CHI-SQUARE TEST

PURPOSE

Perform a one sample chi-square test that the standard deviation (the σ below) is equal to a user specified value (the σ_0 below).

DESCRIPTION

The hypothesis test is:

H0: $\sigma = \sigma_0$

Ha: $\sigma < \sigma_0$ (lower one tail test)

$\sigma <> \sigma_0$ (two tailed test)

$\sigma > \sigma_0$ (upper one tail test)

Test Statistic:

$T = (N-1)*(\text{sample standard deviation}/\sigma_0)^2$

where N is the sample size.

Significance level: Typically set to 0.05

Critical Region:

$T < 0.95$ (lower one tail test)

$0.025 < T < 0.975$ (two tailed test)

$T > 0.05$ (upper one tail test)

where the critical region is determined from the chi-square cumulative distribution function with (N-1) degrees of freedom and a significance level of 0.05.

Conclusion: Reject null hypothesis if T is in the critical region.

The standard output generates the test for all 3 cases (two tailed, lower one tail, upper one tail).

DATAPLOT tests the hypothesis that the standard deviation is equal to a given value. Be aware that many statistical textbooks state the hypothesis test in terms of the variance. These tests are equivalent, just be sure to specify the σ_0 value in terms of the standard deviation for DATAPLOT purposes.

SYNTAX 1

CHI-SQUARE TEST <y> <sigma0> <SUBSET/EXCEPT/FOR qualification>

where <y> is a response variable;

<sigma0> is a number or parameter that is the value to test against;

and where the <SUBSET/EXCEPT/FOR qualification> is optional.

SYNTAX 2

CHI-SQUARE TEST <sigma0> <y> <SUBSET/EXCEPT/FOR qualification>

where <sigma0> is a number or parameter that is the value to test against;

<y> is a response variable;

and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

```
CHI-SQUARE TEST Y1 8.5
CHI-SQUARE TEST Y1 A
CHI-SQUARE TEST Y1 A SUBSET Y > 0
```

NOTE 1

To use a different significance level, simply compare the value on the line labeled CHI-SQUARED CDF VALUE to the proper acceptance interval. For example, for alpha = 0.10, the acceptance intervals are:

(0.000,0.900) - lower one tail case

(0.050,0.950) - two tail case

0.100,1.000) - upper one tail case

NOTE 2

A chi-square test for independence for a two-way table can be generated with the CROSS TABULATE command. See the documentation for CROSS TABULATE for details.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

CONFIDENCE LIMITS	=	Compute the confidence limits for the mean of a sample.
T TEST	=	Performs a two-sample t test.
F TEST	=	Performs an F test for the ratio of 2 variances.
STANDARD DEVIATION	=	Computes the standard deviation of a variable.

REFERENCE

Chi-square tests are discussed in most introductory statistics books.

APPLICATIONS

Confirmatory Data Analysis

IMPLEMENTATION DATE

94/2

PROGRAM

```
SKIP 25
READ GEAR.DAT DIAMETER BATCH
LET A = 0.1
CHI-SQUARE TEST DIAMETER A
```

The following output is generated:

```
                  CHI-SQUARED TEST
                SIGMA0 =   0.1000000
 HYPOTHESIS BEING TESTED--STANDARD DEVIATION SIGMA = .1000000

 SAMPLE:
    NUMBER OF OBSERVATIONS      =      100
    MEAN                        =   0.9976400
    STANDARD DEVIATION S        =   0.6278908E-02

 TEST:
    S/SIGMA0                    =   0.6278908E-01
    CHI-SQUARED STATISTIC       =   0.3903044
    DEGREES OF FREEDOM          =    99.00000
    CHI-SQUARED CDF VALUE       =    0.000000

    HYPOTHESIS    ACCEPTANCE INTERVAL    CONCLUSION
 SIGMA < .1000000    (0.000,0.950)        ACCEPT
 SIGMA = .1000000    (0.025,0.975)        REJECT
 SIGMA > .1000000    (0.050,1.000)        REJECT
```