

Package ‘neutroPPS’

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Title Neutrosophic PPSWOR Sampling with NHT and NGREG Estimators

Version 0.1.1

Description Provides neutrosophic extensions of Lahiri's method to select a random sample of size n using probability proportional to size without replacement (PPSWOR) sampling. It computes the corresponding neutrosophic inclusion probabilities and provides estimates of the population total and mean using both the neutrosophic Horvitz Thompson (NHT) estimator and the neutrosophic generalized regression (NGREG) estimator and its percent relative efficiency.

License GPL-3

Encoding UTF-8

Language en-US

Imports stats, utils

Suggests testthat (>= 3.0.0)

NeedsCompilation no

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RoxygenNote 7.3.3

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Description

neutro_pps performs probability proportional to size sampling without replacement (PPSWOR) using Lahiri's method for interval-valued (neutrosophic) data. It computes neutrosophic first- and second-order inclusion probabilities and estimates population totals and means using the neutrosophic Horvitz–Thompson (NHT) and neutrosophic generalized regression (NGREG) estimators. The function also provides variance estimation, coefficients of variation, and relative efficiency measures.

Usage

```
neutro_pps(data_neutro, n, seed = NULL, verbose = FALSE)
```

Arguments

data_neutro	A data frame containing the following columns: Auxili_min, Auxili_max, Study_min, and Study_max.
n	Desired sample size. Must be an integer satisfying $2 \leq n \leq N$, where N is the population size.
seed	Optional random seed for reproducible sample selection. If NULL, sampling is performed without setting a seed.
verbose	Logical value indicating whether progress messages, intermediate tables, and estimation results should be printed. Defaults to FALSE.

Value

An invisible list with the following components:

sample_indices	Integer vector containing the indices of the selected sample units.
inclusion_probs	A list containing the lower and upper first-order neutrosophic inclusion probabilities (π_l and π_u) for all population units.
joint_inclusion	A data frame containing lower and upper joint inclusion probabilities for all sampled pairs.
ht	A list containing the neutrosophic Horvitz–Thompson estimates, including estimated totals, means, auxiliary totals, variance estimates, and coefficients of variation.
greg	A list containing the neutrosophic generalized regression estimates, including estimated totals, coefficients of variation, and relative efficiency measures.

Author(s)

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References

- Cochran, W. G. (1977). *Sampling Techniques* (3rd ed.). John Wiley & Sons.
- Lahiri, D. B. (1951). "A Method of Sample Selection Providing Unbiased Ratio Estimates." *Bulletin of the International Statistical Institute*, 33, 133–140. Available at: <https://cir.nii.ac.jp/crid/1370588381061610886/>
- Särndal, C. E., Swensson, B., and Wretman, J. (1992). *Model Assisted Survey Sampling*. Springer.
- Smarandache, F. (2014). *Introduction to Neutrosophic Statistics*. Available at: https://digitalrepository.unm.edu/math_fsp/40/

Examples

```
data_neutro <- data.frame(
  Auxili_min = c(10, 15, 20, 25, 30),
  Auxili_max = c(12, 18, 25, 32, 40),
  Study_min  = c(50, 60, 75, 90, 110),
  Study_max  = c(55, 70, 85, 105, 130)
)
# Returns an invisible list - assign it to explore results
res <- neutro_pps(
  data_neutro,
  n = 2,
  seed = 12,
  verbose = FALSE
)

res$ht      # Neutrosophic Horvitz-Thompson results
res$greg    # Neutrosophic GREG results
```

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