Package ‘allocation’

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Type Package

Title Exact Optimal Allocation Algorithms for Stratified Sampling

Version 0.1.0

Maintainer Andrew M. Raim <andrew.raim@gmail.com>

Description Implements several exact methods for allocating optimal sample sizes when designing stratified samples. These methods are discussed in Wright (2012) <doi:10.1080/00031305.2012.733679> and Wright (2017) <doi:10.1016/j.spl.2017.04.026>.

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Author Andrew M. Raim [aut, cre]

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Author(s)

Maintainer: Andrew M. Raim <andrew.raim@gmail.com>

`allocation` *Accessor for to Extract Allocation*

Description

Extract the allocation from the result of one of the Allocation-Methods.

Usage

```
allocation(object)
```

Arguments

`object`	Result from an allocation method

Value

A numeric vector whose elements contain an allocation for the corresponding stratum.

`Allocation-Methods` *Algorithms for Exact Optimization Allocation*

Description

Algorithms III and IV from Wright (2017), and classical unconstrained Neyman allocation (Neyman, 1934).

Usage

```
allocate_fixn(n0, N, S, lo = NULL, hi = NULL, control = allocation_control())

allocate_neyman(n0, N, S, control = allocation_control())

allocate_prec(v0, N, S, lo = NULL, hi = NULL, control = allocation_control())
```

Arguments

`n0`	Target sample size for Algorithm III; integer.
`N`	Population size for each stratum; integer vector of length `H`.
`S`	Standard deviation for each stratum; numeric vector of length `H`.
`lo`	Sample size lower bounds for each stratum; numeric vector of length `H`. Default argument `NULL` is transformed to a vector of ones.
`hi`	Sample size upper bounds for each stratum; numeric vector of length `H`. Default argument `NULL` is transformed to a vector of `Inf`.
`control`	Control object from allocation_control.
`v0`	Target variance for Algorithm IV; numeric.

Details

The function `allocate_fixn` implements Algorithm III of Wright (2017) and finds the optimal allocation for a given total sample size `n0`. The function `allocate_prec` implements Algorithm IV of Wright (2017) and optimally allocates units until the overall variance is smaller than a given `v0`. Classical Neyman allocation is implemented by the function `allocate_neyman`.

Value

A list whose structure depends on the allocation method.

`allocate_neyman`

- `n`: Integer vector with allocation $n_1, \ldots, n_H$.
- `v`: Value of variance achieved at selected allocation.
- `N`: The argument `N` passed to the function.
- `S`: The argument `S` passed to the function.

`allocate_fixn`

- `n`: Integer vector with allocation $n_1, \ldots, n_H$.
- `iter`: Number of steps taken in the algorithm.
- `v`: Value of variance achieved at selected allocation.
- `N`: The argument `N` passed to the function.
- `S`: The argument `S` passed to the function.
- `lo`: The argument `lo` passed to the function.
- `hi`: The argument `hi` passed to the function.

`allocate_prec`

- `n`: Integer vector with allocation $n_1, \ldots, n_H$.
- `iter`: Number of steps taken in the algorithm.
- `v`: Value of variance achieved at selected allocation.
- `v0`: The argument `v0` passed to the function.

- N: The argument N passed to the function.
- S: The argument S passed to the function.
- lo: The argument lo passed to the function.
- hi: The argument hi passed to the function.

References

Neyman, Jerzy (1934). On the Two Different Aspects of the Representative Method: The Method of Stratified Sampling and the Method of Purposive Selection. Journal of the Royal Statistical Society, 97 (4): 558-625.

Tommy Wright (2012). The Equivalence of Neyman Optimum Allocation for Sampling and Equal Proportions for Apportioning the U.S. House of Representatives. The American Statistician, 66, pp.217-224.

Tommy Wright (2017), Exact optimal sample allocation: More efficient than Neyman, Statistics & Probability Letters, 129, pp.50-57.

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allocation_control   *Control Object for Allocation Methods*

Description

Additional arguments (controls) for Allocation-Methods.

Usage

```
allocation_control(verbose = FALSE, bits = 256, tol = 1e-10, digits = 4)
```

Arguments

verbose	Logical; if TRUE, detailed information will be printed to the console by allocate_fixn and allocate_prec.
bits	Number of bits of precision to use with mpfr objects in internal calculations.
tol	A small positive number for use in allocate_prec; if all strata have V <= tol, regard the situation as one where no more allocation is possible, even if target value v0 has not yet been attained.
digits	Number of decimals to display in output.

Value

An list of class allocation_control.

Examples

```
out1 = allocation_control()
out2 = allocation_control(verbose = TRUE, bits = 128, tol = 1e-8, digits = 2)
```

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