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3. Asymptotic Variance

a)

2/2 points (graded)

Note: *This question is the ungraded problem from homework 2.*

Let $X_1, \ldots, X_n \overset{i.i.d.}{\sim} \mathcal{N}(0, \sigma^2)$, for some $\sigma^2 > 0$. Let

$$\widehat{\sigma^2} = \frac{1}{n}\sum_{i=1}^{n} X_i^2, \quad \text{and} \quad \widetilde{\sigma^2} = \frac{1}{n}\sum_{i=1}^{n} (X_i - \overline{X}_n)^2.$$

Argue that both proposed estimators $\widehat{\sigma^2}$ and $\widetilde{\sigma^2}$ below are consistent and asymptotically normal.

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their asymptotic variances $V(\widehat{\sigma^2})$ and $V(\widetilde{\sigma^2})$ and decide if one of them is always bigger than the other.

Hint: Use the multivariate Delta method. Also see Recitation 5 *Inference for the Variance of a Gaussian distribution*.

$V(\widehat{\sigma^2}) =$ 2*sigma^4 ✔

$2 \cdot \sigma^4$

$V(\widetilde{\sigma^2}) =$ 2*sigma^4 ✔

$2 \cdot \sigma^4$

STANDARD NOTATION

Submit You have used 1 of 3 attempts

✔ Correct (2/2 points)

Discussion

Topic: Unit 3 Methods of Estimation:Homework 5: Maximum Likelihood Estimation / 3. Asymptotic Variance

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- Variance of two estimators 2
- [Staff] Reference to Recitation 5 should be changed to Recitation 6
  Also Recitation 6: MLE for Multinomials should be changed to Recitation 7. All the future recitation numbers will need to be increased by 1.
  Community TA 3
- n not permitted in answer
  Why is n not permitted in answer as a variable? 3

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