Time series analysis and forecasting

Academic Year: (2023 / 2024) **Review date: 12-04-2023**

Department assigned to the subject: Statistics Department

Coordinating teacher: NOGALES MARTIN, FRANCISCO JAVIER

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Statistical modelling for data analysis
Mathematics for data analysis

OBJECTIVES

Basic competences

To have and to include/understand knowledge that contribute to a base or opportunity of to be original at the development and/or application of ideas, to slight in an investigation context
That the students know to apply to the acquired knowledge and their capacity of resolution of problems in new surroundings or little known within ampler contexts (or you will multidiscipline) related to their area study
That the students are able to integrate knowledge and to face the complexity to formulate judgments from a information that, incomplete or being limited, includes reflections on tie the social and ethical responsibilities to the application of its knowledge and judgments
That the students have the learning abilities that allow them to continue studying of a way that will be to be in great homing or independent measurement.

General competitions

To apply the theoretical foundations of the collection techniques , storage, treatment and presentation of information, specially for great volumes of data, as it bases for the development and adaptation of these techniques to concrete problems
To identify different techniques to store, to talk back and to distribute great amounts of data, and to differentiate them based on its theoretical and practical characteristics
To identify the techniques of analyses of data but adapted each problem and knowledge to apply them for the analysis, design and solution of such
To obtain practical and efficient solutions for problems of treatment of great volumes of data, as much individually as in equipment
To synthesize the obtained conclusions of these analyses and to as much present/display them of clear and convincing way in bilingual surroundings (Spanish and English) in writing as orally
To be able to generate new ideas (creativity) and to anticipate new situations, in the contexts of the analysis of data and the decision making
To use abilities for the work in equipment and to be related to others of independent form

Specific competitions

To use the basic results of inference and regression like foundation for advanced methods of prediction and classification
To identify and to select the suitable software tools for the treatment of great amounts of data
To use advanced statistical procedures for the treatment of great volumes of data in areas like the estimation, the inference, the prediction or the classification, as well as the way to apply them of efficient form
To correctly identify the kind of statistical problem corresponding to certain objectives and data
To know how to design systems for the processing of the data, from the obtaining and initial filtrate of such, its statistical analysis, to the presentation of the final results
To use techniques and usable tools of operations research with massive data in procedures for its analysis, visualization of its results or within systems of support to decisions

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction.

2. Time series decomposition.

3. ARIMA models.

4. Dynamic regression and Machine Learning.

5. Multivariate time-series.

6. Volatility models.

LEARNING ACTIVITIES AND METHODOLOGY

Formative activities:

Theory classes
Practical classes
Computing practicals
Individual student work

ASSESSMENT SYSTEM

In the middle of the course: 50% of the continuous assessment (first part)

At the end of the course: 50% of the continuous assessment (second part)

With a minimum grade of 5 points over 10 in each assessment activity.

% end-of-term-examination:	0
% of continuous assessment (assigments, laboratory, practicals...):	100

BASIC BIBLIOGRAPHY

- Rob J Hyndman and George Athanasopoulos Forecasting: Principles and Practice, OTexts: Melbourne, Australia, 2021
- Robert H. Shumway, David S. Stoffer Time series analysis and its applications, Springer, 2016
- Ruey S. Tsay Analysis of Financial Time Series, Wiley, 2010
- Ruey S. Tsay An Introduction to Analysis of Financial Data with R, Wiley, 2013