

PhD Course  
**Econometrics**

Block course

Time: February 5<sup>th</sup> -7<sup>th</sup>, 2025 (~~January 22<sup>nd</sup> -24<sup>th</sup>, 2025~~)

Place: Room 0029, Moorweidenstraße 18

**Course instructor:** Professor Martin Spindler (UHH)

**Course value:** 2 SWS or 5 LP

**Teaching language:** English

**Student evaluation:** Presentation of a recent paper or own research project in a blocked session and written summary of a research project/idea

**Registration:** via STiNE

**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 researchers/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

**Recommended textbooks:**

Martin Huber: Casual Analysis. MIT Press (available online for free).

Scott Cunningham: Causal Inference: The Mix Tape. Yale University Press (available online for free).

Joshua Angrist and Jörn-Steffen Pischke: Mostly Harmless Econometrics.

**Schedule (tentative):**

Date	Times	Location	Topics
Day 1 (January 22 <sup>nd</sup> )	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 (January 23 <sup>rd</sup> )	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 (January 24 <sup>th</sup> )	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 Heterogeneous Causal Effects. PNAS.
- Athey and Wager (2017). Estimation and Inference of Heterogeneous 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 Heterogeneous Treatment Effects using Machine Learning. arxiv.
- Powers et al. (2017). Some Methods for Heterogeneous Treatment Effect Estimation in High-Dimensions. arxiv.