Difference-in-differences with negative controls

Marco Gregori
Warwick Business School

Difference-in-differences with negative controls

Abstract

When individuals self-select into treatment, unobserved covariates can lead to violation of the parallel trends assumption in difference-in-differences designs, leading to biased estimates. Building on proximal causal inference, we propose a semiparametric doubly-robust estimator that incorporates a pair of negative control variables to correct for bias from omitted covariates. This estimator is well-suited for settings with staggered adoption and temporal variation in treatments. To demonstrate its usefulness, we analyze the impact of a Buy-Now-Pay-Later program on an online food order and delivery platform, using a longitudinal dataset of over 115,000 users. Unobserved income shocks may influence both self-selection into the program and users' spending behavior on the platform. Our results show that the standard two-way fixed effects estimator underestimates the treatment effect, being unable to account for unobserved disposable income.

Keywords: Causal Inference, Retailing, Fintech

Track: Methods, Modelling & Marketing Analytics