cholinv() — Symmetric, positive-definite matrix inversion

Syntax

numeric matrix  cholinv(numeric matrix A)
numeric matrix  cholinv(numeric matrix A, real scalar tol)

void  _cholinv(numeric matrix A)
void  _cholinv(numeric matrix A, real scalar tol)

Description

cholinv(A) and cholinv(A, tol) return the inverse of real or complex, symmetric (Hermitian), positive-definite, square matrix A.

_cholinv(A) and _cholinv(A, tol) do the same thing except that, rather than returning the inverse matrix, they overwrite the original matrix A with the inverse.

In all cases, optional argument tol specifies the tolerance for determining singularity; see Remarks and examples below.

Remarks and examples

These routines calculate the inverse of a symmetric, positive-definite square matrix A. See [M-5] luinv() for the inverse of a general square matrix.


cholinv(A) is logically equivalent to cholsolve(A, I(rows(A))); see [M-5] cholsolve() for details and for use of the optional tol argument.

Conformability

cholinv(A, tol):

A:    n x n  
tol:  1 x 1  (optional)
result:  n x n

_cholinv(A, tol):

input:

A:    n x n  
tol:  1 x 1  (optional)

output:

A:    n x n

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Diagnostics

The inverse returned by these functions is real if \( A \) is real and is complex if \( A \) is complex. If you use these functions with a non–positive-definite matrix, or a matrix that is too close to singularity, returned will be a matrix of missing values. The determination of singularity is made relative to \( tol \). See Tolerance under Remarks and examples in \([M-5]\) cholsolve() for details.

cholinv(\( A \)) and _cholinv(\( A \)) return a result containing all missing values if \( A \) is not positive definite or if \( A \) contains missing values.

_cholinv(\( A \)) aborts with error if \( A \) is a view.

See \([M-5]\) cholsolve() and \([M-1]\) tolerance for information on the optional \( tol \) argument.

Both functions use the elements from the lower triangle of \( A \) without checking whether \( A \) is symmetric or, in the complex case, Hermitian.

Also see

\([M-5]\) invsym() — Symmetric real matrix inversion
\([M-5]\) luinv() — Square matrix inversion
\([M-5]\) qrinv() — Generalized inverse of matrix via QR decomposition
\([M-5]\) pinv() — Moore–Penrose pseudoinverse
\([M-5]\) cholsolve() — Solve \( AX=B \) for \( X \) using Cholesky decomposition
\([M-5]\) solve_tol() — Tolerance used by solvers and inverters
\([M-4]\) matrix — Matrix functions
\([M-4]\) solvers — Functions to solve \( AX=B \) and to obtain \( A \) inverse