Maximum Likelihood Syntax

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1 Description of the syntax of the maximum likelihood module

[beta,stderr,vc,logl]=Max_lik(lik_fct,b0,vc_type,A,b,Aeq,beq,lb,ub,nonlcon,options,varargin);

2 Description

This module performs the estimation of a parameter vector via maximum likelihood. This estimation is largely built around the Matlab procedure that computes constrained minimization named fmincon. Many of the parameters need to be provided to that optimizer.

3 Input parameters

lik_fct a function handle

b0 the initial values

vc_type instructions which variance-covariance matrix to implement. Currently available procedures are Hessian and White's Sandwiched method.

the next set of parameters is feed to the optimizer. We use the optimizer in its most general way.

3.1 fmincon

The optimizer gets called with:

fmincon(fun,x0,A,b,Aeq,beq,lb,ub,nonlcon,options,P1,P2,...)

fmincon finds the constrained minimum of a scalar function of several variables starting at an initial estimate. This is generally referred to as constrained nonlinear optimization or nonlinear programming.

fmincon starts at **x0** and finds a minimum **x** to the function described in **fun** subject to the linear inequalities **A***x <= **b**. x0 can be a scalar, vector, or matrix. It is possible to minimize **fun** subject to the linear equalities **Aeq***x = **beq** as well as A*x <= b. Set A=[] and b=[] if no inequalities exist. Set Aeq=[] and beq=[] if no equalities exist.

lb and **ub** defines a set of lower and upper bounds on the variables, x, so that the solution is always in the range lb <= x <= ub. It is always possible to define lb and ub very large so that the constrained optimization can also be used for unconstrained optimization.

nonlcon subjects the minimization to the nonlinear inequalities **c(x)** or equalities **ceq(x)** defined in **nonlcon**. fmincon optimizes such that c(x) <= 0 and ceq(x) = 0. **options** minimizes with the optimization parameters specified in the structure 'options'. **P1,P2,...** passes the problem-dependent parameters P1, P2, etc., directly to the functions fun and nonlcon.

[x,fval,exitflag,output,lambda,grad,hessian] = fmincon(...) returns

x the minimum

fval the value of f evaluated at the minimum

exitflag a value that describes the exit condition of fmincon.

output a structure output with information about the optimization.

lambda is a structure lambda whose fields contain the Lagrange multipliers at the solution x.

grad returns the value of the gradient of fun at the solution x.

hessian returns the value of the Hessian of fun at the solution x.

3.2 fun

the function to be optimized should have as a first argument the vector of parameters over which the optimization should be done.

then the function may import a list of parameters.

It is possible to include in this list of parameters the vector of data. Typically this would be a vector containing T observations.

fun should export the vector of log-likelihoods.

4 Output parameters

beta vector of parameters that maximize the log_likelihood

stderr vector of associated standard errors. These standard errors get computed either via numerical hessians or via the sandwich method.

vc the variance covariance matricx. Again the same method as for stderr is used

logl the log-likelihood of the problem.