Package ‘drord’

May 21, 2021

Title Doubly-Robust Estimators for Ordinal Outcomes
Version 1.0.1
Description Efficient covariate-adjusted estimators of quantities that are useful for establishing the effects of treatments on ordinal outcomes.
Depends R (>= 3.5.0)
Imports MASS, VGAM, ordinal, ggplot2
Suggests testthat, knitr, rmarkdown, ggsci
License MIT + file LICENSE
URL https://github.com/benkeser/drord
BugReports https://github.com/benkeser/drord/issues
Encoding UTF-8
LazyData true
VignetteBuilder knitr
RoxygenNote 7.1.1
NeedsCompilation no
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Repository CRAN
Date/Publication 2021-05-20 22:30:03 UTC

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**bca_interval**

Compute a BCa confidence interval

**Description**

Compute a BCa confidence interval

**Usage**

```r
bca_interval(pt_est, boot_samples, jack_samples, alpha = 0.05)
```

**Arguments**

- `pt_est` The point estimate of the parameter of interest
- `boot_samples` A collection of bootstrap realizations of the estimator of the parameter of interest
- `jack_samples` A vector of jackknife estimates of the parameter of interest.
- `alpha` Confidence intervals have nominal level 1-\(\alpha\).

**Value**

2-length vector containing BCa confidence interval limits.

**bcas_logodds**

Compute a BCa bootstrap confidence interval for the weighted mean. The code is based on the slides found here: http://users.stat.umn.edu/~helwig/notes/bootci-Notes.pdf

**Description**

Compute a BCa bootstrap confidence interval for the weighted mean. The code is based on the slides found here: http://users.stat.umn.edu/~helwig/notes/bootci-Notes.pdf
Usage

```r
bcalogodds(
  treat,  # A numeric vector containing treatment status. Should only assume a value 0 or 1.
  covar,  # A data.frame containing the covariates to include in the working proportional odds model.
  out,    # A numeric vector containing the outcomes. Missing outcomes are allowed.
  nboot,  # Number of bootstrap replicates used to compute bootstrap confidence intervals.
  treat_form,  # The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
  out_levels,  # A numeric vector containing all ordered levels of the outcome.
  out_form,  # The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
  out_model,  # Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
  logodds_est,  # The estimated log-odds.
  alpha = 0.05  # Level of confidence interval.
)
```

Arguments

treat A numeric vector containing treatment status. Should only assume a value 0 or 1.
covar A data.frame containing the covariates to include in the working proportional odds model.
out A numeric vector containing the outcomes. Missing outcomes are allowed.
nboot Number of bootstrap replicates used to compute bootstrap confidence intervals.
treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
out_levels A numeric vector containing all ordered levels of the outcome.
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
logodds_est The estimated log-odds.
alpa Level of confidence interval.

Value

matrix with treatment-specific log-odds CIs and CI for difference.

---

**bcamannwhitney**

Compute a BCa bootstrap confidence interval for the Mann-Whitney parameter. The code is based on the slides found here: http://users.stat.umn.edu/~helwig/notes/bootci-Notes.pdf
Description

Compute a BCa bootstrap confidence interval for the Mann-Whitney parameter. The code is based on the slides found here: http://users.stat.umn.edu/~helwig/notes/bootci-Notes.pdf

Usage

```r
bc_a_mannwhitney(
  treat,
  covar,
  out,
  nboot,
  treat_form,
  out_levels,
  out_form,
  mannwhitney_est,
  out_model,
  alpha = 0.05
)
```

Arguments

- `treat`: A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
- `covar`: A `data.frame` containing the covariates to include in the working proportional odds model.
- `out`: A numeric vector containing the outcomes. Missing outcomes are allowed.
- `nboot`: Number of bootstrap replicates used to compute bootstrap confidence intervals.
- `treat_form`: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.
- `out_levels`: A numeric vector containing all ordered levels of the outcome.
- `out_form`: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
- `mannwhitney_est`: The point estimate of the Mann-Whitney parameter.
- `out_model`: Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
- `alpha`: Level of confidence interval.

Value

Confidence interval for the Mann-Whitney parameter
Compute a BCa bootstrap confidence interval for the weighted mean. The code is based on the slides found here: http://users.stat.umn.edu/~helwig/notes/bootci-Notes.pdf

Description

Compute a BCa bootstrap confidence interval for the weighted mean. The code is based on the slides found here: http://users.stat.umn.edu/~helwig/notes/bootci-Notes.pdf

Usage

```r
bca_marg_dist(
  treat, covar, out, nboot, treat_form, out_levels, out_form, out_model, marg_cdf_est, marg_pmf_est, alpha = 0.05
)
```

Arguments

- `treat`: A numeric vector containing treatment status. Should only assume a value 0 or 1.
- `covar`: A data.frame containing the covariates to include in the working proportional odds model.
- `out`: A numeric vector containing the outcomes. Missing outcomes are allowed.
- `nboot`: Number of bootstrap replicates used to compute bootstrap confidence intervals.
- `treat_form`: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.
- `out_levels`: A numeric vector containing all ordered levels of the outcome.
- `out_form`: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
- `out_model`: Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
- `marg_cdf_est`: Point estimate of treatment-specific CDF.
- `marg_pmf_est`: Point estimate of treatment-specific PMF.
- `alpha`: Level of confidence interval.
**Value**

List (cdf, pmf) of lists (treat=1, treat=0) of confidence intervals for distributions.

