A Test for Symmetry Using Ranked Set Samples

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Abstract: Based on ranked set samples, we propose a sign test for the hypothesis of symmetry when the center of the distribution is assumed known (B-Test). We show that the test statistic follows a binomial distribution under the null hypothesis. We study the effect of estimating the center of symmetry by the sample mean on this test. Under the null hypothesis, the modified sign test will lose its distribution-free property. We obtain the efficacy of B-Test and compare it with the efficacy of the sign test of symmetry based on a simple random sample (S-test) and with the ranked set sample analog of the sign test (T-test). We show that for skewed distributions, B-Test is more efficient than the S-test and T-test. For shifted symmetric distributions, the B-Test is more efficient than the S-test and the T-test when the parent distributions do not have heavy tails. We assess the ability of the three tests to detect asymmetry in a Monte Carlo study.