

Estimating a bounded parameter for symmetric distributions

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Received: 26 July 2006 / Revised: 17 January 2007 / Published online: 19 April 2007
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Abstract For the problem of estimating under squared error loss the parameter of a symmetric distribution which is subject to an interval constraint, we develop general theory which provides improvements on various types of inadmissible procedures, such as maximum likelihood procedures. The applications and further developments given include: (i) symmetric location families such as the exponential power family including double-exponential and normal, Student and Cauchy, a Logistic type family, and scale mixture of normals in cases where the variance is lower bounded; (ii) symmetric exponential families such as those related to a Binomial(n, p) model with bounded $|p - 1/2|$ and to a Beta($\alpha + \theta, \alpha - \theta$) model; and (iii) symmetric location distributions truncated to an interval $(-c, c)$. Finally, several of the dominance results are studied with respect to model departures yielding robustness results, and specific findings are given for scale mixture of normals and truncated distributions.

Keywords Maximum likelihood estimator · Restricted parameter space · Bayes estimator · Squared error loss · Dominance · Robustness · Symmetric location families · Truncated distributions · Exponential families · Scale mixture of normals