

# 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  $\alpha$  and  $\xi$ , 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 *Input*  
*On entry:*  $n$ , the number of elements in  $x$ .
- 2: X(\*) – REAL (KIND=nag\_wp) array *Input*  
**Note:** the dimension of the array X must be at least  $\max(1, 1 + (N - 1) \times \text{INCX})$ .  
*On entry:* 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 *Input*  
*On entry:* the increment in the subscripts of X between successive elements of  $x$ .  
*Constraint:*  $\text{INCX} > 0$ .
- 4: SCAL – REAL (KIND=nag\_wp) *Input/Output*  
*On entry:* the scaling factor  $\alpha$ . On the first call to F06FJF  $\text{SCAL} = 0.0$ .  
*Constraint:*  $\text{SCAL} \geq 0.0$ .  
*On exit:* 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  $\xi$ . 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.

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