

Constrained estimation using judgment post-stratification

Jesse Frey · Omer Ozturk

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Abstract In ranked-set sampling (RSS) and judgment post-stratification (JPS), more efficient inference is obtained by creating a stratification based on ranking information. Using this stratification exactly as is done in stratified sampling or standard post-stratification leads to the standard nonparametric estimators for RSS and JPS. However, we show that strata obtained from ranking information satisfy additional constraints that need not be met by ordinary strata. Specifically, the in-stratum cumulative distribution functions (CDFs) can be no more extreme, in a certain sense, than the CDFs for order statistics from the overall distribution. The additional constraints can be used to obtain better small-sample estimates of the in-stratum CDFs using either RSS or JPS. In the JPS case, the constraints also lead to better small-sample estimates of the overall CDF and the population mean.

Keywords Convexity · Maximum likelihood · Ranked-set sampling · Stratified sampling