sec12

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a) Introducing data to R

```
y1<-c(47.8,46.4,46.3,45.1,47.6,52.5,51.2,49.8,48.1,45.0,51.2,48.5,52.,48.2,49
.6,50.7,47.2,53.3,46.2,46.3)
y2<-c(48.8,47.3,46.8,45.3,48.5,53.2,53.0,50.0,50.8,47.0,51.4,49.2,52.8,48.9,5
0.4,51.7,47.7,54.6,47.5,47.6)
y3<-c(49.0,47.7,47.8,46.1,48.9,53.3,54.3,50.3,52.3,47.3,51.6,53.0,53.7,49.3,5
1.2,52.7,48.4,55.1,48.1,51.3)
y4<-c(49.7,48.4,48.5,47.2,49.3,53.7,54.5,52.7,54.4,48.3,51.9,55.5,55.0,49.8,5
1.8,53.3,49.5,55.3,48.4,51.8)

dat<-data.frame(y1,y2,y3,y4)
dat
```

```
##      y1   y2   y3   y4
## 1  47.8 48.8 49.0 49.7
## 2  46.4 47.3 47.7 48.4
## 3  46.3 46.8 47.8 48.5
## 4  45.1 45.3 46.1 47.2
## 5  47.6 48.5 48.9 49.3
## 6  52.5 53.2 53.3 53.7
## 7  51.2 53.0 54.3 54.5
## 8  49.8 50.0 50.3 52.7
## 9  48.1 50.8 52.3 54.4
## 10 45.0 47.0 47.3 48.3
## 11 51.2 51.4 51.6 51.9
## 12 48.5 49.2 53.0 55.5
## 13 52.0 52.8 53.7 55.0
## 14 48.2 48.9 49.3 49.8
## 15 49.6 50.4 51.2 51.8
## 16 50.7 51.7 52.7 53.3
## 17 47.2 47.7 48.4 49.5
## 18 53.3 54.6 55.1 55.3
## 19 46.2 47.5 48.1 48.4
## 20 46.3 47.6 51.3 51.8
```

H0: mean(y1,y2,y3,y4) == mu

H1: mean(y1,y2,y3,y4) != mu

b)

Now we want to test all variable with HotelingsT2 function

```
library("ICSNP")

HotellingsT2(dat,mu= c(48,49,50,51),test = "chi")

##
##  Hotelling's one sample T2-test
##
## data:  dat
## T.2 = 1.7708, df = 4, p-value = 0.7778
## alternative hypothesis: true location is not equal to c(48,49,50,51)
```

According to this test we can say that the H0 accept becuse our p-value is more than 0.05(alpha) and it means that the lower jaw bone size of boys are not equal with mu(48,49,50,51) in 8,8.5,9,9.5 years old.

c)

Now we want to test each variable mean with mu value

```
#H0: mean(y1) == 48

#H1: mean(y1) != 48

t.test(y1,mu = 48)

##
##  One Sample t-test
##
## data:  y1
## t = 1.1587, df = 19, p-value = 0.2609
## alternative hypothesis: true mean is not equal to 48
## 95 percent confidence interval:
##  47.47583 49.82417
## sample estimates:
## mean of x
##     48.65
```

according to tests outputs we can say that the p-value is more that alpha and H0 accept and we can say the mean of y1 approximately is equal to 48.65.

```r
#H0: mean(y2) == 49

#H1: mean(y2) != 49
t.test(y2, mu = 49)
```

```
##
##  One Sample t-test
##
## data:  y2
## t = 1.1006, df = 19, p-value = 0.2848
## alternative hypothesis: true mean is not equal to 49
## 95 percent confidence interval:
##  48.43645 50.81355
## sample estimates:
## mean of x
##    49.625
```

according to tests outputs we can say that the p-value is more that alpha and H0 accept and we can say the mean of y2 approximately is equal to 49.625.

```r
#H0: mean(y3) == 50

#H1: mean(y3) != 50
t.test(y3, mu = 50)
```

```
##
##  One Sample t-test
##
## data:  y3
## t = 0.96917, df = 19, p-value = 0.3446
## alternative hypothesis: true mean is not equal to 50
## 95 percent confidence interval:
##  49.33902 51.80098
## sample estimates:
## mean of x
##     50.57
```

according to tests outputs we can say that the p-value is more that alpha and H0 accept and we can say the mean of y3 approximately is equal to 50.57.

```r
#H0: mean(y4) == 51

#H1: mean(y4) != 51
t.test(y4, mu = 51)
```

```
##
##  One Sample t-test
##
## data:  y4
## t = 0.73658, df = 19, p-value = 0.4704
## alternative hypothesis: true mean is not equal to 51
## 95 percent confidence interval:
##  50.17131 52.72869
## sample estimates:
## mean of x
##     51.45
```

according to tests outputs we can say that the p-value is more that alpha and H0 accept and we can say the mean of y4 approximately is equal to 51.45.

End.