ECON 474 – Econometrics of Policy Evaluation

Spring 2023

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Noyes Laboratory 163
TR 9:30am–10:50am

Canvas
DKH 15
Wed. 3:30pm-4:30pm

Course Description

Develops the basic tools to understand and use modern econometric methods for estimating and making inference of causal effects. The topics include randomized experiments, natural experiments, matching methods, instrumental variables, and regression discontinuity. Focuses on topics which are relevant for policy problem.

Required Software

R and RStudio
R Markdown

Required Reading

R for Data Science by Hadley Wickham & Garett Grolemund (2017)
Causal Inference: The Mixtape by Scott Cunningham (2021)

Additional Reading

- (Recommended) Mastering Metrics by Joshua Angrist & Jörn-Steffen Pischke (2015)
- (Econometrics review) Introductory Econometrics by Jeffery Wooldridge (2020)
- (Graduate-level) Mostly Harmless Econometrics by Angrist & Pischke (2009)
- Various illustrative academic papers

Learning Objectives

By the end of the course, you should have a solid understanding of which settings are suited to causal inference. Moreover, you should know which techniques to apply when. You should also understand the assumptions and limitations of each technique.

You ~~should~~ will feel comfortable programming in R. This includes implementing the statistical techniques learned in class, processing data, plotting data, and presenting results. You will also learn how to write basic LaTeX math and how to write a document in Markdown.

This course is also intended to help you interact with the material and teach you good analyst habits. Coding is not as glamorous as Hollywood would have you believe. It is a lot of, why the @#!&$ isn't my code working? We will learn how to debug our code.

Teaching Philosophy

- I don't believe in busy work
- My goal is to teach you skills useful for a career
- Computers are dumb; (some) theory is vital to understanding the why and when of causal econometric tools
- I am here to help you learn. Ask questions, communicate with me, be a nerd.

Any sort of discrimination is strictly prohibited and unacceptable. I will follow up with the university about any cases. Everyone is, and should feel, included.

Expectations

Of you

I expect you to start on course work early, to follow the Coding Assistance Checklist, to be prepared with questions and do the readings for course time (such as questions on the most confusing point), to attend lecture, to communicate about inability about deadlines ASAP, and to ask for help when you need it.

Of me

I will only give assignments and problems if I believe they will help you understand the material and/or will be applicable in future life. I am most likely available by email from 9:00am–5:00pm central time. I will always do my best to respond within 24 hours. I will ask for mid-semester anonymous feedback on the course and adjust accordingly.

Grading

GPA	Letter	Percentage
4.0 & ★	A+	[97%, ∞)
4.0	A	[93%, 97%)
3.7	A-	[90%, 93%)
3.3	B+	[87%, 90%)
3.0	B	[83%, 87%)
2.7	B-	[80%, 83%)
2.3	C+	[77%, 80%)
2.0	C	[73%, 77%)
1.7	C-	[70%, 73%)
1.3	D+	[67%, 70%)
1.0	D	[60%, 67%)
0.0	F	[0, 60%)

The final grade is broken down into **five homework assignments** to apply the concepts learned in class and **two exams** that are non-cumulative, conceptual, and hand-written.

Homework		Exams	
0: R Basics (R), Data (DwD), Regression (Reg)	10%	DwD, Reg, & RE	15%
1: Randomized Experiments (RE)	15%	IV, RDD, & DiD	15%
2: Instrumental Variables (IV)	15%		
3: Regression Discontinuity Design (RDD)	15%		
4: Difference-in-Differences (DiD)	15%		
Total:	70%		30%

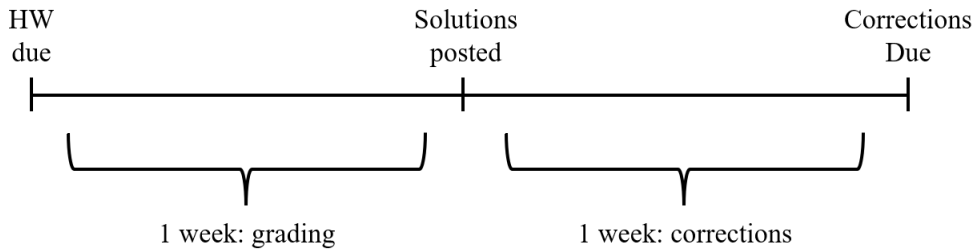
All homework assignments are due at 9:30 AM. See the Tentative Schedule for tentative due dates.

