

# Package ‘betaMC’

December 28, 2022

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

**Version** 1.0.0

**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](https://doi.org/10.1080/19312458.2012.679848)>) and the sampling covariance matrix of regression coefficients (Dudgeon, 2017 <[doi:10.1007/s11336-017-9563-z](https://doi.org/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

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BetaMC	<i>Estimate Standardized Regression Coefficients and Generate Sampling Distributions Using the Monte Carlo Method</i>
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**Description**

Estimate Standardized Regression Coefficients and Generate Sampling Distributions 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. Correction type. Possible values are "adf", "hc0", "hc1", "hc2", "hc3", "hc4", "hc4m", "hc5", and "mvn".
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.

**Value**

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

**call** Function call.

**lm** Object of class `lm`.

**type** Standard error type.

**beta** Vector of standardized slopes.

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

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

**n** Sample size.

**p** Number of regressors.

**df**  $n - p - 1$  degrees of freedom.

**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

**Examples**

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

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coef.betamc

*Standardized Regression Slopes*

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**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)
out <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
coef(out)
```

---

confint.betamc

*Confidence Intervals for Standardized Regression Slopes*

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**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)
out <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
confint(out, level = 0.95)
```

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nas1982

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*1982 National Academy of Sciences Doctoral Programs Data*


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**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.

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print.betamc	<i>Print Method for an Object of Class betamc</i>
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**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, test statistics, p-values, and confidence intervals.

**Author(s)**

Ivan Jacob Agaloos Pesigan

**Examples**

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

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summary.betamc	<i>Summary Method for an Object of Class betamc</i>
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**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, test statistics, p-values, and confidence intervals.

**Author(s)**

Ivan Jacob Agaloos Pesigan

**Examples**

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

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vcov.betamc

*Sampling Covariance Matrix of the Standardized Regression Slopes*


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**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)
out <- BetaMC(object, R = 100)
# use a large R, for example, R = 20000 for actual research
vcov(out)
```



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