

Package ‘XRSCC’

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Type Package

Title Statistical Quality Control Simulation

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Description This is a set of statistical quality control functions, that allows plotting control charts and its iterations, process capability for variable and attribute control, highlighting the `xrs_gr()` function, like a first iteration for variable chart, meanwhile the `we_rules()` function detects non random patterns in sample.

License GPL (>= 2)

LazyData TRUE

Imports stats, graphics, utils, grDevices

NeedsCompilation no

Repository CRAN

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R topics documented:

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| | |
|---------------|--|
| XRSCC-package | <i>Calculates and plots variable and attributes control charts</i> |
|---------------|--|

Description

Calculates the control limits for each type of variable or attribute control chart, then using an iteration to get the true control limits

Details

Package: XRSCC
 Type: Package
 Version: 0.1
 Date: 2016-05-04
 License: GPL

Author(s)

Erick Marroquin
 Maintainer: Erick Marroquin <ericksuhel@gmail.com>

| | |
|--------|-------------------------|
| Beta.X | <i>X chart OC Curve</i> |
|--------|-------------------------|

Description

Calculates and plots the risk of not detecting shifts and the Average Run Length

Usage

Beta.X(k,n)

Arguments

| | |
|---|---|
| k | A numeric vector, of length one, is the k standard deviations factor since the known mean |
| n | An integer, equal the sample size |

Value

| | |
|------|------------------------------|
| beta | risk of not detecting shifts |
| ARL | Average Run Length |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[xrs_gr](#)

Examples

```
Beta.X(k=1, n=5)
Beta.X(k=0.5, n=5)
Beta.X(k=1, n=3)
```

| | |
|---------|--------------------------------|
| bottles | <i>Defetive bottles sample</i> |
|---------|--------------------------------|

Description

The data give the number of defective bottles in a fixed sample size

Usage

```
data(bottles)
```

Format

A data frame with 80 observations on the following variable.

D a numeric vector of integer number of defective bottles

Examples

```
data(bottles)
require(XRSCC)
p_gr(bottles, n=100)
```

| | |
|---------|------------------------------------|
| clothes | <i>Defective number per sample</i> |
|---------|------------------------------------|

Description

The data give a defectives number in a clothes process

Usage

```
data(clothes)
```

Format

A data frame with 90 observations on the following variable.

c a numeric vector of integer number of nonconformities in a sample

Examples

```
require(XRSCC)
data(clothes)
c_gr(clothes)
```

| | |
|----------|----------------------------------|
| clothes2 | <i>Defective number per unit</i> |
|----------|----------------------------------|

Description

The data give a nonconformities number in a clothes process in a variable sample

Usage

```
data(clothes2)
```

Format

A data frame with 90 observations and two variables.

d a numeric vector of integer number of nonconformities in a sample

n a numeric vector of sample size

Examples

```
require(XRSCC)
data(clothes2)
u_gr(clothes2)
```

Cp_X

*Calculates the process capability***Description**

Given a variable sample, the function calculates the process capability and, assuming a normal distribution of the X chart, after the true control limits were found.

Usage

```
Cp_X(prev.results, LES, LEI, mu)
```

Arguments

| | |
|--------------|---|
| prev.results | Is a list of previous results obtained by the <code>xrs_gr</code> function in the first iteration, or the results obtained in further iterations by the <code>X_it</code> function. |
| LES | A numeric vector of length one, containing the upper specification limit. |
| LEI | A numeric vector of length one, containing the lower specification limit. |
| mu | A numeric vector of length one, containing the average specification, if not exists, function takes the Control Limit of previous results. |

Details

The function stops for the lack of any arguments.

