CHSCDF

PURPOSE

Compute the chi-square cumulative distribution function with degrees of freedom parameter ν.

DESCRIPTION

The input value should be greater than 0 and the degrees of freedom should be a positive integer. The probability density function of the chi-square distribution is:

$$f(x) = \frac{x^{\left(\frac{\upsilon}{2}-1\right)} e^{\left(\frac{-x}{2}\right)}}{2^{\upsilon/2}\Gamma\left(\frac{\upsilon}{2}\right)} \qquad \text{for } x > 0 \qquad \textbf{(EQ 8-140)}$$

where Γ is the gamma function. The chi-square cdf can be expressed in terms of the incomplete gamma and the complete gamma functions (see the documentation for the GAMMA and GAMMAI functions in the Mathematical Library Functions chapter for details on these functions) as follows:

$$F(x, \upsilon) = \frac{\Upsilon\left(\frac{\upsilon}{2}, \frac{x}{2}\right)}{\Gamma\left(\frac{\upsilon}{2}\right)} \qquad \text{for } x > 0 \qquad \textbf{(EQ 8-141)}$$

SYNTAX

LET <y2> = CHSCDF(<y1>,<nu>) <SUBSET/EXCEPT/FOR qualification>

where <y1> is a variable, a number, or a parameter;

<y2> is a variable or a parameter (depending on what <y1> is) where the computed chi-square cdf value is stored;

<nu> is a positive integer number or parameter that specifies the degrees of freedom;

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

EXAMPLES

LET A = CHSCDF(3,10)

LET Y = CHSCDF(X1,10)

NOTE 1

This function is calculated with various numeric approximations. For small and moderate ν (less than 1,000), an exact finite sum method is used. For large ν (greater than 1,000) and x smaller than ν, the Wilson-Hilferty approximation is used. For large ν (greater than 1,000) and x greater than ν, the Wilson asymptotic expansion is used.

NOTE 2

The function NCCCDF function can be used to compute the cumulative distribution function of the non-central chi-square distribution. This function can also be used to compute the cumulative distribution function of a central chi-square distribution with non-integer degrees of freedom.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

CHSPDF	=	Compute the chi-square probability density function.
CHSPPF	=	Compute the chi-square percent point function.
NCCCDF	=	Compute the non-central chi-square cumulative distribution function.
NCCPPF	=	Compute the non-central chi-square percent point function.
GAMCDF	=	Compute the gamma cumulative distribution function.
GAMPPF	=	Compute the gamma percent point function.

REFERENCE

"Continuous Univariate Dsitributions - 1," Johnson and Kotz, Houghton Mifflin, 1970 (chapter 17).

"Handbook of Mathematical Functions, Applied Mathematics Series, Vol. 55," Abramowitz and Stegum, National Bureau of Standards, 1964 (page 941).

APPLICATIONS

Hypothesis Testing

IMPLEMENTATION DATE

Pre-1987

PROGRAM

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TITLE CHSCDF FOR VARIOUS VALUES OF NU
X1LABEL X
Y1LABEL PROBABILITY
SEGMENT 1 COORDINATES 16 88 21 88; SEGMENT 1 PATTERN SOLID
SEGMENT 2 COORDINATES 16 84 21 84; SEGMENT 2 PATTERN DASH
SEGMENT 3 COORDINATES 16 80 21 80; SEGEMNT 3 PATTERN DOT
SEGMENT 4 COORDINATES 16 76 21 76; SEGMENT 4 PATTERN DA2
LEGEND 1 NU = 5; LEGEND 1 COORDINATES 22 87
LEGEND 2 NU = 10; LEGEND 2 COORDINATES 22 83
LEGEND 3 NU = 20; LEGEND 3 COORDINATES 22 79
LEGEND 4 NU = 30; LEGEND 4 COORDINATES 22 75
YLIMITS 0 1; YTIC DECIMAL 1
MAJOR YTIC NUMBER 6; MINOR YTIC NUMBER 1
LINES SOLID DASH DOT DASH2
PLOT CHSCDF(X,5) FOR X = 0 .1 30 AND
PLOT CHSCDF(X,10) FOR X = 0 .1 30 AND
PLOT CHSCDF(X,20) FOR X = 0 .1 30 AND
PLOT CHSCDF(X,30) FOR X = 0 .1 30
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