Colloquium

Michigan State University
Department of Statistics and Probability

Rebecca C. Steorts
Carnegie Mellon University

Balancing the books by benchmarking: What to do when small area estimates just don't add up

Tuesday, September 25, 2012
10:20 a.m. - 11:10 a.m.
Refreshments 10:00am
C405 Wells Hall

Abstract

Small area estimation has become increasingly popular due to growing demand for such statistics. In order to produce estimates of adequate precision for these small areas, it is often necessary to borrow strength from other related areas. The resulting model-based estimates may not aggregate to the more reliable direct estimates at the higher level, which may be politically problematic. Adjusting model-based estimates to correct this problem is known as benchmarking.

In this talk, we propose a general class of benchmarked Bayes estimators that can be expressed in the form of a Bayesian adjustment applicable to any estimator, linear or nonlinear. We also derive a second set of estimators under an additional constraint that benchmarks the weighted variability. We illustrate this work using U.S. Census Bureau data.

Finally, we determine the excess mean squared error (MSE) from constraining the estimates through benchmarking under an empirical Bayes model, and we also find an asymptotically unbiased estimator of this MSE and compare it to the second-order approximation of the MSE of the EB estimator or, equivalently, of the MSE of the empirical best linear unbiased predictor (EBLUP), that was derived by Prasad and Rao (1990). Morever, using methods similar to those of Butar and Lahiri (2003), we compute a parametric bootstrap estimator of the MSE of the benchmarked EB estimator and compare it to the MSE of the benchmarked EB estimator. Finally, we illustrate our methods using SAIPE data from the U.S. Census Bureau, and in a simulation study.