Package ‘MPV’

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Title Data Sets from Montgomery, Peck and Vining
Version 1.63
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Description Most of this package consists of data sets from the textbook Introduction to Linear Regression Analysis, by Montgomery, Peck and Vining. All data sets from the 3rd edition are included and many from the 6th edition are also included. The package also contains some additional data sets and functions.
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**Description**

Graphs of confidence interval estimates for bias and standard deviation of bias-corrected local polynomial regression curve estimates.

**Usage**

```r
BCCIPlot(data, k1=1, k2=2, h, h2, output, g, layout, incl.biasplot, plotdata)
```

**Arguments**

- **data**
  A data frame, whose first column must be the explanatory variable and whose second column must be the response variable.

- **k1**
  Degree of local polynomial used in curve estimator.

- **k2**
  Degree of local polynomial used in bias estimator.

- **h**
  Bandwidth for regression estimator.

- **h2**
  Bandwidth for bias estimator.

- **output**
  If TRUE, numeric output is printed to the console window.

- **g**
  The target function, if known (for use in simulations).

- **layout**
  If TRUE, a 2x1 layout of plots is sent to the graphics device.

- **incl.biasplot**
  If TRUE, the confidence intervals for the bias of the uncorrected estimate are plotted.

- **plotdata**
  If TRUE, the data points are plotted as a scatter plot.
**Value**

A list containing the confidence interval limits, pointwise estimates of bias, standard deviation of bias, curve estimate, standard deviation of curve estimate, and approximate confidence limits for curve estimates. Graphs of the curve estimate confidence limits and the bias confidence limits.

**Author(s)**

W. John Braun and Wenkai Ma
BiasVarPlot

Local Polynomial Bias and Variability

Description

Graphs of confidence interval estimates for bias and standard deviation of in local polynomial regression curve estimates.

Usage

BiasVarPlot(data, k1=1, k2=2, h, h2, output=FALSE, g, layout=TRUE)

Arguments

data A data frame, whose first column must be the explanatory variable and whose second column must be the response variable.
k1 degree of local polynomial used in curve estimator.
k2 degree of local polynomial used in bias estimator.
h bandwidth for regression estimator.
h2 bandwidth for bias estimator.
output if true, numeric output is printed to the console window.
g the target function, if known (for use in simulations).
layout if true, a 2x1 layout of plots is sent to the graphics device.

Value

A list containing the confidence interval limits, pointwise estimates of bias, standard deviation of bias, curve estimate, standard deviation of curve estimate, and approximate confidence limits for curve estimates. Graphs of the curve estimate confidence limits and the bias confidence limits.

Author(s)

W. John Braun and Wenkai Ma
BioOxyDemand

**Biochemical Oxygen Demand**

**Description**

The BioOxyDemand data frame has 14 rows and 2 columns.

**Usage**

```r
data(BioOxyDemand)
```

**Format**

This data frame contains the following columns:

- `x` a numeric vector
- `y` a numeric vector

**Source**


**Examples**

```r
plot(BioOxyDemand)
summary(lm(y ~ x, data = BioOxyDemand))
```

bp

**Blood Pressure Measurements on a Single Adult Male**

**Description**

Systolic and diastolic blood pressure measurement readings were taken on a 56-year-old male over a 39 day period, sometimes in the mornings (AM) and sometimes in the evening (PM). Varying number of replicate measurements were taken at each time point.

**Usage**

```r
bp
```

**Format**

A data frame with 121 observations on the following 4 variables.

- `TimeofDay` factor with levels AM and PM
- `Date` numeric
- `Systolic` numeric
- `Diastolic` numeric
Examples

```r
require(lattice)
xyplot(Date ~ Diastolic|TimeofDay, groups=cut(Systolic, c(0, 130, 140, 200)), data = bp, col=c(3, 1, 2), pch=16)
matplot(bp[, c(3, 4)], type="l", lwd=2, ylab="Pressure")
n <- nrow(bp)
abline(v=(1:n)[bp[,1]=="PM"]-.5, col="grey")
abline(v=(1:n)[bp[,1]=="PM"], col="grey")
abline(v=(1:n)[bp[,1]=="PM"]+.5, col="grey")
bp.stk <- stack(bp, c("Systolic", "Diastolic"))
bp.tmp <- rbind(bp[,1:2], bp[,1:2])
bp.stk <- cbind(bp.tmp, bp.stk)
names(bp.stk) <- c("TimeofDay", "Date", "Pressure", "Type")
reps <- NULL
for (j in rle(paste(bp.stk$Date, bp.stk$TimeofDay)$lengths) lengths) reps <- c(reps, (1:j))
bp.stk$Rep <- reps
xyplot(Pressure ~ I(Date+Rep/24)|TimeofDay, groups=Type, data = bp.stk, xlab="Date", pch=16)
```

cement

**Table B21 - Cement Data**

<table>
<thead>
<tr>
<th></th>
<th>y</th>
<th>x1</th>
<th>x2</th>
<th>x3</th>
<th>x4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>y</strong></td>
<td>a numeric vector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>x1</strong></td>
<td>a numeric vector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>x2</strong></td>
<td>a numeric vector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>x3</strong></td>
<td>a numeric vector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>x4</strong></td>
<td>a numeric vector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Description**

The cement data frame has 13 rows and 5 columns.

**Usage**

data(cement)

**Format**

This data frame contains the following columns:

- **y** a numeric vector
- **x1** a numeric vector
- **x2** a numeric vector
- **x3** a numeric vector
- **x4** a numeric vector

**Source**


**Examples**

data(cement)
pairs(cement)
cigbutts

Description
On a university campus there are a number of areas designated for smoking. Outside of those areas, smoking is not permitted. One of the smoking areas is towards the north end of the campus near some parking lots and a large walkway towards one of the residences. Along the walkway, cigarette butts are visible in the nearby grass. Numbers of cigarette butts were counted at various distances from the smoking area in 200x80 square-cm quadrats located just west of the walkway.

Usage
data("cigbutts")

Format
A data frame with 15 observations on the following 2 variables.

distance  distance from gazebo
count    observed number of butts

earthquake

Description
The earthquake data frame contains measurements of latitude, longitude, focal depth and magnitude for all earthquakes having magnitude greater than 5.8 between 1964 and 1985.

Usage
earthquake

Format
This data frame contains 2178 observations on the following columns:

depth    numeric vector of focal depths.
latitude latitudinal coordinate.
longitude longitudinal coordinate.
magnitude numeric vector of magnitudes.

Source
Examples

`summary(earthquake)`

---

**fires**  
*Micro-fires recorded in a lab setting*

---

**Description**

Rate of spread measurements (inches/s) in each direction: East, West, North and South for each of 31 experimental runs at given slopes, measured over the given time period of each (measured in seconds).

**Usage**

`fires`

**Format**

A data frame with 31 observations on the following 7 variables.

- `Run` numeric
- `Slope` numeric: vertical rise divided by horizontal run, inclined from East to West
- `ROS_E` numeric: rate of spread measured in easterly direction
- `ROS_W` numeric: rate of spread measured in westerly direction
- `ROS_S` numeric: rate of spread measured in southerly direction
- `ROS_N` numeric: rate of spread measured in northerly direction
- `Time` numeric

**Source**

Graphical ANOVA Plot

Description

Graphical analysis of one-way ANOVA data. It allows visualization of the usual F-test.

Usage

GANOVA(dataset, var.equal=TRUE, type="QQ", center=TRUE, shift=0)

Arguments

dataset: A data frame, whose first column must be the factor variable and whose second column must be the response variable.
var.equal: Logical: if TRUE, within-sample variances are assumed to be equal

type: "QQ" or "hist"

center: if TRUE, center and scale the means to match the scale of the errors

shift: on the histogram, lift the points representing the means above the horizontal axis by this amount.

Value

A QQ-plot or a histogram and rugplot

Author(s)

W. John Braun and Sarah MacQueen

Source


Natural Gas Consumption in a Single-Family Residence

Description

This data frame contains the average monthly volume of natural gas used in the furnace of a 1600 square foot house located in London, Ontario, for each month from 2006 until 2011. It also contains the average temperature for each month, and a measure of degree days. Insulation was added to the roof on one occasions, the walls were insulated on a second occasion, and the mid-efficiency furnace was replaced with a high-efficiency furnace on a third occasion.
Usage

data("gasdata")

Format

A data frame with 70 observations on the following 9 variables.

- `month` numeric 1=January, 12=December
- `degreedays` numeric, Celsius
- `cubicmetres` total volume of gas used in a month
- `dailyusage` average amount of gas used per day
- `temp` average temperature in Celsius
- `year` numeric
- `I1` indicator that roof insulation is present
- `I2` indicator that wall insulation is present
- `I3` indicator that high efficiency furnace is present

GFplot

Graphical F Plot for Significance in Regression

Description

This function analyzes regression data graphically. It allows visualization of the usual F-test for significance of regression.

