Problem Set 4

ECN 301E - Fall 2024

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Question 1

Define the following terms in your own words.

a. Estimator and estimate
b. Unbiased estimator, consistent estimator and efficient estimator
c. Null hypothesis and alternative hypothesis
d. One-sided alternative hypothesis and two-sided alternative hypothesis
e. Test statistic
f. Significance level
g. P-value
h. Critical value and rejection region
i. Confidence interval

Question 2

Let $Y_1, \ldots, Y_n$ be a random sample from a population with $\mu_Y = 35$ and $\sigma_Y^2 = 15$. Use the central limit theorem to answer the following questions:

a. In a random sample of size $n = 30$, find $P(\bar{Y} < 34.5)$.
b. In a random sample of size $n = 80$, find $P(36 < \bar{Y} < 37)$.

Question 3

A new version of the university entrance test is given to 800 randomly selected high school seniors. The sample mean test score is 1230, and the sample standard deviation is 145. Construct the 95% and 99% confidence intervals for the population mean test score for high school seniors.

Question 4

Let $Y_1, \ldots, Y_{500}$ be a random sample from a population that has mean μ_Y and variance σ_Y^2. Assume that $\bar{Y} = 0.54$ and the sample variance is $s_Y^2 = 0.2484$.

a. Find the standard error of $\bar{Y}$.
b. What is the p-value for the test of $H_0 : \mu_Y = 0.5$ vs. $H_1 : \mu_Y \neq 0.5$?
c. What is the p-value for the test of $H_0 : \mu_Y = 0.5$ vs. $H_1 : \mu_Y > 0.5$?
d. Why do the results from (c) and (d) differ?
e. Did the sample contain statistically significant evidence for H_0? Explain.