Package: intRegGOF (via r-universe)

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Title Integrated Regression Goodness of Fit

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Description Performs Goodness of Fit for regression models using Integrated Regression method. Works for several different fitting techniques.

Depends R (>= 2.5.0), graphics, stats

License GPL (>= 2)

NeedsCompilation yes

Repository CRAN

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Contents

`anovarIntReg` *Integrated Regression Goodness of Fit*

Description

Integrated Regression Goodness of Fit to test the adequacy of different model to represent the regression function for a given data.

Usage

```
  anovarIntReg(objH0, ..., covars = NULL, B = 499,
    LINMOD = FALSE, INCREMENTAL = FALSE)
  ## S3 method for class 'anovarIntReg'
print(x,...)
```

Arguments

objH0	An object of class lm, glm or nls which will be considered as hull hypotheses model or the base reference mode when INCREMENTAL is set to TRUE
.	
...	One or more objects of class lm, glm or nls
covars	Names of continuous (numerical) variates used to compute Integrated Regression. They should be variables contained in the data frame used to compute the regression fit. When NULL it is obtained as the max. number of different covariates in all tested models. It also can be a formula like ~x1+x2+....
B	Bootstrap resampling size.
LINMOD	When TRUE and if obj is an object of class print.intRegGOFprint.intRegGOFlm Linear Model matrix fitting equations are used.
INCREMENTAL	When is FALSE all models in ... are tested against objH0, while when TRUE each of the models are checked against the next one startin in objH0.
x	An object of class anovarIntReg.

Details

This function implements the test

$$H_0 : m \in M_0 \text{ vs } H_1 : m \in M_1$$

for two different models M_0, M_1 using the Integrated Regression Goodness of Fit as os done in intRegGOF, but instead of the accumulation of the residual of a givem model, in this case, the accumuation of the difference in the fits is considered:

$$R_n^w(x) = n^{-1/2} \sum_{i=1}^{n} (\hat{y}_{0i} - \hat{y}_{1i}) I(x_i \leq x).$$

The test statistics considered are K_n and W^2_n.

If objH0 and objH1 are lm, glm or nls fits for the models in classes M_0 and M_1 respectively, then anovarIntReg(objH0,objH1) computes test $H_0 : m \in M_0$ vs $H_1 : m \notin M_1$. When anovarIntReg(objH0,objH1,...,objHk) is executed (notice that by default INCREMENTAL=FALSE) we obtain a table with the statistics K_n and W_n^2 and its associated p-values for each of the tests $H_0 : m \in M_0$ vs $H_i : m \notin M_i$ being $i = 1, \ldots, k$. On the other hand, if the parameter INCREMENTAL is set to TRUE, the command returns the results for the tests $H_i : m \in M_i$ vs $H_{i+1} : m \notin M_{i+1}$ being $i = 1, \ldots, k-1$.

Value

This function returns an object of class `anovarIntReg`, a matrix like `structure` whose rows refers to models and columns to statistics and its p-values. It also has an attribute `heading` to support printing the object.

Note

This method requires more testing, and careful study of the effect of factors (discrete random variables) when fitting the model.

Author(s)

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See Also

`lm`, `glm`, `nls`, and `intRegGOF`.

Examples

```
n <- 50
d <- data.frame( X1=runif(n),X2=runif(n))
d$Y <- 1 - 2*d$X1 - 5*d$X2 + rnorm(n,sd=.125)
a0 <- lm(Y~1,d)
a1 <- lm(Y~X1,d)
a2 <- lm(Y~X1+X2,d)
anovarIntReg(a0,a1,a2,B=50)
anovarIntReg(a0,a1,a2,B=50,INCREMENTAL=TRUE)
```

`Core Functions` *Utility functions for Integrated Regression Goodness of Fit*

Description

Core functions for the computation of the Integrated Regression Goodness of Fit

Usage

```
compIntRegProc(y, xord, weig = rep(1, length(y)))
compBootSamp(obj, datLT, B = 999, LINMOD = FALSE)
plotIntRegProc(y, x, weig = rep(1, length(y)), ADD = FALSE, ...)
getModelFrame(obj)
getResiduals(obj,type)
```

Arguments

y	vector, values to add to compute the Integrated Regression.
xord	list of list with the index of covariate points that are *less than* covariate data. This tells how to cumulate according to covariates,
weig	vector of weights, specifically used to fit and compute test statistics when data is selection biased.
obj	An object of class lm, glm or nls.
datLT	structure as xord telling how to cumulate according to covariates.
B	Bootstrap resampling size.
LINMOD	When TRUE and if obj is an object of class lm Linear Model matrix fitting equations are used.
x	vector with covarates to plot
ADD	If TRUE the plot is added to existing plot.
type	Type of residual.
...	Further parameters to plot.

Details

...TODO: Each of them computes what in which way

Note

Surely they can better implemented.

Author(s)

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intRegGOF *Integrated Regression Goodness of Fit*

Description

Integrated Regression Goodness of Fit to test if a given model is suitable to represent the regression function for a given data.

Usage

```
  intRegGOF(obj, covars = NULL, B = 499, LINMOD = FALSE)
  ## S3 method for class 'intRegGOF'
print(x,...)
```

Arguments

obj	An object of class lm, glm or nls.
covars	Names of continuous (numerical) variates used to compute Integrated Regression. They should be variables contained in the data frame used to compute the regression fit.
B	Bootstrap resampling size.
LINMOD	When TRUE and if obj is an object of class lm Linear Model matrix fitting equations are used.
x	An object of class intRegGOF.
...	Further parameters for print command.

