NAG Toolbox for MATLAB

g01aj

1   Purpose

g01aj prints a histogram on a character printing device, allowing you control over size, positioning, and the range of data values included.

2   Syntax

```
[nstepx, nstepy, ispace, xmin, xmax, xstep, n1, multy, ifail] = g01aj(x,
nstepx, nstepy, itype, ispace, xmin, xmax, 'n', n)
```

3   Description

A histogram is printed using vertical bars consisting of * characters. The output is directed to the current advisory message unit. It may be redirected by a call to x04ab before calling g01aj.

The following options are available:

(a) inclusion of all data values, or only of those lying within a specified range;

(b) specification of the size of the histogram in the vertical and horizontal directions, and of positioning in the horizontal direction;

(c) calculation of frequencies or cumulative frequencies in the histogram.

The maximum and minimum data values used, the (integral) number of observations represented by each * in the histogram, and the step size per character position in the horizontal direction, are returned.

The histogram is headed FREQUENCY or CUM.FREQ. depending on the option selected. Each line is annotated with the minimum frequency which a bar reaching that line represents. The data maximum and minimum are printed under the histogram, unless either exceeds 9999.99 in modulus, in which case they are not printed (although they are still returned).

4   References

None.

5   Parameters

5.1   Compulsory Input Parameters

1:    **x(n) – double array**

The data values.

2:    **nstepx – int32 scalar**

The number of character positions to be used in the horizontal direction, i.e., the number of categories in the histogram.

3:    **nstepy – int32 scalar**

The number of character positions to be used in the vertical direction, i.e., the maximum height of a histogram bar.

4:    **itype – int32 scalar**

Indicates whether a histogram of frequencies or cumulative frequencies is required.

itype $= 0$ for frequencies.

itype $\neq 0$ for cumulative frequencies.

The second option effectively displays the distribution function of the data rather than the density function.

5: **ispace** – **int32 scalar**

Indicates how many spaces are to be inserted at the beginning of each output line.

If **ispace** < 0 on input, **ispace** $= 0$ is used

If **ispace** $+$ **nstepx** $+ 14 > 120$, then **ispace** $= 0$ is used.

The second condition imposes an effective line length limit of 120 characters.

6: **xmin** – **double scalar**
7: **xmax** – **double scalar**

If **xmin** $<$ **xmax**, only those values in **x** such that **xmin** $\leq$ **x**$(i) \leq$ **xmax**, for $i = 1, 2, \ldots, n$, are included in the histogram.

If **xmin** $\geq$ **xmax**, all the data are included.

5.2   Optional Input Parameters

1: **n** – **int32 scalar**

Default: The dimension of the array **x**.

the number of data values.

Constraint: **n** ≥ 1.

5.3   Input Parameters Omitted from the MATLAB Interface

None.

5.4   Output Parameters

1: **nstepx** – **int32 scalar**

If **nstepx** < 10 on entry, **nstepx** is reset to 10.

If **nstepx** > 99 on entry, **nstepx** is reset to 99.

Otherwise, **nstepx** is unchanged on exit.

2: **nstepy** – **int32 scalar**

If **nstepy** < 10 on entry, **nstepy** is reset to 10.

If **nstepy** > 99 on entry, **nstepy** is reset to 99.

Otherwise, **nstepy** is unchanged on exit.

3: **ispace** – **int32 scalar**

Unchanged unless **ispace** < 0 or **ispace** $+$ **nstepx** $+ 14 > 120$, in which case **ispace** is set to 0.

4: **xmin** – **double scalar**
5: **xmax** – **double scalar**

If **xmin** $<$ **xmax** on entry, then **xmin** and **xmax** are unchanged.

If **xmin** $\geq$ **xmax** then **xmin** and **xmax** contain the minimum and maximum data values respectively.

6: **xstep – double scalar**

The width of each class interval.

7: **n1 – int32 scalar**

The total number of observations actually included in the histogram.

8: **multy – int32 scalar**

The number of observations represented by each * in the histogram.

9: **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, $\mathbf{n} < 1$.

7   Accuracy

Accuracy is limited by the number of plotting positions available.

8   Further Comments

The time taken by g01aj increases with **n**, **nstepx** and **nstepy**.

A total of $(\mathbf{nstepx} + \mathbf{ispace} + 14)$ character positions are used in the horizontal direction, not including the carriage control character. It is important that this total does not exceed the maximum line length available on the output device.

A total of $(\mathbf{nstepy} + 3)$ output lines are normally generated, one less if **xmin** and/or **xmax** is too large in modulus to be printed.

9   Example

```
x = [2.68;
     8.23;
     0.11;
     1.39;
     -2.77;
     -1.17;
     3.49;
     7.39;
     5.22;
     5.44;
     7.06;
     6.17;
     -4.44;
     5.98;
     14.02;
     8.06;
     10.96;
     0.99;
     7.87;
     4.85;
     9.76;
```

```
      3.3;
      4.45;
      7.02;
      5.43;
      3.57;
      1.98;
      3.09;
     -2.66;
      5.04;
     14.52;
     -0.61;
      5.04;
      6.85;
      3.94;
      4.87;
      3.82;
      5.93;
      7.89;
      9.48;
      6.81;
      6.91;
      7.76;
      6.21;
      0.55;
     -2.44;
     18.09;
      6.19;
      9.19;
     10.55];
nstepx = int32(10);
nstepy = int32(10);
itype = int32(0);
ispace = int32(10);
xmin = 0;
xmax = 0;
[nstepxOut, nstepyOut, ispaceOut, xminOut, xmaxOut, xstep, n1, multy,
ifail] = ...
    g01aj(x, nstepx, nstepy, itype, ispace, xmin, xmax)
```

```
FREQUENCY
                20  .           .   20
                18  .           .   18
                16  .           .   16
                14  .           .   14
                12  .     *     .   12
                10  .    **     .   10
                 8  .   ***     .    8
                 6  .   ***     .    6
                 4  .* *****    .    4
                 2  .******* * .    2
                    ------------
                  -4.44     18.09
nstepxOut =
          10
nstepyOut =
          10
ispaceOut =
          10
xminOut =
    -4.4400
xmaxOut =
    18.0900
xstep =
     2.2530
n1 =
          50
multy =
           2
ifail =
           0
```