

Course Syllabus: Introduction to Causal Inference

WS 2023/34

Dr. Patrick Schneider and Judith Vornberger

Aim and Outline of the Course

This course offers an introduction to the fundamentals of causal inference and to widely used research designs in the social sciences. In the first part a framework for understanding causality is introduced. Specifically, the epistemological differences between association, intervention and counterfactuals are explained. Then it is shown why experiments are paramount in generating causal knowledge and which assumptions are needed for which level of the causal hierarchy. Finally, we will discuss two widely used approaches to causality, i.e. potential outcomes and directed acyclic graphs.

The second part is devoted to the research designs such as regressions analysis, difference-in-differences, instrumental variables, and regression discontinuity. The emphasis is how these research designs are for example applied to answer important questions in applied microeconomics such as

- how a minimum wage increase affects employment
- the effect of medicaid expansion on health outcomes
- how class size influences educational attainment
- whether there is an effect of military service on earnings
- the career costs of children
- the effect of schooling/job training on wages
- age discrimination
- how punishment affects drunk driving

The lecture will focus on the assumptions required by each research design to identify a causal effect. Therefore the emphasis is to teach students what one can learn from data and what one needs to estimate in order to answer a given question. Further, the research designs are discussed such that students will be able to evaluate and apply these research designs to other questions and fields.

The course is accompanied by the tutorial “Programming in Stata”. In the tutorial students will get a hands on introduction on how to estimate the research design discussed

during the lecture. For that students will replicate some results of various published papers using Stata.

After the course, students should be able to understand the basic concepts and methods of causal inference; should be able to read and interpret research and judge its credibility. Further, students will be enabled to replicate previous research and to conduct own research within seminar papers or theses. This course furthermore serves as a complement for master courses on statistical inference, i.e. on how to learn from data.

Literature

The course's material is mainly based on the following books:

- Angrist, J. D. and J.-S. Pischke. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton University Press.
- Pearl, J. and D. Mackenzie. (2018). *The Book of Why: The New Science of Cause and Effect*. New York: Basic Books.
- Cunningham, S. (2021). *Causal Inference: The Mixtape*. New Haven: Yale University Press

Presentation slides will also be provided as supplementary materials.

Prerequisites

While no prior knowledge of causal inference is required, having taken an introductory statistics course will be beneficial.

Examination

There will be one take-home exam. Evaluation and credit allocation will be as follows:

- PhD: 6 ECTS for the lecture and tutorial.
- Master: 8 ECTS for the lecture and tutorial.
- Bachelor: 3 ECTS for the tutorial.

PhD and master students will be graded on both the lecture and tutorial components, while Bachelor students will be assessed solely on the tutorial portion. While participation in the lecture is not mandatory for Bachelor students, it is encouraged and warmly welcomed.

Contact Information

For any inquiries, please feel free to reach out to us:

- Lecture: Patrick Schneider p.schneider@uni-konstanz.de
- Tutorial: Judith Vornberger judith.vornberger@uni-konstanz.de

Course Schedule

Introduction

- Tue 24.10.2023: 17:00-18:30 **online**

Lecture

- Tue 21.11.23: 11:45-13:15 **online** and 17:00-18:30 **online**
- Tue 28.11.23: 11:45-13:15 in Z1003 and 17:00-18:30 in D432
- Tue 05.12.23: 11:45-13:15 in Z1003 and 17:00-18:30 in D432
- Tue 12.12.23: 11:45-13:15 in Z1003 and 17:00-18:30 in D432
- Tue 19.12.23: 11:45-13:15 in Z1003 and 17:00-18:30 in D432
- Tue 09.01.24: 11:45-13:15 and 17:00-18:30 (tba)

Tutorial

- Fri 08.12.23: 08:15-09:45 and 13:30-18:30 in J213
- **Sat** 09.12.23: 09:30-18:30 in J213
- Fri 12.01.24: 08:15-09:45 and 13:30-18:30 in J213

Take-home Exam

- Mon 22.01.2024 upload
- Mon 29.01.2024 submission deadline