

# Bias of regression estimator in survey sampling

Keit Musting and Imbi Traat

*University of Tartu, Tartu, Estonia*

## Abstract

The regression estimator (see Särndal, Swensson, Wretman 1992) is now widely used in official statistics. In estimating finite population totals it borrows strength from the auxiliary variables. The estimator is more effective than the classical Horvitz-Thompson estimator is. Nevertheless, it is a biased estimator, though for big samples the bias is negligible.

We develop a general matrix expression for the bias of regression estimator. The Taylor expansion with matrix derivatives is used. The bias depends on the covariances of involved random quantities. Special cases for different sampling designs and different relationships between variables are drawn from the general formula. A ratio estimator as a particular special case is considered. Numerical illustration is given.

## Keywords

Regression estimator, Ratio estimator, Bias.

## References:

Särndal, C.-E., B. Swensson, and J. Wretman (1992). *Model Assisted Survey Sampling*. New York: Springer-Verlag.