GRADUATE CAUSAL INFERENCE AND RESEARCH DESIGN: SYLLABUS

Course code: Economics 5341
Term: Spring 2014
Location: Cashion 408
Time: 12:30 - 1:45pm
Website: `http://business.baylor.edu/scott_cunningham/Causal_inference.html`

Instructor: Prof. Scott Cunningham
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Office: Hankamer 365
Office hours: Wednesday/Friday 9:30-11:00am, or by appointment

COURSE DESCRIPTION

Confusion between correlation and causation can be costly, regardless of whether it is an individual, a firm or a public agency making the error. This class introduces students to the modern theory of "causal inference" which can be traced back to the randomized experimental framework developed by Ronald Fisher, the "potential outcomes" model by Donald Rubin, and the causal graphical models developed by Judea Pearl.

The class is a very hands-on course. Students will learn to write programs in the econometrics software package, STATA, in addition to learn the numerous research designs economists and statisticians have developed to estimate causal inference when experiments are not feasible. We will cover matching estimation, linear and nonlinear regression models, panel methods, differences-in-differences, synthetic control, instrumental variables and regression discontinuity. The majority of the class will focus on selection bias and treatment assignment.

COURSE OBJECTIVES

The primary objective of this course is for students to understand the difficulty in inferring causality in social scientific research. Complementary course objectives consist of:
· implementing a variety of econometric tools and research strategies for causal inference, and
· developing programming skills (in the statistical software package Stata)

COURSE OUTCOMES

Course objectives are measures via the course assignments which assess acquired substantive knowledge and analytical ability via written work. See below under "Coursework, Grades, and Grading Policies".

CREDIT

Students will be evaluated based on two midterm, several problem sets including empirical exercises, and the exhaustive replication of another paper.

TEXTBOOKS

The required texts are:

Morgan, Stephen L. and Christopher Winship. 2007. <u>Counterfactuals and Causal Inference: Methods and Principles for Social Research</u>. Cambridge University Press.

You can purchase it online here:

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http://www.amazon.com/Counterfactuals-Causal-Inference-Principles-Analytical/dp/0521671930/
ref=sr_1_1?ie=UTF8&qid=1345516215&sr=8-1/
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and:

> Angrist, Joshua and Jrn-Steffen Pischke, 2008. <u>Mostly Harmless Econometrics:</u>
> <u>An Empiricist's Companion</u> Princeton University Press, 1st edition.

You can purchase it online here:

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http://www.amazon.com/Mostly-Harmless-Econometrics-Empiricists-Companion/dp/0691120358
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All other readings are available online, either through a link to an electronic journal or through library e-reserve. Links will be distributed to students via the instructor's course website as the semester progresses. Some of the readings are technical pieces from economics journals. The degree to which a student needs to be familiar with the details of a paper will be clear from the emphasis given to the paper in lecture.

COURSEWORK, GRADES, AND GRADING POLICIES

Graduate credit is weighted equally across midterm 1, midterm 2, replication projects and an original research project:

· Midterm 1 (30%)
· Midterm 2 (30%)
· Problem sets (25%)
· Research Project (15%)
  · Project: Selection of appropriate paper for replication (5%)
  · Project: Obtaining data set and producing summary statistics table (10%)
  · Project: Reproduction of the remainder of the paper, including do-file and log output (10%)

EXAMS (60%)

The exams may cover any material from the assigned readings in the text, as well as any additional material that I cover in lecture. Students will be excused from the midterm exams only for valid medical or family emergencies. These excuses must be identified before the midterm and students must produce signed evidence verifying the reason why they cannot attend. If it is missed for a valid reason, weight will be reassigned from the other exams; otherwise, zero credit will be given.

The first exam is scheduled for **TBA**. The final exam is **TBA**. The final exam will cover material from the entire semester. No makeup final exams will be allowed. If you will not be available during this time, please enroll in another course.

Students may ask that an exam be re-graded if they feel that a mistake has been made, by giving me a request in writing explaining their reasoning. The entire exam will be regraded and, after re-reading the exam, the grade may rise or fall. Of course, if a simple mistake has been made in adding up points, students should bring this to my attention and the grade will be changed.

PROBLEM SETS (25%)

This is a very hands-on course, and students will be required to learn STATA, an econometric package available for purchase. A student version is available through STATA Gradplan for $65, or students can use the version installed in the computer labs. Please contact me if you are interested in purchasing a Stata DVD for yourself and I will arrange it. Stata Corp. has a list of excellent

web-based tutorials for learning how to use Stata:

· http://www.stata.com/links/resources1.html

RESEARCH PROJECTS (25%)

In addition to the midterm and replication, students are required to produce an original work showcasing the application of these methods to a social science or policy question. There are three dates associated with this assignment: the selection of a research question and a viable dataset is required by the end of the fourth week; a description of the identification strategy as well as a table of summary statistics by the end of the eighth week (10%); a completed working draft by the end of the semester (10%).

CLASS PARTICIPATION

If you miss more than 7 classes, Baylor policy requires that I fail you. In addition to being physically present, I expect students to come to class mentally prepared.

ACADEMIC HONESTY

All students must be familiar with and abide by Baylor's Code of Academic Conduct, which is available online at `http://www.baylor.edu/honorcode/index.php?id=44060`. I take matters of academic honesty very seriously. A student who commits academic dishonesty disrespects the hard work of his classmates. Any student found cheating, plagiarizing, or colluding during the course will be referred to the Associate Dean. If you fall behind in your coursework and even feel tempted to be dishonest, please see me first so that we find a way for you to turn in your work late (but with some penalty). That said, students are encouraged to study together and to collaborate on homework, although each student must write up her own homework.

TENTATIVE SCHEDULE AND TOPICS

The following is a rough outline of the topics we will cover in class:

· Potential outcomes model, directed acyclic graphical modeling, statistics review
· Selection on observables: back-door criterion
· Selection on observables: stratification, propensity score matching, covariate matching
· Selection on observables: ordinary least squares
· Selection on unobservables: partial identification, bounded estimates of ATE, Manski
· Selection on unobservables: instrumental variables, heterogenous treatment effects, LATE
· Selection on unobservables: front-door criterion, mechanisms
· Selection on unobservables: panel methods, differences-in-differences, triple differences, synthetic control
· Selection on unobservables: regression discontinuity design
· Other topics (remainder)