Property Assessment Problem

Shah Shoib

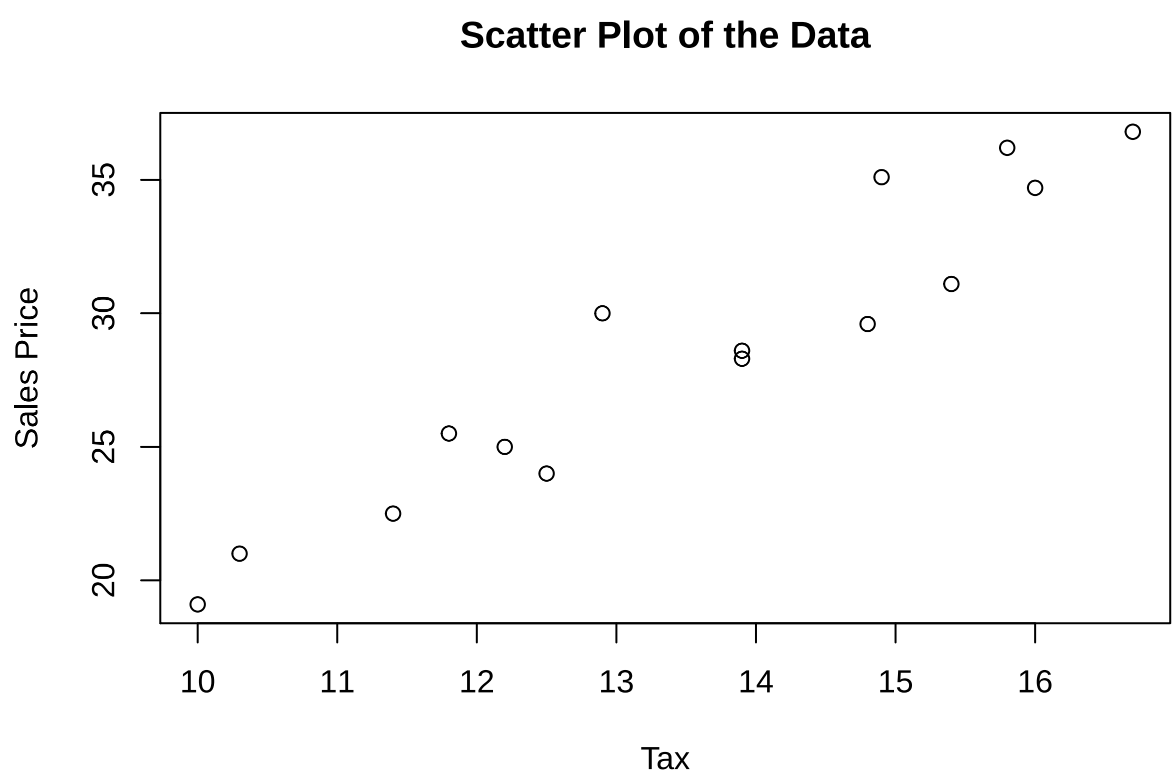
March 30, 2016

Property assessments:The data that follow show assessed value for property tax purposes (Y" in thousand dollars) and sales price (Y2, in thousand dollars) for a sample of 15 parcels of land for industrial development sold recently in "arm's length" transactions in a tax district.Assume that bivariate normal model (2.74) is appropriate here.

```
property_data <- read.table("http://www.stat.ufl.edu/~rrandles/sta4210/Rclassnotes/data/textdatasets/Ku

attach(property_data)
head(property_data);dim(property_data)
```

```
##    Tax Sales_Price
## 1 13.9        28.6
## 2 16.0        34.7
## 3 10.3        21.0
## 4 11.8        25.5
## 5 16.7        36.8
## 6 12.5        24.0

## [1] 15  2
```

```
n<-15

#a. Plot the data in a scatter diagram. Does the bivariate normal model
#appear to be appropriate here? Discuss.
plot(Tax,Sales_Price,main="Scatter Plot of the Data",ylab="Sales Price")
```




```r
mean1 <-mean(Tax)
var1<-sum((Tax-mean1)^2)/n
sd1<-sqrt(var1)
mean2 <-mean(Sales_Price)
var2<-sum((Sales_Price-mean2)^2)/n
sd2<-sqrt(var2)

sd12 <- mean((Tax-mean1)*(Sales_Price-mean2))


(cor12<-sd12/(sd1*sd2))# coefficient of determination
```

```
## [1] 0.9528469
```

```r
#Since the r^2 is not equal to zero, it means that variable are dependent.
#Here Y1 tends to be large when Y2 is large and also sd12 is positive so
#the rho12 is also positive.


#b. Calculate r^2. What parameter is estimated by r^2? What is the
#interpretation of this parameter?

paste("Coefficient of determination is",round(cor12,4))
```

```
## [1] "Coefficient of determination is 0.9528"
```

```r
#c. Test whether or not Y1,and Y2 are statistically independent in the
#population, using test statistic (2.87) and level of significance .01.
#State the alternatives, decision rule, and conclusion.

#H0: rho12=0
#Ha: rho12 !=0

tstar <- cor12*sqrt(n-2)/sqrt(1-(cor12)^2)

qt(1-.01/2,n-2)
```

```
