MITx: 14.310x Data Analysis for Social Scientists

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Bookmarks

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. $\frac{(n-1)s^2}{\sigma^2} \sim \chi^2_n$
- [x] c. $\frac{(n-1)s^2}{\sigma^2} \sim \chi^2_{n-1}$
- [ ] d. $\frac{(\bar{X}-\mu)}{\sqrt{(\frac{\sigma^2}{n})}} \sim \chi^2_{n-1}$
- [ ] e. $\frac{(\bar{X}-\mu)}{\sqrt{(\frac{\sigma^2}{n})}} \sim \chi^2_n$

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

✔

Submit You have used 1 of 2 attempts

✔ Correct (1/1 point)

Question 2

1/1 point (graded)

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

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

- ( ) a. True
- (•) b. False ✔

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Explanation

Professor Ellison explained in class, that if $X \sim N(0,1)$ and $Z \sim \chi_n^2$ then $\frac{X}{\sqrt{\frac{Z}{n}}} \sim t_n$. This is useful because it allows us to characterize the sample distribution in cases where the variance is unknown. Because we know that if $X_1, \ldots, X_n$ are i.i.d from a standard normal distribution, then the **estimator** of the sample variance 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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✔ Correct (1/1 point)

Discussion

Topic: Module 7 / The t-distribution - Quiz

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