UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# SYLLABUS DEL CORSO

## Statistical Modeling

**2021-1-F9101Q009**

### Learning objectives

The aim of this course is the analysis of advanced statistical models, such as generalized linear model, multivariate classic and generalized models, multivel models

Knowledge and understanding: the students can learn models more general than linear classical model, characterized by less and less restrictive hypotheses.

Ability to apply knowledge and understanding Students will be able to analyze real multiple, multivariate and hierarchical data, under conditions more and more adherent to the complexity of reality

### Contents

The goal of the course is the study of more advanced models of the classical linear model. The training is carried out through lectures and laboratory practical lessons.

## Detailed program

The course aims at introducing at the specification, estimation and verification of the interpretative advanced linear models compared to the classical linear model. It presents:

· Generalized linear models that do not meet the assumptions of the classical linear model: models with esteroschedastici and related errors, non-linear models, the treatment of outliers

· Multivariate linear models of classic and not

Each area will be the specific object of a course module. The training is carried out through lectures and practical classes in statistical and computer lab in which you will face analysis of empirical cases by the use of SAS and R software. The material of the course (both the theoretical lessons both practical lessons) and additional information will be posted on the web page in the e-learning platform unimib: http://elearning.unimib.it/.

## Prerequisites

Good knowledge of:

Univariate descriptive statistics: position indeces; variability indices: symmetry and kurtosis indices.

Bivariate descriptive statistics: connection, average dependence, linear correlation, linear bivariate,
Multiple, multivariate, polynomial, non-linear regressions.

Probability theory: population and sample; probability in the classic version; combinatorial calculation elements; sampling types; distributions of univariate random variables; random variables Normal, t of Student, F d Snedecor; random sampling distributions

Inference:estimation theory, property of the punctual estimators; interval estimation ;hypothesis tests: general theory, Neyman Pearson hypothesis tests,

hypothesis tests on mean (Normal t of Student) and variance.

Classical linear model: general hypotheses; estimation of model parameters; properties of least squares estimators; hypothesis tests on parameters;
hypothesis testing on the model and on parameter groups.

Software SAS, R

It is suggested to those who do not come from three-year courses of statistics or economics to follow the introductory courses in advance

## Teaching methods

The course presents both theoretical and applied classes. During the theoretical part, the methodological frameworks related to the course are presented and then applied during the practical lessons in the laboratory. In the lab, you use SAS software, and you'll learn how to code and read model outputs.

## Assessment methods

The examination consists of two theoretical questions and a practical exercise. The exercise covers one of the topics proposed during the classroom exercises and involves solving a problem using SAS or R software and commenting on the results.

This way the examination verifies both the theoretical knowledge and the ability to apply the proposed models on real databases.

There are no intermediate tests.

There are no different treatments for attending and not attending students.

## Textbooks and Reading Materials

The course material and additional information will be posted on the web page in the e-learning platform unimib: http://elearning.unimib.it/.

James H.Stock-Mark W. Watson (2016) Introduzione all'Econometria 3/Ed. Pearson

Baltagi B. H. (2008), Econometrics, fourth Edition, Springer Berlin (Part I chapters 1-5; Part II chapters 9-10-11).

Johnston J. (1993). Econometrica, 3a edizione, Franco Angeli, Milano (chapters 2, 3, 5, 7, 8).

Srivastava V.K., Giles D.E.A. (1987). Seemingly Unrelated Regression Equations Models, Marcel Dekker, New York (In particolare, chapters 1, 2).

Manuale SAS/STAT 9.3 (chapters 4,  5, 6, 8, 29, 41, 58, 76).

## Semester

II semester

## Teaching language

Italian