Faculty of Economic, Social and Political Sciences

SESP1111   Statistics and Elements of Probability

[37.5h+37.5h exercises] 7 credits

Teacher(s):   Dominique Deprins, Annie Robert, Sébastien Van Bellegem
Language: French
Level: First cycle

Aims

Statistics is the science allowing to compare data from a sample (reality of the estimations or numerical data collected by observing or experimenting part of the population) with the theory (statement of abstract hypotheses on parameters in the whole population). It is also the science for analysing quantitative data, which applies widely in economical, political and social sciences.
This course is an introduction to statistics. The student will be able to describe and analyse a sample, to understand the basics of probability calculations applied to counts, to identify the simple sampling procedures, to establish the operational characteristics of basic statistics (average, deviation, proportion) in these procedures and to narrow their qualities to allow drawing inferences on the population parameter.
The teaching is focused on the resolution of applications or on the problems of data analysis in economical, political and social sciences. It should aim to develop a systematic method of resolution: what is the question in quantitative terms? Which tools to use? Are the validity conditions respected? How to calculate these tools? What is the answer to the question?#,
The theory of probability is a branch of mathematics which allows the description and understanding of random experiments. It's therefore the essential tool for better measurement and control of the uncertainties due to the statistical reasoning. This course develops more thoroughly the basic elements of the descriptive statistics course, which was limited to the study of finite sets. The goal is to furnish tools specific to experiments whereof possible results are countable but infinite or non-countable (continuous). It will teach also the elements to analyse experiments where numerous characteristics are considered simultaneously.
These tools are studied with the aim of applying them in basic methods of statistical analysis. Simple examples will explain why probability theory is essential to control the random aspects of sampling and to understand better the link between sampling and population.

Main themes

1: Descriptive statistics
It contains the methods for summarizing the data of a sample or population in some useful characteristics or estimates. Frequency distributions, density functions, distribution functions and parametric and non-parametric characteristics are studied in the samples. The description of double entries tables enables to describe samples where two characteristics are analysed simultaneously.
2: Introduction to probability calculation
According to the sample selection procedure, the probability calculation ensures the link between the population and its sample. The studied topics are the calculations methods (conditional, total, Bayes' rule #), the quantification of events in a univariate random variable with its probability distribution, for finite set. The counting issued from experimental schemes, which generates the laws uniform discrete, binomial or hypergeometric will be studied thoroughly.
3: Introduction to Statistical inference
To compare observations with issued hypotheses on a population parameter, statistical inference uses estimators. This part of the course analyses the statistical estimators, their characteristics and their inference qualities.

Content and teaching methods

The statistics part of the course is taught with:
-lectures (the teacher calculates and interprets the "tools" from an application and extract its abstract expressions),
-practical courses (the teacher submits applications and/or problems to the students and proposes a method of resolution) with additionally an active participation of the students by readings, problems resolutions, case resolution reports, knowledge tests,#

Other credits in programs

ECGE11BA	Première année de bachelier en sciences économiques et de gestion	(7 credits)	Mandatory
STAT21MS/DM	Première année du master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(7 credits)	
STAT21MS/EA	Première année du master en statistique, orientation générale, à finalité sécialisée (économie et assurance)	(7 credits)	
STAT21MS/MM	Première année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(7 credits)	
STAT21MS/MS	Première année du master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(7 credits)	
STAT21MS/ST	Première année du master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(7 credits)	
STAT22MS/DM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (data management et data mining)	(7 credits)	
STAT22MS/EA	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (économie et assurance)	(7 credits)	
STAT22MS/MM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(7 credits)	
STAT22MS/MS	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (marketing et sondage)	(7 credits)	
STAT22MS/ST	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (sciences et technologie)	(7 credits)	