Quantitative Methods I

Academic Year: (2021 / 2022) **Review date: 07-06-2021**

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 review, at an intermediate level, the basic concepts and methods of Linear Regression. Emphasis is both in theory and applications.

DESCRIPTION OF CONTENTS: PROGRAMME

1. INTRODUCTION.

** 1.1 Formulation and meaning of a statistical regression problem.
** 1.2 Regression models. Goals of a regression analysis.
** 1.3 Data in a regression analysis.
** 1.4 Regression software.

2. THE MULTIPLE LINEAR REGRESSION MODEL: ESTIMATION.

** 2.1 Definition and matrix expression.
** 2.2 Least squares estimation.
** 2.3 Analysis of variance.

Appendix:

** A.1 The multivariate normal distribution.

3.THE MULTIPLE LINEAR REGRESSION MODEL: HYPOTHESIS TESTING AND CONFIDENCE REGIONS.

** 3.1 The F-test for the general linear hypothesis.
** 3.2 Confidence regions.
** 3.3 Prediction intervals.

Appendix:

** A.1 Indicator variables.

4. MULTICOLLINEARITY, RESIDUAL ANALYSIS, AND DIAGNOSTIC TECHNIQUES.

** 4.1 Multicollinearity: description and consequences.
** 4.2 Residual analysis.
** 4.3 Outliers and extreme cases.

5. GENERALIZED LEAST SQUARES THEORY.

** 5.1 Cases of known and unknown covariance matrix.
** 5.2 Heteroscedasticity.
** 5.3 Transformations.
** 5.4 Serial correlation.

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

Online (50%) and Computer Labs (50%) in both the regular and retake exams.

% 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