

Statistics

1. Objectives

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.

2. Methodology

2.1. Contents

1. Descriptive statistics
2. Probability basics
3. Probability distributions
4. Parameter estimation
5. Testing means and variances
6. Linear regression analysis

2.2. Description of the 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. Analysis is performed with both R and Stata. The lecture notes are complemented with data sets and scripts with the commands used in the examples.

2.3. Number and title of the sessions

The course has 30 sessions, listed in the table at the end of this outline.

2.4. Description of the topics

The topics covered in each session are described in the table.

2.5. Required readings

[STAT-01] Mean, variance and covariance

[STAT-02] Regression and correlation (1)

[STAT-03] Introduction to probability

[STAT-04] Conditional probability

[STAT-05] Discrete probability distributions

[[STAT-06] Binomial and Poisson distributions

[STAT-07] Continuous probability distributions

[STAT-08] Expectation in continuous distributions

[STAT-09] The normal distribution

[STAT-10] Sampling distributions

[STAT-11] The central limit theorem

[STAT-12] Parameter estimation

[STAT-13] Confidence limits for the mean

[STAT-14] The one-sample t test

[STAT-15] Two-sample t tests

[STAT-16] One-way ANOVA

[STAT-17] The linear regression model

[STAT-18] Testing regression coefficients

[STAT-19] Testing nested models

[STAT-20] Regression and correlation (2)

[STAT-21] Regression with dummy variables

2.6. Optional readings

MH DeGroot & MJ Schervish (2002), *Probability and Statistics*, Addison-Wesley.

WN Venables, DM Smith & The R Core Team (2016), *An Introduction to R*.

JM Wooldridge (2013), *Introductory Econometrics --- A Modern Approach*, South-Western College Publishing.

3. Grading

The grades are based on the exercises delivered at the end of each session (60%) and the final exam (40%)

4. Competences

4.1 General Competences

- To manage the probability language used in statistical analysis.
- To understand the principles of statistical inference.
- To get practice with elementary statistical analysis and its implementation in statistical software

4.2 Specific Competences

- To easily manage the techniques of Descriptive Statistics.
- To manage the classical probability distributions.
- To manage the t tests and the one-way ANOVA test.
- To estimate and test regression coefficients.

5. Course Outline and Bibliography

SESSION	DESCRIPTION	DOCUMENTS
21/OCT	Mean, variance and covariance	Outline of the Statistics course [STAT-01] Mean, variance and covariance
21/OCT	Regression and correlation (1)	[STAT-02] Regression and correlation (1)
24/OCT	Introduction to probability	[STAT-03] Introduction to probability
24/OCT	Conditional probability	[STAT-04] Conditional probability
27/OCT	Discussion of assignments	
27/OCT	Computer session	
28/OCT	Discrete probability distributions	[STAT-05] Discrete probability distributions
28/OCT	Binomial and Poisson distributions	[STAT-06] Binomial and Poisson distributions
02/NOV	Continuous probability distributions	[STAT-07] Continuous probability distributions
02/NOV	Expectation in continuous distributions	[STAT-08] Expectation in continuous distributions
03/NOV	Computer session	
03/NOV	Discussion of assignments	
07/NOV	The normal distribution	[STAT-09] The normal distribution
10/NOV	Sampling distributions	[STAT-10] Sampling distributions
10/NOV	The central limit theorem	[STAT-11] The central limit theorem
10/NOV	Parameter estimation	[STAT-12] Parameter estimation
17/NOV	Discussion of assignments	
17/NOV	Confidence limits for the mean	[STAT-13] Confidence limits for the mean
22/NOV	The one-sample t test	[STAT-14] The one-sample t test

24/NOV	Two-sample t tests	[STAT-15] Two-sample t tests
24/NOV	One-way ANOVA	[STAT-16] One-way ANOVA
29/NOV	Computer session	
01/DEC	Discussion of assignments	
01/DEC	The linear regression model	[STAT-17] The linear regression model
09/DEC	Testing regression coefficients	[STAT-18] Testing regression coefficients
09/DEC	Testing nested models	[STAT-19] Testing nested models
12/DEC	Discussion of assignments	
12/DEC	Regression and correlation (2)	[STAT-20] Regression and correlation (2)
14/DEC	Regression with dummy variables	[STAT-21] Regression with dummy variables
14/DEC	Discussion of assignments	
16/DEC	Final exam	
16/DEC	Final exam	

6. Professor's Biography



Prof. Miguel-Angel Canela
Associate Professor of Managerial Decision Sciences

Miguel Angel Canela teaches quantitative methods at IESE Business School. He holds a Ph. D. degree in Mathematics from the Universitat de Barcelona and has been a professor at this university for thirty years, as well as a senior consultant and director of the Master in Quality Management at the Institut Català de Tecnologia.

After some years devoted to research in mathematical analysis, Prof. Canela's interest was driven

towards interdisciplinary research. His research experience covers a wide spectrum of applications, from statistics and mathematical modelling to diverse fields such as biochemistry, botany, nutrition and management science. He is actually working on the application of data mining techniques to business problems.