---

**Description**

Compute a BCa bootstrap confidence interval for the weighted mean. The code is based on the slides found here: http://users.stat.umn.edu/~helwig/notes/bootci-Notes.pdf

**Usage**

```r
bcawmean( 
  treat, 
  covar, 
  out, 
  nboot, 
  treat_form, 
  out_levels, 
  out_form, 
  out_weights, 
  out_model, 
  wmean_est, 
  alpha = 0.05 
)
```

**Arguments**

- **treat**: A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
- **covar**: A data.frame containing the covariates to include in the working proportional odds model.
- **out**: A numeric vector containing the outcomes. Missing outcomes are allowed.
- **nboot**: Number of bootstrap replicates used to compute bootstrap confidence intervals.
- **treat_form**: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.
- **out_levels**: A numeric vector containing all ordered levels of the outcome.
- **out_form**: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
out_weights  A vector of numeric weights with length equal to the length of out_levels.
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
wmean_est The estimated weighted means + estimated covariance matrix.
alpha Level of confidence interval.

Value
matrix with treatment-specific weighted mean CIs and CI for difference.

---

compute_trt_spec_bca_intervals
Used to compute treatment-specific BCa intervals for the CDF and PMF

Description
Used to compute treatment-specific BCa intervals for the CDF and PMF

Usage
compute_trt_spec_bca_intervals(
  dist = c("cdf", "pmf"),
  trt = c(1, 0),
  marg_est,
  boot_samples,
  jack_samples,
  alpha
)

Arguments
dist Which one? CDF or PMF?
trt Which treatment?
marg_est The point estimate
boot_samples A collection of bootstrap realizations of the estimator of the parameter of interest
jack_samples A vector of jackknife estimates of the parameter of interest.
alpha Confidence intervals have nominal level 1-alpha.

Value
List of pointwise and simultaneous confidence intervals for dist.
compute_trt_spec_marg_dist_ptwise_ci

*Compute simultaneous confidence interval for treatment-specific marginal distribution*

**Description**

Compute simultaneous confidence interval for treatment-specific marginal distribution

**Usage**

```r
compute_trt_spec_marg_dist_ptwise_ci(pt_est, cov_est, alpha, cdf = TRUE)
```

**Arguments**

- **pt_est**: The point estimate of the treatment-specific marginal CDF/PMF
- **cov_est**: Covariance matrix estimates.
- **alpha**: Confidence intervals have nominal level 1-alpha.
- **cdf**: Is this for CDF or PMF?

**Value**

Confidence interval

---

compute_trt_spec_marg_dist_simul_ci

*Compute simultaneous confidence interval for treatment-specific marginal distribution*

**Description**

Compute simultaneous confidence interval for treatment-specific marginal distribution

**Usage**

```r
compute_trt_spec_marg_dist_simul_ci(
  pt_est, trt_spec_marg_dist_eif,
  remove_last = TRUE, alpha
)
```
Arguments

- **pt_est**: The point estimate of the treatment-specific marginal CDF/PMF
- **trt_spec_marg_dist_eif**: The EIF estimates for the treatment-specific marginal CDF/PMF estimates
- **remove_last**: Should the last level be removed? Should be set equal to `TRUE` for CDF computations and `FALSE` for PMF computations.
- **alpha**: Confidence intervals have nominal level 1-\(\alpha\).

Value

Confidence interval

---

**covid19**  
*Simulated COVID-19 outcomes for hospitalized patients.*

---

Description

A simulated dataset containing outcomes, (hypothetical) treatment, and age group

Usage

`covid19`

Format

A data frame with 500 rows and 3 variables:

- **out**: study outcome, here 1 represents death, 2 intubation, 3 no adverse outcome
- **age_grp**: age category with 1 the youngest and 7 the oldest
- **treat**: hypothetical treatment, here 1 represents an (effective) active treatment and 0 a control

---

**drord**  
*Doubly robust estimates of for evaluating effects of treatments on ordinal outcomes.*

---

Description

The available parameters for evaluating treatment efficacy are:

- Difference in (weighted) means: The outcome levels are treated numerically, with each level possibly assigned a weight. The difference in average outcomes is computed.
- Log odds ratio: The comparison describes the average log-odds (treatment level 1 versus 0) of the cumulative probability for each level of the outcome.
- Mann-Whitney: The probability that a randomly-selected individual receiving treatment 1 will have a larger outcome value than a randomly selected individual receiving treatment 0 (with ties assigned weight 1/2).
Usage

drord(
  out,
  treat,
  covar,
  out_levels = sort(unique(out)),
  out_form = paste0(colnames(covar), collapse = "+")
  out_weights = rep(1, length(out_levels)),
  out_model = "pooled-logistic",
  treat_form = "1",
  param = c("weighted_mean", "log_odds", "mann_whitney"),
  ci = "wald",
  alpha = 0.05,
  nboot = 1000,
  return_models = TRUE,
  est_dist = TRUE,
  stratify = FALSE,
  ...
)

Arguments

out A numeric vector containing the outcomes. Missing outcomes are allowed.

treat A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.

covar A data.frame containing the covariates to include in the working proportional odds model.

out_levels A numeric vector containing all ordered levels of the outcome.

out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.

out_weights A vector of numeric weights with length equal to the length of out_levels.

out_model Which R function should be used to fit the proportional odds model. The recommended option is "pooled-logistic". Other options available include "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates

param A vector of characters indicating which of the three treatment effect parameters should be estimated ("weighted_mean", "log_odds", and/or "mann_whitney").

ci A vector of characters indicating which confidence intervals should be computed ("bca" and/or "wald")

alpha Confidence intervals have nominal level 1-alpha.
nboot

Number of bootstrap replicates used to compute bootstrap confidence intervals.

return_models

If TRUE the fitted working proportional odds models and treatment probability models are returned.

est_dist

A boolean indicating whether estimates of the CDF and PMF should be computed and returned. For real data analysis, we generally recommend leaving as TRUE; however, when studying performance in simulations, it can save time to set to FALSE.

stratify

If TRUE, then a fully stratified estimator is computed, i.e., the empirical CDF of each treatment arm is estimated stratifying by levels of covar. For now, this option is limited to univariate covariates.

