



Industrial
per l'Elaborazione Automatica



and Applied Mathematics

Mathematical Finance Course

Segrate, 13-14-15 settembre 1999

Mathematical finance is currently in a phase of explosive growth, and there is very indication it will continue growing rapidly for a while yet.

The growth is due to a combination of demand from financial institutions and a seminal breakthrough in the mathematical theory of option pricing based on the Black-Scholes model. Consequently, an alternative career path is now available to mathematicians, physicists and engineers.

This course is aimed at mathematicians, physicists, and engineers, as well as economists, who are either considering a career in mathematical finance, or who would simply like to learn more about an exciting interdisciplinary subject in rapid growth. Accordingly, the mathematical background required for the course is that of a Laurea in Science, Engineering or Economics.

The main purpose of the course is to introduce and explain the basic principles and methods for pricing and hedging derivatives and new sophisticated financial instruments. The course will include the following:

- **The Black-Scholes model**

The model is based on the principle of "No Arbitrage", on attainability of contingent claims, and on assumptions about the stochastic price process. We will discuss the meaning of volatility, implied volatility, volatility evolution and volatility trading. We will also discuss some weaknesses of the model.

- **Modeling financial security markets**

We will illustrate the two fundamental principles of asset pricing, the absence of arbitrage and completeness, which leads to the probabilistic approach to asset pricing and to the martingale pricing technology.

- **Derivative industry and financial engineering**

We will consider some more recent approaches to pricing and hedging new financial products. Since the Black-Scholes model was published in 1973, a whole fauna of exotic options.

- **Case study**

Dr. P. Wilmott from the University of Oxford will present a case study, and will discuss some of the most recent issues in financial engineering.

- **Hands-on experience**

To illustrate the theory, we provide the participants with programs for option pricing that should be modified to solve simple exercises. These programs can be taken home, with no restrictions on later use.

- **Scientific coordinator: prof. Vincenzo Capasso**

MIRIAM, Dipartimento di Matematica, Università degli Studi di Milano.

Full professor of mathematical statistics at the Faculty of Sciences of the University of Milano. Visiting professor at various universities, including Maryland, Oxford, Linz, Heidelberg. Member of various professional associations, and on the editorial boards of international journals. Ordinary member of the International Statistical Institute, Vice-President of the European Society of Mathematical and Theoretical Biology (ESMTB), President of the European Consortium for Mathematics in Industry (ECMI), Coordinator of the Milan Research Centre for Industrial and Applied Mathematics (MIRIAM). Member of the Committee for the Applications of Mathematics of the European Mathematical Society (EMS). Author of more than 100 publications and monographs on various

fields of pure and applied Mathematics and Statistics.

Titolare della cattedra di Statistica Matematica presso la facoltà di Scienze della Università di Milano. È stato Professore Visitatore in diverse università straniere, tra cui la Maryland University, Oxford, Linz, Heidelberg. Membro di varie associazioni scientifiche e di comitati editoriali a livello internazionale; Membro Ordinario dell'International Statistical Institute; Vice Presidente della Società Europea per la Biologia Matematica e Teorica (ESMTB), Presidente del Consorzio Europeo per la Matematica Industriale (ECMI), Coordinatore di MIRIAM (Milan Research Centre for Industrial and Applied Mathematics). Membro della Commissione per le Applicazioni della Matematica della Società Matematica Europea (EMS). Autore di oltre 100 pubblicazioni e monografie in diverse aree della Matematica e Statistica pure e applicate.

- **Lecturer: Prof. Marco Frittelli**
Facoltà di Economia, Università II, Milano.

PhD in Financial Mathematics, Associate Professor of Financial Mathematics at the 2nd Milan University. Specialized in arbitrage pricing and in modeling incomplete security markets. He investigated the fundamental theorem of asset pricing and proposed a model of option pricing based on the principle of entropy minimization. Invited lecturer at Cambridge, Columbia, Humboldt, Vienna, Zurich ETH and Oberwolfach, among many others.

Dottore di ricerca in Matematica Finanziaria e Professore Associato di Matematica Finanziaria presso l'Università di Milano. I principali contributi dell'attività di ricerca riguardano la teoria della valutazione finanziaria e dei mercati finanziari incompleti, con particolare riguardo al teorema fondamentale di valutazione e al modello di pricing basato sul principio di minimizzazione dell'entropia. Conferenziere invitato in molte istituzioni e università fra cui Cambridge, Columbia, Humboldt, Vienna, Zurich ETH and Oberwolfach.

- **Lecturer: Dr. Henrik Rasmussen**
Dipartimento di Matematica, Università degli Studi di Milano.

PhD in Applied Mathematics from the University of Cambridge. Currently post-doc at MIRIAM, and part-time with the Mathematical Finance Group at the University of Oxford. Research concern models for high-frequency data and asymptotic analysis of stochastic volatility models for option prices. In the past, post-doc and long-term visitor at Cambridge, Oxford, Ecole Normale Supérieure in Paris, CNRS in Marseille.

- **Guest lecturer: Dr. Paul Wilmott**
Mathematical Finance Group, Mathematical Institute, University of Oxford, UK. Author of numerous papers and several books on mathematical finance, including the best-selling *Derivatives*. He is principal lecturer at the Mphil course in finance at the University of Oxford, leader of the mathematical finance group at the Mathematical Institute at Oxford, director of Wilmott Associates, a training and consulting company based in London.

Schedule for the course

13th September

- Introduction to Financial Concepts
M. Frittelli
- Introduction to software
H. Rasmussen

14th September

- Introduction to Stochastic Analysis
V. Capasso
- Software Laboratory
H. Rasmussen

15th September

- A Case Study
P. Wilmott
- Software Laboratory
H. Rasmussen

Literature:

- *Derivatives*, P Wilmott, (Wiley, 1998).
- *Financial calculus*, Baxter & Rennie, (CUP, 1996).
- Lecture notes for the course will be made available in advance.

PARTECIPAZIONE

Si prega di confermare la partecipazione a:
CILEA - Segreteria Tecnica
Tel. 02/2135520 - Fax 02/2135520
e-mail: cileaset@cilea.it