Value

| | |
|------------------------|---|
| Cp | The process capability index |
| Cpk | The process capability index in case is not centered |
| P.cp | The specification range percentage used by the control limits |
| X.sigma | The process standard deviation |
| Conclusion del proceso | A phrase to take conclusion about the process capability |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[xrs_gr](#) [X_it](#) [R_it](#) [we_rules](#)

Examples

```
data(vol_sample)
results1<-xrs_gr(vol_sample)
results2<-X_it(results1)
# Type dev.off() function before use Cp_X
Cp_X(results2, LES=510, LEI=490, mu=500)
```

c_gr

The c chart control for attributes

Description

Calculates the *c* control chart for attributes, using a sample *C* of number of nonconformities. The plotted values in graph are the nonconformities number on each sample at a regular time interval when there is not a standard given.

Usage

```
c_gr(C)
```

Arguments

C A data frame or a vector containing the number of nonconformities per sample. Note that the variable name must be the uppercase letter, like ***D***.

Value

| | |
|------------------------------|--|
| in.control | The <i>under control</i> row list for the <i>c</i> chart |
| out.control | The <i>out of control</i> row list for the <i>c</i> chart |
| Iteraciones | The number of iterations, in this function always will be the first and the last one |
| data.0 | The original data frame |
| data.1 | Subsetting the data frame with <i>under control</i> rows |
| bin | The binary values for <i>out of control</i> equal to one, and results <i>under control</i> equal to zero |
| Limites de Control Grafica c | The <i>c</i> chart control limits vector |
| Conclusion del proceso | The same results in a phrase as the <i>bin</i> values |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[p_gr](#), [np_gr](#), [u_gr](#), [P_it](#), [NP_it](#), [C_it](#), [U_it](#)

Examples

```
data(clothes)
c_gr(clothes)
```

C_it

Iteration of c control chart for attributes

Description

Calculates the iteration i 'th, for the control limits of c chart using the results obtained in [c_gr](#) and previous [C_it](#) iteration.

Usage

```
C_it(prev.results)
```

Arguments

`prev.results` Its a list of previous results obtained by the [c_gr](#) function. In other cases, needs more than one iteration, to obtain the true control limits, before take conclusions about the process.

Value

| | |
|---|---|
| <code>in.control</code> | The <i>under control</i> row list for the c chart |
| <code>out.control</code> | The <i>out of control</i> row list for the c chart |
| <code>Iteraciones</code> | The number of iterations, It is assumed to be the second or later |
| <code>data.0</code> | The original data frame or vector |
| <code>data.1</code> | The <i>under control</i> subset after iteration |
| <code>bin</code> | The binary values for <i>out of control</i> equal to one and <i>under control</i> equal to zero |
| <code>Limites de Control Grafica c</code> | The c chart control limits vector |
| <code>Conclusion del proceso</code> | The same results in a phrase as the <i>bin</i> values |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[p_gr](#), [np_gr](#), [u_gr](#), [c_gr](#), [P_it](#), [NP_it](#), [U_it](#)

Examples

```
data(clothes)
r1<-c_gr(clothes)
r2<-C_it(r1)
r3<-C_it(r2)
```

| | |
|-------|-------------------------------------|
| dato2 | <i>The piston hole length in mm</i> |
|-------|-------------------------------------|

Description

A sample containing piston hole length in mm

Usage

```
data(dato2)
```

Format

A data frame with 45 subgroup of 5 observations

n1 a numeric vector of length in mm

n2 a numeric vector of length in mm

n3 a numeric vector of length in mm

n4 a numeric vector of length in mm

n5 a numeric vector of length in mm

Examples

```
data(dato2)
require(XRSCC)
results1<-xrs_gr(dato2)
results2<-X_it(results1)
results3<-R_it(results2)
```

`factor.a`*Table: Factor for variable control charts*

Description

A data frame containing the factor for variable control charts calculations.

Usage

```
data(factor.a)
```

Format

A data frame with factors (ex: A2, d2, D4 and so on) for size groups from 2 to 25.

Source

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

Examples

```
data(factor.a)
```

`np_gr`*The np chart control for attributes*

Description

Calculates the *np* control chart for attributes, using a sample *D* of number of defectives or nonconforming items and a constant sample size *n*. The values plotted in graph are the defectives number.