Usage

GFplot(X, y, plotIt=TRUE, sortTrt=FALSE, type="hist", includeIntercept=TRUE, labels=FALSE)

Arguments

- `X` The design matrix.
- `y` A numeric vector containing the response.
- `plotIt` Logical: if TRUE, a graph is drawn.
- `sortTrt` Logical: if TRUE, an attempt is made at sorting the predictor effects in descending order.
- `type` "QQ" or "hist"
- `includeIntercept` Logical: if TRUE, the intercept effect is plotted; otherwise, it is omitted from the plot.
- `labels` logical: if TRUE, names of predictor variables are used as labels; otherwise, the design matrix column numbers are used as labels
Value

A QQ-plot or a histogram and rugplot, or a list if plotIt=FALSE

Author(s)

W. John Braun

Source


Examples

# Example 1
X <- p4.18[, -4]
y <- p4.18[, 4]
GFplot(X, y, type="hist", includeIntercept=FALSE)
title("Evidence of Regression in the Jojoba Oil Data")
# Example 2
set.seed(4571)
Z <- matrix(rnorm(400), ncol=10)
A <- matrix(rnorm(81), ncol=9)
simdata <- data.frame(Z[, 1], crossprod(t(Z[, -1]), A))
names(simdata) <- c("y", paste("x", 1:9, sep=""))
GFplot(simdata[, -1], simdata[, 1], type="hist", includeIntercept=FALSE)
title("Evidence of Regression in Simulated Data Set")
# Example 3
GFplot(table.b1[, -1], table.b1[, 1], type="hist", includeIntercept=FALSE)
title("Evidence of Regression in NFL Data Set")
# An example where stepwise AIC selects the complement
# of the set of variables that are actually in the true model:
X <- pathoeg[, -10]
y <- pathoeg[, 10]
par(mfrow=c(2,2))
GFplot(X, y)
GFplot(X, y, sortTrt=TRUE)
GFplot(X, y, type="QQ")
GFplot(X, y, sortTrt=TRUE, type="QQ")
X <- table.b1[, -1] # NFL data
y <- table.b1[, 1]
GFplot(X, y)
GRegplot

Usage

GRegplot(X, y, sortTrt=FALSE, includeIntercept=TRUE, type="hist")

Arguments

X  The design matrix.
y  A numeric vector containing the response.
sortTrt Logical: if TRUE, an attempt is made at sorting the predictor effects in descending order.
includeIntercept Logical: if TRUE, the intercept effect is plotted; otherwise, it is omitted from the plot.
type Character: hist, for histogram; dot, for stripchart

Value

A histogram or dotplot and rugplot

Author(s)

W. John Braun

Source


Examples

# Example 1
X <- p4.18[, -4]
y <- p4.18[, 4]
GRegplot(X, y, includeIntercept=FALSE)
title("Evidence of Regression in the Jojoba Oil Data")
# Example 2
set.seed(4571)
Z <- matrix(rnorm(400), ncol=10)
A <- matrix(rnorm(81), ncol=9)
simdata <- data.frame(Z[, 1], crossprod(t(Z[, -1]), A))
names(simdata) <- c("y", paste("x", 1:9, sep=""))
GRegplot(simdata[, -1], simdata[, 1], includeIntercept=FALSE)
title("Evidence of Regression in Simulated Data Set")
# Example 3
GRegplot(table.b1[, -1], table.b1[, 1], includeIntercept=FALSE)
title("Evidence of Regression in NFL Data Set")
# An example where stepwise AIC selects the complement
# of the set of variables that are actually in the true model:
X <- pathoeg[, -10]
y <- pathoeg[, 10]
par(mfrow=c(2,1))
GRegplot(X, y)
GRegplot(X, y, sortTrt=TRUE)
X <- table.b1[,,-1]  # NFL data
y <- table.b1[,1]
GRegplot(X, y)

Description

Juliet has 28 rows and 9 columns. The data is of the input and output of the Spirit Still "Juliet" from Endless Summer Distillery. It is suggested to split the data by the Batch factor for ease of use.

Usage

Juliet

Format

The data frame contains the following 9 columns.

Batch  a Factor determining how many times the volume has been through the still.
Vol1  Volume in litres, initial
P1  Percent alcohol present, initial
LAA1  Litres Absolute Alcohol initial, Vol1*P1
Vol2  Volume in litres, final
P2  Percent alcohol present, final
LAA2  Litres Absolute Alcohol final, Vol2*P2
Yield  Percent yield obtained, LAA2/LAA1
Date  Character, Date of run

Details

The purpose of this information is to determine the optimal initial volume and percentage. The information is broken down by Batch. A batch factor 1 means that it is the first time the liquid has gone through the spirit still. The first run through the still should have the most loss due to the "heads" and "tails". Literature states that the first run through a spirit still should yield 70 percent. A batch factor 2 means that it is the second time the liquid has gone through the spirit still. A batch factor 3 means that it is the third time or more that the liquid has gone through the spirit still. Each subsequent distillation should result in a higher yield, never to exceed 95 percent.

Source

Examples

```r
summary(Juliet)

# Split apart the Batch factor for easier use.
juliet<-split(Juliet,Juliet$Batch)
juliet1<-juliet$'1'
juliet2<-juliet$'2'
juliet3<-juliet$'3'

plot(LAA1~LAA2,data=Juliet)
plot(LAA1~LAA2,data=juliet1)
```

---

**lengthguesses**

*Length Guesses Data*

Description

The `lengthguesses` list consists of 2 numeric vectors, one giving the metric-converted length guesses (in feet) of an auditorium whose actual length (in meters) was 13.1m, and the other containing the length guesses of 69 others (in meters).

Usage

```r
data(lengthguesses)
```

Format

This list contains the following columns:

- **imperial** a numeric vector of 69 student guesses as to the length of an auditorium using the imperial system, converted to meters.
- **metric** a numeric vector of 44 student guesses as to the length of an auditorium using the metric system.

Source


References


Examples

```r
with(lengthguesses, t.test(imperial, metric))
```
Lesions in Rat Colons

Description

Numbers of aberrant crypt foci (ACF) in each of six cross-sectional regions of the colons of 66 rats subjected to varying doses of the carcinogen azoxymethane (AOM), sacrificed at 3 different times.

Usage

lesions

Format

This data frame contains the following columns:

- **T**  Incubation time factor, levels: 6, 12 and 18 weeks
- **INJ**  Number of injections
- **SECT**  Section of colon, a factor with levels 1 through 6, where 1 denotes the proximal end of the colon and 6 denotes the distal end
- **RAT**  Label for animal within a particular T-INJ factor level combination
- **ACF.Total**  Total number of ACF lesions in a section of a rat’s colon
- **ACF.total.mult**  Sum of ACF multiplicities for a section of a rat’s colon
- **id**  Identifier for each of the 66 rats.

Source

Ranjana P. Bird, University of Northern British Columbia, Prince George, Canada.

References


Examples

```r
summary(lesions)
ACF.All <- aggregate(ACF.Total ~ id + INJ + T, FUN=sum, data = lesions)
lesions.glm <- glm(ACF.Total ~ INJ * T, data = ACF.All, family=poisson)
summary(lesions.glm)
lesions.qp <- glm(ACF.Total ~ INJ * T, data = ACF.All, family=quasipoisson)
summary(lesions.qp)
lesions.noInt <- glm(ACF.Total ~ INJ + T, data = ACF.All, family=quasipoisson)
summary(lesions.noInt)
```
**LPBias**

*Local Polynomial Bias*

**Description**

Confidence interval estimates for bias in local polynomial regression.

**Usage**

```r
LPBias(xy,k1,k2,h,h2,numgrid=401,alpha=.95)
```

**Arguments**

- `xy` A data frame, whose first column must be the explanatory variable and whose second column must be the response variable.
- `k1` degree of local polynomial used in curve estimator.
- `k2` degree of local polynomial used in bias estimator.
- `h` bandwidth for regression estimator.
- `h2` bandwidth for bias estimator.
- `numgrid` number of gridpoints used in the curve estimator.
- `alpha` nominal confidence level.

**Value**

A list containing the confidence interval limits, pointwise estimates of bias, standard deviation of bias, curve estimate, standard deviation of curve estimate, and approximate confidence limits for curve estimates.

**Author(s)**

W. John Braun and Wenkai Ma

---

**motor**

*Motor Vibration Data*

**Description**

Noise measurements for 5 samples of motors, each sample based on a different brand of bearing.

**Usage**

```r
data("motor")
```
**noisyimage**

**Format**

A data frame with 5 columns.

- **Brand 1** A numeric vector length 6
- **Brand 2** A numeric vector length 6
- **Brand 3** A numeric vector length 6
- **Brand 4** A numeric vector length 6
- **Brand 5** A numeric vector length 6

**Source**


**Description**

The `noisyimage` is a list. The third component is noisy version of the third component of `tarimage`.

**Usage**

`data(noisyimage)`

**Format**

This list contains the following elements:

- **x** a numeric vector having 101 elements.
- **y** a numeric vector having 101 elements.
- **xy** a numeric matrix having 101 rows and columns

**Examples**

`with(noisyimage, image(x, y, xy))`
The `oldwash` dataframe has 49 rows and 8 columns. The data are from the start up of a wash still considering the amount of time it takes to heat up to a specified temperature and possible influencing factors.

```r
data("oldwash")
```

A data frame with 49 observations on the following 8 variables.

- **Date**: character, the date of the run
- **startT**: degrees Celsius, numeric, initial temperature
- **endT**: degrees Celsius, numeric, final temperature
- **time**: in minutes, numeric, amount of time to reach final temperature
- **Vol**: in litres, numeric, amount of liquid in the tank (max 2000L)
- **alc**: numeric, the percentage of alcohol present in the liquid
- **who**: character, relates to the person who ran the still
- **batch**: factor with levels 1 = first time through, 2 = second time through

The purpose of the wash still is to increase the percentage of alcohol and strip out unwanted particulate. It can take a long time to heat up and this can lead to problems in meeting production time limits.

