

Package ‘svyCausalGLM’

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Title Survey-Weighted Modeling Utilities

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Description Utility functions for survey-weighted regression, diagnostics, and visualization.

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final_prog_svyglm	<i>Prognostic-weighted survey GLM Prognostic-weighted survey GLM</i>
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Description

Fits a survey-weighted logistic regression model using stabilized prognostic score weights derived from a model predicting the outcome conditional on baseline covariates and excluding the exposure effect. The function supports design-based inference under complex survey sampling while adjusting for confounding through prognostic weighting

Usage

```
final_prog_svyglm(
  data,
  dep_var,
  exposure,
  covariates,
  id_var,
  strata_var,
  weight_var,
  outcome_covariates = NULL,
  level = 0.95,
  ...
)
```

Arguments

data	Data frame
dep_var	Character; binary outcome
exposure	Character; exposure variable
covariates	Character vector; adjustment variables
id_var	Character; PSU
strata_var	Character; strata
weight_var	Character; survey weight
outcome_covariates	Character vector; optional covariates for final model
level	Numeric; CI level
...	Additional args to svyglm

Value

A list with:

- prog_model: Prognostic svyglm.

- final_model: Weighted outcome svyglm.
- OR_table: Odds ratios with CI.
- AUC: Weighted AUC.
- data: Data with prognostic weights.

Examples

```
set.seed(123)
n <- 1000
dat <- data.frame(
  psu = sample(1:10, n, replace = TRUE),
  strata = sample(1:5, n, replace = TRUE),
  weight = runif(n, 0.5, 2),
  age = rnorm(n, 50, 10),
  sex = factor(sample(c("Male", "Female"), n, replace = TRUE)),
  exposure = rbinom(n, 1, 0.5)
)
dat$outcome <- rbinom(n, 1, plogis(-2 + 0.03*dat$age + 0.5*dat$exposure))
fit <- final_prop_svyglm(data = dat,
  dep_var = "outcome",
  exposure = "exposure",
  covariates = c("age", "sex"),
  id_var = "psu",
  strata_var = "strata",
  weight_var = "weight",
  level = 0.95
)
names(fit)
fit$OR_table
```

final_prop_svyglm *Propensity-weighted survey GLM*

Description

Calculates IPTW weights and fits survey-weighted GLM. Supports binary, multinomial, or continuous exposures.

Usage

```
final_prop_svyglm(
  data,
  dep_var,
  covariates,
  exposure,
  id_var,
  strata_var,
  weight_var,
```

```

  exposure_type = "binary",
  outcome_covariates = NULL,
  level = 0.95,
  ...
)

```

Arguments

data	Data frame
dep_var	Character; binary outcome
covariates	Character vector; adjustment variables
exposure	Character; treatment/exposure variable
id_var	Character; PSU
strata_var	Character; strata
weight_var	Character; base weight
exposure_type	Character; "binary", "multinomial", "continuous"
outcome_covariates	Character vector of additional covariates to include in the final outcome model after applying propensity weights (default = NULL)
level	Numeric; confidence interval level
...	Additional args to svyglm

Value

A list with:

- ps_model: Propensity score svyglm model.
- final_model: Weighted outcome svyglm model.
- OR_table: Odds ratios with CI and p-values.
- AUC: Weighted AUC.
- data: Data with IPTW and predictions.

Examples

```

set.seed(123)
n <- 1500
dat <- data.frame(
  psu = sample(1:10, n, replace = TRUE),
  strata = sample(1:5, n, replace = TRUE),
  weight = runif(n, 0.5, 2),
  age = rnorm(n, 50, 10),
  sex = factor(sample(c("Male", "Female"), n, replace = TRUE)),
  exposure_bin = rbinom(n, 1, 0.5)
)
dat$outcome <- rbinom(n, 1, plogis(-2 + 0.03*dat$age + 0.5*dat$exposure_bin))
## ---- Example 1: Binary exposure ----

