FCACDF

PURPOSE

Compute the folded Cauchy cumulative distribution function.

DESCRIPTION

If X is Cauchy distributed, then ABS(X) has a folded Cauchy distribution whose probability density function can be expressed in terms of the standard Cauchy distribution as:

$$f(x,\mu,\sigma) = \frac{1}{\sigma}\left(\mathrm{CAUPDF}\left(\frac{x-\mu}{\sigma}\right) + \mathrm{CAUPDF}\left(\frac{x+\mu}{\sigma}\right)\right) \qquad x \geq 0 \qquad \textbf{(EQ Aux-137)}$$

where CAUPDF is the probability density function of a standard Cauchy distribution and u and s are the location and scale parameters of the parent Cauchy distribution. These parameters are shape parameters for the folded Cauchy distribution. If u is zero, the folded Cauchy distribution reduces to a half-Cauchy distribution.

The formula for the cumulative distribution function of the folded Cauchy distribution can be expressed in terms of the cumulative distribution of the standard Cauchy distribution as follows:

$$F(x,\mu,\sigma) = \mathrm{CAUCDF}\left(\frac{x-\mu}{\sigma}\right) - \mathrm{CAUCDF}\left(\frac{-x-\mu}{\sigma}\right) \qquad x \geq 0 \qquad \textbf{(EQ Aux-138)}$$

where CAUCDF is the standard Cauchy cumulative distribution function.

SYNTAX

LET <y> = FCACDF(<x>,<u>,<s>) <SUBSET/EXCEPT/FOR qualification>

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

<u> is a number, parameter, or variable that defines the location parameter of the parent Cauchy distribution;

<s> is a number, parameter, or variable that defines the scale parameter of the parent Cauchy distribution;

<y> is a variable or a parameter (depending on what <x> is) where the computed folded Cauchy cdf value is stored;

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

EXAMPLES

LET A = FCACDF(3,2,0.7)
LET X2 = FCACDF(X1,U,SD)

NOTE

Folded distributions are typically used when measurements are taken without regard to sign and the underlying distribution is assumed to be Cauchy.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

FCAPDF	=	Compute the folded Cauchy probability density function.
FCAPPF	=	Compute the folded Cauchy percent point function.
CAUCDF	=	Compute the Cauchy cumulative distribution function.
CAUPDF	=	Compute the Cauchy probability density function.
CAUPPF	=	Compute the Cauchy percent point function.
FNRCDF	=	Compute the folded normal cumulative distribution function.
FNRPDF	=	Compute the folded normal probability density function.
FNRPPF	=	Compute the folded normal percent point function.
HFCCDF	=	Compute the half-Cauchy cumulative distribution function.
HFCPDF	=	Compute the half-Cauchy probability density function.
HFCPPF	=	Compute the half-Cauchy percent point function.

REFERENCE

"Continuous Univariate Distributions - Vol. 1," 2nd Ed., Johnson, Kotz, and Balakrishnan, Wiley and Sons, 1994 (page 328).

APPLICATIONS

Data Analysis

IMPLEMENTATION DATE

96/1

PROGRAM

```
MULTIPLOT 2 2; MULTIPLOT CORNER COORDINATES 0 0 100 100
TITLE AUTOMATIC
LET U = 0.5
LET SD = 6
X1LABEL U = ^U, SD= ^SD
PLOT FCACDF(X,U,SD) FOR X = 0 0.1 20
LET U = 6
LET SD = 0.5
X1LABEL U = ^U, SD= ^SD
PLOT FCACDF(X,U,SD) FOR X = 0 0.01 8.0
LET U = 2
LET SD = 10
X1LABEL U = ^U, SD= ^SD
PLOT FCACDF(X,U,SD) FOR X = 0 0.1 50
LET U = 3
LET SD = 2
X1LABEL U = ^U, SD= ^SD
PLOT FCACDF(X,U,SD) FOR X = 0 0.01 10
END OF MULTIPLOT
```