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Bayesian Analysis and Reliability Estimation of Generalized Probability Distributions

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About this Book
This edited volume entitled "Bayesian Estimation and Reliability Estimation of Generalized Probability Distributions" is being published for the benefit of researchers and academicians. It contains [illegible] different chapters covering a wide range of topics both in applied mathematics and statistics. The proofs of various [illegible] and examples have been given with minute details.

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Chapter 9:

A New Optimal Orthogonal Additive Randomized Response Model Based on Moments Ratios of Scrambling Variable

Tanveer A. Tarray

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Additional information is available at the end of the chapter

Introduction

The Randomized response (RR) technique was first presented by Warner (1965) mainly to cut down the probability of (i) reduced response rate and (ii) inflated response bias experienced in direct or open survey relating to sensitive issues. Some recent involvement to randomized response sampling is given by Fox and Tracy (1986), Singh and Mathur (2004, 2005), Gjestvang and Singh (2006), Singh and Tarray (2013, 2014, 2015, 2016) and Tarray and Singh (2016, 2017, 2018). We below give the description of the model due to Singh (2010).

Singh (2010) Additive Model

Let there be k scrambling variables denoted by S_j, j = 1,2,...,k whose mean θ_j (i.e. $E(S_j) = \theta_j$) and variance γ_j^2 (i.e. $V(S_j) = \gamma_j^2$) are known. In Singh's (2010) 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. 9.1, in which the proportion of the k shaded areas, say $P_1, P_2, \ldots, P_k$ are orthogonal to the means of the k scrambling variables, say $\theta_1, \theta_2, \ldots, \theta_k$ such that

$$\sum_{j=1}^{k} P_j \theta_j = 0 \qquad (9.1)$$

and

$$\sum_{j=1}^{k} P_j = 1 \qquad (9.2)$$