DATA ANALYSIS FOR ECONOMICS

IE University
Professor: **AINARA GONZALEZ DE SAN ROMAN ROSADO**

E-mail: agod@faculty.ie.edu

Academic year: 22-23
Degree course: THIRD
Semester: 1º
Category: COMPULSORY
Number of credits: 5.0
Language: English

PREREQUISITES
MATHS I & II, STATISTICS

SUBJECT DESCRIPTION
Data Analysis for Economics is the application of statistics tools and mathematical methods to describe, analyse and predict economic and business phenomenon. The main concern of this course is related with the art of using economic theory and statistical techniques to analyse real world data sets.

This is an introductory course. Students will learn the basic techniques to analyse, model and interpret business and economic data. On one hand, the course will provide a broad training in basic econometric methods and tools, mostly related to linear regression analysis. On the other hand, students will learn practical applications to real economic and business problems using those econometric approaches.

Particular emphasis is given to the careful interpretation of numerical results and to understanding the implications of those results for economic policy and business decision making

OBJECTIVES AND SKILLS
The course aims to provide students with a rigorous reasoning using the econometric approach when analysing problems and making decisions. Students will also learn practical applications mostly related within an economic and business context.

Objectives to be attained along the course:

- Apply econometric techniques for making decisions with quantitative and categorical data within an economic and business context.
- Understand the regression model (simple and multiple), its scope and limitations.
- Interpret and evaluate relationships between variables using econometrics.
- Understand and drive the properties of OLS.
- Interpret, evaluate and apply inferential methods to linear regression.
- Understand the use and implications of data scaling, functional form and dummy variables in regression modelling.

- Identify the presence of estimation problems.
- Acquire fluency in the use of R Studio in order to apply econometric techniques using real world data.

Skills to be acquired during the course:

- Fostering a logic and rigorous reasoning when facing quantitative analysis.
- The analysis and critical assesment of numerical results.
- The ability to formulate, express and solve a problem or question with a model.
- The ability to identify the relevant elements when facing a business decision.

METHODOLOGY

There will be a distribution 50/50 between theoretical and practical sessions.

<u>Lectures</u>:

Theoretical sessions will be concerned with the study of the different econometric tools. The appropriate use of mathematical and statistics concepts and methods is very relevant in this part of the course. Along the different lectures, examples and/or dicussions about real applications will be provided in order to improve the understanding of the different theoretical concepts.

<u>Classes</u>:

Practical sessions will consist on discussions about practical worksheets so called Problem Sets. Students are required to work by themselves on these Problem Sets that will be provided in advance to the due date.

<u>Computer Classes</u>:

In addition, practical sessions are complemented with computer classes along the course. Students will learn how to use R studio in order to apply econometric techniques with real data sets. Part of the evaluation will consist on a computer exam with real data using the software.

The program of the course is divided into five parts (units) that are detailed in the next section (PROGRAM):

UNIT 1: INTRODUCTION
UNIT 2: LINEAR REGRESSION MODEL (LRM)
UNIT 3: HYPOTHESIS TESTING
UNIT 4: DUMMY VARIABLES
UNIT 5: ESTIMATION PROBLEMS

The sessions within each of the units are a combination of theoretical and practical classes (lectures, problem sets and computer classes).

In the below table you can find the teaching methodology by time dedication.

Teaching methodology	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	20.0 %	25 hours
Discussions	0.0 %	0 hours
Exercises	20.0 %	25 hours
Group work	20.0 %	25 hours
Other individual studying	40.0 %	50 hours
TOTAL	100.0 %	125 hours

PROGRAM

SESSION 1 (LIVE IN-PERSON)

PRESENTATION

Lecture 1: Presentation of the programme, aims and guidelines of the course.

SESSION 2 (LIVE IN-PERSON)

REVIEW OF STATS. & BASIC CONCEPTS IN ECONOMETRICS

Lecture 2: Definition of population, sample, random variable, expected value, sample covariance, sample variance and correlation coefficient.

SESSION 3 (LIVE IN-PERSON)

ESTIMATOR & ITS PROPERTIES

Lecture 3: Definition of estimator and its properties: unbiasedness, efficiency, consistency and sufficiency.

SESSION 4 (LIVE IN-PERSON)

INTRODUCTION TO THE LINEAR REGRESSION MODEL

Lecture 4: The simple linear regression model and its assumptions.

SESSION 5 (LIVE IN-PERSON)

CLASS

Problem Set 1: Descriptive and correlation analysis.

SESSION 6 (ASYNCHRONOUS)

COMPUTER CLASS 1

Introduction, descriptive and correlation analysis.

SESSION 7 (LIVE IN-PERSON)

ESTIMATION AND PROPERTIES OF THE REGRESSION COEFFICIENTS

Lecture 5: Ordinary Least Squares estimation method. Model derivation and interpretation of the estimated coefficients. Determination coefficient. Unbiasedness and precision of the regression coefficients. Gauss-Markov theorem.

