

NAG Toolbox for MATLAB

g05dj

1 Purpose

g05dj returns a pseudo-random real number taken from a Student's t -distribution with n degrees of freedom.

2 Syntax

```
[result, ifail] = g05dj(n)
```

3 Description

The distribution has PDF (probability density function)

$$f(x) = \frac{\left(\frac{n-1}{2}\right)!}{\left(\frac{1}{2}n - 1\right)! \sqrt{\pi n} \left(1 + \frac{x^2}{n}\right)^{\frac{1}{2}(n+1)}}.$$

g05dj returns the value

$$y \sqrt{\frac{n}{z}}$$

where y is generated by g05dd from a Normal distribution with mean 0 and standard deviation 1.0, and z is generated by g05ff from a gamma distribution with parameters $\frac{1}{2}n$ and 2 (i.e., from a χ^2 -distribution with n degrees of freedom).

4 References

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

5 Parameters

5.1 Compulsory Input Parameters

1: **n** – int32 scalar

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

Constraint: $n \geq 1$.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **result** – double scalar

The result of the function.

2: **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, **n** < 1.

7 Accuracy

Not applicable.

8 Further Comments

The time taken by g05dj increases with *n*.

9 Example

```
n = int32(5);  
g05za('O');  
g05cb(int32(0));  
[result, ifail] = g05dj(n)
```

```
result =  
    0.9435  
ifail =  
        0
```