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*Shrinkage Versus Lasso in Partially Linear Models*

In the context of a partially linear regression model, we consider shrinkage semi-parametric estimators based on the Stein-rule. In our framework the coefficient vector may be partitioned into two sub-vectors, where the first sub-vector gives the coefficients of interest, i.e., main effects (for example treatment effects), and the second sub-vector is for variables that may or may not need to be controlled for. When estimating the first sub-vector, we may get the best estimate using the full model that includes both sub-vectors, or using the reduced model which leaves out the second sub-vector. We demonstrate that under certain conditions shrinkage estimators which combines two semi-parametric estimators computed for the full model and the reduced model outperforms the semi-parametric estimate for the full mode. Using the semi-parametric estimate for the reduced model is best when the second sub-vector is the null vector, but this estimator suffers seriously from bias otherwise. The relative dominance picture of suggested estimators is investigated. In each case we consider estimates of the nonparametric component based on B-splines. We primarily explore the suitability of estimating the nonparametric component based on B-spline, and compare the risk performance numerically with that of the kernel estimates. Further, the performance of the proposed estimators have been compared with an absolute penalty estimator through Monte Carlo simulation.