NAG C Library Function Document

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

```c
#include <nag.h>
#include <nag05.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:

\[
P(\lambda = i) = \frac{\lambda^i e^{-\lambda}}{i!} \quad \text{if } i = 0, 1, \ldots
\]

\[
P(\lambda = i) = 0 \quad \text{otherwise.}
\]

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

4 Parameters

1: \( t \) – double \hspace{1cm} \text{Input}

\text{On entry: the mean, } t, \text{ of the distribution.}

\text{Constraint: } t \geq 0.

2: \( r \) – double ** \hspace{1cm} \text{Output}

\text{On exit: reference vector for which memory will be allocated internally. If no memory is allocated to } r \text{ (e.g., when an input error is detected) then } r \text{ will be NULL on return, otherwise the user should use the NAG macro NAG_FREE to free the storage allocated by } r \text{ when it is no longer of use.}

3: \( \text{fail} \) – NagError * \hspace{1cm} \text{Input/Output}

The NAG error parameter (see the Essential Introduction).

5 Error Indicators and Warnings

NE_REAL_ARG_LT

\text{On entry, } t \text{ must not be less than } 0.0: t = <value>.

NE_ALLOC_FAIL

\text{Memory allocation failed.}

6 Further Comments

6.1 Accuracy

Not applicable.
6.2 References

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 */
* *
* *
* *
* 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