NCCNCP

PURPOSE

Compute the non-centrality parameter of a non-central chi-square distribution with degrees of freedom parameters υ given the cumulative distribution function value.

DESCRIPTION

The non-central chi-square distribution with degrees of freedom υ and non-centrality parameter δ is the sum of υ independent normal distributions with standard deviation 1. The non-centrality parameter is one half the sum of squares of the normal means. The formula for the cumulative distribution function is:

$$F(x) = \sum_{i=0}^{\infty} \frac{e^{\frac{-\delta}{2}}\left(\frac{\delta}{2}\right)^i}{i!} F_c(x, \upsilon + 2i) \qquad x > 0 \qquad \textbf{(EQ 8-279)}$$

where δ is the non-centrality parameter, υ is the degrees of freedom parameter, and F_c is the central chi-square cumulative distribution function. See the documentation for the CHSCDF command for a description of the central chi-square distribution function.

The DATAPLOT function NCCCDF can be used to compute the cumulative distribution function value (given the degrees of freedom and non-centrality parameter). The NCCNCP function computes the non-centrality parameter given the degrees of freedom and the cumulative distribution function value. This is sometimes useful in sample size calculations. This function does not have a simple closed form. It is calculated numerically.

SYNTAX

LET <y2> = NCCNCP(<y1>,<v>,<cdf>)   <SUBSET/EXCEPT/FOR qualification>

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

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

    <v> is a positive number, parameter or variable that specifies the degrees of freedom parameter;

    <cdf> is a number, parameter or variable in the interval (0,1) that specifies the cdf value;

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

EXAMPLES

LET A = NCCNCP(0.7,1,0.95)
LET A = NCCNCP(3,10,.90)

NOTE

DATAPLOT uses algorithm AS 170 (see the REFERENCE section below) obtained from the statlib archive to compute the non-central chi-square non-centrality parameter. It uses the DGAMI and DLNGAM routines from the SLATEC library rather than the corresponding algorithms from the Applied Statistics series to compute the log gamma and incomplete gamma functions.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

NCCCDF	=	Compute the non-central chi-square cumulative distribution function.
NCCPPF	=	Compute the non-central chi-square percent point function.
CHSPDF	=	Compute the chi-square probability density function.
CHSPPF	=	Compute the chi-square percent point function.
CHSCDF	=	Compute the chi-square cumulative distribution function.
NCFCDF	=	Compute the non-central F cumulative distribution function.
NCFPPF	=	Compute the non-central F percent point function.
NCBCDF	=	Compute the non-central beta cumulative distribution function.
NCBPPF	=	Compute the non-central beta percent point function.
NCTCDF	=	Compute the non-central t cumulative distribution function.
NCTPPF	=	Compute the non-central t percent point function.

NORCDF	=	Compute the normal cumulative distribution function.
NORPDF	=	Compute the normal probability density function.
NORPPF	=	Compute the normal percent point function.

REFERENCE

"Computation of Probability and Non-centrality Parameter of a Non-central Chi-squared Distribution," Narula and Desu, Applied Statistics, Vol. 30, No. 3, 1981, pp. 349-352.

"Continuous Univariate Distributions," Johnson and Kotz, Wiley and Sons, 1970.

"Statistical Distributions," 2nd Edition, Evans, Hastings, and Peacock, 1970 (chapter 9).

APPLICATIONS

Sample size computations

IMPLEMENTATION DATE

94/9

PROGRAM

TITLE AUTOMATIC
PLOT NCCNCP(X,10,0.90) FOR X = 5 1 100