Package 'iRegression'

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Title Regression Methods for Interval-Valued Variables

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Description Contains some important regression methods for interval-valued variables. For each method, it is available the fitted values, residuals and some goodness-of-fit measures.

Depends R(>= 2.8.0)

License GPL (>= 2)

LazyLoad yes

NeedsCompilation no

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`iRegression-package` *Regression Methods for Interval-Valued Variables*

Description

Contains some important regression methods for interval-valued variables. For each method, it is available the fitted values, residuals and some goodness-of-fit measures.

Details

Package:	iRegression
Type:	Package
Version:	1.2.1
Date:	2016-07-16
License:	GPL (>= 2)
LazyLoad:	yes

Some available functions: `cm`, `MinMax`, `crm`, `ccrm`, `bivar`

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References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

Lima Neto, E.A. and De Carvalho, F.A.T. (2008). Centre and range method to fitting a linear regression model on symbolic interval data. *Computational Statistics and Data Analysis*, **52**, 1500–1515.

Lima Neto, E.A. and De Carvalho, F.A.T. (2010). Constrained linear regression models for symbolic interval-valued variables. *Computational Statistics and Data Analysis*, 54, 333–347.

Lima Neto, E. A., Cordeiro, G. and De Carvalho, F.A.T. (2011). Bivariate symbolic regression models for interval-valued variables. *Journal of Statistical Computation and Simulation (Print)*, 81, 1727–1744.

`bivar` *Bivariate Symbolic Regression Method*

Description

This function fits an bivariate regression model for interval-valued variables, based on bivariate exponential family of distributions, and return the fitted values, the residuals, rho, phi and the goodness-of-fit measure deviance

Usage

```
bivar(formula1, lig1, formula2, lig2, data, ...)
```

Arguments

`formula1`	an object of class "`formula`": the description of the first model to be fitted.
`lig1`	the link function to be considered in the first model: identity, inverse or log
`formula2`	an object of class "`formula`": the description of the second model to be fitted.
`lig2`	the link function to be considered in the second model: identity, inverse or log
`data`	an optional data frame containing the variables in the model.
`...`	other arguments.

Details

This function fits an bivariate regression model for interval-valued variables considering the bivariate Gaussian distribution in the random component Y = [Y1, Y2]. It is possible consider any pair of interval features for the bivariate random vector Y. For example, the lower and upper interval bounds or the midpoint and the range of intervals, respectively. It also possible to choice different link functions (identity, inverse or log) to connect the random variables Y1 and Y2 with the respective linear predictors.

Value

bivar returns an object of class "bivar" including at least the following elements:

coefficients1	a named vector of coefficients for the explanatory variables of the model "1".
coefficients2	a named vector of coefficients for the explanatory variables of the model "2".
fitted.values1	the fitted values for the response variable Y1 .
fitted.values2	the fitted values for the response variable Y2.
residuals1	the ordinary residual for the response variable Y1.
residuals2	the ordinary residual for the response variable Y2.
residual.deviance	the global residual for the bivariate vector Y=[Y1, Y2].
Rho	the estimative for the correlation coefficient between Y1 and Y2.
Phi	the estimative of the dispersion parameter.
D	the goodness-of-fit measure deviance for the current model.

Note

lig1 and lig2 must be "identity", "inverse" or "log" for identity, inverse or logarithmic link functions, respectively.

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References

Lima Neto, E. A., Cordeiro, G. and De Carvalho, F.A.T. (2011). Bivariate symbolic regression models for interval-valued variables. *Journal of Statistical Computation and Simulation (Print)*, 81, 1727–1744.

See Also

summary.bivar, coef.bivar, fitted.bivar, residuals.bivar, formula

Examples

```
data("soccer.bivar", package = "iRegression")
ex.bivar <- bivar("yMin~t1Min+t2Min", "identity", "yMax~t1Max+t2Max", "identity", data=soccer.bivar)
ex.bivar
```

Cardiological.CR *Cardiological Interval Data Set (Centre and Range)*

Description

A real interval-valued data set represented in terms of the centre and the range of the intervals.

