BBNCDF

PURPOSE

Compute the beta-binomial cumulative distribution function with shape parameters α, β, and N.

DESCRIPTION

The beta-binomial distribution has the following cumulative distribution function:

$$p(x, \alpha, \beta, n) = \sum_{i=0}^{x} \frac{B(n - i + \alpha, i + \beta)}{(n + 1)\, B(n - i + 1, i + 1)\, B(\alpha, \beta)} \qquad x = 0, 1, 2, \ldots, n, \alpha, \beta > 0 \qquad \textbf{(EQ Aux-24)}$$

where B is the complete beta function, n is non-negative integer, and α and β are shape parameters. See the documentation for the BETA command for a description of the complete beta function.

SYNTAX

LET <y> = BBNCDF(<x>,<a>,<b>,<n>) <SUBSET/EXCEPT/FOR qualification>

where <x> is a number, parameter, or variable containing non-negative integer values (real values are rounded to the closest value);

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

<a> is a number, parameter, or variable that specifies the first shape parameter;

<b> is a number, parameter, or variable that specifies the second shape parameter;

<n> is a number, parameter, or variable that specifies the third shape parameter;

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

EXAMPLES

LET A = BBNCDF(10,0.5,0.9,22)
LET A = BBNCDF(X,2.1,4,N)
LET X2 = BBNCDF(X1,ALPHA,BETA,N)

NOTE

The beta-binomial distribution is derived from a binomial distribution B:n,p where the p parameter is a beta distributed variable with parameters a and b.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

BBNPDF	=	Compute the beta-binomial probability density function.
BBNPPF	=	Compute the beta-binomial percent point function.
BETCDF	=	Compute the beta cumulative distribution function.
BETPDF	=	Compute the beta probability density function.
BETPPF	=	Compute the beta percent point function.
BINCDF	=	Compute the binomial cumulative distribution function.
BINPDF	=	Compute the binomial probability density function.
BINPPF	=	Compute the binomial percent point function.

REFERENCE

"Empirical Bayes Estimation Of Generator Reliability," Martz, Kvam, and Abramson, Technometrics, February, 1996 (page 23).

"Statistical Distributions," 2nd Edition, Evans, Hastings, and Peacock, 1994 (chapter 5).

APPLICATIONS

Reliability, Bayeseian Analysis

IMPLEMENTATION DATE

96/2

PROGRAM

```
XLIMITS 0 50
XTIC OFFSET 0.5 0.5
LINE BLANK
SPIKE ON
SPIKE THICKNESS 0.3
TITLE AUTOMATIC
X1LABEL NUMBER OF SUCCESSES
Y1LABEL PROBABILITY
.
MULTIPLOT 2 2; MULTIPLOT CORNER COORDINATES 0 0 100 100
PLOT BBNCDF(X,0.5,0.5,50) FOR X = 0 1 50
PLOT BBNCDF(X,3.0,0.5,50) FOR X = 0 1 50
PLOT BBNCDF(X,0.5,3.0,50) FOR X = 0 1 50
PLOT BBNCDF(X,3.0,3.0,50) FOR X = 0 1 50
END OF MULTIPLOT
```