Usage

```
np_gr(D, n)
```

Arguments

D A data frame containing the non conforming items, and must be integer and non negative.

n A vector of length one, integer and nonnegative, to fix the sample size.

Value

| | |
|-------------------------------|---|
| in.control | The <i>under control</i> row list for the <i>np</i> chart |
| out.control | The <i>out of control</i> row list for the <i>np</i> chart |
| Iteraciones | The number of iterations, in this function always will be the first and the last one |
| data.n | The fixed sample size |
| data.0 | The original data frame |
| data.1 | The filtered data frame |
| bin | The binary values for <i>out of control</i> equal to one and <i>under control</i> equal to zero |
| Limites de Control Grafica np | The <i>np</i> chart control limits vector |
| Conclusion del proceso | The same results in a phrase as the <i>bin</i> values |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[p_gr](#), [u_gr](#), [c_gr](#), [P_it](#), [NP_it](#), [C_it](#), [U_it](#)

Examples

```
data(bottles)
np_gr(bottles, n=100)
```

NP_it

Iteration of np control chart for attributes

Description

Calculates the iteration *i*'th for the control limits of *p* chart using the results obtained in [np_gr](#) or further [NP_it](#) iterations.

Usage

```
NP_it(prev.results)
```

Arguments

prev.results Is a list of previous results obtained by the `np_gr` function. In other cases, needs more than one iteration, to obtain the true control limits for *np* chart before take conclusions about the process.

Value

in.control The *under control* row list for the *np* chart in this iteration

out.control The *out of control* row list for the *np* chart

Iteraciones The number of iterations, It is assumed to be the second or later

data.n The fixed sample size

data.0 The original data frame

data.1 The *under control* subset after iteration

bin The binary values for *out of control* equal to one and *under control* equal to zero

Limites de Control Grafica np
 The *np* chart control limits vector

Conclusion del proceso
 The same results in a phrase as the *bin* values

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[p_gr](#), [np_gr](#), [c_gr](#), [u_gr](#), [P_it](#), [C_it](#), [U_it](#)

Examples

```
data(bottles)
r1<-np_gr(bottles, n=100)
r2<-NP_it(r1)
r3<-NP_it(r2)
```

p_gr

*P control chart for attributes***Description**

Calculates the p control chart for attributes, using a sample D of number of defectives or non-conforming items and a constant sample size n . The values plotted in graph are the fractions p of defectives.

Usage

```
p_gr(D, n)
```

Arguments

| | |
|---|---|
| D | A data frame containing in one column the non conforming items, and must be integer and non negative. |
| n | A vector of length one, integer and nonnegative, to fix the sample size. |

Value

| | |
|------------------------------|---|
| in.control | The <i>under control</i> row list for the p chart |
| out.control | The <i>out of control</i> row list for the p chart |
| Iteraciones | The number of iterations, in this function always will be the first and the last one |
| data.n | The fixed sample size |
| data.0 | The original data frame |
| data.1 | The filtered data frame |
| bin | The binary values for <i>out of control</i> equal to one and <i>under control</i> equal to zero |
| Limites de Control Grafica p | The p chart control limits vector |
| Conclusion del proceso | The same results in a phrase as the <i>bin</i> values |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[P_it](#), [c_gr](#), [C_it](#), [np_gr](#), [NP_it](#), [u_gr](#), [U_it](#)

Examples

```
data(bottles)
p_gr(bottles, n=100)
```

P_it *Iteration of p control chart for attributes*

Description

Calculates the iteration i 'th for the control limits of p chart using the results obtained in `p_gr` or further `P_it` iterations.

Usage

```
P_it(prev.results)
```

Arguments

`prev.results` Is a list of previous results obtained by the `p_gr` function. In other cases, needs more than one iteration, to obtain the true control limits for p chart before take conclusions about the process.

