# Question No 1:

A F&B manager wants to determine whether there is any significant difference in the diameter of the cutlet between two units. A randomly selected sample of cutlets was collected from both units and measured? Analyze the data and draw inferences at 5% significance level. Please state the assumptions and tests that you carried out to check validity of the assumptions.

Ans :

## Business Problem:

Whether the diameter of the cutlet between two units are same or different. Whether there is any significant difference between the diameter of the cutlets or not.

## Hypothesis Part:

Ho : Mean diameter of Unit A = mean diameter of Unit B.

The Diameters of the cutlets are same.

Ha : The Diameters of the cutlets are not same.

## Normality Test:

Ho: The data is following Normal Distribution.

Ha: The data is not following Normal Distribution.

From the Anderson Darling Test, we get p = 0.2866 i.e. greater than 0.05 so we accept the null hypothesis. i.e. The data of “Unit A” is following Normal distribution.

From the Anderson Darling Test, we get p = 0.6869 i.e. greater than 0.05 so we accept the null hypothesis. i.e. The data of “Unit A” is following Normal distribution.

As the data is Normally distributed so we go for the Parametric test.

## Variance Ratio Test:

Ho: Both the variance of Unit A and Unit B are same.

Ha: Variance of Unit A and Unit B are different.

Ratio of the variance is found out to be 0.705369

And p-value is found out to be 0.3136 i.e. greater than 0.05 so we accept the null Hypothesis that Both the variance are same.

## T-Test for Equal Variances:

Ho: Mean diameter of cutlets for both the units are same.

Ha: Mean diameter of cutlets for both the units are not same.

P-value is found out to be 0.4722 i.e. greater than 0.05 so we accept the null hypothesis that Mean diameter of cutlets are same for both the sample units.

## Conclusion:

There is no significant difference between the two units of cutlets.

# Question No 2:

A hospital wants to determine whether there is any difference in the average Turn Around Time (TAT) of reports of the laboratories on their preferred list. They collected a random sample and recorded TAT for reports of 4 laboratories. TAT is defined as sample collected to report dispatch. Analyze the data and determine whether there is any difference in average TAT among the different laboratories at 5% significance level.

Answer:

## Business Problem:

To determine whether there is any significant difference between the average Turn Around Time over different laboratories or not.

Ho: The mean TAT among all the laboratories are same.

Ha: The mean TAT among all the laboratories are not similar.

## Normality test:

Ho: Data is Normally Distributed

Ha: Data is not Normally Distributed

Laboratory No: P-Value: Ho: Remark:

Lab 1 0.5322 Accepted Data is Normally Distributed

Lab 2 0.7331 Accepted Data is Normally Distributed

Lab 3 0.5768 Accepted Data is Normally Distributed

Lab 4 0.4196 Accepted Data is Normally Distributed

## Homogeneity of Variance Test Levene test:

Ho: All the laboratory have equal variance

Ha: At least two laboratory have unequal variance

P-value is found out to be 0.05161 i.e. greater than 0.05, hence all the laboratory have homogenous variance.

## ANOVA Test:

Ho: The mean TAT among all the laboratories are same.

Ha: The mean TAT among all the laboratories are not similar.

P-value is found out to be 2e-16 ie << 0.05 so we may reject the null hypothesis .

## Conclusion:

The mean TAT among all the laboratories are not similar. There is significant difference between the mean TAT values of 4 different laboratories.

# Question no 3 :

Sales of products in four different regions is tabulated for males and females. Find if male-female buyer rations are similar across regions.

Answer:

## Business Problem:

To verify whether the male-female buyer are similar across the regions are same or not.

Ho: Male-Female buyer over the 4 regions are similar.

Ha: Male-Female buyer over the 4 regions are different.

Observed.Values East West North South

1 Males 50 142 131 70

2 Females 435 1523 1356 750

Data is Categorical as well as in the form of a 2x4 contingency table so we go for the chi-square test

## Chi-Square Test:

Ho: Male-Female buyer over the 4 regions are similar.

Ha: Male-Female buyer over the 4 regions are different.

p-value is found out to be 0.6603 i.e > 0.05, hence we accept the null hypothesis, Male-Female buyer over the 4 regions are similar.

## Conclusion:

Male-Female buyers’ ratio are similar across the 4 regions.

# Question no 4 :

TeleCall uses 4 centers around the globe to process customer order forms. They audit a certain % of the customer order forms. Any error in order form renders it defective and has to be reworked before processing. The manager wants to check whether the defective % varies by centre. Please analyze the data at 5% significance level and help the manager draw appropriate inferences.

Answers:

## Business Problem:

To check whether the defective percentage varies by the centers (4 centers) or not.

Ho: The proportion of defective are same over the 4 centers.

Ha: The proportion of defective are different over the 4 centers.( varies with the centers)

India Indonesia Malta Phillippines

1 20 33 31 29

2 280 267 269 271

# 1 is for Defective and 2 is for Error free

Data is categorical and in the form of 2x4 contingency table. So we may perform the Chi-Square test for independence of attributes.

## Chi-square test:

Ho: The proportion (percentage) of defectives are similar over the 4 centers.

Ha: The proportion (percentage) of defectives are not similar over the 4 centers.

p-value is found out to be 0.2771 i.e. greater than 0.05. so we may accept the null hypothesis.

## Conclusion:

The proportion(percentage) of defectives are similar over the 4 centers.

# Question no 5 :

Fantaloons Sales managers commented that % of males versus females walking in to the store differ based on day of the week. Analyze the data and determine whether there is evidence at 5 % significance level to support this hypothesis.

## Business Problem:

To test whether the males vs females walking to the store differs based on the day pf the week or not.

Ho: The number of male customers are similar to the no of female customers over the day of the week.

Ha: The number of male customers are not similar to the no of female customers over the day of the week.

Day

Gender Weekdays Weekend

1 287 233

2 113 167

# 1 for Female and 2 for Male

Here we are dealing with categorical data and converting it to the 2x2 contingency table so we perform the Chi-Square test.

## Chi-Square Test:

Ho: No of female customers and no of male customers arriving to the store is same over the week days and weekend days.

Ha: No of female customers and no of male customers arriving to the store are not same over the week days and weekend days.

P-value is found out to be 8.543e-05 which is less than 0.05 so we may reject the Null hypothesis.

## Conclusion:

The Percentage of male customers are not similar to the no of female customers over the day of the week.

i.e. Percentage of males versus females walking in to the store differ based on day of the week.