Problem Set 8 - ECON 5253

Thomas Mondry

April 5, 2022

The table below shows the OLS estimate for the regression model, obtained using the matrix solution under the hood of R's `lm` function. Generally, nearly identical solutions are obtained using the other assigned methods; some commentary is below.

X1	1.501
	(0.002)
X2	-1.001
	(0.002)
X3	-0.252
	(0.002)
X4	0.749
	(0.002)
X5	3.501
	(0.002)
X6	-2.001
	(0.002)
X7	0.499
	(0.002)
X8	1.003
	(0.002)
X9	1.247
	(0.002)
X10	2.001
	(0.002)
Num.Obs.	100000
R2	0.991
R2 Adj.	0.991
AIC	145143.6
BIC	145248.3
Log.Lik.	-72560.811
F	1075525.531
RMSE	0.50

- As shown above, the betas in the OLS estimate for the model are generally within a couple thousandths of the true betas which underlie the process with noise removed; standard errors are quite small, since the noise is small in magnitude relative to the data.
- Using manually-coded gradient descent with step size equal to 3E-7 resulted in a nearly identical solution; the process converged to within a few thousandths of the solution at around 150 iterations.
- Using `nloptr`, an identical solution was obtained using the L-BFGS gradient algorithm and the Nelder-Mead simplex algorithm; however, the L-BFGS converged enough to meet the (relatively strict) stop condition with only 10 iterations, while the Nelder-Mead did not converge sufficiently to meet this condition in 1000 iterations (although the results are functionally equivalent, relative to the amount of noise in the data).