

# 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.

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**License** GPL (>= 2)

**LazyLoad** yes

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iRegression-package	<i>Regression Methods for Interval-Valued Variables</i>
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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.

## 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](#)

## 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.
- 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.

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 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 " <a href="#">formula</a> ": 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 " <a href="#">formula</a> ": 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.,  $y_L < y_U$ .

**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.

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

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**

[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 <code>formula</code> : a symbolic description of the model to be fitted.
formula2	an object of class <code>formula</code> : 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.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.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	<i>Extract the Coefficients for the Constrained Centre and Range Method</i>
-----------	---

---

**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	<i>Extract the Coefficients for the Centre and Range Method</i>
----------	---

---

**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**[coef](#)

---

`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)

Eufrazio de A. Lima Neto <eufrazio@de.ufpb.br> , Claudio A. V. de Souza Filho and Pedro R. D. Marinho

## 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	<i>Extract Constrained Centre and Range Method Residuals</i>
----------------	--

---

**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	<i>Extract Centre Method Residuals</i>
--------------	--

---

**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 `crm`.

**See Also**

[crm](#)

---

<code>residuals.crm</code>	<i>Extract Centre and Range Method Residuals</i>
----------------------------	--

---

**Description**

Returns the residuals from an object class `crm`.

**Usage**

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

**Arguments**

<code>object</code>	an object class <code>crm</code> .
<code>...</code>	other arguments.

**Value**

Residuals extracted from the object class `crm`.

**See Also**

[crm](#)

---

<code>residuals.MinMax</code>	<i>Extract MinMax Method Residuals</i>
-------------------------------	--

---

**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 <a href="#">ccrm</a> .
...	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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