# Package ‘betaMC’

February 15, 2023

**Title** Monte Carlo Confidence Intervals for Standardized Regression Coefficients

**Version** 1.0.0.9000

**Description** Generates Monte Carlo confidence intervals for standardized regression coefficients for models fitted by lm().
'betaMC' combines ideas from Monte Carlo confidence intervals for the indirect effect (Preacher and Selig, 2012 <doi:10.1080/19312458.2012.679848>)
and the sampling covariance matrix of regression coefficients (Dudgeon, 2017 <doi:10.1007/s11336-017-9563-z>)
to generate confidence intervals for standardized regression coefficients.

**URL** https://github.com/jeksterslab/betaMC,
https://jeksterslab.github.io/betaMC/

**BugReports** https://github.com/jeksterslab/betaMC/issues

**License** MIT + file LICENSE

**Encoding** UTF-8

**LazyData** true

**Roxygen** list(markdown = TRUE)

**Depends** R (>= 3.5.0)

**Imports** stats, methods

**Suggests** knitr, rmarkdown, testthat

**RoxygenNote** 7.2.3

**NeedsCompilation** no

**Author** Ivan Jacob Agaloos Pesigan [aut, cre, cph] (<https://orcid.org/0000-0003-4818-8420>)

**Maintainer** Ivan Jacob Agaloos Pesigan <r.jeksterslab@gmail.com>

## R topics documented:

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`BetaMC` *Estimate Standardized Regression Coefficients and Generate the Corresponding Sampling Distribution Using the Monte Carlo Method*

---

## Description

Estimate Standardized Regression Coefficients and Generate the Corresponding Sampling Distribution Using the Monte Carlo Method

## Usage

```
BetaMC(
  object,
  R = 20000L,
  type = "hc3",
  g1 = 1,
  g2 = 1.5,
  k = 0.7,
  decomposition = "eigen",
  pd = TRUE,
  tol = 1e-06
)
```

## Arguments

| | |
|---|---|
| `object` | Object of class `lm`. |
| `R` | Positive integer. Number of Monte Carlo replications. |
| `type` | Character string. Sampling covariance matrix type. Possible values are `"mvn"`, `"adf"`, `"hc0"`, `"hc1"`, `"hc2"`, `"hc3"`, `"hc4"`, `"hc4m"`, and `"hc5"`. `type = "mvn"` uses the normal-theory sampling covariance matrix. `type = "adf"` uses the asymptotic distribution-free sampling covariance matrix. `type = "hc0"` through `"hc5"` uses different versions of heteroskedasticity-consistent sampling covariance matrix. |
| `g1` | Numeric. `g1` value for `type = "hc4m"` or `type = "hc5"`. |
| `g2` | Numeric. `g2` value for `type = "hc4m"`. |
| `k` | Numeric. Constant for `type = "hc5"` |
| `decomposition` | Character string. Matrix decomposition of the sampling variance-covariance matrix for the data generation. If `decomposition = "chol"`, use Cholesky decomposition. If `decomposition = "eigen"`, use eigenvalue decomposition. If `decomposition = "svd"`, use singular value decomposition. |
| `pd` | Logical. If `pd = TRUE`, check if the sampling variance-covariance matrix is positive definite using `tol`. |
| `tol` | Numeric. Tolerance used for `pd`. |

## Details

The empirical sampling distribution of parameter estimates for the unstandardized regression model is generated using the Monte Carlo method, that is, random values of parameter estimates are sampled from the multivariate normal distribution using the estimated parameter vector as the mean vector and the specified sampling covariance matrix using the `type` argument as the covariance matrix. The standardized regression coefficients are derived from each randomly generated vector of parameters to generate the empirical sampling distribution of estimates of standardized slopes. Confidence intervals are generated by obtaining percentiles corresponding to $100(1-\alpha)\%$ from the generated sampling distribution of standardized slopes, where $\alpha$ is the significance level.

## Value

Returns an object of class `betamc` 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.

