

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

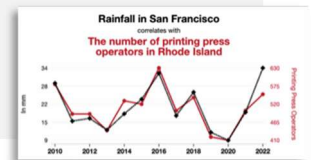
COURSE SCHEDULE & MODULES

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
- **Milestones:** 🚀 Project proposal due, 📖 HW 2 due

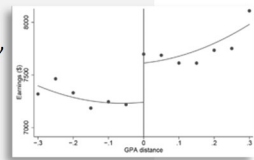


MODULE 3: Returns to Education

[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
- **Milestones:** 🚀 Project check-in, 📖 HW 4 due



FINALE: Project Showcase

[1 Week]

Presentations & Final Submissions

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

