C() — Make complex

Syntax

complex matrix  C( numeric matrix A)

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

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+0i—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+li and is faster than the alternative R + I:*1i.

Remarks and examples

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 1i.

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] \texttt{Re()} — Extract real or imaginary part

[M-4] \texttt{scalar} — Scalar mathematical functions

[M-4] \texttt{utility} — Matrix utility functions