DataMining1

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2/27/2020

#Libraries used in this task

```
library(ISLR)
library(caret)

## Loading required package: lattice

## Loading required package: ggplot2

library(dplyr)

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

library(glmnet)

## Warning: package 'glmnet' was built under R version 3.6.2

## Loading required package: Matrix

## Loaded glmnet 3.0-2
```

#SafeBabies is the filtered dataset from Carseats with only three variables like Sales,Price,ShelveLoc

```
SafeBabies <- Carseats %>% select("Sales", "Price", "ShelveLoc")
```

#To know data type of each variable

```
str(SafeBabies)

## 'data.frame':    400 obs. of  3 variables:
##  $ Sales    : num  9.5 11.22 10.06 7.4 4.15 ...
##  $ Price    : num  120 83 80 97 128 72 108 120 124 124 ...
##  $ ShelveLoc: Factor w/ 3 levels "Bad","Good","Medium": 1 2 3 3 1 1 3 2 3
3 ...
```

#Filter the data according to ShelveLoc location catagory good and bad.

```
#Good ShelveLoc data
good <- filter(SafeBabies,ShelveLoc == "Good")
#Bad ShelveLoc data
bad <- filter(SafeBabies,ShelveLoc=="Bad")
```

#To maximize the profit we based on ShelveLoc following mathematical analysis is pre-required Profit = Sales * (Price - ProductionCost) Profit = S*(P-C)————-(1) S = -b1*P+b0 By doing regression we can find values of b0,b1 So equation(1) becomes Profit = (-b1*P+b0)*(P-C) Profit = -b1*P^2+b1*PC+b0*P-b0*C ——-(2) Now Profit is quadratioc equation to find value of P(Price) by doing derivative of eq(2) to 0.

#Regression for finding b0,b1 values for good and bad ShelvLOc

```
good_model <- lm(Sales ~ Price,data=good)
summary(good_model)

##
## Call:
## lm(formula = Sales ~ Price, data = good)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -3.721 -1.351 -0.098  1.483  4.353
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 17.968864   0.988008  18.187  < 2e-16 ***
## Price       -0.065785   0.008199  -8.023 5.85e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.888 on 83 degrees of freedom
## Multiple R-squared:  0.4368, Adjusted R-squared:   0.43
## F-statistic: 64.37 on 1 and 83 DF,  p-value: 5.848e-12

bad_model <- lm(Sales ~ Price,data=bad)
summary(bad_model)

##
## Call:
## lm(formula = Sales ~ Price, data = bad)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.4622 -1.0617 -0.2014  1.2050  4.6412
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 11.832984   0.990317  11.949  < 2e-16 ***
```

```
## Price       -0.055220   0.008486  -6.507  3.7e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.967 on 94 degrees of freedom
## Multiple R-squared:  0.3105, Adjusted R-squared:  0.3032
## F-statistic: 42.34 on 1 and 94 DF,  p-value: 3.702e-09
```

#Finding Derivative of equation(2) by substituting b1,b0,C=55 values

```
Profit_good <- expression(-0.065785*P^2 + 17.968864*P*55 + (17.968864)*P
+55*0.065785)
D1 <- D(Profit_good,'P')
P_good <- (-0.065785 *55 - 17.968864)/(2 * -0.065785)
P_good

## [1] 164.0727

Profit_bad <- expression(-0.055220*P^2 + 11.832984*P*55 + (11.832984)*P
+55*0.055220)
D2 <- D(Profit_bad,'P')
P_bad <- (-0.055220 *55 - 11.832984)/(2 * -0.055220)
P_bad

## [1] 134.644
```

