200620 - QR - Risk Quantification

**Coordinating unit:** 200 - FME - School of Mathematics and Statistics  
**Teaching unit:** 1004 - UB - (ENG)Universitat de Barcelona  
**Academic year:** 2017  
**Degree:** MASTER'S DEGREE IN STATISTICS AND OPERATIONS RESEARCH (Syllabus 2013). (Teaching unit Optional)  
**ECTS credits:** 5  
**Teaching languages:** Spanish

### Teaching staff

**Coordinator:** CATALINA BOLANCÉ LOSILLA  
**Others:** Primer quadrimestre:  
CATALINA BOLANCÉ LOSILLA - A  
ISABEL SERRA MOCHANES - A

### Requirements

Basic notions of statistical inference (as in DeGroot and Schervish, 2012) and multivariate analysis (principal components; see, for instance, Peña, 2002).


### Degree competences to which the subject contributes

#### Specific:

1. CE-1. Ability to design and manage the collection of information and coding, handling, storing and processing it.
2. 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.
3. 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.
4. 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
5. CE-6. Ability to use appropriate software to perform the necessary calculations in solving a problem.
6. 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.
7. CE-9. Ability to implement statistical and operations research algorithms.

#### Transversal:

1. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.  
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.
Learning objectives of the subject

- Understanding and knowing how to use statistical methodology for risk management in banks, insurance companies and similar institutions.
- Training researchers in quantitative risk techniques most recent, also to show the research topics in this area.
- Using the program R in the application of statistical techniques for quantification of risks.

Study load

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

## 1. Introduction

**Learning time:** 7h 30m  
Theory classes: 7h 30m

**Description:**  
1.1 Basics concepts of Risk Management  
1.2 Definition of risk  
1.3 Types of Risk  
1.4 Notation  
1.5 Some examples

## 2. Multivariate models for risk management e english

**Learning time:** 10h 30m  
Theory classes: 10h 30m

**Description:**  
2.1 Random Vectors and Their Distribution  
2.2 Multivariate Normal Distribution  
2.3 Spherical and Elliptical Distributions and Risk Quantification

## 3. Measures of dependence and copulas

**Learning time:** 10h  
Theory classes: 10h

**Description:**  
3.1 Definitions  
3.2 Examples of copulas  
3.3 Applications

## 4. Risk Measures

**Learning time:** 8h  
Theory classes: 8h

**Description:**  
4.1 Coherent risk measures  
4.2 Value at Risk  
4.3 Risk measures based on the distortion of the survival function  
4.4 Aggregated risk measures
Continuous assessment: We propose to use risk quantification techniques reviewed throughout the course to analyse the risk of a portfolio of shares that each student will have to design (50%). A session will be devoted entirely to solve exercises individually (50%).

A Single Assessment: The single assessment consists of a written examination which will have five or six exercises. Some of these exercises consist of interpreting the results of a quantitative risk measurement situation.

Bibliography

Basic:


