

# 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  $\gamma$ -weighted Hodges-Lehmann mean ( $\text{WHLM}_{k,\epsilon,\gamma}$ ) can achieve  
6 consistency for the population mean in any  $\gamma$ -symmetric dis-  
7 tribution with a finite mean. However, it falls considerably  
8 short of consistently handling other parametric distributions  
9 that are not  $\gamma$ -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 class of  
13 distributions and a distinct parametric distribution that does  
14 not belong to that semiparametric class,

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