Multi-Linear Regression

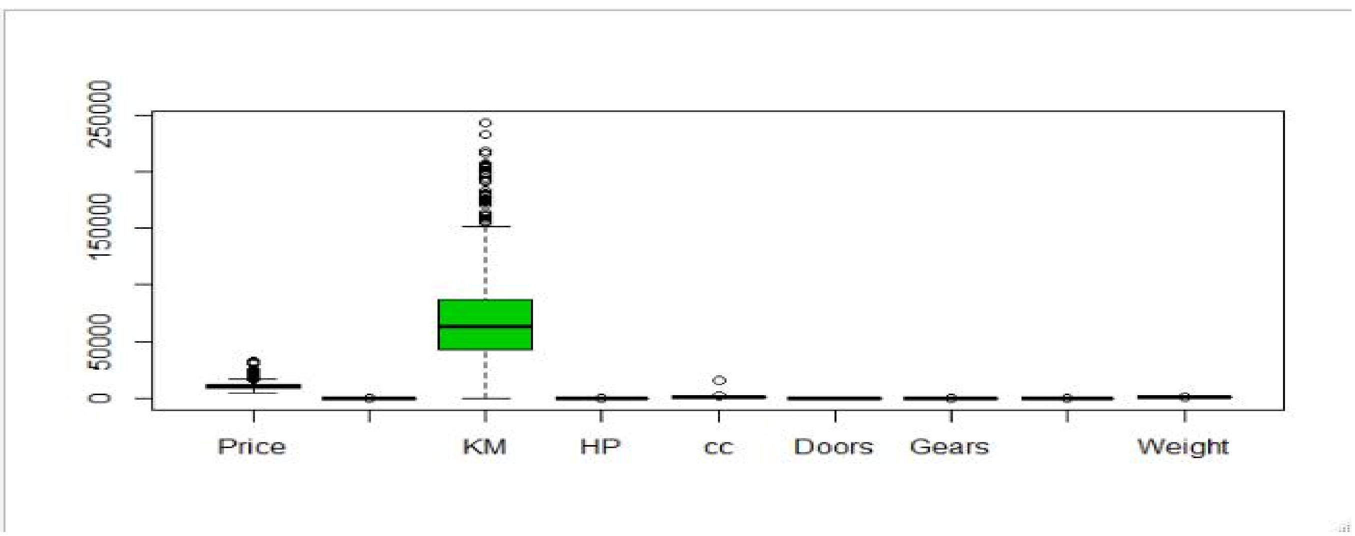
Example- Toyota Corolla Dataset

Target variable is Price

Summary ➔

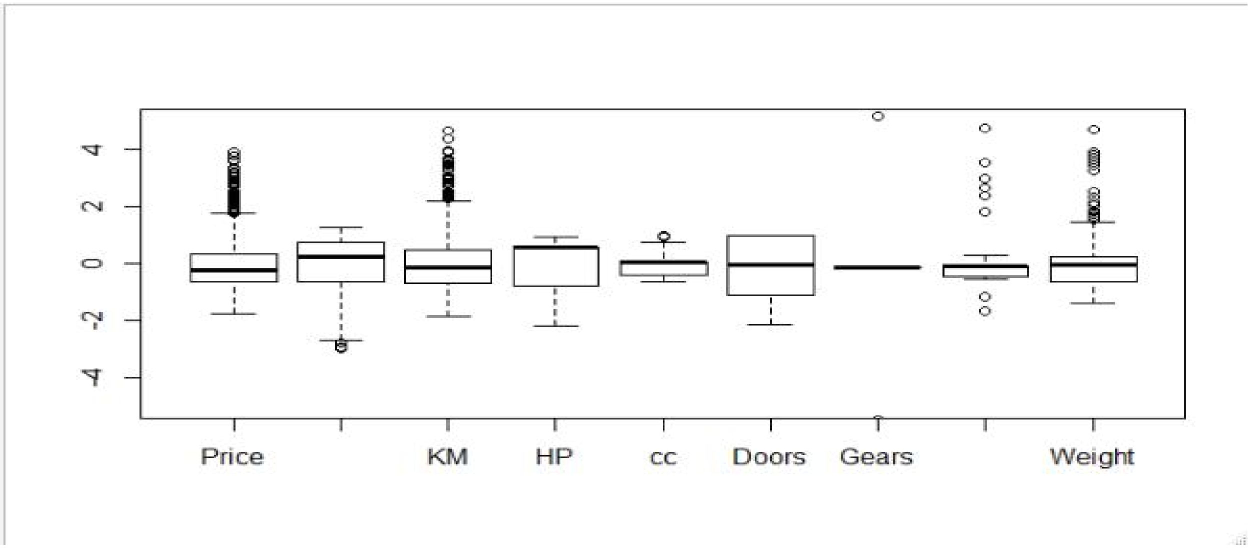
Price	Age_08_04	KM	HP	cc	Doors	Gears	Quarterly_Tax	Weight
Min. : 4350	Min. : 1.00	Min. : 1	Min. : 69.0	Min. : 1300	Min. :2.000	Min. :3.000	Min. : 19.00	Min. :1000
1st Qu.: 8450	1st Qu.:44.00	1st Qu.: 43000	1st Qu.: 90.0	1st Qu.: 1400	1st Qu.:3.000	1st Qu.:5.000	1st Qu.: 69.00	1st Qu.:1040
Median:9900	Median:61.00	Median :63390	Median:110.0	Median:1600	Median:4.000	Median:5.000	Median :85.00	Median:1070
