MAXIMUM LIKELIHOOD MT 1.0

GAUSS

New Features:

- Simple bounds may be placed on parameters; bounds are all that are needed for many models, and Maximum Likelihood MT is faster than other applications with more general types of constraints
- Structures, in particular DS structures for handling data, and PV structures for handling parameters
- New numerical derivatives, user-provided analytical derivatives can compute a subset of the derivatives, the rest will be computed numerically
- MLMT uses standard Newton and quasi-Newton descent methods and it allows for only one kind of constraint, bounds on the parameters

Requirements:

Requires GAUSS Mathematical and Statistical System (GAUSS) Version 8.0 or the GAUSS Engine 8.0.

Platforms:

Available for Windows, LINUX, UNIX (Sun SPARC and HPUX11) and Mac OS X.

Maximum Likelihood MT 1.0

The new Maximum Likelihood MT 1.0 uses structures for input, control, and output. Structures add flexibility and help organize information.

Maximum Likelihood MT (MLMT) is a new product from Aptech Systems that has powerful new features. For example, the same procedure computing the log-likelihood or objective function will be used to compute analytical derivatives as well if they are being provided. Its return argument is a "results" structure with three members, a scalar, or Nx1 vector containing the log-likelihood (or objective), a 1XK vector, or NxK matrix of first derivatives, and a KxK matrix or NxKxK array of second derivatives (it needs to be an array if the log-likelihood is weighted). The derivatives are optional, of course, or even partially optional; i.e., you can compute a subset of the derivatives if you like and the remaining will be computed numerically. This procedure will have an additional argument which tells the function which to compute, the log-likelihood or objective, the first derivatives, or the second derivatives, or all three. This means that calculations in common won't have to be redone.

MLMT uses standard Newton and quasi-Newton descent methods. It allows for only one kind of constraint, bounds on the parameters. The usual types of statistical inference, including bootstrap and profile likelihood do not apply for models with bounds on parameters; a GAUSS function, `Conscore`, can be used with output from MLMT to test hypotheses for such models. It implements a method described in *Constrained Statistical Inference* by Silvapule and Sen.

The new MLMT will use the DS and PV structures that are now in use by Sqpsolvemt. The DS structure is completely flexible, allowing you to pass anything you can think of into your procedure. The PV structure revolutionizes how you pass the parameters into the procedure. No more do you have to struggle to get the parameter vector into matrices for calculating the function and its derivatives, trying to remember, or figure out, which parameter is where in the vector. If your log-likelihood uses matrices or arrays, you can store them directly into the PV structure and remove them as matrices or arrays with the parameters already plugged into them. The PV structure can handle matrices and arrays where some of their elements are fixed and some free. It remembers the fixed parameters and knows where to plug in the current values of the free parameters. It can handle symmetric matrices where parameters below the diagonal are repeated above the diagonal.

There will no longer be any need to use global variables.Anything the procedure needs can be passed into it through the DS structure.And these new applications will use control structures rather than global variables. This means, in addition to thread safety, that it will be straightforward to nest calls to MLMT inside of a call to MLMT (not to mention QNewtonmt, QProgmt, or EQsolvemt).

Aptech Systems, Inc.
P.O. Box 250
Black Diamond, WA 98010
Phone: (425) 432-7855 ♦ FAX: (425) 432-7832 ♦ URL: http://www.Aptech.com