Package 'surveySimR'

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Type Package

Title Estimation of Population Total under Complex Sampling Design

Version 0.1.0

Depends R(>= 2.10)

Suggests roxygen2, knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

Description Sample surveys use scientific methods to draw inferences about population parameters by observing a representative part of the population, called sample. The SRSWOR (Simple Random Sampling Without Replacement) is one of the most widely used probability sampling designs, wherein every unit has an equal chance of being selected and units are not repeated.This function draws multiple SRSWOR samples from a finite population and estimates the population parameter i.e. total of HT, Ratio, and Regression estimators. Repeated simulations (e.g., 500 times) are used to assess and compare estimators using metrics such as percent relative bias (%RB), percent relative root means square error (%RRMSE).For details on sampling methodology,
see, Cochran (1977) ``Sampling Techniques'' <https://archive.org/details/samplingtechniqu0000coch_t4x6>.

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Encoding UTF-8

Imports shiny, moments, stats

RoxygenNote 7.3.2

NeedsCompilation no

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run_survey_sim_app   *Run Survey Simulation 'Shiny' App*

Description

Launches the 'Shiny' app for finite population total estimation under SRSWOR.

Usage

```
run_survey_sim_app()
```

Value

Launches a 'Shiny' application.

Examples

```
if (interactive()) {
  run_survey_sim_app()
}
```

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survey_sim_est   *Estimation of Finite Population Total under Complex Sampling Design*
                              Viz. SRSWOR

Description

Sample surveys use scientific methods to draw inferences about population parameters by observing
a representative part of the population, called sample.SRSWOR (Simple Random Sampling Without
Replacement) is one of the most widely used probability sampling designs,wherein every unit has an
equal chance of being selected and units are not repeated.This function draws multiple SRSWOR
samples from a finite population and estimates the population parameter i.e. total of HT, Ratio,
and Regression estimators.Repeated simulations (e.g., 500 times) are used to assess and compare
estimators using metrics such as percent relative bias (

Usage

```
survey_sim_est(Y, X, n = 40, SimNo = 500, seed = NULL)
```

Arguments

Y	Numeric vector. The study variable for which the population total is to be estimated.
X	Numeric vector. The auxiliary variable used for ratio and regression estimators.
n	Integer. Sample size to be drawn from the population in each simulation (default is 40).
SimNo	Integer. Number of simulations or iterations to be performed (default is 500).
seed	Integer. Random seed for reproducibility (default is 123).

Details

This function evaluates and compares the performance of three estimators—Horvitz-Thompson (HT), Ratio, and Regression-for estimating the finite population total using repeated sampling and simulation under Simple Random Sampling Without Replacement (SRSWOR).

Value

A data frame with the following columns: - Est_Total: Estimated population total of HT, Ratio, and Regression estimators. - RB: Relative Bias (- RRMSE: Relative Root Means Square Error (- Skewness: Skewness of estimator distributions. - Kurtosis: Kurtosis of estimator distributions. - Coverage: Coverage probability (within ±1.96 SE of true total) of each estimator. - PopVar: Theoretical variance of each estimator. - EmpVar: Empirical variance from simulations. - EstVar: Average estimate of variances across simulations. - CV: Coefficient of variation (

References

1. Cochran, W. G. (1977). *Sampling Techniques, 3rd Edition*. New York: John Wiley & Sons, Inc.

2. Singh, D. and Chaudhary, F.S. (1986). *Theory and Analysis of Sample Survey Designs*. New York: John Wiley & Sons, Inc.

3. Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C. (1984). *Sampling Theory of Surveys with Applications*. Iowa State University Press, Ames and Indian Society of Agricultural Statistics, New Delhi.

4. Särndal, C.-E., Swensson, B., & Wretman, J. (1992). Model Assisted Survey Sampling. Springer.

Examples

```
set.seed(101)
N <- 400
X <- runif(N, 5, 15)
Y <- 10 + 2 * X + rnorm(N, sd = 2)
survey_sim_est(Y, X, n = 40, SimNo = 500)
```

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