Design-Based Regression Inference

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Course Description

Many regressions and instrumental variable (IV) specifications can be understood as leveraging the "design" of observed shocks for credibly estimating causal effects or structural parameters. This three-day workshop will build up this design-based toolkit and illustrate some of its advantages over alternative identification strategies. Questions we will seek to answer include:

- "What controls do I need to include to avoid omitted variables bias?"
- "Do I need to worry about 'negative weighting' of heterogeneous effects?"
- "How should I be clustering my standard errors?"
- "What's the payoff to considering nonlinear/'structural' analyses?"

The course will include two programming exercises, where different techniques will be illustrated in real-world applications.

About the Instructor

Peter Hull is the Groos Family Assistant Professor of Economics at Brown Univeristy and a Faculty Research Fellow at the National Bureau of Economic Research. He has published papers on topics in applied econometrics, education, healthcare, and criminal justice, in outlets such as the *American Economic Review*, *Econometrica*, the *Quarterly Journal of Economics*, the *Review of Economic Studies*, *PNAS,* and the *New England Journal of Medicine*. Prior to Brown, Professor Hull taught at the Kenneth C. Griffin Department of Economics at the University of Chicago and worked at Microsoft Research and the Federal Reserve Bank of New York. He earned his PhD in economics from MIT in 2017, under 2021 Nobel Laureate Josh Angrist.

Course Objectives

This course is appropriate for students familiar with core causal inference tools (e.g. potential outcomes and/or causal graphs) and basics of linear regression and instrumental variables. Students should be familiar with either Stata, R, or Python to complete the coding labs.

Course Structure

This is a three-day (9 hour) intensive workshop, with 6-7 hours of lectures and two 30-minute coding demonstrations. The remaining time will be given to breaks. The coding demonstrations will feature me going through a real-world application, which will be handed out in advance if you'd like to attempt it on your own or in small groups beforehand.

Schedule

Monday 4/22	6:00-7:50pm	Lecture 1: Selection-on-Observables
	6:50-7:00pm	*Break*
	7:00-7:50pm	Lecture 2: Design-Based IV
	7:50-8:00pm	*Break*
	8:00-8:50pm	Lecture 3: Design vs. Outcome Models
	8:50-9:00pm	Application 1 Overview
Wednesday 4/24	6:00-6:30pm	Live-Coding Application 1
	6:30-6:40pm	*Break*
	6:40-7:40pm	Lecture 4: Negative Weights
	7:40-7:50pm	*Break*
	7:50-8:50pm	Lecture 5: Clustering
	8:50-9:00pm	Application 2 Overview
Friday 4/26	6:00-6:30pm	Live-Coding Application 2
	6:30-6:40pm	*Break*
	6:40-7:40pm	Lecture 6: Recentering
	7:40-7:50pm	*Break*
	7:50-9:00pm	Lecture 7: Nonlinear Models