Mean :10731	Mean :55.95	Mean : 68533	Mean :101.5	Mean : 1577	Mean :4.033	Mean :5.026	Mean : 87.12	Mean :1072
3rdQu.:11950	3rd Qu.:70.00	3rd Qu.: 87021	3rd Qu.:110.0	3rd Qu.: 1600	3rd Qu.:5.000	3rd Qu.:5.000	3rd Qu.: 85.00	3rd Qu.:1085
Max. :32500	Max. :80.00	Max. :243000	Max. :192.0	Max. :16000	Max. :5.000	Max. :6.000	Max. :283.00	Max. :1615

Box Plot ➔



Based on above summary and box plot we can see that outliers are available in the dataset.

So will do scale free plot.



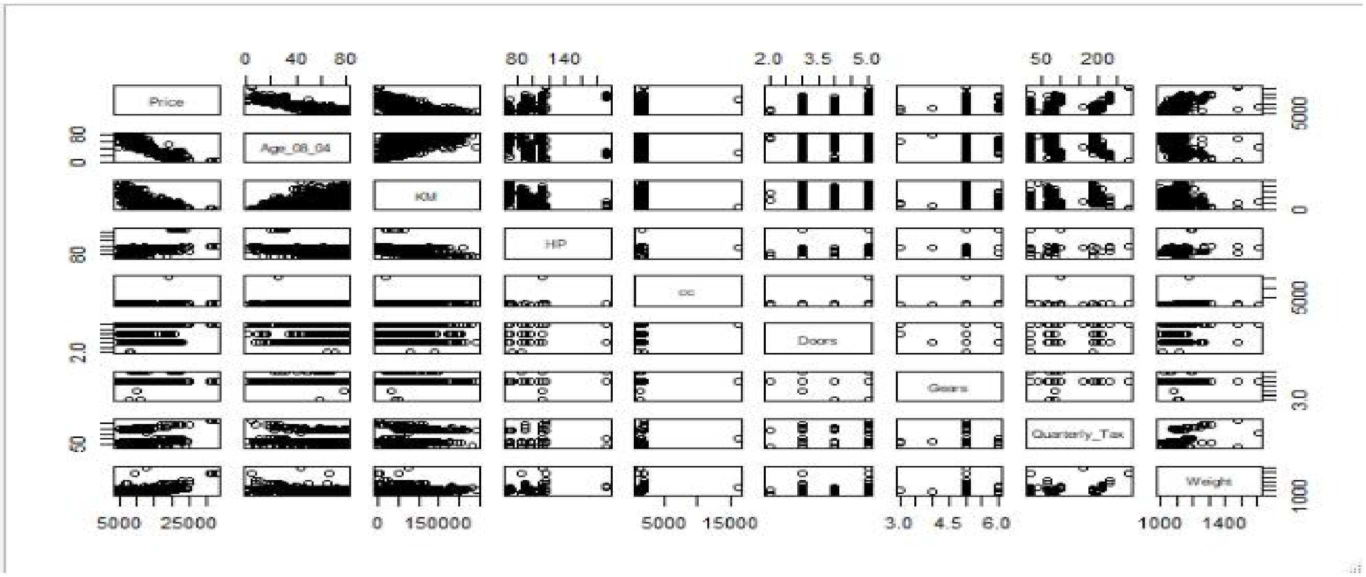
We can see that large number of outliers are in the dataset.

