200626 - EF - Financial Statistics

Coordinating unit: 200 - FME - School of Mathematics and Statistics
Teaching unit: 1004 - UB - (ENG)Universitat de Barcelona
Academic year: 2019
Degree: MASTER'S DEGREE IN STATISTICS AND OPERATIONS RESEARCH (Syllabus 2013). (Teaching unit Optional)
ECTS credits: 5

Teaching languages: Spanish

Teaching staff
Coordinator: HELENA CHULIÁ SOLER
Others: Segon quadrimestre:
    HELENA CHULIÁ SOLER - A
    LUIS ORTIZ GRACIA - A

Opening hours
Timetable: Quering by appointment

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:
200626 - EF - Financial Statistics

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 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
- To model financial time series volatility
- To use volatility models to forecast financial time series volatility
- Critical analysis of scientific papers

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 30h</th>
<th>24.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>12.00%</td>
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<td>Guided activities: 0h</td>
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<td></td>
<td>Self study: 80h</td>
<td>64.00%</td>
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# Content

<table>
<thead>
<tr>
<th>1. Option valuation and risk measurement</th>
<th>Learning time: 62h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] 1. Proposed exercises</td>
<td>Theory classes: 15h</td>
</tr>
<tr>
<td>[ ] 2. Presentation of a research article</td>
<td>Laboratory classes: 7h 30m</td>
</tr>
<tr>
<td>[ ] 3. Exam of each block</td>
<td>Self study: 40h</td>
</tr>
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**Description:**
- 1.1. Derivatives, arbitrage and risk neutral valuation formula
- 1.2. Binomial trees and Black-Scholes formulas
- 1.3. Option valuation by Monte Carlo and reduction of variance
- 1.4. Stochastic volatility and interest rates models
- 1.5. Methods of measuring risk on a portfolio of options

<table>
<thead>
<tr>
<th>2. Volatility models</th>
<th>Learning time: 62h 30m</th>
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</thead>
<tbody>
<tr>
<td>[ ] 1. Statistical properties of financial series</td>
<td>Theory classes: 15h</td>
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<tr>
<td>[ ] 2. Modelling univariate volatility</td>
<td>Laboratory classes: 7h 30m</td>
</tr>
<tr>
<td>[ ] 3. Specification, estimation and diagnostic of GARCH models</td>
<td>Self study: 40h</td>
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<tr>
<td>[ ] 4. Forecasting with GARCH models</td>
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<tr>
<td>[ ] 5. Multivariate GARCH models</td>
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</tbody>
</table>

**Description:**
- 2.1. Statistical properties of financial series
- 2.2. Modelling univariate volatility
- 2.3. Specification, estimation and diagnostic of GARCH models
- 2.4. Forecasting with GARCH models
- 2.5. Multivariate GARCH models

# Qualification system

Three elements will be taken into account:
- Proposed exercises
- Presentation of a research article.
- Exam of each block
Bibliography

Basic: