Stochastic covariates-based treatment effects from non-linear regression models

Christoph Kiefer

Bielefeld University

Keywords: causal inference, stochastic covariates, non-linear regression models
Category: SEM and Causality

Recent developments in statistical inference on causal effects have laid a stronger focus on adequately accounting for the sampling processes of the social sciences. Traditional models in the social sciences as well as effect estimation procedures often assume that properties of a sample as, for instance, the overall or groups' size or even observed values of a covariate, would be predetermined by the researcher and only the outcome variable does vary across sample. However, the opposite is true in many applied scenarios where random sampling of persons is conducted and the observations and observed properties of the sample are 'stochastic'. Many researchers have shown that neglecting stochastic group sizes or stochastic covariates can have an adverse impact on the validity of statistical inferences on causal effects, typically leading to deflated standard errors and increased Type 1 error rates. In this talk, we give a brief overview of our recent studies and findings on the role of stochastic covariates for effect estimation in non-linear regression models (i.e., Poisson and logistic regression models). We illustrate why controlling for stochastic covariates is especially important if a treatment variable has very different effects for different persons and discuss why this also applies in settings with bounded effect ranges (e.g., binary outcomes). In addition, we compare two approaches of accounting for stochastic covariates in non-linear regression models, finding that both outperform statistical inferences based on the fixed-covariate assumption if covariate' values were indeed randomly sampled. Thus, accounting for stochastic covariates is discussed as an important aspect of statistical inference in treatment effect estimation, especially in light of heterogeneous effects and/or random, non-predetermined sampling processes in general.