

# Package: elgbd (via r-universe)

September 2, 2024

**Type** Package

**Title** Empirical Likelihood for General Block Designs

**Version** 0.9.0

**Description** Performs hypothesis testing for general block designs with empirical likelihood. The core computational routines are implemented using the 'Eigen' 'C++' library and 'RcppEigen' interface, with 'OpenMP' for parallel computation. Details of the methods are given in Kim, MacEachern, and Peruggia (2023) <[doi:10.1080/10485252.2023.2206919](https://doi.org/10.1080/10485252.2023.2206919)>. This work was supported by the U.S. National Science Foundation under Grants No. SES-1921523 and DMS-2015552.

**License** GPL (>= 3)

**URL** <https://github.com/markean/elgbd>

**BugReports** <https://github.com/markean/elgbd/issues>

**Depends** R (>= 4.1.0)

**Imports** Rcpp, stats

**Suggests** melt, spelling

**LinkingTo** Rcpp, RcppEigen, RcppProgress

**Config/testthat/edition** 3

**Encoding** UTF-8

**Language** en-US

**NeedsCompilation** yes

**Roxygen** list(markdown = TRUE)

**RoxygenNote** 7.3.1

**Repository** <https://markean.r-universe.dev>

**RemoteUrl** <https://github.com/markean/elgbd>

**RemoteRef** HEAD

**RemoteSha** a2738a1a815b4d6f74042f0ca47fb932e7cb8382

## Contents

clothianidin . . . . .	2
el_aov . . . . .	3
el_pairwise . . . . .	4
el_test . . . . .	5
<b>Index</b>	<b>7</b>

---

clothianidin	<i>Clothianidin concentration in maize plants</i>
--------------	---

---

### Description

A dataset summarizing field experiments result of seed treatments on clothianidin concentration.

### Usage

```
data("clothianidin")
```

### Format

A data frame with 102 observations and 3 variables:

**blk** New blocks constructed from original data. The format is 'days post planting\_original block\_year'.

**trt** Seed treatment.

**clo** Log transformed clothianidin concentration ( $\mu\text{g}$ ).

### Details

The original data is provided by Alford and Krupke (2017). Only some of the shoot region observations are taken from the original data and processed for illustration.

### Source

Alford A, Krupke CH (2017). "Translocation of the Neonicotinoid Seed Treatment Clothianidin in Maize." *PLOS ONE*, **12**(3), 1–19. [doi:10.1371/journal.pone.0173836](https://doi.org/10.1371/journal.pone.0173836).

### Examples

```
data("clothianidin")
clothianidin
```

---

el_aov	<i>Analysis of variance with empirical likelihood</i>
--------	---

---

## Description

Fits an one-way analysis of variance model with empirical likelihood.

## Usage

```
el_aov(formula, data, maxit = 10000, abstol = 1e-08)
```

## Arguments

formula	An object of class <code>formula</code> (or one that can be coerced to that class) for a symbolic description of the model to be fitted. It must specify the variables for response and treatment as <code>response ~ treatment</code> .
data	A data frame containing the variables in <code>formula</code> .
maxit	A single integer for the maximum number of iterations for optimization. Defaults to <code>10000</code> .
abstol	A single numeric for the absolute convergence tolerance for optimization. Defaults to <code>1e-08</code> .

## Value

A list containing the model fit and optimization results.

## References

Owen, A (1991). "Empirical Likelihood for Linear Models." *The Annals of Statistics*, **19**(4), 1725–1747. doi:[10.1214/aos/1176348368](https://doi.org/10.1214/aos/1176348368).

## Examples

```
data("clothianidin")
el_aov(clo ~ trt, clothianidin)
```

---

el_pairwise	<i>Pairwise comparisons for general block designs with empirical likelihood</i>
-------------	---

---

### Description

Tests all pairwise comparisons or comparisons with control for general block designs with empirical likelihood. Two single step asymptotic  $k$ -FWER (generalized family-wise error rate) controlling procedures are available: asymptotic Monte Carlo (AMC) and nonparametric bootstrap (NB).

