University of Colorado at Boulder
Department of Economics

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ECON 8848: Applied Microeconometrics, Fall 2016
Syllabus and Schedule
Office Hours: MW 9:15-10:45 AM
Economics 208D
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

(AER, 1983):

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 Desire2Learn 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 (paper or electronic) 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 Desire2Learn website. I recommend starting with Stata/IC. The price is $198 for a perpetual license (one that never expires).

Note: SMALL STATA WILL BE INSUFFICIENT FOR THIS COURSE.

You will receive a copy of the STATA documentation in PDF format if you choose to purchase your own. 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	15%	Every 1-2 weeks (~10 total)
Paper Replication/Extension	30%	Friday, 12/09, 5 PM D2L or Hard Copy
Midterm	25%	Monday, 10/24 In Class (tentative date)
Final Exam	30%	Monday, 12/12 4:30-7:00 PM

Problem Sets will be posted at the onset of the course with deadlines every 1-2 weeks. 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. These problem sets will not require proofs; rather, they will ask you to simulate or to demonstrate a particular property using real-world or simulated data. Five percentage points of your overall grade will be based on whether you complete the assignments and turn them in on time. I will also choose two assignments at random to grade in depth, and these grades will account for the remainder of your grade. Note that the problem sets are fairly short and simple to start and become more difficult as we tackle more complicated material. You may work with other students on these assignments, and the code may be identical to other students' submissions. To eliminate the temptation to free ride, each student must submit his/her own copy of the problem set (via D2L), and you should indicate each of your collaborators on each problem set.

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 the central analysis of 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. The paper's central methodology should be one of the methods we cover in this course. 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 paper is not suitable as a replication paper if you cannot feasibly extend the paper. A hard copy of this paper will be due in my office by close of business on December 9. I will also ask for an electronic copy so that I can submit the paper to TurnItIn.

Note that although this assignment requires the replication of the central analysis from a published paper, you

I will require that you complete and attach the department's academic integrity cover sheet for the assignment.

http://www.colorado.edu/Economics/graduate/AcademicIntegrityAgreement.pdf

The Midterm will cover material from the beginning of the course through lecture on October 19. The exam will take place during our normal class meeting on Monday, October 24. You have to do any STATA programming for the midterm. Instead, the questions will focus on the interpretation and implementation of techniques we have discussed. The questions will thus be very similar to the interpretation questions asked on the problem sets. 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 Monday, December 12. 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 September 30. 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.

Writing: Please note that this course requires a great deal of writing. The goal of the course is to prepare you to conduct and original research using applied microeconomics. As you will soon find, the writing and communication components of applied econometrics are at least as important as the actual econometric skills. In grading papers, exams, and problem sets, I place substantial weight on students' ability to communicate their understanding and interpretation of the methodologies and results.

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 Desire2Learn website where they will receive a time stamp. All of the problem sets will be posted on the first day of class, and each will be due on a Friday by 5 PM. Following a 5-minute grace period, I will assign zero credit toward the "completion" component of the Problem Set grade for any assignment turned in after the deadline. In the event that a late problem set is randomly selected to be graded in detail, I will deduct 1 point (out of 5) for each half day it is late, and assignments submitted more than 48 hours after the due date will receive no credit.

[1] http://www.colorado.edu/policies/final-examination-policy

The paper replication must be turned in on time. Following a ten minute grace period, I will apply at least a 15 percent penalty to final projects turned in after the deadline, with greater penalties likely for delays of more than 24 hours.

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 documented emergency, the missed 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 am 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. I will not tell you how to solve specific coding issues on the problem sets, nor will I tell you whether you have answered interpretation questions properly prior to the due date. Solutions will be provided shortly after the deadline to turn in the assignment.

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.

Cheating: If you copy interpretation answers from a classmate (or previous student) on a problem set, you will receive no credit for that problem set. If you cheat on an exam, you will fail that exam. If you plagiarize even a portion of your final project, you will fail the final project. I reserve the right to impose harsher academic sanctions up to and including failing the course for any instance of cheating. Also, note that failing any component of the course makes it very unlikely that you will earn a “B” or better in the course.

