

NAG Library Routine Document

C09DBF

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

C09DBF computes the inverse one-dimensional maximal overlap discrete wavelet transform (MODWT) at a single level. The initialization routine C09AAF must be called first to set up the MODWT options.

2 Specification

```
SUBROUTINE C09DBF (LENC, CA, CD, N, Y, ICOMM, IFAIL)
  INTEGER          LENC, N, ICOMM(100), IFAIL
  REAL (KIND=nag_wp) CA(LENC), CD(LENC), Y(N)
```

3 Description

C09DBF performs the inverse operation of C09DAF. That is, given sets of n_c approximation coefficients and detail coefficients, computed by C09DAF using a MODWT as set up by the initialization routine C09AAF, on a real data array of length n , C09DBF will reconstruct the data array y_i , for $i = 1, 2, \dots, n$, from which the coefficients were derived.

4 References

Percival D B and Walden A T (2000) *Wavelet Methods for Time Series Analysis* Cambridge University Press

5 Parameters

- 1: LENC – INTEGER *Input*
On entry: the dimension of the arrays CA and CD as declared in the (sub)program from which C09DBF is called.
Constraint: $LENC \geq n_c$, where n_c is the value returned in NWC by the call to the initialization routine C09AAF.
- 2: CA(LENC) – REAL (KIND=nag_wp) array *Input*
On entry: the n_c approximation coefficients, C_a . These will normally be the result of some transformation on the coefficients computed by C09DAF.
- 3: CD(LENC) – REAL (KIND=nag_wp) array *Input*
On entry: the n_c detail coefficients, C_d . These will normally be the result of some transformation on the coefficients computed by C09DAF.
- 4: N – INTEGER *Input*
On entry: n , the length of the original data array from which the wavelet coefficients were computed by C09DAF and the length of the data array Y that is to be reconstructed by this routine.
Constraint: This must be the same as the value N passed to the initialization routine C09AAF.

- 5: Y(N) – REAL (KIND=nag_wp) array *Output*
On exit: the reconstructed data based on approximation and detail coefficients C_a and C_d and the transform options supplied to the initialization routine C09AAF.
- 6: ICOMM(100) – INTEGER array *Communication Array*
On entry: contains details of the discrete wavelet transform and the problem dimension and, possibly, additional information on the previously computed forward transform.
- 7: IFAIL – INTEGER *Input/Output*
On entry: IFAIL must be set to 0, -1 or 1. If you are unfamiliar with this parameter you should refer to Section 3.3 in the Essential Introduction for details.
- For environments where it might be inappropriate to halt program execution when an error is detected, the value -1 or 1 is recommended. If the output of error messages is undesirable, then the value 1 is recommended. Otherwise, if you are not familiar with this parameter, the recommended value is 0. **When the value -1 or 1 is used it is essential to test the value of IFAIL on exit.**
- On exit:* IFAIL = 0 unless the routine detects an error or a warning has been flagged (see Section 6).

6 Error Indicators and Warnings

If on entry IFAIL = 0 or -1, explanatory error messages are output on the current error message unit (as defined by X04AAF).

Errors or warnings detected by the routine:

IFAIL = 1

On entry, array dimension LENC not large enough: LENC = $\langle value \rangle$ but must be at least $\langle value \rangle$.

IFAIL = 4

On entry, N is inconsistent with the value passed to the initialization routine: N = $\langle value \rangle$, N should be $\langle value \rangle$.

IFAIL = 6

On entry, the initialization routine C09AAF has not been called first or it has not been called with WTRANS = 'T', or the communication array ICOMM has become corrupted.

IFAIL = -99

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

See Section 3.8 in the Essential Introduction for further information.

IFAIL = -399

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

See Section 3.7 in the Essential Introduction for further information.

IFAIL = -999

Dynamic memory allocation failed.

See Section 3.6 in the Essential Introduction for further information.

7 Accuracy

The accuracy of the wavelet transform depends only on the floating-point operations used in the convolution and downsampling and should thus be close to *machine precision*.

8 Parallelism and Performance

Not applicable.

9 Further Comments

None.

10 Example

See Section 10 in C09DAF.