**Source**

Charisse Woods, Endless Summer Distillery (2014)

**Examples**

```r
oldwash.lm<-lm(log(time)~startT+endT+Vol+alc+who+batch,data=oldwash)
summary(oldwash.lm)
par(mfrow=c(2,2))
plot(oldwash.lm)

data2<-subset(oldwash,batch==2)
hist(data2$time)
data1<-subset(oldwash,batch==1)
```
p11.12

hist(data1$time)
oldwash.lmc<-lm(time~startT+endT+Vol+alc+who+batch,data=data1)
summary(oldwash.lmc)
plot(oldwash.lmc)

oldwash.lmd<-lm(time~startT+endT+Vol+alc+who+batch,data=data2)
summary(oldwash.lmd)
plot(oldwash.lmd)

---

Data For Problem 11-12

Description

The p11.12 data frame has 19 observations on satellite cost.

Usage

data(p11.12)

Format

This data frame contains the following columns:

cost  first-unit satellite cost
x     weight of the electronics suite

Source


References

Simpson and Montgomery (1998)

Examples

data(p11.12)
attach(p11.12)
plot(cost~x)
detach(p11.12)
Data set for Problem 11-15

Description

The p11.15 data frame has 9 rows and 2 columns.

Usage

data(p11.15)

Format

This data frame contains the following columns:

x  a numeric vector
y  a numeric vector

Source


References

Ryan (1997), Stefanski (1991)

Examples

data(p11.15)
plot(p11.15)
attach(p11.15)
lines(lowess(x,y))
detach(p11.15)

Data Set for Problem 12-11

Description

The p12.11 data frame has 44 observations on the fraction of active chlorine in a chemical product as a function of time after manufacturing.

Usage

data(p12.11)
p12.12

Format

This data frame contains the following columns:

- xi  time
- yi  available chlorine

Source


Examples

data(p12.11)
plot(p12.11)
lines(lowess(p12.11))

data(p12.12)

Description

The p12.12 data frame has 18 observations on an chemical experiment. A nonlinear model relating concentration to reaction time and temperature with an additive error is proposed to fit these data.

Usage

data(p12.12)

Format

This data frame contains the following columns:

- x1  reaction time (in minutes)
- x2  temperature (in degrees Celsius)
- y   concentration (in grams/liter)

Source

Examples

data(p12.12)
attach(p12.12)
# fitting the linearized model
logy.lm <- lm(I(log(y))~I(log(x1))+I(log(x2)))
summary(logy.lm)
plot(logy.lm, which=1)  # checking the residuals
# fitting the nonlinear model
y.nls <- nls(y ~ theta1*I(x1^theta2)*I(x2^theta3), start=list(theta1=.95,
theta2=.76, theta3=.21))
summary(y.nls)
plot(resid(y.nls)-fitted(y.nls))  # checking the residuals

Data Set for Problem 12-16

Description

The p12.16 data frame has 26 observations on 5 variables.

Usage

data(p12.16)

Format

This data frame contains the following columns:

Mixture numeric
x1 numeric
x2 numeric
x3 numeric
y numeric

Source


References

**Data Set for Problem 12-8**

**Description**

The p12.8 data frame has 14 rows and 2 columns.

**Usage**

data(p12.8)

**Format**

This data frame contains the following columns:

- **x** a numeric vector
- **y** a numeric vector

**Source**


**Examples**

data(p12.8)

---

**Data Set for Problem 13-1**

**Description**

The p13.1 data frame has 25 observation on the test-firing results for surface-to-air missiles.

**Usage**

data(p13.1)

**Format**

This data frame contains the following columns:

- **x** target speed (in Knots)
- **y** hit (=1) or miss (=0)
Source

Examples
data(p13.1)

data(p13.16)

Description
The p13.16 data frame has 16 rows and 5 columns.

Usage
data(p13.16)

Format
This data frame contains the following columns:

X1 a numeric vector
X2 a numeric vector
X3 a numeric vector
X4 a numeric vector
Y a numeric vector

Source

Examples
data(p13.16)
Data Set for Problem 13-2

Description
The p13.2 data frame has 20 observations on home ownership.

Usage
data(p13.2)

Format
This data frame contains the following columns:

x family income
y home ownership (1 = yes, 0 = no)

Source

Examples
data(p13.2)

Data Set for Problem 13-20

Description
The p13.20 data frame has 30 rows and 2 columns.

Usage
data(p13.20)

Format
This data frame contains the following columns:

yhat a numeric vector
resdev a numeric vector
Source


Examples

data(p13.3)

Description

The p13.3 data frame has 10 observations on the compressive strength of an alloy fastener used in aircraft construction.

Usage

data(p13.3)

Format

This data frame contains the following columns:

- x load (in psi)
- n sample size
- r number failing

Source


Examples

data(p13.3)
Data Set for Problem 13-4

Description
The p13.4 data frame has 11 observations on the effectiveness of a price discount coupon on the purchase of a two-litre beverage.

Usage
data(p13.4)

Format
This data frame contains the following columns:

- x discount
- n sample size
- r number redeemed

Source

Examples
data(p13.4)

Data Set for Problem 13-5

Description
The p13.5 data frame has 20 observations on new automobile purchases.

Usage
data(p13.5)

Format
This data frame contains the following columns:

- x1 income
- x2 age of oldest vehicle
- y new purchase less than 6 months later (1=yes, 0=no)
### Data Set for Problem 13-6

**Description**

The p13.6 data frame has 15 observations on the number of failures of a particular type of valve in a processing unit.

**Usage**

```r
data(p13.6)
```

**Format**

This data frame contains the following columns:

- **valve**: type of valve
- **numfail**: number of failures
- **months**: months

**Source**


**Examples**

```r
data(p13.6)
```
Data Set for Problem 13-7

Description

The p13.7 data frame has 44 observations on the coal mines of the Appalachian region of western Virginia.

Usage

data(p13.7)

Format

This data frame contains the following columns:

- \( y \) number of fractures in upper seams of coal mines
- \( x_1 \) inner burden thickness (in feet), shortest distance between seam floor and the lower seam
- \( x_2 \) percent extraction of the lower previously mined seam
- \( x_3 \) lower seam height (in feet)
- \( x_4 \) time that the mine has been in operation (in years)

Source


References

Myers (1990)

Examples

data(p13.7)
Description
The p14.1 data frame has 15 rows and 3 columns.

Usage
data(p14.1)

Format
This data frame contains the following columns:

- x  a numeric vector
- y  a numeric vector
- time  a numeric vector

Source

Examples
data(p14.1)

Description
The p14.2 data frame has 18 rows and 3 columns.

Usage
data(p14.2)

Format
This data frame contains the following columns:

- t  a numeric vector
- xt  a numeric vector
- yt  a numeric vector
Source


Examples

data(p14.2)

data(p15.4)

Description

The p15.4 data frame has 40 rows and 4 columns.

Usage

data(p15.4)

Format

This data frame contains the following columns:

- x1 a numeric vector
- x2 a numeric vector
- y a numeric vector
- set a factor with levels e and p

Source


Examples

data(p15.4)
Data Set for Problem 2-10

Description

The p2.10 data frame has 26 observations on weight and systolic blood pressure for randomly selected males in the 25-30 age group.

Usage

data(p2.10)

Format

This data frame contains the following columns:

- **weight**: in pounds
- **sysbp**: systolic blood pressure

Source


Examples

```
data(p2.10)
attach(p2.10)
cor.test(weight, sysbp, method="pearson")  # tests rho=0
                                        # and computes 95% CI for rho
                                        # using Fisher's Z-transform
```

Data Set for Problem 2-12

Description

The p2.12 data frame has 12 observations on the number of pounds of steam used per month at a plant and the average monthly ambient temperature.

Usage

data(p2.12)
Format

This data frame contains the following columns:

- **temp** ambient temperature (in degrees F)
- **usage** usage (in thousands of pounds)

Source


Examples

```r
data(p2.12)
attach(p2.12)
usage.lm <- lm(usage ~ temp)
summary(usage.lm)
predict(usage.lm, newdata=data.frame(temp=58), interval="prediction")
detach(p2.12)
```

Description

The p2.13 data frame has 16 observations on the number of days the ozone levels exceeded 0.2 ppm in the South Coast Air Basin of California for the years 1976 through 1991. It is believed that these levels are related to temperature.

Usage

```r
data(p2.13)
```

Format

This data frame contains the following columns:

- **days** number of days ozone levels exceeded 0.2 ppm
- **index** a seasonal meteorological index giving the seasonal average 850 millibar temperature.

Source


References

Examples

data(p2.13)
attach(p2.13)
plot(days~index, ylim=c(-20,130))
ozone.lm <- lm(days ~ index)
summary(ozone.lm)
# plots of confidence and prediction intervals:
ozone.conf <- predict(ozone.lm, interval="confidence")
lines(sort(index), ozone.conf[order(index),2], col="red")
lines(sort(index), ozone.conf[order(index),3], col="red")
ozone.pred <- predict(ozone.lm, interval="prediction")
lines(sort(index), ozone.pred[order(index),2], col="blue")
lines(sort(index), ozone.pred[order(index),3], col="blue")
detach(p2.13)

Data Set for Problem 2-14

Description

The p2.14 data frame has 8 observations on the molar ratio of sebacic acid and the intrinsic viscosity of copolyesters. One is interested in predicting viscosity from the sebacic acid ratio.

