

Prof. Miguel-Angel Canela
Prof. email: mcanela@iese.edu
Office: S-604
Phone: 504355

Assistant: Pilar Pallás
Assistant email: ppallas@iese.edu
Office: S-600
Phone: 505143

Introduction

This course is an elementary course of Statistics, with especial emphasis on practical data analysis. It differs from other introductory courses in that multiple regression is covered and analysis of variance is restricted to one-way ANOVA.

The course has three parts. The first part is a refresher of descriptive statistics. The second part is devoted to probability basics. The third part of the course is devoted to estimation and testing, covering the classical tests on group differences and regression coefficients.

Objectives

This course has two objectives. First, to cover a range of elementary statistical techniques, such as two-sample testing, one-way analysis of variance and linear regression. Second, to introduce probability as the language of Statistics, so the students can understand the precise meaning of the concepts involved in the statistical analyses that they will perform later in their research projects: the null hypothesis, significance, bias, etc.

Learning Outcomes

- i. Calculate conditional probabilities.
- ii. Select the appropriate probability.
- iii. Estimate and test means and variances.
- iv. Fit a linear regression equation to data.
- v. Test heteroskedasticity in a linear regression model.
- vi. Estimate and test moderation effects.
- vii. Test differences between groups using Nonparametric Statistics.

Competencies

General Competencies

- CG6: Use appropriate tools and techniques for problem solving, correction contrasting and decision validation.

Basic Competencies

- CB9: Students should be able to communicate clearly and concisely their conclusions, underlying knowledge and reasons to a specialized and non-specialized audience.
- CB 10: Students should possess the learning outcomes that enable them to continue studying in a way that will be largely self-directed or autonomous.

Specific Competencies

- CE2: Profound knowledge of tools in the fields of mathematics, statistics, econometrics and multivariable analyzes in order to carry out relevant research projects on a global level.
- CE8: Analyze business phenomena formal analysis tools (logic and mathematics) in order to develop consistent structural theories.
- CE9: Knowledge of and ability to use the tools of economic analysis and the classical theory of markets in the analysis of organizations.
- CE20: Ability to use econometric methods, mainly regression analysis of real data of organizations and to assess the scope and limitations these methods can have.
- CE27: Develop a scientific report with the objective to integrate the existing literature of a chosen research topic and to articulate research questions that could extend our understanding of the field.

Content

1. *Descriptive Statistics*
2. *Probability Calculus*
3. *Estimation and testing*
4. *Classical tests of means and variances*
5. *Nonparametric testing*
6. *Regression analysis*

Methodology

The course is based on lectures, given in a traditional, professor-to-student way. The topics covered in the lectures are explained in a set of lecture notes.

Evaluation

Grading is based on the exercises proposed at the end of each session (50%) and the final exam (50%).

Course Outline

TITLE OF SESSION & MATERIAL

1	<i>The least squares method</i> Lecture notes: The least squares method
2	<i>Computer session</i>
3	<i>Descriptive statistics</i> Lecture notes: [STAT-01] <i>Descriptive statistics</i>
4	<i>Descriptive statistics (continuation)</i>
5	<i>Computer session</i>
6	<i>Computer session</i>
7	<i>Probability calculus</i> Lecture notes: [STAT-02] Probability calculus
8	<i>Probability calculus (continuation)</i>
9	<i>Discrete probability distributions</i> Lecture notes: [STAT-03] Discrete probability distributions
10	<i>Discrete probability distributions (continuation)</i>
11	<i>Continuous probability distributions</i> Lecture notes: [STAT-04] Continuous probability distributions
12	<i>Continuous probability distributions (continuation)</i>
13	<i>Binomial, Poisson and normal distributions</i> Lecture notes: [STAT-05] Binomial, Poisson and normal distributions
14	<i>Binomial, Poisson and normal distributions (continuation)</i>
15	<i>Sampling distributions</i> Lecture notes: [STAT-06] Sampling distributions
16	<i>Sampling distributions (continuation)</i>
17	<i>Parameter estimation</i> Lecture notes: [STAT-07] Parameter estimation
18	<i>Parameter estimation (continuation)</i>
19	<i>The t tests</i> Lecture notes: [STAT-08] The t tests
20	<i>The t tests (continuation)</i>
21	<i>More on testing between-groups differences</i> Lecture notes: [STAT-09] More on testing between-groups differences
22	<i>More on testing between-groups differences (continuation)</i>
23	<i>The linear regression model</i> Lecture notes: [STAT-10] The linear regression model

24	<i>The linear regression model (continuation)</i>
25	<i>More on testing linear models</i> Lecture notes: [STAT-11] More on testing linear models
26	<i>More on testing linear models (continuation)</i>
27	<i>Regression with dummy variables</i> Lecture notes: [STAT-12] Regression with dummy variables
28	<i>Regression with dummy variables (continuation)</i>
29	<i>Heteroskedasticity</i> Lecture notes: [STAT-13] Heteroskedasticity
30	<i>Computer session</i>
31/32	<i>Final exam</i>

Bibliography

- MJ Crawley (2012), *The R Book*, Wiley. Free access at <ftp.tuebingen.mpg.de/pub/kyb/bresciani>.
- MH DeGroot & MJ Schervish (2002), *Probability and Statistics*, Addison-Wesley.
- JM Wooldridge (2013), *Introductory Econometrics*, South-Western College Publishing.

Professor's Biography



Prof. Miguel-Angel Canela

Associate Professor of Managerial Decision Sciences

Prof. Canela holds a Ph. D. degree in Mathematics from the Universitat de Barcelona (1980). Before joining IESE in 2009, he was a professor at the Department of Applied Mathematics and Analysis of that university and a part-time professor of the Ph. D. Program at IESE. He also worked many years as a consultant at the Institut Català de Tecnologia.

His first research papers were concerned with various problems of Functional Analysis. Later, his interest switched towards interdisciplinary research, entering diverse fields, such as Management Science, Nutrition, Botany and Toxicology and Biochemistry. Nowadays, his attention is focused on the application of Data Science to various aspects of management.