Porsche

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Porsche

reference:
- Cannon, et al., Stat2, chapter 04, example 4.10

Import the data.

```
data <- read.csv("PorschePrice.csv", header=TRUE)
head(data)
```

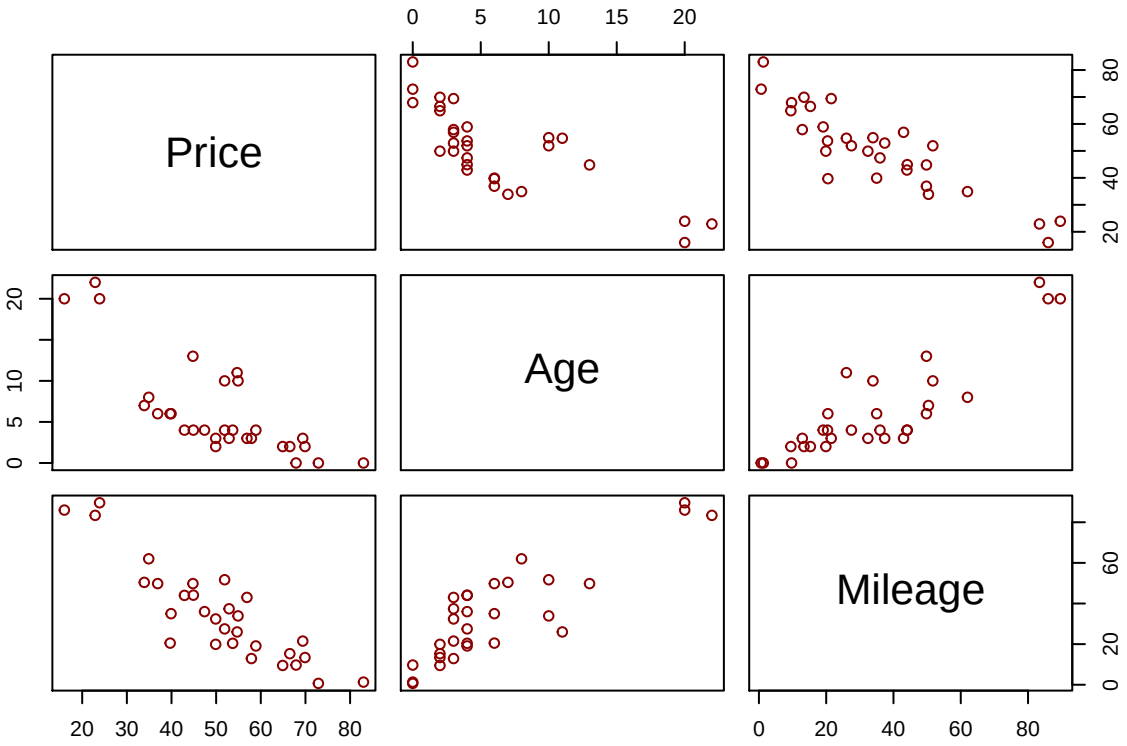
```
##   Price Age Mileage
## 1  69.4   3    21.5
## 2  56.9   3    43.0
## 3  49.9   2    19.9
## 4  47.4   4    36.0
## 5  42.9   4    44.0
## 6  36.9   6    49.8
```

```
dim(data)
```

```
## [1] 30  3
```