Usage

data(p2.14)

Format

This data frame contains the following columns:

- ratio  molar ratio
- visc  viscosity

Source


References

Examples

```r
data(p2.14)
attach(p2.14)
plot(p2.14, pch=16, ylim=c(0,1))
visc.lm <- lm(visc ~ ratio)
summary(visc.lm)
visc.conf <- predict(visc.lm, interval="confidence")
lines(ratio, visc.conf[,2], col="red")
lines(ratio, visc.conf[,3], col="red")
visc.pred <- predict(visc.lm, interval="prediction")
lines(ratio, visc.pred[,2], col="blue")
lines(ratio, visc.pred[,3], col="blue")
detach(p2.14)
```

Data Set for Problem 2-15

Description

The p2.15 data frame has 8 observations on the impact of temperature on the viscosity of toluene-tetralin blends. This particular data set deals with blends with a 0.4 molar fraction of toluene.

Usage

```r
data(p2.15)
```

Format

This data frame contains the following columns:

- **temp** temperature (in degrees Celsius)
- **visc** viscosity (mPa s)

Source


References

Examples

data(p2.15)
attach(p2.15)
plot(visc ~ temp, pch=16)
visc.lm <- lm(visc ~ temp)
plot(visc.lm, which=1)
detach(p2.15)

Data Set for Problem 2-16

Description

The p2.16 data frame has 33 observations on the pressure in a tank the volume of liquid.

Usage

data(p2.16)

Format

This data frame contains the following columns:

volume  volume of liquid
pressure  pressure in the tank

Source


References


Examples

data(p2.16)
attach(p2.16)
plot(pressure ~ volume, pch=16)
pressure.lm <- lm(pressure ~ volume)
plot(pressure.lm, which=1)
summary(pressure.lm)
detach(p2.16)
**p2.17**

*Data Set for Problem 2-17*

**Description**

The p2.17 data frame has 17 observations on the boiling point of water (in Fahrenheit degrees) for various barometric pressures (in inches of mercury).

**Usage**

```r
data(p2.17)
```

**Format**

This data frame contains the following columns:

- **BoilingPoint** numeric vector
- **BarometricPressure** numeric vector

**Source**


**References**


**Examples**

```r
data(p2.17)
attach(p2.17)
plot(BoilingPoint ~ BarometricPressure, pch=16)
detach(p2.17)
```

---

**p2.18**

*Data Set for Problem 2-18*

**Description**

The p2.18 data frame has 21 observations on the advertising expenses (in millions of US dollars) and retain impressions (in millions per week) for various companies.

**Usage**

```r
data(p2.18)
```
The p2.7 data frame has 20 observations on the purity of oxygen produced by a fractionation process. It is thought that oxygen purity is related to the percentage of hydrocarbons in the main condensor of the processing unit.
Examples

data(p2.7)
attach(p2.7)
purity.lm <- lm(purity ~ hydro)
summary(purity.lm)
# confidence interval for mean purity at 1% hydrocarbon:
predict(purity.lm,newdata=data.frame(hydro = 1.00),interval="confidence")
detach(p2.7)

p2.9

Data Set for Problem 2.9

Description

The p2.9 data frame has 25 rows and 2 columns. See help on softdrink for details.

Usage

data(p2.9)

Format

This data frame contains the following columns:

y a numeric vector: time
x a numeric vector: cases stocked

Source


Examples

data(p2.9)
Data Set for Problem 4-18

Description

The p4.18 data frame has 13 observations on an experiment to produce a synthetic analogue to jojoba oil.

Usage

data(p4.18)

Format

This data frame contains the following columns:

- x1 reaction temperature
- x2 initial amount of catalyst
- x3 pressure
- y yield

Source


References


Examples

data(p4.18)
y.lm <- lm(y ~ x1 + x2 + x3, data=p4.18)
summary(y.lm)
y.lm <- lm(y ~ x1, data=p4.18)
Description

The p4.19 data frame has 14 observations on a designed experiment studying the relationship between abrasion index for a tire tread compound and three factors.

Usage

data(p4.19)

Format

This data frame contains the following columns:

- **x1** hydrated silica level
- **x2** silane coupling agent level
- **x3** sulfur level
- **y** abrasion index for a tire tread compound

Source


References


Examples

data(p4.19)
attach(p4.19)
y.lm <- lm(y ~ x1 + x2 + x3)
summary(y.lm)
plot(y.lm, which=1)
y.lm <- lm(y ~ x1)
detach(p4.19)
Data Set for Problem 4-20

Description

The p4.20 data frame has 26 observations on a designed experiment to determine the influence of five factors on the whiteness of rayon.

Usage

data(p4.20)

Format

This data frame contains the following columns:

- **acidtemp**  acid bath temperature
- **acidconc**  cascade acid concentration
- **watertemp** water temperature
- **sulfconc**  sulfide concentration
- **amtbl**  amount of chlorine bleach
- **y**  a measure of the whiteness of rayon

Source


References


Examples

data(p4.20)
y.lm <- lm(y ~ acidtemp, data=p4.20)
summary(y.lm)
p5.1

Data Set for Problem 5-1

Description
The p5.1 data frame has 8 observations on the impact of temperature on the viscosity of toluene-tetralin blends.

Usage
data(p5.1)

Format
This data frame contains the following columns:

- **temp** temperature
- **visc** viscosity

Source

References

Examples
data(p5.1)
plot(p5.1)

---

p5.10

Data Set for Problem 5-10

Description
The p5.10 data frame has 27 observations on the effect of three factors on a printing machine’s ability to apply coloring inks on package labels.

Usage
data(p5.10)
Format

This data frame contains the following columns:

- **x1** speed
- **x2** pressure
- **x3** distance
- **yi1** response 1
- **yi2** response 2
- **yi3** response 3
- **ybar.i** average response
- **si** standard deviation of the 3 responses

Source


Examples

```r
data(p5.10)
attach(p5.10)
y.lm <- lm(ybar.i ~ x1 + x2 + x3)
plot(y.lm, which=1)
detach(p5.10)
```

Description

The `p5.11` data frame has 8 observations on an experiment with a catapult. This data set is used in Exercise 5.13 of the 6th edition of MPV.

Usage

```r
data(p5.11)
```

Format

This data frame contains the following columns:

- **x1** hook
- **x2** arm length
- **x3** start angle
- **x4** stop angle
- **yi1** response 1
- **yi2** response 2
- **yi3** response 3
Source

See Also
p5.13

Examples
attach(p5.11)
ybar.i <- apply(p5.11[,5:7], 1, mean)
sd.i <- apply(p5.11[,5:7], 1, sd)
y.lm <- lm(ybar.i ~ x1 + x2 + x3 + x4)
plot(y.lm, which=1)
detach(p5.11)

p5.12

Data Set for Problem 5-12

Description
The p5.12 data frame has 27 observations on 3 variables, with responses replicated 3 times. Averages and standard deviations are calculated for each level of the experimental design.

Usage
data(p5.12)

Format
This data frame contains the following columns:

i numeric, experimental run number
xi numeric
x2 numeric
x3 numeric
yi1 response 1
yi2 response 2
yi3 response 3
ybari average of 3 responses at ith level
si standard deviation of 3 responses at ith level

Source
References


Examples

```r
y.lm <- lm(ybari ~ xi + x2 + x3, data = p5.12)
plot(y.lm, which=1)
```

---

p5.13 Data Set for Problem 5-13

Description

The p5.13 data frame has 8 observations on 4 variables, with responses replicated 3 times.

Usage

```r
data(p5.13)
```

Format

This data frame contains the following columns:

- **x1** numeric
- **x2** numeric
- **x3** numeric
- **x4** numeric
- **y.1** response 1
- **y.2** response 2
- **y.3** response 3

Source


References


Examples

```r
y.lm <- lm(I((y.1+y.2+y.3)/3) ~ x1 + x2 + x3 + x4, data = p5.13)
plot(y.lm, which=1)
```
Data Set for Problem 5.2

Description

The p5.2 data frame has 11 observations on the vapor pressure of water for various temperatures.

Usage

data(p5.2)

Format

This data frame contains the following columns:

- **temp** temperature (K)
- **vapor** vapor pressure (mm Hg)

Source


Examples

data(p5.2)
plot(p5.2)

Data Set for Problem 5.21

Description

The p5.21 data frame has 4 observations on 2 variables (replicated 4 times).

Usage

data(p5.21)

Format

This data frame contains the following columns:

- **Mix.Rate** a numeric vector
- **y1** a numeric vector
- **y2** a numeric vector
- **y3** a numeric vector
- **y4** a numeric vector
Source


Examples

cementStrength <- reshape(p5.21, idvar = "Mix.Rate", varying=list(2:5),
direction="long", v.names=c("TensileStrength"))
rownames(cementStrength) <- NULL
anova(lm(TensileStrength ~ Mix.Rate*time, data = cementStrength))

---

Data Set for Problem 5.22

Description

The p5.22 data frame has 18 observations on 2 variables.

