

Variance Estimation in Multi-phase Calibration

Noam Cohen*, noamc@cbs.gov.il, Dan Ben-Hur, danh@cbs.gov.il, Luisa Burck, louiza@cbs.gov.il, Central Bureau of Statistics, Jerusalem, Israel

Abstract

The derivation of estimators in a multi-phase calibration process requires a sequential computation of calibrated weights of previous phases in order to obtain those of later ones. Already after two phases of calibration the estimators and their variances involve calibration factors and regression remainders from both phases and the formulae become cumbersome and uninformative. As a consequence the literature so far deals mainly with two phases while three phases or more are rarely being considered. The analysis in those cases is ad-hoc for the specific design and no comprehensive methodology for constructing calibrated estimators, and even more challengingly, estimating their variances in three or more phases was formed and thus in most cases does not exist. We provide a closed form formula for the variance of multi-phase calibrated estimators that holds for any number of phases of calibration. This new estimator of the variance is not only general for any number of phases but also has some favorable characteristics.

KEY WORDS: Multi-phase sampling, Generalized regression.