... Other options (not currently used).

Details

In each case, estimates are constructed by obtaining a doubly robust estimate of the cumulative distribution function (CDF) for each treatment group. This is achieved by fitting a (working) proportional odds model that includes inverse probability of treatment weights. The inclusion of these weights ensures that, so long as the working model includes intercept terms, the resultant estimate of the CDF is an augmented inverse probability of treatment weighted estimate. This implies that the estimate is nonparametric efficient if the working model contains the truth; however, even if the working model does not contain the truth, the CDF estimates are consistent and asymptotically normal with variance expected to dominate that of an unadjusted estimate of the same treatment effect.

The CDF estimates are subsequently mapped into estimates of each requested parameter for evaluating treatment effects. The double robustness and efficiency properties of the CDF estimates extend to these quantities as well. Confidence intervals and hypothesis tests can be carried out in closed form using Wald-style intervals and tests or using a nonparametric corrected and accelerated bootstrap (BCa). Inference for the CDF and probability mass function is also returned and can be used for subsequent visualizations (see plot.drord).

Value

An object of class drord. In addition to information related to how drord was called, the output contains the following:

log_odds inference pertaining to the log-odds parameter. NULL if this parameter not requested in call to drord.

mann_whitney inference pertaining to the Mann-Whitney parameter. NULL if this parameter not requested in call to drord.

weighted_mean inference pertaining to weighted mean parameter. NULL if this parameter not requested in call to drord.

cdf inference pertaining to the treatment-specific CDFs. See the plot method for a convenient way of visualizing this information. NULL if est_dist = FALSE in call to drord.

pmf inference pertaining to the treatment-specific PMFs. See the plot method for a convenient way of visualizing this information. NULL if est_dist = FALSE in call to drord.

treat_mod the fitted model for the probability of treatment as a function of covariates. NULL if return_models = FALSE
**eif_pmf_k**

*Get EIF estimates for treatment-specific PMF at a particular level of the outcome*

**Description**

Get EIF estimates for treatment-specific PMF at a particular level of the outcome

**Usage**

```r
eif_pmf_k(k, out, treat, trt_level, trt_spec_prob_est, trt_k_spec_pmf_est)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>k</code></td>
<td>The level of the outcome.</td>
</tr>
<tr>
<td><code>out</code></td>
<td>A numeric vector containing the outcomes. Missing outcomes are allowed.</td>
</tr>
</tbody>
</table>
estimate_cdf

treat A numeric vector containing treatment status. Should only assume a value 0 or 1.
trt_level Treatment level
trt_spec_prob_est Estimated propensity for trt_level.
trt_k_spec_pmf_est Estimated conditional PMF for trt_level at k.

---

eif_theta_k Get EIF estimates for treatment-specific CDF at a particular level of the outcome

Description
Get EIF estimates for treatment-specific CDF at a particular level of the outcome

Usage
eif_theta_k(k, out, treat, trt_level, trt_spec_prob_est, trt_k_spec_cdf_est)

Arguments
k The level of the outcome.
out A numeric vector containing the outcomes. Missing outcomes are allowed.
treat A numeric vector containing treatment status. Should only assume a value 0 or 1.
trt_level Treatment level
trt_spec_prob_est Estimated propensity for trt_level.
trt_k_spec_cdf_est Estimated conditional CDF for trt_level at k.

---

estimate_cdf Map an estimate of the conditional PMF into an estimate of the conditional CDF

Description
Map an estimate of the conditional PMF into an estimate of the conditional CDF

Usage
estimate_cdf(pmf_est)
estimate_ci_logodds

Arguments

pmf_est A list of the treatment-specific PMF estimates

Value

A list of treatment-specific CDF estimates

Description

Compute confidence interval/s for the log-odds parameters

Usage

estimate_ci_logodds(
  logodds_est,
  cdf_est,
  out_form,
  covar,
  treat_prob_est,
  treat,
  treat_form,
  out,
  ci,
  alpha = 0.05,
  nboot,
  out_levels,
  out_model,
  ...
)

Arguments

logodds_est The point estimates for log-odds.
cdf_est A list of treatment-specific CDF estimates.
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
covar A data.frame containing the covariates to include in the working proportional odds model.
treat_prob_est Estimated probability of treatments, output from call to estimate_treat_prob.
treat A numeric vector containing treatment status. Should only assume a value 0 or 1.
Compute confidence interval/s for the Mann-Whitney parameter

