#### **solve\_tol()** — Tolerance used by solvers and inverters

Description Syntax Remarks and examples Conformability Diagnostics Also see

## **Description**

solve\_tol(Z, usertol) returns the tolerance used by many Mata solvers to solve AX = B and by many Mata inverters to obtain  $A^{-1}$ . usertol is the tolerance specified by the user or is missing value if the user did not specify a tolerance.

## **Syntax**

real scalar solve\_tol(numeric matrix Z, real scalar usertol)

## Remarks and examples

The tolerance used by many Mata solvers to solve AX = B and by many Mata inverters to obtain  $A^{-1}$  is

$$eta = s * \frac{\operatorname{trace}(\operatorname{abs}(Z))}{n}$$
 when  $s > 0$  (1)  
 $eta = -s$  when  $s < 0$ 

where s = 1e-13 or a value specified by the user, n is the min(rows(Z), cols(Z)), and Z is a matrix related to A, usually by some form of decomposition, but could be A itself (for instance, if A were triangular). See, for instance, [M-5] solvelower() and [M-5] cholsolve().

When usertol > 0 and usertol < . is specified, solvetol() returns eta calculated with s = usertol.

When usertol < 0 is specified, solvetol() returns -usertol.

When usertol > . is specified, solvetol() returns a default result, calculated as

- 1. If the matasolvetol setting is set to . (missing), the value of *eta* is computed using s = 1e-13.
- 2. If the matasolvetol setting is set to positive, the value of *eta* is computed using  $s = \text{st\_numscalar}("c(\text{matasolvetol})")$ .
- 3. If the matasolvetol setting is set to 0 or negative, the value of *eta* is —st\_numscalar("c(matasolvetol)").

## Conformability

solve\_tol(Z, usertol):

Z:  $r \times c$ usertol:  $1 \times 1$ result:  $1 \times 1$ 

# **Diagnostics**

 $solve\_tol(Z, usertol)$  skips over missing values in Z in calculating (1); n is defined as the number of nonmissing elements on the diagonal.

#### Also see

[M-4] Utility — Matrix utility functions

Stata, Stata Press, and Mata are registered trademarks of StataCorp LLC. Stata and Stata Press are registered trademarks with the World Intellectual Property Organization of the United Nations. StataNow and NetCourseNow are trademarks of StataCorp LLC. Other brand and product names are registered trademarks or trademarks of their respective companies. Copyright © 1985-2025 StataCorp LLC, College Station, TX, USA. All rights



For suggested citations, see the FAQ on citing Stata documentation.