Evaluating Weights for Sample Selection Bias Correction

A. C. Liu[1,2], S. Scholtus[2], K. Van Deun[1], and T. de Waal[1,2]

[1]Tilburg University, Department of Methodology and Statistics, Warandelaan 2, 5037 AB Tilburg, the Netherlands
[2]Statistics Netherlands, Henri Faasdreef 312, 2492 JP The Hague, the Netherlands

When estimating a population parameter by a nonprobability sample, i.e. a sample without a known sampling mechanism, the estimate may suffer from sample selection bias [1]. To correct selection bias, one of the often-used methods is assigning a set of unit weights to the nonprobability sample and estimating the target parameter by a weighted sum. The unit weights can be obtained by inverse propensity weighting or calibration, and plenty of ways to construct the weights are available. For example, by logistic regression or machine learning methods [2].

However, a tailor-made framework to evaluate the assigned weights is missing in the literature. We try to fill in the gap by discussing several performance metrics when the population mean is of interest. A simulation study and real data examples show that some performance metrics have a strong positive relationship with the mean squared error of the estimated population mean.

KEYWORDS: Model Evaluation; Nonprobability Sample; Descriptive Inference

[1] X.-L. Meng, "Statistical paradises and paradoxes in big data (i): Law of large populations, big data paradox, and the 2016 us presidential election," *Annals of Applied Statistics*, vol. 12, no. 2, pp. 685–726, 2018.

[2] A.-C. Liu, S. Scholtus, and T. de Waal, "Correcting selection bias in big data by pseudo weighting," *Journal of Survey Statistics and Methodology*, 2022.