GEPCDF

PURPOSE

Compute the standard form for the generalized Pareto cumulative distribution function with shape parameter γ.

DESCRIPTION

The standard form of the generalized Pareto cumulative distribution function for the maximum order statistic is:

$$F(x) = 1 - (1 + \gamma x)^{\left(\frac{-1}{\gamma}\right)} \qquad \text{for } x \geq 0, \quad \gamma \neq 0 \qquad \textbf{(EQ 8-227)}$$

where γ is a shape parameter that can be any real number. If γ is negative, the x value is additionally restricted to be less than $-1/\gamma$. If γ is 0, the generalized Pareto distribution reduces to an exponential distribution. See the documentation for the EXPCDF command in this chapter for the cdf of the exponential distribution.

SYNTAX

LET <y2> = GEPCDF(<y1>,<gamma>) <SUBSET/EXCEPT/FOR qualification>
where <y1> is a variable, number, or parameter;
<y2> is a variable or a parameter (depending on what <y1> is) where the computed generalized Pareto cdf value is stored;
<gamma> is a number or parameter that specifies the shape parameter;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

LET A = GEPCDF(3,2)
LET Y = GEPCDF(X1,8)

NOTE 1

The SET MINMAX command is used to specify whether the minimum order statistic or the maximum order statistic form is used. Specifically, SET MINMAX 1 specifies the minimum order statistic while SET MINMAX 2 specifies the maximum order statistic. Currently, only the maximum order statistic form is supported.

NOTE 2

The Johnson and Kotz (see the REFERENCE section below) book gives 2 definitions for this distribution. DATAPLOT uses the Pickand's form, which is the form commonly used for extreme value applications.

NOTE 3

The general form of the generalized Pareto cumulative distribution functions is:

$$F(x) = 1 - \left(1 + \frac{\gamma x}{\beta}\right)^{\left(\frac{-1}{\gamma}\right)} \qquad \text{for } 1+\gamma\frac{x}{\beta} \geq 0, \quad \gamma \neq 0 \qquad \textbf{(EQ 8-228)}$$

The parameter β is a scale parameter. 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

GEPPDF	=	Compute the generalized Pareto probability density function.
GEPPPF	=	Compute the generalized Pareto percent point function.
GEPPDF	=	Compute the generalized Pareto probability density function.
PARCDF	=	Compute the Pareto cumulative distribution function.
EV2CDF	=	Compute the extreme value type II cumulative distribution function.
WEICDF	=	Compute the Weibull cumulative probability density function.

REFERENCE

"Continuous Univariate Distributions - 1," 2nd ed., Johnson and Kotz, 1994 (chapter 19).

"Computing Maximum Likelihood Estimates for the Generalized Pareto Distribution," Grimshaw, Technometrics, May, 1993.

APPLICATIONS

Extreme Value Analysis

IMPLEMENTATION DATE

94/2 (updated 95/1 to check for legal x values)

PROGRAM

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SEGMENT 1 COORDINATES 69 38 74 38; SEGMENT 1 PATTERN SOLID
SEGMENT 2 COORDINATES 69 34 74 34; SEGMENT 2 PATTERN DASH
SEGMENT 3 COORDINATES 69 30 74 30; SEGMENT 3 PATTERN DOT
SEGMENT 4 COORDINATES 69 26 74 26; SEGMENT 4 PATTERN DA2
LEGEND 1 GAMMA = 0.5; LEGEND 1 COORDINATES 75 37
LEGEND 2 GAMMA = 2; LEGEND 2 COORDINATES 75 33
LEGEND 3 GAMMA = -0.5; LEGEND 3 COORDINATES 75 29
LEGEND 4 GAMMA = -2; LEGEND 4 COORDINATES 75 25
XLIMITS 0 5; YLIMITS 0 1
MAJOR YTIC NUMBER 6; MINOR YTIC NUMBER 1
YTIC DECIMAL 1
TITLE GEPCDF FOR VARIOUS VALUES OF GAMMA
LINES SOLID DASH DOT DASH2
X1LABEL X; Y1LABEL PROBABILITY
SET MINMAX 2
PLOT GEPCDF(X,0.5) FOR X = 0 0.01 5 AND
PLOT GEPCDF(X,2) FOR X = 0 0.01 5 AND
LET G = -0.5; PLOT GEPCDF(X,G) FOR X = 0 0.01 1.99 AND
LET G = -2; PLOT GEPCDF(X,G) FOR X = 0 0.01 0.49
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