PS 8

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Results Comparison

Question 5

The estimates obtained using matrices closely approximate the true β value with high precision.

Question 6

The estimates obtained using gradient closely approximate the true β value.

Question 7

The estimates obtained using nloptr's L-BFGS and Nelder-Mead algorithms are highly similar to each other and closely approximate the true β value.

Question 8

The estimates of $\hat{\beta}$ obtained using the lm() function closely approximate the true β values that were used to generate the data in (1). The Ordinary Least Squares (OLS) estimates are presented on the following page.

$\begin{array}{c cccc} & & & & & & & \\ X1 & & & & & & \\ & & & & & & \\ & & & & & $		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(1)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	X1	1.501
$\begin{array}{c} X3 & \begin{array}{c} (0.002) \\ X3 & -0.249 \\ (0.002) \\ X4 & 0.747 \\ (0.002) \\ X5 & 3.502 \\ (0.002) \\ X6 & -1.999 \\ (0.002) \\ X6 & -1.999 \\ (0.002) \\ X7 & 0.501 \\ (0.002) \\ X8 & 0.999 \\ (0.002) \\ X8 & 0.999 \\ (0.002) \\ X9 & 1.253 \\ (0.002) \\ X10 & 1.999 $		(0.002)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	X2	-0.996
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(0.002)
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	X3	-0.249
$\begin{array}{c} X5 & \begin{array}{c} (0.002) \\ X5 & \begin{array}{c} 3.502 \\ (0.002) \\ \end{array} \\ X6 & \begin{array}{c} -1.999 \\ (0.002) \\ \end{array} \\ X7 & \begin{array}{c} 0.501 \\ (0.002) \\ \end{array} \\ X8 & \begin{array}{c} 0.999 \\ (0.002) \\ \end{array} \\ X9 & \begin{array}{c} 1.253 \\ (0.002) \\ \end{array} \\ X10 & \begin{array}{c} 1.999 \\ (0.002) \\ \end{array} \\ X10 & \begin{array}{c} 1.999 \\ (0.002) \\ \end{array} \\ X10 & \begin{array}{c} 1.999 \\ (0.002) \\ \end{array} \\ X10 & \begin{array}{c} 1.44993 \\ \end{array} \\ X10 & \begin{array}{c} 1.44993.2 \\ \end{array} \\ X10 & \begin{array}{c} 1.44993.2 \\ \end{array} \\ X10 & \begin{array}{c} 1.45097.9 \\ \end{array}$		
$\begin{array}{cccc} X5 & 3.502 \\ & (0.002) \\ X6 & -1.999 \\ & (0.002) \\ X7 & 0.501 \\ & (0.002) \\ X8 & 0.999 \\ & (0.002) \\ X9 & 1.253 \\ & (0.002) \\ X10 & 1.999 \\ & (0.002) \\ X10 & 1.999 \\ & (0.002) \\ \end{array}$ $\begin{array}{cccc} Num.Obs. & 1\times10^5 \\ R2 & 0.991 \\ R2 & Adj. & 0.991 \\ R2 & Adj. & 0.991 \\ AIC & 144 993.2 \\ BIC & 145 097.9 \\ Log.Lik. & -72 485.615 \\ \end{array}$	X4	
$\begin{array}{c} X6 & (0.002) \\ X6 & -1.999 \\ (0.002) \\ X7 & 0.501 \\ (0.002) \\ X8 & 0.999 \\ (0.002) \\ X9 & 1.253 \\ (0.002) \\ X10 & 1.999 \\ (0.002) \\ \hline X10 & 1.999 \\ (0.002) \\ \hline Num.Obs. & 1 \times 10^5 \\ R2 & 0.991 \\ R2 \ Adj. & 0.991 \\ R2 \ Adj. & 0.991 \\ AIC & 144 \ 993.2 \\ BIC & 145 \ 097.9 \\ Log.Lik. & -72 \ 485.615 \\ \hline \end{array}$		(0.002)
$\begin{array}{cccc} X6 & -1.999 \\ & & (0.002) \\ X7 & 0.501 \\ & & (0.002) \\ X8 & 0.999 \\ & & (0.002) \\ X9 & 1.253 \\ & & (0.002) \\ X10 & 1.999 \\ & & (0.002) \\ \end{array}$ $\begin{array}{cccc} X10 & 1.999 \\ & & (0.002) \\ \end{array}$ $\begin{array}{ccccc} X10 & 1.999 \\ & & (0.002) \\ \end{array}$ $\begin{array}{ccccc} X10 & 1.999 \\ & & (0.002) \\ \end{array}$ $\begin{array}{ccccc} X10 & 1.999 \\ & & (0.002) \\ \end{array}$ $\begin{array}{ccccc} X10 & 1.999 \\ & & (0.002) \\ \end{array}$ $\begin{array}{cccccc} X10 & 1.999 \\ & & (0.002) \\ \end{array}$ $\begin{array}{cccccc} X10 & 1.991 \\ X10 & 1.991 \\ X2 & 1.991 \\ X2 & 1.991 \\ X3 & 1.991 \\ X4 & 1.993 \\ X4 & 1.993 \\ X4 & 1.993 \\ X5 & 1.991 \\ X6 & 1.991 \\ X7 & 1.991 \\$	X5	0.00-
