Quantitative Methods I

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%).

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	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