

FNRPDF**PURPOSE**

Compute the folded normal probability density function.

DESCRIPTION

If X is normally distributed, then ABS(X) has a folded normal distribution whose probability density function can be expressed in terms of the standard normal distribution as:

$$f(x, \mu, \sigma) = \left(\frac{1}{\sigma}\right) \left(\phi\left(\frac{x-\mu}{\sigma}\right) + \phi\left(\frac{x+\mu}{\sigma}\right) \right) \quad x \geq 0 \quad \text{(EQ Aux-143)}$$

where ϕ is the probability density function of a standard normal distribution and μ and σ are the mean and standard deviation of the parent normal distribution. The μ and σ parameters are location and scale parameters for the parent normal distribution. However, they are shape parameters for the foleded normal distribution. If u is zero, the folded normal distribution reduces to a half-normal distribution. The folded normal distribution also corresponds to a non-central chi distribution with 1 degree of freedom. This is discussed in Johnson and Kotz (see the Reference section below).

SYNTAX

LET <y> = FNRPDF(<x>,<u>,<s>) <SUBSET/EXCEPT/FOR qualification>

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

<u> is a number, parameter, or variable that defines the mean of the parent normal distribution;

<s> is a number, parameter, or variable that defines the standard deviation of the parent normal distribution;

<y> is a variable or a parameter (depending on what <x> is) where the computed folded normal pdf value is stored;

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

EXAMPLES

LET A = FNRPDF(3,2,0.7)

LET X2 = FNRPDF(X1,U,SD)

NOTE

Folded distributions are typically used when measurements are taken without regard to sign and the underlying distribution is assumed to be normal.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

FNRCDF	=	Compute the folded normal cumulative distribution function.
FNRPPF	=	Compute the folded normal percent point function.
HFNCDF	=	Compute the half-normal cumulative distribution function.
HFNPDF	=	Compute the half-normal probability density function.
HFNPPF	=	Compute the half-normal percent point function.
NORCDF	=	Compute the normal cumulative distribution function.
NORPDF	=	Compute the normal probability density function.
NORPPF	=	Compute the 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

"The Folded Normal Distribution," Leone, Nelson, Nottingham, Technometrics, 3, 1961 (pp. 543-550).

"Continuous Univariate Distributions - 1," 2nd Ed., Johnson, Kotz, and Balakrishnan, Wiley and Sons, 1994 (page 170).

APPLICATIONS

Data Analysis

IMPLEMENTATION DATE

95/9

PROGRAM

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MULTIPLY 2 2; MULTIPLY CORNER COORDINATES 0 0 100 100
TITLE AUTOMATIC
LET U = 0.5
LET SD = 6
X1LABEL U = ^U, SD= ^SD
PLOT FNRPDF(X,U,SD) FOR X = 0 0.1 20
LET U = 6
LET SD = 0.5
X1LABEL U = ^U, SD= ^SD
PLOT FNRPDF(X,U,SD) FOR X = 0 0.01 8.0
LET U = 2
LET SD = 10
X1LABEL U = ^U, SD= ^SD
PLOT FNRPDF(X,U,SD) FOR X = 0 0.1 50
LET U = 3
LET SD = 2
X1LABEL U = ^U, SD= ^SD
PLOT FNRPDF(X,U,SD) FOR X = 0 0.01 10
END OF MULTIPLY

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