SESSION 8 (LIVE IN-PERSON)

ESTIMATION AND PROPERTIES OF THE REGRESSION COEFFICIENTS

Lecture 6: Ordinary Least Squares estimation method. Model derivation and interpretation of the estimated coefficients. Determination coefficient. Unbiasedness and precision of the regression coefficients. Gauss-Markov theorem

SESSION 9 (LIVE IN-PERSON)

TRANSFORMATION OF VARIABLES

Lecture 7: Transformation in a new variable. Logarithmic transformation

SESSION 10 (LIVE IN-PERSON)

MULTIPLE LINEAR REGRESSION MODEL
Lecture 8. Introduction to the MLRM

SESSION 11 (LIVE IN-PERSON)

CLASS
Problem Set 2: OLS estimation.

SESSION 12 (ASYNCHRONOUS)

COMPUTER CLASS 2
Estimation of the regression model.

SESSION 13 (LIVE IN-PERSON)

MID-TERM REVIEW
Review of the basic concepts learnt during Units I and II.

SESSION 14 (LIVE IN-PERSON)

MID-TERM EXAM

SESSION 15 (LIVE IN-PERSON)

HYPOTHESIS TESTING IN THE SLRM
Lecture 9: Individual and overall tests.

SESSION 16 (LIVE IN-PERSON)

HYPOTHESIS TESTING IN THE MLRM
Lecture 10: Individual and overall tests.

SESSION 17 (LIVE IN-PERSON)

DISCUSSION CLASS
Discussion of the results of the mid term exam

SESSION 18 (LIVE IN-PERSON)

CLASS
Problem Set 3: Hypothesis testing.

SESSION 19 (ASYNCHRONOUS)

COMPUTER CLASS 3
Hypothesis testing

SESSION 20 (LIVE IN-PERSON)

DUMMY VARIABLES
Lecture 11: Definition, application, types and interpretation.

SESSION 21 (LIVE IN-PERSON)

DUMMY VARIABLES
Lecture 12. Chow Test

SESSION 22 (LIVE IN-PERSON)

CLASS
Problem Set 4: Dummy variables.

SESSION 23 (LIVE IN-PERSON)

ESTIMATION PROBLEMS
Lecture 13: Specification errors. Definition and detection of the multicollinearity problem.

SESSION 24 (LIVE IN-PERSON)

ESTIMATION PROBLEMS
Lecture 14: Other estimation problems. Non-linearity. Outliers

SESSION 25 (ASYNCHRONOUS)

COMPUTER CLASS 4
Dummy variables and validation.

SESSION 26 (LIVE IN-PERSON)

CLASS
Problem Set 5: Estimation problems.

SESSION 27 (ASYNCHRONOUS)

COMPUTER MOCK EXAM

SESSION 28 (LIVE IN-PERSON)

COMPUTER EXAM

SESSION 29 (LIVE IN-PERSON)

FINAL REVIEW
Review of the course.

SESSION 30 (LIVE IN-PERSON)

FINAL EXAM

BIBLIOGRAPHY

Compulsory

- Wooldrigde,J. (2019). *Introductory Econometrics: A modern Approach.* 7th Edition. Cengage. ISBN 9781337558860 (Printed)

Any edition

EVALUATION CRITERIA

Ordinary evaluation

Your final grade in the course will be based on a combination of different items that are described in the following table:

Criteria	Percentage	Comments
Class Participation	10 %	Participation
Intermediate Tests	20 %	Mid-term exam
Workgroups	20 %	Computer exam
Final Exam	50 %	FInal Exam

CLASS PARTICIPATION (10%)

Participation in class will be evaluated positively if students: (1) attain a threshold quantity of contributions that is sufficient for making a reliable assessment of comment quality. Additionally, (2) participation will be evaluated in quality terms. A high quality comment reveals depth of insight, rigorous use of case evidence, consistency of argument, and realism. A high quality presentation of ideas must consider the relevance and timing of comments, and the flow and content of the ensuing class discussion. It demands comments that are concise and clear, and that are conveyed with a spirit of involvement in the discussion at hand.

MID-TERM EXAM (20%)

The mid-term exam will cover Units 1 and 2 of the content of the course. More details about this exam will be provided in advance in class.

COMPUTER EXAM (20%)

This exam mainly consists in solving and discussing some questions about a case study in econometrics with real data using R Studio. This exam is in groups (no more than 4 students per group). More details about this exam will be provided in advance in class.

FINAL EXAM (50%)

The final exam will take place in session 30 and will cover all the content of the course. More details about this exam will be provided in advance in class.