```
estimate_ci_mannwhitney(
  mannwhitney_est,
  cdf_est,
  pmf_est,
  treat_prob_est,
  treat_form,
  out_form,
  treat,
  ci,
  out,
  alpha,
  nboot,
  out_levels,
  covar,
  out_model
)
```
**Arguments**

- **mannwhitney_est**: The point estimates for log-odds.
- **cdf_est**: The estimated conditional CDF.
- **pmf_est**: The estimated conditional PMF.
- **treat_prob_est**: Estimated probability of treatments, output from call to `estimate_treat_prob`.
- **treat_form**: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.
- **out_form**: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
- **treat**: A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
- **ci**: A vector of characters indicating which confidence intervals should be computed ("bca" and/or "wald")
- **out**: A numeric vector containing the outcomes. Missing outcomes are allowed.
- **alpha**: Confidence intervals have nominal level 1-alpha.
- **nboot**: Number of bootstrap replicates used to compute bootstrap confidence intervals.
- **out_levels**: A numeric vector containing all ordered levels of the outcome.
- **covar**: A data.frame containing the covariates to include in the working proportional odds model.
- **out_model**: Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

**Value**

List with wald and bca-estimated confidence intervals for the Mann-Whitney parameter.

**estimate_ci_marg_dist** *Compute confidence interval/s for the treatment specific PMF and CDF.*

**Description**

Compute confidence interval/s for the treatment specific PMF and CDF.
estimate_ci_marg_dist

Usage

estimate_ci_marg_dist(
marg_cdf_est,
marg_pmf_est,
cdf_est,
pmf_est,
covar,
treat_prob_est,
treat_form,
out_form,
treat,
ci,
out_levels,
out_model,
out,
alpha,
nboot
)

Arguments

marg_cdf_est Point estimate of treatment-specific CDF.
marg_pmf_est Point estimate of treatment-specific PMF.
cdf_est Estimates of treatment-specific conditional CDF.
pmf_est Estimates of treatment-specific conditional PMF.
covar A data.frame containing the covariates to include in the working proportional odds model.
treat_prob_est Estimated probability of treatments, output from call to estimate_treat_prob.
treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
treat A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
ci A vector of characters indicating which confidence intervals should be computed ("bca" and/or "wald")
out_levels A numeric vector containing all ordered levels of the outcome.
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
out A numeric vector containing the outcomes. Missing outcomes are allowed.
alpha Confidence intervals have nominal level 1-alpha.
nboot Number of bootstrap replicates used to compute bootstrap confidence intervals.
estimate_ci_wmean

Value
List of lists (cdf and pmf) with wald and bca-estimated confidence intervals for the marginal treatment-specific distribution functions.

Description
Compute confidence interval/s for the weight mean parameters

Usage
estimate_ci_wmean(
  out, treat, covar, wmean_est, alpha = 0.05, out_levels = order(unique(out)), out_form = NULL, out_weights = rep(1, length(out_levels)), out_model, treat_form = "1", ci = c("bca", "wald"), nboot = 10000
)

Arguments
out A numeric vector containing the outcomes. Missing outcomes are allowed.
treat A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
covar A data.frame containing the covariates to include in the working proportional odds model.
wmean_est The point estimates for weighted means
alpha Confidence intervals have nominal level 1-alpha.
out_levels A numeric vector containing all ordered levels of the outcome.
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
out_weights A vector of numeric weights with length equal to the length of out_levels.
Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

The right-hand side of a regression formula for the working model of treatment probability as a function of covariates

A vector of characters indicating which confidence intervals should be computed ("bca" and/or "wald")

Number of bootstrap replicates used to compute bootstrap confidence intervals.

List with wald and bca-estimated confidence intervals for the weighted mean parameters.

Map an estimate of treatment-specific PMF into an estimate of treatment specific conditional mean for each observation.

Map an estimate of treatment-specific PMF into an estimate of treatment specific conditional mean for each observation.

estimate_cond_mean(trt_spec_pmf_est, ordered_out_levels, ordered_out_weights)

The treatment-specific PMF estimates

Self explanatory

Self explanatory

Vector of estimated conditional means
estimate_eif_wmean

*Obtain an estimate of the efficient influence function for the treatment-specific weighted mean parameter*

**Description**

Obtain an estimate of the efficient influence function for the treatment-specific weighted mean parameter

**Usage**

```r
estimate_eif_wmean(
  trt_spec_cond_mean_est,
  trt_spec_prob_est,
  trt_level,
  out,
  treat
)
```

**Arguments**

- `trt_spec_cond_mean_est`: Conditional mean for `trt_level`
- `trt_spec_prob_est`: Propensity for `trt_level`
- `trt_level`: Treatment level
- `out`: A numeric vector containing the outcomes. Missing outcomes are allowed.
- `treat`: A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.

---

estimate_logodds

*implements a plug-in estimator of equation (2) in Diaz et al*

**Description**

implements a plug-in estimator of equation (2) in Diaz et al

**Usage**

```r
estimate_logodds(cdf_est)
```
### estimate_pmf

**Arguments**

- **cdf_est**: A list of treatment-specific CDF estimates

**Value**

Log odds of treatment = 1, = 0, and the difference.

---

### estimate_mannwhitney

*Compute the estimate of Mann-Whitney based on conditional CDF and PMF*

**Description**

Compute the estimate of Mann-Whitney based on conditional CDF and PMF

**Usage**

```r
estimate_mannwhitney(cdf_est, pmf_est)
```

**Arguments**

- **cdf_est**: Conditional CDF estimates
- **pmf_est**: Conditional PMF estimates

**Value**

Mann-Whitney point estimate

---

### estimate_pmf

*Get a treatment-specific estimate of the conditional PMF. Essentially this is a wrapper function for fit_trt_spec_reg, which fits the proportion odds model in a given treatment arm.*

**Description**

Get a treatment-specific estimate of the conditional PMF. Essentially this is a wrapper function for fit_trt_spec_reg, which fits the proportion odds model in a given treatment arm.
Usage

estimate_pmf(
  out,
  treat,
  covar,
  out_levels,
  out_form = NULL,
  out_model,
  treat_prob_est,
  stratify = FALSE,
  return_models = TRUE,
  ...
)

Arguments

out A numeric vector containing the outcomes. Missing outcomes are allowed.
treat A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
covar A data.frame containing the covariates to include in the working proportional odds model.
out_levels A numeric vector containing all ordered levels of the outcome.
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
treat_prob_est Estimated probability of treatments, output from call to `estimate_treat_prob`.
stratify Boolean indicating whether to use nonparametric maximum likelihood (i.e., a stratified estimator). If `out_form = "1"`, then a covariate-unadjusted estimate is computed.
return_models If TRUE the fitted working proportional odds models and treatment probability models are returned.
...
Other options (not used).

Value

A list with `fm` the fitted model for treatment 1 and 0 (or, if !`return_models` then NULL) and `pmf` the estimated PMF under treatment 1 and 0 evaluated on each observation.
estimate_treat_prob  Estimate probability of receiving each level of treatment

Description

Estimate probability of receiving each level of treatment

Usage

