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The t-distribution - Quiz

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Question 1

1.0 point possible (graded)

Suppose we are sampling from a $N(\mu, \sigma^2)$ distribution. Which of the following statements is true? (Select all that apply)

☐ a. $\frac{(n-1)s^2}{\sigma^2} \sim N(0, 1)$

☐ b. $\frac{(n-1)s^2}{\sigma^2} \sim \chi_n^2$


☒ c. $\frac{(n-1)s^2}{\sigma^2} \sim \chi_{n-1}^2$

☐ d. $\frac{(\bar{X} - \mu)}{\sqrt{(\frac{\sigma^2}{n})}} \sim \chi_{n-1}^2$


☐ e. $\frac{(\bar{X} - \mu)}{\sqrt{(\frac{\sigma^2}{n})}} \sim \chi_n^2$

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[Assessing and Deriving Estimators](#)

Finger Exercises due Nov 14, 2016 at 05:00 IST 

[Confidence Intervals and Hypothesis Testing](#)

Finger Exercises due Nov 14, 2016 at 05:00 IST 

[Module 7: Homework](#)

Homework due Nov 07, 2016 at 05:00 IST 

☒ f. $\frac{(\bar{X}-\mu)}{\sqrt{(\frac{\sigma^2}{n})}} \sim N(0, 1)$

☐ g. $\frac{(\bar{X}-\mu)}{\sqrt{(\frac{\sigma^2}{n})}} \sim N(\mu, \sigma^2)$



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You have used 1 of 2 attempts

✓ Correct (1/1 point)

Question 2

1/1 point (graded)

True or False: Let $X_1, \dots, X_n \sim N(\mu, \sigma^2)$, and suppose σ^2 is known, then

$$\frac{\bar{X}-\mu}{\sqrt{(\frac{\sigma^2}{n})}} \sim t_n$$

☐ a. True

☒ b. False ✓

► [Exit Survey](#)

Explanation

Professor Ellison explained in class, that if $\mathbf{X} \sim N(0, 1)$ and $\mathbf{Z} \sim \chi_n^2$ then $\frac{\mathbf{X}}{\sqrt{\frac{\mathbf{Z}}{n}}} \sim t_n$. This is useful

because it allows us to characterize the sample distribution in cases where the variance is unknown. Because we know that if $\mathbf{X}_1, \dots, \mathbf{X}_n$ are i.i.d from a standard normal distribution, then the **estimator** of the sample variance \mathbf{s}^2 follows a chi squared distribution with $(n - 1)$ degrees of freedom, so we appeal to this distributional fact to form the confidence interval. However, if the variance is known, then we know that

$$\frac{\bar{X} - \mu}{\sqrt{(\frac{\sigma^2}{n})}} \sim N(0, 1)$$

so we can construct the confidence interval.

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Discussion

Topic: Module 7 / The t-distribution - Quiz

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