**thetahatstar** List of parameters.

**thetahatstar_std** Sampling distribution of standardized slopes.

**vcov** Sampling distribution of 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

Preacher, K. J., & Selig, J. P. (2012). Advantages of Monte Carlo confidence intervals for indirect effects. *Communication Methods and Measures*, *6*(2), 77-98. doi:10.1080/19312458.2012.679848

## See Also

Other Beta Monte Carlo Functions: `DiffBetaMC()`, `PCorBetaMC()`, `RSqBetaMC()`

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
# Methods -------------------------------------------------------
print(std)
summary(std)
coef(std)
vcov(std)
confint(std, level = 0.95)
```

---

`coef.betamc` *Standardized Regression Slopes*

---

## Description

Standardized Regression Slopes

## Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `betamc`. |
| `...` | 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 <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
coef(std)
```

---

`coef.diffbetamc` *Differences of Standardized Regression Slopes*

---

## Description

Differences of Standardized Regression Slopes

## Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `diffbetamc`. |
| `...` | 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 <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
diff <- DiffBetaMC(std)
coef(diff)
```

## coef.pcorbetamc *Partial and Semipartial Correlation Coefficients*

### Description

Partial and Semipartial Correlation Coefficients

### Usage

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

### Arguments

| | |
|---|---|
| `object` | Object of class `pcorbetamc`. |
| `...` | additional arguments. |

### Value

Returns a vector of partial and semipartial correlation coefficients

### Author(s)

Ivan Jacob Agaloos Pesigan

### Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
pcor <- PCorBetaMC(std)
coef(pcor)
```

## coef.rsqbetamc *Multiple Correlation Coefficients (R-Squared and Adjusted R-Squared)*

### Description

Multiple Correlation Coefficients (R-Squared and Adjusted R-Squared)

### Usage

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

### Arguments

| | |
|---|---|
| `object` | Object of class `rsqbetamc`. |
| `...` | additional arguments. |

### Value

Returns a vector of multiple correlation coefficients (R-squared and adjusted R-squared)

### Author(s)

Ivan Jacob Agaloos Pesigan

### Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
rsq <- RSqBetaMC(std)
coef(rsq)
```

---

## `confint.betamc` *Confidence Intervals for Standardized Regression Slopes*

---

### Description

Confidence Intervals for Standardized Regression Slopes

### Usage

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

### Arguments

| | |
|---|---|
| `object` | Object of class `betamc`. |
| `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 <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
confint(std, level = 0.95)
```

---

`confint.diffbetamc` *Confidence Intervals for Differences of Standardized Regression Slopes*

---

## Description

Confidence Intervals for Differences of Standardized Regression Slopes

## Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `diffbetamc`. |
| `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 <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
diff <- DiffBetaMC(std)
confint(diff, level = 0.95)
```

`confint.pcorbetamc` *Confidence Intervals for Partial and Semipartial Correlation Coefficients*

## Description

Confidence Intervals for Partial and Semipartial Correlation Coefficients

## Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `pcorbetamc`. |
| `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 <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
pcor <- PCorBetaMC(std)
confint(pcor, level = 0.95)
```

`confint.rsqbetamc` *Confidence Intervals for Multiple Correlation Coefficients (R-Squared and Adjusted R-Squared)*

## Description

Confidence Intervals for Multiple Correlation Coefficients (R-Squared and Adjusted R-Squared)

## Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `rsqbetamc`. |
| `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 <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
rsq <- RSqBetaMC(std)
confint(rsq, level = 0.95)
```

DiffBetaMC — *Estimate Differences of Standardized Slopes and Generate the Corresponding Sampling Distribution Using the Monte Carlo Method*

## Description

Estimate Differences of Standardized Slopes and Generate the Corresponding Sampling Distribution Using the Monte Carlo Method

## Usage

```
DiffBetaMC(object)
```

## Arguments

| | |
|---|---|
| `object` | Object of class `betamc`, that is, the output of the `BetaMC()` function. |

## Value

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

**fit** The argument `object`.

**thetahatstar** Sampling distribution of differences of standardized slopes.

**vcov** Sampling covariance matrix of differences of standardized slopes.

**est** Vector of differences of standardized slopes.

## Author(s)

Ivan Jacob Agaloos Pesigan

## See Also

Other Beta Monte Carlo Functions: `BetaMC()`, `PCorBetaMC()`, `RSqBetaMC()`

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
diff <- DiffBetaMC(std)
# Methods -------------------------------------------------------
print(diff)
summary(diff)
coef(diff)
vcov(diff)
confint(diff, level = 0.95)
```

`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.

