

Package ‘lineartestr’

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Type Package

Title Linear Specification Testing

Version 1.0.0

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Description Tests whether the linear hypothesis of a model is correct specified using Dominguez-Lobato test. Also Ramsey's RESET (Regression Equation Specification Error Test) test is implemented and Wald tests can be carried out. Although RESET test is widely used to test the linear hypothesis of a model, Dominguez and Lobato (2019) proposed a novel approach that generalizes well known specification tests such as Ramsey's. This test relies on wild-bootstrap; this package implements this approach to be usable with any function that fits linear models and is compatible with the update() function such as 'stats::lm()', 'lfe::felm()' and 'forecast::Arima()', for ARMA (autoregressive–moving-average) models. Also the package can handle custom statistics such as Cramer von Mises and Kolmogorov Smirnov, described by the authors, and custom distributions such as Mammen (discrete and continuous) and Rademacher. Manuel A. Dominguez & Ignacio N. Lobato (2019) <doi:10.1080/07474938.2019.1687116>.

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Depends R (> 3.2)

LazyData true

Imports Matrix, sandwich, dplyr, ggplot2, viridis, tidyr, readr, parallel, forecast

Suggests testthat

RoxygenNote 7.0.2

URL <https://github.com/FedericoGarza/lineartestr>

BugReports <https://github.com/FedericoGarza/lineartestr/issues>

NeedsCompilation no

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dominguez_lobato_test	Tests the specification of a linear model using wild-bootstrap.
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Description

Tests the specification of a linear model using wild-bootstrap.

Usage

```
dominguez_lobato_test(  
  model,  
  distribution = "rnorm",  
  statistic = "cvm_value",  
  times = 300,  
  quantiles = c(0.9, 0.95, 0.99),  
  verbose = FALSE,  
  n_cores = 1  
)
```

Arguments

model	An existing fit from a model function such as ‘lm’, ‘lfe’ and others compatible with ‘update’.
distribution	Type of noise added to residuals, ej ‘rnorm’ or ‘rrademacher’.
statistic	Type of statistic to be used, can be one of ‘cvm_value’ or ‘kmv_value’.
times	Number of bootstrap samples.
quantiles	Vector of quantiles to calculate pvalues.

verbose	TRUE to print each bootstrap iteration.
n_cores	Number of cores to be used.

Value

A list with dataframe results and the ordered values of each bootstrap iteration.

References

Manuel A. Dominguez and Ignacio N. Lobato (2019). Specification Testing with Estimated Variables. Econometric Reviews.

Examples

```
x <- 1:10 + rnorm(10)
y <- 1:10
model <- lm(y~x)
dl_test <- dominguez_lobato_test(model)
dl_test <- dominguez_lobato_test(model, distribution = "rmammen_point", statistic = "kmv_value")
dl_test <- dominguez_lobato_test(model, times = 100)
```

plot_dl_test	<i>Plots the Dominguez-Lobato test.</i>
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Description

Plots the Dominguez-Lobato test.

Usage

```
plot_dl_test(x)
```

Arguments

x	An object of class 'dl_test'.
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Value

Plot of type ggplot.

Examples

```
x <- 1:10
y <- 1:10
model <- lm(y~x-1)
dl_test <- dominguez_lobato_test(model)
plot_dl_test(dl_test)
```

plot_reset_test	<i>Plot the reset test.</i>
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Description

Plot the reset test.

Usage

```
plot_reset_test(x)
```

Arguments

x An object of class ‘reset_test’.

Value

Plot of type ggplot.

Examples

```
x <- 1:10 + rnorm(10)
y <- 1:10
model <- lm(y~x-1)
r_test <- reset_test(model)
plot_reset_test(r_test)
```

presiduals	<i>Calculates the accumulated distribution of residuals at each residual point.</i>
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Description

Calculates the accumulated distribution of residuals at each residual point.

Usage

```
presiduals(fitted_values, resids)
```

Arguments

fitted_values Vector of fitted values.
resids Residuals vector of each fitted value.

Value

Vector of size length(resids).

Examples

```
y_hat <- c(4, 8, 7)
resids <- c(1, 5, 3)
presiduals(y_hat, resids)
```

reset_test	<i>Reset test. Tests the specification of a linear model adding and testing powers of fitted values.</i>
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Description

Reset test. Tests the specification of a linear model adding and testing powers of fitted values.

Usage

```
reset_test(
  model,
  robust = FALSE,
  vcov = NULL,
  max_power = 3,
  quantiles = c(0.9, 0.95, 0.99)
)
```

Arguments

model	An existing fit from a model function such as ‘lm’, ‘lfe’ and others compatible with ‘update’.
robust	Use robust ‘varcov’ matrix.
vcov	Particular variance and covariances matrix.
max_power	Max power of fitted values to add.
quantiles	Vector of quantiles to calculate pvalues.

