PLNPPF

PURPOSE

Compute the power-lognormal percent point function.

DESCRIPTION

The standard lognormal distribution has the following probability density function:

$$f(x, \sigma, p) = \left(\frac{p}{x\sigma}\right)\phi\left(\frac{\ln(x)}{\sigma}\right)\left(\Phi\left(\frac{-\ln(x)}{\sigma}\right)\right)^{p-1} \qquad x > 0, \sigma > 0, p > 0 \qquad \textbf{(EQ Aux-266)}$$

where σ is the shape parameter, p is the power parameter, and Φ and ϕ are the cumulative distribution function and the probability density function for the standard normal distribution respectively.

The percent point function is the inverse of the cumulative distribution function. The cumulative distribution sums the probability from 0 to the given x value (i.e., the integral of the above function). The percent point function takes a cumulative probability value and computes the corresponding x value. The formula for the power-lognormal percent point function is:

$$G(x, \sigma, p) = e^{Z_f \sigma} \qquad x > 0, \sigma > 0, p > 0 \qquad \textbf{(EQ Aux-267)}$$

where $Z_f = \text{NORPPF}(1-(1-x)^{1/p})$ NORPPF is the percent point function of the standard normal distribution. The input value is a real number between 0 and 1 (since it corresponds to a probability).

If p is 1, this distribution reduces to the lognormal distribution.

SYNTAX

LET <y2> = PLNPPF(<y1>,<p>,<s>) <SUBSET/EXCEPT/FOR qualification>

where <y1> is a number, parameter, or variable in the range 0 to 1;

<p> is a positive number, parameter, or variable that specifies the power parameter;

<s> is an optional positive number, parameter, or variable that specifies the shape parameter;

<y2> is a variable or a parameter (depending on what <y1> is) where the computed lognormal ppf value is stored;

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

If the <s> parameter is omitted, it defaults to 1.

EXAMPLES

LET A = PLNPPF(0.9,2,1)
LET X2 = PLNPPF(X1,P,SD)
LET X2 = PLNPPF(X1,0.5,2)

NOTE

The general power-lognormal distribution has the following probability density function:

$$f(x, \mu, \sigma, p) = \left(\frac{p}{x\sigma}\right)\phi\left(\frac{\ln(x) - \mu}{\sigma}\right)\left(\Phi\left(\frac{-\ln(x) - \mu}{\sigma}\right)\right)^{p-1} \qquad x > 0, \sigma > 0, p > 0 \qquad \textbf{(EQ Aux-268)}$$

where μ is the location parameter, σ is the shape parameter and p is the power parameter. The formula for the percent point function is:

$$G(x, \mu, \sigma, p) = e^{\mu + Z_f \sigma} \qquad x > 0, \sigma > 0, p > 0 \qquad \textbf{(EQ Aux-269)}$$

where Z_f is defined as above and μ is a location parameter.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

PLNCDF	=	Compute the power-lognormal cumulative distribution function.
PLNPDF	=	Compute the power-lognormal probability density function.

PNRCDF	=	Compute the power-normal cumulative density function.
PNRPDF	=	Compute the power-normal probability density function.
PNRPPF	=	Compute the power-normal percent point function.
LGNCDF	=	Compute the lognormal cumulative distribution function.
LGNPDF	=	Compute the lognormal probability density function.
LGNPPF	=	Compute the lognormal percent point function.

REFERENCE

"A Computer Program POWNOR for Fitting the Power-Normal and -Lognormal Models to Life or Strength Data from Specimens of Various Sizes," Nelson and Doganaksoy, NIST-IR 4760, March 1992.

APPLICATIONS

Reliability

IMPLEMENTATION DATE

95/5

PROGRAM

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TITLE SIZE 2
X1LABEL PPF's
TITLE SD=1, P=10000, 3000, 1000, 300, 100, 50, 20, 5, 1
PLOT PLNPPF(P,10000,1) FOR P = .01 .01 .99 AND
PLOT PLNPPF(P,3000,1) FOR P = .01 .01 .99 AND
PLOT PLNPPF(P,1000,1) FOR P = .01 .01 .99 AND
PLOT PLNPPF(P,300,1) FOR P = .01 .01 .99 AND
PLOT PLNPPF(P,100,1) FOR P = .01 .01 .99 AND
PLOT PLNPPF(P,50,1) FOR P = .01 .01 .99 AND
PLOT PLNPPF(P,20,1) FOR P = .01 .01 .99 AND
PLOT PLNPPF(P,5,1) FOR P = .01 .01 .99 AND
PLOT PLNPPF(P,1,1) FOR P = .01 .01 .9
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