Usage

```
data("Cardiological.CR")
```

Format

A data frame containing the following variables:.

PulseC The midpoint of the response interval-valued variable Pulse

SystC The midpoint of the explanatory interval-valued variable Systolic Pressure

DiastC The midpoint of the explanatory interval-valued variable Diastolic Pressure

PulseR The range of the response interval-valued variable Pulse

SystR The range of the explanatory interval-valued variable Systolic Pressure

DiastR The range of the explanatory interval-valued variable Diastolic Pressure

Details

This data set concerns the record of the pulse rate (Y), systolic blood pressure (X1) and diastolic blood pressure (X2) from 11 patients.

Source

Billard and Diday (2000)

References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

See Also

crm

Examples

```
data("Cardiological.CR", package = "iRegression")

crm1 <- crm("PulseC~SystC+DiastC","PulseR~SystR+DiastR",data=Cardiological.CR)
summary(crm1)
```

`Cardiological.MinMax` *Cardiological Interval Data Set*

Description

A real interval-valued data set.

Usage

```
data("Cardiological.CR")
```

Format

A data frame containing following variables:

PulseMin Lower bound of the response interval-valued variable Pulse

SystMin Lower bound of the explanatory interval-valued variable Systolic Pressure

DiastMin Lower bound of the explanatory interval-valued variable Diastolic Pressure

PulseMax Upper bound of the response interval-valued variable Pulse

SystMax Upper bound of the explanatory interval-valued variable Systolic Pressure

DiastMax Upper bound of the explanatory interval-valued variable Diastolic Pressure

Details

This data set concerns the record of the pulse rate (Y), systolic blood pressure (X1) and diastolic blood pressure (X2) from 11 patients.

Source

Billard and Diday (2000)

References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

See Also

`cm`, `MinMax`

Examples

```
data("Cardiological.MinMax", package = "iRegression")

cm1 <- cm(PulseMin~SystMin+DiastMin,PulseMax~SystMax+DiastMax,data=Cardiological.MinMax)
summary(cm1)

##
data("Cardiological.MinMax", package = "iRegression")

MinMax1 <- MinMax(PulseMin~SystMin+DiastMin,PulseMax~SystMax+DiastMax,data=Cardiological.MinMax)
summary(MinMax1)
```

---

ccrm *Constrained Centre and Range Method*

Description

`ccrm` is used to fit a linear regression model to symbolic interval-valued variables based on the inequality constraints over the range variables (Lima Neto and De Carvalho, 2010).

Usage

```
ccrm(formula1, formula2, data, ...)
```

Arguments

`formula1`	an object of class "`formula`": the description of the first model to be fitted.
`formula2`	an object of class "`formula`": the description of the second model to be fitted.
`data`	an optional data frame containing the variables in the model.
`...`	other arguments.

Details

The Constrained Centre and Range method (CCRM) was proposed by Lima Neto and De Carvalho (2010) and fits two independent linear regression models on the midpoint and range of the intervals. In the Constrained Centre and Range Method, the estimative of the parameters of the range's model is based on inequality constraints. There is no constraints over the parameters estimates for the midpoint regression equation. The aim is to guarantee mathematical coherence between the predicted values of the lower and upper bounds of the response interval-valued variable Y, i.e., yL < yU.

Value

`ccrm` returns an object of class "`ccrm`" including at least the following elements:

`coefficients.C`	a named vector of coefficients for the Centre's explanatory variables.
`coefficients.R`	a named vector of coefficients for the Range's explanatory variables.
`sigma.C`	an estimative of the standard deviation for the Centre's response variable.

sigma.R	an estimative of the standard deviation for the Range's response variable.
df.C	the degrees of freedom for the Centre residuals
df.R	the degrees of freedom for the Range residuals
fitted.values.l	the fitted values for the lower interval bound.
fitted.values.u	the fitted values for the upper interval bound.
residuals.l	the ordinary residuals for the lower interval bound.
residuals.u	the ordinary residuals for the upper interval bound.

Note

formula1 must contain the midpoint of the symbolic interval-valued variables. formula2 contain the range (upper limit minus lower limit) of the symbolic interval-valued variables.

