Course guide
200653 - FQ - Quantitative Finance

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: 2022  ECTS Credits: 5.0  Languages: Spanish, English

LECTURER

Coordinating lecturer: HELENA CHULIÀ SOLER

Others: Segon quadrimestre:
HELENA CHULIÀ SOLER - A
TONY KLEIN - A

L'idioma d'impartició d'aquesta assignatura canvia depenent del professor
El idioma de impartición de esta asignatura cambia dependiendo del profesor que la imparta
The teaching language of this subject depends on the professor who teaches it

PRIOR SKILLS

The course assumes basic levels of statistics similar to those that can be achieved in the first semester of the Master. Some basic concepts related to Finance would help to follow the course. The prior skills that are desirable are the ones from the course "Time Series" or to be familiar with ARIMA models (see the second chapter of the book "Analysis of Financial Time Series" de Ruey S. Tsay, Ed. Wiley, 2nd edition).

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 on theoretical sessions where the student has to participate having read before the material. There will be practice sessions and lab classes. Students must present a report on a case study corresponding to each topic. In addition to this, they (in group or individually) must present and discuss a scientific paper.

LEARNING OBJECTIVES OF THE SUBJECT
- To model the volatility of financial time series
- To use volatility models to forecast the volatility of financial time series
- Critical analysis of scientific papers
- To know the derivatives market and valuation theory in the absence of arbitrage
- To get familiar with some option pricing models
- To study the most common methods for measuring market risk

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>12.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
</tbody>
</table>

Total learning time: 125 h
CONTENTS

1. Volatility models

Description:
1.1. Statistical properties of financial series
1.2. Modelling univariate volatility
1.3. Specification, estimation and diagnostic of GARCH models
1.4. Forecasting with GARCH models
1.5. Multivariate GARCH models

Full-or-part-time: 62h 30m
Theory classes: 15h
Laboratory classes: 7h 30m
Self study: 40h

2. Option valuation and risk measurement

Description:
2.1. Derivatives, arbitrage and risk neutral valuation formula
2.2. Binomial trees and Black-Scholes formulas
2.3. Option valuation by Monte Carlo and reduction of variance
2.4. Stochastic volatility and interest rates models
2.5. Methods of measuring risk on a portfolio of options

Full-or-part-time: 62h 30m
Theory classes: 15h
Laboratory classes: 7h 30m
Self study: 40h

GRADING SYSTEM

CONTINUOUS ASSESSMENT
The continuous assessment consists of the following parts:

1) Elaboration of an assignment of block I (35%)
2) Presentation and discussion of a research article of block I (15%)
3) Examination of block II (30%)
4) Presentation of an assignment of block II (20%)

SINGLE ASSESSMENT
The single assessment consists of a written examination that includes all the content of the course and represents 100% of the final grade.

BIBLIOGRAPHY

Basic: