

Academic Year/course: 2022/23

## 27545 - Statistical Analysis for Finance

### Syllabus Information

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**Academic Year:** 2022/23

**Subject:** 27545 - Statistical Analysis for Finance

**Faculty / School:** 109 - Facultad de Economía y Empresa

**Degree:** 449 - Degree in Finance and Accounting

**ECTS:** 6.0

**Year:** 4

**Semester:** Second semester

**Subject Type:** Optional

**Module:**

## 1. General information

### 1.1. Aims of the course

The course and its expected results respond to the following approaches and objectives:

The content is divided in 3 blocks: 1) Introduction to the R program through a basic statistical analysis of data, 2) Multivariate statistical techniques and 3) Volatility modeling and risk assessment.

After a presentation of the subject (situation in the study plan, description of the teaching program, evaluation criteria and most relevant bibliography), in the **first block** R is introduced as a calculation tool for the entire course, and a basic one- and two-dimensional statistical analysis is carried out. This analysis serves to exemplify the operation of R and review some concepts already known from the subjects Statistics I and II and that will be very useful in the next two blocks. The **second block** is dedicated to the study of some multivariate statistical techniques. Specifically, the techniques that are going to be presented are of two types: the first group (principal components analysis and factor analysis) seek to carry out a data reduction process by identifying and calculating latent factors whose purpose is to express the information contained in a data set in terms of a smaller number of variables that represent the interrelationships. The second group (cluster analysis and discriminant analysis) seeks to classify the objects/individuals into internally homogeneous and externally heterogeneous groups, analyzing the differences between them. All this results in a better understanding of the information contained in a set of data within the financial field. The **third block** deals with the temporal analysis of financial series, beginning with an analysis of their most relevant empirical characteristics, both static and dynamic. Within this third block, a second topic is devoted to the problem of modeling volatility. It describes various models proposed in the literature to estimate this important component of risk in the evolution of many financial series, paying special attention to the GARCH family of models and their extensions. Finally, the third topic within the third block is devoted to introducing various ways of quantifying financial risk used in the literature, focusing especially on the expected risk value and loss, as well as the retrospective validation of the behavior of the calculated measures.

These approaches and objectives are directly aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>), in such a way that the acquisition of the learning outcomes of the subject provides training and competence to contribute to some extent to the achievement of the SDGs. Among the objectives most dealt with in depth in the subject, the following stand out:

? Goal 7: Affordable and clean energy.

? Goal 11: Sustainable cities and communities

? Goal 12: Responsible consumption and production

? Goal 13: Climate action

since the examples that are shown in class analyze databases that address these issues. Although it is true that all the training provided by this subject (theoretical and practical) contributes transversally to the 2030 AGENDA and SDGs, given that their training enables the student to contribute to the analysis and management of the 245 SDG indicators.

## 2. Learning goals

## 3. Assessment (1st and 2nd call)

### 3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

In the **first call**, the student will be able to choose between following a Continuous Assessment process or a Global Assessment process.

**Continuous Assessment** involves the following:

- Between 5 ? 8 multiple-choice questionnaires for each of the topics. These questionnaires will account for 30% of the mark if their average exceeds 3.

- 1 report corresponding to the resolution of exercises related both one-dimensional and two-dimensional exploratory analysis applied to a database (topics 1 and 2) that will account for 30% of the final mark if is higher than 3.

- 1 report consisting of the resolution of exercises that apply the multivariate techniques (topics 3 and 4), that will account for 40% of the final mark if is higher than 3.

The questionnaires (C) and the reports (I1, I2) will be scored on a scale from 0 to 10. The student must have at least a 3 in each of the three types of activities (the average of the questionnaires, the I1 report and the I2 report) in order to perform the average.

To pass the subject, the final mark must be equal to or greater than 5 points and it will be calculated as the weighted average of 30% of the average assessment of the questionnaires, 30% of the I1 report and 40% of the I2 report, provided they have at least a 3 in each of the three parts. That is, the applied formula will be:

$$\text{Final mark} = 0.3 * \text{Mean (C)} + 0.3 * I1 + 0.4 * I2$$

If in any of the parts the mark is less than 3, the final mark would be calculated as follows:

$$\text{Final mark} = \min \{0.3 * \text{Mean (C)} + 0.3 * I1 + 0.4 * I2; 4.5\}$$

Students who do not pass this continuous evaluation system may also opt for the global evaluation.

**Global Assessment** consists of the following:

Students who have not opted for continuous assessment, those who, having opted for continuous assessment, have not passed the subject or those who, having passed the subject in the continuous assessment modality, want to improve their mark, will take a final exam (E) on the official call dates established by the Faculty. This exam will assess the theoretical and practical knowledge of the subject through exercises in which the students will have to answer different questions about different databases. The answers to the questions will be made through scripts using the R program, and writing a report with the conclusions obtained. This evaluation exam (E) will mean 100% of the final mark. The student must obtain a score equal to or greater than 5 out of 10 points.

In the **second call**, the student must pass a final evaluation exam (E) similar to the one described for the global evaluation of the first call.

It is planned that the course assessment will be onsite, but if the health circumstances require it, it will be carried out online. It should be noted that in any online assessment task the student performance may be recorded, following the regulations described in:

?[https://protecciondatos.unizar.es/sites/protecciondatos.unizar.es/files/users/lopd/gdocencia\\_reducida.pdf](https://protecciondatos.unizar.es/sites/protecciondatos.unizar.es/files/users/lopd/gdocencia_reducida.pdf)?

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

Different teaching methods will be used depending on the objectives and the skills developed. Thus, expository techniques will be used for the theoretical classes, with the aim of analyzing and developing the fundamental concepts of the subject. However, and given that the subject will be entirely taught in computer rooms, computer tools will be used, alternating theoretical explanations with their application to the analysis of data sets, which will facilitate practical learning of the techniques studied.

The practical classes will be developed with the computer in which each student will apply the statistical techniques explained in the theoretical classes for the analysis of practical cases designed for this purpose. Some of these classes will be used for students to self-evaluate and / or complete their practical works and activities under the auspice of the professor who will act as a tutor to help them solve the difficulties they may have encountered.

As support, the Moodle 2.0 platform will be used, in which the theoretical and practical materials of the subject will be published, as well as all the information necessary for its development, starting with the teaching guide itself.

### 4.2. Learning tasks

The course includes the following learning tasks:

- Lectures (30h). These sessions will be used to develop mainly the concepts and theoretical developments of each of the topics. Expository techniques will be used, but motivating participation and class discussion. The teacher will lean on the computer to illustrate the practical use of the techniques explained by applying real or simulated series. It is recommended to attend to these sessions because, in our experience, the theoretical part of the subject is the more difficult part to understand and study. The student will have previously published the theoretical development that complements the presentation.
- Computer Practice sessions (30h). This activity will take place in computer rooms. It will be developed through

directed exercises in which the students apply the statistical techniques explained in the theoretical classes, using the computer and, more specifically, the R statistical package, which is the one that will be used as the computer tool.

- Autonomous work (90h)

The teaching delivery methodology is expected to pivot around face-to-face classes. However, if necessary for health reasons, classes may be taught online.

### 4.3. Syllabus

The course will address the following topics:

#### **Block 1: Introduction to R through a basic statistical data analysis**

Topic 1: Introduction to R

Topic 2: Initial exploratory data analysis

#### **Block 2: Multivariate statistical techniques**

Topic 3: Dimension reduction techniques. Principal component analysis. Factorial analysis

Topic 4: Classification techniques. Cluster Analysis. Discriminant Analysis

#### **Block 3: Dynamic analysis of financial series**

Topic 5: Empirical characteristics of a financial series

Topic 6: Statistical modeling of volatility

Topic 7: Statistical techniques for risk assessment and management

### 4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Faculty of Economics and Business website (<https://econz.unizar.es/>) and the Moodle Platform.