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Partial linear single index models with distortion measurement errors

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Abstract We study partial linear single index models when the response and the covariates in the parametric part are measured with errors and distorted by unknown functions of commonly observable confounding variables, and propose a semiparametric covariate-adjusted estimation procedure. We apply the minimum average variance estimation method to estimate the parameters of interest. This is different from all existing covariate-adjusted methods in the literature. Asymptotic properties of the proposed estimators are established. Moreover, we also study variable selection by adopting the coordinate-independent sparse estimation to select all relevant but distorted covariates in the parametric part. We show that the resulting sparse estimators can exclude all irrelevant covariates with probability approaching one. A simulation study is conducted to evaluate the performance of the proposed methods and a real data set is analyzed for illustration.

Keywords Coordinate-independent sparse estimation (CISE) · Covariate adjusted · Dimension reduction · Distorting function · Minimum average variance estimation (MAVE) · Measurement errors · Single index · Sparse principle component (SPC)