20594 ECONOMETRICS FOR BIG DATA

Classe impartita in lingua inglese

Programs: DSBA (8 crediti - I sem. - OB | 8 cfu - SECS-P/05)
Class: 23 (I sem.)
Department: Economics

Course director: LUCA SALA

Classe 23

FRANCESCA GARBIN
Department of Economics
Università Bocconi, Milan, Italy
francesca.garbin@unibocconi.it

PAMELA GIUSTINELLI
Department of Economics
Università Bocconi, Milan, Italy
pamela.giustinelli@unibocconi.it

LUCA SALA
Department of Economics
Università Bocconi, Milan, Italy
luca.sala@unibocconi.it

Attenzione! Il programma di seguito riportato è da considerarsi valido SOLO per l'anno accademico 2021/2022.

MISSION

The main goal of this course is to give students a working knowledge of the most used econometric techniques. The key concepts of statistical theory underlying each method are covered, but special emphasis is placed on implementation of each method in actual applications. The course is divided in two parts. The first, deals with regression and causal inference methods used in the analysis of cross-sectional and longitudinal data, typically used in micro-econometrics (where the focus is on the individual behavior of individuals, households, firms and so on). The second, deals with time series data and methods, typically used in macro-economic applications (where the focus is on the interaction of macroeconomic variables). As observational data, most commonly used in non-experimental sciences such as economics, hardly tell the researcher what is the effect of a certain treatment variable on a given outcome variable of interest, economists have devised a variety of approaches to address questions of cause-and-effect among economic variables both in microeconomics and macroeconomics. The unifying theme of the two parts of the course is a focus on understanding causality.

COURSE CONTENT DETAILED - SCHEDULE

- DSBA cl. 23

***** PART I: Microeconometrics *****

- Introduction to Microeconometrics: Description, Prediction, and Causal inference
- Potential Outcomes Framework (POF) I: POF basics (Ideal RCTs, Missing outcomes, Selection)
- Regression Fundamentals I: Regressions as best predictors (loss functions; types of prediction; identification vs. estimation; parametric vs. nonparametric regressions)
- Regression Fundamentals II: Conditional expectation function and mean regression
- Regression Fundamentals III: More on regression specifications (dummy variables on the right and on the left; saturated models)
- Regression Fundamentals IV [if time permits]: Limited dependent variables models (LDV)
- Potential Outcomes Framework II: POF meets regression
- Selection on Observables: Conditional independence and other solutions based on observables
- Selection on Unobservables I: 'Classic' Instrumental Variables (IV)
- Selection on Unobservables II: Differences-in-Differences (DID)
- Potential Outcomes Framework III: POF with imperfect compliance
- Selection on Unobservables III: LATE IV
- Selection on Unobservables IV: Regression Discontinuity Designs (Sharp and Fuzzy RRDs)
- Applications of the listed methods

***** PART II: Macroeconometrics *****

- Basics of time series analysis.
- Stationarity and ergodicity.
- The lag operator.
- ARMA models. The characteristic equation and the eigenvalues of the companion form.
- The autocovariance - autocorrelation function and the partial autocorrelation function.
- The Box- Jenkins approach: specification, maximum likelihood estimation, testing, diagnostics and forecasting.
- The Wold decomposition.
- Non-stationarity. Unit roots vs. Trend stationarity. Testing for unit roots: the Dickey-Fuller test, the augmented Dickey-Fuller test. Spurious regression; the Beveridge Nelson decomposition.

- Multivariate stationary processes: VAR. Granger-causality.
- Identification of structural models: simultaneous equation bias. The need of instrumental variables and exogenous variables. The rank and order condition.
- The Sims' critique: structural VARs. Choleski identification; long-run identification. News shock identification.

TEACHING METHODS

Selection:

- Face-to-face lectures
    - face-to-face lectures
- Exercises (exercises, database, software etc.)
    - in-class exercises

The learning experience of the course includes: (i) face-to-face lectures, introducing and illustrating the main topics of the course; (ii) interactive in-class discussions around stylized microeconomic and macroeconomic applications, focusing on specific aspects of their implementation and interpretation.

Although attendance is strongly encouraged, there will be no differential treatment between attending and non-attending students.

ASSESSMENT METHODS

Selected methods:	Continuous assessment	Partial exams	General exam
Written individual exam (traditional/online)		**x**	**x**
Open-answer questions exam		x	x
Closed answers questions exam (e.g.: single input, multiple choice, select etc.)		x	x
Open and/or closed answers questions exam		x	x

Students will be evaluated through a written, in-class exam.

The exam will consist of exercises, open-ended and/or closed-ended questions. The exam will assess students' knowledge and understanding of the topics and students' ability to carry out and interpret results from empirical econometric work.

The exam can be taken as two Midterms on the two parts of the course or as a single General (on both parts of the course).

TEACHING MATERIALS

- DSBA cl. 23

Part I (Microeconometrics)

Main References

1. Slides and reading material (papers, book chapters) on specific topics will be made available to students on BlackBoard.

Useful Textbook References

1. Angrist, J.D. and J.-S. Pischke (2009), Mostly Harmless Econometrics, Princeton University Press (free e-version online)
2. Angrist, J.D. and J.-S. Pischke (2014), Mastering 'Metrics, Princeton University Press
3. Cunningham, S. (2021), Causal Inference: The Mixtape, Yale University Press (free 2018 e-version online)
4. Békés, G. and G. Kézdi (2021). Data Analysis for Business, Economics, and Policy. Cambridge University Press
5. Wooldridge, J.M., Introductory Econometrics: A Modern Approach (2012 or any following edition)

Part II (Macroeconometrics)

Main References

1. Sala, L., *Lecture Notes on Time Series Analysis*, (available on Bboard).
2. Enders, W. *Applied Econometric Time Series,* last edition, selected chapters.
3. Hamilton, J. H., *Time Series Analysis,* Princeton University Press, 1994, selected chapters.

The slides of the course, additional readings and support material will be uploaded to the Bboard platform of the course.

HONOR CODE

Bocconi University conceives of education as an ongoing process that stretches across a person's entire professional life. The University hopes that the entire Bocconi community will respect the values of fairness and correctness associated with it, values which inspire and guide the conduct of all community members as they pursue common objectives and a shared mission. The Bocconi University Honor Code is published at http://www.unibocconi.eu/honorcode. We encourage all students to read it.

Aggiornato al 31/08/2021 11:06