$\begin{array}{c} X7 & \begin{array}{c} (0.002) \\ X7 & 0.501 \\ (0.002) \\ X8 & 0.999 \\ (0.002) \\ X9 & 1.253 \\ (0.002) \\ X10 & 1.999 \\ (0.002) \\ \end{array}$ $\begin{array}{c} X10 & 1.999 \\ (0.002) \\ \end{array}$ $\begin{array}{c} Num.Obs. & 1 \times 10^5 \\ R2 & 0.991 \\ R2 \ Adj. & 0.991 \\ AIC & 144 \ 993.2 \\ BIC & 145 \ 097.9 \\ Log.Lik. & -72 \ 485.615 \\ \end{array}$		
$\begin{array}{ccc} {\rm X7} & 0.501 \\ & (0.002) \\ {\rm X8} & 0.999 \\ & (0.002) \\ {\rm X9} & 1.253 \\ & (0.002) \\ {\rm X10} & 1.999 \\ & (0.002) \\ \\ {\rm Num.Obs.} & 1\times10^5 \\ {\rm R2} & 0.991 \\ {\rm R2~Adj.} & 0.991 \\ {\rm R2~Adj.} & 0.991 \\ {\rm AIC} & 144993.2 \\ {\rm BIC} & 145097.9 \\ {\rm Log.Lik.} & -72485.615 \\ \end{array}$	X6	
$\begin{array}{c} X8 & \begin{array}{c} (0.002) \\ X8 & 0.999 \\ (0.002) \\ X9 & 1.253 \\ (0.002) \\ X10 & 1.999 \\ (0.002) \\ \end{array}$ $\begin{array}{c} Num.Obs. & 1\times10^5 \\ R2 & 0.991 \\ R2 \ Adj. & 0.991 \\ AIC & 144 \ 993.2 \\ BIC & 145 \ 097.9 \\ Log.Lik. & -72 \ 485.615 \\ \end{array}$		` /
$\begin{array}{ccc} X8 & 0.999 \\ & (0.002) \\ X9 & 1.253 \\ & (0.002) \\ X10 & 1.999 \\ & (0.002) \\ \hline \\ Num.Obs. & 1 \times 10^5 \\ R2 & 0.991 \\ R2 \ Adj. & 0.991 \\ R2 \ Adj. & 0.991 \\ AIC & 144 \ 993.2 \\ BIC & 145 \ 097.9 \\ Log.Lik. & -72 \ 485.615 \\ \hline \end{array}$	X7	
$\begin{array}{c} \text{X9} & (0.002) \\ \text{X9} & 1.253 \\ (0.002) \\ \text{X10} & 1.999 \\ (0.002) \\ \hline \text{Num.Obs.} & 1 \times 10^5 \\ \text{R2} & 0.991 \\ \text{R2 Adj.} & 0.991 \\ \text{AIC} & 144 993.2 \\ \text{BIC} & 145 097.9 \\ \text{Log.Lik.} & -72 485.615 \\ \hline \end{array}$		` /
$\begin{array}{c} \text{X9} & 1.253 \\ & (0.002) \\ \text{X10} & 1.999 \\ & (0.002) \\ \hline \text{Num.Obs.} & 1 \times 10^5 \\ \text{R2} & 0.991 \\ \text{R2 Adj.} & 0.991 \\ \text{AIC} & 144 993.2 \\ \text{BIC} & 145 097.9 \\ \text{Log.Lik.} & -72 485.615 \\ \hline \end{array}$	X8	
$\begin{array}{c} X10 & \begin{array}{c} (0.002) \\ 1.999 \\ (0.002) \end{array} \\ \\ \text{Num.Obs.} & 1 \times 10^5 \\ \text{R2} & 0.991 \\ \text{R2 Adj.} & 0.991 \\ \text{AIC} & 144993.2 \\ \text{BIC} & 145097.9 \\ \text{Log.Lik.} & -72485.615 \end{array}$		
$\begin{array}{c} \text{X10} & 1.999 \\ & (0.002) \\ \hline \text{Num.Obs.} & 1 \times 10^5 \\ \text{R2} & 0.991 \\ \text{R2 Adj.} & 0.991 \\ \text{AIC} & 144993.2 \\ \text{BIC} & 145097.9 \\ \text{Log.Lik.} & -72485.615 \\ \hline \end{array}$	X9	
$\begin{array}{c} \text{Num.Obs.} & (0.002) \\ \text{Num.Obs.} & 1 \times 10^5 \\ \text{R2} & 0.991 \\ \text{R2 Adj.} & 0.991 \\ \text{AIC} & 144 993.2 \\ \text{BIC} & 145 097.9 \\ \text{Log.Lik.} & -72 485.615 \\ \end{array}$		
$\begin{array}{lll} \text{Num.Obs.} & 1\times 10^5 \\ \text{R2} & 0.991 \\ \text{R2 Adj.} & 0.991 \\ \text{AIC} & 144993.2 \\ \text{BIC} & 145097.9 \\ \text{Log.Lik.} & -72485.615 \\ \end{array}$	X10	
R2 0.991 R2 Adj. 0.991 AIC 144 993.2 BIC 145 097.9 Log.Lik72 485.615		(0.002)
R2 Adj. 0.991 AIC 144 993.2 BIC 145 097.9 Log.Lik72 485.615	Num.Obs.	1×10^5
AIC 144 993.2 BIC 145 097.9 Log.Lik72 485.615	R2	0.991
BIC 145 097.9 Log.Lik72 485.615	R2 Adj.	0.991
Log.Lik. -72485.615	AIC	144993.2
	BIC	145097.9
RMSE 0.50		-72485.615
	RMSE	0.50