Usage

data(p5.22)

Format

This data frame contains the following columns:

- **Temp** a numeric vector
- **Density** a numeric vector

Source


Examples

anova(lm(Density ~ Temp, data = p5.22))
**Data Set for Problem 5.23**

**Description**

The p5.23 data frame has 18 observations on 3 variables.

**Usage**

```r
data(p5.23)
```

**Format**

This data frame contains the following columns:

- **Batch**  a character vector
- **Pressure**  a numeric vector
- **Strength**  a numeric vector

**Source**


**Examples**

```r
anova(lm(Strength ~ Pressure*Batch, data = p5.23))
```

---

**Data Set for Problem 5.24**

**Description**

The p5.24 data frame has 13 observations on 7 variables.

**Usage**

```r
data(p5.24)
```
Format

This data frame contains the following columns:

- **Location** a character vector
- **x1** a numeric vector
- **x2** a numeric vector
- **x3** a numeric vector
- **x4** a numeric vector
- **x5** a numeric vector
- **y** a numeric vector

Source


References


Examples

```r
lm(y ~ x1 + x2 + x3 + x4 + x5, data = p5.24)
```

p5.3  Data Set for Problem 5.3

Description

The p5.3 data frame has 12 observations on the number of bacteria surviving in a canned food product and the number of minutes of exposure to 300 degree Fahrenheit heat.

Usage

data(p5.3)

Format

This data frame contains the following columns:

- **bact** number of surviving bacteria
- **min** number of minutes of exposure
Source

Examples
data(p5.3)
plot(bact~min, data=p5.3)

---

p5.4  Data Set for Problem 5-4

Description
The p5.4 data frame has 8 observations on 2 variables.

Usage
data(p5.4)

Format
This data frame contains the following columns:

- x  a numeric vector
- y  a numeric vector

Source

Examples
data(p5.4)
plot(y ~ x, data=p5.4)
Data Set for Problem 5-5

Description

The p5.5 data frame has 14 observations on the average number of defects per 10000 bottles due to stones in the bottle wall and the number of weeks since the last furnace overhaul.

Usage

data(p5.5)

Format

This data frame contains the following columns:

- **defects** a numeric vector
- **weeks** a numeric vector

Source


Examples

data(p5.5)
defects.lm <- lm(defects~weeks, data=p5.5)
plot(defects.lm, which=1)

Data Set for Problem 7-1

Description

The p7.1 data frame has 10 observations on a predictor variable.

Usage

data(p7.1)

Format

This data frame contains the following columns:

- **x** a numeric vector
Source

Examples
```r
data(p7.1)
attach(p7.1)
x2 <- x^2
detach(p7.1)
```

---

**p7.11  Data Set for Problem 7-11**

Description
The p7.11 data frame has 11 observations on production cost versus production lot size.

Usage
data(p7.11)

Format
This data frame contains the following columns:

- `x` production lot size
- `y` average production cost per unit

Source

Examples
```r
data(p7.11)
plot(y ~ x, data=p7.11)
```
**p7.13  Data Set for Problem 7-13**

**Description**

The p7.13 data frame has 11 observations on production cost versus production lot size. (This data set was for problem 7-11 in the third edition of MPV).

**Usage**

data(p7.13)

**Format**

This data frame contains the following columns:

- **x** production lot size
- **y** average production cost per unit

**Source**


**Examples**

plot(y ~ x, data=p7.13)

---

**p7.15  Data Set for Problem 7-15**

**Description**

The p7.15 data frame has 6 observations on vapor pressure of water at various temperatures.

**Usage**

data(p7.15)

**Format**

This data frame contains the following columns:

- **y** vapor pressure (mm Hg)
- **x** temperature (degrees Celsius)
Source


Examples

data(p7.15)
y.lm <- lm(y ~ x, data=p7.15)
plot(y ~ x, data=p7.15)
abline(coef(y.lm))
plot(y.lm, which=1)

p7.16

Data Set for Problem 7-16

Description

The p7.16 data frame has 26 observations on the observed mole fraction solubility of a solute at a constant temperature.

Usage

data(p7.16)

Format

This data frame contains the following columns:

- **y** negative logarithm of the mole fraction solubility
- **x1** dispersion partial solubility
- **x2** dipolar partial solubility
- **x3** hydrogen bonding Hansen partial solubility

Source


References


Examples

data(p7.16)
pairs(p7.16)
Data Set for Problem 7-17

Description

The p7.17 data frame has 6 observations on vapor pressure of water at various temperatures. This data set is the same as p7.15 which was used for exercise 7-15 in the third edition of MPV.

Usage

data(p7.17)

Format

This data frame contains the following columns:

- `y` vapor pressure (mm Hg)
- `x` temperature (degrees Celsius)

Source


Examples

```r
y.lm <- lm(y ~ x, data=p7.17)
plot(y ~ x, data=p7.17)
abline(coef(y.lm))
plot(y.lm, which=1)
```

Data Set for Problem 7-18

Description

The p7.18 data frame has 26 observations on the observed mole fraction solubility of a solute at a constant temperature. This data set is the same as p7.16 which was for problem 7-16 in the third edition of MPV.

Usage

data(p7.18)
Format

This data frame contains the following columns:

- **y** negative logarithm of the mole fraction solubility
- **x1** dispersion partial solubility
- **x2** dipolar partial solubility
- **x3** hydrogen bonding Hansen partial solubility

Source


References


Examples

`pairs(p7.18)`

---

p7.19  
Data Set for Problem 7.19

Description

The p7.19 data frame has 10 observations on the concentration of green liquor and paper machine speed from a kraft paper machine.

Usage

`data(p7.19)`

Format

This data frame contains the following columns:

- **y** green liquor (g/l)
- **x** paper machine speed (ft/min)

Source


References

Examples

data(p7.19)
y.lm <- lm(y ~ x + I(x^2), data=p7.19)
summary(y.lm)

p7.2

Data Set for Problem 7.2

Description

The p7.2 data frame has 10 observations on solid-fuel rocket propellant weight loss.

Usage

data(p7.2)

Format

This data frame contains the following columns:

x  months since production
y  weight loss (kg)

Source


Examples

data(p7.2)
y.lm <- lm(y ~ x + I(x^2), data=p7.2)
summary(y.lm)
plot(y ~ x, data=p7.2)
Description

The p7.20 data frame has 10 observations on the concentration of green liquor and paper machine speed from a kraft paper machine. This data set is the same as p7.19 which was used in problem 7.19 of the third edition of MPV.

Usage

data(p7.20)

Format

This data frame contains the following columns:

- **y**: green liquor (g/l)
- **x**: paper machine speed (ft/min)

Source


References


Examples

data(p7.20)
y.lm <- lm(y ~ x + I(x^2), data=p7.20)
summary(y.lm)

Description

The p7.4 data frame has 12 observations on two variables.

Usage

data(p7.4)
**Format**

This data frame contains the following columns:

- **x** a numeric vector
- **y** a numeric vector

**Source**


**Examples**

```r
data(p7.4)
y.lm <- lm(y ~ x + I(x^2), data = p7.4)
summary(y.lm)
```

---

**p7.6  Data Set for Problem 7-6**

---

**Description**

The p7.6 data frame has 12 observations on softdrink carbonation.

**Usage**

```r
data(p7.6)
```

**Format**

This data frame contains the following columns:

- **y** carbonation
- **x1** temperature
- **x2** pressure

**Source**


**Examples**

```r
data(p7.6)
y.lm <- lm(y ~ x1 + I(x1^2) + x2 + I(x2^2) + I(x1*x2), data=p7.6)
summary(y.lm)
```
**Data Set for Problem 8.11**

**Description**

The p8.11 data frame has 25 observations on the tensile strength of synthetic fibre used for men’s shirts.

**Usage**

```r
data(p8.11)
```

**Format**

This data frame contains the following columns:

- `y` tensile strength
- `percent` percentage of cotton

**Source**


**References**

Montgomery (2001)

**Examples**

```r
data(p8.11)
y.lm <- lm(y ~ percent, data=p8.11)
model.matrix(y.lm)
```

---

**Data Set for Problem 8.16**

**Description**

The p8.16 data frame has 17 observations on 4 variables.

**Usage**

```r
data(p8.16)
```
Data Set for Problem 8.3

Description

The p8.3 data frame has 25 observations on delivery times taken by a vending machine route driver.

Usage

data(p8.3)

Format

This data frame contains the following columns:

- y delivery time (in minutes)
- x1 number of cases of product stocked
- x2 distance walked by route driver

Source


Examples

data(p8.3)
pairs(p8.3)
Description

The p9.10 data frame has 31 observations on the rut depth of asphalt pavements prepared under different conditions.

Usage

data(p9.10)

Format

This data frame contains the following columns:

- y change in rut depth/million wheel passes (log scale)
- x1 viscosity (log scale)
- x2 percentage of asphalt in surface course
- x3 percentage of asphalt in base course
- x4 indicator
- x5 percentage of fines in surface course
- x6 percentage of voids in surface course

Source


References

Gorman and Toman (1966)

Examples

data(p9.10)
pairs(p9.10)
**Pathological Example**

Artificial regression data which causes stepwise regression with AIC to produce a highly non-parsimonious model. The true model used to simulate the data has only one real predictor (x8).

**Usage**

```
pathoeg
```

**Format**

This data frame contains the following columns:

- `x1` a numeric vector
- `x2` a numeric vector
- `x3` a numeric vector
- `x4` a numeric vector
- `x5` a numeric vector
- `x6` a numeric vector
- `x7` a numeric vector
- `x8` a numeric vector
- `x9` a numeric vector
- `y` a numeric vector

**PRESS**

**PRESS statistic**

**Description**

Computation of Allen’s PRESS statistic for an `lm` object.

