Quiz 5

Due: Thursday October 22, 2020 6:30 PM (EDT)

Submit your assignment

Help

After you have completed the assignment, please save, scan, or take photos of your work and upload your files to the questions below. Crowdmark accepts PDF, JPG, and PNG file formats.

Q1 (6 points)

For $i = 1, \dots, n$, let $y_i = \beta_1 x_{i,1} + \beta_2 x_{i,2} + \epsilon_i$, where the $x_{i,j}$ are known constants and $\epsilon_1, \dots, \epsilon_n$ are independent with expected value 0 and variance σ^2. We seek to estimate the following linear combination of β values: $\ell_1\beta_1 + \ell_2\beta_2$, where ℓ_1 and ℓ_2 are known constants. The estimator will be the following linear combination of the y values: $L = \sum_{i=1}^n c_i y_i$. This is the setting of the Gauss-Markov Theorem.

Suppose that L is an unbiased estimator; that is, suppose $E(L) = \ell_1\beta_1 + \ell_2\beta_2$ for all real β_1 and β_2. Prove that $\ell_1 = \sum_{i=1}^n c_i x_{i,1}$ and $\ell_2 = \sum_{i=1}^n c_i x_{i,2}$.

Q2 (4 points)

For this question, you will upload your complete answer to Question 16 of Assignment 5, based on the SAT data. Part (c) asked you to calculate and display the mean of the $\widehat{y}_i$. The answer is a number. **Circle the number on your R input/output**. If for some technical reason you are unable to circle the number, you may write it on a separate sheet and unload that as well. *You cannot get any marks on this question without your complete answer to Question 16.*

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(1) $E(L) = E\left(\sum_{i=1}^{n} c_i y_i\right) = \sum_{i=1}^{n} c_i E(y_i)$

$= \sum_{i=1}^{n} c_i (\beta_1 x_{i1} + \beta_2 x_{i2}) = \beta_1 \sum_{i=1}^{n} c_i x_{i1} + \beta_2 \sum_{i=1}^{n} c_i x_{i2}$

$= l_1 \beta_1 + l_2 \beta_2$ for all real β_1 & β_2. In particular, it is true for $\beta_1 = 1$ & $\beta_2 = 0$, so $\sum_{i=1}^{n} c_i x_{i1} = l_1$. It is also true for $\beta_1 = 0$ & $\beta_2 = 1$, so $\sum_{i=1}^{n} c_i x_{i2} = l_2$. done

(2) ~~−4.190341e−09, but other correct ways of doing it may yield other answers close to zero.~~

2.6301

No marks if the answer is based on lm. Matrix operations were specified.

At best part marks if the answer to Q16 is incomplete.