UNIVERSITÀ degli STUDI di CATANIA

DEPARTMENT OF ECONOMICS AND BUSINESS
Master's Degree in Corporate finance
Academic Year 2019/2020 - 2° Year

MODELLI MATEMATICI PER I MERCATI FINANZIARI

SECS-S/06 - 9 CFU - 2° Semester

Teaching Staff

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LEARNING OBJECTIVES

1.Knowledge and understanding

The purpose of the course is the acquisition of theoretical principles concerning the financial decisions under risk and uncertainty (stochastic dominance, expected utility, Cumulative Prospect Theory, ...), the most important theories of financial portfolios (mean-variance, CHAPM, APT) and the use of some tools for managing financial risk. Beyond the indispensable theoretical knowledge, properly formalized, we also intend to transfer adequate professional skills to deepen the topics covered by an operational point of view.

The teaching methodologies are designed to develop students' professional skills using also multimedia, database access, use of spreadsheets, etc.

The exam is composed of a written test and an oral examination, withe the goal of testing for the student's knowledge, his understanding of the abstract concepts, and their translation from an operational point of view.

During the entire course, knowledge and understanding are tested on a continuous basis, and a fruitful and active participation by students is always stimulated.

2. Applying knowledge and understanding

Special attention is also paid to operating activities of future graduates, who are facing the problems professionally before mentioned, often under different assumptions or in different contexts, also transversal and interdisciplinary. To this end, teachers use a teaching method with the emphasis to the acquisition operations ("know-how") of the analytical tools and concepts proposed during the teaching of the discipline, aiming to develop critical skills of the student in a continuous process interaction analysis - synthesis, also presenting in the classroom appropriate real cases, guiding the study and analysis with the help of educational tools and technology more appropriate. Teachers care in its review of final learning the actual acquisition of these skills, even proposing and discussing critically and constructively with students drawn from them prepared with these precipue purposes.

3. Making judgments

The development of a critical ability in the context of the topics covered is a major educational objectives of teaching.

A good acquisition of theoretical knowledge and operational chapabilities in the program of education is not enough for a complete training of the student if such preparation is not accompanied by the acquisition of a thorough, independent, socially and morally responsible for chapacity assessment, setting and resolution of a problem, proposing models that consider more appropriate analysis of financial issues considered. Such awareness serves as a guide to teachers throughout the training of discipline, making them interact with students in a constructive logic, in order to stimulate all phases of teaching, their chapacity for reflection, acquisition and interpretation of the information needed and Data essential, although insufficient or incomplete, for the management of complex issues, the construction and understanding of formal models, both descriptive and prescriptive. The focus is, therefore, training of research of economic and financial information sources, both traditional and modern, more appropriate (consultations of specialized publications, databases, websites, etc.),

4. Communication skills

the teaching will put the student in a position to transfer to third parties, even non-specialists, with clarity, precision and language appropriate technical, information, analysis, value judgments, projects and proposals on complex financial issues, that on the job will face.

The student is continually urged to make oral and formally their thoughts in proper arguments and techniques, to draft documents in writing, to prepare presentations

multimedia, individually and in groups, to discuss what has been presented in the classroom, to stimulate a fruitful collaboration on the level of communication. The final exam is an additional chance for reflection and verification of the various communication skills actually achieved by the student.

5. Learning skills

will provide students both an encouragement for a more active participation as possible to the entire educational process and for an improvement in the method of study and the purpose of a more effective learning of the discipline, presenting characteristics precipue in terms of learning by means of an appropriate process inductive - deductive.

COURSE STRUCTURE

the training activity foresees both traditional frontal teaching activities (lessons and exercises) with the help of slides, PC projector, use of EXCEL, of MATLAB.

DETAILED COURSE CONTENT

Completeness of the financial markets; Arbitrage strategies; State preference model; Absence of Non-arbitrage ; Utility theory; Theorem of Von Neumann Morgenstern; Stochastic dominance of the first order and second order; First and second order stochastic dominance characterization; Paradoxes of Allais, Ellsberg and St. Petersburg; Properties of utility functions. Certain equivalent, risk premium, ARA, RRA; Main utility functions; mean - variance principle compatible with expected utility theory; Markowitz portfolio theory; Single-index model; CAPM; Performance indicators; APT; European and American calls and Puts; Cox-Ross-Rubinstein binomial model; Neutral risk probability: replicating portfolio and delta hedging; American options in the binomial model; Spreads, Combinations on Options; Lognormal distribution of prices; Black-Scholes differential equation; Black-Scholes formula in the case of European call and put; Greeks of options; Strategies with the greeks; Exotic options: Cash or nothing options, chooser, barrier, lookback and Asian options.

TEXTBOOK INFORMATION

(1) E. Castagnoli, Matematica dei Mercati Finanziari, Egea, 2017

(2) E. J. Elton, M. J. Gruber ,“Modern portfolio theory and investment analysis”, Wiley, 2002.

(3) J. Hull, Options, Futures, and Other Derivatives, 7th Edition, Pearson, 2018

(4) E. Rosazza Gianin, C. Sgarra. From Binomial Model to Risk Measures. In: Mathematical Finance: Theory Review and Exercises. UNITEXT, vol 70. Springer, Cham, 2013

(5) D. Luenberger , Finanza e Investimenti, Apogeo, Milano 2006.

(6) J. Cvitanic, F. Zapatero, Introduction to the Economics and Mathematics of Financial Markets.The MIT Press Cambridge, Massachusetts London, England, 2004.

(7) D.J. Higham, An Introduction to Financial Option Valuation: Mathematics, Stochastics and Computation, Cambridge University Press, 2012
