Applied Quantitative Methods for the Social Sciences I

Academic Year: (2022 / 2023)   **Review date: 28-03-2022**

Department assigned to the subject: Social Sciences Department

Coordinating teacher: KRAFT , PATRICK WILLI

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

OBJECTIVES

Basic Skills

To get and understand notions that are susceptible of being original in the development and/or application of the ideas, often in the context of research.
Learning to apply the acquired knowledge and their skills of resolution of problems in new or not well known settings within wider (or multidisciplinary) contexts related with their study area.
Being able to integrate knowledge and face the complexity of formulation of judgements from incomplete or limited information that includes reflexions over the social or ethic responsibilities linked to the application of their knowledge and judgements.
Knowing how to communicate the knowledge and the ultimate reasons that support them to specialized and non-specialized audience clearly and without ambigüities.
Habilities that allow a self-sufficient or autonomous continuous training

General skills

Evaluating and comparing the different contributions to the important debates of the social sciences from an analytic, methodologic and empirical point of view.
Planning and execution of an autonomous research program in a field of the social sciences.
Assessing the reasoning behind a scientific publication, examining the consistency among theory, analytic strategy, indicators, results and conclusions.
Development of clear and precise scientific arguments.
Knowing how to apply the advanced quantitative techniques in specific research projects.
Design a research proposal that allows to test general hipotheses.

Specific skills

Searching, analyzing and understanding the properties of quantitative data related with the study of social phenomena.
Operating with quantitative research data: having a good command of the instruments for quantitative data analysis for application in the research process.

Results of the knowledge acquired by the student

1. Having a good command of the quantitative methods for applied research at the master level in the area of Sociology, Political Science and Economic History.
2. Having a good command of the inference theory for linear models under different setups.
3. Developing the capacity for the construction of statistical models that are convenient for the type of data coming from different sources.
4. Developing the skills for analysing the properties of the models and to know the appropriate statistical inference methods in practical problems.
5. Developing the skills that are needed for carrying adequate model checking and using it for improving the model.
6. Developing the skills for empirical analysis by means of statistical models for testing theories.
7. Developing the skills for evaluating alternative models and selecting the most appropriate empirical model.
8. Developing interpretation skills for causal analysis.
9. Having a good command of the empirical analysis of microdata: households, companies or individuals; in particular, specifications, methods for estimation and inference of various types of models that are formulated for panel or cross-sectional data.

10. Being able to replicate the results of a scientific publication and for transmitting the details of the replication.
11. Development of skills for being critic, synthesizing and creativity in quantitative empirical projects.

DESCRIPTION OF CONTENTS: PROGRAMME

TOPIC 1. PROBABILITY

1.1   Random variables. Definition. Discrete and continuous variables. Cumulative distribution, probability density and probability mass functions.
1.2   Univariate and multivariate variables: marginal and conditional distributions.
1.3   Summarizing information of univariate variables: mean, variance, asymmetry and kurtosis.
1.4   Summarizing information of multivariate variables: Covariances and independence.
1.5   Some common univariate distributions: Bernoulli, Binomial, Poisson, Uniform, Normal
1.6 The multivariate normal distribution

TOPIC 2. INFERENCE AND ESTIMATION METHODS

2.1 Population and sample: Parameters and statistics
2.2 Point estimation: means and proportions
2.3 Interval estimation
2.4 Hypothesis testing
2.5 Large samples: consistency and asymptotic distribution
2.6 Method of Moments estimator
2.7 Maximum Likelihood estimator

TOPIC 3. REGRESSION MODEL

3.1 Simple Regression model: Conditional means
3.2 Estimating the parameters: Least Squares estimator
3.3 Properties of LS estimator: Consistency, normality and efficiency
3.4 Residual diagnostic
3.5 hypothesis testing
3.6 Heteroscedasticity
3.7 Using the regression model to predict

LEARNING ACTIVITIES AND METHODOLOGY

Learning activities

Theoretical class
Practical classes
Office hours
Individual work of the student

Methogology

Presentation in class by the professor with the support of computational and audiovisual means, where the main concepts of the subject matter are developed and complementary bibliography is provided for completing the learning process of the students.
Critical readings of recommended tests by the professor:
press articles, reports, manuals and/or academic papers, either for the posterior discussion in class, or for widening and consolidating the knowledge on the subject.
Resolution of practical cases, problems, etc, proposed by the professor either individually or in groups.

ASSESSMENT SYSTEM

Final exam: 40%

Two partial exam evaluations: 40%

Stata project: 20%

The continuous evaluation will be only considered if the calification of the final exam is at least 4.

% end-of-term-examination: 40

% of continuous assessment (assigments, laboratory, practicals…):   60

BASIC BIBLIOGRAPHY

  - Moore, D.S., G.P. McCabe and B.A. Graig Introduction to the Practice of Statistics, W.H. Freeman and Company, 2009
  - Newbold, P., W.L. Carlson and B. Thorne Statistics for Business and Economics, Pearson Educación, 2013

  - Stevens, J.S. Applied Multivariate Statistics for the Social Sciences, Routlegde, 2009

ADDITIONAL BIBLIOGRAPHY

  - De Groot, M.H. Probability and Statistics, Addison-Wesley, 1986

  - Wackerly, D.D., W. Mendenhall and R.L. Scheaffer Mathematical Statistics with Applications, Cengage Learning, 2008