8. Exercise: LLMS drill

Exercises due Apr 15, 2020 05:29 IST *Completed*

Exercise: LLMS drill

2/2 points (graded)

Suppose that Θ and W are independent, both with variance 1, and that $X = \Theta + W$. Furthermore, $\mathbf{E}[\Theta] = 1$ and $\mathbf{E}[W] = 2$. The LLMS estimator $\widehat{\Theta} = aX + b$ has

$a =$ 0.5 ✔ **Answer:** 0.5

$b =$ -0.5 ✔ **Answer:** -0.5

Hint: Remember the formula $\mathsf{Cov}(X+Y, Z) = \mathsf{Cov}(X, Z) + \mathsf{Cov}(Y, Z)$.

Solution:

We have $\mathbf{E}[X] = \mathbf{E}[\Theta] + \mathbf{E}[W] = 3$ and $\mathsf{Var}(X) = \mathsf{Var}(\Theta) + \mathsf{Var}(W) = 2$. Also,

$$\mathsf{Cov}(X, \Theta) = \mathsf{Cov}(\Theta, \Theta) + \mathsf{Cov}(\Theta, W) = \mathsf{Var}(\Theta) + 0 = 1.$$

Therefore, the LLMS estimator is

$$\widehat{\Theta} = 1 + \frac{1}{2}(X - 3) = \frac{1}{2}X - \frac{1}{2}.$$

Submit You have used 2 of 3 attempts

Answers are displayed within the problem

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True Positive

Since there are no comments, I think everyone got it, and I'll say it's nice to get a repetition in! Thank you!

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