

Confidence sets based on the positive part James-Stein estimator with the asymptotically constant coverage probability

Ahmed S., Kareev I., Suraphee S., Volodin A., Volodin I.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2014 Taylor & Francis. The asymptotic expansions for the coverage probability of a confidence set centred at the James-Stein estimator presented in our previous publications show that this probability depends on the non-centrality parameter τ^2 (the sum of the squares of the means of normal distributions). In this paper we establish how these expansions can be used for a construction of confidence region with constant confidence level, which is asymptotically (the same formula for both case $\tau \rightarrow 0$ and $\tau \rightarrow \infty$) equal to some fixed value $1-\alpha$. We establish the shrinkage rate for the confidence region according to the growth of the dimension p and also the value of τ for which we observe quick decreasing of the coverage probability to the nominal level $1-\alpha$. When $p \rightarrow \infty$ this value of τ increases as $O(p^{1/4})$. The accuracy of the results obtained is shown by the Monte-Carlo statistical simulations.

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Keywords

asymptotical expansions, confidence sets, coverage probability, multivariate normal distribution, positive part James-Stein estimator, second-order asymptotic