

AN EIGENPROBLEM APPROACH TO OPTIMAL EQUAL-PRECISION SAMPLE ALLOCATION IN SUBPOPULATIONS

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In a survey often the constraints for precision of estimators of subpopulations parameters have to be taken care of during the allocation of the sample. Such issues are often solved with mathematical programming procedures. It is desirable to allocate the sample, in a way which forces the precision of estimates at the subpopulation level to be both: optimal and comparable, while the constraints of the total (expected) size of the sample (or samples, in two-stage sampling) are imposed. We show that such problem in a wide class of sampling plans has an elegant mathematical and convenient computational solution involving eigenvalues and eigenvectors of matrices defined in terms of some population quantities. As a final result we present a simple method for calculating the subpopulation optimal and equal-precision allocation which is based on one of the most standard algorithms of linear algebra (available e.g. in R software).

Theoretical solutions are illustrated through a numerical example based on the Labour Force Survey. The method allows to accommodate rather automatically for different levels of precision priority for subpopulations.

This is a joint work with R. Wiczorkowski (CSO, Warsaw, Poland).