

## NAG Toolbox

### nag\_file\_print\_matrix\_real\_band (x04ce)

#### 1 Purpose

nag\_file\_print\_matrix\_real\_band (x04ce) is an easy-to-use function to print a double band matrix stored in a packed two-dimensional array.

#### 2 Syntax

```
[ifail] = nag_file_print_matrix_real_band(m, n, kl, ku, a, title)
[ifail] = x04ce(m, n, kl, ku, a, title)
```

#### 3 Description

nag\_file\_print\_matrix\_real\_band (x04ce) prints a double band matrix stored in a packed two-dimensional array. It is an easy-to-use driver for nag\_file\_print\_matrix\_real\_band\_comp (x04cf). The function uses default values for the format in which numbers are printed, for labelling the rows and columns, and for output record length.

nag\_file\_print\_matrix\_real\_band (x04ce) will choose a format code such that numbers will be printed with an F8.4, an F11.4 or a 1PE13.4 format. The F8.4 code is chosen if the sizes of all the matrix elements to be printed lie between 0.001 and 1.0. The F11.4 code is chosen if the sizes of all the matrix elements to be printed lie between 0.001 and 9999.9999. Otherwise the 1PE13.4 code is chosen.

The matrix is printed with integer row and column labels, and with a maximum record length of 80. The matrix is output to the unit defined by nag\_file\_set\_unit\_advisory (x04ab).

#### 4 References

None.

#### 5 Parameters

##### 5.1 Compulsory Input Parameters

- 1: **m** – INTEGER
- 2: **n** – INTEGER

The number of rows and columns of the band matrix, respectively, to be printed.

If either **m** or **n** is less than 1, nag\_file\_print\_matrix\_real\_band (x04ce) will exit immediately after printing **title**; no row or column labels are printed.

- 3: **kl** – INTEGER

The number of subdiagonals of the band matrix *A*.

*Constraint:* **kl** ≥ 0.

- 4: **ku** – INTEGER

The number of superdiagonals of the band matrix *A*.

*Constraint:* **ku** ≥ 0.

5: **a**(*lda*,:) – REAL (KIND=nag\_wp) array

The first dimension of the array **a** must be at least **kl** + **ku** + 1.

The second dimension of the array **a** must be at least  $\max(1, \min(\mathbf{m} + \mathbf{ku}, \mathbf{n}))$ .

The band matrix to be printed.

The matrix is stored in rows 1 to  $k_l + k_u + 1$ , more precisely, the element  $A_{ij}$  must be stored in

$$\mathbf{a}(k_u + 1 + i - j, j) \quad \text{for } \max(1, j - k_u) \leq i \leq \min(m, j + k_l).$$

6: **title** – CHARACTER(\*)

A title to be printed above the matrix.

If **title** = ' ', no title (and no blank line) will be printed.

If **title** contains more than 80 characters, the contents of **title** will be wrapped onto more than one line, with the break after 80 characters.

Any trailing blank characters in **title** are ignored.

## 5.2 Optional Input Parameters

None.

## 5.3 Output Parameters

1: **ifail** – INTEGER

**ifail** = 0 unless the function detects an error (see Section 5).

## 6 Error Indicators and Warnings

Errors or warnings detected by the function:

**ifail** = 1

On entry, **kl** < 0.

**ifail** = 2

On entry, **ku** < 0.

**ifail** = 3

On entry,  $lda < \mathbf{kl} + \mathbf{ku} + 1$ .

**ifail** = -99

An unexpected error has been triggered by this routine. Please contact NAG.

**ifail** = -399

Your licence key may have expired or may not have been installed correctly.

**ifail** = -999

Dynamic memory allocation failed.

## 7 Accuracy

Not applicable.

## 8 Further Comments

A call to `nag_file_print_matrix_real_band` (x04ce) is equivalent to a call to `nag_file_print_matrix_real_band_comp` (x04cf) with the following argument values:

```
ncols = 80
indent = 0
labrow = 'I'
labcol = 'I'
form = ' '
```

## 9 Example

The example program calls `nag_file_print_matrix_real_band` (x04ce) to print a 5 by 5 band matrix with one subdiagonal and one superdiagonal.

### 9.1 Program Text

```
function x04ce_example

fprintf('x04ce example results\n\n');

% Banded matrix (tridiagonal) A in banded storage format
m = nag_int(5);
n = m;
kl = nag_int(1);
ku = kl;
% diagonals are stored as rows and columns are preserved.
a = [ 0, 12, 13, 14, 15;
      21, 22, 23, 24, 25;
      31, 32, 33, 34, 0];

mtitle = 'Band Matrix: ';
[ifail] = x04ce(m, n, kl, ku, a, mtitle);
```

### 9.2 Program Results

```
x04ce example results

Band Matrix:
   1         2         3         4         5
1  21.0000  12.0000
2  31.0000  22.0000  13.0000
3         32.0000  23.0000  14.0000
4                 33.0000  24.0000  15.0000
5                         34.0000  25.0000
```

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