`PCorBetaMC` *Estimate Partial and Semipartial Correlation Coefficients and Generate the Corresponding Sampling Distribution Using the Monte Carlo Method*

## Description

Estimate Partial and Semipartial Correlation Coefficients and Generate the Corresponding Sampling Distribution Using the Monte Carlo Method

## Usage

```
PCorBetaMC(object)
```

### Arguments

| | |
|---|---|
| `object` | Object of class `betamc`, that is, the output of the `BetaMC()` function. |

### Value

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

**fit** The argument `object`.

**thetahatstar** Sampling distribution of partial and semipartial correlation coefficients.

**vcov** Sampling covariance matrix of partial and semipartial correlation coefficients.

**est** Vector of partial and semipartial correlation coefficients.

### Author(s)

Ivan Jacob Agaloos Pesigan

### See Also

Other Beta Monte Carlo Functions: `BetaMC()`, `DiffBetaMC()`, `RSqBetaMC()`

### Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
pcor <- PCorBetaMC(std)
# Methods -------------------------------------------------------
print(pcor)
summary(pcor)
coef(pcor)
vcov(pcor)
confint(pcor, level = 0.95)
```

---

## `print.betamc` *Print Method for an Object of Class* `betamc`

---

### Description

Print Method for an Object of Class `betamc`

### Usage

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

### Arguments

| | |
|---|---|
| `x` | Object of Class `betamc`. |
| `alpha` | Significance level. |
| `digits` | Digits to print. |
| `...` | additional arguments. |

### Value

Returns a matrix of standardized regression slopes, standard errors, number of Monte Carlo replications, and confidence intervals.

### Author(s)

Ivan Jacob Agaloos Pesigan

### Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
print(std)
```

---

## `print.diffbetamc` *Print Method for an Object of Class* `diffbetamc`

---

### Description

Print Method for an Object of Class `diffbetamc`

### Usage

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

### Arguments

| | |
|---|---|
| `x` | Object of class `diffbetamc`. |
| `alpha` | Significance level. |
| `digits` | Digits to print. |
| `...` | additional arguments. |

### Value

Returns a matrix of differences of standardized regression slopes, standard errors, number of Monte Carlo replications, and confidence intervals.

## Author(s)

Ivan Jacob Agaloos Pesigan

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
diff <- DiffBetaMC(std)
print(diff)
```

---

# print.pcorbetamc *Print Method for an Object of Class* pcorbetamc

---

## Description

Print Method for an Object of Class pcorbetamc

## Usage

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

## Arguments

| | |
|---|---|
| x | Object of class pcorbetamc. |
| alpha | Significance level. |
| digits | Digits to print. |
| ... | additional arguments. |

## Value

Returns a matrix of partial and semipartial correlation coefficients, standard errors, number of Monte Carlo replications, and confidence intervals.

## Author(s)

Ivan Jacob Agaloos Pesigan

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
pcor <- PCorBetaMC(std)
print(pcor)
```

`print.rsqbetamc` *Print Method for an Object of Class* `rsqbetamc`

## Description

Print Method for an Object of Class `rsqbetamc`

## Usage

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

## Arguments

| | |
|---|---|
| `x` | Object of class `rsqbetamc`. |
| `alpha` | Significance level. |
| `digits` | Digits to print. |
| `...` | additional arguments. |

## Value

Returns a matrix of multiple correlation coefficients (R-squared and adjusted R-squared), standard errors, number of Monte Carlo replications, and confidence intervals.

## Author(s)

Ivan Jacob Agaloos Pesigan

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
rsq <- RSqBetaMC(std)
print(rsq)
```

RSqBetaMC — *Estimate Multiple Correlation Coefficients (R-Squared and Adjusted R-Squared) and Generate the Corresponding Sampling Distribution Using the Monte Carlo Method*

## Description

Estimate Multiple Correlation Coefficients (R-Squared and Adjusted R-Squared) and Generate the Corresponding Sampling Distribution Using the Monte Carlo Method

## Usage

```
RSqBetaMC(object)
```

## Arguments

| | |
|---|---|
| `object` | Object of class `betamc`, that is, the output of the `BetaMC()` function. |

## Value

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

**fit** The argument `object`.

**thetahatstar** Sampling distribution of multiple correlation coefficients (R-squared and adjusted R-squared).

**vcov** Sampling covariance matrix of multiple correlation coefficients (R-squared and adjusted R-squared).

**est** Vector of multiple correlation coefficients (R-squared and adjusted R-squared).

## Author(s)

Ivan Jacob Agaloos Pesigan

## See Also

Other Beta Monte Carlo Functions: `BetaMC()`, `DiffBetaMC()`, `PCorBetaMC()`

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
rsq <- RSqBetaMC(std)
# Methods -------------------------------------------------------
print(rsq)
summary(rsq)
coef(rsq)
vcov(rsq)
confint(rsq, level = 0.95)
```

## summary.betamc — *Summary Method for an Object of Class* `betamc`

### Description

Summary Method for an Object of Class `betamc`

### Usage

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

### Arguments

| | |
|---|---|
| `object` | Object of class `betamc`. |
| `alpha` | Significance level. |
| `digits` | Digits to print. |
| `...` | additional arguments. |

### Value

Returns a matrix of standardized regression slopes, standard errors, number of Monte Carlo replications, and confidence intervals.