```
estimate_treat_prob(treat, covar, treat_form, return_models)
```

Arguments

- **treat**: A numeric vector containing treatment status. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing.
- **covar**: A `data.frame` containing the covariates to include in the working proportional odds model.
- **treat_form**: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
- **return_models**: If `TRUE` the fitted working proportional odds models and treatment probability models are returned.

Value

A list where the first element is estimate of `Pr(treat = 1 | covar)` for `covar` equal to inputted values of `covar` and second element is estimate of `Pr(treat = 0 | covar)` for `covar` equal to inputted values of `covar`

estimate_wmean  Compute the estimate of the weighted mean parameter based on estimated PMF in each treatment arm.

Description

Compute the estimate of the weighted mean parameter based on estimated PMF in each treatment arm.
evaluate_beta_cov

Usage

```r
estimate_wmean(
  pmf_est,
  treat,
  out,
  out_levels,
  out_weights,
  treat_prob_est,
  return_cov = TRUE
)
```

Arguments

- `pmf_est`: List of treatment-specific PMF estimates.
- `treat`: A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
- `out`: A numeric vector containing the outcomes. Missing outcomes are allowed.
- `out_levels`: A numeric vector containing all ordered levels of the outcome.
- `out_weights`: A vector of numeric weights with length equal to the length of `out_levels`.
- `treat_prob_est`: Estimated probability of treatments, output from call to `estimate_treat_prob`.
- `return_cov`: If TRUE the estimated covariance matrix is returned.

Value

List with estimates of treatment-specific means and difference in means. If `return_cov = TRUE`, also includes covariance matrix estimates.

---

evaluate_beta_cov

*Get the covariance matrix for beta*

---

Description

Get the covariance matrix for beta

Usage

