

# Semiparametric robust mean estimations based on the orderliness of quantile averages

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1 As one of the most fundamental problems in statistics, robust loca-  
2 tion estimation has many prominent solutions, such as the symmetric  
3 trimmed mean, symmetric Winsorized mean, Hodges–Lehmann es-  
4 timator, Huber M-estimator, and median of means. Recent studies  
5 suggest that their biases concerning the mean can be quite different  
6 in asymmetric distributions, but the underlying mechanisms remain  
7 largely unclear. This study establishes two forms of orderliness,  
8 similar to the mean-median-mode inequality, within a wide range of  
9 semiparametric distributions, particularly highlighting the unique role  
10 of  $\gamma$ -symmetric distributions.

semiparametric | mean-median-mode inequality | asymptotic | unimodal  
| Hodges–Lehmann estimator

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