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References

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See Also

summary.ccrm, coef.ccrm, fitted.ccrm, residuals.ccrm, formula

Examples

```
data("Cardiological.CR", package = "iRegression")
ex.ccrm <- ccrm("PulseC~SystC+DiastC","PulseR~SystR+DiastR",data=Cardiological.CR)
ex.ccrm
```

---

cm *Centre Method*

Description

cm is used to fit a linear regression model to symbolic interval-valued variables based on the centre method (Billard and Diday, 2000).

Usage

```
cm(formula1, formula2, data, ...)
```

Arguments

formula1	an object of class formula: a symbolic description of the model to be fitted.
formula2	an object of class formula: a symbolic description of the model to be fitted.
data	an optional data frame containing the variables in the model.
...	other arguments.

Details

Billard and Diday (2000) presented the first approach to fitting a linear regression model to symbolic interval data sets from a SDA of view. Their approach consists on fitting a linear regression model to the mid-points of the interval values assumed by the symbolic interval variables in the learning set and applies this model to the lower and upper bounds of the interval values of the independent symbolic interval variables to be predicted, respectively, the lower and upper bounds of the interval value of the dependent variable. The Centre Method is based on the minimization of the midpoint error. The lower and upper bounds of the dependent variable are predicted, respectively, from the lower and upper bounds of the independent variable using the same vector of parameters ***beta***.

Value

cm returns an object of class "cm" including at least the following elements:

coefficients	a named vector of coefficients.
sigma	an estimate of standard deviation.
df	the residual degrees of freedom.
fitted.values.l	the fitted values for the lower interval bound.
fitted.valuues.u	the fitted values for the upper interval bound.
residuals.l	the ordinary residuals for the lower interval bound .
residuals.u	the ordinary residuals for the upper interval bound .

Note

formula1 must contain the lower limit of the symbolic interval-valued variables. formula2 contain the upper limit of the symbolic interval-valued variables.

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References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

Lima Neto, E.A. and De Carvalho, F.A.T. (2008). Centre and range method to fitting a linear regression model on symbolic interval data. *Computational Statistics and Data Analysis*, **52**, 1500–1515.

See Also

summary.cm, coef, fitted.cm, residuals.cm, formula

Examples

```
data("Cardiological.MinMax", package = "iRegression") ## see Billard and Diday (2000)
ex.cm <- cm(PulseMin~SystMin+DiastMin,PulseMax~SystMax+DiastMax,data=Cardiological.MinMax)
ex.cm
```

---

coef.bivar *Extract the Coefficients for the Bivariate Symbolic Regression Method*

Description

Returns the coefficients from an object class bivar.

Usage

```
## S3 method for class 'bivar'
coef(object, ...)
```

Arguments

object	an object class bivar.
...	other arguments.

Value

Coefficients extracted from an object class bivar.

See Also

bivar

coef.ccrm *Extract the Coefficients for the Constrained Centre and Range Method*

Description

Returns the coefficients from an object class `ccrm`.

Usage

```
## S3 method for class 'ccrm'
coef(object, ...)
```

Arguments

`object`	an object class `ccrm`.
`...`	other arguments.

Value

Coefficients extracted from an object class `object`.

See Also

`ccrm`

coef.crm *Extract the Coefficients for the Centre and Range Method*

Description

Returns the coefficients from an object class `crm`.

Usage

```
## S3 method for class 'crm'
coef(object, ...)
```

Arguments

`object`	an object class `crm`.
`...`	other arguments.

Value

Coefficients extracted from an object class `object`.

See Also

crm

---

coef.MinMax *Extract Coefficients for the MinMax Method*

Description

Returns the coefficients from an object class MinMax.

Usage

```
## S3 method for class 'MinMax'
coef(object, ...)
```

Arguments

object	an object class MinMax.
...	other arguments.

Value

Coefficients extracted from an object class MinMax.

See Also

MinMax

---

crm *Centre and Range Method*

Description

crm is used to fit a linear regression model to symbolic interval-valued variables based on the Centre and Range method (Lima Neto and De Carvalho, 2008).