<u>Correlation →</u>

	Price	Age_08_04	KM	HP	cc	Doors	Gears	Quarterly_Tax	Weight
Price	1	-0.876590497	-0.569960165	0.31498983	0.126389197	0.18532555	0.063103857	0.219196911	0.581197589
Age_08_04	-0.876590497	1	0.50567218	-0.15662202	-0.098083739	-0.148359215	-0.005363947	-0.198430508	-0.470253184
KM	-0.569960165	0.50567218	1	-0.333537948	0.102682891	-0.036196614	0.015023328	0.278164697	-0.028598457
HP	0.31498983	-0.15662202	-0.333537948	1	0.035855803	0.092424496	0.209477146	-0.298431717	0.089614059
cc	0.126389197	-0.098083739	0.102682891	0.035855803	1	0.079903296	0.014629352	0.306995798	0.335637399
Doors	0.18532555	-0.148359215	-0.036196614	0.092424496	0.079903296	1	-0.16014143	0.109363225	0.302617644
Gears	0.063103857	-0.005363947	0.015023328	0.209477146	0.014629352	-0.16014143	1	-0.005451955	0.020613284
Quarterly_Tax	0.219196911	-0.198430508	0.278164697	-0.298431717	0.306995798	0.109363225	-0.005451955	1	0.626133733
Weight	0.581197589	-0.470253184	-0.028598457	0.089614059	0.335637399	0.302617644	0.020613284	0.626133733	1

<u>From the above table it is clearly seen that Price and Age are highly negatively correlated.</u>

