

Academic Year: ( 2022 / 2023 )

Review date: 20-05-2022

Department assigned to the subject: Statistics Department

Coordinating teacher: MEILAN VILA, ANDREA

Type: Compulsory ECTS Credits : 5.0

Year : 1 Semester : 1

**REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)**

Statistics for Economics and Business

**OBJECTIVES**

The aim of the course is to introduce concepts and methods of Linear Regression. Emphasis is both in theory and applications.

**DESCRIPTION OF CONTENTS: PROGRAMME**

1. Introduction
  - 1.1. Regression models.
  - 1.2. Simple linear regression.
    - 1.2.1. Formulation of the model.
    - 1.2.2. Model assumptions.
    - 1.2.3. Parameter estimation.
    - 1.2.4. The F test.
    - 1.2.5. Prediction.
  - 1.3. Statistical Software R.
2. Multiple linear regression: estimation, confidence regions and hypothesis testing.
  - 2.1. The general linear model.
    - 2.1.1. Formulation of the model.
    - 2.1.2. Analysis of variance (ANOVA) model.
    - 2.1.3. Model assumptions.
  - 2.2. Parameter estimation.
  - 2.3. Inference about the parameters.
  - 2.4. Variability decomposition. The F test.
  - 2.5. Prediction.
3. Validation of a regression model.
  - 3.1. The determination coefficient.
  - 3.2. Model diagnosis.
  - 3.3. Regression transformations.
4. Diagnosis of outliers or influential observations. Construction of regression models.
  - 4.1. Diagnostic techniques.
    - 4.1.1. Leverages.
    - 4.1.2. Detection of outliers and influential observations.
    - 4.1.3. Dealing with outliers or influential observations.
  - 4.2. Construction of regression models.
    - 4.2.1. Polynomial regression.
    - 4.2.2. Interactions.
    - 4.2.3. Collinearity.
    - 4.2.4. Variable selection methods.
5. Generalized least squares.
  - 5.1. Introduction.
  - 5.2. Generalized least squares.
  - 5.3. Weighted least squares.
  - 5.4. Iteratively reweighted least squares.
  - 5.5. Feasible generalized least squares.

- 6. Time series models.
- 6.1. Autoregressive (AR) and moving average (MA) models.
- 6.2. ARMA and ARIMA models.

#### LEARNING ACTIVITIES AND METHODOLOGY

The course is organized in theoretical classes, whose materials are slides, and computer classes, where R will be used in order to illustrate and consolidate the contents.

#### ASSESSMENT SYSTEM

Continuous evaluation through two tests (50%) and final exam (50%).

<b>% end-of-term-examination:</b>	50
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	50

#### BASIC BIBLIOGRAPHY

- CHATERJEE, S. and HADI, A. Regression Analysis by Example, 5th Edn, John Wiley, 2012
- FREES, E.W. Regression Modeling with Actuarial and Financial Applications, Cambridge University Press, 2010
- WOOLDRIDGE, J. M. Introductory Econometrics. A Modern Approach (5th edition), South-Western College Publishing, 2012

#### ADDITIONAL BIBLIOGRAPHY

- KABACOFF, R. L. R in action: Data analysis and graphics with R, 2nd Edn. , Manning Publications, 2015
- BROCKWELL P. J. and DAVIS, R. A. Introduction to Time Series and Forecasting, 3rd Edn., Springer Verlag, 2016
- JAMES, G., WITTEN, D., HASTIE, T. and TIBSHIRANI, R. An Introduction to Statistical Learning with Applications in R , Springer Verlag, 2013
- KUTNER, M. H., NACHSTEIM, C., and NETER, J. Applied Linear Statistical Models 4th Edition., McGraw Hill, 2004
- MATLOFF, N. The Art of R programming: A Tour of Statistical Software Design, No Starch Press, 2011
- RAWLINGS, J. O., PANTULA, S. G. and DICKEY, D. A. Applied Regression Analysis: A Research Tool, 2nd Edn., Springer Verlag, 1998
- WEISBERG, S. Applied Linear Regression, 4th Edition, Wiley , 2014