Asymptotic properties of an optimization-based matching estimator for average treatment effects

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Abstract

This paper investigates the asymptotic properties of a novel matching estimator for the average treatment effects of binary programs. In order to impute the missing potential outcome for each unit, this approach employs both a number of neighbors and a weighting scheme that are endogenously determined by solving a nested pair of optimization problems associated with an individual covariate balancing criterion. Under mild conditions, our main contributions are: (i) the asymptotic normality and a consistent estimator of the conditional variance of the estimators for the ATE and ATT, (ii) the conditional bias of the estimator for the ATE is $O_p(n^{-2/\mathbf{d}})$, where n is the sample size and $\mathbf{d}$ the dimension of continuous covariate, and (iii) general conditions under which the estimator of the ATT do attain $\sqrt{n}$-consistency. Save particular cases, the order of convergence in (ii) cannot be achieved by the conditional bias of any nonparametric "matching estimator" for the ATT, neither by k-NN matching estimators.

Keywords: Matching estimator, treatment effect, nonparametric methods, asymptotic properties.

JEL Classification: C01, C14, C61.

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