

# Impact of various factors(specially transmission) on MPG in Cars

## Executive Summary

For a Car having same weight, Manual gives better mileage than Automatic. Also, for every increase in weight and / or qsec, corresponding increase in Manual is in range of  $> 2.9358$  and  $< 9.863$ .

## Evaluate Dataset

### FIT MODEL

#### Identify Corelation

Let's try to observe the correlation between mpg and other variables (except cyl, am and vs, since these are categorical variable)

```
##           hp           drat           wt           disp           carb           qsec
## -0.7761684  0.6811719 -0.8676594 -0.8475514 -0.5509251  0.4186840
```

#### Fit a Linear Model

Based on correlation found above let's use AIC to choose attributes for Linear Model

```
library(MASS)
lm_initial <- lm(mpg ~ am + hp + drat + wt + disp + carb + qsec, data = mtcars)
step <- stepAIC(lm_initial, direction="both")
```

Model recommendation by AIC

```
step$anova # display results
```

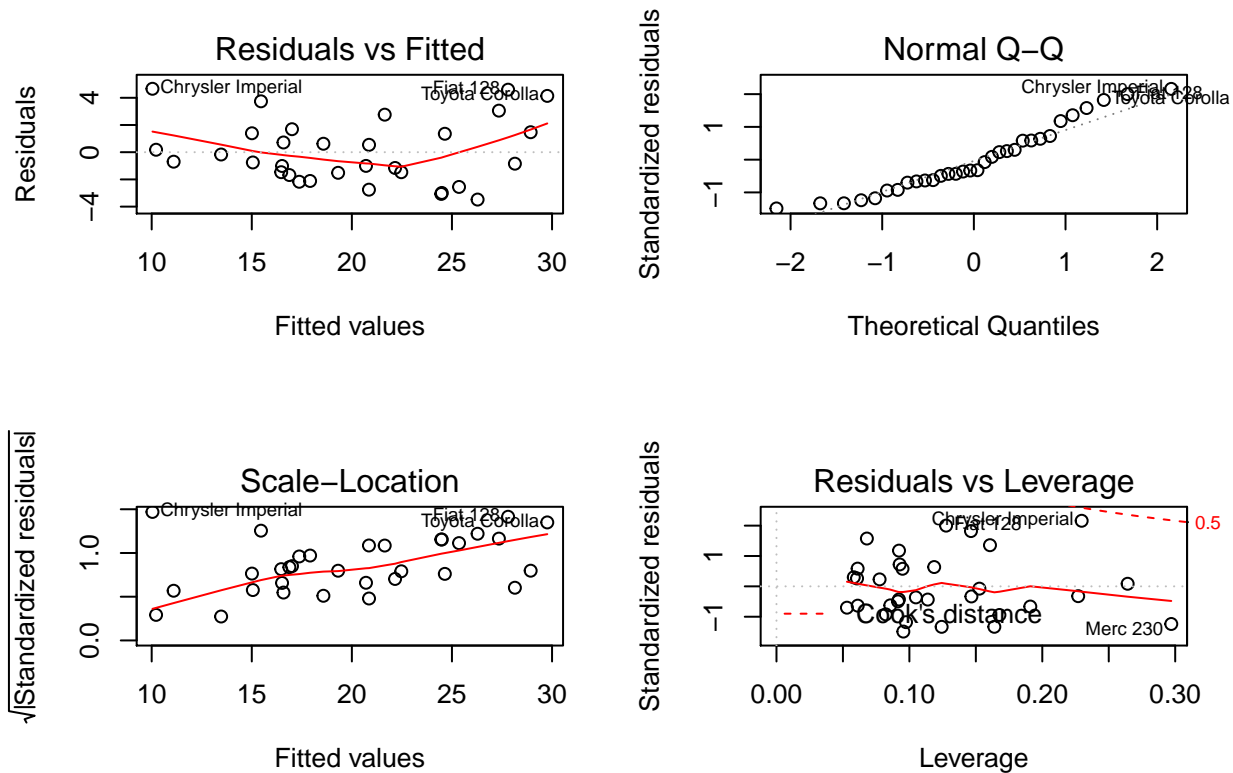
```
## Stepwise Model Path
## Analysis of Deviance Table
##
## Initial Model:
## mpg ~ am + hp + drat + wt + disp + carb + qsec
##
## Final Model:
## mpg ~ am + wt + qsec
##
##
```

##	Step	Df	Deviance	Resid. Df	Resid. Dev	AIC
##	1			24	149.9865	65.43390
##	2 - carb	1	0.1067476	25	150.0933	63.45667
##	3 - drat	1	3.3445512	26	153.4378	62.16190
##	4 - disp	1	6.6286537	27	160.0665	61.51530
##	5 - hp	1	9.2194693	28	169.2859	61.30730

From above analysis, we can conclude that below should be the final model

```
lm <- lm(mpg ~ am + wt + qsec, data = mtcars)
```

## Plot of Model



## Coefficients as per the model

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -3.91700 -0.05971  2.08100  2.46600  4.60600  9.61800
```

## Questions of Interest

- **Is an automatic or manual transmission better for MPG** From above coefficients we can understand that *Manual Transmission is better* than Automatic Transmission.
- **Quantify the MPG difference between automatic and manual transmissions** If we keep weight and qsec constant (mean) then extra milega that will be provided by Manual as compared to Automatic is 2.9358372. However, for every increase in weight by single unit gain in mileage is 8.637114 and for every increase in qsec gain in mileage is 13.7795037 more than Automatic.