

Package ‘bssbinom’

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Title Bayesian Sample Size for Binomial Proportions

Version 1.0.0

Description Computation of the minimum sample size using the Average Coverage Criterion or the Average Length Criterion for estimating binomial proportions using beta prior distributions. For more details see Costa (2025) <[DOI:10.1007/978-3-031-72215-8_14](https://doi.org/10.1007/978-3-031-72215-8_14)>.

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Author Eliardo Costa [aut, cre] (ORCID:
<<https://orcid.org/0000-0003-4528-0379>>)

Maintainer Eliardo Costa <eliardo.costa@ufrn.br>

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`hd.beta`*HD interval for the beta distribution*

Description

Computes the highest density interval for the beta distribution by optimization or simulation.

Usage

```
hd.beta(c, d, rho = NULL, len = NULL, N = 1000)
```

Arguments

<code>c</code>	First parameter of the beta distribution.
<code>d</code>	Second parameter of the beta distribution.
<code>rho</code>	A number in (0, 1) representing the fixed probability for the HD interval.
<code>len</code>	A positive real number representing the fixed length for the HD interval.
<code>N</code>	Number of replicates used in the simulation when the length is fixed. Default is 1000.

Value

Lower and upper bounds of the HD interval.

Note

For fixed probability (`rho`) of the HD interval the function uses `betaHPD` function from `pscl` R package. For fixed length of the HD interval the function uses an algorithm proposed in M'Lan et al. (2006). For the case that uses Monte Carlo simulations, the provided interval may vary from one call to the next. The difference is expected to decrease as the number of replicates (`N`) increases.

References

M'Lan, C.E., Joseph, L., Wolfson, D.B. (2006). Bayesian sample size determination for case-control studies. *Journal of the American Statistical Association*, 101, 760–772.

Examples

```
hd.beta(c = 2, d = 3, rho = 0.95)
```

```
hd.beta(c = 2, d = 3, len = 0.3)
```

hd.diffbetas	<i>HD interval for the difference of two beta distributions</i>
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Description

Computes the highest density interval for the difference of two beta distributions.

Usage

```
hd.diffbetas(c1, d1, c2, d2, rho = NULL, len = NULL, N = 1000)
```

Arguments

c1	First parameter of the beta distribution of the first proportion.
d1	Second parameter of the beta distribution of the first proportion.
c2	First parameter of the beta distribution of the second proportion.
d2	Second parameter of the beta distribution of the second proportion.
rho	A number in (0, 1) representing the fixed probability for the HD interval.
len	A positive real number representing the fixed length for the HD interval.
N	Number of replicates used in the simulation. Default is 1000.

Value

Lower and upper bounds of the HD interval.

Note

For fixed probability (rho) of the HD interval the function uses `emp.hpd` function from `TeachingDemos` R package. For fixed length of the HD interval the function uses an algorithm proposed in M'Lan et al. (2006). In the latter case, the provided interval may vary from one call to the next. The difference is expected to decrease as the number of replicates (N) increases.

References

M'Lan, C.E., Joseph, L., Wolfson, D.B. (2006). Bayesian sample size determination for case-control studies. *Journal of the American Statistical Association*, 101, 760–772.

Examples

```
hd.diffbetas(c1 = 8, d1 = 2, c2 = 2, d2 = 8, rho = 0.95)
```

```
hd.diffbetas(c1 = 8, d1 = 2, c2 = 2, d2 = 8, len = 0.2)
```

mss.bb	<i>Bayesian sample size for a binomial proportion under a binomial/beta model</i>
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Description

Computes the minimum sample size for estimating a binomial proportion under a binomial/beta model using Average Coverage Criterion or Average Length Criterion.

Usage

```
mss.bb(
  crit,
  c,
  d,
  rho.min = NULL,
  len = NULL,
  rho = NULL,
  len.max = NULL,
  R = 1000,
  n0 = 1
)
```

Arguments

crit	A character string specifying the criterion. Available criteria: "ACC", "ALC" and "ALCAprox".
c	First parameter of the beta prior distribution.
d	Second parameter of the beta prior distribution.
rho.min	A number in (0, 1) representing the minimum admissible posterior probability for the HPD interval in the ACC.
len	A positive real number representing the length of the HPD interval in the ACC.
rho	A number in (0, 1) representing the posterior probability of the HPD in the ALC.
len.max	A positive real number representing the maximum admissible length for the HPD interval in the ALC.
R	Number of replicates used in the simulation. Default is 1000.
n0	A positive integer, n0+1 is the initial sample size in which the function will check the criterion. Default is 1.

Value

An integer representing the minimum sample size.

Note

Depending on the fixed values for interval length and probability, the function may take a while to calculate the sample size. ALC tends to be faster than ACC. Since this function uses Monte Carlo simulations, the provided minimum sample sizes may vary from one call to the next. The difference is expected to decrease as the number of replicates (R) used in the Monte Carlo simulation increases. For the "ALCAprox" criterion the function uses the result of Theorem 4.1 of M'Lan et al. (2008).

References

- Costa, E. G. (2025). Bayesian Sample Size for Binomial Proportions with Applications in R. In: Awe, O.O., A. Vance, E. (eds) Practical Statistical Learning and Data Science Methods. STEAM-H: Science, Technology, Engineering, Agriculture, Mathematics & Health. Springer, Cham. [doi:10.1007/9783031722158_14](https://doi.org/10.1007/9783031722158_14).
- M'Lan, C.E., Joseph, L., Wolfson, D.B. (2008). Bayesian sample size determination for binomial proportions. *Bayesian Analysis*, 3, 269–296.

Examples

```
mss.bb(crit = "ALC", c = 10, d = 2, rho = 0.9, len.max = 0.25)
```

```
mss.bb(crit = "ALCAprox", c = 10, d = 2, rho = 0.9, len.max = 0.25)
```

```
mss.bb(crit = "ACC", c = 2, d = 10, rho.min = 0.9, len = 0.25)
```

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