R documentation

of ‘`ldnbinom.Rd`’

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`ldnbinom` *Locally D-optimal designs for Negative Binomial model*

Description

Finds Locally D-optimal designs for Negative binomial regression model which is defined as $E(y) = \lambda(x)$ with $Var(y) = \sigma^2\lambda(x)(1 + (\lambda(x)/\theta))$, where $y\ NB(\theta, \lambda(x))$, $\lambda(x) = a\exp(-bx)$ and a, b and σ are unknown parameters.

Usage

```
ldnbinom(a, b, theta, lb, ub, user.points = NULL, user.weights = NULL,
..., n.restarts = 1, n.sim = 1, tol = 1e-8, prec = 53)
```

Arguments

`a` initial value for paremeter a.

`b` initial value for paremeter b.

`theta` initial value for paremeter θ which is the number of successes in a sequence of Bernoulli trials, must be a Natural number.

`lb` lower bound of design interval.

`ub` upper bound of design interval.

`user.points` (optional) vector of user design points which calculation of its D-efficiency is aimed. Each element of `user.points` must be within the design interval.

`user.weights` (optional) vector of weights which its elements correspond to `user.points` elements. The sum of weights should be 1; otherwise they will be normalized.

`...` (optional) additional parameters will be passed to function `curve`.

`prec` (optional) a number, the maximal precision to be used for D-efficiency calculation, in bite. Must be at least 2 (default 53), see ’Details’.

`n.restarts` (optional optimization parameter) number of solver restarts required in optimization process (default 1), see ’Details’.

`n.sim` (optional optimization parameter) number of random parameters to generate for every restart of solver in optimization process (default 1), see ’Details’.

`tol` (optional optimization parameter) relative tolerance on feasibility and optimality in optimization process (default $1e-8$).

Details

While D-efficiency is NaN, an increase in the value of prec can be beneficial to achieve a numeric value, however, can slow down the calculation speed.

Values of n.restarts and n.sim should be chosen according to the length of design interval.

Value

plot of derivative function, see 'Note'.

a list containing the following values:

points	obtained design points
weights	corresponding weights to the obtained design points
det.value	value of Fisher information matrix determinant at the obtained design
user.eff	D-efficeincy of user design, if user.design and user.weights are not NULL.

Note

To verify optimality of obtained design, derivate function (symmetry of Frechet derivative with respect to the x-axis) will be plotted on the design interval. Based on the equivalence theorem (Kiefer, 1974), a design is optimal if and only if its derivative function are equal or less than 0 on the design interval. The equality must be achieved just at the obtained points.

Author(s)

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References

Masoudi, E., Sarmad, M. and Talebi, H. 2012, An Almost General Code in R to Find Optimal Design, In Proceedings of the 1st ISM International Statistical Conference 2012, 292-297.

Rodriguez-Torreblanca, C. Rodriguez-Diaz, J.M. (2007), Locally D- and c-optimal designs for Poisson and negative binomial regression models, Metrika, 66, 161-172.

Kiefer, J. C. 1974, General equivalence theory for optimum designs (approximate theory), Ann. Statist., 2, 849-879.

See Also

cfisher, cfderiv and eff.

Examples

```
ldnbinom(a = 2, b = 3, theta = 10, lb = -3, ub =3)
## $points: -3.0000000 -0.8115872

## D-effecincy computation:
ldnbinom(a = 2, b = 3, theta = 10, lb = -3, ub =3, user.points = c(2, -3),
user.weights = rep(.5, 2)) ## $user.eff: 0.06099
```

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