INTERCENSAL UPDATING OF SMALL AREA ESTIMATES

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To Inay and Itay

Abstract

Small area estimation (SAE) involves fitting statistical models to generate statistics for areas where the sample size of the survey data is insufficient for generating precise estimates. A recent application of SAE techniques is in estimating local level poverty measures in Third World countries necessary for aid allocation and monitoring of the Millennium Development Goals (MDGs). The SAE technique commonly known as ELL method (Elbers et al., 2003) is extensively implemented by the World Bank in collaboration with national statistical agencies in most Third World countries. This technique generates estimates by fitting a linear mixed model to household level income or consumption using the survey and census data. The ELL method differs in various ways from the mainstream SAE techniques, two of which are emphasized in this thesis: (1) the ELL model does not include area level effects and (2) the model fitting technique follows a non-standard weighted generalized least squares (GLS).

Under the ELL method the survey and the census data are assumed to have been conducted at the same time period, hence generating updated estimates of poverty measures during non-census years is a problem. The method for SAE updating developed in this thesis is called the Extended Structure Preserving Estimation (ESPREE) method, an extension of the classical SAE technique called the structure preserving estimation (SPREE) method - an approach to SAE based on a categorical data analysis framework. The ESPREE method is structured within a generalized linear model (GLM) framework and uses information from the most recent survey and pseudo-census (census replicates) data to generate updated small area estimates under a superpopulation.

The World Bank in collaboration with the National Statistical Coordination Board in the Philippines has conducted an intercensal updating project using an ELL-based method requiring time invariant variables. Comparison of the estimates generated from the ELL-based and ESPREE updating method revealed substantial differences. The ESPREE method but not the ELL updating method generated unbiased estimates. An in-country validation exercise conducted in the Philippines supported the view that ESPREE based estimates, besides having theoretical advantages, also conformed better to local experts' opinion on current poverty levels.

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