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论文

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### 小子样场合下估算母体百分位值置信下限和可靠度置信下限的Bootstrap方法

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### Bootstrap Method for Confidence Lower Limit Estimation of Population Percentile and Reliability in Small Number of Test-Sample

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摘要

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**摘要** 将Bootstrap方法引入到小子样场合下母体百分位值置信下限的计算中,并与传统的单侧容限系数法和新单侧容限系数法进行了大量的对比计算,算例表明Bootstrap方法明显优于其他两种方法,在较高可靠度和置信度要求下母体百分位值置信下限不会出现负值的情况,而且计算得到的结果更接近真值。发展了一种半参数Bootstrap方法用于计算可靠度的置信下限,模拟计算表明半参数Bootstrap方法很好地克服了置信度较高时,新旧单侧容限系数计算出的可靠度置信下限过低的局限性,而且半参数Bootstrap方法的计算结果均有较高的精度。

**关键词:** Bootstrap方法 小子样 母体百分位值 可靠度 置信下限

**Abstract:** Bootstrap method is firstly employed to evaluate the confidence lower limit of population percentile under small number of test-sample. Large number of simulation is implemented to verify the advantage of the method. Comparing simulation results of the introduced Bootstrap method to those of traditional and improved one-sided tolerance factor methods, it is found that the Bootstrap method is more accurate than the one-sided tolerance factor method. Especially at small number of test-sample, the results of the introduced Bootstrap method are closer to the actual population percentile than those of other two methods. Under high confidence degree and reliability demand, negative evaluation value may appear in the result of one-sided tolerance factor method, but no one in the Bootstrap method, which shows that the bootstrap method fits the actual population percentile better than other two one-sided tolerance factor methods. A semiparameter Bootstrap method is investigated to determine the confidence lower limit for the reliability as well. Simulations indicate an improvement in accuracy at small number of test-sample and high confidence degree.

**Keywords:** Bootstrap method small sample population percentile reliability low confidence limit

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