Package 'betaSandwich'

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Title Robust Confidence Intervals for Standardized Regression
Coefficients

Version 1.0.3.9000

Description Generates robust confidence intervals for standardized regression coefficients
using heteroskedasticity-consistent standard errors for models fitted by lm()
as described in Dudgeon (2017) <doi:10.1007/s11336-017-9563-z>.

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BetaADF	*Estimate Standardized Regression Coefficients and Sampling Covariance Matrix Using the Asymptotic Distribution-Free Approach*

Description

Estimate Standardized Regression Coefficients and Sampling Covariance Matrix Using the Asymptotic Distribution-Free Approach

Usage

```
BetaADF(object)
```

Arguments

object   Object of class `lm`.

Details

Note that while the calculation in `BetaADF()` is different from `betaDelta::BetaDelta()` with `type = "adf"`, the results are numerically equivalent. `BetaADF()` is appropriate when sample sizes are moderate to large (`n > 250`). `BetaHC()` is recommended in most situations.

Value

Returns an object of class `betasandwich` which is a list with the following elements:

call Function call.

lm Object of class `lm`.

lm_process Pre-processed object of class `lm`.

type Standard error type.

gamma Asymptotic covariance matrix of the sample covariance matrix.

acov Asymptotic covariance matrix of the standardized slopes.

vcov Sampling covariance matrix of the standardized slopes.

est Vector of standardized slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

See Also

Other Beta Sandwich Functions: BetaHC(), BetaN()

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaADF(object)
# Methods -----------------------------------------------------
print(std)
summary(std)
coef(std)
vcov(std)
confint(std, level = 0.95)
## Differences of standardized regression coefficients -------
out <- dif(std)
print(out)
summary(out)
coef(out)
vcov(out)
confint(out, level = 0.95)
## Multiple Correlation --------------------------------------
out <- rsq(std)
print(out)
summary(out)
coef(out)
vcov(out)
confint(out, level = 0.95)
```

BetaHC	*Estimate Standardized Regression Coefficients and Robust Sampling Covariance Matrix*

Description

Estimate Standardized Regression Coefficients and Robust Sampling Covariance Matrix

Usage

```
BetaHC(object, type = "hc3", g1 = 1, g2 = 1.5, k = 0.7)
```

Arguments

object	Object of class lm.
type	Character string. Correction type. Possible values are "hc0", "hc1", "hc2", "hc3", "hc4", "hc4m", and "hc5".
g1	Numeric. g1 value for type = "hc4m" or type = "hc5".
g2	Numeric. g2 value for type = "hc4m".
k	Numeric. Constant for type = "hc5"

Value

Returns an object of class betasandwich which is a list with the following elements:

call Function call.

lm Object of class lm.

lm_process Pre-processed object of class lm.

type Standard error type.

gamman Asymptotic covariance matrix of the sample covariance matrix assuming multivariate normal distribution.

gammahc Asymptotic covariance matrix HC adjustment.

gamma Asymptotic covariance matrix of the sample covariance matrix.

acov Asymptotic covariance matrix of the standardized slopes.

vcov Sampling covariance matrix of the standardized slopes.

est Vector of standardized slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

References

Dudgeon, P. (2017). Some improvements in confidence intervals for standardized regression coefficients. *Psychometrika*, *82*(4), 928–951. doi:10.1007/s113360179563z

See Also

Other Beta Sandwich Functions: BetaADF(), BetaN()

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
# Methods -----------------------------------------------------
print(std)
summary(std)
coef(std)
vcov(std)
confint(std, level = 0.95)
## Differences of standardized regression coefficients -------
out <- dif(std)
print(out)
summary(out)
coef(out)
vcov(out)
confint(out, level = 0.95)
## Multiple Correlation ------------------------------------
out <- rsq(std)
print(out)
summary(out)
coef(out)
vcov(out)
confint(out, level = 0.95)
```

BetaN | *Estimate Standardized Regression Coefficients and Sampling Covariance Matrix Assuming Multivariate Normality*

Description

Estimate Standardized Regression Coefficients and Sampling Covariance Matrix Assuming Multivariate Normality

Usage

```
BetaN(object)
```

Arguments

object | Object of class lm.

Details

Note that while the calculation in BetaN() is different from betaDelta::BetaDelta() with type = "mvn", the results are numerically equivalent. BetaN() assumes multivariate normality. BetaHC() is recommended in most situations.

