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James-Stein confidence set: Equal area approach to the global approximation of coverage probability

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Abstract

In [S. A. Ahmed, A. K. MD. E. Saleh, A. I. Volodin, and I. N. Volodin, "Asymptotic Expansion of the Coverage Probability of James-Stein Estimators," *Theory Probab. Appl.* 51, 683-695 (2007)], an asymptotic expansion of coverage probabilities for the James-Stein confidence sets was constructed, which was asymptotically exact for both large and small values of the noncentrality parameter τ^2 , that is, the sum of squares of the means of $p \geq 3$ normal distributions subject to confidence estimation. As numerical examples show, this expansion can be used on the almost entire domain of values τ^2 for computing the coverage probability with error of order 10^{-2} . In this paper, a similar asymptotic expansion is suggested, which computes the coverage probability with much smaller global error in the domain of small and moderate values of p . The accuracy of approximations is illustrated by statistical modeling data. © 2011 Pleiades Publishing, Ltd.

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Keywords

asymptotic expansion, confidence set, coverage probability, multivariate normal distribution, positive-part James-Stein estimator