Late Penalties

Lateness	Total Possible Credit
(0, 1 hour]	90% credit
(1 hour, 2 days]	75% credit
(2 days, 1 week]	50% credit
(1 week, ∞]	0% credit

Homework Corrections

You may provide homework corrections for up to 50% of the points you missed. The entire assignment will be regraded. Late penalties still apply. See the timeline below:



Grading FAQs

Can I work together with my classmate?

Yes. If you work with another student on **homework assignments**, you must write up your own solutions and write "Collaborated with (insert_peer's_name_here)" on the top of your assignment. I encourage you to try the problems on your own first, however.

Will there be a curve?

Nope.

Can I ask for a regrade?

Sure. All regrade requests must be submitted in writing to the instructor **no more than one week after** the assignment has been graded. The request must be written (e.g. email) and include a detailed summary of why you believe the grade they received was incorrect. I will regrade the entire assignment, so the **grade may go up or down**. Consequently, you should only request a regrade if they are very confident that the original grade they received was incorrect.

Policies

Coding Assistance Checklist

1. Read your error code
2. `?the_function_you_are_using`
3. Web search your error code
4. Ask a peer, email instructor, and/or go to office hours

Make-up Exams

Students must present a letter from the Dean's Office justifying their absence, otherwise, they will receive a zero on the missed exam. **There are no make-up exams**.

Attendance Policy

Attendance is highly encourage. Any content delivered during lecture may appear on homework assignments or exams, regardless of the presence of said content on distributed material.

Student Code pertaining to student attendance.

Office of the Dean of Students helps to assist students navigate the Student Code and course policies. If students will be absent for an extended period of time, they should discuss with this office.

Academic Assistance

Students are encouraged to utilize the many resources we have throughout campus to assist with academics. We recommend that you seek them out starting early in the semester, not just in times of academic need, in order to develop good study habits and submit work which represents your full academic potential. Many resources may be located on the Economics Website, including information about the Economics Tutoring Center, other tutoring centers.

Academic Integrity

According to the Student Code, "It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions." Please know that it is my responsibility as an instructor to uphold the academic integrity policy of the University, which can be found here.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policies. Ignorance is not an excuse for any academic

dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity. Read the full Student Code.

Students with Disabilities

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TTY), or e-mail a message to disability@illinois.edu

DRES Website

Emergency Response Recommendations

Emergency response recommendations.

I encourage you to review this website and the campus building floor plans website within the first 10 days of class.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See the registrar's website for more information on FERPA. Student information and records will not be released to anyone other than the student, unless the student has provided written approval or as required by law. More information may be found here.

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options. A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here. Other information about resources and reporting is available here.

Student Support

The Counseling Center is committed to providing a range of services intended to help students develop improved coping skills in order to address emotional, interpersonal, and academic concerns. Please visit their website to find valuable resources and services:

Counseling Center

- Information: 217-333-3704
- Location: Room 206, Student Services Building 610 East John Street, Champaign, IL
- Appointment: Scheduled for same day, recommend calling at 7:50 a.m.

McKinley Mental Health Information:

- 217-333-2705
- **Location:** 3rd Floor McKinley Health Center 1109 South Lincoln, Urbana, IL
- **Hours:** 8 a.m. – 5 p.m., Monday through Friday Appointment: Scheduled in advance.

