Regression Model Assignment

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Executive Summary : **You work for Motor Trend, a magazine about the automobile industry. Looking at a data set of a collection of cars, they are interested in exploring the relationship between a set of variables and miles per gallon (MPG) (outcome). They are particularly interested in the following two questions:**

1. Is an automatic or manual transmission better for MPG.

2. Quantify the MPG difference between automatic and manual transmissions.

Let's start with data preprocessing

Start Analyzing the data

We need to see the relationship between mpg and other variables.

```
cor(mtcars$mpg,mtcars[,-1])
```

```
##             cyl       disp        hp      drat        wt     qsec
## [1,] -0.852162 -0.8475514 -0.7761684 0.6811719 -0.8676594 0.418684
##               vs        am      gear      carb
## [1,] 0.6640389 0.5998324 0.4802848 -0.5509251
```

As we can see that there is negative relation between mpg and cyl,disp,hp,wt,carb.

Transmission(0 = automatic, 1 = manual) by checking ?mtcars

some variables need to be converted into factor

```
mtcars$cyl <- factor(mtcars$cyl)
mtcars$vs <- factor(mtcars$vs)
mtcars$am <- factor(mtcars$am)
```

```
mtcars$gear <- factor(mtcars$gear)
mtcars$carb <- factor(mtcars$carb)
```

Quantifying mpg difference

Stepwise model selection using backwards elimination to determine the variables for the good model

let's interpret the summary

According to the procedure we did above the good model have cyl6,cyl8,hp,wt, and amManual variables as the overall p-value is less than 0.001. Additionaly, the result of this model shows that mpg decreases with respect to the cylinders.
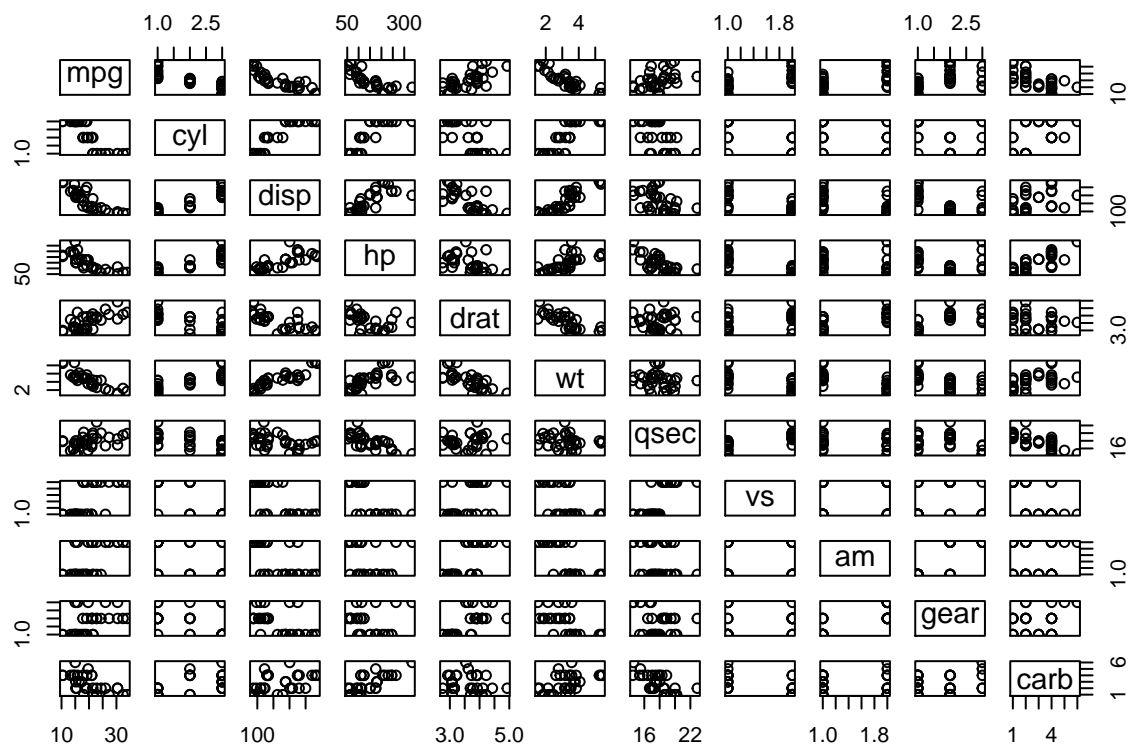
t-test

