

Course guide

200653 - FQ - Quantitative Finance

Last modified: 20/06/2023

Unit in charge: School of Mathematics and Statistics
Teaching unit: 1004 - UB - (ENG)Universitat de Barcelona.

Degree: MASTER'S DEGREE IN STATISTICS AND OPERATIONS RESEARCH (Syllabus 2013). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** Spanish, English

LECTURER

Coordinating lecturer: LUIS ORTIZ GRACIA

Others: Segon quadrimestre:
LUIS ORTIZ GRACIA - A

PRIOR SKILLS

The course assumes basic knowledge of probability, statistics, and programming. No prior knowledge of finance is necessary.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

5. CE-1. Ability to design and manage the collection of information and coding, handling, storing and processing it.
 6. CE-2. Ability to master the proper terminology in a field that is necessary to apply statistical or operations research models and methods to solve real problems.
 7. CE-3. Ability to formulate, analyze and validate models applicable to practical problems. Ability to select the method and / or statistical or operations research technique more appropriate to apply this model to the situation or problem.
 8. CE-5. Ability to formulate and solve real problems of decision-making in different application areas being able to choose the statistical method and the optimization algorithm more suitable in every occasion.
- Translate to english
9. CE-6. Ability to use appropriate software to perform the necessary calculations in solving a problem.
 10. CE-7. Ability to understand statistical and operations research papers of an advanced level. Know the research procedures for both the production of new knowledge and its transmission.
 11. CE-8. Ability to discuss the validity, scope and relevance of these solutions and be able to present and defend their conclusions.
 12. CE-9. Ability to implement statistical and operations research algorithms.

Transversal:

1. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.
2. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
3. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
4. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

The course consists of weekly theoretical sessions in which the student must participate having read previously the provided material. Problems will be solved on the blackboard and implementations of methodologies learned will be carried out by means of programs in R or any other language chosen by the student.

LEARNING OBJECTIVES OF THE SUBJECT

- Know the derivatives market and valuation theory in the absence of arbitrage
- Know the discrete and continuous models in finance
- Become familiar with some of the methods of pricing options
- Know the most common risk measures
- Study state-of-the-art methods in measuring options portfolio risk

STUDY LOAD

Type	Hours	Percentage
Self study	80,0	64.00
Hours large group	30,0	24.00
Hours small group	15,0	12.00

Total learning time: 125 h

CONTENTS

1. Modelling and valuation of derivatives

Description:

- 1.1. Discrete-time models
- 1.2. Geometric Brownian motion and Black-Scholes formula
- 1.3. Monte Carlo simulation and pricing in continuous time

Full-or-part-time: 75h

Theory classes: 18h

Laboratory classes: 9h

Self study : 48h

2. Computational risk management

Description:

- 2.1. Basic concepts in risk management
- 2.2. Options portfolio risk

Full-or-part-time: 50h

Theory classes: 12h

Laboratory classes: 6h

Self study : 32h



GRADING SYSTEM

CONTINUOUS ASSESSMENT

Continuous assessment consists of two follow-up tests (PS1 and PS2), and a practice (PR) proposed during the semester. PS1 and PS2 have a weight of 40% each, and PR has a weight of 20%.

SINGLE ASSESSMENT

Single assessment consists of a written examination that includes the entire content of the subject and represents 100% of the final grade.

BIBLIOGRAPHY

Basic:

- Hull, J. C. Options, futures and other derivatives [on line]. Prentice Hall, 2012 [Consultation: 07/07/2023]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6661730>. ISBN 9781292410623.
- Seydel, R. U. Tools for computational finance [on line]. Springer, 2012 [Consultation: 26/06/2023]. Available on: <https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-1-4471-2993-6>. ISBN 3540279261.
- Glasserman, P. Monte Carlo methods in financial engineering. Springer, 2003. ISBN 9780387004518.
- Hassler, U. Stochastic processes and calculus : an elementary introduction with applications. Springer, 2016. ISBN 3319234277.
- McNeil, A. J.; Frey, R.; Embrechts, P. Quantitative risk management : concepts, techniques and tools. Princeton University Press, 2005. ISBN 0691122555.