```r
evaluate_beta_cov(cdf_est, theta_cov)
```

Arguments

- `cdf_est`: Estimated CDFs
- `theta_cov`: Covariance matrix for CDF estimates
Value

Estimated covariance matrix for log-odds ratio parameters

evaluate_mannwhitney_gradient

Compute the estimated gradient of the Mann-Whitney parameter. Needed to derive standard error for Wald confidence intervals.

Description

Compute the estimated gradient of the Mann-Whitney parameter. Needed to derive standard error for Wald confidence intervals.

Usage

evaluate_mannwhitney_gradient(cdf_est, pmf_est)

Arguments

cdf_est  Conditional CDF estimates
pmf_est  Conditional PMF estimates

Value

3-length vector for delta method calculus

evaluate_marg_cdf_eif

Get eif estimates for treatment-specific CDF

Description

Get eif estimates for treatment-specific CDF

Usage

evaluate_marg_cdf_eif(cdf_est, treat_prob_est, treat, out, out_levels)

Arguments

cdf_est  Estimated conditional CDF for trt_level.
treat_prob_est  Estimated propensity for trt_level.
treat  A numeric vector containing treatment status. Should only assume a value 0 or 1.
out  A numeric vector containing the outcomes. Missing outcomes are allowed.
out_levels  A numeric vector containing all ordered levels of the outcome.
evaluate_marg_cdf_ptwise_ci  

Evaluate pointwise confidence interval for marginal CDF.

Description
Evaluate pointwise confidence interval for marginal CDF.

Usage
evaluate_marg_cdf_ptwise_ci(marg_cdf_est, marg_cdf_eif, alpha)

Arguments
- marg_cdf_est: The point estimate of the marginal CDF distribution
- marg_cdf_eif: The EIF estimates for the marginal CDF estimates
- alpha: Confidence intervals have nominal level 1-alpha.

Value
List by treatment of simultaneous confidence intervals

evaluate_marg_dist_simul_ci  

Evaluate simultaneous confidence interval for marginal PMF or CDF.

Description
Evaluate simultaneous confidence interval for marginal PMF or CDF.

Usage
evaluate_marg_dist_simul_ci(
    marg_dist_est,
    marg_dist_eif,
    alpha,
    remove_last = FALSE
)
evaluate_marg_pmf_eif

Arguments

- marg_dist_est: The point estimate of the marginal CDF/PMF distribution
- marg_dist_eif: The EIF estimates for the marginal CDF/PMF estimates
- alpha: Confidence intervals have nominal level 1-alpha.
- remove_last: Should the last level be removed? Should be set equal to TRUE for CDF computations and FALSE for PMF computations.

Value

List by treatment of simultaneous confidence intervals

evaluate_marg_pmf_eif  Get eif estimates for treatment-specific PMF

Description

Get eif estimates for treatment-specific PMF

Usage

evaluate_marg_pmf_eif(pmf_est, treat_prob_est, treat, out, out_levels)

Arguments

- pmf_est: Estimated conditional PMF for trt_level.
- treat_prob_est: Estimated propensity for trt_level.
- treat: A numeric vector containing treatment status. Should only assume a value 0 or 1.
- out: A numeric vector containing the outcomes. Missing outcomes are allowed.
- out_levels: A numeric vector containing all ordered levels of the outcome.

Value

A list of eif estimates
evaluate_marg_pmf_ptwise_ci

Evaluate pointwise confidence interval for marginal PMF.

Description
Evaluate pointwise confidence interval for marginal PMF.

Usage
evaluate_marg_pmf_ptwise_ci(marg_pmf_est, marg_pmf_eif, alpha)

Arguments
- marg_pmf_est: The point estimate of the marginal PMF distribution
- marg_pmf_eif: The EIF estimates for the marginal PMF estimates
- alpha: Confidence intervals have nominal level 1-alpha.

Value
List by treatment of simultaneous confidence intervals

evaluate_theta_cov
get a covariance matrix for the estimated CDF

Description
get a covariance matrix for the estimated CDF

Usage
evaluate_theta_cov(cdf_est, treat_prob_est, treat, out, out_levels)

Arguments
- cdf_est: The estimates of the treatment-specific CDFs
- treat_prob_est: List of estimated probability of treatments, output from call to estimate_treat_prob.
- treat: A numeric vector containing treatment status. Should only assume a value 0 or 1.
- out: A numeric vector containing the outcomes. Missing outcomes are allowed.
- out_levels: A numeric vector containing all ordered levels of the outcome.

Value
Estimated covariance matrix for CDF estimates
evaluate_trt_spec_pmf_eif

Get a matrix of eif estimates for treatment-specific PMF

Description

Get a matrix of eif estimates for treatment-specific PMF

Usage

evaluate_trt_spec_pmf_eif(
  trt_spec_pmf_est,
  trt_spec_prob_est,
  trt_level,
  treat,
  out,
  out_levels
)

Arguments

trt_spec_pmf_est
  Estimated conditional PMF for trt_level.
trt_spec_prob_est
  Estimated propensity for trt_level.
trt_level
  Treatment level

treat
  A numeric vector containing treatment status. Should only assume a value 0 or 1.
out
  A numeric vector containing the outcomes. Missing outcomes are allowed.
out_levels
  A numeric vector containing all ordered levels of the outcome.

Value

a matrix of EIF estimates

evaluate_trt_spec_theta_eif

get a matrix of eif estimates for the treatment-specific CDF estimates

Description

get a matrix of eif estimates for the treatment-specific CDF estimates
Usage

evaluate_trt_spec_theta_eif(
    trt_spec_cdf_est,
    trt_spec_prob_est,
    trt_level,
    treat,
    out,
    out_levels
)

Arguments

trt_spec_cdf_est
    Estimated conditional CDF for trt_level.

trt_spec_prob_est
    Estimated propensity for trt_level.

trt_level
    Treatment level

treat
    A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.

out
    A numeric vector containing the outcomes. Missing outcomes are allowed.

out_levels
    A numeric vector containing all ordered levels of the outcome.

Value

matrix of EIF estimates for CDF.

fit_trt_spec_reg

Helper function to fit a treatment specific outcome regression. If there are more than 2 observed levels of the outcome for the specified treatment arm, then polr is used from the MASS package. Otherwise logistic regression is used. In both cases, inverse probability of treatment weights are included in the regression. If there are levels of the outcome that are not observed in this treatment group, then 0’s are added in. The function returns a matrix with named columns corresponding to each outcome (ordered numerically). The entries represent the estimated covariate-conditional treatment-specific PMF.

Description

Helper function to fit a treatment specific outcome regression. If there are more than 2 observed levels of the outcome for the specified treatment arm, then polr is used from the MASS package. Otherwise logistic regression is used. In both cases, inverse probability of treatment weights are
included in the regression. If there are levels of the outcome that are not observed in this treatment
group, then 0’s are added in. The function returns a matrix with named columns corresponding
to each outcome (ordered numerically). The entries represent the estimated covariate-conditional
treatment-specific PMF.

Usage