Value

A ‘tibble’ with the Wald value, the corresponding pvalue, and the quantiles of the distribution.

Examples

```
x <- 1:10 + rnorm(10)
y <- 1:10
model <- lm(y~x)
r_test <- reset_test(model)
r_test <- reset_test(model, robust = TRUE)
r_test <- reset_test(model, quantiles = c(.97))
r_test <- reset_test(model, max_power = 4)
r_test <- reset_test(model, robust = TRUE, max_power = 4)
```

rmammen_cont	<i>Random deviates of Mammen continuous distribution.</i>
--------------	---

Description

Random deviates of Mammen continuous distribution.

Usage

```
rmammen_cont(n)
```

Arguments

n	Number of observations.
---	-------------------------

Value

Random deviates of size n.

Examples

```
rmammen_cont(10)
```

rmammen_point	<i>Random deviates of Mammen distribution.</i>
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Description

Random deviates of Mammen distribution.

Usage

```
rmammen_point(n)
```

Arguments

n	Number of observations.
---	-------------------------

Value

Random deviates of size n.

Examples

```
rmammen_point(10)
```

rrademacher	<i>Random deviates of Rademacher distribution.</i>
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Description

Random deviates of Rademacher distribution.

Usage

```
rrademacher(n)
```

Arguments

n	Number of observations.
---	-------------------------

Value

Random deviates of size n.

Examples

```
rrademacher(10)
```

statistic_value	<i>Calculates the Cramer von Mises value or Kolmogorov value given a linear model compatible with 'fitted.values' and 'residuals' functions.</i>
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Description

Calculates the Cramer von Mises value or Kolmogorov value given a linear model compatible with 'fitted.values' and 'residuals' functions.

Usage

```
statistic_value(model, value = "cvm_value")
```

Arguments

model	An existing fit from a linear model function.
value	Type of value to compute, can be 'cvm_value' or 'kmv_value'.

Value

The statistic value of the model.

Examples

```
x <- 1:10
y <- 2*x + rnorm(10)
model <- lm(y~x-1)
statistic_value(model)
statistic_value(model, value = "cvm_value")
statistic_value(model, value = "kmv_value")
```

updated_model	<i>Constructs a new model with noised residuals: $y_{\text{new}} = y_{\text{fitted}} + \text{residuals} * \text{noise}$</i>
---------------	--

Description

Constructs a new model with noised residuals: $y_{\text{new}} = y_{\text{fitted}} + \text{residuals} * \text{noise}$

Usage

```
updated_model(model, fitting_data, distribution = "rnorm")
```

Arguments

model	An existing fit from a model function such as 'lm', 'lfe', 'Arima' and others compatible with 'update'.
fitting_data	Data used to adjust a linear model.
distribution	Type of noise added to residuals, ej "rnorm" or "rrademacher".

Value

Constructed linear model.

Examples

```
x <- 1:100
y <- 2*x + rnorm(100)
model <- lm(y~x-1)
fitting_data <- model.frame(model)
updated_model(model, fitting_data)
updated_model(model, fitting_data, distribution = "rnorm")
updated_model(model, fitting_data, distribution = "rmammen_point")
updated_model(model, fitting_data, distribution = "rmammen_cont")
updated_model(model, fitting_data, distribution = "rrademacher")

x_arma <- rnorm(100)
arma_model <- forecast::Arima(x_arma, c(1, 0, 1))
fitting_data_arma <- model.frame(arma_model)
updated_model(arma_model, fitting_data_arma)
```

wald_test	<i>Wald test. Tests restrictions*coefficients = value.</i>
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Description

Wald test. Tests restrictions*coefficients = value.

Usage

```
wald_test(
  model,
  restrictions,
  value,
  robust = FALSE,
  vcov = NULL,
  quantiles = c(0.9, 0.95, 0.99)
)
```

Arguments

model	Model compatible with ‘fitted’ and ‘residuals’ functions.
restrictions	Matrix of size (number of restrictions) times length(coefficients), for free restrictions use zeros.
value	Values of restrictions.
robust	Use robust ‘varcov’ matrix.
vcov	Particular variance and covariances matrix.
quantiles	Vector of quantiles to calculate pvalues.

Value

A ‘tibble’ with the Wald value, the corresponding pvalue and the quantiles of the distribution.

Examples

```
x <- 1:10
z <- x**2
y <- 1:10
model <- lm(y~x+z)
restrictions <- diag(3)
value <- as.matrix(c(0, 0, 0))
w_test <- wald_test(model, restrictions, value)
w_test <- wald_test(model, restrictions, value, robust = TRUE)
w_test <- wald_test(model, restrictions, value, quantiles = c(.97))
```

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