```

```

fit_bin_exp<-final_prop_svyglm(dat, dep_var="outcome",
                             covariates=c("age","sex"),
                             exposure="exposure_bin",
                             id_var="psu", strata_var="strata",
                             weight_var="weight", outcome_covariates = NULL)
fit_bin_exp$OR_table
## ---- Example 2: Continuous exposure ----
fit_cont_exp <- final_prop_svyglm(
  dat,
  dep_var      = "outcome",
  covariates   = c("sex"),
  exposure     = "age",
  id_var       = "psu",
  strata_var   = "strata",
  weight_var   = "weight",
  exposure_type = "continuous",
  outcome_covariates = NULL)
fit_cont_exp$OR_table
#### ---- Example 1: Multinomial exposure ----
dat$exposure_3cat <- cut(dat$age,
                        breaks = quantile(dat$age, probs = c(0, 1/3, 2/3, 1)), # tertiles
                        labels = c("Low", "Medium", "High"),
                        include.lowest = TRUE)
# Numeric coding for exposure effect
exp_eff <- ifelse(dat$exposure_3cat == "Low", 0,
                  ifelse(dat$exposure_3cat == "Medium", 0.6, 1.2))
dat$outcome <- rbinom(n,1,plgis(-3 +0.02 * dat$age +0.4 * (dat$sex == "Male") +exp_eff))
fit_multi_cat <- final_prop_svyglm(dat, dep_var      = "outcome",
                                  covariates   = c("age", "sex"), exposure     = "exposure_3cat",
                                  id_var       = "psu", strata_var   = "strata", weight_var   = "weight",
                                  exposure_type = "multinomial",
                                  outcome_covariates = NULL)
fit_multi_cat$OR_table

```

final_svyglm

Final Survey-Weighted GLM

Description

Fits a survey-weighted logistic regression model (quasibinomial) using raw survey variables. Returns ORs, confidence intervals, p-values, and model discrimination statistics.

Usage

```

final_svyglm(
  data,
  dep_var,
  covariates,
  id_var,
  strata_var,

```

```

weight_var,
family = "binomial",
level = 0.95,
interaction_terms = NULL
)

```

Arguments

<code>data</code>	A data frame containing the survey data.
<code>dep_var</code>	Character. Name of the binary outcome variable (0/1).
<code>covariates</code>	Character vector of covariate names to adjust for.
<code>id_var</code>	Character. Name of the primary sampling unit variable.
<code>strata_var</code>	Character. Name of the stratification variable.
<code>weight_var</code>	Character. Name of the survey weight variable.
<code>family</code>	Character. Currently supports only "binomial".
<code>level</code>	Numeric. Confidence level for intervals (default = 0.95).
<code>interaction_terms</code>	Optional character vector of interaction terms.

Value

A list containing:

- `model`: Survey-weighted logistic regression model.
- `results_table`: Odds ratios with confidence intervals and p-values.
- `AUC`: Survey-weighted AUC (Somers' C).
- `data`: Input data with predicted probabilities.
- `design`: Survey design object.

Examples

```

set.seed(123)
n <- 100
dat <- data.frame(
  psu = sample(1:10, n, replace = TRUE),
  strata = sample(1:5, n, replace = TRUE),
  weight = runif(n, 0.5, 2),
  age = rnorm(n, 50, 10),
  sex = factor(sample(c("Male", "Female"), n, replace = TRUE)),
  exposure = rbinom(n, 1, 0.5)
)
dat$outcome <- rbinom(n, 1, plogis(-2 + 0.03*dat$age + 0.5*dat$exposure))
fit_simple <- final_svyglm(dat, dep_var="outcome", covariates=c("age", "sex"),
  id_var="psu", strata_var="strata", weight_var="weight")
fit_simple$OR_table

```

print.svyCausal	<i>Print method for svyCausal objects</i>
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Description

Print method for svyCausal objects

Usage

```
## S3 method for class 'svyCausal'  
print(x, ...)
```

Arguments

x	An object of class svyCausal.
...	Additional arguments passed to print.

Value

The object x, invisibly.

viz_auc_svyglm	<i>Weighted ROC Curve for Survey-Weighted Models</i>
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Description

Produces a weighted ROC curve and reports weighted AUC for survey-based models.

Usage

```
viz_auc_svyglm(  
  fit_object,  
  title = "Weighted ROC Curve",  
  line_color = "#0072B2"  
)
```

Arguments

fit_object	object obtain from logistic regression
title	Character. Plot title.
line_color	Character. ROC curve color.

Details

AUC is computed using, consistent with complex survey weighting.

Value

A ggplot object.

Examples

```
set.seed(123)
n <- 100
dat <- data.frame(
  psu = sample(1:10, n, replace = TRUE),
  strata = sample(1:5, n, replace = TRUE),
  weight = runif(n, 0.5, 2),
  age = rnorm(n, 50, 10),
  sex = factor(sample(c("Male", "Female"), n, replace = TRUE)),
  exposure = rbinom(n, 1, 0.5)
)
dat$outcome <- rbinom(n, 1, plogis(-2 + 0.03*dat$age + 0.5*dat$exposure))
fit_example <- final_svyglm(dat, dep_var="outcome", covariates=c("age", "sex"),
  id_var="psu", strata_var="strata", weight_var="weight")
viz_auc_svyglm(fit_object=fit_example)
```

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