**HYPOTHESIS TESTING**

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 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.

**Problem Statement:**

Determine whether there is any significant difference in the diameter of the cutlet between two units.

**Business Problem:**

Does there any significant difference in the diameter of the cutlet between two units or not.

**Data:**

X has 2 samples. They are Unit A & Unit B.

Y represents the Diameter it is in continuous format.

**Normality Test:**

**Case 1:**

H0: Unit A data are Normal

Ha: Unit A data are not Normal

W = 0.96495, p-value = 0.32

Fail to Reject Null Hypothesis. Hence Unit A data are Normal.

**Case 2:**

H0: Unit B data are Normal

Ha: Unit B data are not Normal

W = 0.97273, p-value = 0.5225

Fail to Reject Null Hypothesis. Hence Unit B data are Normal.

**Variance Test:**

H0: Variances are equal for both Unit A and Unit B.

Ha: Variances are Not equal for both Unit A and Unit B.

p-value = 0.3136 from Variance Test.

Fail to Reject Null Hypothesis. Hence both Units are having Equal Variance.

**2 Sample t – test:**

Assuming both Units are having equal variances.

H0: Average diameter of the cutlet of Unit A < = Average diameter of the cutlet of Unit B.

Ha: Average diameter of the cutlet of Unit A > Average diameter of the cutlet of Unit B.

**Case 1:**

H0: Average diameter of the cutlet of Unit A = Average diameter of the cutlet of Unit B.

Ha: Average diameter of the cutlet of Unit A Not = Average diameter of the cutlet of Unit B. Go to Case 2.

With 95% of confidence level, 2 sample t – test.

t = 0.72287, df = 66.029, p-value = 0.4723 > 0.05

Fail to Reject Null Hypothesis. Probability value is greater than accepting value (0.05).Hence Unit A & Unit B are having equal diameter of the cutlet.

**Conclusion:**

There was No significant difference in the diameter of the cutlet between two units.

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.

**Problem Statement:**

Determine any difference in the average Turnaround Time (TAT) of reports of the laboratories on their preferred list.

**Business Problem:**

Does there any difference in the average Turnaround Time (TAT) of reports of the 4 laboratories or not.

**Data:**

X has 4 samples. They are Laboratory 1, Laboratory 2, Laboratory 3, and Laboratory 4.

Y represents the Turnaround Time (TAT), it is in continuous format.

**Normality Test:**

**Case 1:**

H0: Laboratory 1 data are Normal

Ha: Laboratory 1 data are not Normal

W = 0.99018, p-value = 0.5508

Fail to Reject Null Hypothesis. Hence Laboratory 1 data are Normal.

**Case 2:**

H0: Laboratory 2 data are Normal

Ha: Laboratory 2 data are not Normal

W = 0.99363, p-value = 0.8637

Fail to Reject Null Hypothesis. Hence Laboratory 2 data are Normal.

**Case 3:**

H0: Laboratory 3 data are Normal

Ha: Laboratory 3 data are not Normal

W = 0.98863, p-value = 0.4205

Fail to Reject Null Hypothesis. Hence Laboratory 3 data are Normal.

**Case 4:**

H0: Laboratory 4 data are Normal

Ha: Laboratory 4 data are not Normal

W = 0.99138, p-value = 0.6619

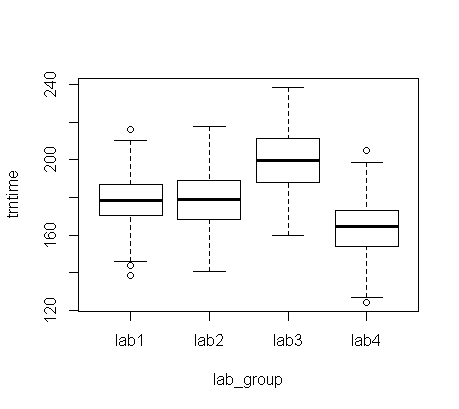
Fail to Reject Null Hypothesis. Hence Laboratory 4 data are Normal.

**Variance Test:**

H0: All Laboratories Variances are Equal.

Ha: At least one Laboratories Variances is different.

p-value from **Bartlett.test is 0.1069**



Probability value is greater than accepted value. Fail to Reject Null Hypothesis. Hence all labs are having equal variance. Also we have only one type of Y ( i.e TAT) So we are proceeding with One-way ANOV Test.

**One-way ANOV test:**

H0: Average Turnaround Time (TAT) of reports of all laboratories is equal.

Ha: Average Turnaround Time (TAT) of reports of at least one laboratory is not equal.

p-value = 0.0000000000000002 approximately zero.

Hence Reject Null Hypothesis.

**Conclusion:**

There is difference in the average Turnaround Time (TAT) of reports of the laboratories at 5% significance level.

3) Sales of products in four different regions is tabulated for males and females. Find if male-female buyer rations are similar across regions. East West North South Males 50 142 131 70 Females 550 351 480 350.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Observed Values** | **East** | **West** | **North** | **South** |
| **Males** | 50 | 142 | 131 | 70 |
| **Females** | 435 | 1523 | 1356 | 750 |

**Problem Statement:**

Check Female and Male buyer rations are same across the regions.

**Business Problem:**

Does Female and Male buyer rations are similar across four the regions.

**Data:**

X has 4 samples (East, West, North and South)

Y is Discrete. So we can go with Chi-Square Test.

**Chi-Square Test:**

H0: Male and Female buyer rations are similar across regions

Ha: Male and Female buyer rations are not similar across regions

p-value = 0.2931 is greater than 0.05.

Fail to Reject the Null Hypothesis because Probability value is greater than the accepted value.

**Conclusion:**

Male-female buyer rations are similar across regions.

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

**Problem Statement:**

The manager wants Checks whether the defective % varies by centres.

**Business Problem:**

Check whether the defective % varies by centre or not.

**Data:**

X has 4samples.They are Phillippines, Indonesia, Malta and India.

Y represents the Error Free and Defective, it is in discrete format.

**Chi-Square Test:**

H0: Proportion of all centres defective % is Equal.

Ha: Proportion of at least one centres defective % is different.

p-value = 0.2771 from chisq.test**. 0.2771 > 0.05**

Fail to reject Null Hypothesis because Probability value is greater than accepted value (0.05). Hence Proportion of all centres defective % is Equal.

**Conclusion:**

Proportion of all centres defective % is Equal.

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.

**Problem Statement:**

Fantaloons Sales manager’s wants to check that % of males versus females walking in to the store differ based on day of the week.

**Business Problem:**

Check that % of males versus females walking in to the store differs based on day of the week or not.

**Data:**

X has 2 samples. They are Weekday and Weekend.

Y represents the Male & Female, it is in discrete format.

**2-Proportion Test:**

**Case 1:**

H0: Proportion of males versus females walking in to the store is equal for all days.

Ha: Proportion of males versus females walking in to the store is differs between weekdays and weekends.

P**-value is 8.543e-05** from Prop.test. It is almost zero. Reject Null Hypothesis because probability value is less than the accepting value (0.05). Hence Proportion of males versus females walking in to the store is differing between weekday and weekend.

**Conclusion:**

Proportion of males versus females walking in to the store is differs between weekdays and weekends.