University of Colorado at Boulder
Department of Economics

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ECON 8848: Applied Microeconometrics, Spring 2011
Syllabus and Schedule
Office Hours: MW 12:30-1:30 PM, 3:00-4:00 PM
Economics 14A
Other times by appointment

Course Description:

Students who are successful in this course will be well-prepared to conduct empirical research across a broad range of fields, although the tools are used most frequently in the applied microeconomics fields. The course provides a "user's guide" to many of the most commonly used econometric techniques, with a heavy focus on implementation and interpretation. We will begin the course with a STATA boot camp, quickly becoming familiar with the software package including programming techniques and data management skills. We will then move through a range of econometric topics, making sure to practice each technique in STATA. I hope to live up to the following quotation by Edward Leamer in his article *Let's Take the Con out of Econometrics* (AER, 1983):

> *"Methodology, like sex, is better demonstrated than discussed, though often better anticipated than experienced."*

Prerequisites:

To enroll in this course, you must have a working knowledge of statistics and econometrics equivalent to that obtained in ECON 7818 and ECON 7828.

Course Materials:

There is no required textbook for this course, although I will provide references to a number of books and articles for the interested student. We will also read and discuss several articles. Some of these articles will be "theory" articles, discussing the relative merits of estimators or developing and applying new ones. Others will be "application" papers, usually papers that use a technique we have discussed in an honest and useful way. I will also provide lecture notes, and you will find these and the assigned articles posted or linked on the CULearn website. You should read the articles assigned prior to coming to class and be prepared to answer questions and participate in discussions. Please bring a copy of the papers we are discussing with you to class.

Students are not required to purchase their own copies of STATA, although those desiring to do so qualify for a substantial discount through the University's GradPlan. More information is available through a link posted on the CULearn website. I recommend Stata/IC. The price is $179 for a perpetual license (i.e. never expires).

Note: SMALL STATA WILL BE INSUFFICIENT FOR THIS COURSE.

You will receive a copy of "Getting Started", an official STATA guide if you elect to purchase your own copy. If you expect to use STATA beyond this course, you can feel free to purchase a

more advanced copy (SE or MP), but the Intercooled version will allow you to complete all the requirements of this course.

I will use STATA during some lectures to demonstrate estimators and methods that we cover. If you have STATA installed on a laptop, you may find it useful to bring on those days.

Requirements and Grading:
Your grade will depend on your performance on a number of assignments, according to the table below:

Assignment	Weight	Due Date
Problem Sets	25%	Every 1-2 weeks (~10 total)
Paper Replication/Extension	30%	Friday, 4/29 5 PM Hard Copy in my Office
Midterm	20%	Wednesday, 3/16 In Class
Final Exam	25%	Wednesday, 5/4 4:30-7:00 PM

Problem Sets will be assigned roughly weekly, and will be closely related to the topics covered in this course. These problem sets will allow you to gain direct experience with all of the econometric techniques we cover. All assignments will be STATA-based, although they will require answering interpretation/"thinking" questions as well. Although I may ask you to prove something formally, this is much less likely than asking you to simulate or to demonstrate a particular property using real-world or simulated data. Problem Sets will be graded on a 3-point scale, with missing assignments given a grade of zero.

Paper Replication/Extension: Unlike the harder sciences, the field of economics places a relatively small weight on the value of replication. Nevertheless, economists make mistakes all the time, and some of them go undiscovered forever. So, as a means to practice all of the skills we are developing, and in service of the broader good, you will replicate a paper in a field that is of interest to you. You should choose a published paper that relies on publicly available data or on data that the authors have made freely available. You should also provide at least one extension to the original work. Possible extensions include adding additional years of data, running additional specifications (e.g. functional form, RD instead of DiD, etc.), and subjecting the results to additional robustness checks. Alternatively, you could use similar methods in a slightly different context – different geography, different time period, etc. A hard copy of this paper will be due in my office by close of business on April 29.

The Midterm will cover material from the beginning of the course through lecture on March 9. The exam will take place during our normal class meeting on Wednesday, March 16. You *will not* have to do any STATA programming for the midterm. Instead, the questions will focus on the interpretation and implementation of techniques we have discussed. I will ask several questions of the form: "Suppose you used to technique X to answer question Y and received the following results. What do they mean? What are you worried about? How could you address potential threat to identification Z? You may also be asked questions about the papers that we read.

