A Two-Stage Multi-Level Randomized Response Technique with Proportional Odds Models and Missing Covariates

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Abstract

Surveys of income are complicated by the sensitive nature of the topic. The problem researchers face is how to encourage participants to respond and to provide truthful responses in surveys. To correct biases induced by nonresponse or underreporting, we propose a two-stage multi-level randomized response (MRR) technique to investigate the true level of income and to protect personal privacy. For a wide range of applications, we present a proportional odds model for two-stage MRR data, and apply inverse probability weighting and multiple imputation methods to deal with covariates on some subjects that are missing at random. A simulation study is conducted to investigate the effects of missing covariates and to evaluate the performance of the proposed methods. The practicality of the proposed methods is illustrated with the regular monthly income data collected in the Taiwan Social Change Survey. Furthermore, we provide an estimate of personal regular monthly mean income.

Keywords: inverse probability weighting, missing at random, multi-level randomized response technique, multiple imputation, Taiwan Social Change Survey.