

# NAG Library Routine Document

## H02BVF

**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

H02BVF prints the solution to a linear or integer programming problem computed by E04MFF/E04MFA or H02BBF and H02BZF, with user-supplied names for the rows and columns.

### 2 Specification

```

SUBROUTINE H02BVF (N, M, A, LDA, BL, BU, X, CLAMDA, ISTATE, CRNAME,      &
                  IFAIL)
INTEGER                N, M, LDA, ISTATE(N+M), IFAIL
REAL (KIND=nag_wp)    A(LDA,*), BL(N+M), BU(N+M), X(N), CLAMDA(N+M)
CHARACTER(8)          CRNAME(N+M)

```

### 3 Description

H02BVF prints the solution to a linear or integer programming problem with user-supplied names for the rows and columns. All output is written to the current advisory message unit (as defined by X04ABF). The routine must be preceded in the same program by calls to H02BUF and either E04MFF/E04MFA (if an LP problem has been solved) or H02BBF and H02BZF (if an IP problem has been solved). The documents for E04MFF/E04MFA, H02BUF and/or H02BBF and H02BZF should be consulted for further details.

### 4 References

IBM (1971) MPSX – Mathematical programming system *Program Number 5734 XM4* IBM Trade Corporation, New York

### 5 Arguments

- 1: N – INTEGER *Input*  
*On entry:* the number of variables, as returned by H02BUF.  
*Constraint:*  $N > 0$ .
- 2: M – INTEGER *Input*  
*On entry:* the number of general linear constraints, as returned by H02BUF.  
*Constraint:*  $M \geq 0$ .
- 3: A(LDA,\*) – REAL (KIND=nag\_wp) array *Input*  
**Note:** the second dimension of the array A must be at least N if  $M > 0$  and at least 1 if  $M = 0$ .  
*On entry:* the matrix of general linear constraints, as returned by H02BUF.
- 4: LDA – INTEGER *Input*  
*On entry:* this **must** be the same argument MAXM as supplied to H02BUF.  
*Constraint:*  $LDA \geq \max(1, M)$ .

- 5: BL(N + M) – REAL (KIND=nag\_wp) array *Input*  
*On entry:* the lower bounds for all the constraints, as returned by E04MFF/E04MFA or H02BZF.
- 6: BU(N + M) – REAL (KIND=nag\_wp) array *Input*  
*On entry:* the upper bounds for all the constraints, as returned by E04MFF/E04MFA or H02BZF.
- 7: X(N) – REAL (KIND=nag\_wp) array *Input*  
*On entry:* the solution to the problem, as returned by E04MFF/E04MFA or H02BBF.
- 8: CLAMDA(N + M) – REAL (KIND=nag\_wp) array *Input*  
*On entry:* the Lagrange-multipliers (reduced costs) for each constraint with respect to the working set, as returned by E04MFF/E04MFA or H02BZF.
- 9: ISTATE(N + M) – INTEGER array *Input*  
*On entry:* the status of every constraint in the working set at the solution, as returned by E04MFF/E04MFA or H02BZF.
- 10: CRNAME(N + M) – CHARACTER(8) array *Input*  
*On entry:* the user-defined names for all the variables and constraints, as returned by H02BUF.
- 11: IFAIL – INTEGER *Input/Output*  
*On entry:* IFAIL must be set to 0, -1 or 1. If you are unfamiliar with this argument you should refer to Section 3.4 in How to Use the NAG Library and its Documentation 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 argument, 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,  $N \leq 0$ ,  
 or  $M < 0$ ,  
 or  $LDA < \max(1, M)$ .

IFAIL = -99

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

See Section 3.9 in How to Use the NAG Library and its Documentation for further information.

IFAIL = -399

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

See Section 3.8 in How to Use the NAG Library and its Documentation for further information.

IFAIL = -999

Dynamic memory allocation failed.

See Section 3.7 in How to Use the NAG Library and its Documentation for further information.

## **7 Accuracy**

Not applicable.

## **8 Parallelism and Performance**

H02BVF is not thread safe and should not be called from a multithreaded user program. Please see Section 3.12.1 in How to Use the NAG Library and its Documentation for more information on thread safety.

H02BVF is not threaded in any implementation.

## **9 Further Comments**

None.

## **10 Example**

See Section 10 in H02BUF.

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