

Sign Test

If the conditions for the one mean test (no outliers, data from a normally distributed population) are not met, one alternative test that we can perform is the **Sign Test**. The sign test is known as a nonparametric test, and requires no assumptions.

We begin by rewriting the test in terms of the population median M instead of the population mean μ . If we were doing this by hand, we would assign each value that is greater than the claimed median a plus sign (+) and each value that is less than the claimed median a minus sign (-). Ignore any value that is equal to the claimed median.

If we are trying to show that the population median is higher than the claimed median, we total the number of positive signs. If we are trying to show that the population median is lower than the claimed median, we total the number of negative signs.

The P -value can be found using the binomial distribution. Half of all values are supposed to be below the median, and half above. We use 0.5 for p . The value of n is the total number of signs, leaving out values that are equal to the median. Compute the probability of having at least the number of signs of interest as the sample produced.

(StatCrunch can perform the test using Stat > Nonparametrics > Sign Test.)

Problem

The mean wait time at a drive-thru of a fast-food restaurant is 90 seconds. A new system is implemented to reduce the wait time.

Here are the wait times (in seconds) for 10 randomly selected drive-thru customers:

109 67 58 76 65 80 96 86 71 72

Use the sign test to test the claim that the new system has reduced the waiting time, using a 0.05 level of significance.

(Data can be found as "AMATYC 2020" in the "Woodbury Math 21" StatCrunch group.)