NBPDF

PURPOSE

Compute the negative binomial probability density function.

DESCRIPTION

The negative binomial distribution is used when there are exactly two mutually exclusive outcomes of a trial. These outcomes are often called success and failure. The negative binomial probability distribution is the probability of obtaining the kth success on the xth trial (the binomial distribution is the probability of x successes in n trials). It has the following probability density function:

$$\text{nbpdf}(x, p, k) = \binom{x-1}{k-1} p^k (1-p)^{(x-k)} \qquad \textbf{(EQ 8-273)}$$

where p is the probability of a success on a single trial. The combinatorial function of x-1 things taken k-1 at a time has the formula:

$$\binom{x-1}{k-1} = \frac{(x-1)!}{(k-1)!((x-1)-(k-1))!} \qquad \textbf{(EQ 8-274)}$$

The negative binomial distribution has a mean of x*(1-p)/p and a standard deviation of sqrt(x*(1-p)/p^2).

SYNTAX

LET <y2> = NBPDF(<y1>,<p>,<k>) <SUBSET/EXCEPT/FOR qualification>

where <y1> is a non-negative integer variable, number, or parameter specifying the number of trials;

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

<p> is a number or parameter between 0 and 1 that is the probability of success on a single trial;

<k> is the number of successes;

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

EXAMPLES

LET A = NBPDF(10,0.5,3)

LET Y = NBPDF(X1,0.3,25))

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

NBCDF	=	Compute the negative binomial cumulative distribution function.
NBPPF	=	Compute the negative binomial percent point function.
BINCDF	=	Compute the binomial cumulative distribution function.
BINPDF	=	Compute the binomial probability density function.
BINPPF	=	Compute the binomial percent point function.
POIPDF	=	Compute the Poisson probability density function.
POICDF	=	Compute the Poisson cumulative distribution function.
POIPPF	=	Compute the Poisson percent point function.
GEOCDF	=	Compute the geometric cumulative distribution function.
GEOPDF	=	Compute the geometric probability density function.
GEOPPF	=	Compute the geometric percent point function.

REFERENCE

"Discrete Univariate Distributions," Johnson and Kotz, Houghton Mifflin, 1970 (chapter 5).

"Statistical Distributions," 2nd ed., Evans, Hastings, and Peacock, Wiley and Sons, 1993 (chapter 28).

APPLICATIONS

Data Analysis

IMPLEMENTATION DATE

94/4

PROGRAM

```
XLIMITS 0 50
XTIC OFFSET 0.5 0.5
LINE BLANK
SPIKE ON
SPIKE THICKNESS 0.3
TITLE AUTOMATIC
X1LABEL NUMBER OF TRIALS TILL FIRST SUCCESS
Y1LABEL PROBABILITY
PLOT NBPDF(X,0.2,5) FOR X = 0 1 50
```