# Package 'crwbmetareg'

May 8, 2026

**Type** Package

**Title** Cluster Robust Wild Bootstrap Meta Regression

**Version** 1.0

**Date** 2023-10-18

**Author** Michail Tsagris [aut, cre]

**Maintainer** Michail Tsagris <mtsagris@uoc.gr>

**Depends** R (>= 4.0)

**Imports** lmtest, Rfast2, sandwich, stats, utils

**Suggests** clusterSEs

**Description** In meta regression sometimes the studies have multiple effects that are correlated. For this reason cluster robust standard errors must be computed. However, since the clusters are unbalanced the wild bootstrap is suggested. See Oczkowski E. and Doucouliagos H. (2015). ``Wine prices and quality ratings: a meta-regression analysis". American Journal of Agricultural Economics, 97(1): 103--121. <doi:10.1093/ajae/aau057> and Cameron A. C., Gelbach J. B. and Miller D. L. (2008). ``Bootstrap-based improvements for inference with clustered errors". The Review of Economics and Statistics, 90(3): 414--427. <doi:10.1162/rest.90.3.414>.

**License** GPL (>= 2)

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2023-10-19 08:10:05 UTC

## Contents

crwbmetareg-package *Cluster Robust Wild Bootstrap Meta Regression.*

## Description

In meta regression sometimes the studies have multiple effects that are correlated. For this reason cluster robust standard errors must be computed. However, since the clusters are unbalanced the wild bootstrap is suggested.

## Details

| | |
|---|---|
| Package: | crwbmetareg |
| Type: | Package |
| Version: | 1.0 |
| Date: | 2023-10-18 |
| License: | GPL-2 |

## Maintainers

Michail Tsagris <mtsagris@uoc.gr>.

## Author(s)

Michail Tsagris <mtsagris@uoc.gr>.

## References

Chatzimichael K., Daskalaki C., Emvalomatis G., Tsagris M. and Vangelis Tzouvelekas V. (2023). Factors Shaping Innovative Behavior: A Meta-Analysis of Technology Adoption Studies in Agriculture. https://economics.soc.uoc.gr/el/market/998/factors-shaping-farmers-innovative-behavior-a-meta-analysis-of-technology-adoption-studies-in-agriculture

Oczkowski, E. and Doucouliagos, H. (2015). Wine prices and quality ratings: a meta-regression analysis. American Journal of Agricultural Economics, 97(1): 103-121.

Cameron, A. C., Gelbach, J. B. and Miller, D. L. (2008). Bootstrap-based improvements for inference with clustered errors. The Review of Economics and Statistics, 90(3): 414-427.

`Column-wise weighted least squares meta analysis`
*Column-wise weighted least squares meta analysis*

## Description

Column-wise weighted least squares meta analysis.

## Usage

```
colwlsmeta(yi, vi)
```

## Arguments

| | |
|---|---|
| `yi` | A matrix with the observations. |
| `vi` | A matrix with the variances of the observations. |

## Details

The weighted least squares (WLS) meta analysis is performed in a column-wise fashion. This function is suitable for simulation studies, where one can perform multiple WLS meta analyses at once. See references for this.

## Value

A vector with many elements. The fixed effects mean estimate, the $\bar{v}$ estimate, the $I^2$, the $H^2$, the Q test statistic and it's p-value, the $\tau^2$ estimate and the random effects mean estimate.

## Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

## References

Stanley T. D. and Doucouliagos H. (2015). Neither fixed nor random: weighted least squares meta-analysis. Statistics in Medicine, 34(13), 2116–2127.

Stanley, T. D. and Doucouliagos, H. (2017). Neither fixed nor random: Weighted least squares meta-regression. Research synthesis methods, 8(1): 19–42.

## See Also

`wlsmeta`

## Examples

```
y <- matrix( rnorm(50* 5), ncol = 5)
vi <- matrix( rexp(50* 5), ncol = 5)
colwlsmeta(y, vi)
wlsmeta(y[, 1], vi[, 1])
```

---

`FAT-PET test using cluster robust wild bootstrap`

*FAT-PET test using cluster robust wild bootstrap*

---

## Description

FAT-PET test using cluster robust wild bootstrap.

