

## Course guide

### 200626 - EF - Financial Statistics

**Last modified:** 16/06/2021

**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:** 2021    **ECTS Credits:** 5.0    **Languages:** Spanish

#### LECTURER

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**Coordinating lecturer:** HELENA CHULIÁ SOLER

**Others:** Segon quadrimestre:  
HELENA CHULIÁ SOLER - A  
TONY KLEIN - A  
LUIS ORTIZ GRACIA - A

#### PRIOR SKILLS

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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

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**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 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

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

**Total learning time:** 125 h

## CONTENTS

### 1. Option valuation and risk measurement

#### 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

**Full-or-part-time:** 62h 30m

Theory classes: 15h

Laboratory classes: 7h 30m

Self study : 40h

## 2. Volatility models

### 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

**Full-or-part-time:** 62h 30m

Theory classes: 15h

Laboratory classes: 7h 30m

Self study : 40h

## GRADING SYSTEM

### CONTINUOUS ASSESMENT

The continuous assesment consists of the following parts:

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

### SINGLE ASSESMENT

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:

- Hull, J.C.. Options, futures and other derivatives. Prentice Hall, 2012.
- Tsay, Ruey S. Analysis of financial time series. 3rd ed. Wiley, 2010.
- Seydel, R.U.. Tools for computational finance [on line]. Springer, 2012 [Consultation: 12/05/2020]. Available on: <https://doi.org/10.1007/978-1-4471-2993-6>.
- Glasserman, P.. Monte Carlo methods in financial engineering. Springer, 2004.