Communications in Advanced Mathematical Sciences
Vol. II, No. 1, 48-54, 2019
Research Article
e-ISSN:2651-4001
DOI: 10.33434/cams.443055

An Agile Optimal Orthogonal Additive Randomized Response Model

Tanveer A. Tarray[1]*, Housila P. Singh[2]

Abstract
In this paper, a new additive randomized response model has been proposed. The properties of the proposed model have been studied. It has been shown theoretically that the suggested additive model is better than the one envisaged by [1] under very realistic conditions. Numerical illustrations are also given in support of the present study.

Keywords: Estimation of mean, Randomized response sampling, Respondents protection, Sensitive quantitative variable.
2010 AMS: Primary 62D05, Secondary 62D99

[1] *Department of Mathematical Sciences, Islamic University of Science and Technology – Awantipora – Pulwama – Kashmir – India – 192122*
[2] *School of Studies in Statistics , Vikram University Ujjain, M.P. - India -456010*
***Corresponding author**: tanveerstat@gmail.com
Received: 12 July 2018, **Accepted:** 29 November 2018, **Available online:** 22 March 2019

1. Introduction

One problem with research on high – risk behavior is that respondents may consciously or unconsciously provide incorrect information. In psychological surveys, a social desirability bias has been observed as a major cause of distortion in standardized personality measures.. Survey researchers have similar concerns about the truth of survey results findings of such topics as drunk driving, use of marijuana, tax evasion, illicit drug use, induced abortion, shop lifting, child abuse, family disturbances, cheating in exams, HIV/AIDS, and sexual behavior. The most serious problem in studying certain social problems that are sensitive in nature (e.g. induced abortion, drug usage, tax evasion, etc.) is the lack of reliable measure of their incidence or prevalence. Thus to obtain trustworthy data on such confidential matters, especially the sensitive ones, instead of open surveys alternative procedures are required. Such an alternative procedure known as "randomized response technique" (RRT) was first introduced by [2]. It provides the opportunity of reducing response biases due to dishonest answers to sensitive questions. As a result, the technique assures a considerable degree of privacy protection in many contexts. Following the pioneering work of [2], many modifications are proposed in the literature. A good exposition of developments on randomized response techniques could refer to [3]-[18]. We below give the description of the model due to [1]

1.1 Additive model[1]:

Let there be k scrambling variables denoted by $S_j, j = 1,2,\ldots,k$ whose mean $\theta_j (i.e. E(S_j) = \theta_j)$ and variance $\gamma_j^2 (i.e. V(S_j) = \gamma_j^2)$ are known. In [1] proposed optimal new orthogonal additive model named as (POONAM), each respondent selected in the sample is requested to rotate a spinner, as shown in Fig. 1.1, in which the proportion of the k shaded areas, say $P_1, P_2, \ldots P_k$ are