When cost "C" is range from 40 to 85

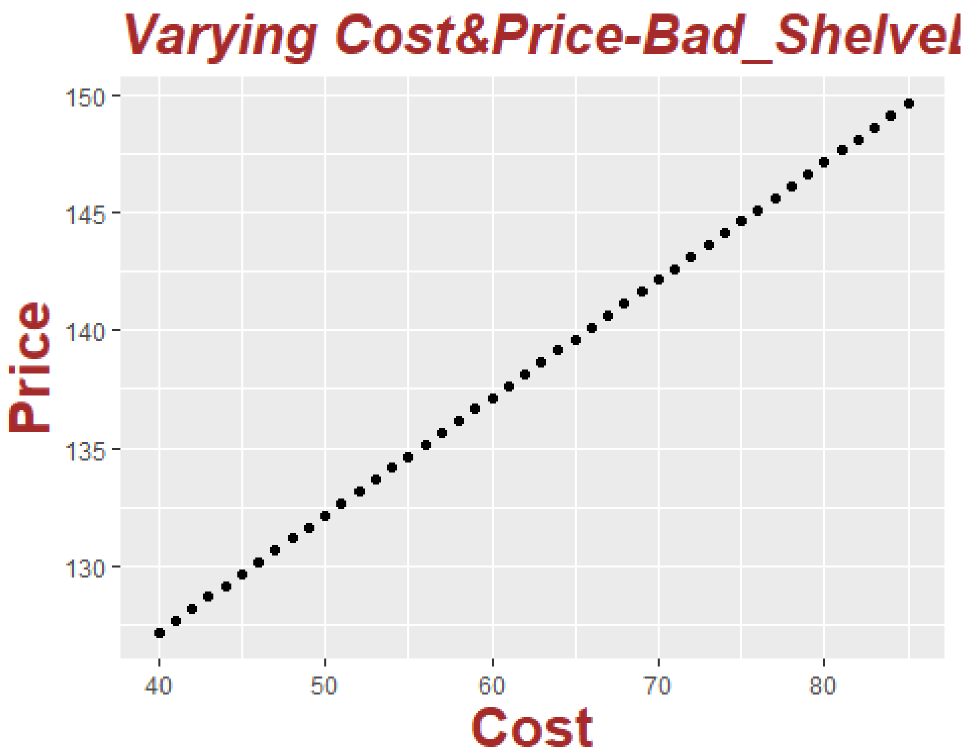
```
c <- 40:85
Price_good <- numeric(length=length(c))
for (i in seq_along(c)){
   Price_good[i] <- (-0.065785 *c[i] - 17.968864)/(2 * -0.065785)
   optimal_good <- cbind.data.frame(Varying_cost = c(40:85),Price_good)
}
Price_good

##  [1] 156.5727 157.0727 157.5727 158.0727 158.5727 159.0727 159.5727
##  [8] 160.0727 160.5727 161.0727 161.5727 162.0727 162.5727 163.0727
## [15] 163.5727 164.0727 164.5727 165.0727 165.5727 166.0727 166.5727
## [22] 167.0727 167.5727 168.0727 168.5727 169.0727 169.5727 170.0727
## [29] 170.5727 171.0727 171.5727 172.0727 172.5727 173.0727 173.5727
## [36] 174.0727 174.5727 175.0727 175.5727 176.0727 176.5727 177.0727
## [43] 177.5727 178.0727 178.5727 179.0727

c <- 40:85
Price_bad <- numeric(length=length(c))
for (i in seq_along(c)){
   Price_bad[i] <- (-0.055220 *c[i] - 11.832984)/(2 * -0.055220)
   optimal_bad <- cbind.data.frame(Varying_cost = c(40:85),Price_bad)
}
Price_bad
```

```
##  [1] 127.144 127.644 128.144 128.644 129.144 129.644 130.144 130.644
##  [9] 131.144 131.644 132.144 132.644 133.144 133.644 134.144 134.644
## [17] 135.144 135.644 136.144 136.644 137.144 137.644 138.144 138.644
## [25] 139.144 139.644 140.144 140.644 141.144 141.644 142.144 142.644
## [33] 143.144 143.644 144.144 144.644 145.144 145.644 146.144 146.644
## [41] 147.144 147.644 148.144 148.644 149.144 149.644
```

Plots between varying cost and respective price for good and bad shelveloc

```
ggplot(optimal_good,aes(x=Varying_cost,y=Price_good))+geom_point()+
ggtitle("Varying Cost&Price-Good_ShelveLoc") +xlab("Cost") + ylab("Price") +
theme(plot.title = element_text(color="blue", size=20, face="bold.italic"),
axis.title.x = element_text(color="blue", size=20, face="bold"),
axis.title.y = element_text(color="blue", size=20, face="bold")
)
```


```
ggplot(optimal_bad,aes(x=Varying_cost,y=Price_bad))+geom_point()+
ggtitle("Varying Cost&Price-Bad_ShelveLoc") +xlab("Cost") + ylab("Price") +
theme(plot.title = element_text(color="brown", size=20, face="bold.italic"),
axis.title.x = element_text(color="brown", size=20, face="bold"),
axis.title.y = element_text(color="brown", size=20, face="bold")
)
```



Varying Cost&Price-Bad_Shelvel
Price
150
145
140
135
130
40
50
60
70
80
Cost