

TRIANGULAR INVERSE

PURPOSE

Compute the inverse of a triangular matrix.

DESCRIPTION

The inverse is the matrix that when multiplied by the original matrix yields the identity matrix (i.e., $AA' = I$ where I has one's on the diagonal and zero's everywhere else).

An upper triangular matrix is one with all zeros below the diagonal. Likewise, a lower triangular matrix is one with all zeros above the diagonal. For example, the Cholesky decomposition factors a positive definite matrix (such as a variance-covariance) into an upper triangular matrix and its transpose. Finding the inverse of a triangular system allows some simplifications that provide a faster solution than the standard LU decomposition used by the `MATRIX INVERSE` command. The `TRIANGULAR INVERSE` command checks whether the matrix is upper or lower triangular by scanning the upper half of the matrix. If a non-zero element is found, the matrix is assumed to be upper triangular. Otherwise it is assumed to be lower triangular.

SYNTAX

`LET <mat2> = TRIANGULAR INVERSE <mat1> <SUBSET/EXCEPT/FOR qualification>`
 where `<mat1>` is a matrix for which the inverse is to be computed;
`<mat2>` is a matrix where the resulting inverse is saved;
 and where the `<SUBSET/EXCEPT/FOR qualification>` is optional and rarely used in this context.

EXAMPLES

`LET C = TRIANGULAR INVERSE A`

NOTE 1

`DATAPLOT` uses the LINPACK routine `STRDI` to find the inverse of the triangular system.

NOTE 2

Matrices for which the inverse to be computed must have the same number of rows and columns. An error message is printed if they do not.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

<code>MATRIX DETERMINANT</code>	=	Compute a matrix determinant.
<code>MATRIX EIGENVALUES</code>	=	Compute the matrix eigenvalues.
<code>MATRIX EIGENVECTORS</code>	=	Compute the matrix eigenvectors.
<code>MATRIX INVERSE</code>	=	Compute the inverse of a matrix.
<code>MATRIX SIMPLEX SOLUTION</code>	=	Compute a matrix simplex solution.
<code>MATRIX SOLUTION</code>	=	Solve a system of linear equations.
<code>TRIANGULAR SOLUTION</code>	=	Solve a triangular system of linear equations.
<code>TRIDIAGONAL SOLUTION</code>	=	Solve a tridiagonal system of linear equations.

REFERENCE

"LINPACK User's Guide," Dongarra, Bunch, Moler, and Stewart, Siam, 1979.

"Numerical Recipes: The Art of Scientific Programming (FORTRAN Version)," Press, Flannery, Teukolsky, and Vetterling, Cambridge University Press, 1989 (chapter 2).

APPLICATIONS

Linear Algebra

IMPLEMENTATION DATE

93/10

PROGRAM

```

READ MATRIX A
2.0 2.0 -4.0
0.0 -1.0 2.0
0.0 0.0 5.0
END OF DATA
LET AINV = TRIANGULAR INVERSE A
PRINT AINV
    
```

The following output is generated.

```

      MATRIX AINV  --      3 ROWS
      --          3 COLUMNS

VARIABLES--AINV1    AINV2    AINV3

0.5000000E+00 0.1000000E+01 0.0000000E+00
0.0000000E+00 -0.1000000E+01 0.4000000E+00
0.0000000E+00 0.0000000E+00 0.2000000E+00
    
```