Package: CEACT (via r-universe)

June 16, 2026

Type Package

Title Cost-Effectiveness Analysis Toolkit for Clinical Trials

Version 0.5.0

Author Imad EL BADISY [aut, cre]

Maintainer Imad EL BADISY <elbadisyimad@gmail.com>

Description Provides tools for trial-based economic evaluation of healthcare interventions. Computes and visualizes incremental cost-effectiveness ratios, cost-effectiveness acceptability curves, cost-effectiveness planes, net monetary benefit tables, and one-way deterministic sensitivity analyses. Supports cost-utility analyses using observed summaries and non-parametric bootstrap uncertainty.

License MIT + file LICENSE

Encoding UTF-8

LazyData true

RoxygenNote 7.3.3

URL https://github.com/ielbadisy/CEACT

BugReports https://github.com/ielbadisy/CEACT/issues

Depends R (>= 3.5.0)

Imports ggplot2, boot

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

VignetteBuilder knitr

NeedsCompilation no

Repository https://cran.r-universe.dev

Date/Publication 2026-06-16 20:00:02 UTC

RemoteUrl https://github.com/cran/CEACT

RemoteRef HEAD

RemoteSha 87b439e9d44d66b5a3b63fd93f357ecea843a0d5

Contents

`boot_icer` *Bootstrap Incremental Cost, Effect, ICER, and Net Benefit*

Description

Performs non-parametric stratified bootstrap resampling for a two-arm trial-based economic evaluation. Resampling is stratified by trial group to preserve arm sizes.

Usage

```
boot_icer(formula, data, ref, R = 1000, ci.type = "bca", na.omit = TRUE)
```

Arguments

`formula`	A formula of the form `cost + effect ~ group`.
`data`	A data frame containing the variables in the formula.
`ref`	Reference group label.
`R`	Number of bootstrap replications.
`ci.type`	Confidence interval type passed to `boot::boot.ci()`.
`na.omit`	Logical; whether to remove rows with missing values.

Value

An object of class `boot_icer` containing a summary table, bootstrap distribution, observed estimates, formula, reference group, and matched call.

Examples

```
df <- simulate_ce_trial(n = 100, seed = 123)
res <- boot_icer(cost + effect ~ group, data = df, ref = "control", R = 200)
summary(res)
```

cea *Cost-Effectiveness Analysis Summary for a Two-Arm Trial*

Description

Computes observed cost-effectiveness summaries comparing one treatment group with one reference group. The incremental cost-effectiveness ratio is `ICER = (mean(cost_treatment) - mean(cost_reference)) / (mean(effect_treatment) - mean(effect_reference))`.

Usage

```
cea(formula, data, ref, na.omit = TRUE)
```

Arguments

`formula`	A formula of the form `cost + effect ~ group`.
`data`	A data frame containing the variables used in the formula.
`ref`	Character string specifying the reference group.
`na.omit`	Logical; whether to remove rows with missing values.

Value

An object of class `cea`, a data frame with group means, standard deviations, differences, confidence intervals, and p-values. Attributes include `ICER`, `delta_cost`, `delta_effect`, `formula`, `ref`, and `call`.

Examples

```
df <- simulate_ce_trial(n = 100, seed = 123)
res <- cea(cost + effect ~ group, data = df, ref = "control")
summary(res)
```

compute_nmb_ceac *Compute Net Monetary Benefit and CEAC Table*

Description

Computes expected incremental net monetary benefit (INMB) and the probability that treatment is cost-effective across willingness-to-pay thresholds. For a two-arm trial, `INMB(k) = k * DeltaEffect - DeltaCost`.

Usage

```
compute_nmb_ceac(
  x,
  data = NULL,
  wtp_range = seq(0, 1e+05, 1000),
  ref = NULL,
  R = 1000,
  ...
)
```

Arguments

x	Either a boot_icer object or a formula of the form cost + effect ~ group.
data	Data frame required when x is a formula.
wtp_range	Numeric vector of willingness-to-pay thresholds.
ref	Reference group label required when x is a formula.
R	Number of bootstrap replications used when x is a formula.
...	Additional arguments passed to boot_icer() for formula input.

Value

An object of class "nmb_ceac" with columns WTP, ENMB, and Prob_CE.

Examples

```
df <- simulate_ce_trial(n = 100, seed = 123)
ceac_tbl <- compute_nmb_ceac(cost + effect ~ group, data = df,
                             ref = "control", R = 200,
                             wtp_range = seq(0, 50000, 5000))
head(ceac_tbl)
```

---

dsa_icer *Deterministic Sensitivity Analysis for ICER or INMB*

Description

Varies one treatment-arm parameter while holding observed reference-arm data fixed, then recomputes the ICER or incremental net monetary benefit.

Usage

```
dsa_icer(formula, data, param, range, ref, metric = "ICER", k = 1000)
```

Arguments

formula	A formula of the form cost + effect ~ group.
data	A data frame.
param	Name of the variable to vary, usually the cost or effect variable from formula.
range	Numeric vector of values assigned to the treatment arm.
ref	Reference group label.
metric	Either "ICER" or "INMB". "NMB" is accepted as an alias for "INMB".
k	Willingness-to-pay threshold used for INMB.

Value

A data frame with varied parameter values and resulting metric.

