MSE-Optimal Difference-in-Differences Estimator*

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Abstract

This paper introduces a new difference-in-differences (DiD) estimation method that selects the optimal length of pre-trends by minimizing the mean squared error (MSE). Conventional DiD regression models, such as the two-way fixed effects model or the event study model, may suffer from accuracy and validity concerns. If the sample size is small, the estimator may have a larger variance. Also, pre-tests often lack power to detect violations of the parallel trends assumption as Roth (2022) highlights. By focusing on the bias and variance tradeoff, the proposed method derives the MSE-optimal estimator from the optimal length of pre-trends. Simulation results and an empirical application demonstrate the practical applicability of the proposed method.

Keywords: Difference-in-Differences, Pre-trends, Mean Squared Error

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