

Asymptotic properties of sample quantiles from a finite population

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Abstract In this paper we consider the problem of estimating quantiles of a finite population of size N on the basis of a finite sample of size n selected without replacement. We prove the asymptotic normality of the sample quantile and show that the scaled variance of the sample quantile converges to the asymptotic variance under a slight moment condition. We also consider the performance of the bootstrap in this case, and find that the usual (Efron's) bootstrap method fails to be consistent, but a suitably modified version of the bootstrapped quantile converges to the same asymptotic distribution as the sample quantile. Consistency of the modified bootstrap variance estimate is also proved under the same moment conditions.

Keywords Quantile estimation · Finite population · Asymptotic normality · Variance estimation · Bootstrap