project of regmods-010

Executive summary

The goal of this project is to find out: - “Is an automatic or manual transmission better for MPG” - “Quantify the MPG difference between automatic and manual transmissions”

Results: On a significant level of 99%, manual is better than automatic in terms of mpg. Regression shows Manual is 2.083710 mpg better than Automatic.

Data Processing

```
library(datasets)
data(mtcars)
#str(mtcars)
# am is factor variable
mtcars$am <- as.factor(mtcars$am)
levels(mtcars$am) <- c("Automatic", "Manual")
```

Exploratory Data Analysis

```
# look at the y values
hist(mtcars$mpg,20,probability = T, main='histogram of mpg and fitted dnesity')
lines(density(mtcars$mpg))
# relation ship between y and other x values
pairs(mtcars)
```

In particular, how mpg differs in am.

```
boxplot(mpg~am, data = mtcars,
        main = "mpg vs am")
```

Do a hypothesis testing

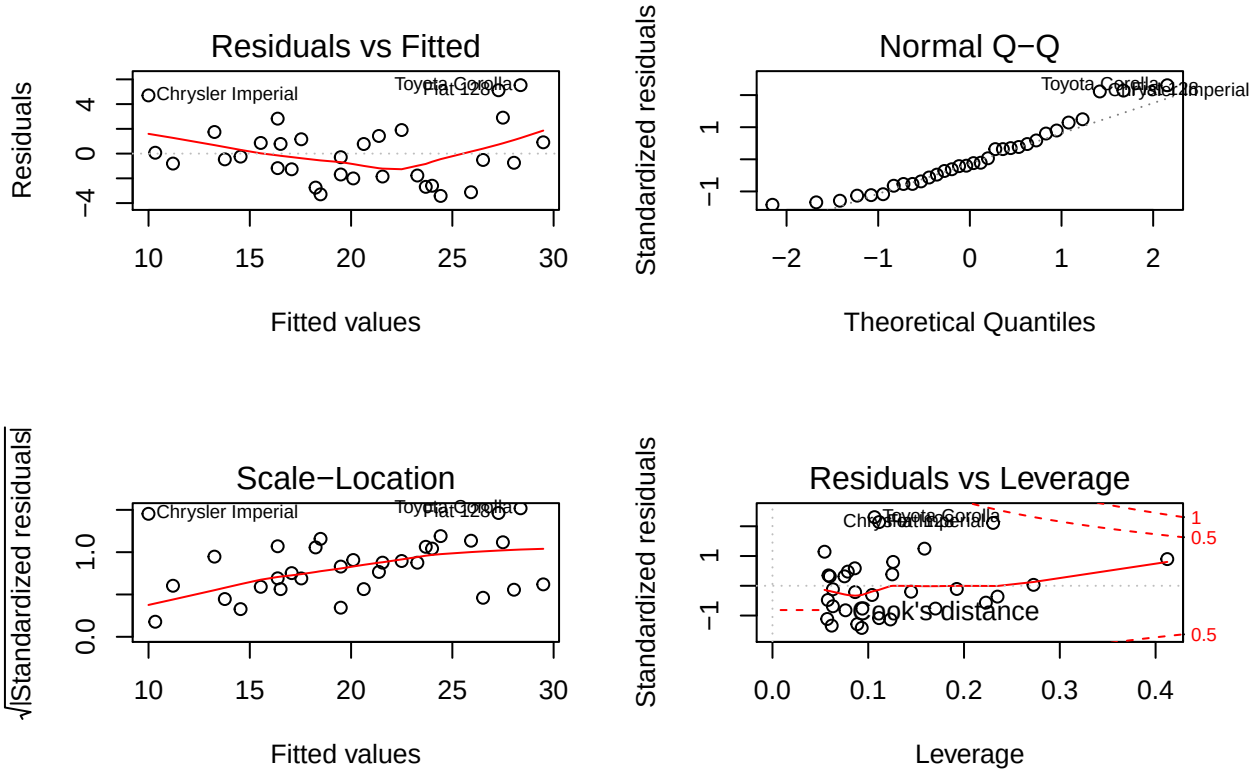
```
t.test(mtcars$mpg[mtcars$am=='Automatic'], mtcars$mpg[mtcars$am=='Manual'])
```

```
##
##  Welch Two Sample t-test
##
## data:  mtcars$mpg[mtcars$am == "Automatic"] and mtcars$mpg[mtcars$am == "Manual"]
## t = -3.7671, df = 18.332, p-value = 0.001374
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.280194  -3.209684
## sample estimates:
## mean of x mean of y
##  17.14737  24.39231
```

On a significant level of 99%, manual is better than automatic in terms of mpg.

