wavestats

Monday, September 03, 2012
2:53 PM

WaveStats /ALPH=*val* /C=*method* /M=*moment* /Q [/R = (*startX*, *endX*)]/Z *waveName*

The WaveStats operation computes several values associated with the named wave.

Details

WaveStats uses a two-pass algorithm to produce more accurate results than obtained by computing the binomial expansions of the third and fourth order moments.

WaveStats returns the statistics in the automatically created variables:

V_npnts	Number of points. Doesn't include NaN or INF points.	
V_numNans	Number of NaNs.	
V_numINFs	Number of INFs.	
V_avg	Average of Y values.	
V_sdev	Standard deviation of Y values, ("Variance" is V_sdev^2.)	$\sigma = \sqrt{\frac{1}{V\_npnts - 1}\sum(Y_i - V\_avg)^2}$
V_sem	Standard error of the mean	$sem = \sigma / \sqrt{V\_numPnts}$
V_rms	RMS of Y values	$= \sqrt{\left(\frac{1}{V\_npnts}\sum Y_i^2\right)}$
V_adev	Average deviation	$= \frac{1}{V\_npnts}\sum_{i=0}^{V\_npnts-1}\lvert Y_i - \overline{Y}\rvert$
V_skew	Skewness	$= \frac{1}{V\_npnts}\sum_{i=0}^{V\_npnts-1}\left[\frac{Y_i - \overline{Y}}{\sigma}\right]^3$
V_kurt	Kurtosis	$= \frac{1}{V\_npnts}\sum_{i=0}^{V\_npnts-1}\left[\frac{Y_i - \overline{Y}}{\sigma}\right]^4 - 3$

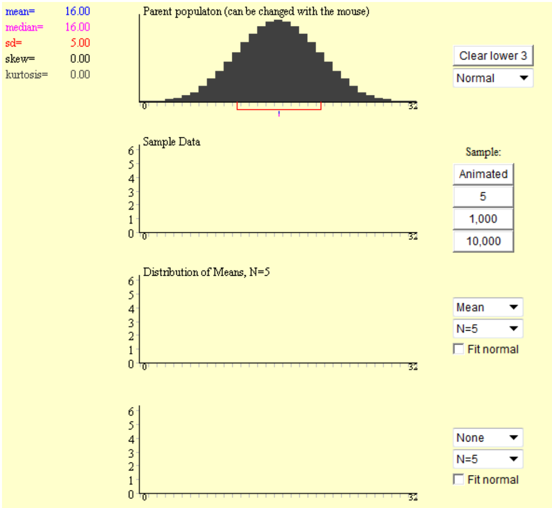
Statistical Parameters from Ch. 4:

Mean	V_avg
Standard Deviation*	V_sdev
Standard Deviation (Error) of the Mean	V_sem

* *Sample* sdev with 1/(N-1)

Some discussion with a simulation

http://onlinestatbook.com/stat_sim/sampling_dist/index.html



Some examples from Taylor (Sect. 4.5): (data on course web page)

Area of a Rectangle.

Write a function that calculates area and the uncertainty of the area

a. by finding the mean & uncertainty of the length and width first. Print your results to the command line.

b. by finding the area for each set of measurements (l_1 x w_1) first.

c. by finding mean & uncertainty of length and width **BUT** storing them in waves, like this:

length_stats 0 $\bar{l}$ 1 unc l width_stats 0 $\bar{w}$ 1 unc w

Pseudocode for (a)

function versionA(length_mm, width_mm)

length_mm → V_avg, V_sem

width_mm → V_avg, V_sem

wavestats length_mm
variable length_avg = V_avg
variable length_sem = V_sem
wavestats width_mm
variable width_avg = V_avg
variable width_sem = V_sem

length_stats

width_stats

variable Area = length_avg · width_avg

variable frac_unc_Area = sqrt((unc_leng / leng)^2 + (unc_width / width)^2)

print "Area = ", Area, ", unc = ", Area * frac_unc_area

end

for (c)

wavestats length_mm

length_stats [0] = V_avg
length_stats [1] = V_sem

same for width_stats
width_stats [0] = V_avg
width_stats [1] = V_sem

area = withstats[0] * length_stats[0]
(mult. means)

Challenge with Sdev and SDOM is what they mean.

Variance (= sdev^2) describes variation from the average

Sdev describes the width (precision) of a set of measurements.

SDOM describes how good the calculated mean estimates the true mean.