A STUDY ON THE
CHAIN RATIO-TYPE ESTIMATOR

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Abstract

We examine the chain ratio-type estimator and obtain its MSE equation. We prove that the chain ratio-type estimator is more efficient than the traditional ratio estimator under certain conditions. In addition, this proof is supported by an application with original data.

Keywords: Chain ratio-type estimator, Sampling, Efficiency.

1. Introduction

The classical ratio estimator for the population mean $\bar{Y}$ of the variate of interest $y$ is defined by

$$\bar{y}_r = \frac{\bar{y}}{\bar{x}},$$

where it is assumed that the population mean $\bar{X}$ of the auxiliary variate $x$ is known. Here

$$\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i \quad \text{and} \quad \bar{y} = \frac{1}{n} \sum_{i=1}^{n} y_i,$$

where $n$ is the number of units in the sample [1].

The MSE of the classical ratio estimator is

$$\text{MSE}(\bar{y}_r) \cong \frac{1}{n} \left( R^2 S_x^2 - 2R\rho S_x S_y + S_y^2 \right),$$

where $f = \frac{n}{N}$; $N$ is the number of units in the population; $R = \frac{\sum X}{n}$ is the population ratio; $S_x^2$ is the population variance of the auxiliary variate and $S_y^2$ is the population variance of the variate of interest [2].

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