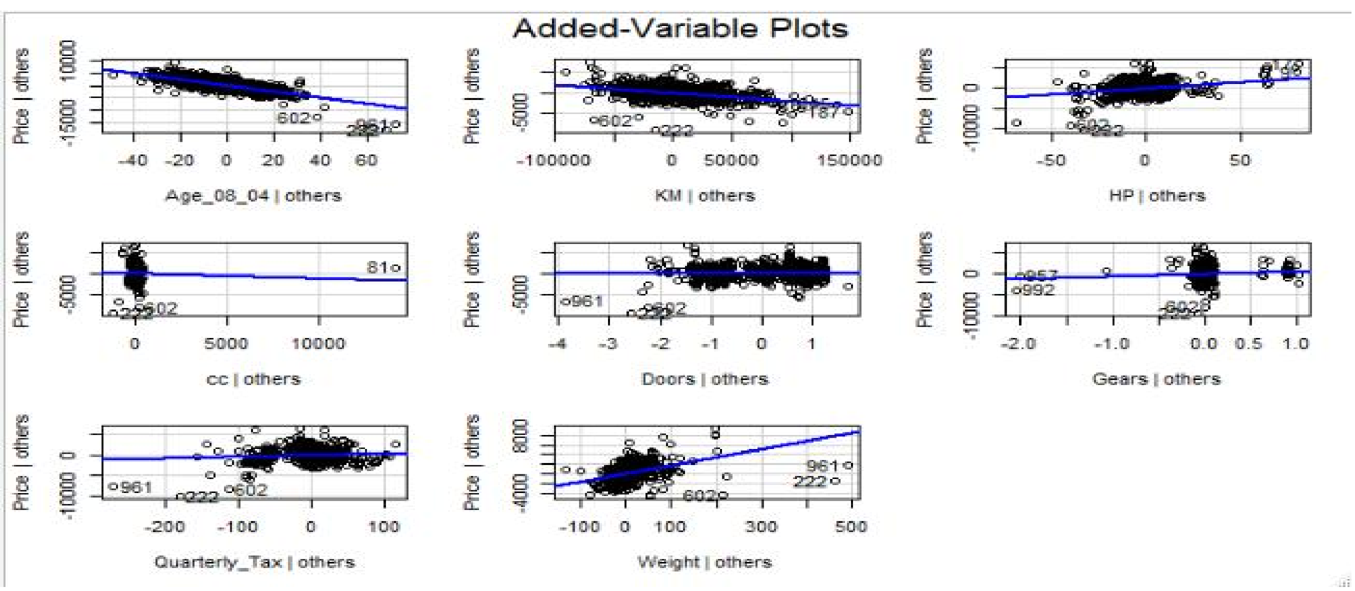
Pairs Plot ➔



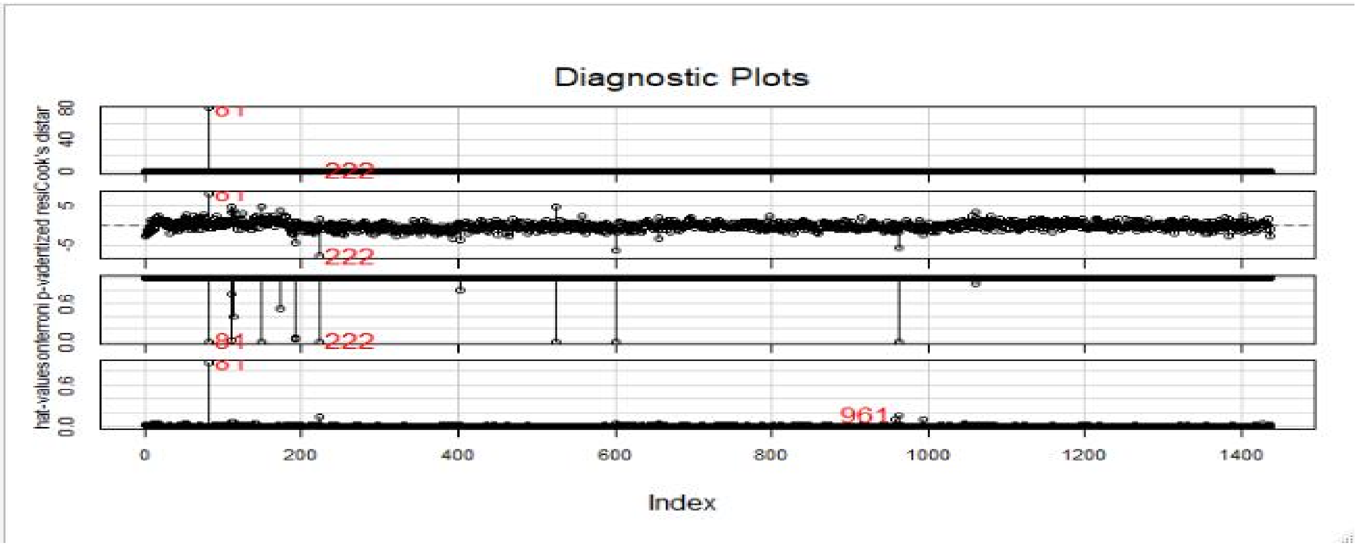
Model-1 ➔

```
model_T_1 <- lm(Price~.,data = Corolla)
Multiple R-squared:  0.8638,   Adjusted R-squared:  0.863
correlation  is 0.9293884
RMSE value as 1338.258
```