## Usage

```
fatpet(target, se, cluster, weights, boot.reps = 1000, prog.bar = FALSE, seed = NULL)
```

## Arguments

| | |
|---|---|
| `target` | A vector with the effect sizes. |
| `se` | A vector with the standard errors, or the variances, of the effect sizes. |
| `cluster` | A vector indicating the clusters. |
| `weights` | A vector with the inverse of the the variances of the effect sizes. |
| `boot.reps` | The number of bootstrap re-samples to generate. |
| `prog.bar` | If you want the progress bar to appear set this equal to TRUE. |
| `seed` | IF you want the results to be rerpoducible set this equal to TRUE. |

## Details

It implements the FAT-PET test using cluster robust wild bootstrap to compute the p-values. See references for this.

The function uses a modification of the function "cluster.wild.glm()" of the package "clusterSEs".

## Value

A vector with two p-values. One for the constant and one for the cofficient of the "vse".

## Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

## References

Oczkowski, E. and Doucouliagos, H. (2015). Wine prices and quality ratings: a meta-regression analysis. American Journal of Agricultural Economics, 97(1): 103–121.

Cameron, A. C., Gelbach, J. B. and Miller, D. L. (2008). Bootstrap-based improvements for inference with clustered errors. The Review of Economics and Statistics, 90(3): 414–427.

## See Also

crwbmetareg

## Examples

```
y <- rnorm(50)
se <- rexp(50, 3)
cluster <- sample(1:20, 50, replace = TRUE)
fatpet(y, se, cluster, weights = se^2, boot.reps = 500)
```

---

`Meta regression using cluster robust wild bootstrap`

*Meta regression using cluster robust wild bootstrap*

---

## Description

Meta regression using cluster robust wild bootstrap.

## Usage

```
crwbmetareg(target, se, dataset, cluster, weights, boot.reps = 1000,
prog.bar = FALSE, seed = NULL)
```

## Arguments

| | |
|---|---|
| `target` | A vector with the effect sizes. |
| `se` | A vector with the standard errors, or the variances, of the effect sizes. |
| `dataset` | A matrix or data.frame with the independent variables. |
| `cluster` | A vector indicating the clusters. |
| `weights` | A vector with the inverse of the the variances of the effect sizes. |
| `boot.reps` | The number of bootstrap re-samples to generate. |
| `prog.bar` | If you want the progress bar to appear set this equal to TRUE. |
| `seed` | IF you want the results to be rerpoducible set this equal to TRUE. |

## Details

It implements metaregression using cluster robust wild bootstrap to compute the p-values. See references for this.

The function uses a modification of the function "cluster.wild.glm()" of the package "clusterSEs".

## Value

A vector with two p-values. One for the constant and one for the cofficient of the "se".

## Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

## References

Oczkowski, E. and Doucouliagos, H. (2015). Wine prices and quality ratings: a meta-regression analysis. American Journal of Agricultural Economics, 97(1): 103–121.

Cameron, A. C., Gelbach, J. B. and Miller, D. L. (2008). Bootstrap-based improvements for inference with clustered errors. The Review of Economics and Statistics, 90(3): 414–427.

## See Also

fatpet

## Examples

```
y <- rnorm(50)
se <- rexp(50, 3)
cluster <- sample(1:20, 50, replace = TRUE)
dataset <- matrix( rnorm(50 * 2), ncol = 2 )
fatpet(y, se, dataset, cluster, weights = se^2, boot.reps = 100)
```

---

`Weighted least squares meta analysis`

*Weighted least squares meta analysis*

---

## Description

Weighted least squares meta analysis.

## Usage

```
wlsmeta(yi, vi)
```

## Arguments

| | |
|---|---|
| yi | The observations. |
| vi | The variances of the observations. |

## Details

It implements weighted least squares (WLS) meta analysis. See references for this.

## Value

A vector with many elements. The fixed effects mean estimate, the $\bar{v}$ estimate, the $I^2$, the $H^2$, the Q test statistic and it's p-value, the $\tau^2$ estimate and the random effects mean estimate.

## Author(s)

Michail Tsagris.

R implementation and documentation: Michail Tsagris <mtsagris@uoc.gr>.

## References

Stanley T. D. and Doucouliagos H. (2015). Neither fixed nor random: weighted least squares meta-analysis. Statistics in Medicine, 34(13): 2116–2127.

Stanley, T. D. and Doucouliagos, H. (2017). Neither fixed nor random: Weighted least squares meta-regression. Research synthesis methods, 8(1): 19–42.

## See Also

colwlsmeta

## Examples

```
y <- rnorm(30)
vi <- rexp(30, 3)
wlsmeta(y, vi)
```

# Index