NAG Toolbox

nag_rand_dist_weibull (g05ss)

1 Purpose

nag_rand_dist_weibull (g05ss) generates a vector of pseudorandom numbers from a two parameter Weibull distribution with shape parameter a and scale parameter b.

2 Syntax

```
[state, x, ifail] = nag_rand_dist_weibull(n, a, b, state)
[state, x, ifail] = g05ss(n, a, b, state)
```

3 Description

The distribution has PDF (probability density function)

$$f(x) = \frac{a}{b}x^{a-1}e^{-x^a/b} \quad \text{if } x > 0,$$

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

nag_rand_dist_weibull (g05ss) returns the value $(-b\ln y)^{1/a}$, where y is a pseudorandom number from a uniform distribution over $(0, 1]$.

One of the initialization functions nag_rand_init_repeat (g05kf) (for a repeatable sequence if computed sequentially) or nag_rand_init_nonrepeat (g05kg) (for a non-repeatable sequence) must be called prior to the first call to nag_rand_dist_weibull (g05ss).

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: **n** – INTEGER

n, the number of pseudorandom numbers to be generated.

Constraint: $\mathbf{n} \geq 0$.

2: **a** – REAL (KIND=nag_wp)

a, the shape parameter of the distribution.

Constraint: $\mathbf{a} > 0.0$.

3: **b** – REAL (KIND=nag_wp)

b, the scale parameter of the distribution.

Constraint: $\mathbf{b} > 0.0$.

4: **state**(:) – INTEGER array

Note: the actual argument supplied **must** be the array **state** supplied to the initialization routines nag_rand_init_repeat (g05kf) or nag_rand_init_nonrepeat (g05kg).

Contains information on the selected base generator and its current state.

5.2 Optional Input Parameters

None.

5.3 Output Parameters

1: **state**(:) – INTEGER array

Contains updated information on the state of the generator.

2: **x**(**n**) – REAL (KIND=nag_wp) array

The n pseudorandom numbers from the specified Weibull distribution.

3: **ifail** – INTEGER

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

6 Error Indicators and Warnings

Errors or warnings detected by the function:

ifail $= 1$

Constraint: **n** ≥ 0.

ifail $= 2$

Constraint: **a** > 0.0.

ifail $= 3$

Constraint: **b** > 0.0.

ifail $= 4$

On entry, **state** vector has been corrupted or not initialized.

ifail $= -99$

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

ifail $= -399$

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

ifail $= -999$

Dynamic memory allocation failed.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

This example prints the first five pseudorandom numbers from a Weibull distribution with shape parameter 1.0 and scale parameter 2.0, generated by a single call to nag_rand_dist_weibull (g05ss), after initialization by nag_rand_init_repeat (g05kf).

9.1 Program Text

```
     function g05ss_example

fprintf('g05ss example results\n\n');

% Initialize the base generator to a repeatable sequence
seed  = [nag_int(1762543)];
genid = nag_int(1);
subid = nag_int(1);
[state, ifail] = g05kf( ...
                        genid, subid, seed);

% Number of variates
n = nag_int(5);

% Parameters
a = 1;
b = 2;

% Generate variates from Weibull distribution
[state, x, ifail] = g05ss( ...
                           n, a, b, state);

disp('Variates');
disp(x);
```

9.2 Program Results

```
     g05ss example results

Variates
    0.9039
    4.4796
    0.5860
    0.4506
    4.5154
```