

error, uncertain: determine confidence intervals of a fit

Determine the confidence region for a model parameter.

Syntax: **error** [[stopat <ntrial> <toler>] [maximum <redchi>]
[<delta fit statistic>] [<model param range>...]]

where

<model param range> =: [<modelName:>] <first param>-- <last param>

determines the ranges of parameters to be examined, and <delta fit statistic> (distinguished from the model parameter indices by the inclusion of a decimal point), is the change in fit statistic used.

For response parameters (see **gain** command), use **rerror** with identical syntax except:

<response param range> =: [<sourceNum:>] <first param>-- <last param>

Each indicated parameter is varied, within its allowed hard limits, until the value of the fit statistic, minimized by allowing all the other non-frozen parameters to vary, is equal to the last value of fit statistic determined by the **fit** command plus the indicated <delta fit statistic>, to within an absolute (not fractional) tolerance of <toler>. Note that before the **error** command is executed, the data must be fitted. The initial default values are the range 1—1 and the <delta fit statistic> of 2.706, equivalent to the 90% confidence region for a single interesting parameter. The number of trials and the tolerance for determining when the critical fit statistic is reached can be modified by preceeding them with the **stopat** keyword. Initially, the values are 20 trials with a tolerance of 0.01 in fit statistic.

If a new minimum is found in the course of finding the error, then the calculation is aborted and control returned to the user. The **maximum** keyword ensures that **error** will not be run if the reduced chi-squared of the best fit exceeds <redchi>. The default value for <redchi> is 2.0.

Since there are very many scenarios which may cause an **error** calculation to fail, it is highly recommended that you check the results by viewing the 9-letter error string, which is part of the output from the **tlout error** command (see **tlout** for a description of the error string). If everything went well, the error string should be “FFFFFFFF”.

Examples:

Assume that the current model has four model parameters.

```
XSPEC12> error 1-4
```

```
//Estimate the 90% confidence ranges for each parameter.
```

```
XSPEC12> error 9.0
```

```
//Estimate the confidence range for parameters 1-4 with delta fit
```

```
// statistic = 9.0, equivalent to the 3 sigma range.
```

```
XSPEC12> error 2.706 1 3 1. 2
```

```
//Estimate the 90% ranges for parameters 1 and 3, and the 1. sigma
```

```
// range for parameter 2.  
XSPEC12> error 4  
//Estimate the 1. sigma range for parameter 4.  
XSPEC12> error stop 20,,3  
//Estimate the 1-sigma range for parameter 3 after resetting the number  
// of trials to 20.Note that the tolerance field had to be included  
//(or at least skipped over).
```