# Package: Blendstat (via r-universe)

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**Type** Package

**Title** Joint Analysis of Experiments with Mixtures and Random Effects

**Version** 1.0.5

**Date** 2024-06-21

**Imports** MASS, lattice

**Description** Performs a joint analysis of experiments with mixtures and random effects, taking on a process variable represented by a covariable.

**License** GPL-3

**Encoding** UTF-8

**LazyData** true

**NeedsCompilation** no

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**Repository** CRAN

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## Contents

## Blendstat-package *Joint Analysis of Experiments with Mixtures and Random Effects.*

### Description

Joint analysis of experiments with mixtures and random effects, taking on a process variable represented by a covariable.

### Details

| | |
|---|---|
| Package: | Blendstat |
| Type: | Package |
| Version: | 1.0.5 |
| Date: | 2024-06-21 |
| License: | GPL(>= 2) |
| LazyLoad: | yes |

### Author(s)

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### References

Kalirajan, K. P. On the estimation of a regression model with fixed and random coefficients. *Journal of Applied Statistics*, 17(2): 237-244, 1990. doi:10.1080/757582835

Swany, P. A. V. B. *Statistical Inference in Random Coefficient Regression Models.* Amsterdam: Springer Science & Business Media, 1971. 209 p.

## Blend *Joint analysis of experiments with mixtures and random effects.*

### Description

Joint analysis of experiments with mixtures and random effects, taking on a process variable represented by a covariable.

### Usage

```
Blend(exp, X, Y, conc = NULL, effects = NULL)
```

## Arguments

| | |
|---|---|
| exp | Vector with the names of the experiments. |
| X | Mixture variables (components), without the vector of the concentrations (covariable). |
| Y | Response variable. |
| conc | Vector with the concentrations (covariable) of the experiments. |
| effects | Vector of the effects of the mixtures in a reference mixture (example: centroid). |

## Value

| | |
|---|---|
| MPred | Matrix with the predicted and observed values. |
| MCPred | Matrix with the values predicted by components. |
| Mexp | Matrix with the design of the experiments. |
| theta | Vector with the theta estimates. |

## Author(s)

Marcelo Angelo Cirillo

Paulo Cesar Ossani

## References

Kalirajan, K. P. On the estimation of a regression model with fixed and random coefficients. *Journal of Applied Statistics*, 17(2): 237-244, 1990. doi:10.1080/757582835

Swany, P. A. V. B. *Statistical Inference in Random Coefficient Regression Models.* Amsterdam: Springer Science & Business Media, 1971. 209 p.

## See Also

Plot.Blend

## Examples

```
data(DataNAT) # dataset

Exp <- DataNAT[,2]   # identification of experiments

X <- DataNAT[,3:6] # independent variable
Y <- DataNAT[,11]  # dependent variable

# effects of the blends in a reference mixture
Effects <- rep(c(-0.1,0,0.1,0.2,0.3,0.4,0.5,0.6,0.7),4)

Conc <- as.matrix(DataNAT[,7]) # covariate (process variable)

Res <- Blend(exp = Exp, X = X, Y = Y, conc = Conc, effects = Effects)
```

```
print("Predicted and observed values"); Res$MPred
print("Values predicted by components:"); Res$MCPred
print("Design of the experiments:"); Res$Mexp
print("Estimates of the linear model parameters:"); Res$theta

Tit <- c("Covariate (process variable)","Variable")

Xlab = "effects"  # label of the X axis
Ylab = "Predicted values"  # label of the Y axis

Plot.Blend(Res, titles = Tit, posleg = 2, xlabel = Xlab,
           ylabel = Ylab, boxleg = TRUE, color = TRUE,
           expcolor = c("goldenrod3","gray53","red2", "blue2"),
           casc = TRUE)
```

---

DataCD *Dataset, peeled cherry coffee.*

---

## Description

Database of coffee blends of different varieties processed via wet (peeled cherry).

## Usage

```
data(DataCD)
```

## Format

Database of coffee blends of different varieties processed via wet (peeled cherry). Formed by the variables: Exp (code of the experiments); CEB (specialty Bourbon Yellow coffee produced at an altitude above 1,200m); CT (roasted commercial coffee); CC (Conillon coffee); CEA (Acaia specialty coffee produced at altitude below 1,100m); Conc (concentrations at 7% and 10% (m/v) of roasted and ground coffee beans in 100 ml of water). Response variables defined by the sensorial attributes: Body, Taste, Acidity, Bitterness, Score.

## References

Project yield and research entitled by "Quality of blends of specialty and non-specialty coffees of the region of the Mantiqueira Mountains - treatment of discrepant scores in tests with consumers". CNPq for their aid via grant number 304974/2015-3.

