**IB/ST 350 ECONOMETRICS FOR BUSINESS**

IES Abroad Milan

**DESCRIPTION:** Econometrics is the application of statistics and mathematics to economic and financial data. In today's world data are largely available and econometric techniques are crucially important to conducting reliable data analyses in private and public institutions. This course introduces students to regression methods for analyzing data in business and economics. After presenting the basic theoretical features of each method, it will familiarize students with how to practically implement estimation and hypothesis testing techniques in various empirical contexts. The main goal of the course is to provide students with a solid theoretical background in introductory level econometrics, to stimulate their abilities to apply such techniques on diverse datasets, and to enable them to critically analyze empirical studies in economics, business, and finance.

**CREDITS:** 3

**CONTACT HOURS:** 45

**INSTRUCTOR:** Irina Gardini - irinagardini@gmail.com

**LANGUAGE OF INSTRUCTION:** English

**PREREQUISITES:** One undergraduate-level course in Statistics.

**METHOD OF PRESENTATION:**

- Lectures, seminars to discuss assignments, data analysis sessions.
- Slides for each lecture will be made available to students before each lecture. References to the textbook will be provided as well in order to facilitate and clarify the content of the slides.

**REQUIRED WORK AND FORM OF ASSESSMENT:**

- Course Engagement - 10%
- Assignments - 20%
- Midterm - 25%
- Final Exam - 30%
- Final Project - 15%

**Course Engagement**

In addition to actively participating in class, students are required to perform weekly readings and complete practical problem sets. Some of these practice problems will be based on students' datasets and will be carried out using the popular and freely available statistical software **Gretl**. Students will be expected to complete and submit these exercises. The solutions to these assignments will be discussed during class and are meant to enable students to gain some self-awareness on their level of understanding of the topic and to practice new concepts as they are introduced.

**Assignments**

Students will be given **problem sets** composed of practice questions addressing the material covered in the classes before each assignment is due. When appropriate, some of the questions may involve the use of statistical software. Students may work in groups, but each must submit his or her solutions individually. This assignments will be given a letter grade and each will count for 15% of the final grade. These graded problem sets are intended to give students concrete feedback on their work. The solutions to the problems will be discussed extensively in class.

**Midterm**

The midterm will be a take-home exam and will take place in Week 6. This will consist of a series of practical questions on the material covered from Week 1 to Week 5. When appropriate, some of the questions may involve the use of statistical software. Students will have three days to complete the take-home exam. Students can expect five questions, each containing several sub-points. Students may work in groups but each student must submit his or her solutions individually.

**Final Exam**

The final exam will be held in-class and will be composed of practical questions on all the material covered in the course. Some of the questions in the final exam will **not** involve the use of a statistical software. Students will be allowed to use a formulae sheet and statistical tables.

**Final Project**

Students will be asked to conduct a comprehensive analysis of an empirical dataset that requires them to evaluate data, perform advanced calculations, and make recommendations regarding the data. Student will work in groups on this project over the **last week** of the semester. Each group will be assigned a different dataset and will be asked to explain and support their results. Results will be presented as a group during the last class of the semester.

**LEARNING OUTCOMES:**

By the end of the course, students will be able to:

- Know the fundamental econometric models for cross-sections, time series and panel data, their statistical properties, and how to apply them to real data.
- Estimate and critically interpret parameter estimates in simple empirical settings.
- Conduct a comprehensive analysis of an empirical dataset and explain and support their results.
- Evaluate a dataset to extract policy and/or business recommendations.

**ATTENDANCE POLICY:**

As a member of our class community, you are expected to be present and on time every day. Attending class has an impact on your learning and academic success. For the reason, the IES Abroad Milan attendance policy allows for the following number of absences, which are intended to be used for physical and mental health reasons:

- THREE (3) absences in each Italian language course,
- TWO (2) absences in each Area Studies course,
- ONE (1) absence in each seminar course or course meeting 1 day a week,

- ZERO (0) absences in each course of individual music instruction.

Every absence beyond this allowance will automatically result in a penalty of 2 percentage points off the final grade. SEVEN (7) absences will result in a failing grade in Italian language and Area Studies courses. FOUR (4) absences will result in a failing grade in seminar or 1-day-a-week courses. Failure to attend a scheduled exam, test, quiz, or presentation will automatically result in an F grade on that assessment.

Students are expected to abide by the IES Abroad Code of Academic Integrity. All work submitted by a student for academic credit should constitute the student's own original work. Any work submitted for academic credit may be subject to review by a textual similarity detection service for the detection of plagiarism and AI usage.

