



UNIVERSITÀ
CATTOLICA
del Sacro Cuore

Applied econometrics

PROF. MATTEO BARIGOZZI; PROF. LUCA TRAPIN

Course aims and intended learning outcomes

The course aims at acquainting students with the fundamental aspects of econometric methods from both classical and time-series standpoints. The purpose is to prepare the student to competently handle the basic econometric tools for the measurement, modelling, interpretation and forecast of macro, micro-economic and financial phenomena.

Students will:

- know how to estimate causal effects and make predictions using cross-sectional data;
- be able to estimate dynamic causal effects and make forecasts using time series data;
- be able to manage the R software for regression analysis;
- be able to reproduce econometric analysis of others;
- be familiar with basic econometric theory.

Course content

FIRST MODULE: Prof. Luca Trapin

- *Introduction to Econometrics*.
- *The Simple Linear Regression model*: OLS estimator. Inference with OLS. Measures of fit. Prediction. Dummy variables. Heteroskedasticity
- *The Multiple Linear Regression model*: Omitted variable problem. Multicollinearity. Joint testing hypothesis. Model selection.
- *Nonlinear Regression*: Polynomial and logarithmic models. Interaction between independent variables
- *Evaluation of studies based on the multiple regression*: Internal and external validity. Threats to internal validity.

SECOND MODULE: Prof. Matteo Barigozzi

- Univariate and Multivariate linear time series models.
- Integrated processes and unit root tests.
- The concept and role of cointegration.
- Models for heteroskedastic time series: ARCH and GARCH models.

Reading list

J.H. STOCK-M.W. WATSON, *Introduction to Econometrics*, Pearson, Third edition, 2015.

D.N. GUJARATI-D.C. PORTER, *Basic Econometrics*, Mc.Graw-Hill, Fifth edition, 2009.

J.M. WOOLDRIDGE, *Introductory Econometrics, a modern approach*, South-Western, Cengage Learning, 2013.

R.H. SHUMWAY, D.S. STOFFER, *Time Series Analysis and its applications, with R Examples*, 4th Ed, Springer, 2017.

R.S. TSAY, *Analysis of Financial Time Series*, 3rd Ed, Wiley, 2010.

S.M. ZOIA, *Topics in Time Series Econometrics*, EDUCatt, 2014.

Students will be provided with a detailed reading list of papers, class notes and supplementary teaching material which will be uploaded on blackboard.



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Teaching method

The course has a solid content of econometric practice to complement basic theory. Lectures will be complemented by tutorial exercises and the practical application of economic and financial data using appropriate econometric packages.

Assessment method and criteria

Students are required to sit a one-hour written exam at the end of each module consisting of questions on topics covered in the course. The partial exam at the end of the first module will assess the students comprehension of the econometric methods for cross-sectional data. The partial exam at the end of the second module will assess the students comprehension of the econometric methods for time series. Each exam will be divided in three parts: the first one will contain questions on the main theoretical results underlying the econometric tools learned in class; the second part will contain questions related to an empirical application of the econometric tools; the third part will ask to interpret the R output containing the results from an econometric analysis. The final mark is the average grade obtained in the two modules.

Alternatively, students may choose to sit a two-hour final exam on the contents of the two modules at the end of the course. This exam will have the same structure of the two partial exams, and will cover the econometric methods for both cross-sectional and time series data.

The exam procedure is the same in each exam session and applies to attending and non-attending students. Sample exams will be provided on blackboard to let the students understand the structure of the exam.

Notes and prerequisites

Empirical applications with the R software will be carried out to help students in deepening their understanding of the econometric theory and techniques developed in the course. All the necessary teaching material, including codes for elaborations and datasets, will be provided by the professor.