Small Area Estimation Using Times Series Models Subject to Benchmarking Constraints

Danny Pfeffermann, The Hebrew University of Jerusalem

The problem of Small Area Estimation is how to produce reliable estimates of area (domain) characteristics, when the sample sizes within the areas are too small to warrant the use of traditional direct survey estimates. This presentation will focus on the use of time series models as a vehicle for borrowing strength from past surveys. In order to protect against possible model breakdowns and to satisfy arithmetic consistency in publication, it is often required to benchmark the model dependent estimates in the small areas to the corresponding direct survey estimate in a large area for which the survey estimate is sufficiently accurate. This benchmarking process defines implicitly a way of borrowing information across the areas, which can be further enhanced via the model equations.

The presentation will show how the benchmarking can be implemented within state-space time series modelling. The computation of the benchmarked estimators and their variances requires joint modelling of the direct estimators in several areas, which in the case of many areas requires the development of new filtering and smoothing algorithms for state-space models with correlated measurement errors. The application of the proposed procedure is illustrated using U.S. Employment and Unemployment series.