Econ-5253

Problem Set 8

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Due by Apr. 2th, 2024

Question 5 : Using the matrices you just generated, compute $\hat{\beta}_{OLS}$, which is the OLS estimate of β using the closed-form solution. How does your estimate compare with the true value of β in (1)?

	V1
1	1.5010518
2	-1.0008296
3	-0.2516480
4	0.7490406
5	3.5005531
6	-2.0008185
7	0.4987148
8	1.0028269
9	1.2465102
10	2.0010012

It is almost the same as the actual the value of β.

Question 6 : Compute $\hat{\beta}_{OLS}$ using gradient descent (as we went over in class). Make sure you appropriately code the gradient vector! Set the "learning rate" (step size) to equal 0.0000003.

	[, 1]
[1,]	1.5010518
[2,]	-1.0008296
[3,]	-0.2516480
[4,]	0.7490406
[5,]	3.5005531
[6,]	-2.0008185
[7,]	0.4987148
[8,]	1.0028269
[9,]	1.2465102
[10,]	2.0010012

Question 7 : Compute $\hat{\beta}_{OLS}$ using nloptr's L-BFGS algorithm. Do it again using the Nelder-Mead algorithm. Do your answers differ?

	L-BFGS	Nelder-Mead
1	1.4375000	1.29909653
2	-1.0312500	-1.11422148
3	-0.1718750	-0.13531271
4	0.8515625	-0.12435493
5	3.5249023	3.58933602
6	-2.0322266	-2.49532367
7	0.5234375	0.34502814
8	0.8945312	0.55734366
9	1.3437500	0.04687693
10	2.0781250	1.22608191

Yes. It is a little different.

Question 8 : Now Compute $\hat{\beta}_{MLE}$ using nloptr's L-BFGS algorithm.

1	-3.350324e-07
2	1.781591e-07
3	1.637747e-07
4	-8.340968e-08
5	-6.032341e-07
6	4.866040e-07
7	-6.535479e-08
8	-6.289788e-08
9	-2.755593e-07
10	-2.658273e-07

Question 9-1 : Now compute $\hat{\beta}_{OLS}$ the easy way:using lm() and directly calling the matrices Y and X (no need to create a data frame). Make sure you tell lm() not to include the constant! This is done by typing lm(Y X -1)

X1	1.5011
X2	-1.0008
X3	-0.2516
X4	0.7490
X5	3.5006
X6	-2.0008
X7	0.4987
X8	1.0028
X9	1.2465
X10	2.0010

Question 9-2 : Use modelsummary to export the regression output to a .tex file. In your .tex file, tell me about how similar your estimates of $\hat{\beta}$ are to the "ground truth" β that you used to create the data in (1).

X1	1.501
X2	-1.001
X3	-0.252
X4	0.749
X5	3.501
X6	-2.001
X7	0.499
X8	1.003
X9	1.247
X10	2.001

My estimates of $\hat{\beta}$ is almost same as the "ground truth" β.