```r
fit_trt_spec_reg(
  trt_level,
  trt_spec_prob_est,
  out,
  treat,
  covar,
  out_levels,
  out_form = NULL,
  out_model,
  stratify,
  ...
)
```

Arguments

- `trt_level` Which level of treatment to fit the proportional odds model for
- `trt_spec_prob_est` A vector of estimates of Pr(treat = trt_level | covar).
- `out` A numeric vector containing the outcomes. Missing outcomes are allowed.
- `treat` A numeric vector containing treatment status. Missing values are not allowed
  unless the corresponding entry in `out` is also missing. Only values of 0 or 1
  are treated as actual treatment levels. Any other value is assumed to encode a
  value for which the outcome is missing and the corresponding outcome value is
  ignored.
- `covar` A data.frame containing the covariates to include in the working proportional
  odds model.
- `out_levels` A numeric vector containing all ordered levels of the outcome.
- `out_form` The right-hand side of a regression formula for the working proportional odds
  model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
- `out_model` Which R function should be used to fit the proportional odds model. Options
  are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm"
  (from the ordinal package).
- `stratify` Boolean indicating whether to use nonparametric maximum likelihood (i.e., a
  stratified estimator). If `out_form = "1"`, then a covariate-unadjusted estimate is
  computed.
- `...` Other options (not used).
getResponseFromFormula

Get a response from model formula

Description
Get a response from model formula

Usage
getResponseFromFormula(formula, data)

Arguments
- formula: The model formula
- data: The data frame associated with the model

get_one_logodds
Compute one log odds based on a given data set.

Description
Compute one log odds based on a given data set.

Usage
get_one_logodds(treat, covar, treat_form, out_model, out, out_levels, out_form)

Arguments
- treat: A numeric vector containing treatment status. Should only assume a value 0 or 1.
- covar: A data.frame containing the covariates to include in the working proportional odds model.
- treat_form: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
- out_model: Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
- out: A numeric vector containing the outcomes. Missing outcomes are allowed.
- out_levels: A numeric vector containing all ordered levels of the outcome.
- out_form: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
get_one_mannwhitney

Description

Compute one estimate of Mann-Whitney parameter based on a given data set.

Usage

get_one_mannwhitney(
  treat,
  covar,
  treat_form,
  out,
  out_levels,
  out_form,
  out_model
)

Arguments

treat A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
covar A data.frame containing the covariates to include in the working proportional odds model.
treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
out A numeric vector containing the outcomes. Missing outcomes are allowed.
out_levels A numeric vector containing all ordered levels of the outcome.
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

Value

Estimate of Mann-Whitney parameter for these input data.
get_one_marg_dist

Compute one estimate of the marginal CDF/PMF on a given data set.

Description

Compute one estimate of the marginal CDF/PMF on a given data set.

Usage

get_one_marg_dist(
  treat,  
  covar,  
  treat_form,  
  out_model,  
  out,  
  out_levels,  
  out_form
)

Arguments

treat A numeric vector containing treatment status. Should only assume a value 0 or 1.
covar A data.frame containing the covariates to include in the working proportional odds model.
treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
out A numeric vector containing the outcomes. Missing outcomes are allowed.
out_levels A numeric vector containing all ordered levels of the outcome.
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.

Value

List of estimated cdf/pmf for these input data.
get_one_wmean  

Compute one weighted mean based on a given data set.

Description

Compute one weighted mean based on a given data set.

Usage

get_one_wmean(
  treat,
  covar,
  treat_form,
  out,
  out_levels,
  out_form,
  out_model,
  out_weights
)

Arguments

treat A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.

covar A data.frame containing the covariates to include in the working proportional odds model.

treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates

out A numeric vector containing the outcomes. Missing outcomes are allowed.

out_levels A numeric vector containing all ordered levels of the outcome.

out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.

out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

out_weights A vector of numeric weights with length equal to the length of out_levels.
jack_logodds

Compute jackknife log-odds estimates.

Description

Compute jackknife log-odds estimates.

Usage

jack_logodds(treat, covar, out, treat_form, out_model, out_levels, out_form)

Arguments

treat A numeric vector containing treatment status. Should only assume a value 0 or 1.
covar A data.frame containing the covariates to include in the working proportional odds model.
out A numeric vector containing the outcomes. Missing outcomes are allowed.
treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
out_levels A numeric vector containing all ordered levels of the outcome.
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.

Value

Jackknife estimated log-odds

jack_mannwhitney

Compute Mann-Whitney log-odds estimates.

Description

Compute Mann-Whitney log-odds estimates.
Usage

```r
jack_mannwhitney(
  treat,  # A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
  covar,  # A data.frame containing the covariates to include in the working proportional odds model.
  out,  # A numeric vector containing the outcomes. Missing outcomes are allowed.
  treat_form,  # The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
  out_levels,  # A numeric vector containing all ordered levels of the outcome.
  out_form,  # The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
  out_model  # Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
)
```

Arguments

- `treat`: A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.

- `covar`: A data.frame containing the covariates to include in the working proportional odds model.

- `out`: A numeric vector containing the outcomes. Missing outcomes are allowed.

- `treat_form`: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.

- `out_levels`: A numeric vector containing all ordered levels of the outcome.

- `out_form`: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.

- `out_model`: Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

Value

Jackknife estimate of Mann-Whitney parameter

---

### Description

Compute jackknife distribution estimates.

Usage

```r
jack_marg_cdf(treat, covar, out, treat_form, out_levels, out_form, out_model)
```
Arguments

- **treat**: A numeric vector containing treatment status. Should only assume a value 0 or 1.
- **covar**: A data.frame containing the covariates to include in the working proportional odds model.
- **out**: A numeric vector containing the outcomes. Missing outcomes are allowed.
- **treat_form**: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.
- **out_levels**: A numeric vector containing all ordered levels of the outcome.
- **out_form**: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
- **out_model**: Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

Value

Jackknife estimated distributions

Description

Compute jackknife weighted mean estimates.

Usage

```r
jack_wmean(
  treat, covar, out, treat_form, out_levels, out_form, out_weights, out_model
)
```

Arguments

- **treat**: A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
covar A data.frame containing the covariates to include in the working proportional odds model.
out A numeric vector containing the outcomes. Missing outcomes are allowed.
treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
out_levels A numeric vector containing all ordered levels of the outcome.
out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
out_weights A vector of numeric weights with length equal to the length of out_levels.
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

Value

Jackknife-estimated weighted mean

marginalize_cdf Marginalize over empirical distribution to obtain marginal treatment-specific CDF estimate.

Description
Marginalize over empirical distribution to obtain marginal treatment-specific CDF estimate.

Usage
marginalize_cdf(cdf_est)

Arguments
cdf_est Estimates of treatment-specific conditional CDF.

marginalize_pmf Marginalize over empirical distribution to obtain marginal treatment-specific PMF estimate.

Description
Marginalize over empirical distribution to obtain marginal treatment-specific PMF estimate.

Usage
marginalize_pmf(pmf_est)
one_boot_logodds

Arguments

- pmf_est: Estimates of treatment-specific conditional PMF.

Description

Get one bootstrap computation of the log odds parameters.

Usage

one_boot_logodds(
  treat,
  covar,
  out,
  treat_form,
  out_levels,
  out_form,
  out_model
)

Arguments

- treat: A numeric vector containing treatment status. Should only assume a value 0 or 1.
- covar: A data.frame containing the covariates to include in the working proportional odds model.
- out: A numeric vector containing the outcomes. Missing outcomes are allowed.
- treat_form: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.
- out_levels: A numeric vector containing all ordered levels of the outcome.
- out_form: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
- out_model: Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

Value

Estimates of log odds for a particular bootstrap sample.
one_boot_mannwhitney

Get one bootstrap computation of the Mann-Whitney parameter.

Description

Get one bootstrap computation of the Mann-Whitney parameter.

Usage

one_boot_mannwhitney(
  treat,
  covar,
  out,
  treat_form,
  out_levels,
  out_form,
  out_model
)

Arguments

treat A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.

covar A data.frame containing the covariates to include in the working proportional odds model.

out A numeric vector containing the outcomes. Missing outcomes are allowed.

treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates

out_levels A numeric vector containing all ordered levels of the outcome.

out_form The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.

out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

Value

Estimates of Mann-Whitney parameter for a particular bootstrap sample.
one_boot_marg_dist

Description

Get one bootstrap computation of the CDF and PMF estimates

Usage

one_boot_marg_dist(
  treat,
  covar,
  out,
  treat_form,
  out_levels,
  out_form,
  out_model
)

Arguments

treat  A numeric vector containing treatment status. Should only assume a value 0 or 1.
covar  A data.frame containing the covariates to include in the working proportional odds model.
out    A numeric vector containing the outcomes. Missing outcomes are allowed.
treat_form The right-hand side of a regression formula for the working model of treatment probability as a function of covariates
out_levels A numeric vector containing all ordered levels of the outcome.
out_form  The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
out_model Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

Value

Estimates of CDF and PMF for a particular bootstrap sample.
**one_boot_wmean**

Get one bootstrap computation of the weighted mean parameters.

### Description

Get one bootstrap computation of the weighted mean parameters.

### Usage