Value

`in.control` The *under control* row list for the p chart in this iteration
`out.control` The *out of control* row list for the p chart
`Iteraciones` The number of iterations, It is assumed to be the second or later
`data.n` The fixed sample size
`data.0` The original data frame
`data.1` The *under control* subset after iteration
`bin` The binary values for *out of control* equal to one and *under control* equal to zero
`Limites de Control Grafica p`
The p chart control limits vector
`Conclusion del proceso`
The same results in a phrase as the *bin* values

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[p_gr](#), [c_gr](#), [C_it](#), [np_gr](#), [NP_it](#), [u_gr](#), [U_it](#)

Examples

```
data(bottles)
r1<-p_gr(bottles, n=100)
r2<-P_it(r1)
r3<-P_it(r2)
```

qqsugar

Sugar bags weights in pounds

Description

A sample containing weights of sugar bags

Usage

```
data(qqsugar)
```

Format

A data frame with 100 subgroup of ten observations

muestra1 a numeric vector of weights in pounds

muestra2 a numeric vector of weights in pounds

muestra3 a numeric vector of weights in pounds

muestra4 a numeric vector of weights in pounds

muestra5 a numeric vector of weights in pounds

muestra6 a numeric vector of weights in pounds

muestra7 a numeric vector of weights in pounds

muestra8 a numeric vector of weights in pounds

muestra9 a numeric vector of weights in pounds

muestra10 a numeric vector of weights in pounds

Examples

```
data(qqsugar)
require(XRSCC)
xrs_gr(qqsugar)
```

R_it *Calculates the i'th iteration R Chart*

Description

Calculates the iteration i'th for R chart, after the X chart is under control. The function estimates if any value (range) is out of control limits, and returns a values list.

Usage

```
R_it(prev.results)
```

Arguments

`prev.results` Is a list of previous results obtained by the `xrs_gr`, followed by `X_it` function if it is necessary. In other cases, needs more than one iteration to obtain the true control limits for R chart, before take conclusions about the process.

Details

The function stops if the R chart is under control already, and also stops if there is not any active graphic device.

Value

| | |
|-------------------------------------|---|
| <code>in.control</code> | The under control row list for the X chart |
| <code>R.in.control</code> | The <i>under control</i> row list for the R chart |
| <code>out.control</code> | The <i>out of control</i> row list for the X chart |
| <code>Iteraciones</code> | The number of iterations, It is assumed to be the second or later |
| <code>data.0</code> | The original data frame |
| <code>data.1</code> | The filtered data frame |
| <code>data.r.1</code> | The calculated ranges of data.0 |
| <code>bin</code> | The binary values for <i>out of control</i> equal to one and <i>under control</i> equal to zero, for X and R charts |
| <code>LX</code> | The X chart control limits vector |
| <code>LR</code> | The R chart control limits vector |
| <code>Limites Grafixa X</code> | The X chart control limits vector |
| <code>Limites Grafixa R</code> | The R chart control limits vector |
| <code>Conclusion del proceso</code> | The same results in a phrase as the <i>bin</i> values |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[xrs_gr](#) [X_it](#) [we_rules](#) [Cp_X](#)

Examples

```
data(dato2)
results1<-xrs_gr(dato2)
results2<-X_it(results1)
results3<-R_it(results2)
```

udata2

Defective number per unit

Description

The data give a nonconformities number on a clothes manufacturing process, the sample size is fixed.

Usage

```
data(udata2)
```

Format

A data frame with 90 observations and two variables.

d a numeric vector of integer number of nonconformities in a sample

n a numeric vector of sample size

Examples

```
require(XRSCC)
data(udata2)
u_gr(udata2)
```

u_gr

The u chart control for attributes

Description

Calculates the u control chart for attributes, given a variable sample n and a number of nonconformities u per sample. The plotted values in graph are the average number of nonconformities per unit.

