

An Improved Randomized Response Additive Model

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ABSTRACT

In this paper a new randomized response model has been proposed. The theoretical properties of the proposed model have been studied. Comparisons of the proposed model with the existing additive models have been made. It is found that the proposed model is superior to the existing additive model under very realistic condition. Numerical illustrations are also given in support of the present study.

Keywords: Randomized response sampling, Estimation of proportion, Respondents protection, sensitive quantitative variable.

1. Introduction

Himmelfarb and Edgel (1980) have considered the usual additive model for gathering information on quantitative sensitive variables. Their model permits the interviewer to hide personal information using a scrambling variable to the response. Let Y be the true response variable for which we desire to estimate its mean μ_Y . Suppose S is a scrambling variable whose distribution is known, that is, its population mean θ and variance γ^2 are known. For estimating μ_Y , a simple random sample of n respondents is selected with replacement from the population. Each respondent selected in the sample is requested to draw a value from the distribution of the scrambling variable, add it to the real response and report back to the interviewer. Thus, the observed i^{th} scrambled response is given by

$$Z_i = [Y_i + S] \quad (1)$$

Thus an unbiased estimator of the population mean μ_Y is given by