/WSTR=*waveListString*

Specifies a string containing a semicolon-separated list of waves that contain sample data. Use *waveListString* instead of listing each wave after the flags.

/Z Ignores errors.

Details

The StatsWatsonWilliamsTest must have at least two input waves, which contain angles in radians (mod 2π), can be single or double precision, and can be of any dimensionality; the waves must not contain any NaNs or INFs.

The Wheeler-Watson H_0 postulates that the samples came from the same population. The extension of the test to more than two samples is due to Mardia. The Wheeler-Watson test is not valid for data with ties, in which case you should use Watson's U^2 test.

V_flag will be set to -1 for any error and to zero otherwise.

References

Mardia, K.V., *Statistics of Directional Data*, Academic Press, New York, New York, 1972.

See, in particular, Chapter 27 of:

Zar, J.H., *Biostatistical Analysis*, 4th ed., 929 pp., Prentice Hall, Englewood Cliffs, New Jersey, 1999.

See Also

Chapter III-12, **Statistics** for a function and operation overview; **StatsWatsonUSquaredTest** and **StatsWheelerWatsonTest**.

StatsWilcoxonRankTest

StatsWilcoxonRankTest [***flags***] ***waveA, waveB***

The StatsWilcoxonRankTest operation performs the nonparametric Wilcoxon-Mann-Whitney two-sample rank test or the Wilcoxon Signed Rank test (for paired data) on *waveA* and *waveB*. Output is to the W_WilcoxonTest wave in the current data folder or optionally to a table.

waveA and *waveB* must not contain NaNs or INFs.

Flags

/ALPH = *val* Sets the significance level (default *val*=0.05).

/APRX=*m* Sets the approximation method. It computes an exact critical value by default.

m=1: Standard normal approximation with ties (Zar P. 151).

m=2: Improved normal approximation (Zar P. 152).

Approximations may be appropriate for large sample sizes when computation may take a long time.

/Q No results printed in the history area.

/T=*k* Displays results in a table. *k* specifies the table behavior when it is closed.

k=0: Normal with dialog (default).

k=1: Kills with no dialog.

k=2: Disables killing.

The table is associated with the test, not the data. If you repeat the test, it will update any existing table with the new results.

/TAIL=*tail* *tail* is a bitwise parameter that specifies the tails tested.

Bit 0: Lower tail.

Bit 1: Upper tail (default).

Bit 2: Two tail.

See **Setting Bit Parameters** on page IV-12 for details about bit settings.

You can perform any combination of tests by adding their corresponding tail values (/TAIL=7 tests all tail possiblities). Note that H0 changes according to the selected tail.

/WSRT — Performs the Wilcoxon Signed Rank Test for paired data. The test computes statistics Tp and Tm, lower-tail, upper-tail, and two-tail P-values. If the number of samples is less than 200 it computes exact P-values, otherwise they are computed using the normal approximation. Do not use /ALPH, /APRX, and /TAIL with this flag.

/Z — Ignores errors.

Details

The Wilcoxon-Mann-Whitney test combines the two samples and ranks them to compute the statistic U. If *waveA* has *m* points and *waveB* has *n* points, then *U* is given by

$$U = mn + \frac{m(m+1)}{2} - R_1,$$

with the corresponding statistic *U'* given by

$$U' = nm + \frac{n(n+1)}{2} - R2.$$

where R_i is the ranks of data in the *i*th wave (ranked in ascending order).

The distribution of *U* is difficult to compute, requiring the number of possible permutations of *m* elements of *waveA* and *n* elements of *waveB* that give rise to *U* values that do not exceed the one computed. The distribution is computed according to the algorithm developed by Klotz. With increasing sample size one can avoid the time consuming distribution computation and use a normal approximation instead. Klotz recommends this approximation for *N*=*m*+*n*~100.

Use /APRX=2 for the best approximation. The two approximations are discussed by Zar.

The Wilcoxon Signed Rank Test, or Wilcoxon Paired-Sample Test, ranks the difference between pairs of values and computes the sums of the positive ranks (Tp) and the negative ranks (Tm). It calculates Tp and Tm and P-values for all tail combinations. The P-values are:

P_lower_tail P(Wp<=Tp)

P_upper_tail P(Wp>=Tp)

P_two_tail 2*Min(P_lower_tail,P_upper_tail)

Wp is the generic symbol for the sum of positive ranks for the given number of pairs.

V_flag will be set to -1 for any error and to zero otherwise.

In both Wilcoxon-Mann-Whitney two-sample rank test and the Wilcoxon Signed Rank test H0 is that the data in the two input waves are statistically the same.

References

Cheung, Y.K., and J.H. Klotz, The Mann Whitney Wilcoxon distribution using linked lists, *Statistica Sinica*, *7*, 805-813, 1997.

See in particular Chapter 15 of:

Klotz, J.H., *Computational Approach to Statistics*.

Streitberg, B., and J. Rohmel, Exact distributions for permutations and rank tests: An introduction to some recently published algorithms, *Statistical Software Newsletter*, *12*, 10-17, 1986.

Zar, J.H., *Biostatistical Analysis*, 4th ed., 929 pp., Prentice Hall, Englewood Cliffs, New Jersey, 1999.

See Also

Chapter III-12, **Statistics** for a function and operation overview.