

luinv() — Square matrix inversion

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Description

`luinv(A)` and `luinv(A, tol)` return the inverse of real or complex, square matrix A .

`_luinv(A)` and `_luinv(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.

`_luinv_la(A, b)` is the interface to the [M-1] **LAPACK** routines that do the work. The output b is a real scalar, which is 1 if the LAPACK routine used a blocked algorithm and 0 otherwise.

Syntax

numeric matrix `luinv(numeric matrix A)`

numeric matrix `luinv(numeric matrix A, real scalar tol)`

void `_luinv(numeric matrix A)`

void `_luinv(numeric matrix A, real scalar tol)`

real scalar `_luinv_la(numeric matrix A, b)`

Remarks and examples

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These routines calculate the inverse of A . The inverse matrix A^{-1} of A satisfies the conditions

$$AA^{-1} = I$$

$$A^{-1}A = I$$

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

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

Conformability

```

luinv(A, tol):
    A:      n × n
    tol:    1 × 1 (optional)
    result: n × n
_luinv(A, tol):
    input:
        A:      n × n
        tol:    1 × 1 (optional)
    output:
        A:      n × n
_luinv_la(A, b):
    input:
        A:      n × n
    output:
        A:      n × n
        b:      1 × 1
    result:    1 × 1

```

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 singular matrix, 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] **lusolve()** for details.

`luinv(A)` and `_luinv(A)` return a matrix containing missing if A contains missing values.

`_luinv(A)` aborts with error if A is a view.

`_luinv_la(A, b)` should not be used directly; use `_luinv()`.

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

Also see

[M-5] **invsym()** — Symmetric real matrix inversion

[M-5] **cholinv()** — Symmetric, positive-definite matrix inversion

[M-5] **qrinv()** — Generalized inverse of matrix via QR decomposition

[M-5] **pinv()** — Moore–Penrose pseudoinverse

[M-5] **lusolve()** — Solve $AX=B$ for X using LU decomposition

[M-5] **lud()** — LU decomposition

[M-4] **matrix** — Matrix functions

[M-4] **solvers** — Functions to solve $AX=B$ and to obtain A inverse