The Final Exam will be nominally cumulative, but it will focus heavily on material covered after the midterm. It will be similar in format to the midterm. Our assigned time from the Registrar is 4:30-7:00 PM on Wednesday, May 4.   University policy provides students with

three or more exams on the same day the right to reschedule exams following the first two.[1] Any student wishing to invoke this right should notify me as soon as possible and no later than February 28. I will ask for a printed copy of your schedule to verify the conflict.

Final Letter Grades will be a weighted average of each of the components listed above. Prior to averaging, I will assign letter grades to each component based on the scores a good student at this level could reasonably be expected to attain.

Seminar Series: You are strongly encouraged to attend the Economics department seminar series, especially when the speaker presents on an empirical applied micro topic. Learning to conduct and present original research is the key to your success in the discipline. These seminars are an excellent resource for you in that endeavor.

Late Assignments/ Missed Examinations Policy: Problem Sets will be turned in through the CULearn website where they will receive a time stamp. I will post each week's problem set by the end of the week, and it will be due the following Friday by 5 PM. Following a 5-minute grace period, I will deduct 1 point from each assignment for each day it is late. Assignments submitted more than 48 hours after the due date will receive no credit.

The paper replication must be turned in on time. I will deduct 25 percent of the grade for each day after the deadline when it is turned in.

If you miss the midterm or the final exam you will receive no credit unless you provide documentation of a medical or family emergency. In the case of a legitimate emergency, the missed quiz or exam will be given no weight in the calculation of the final grade and other assignments will be reweighted accordingly. There will be no make-up exams. If you foresee any conflict that will prevent you from taking an exam, please let me know as soon as possible and at least two weeks beforehand.

A note on my role: I will always be willing to offer you assistance with any assignment for this course, including the final paper. I will strongly suggest, however, that you form study groups for the problem sets and use the other members of your group as your initial resource in solving programming problems. In addition, I cannot generally offer help on projects that are unrelated to this course, e.g. work you are doing as part of your dissertation or as an RA for other faculty members. My goal in offering this course is to create a critical mass of well-trained graduate students who can then continue to learn more on their own and begin to serve as a resource to each other.

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[1] http://www.colorado.edu/policies/final_exam.html

Tentative Schedule

Topic	Tentative Dates
Introduction and STATA Basics	1/10, 1/12
MLK Day NO CLASS	1/17
Advanced STATA	
Descriptive Statistics, Figures and Tables	1/19
Data Management	1/24
Programming – Loops, Macros	1/26
Simulation	1/31
Linear Regression Review	
Functional Forms – Logs, Polynomials, Categorical Variables, Interaction Models	2/2, 2/7
Review of FWL and the meaning of "controlling for"	2/9
The Experimental Ideal	
Treatment Effects – Potential Outcomes Framework	2/14
Causality in an OLS Regression – the CIA	2/16
Propensity Score Matching	2/21, 2/23
Advanced Data Management	2/28
Panel Data Models	
Difference-in-Differences	3/2, 3/7 – paper
RE, FE, FD	3/9, 3/14 – paper(s)
MIDTERM EXAM	3/16
Variance Estimation in Panel Models	3/28, 3/30, 4/4 - papers
Instrumental Variables	
Basics – Constant Treatment Effects	4/6, 4/11 - paper
Local Average Treatment Effects	4/13
Regression Discontinuity	4/18, 4/20 – papers
Binary Dependent Variables	4/25
Review	4/27
FINAL EXAM	5/4 4:30-7:00 PM

Other University Policies:

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please inform me no later than two weeks prior to any conflict you foresee, sooner if possible, so that we can find an alternative arrangement for you to complete the requirements of the course. See full details at http://www.colorado.edu/policies/fac_relig.html

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and www.Colorado.EDU/disabilityservices

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at http://www.colorado.edu/policies/classbehavior.html and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

The University of Colorado at Boulder policy on Discrimination and Harassment, the University of Colorado policy on Sexual Harassment and the University of Colorado policy on Amorous Relationships apply to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based upon race, color, national origin, sex, age, disability, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH, the above referenced policies and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://www.colorado.edu/odh

