapter 1

Week 2. --- Portfolio theory

Objective: solve the optimal asset demand of investors in the (specific) mean variance framework; analyze the set of frontier/efficient portfolios; emphasize the benefits of diversification in reducing risk

Risk vs. return: the mean variance framework
Characterizing the mean variance investor's portfolio
The efficient frontier of risky assets
Decomposition of efficient portfolios

Readings: Huang & Litzenberger, chapter 3

Week 3. --- CAPM

Objective: provide a theoretical foundation for the pricing of risky assets based on the structure of investors' demand for risky assets

Market equilibrium: definition
Market price of risk, decomposition of risk
Beta and the security market line (SML)

Readings: Huang & Litzenberger, chapter 4

Week 4. --- APT

Objective: provide an alternative foundation for the pricing of risky assets; does not depend on investors' preferences, but requires a factor structure of asset returns

Limitations of CAPM
One (market) risk factor may not be enough to describe asset returns
Linear factor models
Identifying the underlying risk factors

Readings: Huang & Litzenberger, chapter 3

Week 5. --- Multi-period Portfolio and Asset pricing models

Objective: extend the previous analysis and results to a multi-period setting; show how investors structure their demand for risky assets through time; show that the demand function for risky assets is very similar to the one-period case already analyzed

Introduction to dynamic programming
The indirect utility function, Bellman equation
Optimal portfolio strategies
Multi-period Equilibrium, ICAPM, Merton (1973)
The consumption based CAPM, Breeden (1979)

References (optional reading)

- Robert Merton (1980), Continuous time finance, Blackwell (Chapters 5-6, 15)
- Robert Merton (1971), "Optimum Consumption and Portfolio Rules in a Continuous-Time Model", Journal of Economic Theory, vol. 3, pp. 373-413
- Robert Merton (1973), "An Intertemporal Capital Asset Pricing Model", Econometrica, vol. 41, pp. 867-87
- Douglas Breeden (1979) "An intertemporal asset pricing model with stochastic consumption and investment opportunities," Journal of Financial Economics, vol.7, pp. 265-296

Week 6. --- Derivative asset pricing: Arbitrage arguments

Objective: show how arbitrage arguments allow derivative asset pricing without the explicit knowledge of investors' preferences; because investors' preferences have already been factored in the price of the primitive assets; give an introduction to the risk neutral pricing technique

Introduction to arbitrage pricing
Replication of derivative cash flows
Change of probability measure and risk neutral pricing

- John Cox, Stephen Ross, and Mark Rubinstein (1979) "Option Pricing: A Simplified Approach, Journal of Financial Economics, vol. 7, pp. 229-63

- Richard Rendleman and Brit Bartter (1979) "Two-State Option Pricing", Journal of Finance, vol. 34, pp. 1093-1110

Week 7. --- Derivative asset pricing/ Applications

Objective: extend the arbitrage arguments to continuous time; show that derivatives like options can be priced without direct knowledge of investors' preferences

Introduction to stochastic calculus
Ito formula, Feynman Kac, Girsanov theorem
Fundamental asset pricing equation
Risk neutral pricing

- Fischer Black and Myron Scholes (1973) "The Pricing of Options and Corporate Liabilities", Journal of Political Economy, vol. 81, pp. 637-54

Interest rates applications (if time permits; otherwise home assignment)

Objective: apply arbitrage arguments to the pricing of interest rates derivatives; provide a theory of the term and risk structure of interest rates;

Pricing of zero coupon bonds and interest rate options
Introduction to credit risk and credit derivatives
Structural models of bankruptcy

- Vasicek (1977) "An equilibrium characterization of the term structure," Journal of Financial Economics, Volume 5, Pages 177-188
- Merton (1974) "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates", Journal of Finance, vol. 29, pp. 449-70

Week 8. --- Mid-term exam

PART II – GAME THEORY IN FINANCE

Week 9. --- Introduction to Game Theory

Objective: analyze situations where the payoffs (welfare) of one player depends not only on his own actions, but also on the actions of other players

Modeling strategic interactions
Prisoner's dilemma and other stylized games
Solution concepts: dominance, backward induction
Definition of Nash Equilibrium,

Readings: Rasmussen, chapter 1

Week 10. --- Games and information

Objective: analyze situations where players have different information; show how the informational asymmetry influences the strategies of players

Games with imperfect information
Mechanism design, optimal contracts, incentive compatibility
The principal agent framework
Moral Hazard, Adverse selection, and signaling problems in finance and insurance

Readings: Rasmussen, chapter 2 & beginning of chapter 7

Week 11. --- Moral Hazard

Objective: analyze the situation where the agent can take some action unobserved by the principal; show how the principal can structure the contract so that the agent will however take an optimal action in the principal's interest

Moral Hazard in the principal agent framework
Controlling Moral Hazard: Incentive contracts
Agency problems in corporate finance
Agency cost from ownership/management separation

Readings: Rasmussen, chapter 7

- Michael Jensen and William Meckling (1976) "Theory of the firm: Managerial behavior, agency costs and ownership structure", Journal of Financial Economics, volume 3, pp. 305-360
- Ram Ramakrishnan and Anjan Thakor, (1984) "The Valuation of Assets under Moral Hazard", Journal of Finance, vol. 39, pp. 229-38

Week 12. --- Adverse selection

Objective: analyze the situation where the agents have private information unknown to the principal; show how the principal can structure the contracts so that each agent will choose the contract that is intended for his type

Readings: Rasmussen, chapter 9

Adverse selection in the job market; in the used car market; in the insurance market:

- George Akerloff (1970) "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism", Quarterly Journal of Economics, vol. 84, pp. 488-500
- Michael Rothschild and Joseph Stigliz (1976) "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information," Quarterly Journal of Economics, vol. 90, pp. 630-49

Week 13. --- Signaling

Objective: show how the agent can credibly convey his private information to the principal when doing so improves his welfare (utility)

Readings: Rasmussen, chapter 11

Signaling with dividend policy
Signaling with retained share in the firm

- Michael Spence (1973) "Job Market Signaling", Quarterly Journal of Economics, vol. 87, pp. 355-74
- Stephen Ross (1977), "The Determination of Financial Structure: The Incentive Signaling Approach", Bell Journal of Economics, vol. 8, pp. 23-40
- Hayne Leland and David Pyle (1977) "Informational Asymmetries, Financial Structure, and Financial Intermediation", Journal of Finance, vol. 32, pp. 371-87
- Sudipto Bhattacharya (1979) "Imperfect Information, Dividend Policy, and the Bird in the Hand Fallacy, Bell Journal of Economics, vol. 10, pp. 259-70

Week 14. --- Review

Moral Hazard and signaling

- David Baron (1982) "A Model of the Demand for Investment Banking Advising and Distribution Services for New Issues", Journal of Finance, vol. 37, pp. 955-76