



Università degli Studi di Cagliari

DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI

Direttore Prof. Rinaldo Brau

Corso di Dottorato in Scienze Economiche e Aziendali – XXXVII ciclo

Quantitative Methods in Economics and Business

Course leader: Emanuela Marrocu

Instructors: Massimo Cannas, Giulia Contu, Claudio Deiana, Emanuela Marrocu, Marco Nieddu, Diego Ronchetti

Organization of the course

The course consists of two tracks. The first course track is specifically addressed to students of the *Economics* and *Quantitative Methods* curricula, whereas the second one is addressed to students of the *Business, Management and Accounting* curriculum. Each track consists of 36 hours of lectures (9 CFU) and include both common modules (24 hours) and curriculum-specific modules (12 hours).

Aims of the course

The course aims to develop students' ability to understand, critically assess and carry out statistical and empirical analysis in research projects.

The main goal is to provide students with statistical, microeconomic and time series tools commonly applied in economics and business research.

Lectures will run online on *Teams*, whenever possible they will be complemented by online lab classes during which students will get familiar with statistical and econometric software to be used in applied analyses.

The *Teams class* is named after the course "Quantitative Methods in Economics and Business – PhD in Economics and Business". First year PhD students have been made members by using their University email account (e.g. name.surname@studenti.unica.it or n.surname@studenti.unica.it). Students can access the *Teams* application by using the same account.

Learning outcomes and competences

At the end of the course students will have acquired knowledge of the core statistical and econometric methods and the ability to critically understand economic and business empirical literature. Students will have also acquired practice with software packages and the ability to develop empirical strategies to be applied in their own research work.

Pre-requisites

The course assumes that students have already acquired the knowledge and skills taught in postgraduate-level courses of Statistics, Mathematics and Econometrics. In particular, students are expected to be familiar with the concepts related to (all pre-requisites are essential):

- functions of two or more variables; limits, derivatives, integrals
- linear algebra
- basic probability theory
- how to draw inference on the population from sample evidence
- linear regression model and Ordinary Least Squares estimation method
- point estimation, confidence intervals, hypothesis testing
- linear restrictions, how to deal with violations of the assumptions of classical linear regression model



Course contents and syllabus

Quantitative methods – syllabus and timetable			
	Curriculum: - Economics - Quantitative Methods	Common modules	Curriculum: - Business, Management and Accounting
	<i>Specific modules</i>		<i>Specific modules</i>
Week 1 18-19 oct 2021		Probability theory 6 hours; Instructor: M. Cannas	
Weeks 1-2 20 oct 2021 25-29 oct 2021		Topics in Statistical Learning (SL) <ul style="list-style-type: none"> • The SL paradigm • K-NN approach to classification and regression • Linear and quadratic discriminant analysis • Naïve Bayes Classification • Classification and regression trees • Re-sampling methods • Model selection criteria in SL 8 hours; Instructor G. Contu	
Week 3 2-5 nov 2021		Econometric modelling <ul style="list-style-type: none"> • Linear regression model • Basic panel data models 4 hours; instructor E. Marrocu	
Week 4 8-12 nov 2021		Limited dependent variable models <ul style="list-style-type: none"> • Logit and Probit models; • Tobit I and Tobit II models • Applications using Stata 6 hours; instructor M. Nieddu	
Week 5 15-19 nov 2021	Panel data models <ul style="list-style-type: none"> • Static linear models: fixed effect, first difference, random effect specifications • Dynamic linear models (basics) • Applications using Stata 6 hours; Instructor M. Nieddu		Topics with longitudinal <ul style="list-style-type: none"> • Longitudinal dataset • Policy tools for social science • Applications using Stata 6 hours; instructor C. Deiana
Week 6 22-26 nov 2021	Estimation of long-run economic relationship <ul style="list-style-type: none"> • Unit root tests; • Models for non-stationary time series; • Cointegration and Error Correction mechanism; 6 hours; instructor D. Ronchetti		Design of difference-in-differences studies in social sciences <ul style="list-style-type: none"> • Basic DID • Advanced DID • Applications using Stata 6 hours; instructor C. Deiana
Total hours	12 hours	24 hours	12 hours



Assessment methods

The assessment is based on an oral examination (70%) and on a paper assignment (30%).

Reading list

- Jacod Protter, Probability Essentials, Springer Universitext 2004
- Brooks C., Introductory Econometrics for Finance, 4th edition, Cambridge University Press, 2019;
- Cameron A.C. and Trivedi P.K., Microeconometrics, Methods and Applications, New York: Cambridge University Press, 2005;
- Cameron A.C. and Trivedi P.K., Microeconometrics Using Stata, Stata Press, 2010.
- Davidson, J. (1994). Econometric Theory. Hastie T., Tibshirani R., Friedman J., The Elements of Statistical Learning: Data Mining, Inference, and Prediction, 2017.
- Hamilton, J. D. (1994). Time series analysis. Princeton university press. Wiley–Blackwell.
- Hayashi, F. (2000). Econometrics. Princeton University Press.
- James G., Witten D., Hastie T., Tibshirani R., An Introduction to Statistical Learning: With Applications in R, 2017.
- Verbeek M., A Guide to modern econometrics, 5th edition, Wiley 2017;
- Wing C., Simon K., Bello-Gomez R.A., Designing difference in difference studies: best practices for public health policy research. Annual Rev Public Health 2018; 39: 453– 69.
- Wooldridge J.M., Introductory Econometrics: a Modern Approach, 5th edition, Thompson South-Western, 2013;
- Wooldridge J.M., Econometric Analysis of Cross Section and Panel Data, 2nd edition, MIT Press, 2010.

For reviewing pre-requisites notions:

- Newbold P, Carlson W., Thorne B., Statistics for Business and Economics, Pearson, 2009 (7th Edition)
- Stock J.H. and M. Watson, Introduction to Econometrics, fourth edition, Pearson, 2019