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Commentary on S. Kumar and P. Chhaparwal, 2016. A robust unbiased dual to product estimator for population mean through Modified Maximum Likelihood in simple random sampling, Cogent Mathematics, 3:1168070

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Abstract: In the manuscript entitled "*A Robust Unbiased Dual to Product Estimator for Population Mean through Modified Maximum Likelihood in Simple Random Sampling*", several publications and derivations which belong to E. Oral were used without sufficient acknowledgment or citation. In this paper, we comment on the manuscript, and refer the reader to the original sources of the derivations and publications.

Subjects: Statistics; Statistics & Computing; Statistical Theory & Methods

Keywords: maximum likelihood; Modified Maximum Likelihood; ratio estimators; product estimators; outliers; robustness

ABOUT THE AUTHORS

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PUBLIC INTEREST STATEMENT

In a research study, when the main interest is to estimate the mean of an outcome (i.e., variable of interest) and if some information is available on every subject of the population (i.e., auxiliary variable), then the estimation of the mean might be improved. Traditional ratio estimator is extensively used to estimate the population mean when there is a positive correlation between the study variable and the auxiliary variable. The problem with the traditional ratio estimator is that it is not robust to non-normality. Oral and Oral (2011) robustified the traditional ratio estimator using Modified Maximum Likelihood (MML) methodology. Motivated from several of Oral E.'s related publications, Kumar and Chhaparwal (2016) proposed a robust unbiased dual to product estimator for estimating population mean using the MML methodology; however, without sufficient acknowledgment or citation. In this paper, we comment on their work and refer the reader to the original sources of the derivations and publications.

Modified maximum likelihood (MML) methodology was first introduced by Tiku (1967) and has been used by many scholars, such as Islam and Tiku (2010), Oral (2012), Balci and Akkaya (2015), Oral (2017), Oral and Danos (2018), Celik and Senoglu (2018), and so on, in various research areas. Kumar and Chhaparwal (2016) proposed a robust unbiased dual to product estimator for estimating population mean using the MML methodology. They specifically considered the case where the distribution of the study variable is from long-tailed symmetric (LTS) family and derived the mean square error (MSE) of their proposed estimator along with necessary conditions where it has smaller MSE with respect to the traditional unbiased product estimator, Hartley and Ross' unbiased ratio type estimator (Hartley & Ross, 1954) and Bandopadhyay's dual product estimator (Bandopadhyay, 1980).

While Kumar and Chhaparwal (2016) successfully showed that their product estimator works well when the study and auxiliary variable is moderately negatively correlated, and the distribution of the error term is from long-tailed symmetric (LTS) family via simulations, we perceive some problems with their manuscript and comment on them here:

(1) Section 2 of Kumar and Chhaparwal (2016), which describes the LTS family has some of its wording from Oral (2010) without citing it properly. $[Cov\,(\hat{\mu}, \bar{x})]$ We refer the reader to Section 2 of Oral (2010) for more details.

(2) The covariance $[Cov\,(\hat{\mu}, \bar{x})]$ on page 6 in Kumar and Chhaparwal (2016) was initially derived by Oral and Oral in 2011; see equations (2.11)—(2.14) of Oral and Oral (2011). This derivation belongs to Oral and Oral (2011) and should be cited accordingly since Kumar and Chhaparwal (2016)'s MSE derivation mainly relies on this result. In fact, Oral and Oral (2011)'s paper is the first study which shows that robustifying the traditional ratio estimator would improve its efficiency under non-normality.

(3) The Monte Carlo study described in Section 4 is motivated by the simulation study of Oral and Kadilar (2011); see Section 3 of Oral and Kadilar (2011). The formulas necessary to select the value of the parameter *θ* such that the correlation coefficient between the study and the auxiliary variables would be sufficiently large was also given by Oral and Kadilar (2011) and thus needed to be cited accordingly.

(4) In the Conclusions section, Kumar and Chhaparwal (2016) state that when the underlying distribution is not normal, such as in Pareto distribution, the MML integrated estimators improve the efficiency of product-type estimators. This generalization is not accurate, because the MML equations given in (2.10) and (2.13) would only be valid for the case when the underlying distribution is from the LTS family; see Tiku and Akkaya (2004), Oral (2010), Oral and Oral (2011) and Oral and Kadilar (2011).

Finally, we want to note that, their proposed estimator's efficiency is *only* better than the traditional dual product estimator and the other ones that they make comparisons *if* the conditions given in Section 5 are satisfied. Thus, their conclusions section is overstating on their proposed method. Realize that, Oral and Oral (2011) theoretically proved that their proposed estimator is *always* better than the traditional ratio estimator.

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