R documentation

of ‘ldmm.Rd’

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ldmm *Locally D-optimal designs for Michaelis-Menten model*

Description

Finds Locally D-optimal designs for Exponential dose-response model which is defined as $E(y) = (ax)/(1+bx)$ or $E(y) = (ax)/(b+x)$ or $E(y) = "x/(a+bx)$ with $Var(y) = \sigma^2$, where a, b and σ are unknown parameters.

Usage

```
ldmm(a, b, form = 1, 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.
form	must be 1 or 2 or 3. If form = 1, then $E(y) = (ax)/(1+bx)$; if form = 2, then $E(y) = (ax)/(b+x)$; if form = 3 then $E(y) = x/(a+bx)$.
lb	lower bound of design interval, must be greater than or equal to 0.
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 `prec` can be beneficial to achieve a numeric value, however, it 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.

Dette, H., Melas, V.B., Wong, W.K. (2005). Optimal design for goodness-of-fit of the Michaelis-Menten enzyme kinetic function. Journal of the American Statistical Association, 100:1370-1381.

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

See Also

`cfisher`, `cfderiv` and `eff`.

Examples

```
ldmm(a = 1, b = 2, form = 1, lb = 0, ub =3) ## $points: 0.375 3.000

ldmm(a = 1, b = 2, form = 2, lb = 0, ub =3) ## $points: 0.8571428 3.0000000

ldmm(a = 1, b = 2, form = 3, lb = 0, ub =3) ## $points: 0.375 3.000

## D-effecincy computation:
ldmm(a = 1, b = 2, form = 3, lb = 0, ub =3, user.points = c(.5, 3, 2),
user.weights = rep(.33, 3)) ## $user.eff: 0.83174
```

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