$$skewness = \frac{\widehat{\rho_2}\sin\left(\hat{\mu}_2' - 2\bar{\theta}\right)}{\left(1-\bar{R}\right)^{3/2}}$$

$$kurtosis = \frac{\widehat{\rho_2}\cos\left(\hat{\mu}_2' - 2\bar{\theta}\right) - \bar{R}^4}{\left(1-\bar{R}\right)^2}$$

where

$$\hat{\mu}_p' = \begin{cases} \text{atan}\left(S_p/C_p\right) & S_p > 0, C_p > 0 \\ \text{atan}\left(S_p/C_p\right) + \pi & C_p < 0 \\ \text{atan}\left(S_p/C_p\right) + 2\pi & S_p < 0, C_p > 0 \end{cases}$$

and

$$C_p = \frac{1}{n}\sum_{i=1}^{n}\cos p\theta_i, \qquad S_p = \frac{1}{n}\sum_{i=1}^{n}\sin p\theta_i.$$

References

Fisher, N.I., *Statistical Analysis of Circular Data*, 295pp., Cambridge University Press, New York, 1995.

Press, William H., *et al*., *Numerical Recipes in C*, 2nd ed., 994 pp., Cambridge University Press, New York, 1992.

Durand, D., and J.A. Greenwood, Modifications of the Rayleigh test for uniformity in analysis of two-dimensional orientation data, *J. Geol*., *66*, 229-238, 1958.

See Also

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

WaveStats, **StatsAngularDistanceTest**, **StatsCircularCorrelationTest**, **StatsCircularMeans**, **StatsHodgesAjneTest**, **StatsWatsonUSquaredTest**, **StatsWatsonWilliamsTest**, and **StatsWheelerWatsonTest**.

StatsCircularTwoSampleTest

StatsCircularTwoSampleTest [***flags***] ***waveA, waveB***

The StatsCircularTwoSampleTest operation performs second order analysis of angles. 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 (mean angles) expressed in radians and an optional second column that contains associated vector lengths. The waves must be either single or double precision. Results are stored in the W_StatsCircularTwoSamples wave in the current data folder and optionally displayed in a table. Some of the tests may have additional outputs.

Flags

/ALPH = *val*	Sets the significance level (default *val*=0.05).
/NPR	Performs nonparametric paired-sample test (Moore). The input waves must contain paired angular data so both must have single column and the same number of points.
/NSOA	Perform nonparametric second order two-sample test. Input waves must each contain two columns.
/PPR	Performs parametric paired-sample test. Input waves must contain paired data and must have the same number of points.