NAG Library Function Document

nag_gen_real_mat_print_comp (x04cbc)

1 Purpose

nag_gen_real_mat_print_comp (x04cbc) prints a real matrix.

2 Specification

```
#include <nag.h>
#include <nagx04.h>
void nag_gen_real_mat_print_comp (Nag_OrderType order,
     Nag_MatrixType matrix, Nag_DiagType diag, Integer m, Integer n,
     const double a[], Integer pda, const char *form, const char *title,
     Nag_LabelType labrow, const char *rlabs[], Nag_LabelType labcol,
     const char *clabs[], Integer ncols, Integer indent, const char *outfile,
     NagError *fail)
```

3 Description

nag_gen_real_mat_print_comp (x04cbc) prints a double matrix, or part of it, using a format specifier supplied by you. The matrix is output to the file specified by **outfile** or, by default, to standard output.

4 References

None.

5 Arguments

1: **order** – Nag_OrderType *Input*

On entry: the **order** argument specifies the two-dimensional storage scheme being used, i.e., row-major ordering or column-major ordering. C language defined storage is specified by **order** = Nag_RowMajor. See Section 3.2.1.3 in the Essential Introduction for a more detailed explanation of the use of this argument.

Constraint: **order** = Nag_RowMajor or Nag_ColMajor.

2: **matrix** – Nag_MatrixType *Input*

On entry: indicates the part of the matrix to be printed.

matrix = Nag_GeneralMatrix
The whole of the rectangular matrix.

matrix = Nag_LowerMatrix
The lower triangle of the matrix, or the lower trapezium if the matrix has more rows than columns.

matrix = Nag_UpperMatrix
The upper triangle of the matrix, or the upper trapezium if the matrix has more columns than rows.

Constraint: **matrix** = Nag_GeneralMatrix, Nag_LowerMatrix or Nag_UpperMatrix.

3: **diag** – Nag_DiagType *Input*

On entry: indicates whether the diagonal elements of the matrix are to be printed.

diag = Nag_NonRefDiag
The diagonal elements of the matrix are not referenced and not printed.

diag = Nag_UnitDiag
The diagonal elements of the matrix are not referenced, but are assumed all to be unity, and are printed as such.

diag = Nag_NonUnitDiag
The diagonal elements of the matrix are referenced and printed.

If **matrix** = Nag_GeneralMatrix, then **diag** must be set to Nag_NonUnitDiag.

Constraints:

if **matrix** $\neq$ Nag_GeneralMatrix, **diag** = Nag_NonRefDiag, Nag_UnitDiag or Nag_NonUnitDiag;
if **matrix** = Nag_GeneralMatrix, **diag** = Nag_NonUnitDiag.

4: **m** – Integer *Input*

5: **n** – Integer *Input*

On entry: the number of rows and columns of the matrix, respectively, to be printed.

If either **m** or **n** is less than 1, nag_gen_real_mat_print_comp (x04cbc) will exit immediately after printing **title**; no row or column labels are printed.

6: **a**[dim] – const double *Input*

Note: the dimension, *dim*, of the array **a** must be at least

$\max(1, \mathbf{pda} \times \mathbf{n})$ when **order** = Nag_ColMajor;
$\max(1, \mathbf{m} \times \mathbf{pda})$ when **order** = Nag_RowMajor.

The (i, j)th element of the matrix A is stored in

a$[(j-1) \times \mathbf{pda} + i - 1]$ when **order** = Nag_ColMajor;
a$[(i-1) \times \mathbf{pda} + j - 1]$ when **order** = Nag_RowMajor.

On entry: the matrix to be printed. Only the elements that will be referred to, as specified by arguments **matrix** and **diag**, need be set.

7: **pda** – Integer *Input*

On entry: the stride separating row or column elements (depending on the value of **order**) in the array **a**.

Constraints:

if **order** = Nag_ColMajor, **pda** $\geq \max(1, \mathbf{m})$;
if **order** = Nag_RowMajor, **pda** $\geq \max(1, \mathbf{n})$.

8: **form** – const char * *Input*

On entry: a valid C format code. This should be of the form $\%[flag]ww.pp[format\ indicator]$, where $ww.pp$ indicates that up to two digits may be used to specify the field width and precision respectively. Only % and $format\ indicator$ must be present. $flag$ can be one of $-$, $+$, < space > or # and $format\ indicator$ can be e, E, f, g or G. Thus, possible formats include %f, %+23.15G, %.6e. **form** is used to print elements of the matrix A.

In addition, nag_gen_real_mat_print_comp (x04cbc) chooses its own format code when **form** is **NULL** or **form** = '$*$'.

form = **NULL**
nag_gen_real_mat_print_comp (x04cbc) will choose a format code such that numbers will be printed with either a %8.4f, a %11.4f or a %13.4e format. The %8.4f code is chosen if the sizes of all the matrix elements to be printed lie between 0.001 and 1.0. The %11.4f code is chosen if the sizes of all the matrix elements to be printed lie between 0.001 and 9999.9999. Otherwise the %13.4e code is chosen.

form = '$*$'
nag_gen_real_mat_print_comp (x04cbc) will choose a format code such that numbers will be printed to as many significant digits as are necessary to distinguish between neighbouring machine numbers. Thus any two numbers that are stored with different internal representations should look different on output.