Usage

```
crm(formula1, formula2, data, ...)
```

Arguments

formula1	an object of class "formula": a symbolic description of the model to be fitted.
formula2	an object of class "formula": a symbolic description of the model to be fitted.
data	an optional data frame containing the variables in the model.
...	other arguments.

Details

In the Center Method, the estimate of the parameters ***beta*** is based only on the midpoint of the intervals. However, the Centre and Range Method proposed by Lima Neto and De Carvalho (2008) consider suitable to include both the information given by the center and by the range of an interval-valued variable on a linear regression model to improve the model prediction performance. The Centre and Range Method fits two independent linear regression models on the midpoint and range of the intervals, respectively, and minimizes the error of the midpoint plus the error of the range.

Value

`cm` returns an object of class "`crm`" including at least the following elements:

`coefficients.C`	a named vector of coefficients for the Centre variables.
`coefficients.R`	a named vector of coefficients for the Range variables.
`sigma.C`	an estimate of standard deviation for the Centre response variable.
`sigma.R`	an estimate of standard deviation for the Range response variable.
`df.C`	the degrees of freedom for the centre residuals
`df.R`	the degrees of freedom for the range residuals
`fitted.values.l`	the fitted mean values for the lower interval bound.
`fitted.values.u`	the fitted mean values for the upper interval bound.
`residuals.l`	the residuals for the lower interval bound (that is response minus fitted values).
`residuals.u`	the residuals for the upper interval bound (that is response minus fitted values).

Note

`formula1` must contain the midpoint of the symbolic interval-valued variables. `formula2` contain the range (upper limit minus lower limit) of the symbolic interval-valued variables.

Author(s)

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References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

Lima Neto, E.A. and De Carvalho, F.A.T. (2008). Centre and range method to fitting a linear regression model on symbolic interval data. *Computational Statistics and Data Analysis*, 52, 1500–1515.

See Also

`summary.crm`, `coef.crm`, `fitted.crm`, `residuals.crm`, `formula`

Examples

```
data("Cardiological.CR", package = "iRegression")
ex.crm <- crm("PulseC~SystC+DiastC","PulseR~SystR+DiastR",data=Cardiological.CR)
ex.crm
```

`fitted.bivar` *Extract Bivariate Symbolic Regression Method Fitted Values*

Description

Returns the fitted values from an object class `bivar`.

Usage

```
## S3 method for class 'bivar'
fitted(object, ...)
```

Arguments

`object`	an object class `bivar`.
`...`	other arguments.

Value

Fitted values extracted from the object class `bivar`.

See Also

`bivar`

`fitted.ccrm` *Extract Constrained Centre and Range Method Fitted Values*

Description

Returns the fitted values from an object class `ccrm`.

Usage

```
## S3 method for class 'ccrm'
fitted(object, ...)
```

Arguments

`object`	an object class `ccrm`.
`...`	other arguments.

Value

Fitted values extracted from the object class `object`.

See Also

`ccrm`

`fitted.cm` *Extract Centre Method Fitted Values*

Description

Returns the fitted values from an object class `cm`.

Usage

```
## S3 method for class 'cm'
fitted(object, ...)
```

Arguments

`object`	an object class `cm`.
`...`	other arguments.

Value

Fitted values extracted from an object class `cm`.

See Also

`cm`

`fitted.crm` *Extract Centre and Range Method Fitted Values*

Description

Returns the fitted values from an object class `crm`.

Usage

```
## S3 method for class 'crm'
fitted(object, ...)
```

Arguments

object	an object class crm.
...	other arguments.

Value

Fitted values extracted from the object class object.

See Also

crm

---

fitted.MinMax *Extract MinMax Method Fitted Values*

Description

Returns the fitted values from an object class MinMax.

Usage

```
## S3 method for class 'MinMax'
fitted(object, ...)
```

Arguments

object	an object class MinMax.
...	other arguments.

Value

Fitted values extracted from the object class MinMax.

