Advanced Time Series

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Programming rules in GAUSS

- Comment your program!!!
- Use useful and sensible names for your variables and programs!
- Create your own program collection!

Reminder: Including Source Files

To render your programs less confusing procedures can be written into source files.

The source file is then included into the program using:

#include mysourcefile.src;

A source file consists only of procedure code, no $hard$ code should be written into a source file;

CML library

CML is a library that inbcludes procedures for the numerical optimization of a function using an algorithm

The cml procedure:

Input: function to be minimized and starting values for parameters and data

Output: vector of parameters and function value at minimum

CML procedure-CALL

$$\{ \text{x,f,g,cov,retcode} \} = \text{CML(dataset,vars,\&fct,start)}$$

INPUT

dataset - name of data matrix

DATA can also go into the &fct as a global variable

vars - character vector of labels selected for analysis

take vars = 0;

fct - the name of a procedure that returns the log-likelihood,

e.g. &malikeliproc

start - a K×1 vector of start values

CML procedure-CALL

$$\{ \text{x,f,g,cov,retcode} \} = \text{CML(dataset,vars,\&fct,start)}$$

OUTPUT

x - Kx1 vector, estimated parameters

f - scalar, function at minimum (mean log-likelihood)

g - Kx1 vector, gradient evaluated at x

cov - KxK matrix, covariance matrix of the parameters

retcode - scalar, return code

CML procedure-GLOBALS

Example:

```
_cml_Algorithm=1;
_cml_LineSearch=1;
_cml_DirTol = 1e-5;
_cml_CovPar_=1;
```

CML Global variables I

CML global: `_cml_DirTol`=0.000000001;

`_cml_DirTol` = scalar is a convergence tolerance for gradient of estimated coefficients.

Default = 1e-5.

When this criterion has been satisfied CML will exit the iterations.

Important!!

Some applications demand a small value in order to prevent convergence on a local minimum!!!!! (local vs. global optima)

CML Global variables II

CML global:`_cml_Algorithm`= scalar indicator for optimization method

`_cml_Algorithm`

= 1, BFGS (Broyden, Fletcher, Goldfarb, Shanno)

= 2, DFP (Davidon, Fletcher, Powell)

= 3, NEWTON (Newton-Raphson)

= 4, BHHH

CML Global variables III

`_cml_LineSearch`;

= 1 One

= 2, STEPBT (default)

= 3, HALF (step-halving)

= 4, BRENT

= 5, BHHHSTEP

CML Global variables IV

`_cml_covPar_`;

$= 0$, Inverse of Information matrix

$= 1$, Inverse of Hessian

$= 2$, Inverse of cross-product of first derivatives

$= 3$, Quasi-ml covariance matrix