CAUCDF

PURPOSE

Compute the standard Cauchy (i.e, median=0, 75% point at 1) cumulative distribution function.

DESCRIPTION

The standard form of the Cauchy distribution has the following probability density function:

$$f(x) = \frac{1}{\pi(1 + x^2)} \qquad \textbf{(EQ 8-125)}$$

The Cauchy cumulative distribution has the formula:

$$F(x) = 0.5 + \frac{\arctan(x)}{\pi} \qquad \textbf{(EQ 8-126)}$$

The input value can be any real number. The Cauchy distribution does not have a finite mean or standard deviation. Like the normal distribution, it is symmetric about its median, but with longer and flatter tails.

SYNTAX

LET <y2> = CAUCDF(<y1>) <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 Cauchy cdf value is stored;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET A = CAUCDF(3)
LET X2 = CAUCDF(X1)

NOTE

The general form of the Cauchy probability density function is:

$$f(x) = \left(\frac{1}{s}\right)\frac{1}{\pi\left(1 + \left(\frac{x - t}{s}\right)^2\right)} \qquad \textbf{(EQ 8-127)}$$

The general form of the Cauchy cumulative distribution function is:

$$F(x) = 0.5 + \frac{\arctan\left(\frac{x - t}{s}\right)}{\pi} \qquad \textbf{(EQ 8-128)}$$

where t and s are the location and scale parameters respectively. See topic (3) under the General considerations section at the beginning of this chapter for a discussion of generating cdf values for the general form of the distribution.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

CAUPDF	=	Compute the Cauchy probability density function.
CAUPPF	=	Compute the Cauchy percent point function.
NORCDF	=	Compute the normal cumulative distribution function.
NORPDF	=	Compute the normal probability density function.
NORPPF	=	Compute the normal percent point function.
TCDF	=	Compute the T cumulative distribution function.
TPDF	=	Compute the T probability density function.

TPPF = Compute the T percent point function.

REFERENCE

"Continuous Univariate Distributions - 1," Johnson and Kotz, Houghton Mifflin, 1970 (chapter 16).

"Handbook of Mathematical Functions, Applied Mathematics Series, Vol. 55," Abramowitz and Stegum, National Bureau of Standards, 1964 (page 930).

APPLICATIONS

Data Analysis

IMPLEMENTATION DATE

94/4

PROGRAM

```
YLIMITS 0 1
MAJOR YTIC NUMBER 6
MINOR YTIC NUMBER 1
YTIC DECIMAL 1
XLIMITS -5 5
XTIC OFFSET 0.6 0.6
TITLE AUTOMATIC
X1LABEL X
Y1LABEL PROBABILITY
PLOT CAUCDF(X) FOR X = -5.5 0.01 5.5
```