

NAG C Library Function Document

nag_ref_vec_discrete_pdf_cdf (g05exc)

1 Purpose

nag_ref_vec_discrete_pdf_cdf (g05exc) sets up the reference vector **R** for a discrete distribution with probability density function (PDF) or cumulative distribution function (CDF) **p**.

2 Specification

```
#include <nag.h>
#include <nagg05.h>

void nag_ref_vec_discrete_pdf_cdf(double p[], Integer np, Integer sizep,
    Nag_DiscreteDistrib distf, double **r, NagError *fail)
```

3 Description

nag_ref_vec_discrete_pdf_cdf sets up a reference vector for use in nag_return_discrete (g05exc) according to information supplied by the user in **p**. This may either be the PDF or CDF of the distribution.

4 Parameters

- 1: **p[np]** – double *Input*
On entry: the PDF or CDF of the distribution.
- 2: **np** – Integer *Input*
On entry: the dimension of the array **p** as declared in the function from which nag_ref_vec_discrete_pdf_cdf is called. **np** is used in the calculation of the length of the reference vector.
Constraint: **np** ≥ 1.
- 3: **sizep** – Integer *Input*
On entry: the value of the variate, assumed to be a whole number, to which the probability in **p[0]** corresponds.
- 4: **distf** – Nag_DiscreteDistrib *Input*
On entry: **distf** indicates the type of information contained in **p**. If **distf** is **Nag_CDF**, **p** contains a cumulative distribution function (CDF); if **distf** is **Nag_PDF**, **p** contains a probability density function (PDF).
Constraint: **distf** = **Nag_PDF** or **Nag_CDF**.
- 5: **r** – double ** *Output*
On exit: reference vector for which memory will be allocated internally. If no memory is allocated to **r** (e.g., when an input error is detected) then **r** will be NULL on return, otherwise the user should use the NAG macro **NAG_FREE** to free the storage allocated by **r** when it is no longer of use.
- 6: **fail** – NagError * *Input/Output*
The NAG error parameter (see the Essential Introduction).

5 Error Indicators and Warnings

NE_BAD_PARAM

On entry, parameter **distf** had an illegal value.

NE_INT_ARG_LT

On entry, **np** must not be less than 1: **np** = *<value>*.

NE_ALLOC_FAIL

Memory allocation failed.

NE_PROB_NOT_ONE

The total probability is not 1, may be due to rounding errors, total probability = *<value>*.

NE_ALL_PROB_ZERO

All the probabilities in array **p** are zero.

NE_NEG_PROB

At least one of the probabilities in array **p** is negative, **p**[*<value>*] = *<value>*.

NE_NOT_INCREASING

distf = **Nag_CDF** and the sequence **p** is not increasing: **p**[*i* - 1] = *<value>*, **p**[*i*] = *<value>*.

6 Further Comments

6.1 Accuracy

Not applicable.

6.2 References

Kendall M G and Stuart A (1969) *The Advanced Theory of Statistics (Volume 1)* Griffin (3rd Edition)

Knuth D E (1981) *The Art of Computer Programming (Volume 2)* Addison-Wesley (2nd Edition)

7 See Also

nag_random_init_repeatable (g05cbc)

nag_random_init_nonrepeatable (g05ccc)

nag_return_discrete (g05eyc)

8 Example

The example program sets up a reference vector for a distribution whose CDF, $f(n)$, is defined as follows:

n	$f(n)$
0	0.0
1	0.1
2	0.2
3	0.4
4	0.5
5	0.6
6	0.8
7	0.9
8	1.0
9	1.0

It then prints the first five pseudo-random numbers generated by `nag_ref_vec_discrete_pdf_cdf`, after initialisation by `nag_random_init_repeatabl` (`g05cbc`).

8.1 Program Text

```

/* nag_ref_vec_discrete_pdf_cdf(g05exc) Example Program
 *
 * Copyright 1991 Numerical Algorithms Group.
 *
 * Mark 2, 1991.
 *
 * Mark 3 revised, 1994.
 */

#include <nag.h>
#include <stdio.h>
#include <nag_stdlib.h>
#include <nagg05.h>

#define NP 10

main()
{
    static double p[NP] = {0.0, 0.1, 0.2, 0.4, 0.5, 0.6, 0.8, 0.9, 1.0, 1.0};
    Integer i, x;
    double *r;

    Vprintf("g05exc Example Program Results\n");
    g05cbc((Integer)0);
    g05exc(p, (Integer)NP, (Integer)0, Nag_CDF, &r, NAGERR_DEFAULT);
    for (i=1; i<=5; i++)
    {
        x = g05eyc(r);
        Vprintf("%5ld\n",x);
    }
    NAG_FREE(r);
    exit(EXIT_SUCCESS);
}

```

8.2 Program Data

None.

8.3 Program Results

g05exc Example Program Results

6
3
3
3
7