## [1] 3.012276
```

```r
#if t* <= 3.012276 conclude ho
#if t* > 3.012276 conclude ha
#Since t* >3.012276, we reject the null hypothesis and accept the
#alternate hypotheis.

#d. To test P12 = .6 versus P12 != .6, would it be appropriate to use test
#statistic (2.87)?

#No, it wouldn't be appropriate to use the test statistics

#a. Obtain the Spearman rank correlation coefficient rs.

#Method 1 to calculate the Spearman Rank Order Coefficient
r1 <- rank(Tax)
r2 <- rank(Sales_Price)
d <- r1-r2
d_sqr <- d^2
n<-15
sp.rhou <- 1 - ((6*sum(d_sqr))/(n*(n^2-1)))

#Method 2 to calculate the Spearman Rank Order Coefficient
r1 <- rank(Tax)
r2 <- rank(Sales_Price)
r1.bar<-mean(r1)
r2.bar<-mean(r2)
sp.rhou2<-(sum((r1-r1.bar)*(r2-r2.bar)))/(sum((r1-r1.bar)^2)*sum((r2-r2.bar)^2))


#b. Test by means of the Spearman rank correlation coefficient whether an
#association exists between property assessments and sales prices using
#test statistic (2.101) with alha = .01. State the alternatives, decision
#rule, and conclusion.

#The Spearman rank correlation coefficient can be used to test the
#alternatives:
#Ho: There is no association between YI and Y2
#Ha: There is association between YI and Y2
#Two sided test is required since Ha includes either positive or negative
#association.
```

```r
#if t* is less than t(1-alpha/2,n-2) conclude ho
#if t* is greater than t(1-alpha/2,n-2) conclude ha

tstar <- sp.rhou*sqrt(n-2)/sqrt(1-sp.rhou^2)

#for alpha = .01
(t<-qt(1-.01/2,n-2))
```

```
## [1] 3.012276
```

```r
2*pt(2.79,df=22)
```

```
## [1] 1.989325
```

```r
#Since tstar > t-crtical, we conclude Ha,that there is a association
#between Tax variable and Sales Price variable

#c. How do your estimates and conclusions in parts (a) and (b) compare to those obtained in Problem 2.4

e<-4.0165
hii=0.096
MSE=109.95
p<-3
d<-(e^2/p*MSE)*((hii/(1-hii)^2))
t <- e/sqrt(MSE*(1-hii))
4.0165/sqrt(109.95)
```

```
## [1] 0.3830453
```

```r
se=sqrt(MSE*(1-hii))
ri<-e/se
detach(property_data)
```