

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

Description  
Diagnostics

Syntax  
Also see

Remarks and examples

Conformability

## 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

stata.com

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

$$eta = s * \frac{\text{trace}(\text{abs}(Z))}{n} \quad (1)$$

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 external real scalar `_solvetolerance` does not exist, as is usually the case, the value of *eta* is returned using  $s = 1e-13$ .
2. If external real scalar `_solvetolerance` does exist,
  - a. If `_solvetolerance` > 0, the value of *eta* is returned using  $s = solvetolerance$ .
  - b. If `_solvetolerance` ≤ 0,  $-\_solvetolerance$  is returned.

## Conformability

`solve_tol(Z, usertol)`:

|                  |              |
|------------------|--------------|
| <i>Z</i> :       | $r \times c$ |
| <i>usertol</i> : | $1 \times 1$ |
| <i>result</i> :  | $1 \times 1$ |

## 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