Details

The Integrated Regression Goodness of Fit technique is introduce in Stute(1997). The main idea is to study the process that results from the cumulation of the residuals up to a given value of the covariates. Once this process is built, different functional over it can be considered to measure the discrepany between the true regression function and its estimation.

The tests that implements this function is

$$H_0 : m \in M \text{ vs } H_1 : m \notin M$$

being m the regression function, and M a given class of functions. The statistics considered are

$$K_n = \sup_{x \in R^d} |R_n^w(x)|$$

$$W_n^2 = \int_{R^d} R_n^w(z)^2 \, dF(z).$$

where $R_n^w(z)$ is the cumulated residual process:

$$R_n^w(x) = n^{-1/2} \sum_{i=1}^{n} (y_i - \hat{y}_i) I(x_i \leq x).$$

As the stochastic behaviour of this cumulated residual process is quite complex, the implementation of the technique is based on resampling techniques. In particular the chosen implementation is based on Wild Bootstrap methods.

The method also handles selection biased data by means of compensation, by means of the weights used to fit the resgression function when computing the cumulated residual process.

At the moment only 'response' type of residuals are considered, jointly with wild bootstrap resampling technique and the result for discrete responses might no be proper.

Value

This function returns an object of class intRegGOF, a list which cointains following objects:

call	The call to the function

regObj	String with the lm, glm or nls object whose fit is cheked
regModel	lm, glm or nls object call.
p.value	p–values for K_n and W_n^2 statistics.
datStat	value of K_n and W_n^2 statistics.
covars	continuous (numerical) variates used to compute Integrated Regression.
intErr	cumulated residual process at the values of covars in data.
xLT	structure with the order of covars summation.
bootSamp	Bootstrap samples for K_n and W_n^2.

Note

This method requires more testing, and careful study of the effect of factors (discrete random variables) when fitting the model.

Author(s)

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References

Stute, W. (1997). *Nonparametric model checks for regression*. Ann. Statist., 25(2), pp. 613–641.

Ojeda, J. L., W. González-Manteiga W. and Cristóbal, J. A *A bootstrap based Model Checking for Selection–Biased data* Reports in Statistics and Operations Research, U. de Santiago de Compostela. Report 07-05 http://eio.usc.es/eipc1/BASE/BASEMASTER/FORMULARIOS-PHP-DPTO/REPORTS/447report07_05.pdf

Ojeda, J. L., Cristóbal, J. A., and Alcalá, J. T. (2008). *A bootstrap approach to model checking for linear models under length-biased data*. Ann. Inst. Statist. Math., 60(3), pp. 519–543.

See Also

lm, glm, nls and its methods summary, print, plot, etc...

Examples

```
n <- 50
d <- data.frame( X1=runif(n),X2=runif(n))
d$Y <- 1 + 2*d$X1 + rnorm(n,sd=.125)
plot( d )
intRegGOF(lm(Y~X1+X2,d),B=99)
intRegGOF(a <- lm(Y~X1-1,d),B=99)
intRegGOF(a,c("X1","X2"),B=99)
intRegGOF(a,~X2+X1,B=99)
```

plot *Integrated Regression Goodness of Fit graphical output*

Description

Methods to develop model validation and visualization of Integrated Regression Goodness of Fit technique.

Usage

```
plotAsIntRegGOF(obj, covar = 1, ADD = FALSE, ...)
pointsAsIntRegGOF(obj,covar=1,...)
linesAsIntRegGOF(obj,covar=1,...)
```

Arguments

obj	An object of class lm, glm or nls.
covar	Variable name, number or vector for which Int. Reg. is computed. If it is a number, it reference a covariate in the model frame, while if it is a name refer to data in data frame using in the fitting process.
ADD	If TRUE the plot is added to existing plot.
...	Further parameters to for plotobj command.

Details

Currently, the implementation computes the accumulated residual process against a single covariate (covar). When the value of covar is set to 0, the response is used as the variable whose residual are accumulated against.

Notice that if covar is a vector its lenght should be equal to the number of residuals.

Note

lm objects that does not have a data parameter set when the call is executed does not work presently when the covar parameter is different than 0.

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See Also

lm, glm, nls its associated plot method and intRegGOF.

Examples

```
n <- 50
d <- data.frame( X1=runif(n),X2=runif(n))
d$Y <- 1 + 2*d$X1 + rnorm(n,sd=.125)
par(ask=TRUE)
plot( d )
plotAsIntRegGOF(lm(Y~X1+X2,d),covar="X1")
plotAsIntRegGOF(a <- lm(Y~X1-1,d))
plotAsIntRegGOF(a,c("X1"))
plotAsIntRegGOF(a,0)
plotAsIntRegGOF(a,fitted(a))
par(ask=FALSE)
```

`Utility Functions` *Utility functions for Integrated Regression Goodness of Fit*

Description

Functions that are basic or/and useful for the computation of the Integrated Regression Goodness of Fit

Usage

```
getLessThan(x, d)
mvCumSum(x, ord)
mvPartOrd(x1, x2)
getContVar(df, vars = NULL)
getModelCovars(obj)
getModelWeights(obj)
rWildBoot(n)
```

Arguments

`x, d`	matrix like structure.
`x1, x2`	vectors with the same length.
`df`	a data frame.
`ord`	list of list structure with the ordering to add data points according to a given covariates.
`obj`	An object of class `lm`, `glm` or `nls`.
`vars`	vector with variable names in observations data frame .
`n`	integer, sample size.

Details

...TODO: Each of them computes what in which way

Note

`getLessThan` can be ceitainly better implemented.

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