

NAG Toolbox for MATLAB

g07da

1 Purpose

g07da finds the median, median absolute deviation, and a robust estimate of the standard deviation for a set of ungrouped data.

2 Syntax

```
[y, xme, xmd, xsd, ifail] = g07da(x, 'n', n)
```

3 Description

The data consists of a sample of size n , denoted by $x_1, x_2, \dots, x_n$, drawn from a random variable X .

g07da first computes the median,

$$\theta_{\text{med}} = \text{med}_i\{x_i\},$$

and from this the median absolute deviation can be computed,

$$\sigma_{\text{med}} = \text{med}_i\{|x_i - \theta_{\text{med}}|\}.$$

Finally, a robust estimate of the standard deviation is computed,

$$\sigma'_{\text{med}} = \sigma_{\text{med}} / \Phi^{-1}(0.75)$$

where $\Phi^{-1}(0.75)$ is the value of the inverse standard Normal function at the point 0.75.

g07da is based upon (sub)program LTMDVV within the ROBETH library, see Marazzi 1987.

4 References

Huber P J 1981 *Robust Statistics* Wiley

Marazzi A 1987 Subroutines for robust estimation of location and scale in ROBETH *Cah. Rech. Doc. IUMSP, No. 3 ROB 1* Institut Universitaire de Médecine Sociale et Préventive, Lausanne

5 Parameters

5.1 Compulsory Input Parameters

1: **x(n)** – double array

The vector of observations, $x_1, x_2, \dots, x_n$.

5.2 Optional Input Parameters

1: **n** – int32 scalar

n , the number of observations.

Constraint: $n > 1$.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

- 1: **y(n) – double array**
The observations sorted into ascending order.
- 2: **xme – double scalar**
The median, θ_{med} .
- 3: **xmd – double scalar**
The median absolute deviation, σ_{med} .
- 4: **xsd – double scalar**
The robust estimate of the standard deviation, σ'_{med} .
- 5: **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

The computations are believed to be stable.

8 Further Comments

None.

9 Example

```
x = [13;  
     11;  
     16;  
     5;  
     3;  
     18;  
     9;  
     8;  
     6;  
     27;  
     7];  
[y, xme, xmd, xsd, ifail] = g07da(x)  
  
y =  
     3  
     5  
     6  
     7  
     8  
     9  
    11  
    13
```

```
      16
      18
      27
xme =
      9
xmd =
      4
xsd =
      5.9304
ifail =
           0
```