Conclusion: Cars with a manual transmission are better for mpg than cars with an automatic transmission.

rate of change of conditional mean mpg with respect to am is about 1.8 (95% confident

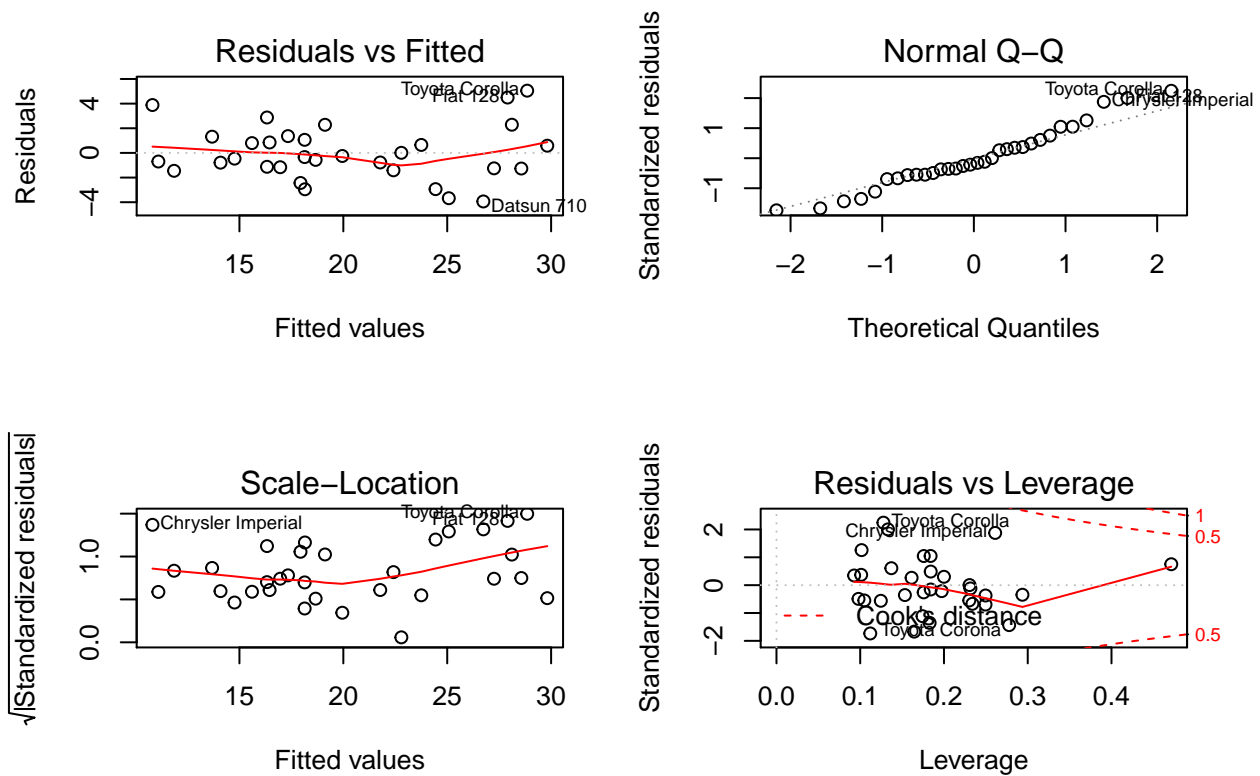that value varies between -1.06 and 4.68.)

Appendix 1. Scatterplots

```
pairs(mpg ~ ., data = mtcars)
```

Appendix 2. Some Plots

```r
par(mfrow=c(2, 2))
plot(goodmodel)
```

Appendix 3. Boxplot of mpg vs transmission type

```r
boxplot(mtcars$mpg ~ mtcars$am, data = mtcars, outpch = 19, ylab="mpg:miles per
gallon",xlab="transmission type",main="mpg vs transmission type", col="blue")
```

mpg vs transmission type

transmission type