

Exact two-sample nonparametric test for quantile difference between two populations based on ranked set samples

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Abstract Creation of a ranked set sample, by its nature, involves judgment ranking error within set units. This ranking error usually distorts statistical inference of the population characteristics. Tests may have inflated sizes, confidence intervals may have incorrect coverage probabilities, and the estimators may become biased. In this paper, we develop an exact two-sample nonparametric test for quantile shift between two populations based on ranked set samples. This test is based on two independent exact confidence intervals for the quantile of interest corresponding to the two populations and rejects the null hypothesis of equal quantiles if these intervals are disjoint. It is shown that a pair of 83 and 93% confidence intervals provide a 5 and 1% test for the equality of quantiles. The proposed test is calibrated for the effect of judgment ranking error so that the test has the correct size even under a wide range of judgment ranking errors. A small scale simulation study suggests that the test performs quite well for cycle sizes as small as 2.

Keywords Sampling design · Sign test · Ranked set sampling · Judgment ranking · Median · Imperfect ranking · Calibration