Near-consistent robust estimations of moments for unimodal distributions

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A. Invariant Moments. All popular robust location estimators, such as the trimmed mean, Winsorized mean, Hodges-Lehmann estimator, Huber M-estimator, and median of means, are symmetric. As shown previously, a γ-weighted Hodges-Lehmann mean ($\mathrm{WHLM}_{k,\epsilon,\gamma}$) can achieve consistency for the population mean in any γ-symmetric distribution with a finite mean. However, it falls considerably short of consistently handling other common distributions. Shifting from semi-parametrics to parametrics, consider an estimator with a non-sample-dependent breakdown point (defined in Subsection **??**) that is consistent simultaneously for both a semiparametric class of distributions and a distinct parametric distribution, such a robust estimator is named with the prefix 'invariant' followed by the population parameter it is consistent with.