BVNPDF

PURPOSE

Compute the bivariate normal probability density function with zero means, standard deviations of one, and a correlation of p.

DESCRIPTION

The probability density function for the standard bivariate normal distribution has the formula:

$$f(x, y, p) = \left(\frac{1}{2\pi\sqrt{1-\rho^2}}\right)\exp\left(-\frac{x^2 - 2\rho xy + y^2}{2(1-\rho^2)}\right) \quad \textbf{(EQ 8-123)}$$

This function can be calculated from the univariate normal density function, ϕ, with the formula:

$$f(x, y, p) = \left(\frac{1}{2\pi\sqrt{1-\rho^2}}\right)\phi(x)\phi\left(\frac{y - px}{\sqrt{1-p^2}}\right) \quad \textbf{(EQ 8-124)}$$

The first two input values can be any real number. The third input argument should be in the interval (-1,1). Correlation values exactly equal to 1 are undefined.

SYNTAX

LET <y> = BVNPDF(<x1>,<x2>,<p>) <SUBSET/EXCEPT/FOR qualification>
where <x1> is a number, parameter, or variable;
<x2> is a number, parameter, or variable;
<p> is a number, parameter, or variable in the interval (-1,1);
<y> is a variable or a parameter (depending on what <x1>, <x2>, and <p> are) where the computed pdf values are stored;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES

```
LET A = BVNPDF(-2,-2,0)
LET A = BVNPDF(-2,-2,.8)
LET Y = BVNPDF(H,K,CORR)
```

NOTE

For a non-standard bivariate normal distribution with means XBAR1 and XBAR2 and standard deviations SD1 and SD2, calculate the pdf as follows:

```
LET CONST = (1/(SD1*SD2))
LET PDF = CONST*BVNPDF((X1-XBAR1)/SD1,(X2-XBAR2)/SD2,P)
```

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

BVNCDF	=	Compute the bivariate normal cumulative distribution function.
NORCDF	=	Compute the normal cumulative distribution function.
NORPDF	=	Compute the normal probability density function.
NORPPF	=	Compute the normal percent point function.

REFERENCE

"Handbook of Mathematical Functions, Applied Mathematics Series Vol. 55," Abramowitz and Stegum, National Bureau of Standards, 1964.

APPLICATIONS

Data Analysis

IMPLEMENTATION DATE

95/9

PROGRAM

```
TITLE AUTOMATIC
TITLE SIZE 3
3D-PLOT BVNPDF(X1,X2,0) FOR X1 = -3. 0.2 3 FOR X2 = -3 0.2 3
```