

**Solvers** — Functions to solve  $AX=B$  and to obtain  $A$  inverse

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<b>Solvers</b>		
<a href="#">cholsolve()</a>	cholsolve() cholsolve_lapacke()	<i>A</i> positive definite; symmetric or Hermitian <i>A</i> positive definite using LAPACK routines; symmetric or Hermitian
<a href="#">lusolve()</a>	lusolve()	<i>A</i> full rank, square, real or complex
<a href="#">qrsolve()</a>	qrsolve()	<i>A</i> general; $m \times n$ , $m \geq n$ , real or complex; least-squares generalized solution
<a href="#">svsolve()</a>	svsolve()	generalized; $m \times n$ , real or complex; minimum norm, least-squares solution
<b>Inverters</b>		
<a href="#">invsym()</a>	invsym()	generalized; real symmetric
<a href="#">cholinv()</a>	cholinv() cholinv_lapacke()	positive definite; symmetric or Hermitian positive definite using LAPACK routines; symmetric or Hermitian
<a href="#">luinv()</a>	luinv()	full rank; square; real or complex
<a href="#">qrinv()</a>	qrinv()	generalized; $m \times n$ , $m \geq n$ ; real or complex
<a href="#">pinv()</a>	pinv()	generalized; $m \times n$ , real or complex Moore–Penrose pseudoinverse

## Description

The above functions solve  $AX = B$  for  $X$  and solve for  $A^{-1}$ .

## Remarks and examples

Matrix solvers can be used to implement matrix inverters, and so the two nearly always come as a pair.

Solvers solve  $AX = B$  for  $X$ . One way to obtain  $A^{-1}$  is to solve  $AX = I$ . If  $f(A, B)$  solves  $AX=B$ , then  $f(A, I(\text{rows}(A)))$  solves for the inverse. Some matrix inverters are in fact implemented this way, although usually custom code is written because memory savings are possible when it is known that  $B = I$ .

The pairings of inverter and solver are

inverter	solver
<code>invsym()</code>	(none)
<code>cholinv()</code>	<code>cholsolve()</code>
<code>cholinvlapacke()</code>	<code>cholsolve lapacke()</code>
<code>luinv()</code>	<code>lusolve()</code>
<code>qrinv()</code>	<code>qrsolve()</code>
<code>pinv()</code>	<code>svsolve()</code>

## Also see

[M-4] [Intro](#) — Categorical guide to Mata functions

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