GEPPDF

PURPOSE

Compute the standard form for the generalized Pareto probability density function with shape parameter γ.

DESCRIPTION

The standard form of the generalized Pareto probability density function for the maximum order statistic is:

$$f(x) = (1+\gamma x)^{\left(-\left(\frac{1}{\gamma}\right)-1\right)} \qquad \text{for } x \geq 0, \quad \gamma \neq 0 \qquad \textbf{(EQ 8-229)}$$

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 $\gamma = 0$, the generalized Pareto distribution reduces to an exponential distribution. See the documentation for the EXPPDF command in this chapter for the pdf of this distribution.

SYNTAX

LET <y2> = GEPPDF(<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 pdf value is stored;

<gamma> is a positive number or parameter that specifies the shape parameter;

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

EXAMPLES

LET A = GEPPDF(3,2)

LET Y = GEPPDF(X1,4)

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 probability density functions is:

$$f(x) = \left(1+\frac{\gamma x}{\beta}\right)^{\left(-\left(\frac{\beta}{\gamma}\right)-1\right)} \qquad \text{for } 1+\gamma\frac{x}{\beta}, \quad \gamma \neq 0 \qquad \textbf{(EQ 8-230)}$$

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 pdf values for the general form of the distribution.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

GEPCDF	=	Compute the generalized Pareto cumulative distribution function.
GEPPPF	=	Compute the generalized Pareto percent point function.
PARCDF	=	Compute the Pareto cumulative distribution function.
PARPDF	=	Compute the Pareto probability density function.
PARPPF	=	Compute the Pareto percent point function.
EV1CDF	=	Compute the extreme value type I cumulative distribution function.
EV1PDF	=	Compute the extreme value type I probability density function.

EV1PPF	=	Compute the extreme value type I percent point function.
EV2PDF	=	Compute the extreme value type II 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 88 74 88; SEGMENT 1 PATTERN SOLID
SEGMENT 2 COORDINATES 69 84 74 84; SEGMENT 2 PATTERN DASH
SEGMENT 3 COORDINATES 69 80 74 80; SEGMENT 3 PATTERN DOT
SEGMENT 4 COORDINATES 69 76 74 76; SEGMENT 4 PATTERN DA2
LEGEND 1 GAMMA = 0.5; LEGEND 1 COORDINATES 75 87
LEGEND 2 GAMMA = 2; LEGEND 2 COORDINATES 75 83
LEGEND 3 GAMMA = -0.5; LEGEND 3 COORDINATES 75 79
LEGEND 4 GAMMA = -2; LEGEND 4 COORDINATES 75 75
TITLE GEPPDF FOR VARIOUS VALUES OF GAMMA; LINES SOLID DASH DOT DASH2
X1LABEL X; Y1LABEL PROBABILITY
YLIMITS 0 2
SET MINMAX 2
PLOT GEPPDF(X,0.5) FOR X = 0 0.01 4 AND
PLOT GEPPDF(X,2) FOR X = 0 0.01 4 AND
LET G = -2; PLOT GEPPDF(X,G) FOR X = 0 0.01 0.49 AND
LET G = -0.5; PLOT GEPPDF(X,G) FOR X = 0 0.01 1.99
```