Value

Returns an object of class betasandwich which is a list with the following elements:

call Function call.

lm Object of class lm.

lm_process Pre-processed object of class lm.

type Standard error type.

gamma Asymptotic covariance matrix of the sample covariance matrix.

acov Asymptotic covariance matrix of the standardized slopes.

vcov Sampling covariance matrix of the standardized slopes.

est Vector of standardized slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

See Also

Other Beta Sandwich Functions: BetaADF(), BetaHC()

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaN(object)
# Methods ---------------------------------------------------
print(std)
summary(std)
coef(std)
vcov(std)
confint(std, level = 0.95)
## Differences of standardized regression coefficients -------
out <- dif(std)
print(out)
summary(out)
coef(out)
vcov(out)
confint(out, level = 0.95)
## Multiple Correlation ------------------------------------
out <- rsq(std)
print(out)
summary(out)
coef(out)
vcov(out)
confint(out, level = 0.95)
```

---

coef.betasandwich *Standardized Regression Slopes*

Description

Standardized Regression Slopes

Usage

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

Arguments

object	Object of class betasandwich.
...	additional arguments.

Value

Returns a vector of standardized regression slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
coef(std)
```

---

coef.difbetasandwich *Differences of Standardized Regression Slopes*

Description

Differences of Standardized Regression Slopes

Usage

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

Arguments

object	Object of class difbetasandwich.
...	additional arguments.

Value

Returns a vector of differences of standardized regression slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- dif(std)
coef(out)
```

---

coef.rsqbetasandwich   *Differences of Standardized Regression Slopes*

Description

Differences of Standardized Regression Slopes

Usage

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

Arguments

object	Object of class rsqbetasandwich.
...	additional arguments.

Value

Returns a vector of differences of standardized regression slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- rsq(std)
coef(out)
```

---

confint.betasandwich   *Confidence Intervals for Standardized Regression Slopes*

Description

Confidence Intervals for Standardized Regression Slopes

Usage

```
## S3 method for class 'betasandwich'
confint(object, parm = NULL, level = 0.95, ...)
```

Arguments

object	Object of class betasandwich.
parm	a specification of which parameters are to be given confidence intervals, either a vector of numbers or a vector of names. If missing, all parameters are considered.
level	the confidence level required.
...	additional arguments.

Value

Returns a matrix of confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
confint(std, level = 0.95)
```

---

confint.difbetasandwich

         Confidence Intervals for Differences of Standardized Regression Slopes

---

Description

Confidence Intervals for Differences of Standardized Regression Slopes

Usage

```
## S3 method for class 'difbetasandwich'
confint(object, parm = NULL, level = 0.95, ...)
```

Arguments

object	Object of class `difbetasandwich`.
parm	a specification of which parameters are to be given confidence intervals, either a vector of numbers or a vector of names. If missing, all parameters are considered.
level	the confidence level required.
...	additional arguments.

Value

Returns a matrix of confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- dif(std)
confint(out, level = 0.95)
```

---

confint.rsqbetasandwich

Confidence Intervals for Differences of Standardized Regression Slopes

---

Description

Confidence Intervals for Differences of Standardized Regression Slopes

Usage

```
## S3 method for class 'rsqbetasandwich'
confint(object, parm = NULL, level = 0.95, ...)
```

Arguments

object	Object of class `rsqbetasandwich`.
parm	a specification of which parameters are to be given confidence intervals, either a vector of numbers or a vector of names. If missing, all parameters are considered.
level	the confidence level required.
...	additional arguments.

Value

Returns a matrix of confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- rsq(std)
confint(out, level = 0.95)
```

---

dif   *Differences of Regression Slopes*

Description

Differences of Regression Slopes

Usage

```
dif(object, ...)

## S3 method for class 'betasandwich'
dif(object, ...)
```

Arguments

object	Object used to select a method.
...	additional arguments.

Author(s)

Ivan Jacob Agaloos Pesigan

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nas1982   *1982 National Academy of Sciences Doctoral Programs Data*

Description

1982 National Academy of Sciences Doctoral Programs Data

Usage

```
nas1982
```

Format

Ratings of 46 doctoral programs in psychology in the USA with the following variables:

QUALITY Program quality ratings.

NFACUL Number of faculty members in the program.

NGRADS Number of program graduates.

PCTSUPP Percentage of program graduates who received support.

PCTGRT Percent of faculty members holding research grants.

NARTIC Number of published articles attributed to program faculty member.

PCTPUB Percent of faculty with one or more published article.

References

National Research Council. (1982). *An assessment of research-doctorate programs in the United States: Social and behavioral sciences*. doi:10.17226/9781. Reproduced with permission from the National Academy of Sciences, Courtesy of the National Academies Press, Washington, D.C.

---

print.betasandwich   *Print Method for an Object of Class* betasandwich

---

Description

Print Method for an Object of Class betasandwich

Usage

```
## S3 method for class 'betasandwich'
print(x, alpha = c(0.05, 0.01, 0.001), digits = 4, ...)
```

Arguments

x	Object of class `betasandwich`.
alpha	Significance level.
digits	Digits to print.
...	additional arguments.

Value

Returns a matrix of standardized regression slopes, standard errors, test statistics, p-values, and confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
print(std)
```

---

print.difbetasandwich *Print Method for an Object of Class* difbetasandwich

---

Description

Print Method for an Object of Class difbetasandwich

Usage

```
## S3 method for class 'difbetasandwich'
print(x, alpha = c(0.05, 0.01, 0.001), digits = 4, ...)
```

Arguments

x	Object of class `difbetasandwich`.
alpha	Significance level.
digits	Digits to print.
...	additional arguments.

