

NAG Toolbox for MATLAB

g05lc

1 Purpose

g05lc generates a vector of pseudo-random numbers taken from a χ^2 -distribution with ν degrees of freedom.

2 Syntax

```
[x, iseed, ifail] = g05lc(df, n, igen, iseed)
```

3 Description

The distribution has PDF (probability density function)

$$f(x) = \frac{x^{\frac{1}{2}\nu-1} \times e^{-x/2}}{2^{\frac{1}{2}\nu} \times (\frac{1}{2}\nu - 1)!} \quad \text{if } x > 0;$$

$$f(x) = 0 \quad \text{otherwise.}$$

This is the same as a gamma distribution with parameters $\frac{1}{2}\nu$ and 2.

One of the initialization functions g05kb (for a repeatable sequence if computed sequentially) or g05kc (for a non-repeatable sequence) must be called prior to the first call to g05lc.

4 References

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

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

5 Parameters

5.1 Compulsory Input Parameters

1: **df** – int32 scalar

ν , the number of degrees of freedom of the distribution.

Constraint: **df** ≥ 1 .

2: **n** – int32 scalar

n , the number of pseudo-random numbers to be generated.

Constraint: **n** ≥ 0 .

3: **igen** – int32 scalar

Must contain the identification number for the generator to be used to return a pseudo-random number and should remain unchanged following initialization by a prior call to g05kb or g05kc.

4: **iseed(4)** – int32 array

Contains values which define the current state of the selected generator.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **x(*)** – **double array**

Note: the dimension of the array **x** must be at least $\max(1, \mathbf{n})$.

The n pseudo-random numbers from the specified χ^2 -distribution.

2: **iseed(4)** – **int32 array**

Contains updated values defining the new state of the selected generator.

3: **ifail** – **int32 scalar**

0 unless the function detects an error (see Section 6).

6 Error Indicators and Warnings

Errors or warnings detected by the function:

ifail = 1

On entry, **df** < 1.

ifail = 2

On entry, **n** < 0.

7 Accuracy

Not applicable.

8 Further Comments

The time taken by g05lc increases with ν .

9 Example

```
df = int32(5);
n = int32(5);
igen = int32(1);
iseed = [int32(1762543);
         int32(9324783);
         int32(42344);
         int32(742355)];
[x, iseedOut, ifail] = g05lc(df, n, igen, iseed)
```

```
x =
    2.0097
   13.6994
    3.8964
    3.0941
    8.0579
iseedOut =
    2192183
   10954283
    67092
   9684925
```

```
ifail =  
      0
```