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at http://www.colorado.edu/policies/honor.html and at http://www.colorado.edu/academics/honorcode/

Reading List

The list below provides a guide to how to get the most out of your available resources for this course. Your most directly relevant text will be our lecture notes. They will provide you with the basics of all of the material that we cover in each class meeting. There are also two books that I think fit nicely with the applied nature of this course and offer a good complement to our in-class discussion. They are both relatively inexpensive, and I would recommend them as your best additional resources for learning the topics we cover. I also strongly recommend having one or more graduate econometrics textbooks for reference. Finally, we will read a few papers that actually apply the methods we are discussing. These are listed below in bold. Additional references that we will probably not have time for are listed in standard font. The links are active, but you will need to be on-campus or connected through VPN.

Books with an Applied Focus. I highly recommend getting a copy of each of these books, as they will provide a very useful supplement to my lectures and notes. Angrist and Pischke is relatively inexpensive (~$25), and I would strongly suggest that each of you get a copy. The Cameron and Travedi book is great, and it is specifically tailored for people learning STATA. A good strategy might be to order one for each study group (~$50). As of this writing, they are currently listed together on Amazon as "Frequently Bought Together"

Angrist and Pischke (2009). *Mostly Harmless Econometrics: An Empiricist's Companion.* **AP**

Cameron and Trivedi (2009). *Microeconometrics Using STATA.* **CT-STATA**

Econometrics Reference Books. I am not going to require you to have any particular one of these. I would recommend that you find at least one of the following books that you find useful as a reference book. I have tried to include the relevant sections where possible in the main table below.

Cameron and Trivedi (2005). *Microeconometrics: Methods and Applications.* **CT**

Davidson and MacKinnon (2004). *Econometric Theory and Methods.* **DM**

Wooldridge (2002). *Econometric Analysis of Cross Section and Panel Data.* **W**

Papers. Papers listed in **bold** are required reading and will be discussed in class during one of the meetings scheduled for the topic. Exact dates will be announced as we see how we are progressing. The additional papers listed are for reference for the interested student.

Topics and Readings

Readings marked with a [*] indicate that if I were you, and I had limited time to read non-required readings, I would prioritize these.

Introduction and STATA Basics
- o **Lecture Notes**
- o [*] CT-STATA Chapter 1

STATA Programming
- o **Lecture Notes**
- o [*] CT-STATA Chapter 1.5-1.8, 4

STATA Descriptive Stats, Figures and Tables
- o **Lecture Notes**
- o [*] CT-STATA Chapter 2

STATA Data Management
- o **Lecture Notes**
- o [*] CT-STATA Chapter 2

Functional Forms
- o **Lecture Notes**
- o AP – Chapter 3, various parts
- o CT-STATA Chapter 3.3
- o CT – Chapter 4.1-4.4

FWL and Multiple Regression
- o **Lecture Notes**
- o Lovell(2008) A Simple Proof of the FWL Theorem, Journal of Economic Education, Vol. 39 No. 1 (Winter 2008)
- o DM pp. 68-?
- o Zax Textbook, Chapter 12, Section 12.4 pp. 26-35

The RCT/Treatment Effects
- o **Lecture Notes**
- o [*] AP – Chapter 2
- o W – Chapter 18

Omitted Variable Bias
- o **Lecture Notes**
- o [*] AP – Chapter 3.2
- o DM – 2.4-2.5
- o W – Chapter 4.3

Panel Data – Fixed Effects, etc.
- o **Lecture Notes**

- Ashenfelter and Krueger (1994) Estimates of the Economic Return to Schooling from a New Sample of Twins, *American Economic Review*, Vol. 84, No. 5 (Dec., 1994) pp. 1157-1173
- McKinnish (2008) Panel Data Models and Transitory Fluctuations in the Explantory Variable. *Advances in Econometrics.* Vol. 21 2008.
- [*] AP – Chapter 5.1, 5.3, 8.2
- [*] CT-STATA Chapter 8
- CT – Chapter 21
- W – Chapter 10

