

M10_Exercise_FunctionalFormFitting_Abhishek_Jain

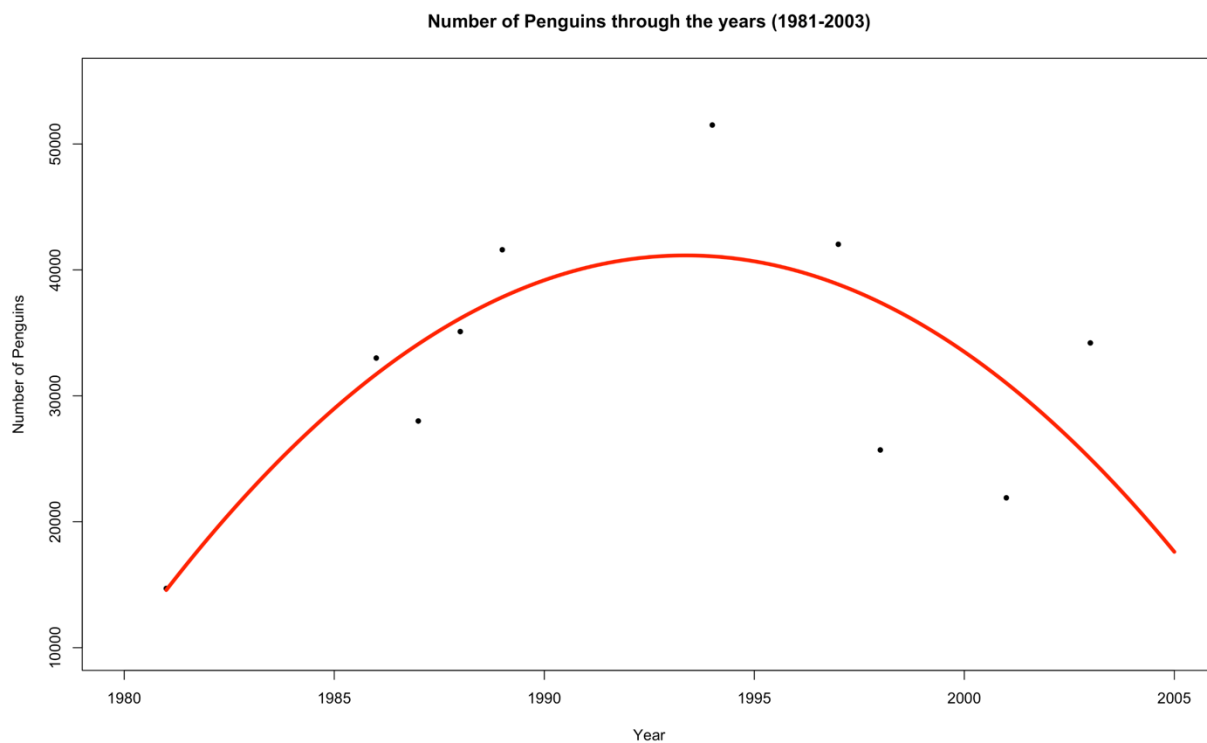
R code

```
a<-read.csv("penguin.csv")
year <- a$Year
numPenguins <- a$Penguins
scatter1 <- plot(x = year, y = numPenguins,

                 main = "Number of Penguins through the years (1981-2003)",
                 xlab = "Year", ylab = "Number of Penguins", pch = 20,
                 xlim = c(1980,2005), ylim = c(10000, 55000))

yearSquare <- year^2
quadCurve <- lm(numPenguins ~ year + yearSquare)
yearSeq <- seq(1981, 2005, 0.1)
penguinPred <- predict(quadCurve, list(year = yearSeq, yearSquare = yearSeq^2))
lines(yearSeq, penguinPred, col="red", lwd=4)
```

Screenshot



Opinion about correlation

The R-squared value of the model is 0.54, so it may be moderately correlated. It only passes through a few points. We cannot say that change in year affects the difference in the number of penguins with certainty. We cannot determine whether it is a positive or negative correlation. The line could be a better/best fit for the data. This looks more like a period curve fit. Though the years are increasing, the number of penguins goes up and down, so they are not correlated.

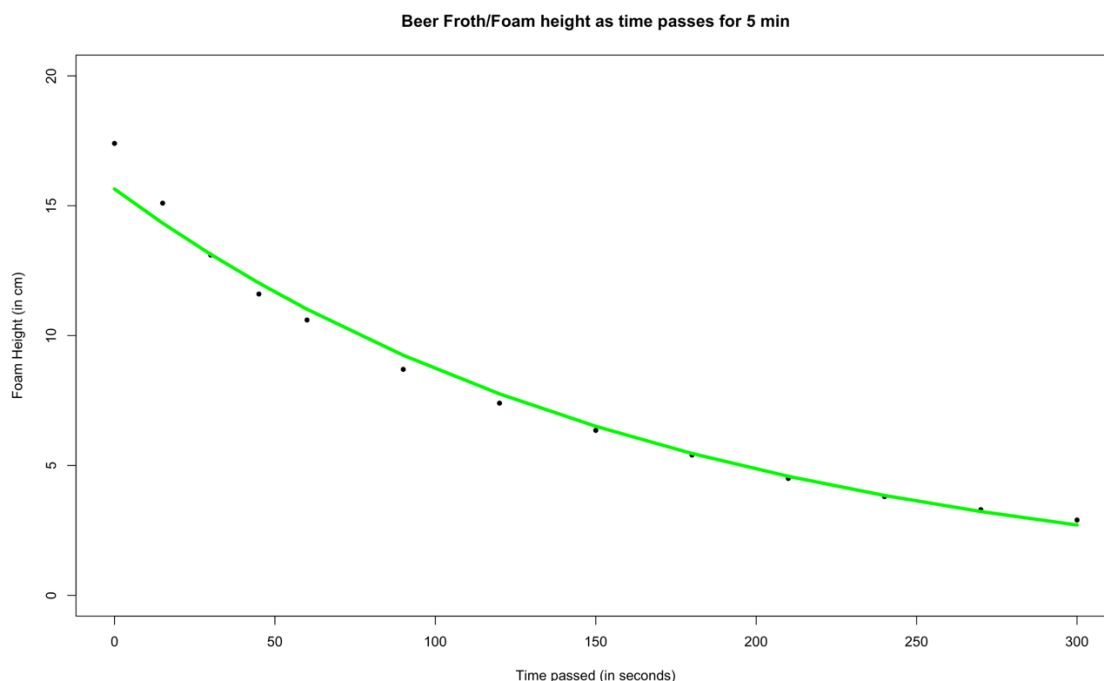
Rcode

```
beerfrothData<-read.csv("beerfroth.csv")
time <- beerfrothData$Time
foam <- beerfrothData$Foam
scatter2 <- plot(x = time, y = foam,

                 main = "Beer Froth/Foam height as time passes for 5 min",
                 xlab = "Time passed (in seconds)",
                 ylab = "Foam Height (in cm)",
                 pch = 20, ylim = c(0, 20))

expCurve<-lm(log(foam)~time)
beerPred<-exp(predict(expCurve, list(time)))
lines(time, beerPred, col="green", lwd=4)
```

Screenshot



Opinion about correlation

The decay in foam height looks like an exponential fit as it decreases rapidly in the beginning and decreases/shrinks slowly after a point. Still, it never goes under 0 or increases after the decrease. But here, the early decay rate did not follow an exponential curve. It might not be the best fit due to some unmentioned external factors. But the nearest functional fit is the exponential fit. Since the values decrease together, they are positively correlated. The R-squared value of the model (0.99) is close to 1, so the line fits well.