**Bootstrap confidence bounds: splitting the sample for higher-order accuracy**

**C Pretorius and JWH Swanepoel**

We propose a new method, based on sample splitting, for constructing bootstrap confidence bounds for a parameter appearing in the regular smooth function model. It has been demonstrated in the literature that the well-known percentile-t bootstrap confidence bounds are typically second-order accurate. Using our version of the bootstrap percentile-t method, confidence bounds of third- and even fourth-order accuracy can be obtained. Furthermore, whereas the standard *percentile* bounds are typically first-order accurate, the new bounds achieve second-order accuracy. In the case where the parameter of interest is the population mean, we derive for each confidence bound the exact coefficient of the leading term in an asymptotic expansion of the coverage error, although similar results may be obtained for other parameters such as the variance, the correlation coefficient, and the ratio of two means. We show that fourth-order accurate equal-tailed confidence intervals may be obtained from the newly proposed bounds, as opposed to the typical first-order accuracy of the standard intervals. It is also shown that the good properties of the new percentile-tbound carry over to regression problems. A small simulation study illustrates the behaviour of the confidence bounds for small to moderate sample sizes.