See Also

MinMax

MinMax *MinMax Method*

Description

MinMax is used to fit a linear regression model to symbolic interval-valued variables based on the MinMax method (Lima Neto and De Carvalho, 2008).

Usage

```
MinMax(formula1, formula2, data, ...)
```

Arguments

formula1	an object of class "formula": a symbolic description of the model to be fitted.
formula2	an object of class "formula": a symbolic description of the model to be fitted.
data	an optional data frame containing the variables in the model.
...	other arguments.

Details

The Min-Max Method suggests to estimate the lower and upper bounds of the intervals using different vectors of parameters. This is equivalent to supposing independence between the values of lower and upper bounds of the intervals. The MinMax Method fits two independent linear regression models on the lower and upper bounds of the intervals, respectively, and minimizes the error of the lower bounds plus the error of the upper bounds.

Value

MinMax returns an object of class "MinMax" including at least the following elements:

coefficients.l	a named vector of coefficients for the Minimum explanatory variables.
coefficients.u	a named vector of coefficients for the Maximum explanatory variables.
sigma.l	an estimate of standard deviation for the Minimum response variable
sigma.u	an estimate of standard deviation for the Maximum response variable
df.l	the degrees of freedom for the lower residuals
df.u	the degrees of freedom for the upper residuals
fitted.values.l	the fitted values for the lower interval bound.
fitted.values.u	the fitted values for the upper interval bound.
residuals.l	the ordinary residuals for the lower interval bound.
residuals.u	the ordinary residuals for the upper interval bound.

Note

formula1 must contain the lower limit of the symbolic interval-valued variables. formula2 contain the upper limit of the symbolic interval-valued variables.

Author(s)

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References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

Lima Neto, E.A. and De Carvalho, F.A.T. (2008). Centre and range method to fitting a linear regression model on symbolic interval data. *Computational Statistics and Data Analysis*, **52**, 1500–1515.

See Also

summary.MinMax, coef.MinMax, fitted.MinMax, residuals.MinMax, formula

Examples

```
data("Cardiological.MinMax", package = "iRegression") ## see Billard, L. and Diday, E. (2000)
ex.MinMax <- MinMax(PulseMin~SystMin+DiastMin,PulseMax~SystMax+DiastMax,data=Cardiological.MinMax)
ex.MinMax
```

---

print-iRegression *Print Values for various iRegression methods*

Description

print prints its argument.

Usage

```
## S3 method for class 'cm'
print(x, ...)
## S3 method for class 'crm'
print(x, ...)
## S3 method for class 'ccrm'
print(x, ...)
## S3 method for class 'MinMax'
print(x, ...)
## S3 method for class 'bivar'
print(x, ...)
```

```
## S3 method for class 'summary.cm'
print(x, ...)
## S3 method for class 'summary.crm'
print(x, ...)
## S3 method for class 'summary.ccrm'
print(x, ...)
## S3 method for class 'summary.MinMax'
print(x, ...)
## S3 method for class 'summary.bivar'
print(x, ...)
## S3 method for class 'coef.crm'
print(x, ...)
## S3 method for class 'coef.ccrm'
print(x, ...)
## S3 method for class 'coef.MinMax'
print(x, ...)
## S3 method for class 'coef.bivar'
print(x, ...)
```

Arguments

x	an object used to select a method..
...	further arguments passed to or from other methods.

See Also

print

`residuals.bivar` *Extract Bivariate Symbolic Regression Method Residuals*

Description

Returns the residuals from an object class `bivar`.

Usage

```
## S3 method for class 'bivar'
residuals(object, ...)
```

Arguments

object	an object class `bivar`.
...	other arguments.

Value

Residuals extracted from the object class `bivar`.

See Also

bivar

`residuals.ccrm` *Extract Constrained Centre and Range Method Residuals*

Description

Returns the residuals from an object class `ccrm`.

Usage

```
## S3 method for class 'ccrm'
residuals(object, ...)
```

Arguments

`object`	an object class `ccrm`.
`...`	other arguments.

Value

Residuals extracted from the object class `ccrm`.

See Also

ccrm

`residuals.cm` *Extract Centre Method Residuals*

Description

Returns the residuals from an object class `cm`.

