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Translation-invariant estimator in a quadratic measurement error model

Alexander Kukush

Kiev National Taras Shevchenko University E-mail: alexander_kukush@univ.kiev.ua

Abstract

An adjusted least squares (ALS) estimator is derived that yields a translation-invariant and consistent estimate of the parameters of an implicit quadratic measurement error model (IQMEM). Consistency means that the estimate converges to the true value of the parameter, as the sample size tends to infinity. In addition, a consistent estimator for the measurement error noise variance is proposed. Important assumptions are: (1) all errors are i.i.d. and (2) the error distribution is normal. The estimators for the quadratic measurement error model are used to estimate consistently conic sections and ellipsoids. In the IQMEM, the ordinary least squares (OLS) estimator is inconsistent, and due to the non-linearity of the model, the orthogonal regression (OR) estimator is inconsistent as well. Simulation examples, comparing the ALS estimator with the OLS method and the OR method, are discussed for the ellipsoid fitting problem.

The results are joint with Prof. S. Van Huffel and I. Markovsky (Belgium). The consistency is shown in [1], and the numerical algorithm is proposed in [2].

References

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