Quiz 3 Probability and Statistics (section AI-3C) Solution 24th Nov.2023

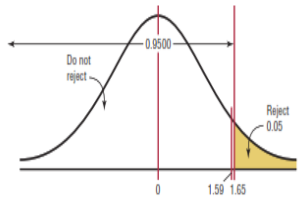
A researcher wishes to see if the mean number of days that a basic, low-price, small automobile sits on a dealer's lot is 29. A sample of 30 automobile dealers has a mean of 30.1 days for basic, low-price, small automobiles. At $\alpha = 0.05$, test the claim that the mean time is greater than 29 days. The standard deviation of the population is 3.8 days.

Solution

Step 1 State the hypotheses and identify the claim.

H_0: $\mu = 29$ and H_1: $\mu > 29$ (claim)

Step 2 Find the critical value. Since $\alpha = 0.05$ and the test is a right-tailed test, the critical value is $z = +1.65$.



Step 3 Compute the test value.

$$z = \frac{\overline{X} - \mu}{\sigma/\sqrt{n}} = \frac{30.1 - 29}{3.8/\sqrt{30}} = 1.59$$

Step 4 Make the decision. Since the test value, $+1.59$, is less than the critical value, $+1.65$, and is not in the critical region, the decision is to not reject the null

Step 5 Summarize the results. There is not enough evidence to support the claim that the mean time is greater than 29 days.

Ten randomly selected people were asked how long they slept at night. The mean time was 7.1 hours, and the standard deviation was 0.78 hour. Find the 95% confidence interval of the mean time. Assume the variable is normally distributed.

Solution

Since σ is unknown $t_{\alpha/2} = 2.262$, with 9 degrees of freedom

The 95% confidence interval can be found by substituting in the formula.

$$\overline{X} - t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right) < \mu < \overline{X} + t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$$

$$7.1 - 2.262\left(\frac{0.78}{\sqrt{10}}\right) < \mu < 7.1 + 2.262\left(\frac{0.78}{\sqrt{10}}\right)$$

$$7.1 - 0.56 < \mu < 7.1 + 0.56$$

$$6.54 < \mu < 7.66$$

Therefore, one can be 95% confident that the population mean is between 6.54 and 7.66 inches.

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