

WCACDF**PURPOSE**

Compute the standard wrapped-up Cauchy cumulative distribution function.

DESCRIPTION

The standard wrapped-up Cauchy distribution has the following probability density function:

$$f(x, p) = \frac{1 - p^2}{2\pi(1 + p^2 - 2p \cos(x))} \quad 0 \leq x < 2\pi \quad (\text{EQ Aux-326})$$

where p is a shape parameter.

The cumulative distribution function has the formula:

$$F(x, p) = \frac{\arctan\left(\frac{-\sin\left(\frac{x}{2}\right) - p \sin\left(\frac{x}{2}\right)}{-\cos\left(\frac{x}{2}\right) + p \cos\left(\frac{x}{2}\right)}\right) - \arctan\left(\frac{\sin\left(\frac{x}{2}\right) + p \sin\left(\frac{x}{2}\right)}{-\cos\left(\frac{x}{2}\right) + p \cos\left(\frac{x}{2}\right)}\right)}{2\pi} \quad 0 \leq x < \pi \quad (\text{EQ Aux-327})$$

For $\pi < x < 2\pi$, the cdf is $1 - \text{WCACDF}(2\pi - x)$ where WCACDF is given by the formula above.

This distribution can be used as an alternative to the Von Mises distribution for symmetric, circular data.

SYNTAX

LET <y> = WCACDF(<x>, <p>)

<SUBSET/EXCEPT/FOR qualification>

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

<p> is a number, parameter, or variable in the range (0,1) that specifies the shape parameter;

<y> is a variable or a parameter (depending on what <x> is) where the computed wrapped-up Cauchy cdf value is saved; and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET A = WCACDF(3,0.5)

LET X2 = WCACDF(X1,P)

NOTE

The general form of the wrapped-up Cauchy probability density function is:

$$f(x, p, \mu) = \frac{1 - p^2}{2\pi(1 + p^2 - 2p \cos(x - \mu))} \quad 0 \leq x < 2\pi \quad (\text{EQ Aux-328})$$

where μ is a location parameter.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

WCAPDF	=	Compute the wrapped-up Cauchy probability density function.
WCAPPF	=	Compute the wrapped-up 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.
VONCDF	=	Compute the normal cumulative distribution function.
VONPDF	=	Compute the normal probability density function.
VONPPF	=	Compute the normal percent point function.

REFERENCE

"Continuous Univariate Distributions - Vol. 1," 2nd. Ed., Johnson, Kotz, and Balakrishnan, John Wiley and Sons, 1994 (pp. 327-329).

APPLICATIONS

Circular Distributions

IMPLEMENTATION DATE

95/10

PROGRAM

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X1LABEL X
Y1LABEL PROBABILITY
LET TWOPI = 2*PI
.
MULTIPLY 2 2; MULTIPLY CORNER COORDINATES 0 0 100 100
LET P = 0.1
TITLE WRAPPED CAUCHY DISTRIBUTION - P = ^P
PLOT WCACDF(X,P) FOR X = 0 0.01 TWOPI
LET P = 0.5
TITLE WRAPPED CAUCHY DISTRIBUTION - P = ^P
PLOT WCACDF(X,P) FOR X = 0 0.01 TWOPI
LET P = 0.9
TITLE WRAPPED CAUCHY DISTRIBUTION - P = ^P
PLOT WCACDF(X,P) FOR X = 0 0.01 TWOPI
LET P = 0.0
TITLE WRAPPED CAUCHY DISTRIBUTION - P = ^P
YLIMITS 0 0.5
PLOT WCACDF(X,P) FOR X = 0 0.01 TWOPI
END OF MULTIPLY

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