Usage

```
## S3 method for class 'cm'
residuals(object, ...)
```

Arguments

`object`	an object class `cm`.
`...`	other arguments.

Value

Residuals extracted from the object class cm.

See Also

cm

---

residuals.crm *Extract Centre and Range Method Residuals*

Description

Returns the residuals from an object class crm.

Usage

```
## S3 method for class 'crm'
residuals(object, ...)
```

Arguments

object	an object class crm.
...	other arguments.

Value

Residuals extracted from the object class crm.

See Also

crm

---

residuals.MinMax *Extract MinMax Method Residuals*

Description

Returns the residuals from an object class MinMax.

Usage

```
## S3 method for class 'MinMax'
residuals(object, ...)
```

Arguments

`object`	an object class `MinMax`.
`...`	other arguments.

Value

Residuals extracted from the object class `MinMax`.

See Also

`MinMax`

`soccer.bivar` *Soccer Interval Data Set*

Description

A real interval-valued data set.

Usage

```
data("soccer.bivar")
```

Format

A data frame containing following variables:

yMin Minimum of the response variable Y (weight)

t1Min Minimum of the explanatory variable T1 (height)

t2Min Minimum of the explanatory variable T2 (age)

yMax Maximum of the response variable Y (weight)

t1Max Maximum of the explanatory variable T1 (height)

t2Max Maximum of the explanatory variable T2 (age)

Details

This data set concerns the record of the Weight (Y), Height (T1) and Age (T2) from 20 soccer teams of the premiere French championship.

Source

Lima Neto et. al. (2011)

References

Lima Neto, E. A., Cordeiro, G. and De Carvalho, F.A.T. (2011). Bivariate symbolic regression models for interval-valued variables. *Journal of Statistical Computation and Simulation (Print)*, 81, 1727–1744.

See Also

cm, MinMax, bivar

Examples

```
data("soccer.bivar", package = "iRegression")

bivar1 <- bivar(yMin~t1Min+t2Min, "identity", yMax~t1Max+t2Max, "identity", data=soccer.bivar)
summary(bivar1)
```

---

summary.bivar *Summarizing Bivariate Symbolic Regression Method Fits*

Description

summary method for class bivar.

Usage

```
## S3 method for class 'bivar'
summary(object, ...)
```

Arguments

object	an object of class "bivar", usually, a result of a call to bivar.
...	other arguments.

Value

The function summary.bivar returns the following elements, given an object of the class "bivar",

Coefficients1	a named vector of coefficients for the explanatory variables of the model "1".
Coefficients2	a named vector of coefficients for the explanatory variables of the model "2".
RMSE1	root mean square error for the model "1".
RMSE2	root mean square error for the model "2".
Rho	the estimative for the correlation coefficient between Y1 and Y2.
Phi	the estimative of the dispersion parameter.
D	the goodness-of-fit measure deviance for the current model.

References

Lima Neto, E. A., Cordeiro, G. and De Carvalho, F.A.T. (2011). Bivariate symbolic regression models for interval-valued variables. *Journal of Statistical Computation and Simulation (Print)*, 81, 1727–1744.

See Also

bivar

Examples

```
##-- Continuing the  bivar() example:
data("soccer.bivar", package = "iRegression")
ex.bivar <- bivar(yMin~t1Min+t2Min, "identity", yMax~t1Max+t2Max, "identity", data=soccer.bivar)
ex.sum <- summary(ex.bivar)
ex.sum
```

---

summary.ccrm *Summarizing Constrained Centre and Range Method Fits*

Description

summary method for class ccrm.

Usage

```
## S3 method for class 'ccrm'
summary(object, ...)
```

Arguments

object	an object of class "ccrm", usually, a result of a call to ccrm.
...	other arguments.

Value

The function summary.ccrm returns the following elements, given an object of the class "ccrm",

Coef.C	a named vector of coefficients for the Centre explanatory variables.
Coef.R	a named vector of coefficients for the Range explanatory variables.
RMSE.l	root mean square error for the lower bound.
RMSE.u	root mean square error for the upper bound.

