

TIME SERIES ANALYSIS

Code: 12311

Main Scientific Area: Statistic

Lecturer: Andreia Alves Forte de Oliveira Monteiro

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 100h

ECTS: 6,0

Objectives

It is intended that students:

- acquire theoretical fundamentals of modelling time series dependent data
- develop sufficient experience in practical modelling of real data sets.
- have the ability of using appropriate software to model economic and financial data sets

Learning Outcomes

Given a time series, it is intended that the student has skills to:

- describe the behavior of the series (analyzing trends, cycles and seasonal variations)
- fit a model to the dataset using the Box-Jenkins methodology
- make predictions of future values of the series.

Course Contents

1. Introduction

Notion of time series. Time data patterns. Correlation measures, cross correlation and their estimation.

2. Stationary, trend or cycle series

Tests for randomness and homogeneity of time series. Kendall autocorrelation test for absence of trend. Mann – Kendall trend test. Mann – Whitney homogeneity tests for mean and variance.

3. Stochastic Processes

Stationary. Autocorrelation and partial autocorrelation functions.

4. Exploratory Analysis

Estimation and extraction of components of a time series: trend, cycle and seasonality. Local linear straightening method. STL method. Moving averages. Exponential Smoothing.

5. Box-Jenkins Methodology

Time series transformations. Stationary processes: MA, AR, ARMA, seasonal and multiplicative ARMA. Nonstationary processes: ARIMA. Estimate Diagnostic check. Forecast

6. Forecast

Analysis and prediction in the presence of many time series. Forms of representation of time series data. Automatic selection of models. Forecast error and confidence intervals for the forecast. Automatic forecasting.

Recommended Bibliography

Brockwell, P. J. e Davis, R. A. (2010). Introduction to Time Series and Forecasting, 2nd Edition, Springer
Cryer, J. D. (2009). Time Series Analysis with applications in R, 2nd Edition, Springer

Learning and Teaching Methods

This Unit aims to provide the knowledge and skills used in the study of time series. In particular, it allows the development of calculus skills, the use of computational tools and the knowledge of mathematical results for use in real situations.

Assessment Methods

Continuous assessment:

- One test (T) (50%)

-One group work (Tr) (50%)

- The final grade (NF) will be given by: $NF = 50\%T + 50\%Tr$

The minimum grade of the test is 7 values. The work comprises the preparation of a report and presentation.

Exam Evaluation:

$NF = 50\%NE + 50\% Tr$

Where NE is the grade obtained in the exam.