Usage

u_gr(U)

Arguments

U A data frame containing the number d of nonconformities per sample, the sample n can be variable. Note that the variable names must be lowercase letter, say d and n .

Value

| | |
|------------------------------|---|
| in.control | The <i>under control</i> row list for the u chart |
| out.control | The <i>out of control</i> row list for the u chart |
| Iteraciones | The number of iterations, in this function always will be the first and the last one |
| data.0 | The original data frame |
| data.1 | Subsetting the data frame with <i>under control</i> rows |
| bin | The binary values for <i>out of control</i> equal to one and <i>under control</i> equal to zero |
| Limites de Control Grafica u | The u chart control limits vector |
| Conclusion del proceso | The same results in a phrase as the <i>bin</i> values |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[p_gr](#), [np_gr](#), [c_gr](#), [P_it](#), [NP_it](#), [C_it](#), [U_it](#)

Examples

```
data(udata2)
u_gr(udata2)
```

U_it

Iteration of u control chart for attributes

Description

Calculates the iteration i 'th for the control limits of c chart using the results obtained in `c_gr` and previous `U_it` iteration.

Usage

```
U_it(prev.results)
```

Arguments

`prev.results` Is a list of previous results obtained by the `u_gr` function. In other cases, needs more than one iteration, to obtain the true control limits for u chart before take conclusions about the process.

Value

`in.control` The *under control* row list for the u chart
`out.control` The *out of control* row list for the u chart
`Iteraciones` The number of iterations, in this function always will be the first and the last one
`data.0` The original data frame
`data.1` Subsetting the data frame with *under control* rows
`bin` The binary values for *out of control* equal to one and *under control* equal to zero
`Limites de Control Grafica u`
The u chart control limits vector
`Conclusion del proceso`
The same results in a phrase as the *bin* values

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

`p_gr`, `np_gr`, `c_gr`, `u_gr`, `P_it`, `NP_it`, `C_it`

Examples

```
data(udata2)
r1<-u_gr(udata2)
r2<-U_it(r1)
```

| | |
|------------|---------------------|
| vol_sample | <i>Volume in ml</i> |
|------------|---------------------|

Description

A volume sample in milliliters

Usage

```
data(vol_sample)
```

Format

A data frame with 100 subgroup of five observations

n1 a numeric vector of volume

n2 a numeric vector of volume

n3 a numeric vector of volume

n4 a numeric vector of volume

n5 a numeric vector of volume

Examples

```
data(vol_sample)
require(XRSCC)
xrs_gr(vol_sample)
```

| | |
|----------|---|
| we_rules | <i>Estimates the first four Western Electric Rules for detecting patterns</i> |
|----------|---|

Description

Estimates the first four Western Electric Rules for detecting patterns, starting with under control X chart obtained in the sequence `xrs_gr`, `X_it`, `R_it` functions. At the same time, plots the X chart including the zones above and below the central limit. For last, a binary value for each rule is presented if at least one rule is violated, '1' for 'yes', 0 for 'no'.

Usage

```
we_rules(prev.results)
```

Arguments

prev.results Its a list of previous results obtained by the `xrs_gr` function in the first iteration, or a list of results obtained in further iterations by the `X_it`, and if necessary by the `R_it` function.

Details

The previous results may say that the process is under control, but, it's a conclusion concerning the first Western Electric rule only.

Value

Resultados de analisis

A phrarse saying the process is or not under control

Las siguientes reglas tienen al menos un grupo que viola la regla

The conclusion about the Western Electric rules from 1 to 4, showing a binary response, '1' for 'yes', 0 for 'no'.