Difference-in-Differences
- **Lecture Notes**
- **Davis (2004) The Effect of Health Risk on Housing Values: Evidence from a Cancer Cluster. *The American Economic Review*, Vol. 94, No. 5 (Dec., 2004), pp. 1693-1704**
- **Bertrand et. al. (2004) How Much Should We Trust Differences-in-Differences Estimates? *Quarterly Journal of Economics*, Vol. 119, No. 1, Pages 249-275**
- Meyer (1995). Natural and Quasi-Experiments in Economics. *Journal of Business and Economic Statistics.* Vol. 13, No. 2 pp. 151-161
- [*] AP – Chapter 5.2
- CT – Chapter 22.6
- W – p.130, p. 284

Getting the Standard Errors Right
- **Lecture Notes**
- **Bertrand et. al. (2004) How Much Should We Trust Differences-in-Differences Estimates? *Quarterly Journal of Economics*, Vol. 119, No. 1, Pages 249-275**
- **Moulton (1990) An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units, *Review of Economics and Statistics*, Vol. 72, No. 2 (May, 1990), pp. 334-338**
- **Cameron, Gelbach, and Miller (2006) Robust Inference with Multi-Way Clustering, *NBER Technical Working Paper* No. 327**
- [*] AP – Chapter 8.2

Event Study Models
- **Jacobson, LaLonde, and Sullivan (1993) Earnings Losses of Displaced *The American Economic Review*, Vol. 83, No. 4 (Sep., 1993), pp. 685-709**

Instrumental Variables
- **Lecture Notes**
- Imbens and Angrist (1994) Identification and Estimation of Local Average Treatment Effects. Econometrica, Vol. 62, No. 2 (Mar., 1994), pp. 467-475
- Bound, Jaeger, and BAPer (1995) Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogeneous Explanatory Variable is Weak. *Journal of the American Statistical Association,* Vol. 90, No. 430 (Jun., 1995), pp. 443-450

- Field and Ambrus (2008) Early Marriage, Age of Menarche, and Female Schooling Attainment in Bangladesh, *Journal of Political Economy*,Vol 116, No. 5, pp. 881-930
- [*] AP – Chapter 4
- [*] CT-STATA Chapter 6
- CT – Chapter 4.8-4.9
- DM – Chapter 8
- W – Chapter 5, 18.4

Regression Discontinuity
- **Lecture Notes**
- Imbens and Lemieux (2008) Regression Discontinuity Designs: A Guide to Practice. *Journal of Econometrics.* Volume 142, Issue 2, February 2008, Pages 615-635
- **Matsudaira (2008) Mandatory Summer School and Student Achievement. Journal of Econometrics. Volume 142, Issue 2, February 2008, Pages 615-635**
- [*] AP – Chapter 6

Selection
- [*] CT-STATA - Chapter 16
- [*] W – Chapter 17

Propensity Score Matching
- **Lecture Notes**
- Smith and Todd (2005) Does Matching Overcome LaLonde's Critique of Nonexperimental Estimators? *Journal of Econometrics*, Vol 125, No. 1-2, pp. 305-353
- Dehejia (2005) Practical Propensity Score Matching: A Reply to Smith and Todd, *Journal of Econometrics*, Vol 125, No. 1-2, pp. 355-364
- Smith and Todd (2005) Rejoinder, *Journal of Econometrics*, Vol 125, No. 1-2, pp. 365-375
- [*] CT – Chapter 25.4
- W – Chapter 18.1-18.3

Propensity Score Reweighting
- **DiNardo, Fortin and Lemieux (1996) Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach *Econometrica*, Vol. 64, No. 5 (Sep., 1996), pp. 1001-1044**

Duration Models
- [*] Meyer (1990) Unemployment Insurance and Unemployment Spells. *Econometrica*, Vol. 58, No. 4 (July 1990), pp. 757-782
- CT – Chapter 17
- W – Chapter 20

Binary Dependent Variables
- **Lecture Notes**
- [*] CT-STATA Chapter 14
- CT – Chapter 14

- o W – Chapter 15.1-15.8

Discrete Choice Models
- o [Train (2009) Discrete Choice Methods with Simulation, Cambridge University Press](#)
- o [*] CT-STATA Chapter 15
- o CT – Chapter 15
- o W – Chapter 15.9-15.10