

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

$$\begin{aligned} \text{eta} &= s * \frac{\text{trace}(\text{abs}(Z))}{n} && \text{when } s > 0 \\ \text{eta} &= -s && \text{when } s \leq 0 \end{aligned} \tag{1}$$

where $s = 1\text{e-}13$ or a value specified by the user, n is the $\min(\text{rows}(Z), \text{cols}(Z))$, 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 $\text{usertol} > 0$ and $\text{usertol} < .$ is specified, `solvetol()` returns *eta* calculated with $s = \text{usertol}$.

When $\text{usertol} \leq 0$ is specified, `solvetol()` returns $-\text{usertol}$.

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

Conformability

`solve_tol(Z, usertol)`:

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

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, Mata, NetCourse, and NetCourseNow are registered trademarks of StataCorp LLC. Stata and Stata Press are registered trademarks with the World Intellectual Property Organization of the United Nations. StataNow is a trademark 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 reserved.



For suggested citations, see the FAQ on [citing Stata documentation](#).