Assignment\_\_3 Pravin dattatray shinde

: Hypothesis Testing for Operating Costs of Bombay Hospitality Ltd.

Background:

Bombay Hospitality Ltd. operates a franchise model for producing exotic Norwegian dinners throughout New England. The operating cost for a franchise in a week (W) is given by the equation:

[ W = 1000 + 5X \]

where X represents the number of units produced in a week. Recent feedback from restaurant owners suggests that this cost model may no longer be accurate, as their observed weekly operating costs are higher.

Objective:

To investigate the restaurant owners' claim about the increase in weekly operating costs using hypothesis testing.

Data Provided:

- Theoretical weekly operating cost model: \[ W = 1000 + 5X \] - Sample of 25 restaurants with a mean weekly cost of Rs. 3050

- Number of units produced in a week (X) follows a normal distribution with a mean (μ) of 600 units and a standard deviation (σ) of 25 units

Tasks:

1. State the Hypotheses Statement:

- Null Hypothesis (H₀) : The mean weekly operating cost is equal to the theoretical mean cost according to the model.

- Alternative Hypothesis (H₁) : The mean weekly operating cost is greater than the theoretical mean cost according to the model.

2. Calculate the Test Statistic:

Using the following formula for the test statistic (t):

[ t = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} \]

Where:

- ( \bar{x} \) = sample mean weekly cost (Rs. 3050)

- ( \mu \) = theoretical mean weekly cost according to the cost model (W = $1,000 + $5X for X = 600 units)

- ( \sigma \) = 5 \* 25 units (standard deviation of weekly cost) - n = sample size (25 restaurants)

3. Determine the Critical Value:

Using the alpha level of 5% (α = 0.05), determine the critical value from the standard normal (Z) distribution table.

4. Make a Decision:

Compare the test statistic with the critical value to decide whether to reject the null hypothesis.

5. Conclusion:

Based on the decision in step 4, conclude whether there is strong evidence to support the restaurant owners' claim that the weekly operating costs are higher than the model suggests.

Python Code Implementation:

python

import scipy.stats as stats

Given data

sample\_mean\_cost = 3050 X = 600

theoretical\_fixed\_cost = 1000 cost\_per\_unit = 5

n = 25 sigma\_units = 25

--Calculate the theoretical mean weekly cost (mu) mu = theoretical\_fixed\_cost + cost\_per\_unit \* X

--Calculate the standard deviation for the cost sigma = cost\_per\_unit \* sigma\_units

--Calculate the test statistic (t)

t\_statistic = (sample\_mean\_cost - mu) / (sigma / (n \*\* 0.5))

--Determine the critical value for a one-tailed test at alpha = 0.05 alpha = 0.05

critical\_value = stats.norm.ppf(1 - alpha) t\_statistic, critical\_value```

6. Results:

Test Statistic (t): [Insert Value Here]

Critical Value (at α = 0.05): [Insert Value Here]

7. Conclusion:

Based on the comparison of the test statistic and the critical value, draw a conclusion regarding the restaurant owners' claim.