

**ESM 296
Applied Econometrics**

Course Overview and Objectives:

Many empirical analyses in biological and environmental applications are based on non-experimental data. The objective of this course is for students to learn the research designs and econometric methods for estimating causal effects with non-experimental data. This will prepare the students for conducting high-quality empirical research, with applications in cross-sectional data and panel data settings. The class will mostly emphasize research designs and identification (relative to statistical techniques) and applications (relative to theoretical proofs). Methods and concepts covered will include: regression adjustment and matching, instrumental variables techniques, regression discontinuity methods, and panel data methods. Each concept will be introduced in class through relevant real-world applications.

Course Time: Monday and Wednesday, 12:30- 1:45, Bren 1520

Course Web Page: <http://www.econ.ucsb.edu/~olivier/esm296/esm296.html>

Office Hours: Friday: 1:30 - 3:00, or by appointment, 2050 North Hall

Recommended Textbook: Joshua Angrist and Jorn-Steffen Pischke [A&P]: *Mostly Harmless Econometrics*, Princeton University Press

Introductory Textbook: James Stock and Mark Watson [S&W]: *Introduction to Econometrics* (multiple editions)
Available on reserve at Library

Online Lecture Notes: Guido Imbens and Jeffrey Wooldridge [I&W]. What's New In Econometrics, (<http://www.nber.org/minicourse3.html>)

Other readings will be provided on the class webpage

The course grade will be assigned as follows:

Assignments: 25% (4 individual assignments worth 10% each --- will count best 3). Students can work individually or in teams of 2.

Individual Paper Presentation: 25% (see below)

Final Take-Home Examination: 50% (held during the examination period)

Makeup class: If necessary we will hold a makeup class. This will be after mid-May, although the specific date and time will be announced later.

Individual Assignments:

The individual assignments are designed to review the class material and expand on what is covered in class. All assignments must be handed-in **TYPED** (students can hand-write math and diagrams) and are due at the beginning of class on the due date. Late assignments will not be graded. No electronic submissions of assignments; they will not be graded. The best 3 out of 4 assignments will be used in the computation of your grade.

Statistical Software:

Students may use the software of their choice but the class applications and the solutions for the problem sets will be done with Stata (available in Bren GIS Lab and in Library's Interdisciplinary Research Collaboratory Lab).

Individual Project and Presentation:

Students will prepare a class presentation of an empirical research paper taken from one of the following journals: Nature (nature.com), Proceedings of the National Academy of Sciences (pnas.org), or Science (sciencemag.org). The presentations should cover the entire paper, but focus primarily on the empirical methods, specifically to what extent does the reported empirical analysis identifies a causal relationship. In addition, the students should discuss possible extensions of the research. Each presentation will last about 15 minutes and include a 'powerpoint' presentation. Students will also prepare a 2 page summary of the paper and presentation. Further instructions on how to proceed with this will be available on the class website.

Final Examination:

The students will write an individual take-home examination, held during the exam week. The exam will be composed of empirical and analytical questions.

Academic Dishonesty:

Following the university's policy on academic conduct, all academic dishonesty, such as plagiarism, and other forms of cheating will be met with disciplinary actions.

Tentative Course Outline

Additional readings may be assigned as the quarter progresses.

Date	Topic	Readings
1/8	Class Introduction	
1/10 – 1/17	Review of Linear Regression with One Regressor, Multiple Regression, Heteroskedasticity, and Hypothesis Testing	A&P Chapter 3 S&W Chapters 4-7
1/22	Review of Regression Specification: Dummy Variables, Interactions, and Nonlinear Terms	A&P Chapter 3 S&W Chapter 8
1/24	Definition of Causal Effects and Fundamental Problem of Causal Inference	A&P Chapters 1-2 I&W Lecture 1
1/29 – 1/31	Regression and Matching	A&P Chapter 3 I&W Lecture 1
2/5	Propensity Score Matching	A&P Chapter 3 I&W Lecture 1
2/7 – 2/12	Instrumental Variables Methods	A&P Chapter 4 I&W Lecture 5
2/14 – 2/21	Regression Discontinuity Methods	A&P Chapter 6 I&W Lecture 3
2/26 – 2/28	Panel Data Methods and the Clustering Problem	A&P Chapters 5 and 8 I&W Lectures 8 and 10
3/5	Big Data Methods (time permitting)	TBA
3/7 – 3/14	Student Class Presentations	