

NAG Toolbox for MATLAB

f01ck

1 Purpose

f01ck returns with the result of the multiplication of two matrices B and C in the matrix A , with the option to overwrite B or C .

2 Syntax

```
[a, b, c, ifail] = f01ck(b, c, opt, 'n', n, 'p', p, 'm', m)
```

3 Description

The n by m matrix B is post-multiplied by the m by p matrix C . If **opt** = 1 the result is formed in the n by p matrix A . If **opt** = 2, m must equal p , and the result is written back to B . If **opt** = 3, n must equal m , and the result is written back to C .

4 References

None.

5 Parameters

5.1 Compulsory Input Parameters

1: **b(n,m)** – double array

The n by m matrix B .

2: **c(m,p)** – double array

The m by p matrix C .

3: **opt** – int32 scalar

The value of **opt** determines which array is to contain the final result.

opt = 1

a must be distinct from **b** and **c** and, on exit, contains the result. **b** and **c** need not be distinct in this case.

opt = 2

b must be distinct from **c** and on exit, contains the result. **a** is not used in this case and need not be distinct from **b** or **c**.

opt = 3

c must be distinct from **b** and on exit, contains the result. **a** is not used in this case and need not be distinct from **b** or **c**.

Constraint: $1 \leq \mathbf{opt} \leq 3$.

5.2 Optional Input Parameters

1: **n** – int32 scalar

Default: The dimension of the arrays **a**, **b**. (An error is raised if these dimensions are not equal.)
 n , the number of rows of the array A and of the array B .

Constraints:

if **opt** = 3, **n** = **m**;
n ≥ 1 otherwise.

2: **p** – **int32 scalar**

Default: The dimension of the arrays **a**, **c**. (An error is raised if these dimensions are not equal.)
p, the number of columns of the array *A* and of the array *C*.

Constraints:

if **opt** = 2, **p** = **m**;
p ≥ 1 otherwise.

3: **m** – **int32 scalar**

Default: The dimension of the arrays **b**, **c**. (An error is raised if these dimensions are not equal.)
m, the number of columns of the array *B* and rows of the array *C*.

Constraints:

if **opt** = 2, **m** = **p**;
 if **opt** = 3, **m** = **n**;
 if **opt** ≠ 1, **m** ≤ **iz**;
m ≥ 1 otherwise.

5.3 Input Parameters Omitted from the MATLAB Interface

z, **iz**

5.4 Output Parameters

1: **a(n,p)** – **double array**

If **opt** = 1, **a** contains the result of the matrix multiplication.

2: **b(n,m)** – **double array**

If **opt** = 2, **b** contains the result of the multiplication.

3: **c(m,p)** – **double array**

If **opt** = 3, **c** contains the result of the multiplication.

4: **ifail** – **int32 scalar**

0 unless the function detects an error (see Section 6).

6 Error Indicators and Warnings

Errors or warnings detected by the function:

ifail = 1

On entry, **m** or **p** or **n** ≤ 0.

ifail = 2

opt = 2 and **m** ≠ **p**.

ifail = 3

opt = 3 and **n** ≠ **m**.

ifail = 4

opt $\neq$ 1 and **iz** < **m**.

7 Accuracy

Each element of the result is effectively computed as an inner product using *basic precision*.

8 Further Comments

The time taken by f01ck is approximately proportional to *mnp*.

9 Example

```
b = [0, 1, 2];  
c = [0, 1;  
     1, 2;  
     2, 3];  
opt = int32(1);  
[a, bOut, cOut, ifail] = f01ck(b, c, opt)
```

```
a =  
    5    8  
bOut =  
    0    1    2  
cOut =  
    0    1  
    1    2  
    2    3  
ifail =  
    0
```