References

Lima Neto, E.A. and De Carvalho, F.A.T. (2010). Constrained linear regression models for symbolic interval-valued variables. *Computational Statistics and Data Analysis*, 54, 333–347.

See Also

ccrm

Examples

```
##-- Continuing the  ccrm() example:
data("Cardiological.CR", package = "iRegression")
ex.ccrm <- ccrm(PulseC~SystC+DiastC,PulseR~SystR+DiastR,data=Cardiological.CR)
ex.sum <- summary(ex.ccrm)
ex.sum
```

---

summary.cm *Summarizing Centre Method Fits*

Description

summary method for class cm.

Usage

```
## S3 method for class 'cm'
summary(object, ...)
```

Arguments

object	an object of class "cm", usually, a result of a call to cm.
...	other arguments.

Value

The function summary.cm returns the following elements, given an object of the class "cm",

coefficients	a named vector of coefficients.
RMSE.l	root mean square error for the lower interval bound.
RMSE.u	root mean square error for the upper interval bound.

References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

Lima Neto, E.A. and De Carvalho, F.A.T. (2008). Centre and range method to fitting a linear regression model on symbolic interval data. Computational Statistics and Data Analysis, **52**, 1500–1515.

See Also

cm

Examples

```
##-- Continuing the  cm() example:
data("Cardiological.MinMax", package = "iRegression")
ex.cm <- cm(PulseMin~SystMin+DiastMin,PulseMax~SystMax+DiastMax,data=Cardiological.MinMax)
ex.sum <- summary(ex.cm)
ex.sum
```

---

summary.crm *Summarizing Centre and Range Method Fits*

Description

summary method for class crm.

Usage

```
## S3 method for class 'crm'
summary(object, ...)
```

Arguments

object	an object of class "crm", usually, a result of a call to crm.
...	other arguments.

Value

The function summary.crm returns the following elements, given an object of the class "crm",

Coef.C	a named vector of coefficients for the Centre explanatory variables.
Coef.R	a named vector of coefficients for the Range explanatory variables.
RMSE.l	root mean square error for the lower bound.
RMSE.u	root mean square error for the upper bound.

References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

Lima Neto, E.A. and De Carvalho, F.A.T. (2008). Centre and range method to fitting a linear regression model on symbolic interval data. Computational Statistics and Data Analysis, **52**, 1500–1515.

See Also

crm

Examples

```
##-- Continuing the  crm() example:
data("Cardiological.CR", package = "iRegression")
ex.crm <- crm(PulseC~SystC+DiastC,PulseR~SystR+DiastR,data=Cardiological.CR)
ex.sum <- summary(ex.crm)
ex.sum
```

---

summary.MinMax *Summarizing MinMax Method Fits*

Description

summary method for class MinMax.

Usage

```
## S3 method for class 'MinMax'
summary(object, ...)
```

Arguments

object	an object of class "MinMax", usually, a result of a call to MinMax.
...	other arguments.

Value

The function summary.MinMax returns the following elements, given an object of the class "MinMax",

Coef.L	a named vector of coefficients for the Min explanatory variables.
Coef.U	a named vector of coefficients for the Max explanatory variables.
RMSE.l	root mean square error for the lower bound.
RMSE.u	root mean square error for the upper bound.

References

Billard, L. and Diday, E. (2000) Regression analysis for interval-valued data. *Data Analysis, Classification and Related Methods: Proceedings of the Seventh Conference of the International Federation of Classification Societies*, Springer-Verlag, pp. 369-374.

Lima Neto, E.A. and De Carvalho, F.A.T. (2008). Centre and range method to fitting a linear regression model on symbolic interval data. *Computational Statistics and Data Analysis*, **52**, 1500–1515.

See Also

MinMax

Examples

```
##-- Continuing the  MinMax() example:
data("Cardiological.MinMax", package = "iRegression")
ex.MinMax <- MinMax(PulseMin~SystMin+DiastMin,PulseMax~SystMax+DiastMax,data=Cardiological.MinMax)
ex.sum <- summary(ex.MinMax)
ex.sum
```

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