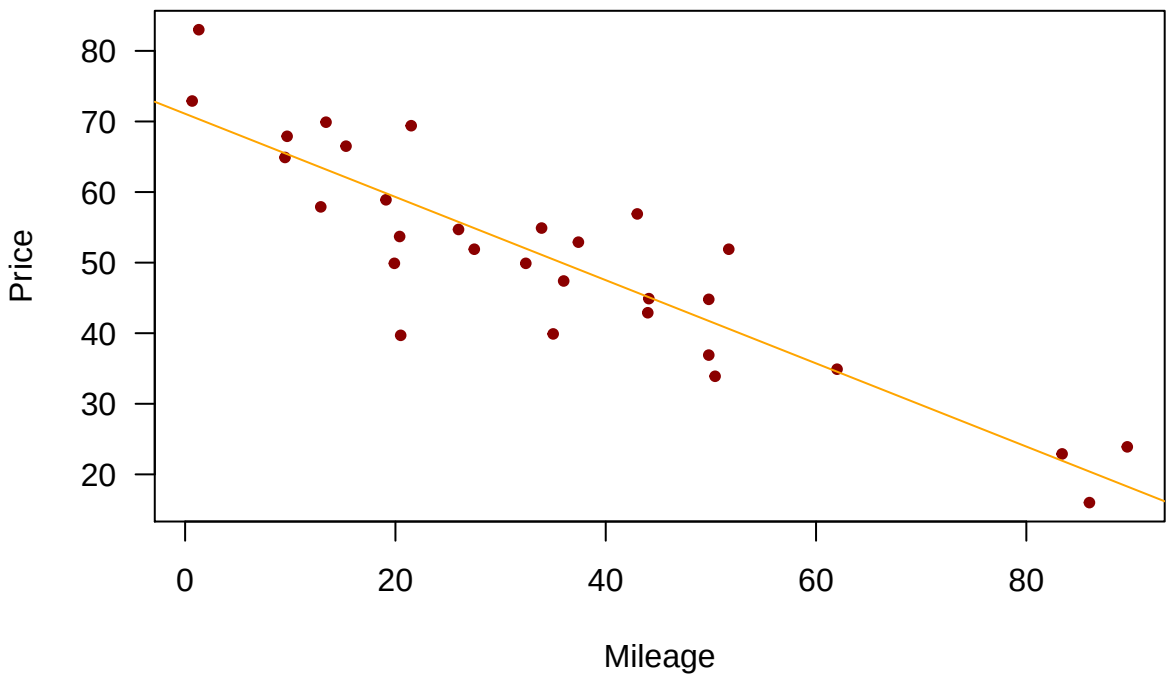
Scatterplot matrix.

```
pairs(~ Price + Age + Mileage, data=data, col="darkred")
```



View the data.

```
plot(Price ~ Mileage, data=data,
     pch=20, col="darkred", las=1)
Porsche.lm <- lm(Price ~ Mileage, data=data)
abline(Porsche.lm, col="orange")
```



Slope of the regression line.

```
Porsche.lm
```

```
##
## Call:
## lm(formula = Price ~ Mileage, data = data)
##
## Coefficients:
## (Intercept)      Mileage
##     71.0905      -0.5894
```

