**HYPOTHESIS TESTING**

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 = $1,000 + $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:**

* The theoretical weekly operating cost model: W = $1,000 + $5X
* Sample of 25 restaurants with a mean weekly cost of Rs. 3,050
* 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

**SOLUTION:**

**STEP 1:**

**FRAMING HYPOTHESIS**

##H 0: The mean operating cost is equal to the theoretical mean weekly cost developed by the cost model.

#that is (μ < = 4000)

##H 1:The mean operating cost is greater than the mean weekly cost developed by the cost model.

#that is (μ > 4000)

**2. Calculate the Test Statistic:**

Use the following formula to calculate the test statistic (t):

where:

* ˉ*x*ˉ = sample mean weekly cost (Rs. 3,050)
* *μ* = theoretical mean weekly cost according to the cost model (W = $1,000 + $5X for X = 600 units)
* *σ* = 5\*25 units
* *n* = sample size (25 restaurants)

###declaring variables

#method 1 for finding z-statistic value

samplemean=3050

samplesize=25

standard\_dev=125

alpha=0.05

popu\_mean=4000

import pandas as pd

import numpy as np

from scipy import stats

xbar=3050

mu=4000

s=125

n=25

zstat=(xbar-mu)/(s/np.sqrt(n))

print("z-statistic value is :",zstat)

OUTPUT:

z-statistic value is : -38.0

Method 2

#finding z-statistic value

import pandas as pd

import numpy as np

from scipy import stats

# Sample data

sample\_mean = 3050 # Sample mean weekly cost (Rs.)

theoretical\_mean = 1000 + 5 \* 600

# Theoretical mean weekly cost according to the cost model

sigma = 5 \* 25 # Standard deviation

n = 25 # Sample size

# Calculate the test statistic

test\_statistic = (sample\_mean - theoretical\_mean) / (sigma / np.sqrt(n))

print ("Test Statistic:", test\_statistic)

OUTPUT:

Test Statistic: -38.0

**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.

#finding critical value

Method 1

critical\_value = stats.norm.ppf(1 - alpha)

print ("Critical Value from Z-table:", critical\_value)

OUPTUT:

Critical Value from Z-table: 1.6448536269514722

Method 2

from scipy import stats

#alpha = 0.05

# critical value from the standard normal (Z) distribution table

critical\_value = stats.norm.ppf(1 - alpha)

print ("Critical Value from Z-table:", critical\_value.round(3))

OUTPUT:

Critical Value from Z-table: 1.645

**4. Make a Decision:**

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

#method 1

#finding p value

import scipy.stats as stats

sem=standard\_dev/(samplesize\*\*0.5)

z\_score=(samplemean-popu\_mean)/sem

z\_score

###p value

pvalue=stats.norm.cdf(z\_score)

pvalue

OUTPUT:

0.0

#method 2

#finding p value

p\_value=stats.norm.cdf(test\_statistic)

print(p\_value)

OUTPUT:0.0

#stating the decision

# comparing p value with alpha

#method 1

alpha=0.05

if pvalue<alpha:

print ("Ho is rejected and H1 is accepted")

else:

print ("H0 is accepted and H1 is rejected")

OUTPUT:

H0 is rejected and h1 is accepted.

#decision making

#comparing test statistic value with tabular value

#method 2

if zstat<critical\_value or test\_statistic<critical\_value:

print("Ho is rejected and H1 is accepted")

else:

print("H0 is accepted and H1 is rejected")

OUTPUT:

Ho is accepted and H1 is accepted

**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.

ANSWER:

Hence, we can say that we have the significance evidence that the mean operating cost is greater than the theoretical mean weekly cost that is developed by the cost model.