

Package ‘robustrcp’

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Type Package
Title Outlier-Robust Ratio-cum-Product Estimators of Finite Population Mean
Version 0.1.0
Description Implements robust ratio-cum-product estimators using auxiliary medians for estimating the population mean under simple random sampling without replacement (SRSWOR). Provides analytical optimal tuning parameters, bias, Mean Squared Error (MSE), and Percent Relative Efficiency (PRE) evaluations.
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compare_estimators	<i>Compare Proposed Robust Estimator against Baselines</i>
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Description

Computes baseline estimators and evaluates Percent Relative Efficiency (PRE).

Usage

```
compare_estimators(y, x1, x2, M1, M2, N)
```

Arguments

y	Vector of study variable.
x1	Vector of first auxiliary variable.
x2	Vector of second auxiliary variable.
M1	Known population median of x1.
M2	Known population median of x2.
N	Finite population size.

Value

A data frame summarizing estimates, Bias, MSE, and PRE.

crop_data	<i>Contaminated Sample Dataset for Robust Estimation</i>
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Description

A simulated dataset containing crop yield, area, and cost data with introduced outliers.

Usage

```
data(crop_data)
```

Format

A data frame with 200 rows and 3 variables:

Yield Primary study variable y (Crop yield with outliers).

Area Auxiliary variable x1 (Positively correlated area).

Cost Auxiliary variable x2 (Negatively correlated cost).

robust_rcp

*Robust Ratio-cum-Product Estimator of Population Mean***Description**

Evaluates the outlier-robust ratio-cum-product estimator of the finite population mean using medians of two auxiliary variables under Simple Random Sampling Without Replacement (SRSWOR).

Usage

```
robust_rcp(y, x1, x2, M1, M2, N, alpha1 = NULL, alpha2 = NULL)
```

Arguments

y	Vector of sample observations for the primary study variable.
x1	Vector of sample observations for the first auxiliary variable (positively correlated with y).
x2	Vector of sample observations for the second auxiliary variable (negatively correlated with y).
M1	Known population median of x1.
M2	Known population median of x2.
N	Total finite population size.
alpha1	Optional numeric tuning parameter for x1. Computed analytically if NULL.
alpha2	Optional numeric tuning parameter for x2. Computed analytically if NULL.

Value

An object of class `robustrcp` containing:

estimate	The estimated population mean.
alpha1_opt	Optimal or specified scaling parameter for x1.
alpha2_opt	Optimal or specified scaling parameter for x2.
bias	First-order approximation of the Bias.
mse	First-order approximation of the Mean Squared Error (MSE).
sample_size	Sample size n.
population_size	Population size N.

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Examples

```
set.seed(123)
N <- 1000
n <- 100
x1 <- rlnorm(n, meanlog = 2, sdlog = 0.8)
x2 <- rlnorm(n, meanlog = 3, sdlog = 1.0)
y <- 2*x1 - 0.5*x2 + rnorm(n, mean = 10, sd = 2)
robust_rcp(y = y, x1 = x1, x2 = x2, M1 = median(x1), M2 = median(x2), N = N)
```

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