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Efficiency of estimators in nonlinear measurement error regression models in the presence of nuisance parameters

Prof. Alexander Kukush, National Taras Shevchenko University of Kyiv Kiev, Ukraine

Efficiency of estimators in nonlinear measurement error regression models in the presence of nuisance parameters. Consistent estimators are considered in nonlinear errors-in-variables models where measurement errors are normally distributed with known variance. While structural methods, in particular the Quasi-Score (QS) method, rely on knowledge of the form of regressor distribution, functional methods, in particular the Corrected Score (CS) method, work without such information.

We compare the efficiency of estimators by comparing its asymptotic covariance matrices. It turns out that the QS estimators are more efficient than the CS ones if the regressor distribution is known precisely.

Mostly we are interested in the situation where the regression distribution parameters are to be estimated additionally. For this case we show a proper way to construct the QS estimator and prove that the QS method is still more efficient than the CS [2]. Suppose that the regressor is normally distributed, with unknown mean and variance. In the Poisson, Gamma, and polynomial models, the QS estimators of mean and variance are constructed via sample mean and sample variance of the observed surrogate data (in such models instead of the regressor a surrogate variable is observed). This corresponds to the procedure of pre-estimation . And in the logistic model, the QS estimator of mean is just the same, but the variance estimation is carried out simultaneously with the regression parameters estimation.

The obtained results are generalized to vector models with measurement errors. Such models arise naturally, e.g., in a particular scalar model, the zero-inflated Poisson model. For the latter model, the efficiency of the QS estimator in a wide class of estimators is shown as well.

Kontakt: Prof. Dr. Udo Krieger, udo.krieger@ieee.org