PhD Course

Econometrics

Block course

Time: January 31st - February 2nd, 2024, Place: Room 0029, Moorweidenstraße 18)

Course instructor: Professor Martin Spindler (UHH)

Course value: 2 SWS or 5 LP

Course overview:
The main goal of this course is to give an introduction to causal inference, and if time allows to recent developments, in particular on the use of Machine Learning Methods for Causal Inference. Handouts of the slides will be provided during the course. The target audience are empirical researcher / PhD students who want to apply those methods for their research.

Topics:

1) **Introduction to Causal Inference / Basic Framework**
2) **Methods for Causal Inference (Diff-in-Diff, IV, Propensity Score Matching, Randomized Control Trials, …)**
3) **Recent Developments**

Teaching language: English

Student evaluation: presentation of a recent paper in a blocked session (Summer Term 2024) or presentation / written summary of a research project / idea

Registration: not required

Schedule (tentative)

Date	Times	Location	Topics
Day 1 (January 31st)	8:30 - 10:00 10:15 - 11:45 13:00 - 14:30	0029, Mo 18	Introduction, Basics of Causal Inference, RCT, Diff-in-Diff, Instrumental Variables Estimation
Day 2 (February 1st)	8:30 - 10:00 10:15 - 11:45 13:00 - 14:30	0029, Mo 18	Regression Discontinuity, Panel Data Methods, Propensity Score Matching
Day 3 (February 2nd)	8:30 - 10:00 10:35 - 11:45 13:00 - 14:30	0029, Mo 18	Current research papers and recent developments

References (advanced papers)

Efron, B. and T. Hastie. Computer Age Statistical Inference. Cambridge University Press 2016.

Athey, Imbens, and Wager (2016). Approximate Residual Balancing: De-Bias Inference of Average Treatment Effects. arxiv.

Athey, Susan, and Guido Imbens. "Machine learning methods for estimating heterogeneous causal effects." arXiv preprint arXiv:1504.01132 (2015).

Athey and Imbens (2016). Recursive Partitioning for Heterogenous Causal Effects. PNAS.

Athey and Wager (2017). Estimation and Inference of Heterogenous Treatment Effects using Random Forests. JASA.

Bloniarz et al. (2015). Lasso Adjustment of Treatment Effect Estimates in Randomized Experiments. arxiv.

Belloni et al. (2017). Program Evaluation and Causal Inference With High-Dimensional Data. Econometrica.

Imbens, Guido W., and Donald B. Rubin. Causal inference in statistics, social, and biomedical sciences. Cambridge University Press, 2015.

Künzel et al. (2017). Meta-learners for Estimating Heterogenous Treatment Effects using Machine Learning. arxiv.

Powers et al. (2017). Some Methods for Heterogenous Treatment Effect Estimation in High-Dimensions. arxiv.