URL: http://cxc.harvard.edu/ciao3.4/levenberg−marquardt.html
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AHELP for CIAO 3.4

levenberg−marquardt

Context: sherpa

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Synopsis

The Levenberg−Marquardt optimization method.

Syntax

```
levenberg−marquardt  [iters] [eps] [smplx] [smplxep] [smplxit]
```

Description

An abbreviated equivalent is LEV−MAR.

The LEVENBERG−MARQUARDT method is a single−shot method which attempts to find the local fit−statistic minimum nearest to the starting point. Its principal advantage is that it uses information about the first and second derivatives of the fit−statistic as a function of the thawed parameter values to guess the location of the fit−statistic minimum. Thus this method works well (and fast) if the statistic surface is well−behaved. Its principal disadvantages are that it will not work as well with pathological statistic surfaces, and there is no guarantee it will find the global fit−statistic minimum.

The code for this method is derived from the implementation in Bevington (1992).

The eps parameter controls when the optimization will cease; for LEVENBERG−MARQUARDT, this will occur when

```
| S_i − S_(i−1) | < eps ,
```

where S_(i−1) and S_i are the observed statistic values for the (i−1)th and ith iteration, respectively.

The smplx parameter controls whether the LEVENBERG−MARQUARDT fit is refined with a SIMPLEX fit. SIMPLEX refinement can be useful for complicated fitting problems where straight LEVENBERG−MARQUARDT does not provide a quick solution. Switchover from LEVENBERG−MARQUARDT to SIMPLEX occurs when delta(S), the change in statistic value from one iteration to the next, is less than LEVENBERG−MARQUARDT.smplxep, for LEVENBERG−MARQUARDT.smplxit iterations in a row. For example, the default is for switchover to occur when delta chi^2 < 1 1 for 3 iterations in a row.

Parameters

name	type	def	min	max
iters	integer	2000	1	10000
eps	real	1.e−3	1.e−9	1
smplx	real	1	0	1
smplxep	real	1	0.0001	1000
smplxit	real	3	1	20

Detailed Parameter Descriptions

Parameter=iters (integer default=2000 min=1 max=10000)

Maximum number of iterations.

Parameter=eps (real default=1.e−3 min=1.e−9 max=1)

Criterion to stop fit.

Parameter=smplx (real default=1 min=0 max=1)

Refine fit with simplex (0=no)

Parameter=smplxep (real default=1 min=0.0001 max=1000)

Switch−to−simplex eps factor

Parameter=smplxit (real default=3 min=1 max=20)

Switch−to−simplex iters factor

Bugs

See the Sherpa bug pages online for an up−to−date listing of known bugs.

See Also

sherpa

get_method_expr, grid, grid−powell, method, monte−lm, monte−powell, montecarlo, powell, sigma−rejection, simplex, simul−ann−1, simul−ann−2, simul−pow−1, simul−pow−2, usermethod

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