Value

Returns a matrix of differences of standardized regression slopes, standard errors, test statistics, p-values, and confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- dif(std)
print(out)
```

---

print.rsqbetasandwich   *Print Method for an Object of Class* rsqbetasandwich

---

Description

Print Method for an Object of Class rsqbetasandwich

Usage

```
## S3 method for class 'rsqbetasandwich'
print(x, alpha = c(0.05, 0.01, 0.001), digits = 4, ...)
```

Arguments

x	Object of class rsqbetasandwich.
alpha	Significance level.
digits	Digits to print.
...	additional arguments.

Value

Returns a matrix of standardized regression slopes, standard errors, test statistics, p-values, and confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- rsq(std)
print(out)
```

---

rsq   *Estimate Coefficient of Determination (R-Squared and Adjusted R-Squared) and Sampling Covariance Matrix*

Description

Estimate Coefficient of Determination (R-Squared and Adjusted R-Squared) and Sampling Covariance Matrix

Usage

```
rsq(object, ...)

## S3 method for class 'betasandwich'
rsq(object, ...)
```

Arguments

object   Object used to select a method.

...   additional arguments.

Author(s)

Ivan Jacob Agaloos Pesigan

---

summary.betasandwich   *Summary Method for an Object of Class* betasandwich

---

Description

Summary Method for an Object of Class betasandwich

Usage

```
## S3 method for class 'betasandwich'
summary(object, alpha = c(0.05, 0.01, 0.001), digits = 4, ...)
```

Arguments

object   Object of class betasandwich.

alpha   Significance level.

digits   Digits to print.

...   additional arguments.

Value

Returns a matrix of standardized regression slopes, standard errors, test statistics, p-values, and confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
summary(std)
```

---

summary.difbetasandwich

Summary Method for an Object of Class difbetasandwich

Description

Summary Method for an Object of Class difbetasandwich

Usage

```
## S3 method for class 'difbetasandwich'
summary(object, alpha = c(0.05, 0.01, 0.001), digits = 4, ...)
```

Arguments

object	Object of class difbetasandwich.
alpha	Significance level.
digits	Digits to print.
...	additional arguments.

Value

Returns a matrix of differences of standardized regression slopes, standard errors, test statistics, p-values, and confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- dif(std)
summary(out)
```

---

summary.rsqbetasandwich
Summary Method for an Object of Class rsqbetasandwich

Description

Summary Method for an Object of Class rsqbetasandwich

Usage

```
## S3 method for class 'rsqbetasandwich'
summary(object, alpha = c(0.05, 0.01, 0.001), digits = 4, ...)
```

Arguments

object	Object of class rsqbetasandwich.
alpha	Significance level.
digits	Digits to print.
...	additional arguments.

Value

Returns a matrix of standardized regression slopes, standard errors, test statistics, p-values, and confidence intervals.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- rsq(std)
summary(out)
```

---

vcov.betasandwich   *Sampling Covariance Matrix of the Standardized Regression Slopes*

Description

Sampling Covariance Matrix of the Standardized Regression Slopes

Usage

```
## S3 method for class 'betasandwich'
vcov(object, ...)
```

Arguments

object   Object of class betasandwich.

...   additional arguments.

Value

Returns a matrix of the variance-covariance matrix of standardized slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
vcov(std)
```

---

vcov.difbetasandwich   *Sampling Covariance Matrix of Differences of Standardized Regression Slopes*

Description

Sampling Covariance Matrix of Differences of Standardized Regression Slopes

Usage

```
## S3 method for class 'difbetasandwich'
vcov(object, ...)
```

Arguments

`object`	Object of class `difbetasandwich`.
`...`	additional arguments.

Value

Returns a matrix of the variance-covariance matrix of differences of standardized regression slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- dif(std)
vcov(out)
```

`vcov.rsqbetasandwich`	*Sampling Covariance Matrix of Differences of Standardized Regression Slopes*

Description

Sampling Covariance Matrix of Differences of Standardized Regression Slopes

Usage

```
## S3 method for class 'rsqbetasandwich'
vcov(object, ...)
```

Arguments

`object`	Object of class `rsqbetasandwich`.
`...`	additional arguments.

Value

Returns a matrix of the variance-covariance matrix of differences of standardized regression slopes.

Author(s)

Ivan Jacob Agaloos Pesigan

Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaHC(object)
out <- rsq(std)
vcov(out)
```

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