Nonparametric Variance Estimation under Fine Stratification : An Alternative to Collapsed Strata

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Fine stratification is commonly used to control the distribution of the sample and improve the precision of resulting estimators. One-per-stratum designs represent the finest possible case and occur in practice, but designs with very low numbers of elements per stratum (say, two or three) are also common. The classical estimator in this context is the collapsed stratum variance estimator, which relies on creating larger "pseudo-strata" and computing the sum of the squared differences between estimated stratum totals across the pseudo-strata.

We propose here a nonparametric alternative, which replaces the pseudo-strata by kernel-weighted stratum neighborhoods and uses deviations from a fitted mean function to estimate the variance. We establish the asymptotic behavior of the kernel-based estimator under a variety of finely-stratified designs and show its superior practical performance relative to the collapsed stratum variance estimator in a simulation study.

This is joint work with Jean Opsomer and Ismael Sánchez Borrego.