Title

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C() — Make complex

Description

`C(`*A*`)` returns *A* converted to complex. `C(`*A*`)` returns *A* if *A* is already complex. If *A* is real, `C(`*A*`)` returns *A*+0*i*—*A* cast up to complex. Coding `C(`*A*`)` is thus how you ensure that the matrix is treated as complex.

`C(`*R*`, `*I*`)` returns the complex matrix *R*+*Ii* and is faster than the alternative *R* `+` *I*`:*1i`.

Syntax

complex matrix `C(`*numeric matrix A*`)`

complex matrix `C(`*real matrix R*`, `*real matrix I*`)`

Remarks and examples

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Many of Mata's functions are overloaded, meaning they return a real when given real arguments and a complex when given complex arguments. Given real arguments, if the result cannot be expressed as a real, missing value is returned. Thus `sqrt(-1)` evaluates to missing, whereas `sqrt(-1+0i)` is 1*i*.

`C()` is the fast way to make arguments that might be real into complex. You can code

```
result = sqrt(C(x))
```

If *x* already is complex, `C()` does nothing; if *x* is real, `C(`*x*`)` returns the complex equivalent.

The two-argument version of `C()` is less frequently used. `C(`*R*`, `*I*`)` is literally equivalent to *R* `:+` *I*`*1i`, meaning that *R* and *I* need only be c-conformable.

For instance, `C(1, (1,2,3))` evaluates to `(1+1i, 1+2i, 1+3i)`.

Conformability

`C(`*A*`)`:

A:	$r \times c$
result:	$r \times c$

`C(`*R*`, `*I*`)`:

R:	$r_1 \times c_1$
I:	$r_2 \times c_2$, *R* and *I* c-conformable
result:	$\max(r_1, r_2) \times \max(c_1, c_2)$

Diagnostics

`C(Z)`, if Z is complex, literally returns Z and not a copy of Z. This makes execution of `C()` applied to complex arguments instant.

In `C(R, I)`, the i,j element of the result will be missing anywhere $R[i,j]$ or $I[i,j]$ is missing. For instance, `C((1,3,.), (.,2,4))` results in `(., 3+2i, .)`. If $R[i,j]$ and $I[i,j]$ are both missing, then the $R[i,j]$ value will be used; for example, `C(.a, .b)` results in `.a`.

Also see

[M-5] **Re( )** — Extract real or imaginary part

[M-4] **Scalar** — Scalar mathematical functions

[M-4] **Utility** — Matrix utility functions