Abstract

This thesis is composed of three papers, all dealing with survey (finite population) sampling issues. Special attention is given to an estimator using auxiliary information; in the sampling literature known as the optimal (regression) estimator.

Asymptotic arguments for the derivation of the optimal estimator is the main theme of the first paper, which also investigates sufficient conditions for asymptotic normality of this estimator under some elementary sampling designs. The optimal estimator is also compared with model-assisted GREG estimators both theoretically and by simulations.

The second paper addresses the problem of estimating the variance of regression estimators in general and the optimal estimator in particular. In focus is a type of weighted variance estimator, which was originally introduced by rather vague theoretical arguments. We have therefore striven for a better understanding of this weighted variance estimation procedure, where the emphasis is on conditional inference.

In the last paper we introduce a confidence interval adjustment procedure, which yields confidence intervals with coverage and non-coverage probabilities closer to the nominal levels than their standard counterparts. We apply this technique on survey sampling situations and with good results, as judged by a simulation study.

Keywords: asymptotic distributions; auxiliary information; GREG estimator; optimal regression estimator; variance estimation; confidence intervals.

MSC 2000 Subject classification: 62D05, 62E20