
Optimum Stratification Using Multiple Auxiliary Variables with 3P Weibull Distributions

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Abstract

The determination of Optimum Stratum Boundaries (OSB) based on the survey variable is not feasible in practice since the variable of interest is unavailable prior to conducting the survey. This paper proposes a method of constructing OSB for a study variable based on multiple auxiliary variables that are readily available and regressible with the study variable. The auxiliary variables used for this problem are estimated to follow skewed 3P Weibull distributions. It is formulated into a Mathematical Programming Problem (MPP) that seeks minimization of the variance of the estimated population parameter. The formulated MPP is then solved for the OSB using a dynamic programming (DP) technique. A numerical example with a real data set, aiming to estimate the Haemoglobin content in women in a national Iron Deficiency Anaemia survey, is presented to illustrate the procedure developed in this paper. The results obtained by the proposed technique are compared with other univariate methods and the results reveal that the proposed approach yields a substantial gain in the precision of the estimates.

Keywords: Optimum stratification; 3PWeibull distribution; Mathematical programming problem; Dynamic programming technique