ICEF, Higher School of Economics Moscow
MSc Programme in Financial Economics
Year 2007-2008
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Financial Economics I (Asset Pricing) Course Syllabus

Objectives of the Course

This course gives an introduction to the economics and mathematics of financial markets. Being the first course in finance within the ICEF Master Programme in Financial Economics, it introduces the students to the relevant modeling techniques for asset pricing. This will be useful for later courses in Corporate Finance, Fixed Income, Derivatives, Portfolio and Risk Management.

Three pricing principles are considered – non-arbitrage, individual optimality, and equilibrium. The first principle is especially useful for pricing derivative instruments (e.g. an option contract) whenever we know (or assume) what the price of the underlying asset (e.g. a stock) is and how it evolves. In order to price the whole universe of financial assets, however, we need to investigate how investors make their investment decisions (individual optimality) and how the coordination of these investors on the financial markets leads to the formation of prices (equilibrium analysis). Many of the models are treated at three different levels – as one-period, multi-period and continuous time models. This is necessary in order to understand the whole variety of models in financial economics. Furthermore, in many cases continuous time models are more tractable and have more elegant solutions than dynamic models in discrete time. Although the focus of the course is on theory, we shall comment on some empirical evidence and on how these theories are used in financial practice.

In my opinion, it is very useful to absorb the ideas and mathematics of financial models by doing small applications on the computer. MATLAB

is a convenient programming language for this purpose. We will dedicate one practice session to give you an introduction to MATLAB, and you are required to solve a part of the homework exercises on the computer.

Prerequisites

Microeconomics I (concepts of utility functions and equilibrium), a good understanding of calculus, algebra, and basic probability theory. Beyond that, the course should be self-contained.

Methods of learning

The following methods and forms of study are used in the course

- Lectures (3 hours a week)
- Classes (1 hour a week). They serve mainly to solve the homework assignments (see next point).
- Written homework assignments, containing paper-and-pencil exercises and applications in Matlab. Doing homework exercises is crucial for understanding and practicing the material.
- Self-study: read the corresponding sections in the lecture notes and in the chapters in the textbooks as indicated in the course outline below.
- A course paper and its presentation in class. Here are some hints for writing the paper. You can choose one of two options for the format of the paper.
  - First option: You write a *research proposal* on a topic in financial economics. It should contain an original research idea. You need to explain the idea and how it relates to the existing literature on 5 to 10 pages. Note that you do not have to actually carry out this research (you may want to do it later in your Master Thesis). Note that a proposal is not a descriptive essay on some topic, neither is it a critical literature survey only. The main task is to present your research question, be it theoretical or empirical, and

a possible strategy to address it. You should come up with a topic yourself, but you are of course welcome to discuss it with me.

- Second option: You work on a *practical project* applying the knowledge acquired in the course. It could be either some simulation exercise, and involve some programming, preferably in Matlab. Or you do some econometric analysis of real data. You need to describe the task and report the results on 5 to 10 pages plus tables, figures, computer code, which you should put into the appendix. You should discuss your idea with me before starting to work on it. If you don't have an own idea you may ask me for an assignment.
- Presentation: There will be a presentation session at the end of the course. The length of the presentation should be 8 to 10 minutes. State at the beginning to which of the two categories your paper belongs to: the research proposal or the practical project. Stress in your presentation what is new about your idea if you belong to the first category. Give us some details how you did the programming if you belong to the second category. We can have a short discussion right after each presentation.
- In general, the course paper and its presentation should lead to an exchange of research ideas and discussions among you. Also, the work on this paper and the discussion should help you to choose your topic for your Master Thesis, which does *not* say that you *have to* continue this line of research.

Readings

Required: Cvitanić, Jakša and Fernando Zapatero, Introduction to the Economics and Mathematics of Financial Markets, MIT Press 2004 [short **CZ**].

Required readings of journal papers (on an occasional basis) will be announced in class.

Recommended: Neftci, Salih N., An Introduction to the Mathematics of Financial Derivatives, 2nd edition, San Diego Academic Press, 2000 [short **N**].

Munk, Claus, Financial Asset Pricing Theory, mimeo, [short **M**] http://www.sam.sdu.dk/∼cmu/cmu_pub3.htm.

Additional: LeRoy, Stephen and Jan Werner, Principles of Financial Economics, Cambridge University Press, 2001.

Lengwiler, Yvan, Microfoundations of Financial Economics, Princeton University Press, 2004.

Other classical texts such as Huang and Litzenberger (1988) Ingersoll (1987), and Cochrane (2001) can be consulted as well.

Evaluation

- *Homework* Randomly chosen problem sets are marked. The grade for homeworks accounts for 15% of the final grade. It will be calculated as the product of the average grade of the marked problem sets and the fraction of problem sets that you have turned in completely.
- *Course paper*: The grade will be based both on the presentation and the paper itself. The **deadline** for the course paper is Thursday, May 22. Every day of delay in turning in the paper rests 10 percentage points. Be prepared to present your work in class shortly after this deadline. The course paper accounts for 20% of the final grade.
- The *midterm exam* accounts for 15%.
- The rest of the grade (50%) comes from the *final exam.*

  Exam questions in the midterm and the final exam will be similar in style to the homework assignments. They are mostly quantitative exercises, and your understanding of general concepts of the course will be asked in some parts of them where you should interpret or explain some result.

Course Outline

This outline lists the topics to be covered in the course with the corresponding chapters in CZ, M, and N, and gives an approximate time schedule.

Part I – Asset Pricing Models and the No-Arbitrage Principle

- Week 1. Introduction: The terminology of financial markets; Bond prices and interest rates under certainty; An example of a simple asset pricing model. CZ 1,2, M 1, N 1,2.
- Week 2-4. Building Blocks of Asset Pricing Models: Review of probability theory and stochastic processes. Stochastic calculus. One-period, multi-period and continuous time models. No-arbitrage and market completeness. Stochastic discount factors and Arrow-Debreu securities. Risk-neutral probabilities. CZ 16, 3.1-3.3, 3.6, M 2-4, N 2, 9-12
- Week 5-6. The Basics of Option pricing: Binomial model and Black & Scholes formula. CZ 6-7, M 11-12, N 13

Part II – Individual optimality

- Week 7. Individual preferences, utility theory, and risk-aversion. CZ 4.1, M 5
- Week 8-9. Optimal consumption and portfolio choice. Dynamic programming. CZ 4.2-4.3, M 6
- Week 10. A Special Case – Mean-variance analysis. CZ 5.1, M 6.2.5.

Part III – Equilibrium models

- Week 11. Equilibrium fundamentals: Concept of equilibrium, representative agent, existence and Pareto-optimality. CZ 12, M 7
- Week 12-13. Consumption CAPM and CAPM. Asset Pricing Puzzles. Alternative Utility Specifications. CZ 13, M 8, 9.2
- Week 14. Multifactor models. CZ 14, M 9.
- Week 16. Review; Presentation of course papers.