### Author(s)

Ivan Jacob Agaloos Pesigan

### Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
summary(std)
```

## summary.diffbetamc — *Summary Method for an Object of Class* `diffbetamc`

### Description

Summary Method for an Object of Class `diffbetamc`

### Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `diffbetamc`. |
| `alpha` | Significance level. |
| `digits` | Digits to print. |
| `...` | additional arguments. |

## Value

Returns a matrix of differences of standardized regression slopes, standard errors, number of Monte Carlo replications, and confidence intervals.

## Author(s)

Ivan Jacob Agaloos Pesigan

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
diff <- DiffBetaMC(std)
summary(diff)
```

---

# `summary.pcorbetamc` *Summary Method for an Object of Class* `pcorbetamc`

---

## Description

Summary Method for an Object of Class `pcorbetamc`

## Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `pcorbetamc`. |
| `alpha` | Significance level. |
| `digits` | Digits to print. |
| `...` | additional arguments. |

## Value

Returns a matrix of partial and semipartial correlation coefficients, standard errors, number of Monte Carlo replications, and confidence intervals.

### Author(s)

Ivan Jacob Agaloos Pesigan

### Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
pcor <- PCorBetaMC(std)
summary(pcor)
```

---

`summary.rsqbetamc` *Summary Method for an Object of Class* `rsqbetamc`

---

### Description

Summary Method for an Object of Class `rsqbetamc`

### Usage

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

### Arguments

| | |
|---|---|
| `object` | Object of class `rsqbetamc`. |
| `alpha` | Significance level. |
| `digits` | Digits to print. |
| `...` | additional arguments. |

### Value

Returns a matrix of multiple correlation coefficients (R-squared and adjusted R-squared), standard errors, number of Monte Carlo replications, and confidence intervals.

### Author(s)

Ivan Jacob Agaloos Pesigan

### Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
rsq <- RSqBetaMC(std)
summary(rsq)
```

| vcov.betamc | *Sampling Covariance Matrix of the Standardized Regression Slopes* |
|---|---|

## Description

Sampling Covariance Matrix of the Standardized Regression Slopes

## Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `betamc`. |
| `...` | 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 <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
vcov(std)
```

| vcov.diffbetamc | *Sampling Covariance Matrix of Differences of Standardized Regression Slopes* |
|---|---|

## Description

Sampling Covariance Matrix of Differences of Standardized Regression Slopes

## Usage

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

### Arguments

| | |
|---|---|
| `object` | Object of class `diffbetamc`. |
| `...` | 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 <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
diff <- DiffBetaMC(std)
vcov(diff)
```

---

## vcov.pcorbetamc — *Sampling Covariance Matrix of Partial and Semipartial Correlation Coefficients*

---

### Description

Sampling Covariance Matrix of Partial and Semipartial Correlation Coefficients

### Usage

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

### Arguments

| | |
|---|---|
| `object` | Object of class `pcorbetamc`. |
| `...` | additional arguments. |

### Value

Returns a matrix of the variance-covariance matrix of partial and semipartial correlation coefficients.

### Author(s)

Ivan Jacob Agaloos Pesigan

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
pcor <- PCorBetaMC(std)
vcov(pcor)
```

---

`vcov.rsqbetamc` *Sampling Covariance Matrix of Multiple Correlation Coefficients (R-Squared and Adjusted R-Squared)*

---

## Description

Sampling Covariance Matrix of Multiple Correlation Coefficients (R-Squared and Adjusted R-Squared)

## Usage

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

## Arguments

| | |
|---|---|
| `object` | Object of class `rsqbetamc`. |
| `...` | additional arguments. |

## Value

Returns a matrix of the variance-covariance matrix of multiple correlation coefficients (R-squared and adjusted R-squared).

## Author(s)

Ivan Jacob Agaloos Pesigan

## Examples

```
object <- lm(QUALITY ~ NARTIC + PCTGRT + PCTSUPP, data = nas1982)
std <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
rsq <- RSqBetaMC(std)
vcov(rsq)
```

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