**Usage**

```
PRESS(x)
```

**Arguments**

- `x` An `lm` object
qqANOVA

Value

Allen’s PRESS statistic.

Author(s)

W.J. Braun

See Also

lm

Examples

data(p4.18)
attach(p4.18)
y.lm <- lm(y ~ x1 + I(x1^2))
PRESS(y.lm)
detach(p4.18)

qqANOVA

QQ Plot for Analysis of Variance

Description

This function is used to display the weight of the evidence against null main effects in data coming from a 1 factor design, using a QQ plot. In practice this method is often called via the function GANOVA.

Usage

qqANOVA(x, y, plot.it = TRUE, xlab = deparse(substitute(x)),
        ylab = deparse(substitute(y)), ...)

Arguments

x numeric vector of errors
y numeric vector of scaled responses
plot.it logical vector indicating whether to plot or not
xlab character, x-axis label
ylab character, y-axis label
... any other arguments for the plot function

Value

A QQ plot is drawn.

Author(s)

W. John Braun
Description

Overlays a quadratic curve to a fitted quadratic model.

Usage

quadline(lm.obj, ...)

Arguments

lm.obj       A lm object (a quadratic fit)
...

Other arguments to the lines function; e.g. col

Value

The function superimposes a quadratic curve onto an existing scatterplot.

Author(s)

W.J. Braun

See Also

lm

Examples

data(p4.18)
attach(p4.18)
y.lm <- lm(y ~ x1 + I(x1^2))
plot(x1, y)
quadline(y.lm)
detach(p4.18)
Description

This function analyzes regression data graphically. It allows visualization of the usual F-test for significance of regression.

Usage

\[
\text{Qyplot}(X, y, \text{plotIt}=\text{TRUE}, \text{sortTrt}=\text{FALSE}, \text{type}=\text{"hist"}, \text{includeIntercept}=\text{TRUE}, \text{labels}=\text{FALSE})
\]

Arguments

- **X**: The design matrix.
- **y**: A numeric vector containing the response.
- **plotIt**: Logical: if TRUE, a graph is drawn.
- **sortTrt**: Logical: if TRUE, an attempt is made at sorting the predictor effects in descending order.
- **type**: "QQ" or "hist"
- **includeIntercept**: Logical: if TRUE, the intercept effect is plotted; otherwise, it is omitted from the plot.
- **labels**: Logical: if TRUE, names of predictor variables are used as labels; otherwise, the design matrix column numbers are used as labels.

Value

A QQ-plot or a histogram and rugplot, or a list if plotIt=FALSE.

Author(s)

W. John Braun

Source


Examples

# Example 1
X <- p4.18[, -4]
y <- p4.18[, 4]
Qyplot(X, y, type=\text{"hist"}, includeIntercept=\text{FALSE})
title("Evidence of Regression in the Jojoba Oil Data")

# Example 2
set.seed(4571)
radon <- matrix(rnorm(400), ncol=10)
A <- matrix(rnorm(81), ncol=9)
simdata <- data.frame(Z[,1], crossprod(t(Z[-1]),A))
names(simdata) <- c("y", paste("x", 1:9, sep=""))
Qyplot(simdata[,1], simdata[,1], type="hist", includeIntercept=FALSE)
title("Evidence of Regression in Simulated Data Set")
# Example 3
Qyplot(table.b1[-1], table.b1[,1], type="hist", includeIntercept=FALSE)
title("Evidence of Regression in NFL Data Set")
# An example where stepwise AIC selects the complement
# of the set of variables that are actually in the true model:
X <- pathoeg[-10]
y <- pathoeg[,10]
par(mfrow=c(2,2))
Qyplot(X, y)
Qyplot(X, y, sortTrt=TRUE)
Qyplot(X, y, type="QQ")
Qyplot(X, y, sortTrt=TRUE, type="QQ")
X <- table.b1[-1] # NFL data
y <- table.b1[,1]
Qyplot(X, y)

---

radon

### Radon Release

#### Description

Percentage of radon from water released in showers with orifices of various diameters. Four replications were obtained, but it should be noted that the temperatures for the replicates (in degrees Celsius) are 21, 30, 38, and 46, respectively. This information should really be accounted for in any serious analysis of the data.

#### Usage

data("radon")

#### Format

A data frame with 15 observations on the following 2 variables.

- **diameter**: shower orifice diameter in mm
- **rep 1**: percentage radon released in first run
- **rep 2**: percentage radon released in second run
- **rep 3**: percentage radon released in third run
- **rep 4**: percentage radon released in fourth run
**Source**


### rectangles

**Length Measurements on Rectangular Objects**

#### Description

Observations of heights, widths and diagonal lengths of several rectangular objects, such as books, photographs, and so on were measured. Only the data in MPV versions 1.62 and later can be trusted; there were errors in the third column in previous versions.

#### Usage

rectangles

#### Format

A data frame with 51 observations on the following 4 variables.

- **h** numeric, heights in centimeters
- **w** numeric, widths in centimeters
- **d** numeric, diagonal lengths in centimeters
- **index** numeric, sum of squares of heights and widths

#### Examples

```r
x <- sqrt(rectangles$index)
y <- rectangles$d
y.lp <- locpoly(x, y, bandwidth=dplin(x), degree=1)
plot(y ~ x)
lines(y.lp, col=2, lty=2)
abline(0,1) # y = x + measurement error
plot(y.lp$y - y.lp$x, type="l", col=2)
```
rftest  

Pseudorandom Number Testing via Random Forest

Description

Given a sequence of pseudorandom numbers, this function constructs a random forest prediction model for successive values, based on previous values up to a given lag. The ability of the random forest model to predict future values is inversely related to the quality of the sequence as an approximation to locally random numbers.

Usage

rftest(u, m=5)

Arguments

u  numeric, a vector of pseudorandom numbers to test
m  numeric, number of lags to test

Value

Side effect is a two way layout of graphs showing effectiveness of prediction on a training and a testing subset of data. Good predictions indicate a poor quality sequence.

Author(s)

W. John Braun

Examples

x <- runif(200)
rftest(x, m = 4)

seismictimings  

Seismic Timing Data

Description

The seismictimings data frame has 504 rows and 3 columns. Thickness of a layer of Alberta substratum as measured by several transects of geophones.

Usage

seismictimings
Format

This data frame contains the following columns:

- **x** longitudinal coordinate of geophone.
- **y** latitudinal coordinate of geophone.
- **z** time for signal to pass through substratum.

Examples

```r
plot(y ~ x, data = seismictimings)
```

---

**softdrink**  

*Softdrink Data*

Description

The *softdrink* data frame has 25 rows and 3 columns.

Usage

```r
data(softdrink)
```

Format

This data frame contains the following columns:

- **y** a numeric vector
- **x1** a numeric vector
- **x2** a numeric vector

Source


Examples

```r
data(softdrink)
```
solar

*Solar Data*

**Description**

The solar data frame has 29 rows and 6 columns.

**Usage**

data(solar)

**Format**

This data frame contains the following columns:

- `total.heat.flux` a numeric vector
- `insolation` a numeric vector
- `focal.pt.east` a numeric vector
- `focal.pt.south` a numeric vector
- `focal.pt.north` a numeric vector
- `time.of.day` a numeric vector

**Source**


**Examples**

data(solar)

---

stain

*Stain Removal Data*

**Description**

Data on an experiment to remove ketchup stains from white cotton fabric by soaking the stained fabric in one of five substrates for one hour. Remaining stains were scored visually and subjectively according to a 6-point scale (0 = completely clean, 5 = no change) The stain data frame has 15 rows and 2 columns.

**Usage**

data(stain)
**Format**

This data frame contains the following columns:

- **treatment** a factor
- **response** a numeric vector

**Examples**

data(stain)

---

**Description**

The `table.b1` data frame has 28 observations on National Football League 1976 Team Performance.

**Usage**

data(table.b1)

**Format**

This data frame contains the following columns:

- **y** Games won in a 14 game season
- **x1** Rushing yards
- **x2** Passing yards
- **x3** Punting average (yards/punt)
- **x4** Field Goal Percentage (FGs made/FGs attempted)
- **x5** Turnover differential (turnovers acquired - turnovers lost)
- **x6** Penalty yards
- **x7** Percent rushing (rushing plays/total plays)
- **x8** Opponents’ rushing yards
- **x9** Opponents’ passing yards

**Source**

Examples

data(table.b1)
attach(table.b1)
y.lm <- lm(y ~ x2 + x7 + x8)
summary(y.lm)
# over-all F-test:
y.null <- lm(y ~ 1)
anova(y.null, y.lm)
# partial F-test for x7:
y7.lm <- lm(y ~ x2 + x8)
anova(y7.lm, y.lm)
detach(table.b1)

data(table.b10)
attach(table.b10)
y.lm <- lm(y ~ x1 + x2)
summary(y.lm)
detach(table.b10)

Description

The table.b10 data frame has 40 observations on kinematic viscosity of a certain solvent system.

