

# Package ‘IAcsSPCR’

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**Title** Data and Functions for ``An Intro. to Accept. Samp. & SPC/R''

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## Contents

arl . . . . .	2
DrugI . . . . .	3
DrugIn . . . . .	3
Frame . . . . .	4
GVcontrol . . . . .	5
Lowry . . . . .	6
MEWMA . . . . .	6
Ryan92 . . . . .	7

Sample . . . . .	8
x1 . . . . .	9
x2 . . . . .	9
Xnew . . . . .	10

<b>Index</b>	<b>11</b>
--------------	-----------

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arl	<i>ARL for Lucas's Cusum Chart for Attribute Data</i>
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### Description

Calculates ARL for Lucas's Cusum Chart for Attribute Data

### Usage

```
arl(h=2,k=2,lambda=1,shift=.5)
```

### Arguments

h	input - this is the decision limit. It should be an even number, so that h/2 for the FIR feature will also be an integer.
k	input - this is the reference value. It should be calculated as $(\mu_d - \mu_a) / \ln(\mu_d / \mu_a)$ , where $\mu_a$ is the in-control Poisson mean and $\mu_d$ mean to detect. k should be rounded to an integer.
lambda	input - this is the in-control Poisson mean.
shift	input - this is the number of standard deviation shift from the in-control mean to the mean to detect , i.e., $\lambda + \text{shift} * \sqrt{\lambda} = \mu_d$ .

### Value

returned list containing the ARL and the ARL with FIR.

### Author(s)

John Lawson

### References

Lucas, J.M.(1985) "Counted data cusums", Technometrics, Vol. 27, No. 2, pp129-143.

### Examples

```
library(IAcSPCR)
arl(h=6,k=2,lambda=1.88,shift=0)
arl(h=6,k=2,lambda=1.88,shift=.9627)
{
}
```

---

DrugI

*Drug Impurities data - Phase I*

---

**Description**

Data from M. Gonzales-de la Parra & P. Rodriguez-Loaiza "Application of the Multivariate T2 Chart and the Mason-Tracy-Young Decomposition Procedure to Study the Consistency of Impurity profiles of Drug Substances"

**Usage**

```
data(DrugI)
```

**Format**

A data frame with 30 observations on the following 6 variables.

observation a numeric vector containing observation numbers from 1 to 30

A a numeric vector containing values of impurity A in ppm

B a numeric vector containing values of impurity B in ppm

D a numeric vector containing values of impurity D in ppm

E a numeric vector containing values of impurity E in ppm

G a numeric vector containing values of impurity G in ppm

**Examples**

```
data(DrugI)
```

---

DrugIn

*Drug Impurities data - Phase II*

---

**Description**

Data from M. Gonzales-de la Parra & P. Rodriguez-Loaiza "Application of the Multivariate T2 Chart and the Mason-Tracy-Young Decomposition Procedure to Study the Consistency of Impurity profiles of Drug Substances"

**Usage**

```
data(DrugIn)
```

**Format**

A data frame with 10 observations on the following 6 variables.

observation a numeric vector containing observation numbers from 1 to 10

A a numeric vector containing values of impurity A in ppm

B a numeric vector containing values of impurity B in ppm

D a numeric vector containing values of impurity D in ppm

E a numeric vector containing values of impurity E in ppm

G a numeric vector containing values of impurity G in ppm

**Examples**

```
data(DrugIn)
```

---

Frame

*Example multivariate data*

---

**Description**

Generated data

**Usage**

```
data(Frame)
```

**Format**

A data frame with 100 observations on the following 4 variables.

subgroup a numeric vector containing subgroup numbers from 1 to 10

V2 a numeric vector containing values of quality characteristic x1

V3 a numeric vector containing values of quality characteristic x2

V4 a numeric vector containing values of quality characteristic x3

**Examples**

```
data(Frame)
```

---

`GVcontrol`*Control Chart for the generalized variance |S|*

---

**Description**

This function makes a control chart of the generalized variance, |S|.

**Usage**

```
GVcontrol(DF, m, n, p)
```

**Arguments**

DF	input - this is dataframe containing the subgrouped multivariate data. One line for each observation and one column for each variable or quality characteristic being monitored. The first column is a subgroup indicator numbered from 1 to m, with n repeats of each. There should be m x n rows and p + 1 columns.
m	input this is the number of observations in each subgroup
n	input this is the known (or estimate from a Phase I study) mean vector of the variables
p	input this is the number of quality characteristics

**Value**

returned list containing the upper control limit, the covariance matrix (S), the generalized variance (|S|), the mean vector (mu), and a vector of the generalized variances (|S<sub>i</sub>|, i=1,2,...m) within each subgroup.

**Author(s)**

John Lawson

**References**

Alt, F. B. (1985) "Multivariate Quality Control", Encyclopedia of Statistical Sciences, Vol. 6 Editors N. L. Johnson and S. Kotz, John Wiley and Sons, N. Y.

