**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.

Minitab File : **Cutlets.mtw**

**Ans :**

cutlets <- read.csv(file.choose())

View(cutlets)

attach(cutlets)

**#normality test**

library(nortest)

ad.test(cutlets$Unit.A)#pvalue =0.2866

ad.test(cutlets$Unit.B)#pvalue =0.6869

**#variance test**

**#H0 <- both the var are same**

**#Ha <- both have diff var**

var.test(cutlets$Unit.A,cutlets$Unit.B)

**#variances=0.70536 , pvalue =0.3136**

**#failed to reject null hypothesis**

**#2-sample t-test for equal variance**

**#H0 <- cutlets have same diameter of 2 units**

**#Ha <- cutlets have diff diameter of 2 units**

t.test(Unit.A,Unit.B,alternative = 'two.sided',conf.level = 0.95)

**#failed to reject null hypothesis**

**#Conclusion : Cutlets have same diameters**

1. 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.

Minitab File: **LabTAT.mtw**

**Ans :**

lab <- read.csv(file.choose())

View(lab)

attach(lab)

**#normality test**

library(nortest)

shapiro.test(Laboratory.1**)#pvalue=0.5508**

shapiro.test(Laboratory.2**)#pvalue=0.8637**

shapiro.test(Laboratory.3**)#pvalue=0.4205**

shapiro.test(Laboratory.4)#**pvalue=0.6619**

**#Conclusion : All the variables are normal**

**#variance test**

stacked <- stack(lab)

stacked

library(car)

leveneTest(stacked$values~stacked$ind,data=stacked)#pvalue=0.05161

**#Conclusion : Variance are equal**

**#one way ANOVA test**

anova\_result <- aov(values~ind,data=stacked)

summary(anova\_result**)#pvalue=2e-16**

**#reject null hypothesis**

**#Conclusion : There is difference in average TAT between different labouratory**

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

Minitab File: BuyerRatio.mtw

**Ans :**

**#buyers ratio**

**#the dependent and independent variables are discrete**

**#chi-square test**

a <- read.csv(file.choose())

View(a)

b <- a[,-1]

b

**#H0 ->product sales ratio are same for males and females**

**#Ha ->product sales ratio are not same for males and females**

chisq.test(b)

**#p =0.6603 >0.05 -> p high null fly ->failed to reject null hypothesis**

**#Conclusion : Product sales ratio are same for males and females**

1. 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

Minitab File: CustomerOrderForm.mtw

**Ans :**

a=read.csv(file.choose())

View(a)

library(BSDA)

library(e1071)

library(nortest)

attach(a)

install.packages("tidyr")

library(tidyr)

**#table formation and stacking of data**

a2 <- table(gather(a,nation,status,1:4))

a2

**#H0 <- all the centers have same defective%**

**#H1 <- different centers have defective%**

chisq.test(a2)

**#pvalue>0.05 failed to reject null hypothesis**

**#Conclusion : All centers have same defective%**

1. 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.

Minitab File: **Fantaloons.mtw**

**Ans :**

fantaloons <- read.csv(file.choose())

View(fantaloons)

attach(fantaloons)

#table formation

table <- table(Weekdays,Weekend)

table

**#2-propotion test**

prop.test(x=c(66,47),n=c(422,588),conf.level = 0.95,alternative = "two.sided")**#pvalue=0.0002147**

**#H0 <- % of males visiting store equal to % of females**

**#Ha <- % of males visiting store not equal to % of females**

**#2-propotion test for alternative is less**

prop.test(x=c(66,47),n=c(422,588),conf.level = 0.95,alternative = "less")**#pvalue=0.9999**

**#H0 <- %of males visiting store is less than % of females**

**#Ha <- % of males visiting store is equal to % of females**

**#Conclusion : Per of males visiting the store is different from per of females during week days**