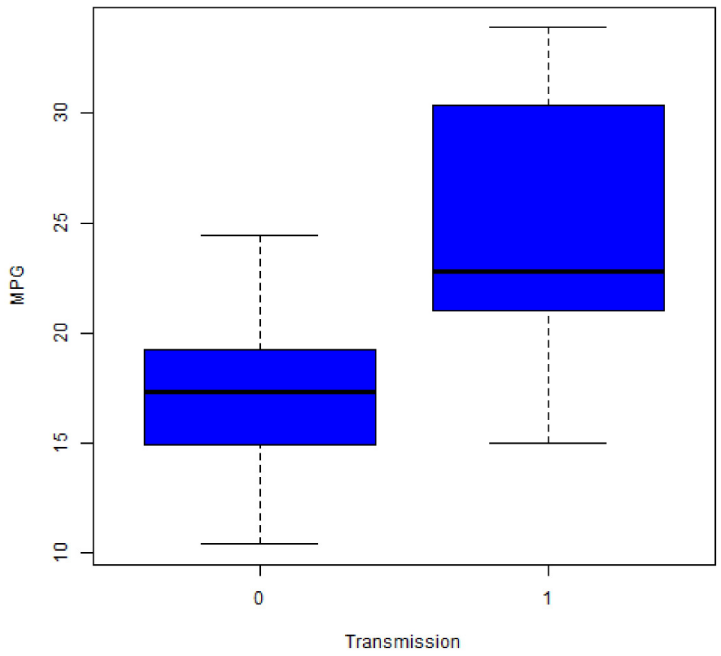
Executive Summary

I have selected the model using the Multi variable regression approach since there are more than one independent variables which dependent variable depends.

Simple relationship between mpg and transmission

Following plot shows the relationship between the mpg and transmission and as per the plot cars those have automatic transmission provide mileage per gallon.

```
plot(x=factor(mtcars$am), y = mtcars$mpg, par=19, col="blue", xlab="Transmission", ylab="MPG")
```



Next we will be analysing the data and provide the relationship between the other variables to MPG.

Linear Regression with Multiple predictors

Different approaches can used to select the model.

Basic Model:

y= b0 + b1x1 + b2x2 +….+bpxp + ei; i= 1 …n

Unknown Parameters

b0: overall mean bk: k=1 …,p: regression coefficients

Model Selection Steps

Model selection was done using the backward elimination process : which involves starting with all candidate variables, testing the deletion of each variable using a chosen model comparison criterion, deleting the variable (if any) that improves the model the most by being deleted, and repeating this process until no further improvement is possible

```
round(cor(mtcars),3)
```

```
model_a<- lm(mpg~.,data=mtcars)
model_b<- lm(mpg~disp+hp+drat+wt+qsec+vs+am+gear+carb,data=mtcars) #Removed Cyl

#Added Cyl and Removed vs becauss these were highly correlated and we need to select one of these.
model_c<- lm(mpg~cyl+disp+hp+drat+wt+qsec+am+gear+carb,data=mtcars)


## Now Remove variable which have highest p values until we get variables with p values 0.05

model_c<- update(model_c,.~.-cyl)
model_c<- update(model_c,.~.-carb)
model_c<- update(model_c,.~.-gear)
model_c<- update(model_c,.~.-drat)
model_c<- update(model_c,.~.-disp)
model_c<- update(model_c,.~.-hp)

## Final Model Summary

summary(model_c)
```

```
##
## Call:
## lm(formula = mpg ~ wt + qsec + am, data = mtcars)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -3.481 -1.556 -0.726  1.411  4.661
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)    9.618      6.960    1.38  0.17792
## wt            -3.917      0.711   -5.51    7e-06 ***
## qsec           1.226      0.289    4.25  0.00022 ***
## am             2.936      1.411    2.08  0.04672 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.46 on 28 degrees of freedom
## Multiple R-squared:  0.85,   Adjusted R-squared:  0.834
## F-statistic: 52.7 on 3 and 28 DF,  p-value: 1.21e-11
```