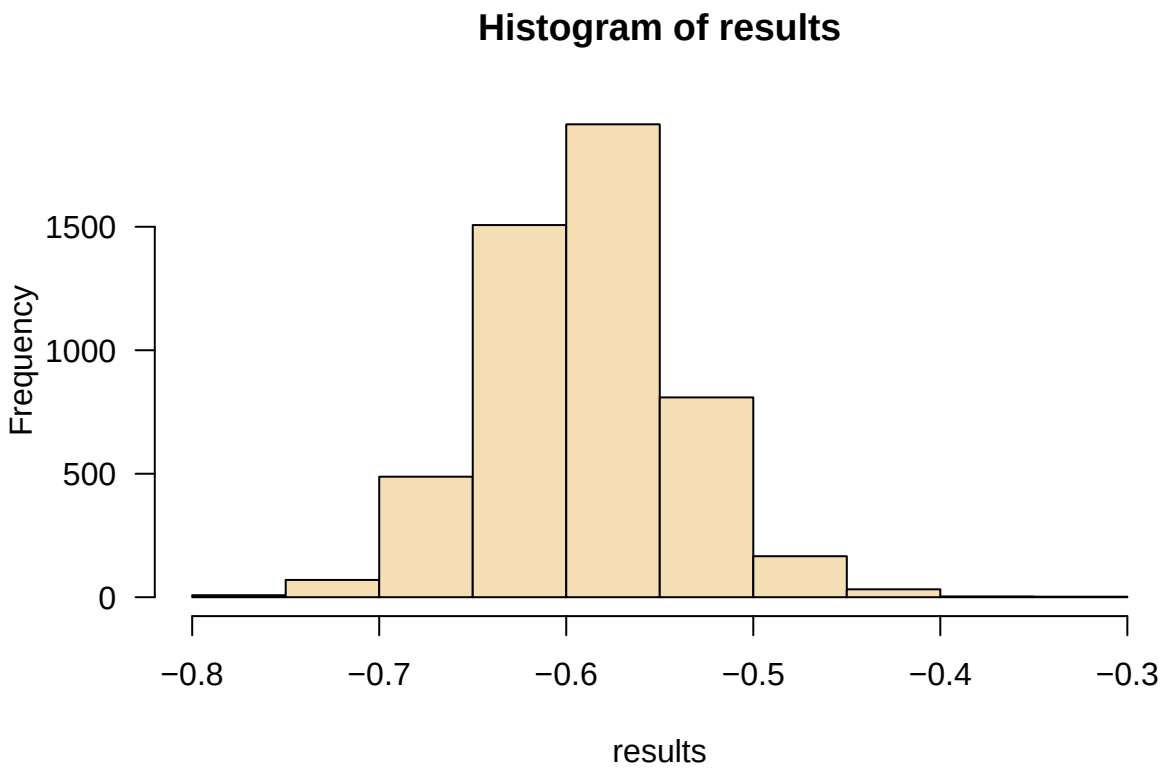
Bootstrap slope.

```
sample.idx <- sample(1:30, replace=TRUE)
Porsche.bootstrap.lm <- lm(Price ~ Mileage, data=data[sample.idx, ])
Porsche.bootstrap.lm
```

```
##
## Call:
## lm(formula = Price ~ Mileage, data = data[sample.idx, ])
##
## Coefficients:
## (Intercept)      Mileage
##     72.5002      -0.5962
```

Bootstrap sampling distribution for sample slope.

```
n.trials <- 5000
results <- rep(NA, n.trials)
for (i in 1:n.trials){
  sample.idx <- sample(1:30, replace=TRUE)
  Porsche.bootstrap.lm <- lm(Price ~ Mileage, data=data[sample.idx, ])
  results[i] <- coef(Porsche.bootstrap.lm)[2]
}
hist(results,
     las=1, col="wheat")
```



Bootstrap CI for slope . . . method 1 (use bootstrap SE).

```
point.estimate <- coef(Porsche.lm)[2]
alpha <- 0.05
z.star <- qnorm(c(0.025, 0.975))
se.bootstrap <- sd(results)
se.bootstrap
```

```
## [1] 0.0513137
```

```
ci1 <- point.estimate + z.star * se.bootstrap
ci1
```

```
## [1] -0.6899739 -0.4888279
```

Bootstrap CI for slope . . . method 2 (use bootstrap quantiles).

```
ci2 <- quantile(results, c(0.025, 0.975))
ci2
```

```
##       2.5%      97.5%
## -0.6876505 -0.4855593
```

Bootstrap CI for slope ... method 3 (reverse the bootstrap quantiles).

```
qs <- quantile(results, c(0.025, 0.975))
qL <- qs[1]
qU <- qs[2]
ci3 <- c(point.estimate - (qU - point.estimate),
        point.estimate + (point.estimate - qL))
ci3
```

```
##    Mileage    Mileage
## -0.6932426 -0.4911514
```

Bootstrap CI for slope ... three methods.

```
CI.table <- rbind(ci1, ci2, ci3)
colnames(CI.table) <- c("lwr", "upr")
CI.table
```

```
##            lwr        upr
## ci1 -0.6899739 -0.4888279
## ci2 -0.6876505 -0.4855593
## ci3 -0.6932426 -0.4911514
```