

uplo = Nag_Lower

The lower triangular part of B is stored.

Constraint: **uplo** = Nag_Upper or Nag_Lower.

3: **n** – Integer *Input*

On entry: n , the order of the matrix B .

Constraint: $n \geq 0$.

4: **kb** – Integer *Input*

On entry: if **uplo** = Nag_Upper, the number of superdiagonals, k_b , of the matrix B .

If **uplo** = Nag_Lower, the number of subdiagonals, k_b , of the matrix B .

Constraint: $kb \geq 0$.

5: **bb**[*dim*] – double *Input/Output*

Note: the dimension, *dim*, of the array **bb** must be at least $\max(1, \mathbf{pddb} \times \mathbf{n})$.

On entry: the n by n symmetric positive definite band matrix B .

This is stored as a notional two-dimensional array with row elements or column elements stored contiguously. The storage of elements of B_{ij} , depends on the **order** and **uplo** arguments as follows:

if **order** = 'Nag_ColMajor' and **uplo** = 'Nag_Upper',
 B_{ij} is stored in **bb**[$k_b + i - j + (j - 1) \times \mathbf{pddb}$], for $j = 1, \dots, n$ and
 $i = \max(1, j - k_b), \dots, j$;
 if **order** = 'Nag_ColMajor' and **uplo** = 'Nag_Lower',
 B_{ij} is stored in **bb**[$i - j + (j - 1) \times \mathbf{pddb}$], for $j = 1, \dots, n$ and
 $i = j, \dots, \min(n, j + k_b)$;
 if **order** = 'Nag_RowMajor' and **uplo** = 'Nag_Upper',
 B_{ij} is stored in **bb**[$j - i + (i - 1) \times \mathbf{pddb}$], for $i = 1, \dots, n$ and
 $j = i, \dots, \min(n, i + k_b)$;
 if **order** = 'Nag_RowMajor' and **uplo** = 'Nag_Lower',
 B_{ij} is stored in **bb**[$k_b + j - i + (i - 1) \times \mathbf{pddb}$], for $i = 1, \dots, n$ and
 $j = \max(1, i - k_b), \dots, i$.

On exit: B is overwritten by the elements of its split Cholesky factor S .

6: **pddb** – Integer *Input*

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

Constraint: $\mathbf{pddb} \geq \mathbf{kb} + 1$.

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

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

6 Error Indicators and Warnings

NE_BAD_PARAM

On entry, argument $\langle value \rangle$ had an illegal value.

NE_INT

On entry, **kb** = $\langle value \rangle$.

Constraint: $kb \geq 0$.

On entry, $\mathbf{n} = \langle \text{value} \rangle$.

Constraint: $\mathbf{n} \geq 0$.

On entry, $\mathbf{pddb} = \langle \text{value} \rangle$.

Constraint: $\mathbf{pddb} > 0$.

NE_INT_2

On entry, $\mathbf{pddb} = \langle \text{value} \rangle$ and $\mathbf{kb} = \langle \text{value} \rangle$.

Constraint: $\mathbf{pddb} \geq \mathbf{kb} + 1$.

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_POS_DEF

The factorization could not be completed, because the updated element $b(\langle \text{value} \rangle, \langle \text{value} \rangle)$ would be the square root of a negative number. Hence B is not positive definite. This may indicate an error in forming the matrix B .

7 Accuracy

The computed factor S is the exact factor of a perturbed matrix $(B + E)$, where

$$|E| \leq c(k+1)\epsilon |S^T| |S|,$$

$c(k+1)$ is a modest linear function of $k+1$, and ϵ is the *machine precision*. It follows that

$$|e_{ij}| \leq c(k+1)\epsilon \sqrt{(b_{ii}b_{jj})}.$$

8 Parallelism and Performance

nag_dpbstf (f08ufc) is not threaded by NAG in any implementation.

nag_dpbstf (f08ufc) makes calls to BLAS and/or LAPACK routines, which may be threaded within the vendor library used by this implementation. Consult the documentation for the vendor library for further information.

Please consult the Users' Note for your implementation for any additional implementation-specific information.

9 Further Comments

The total number of floating-point operations is approximately $n(k+1)^2$, assuming $n \gg k$.

A call to nag_dpbstf (f08ufc) may be followed by a call to nag_dsbgst (f08uec) to solve the generalized eigenproblem $Az = \lambda Bz$, where A and B are banded and B is positive definite.

The complex analogue of this function is nag_zpbstf (f08utc).

10 Example

See Section 10 in nag_dsbgst (f08uec).