The **Emergency Dean** may be reached at (217) 333-0050 and supports students who are experiencing an emergency situation after 5 pm, in which an immediate University response is needed and which cannot wait until the next business day. The Emergency Dean is not a substitute for trained emergency personnel such as 911, Police or Fire. If you are experiencing a life threatening emergency, call 911. Please review the Emergency Dean procedures.

Academic Dates and Deadlines

Students should make note of important academic dates for making changes to their courses (add, drop, credit/no-credit, grade replacement, etc.). Please check with your academic department regarding specific procedures and policies.

Tentative Topics and Schedule

Modules:

0) Coding Basics, Review, and Causal Frameworks — R4DS Ch. 4, 5–7, 9–21; Mixtape Ch. 2–4

   0.1) *Intro to* R: a fancy calculator
   0.2) *Dealing with Data* (DwD): data set formats, manipulating data, cleaning data, aggregating data, plotting data, multiple data sets
   0.3) *Regression* (Reg): OLS, intercept and dummy variables, interactions, robust standard errors, clustered standard errors, fixed effects
   0.4) *Intro to R Markdown*: A document with code
   0.5) *Directed Acyclic Graphs* (DAG): backdoors, colliders, mediators, confounders, unobservables, endogenous samples
   0.6) *Potential Outcomes*: Rubin Causal Model, switching equation, counterfactual, treatment effects, selection bias, Stable Unit Treatment Value Assumption

1) Randomized Experiments (RE) — Mixtape Ch. 5
   – Randomization and selection bias, conditional independence assumption (CIA), matching, propensity scores, experimental design, AB testing

2) Instrumental Variables (IV) — Mixtape Ch. 7
   – Omitted variable bias, two-stage least squares (2SLS), weak instruments, local average treatment effects (LATE), intent to treat (ITT), treatment on the treated (TOT), popular IV designs

3) Regression Discontinuity Designs (RDD) — Mixtape Ch. 6
   – Common support and extrapolation, continuity assumption, sharp RDD, fuzzy RDD, treatment probability

4) Difference-in-Differences (DiD) — Mixtape Ch. 8–10
   – Panel data, fixed effects, parallel pre-trends, event study, differential timing, serial correlation, differential exposure, syntethic controls

Class	Topic	Assigned	Due
Jan. 17	Syllabus & overview		
Jan. 19	Intro to R		
Jan. 24	DwD 1: tidy data, manipulations, plots		
Jan. 26	DwD 2: multiple data sets		
Jan. 31	DwD 3: [LAB] practice		
Feb. 2	Reg 1: OLS fundamentals		
Feb. 7	Reg 2: Logistic regression		
Feb. 9	Reg 3: [LAB] linear probability model		
Feb. 14	Intro to	HW0	
Feb. 16	DAG: [LAB] Causal paths		
Feb. 21	Potential Outcomes		HW0
Feb. 23	RE 1: Randomization		
Feb. 28.	RE 2: matching, propensity scores		
Mar. 2	RE 3: [LAB] designing experiments	HW1	
Mar. 7	Review: Exam 1		
Mar. 9	**Exam 1**		HW1
Mar. 14	**SPRING BREAK**	Sleep	
Mar. 16	**SPRING BREAK**	Relax	
Mar. 21	IV 1: 2SLS		
Mar. 23	IV 2: [LAB] shift shares		
Mar. 28	IV 3: LATE		
Mar. 30	IV 4: TOT	HW2	
Apr. 4	RDD 1: Sharp		
Apr. 6	RDD 2: [LAB] Sharp		HW2
Apr. 11	RDD 3: [LAB] fuzzy	HW3	
Apr. 13	DiD 1: 2×2		
Apr. 18	DiD 2: [LAB] differential exposure		HW3
Apr. 20	DiD 3: differential timing	HW4	
Apr. 25	DiD 4: synthetic controls		
Apr. 27	Review: Exam 2		HW4
May 2	**Exam 2**		
May 4	**READING DAY**		