Usage

data(table.b10)

Format

This data frame contains the following columns:

- x1 Ratio of 2-methoxyethanol to 1,2-dimethoxyethane
- x2 Temperature (in degrees Celsius)
- y Kinematic viscosity (.000001 m2/s)

Source


References

Viscosimetric Studies on 2-Methoxyethanol + 1, 2-Dimethoxyethane Binary Mixtures from -10 to 80C. Canadian Journal of Chemical Engineering, 75, 494-501.

Examples

data(table.b10)
attach(table.b10)
y.lm <- lm(y ~ x1 + x2)
summary(y.lm)
detach(table.b10)
Description

The table.b11 data frame has 38 observations on the quality of Pinot Noir wine.

Usage

data(table.b11)

Format

This data frame contains the following columns:

- **Clarity** a numeric vector
- **Aroma** a numeric vector
- **Body** a numeric vector
- **Flavor** a numeric vector
- **Oakiness** a numeric vector
- **Quality** a numeric vector
- **Region** a numeric vector

Source


Examples

data(table.b11)
attach(table.b11)
Quality.lm <- lm(Quality ~ Clarity + Aroma + Body + Flavor + Oakiness + factor(Region))
summary(Quality.lm)
detach(table.b11)
**Table B12**

**Description**

The table.b12 data frame has 32 rows and 6 columns.

**Usage**

```r
data(table.b12)
```

**Format**

This data frame contains the following columns:

- `temp` a numeric vector
- `soaktime` a numeric vector
- `soakpct` a numeric vector
- `difftime` a numeric vector
- `diffpct` a numeric vector
- `pitch` a numeric vector

**Source**


**Examples**

```r
data(table.b12)
```

---

**Table B13**

**Description**

The table.b13 data frame has 40 rows and 7 columns.

**Usage**

```r
data(table.b13)
```
Format

This data frame contains the following columns:

- **y** a numeric vector
- **x1** a numeric vector
- **x2** a numeric vector
- **x3** a numeric vector
- **x4** a numeric vector
- **x5** a numeric vector
- **x6** a numeric vector

Source


Examples

```r
data(table.b13)
```

Description

The `table.b14` data frame has 25 observations on the transient points of an electronic inverter.

Usage

```r
data(table.b14)
```

Format

This data frame contains the following columns:

- **x1** width of the NMOS Device
- **x2** length of the NMOS Device
- **x3** width of the PMOS Device
- **x4** length of the PMOS Device
- **x5** a numeric vector
- **y** transient point of PMOS-NMOS Inverters

Source

Examples

```r
data(table.b14)
y.lm <- lm(y ~ x1 + x2 + x3 + x4, data=table.b14)
plot(y.lm, which=1)
```

---

Table B15 - Air Pollution and Mortality Data

Description

The `table.b15` data frame has 60 observations on the mortality, environment, and demographic variables for a sample of American cities.

Usage

```r
data(table.b15)
```

Format

This data frame contains the following columns:

- **City** character vector
- **Mort** numeric vector, age-adjusted mortality from all causes per 100000
- **Precip** numeric vector, precipitation in inches
- **Educ** numeric vector, median number of school years completed
- **Nonwhite** numeric vector, percentage of 1960 population that is nonwhite
- **Nox** numeric vector, relative pollution potential of nitrous oxides
- **SO2** numeric vector, relative pollution potential of sulfur dioxide

Source


References


Examples

```r
data(table.b15)
pairs(table.b15[,-1])
```
**Table B16 Data Set**

**Description**

The `table.b16` data frame has 38 observations on 6 variables.

**Usage**

```r
data(table.b16)
```

**Format**

This data frame contains the following columns:

- **Country** character
- **LifeExp** numeric
- **People.per.TV** numeric
- **People.per.Dr** numeric
- **LifeExpMale** numeric
- **LifeExpFemale** numeric

**Source**


---

**Table B17**

**Description**

The `table.b17` data frame has 25 observations on 5 variables.

**Usage**

```r
data(table.b17)
```

**Format**

This data frame contains the following columns:

- **Satisfaction** numeric vector
- **Age** numeric vector
- **Severity** numeric vector
- **Surgical.Medical** numeric vector
- **Anxiety** numeric vector
Source


Examples

pairs(table.b17)

data(table.b18)

Format

This data frame contains the following columns:

- y numeric vector
- x1 numeric vector
- x2 numeric vector
- x3 numeric vector
- x4 numeric vector
- x5 numeric vector
- x6 numeric vector
- x7 numeric vector
- x8 numeric vector

Description

The table.b18 data frame has 16 observations on 9 variables.

Usage

Source


Examples

pairs(table.b18)
Table B19

Description

The table.b19 data frame has 32 observations on 11 variables.

Usage

data(table.b19)

Format

This data frame contains the following columns:

- y  numeric vector
- x1 numeric vector
- x2 numeric vector
- x3 numeric vector
- x4 numeric vector
- x5 numeric vector
- x6 numeric vector
- x7 numeric vector
- x8 numeric vector
- x9 numeric vector
- x10 numeric vector

Source


Examples

pairs(table.b19)
Description

The `table.b2` data frame has 29 rows and 6 columns.

Usage

```r
data(table.b2)
```

Format

This data frame contains the following columns:

- `y` a numeric vector
- `x1` a numeric vector
- `x2` a numeric vector
- `x3` a numeric vector
- `x4` a numeric vector
- `x5` a numeric vector

Source


Examples

```r
data(table.b2)
```

Description

The `table.b20` data frame has 18 observations on 6 variables.

Usage

```r
data(table.b20)
```
Format

This data frame contains the following columns:

- **x1** numeric vector
- **x2** numeric vector
- **x3** numeric vector
- **x4** numeric vector
- **x5** numeric vector
- **y** numeric vector

Source


Examples

```r
pairs(table.b20)
```

---

**Table B22 - Baseball Data**

Description

The `table.b22` data frame has 30 observations on 12 variables.

Usage

```r
data(table.b22)
```

Format

This data frame contains the following columns:

- **Team** character vector
- **Wins** numeric vector
- **Batter.Age** numeric vector
- **Runs** numeric vector
- **HRs** numeric vector
- **SLG** numeric vector
- **Pitcher.Age** numeric vector
- **ERA** numeric vector
- **SO** numeric vector
- **HRA** numeric vector
- **RA.G** numeric vector
- **Errors** numeric vector
Source

Examples
pairs(table.b22[,-1])

data(table.b23)

Format
This data frame contains the following columns:

- Player character vector
- Per numeric vector
- Lane.Agility.Time.Seconds numeric vector
- Shuttle.Run.Seconds numeric vector
- Three.Quarter.Sprint.Seconds numeric vector
- Standing.Vertical.Leap.Inches numeric vector
- Max.Vertical.Leap.Inches numeric vector
- Position character vector

Source

Examples
pairs(table.b23[,-c(1, 8)])
**Description**

The `table.b24` data frame has 51 observations on 6 variables.

**Usage**

```r
data(table.b24)
```

**Format**

This data frame contains the following columns:

- **City** character vector
- **Population** numeric vector
- **X95th.Percentile.Income** numeric vector
- **Median.Sale.Price** numeric vector
- **Median.Price.sqft** numeric vector
- **Rental.Price** numeric vector

**Source**


**Examples**

```r
pairs(table.b24[,,-1])
```

---

**Description**

The `table.b25` data frame has 50 observations on 6 variables.

**Usage**

```r
data(table.b25)
```
Format

This data frame contains the following columns:

- **Player** character vector
- **Average.Score** numeric vector
- **SG..Off.the.Tee** numeric vector
- **SG..Approach.to.Green** numeric vector
- **SG..Around.the.Green** numeric vector
- **SG..Putting** numeric vector

Source


Examples

```
pairs(table.b25[,-1])
```

Table B3

- **table.b3**

Description

The `table.b3` data frame has observations on gasoline mileage performance for 32 different automobiles.

Usage

```
data(table.b3)
```

Format

This data frame contains the following columns:

- **y** Miles/gallon
- **x1** Displacement (cubic in)
- **x2** Horsepower (ft-lb)
- **x3** Torque (ft-lb)
- **x4** Compression ratio
- **x5** Rear axle ratio
- **x6** Carburetor (barrels)
- **x7** No. of transmission speeds
- **x8** Overall length (in)
- **x9** Width (in)
- **x10** Weight (lb)
- **x11** Type of transmission (1=automatic, 0=manual)
Source


References

Motor Trend, 1975

Examples

data(table.b3)
attach(table.b3)
y.lm <- lm(y ~ x1 + x6)
summary(y.lm)
  # testing for the significance of the regression:
y.null <- lm(y ~ 1)
anova(y.null, y.lm)
  # 95% CI for mean gas mileage:
predict(y.lm, newdata=data.frame(x1=275, x6=2), interval="confidence")
  # 95% PI for gas mileage:
predict(y.lm, newdata=data.frame(x1=275, x6=2), interval="prediction")
detach(table.b3)

Description

The table.b4 data frame has 24 observations on property valuation.

Usage

data(table.b4)

Format

This data frame contains the following columns:

- **y**: sale price of the house (in thousands of dollars)
- **x1**: taxes (in thousands of dollars)
- **x2**: number of baths
- **x3**: lot size (in thousands of square feet)
- **x4**: living space (in thousands of square feet)
- **x5**: number of garage stalls
- **x6**: number of rooms
- **x7**: number of bedrooms
- **x8**: age of the home (in years)
- **x9**: number of fireplaces
Source


References


Examples

data(table.b4)
attach(table.b4)
y.lm <- lm(y ~ x1 + x2 + x3 + x4 + x5 + x6 + x7 + x8 + x9)
summary(y.lm)
detach(table.b4)

Data Set for Table B5

Description

The table.b5 data frame has 27 observations on liquefaction.

