

ESSENTIAL STATISTICS FOR ECONOMICS AND ECONOMETRICS (EC112)

Course duration: 54 hours lecture and class time (Over three weeks)

LSE Teaching Department: Department of Economics

Lead Faculty: Dr Miltiadis Mavrakakis and Dr Erik Baurdoux

Pre-requisites: No previous knowledge of statistics will be assumed. The ability to use algebraic formulae and perform basic manipulations is essential. Some knowledge of basic calculus, although not necessary, would be an advantage.

Course Structure:

The course will consist of formal three-hour lectures supported by exercise classes. In the lectures, the fundamental concepts and methods of statistics will be presented, explained, and demonstrated with interactive examples. In addition, there will be various group activities where these concepts and methods will be explored in practice. Exercise sets will be distributed daily; these are a vital part of the course and their solutions will be discussed in the exercise classes. Full lecture notes and exercise solutions will be made available.

Course Objectives:

This is an introductory course in statistics, with a strong emphasis on the concepts and application of probability theory, random variables, distributions, and sampling theory. The aim is to introduce techniques such as parameter estimation, significance testing, and linear regression models, which are essential in the fitting of economic and econometric models. In summary, the main objectives of this course are:

- To provide essential knowledge of the theory and key properties of probability and random variables, and the application of these concepts in practical situations.
- To facilitate an understanding of the main branches of basic statistical inference, and to develop the ability to use statistical techniques to analyse data and assess the accuracy of the resulting estimates and conclusions.
- To introduce the fundamental concepts of statistical modelling, particularly linear regression models.

This course should be of value to those intending to study any course involving economic modelling and econometrics, or any further course in statistics.

Reading List:

As full notes will be provided, there will be no need to rely on a particular textbook. There are several good textbooks at the right level for this course, such as:

- Newbold, P., Carlson, W., and Thorne, B., *Statistics for Business and Economics* (6th edition or later), Prentice Hall
- Larsen, R. J., and Marx, M. L., *An Introduction to Mathematical Statistics and its Applications* (3rd edition or later), Prentice Hall

Course Content:

<i>Descriptive statistics</i>	Histograms, stem-and-leaf plots, box plots Measures of location and dispersion
<i>Probability</i>	Experiments, outcomes, sample spaces, events Union, intersection, complement Axioms of probability Conditional probability Bayes' theorem, Law of total probability
<i>Distribution theory</i>	Random variables and distributions Cumulative distribution function Probability mass and density functions Binomial, Poisson, Normal, Exponential Expectation and variance
<i>Sampling:</i>	Basic sampling concepts Central limit theorem Distribution of sample mean/proportion
<i>Point estimation</i>	Mean of a population Bias, variance, mean squared error
<i>Confidence intervals</i>	Concept and interpretation For means and proportions, for variances Sample size calculation

Significance tests

Null and alternative hypothesis
Type I and Type II error
Significance level and power function
For means and proportions
Contingency tables & tests for association

Correlation

Concept and formula
Estimation and hypothesis testing

Linear regression

Simple linear regression Least squares
estimation Multiple regression

Credit Transfer: If you are hoping to earn credit by taking this course, please ensure that you confirm it is eligible for credit transfer well in advance of the start date. Please discuss this directly with your home institution or Study Abroad Advisor.

As a guide, our LSE Summer School courses are typically eligible for three credits within the US system and 7.5 ECTS in Europe. Different institutions and countries can, and will, vary. You will receive a digital transcript and a printed certificate following your successful completion of the course in order to make arrangements for transfer of credit.

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