### Usage

```
el_pairwise(
  formula,
  data,
  control = NULL,
  k = 1L,
  alpha = 0.05,
  method = c("AMC", "NB"),
  B,
  nthreads = 1L,
  maxit = 10000L,
  abstol = 1e-08,
  verbose = FALSE
)
```

### Arguments

formula	An object of class <code>formula</code> (or one that can be coerced to that class) for a symbolic description of the model to be fitted. It must specify the variables for response, treatment, and block as <code>response ~ treatment   block</code> . Note that the use of vertical bar ( <code> </code> ) separating treatment and block.
data	A data frame, list or environment (or object coercible by <code>as.data.frame()</code> to a data frame) containing the variables in <code>formula</code> .
control	An optional single character that specifies the treatment for comparisons with control.
k	A single integer for $k$ in $k$ -FWER. Defaults to 1.
alpha	A single numeric for the overall significance level. Defaults to 0.05.
method	A single character for the procedure to be used; either AMC or NB is supported. Defaults to AMC.
B	A single integer for the number of Monte Carlo samples for the AMC (number of bootstrap replicates for the NB).
nthreads	A single integer for the number of threads for parallel computation via 'OpenMP' (if available). Defaults to 1.

maxit	A single integer for the maximum number of iterations for constrained minimization of empirical likelihood. Defaults to 10000.
abstol	A single numeric for the the absolute convergence tolerance for optimization. Defaults to 1e-08.
verbose	A single logical. If TRUE, a message on the convergence status is printed. Defaults to FALSE.

### Value

A list containing the model fit and optimization results.

### References

Kim E, MacEachern SN, Peruggia M (2023). "Empirical likelihood for the analysis of experimental designs." *Journal of Nonparametric Statistics*, **35**(4), 709–732. doi:10.1080/10485252.2023.2206919.

### Examples

```
# All pairwise comparisons
data("clothianidin")
el_pairwise(clo ~ trt | blk, data = clothianidin, B = 1000)

# Comparisons with control
el_pairwise(clo ~ trt | blk,
  control = "Naked", data = clothianidin, B = 1000
)
```

---

el\_test

*Hypothesis testing with empirical likelihood*

---

### Description

Tests single hypothesis for general block designs with empirical likelihood.

### Usage

```
el_test(
  formula,
  data,
  lhs,
  rhs = NULL,
  maxit = 10000,
  abstol = 1e-08,
  verbose = FALSE
)
```

**Arguments**

formula	An object of class <code>formula</code> (or one that can be coerced to that class) for a symbolic description of the model to be fitted. It must specify the variables for response, treatment, and block as <code>response ~ treatment   block</code> . Note that the use of vertical bar ( <code> </code> ) separating treatment and block.
data	A data frame containing the variables in <code>formula</code> .
lhs	A numeric matrix specifying the left-hand side of a hypothesis in terms of parameters.
rhs	An optional numeric vector specifying the right-hand side the hypothesis. If not specified, it is set to the zero vector. Defaults to <code>NULL</code> .
maxit	A single integer for the maximum number of iterations for optimization. Defaults to <code>10000</code> .
abstol	A single numeric for the absolute convergence tolerance for optimization. Defaults to <code>1e-08</code> .
verbose	A single logical. If <code>TRUE</code> , a message on the convergence status is printed. Defaults to <code>FALSE</code> .

**Value**

A list containing the model fit and optimization results.

**References**

Kim E, MacEachern SN, Peruggia M (2023). "Empirical likelihood for the analysis of experimental designs." *Journal of Nonparametric Statistics*, **35**(4), 709–732. doi:10.1080/10485252.2023.2206919.

**Examples**

```
# Test for equal means
data("clothianidin")
el_test(clo ~ trt | blk, clothianidin,
  lhs = matrix(c(
    1, -1, 0, 0,
    0, 1, -1, 0,
    0, 0, 1, -1
  ), byrow = TRUE, nrow = 3L)
)
```

# Index

## \* datasets

clothianidin, 2

as.data.frame(), 4

clothianidin, 2

el\_aov, 3

el\_pairwise, 4

el\_test, 5

formula, 3, 4, 6