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## **\*\*** MATHEMATICS

## Asymptotic variance of MLE of normal distribution.

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I am trying to explicitly calculate (without using the theorem that the asymptotic variance of the MLE is equal to CRLB) the asymptotic variance of the MLE of variance of normal distribution, i.e.:

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$$\hat{\sigma}^2=rac{1}{n}\sum_{i=1}^n(X_i-\hat{\mu})^2$$



I have found that:

$$\operatorname{Var}(\hat{\sigma}^2) = rac{2\sigma^4}{n}$$

and so the limiting variance is equal to  $2\sigma^4$ , but how to show that the limiting variance and asymptotic variance coincide in this case?

probability statistics asymptotics statistical-inference estimation

edited Apr 5 '16 at 11:53



Jean-Claude Arbaut marco11 17.5k 6 40 66 784 5 19



For starters,

$$\hat{\sigma}^2 = rac{1}{n} \sum_{i=1}^n (X_i - ar{X}_i)^2.$$

- Math 1000 Apr 5 '16 at 11:19 /

1 A Sorry for a stupid typo and thank you for letting me know, corrected. – marco11 Apr 5 '16 at 11:41

## 2 Answers



You can use the following relation



Limiting Variance  $\geq$  Asymptotic Variance  $\geq CRLB_{n=1}$ 



Now calculate the CRLB for n=1 (where n is the sample size), it'll be equal to  $2\sigma^4$  which is the Limiting Variance. Therefore Asymptotic Variance also equals  $2\sigma^4$ .

answered Oct 13 at 16:27

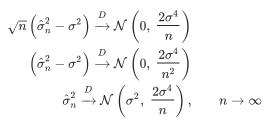




From the asymptotic normality of the MLE and linearity property of the Normal r.v  $\,$ 

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edited Apr 5 '16 at 12:38

answered Apr 5 '16 at 11:48





Thank you, but is it possible to do it without starting with asymptotic normality of the mle? - marco11 Apr 5 '16 at 12:04