**Examples**

```
library(IAcSPCR)
data(Ryan92)
GVcontrol(Ryan92, 20, 4, 2)
{
}
```

---

Lowry

*Phase I multivariate data from Lowry, Woodall, Champ and Rigdon*

---

**Description**

Data from the Phase I multivariate data from Lowry, Woodall, Champ, and Rigdon

**Usage**

```
data(Lowry)
```

**Format**

A data frame with 10 observations on the following 2 variables.

x1 a numeric vector containing values of quality characteristic x1

x2 a numeric vector containing values of quality characteristic x2

**Source**

C. Lowry, W. Woodall, C. Champ, and S. Rigdon, "A Multivariate Exponentially Weighted Moving Average Control Chart", *Technometrics* (34),pp 46-53, 1992.

**Examples**

```
data(Lowry)
```

---

MEWMA

*Multivariate EWMA Control Chart*

---

**Description**

Computes a MEWMA using the method of Lowry, Woodall, Champ and Rigdon. The number of variables  $p$  must be between 2 and 10,  $r$  is fixed at .1

**Usage**

```
MEWMA(X, Sigma=NULL, mu=NULL, Sigma.known=TRUE)
```

**Arguments**

X	input - this is a matrix or data frame containing the multivariate data. One line for each observation and one column for each variable or quality characteristic being monitored.
Sigma	input this is the known (or estimate from a Phase I study) covariance matrix of the variables
mu	input this is the known (or estimate from a Phase I study) mean vector of the variables
Sigma.known	input this is a logical variable, if TRUE, Sigma, and mu must be supplied, if FALSE the function will estimate them from the data in X

**Value**

returned list containing the upper control limit, the covariance matrix and the mean vector.

**Author(s)**

John Lawson

**References**

Lowry, Woodall, Champ and Rigdon(1992)<<https://www.tandfonline.com/doi/abs/10.1080/00401706.1992.10485232>>

**Examples**

```
data(Lowry)
Sigma<-matrix(c(1, .5, .5, 1), nrow=2, ncol=2)
mu<-c(0,0)
MEWMA(Lowry,Sigma,mu,Sigma.known=TRUE)
MEWMA(Lowry,Sigma.known=FALSE)
mu5<-c(-.314, .32)
Sig5<-matrix(c(1.16893, -.3243, -.3243, 1.16893), nrow=2, ncol=2)
MEWMA(Lowry,Sig5,mu5,Sigma.known=TRUE)
```

---

Ryan92

*Phase I multivariate data from Ryan's Table 9.2*

---

**Description**

Data from the Phase I multivariate data from Ryan's Table 9.2 used in chapter 7 of An Introduction to Acceptance Sampling and SPC with R

**Usage**

```
data(Ryan92)
```

**Format**

A data frame with 80 observations on the following 2 variables.

subgroup a numeric vector containing subgroup numbers from 1 to 20

x1 a numeric vector containing values of quality characteristic x1

x2 a numeric vector containing values of quality characteristic x2

**Source**

Statistical Methods for Quality Improvement, by Thomas P. Ryan, John Wiley and Sons Inc.

**Examples**

```
data(Ryan92)
```

---

Sample

*Phase I multivariate data from Ryan's Table 9.2*

---

**Description**

Data for Exercise 2 Chapter 7 of An Introduction to Acceptance Sampling and SPC with R

**Usage**

```
data(Sample)
```

**Format**

A data frame with 125 observations on the following 5 variables.

subgroup a numeric vector containing subgroup numbers from 1 to 25

V1 a numeric vector containing values of quality characteristic V1

V2 a numeric vector containing values of quality characteristic V2

V3 a numeric vector containing values of quality characteristic V3

V4 a numeric vector containing values of quality characteristic V4

**Examples**

```
data(Sample)
```



---

x1

*Phase I data for exercise 7 Chapt 6*

---

**Description**

Data from Phase I

**Usage**

data(x2)

**Format**

A numeric vector of length 50.

x1 a numeric vector

**Examples**

data(x1)

---

x2

*Phase II data for exercise 7 Chapt 6*

---

**Description**

Data from Phase II

**Usage**

data(x2)

**Format**

A numeric vector of length 50.

x2 a numeric vector

**Examples**

data(x2)

---

Xnew

*Phase II for Ryan's Table 9.2*

---

**Description**

Data from the Phase II multivariate data for Ryan's Table 9.2 used in chapter 7 of An Introduction to Acceptance Sampling and SPC with R

**Usage**

```
data(Xnew)
```

**Format**

A data frame with 80 observations on the following 2 variables.

subgroup a numeric vector containing subgroup numbers from 1 to 20

x1 a numeric vector containing values of quality characteristic x1

x2 a numeric vector containing values of quality characteristic x2

**Examples**

```
data(Xnew)
```

# Index

## \* datasets

- DrugI, 3
- DrugIn, 3
- Frame, 4
- Lowry, 6
- Ryan92, 7
- Sample, 8
- x1, 9
- x2, 9
- Xnew, 10

## \* htest

- ar1, 2
- GVcontrol, 5
- MEWMA, 6

ar1, 2

DrugI, 3  
DrugIn, 3

Frame, 4

GVcontrol, 5

Lowry, 6

MEWMA, 6

Ryan92, 7

Sample, 8

x1, 9  
x2, 9  
Xnew, 10