

# Causality, Decision Making, & Data Science

## A Modular Course Template & Executive Summary

Stanford University // ECON 115 // Fall 2025

### COURSE PHILOSOPHY

How do we know if a new policy, a business strategy or a medical treatment *actually works*? This course equips students with the foundational toolkit to move beyond correlation and rigorously estimate causal effects from data. We bridge econometrics, statistics, and machine learning to answer real-world questions.

### LEARNING OBJECTIVES

- Distinguish causation from correlation.
- Implement and interpret regression models.
- Analyze random and quasi-experiments.
- Critically evaluate data-driven claims.
- Communicate findings effectively.

### ASSESSMENT

60% Problem Sets (4x)

25% Final Project

15% Participation & Pre-Class Reading Reactions

### PREREQUISITES

An *Intro to Statistics* course. Experience with programming will be helpful but is not required.

### KEY TOOLS & RESOURCES

Python, Gradescope, Canvas. Optional textbook: *Mastering Metrics* by Angrist & Pischke

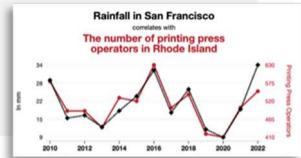
### COURSE SCHEDULE & MODULES

#### MODULE 0: Introductions and Statistics Refresher

[1 Week]

What is this class about?

- Topics:** Course overview, standard errors and confidence intervals, correlation vs. causality, potential outcomes and ATE
- Milestones:** HW 0 due



#### MODULE 1: The Gold Standard

[2 Weeks]

Randomized Experiments

- Topics:** Randomized experiments, problems with experiments, adaptive experiments and multi-armed bandits
- Milestone:** HW 1 due



#### MODULE 2: Universal Basic Income

[2 Weeks]

What is the effect of cash transfers?

- Topics:** Friedman's permanent income hypothesis, linear regression
- Milestone:** Project proposal due, HW 2 due

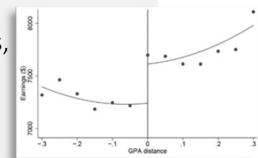


#### MODULE 3: Returns to Education

[2 Weeks]

What are you (and everyone else) getting out of your education?

- Topics:** Mincer model, twin studies, instrumental variables, local average treatment effects, neural networks and non-parametric models, regression discontinuity
- Milestone:** HW 3 due



#### MODULE 4: Panel Data

[2 Weeks]

How do we analyze data with multiple units over time?

- Topics:** Difference-in-differences, matrix completion, synthetic controls, placebo methods
- Milestone:** Project check-in, HW 4 due



#### FINALE: Project Showcase

[1 Week]

Presentations & Final Submissions

- Milestones:** In-class presentations, Final report due

