Flags

/ALZR	Allows zero entries in source waves. If you are using /S zero entries in *srcWave2* are skipped.
/NCON=*nCon*	Specifies the number of constraints (0 by default), which reduces the number degrees of freedom and the critical value by *nCon*.
/S	Sets the calculation mode to a single distribution where *srcWave1* represents an array of binned measurements and *srcWave2* represents the corresponding expected values.
/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.
/Z	Ignores errors. V_flag will be set to -1 for any error and to zero otherwise.

Details

The source waves, *srcWave1* and *srcWave2*, must have the same number of points and can be any real numeric data type. Any nonpositive values (including NaN) in either wave removes the entry in both waves from consideration and reduces the degrees of freedom by one. The number degrees of freedom is initially the number of points in *srcWave1*-1-*nCon*. By default it is assumed that *srcWave1* and *srcWave2* represent two distributions of binned data.

When you specify /S, *srcWave1* must consist of binned values of measured data and *srcWave2* must contain the corresponding expected values. The calculation is:

$$\chi^2 = \sum_{i=0}^{n-1} \frac{\left(Y_i - V_i\right)^2}{V_i}.$$

Here Y_i is the sample point from *srcWave1*, V_i is the expected value of Y_i based on an assumed distribution (*srcWave2*), and n is the number of points in the each wave. If you do not use /S, it calculates:

$$\chi^2 = \sum_{i=0}^{n-1} \frac{\left(Y_{1i} - Y_{2i}\right)^2}{Y_{1i} + Y_{2i}},$$

where Y_{1i} and Y_{2i} are taken from *srcWave1* and *srcWave2* respectively.

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

See Also

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

StatsCircularCorrelationTest

`StatsCircularCorrelationTest [`*`flags`*`] `*`waveA, waveB`*

The StatsCircularTwoSampleTest operation peforms a number of tests for two samples of circular data. Using the appropriate flags you can choose between parametric or nonparametric, unordered or paired tests. The input consists of two waves that contain one or two columns. The first column contains angle data expressed in radians and an optional second column contains associated vector lengths. The waves must be either single or double precision floating point. Results are stored in the W_StatsCircularCorrelationTest wave in the current data folder and optionally displayed in a table. Some flags generate additional outputs, described below.

Flags

/ALPH=*val*	Sets the significance level (default 0.05).
/NAA	Performs a nonparametric angular-angular correlation test.

/PAA	Performs a parametric angular-angular correlation test.
/PAL	Performs a parametric angular-linear correlation test. In this case the angle wave is *waveA* and the linear data corresponds to *waveB*.
/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.
/Z	Ignores errors.

Details

The nonparametric test (/NAA) follows Fisher and Lee's modification of Mardia's statistic, which is an analogue of Spearman's rank correlation. The test ranks the angles of each sample and computes the quantities r' and r'' as follows:

$$r' = \frac{\left\{\sum_{i=0}^{n-1}\cos\left[\frac{2\pi}{n}\left(r_{ai}-r_{bi}\right)\right]\right\}^2 + \left\{\sum_{i=0}^{n-1}\sin\left[\frac{2\pi}{n}\left(r_{ai}-r_{bi}\right)\right]\right\}^2}{n^2},$$

$$r'' = \frac{\left\{\sum_{i=0}^{n-1}\cos\left[\frac{2\pi}{n}\left(r_{ai}+r_{bi}\right)\right]\right\}^2 + \left\{\sum_{i=0}^{n-1}\sin\left[\frac{2\pi}{n}\left(r_{ai}+r_{bi}\right)\right]\right\}^2}{n^2}.$$

Here n is the number of data pairs and r_{ai} and r_{bi} are the ranks of the ith member in the first and second samples respectively.

The test statistic is $(n-1)(r'-r'')$, which is compared with the critical value (for one and two tails). The CDF of the statistic is a highly irregular function. The critical value is computed by a different methods according to n. For $3 \le n \le 8$, a built-in table of CDF transitions gives a "conservative" estimate of the critical value. For $9 \le n \le 30$, the CDF is approximated by a 7th order polynomial in the region $x > 0$. For $n \ge 30$, the CDF is from the asymptotic expression. For $3 \le n \le 30$, CDF values are obtained by Monte-Carlo simulations using 1e6 random samples for each n.

The parametric test for angular-angular correlation (/PAA) involves computation of a correlation coefficient r_{aa} and then evaluating the mean $\overline{r_{aa}}$ and variance $s_{r_{aa}}^2$ of equivalent correlation coefficients computed from the same data but by deleting a different pair of angles each time. The mean and variance are then used to compute confidence limits L1 and L2:

$$L1 = nr_{aa} - (n-1)\overline{r_{aa}} - Z_{\alpha(2)}\sqrt{\frac{s_{r_{aa}}^2}{n}},$$

$$L2 = nr_{aa} - (n-1)\overline{r_{aa}} + Z_{\alpha(2)}\sqrt{\frac{s_{r_{aa}}^2}{n}}$$

where $Z_{\alpha(2)}$ is the normal distribution two-tail critical value at the a level of significance. H_0 (corresponding to no correlation) is rejected if zero is not contained in the interval [L1,L2].

The parametric test for angular-linear correlation (/PAL) involves computation of the correlation coefficient r_{al} which is then compared with a critical value from χ^2 for alpha significance and two degrees of freedom.