**CONTENT:**

| Session | Content | Assignments |
|---|---|---|
| **Week 1**<br>*Feb 10* | • **Statistical Review**: Probability distributions, expected value, estimator of the sample mean and its sampling distribution, hypothesis testing. | **Textbook**: Appendix B (pages 714-744). |
| *Feb 12* | • **Simple linear regression model**: Model assumptions, Ordinary least squares (OLS) and its statistical properties. | **Textbook**: Chapter 2 (pages 22-59). |
| **Week 2**<br>*Feb 17* | • **Multiple regression model:** Model assumptions, interpretation of estimates, multicollinearity, t-test and F-test. | **Textbook**: Chapters 3 and 4 (various sections). |
| *Feb 19* | • **Dummy variables:** Definition and interpretation of coefficients. | **Textbook**: Chapter 7 (pages 225-238). |
| **Week 3**<br>*Feb 24* | • **Heteroskedasticity**: Consequences, robust standard errors, weighted least squares. | **Textbook**: Chapter 8 (pages 264-290). |
| *Feb 26* | • **Model misspecification:** Omitted variable bias, inclusion of irrelevant variables, proxy variables. | **Textbook**: Chapters 3 and 6 (various sections). |

| | | |
|---|---|---|
| **Week 4**<br>*Mar 3* | **Discussion of practical questions on topics covered in Sessions 5 and 6.** | **Assignment 1** |
| *Mar 5* | • **Endogeneity and instrumental variables:** Random regressors, definition of endogeneity, IV and 2SLS. | **Textbook**: Chapter 15, Sections 15.1,15.2, 15.3 (506-525) and appendix C.3 (pages 755- 760). |
| **Week 5**<br>*Mar 10* | • **Endogeneity and instrumental variables:** Measurement error, omitted variables and their IV solution. Testing for endogeneity. | **Textbook**: Chapter 15, Sections 15.4,15.5, 15.6 (pages 525- 531). |
| *Mar 12* | **Discussion of practical questions on topics covered in Sessions 8, 9 and 10.** | |
| **Week 6**<br>*Mar 17* | **Review of models for cross sectional data:** Review of key concepts covered in Weeks 1-5 by means of comprehensive examples. | |
| *Mar 19* | • **Linear probability model:** Model specification, interpretation of coefficients and litimitation of this approach. | **Textbook**: Chapter 7, Sections 7.5,7.6 (246-254).<br>**Midterm take-home exam to be held in Week 7.** |
| **Week 7**<br>*Mar 24* | • **Time series models:** Assumptions, static models, distributed lag models. | **Textbook**: Chapters 10 and 11. |
| *Mar 26* | • **Serial correlation**: Definition of serial correlation, robust standard errors, Testing for serial correlation. | **Textbook**: Chapters 12 (408-436). |
| **Week 8**<br>*Mar 31* | **Discussion of practical questions on topics covered in Sessions 12, 13 and 14.** | **Assignment 2** |
| **Week 9**<br>*Apr 7* | • **Panel data analysis:** definition of panel dataset, pooled OLS, analysis via differencing. | **Textbook:** Chapter 13. |

| | | |
|---|---|---|
| *Apr 9* | • **Panel data analysis:** Fixed effects and random effects models. | **Textbook:** Chapter 14. |
| **Week 10**<br>*Apr 14* | **Discussion of practical questions on topics covered in Sessions 17 and 18.** | |
| *Apr 16* | **Review of key concepts for the time series and panel data.** | |
| **Week 11**<br>*Apr 23* | • **Empirical project**: We will review the main topics on cross sectional data in view of the empirical analysis students have to carry out independently. | |
| **Week 12**<br>*Apr 28* | **Empirical project presentation.** | |
| *Apr 30* | **Mock exam**. | |
| **Week 13** | **Final exam.** | |

**TEXTBOOK:**

• Wooldridge, J., Introductory Econometrics – A Modern Approach, South-Western Cengage Learning, 4e International Edition, 2008.

**RECOMMENDED READINGS:**

• Additional readings will be provided, if necessary, on a case-by-case base

**INSTRUCTOR'S BRIEF BIO:** Professor Irina Gardini earned her Master's Degree in Statistical and Economic Sciences from the University of Milan-Bicocca. She is currently in her third year of the PhD program in Economics at the same university. Since 2021, she has been collaborating with the Eni Enrico Mattei Foundation (FEEM) as part of the Energy Finance Econometrics research program.