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A combined test for the median

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Testing for the median (□) of a random variable *X* is a basic problem in statistics. When the distribution of *X* is symmetric and the moments are finite, the mean (□) and the median (□) are the same. For such situations, a test regarding the median is equivalent to a test regarding the mean. In particular when the distribution of *X* is normal a *t*-test can be used as the test for the median. Otherwise, a nonparametric test like Binomial Sign test can be used as the test for the median. In this study we considered the following "combined median test" for H_0:□ = □□ vs H_1: □□≠ □□□ where □□ is a given value.

Step 1: Test for the normality of *X*.

Step 2: If the normality is not rejected, do the *t*-test for the median.

Step 3: otherwise, do the Binomial Sign test for the median.

There are several tests available for the normality of *X*. In this study, we investigated the effects of five well known normality tests, namely, the Kolmogorov-Smirnov test, Anderson Darling test, Shapiro-Wilk test, D'Agostino's K-Squared test and Cramer-von Mises test on the step 1 of the above combined median test.

It was found that the significance level of the combined median test is closest to the nominal significance level when the Shapiro-Wilk test is used as the normality test in step 1. It was also found that the power of the combined median test does not depend on the normality test in step 1. The results were obtained using Monte Carlo studies with different distributions for *X* and different sample sizes. Based on these results, we recommend the combined median test with Shapiro-Wilk test for normality in step 1.

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