DWECDF

PURPOSE

Compute the standard form of the double Weibull cumulative distribution function with tail length parameter γ.

DESCRIPTION

The standard form of the double Weibull probability density function is:

$$f(x, \gamma) = \left(\frac{\gamma}{2}\right)|x|^{\gamma-1}e^{-|x|^{\gamma}} \qquad \textbf{(EQ Aux-100)}$$

for any real x where γ is the positive tail length parameter. The cumulative distribution function can be expressed in terms of the Weibull cumulative distribution function (with MINMAX set to 1) as follows:

$$F(x, \gamma) = 0.5 + \frac{\text{WEICDF}(x, \gamma)}{2} \qquad x \geq 0 \qquad \textbf{(EQ Aux-101)}$$

$$F(x, \gamma) = 0.5 - \frac{\text{WEICDF}(x, \gamma)}{2} \qquad x < 0 \qquad \textbf{(EQ Aux-102)}$$

where WEICDF is the Weibull cumulative distribution function. This is simply the Weibull distribution reflected about x = 0 when x is negative. For the Weibull distribution, DATAPLOT makes a distinction between the Weibull distribution based on the minimum order statistic and the Weibull distribution based on the maximim order statistic. However, the double Weibull distribution has the same formula in either case.

SYNTAX

LET <y> = DWECDF(<x>,GAMMA) <SUBSET/EXCEPT/FOR qualification>

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

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

<GAMMA> is a positive number or parameter that specifies the tail length parameter;

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

EXAMPLES

LET A = DWECDF(3,2)

LET A = DWECDF(A1,4)

NOTE

The general form of the double Weibull probability density function is:

$$f(x, \gamma, \mu, \alpha) = \left(\frac{\gamma}{2\alpha}\right)\left|\frac{x-\mu}{\alpha}\right|^{\gamma-1}e^{-\left|\frac{x-\mu}{\alpha}\right|^{\gamma}} \qquad \textbf{(EQ Aux-103)}$$

for any real x where μ is a location parameter and α is a positive scale parameter.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

DWEPDF	=	Compute the double Weibull probability density function.
DWEPPF	=	Compute the double Weibull percent point function.
WEICDF	=	Compute the Weibull cumulative distribution function.
WEIPDF	=	Compute the Weibull probability density function.
WEIPPF	=	Compute the Weibull percent point function.
DEXCDF	=	Compute the double exponential cumulative distribution function.
DEXPDF	=	Compute the double exponential probability density function.
DEXPPF	=	Compute the double exponential percent point function.

REFERENCE

"Continuous Univariate Distributions - Vol. 1," 2nd. ed., Johnson, Kotz, and Balakrishnan, 1994 (page 688).

APPLICATIONS

Reliability Analysis

IMPLEMENTATION DATE

95/9

PROGRAM

```
TITLE DWECDF FOR X = -3 0.01 3
X1LABEL X
Y1LABEL PROBABILITY
LET G = DATA 1 2 5 0.5
LEGEND 1 COORDINATES 75 87
MULTIPLOT 2 2; MULTIPLOT CORNER COORDINATES 0 0 100 100
LOOP FOR K = 1 1 4
    LET GAMMA = G(K)
    LEGEND 1 GAMMA = ^GAMMA
    PLOT DWECDF(X,GAMMA) FOR X = -3.0 0.01 3
END OF LOOP
END OF MULTIPLOT
```