**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**

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

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

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


`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

\[
\text{luinv}(A, \text{tol}):
\]
\[
A: \quad n \times n
\]
\[
\text{tol}: \quad 1 \times 1 \quad \text{(optional)}
\]
\[
\text{result}: \quad n \times n
\]

\[
\_\text{luinv}(A, \text{tol}):
\]
\[
\text{input}:
\]
\[
A: \quad n \times n
\]
\[
\text{tol}: \quad 1 \times 1 \quad \text{(optional)}
\]
\[
\text{output}:
\]
\[
A: \quad n \times n
\]

\[
\_\text{luinv\_la}(A, b):
\]
\[
\text{input}:
\]
\[
A: \quad n \times n
\]
\[
\text{output}:
\]
\[
A: \quad n \times n
\]
\[
b: \quad 1 \times 1
\]
\[
\text{result}: \quad 1 \times 1
\]

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 \(\text{tol}\). See *Tolerance* under Remarks and examples in [M-5] lusolve() for details.

\text{luinv}(A) and \_\text{luinv}(A) return a matrix containing missing if \(A\) contains missing values.

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

\_\text{luinv\_la}(A, b) should not be used directly; use \_\text{luinv}().

See [M-5] lusolve() and [M-1] Tolerance for information on the optional \(\text{tol}\) argument.

Also see

[M-5] cholinv() — Symmetric, positive-definite matrix inversion
[M-5] invsym() — Symmetric real matrix inversion
[M-5] lud() — LU decomposition
[M-5] lusolve() — Solve \(AX=B\) for \(X\) using LU decomposition
[M-5] pinv() — Moore–Penrose pseudoinverse
[M-5] qrinv() — Generalized inverse of matrix via QR decomposition
[M-4] Solvers — Functions to solve \(AX=B\) and to obtain \(A\) inverse