Statistics I

Master in Social Sciences

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This course will consist of a brief introduction to probability theory as well as various topics in statistics and how they can be used in Social Sciences. Subject areas will include random variables, distributions, estimation, hypothesis testing and introduction to the regression model. The course elementary in mathematical level. The main objective is to show when, how and why statistical techniques can be used and which the limitations are so that students can understand and apply statistical techniques to answer Social Science research questions. The data sources will be actual examples taken from publicly available social data bases as, for example, the *Centro de Investigaciones Sociológicas* (CIS). R, a freely available general purpose statistical programing package will be used to perform the statistical analysis.

SYLLABUS

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: means and variances.
1.4 Summarizing information of multivariate variables: Covariances and independence.
1.5 Some common univariate distributions: Binomial, Poisson, Uniform, Normal

TOPIC 2. INFERENCE

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

TOPIC 3. ESTIMATION METHODS

3.1 Method of Moments
3.2 Properties of Method of Moments estimator

3.3 Maximum Likelihood

3.4 Properties of ML estimator

TOPIC 4. REGRESSION MODEL

4.1 Simple Regression model: Conditional means

4.2 Estimating the parameters: Least Squares Estimator

4.3 Properties of LS estimator

4.4 Multiple regression model

4.5 Dummy variables

4.6 Using the regression model to predict

TEXTBOOKS

Moore, D.S., G.P. McCabe and B.A. Graig (2009), *Introduction to the Practice of Statistics*, 6th edition, New York: W.H. Freeman and Company.

Newbold, P., W.L. Carlson and B. Thorne (2013), *Statistics for Business and Economics,* 8th edition, Pearson Education.

Stevens, J.S. (2009), *Applied Multivariate Statistics for the Social Sciences*, Routlegde

De Groot, M.H. (1986), *Probability and Statistics,* 2nd edition, Addison-Wesley.

Wackerly, D.D., W. Mendenhall and R.L. Scheaffer (2008), *Mathematical Statistics with Applications*, 7th edition, Cengage Learning.