Assignment 10
Probability and Random Variables

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Outline

Question

Question 8.26

A new car is introduced with the claim that its average mileage in highway driving is at least 28 miles per gallon. Seventeen cars are tested, and the following mileage is obtained:

19 20 24 25 26 26.8 27.2 27.5

28 28.2 28.4 29 30 31 32 33.3 35

Can we conclude with significance level at most 0.05 that the claim is true?

Solution

Our objective is to test the composite null hypothesis $\eta > \eta_0 = 28$ against the hypothesis $\eta < \eta_0$. Consider first the simple null hypothesis $\eta = \eta_0 = 28$. In this case, we can use,

$$q = \frac{\overline{x} - \eta_0}{s/\sqrt{n}}$$

$$\overline{x} = \frac{1}{17}\sum x_i = 27.67$$

$$s^2 = \frac{1}{16}\sum (x_i - \overline{x}) = 17.6$$

This yields $s = 4.2$ and $q = -0.33$. Since

$$q_u = t_u(n-1) = t_{0.05}(16) = -1.95 < -0.33$$

conclusions

we conclude that the evidence does not support rejection of the hypothesis $\eta = 28$.
If $\eta_0 > 28$, then the corresponding value of q is larger than -0.33.
From this it follows that the evidence does not support the hypothesis η_0 for any $\eta_0 > 28$.