

Robust estimations of moments for unimodal distributions

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1 **A. Invariant Moments.** All popular robust location estimators,
2 such as the symmetric trimmed mean, symmetric Winsorized
3 mean, Hodges-Lehmann estimator, Huber M -estimator, and
4 median of means, are symmetric. As shown previously, a
5 γ -weighted Hodges-Lehmann mean ($\text{WHLM}_{k,\epsilon,\gamma}$) can achieve
6 consistency for the population mean in any γ -symmetric dis-
7 tribution with a finite mean. However, it falls considerably
8 short of consistently handling other parametric distributions
9 that are not γ -symmetric. Shifting from semiparametrics to
10 parametrics, consider a robust estimator with a non-sample-
11 dependent breakdown point (defined in Subsection ??) which
12 is consistent simultaneously for both a semiparametric distri-
13 bution and a distinct parametric distribution that does not
14 belong to that semiparametric distribution,