Regression Analysis

```
# simple linear regression
fit0 = lm(mpg~am, mtcars)
#summary(fit0)
# multiple regression
fit1 <- lm(mpg~am + wt + hp, data = mtcars)
#summary(fit1)
par(mfrow = c(2,2))
plot(fit1)
```

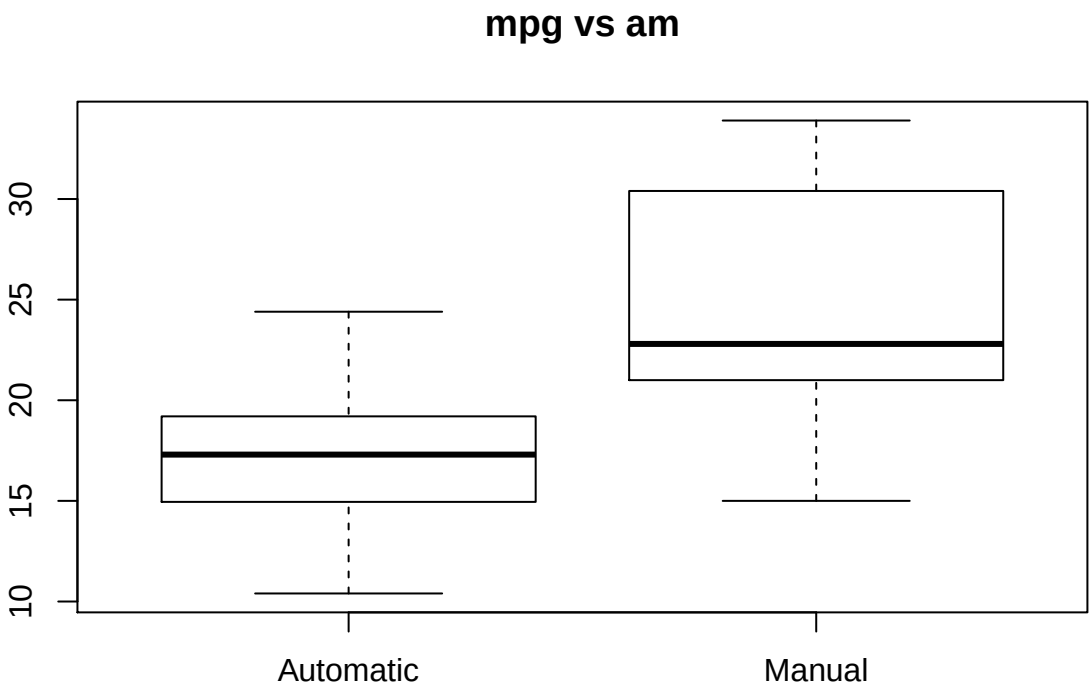


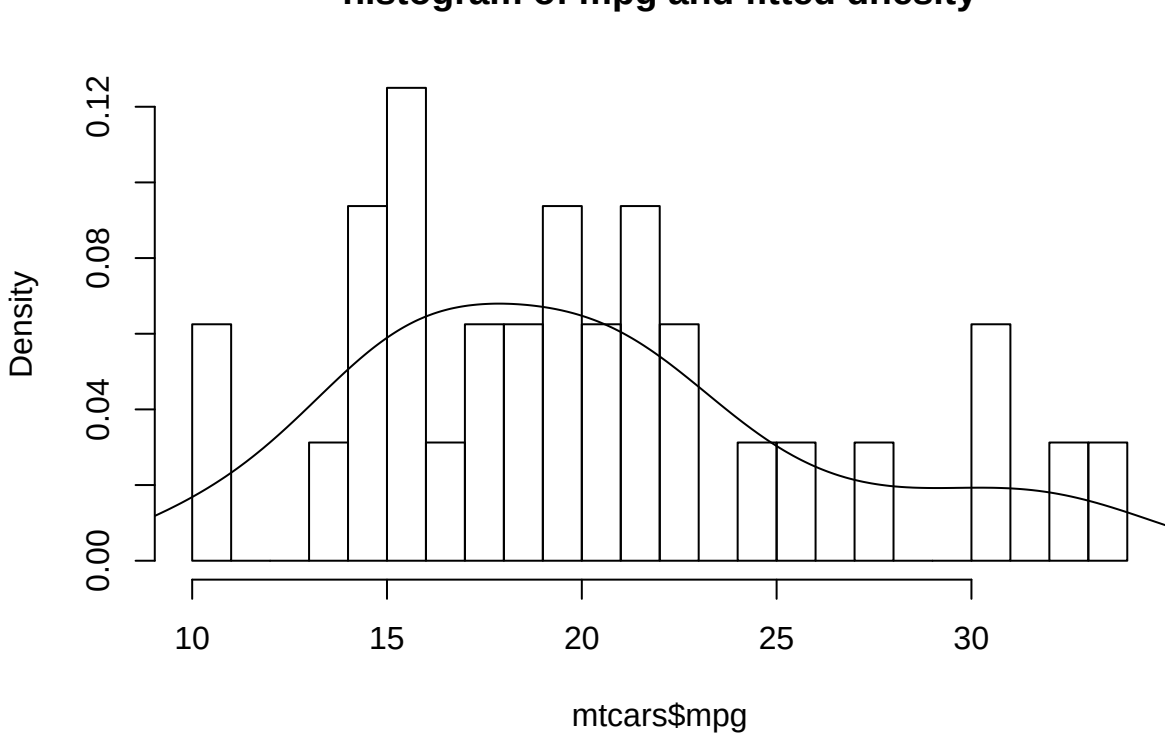

```
# anova test
anova(fit0, fit1)
```

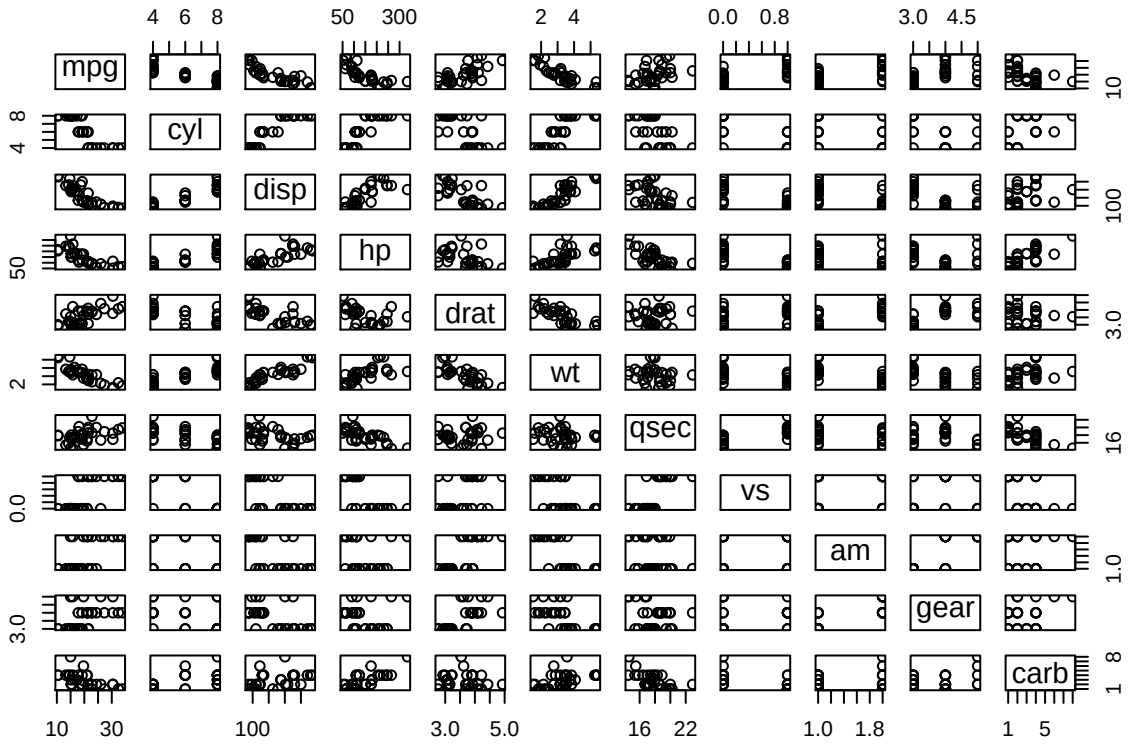
```
## Analysis of Variance Table
##
## Model 1: mpg ~ am
## Model 2: mpg ~ am + wt + hp
##   Res.Df    RSS Df Sum of Sq      F    Pr(>F)
## 1     30 720.90
## 2     28 180.29  2    540.61 41.979 3.745e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

From fit1 model, we can see that Manual is 2.083710 mpg better than automatic.

Appendix


mpg vs am
10
15
20
25
30
Automatic
Manual


histogram of mpg and fitted dnesity
Density
0.00
0.04
0.08
0.12
10
15
20
25
30
mtcars$mpg


mpg
cyl
disp
hp
drat
wt
qsec
vs
am
gear
carb
4 6 8
50 300
2 4
0.0 0.8
3.0 4.5
10 30
100
3.0 5.0
16 22
1.0 1.8
1 5