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

SMALL, Bonnie B. (1956) *Statistical Quality Control Handbook*, 2th ed. Easton : Western Electric Co, Inc.

yhat *The Yhat Blog. Machine Learning, Data Science, Engineering*, [On line] <http://blog.yhathq.com/posts/quality-control-in-r.html>

See Also

[xrs_gr](#), [X_it](#), [R_it](#), [Cp_X](#)

Examples

```
data(qqsugar)
results1<-xrs_gr(qqsugar)
results2<-R_it(results1)
we_rules(results2)
```

xrs_gr

Calculate and plot the X, R and S Charts for variable charts

Description

Calculates the control limits for X, R and S charts, using a data frame with a fixed subgroup size. Plots the corresponding graph, the function estimates if any value is out of the control limits, returns a list with calculations.

Usage

```
xrs_gr(X)
```

Arguments

X A sample in a dataframe object, with m rows like subgroups, and n columns like sample size.

Value

| | |
|------------------------|--|
| in.control | The <i>under control</i> row list for the X chart |
| R.in.control | The <i>under control</i> row list for the R chart |
| out.control | The <i>out of control</i> row list for the X chart |
| Iteraciones | The iterations number, the firsts and the last one on this function |
| data.0 | The original data frame |
| data.1 | The <i>under control</i> subset after iteration |
| data.r.1 | The calculated ranges of data.0 |
| bin | The binary values for <i>out of control</i> equal to one and <i>under control</i> equal to zero, for X, R and S charts |
| LX | The X chart control limits vector |
| LR | The R chart control limits vector |
| LS | The S chart control limits vector |
| Limites Grafixa X | The X chart control limits vector |
| Limites Grafixa R | The R chart control limits vector |
| Limites Grafixa S | The S chart control limits vector |
| Conclusion del proceso | The same results in a phrase as the <i>bin</i> values |

Author(s)

Erick Marroquin

References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control*, 5th ed. New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[X_it](#), [we_rules](#), [R_it](#), [Cp_X](#), [Beta.X](#)

Examples

```
data(vol_sample)
results1<-xrs_gr(vol_sample)
```

| | |
|------|--|
| X_it | <i>Calculates the iteration i'th X Chart</i> |
|------|--|

Description

With the results of [xrs_gr](#) followed by previous [X_it](#) iterations, the function calculates the X control limits charts, using a data frame with a fixed subgroup size n . In the graph plotting, the function estimates if any value (row or subgroup average) is out of control limits, and returns a list with calculations. Also, gives the R chart and control limits, which will be used in [R_it](#) function.

Usage

```
X_it(prev.results)
```

Arguments

`prev.results` Is a list of previous results obtained by the [xrs_gr](#) function in the first iteration, or a list of results obtained in further iterations by the [X_it](#) function.

Details

The function stops if the X chart is under control already, and also stops if there is not any active graphic device.

Value

| | |
|---------------------------|--|
| <code>in.control</code> | The <i>under control</i> row list for the X chart |
| <code>R.in.control</code> | The <i>under control</i> row list for the R chart |
| <code>out.control</code> | The <i>out of control</i> row list for the X chart |
| <code>Iteraciones</code> | The iterations number, It is assumed to be the second or later |
| <code>data.0</code> | The original data frame |
| <code>data.1</code> | The <i>under control</i> subset after iteration |
| <code>data.r.1</code> | The calculated ranges of data.0 |

| | |
|------------------------|---|
| bin | The binary values for <i>out of control</i> equal to one and <i>under control</i> equal to zero, for X and R charts |
| LX | The X chart control limits vector |
| LR | The R chart control limits vector |
| Limites Grafixa X | The X chart control limits vector |
| Limites Grafixa R | The R chart control limits vector |
| Conclusion del proceso | The same results in a phrase as the <i>bin</i> values |

Note

For the true Range control limits calculation, use [R_it](#).

Author(s)

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References

Montgomery, D.C. (2005) *Introduction to Statistical Quality Control, 5th ed.* New York: John Wiley & Sons, ISBN 0-471-65631-3

See Also

[xrs_gr](#), [R_it](#), [Cp_X](#), [we_rules](#)

Examples

```
data(vol_sample)
results1<-xrs_gr(vol_sample)
results2<-X_it(results1)
```

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