Assignment 7

PM522b Introduction to the Theory of Statistics Part 2

Due: March 27, 2018

1. If $X \sim Bin(n, \theta)$, then X/n is an unbiased estimator of θ. The estimate of the variance of X is often $n(X/n)(1 - X/n)$.

   a) Show that $n(X/n)(1 - X/n)$ is a biased estimator of $Var(X)$

   b) Suggest an unbiased estimator of $Var(X)$ by modifying $n(X/n)(1 - X/n)$

2. For $X_1, ..., X_n$ iid $\exp(1/\theta)$

   a) Find MSE$(\bar{X})$

   b) Consider the estimator $Y = a(\bar{X})$. What is MSE(Y), and what is the value of a that minimizes it? Compare with a).

   c) Determine the Cramer-Rao Lower Bound for the variance of an unbiased estimator of θ. Comment on what you find here in relation to what you found in a) and b).

3. CB 7.38 a) (we did b) in class)

4. Finish CB 7.44 finding variance using Stein's Identity (as asked in question) and MGF. Compare to CRLB.

5. CB 7.52