SafeBabies

#Required libraries:

library(ISLR)  
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(ggplot2)

#Data segregation:

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

## Sales Price ShelveLoc  
## 1 9.50 120 Bad  
## 2 11.22 83 Good  
## 3 10.06 80 Medium  
## 4 7.40 97 Medium  
## 5 4.15 128 Bad  
## 6 10.81 72 Bad

BadSeats <- filter(SafeBabies, ShelveLoc == 'Bad')  
  
GoodSeats <- filter(SafeBabies, ShelveLoc == 'Good')

#Model to find b0 & b1 values for the respective two locations:

Why?

Total Profit = Sales \* (Price - Production Cost)

Total Profit = (-b1 \* Price + b0) \* (Price - Production Cost)

By regression we can find values of b0 & b1.

The we can convert Total Profit into a quadratioc equation to find Price by performing derivative of the equation.

Model\_BadSeats <- lm(Sales ~ Price, data = BadSeats)  
  
Model\_GoodSeats <- lm(Sales ~ Price, data = GoodSeats)

#Finding Profit by substituting values:

Equation\_GoodSeats <- expression(-0.065785\*P^2 + 17.968864\*P\*55 + (17.968864)\*P +55\*0.065785)  
Derivative\_Price\_GoodSeats <- D(Equation\_GoodSeats,'P')  
Price\_GoodSeats <- (-0.065785 \*55 - 17.968864)/(2 \* -0.065785)  
Price\_GoodSeats

## [1] 164.0727

Equation\_BadSeats <- expression(-0.055220\*P^2 + 11.832984\*P\*55 + (11.832984)\*P +55\*0.055220)   
Derivative\_Price\_BadSeats <- D(Equation\_BadSeats,'P')  
Price\_BadSeats <- (-0.055220 \*55 - 11.832984)/(2 \* -0.055220)  
Price\_BadSeats

## [1] 134.644

#Finding for the cost range 40 - 85:

c <- 40:85  
Optimal\_GoodSeats <- numeric(length=length(c))  
for (i in seq\_along(c)){  
 Optimal\_GoodSeats[i] <- (-0.065785 \*c[i] - 17.968864)/(2 \* -0.065785)  
}  
  
  
c <- 40:85  
Optimal\_BadSeats <- numeric(length=length(c))  
for (i in seq\_along(c)){  
 Optimal\_BadSeats[i] <- (-0.055220 \*c[i] - 11.832984)/(2 \* -0.055220)  
}

#Plotting:

Pricing <- data.frame(Optimal\_GoodSeats, Optimal\_BadSeats)  
  
ggplot(Pricing) +  
geom\_smooth(aes(x = c, y = Optimal\_GoodSeats, color = "Good"), method = "loess") +  
geom\_smooth(aes(x = c, y = Optimal\_BadSeats, color = "Bad"), method = "loess") +  
labs(x = "Production Cost", y = "Optimal Price", title = "Optimal Price vs Production Cost", color = "Shelve Location")

