



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Modello Lineare Generalizzato

2122-1-F8203B010-F8203B010M

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#### Learning objectives

The aim of this course is the analysis of advanced linear models, from the classical linear model to the multivariate models.

#### Contents

The aim of the course is to present linear model extending the classical ordinary least squares model. The main topics are

- generalized linear models
- multivariate models
- multilevel models

#### 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 also presents:

- Generalized linear models that do not meet the assumptions of the classical linear model: heteroschedastic models, autoregressive models, non-linear models, models with outliers, GLS

- Multivariate linear models: from least squares models to seemingly unrelated regressions
- Multilevel models: hierarchical data and fixed effects anova, mixed models (random slope, random intercept)

Each area will be the specific object of a course module. The course activity comprises theoretical lecture and lab activity with SAS and R\_\_\_\_\_

## Prerequisites

It is requested a good knowledge of:

Univariate descriptive statistics: position indices; 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 and 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.

Basics of matrix algebra

Therefore student that do not have these previous knowledge in statistics are requested to attend biostatistics courses and pass exams of: probability calculation, introduction to statistical inference, introduction to statistical models, statistical models for data categorical. The students also have to know the R or SAS statistical packages.

( in the three-year degree or in the degree course of biostatistics) exams of: univariate and bivariate statistics, probability calculation, introduction to statistical inference, introduction to statistical models, statistical models for data categorical. The students also have to know the R and SAS statistical packages.

## Teaching methods

The course includes theoretical lecture and labs. In theoretical lecture,\_\_\_\_\_

## Assessment methods

The examination is carried out by means of a test at the computer lab and comprises 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 R and SAS software and commenting on the results.

## Textbooks and Reading Materials

-All the reading material is included in the course digital textbook uploaded on the elearning platform. The textbook covers both theoretical topics and practical examples.

Suggested readings

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- Baltagi B. H. (2008), *Econometrics*, fourth Edition, Springer Berlin

- Rencher, A. C., *Methods of Multivariate Analysis*, Wiley

- Tom Snijders, T., Bosker, R., *Multilevel Analysis: An Introduction To Basic And Advanced Multilevel Modeling*, SAGE Publications Inc.

- Littell, R. C., Freund, R. J., and Spector, P. C. (2002), *SAS for Linear Models*, 4th Edition, Cary, NC: SAS Institute Inc.

- Manual SAS/STAT 15.1

- Faraway, J. J. (2004). *Linear models with R*. Chapman and Hall/CRC.

## Semester

3 cycle which corresponds to the 2nd semester in the period between March and April.

## Teaching language

Italian

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