Tentative Schedule

Topic	Tentative Dates
Introduction and STATA Basics	8/22, 8/24
Advanced STATA	
Descriptive Statistics, Figures and Tables	8/29
Programming – Loops, Macros	8/31
NO CLASS – Labor Day	9/5
Simulation	9/7
Linear Regression Review	
Functional Forms – Logs, Polynomials, Categorical Variables, Interaction Models	9/12,9/14
Review of FWL and the meaning of "controlling for"	9/19
The Experimental Ideal	
Treatment Effects – Potential Outcomes Framework	9/21
Causality in an OLS Regression – the CIA	9/26
Propensity Score Methods	9/28
Advanced Data Management	10/3
Panel Data Models	
Difference-in-Differences	10/5, 10/10 – paper
RE, FE, FD	10/12, 10/17 – paper(s)
MIDTERM EXAM	10/24
Variance Estimation in Panel Models	10/19, 10/26 – paper
Instrumental Variables	
Basics – Constant Treatment Effects	10/30
Local Average Treatment Effects	11/2, 11/7 - paper
NO CLASS – Individual Meetings	11/9, 11/14
Regression Discontinuity	11/16, 11/28 – paper
NO CLASS – Fall Break	11/21, 11/23
Binary Dependent Variables	11/30
Wrap-Up	12/5, 12/7
FINAL EXAM	Monday, 12/12 4:30-7:00 PM

Other University Policies:

Disability Accommodation

If you qualify for accommodations because of a disability, please submit to Prof. Cadena a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu.

f you have a temporary medical condition or injury, see Temporary Injuries guidelines under the Quick Links at the Disability Services website and discuss your needs with Prof. Cadena.

Religious Observances

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 course, please inform me no later than two weeks prior to any conflict you foresee, sooner if possible, so that we may find an alternative arrangement for you to complete the requirements of the course. See campus policy regarding religious observances for full details.

Classroom Behavior

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, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, 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. For more information, see the policies on classroom behavior and the student code.

Discrimination and Harassment

The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the OIEC website.

Academic Integrity

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy of the institution. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at honorcode.colorado.edu.

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 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 (~$35), 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 (~$75).

Angrist and Pischke (2009). **AP**

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

Angrist and Pischke have a new book , pitched to an undergraduate crowd that covers many of the same methodologies we study. You may find it useful as well.

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). **CT**

Davidson and MacKinnon (2004). **DM**

Wooldridge (2002). **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
- **Lecture Notes**
- [*] CT-STATA Chapter 1

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

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

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

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

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

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

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

Propensity Score Matching
- **Lecture Notes**

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

Panel Data – Fixed Effects, etc.

- **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. 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**
- Meyer (1995). Natural and Quasi-Experiments in Economics. 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, No. 327
- Cameron, A. Colin and Douglas L. Miller, A Practitioner's Guide to Cluster-Robust Inference, Journal of Human Resources, 50(2) March 2015, pp. 317-372.
- [*] AP – Chapter 8.2

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 Baker (1995) Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogeneous Explanatory Variable is Weak. , 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. Volume 142, Issue 2, February 2008, Pages 615-635
- **Carrell, Scott E. & Hoekstra, Mark & West, James E., 2011. "Does drinking impair college performance? Evidence from a regression discontinuity approach," Journal of Public Economics, Elsevier, vol. 95(1), pages 54-62**
- [*] AP – Chapter 6

Binary Dependent Variables

- **Lecture Notes**
- [*] CT-STATA Chapter 14
- CT – Chapter 14
- W – Chapter 15.1-15.8

Additional Topics[2]

Event Study Models

- Jacobson, LaLonde, and Sullivan (1993) Earnings Losses of Displaced Workers , Vol. 83, No. 4 (Sep., 1993), pp. 685-709

Selection

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

Propensity Score Reweighting

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

[2] I would ideally cover these topics, but in the past, we have not had sufficient time. The citations are provided for those interested in pursing these topics independently.

Duration Models

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

Discrete Choice Models

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