

NAG Library Routine Document

F06FJF

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of *bold italicised* terms and other implementation-dependent details.

1 Purpose

F06FJF updates the Euclidean norm of real vector in scaled form.

2 Specification

```
SUBROUTINE F06FJF (N, X, INCX, SCAL, SUMSQ)
  INTEGER          N, INCX
  REAL (KIND=nag_wp) X(*), SCAL, SUMSQ
```

3 Description

Given an n -element real vector x , and real scalars α and ξ , F06FJF returns updated values $\tilde{\alpha}$ and $\tilde{\xi}$ such that

$$\tilde{\alpha}^2 \tilde{\xi} = x_1^2 + x_2^2 + \cdots + x_n^2 + \alpha^2 \xi.$$

F06FJF is designed for use in the safe computation of the Euclidean norm of a real vector, without unnecessary overflow or destructive underflow. An initial call to F06FJF (with $\xi = 1$ and $\alpha = 0$) may be followed by further calls to F06FJF and finally a call to F06BMF to complete the computation. Multiple calls of F06FJF may be needed if the elements of the vector cannot all be accessed in a single array X.

4 References

None.

5 Arguments

- | | | |
|----|---|---------------------|
| 1: | N – INTEGER | <i>Input</i> |
| | <i>On entry:</i> n , the number of elements in x . | |
| 2: | X(*) – REAL (KIND=nag_wp) array | <i>Input</i> |
| | Note: the dimension of the array X must be at least $\max(1, 1 + (N - 1) \times \text{INCX})$. | |
| | <i>On entry:</i> the n -element vector x . x_i must be stored in $X(1 + (i - 1) \times \text{INCX})$, for $i = 1, 2, \dots, N$. | |
| | Intermediate elements of X are not referenced. | |
| 3: | INCX – INTEGER | <i>Input</i> |
| | <i>On entry:</i> the increment in the subscripts of X between successive elements of x . | |
| | <i>Constraint:</i> $\text{INCX} > 0$. | |
| 4: | SCAL – REAL (KIND=nag_wp) | <i>Input/Output</i> |
| | <i>On entry:</i> the scaling factor α . On the first call to F06FJF $\text{SCAL} = 0.0$. | |
| | <i>Constraint:</i> $\text{SCAL} \geq 0.0$. | |
| | <i>On exit:</i> the updated scaling factor $\tilde{\alpha} = \max_i(\alpha, x_i)$. | |

5: SUMSQ – REAL (KIND=nag_wp)

Input/Output

On entry: the scaled sum of squares ξ . On the first call to F06FJF SUMSQ = 1.0.

Constraint: SUMSQ \geq 1.0.

On exit: the updated scaled sum of squares $\tilde{\xi}$, satisfying: $1 \leq \tilde{\xi} \leq \xi + n$.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Parallelism and Performance

F06FJF is not threaded in any implementation.

9 Further Comments

None.

10 Example

None.
