

# Seminar Series

Friday, November 2, 2018

4:00pm

West Hall, Room 340



## Two-Step Estimation and Inference with Possibly Many Included Covariates

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**Abstract:** We study the implications of including many covariates in a first-step estimate entering a two-step estimation procedure. We find that a first order bias emerges when the number of included covariates is “large” relative to the square-root of sample size, rendering standard inference procedures invalid. We show that the jackknife is able to estimate this “many covariates” bias consistently, thereby delivering a new automatic bias-corrected two-step point estimator. The jackknife also consistently estimates the standard error of the original two-step point estimator. For inference, we develop a valid post-bias-correction bootstrap approximation that accounts for the additional variability introduced by the jackknife biascorrection. We find that the jackknife bias-corrected point estimator and the bootstrap postbias-correction inference perform excellent in simulations, offering important improvements over conventional two-step point estimators and inference procedures, which are not robust to including many covariates. We apply our results to an array of distinct treatment effect, policy evaluation, and other applied microeconomics settings. In particular, we discuss production function and marginal treatment effect estimation in detail.

**Bio:** Matias D. Cattaneo is a Professor of Economics and a Professor of Statistics at the University of Michigan. He joined Michigan’s faculty in 2008, after receiving a Ph.D. in Economics and an M.A. in Statistics from the University of California at Berkeley. Prior to coming to the U.S., he completed an M.A. in Economics at Universidad Torcuato Di Tella and a B.A. in Economics at Universidad of Buenos Aires. His research interests include mathematical statistics, econometric theory, and applied econometrics, with emphasis on applied microeconomics and program evaluation. Most of his recent work is related to the development of new, improved semiparametric and nonparametric inference procedures exhibiting demonstrable robustness properties with respect to tuning parameter and other implementation choices. Most of this work is motivated by concrete empirical problems in social sciences and several other disciplines, and covers a wide array of topics related to treatment effects and policy evaluation, average derivatives and structural response functions, applied finance and applied microeconomics, among others. He current serves as Associate Editor at the *Journal of the American Statistical Association*, the *Review of Economics and Statistics*, *Operations Research*, *Econometric Theory*, the *Econometrics Journal*, and the *Journal of Causal Inference*.

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