Fitted Values and Residuals

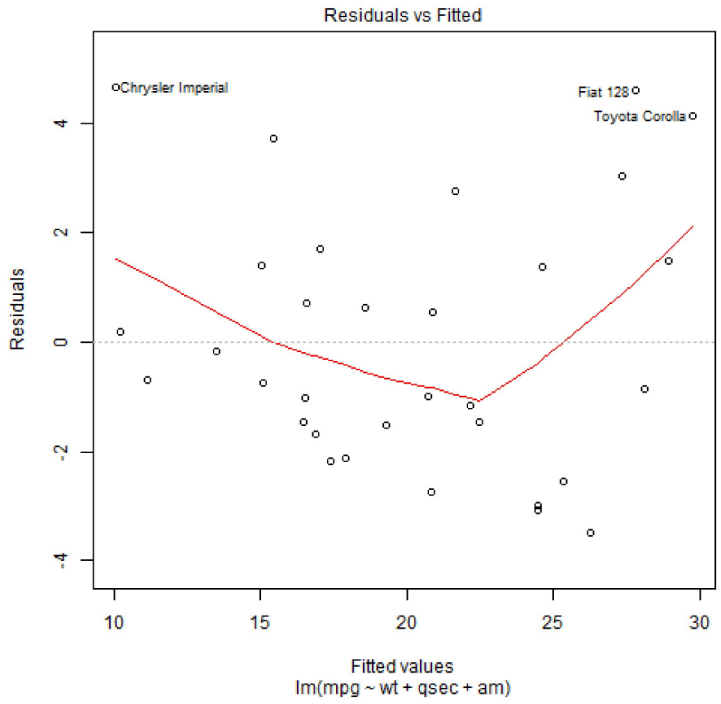
```
FinalDF<-data.frame(mtcars , fitted.value = fitted (model_c) , residual = resid(model_c))
```