Usage

data(table.b5)

Format

This data frame contains the following columns:

- **y** CO2
- **x1** Space time (in min)
- **x2** Temperature (in degrees Celsius)
- **x3** Percent solvation
- **x4** Oil yield (g/100g MAF)
- **x5** Coal total
- **x6** Solvent total
- **x7** Hydrogen consumption

Source

References


Examples

data(table.b5)
attach(table.b5)
y.lm <- lm(y ~ x6 + x7)
summary(y.lm)
detach(table.b5)

---

Data Set for Table B6

Description

The `table.b6` data frame has 28 observations on a tube-flow reactor.

Usage

data(table.b6)

Format

This data frame contains the following columns:

- y  NbOCl3 concentration (g-mol/l)
- x1  COCl2 concentration (g-mol/l)
- x2  Space time (s)
- x3  Molar density (g-mol/l)
- x4  Mole fraction CO2

Source


References

Examples

data(table.b6)
# Partial Solution to Problem 3.9
attach(table.b6)
y.lm <- lm(y ~ x1 + x4)
summary(y.lm)
detach(table.b6)

data(table.b7)

Description

The table.b7 data frame has 16 observations on oil extraction from peanuts.

Usage

data(table.b7)

Format

This data frame contains the following columns:

- **x1** CO2 pressure (bar)
- **x2** CO2 temperature (in degrees Celsius)
- **x3** peanut moisture (percent by weight)
- **x4** CO2 flow rate (L/min)
- **x5** peanut particle size (mm)
- **y** total oil yield

Source


References


Examples

data(table.b7)
attach(table.b7)
# partial solution to Problem 3.11:
peanuts.lm <- lm(y ~ x1 + x2 + x3 + x4 + x5)
summary(peanuts.lm)
detach(table.b7)
Table B8

Description

The `table.b8` data frame has 36 observations on Clathrate formation.

Usage

```r
data(table.b8)
```

Format

This data frame contains the following columns:

- `x1` Amount of surfactant (mass percentage)
- `x2` Time (min)
- `y` Clathrate formation (mass percentage)

Source


References


Examples

```r
data(table.b8)
attach(table.b8)
clathrate.lm <- lm(y ~ x1 + x2)
summary(clathrate.lm)
detach(table.b8)
```
Description

The table.b9 data frame has 62 observations on an experimental pressure drop.

Usage

data(table.b9)

Format

This data frame contains the following columns:

\( x_1 \) Superficial fluid velocity of the gas (cm/s)
\( x_2 \) Kinematic viscosity
\( x_3 \) Mesh opening (cm)
\( x_4 \) Dimensionless number relating superficial fluid velocity of the gas to the superficial fluid velocity of the liquid
\( y \) Dimensionless factor for the pressure drop through a bubble cap

Source


References


Examples

data(table.b9)
attach(table.b9)
# Partial Solution to Problem 3.13:
y.lm <- lm(y ~ x1 + x2 + x3 + x4)
summary(y.lm)
detach(table.b9)
tarimage

tarimage  

target image

Description

The tarimage is a list. Most of the values are 0, but there are small regions of 1’s.

Usage

data(tarimage)

Format

This list contains the following elements:

- x  a numeric vector having 101 elements.
- y  a numeric vector having 101 elements.
- xy  a numeric matrix having 101 rows and columns

Examples

with(tarimage, image(x, y, xy))

tplot

Graphical t Test for Regression

Description

This function analyzes regression data graphically. It allows visualization of the usual t-tests for individual regression coefficients.

Usage

tplot(X, y, plotIt=TRUE, type="hist", includeIntercept=TRUE)

Arguments

- X  The design matrix.
- y  A numeric vector containing the response.
- plotIt  Logical: if TRUE, a graph is drawn.
- type  "QQ" or "hist"
- includeIntercept  Logical: if TRUE, the intercept effect is plotted; otherwise, it is omitted from the plot.
Value

A QQ-plot or a histogram and rugplot, or a list if plotIt=FALSE

Author(s)

W. John Braun

Examples

# Jojoba oil data set
X <- p4.18[,-4]
y <- p4.18[,4]
tplot(X, y, type="hist", includeIntercept=FALSE)
title("Tests for Individual Coefficients in the Jojoba Oil Regression")

# Simulated data set where none of the predictors are in the true model:
set.seed(4571)
Z <- matrix(rnorm(400), ncol=10)
A <- matrix(rnorm(81), ncol=9)
simdata <- data.frame(Z[,1], crossprod(t(Z[,-1]),A))
names(simdata) <- c("y", paste("x", 1:9, sep=""))
X <- simdata[,,-1]
y <- simdata[,1]
tplot(X, y, type="hist", includeIntercept=FALSE)
title("Tests for Individual Coefficients for the Simulated Data Set")

# NFL Data set:
X <- table.b1[,-1]
y <- table.b1[,1]
tplot(X, y, type="hist", includeIntercept=FALSE)
title("Tests for Individual Coefficients for the NFL Data Set")

# Simulated Data set where x8 is the only predictor in the true model:
X <- pathoeg[,-10]
y <- pathoeg[,10]
par(mfrow=c(2,2))
tplot(X, y)
tplot(X, y, type="QQ")

---

**tree.sample**

*Sample of Loblolly Pine Data*

**Description**

A random sample of observations taken from the 'Loblolly' data frame, one per Seed.

**Usage**

data("tree.sample")
Format

A data frame with 12 observations on the following 2 variables.

- height  tree heights (ft)
- age  tree ages (yr)

Description

This function graphically displays the coefficient multipliers used in the Regression Plot for the given predictor.

Usage

Uplot(X.qr, Xcolumn = 1, ...)

Arguments

- X.qr  The design matrix or the QR decomposition of the design matrix.
- Xcolumn  The column(s) of the design matrix under study; this can be either integer valued or a character string.
- ...  Additional arguments to barchart.

Value

A bar plot is displayed.

Author(s)

W. John Braun

Examples

# Jojoba oil data set
X <- p4.18[, -4]
Uplot(X, 1:4)

# NFL data set; see GFplot result first
X <- table.b1[, -1]
Uplot(X, c(2, 3, 9))

# In this example, x8 is the only predictor in the true model:
X <- pathoeg[, -10]
y <- pathoeg[, 10]
pathoeg.F <- GFplot(X, y, plotIt = FALSE)
Uplot(X, "x8")
Uplot(X, 9) # same as above
```
Uplot(pathoeg.F$QR, 9) # same as above
X <- table.b1[, -1]
Uplot(X, c("x2", "x3", "x9"))
```

---

**widths**  
*Measurements of the Widths of Book Covers*

**Description**  
Measurements in centimeters of the widths of a random collection of books.

**Usage**  
widths

**Format**  
A numeric vector of length 24.

---

**windWin80**  
*Winnipeg Wind Speed*

**Description**  
The `windWin80` data frame has 366 observations on midnight and noon windspeed at the Winnipeg International Airport for the year 1980.

**Usage**  
```
data(windWin80)
```

**Format**  
This data frame contains the following columns:

- **h0**: a numeric vector containing the wind speeds at midnight.
- **h12**: a numeric vector containing the wind speeds at the following noon.

**Examples**  
```
data(windWin80)
ts.plot(windWin80$h12^2)
```
Wpgtemp

**Wpgtemp**

*Winnipeg Maximum Temperatures*

**Description**

The Wpgtemp data frame has 7671 observations on daily maximum temperatures at the Winnipeg International Airport for the years 1960 through 1980.

**Usage**

```r
data(Wpgtemp)
```

**Format**

This data frame contains the following columns:

- **temperature**: A numeric vector containing the temperatures in degrees Celsius
- **day**: A numeric vector denoting the observation date in numbers of days after December 31, 1959

**Source**

Environment Canada

**Examples**

```r
summary(Wpgtemp)
```

wxNWO

*Weather Observations for Three Stations in Northwestern Ontario*

**Description**

Daily observations taken from 2012 through 2021 on temperature, rain, snow and wind for Fort Frances, Kenora and Dryden, Ontario.

**Usage**

```r
wxNWO
```
Format

A data frame with 10959 observations on the following 31 variables.

Longitude numeric
Latitude numeric
Station.Name character
Climate.ID numeric
Date.Time numeric
Year numeric
Month numeric
Day numeric
Data.Quality numeric
Max.Temp numeric
Max.Temp.Flag numeric
Min.Temp numeric
Min.Temp.Flag numeric
Mean.Temp numeric
Mean.Temp.Flag numeric
Heat.Deg.Days numeric
Heat.Deg.Days.Flag numeric
Cool.Deg.Days numeric
Cool.Deg.Days.Flag numeric
Total.Rain numeric
Total.Rain.Flag numeric
Total.Snow numeric
Total.Snow.Flag numeric
Total.Precip numeric
Total.Precip.Flag numeric
Snow.on.Ground numeric
Snow.on.Ground.Flag numeric
Dir.of.Max.Gust numeric
Dir.of.Max.Gust.Flag numeric
Speed.of.Max.Gust numeric
Speed.of.Max.Gust.Flag numeric

Source

Environment Canada
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