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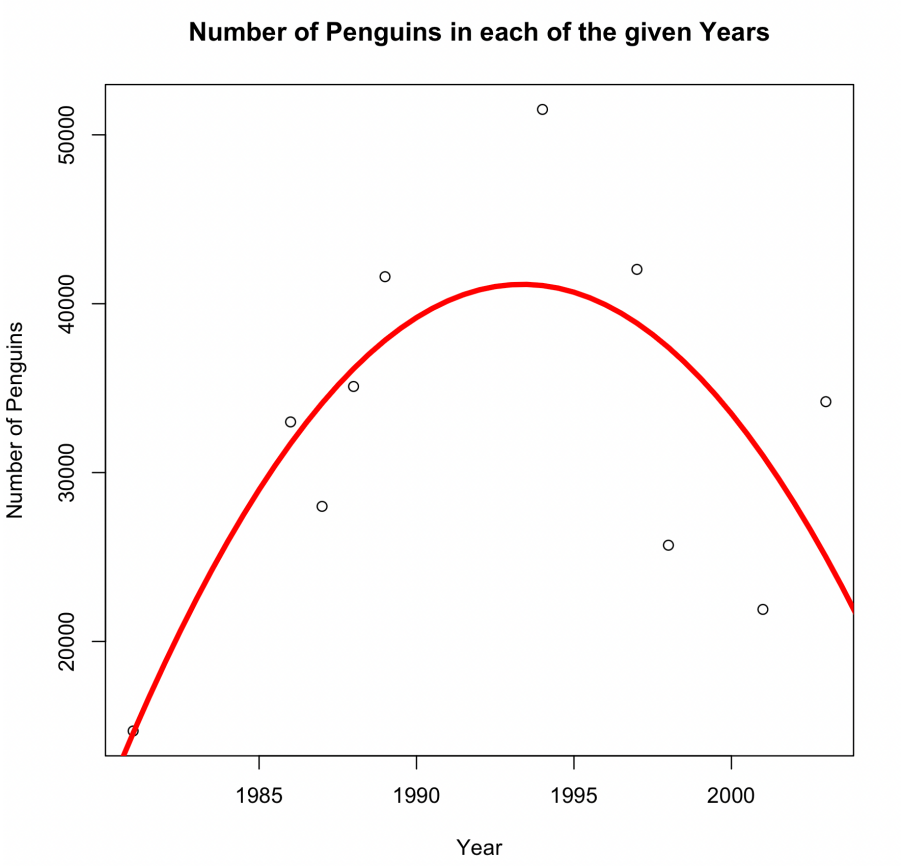
Module 10 Exercise: Functional Form Fitting

i. **The entire R code used when creating the scatter plot in (1), and the quadratic curve in (2)**

```
a<-read.csv("penguin.csv")
year<-a$Year
png<-a$Penguins
plot(a$Year, a$Penguins, xlab="Year", ylab="Number of Penguins", main="Number of Penguins in each of the given Years")
yearSqu<-year*year
quadm<-lm(png~year+yearSqu)
s<-seq(0,3000,0.5)
pc<-predict(quadm, list(year=s, yearSqu=s^2))
lines(s, pc, col="red", lwd=4)
```

ii. **Screenshot of the scatter plot created in (1) with the quadratic curve created in (2)**



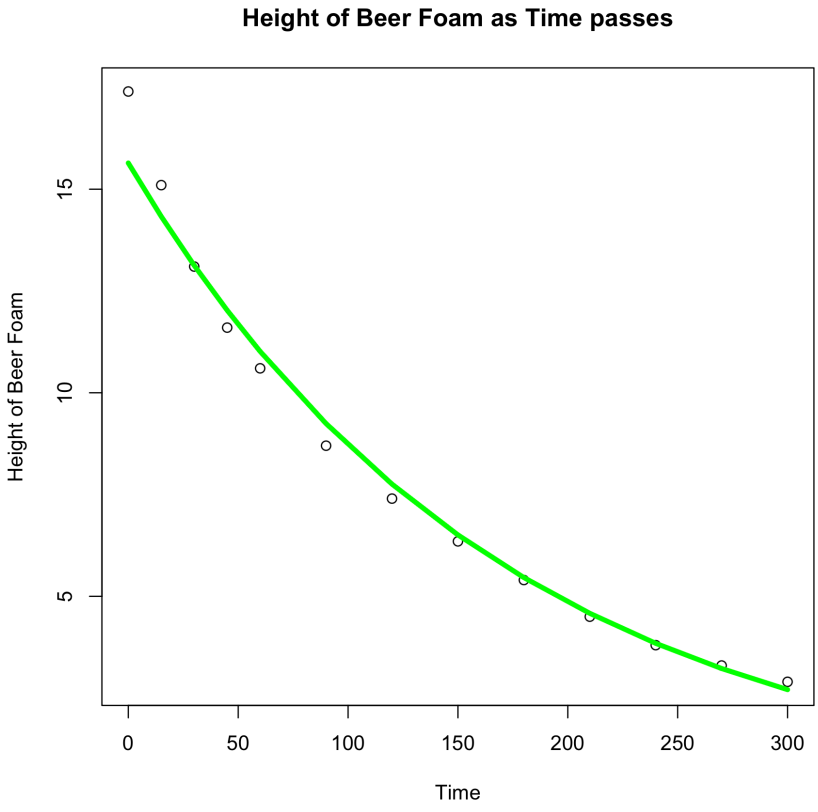
iii. Your opinion about the correlation (or lack thereof) between Penguins and Year

- The discrepancy between the scatter plot and the fitted quadratic curve across various data points suggests that the model fails to demonstrate a significant or consistent correlation between penguin numbers and the years.
- There are noticeable discrepancies where data points stray from the curve, indicating that the quadratic model may fall short in capturing the complex nature of the data.
- The displayed "inverted-U-shaped" curve pattern indicates an initial rise in the penguin population, which peaks at a certain year before it starts to decrease, pointing to a complex and non-linear connection that cannot be simply defined by a direct correlation between the two factors.

iv. The entire R code used when creating the scatter plot in (4), and the exponential/logarithmic curve in (5)

```
a<-read.csv("beerfroth.csv")
plot(a$Time, a$Foam, xlab="Time", ylab="Height of Beer Foam", main="Height of Beer Foam as Time passes")
em<-lm(log(a$Foam)~a$Time)
pd<-exp(predict(em, list(a$Time)))
lines(a$Time, pd, col="green", lwd=4)
```

v. Screenshot of the scatter plot created in (4) with the exponential/logarithmic curve created in (5)



vi. Your opinion about the correlation (or lack thereof) between beer foam height and time

- The scatter plot closely aligns with the exponential curve for most data points, suggesting a robust agreement between the model and actual observations.
- Both the scatter plot and the fitted exponential curve show a pronounced negative correlation, with beer foam height diminishing over time.
- The model portrays an exponential decrease in foam height, characterized by a swift initial drop that gradually levels off, consistent with empirical observations.
- This examination validates the predictability of foam height over time, offering potential utility for the beverage industry.