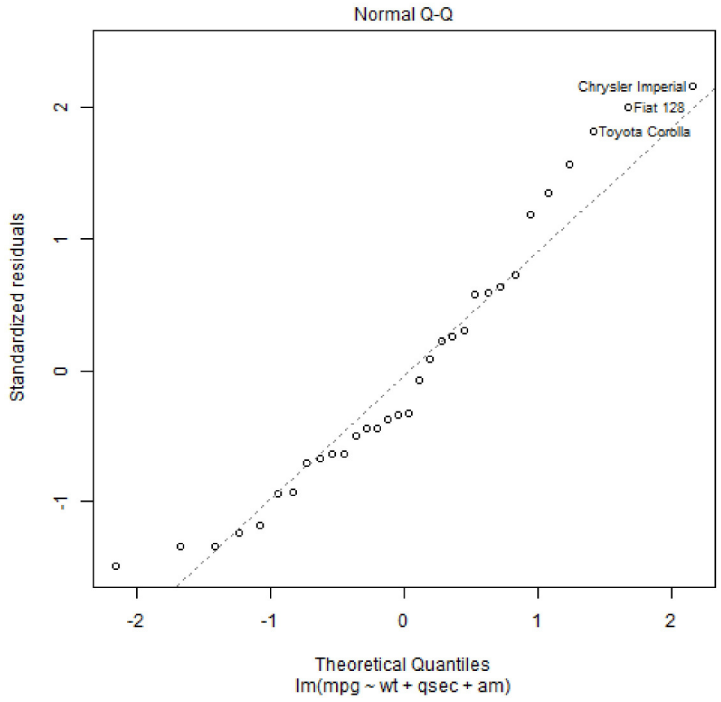
#Analysis of Variance

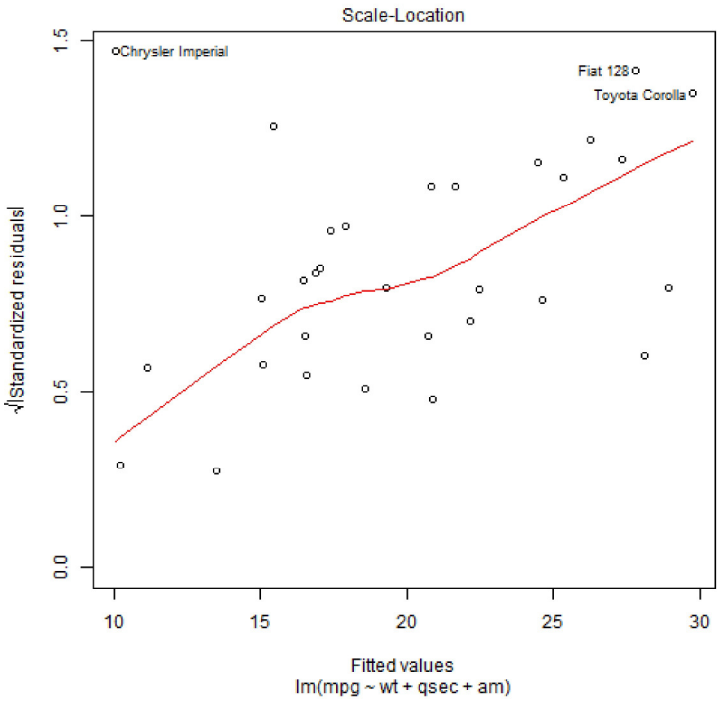
```
anova(model_c)
```

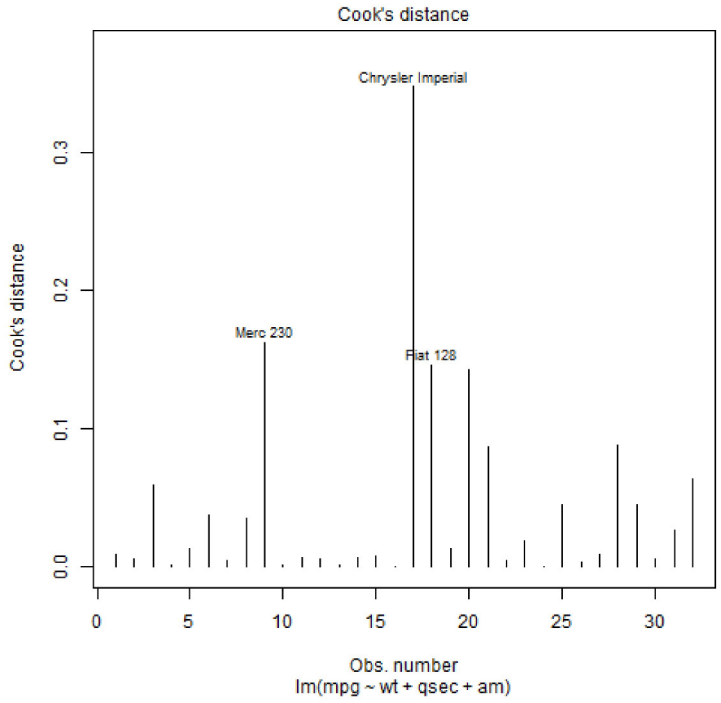
Diagnostics & Exploratory Analysis

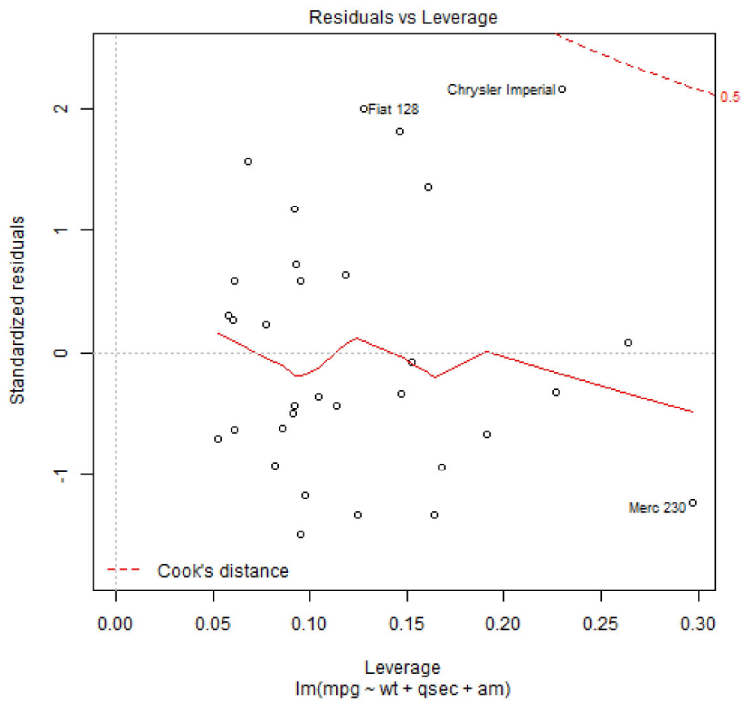
```
plot (model_c , which =1:5)
```






Scale-Location
Chrysler Imperial
Fiat 128
Toyota Corolla
√|Standardized residuals|
0.0
0.5
1.0
1.5
10
15
20
25
30
Fitted values
lm(mpg ~ wt + qsec + am)


Cook's distance
Chrysler Imperial
Merc 230
Fiat 128
Cook's distance
0.0
0.1
0.2
0.3
0
5
10
15
20
25
30
Obs. number
lm(mpg ~ wt + qsec + am)


Residuals vs Leverage
Chrysler Imperial
Fiat 128
0.5
Merc 230
Cook's distance
Standardized residuals
Leverage
lm(mpg ~ wt + qsec + am)
2
1
0
-1
0.00
0.05
0.10
0.15
0.20
0.25
0.30