Near-consistent robust estimations of moments for unimodal distributions

Tuban Lee

This manuscript was compiled on June 8, 2023

A. Robust Estimations of the Central Moments. In 1976, Bickel and Lehmann (1), in their third paper of the landmark series *Descriptive Statistics for Nonparametric Models*, generalized nearly all robust scale estimators of that time as measures of the dispersion of a symmetric distribution around its center of symmetry. In 1979, in the same series, they (2) proposed a class of estimators termed as measures of spread, which "do not require the assumption of symmetry." From this, Rousseeuw and Croux proposed a popular efficient scale estimator (3) in 1993, but the significance of addressing the symmetry assumption has been greatly underestimated, as will be discussed later.

Theorem A.1.

Proof. □

1. PJ Bickel, EL Lehmann, Descriptive statistics for nonparametric models. iii. dispersion in *Selected works of EL Lehmann.* (Springer), pp. 499–518 (2012).
2. PJ Bickel, EL Lehmann, Descriptive statistics for nonparametric models iv. spread in *Selected Works of EL Lehmann.* (Springer), pp. 519–526 (2012).
3. PJ Rousseeuw, C Croux, Alternatives to the median absolute deviation. *J. Am. Stat. association* **88**, 1273–1283 (1993).

DRAFT