



Course guide

240735 - 240735 - Econometrics

Last modified: 16/05/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 1039 - UPF - Universitat Pompeu Fabra.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGIES AND ECONOMIC ANALYSIS (Syllabus 2018).
(Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: Katerina Stoyancheva Petrova

Others: Katerina Stoyancheva Petrova

PRIOR SKILLS

The course is intended to introduce students to econometric methods and techniques.

Econometrics finds itself in the intersection between economics and statistics and econometric methods are widely used in applied work in order to estimate economic models, as well as to test hypotheses and produce forecasts on future paths for relevant economic and financial variables.

REQUIREMENTS

While no previous knowledge of econometrics is required, the course requires strong quantitative skills and assumes an elementary level of linear algebra and probability theory and covers both theoretical properties of various econometric estimators and relevant empirical applications and examples.

TEACHING METHODOLOGY

The teaching methodology is based on lectures and practice sessions. Lectures are aimed at increasing the student's knowledge on the topics presented.

The lectures present various econometric estimators, study their theoretical properties and provide illustrative examples and applications in order to present the empirical relevance of the theory.

The practice sessions are devoted to providing students with problem-solving skills and data-analysis abilities. In the practice sessions, students will learn to solve exercises, and are encouraged to actively participate.

The practice exercises also include computer sessions to give students the opportunity to gain experience about the application of the econometric methods to real economic and financial data. These sessions apply in practice the methods covered in the lectures to economic and financial series to estimate key parameters and conduct hypothesis testing on which to draw conclusions.

In addition, students are expected to spend considerable time on self-study, reading additional material suggested in the lectures and working through the practice questions to reinforce skills that are learned in lectures.



LEARNING OBJECTIVES OF THE SUBJECT

By the end of the subject the students will be able to:

- Understand the classical linear regression model, its assumptions and the consequences of violations of these assumptions
- Understand the generalised least squares and the instrumental variable estimator in a linear setup
- Use the classical linear regression model and some related linear estimators to test economic theories and generate predictions
- Follow elementary asymptotic arguments
- Have a good understanding of the idea behind nonlinear estimators such as Maximum Likelihood and Generalised Method of Moments
- Understand elementary dependent stochastic processes: stationary ARMA models, unit root processes and cointegrating regression models in economic data
- Be able to use statistical packages, to interpret their output, and to produce original pieces of empirical analysis
- If time permits, have a brief introduction to simple machine learning methods, such as penalised regression in rich parameter setups

CONTENTS

Classic Linear Regression Model

Description:

These lectures cover the foundation on linear regression model, including the Gauss Markov theorem, Frisch-Waugh-Lovell theorem and some useful asymptotic results that can be used for hypothesis testing.

Full-or-part-time: 44h 51m

Theory classes: 9h

Practical classes: 2h 06m

Guided activities: 9h 45m

Self study : 24h

Maximum Likelihood and GMM

Description:

These lectures introduce students to nonlinear econometric techniques, with a range of examples, and establish some of the large sample properties of these estimators.

Full-or-part-time: 29h 54m

Theory classes: 6h

Practical classes: 1h 24m

Guided activities: 6h 30m

Self study : 16h

Introduction to univariate time series processes

Description:

The lectures introduce students to basic univariate time series models in econometrics, particularly stationary ARMA processes, martingale theory and unit root and cointegrating regression models.

Full-or-part-time: 29h 54m

Theory classes: 6h

Practical classes: 1h 24m

Guided activities: 6h 30m

Self study : 16h



Machine Learning methods

Description:

These lectures provide a brief introduction to some machine learning techniques such penalised regression models, e.g. ridge and lasso, in a simple linear regression models when the number of regressors is potentially infinite.

Full-or-part-time: 14h 57m

Theory classes: 3h

Practical classes: 0h 42m

Guided activities: 3h 15m

Self study : 8h

GRADING SYSTEM

0.6 Final Exam + 0.3 Midterm test + 0.1 Marked problem sets

EXAMINATION RULES.

The practice sessions contain exercises for each topic covered in the lectures, as well as practical computer software examples where students can use real economic and financial data to estimate the models with the methods covered in the lectures.

BIBLIOGRAPHY

Complementary:

- Abadir, Karim M. ; Jan R. Magnus. Matrix Algebra. Cambridge: Oxford University Press, 2005. ISBN 9780521537469.
- Davidson, Russell; MacKinnon, James G. Econometric theory and methods. New York: Oxford University Press, 2004. ISBN 0195123727.
- Helmut Lütkepohl. New Introduction to Multiple Time Series Analysis [on line]. Berlin: Springer, 2005 [Consultation: 15/09/2022]. Available on: <https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-540-27752-1>. ISBN 9786610312658.
- Tsay, Ruey S. Analysis of financial time series [on line]. 3rd ed. Hoboken: John Wiley & Sons, 2010 [Consultation: 15/09/2022]. Available on: <https://onlinelibrary-wiley-com.recursos.biblioteca.upc.edu/doi/book/10.1002/9780470644560>. ISBN 9780470414354.
- Hamilton, James D. Time series analysis. Princeton, N.J.: Princeton University press, cop. 1994. ISBN 0691042896.
- Abadir, K. M.; Heijmans, R. D. H.; Magnus, J. R. Statistics : econometric exercises 2. New York: Cambridge University Press, 2019. ISBN 9780521822886.

RESOURCES

Other resources:

Bruce Hansen, 2019, Econometrics – the source is free and fully available online at at:

<http://www.ssc.wisc.edu/~bhansen/econometrics/>