

nag_bessel_i0_scaled (s18cec)

1. Purpose

`nag_bessel_i0_scaled (s18cec)` returns a value of the scaled modified Bessel function $e^{-|x|}I_0(x)$.

2. Specification

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

```
double nag_bessel_i0_scaled(double x)
```

3. Description

This function evaluates an approximation to $e^{-|x|}I_0(x)$, where I_0 is a modified Bessel function of the first kind. The scaling factor $e^{-|x|}$ removes most of the variation in $I_0(x)$.

The function uses the same Chebyshev expansions as `nag_bessel_i0 (s18aec)`, which returns the unscaled value of $I_0(x)$.

4. Parameters

x

Input: the argument x of the function.

5. Error Indications and Warnings

None.

6. Further Comments

6.1. Accuracy

Relative errors in the argument are attenuated when propagated into the function value. When the accuracy of the argument is essentially limited by the **machine precision**, the accuracy of the function value will be similarly limited by at most a small multiple of the **machine precision**.

6.2. References

Abramowitz M and Stegun I A (1968) *Handbook of Mathematical Functions* Dover Publications, New York ch 9 p 374.

7. See Also

```
nag_bessel_i0 (s18aec)
nag_bessel_i1_scaled (s18cfc)
```

8. Example

The following program reads values of the argument x from a file, evaluates the function at each value of x and prints the results.

8.1. Program Text

```
/* nag_bessel_i0_scaled(s18cec) Example Program
 *
 * Copyright 1991 Numerical Algorithms Group.
 *
 * Mark 2 revised, 1992.
 */

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

```
#include <nag_stdlib.h>
#include <nags.h>

main()
{
    double x, y;

    /* Skip heading in data file */
    Vscanf("%*[\n]");
    Vprintf("s18cec Example Program Results\n");
    Vprintf("      x      y\n");
    while (scanf("%lf", &x) != EOF)
    {
        y = s18cec(x);
        Vprintf("%12.3e%12.3e\n", x, y);
    }
    exit(EXIT_SUCCESS);
}
```

8.2. Program Data

```
s18cec Example Program Data
      0.0
      0.5
      1.0
      3.0
      6.0
     10.0
    1000.0
     -1.0
```

8.3. Program Results

```
s18cec Example Program Results
      x      y
0.000e+00  1.000e+00
5.000e-01  6.450e-01
1.000e+00  4.658e-01
3.000e+00  2.430e-01
6.000e+00  1.667e-01
1.000e+01  1.278e-01
1.000e+03  1.262e-02
-1.000e+00  4.658e-01
```