Constraint: **form** must be of the form $\%[flag]ww.pp[format\ indicator]$.

9: **title** – const char * *Input*

On entry: a title to be printed above the matrix, or name of the matrix.

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

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

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

10: **labrow** – Nag_LabelType *Input*

On entry: indicates the type of labelling to be applied to the rows of the matrix.

labrow = Nag_NoLabels
Prints no row labels.

labrow = Nag_IntegerLabels
Prints integer row labels.

labrow = Nag_CharacterLabels
Prints character labels, which must be supplied in array **rlabs**.

Constraint: **labrow** = Nag_NoLabels, Nag_IntegerLabels or Nag_CharacterLabels.

11: **rlabs**[dim] – const char * *Input*

Note: the dimension, *dim*, of the array **rlabs** must be at least

m when **labrow** = Nag_CharacterLabels;
otherwise **rlabs** may be **NULL**.

On entry: if **labrow** = Nag_CharacterLabels, **rlabs** must contain labels for the rows of the matrix; otherwise **rlabs** is not referenced and may be **NULL**.

Labels are right-justified when output, in a field which is as wide as necessary to hold the longest row label. Note that this field width is subtracted from the number of usable columns, **ncols**.

12: **labcol** – Nag_LabelType *Input*

On entry: indicates the type of labelling to be applied to the columns of the matrix.

labcol = Nag_NoLabels
Prints no column labels.

labcol = Nag_IntegerLabels
Prints integer column labels.

labcol = Nag_CharacterLabels
Prints character labels, which must be supplied in array **clabs**.

Constraint: **labcol** = Nag_NoLabels, Nag_IntegerLabels or Nag_CharacterLabels.

13: **clabs**[*dim*] – const char * *Input*

Note: the dimension, *dim*, of the array **clabs** must be at least

n when **labcol** = Nag_CharacterLabels;
otherwise **clabs** may be **NULL**.

On entry: if **labcol** = Nag_CharacterLabels, **clabs** must contain labels for the columns of the matrix; otherwise **clabs** is not referenced and may be **NULL**.

Labels are right-justified when output. Any label that is too long for the column width, which is determined by **form**, is truncated.

14: **ncols** – Integer *Input*

On entry: the maximum output record length. If the number of columns of the matrix is too large to be accommodated in **ncols** characters, the matrix will be printed in parts, containing the largest possible number of matrix columns, and each part separated by a blank line.

ncols must be large enough to hold at least one column of the matrix using the format specifier in **form**. If a value less than or equal to 0 or greater than 132 is supplied for **ncols**, then the value 80 is used instead.

15: **indent** – Integer *Input*

On entry: the number of columns by which the matrix (and any title and labels) should be indented. The effective value of **ncols** is reduced by **indent** columns. If a value less than 0 or greater than **ncols** is supplied for **indent**, the value 0 is used instead.

16: **outfile** – const char * *Input*

On entry: the name of a file to which output will be directed. If **outfile** is **NULL** the output will be directed to standard output.

17: **fail** – NagError * *Input/Output*

The NAG error argument (see Section 3.6 in the Essential Introduction).

6 Error Indicators and Warnings

NE_ALLOC_FAIL

Memory allocation failed.

NE_BAD_PARAM

On entry, argument ⟨*value*⟩ had an illegal value.

NE_COL_WIDTH

⟨*value*⟩ is not wide enough to hold at least one matrix column. **ncols** = ⟨*value*⟩ and **indent** = ⟨*value*⟩.

NE_INTERNAL_ERROR

An internal error has occurred in this function. Check the function call and any array sizes. If the call is correct then please contact NAG for assistance.

NE_INVALID_FORMAT

The string ⟨*value*⟩ has not been recognized as a valid format.

NE_NOT_APPEND_FILE

Cannot open file ⟨*value*⟩ for appending.

NE_NOT_CLOSE_FILE

Cannot close file ⟨*value*⟩.

NE_NOT_WRITE_FILE

Cannot open file ⟨*value*⟩ for writing.

7 Accuracy

Not applicable.

8 Parallelism and Performance

Not applicable.

9 Further Comments

nag_gen_real_mat_print_comp (x04cbc) may be used to print a vector, either as a row or as a column. The following code fragment illustrates possible calls.

```
#include <nag.h>
#include <nagx04.h>
#include <nag_stdlib.h>
double *a = 0;
Integer n = 4;
if ( !(a = NAG_ALLOC(n, double)) )
  {
    Vprintf("Allocation failure\n");
    return -1;
  }
/* Read A from data file */
for (i = 0; i < n; ++i)
  Vscanf("%lf", &a[i]);
/* Print vector A as a row vector */
x04cbc(Nag_RowMajor, Nag_GeneralMatrix, Nag_NonUnitDiag,
1, n, a, n, 0, 0,  Nag_NoLabels, 0, Nag_IntegerLabels, 0,
0, 0, 0, NAGERR_DEFAULT);
/* Print vector A as a column vector */
x04cbc(Nag_RowMajor, Nag_GeneralMatrix, Nag_NonUnitDiag,
n, 1, a, 1, 0, 0,  Nag_IntegerLabels, 0, Nag_NoLabels, 0,
0, 0, 0, NAGERR_DEFAULT);
```

10 Example

None.