## Examples

```
data(DataCD) # dataset

Exp <- DataCD[,2]   # identification of the experiments

X <- DataCD[,3:6] # independent variables (components)
```

```
Y <- DataCD[,11]  # dependent variable (response Bitterness)

# effects o the mixtures in the reference mixture
Effects <- rep(c(-0.1,0,0.1,0.2,0.3,0.4,0.5,0.6,0.7),4)

Conc <- as.matrix(DataCD[,7]) # covariable (process variable)

Res <- Blend(exp = Exp, X = X, Y = Y, conc = Conc, effects = Effects)

print("Predicted and observed values"); Res$MPred
print("Values predicted by components:"); Res$MCPred
print("Design of the experiments:"); Res$MExp
print("Estimates of the linear model parameters:"); Res$theta
```

---

DataNAT *Dataset, natural cherry coffee.*

---

## Description

Database of coffee blends of different varieties processed by dry via.

## Usage

```
data(DataNAT)
```

## Format

Database of coffee blends of different varieties processed by dry via. Formed by the variables: Exp (code of the experiments); CEB (specialty Bourbon Yellow coffee produced at an altitude above 1,200m); CT (roasted commercial coffee); CC (Conillon coffee); CEA (Acaia specialty coffee produced at altitude below 1,100m); Conc (concentrations at 7% and 10% (w/v) of roasted and ground coffee beans in 100 ml of water). Variable responses defined by sensory attributes: Body, Taste, Acidity, Bitterness, Score.

## References

Project yield and research entitled by "Quality of blends of specialty and non-specialty coffees of the region of the Mantiqueira Mountains - treatment of discrepant scores in tests with consumers". CNPq for their aid via grant number 304974/2015-3.

## Examples

```
data(DataNAT) # dataset

Exp <- DataNAT[,2]   # identification of the experiments

X <- DataNAT[,3:6] # independent variables (components)
Y <- DataNAT[,11]  # dependent variable (response Bitterness)
```

```
# effects o the mixtures in the reference mixture
Effects <- rep(c(-0.1,0,0.1,0.2,0.3,0.4,0.5,0.6,0.7),4)

Conc <- as.matrix(DataNAT[,7]) # covariable (process variable)

Res <- Blend(exp = Exp, X = X, Y = Y, conc = Conc, effects = Effects)

print("Predicted and observed values"); Res$MPred
print("Values predicted by components:"); Res$MCPred
print("Design of the experiments:"); Res$MExp
print("Estimates of the linear model parameters:"); Res$Theta
```

---

`Plot.Blend` *Plots of the results.*

---

## Description

Plots of the results of the joint analysis of the experiments.

## Usage

```
Plot.Blend(BL, titles = c(NA,NA), posleg = 2, xlabel = NA,
           ylabel = NA, boxleg = FALSE, color = TRUE, expcolor = NA,
           casc = TRUE)
```

## Arguments

| | |
|---|---|
| `BL` | Data of the Blend function. |
| `titles` | Titles for the plot of the effects of the concentrations and components. If it is not defined, it assumes the default text. |
| `posleg` | 1 for caption in the left upper corner,<br>2 for caption in the right upper corner (default),<br>3 for caption in the right lower corner,<br>4 for caption in the left lower corner. |
| `xlabel` | Names the X axis, if not set, assumes the default text. |
| `ylabel` | Names the Y axis, if not set, assumes the default text. |
| `boxleg` | Puts frame on the caption (default = TRUE). |
| `color` | Colorful plots (default = TRUE). |
| `expcolor` | Vector with the colors of the experiments. |
| `casc` | Cascade effect in the presentation of the plots (default = TRUE). |

## Value

Return several plots.

## Author(s)

Marcelo Angelo Cirillo

Paulo Cesar Ossani

## See Also

Blend

## Examples

```
data(DataCD) # dataset

Exp <- DataCD[,2]   # identification of the experiments

X <- DataCD[,3:6] # independent variables (components)
Y <- DataCD[,11]  # dependent variable (response Bitterness)

# effects o the mixtures in the reference mixture
Effects <- rep(c(-0.1,0,0.1,0.2,0.3,0.4,0.5,0.6,0.7),4)

Conc <- as.matrix(DataCD[,7]) # covariable (process variable)

Res <- Blend(exp = Exp, X = X, Y = Y, conc = Conc, effects = Effects)

print("Predicted and observed values"); Res$MPred
print("Values predicted by components:"); Res$MCPred
print("Design of the experiments:"); Res$MExp
print("Estimates of the linear model parameters:"); Res$Theta

Tit <- c("Covariable (process variable)","Variable")

Xlab = "Effects"  # label of the X axis
Ylab = "Predicted values"  # label of the Y axis

Plot.Blend(Res, titles = Tit, posleg = 2, xlabel = Xlab,
           ylabel = Ylab, boxleg = TRUE, color = TRUE,
           expcolor = c("goldenrod3","gray53","red2", "blue2"),
           casc = TRUE)
```

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