IESE Business School
University of Navarra

MRM 2024 2nd Term

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ECONOMETRICS I

Course Description

This course covers the essential econometrics and statistical tools needed to understand empirical research and to execute independent research projects. Topics include linear regression models, statistical inference, instrumental variables, qualitative response models and panel data.

You will learn how to use R for econometric modeling through in-class R tutorials involving analysis of real-world datasets.
You are expected to be conversant with elementary probability and statistics as well as the basics of R programming.

Objectives

This course will enable you to:

- Develop your knowledge of applied econometrics
- Put this knowledge into practice through examples and replication works
- Apply models to real-world problems
- Apply econometric models using the R programming language
- Prepare you for conducting independent research

Learning Outcomes

- Understand core concepts and techniques in econometrics
- Understand the assumptions upon which different econometric methods are based and their implications
- Use statistical software to implement the various techniques taught in the course
- Demonstrate ability to analyze and assess empirical results
- Interpret and critically evaluate applied work and econometric findings

Competences

- Conduct independent econometric and statistical analysis of data in an applied research setting
- Make use of the course content in your own academic work
- Demonstrate your understanding of applied econometric analysis with respect to the choice of model, estimation method and interpretation of results
- Be able to read and understand journal articles that make use of the concepts and methods that are introduced in the course
- Carry out independent research

Content

The first part of the course introduces regression analysis applied to cross-sectional data. We start with the classical linear regression model and introduce the ordinary least squares estimator, its properties, and its use in statistical inference. We then discuss how various technical problems and restrictive assumptions inherent in the linear regression model should be handled. Specifically, we discuss the topics of heteroskedasticity, multicollinearity, omitted variables, measurement errors and endogeneity. Alternative methods, such as weighted least squares, generalized least squares and instrumental variables estimators, are introduced.

The second part of the course discusses other important topics in cross-section econometrics, such as qualitative response regression models and count-data related models.

Finally, Part III explores panel data regression models, mainly focusing on fixed effects and random effects models.

For each topic, the basic underlying theory is discussed, starting with the model formulation, estimation of the chosen model and testing hypotheses about the phenomenon under study.

The focus of the course is on modeling and economic meaning rather than on proving theorems. Examples of applications in economics, social sciences and management will be used throughout the course, together with their practical implementation in R.

Methodology

Lecture Notes: Lecture slides will be provided in each class.

R codes: The R codes used in class will be also available after each lecture.

Main References: The main references for the course are:
- Jeffrey Wooldridge, *"Introductory Econometrics: A Modern Approach*", South-Western.
- Damodar N. Gujarati. *"Basic Econometrics"*, Mc Graw Hill.

Software Requirements: We will use the statistical package R via a front-end called RStudio throughout the course. Both R and RStudio are free and open source. To set them up on your own computer, first download and install R from http://cran.r-project.org/. Then download and install RStudio from http://rstudio.org/download/desktop.

Optional Textbooks:
For students who want a deeper theoretical grounding in the material covered as well as the basics of R programming, additional books are listed below:

- *"Econometric Analysis"*, by W. Greene.
- *"R for Data Science"*, by Wickham & Grolemund

Evaluation

Grades for this course will be based on individual assignments (40%) and a final exam (60%).

Individual Assignments
I will assign several problem-sets over the course. Each problem set will contain both theoretical and practical questions. Each assignment will be due a deadline specified in class. Problem set solutions should include both the pdf report and the R code to replicate your results. You may discuss problem set questions and how to solve them with your colleagues, but your code and write-up must be your own. More instructions will be given during the course.

Final Exam
This is a closed book exam. General exam instructions will be given during the course.

Contact

You will find assignments, readings and other course material uploaded in Virtual Campus at https://vc.iese.edu. Occasionally, I will also send e-mails to the class regarding logistical matters, such as information about when an assignment is due. Please check your e-mail before coming to class.

The best way to get in touch with me is by e-mail: vraponi@iese.edu. You can drop by my office (E-306) if you have questions about the course or would like to talk about a research idea. I greatly value your feedback on any aspects of this course. Please feel free to contact me in person or by e-mail with suggestions.

Course Outline

The topics scheduled below are approximate. I will post any updated version of this outline on the course web page.

Session	Session Topics
1-2	**The linear regression model (I).** Estimation and interpretation. Required readings: Wooldridge, Charters 2-3 Gujarati, Chapters 2-3
3-4	**The linear regression model (II).** Inference Required readings: Wooldridge, Charters 4-5 Gujarati, Chapters 4-5
5-6	**Extensions of the linear regression model.** Interactions, quadratics, dummy variables, and logarithms Required readings: Wooldridge, Charter 6 Gujarati, Chapters 6 and 9
7-8	**Relaxing the assumptions of the classical model (I).** Multicollinearity, heteroskedasticity and autocorrelation Required readings: Gujarati, Chapters 10-11-12
9-10	**Relaxing the assumptions of the classical model (II).** Incorrect model specification, omitted variables and measurement errors Required readings: Gujarati, Chapter 13 Wooldridge, Chapter 9
11-12	**Instrumental variables.** Endogeneity and IV estimation Required readings: Wooldridge, Chapter 15

13-14	**Qualitative response variables and related models.** Logit, Probit and multinomial models Required readings: Gujarati, Chapter 15 Wooldridge, Chapter 17
15-16	**Count data and related models.** The Poisson regression model and further topics in qualitative response models Required readings: Gujarati, Chapter 15 Wooldridge, Chapter 17
17-18	**Limited Dependent Variables Models for Corner Solution Responses.** The Tobit model Required readings: Wooldridge, Chapter 17
19-20	**Truncated and Censored Dependent Variables.** Truncated and Censored Regression Models, Incidental Truncation Required readings: Wooldridge, Chapter 17

Professor's Biography

Prof. Valentina Raponi
Assistant Professor of Financial Management

Ph.D. in Finance, Imperial College Business School
Ph.D. in Methodological Statistics, University of Rome La Sapienza
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Biography

Valentina Raponi is Assistant Professor at the Financial Management Department of IESE. She holds a Ph.D. in Finance from Imperial College Business School, a PhD in Methodological Statistics from the University of Rome La Sapienza, an MSc in Econometrics and Mathematical Economics from the London School of Economics and Political Science, an MSc in Statistics and Economics from the University of Rome La Sapienza and a BSc in Statistics and Economics from the University of Rome La Sapienza.

Her research interests include Financial Econometrics, Asset Pricing and Portfolio Choice, Econometric Theory and Machine Learning. Her dissertation has been published in the Review of Financial Studies.

Before joining IESE, Valentina has also worked as intern at the European Central Bank, the Bank of Italy and the Italian Ministry of Economy and Finance.

Areas of interest

* Financial Econometrics
* Empirical asset pricing
* Asset pricing anomalies
* Portfolio Choice
* Econometric Theory
* Machine Learning