

nag_ref_vec_poisson (g05ecc)

1. Purpose

nag_ref_vec_poisson (g05ecc) sets up the reference vector **r** for a Poisson distribution with mean t .

2. Specification

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

```
void nag_ref_vec_poisson(double t, double **r, NagError *fail)
```

3. Description

This sets up a reference vector for use in **nag_return_discrete (g05eyc)**. Together these routines produce random numbers from the Poisson distribution defined by:

$$\begin{aligned} P(I = i) &= \frac{t^i e^{-t}}{i!} && \text{if } i = 0, 1, \dots \\ P(I = i) &= 0 && \text{otherwise.} \end{aligned}$$

The reference array is found using a recurrence relation if t is less than 50 and by Stirling's formula otherwise.

4. Parameters

t

Input: the mean, t , of the distribution.
Constraint: $t \geq 0$.

r

Output: 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.

fail

The NAG error parameter, see the Essential Introduction to the NAG C Library.

5. Error Indications and Warnings

NE_REAL_ARG_LT

On entry, **t** must not be less than 0.0: **t** = $\langle value \rangle$.

NE_ALLOC_FAIL

Memory allocation failed.

6. Further Comments

6.1. Accuracy

Not applicable.

6.2. References

Kendall M G and Stuart A (1969) *The Advanced Theory of Statistics (Vol 1)* (3rd Edn) Griffin.
Knuth D E (1981) *The Art of Computer Programming (Vol 2)* (2nd Edn) Addison-Wesley.

7. See Also

nag_random_init_repeatable (g05cbc)
nag_random_init_nonrepeatable (g05ccc)
nag_random_exp (g05dbc)
nag_random_normal (g05ddc)
nag_ref_vec_binomial (g05edc)
nag_return_discrete (g05eyc)

8. Example

The example program sets up a reference for a Poisson distribution with mean 2.7 and then prints the first five pseudo-random numbers generated by nag_return_discrete (g05eyc), after initialisation by nag_random_init_repeatable (g05cbc).

8.1. Program Text

```
/* nag_ref_vec_poisson(g05ecc) 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>

main()
{
    Integer i, x;
    double *r;
    double t = 2.7;

    Vprintf("g05ecc Example Program Results\n");
    g05cbc((Integer)0);
    g05ecc(t, &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

```
g05ecc Example Program Results
 4
 1
 2
 1
 5
```