```r
one_boot_wmean(
  treat,  # A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in out is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
  covar,  # A data.frame containing the covariates to include in the working proportional odds model.
  out,    # A numeric vector containing the outcomes. Missing outcomes are allowed.
  treat_form,  # The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.
  out_levels,  # A numeric vector containing all ordered levels of the outcome.
  out_form,  # The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
  out_weights,  # A vector of numeric weights with length equal to the length of out_levels.
  out_model   # Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).
)
```

### Arguments

- **treat**: A numeric vector containing treatment status. Missing values are not allowed unless the corresponding entry in `out` is also missing. Only values of 0 or 1 are treated as actual treatment levels. Any other value is assumed to encode a value for which the outcome is missing and the corresponding outcome value is ignored.
- **covar**: A data.frame containing the covariates to include in the working proportional odds model.
- **out**: A numeric vector containing the outcomes. Missing outcomes are allowed.
- **treat_form**: The right-hand side of a regression formula for the working model of treatment probability as a function of covariates.
- **out_levels**: A numeric vector containing all ordered levels of the outcome.
- **out_form**: The right-hand side of a regression formula for the working proportional odds model. NOTE: THIS FORMULA MUST NOT SUPPRESS THE INTERCEPT.
- **out_weights**: A vector of numeric weights with length equal to the length of `out_levels`.
- **out_model**: Which R function should be used to fit the proportional odds model. Options are "polr" (from the MASS package), "vglm" (from the VGAM package), or "clm" (from the ordinal package).

### Value

Estimates of weighted mean for a particular bootstrap sample.
Description

Print the output of a "drord" object.

Usage

## S3 method for class 'drord'
plot(
  x,
  treat_labels = c(1, 0),
  dist = "pmf",
  out_labels = if (dist == "pmf") { x$out_levels } else {
    x$out_levels[-length(x$out_levels)] },
  ...
)

Arguments

x A "drord" object.
treat_labels Labels for the treatment variables (treat = 1 followed by treat = 0).
dist Which distribution to plot. Valid options are "cdf" or "pmf".
out_labels Labels for the ordered outcome levels. If dist = "cdf", the highest level of outcome will be dropped.
...
Other arguments (not used)

Value

A list with named entries plot (a ggplot2 object) and plot_data, the data.frame from which the plot is made. The latter is included for additional modifications to the plot that are desired.

POplugin

Fits a proportional odds model via pooled logistic regression.

Description

The outcome in data (indicated in the form object) should be an ordered factor.

Usage

POplugin(form, data, weights = 1)
### Arguments

- **form**: The model formula
- **data**: The data set used to fit the model
- **weights**: Either equal to 1 (no weights) or a vector of length equal to nrow(data)

### Value

A list with the fitted glm, the original data, levels of the outcome, and the outcome name

---

### predict.POplugin

*Predict method for a POplugin object*

#### Description

Predict method for a POplugin object

#### Usage

```r
## S3 method for class 'POplugin'
predict(object, newdata = NULL)
```

#### Arguments

- **object**: An object of class POplugin
- **newdata**: A data.frame on which to predict

#### Value

A data frame with nrow = number of rows in newdata (or the original data frame) and with the number of columns equal to the number of levels of the outcome observed in the original data frame

---

### print.drord

*Print the output of a "drord" object.*

#### Description

Print the output of a "drord" object.

#### Usage

```r
## S3 method for class 'drord'
print(x, ci = "bca", ...)
```
trimmed_logit

Arguments

x A "drord" object

ct Which confidence interval should be printed. Defaults to BCa, but if BCa was not computed in call to drord, defaults back to Wald.

... Other arguments (not used)

Description

Trimmed logistic function

Usage

trimmed_logit(x)

Arguments

x A numeric between 0 and 1

wald_ci_wmean Compute a Wald confidence interval for the weighted mean

Description

Compute a Wald confidence interval for the weighted mean

Usage

wald_ci_wmean(wmean_est, alpha)

Arguments

wmean_est The estimated weighted means + estimated covariance matrix.

alpha Level of confidence interval.

Value

matrix with treatment-specific weighted mean CIs and CI for difference.
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