cholinv( ) — Symmetric, positive-definite matrix inversion

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.

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)

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.

A is required to be square and positive definite. See [M-5] qrinv( ) and [M-5] pinv( ) for generalized inverses of nonsquare or rank-deficient matrices. See [M-5] invsym( ) for generalized inverses of real, symmetric matrices.

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):

\[
\begin{align*}
A &: \quad n \times n \\
\text{tol} &: \quad 1 \times 1 \quad \text{(optional)} \\
\text{result} &: \quad n \times n
\end{align*}
\]

_cholinv(A, tol):

\[
\begin{align*}
\text{input} &: \quad A &: \quad n \times n \\
\text{tol} &: \quad 1 \times 1 \quad \text{(optional)} \\
\text{output} &: \quad A &: \quad n \times n
\end{align*}
\]
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.

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

_\text{cholinv}(A) aborts with error if \( A \) is a view.


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