

Fitting A Linear Regression Model

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12/06/2019

A rocket motor is manufactured by bonding together two types of propellants, an igniter and a sustainer. The shear strength of the bond (Y) is thought to be a linear function of the age of the propellant (X) when the motor is cast.

Fit a simple linear regression to the data that involving the following steps by using R.

- a) Plot the scatter diagram for the data.
- b) Estimate the parameters of a simple linear regression model.
- c) Obtain the fitted values of the model.
- d) Show that the sum of fitted values and sum of observed values of Y are equal.
- e) Obtain the residuals and show that the sum of residuals is zero.

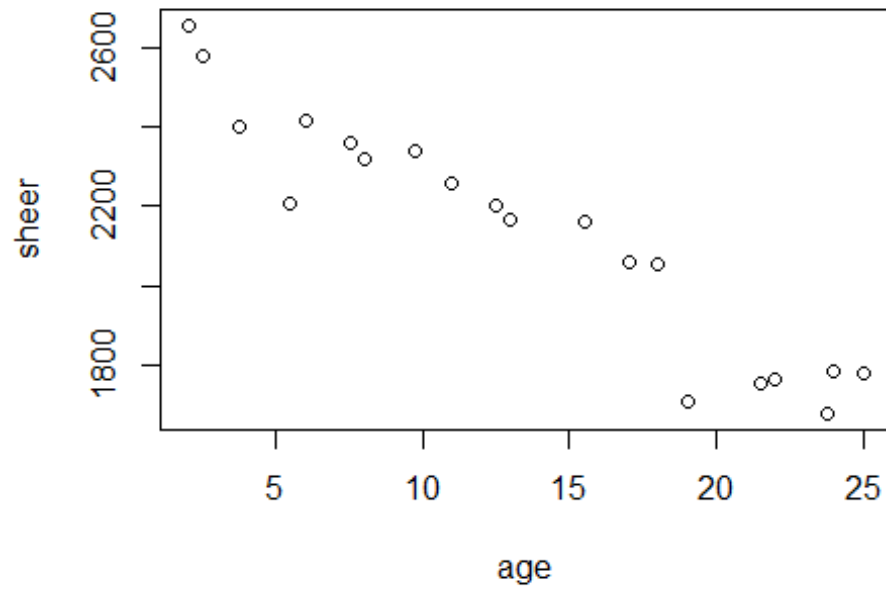
```
library(readxl)

## Warning: package 'readxl' was built under R version 3.5.2

lab1 <- read_excel("C:/Users/Jeevan/Desktop/Christ
University/Statistics/Linear Regression/lab1.xlsx")
View(lab1)
attach(lab1)

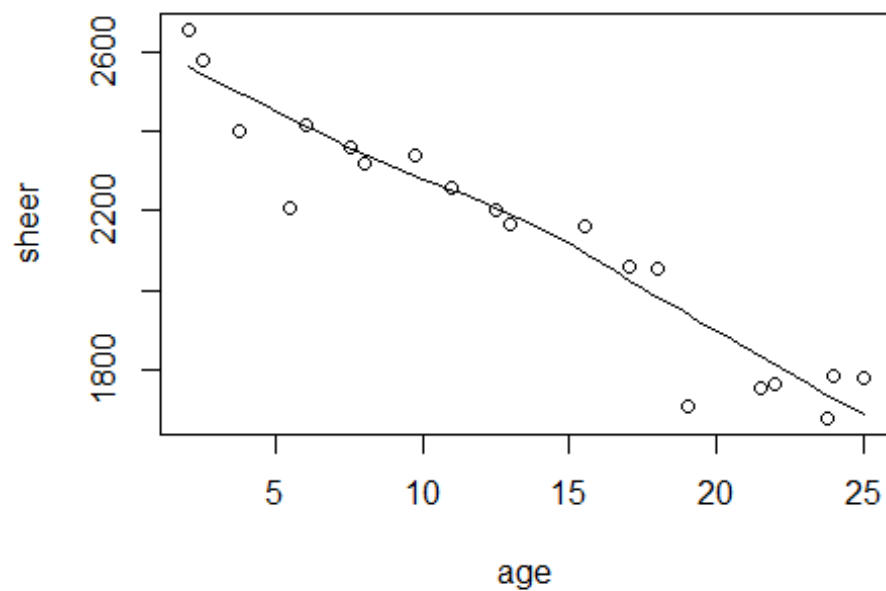
plot(age, sheer, main="Scatter Plot")
```

Scatter Plot



```
scatter.smooth(age,sheer,main = "Fitted Linear Scatter Plot")
```

Fitted Linear Scatter Plot



The above figure shows a scatter plot for the data with a fitted linear regression model.

```

model=lm(sheer~age)
model

##
## Call:
## lm(formula = sheer ~ age)
##
## Coefficients:
## (Intercept)      age
##      2627.82      -37.15

```

We fit a linear model to the variables which gives us the slope intercept.

```

fit = fitted.values(model)
fit

##           1           2           3           4           5           6           7           8
## 2051.942 1745.425 2330.594 1996.211 2423.478 1921.904 1736.136 2534.938
##           9          10          11          12          13          14          15          16
## 2349.170 2219.133 2144.826 2488.496 1698.983 2265.575 1810.443 1959.058
##          17          18          19          20
## 2404.901 2163.402 2553.515 1829.020

```

These are the fitted values of the model.

```

res=resid(model)
sum(res)

## [1] -1.367795e-13

sum(fit)

## [1] 42627.15

sum(sheer)

## [1] 42627.15

```

Here we see that the sum of residuals is nearly zero.

Also the sum of fitted values and sum of observed values of Y are equal.