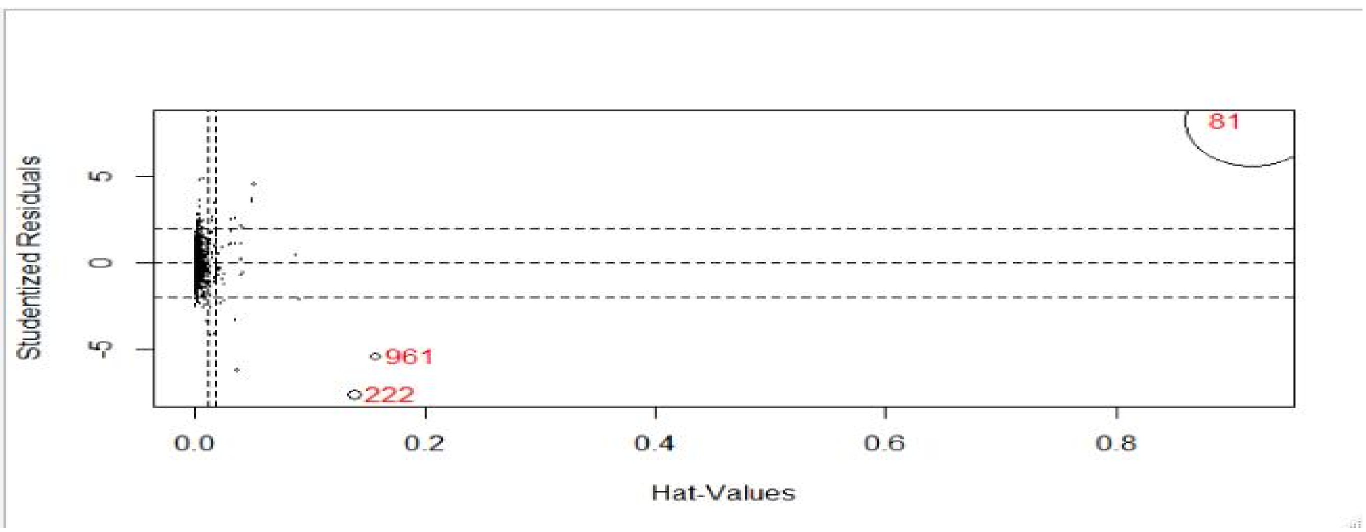
AV Plot ➔



<u>From the above plot, cc, Doors and Gears are insignificant for our model.</u>



<u>Influence Plot</u>

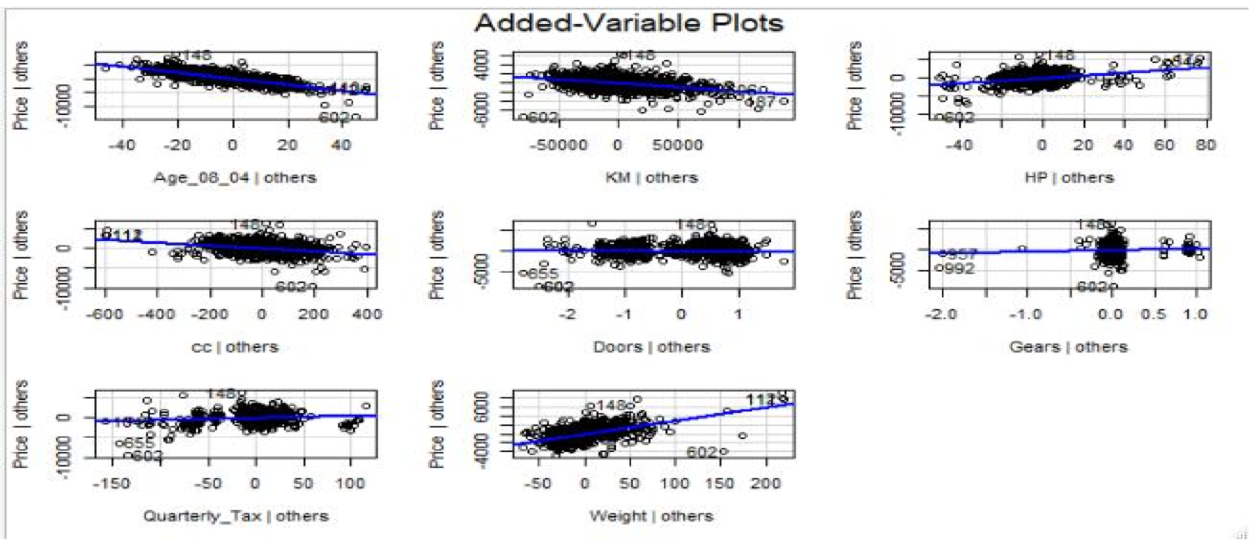


From the above plot, 81,222,961 are more influencing our model.

Model-2 ➔

```
df_Corola <- Corolla[-c(influence_index),]
> model_T_2 <- lm(Price~.,data = df_Corola)
Multiple R-squared:  0.8852,   Adjusted R-squared:  0.8845
correlation  as 0.9408425
RMSE value as 1227.474
```

AV Plot



From the above plot now cc is showing somewhat significance but Doors and Gears are not.

Comparison ➔

Model No	R^2	RMSE	Cor
Model-1	0.8698	1338.25	0.929
Model-2	0.8852	1227.474	0.9408425

From above table we can infer Model-2 is best model as it is having less RMSE and highly correlated between predicted and actual value with 80% variation in Price.