Empirical Methods in Economics

Assignment III

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- The results of the estimation, for the four methods, are given in the table below. For the simplex method, I've used Matlab's `fminsearch` function, while for the quasi-newton implementations, I've used `fminunc`. It is of some comfort that the values of the coefficients do not change between different optimization routines.

Table 1: Estimated coefficients

Coefficient	MLE (Simplex)	MLE (Quasi Newton)	NLS (lsqnonlin)	NLS (Simplex)
Constant	2.5339	2.5339	2.5126	2.5126
Age	-0.0323	-0.323	-0.0384	-0.0384
Years Married	0.1157	0.1157	0.1141	0.1141
Religiousness	-0.3540	-0.3540	-0.2796	-0.2796
Occupation	0.0798	0.0798	0.0676	0.0676
Self-rating of Marriage	-0.4094	-0.4094	-0.3698	-0.3698

- In the above, it should be noted that `fminunc` is extremely sensitive to the initial point, when estimating MLE (not NLS). Also, during MLE, using `fminsearch` results in relatively slow convergence, requiring that one manually set the maximum number of iterations in the problem, or restart the evaluation at the point it breaks.

- In terms of robustness to starting values, I'd rank Nelder-Mead over Quasi Newton methods. Timing considerations are slightly more interesting. The plot on the following page shows time taken till convergence, for a number of initial starting values. The initial points are chosen such that all methods converge (either themselves, or the area of the simplex, in the case of Nelder-Mead is negligibly small). To allow for a simple illustration, I am considering perturbations in a single dimension of the initial value, namely the first component. In all the estimations above, I have used a starting vector of `[3,0,0,0,0,0]`. The figure below shows the time till convergence for a hundred initial values of the form `[a,0,0,0,0,0]`, where `a` ranges from 2 to 4.

- As can be seen, Nelder-Mead takes longer to converge than Quasi-Newton in the case of MLE. For NLS, however, Nelder-Mead performs better than the standard `nsqnonlin` function.

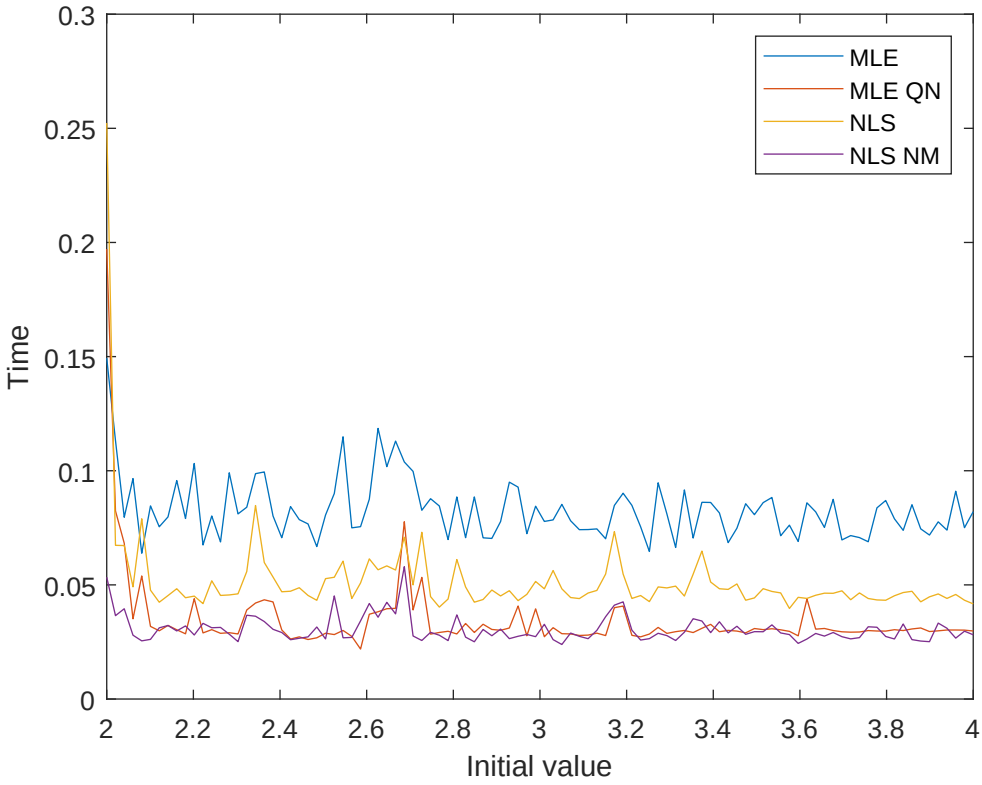

Figure 1: Time taken for convergence in coefficients, for the four methods, in a neighbourhood of starting values.