A small sample bias correction and implications for inference

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The most popular and perhaps universal estimator of location and scale in robust estimation, where one accepts that ideally we have a normal population, but wish to guard against possible small departures from such, is Huber's Proposal-2 M-estimator. We outline the first order small sample bias correction for the scale estimator, which has been verified both through theory and simulation. While there may be other ways of reducing small sample bias, say as in jackknifing or bootstrapping, these can be computationally intensive, and would not be routinely used with this iteratively derived estimator. It is suggested that bias reduced estimates of scale are most useful when forming confidence intervals for location and or scale based on the asymptotic distribution. In this paper we expand on the results of an earlier work by the authors to include Hampel's three part re-descending psi function (with a three part redescender for scale).

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