

Anderson School of Management  
UCLA

Mgmt 201B  
Econometrics

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Winter 2020

Syllabus

Course Information

201B is a PhD level introduction to micro-econometrics, focusing on proper interpretation of regression analyses and causal inference.

Mathematical Prerequisites

A working knowledge of calculus and matrix algebra. Non-Anderson students must secure permission of the instructor to enroll in 201B.

Computing

All computing will be done with R. R is a free programming environment and language for statistics and data manipulation. R is used world-wide in both academe and the private sector. We will use only a small subset of the capabilities of R in this course and this will not require extensive training. All material needed for the use of R will be developed in class and no prior knowledge of R is required. We will use the R-studio IDE (Integrated Development Environment).

Homework and Tests

A 7<sup>th</sup> week midterm (30%), a final project (30%), and five home works (40%) will constitute the course evaluation. For the final project, each student will select an empirical paper of relevance to them for replication and analysis. You will be expected to prepare a brief (20 minutes) slide presentation and provide a 10 page maximum paper summarizing the research questions of this paper, empirical strategy, replication of results and critique.

**Check the CCLE web page for important dates.**

**Late Homework Policy:** Since homework submission is available on the CCLE web site, no late homeworks will be accepted. If you do not submit the homework before the submission deadline, the drop-box on the CCLE website will close and not allow for any further submission. **NO LATE HOMEWORKS are allowed.**

Exam attendance:

It is expected that students will complete the midterm for the course. **I will only entertain requests for rescheduling the exam in cases of extreme medical or personal emergency.** This **does not** include job interviews, weddings, vacations or class trips. Any request must be made *in advance*.

Having one or more other exams on the same day is NOT a legitimate reason for exam rescheduling. Similarly, the fact that a case assignment or course project is due on the exam date is NOT legitimate either. Plan ahead to manage your time.

Exam Format:

The exam is closed-book/closed-notes. You may bring one 8 1/2" x 11" cheat sheet (you may use both sides).

**Please bring a calculator to all exams. Your calculator must be able to compute natural logs and exponentiate.**

Students with Learning Disabilities

If you have a learning disability and require special provisions for taking exams, it is your responsibility to get in touch with the UCLA OSD

<http://www.osd.ucla.edu/>

and have them contact me directly to make exam arrangements for you. I will email the exam to them and they will administer it.

Class Handouts

You are responsible for bringing the relevant section of the lecture notes to **every** lecture. All materials are on the course website – login into ccle.ucla.edu with your myUCLA username and password.

Office Hours/Email

**In person:** B5.05, please email for an appointment.

**By E-mail:** [stephan.a.seiler@gmail.com](mailto:stephan.a.seiler@gmail.com)

Class Materials

All course materials are available on the CCLE web. Students are responsible for printing their own copies of course materials.

There is only one required text for the class, Angrist and Pischke, Mostly Harmless Econometrics.

Other useful texts include:

Wooldridge, *Econometric Analysis of Cross Section and Panel Data*

Hayashi, *Econometrics*

Greene, *Econometric Analysis*

## Course Outline and Readings

### I. Topics in Regression

- A. Review of basic results for linear regression
- B. Understanding how OLS uses variation
- C. Omitted Variable Bias
- D. Errors-In-The-Variables
- E. Heteroskedasticity
  - i. variance stabilizing transformations
  - ii. GLS and Heteroskedasticity Robust Inference
  - iii. Testing for Heteroskedasticity
- F. Regression and Causality
- G. Non-linearity
  - i. the approximation theorem
  - ii. various approaches to flexibility
    - polynomials and interactions
    - log-linear regression
    - piecewise linear and splines
    - Kernel Regression
- H. Variable Selection
  - i. R-squared and Adjusted R-squared
  - ii. AIC/BIC criterion
  - iii. Stepwise Procedures
  - iv. LASSO and Bayesian Methods
- I. Multi-collinearity
- J. Diagnostics and Validation
  - i. Leverage and Cook's Distance
  - ii. Predictive Validation

### II. Instrumental Variables

- A. Structural and reduced forms
- B. Restrictions required for Instrument Validity
- C. Examples of Instruments used
- D. 2SLS with robust standard errors
- E. Weak Instruments and Testing

### III. Panel Data

- A. Fixed Effects
  - i. differencing
  - ii. demeaning
  - iii. cluster standard errors
  - iv. non-linear models and Chamberlain's conditional logit
- B. Random Effect Models
  - Assumptions and problems with the likelihood
  - Heterogeneity Everywhere

Simulated Maximum Likelihood

C. Bayesian Approaches to RE

- i. the hierarchical approach vs. integrating out
- ii. Non-normal distributions of random effects
- iii. Non-linear models including discrete choice

IV. Topics in Causal Inference

- A. Conditional Independence and Propensity Scores
- B. Causal Interpretation of IV
- C. Imbens-Rubins assumptions for identification of causal effects.
- D. Regression Discontinuity
- E. Difference-In-Differences
- F. Synthetic Controls
- G. Issues in the Design of Experiments

VI. Examples of Empirical Identification at Work

- A. Identifying Effects of Superbowl Ads
- B. Identifying Income Effects on Private Label Demand
- C. Identifying Returns to Schooling
- D. An RD example

VII. Student Presentations of Current Empirical Work