

## NAG Toolbox

### nag\_contab\_binary\_service (g11sb)

#### 1 Purpose

nag\_contab\_binary\_service (g11sb) is a service function which may be used prior to calling nag\_contab\_binary (g11sa) to calculate the frequency distribution of a set of dichotomous score patterns.

#### 2 Syntax

```
[ns, x, irl, ifail] = nag_contab_binary_service(x, 'ip', ip, 'n', n)
[ns, x, irl, ifail] = g11sb(x, 'ip', ip, 'n', n)
```

**Note:** the interface to this routine has changed since earlier releases of the toolbox:

At Mark 22: **n** was made optional.

#### 3 Description

When each of  $n$  individuals responds to each of  $p$  dichotomous variables the data assumes the form of the matrix  $X$  defined below

$$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1p} \\ x_{21} & x_{22} & \dots & x_{2p} \\ \vdots & \vdots & & \vdots \\ x_{n1} & x_{n2} & \dots & x_{np} \end{bmatrix} = \begin{bmatrix} \underline{x}_1 \\ \underline{x}_2 \\ \vdots \\ \underline{x}_n \end{bmatrix},$$

where the  $x$  take the value of 0 or 1 and  $\underline{x}_l = (x_{l1}, x_{l2}, \dots, x_{lp})$ , for  $l = 1, 2, \dots, n$ , denotes the score pattern of the  $l$ th individual. nag\_contab\_binary\_service (g11sb) calculates the number of different score patterns,  $s$ , and the frequency with which each occurs. This information can then be passed to nag\_contab\_binary (g11sa).

#### 4 References

None.

#### 5 Parameters

##### 5.1 Compulsory Input Parameters

1: **x(ldx, ip)** – LOGICAL array

*ldx*, the first dimension of the array, must satisfy the constraint  $ldx \geq \mathbf{n}$ .

$\mathbf{x}(i, j)$  must be set equal to *true* if  $x_{ij} = 1$ , and *false* if  $x_{ij} = 0$ , for  $i = 1, 2, \dots, n$  and  $j = 1, 2, \dots, p$ .

##### 5.2 Optional Input Parameters

1: **ip** – INTEGER

*Default:* the second dimension of the array **x**.

$p$ , the number of dichotomous variables.

*Constraint:*  $\mathbf{ip} \geq 3$ .

2:  $\mathbf{n}$  – INTEGER

*Default:* the first dimension of the array  $\mathbf{x}$ .

$n$ , the number of individuals in the sample.

*Constraint:*  $\mathbf{n} \geq 7$ .

### 5.3 Output Parameters

1:  $\mathbf{ns}$  – INTEGER

The number of different score patterns,  $s$ .

2:  $\mathbf{x}(\mathit{ldx}, \mathbf{ip})$  – LOGICAL array

The first  $s$  rows of  $\mathbf{x}$  contain the  $s$  different score patterns.

3:  $\mathbf{irl}(\mathbf{n})$  – INTEGER array

The frequency with which the  $l$ th row of  $\mathbf{x}$  occurs, for  $l = 1, 2, \dots, s$ .

4:  $\mathbf{ifail}$  – INTEGER

$\mathbf{ifail} = 0$  unless the function detects an error (see Section 5).

## 6 Error Indicators and Warnings

Errors or warnings detected by the function:

$\mathbf{ifail} = 1$

On entry,  $\mathbf{ip} < 3$ ,  
or  $\mathbf{n} < 7$ ,  
or  $\mathit{ldx} < \mathbf{n}$ .

$\mathbf{ifail} = -99$

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

$\mathbf{ifail} = -399$

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

$\mathbf{ifail} = -999$

Dynamic memory allocation failed.

## 7 Accuracy

Exact.

## 8 Further Comments

The time taken by `nag_contab_binary_service` (g11sb) is small and increases with  $n$ .

## 9 Example

This example counts the frequencies of different score patterns in the following list:

## Score Patterns

```
000
010
111
000
001
000
000
000
110
001
011
```

**9.1 Program Text**

```
function g11sb_example

fprintf('g11sb example results\n\n');

x = [false, false, false;
     false, true, false;
     true, true, true;
     false, false, false;
     false, false, true;
     false, false, false;
     false, false, false;
     true, true, false;
     false, false, true;
     false, true, true];

[ns, x, irl, ifail] = g11sb(x);

% Display results
fprintf('Frequency      Score pattern\n\n');
for i = 1:ns
    fprintf('%5d          ', irl(i));
    fprintf('%2d', x(i,:));
    fprintf('\n');
end
```

**9.2 Program Results**

```
g11sb example results

Frequency      Score pattern

  4             0 0 0
  1             0 1 0
  1             1 1 1
  2             0 0 1
  1             1 1 0
  1             0 1 1
```

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