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.


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):

<table>
<thead>
<tr>
<th></th>
<th>A:</th>
<th>tol:</th>
<th>result:</th>
</tr>
</thead>
<tbody>
<tr>
<td>input</td>
<td>n × n</td>
<td>1 × 1 (optional)</td>
<td>n × n</td>
</tr>
</tbody>
</table>

_cholinv(A, tol):

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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.

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

\texttt{_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

\[M-5\] 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

\[M-4\] Matrix — Matrix functions

\[M-4\] Solvers — Functions to solve \( AX=B \) and to obtain \( A \) inverse