DNTCDF

PURPOSE

Compute the doubly non-central t cumulative distribution function with degrees of freedom parameters ν and with non-centrality parameters δ and λ.

DESCRIPTION

Given the random variable:

$$Y = Z/SQRT(X/\nu)$$

where Z is a normal distribution with mean δ and a standard deviation of 1 and X is a non-central chi-square distribution with ν degrees of freedom and a non-centrality parameter of λ, then Y has a doubly non-central t distribution. There is a series representation for the cumulative distribution function. However, since it is rather complicated, it is not given here. It is given in the Reeve's paper (see the REFERENCE section below).

SYNTAX

LET <y2> = DNTCDF(<y1>,<v>,<delta>,<lambda>) <SUBSET/EXCEPT/FOR qualification>
where <y1> is a number, variable or a parameter;
<y2> is a variable or a parameter (depending on what <y1> is) where the computed cdf value is stored;
<v> is a non-negative number, parameter or variable that specifies the degrees of freedom parameter;
<delta> is a non-negative number, parameter or variable that specifies the first non-centrality parameter;
<lambda> is a non-negative number, parameter or variable that specifies the second non-centrality parameter;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET A = DNTCDF(0.7,1,1,1)
LET A = DNTCDF(3,10,10,100)
LET Y = DNTCDF(95,10,100,1)

NOTE 1

This function uses code written by Charles Reeves while he was a member of the Statistical Engineering Division at NIST. The algorithm is described in the paper listed in the REFERENCE section below. This algorithm is based on a series representation given by Krishnan (see the REFERENCE below) of the exact form of the doubly non-central t distribution.

NOTE 2

The degrees of freedom parameter and the non-centrality parameters can be non-negative real numbers. The δ non-centrality parameters is restricted to value under 100 and the λ non-centrality parameter is restricted to values under 10,000. The compute time increases as the values of the non-centrality parameters increase.

NOTE 3

DATAPLOT also supports the central t and the singly non-central t distributions (see the documentation for TCDF and NCTCDF). The DNTCDF function can be used for these cases as well by setting one or both non-centrality parameters to zero. However, it uses a different algorithm.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

DNTPPF	=	Compute the doubly non-central t percent point function.
NCTCDF	=	Compute the singly non-central t cumulative distribution function.
NCTPPF	=	Compute the singly non-central t percent point function.
TCDF	=	Compute the t cumulative distribution function.
TPDF	=	Compute the t probability density function.
TPPF	=	Compute the t percent point function.
DNFCDF	=	Compute the doubly non-central F cumulative distribution function.

DNFPPF	=	Compute the doubly non-central F 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.
NORCDF	=	Compute the normal cumulative distribution function.
NORPDF	=	Compute the normal probability density function.
NORPPF	=	Compute the normal percent point function.
FCDF	=	Compute the F cumulative distribution function.
FPDF	=	Compute the F probability density function.
FPPF	=	Compute the F percent point function.

REFERENCE

"An Algorithm for Computing the Doubly Non-Central t C.D.F. to a Specified Accuracy," Charles Reeve, SED Note 86-5, December, 1986.

"Series Representation of the Doubly Non-Central t-Distribution," Marakatha Krishnan, Journal of the American Statistical Association, Vol. 63, No. 323, 1968 (pp. 1004-1012).

APPLICATIONS

Hypothesis testing

IMPLEMENTATION DATE

94/9

PROGRAM

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TITLE A DOUBLY NON-CENTRAL T DISTRIBUTION
X1LABEL X
Y1LABEL PROBABILITY
PLOT DNTCDF(X,10,10,1) FOR X = -10 0.2 30
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