Examples

```
df <- simulate_ce_trial(n = 100, seed = 123)
dsa <- dsa_icer(cost + effect ~ group, data = df, param = "effect",
                range = seq(0.74, 0.82, 0.02), ref = "control",
                metric = "INMB", k = 20000)
head(dsa)
```

---

plot_ceac *Plot Cost-Effectiveness Acceptability Curve*

Description

Plots the probability that treatment is cost-effective across willingness-to-pay thresholds.

Usage

```
plot_ceac(
  x,
  data = NULL,
  wtp_range = seq(0, 1e+05, 1000),
  ref = NULL,
  R = 1000,
  ...
)
```

Arguments

x	A boot_icer object, nmb_ceac object, or formula of the form cost + effect ~ group.
data	Data frame required when x is a formula.
wtp_range	Numeric vector of willingness-to-pay thresholds.

ref	Reference group label required when x is a formula.
R	Number of bootstrap replications used when x is a formula.
...	Additional arguments passed to ggplot2::labs().

Value

A ggplot object.

Examples

```
df <- simulate_ce_trial(n = 100, seed = 123)
res <- boot_icer(cost + effect ~ group, data = df, ref = "control", R = 200)
plot_ceac(res, wtp_range = seq(0, 50000, 5000))
```

---

plot_ceplane *Plot Cost-Effectiveness Plane*

Description

Visualizes bootstrap replicates of incremental cost and incremental effect.

Usage

```
plot_ceplane(boot_icer_result, k = NULL, subtitle = NULL)
```

Arguments

boot_icer_result	A boot_icer object from boot_icer().
k	Optional willingness-to-pay threshold shown as a straight line with slope k.
subtitle	Optional subtitle text.

Value

A ggplot object.

Examples

```
df <- simulate_ce_trial(n = 100, seed = 123)
res <- boot_icer(cost + effect ~ group, data = df, ref = "control", R = 200)
plot_ceplane(res, k = 20000)
```

plot_dsa *One-Way Deterministic Sensitivity Plot*

Description

Creates a one-way sensitivity plot from a data frame generated by `dsa_icer()`.

Usage

```
plot_dsa(df, metric = "ICER")
```

Arguments

`df`	A data frame from `dsa_icer()`.
`metric`	Character string. Either `"ICER"` or `"INMB"`.

Value

A `ggplot` object.

Examples

```
df <- simulate_ce_trial(n = 100, seed = 123)
dsa <- dsa_icer(cost + effect ~ group, data = df, param = "effect",
                range = seq(0.74, 0.82, 0.02), ref = "control")
plot_dsa(dsa, metric = "ICER")
```

plot_tornado *Deprecated Tornado Plot Alias*

Description

`plot_tornado()` is kept for backward compatibility. Use `plot_dsa()` instead. The plot produced by CEACT is a one-way deterministic sensitivity curve, not a conventional tornado plot.

Usage

```
plot_tornado(df, metric = "ICER")
```

Arguments

`df`	A data frame from `dsa_icer()`.
`metric`	Character string. Either `"ICER"` or `"INMB"`.

Value

A `ggplot` object.

`simulate_ce_trial` *Simulate a Two-Arm Trial for Cost-Effectiveness Analysis*

Description

Generates individual-level cost and effect outcomes for a simple two-arm randomized clinical trial. The function is intended for examples, tutorials, tests, and manuscript demonstrations.

Usage

```
simulate_ce_trial(
  n = 200,
  mean_cost = c(5000, 5600),
  sd_cost = c(900, 1000),
  mean_effect = c(0.72, 0.78),
  sd_effect = c(0.1, 0.11),
  rho = 0.15,
  seed = NULL,
  group_names = c("control", "treatment")
)
```

Arguments

`n`	Number of participants per arm.
`mean_cost`	Control and treatment mean costs.
`sd_cost`	Control and treatment cost standard deviations.
`mean_effect`	Control and treatment mean effects, for example QALYs.
`sd_effect`	Control and treatment effect standard deviations.
`rho`	Within-person cost-effect correlation used in a Gaussian construction.
`seed`	Optional random seed.
`group_names`	Character vector naming control and treatment arms.

Value

A data frame with `cost`, `effect`, and `group`.

Examples

```
trial <- simulate_ce_trial(n = 50, seed = 1)
head(trial)
```

`trial_cea` *Example Trial-Based Cost-Effectiveness Dataset*

Description

A patient-level clinical-trial cost-effectiveness dataset with treatment assignment, total cost, QALYs, and baseline covariates. The dataset is used in teaching examples for trial-based economic evaluation and was described as being provided by the Health Services Research Unit for the textbook *Economic Evaluation in Clinical Trials*.

Usage

```
trial_cea
```

Format

A data frame with 500 rows and 10 variables:

id Patient identifier.

treat Treatment indicator, 1 for treatment and 0 for control.

cost Total cost in US dollars.

qaly Quality-adjusted life-years.

dissev Disease severity, ranging approximately from 0.025 to 0.729.

race Race indicator as supplied in the source dataset.

blcost Baseline cost in US dollars.

blqaly Baseline QALY.

male Sex indicator, 1 for male and 0 for female.

group Factor version of `treat`, with levels `control` and `treatment`.

Source

Health Services Research Unit example dataset used in Glick HA, Doshi JA, Sonnad SS, Polsky D. *Economic Evaluation in Clinical Trials*. Oxford University Press. Also distributed in the `ceaR` package as `clintrial_cea`.

Index