IMPORTANT: In order to pass the course, you need a minimum grade of 3.5 in the final exam. If your grade in the final exam do not reach the threshold value of 3.5, you will fail the course, even in the case in which your weighted average of the course exceeds 5.

Given that the dates of exams are provided in advance, no excepcions will be made. If you do not attend the exams (for whatever reason), this will automatically imply a 0 in this part of the course. Please take this into consideration when planning your semester.

RE-SIT / RE-TAKE POLICY

Each student has four (4) chances to pass any given course distributed over two (2) consecutive academic years. Each academic year consists of two calls: one (1) ordinary call (during the semester when the course is taking place); and one (1) extraordinary call (or "re-sit") in June/July.

Students who do not comply with the 70% attendance requirement in each subject during the semester will automatically fail both calls (ordinary and extraordinary) for that Academic Year and have to re-take the course (i.e., re-enroll) during the next Academic Year.

The Extraordinary Call Evaluation criteria will be subject to the following rules:

- Students failing the course in the ordinary call (during the semester) will have to re-sit evaluation for the course in June / July (except those students who do not comply with the attendance rule, and therefore will not have that opportunity, since they will fail both calls and must directly re-enroll in the course during the next Academic Year).

- It is not permitted to change the format nor the date of the extraordinary call exams or deadlines under any circumstance. All extraordinary call evaluation dates will be announced in advance and must be taken into consideration before planning the summer (e.g. internships, trips, holidays, etc.)

- The June/July re-sit will consist of a comprehensive evaluation of the course. Your final grade for the course will depend on the performance in this exam or evaluation only. I.e., continuous evaluation over the semester (e.g. participation, quizzes, projects and/or other grade components over the semester) will not be taken into consideration on the extraordinary call. Students will have to achieve the minimum passing grade of 5 and the maximum grade will be capped at 8.0 (out of 10.0) – i.e., "notable" in the extraordinary call.

- Re-takers: Students who failed the subject on a previous Academic Year and are now re-enrolled as re-takers in a course will need to check the syllabus of the assigned professor, as well as contact the professor individually, regarding the specific evaluation criteria for them as re-takers in the course during that semester (ordinary call of that Academic Year). The maximum grade that may be obtained as a retaker during the ordinary call (i.e., the 3rd call) is 10.0 (out of 10.0).

After exams and other assessments are graded by the professor (on either the ordinary or extraordinary call), students will have a possibility to attend a review session (whether it be a final exam, a final project, or the final overall grade in a given course). Please be available to attend the session in order to clarify any concerns you might have regarding your grade. Your professor will inform you about the time and place of the review session.

- Students failing more than 18 ECTS credits after the June/July re-sits will be asked to leave the Program. Please, make sure to prepare yourself well for the exams in order to pass your failed subjects.

- In case you decide to skip the opportunity to re-sit for an exam or evaluation during the June/July extraordinary call, you will need to enroll in that course again for the next Academic Year as a re-taker, and pay the corresponding tuition fees. As you know, students have a total of four (4) allowed calls to pass a given subject or course, in order to remain in the program.

PROFESSOR BIO

Academic Background

- PhD. Economics, Universidad del País Vasco, March 2013.
- MPhil. Economics and Finance CEMFI, Spain. June 2009.

- MPhil. Economics: Empirical Applications and Policies, U. País Vasco, Spain. June 2007.
- Licenciado en Economía, Universidad del País Vasco, Spain. June 2006.

Academic Experience

- Researcher at Fundación Novia Salcedo (NSF), Research Laboratory in Social Innovation, Bilbao. 2013
- Teaching Assistant, Teoría Macroeconómica III (Undergraduate) for Professor Cruz Angel Echevarria, Universidad del País Vasco, 2011-2012
- Researcher at Queen Mary, University of London (with Ghazala Azmat). 2012
- Teaching Assistant, Statistical Methods in Econometrics (Graduate), for Prof. Stephane Bohonomme, CEMFI, Spain. Fall 2010
- Teaching Assistant, Introduction to Statistics (Graduate), for Prof. Pedro Mira, CEMFI, Spain. September 2010
- Teaching Assistant, Microeconomics (Graduate) for Prof. Guillermo Caruana, CEMFI, Spain. Fall 2009
- Researcher at CEMFI, Madrid (with Stephane Bohonomme). Summer 2008
- Teaching Assistant, El Mercado de Trabajo en España

Professor: **AINARA GONZALEZ DE SAN ROMAN ROSADO**

E-mail: agod@faculty.ie.edu

AINARA GONZALEZ DE SAN ROMAN ROSADO

OTHER INFORMATION
USE OF ELECTRONIC DEVICES IN CLASS

Cell phones must be turned off and out of sight during class. Students who do not comply with this rule will lose points in the participation grade.

- Office hours: To be announced (or by email to set a date and time).
- Contact details: agod@faculty.ie.edu