Final_Project-DS-510

2022-11-10

Installing the required software and utilizing it in the code:

```
install.packages("tinytex", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)
```

```
## package 'tinytex' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("dplyr", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)
```

```
## package 'dplyr' successfully unpacked and MD5 sums checked
```

```
## Warning: cannot remove prior installation of package 'dplyr'
```

```
## Warning in file.copy(savedcopy, lib, recursive = TRUE): problem copying C:
## \Users\vkoyya\AppData\Local\R\win-library\4.2\00LOCK\dplyr\libs\x64\dplyr.dll
## to C:\Users\vkoyya\AppData\Local\R\win-library\4.2\dplyr\libs\x64\dplyr.dll:
## Permission denied
```

```
## Warning: restored 'dplyr'
```

```
##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("tidyr", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)
```

```
## package 'tidyr' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'tidyr'

## Warning in file.copy(savedcopy, lib, recursive = TRUE): problem copying C:
## \Users\vkoyya\AppData\Local\R\win-library\4.2\00LOCK\tidyr\libs\x64\tidyr.dll
## to C:\Users\vkoyya\AppData\Local\R\win-library\4.2\tidyr\libs\x64\tidyr.dll:
## Permission denied

## Warning: restored 'tidyr'

##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("magrittr", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)

## package 'magrittr' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'magrittr'

## Warning in file.copy(savedcopy, lib, recursive = TRUE):
## problem copying C:\Users\vkoyya\AppData\Local\R\win-
## library\4.2\00LOCK\magrittr\libs\x64\magrittr.dll to C:
## \Users\vkoyya\AppData\Local\R\win-library\4.2\magrittr\libs\x64\magrittr.dll:
## Permission denied

## Warning: restored 'magrittr'

##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("knitr", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)

## package 'knitr' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("glmnet", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)
```

```
## package 'glmnet' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'glmnet'

## Warning in file.copy(savedcopy, lib, recursive = TRUE): problem copying C:
## \Users\vkoyya\AppData\Local\R\win-library\4.2\00LOCK\glmnet\libs\x64\glmnet.dll
## to C:\Users\vkoyya\AppData\Local\R\win-library\4.2\glmnet\libs\x64\glmnet.dll:
## Permission denied

## Warning: restored 'glmnet'

##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("leaps", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)

## package 'leaps' successfully unpacked and MD5 sums checked

## Warning: cannot remove prior installation of package 'leaps'

## Warning in file.copy(savedcopy, lib, recursive = TRUE): problem copying C:
## \Users\vkoyya\AppData\Local\R\win-library\4.2\00LOCK\leaps\libs\x64\leaps.dll
## to C:\Users\vkoyya\AppData\Local\R\win-library\4.2\leaps\libs\x64\leaps.dll:
## Permission denied

## Warning: restored 'leaps'

##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("gvlma", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)

## package 'gvlma' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("psych", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)
```

```
## package 'psych' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("latticeExtra", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)
```

```
## package 'latticeExtra' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
install.packages("caret", repos = "http://cran.us.r-project.org")
```

```
## Installing package into 'C:/Users/vkoyya/AppData/Local/R/win-library/4.2'
## (as 'lib' is unspecified)
```

```
## package 'caret' successfully unpacked and MD5 sums checked
```

```
## Warning: cannot remove prior installation of package 'caret'
```

```
## Warning in file.copy(savedcopy, lib, recursive = TRUE): problem copying C:
## \Users\vkoyya\AppData\Local\R\win-library\4.2\00LOCK\caret\libs\x64\caret.dll
## to C:\Users\vkoyya\AppData\Local\R\win-library\4.2\caret\libs\x64\caret.dll:
## Permission denied
```

```
## Warning: restored 'caret'
```

```
##
## The downloaded binary packages are in
##  C:\Users\vkoyya\AppData\Local\Temp\RtmpysAI7P\downloaded_packages
```

```
library(knitr)
```

```
## Warning: package 'knitr' was built under R version 4.2.2
```

```
library(magrittr)
```

```
## Warning: package 'magrittr' was built under R version 4.2.2
```

```
library(leaps)
```

```
## Warning: package 'leaps' was built under R version 4.2.2
```

```
library(gvlma)
library(glmnet)
```

```
## Warning: package 'glmnet' was built under R version 4.2.2
```

```
## Loading required package: Matrix
```

```
## Loaded glmnet 4.1-4
```

```
library(psych)
```

```
## Warning: package 'psych' was built under R version 4.2.2
```

```
library(caret)
```

```
## Warning: package 'caret' was built under R version 4.2.2
```

```
## Loading required package: ggplot2
```

```
##
## Attaching package: 'ggplot2'
```

```
## The following objects are masked from 'package:psych':
##
##     %+%, alpha
```

```
## Loading required package: lattice
```

```
library(latticeExtra)
```

```
## Warning: package 'latticeExtra' was built under R version 4.2.2
```

```
##
## Attaching package: 'latticeExtra'
```

```
## The following object is masked from 'package:ggplot2':
##
##     layer
```

```
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 4.2.2
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(tidyr)
```

```
## Warning: package 'tidyr' was built under R version 4.2.2
```

```
##
## Attaching package: 'tidyr'

## The following objects are masked from 'package:Matrix':
##
##     expand, pack, unpack

## The following object is masked from 'package:magrittr':
##
##     extract
```

##the auto-mpg.csv file for reading:

```
atodf_main =  read.csv("C:/Users/Public/project/auto-mpg.csv")
str(atodf_main)
```

```
## 'data.frame':    398 obs. of  9 variables:
##  $ mpg         : num  18 15 18 16 17 15 14 14 14 15 ...
##  $ cylinder    : int  8 8 8 8 8 8 8 8 8 8 ...
##  $ displacement: num  307 350 318 304 302 429 454 440 455 390 ...
##  $ horsepower  : chr  "130" "165" "150" "150" ...
##  $ weight      : int  3504 3693 3436 3433 3449 4341 4354 4312 4425 3850 ...
##  $ acceleration: num  12 11.5 11 12 10.5 10 9 8.5 10 8.5 ...
##  $ model.year  : int  70 70 70 70 70 70 70 70 70 70 ...
##  $ origin      : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ car.name    : chr  "chevrolet chevelle malibu" "buick skylark 320" "plymouth satellite" "amc rebel
```

##Data transformation

```
names(atodf_main) = c("mpg","cylinder","displacement","horsepower","weight","acceleration","model_year"
head(atodf_main)
```

```
##   mpg cylinder displacement horsepower weight acceleration model_year origin
## 1  18        8          307        130   3504         12.0         70      1
## 2  15        8          350        165   3693         11.5         70      1
## 3  18        8          318        150   3436         11.0         70      1
## 4  16        8          304        150   3433         12.0         70      1
## 5  17        8          302        140   3449         10.5         70      1
```

```
## 6  15        8          429        198   4341         10.0         70      1
##                   car_name
## 1 chevrolet chevelle malibu
## 2         buick skylark 320
## 3        plymouth satellite
## 4             amc rebel sst
## 5               ford torino
## 6          ford galaxie 500
```

```
atodf_main$horsepower[atodf_main$horsepower=="?"] = NA
atodf_main$horsepower = as.numeric(atodf_main$horsepower)
atodf_main$cylinder = as.numeric(atodf_main$cylinder)
str(atodf_main)
```

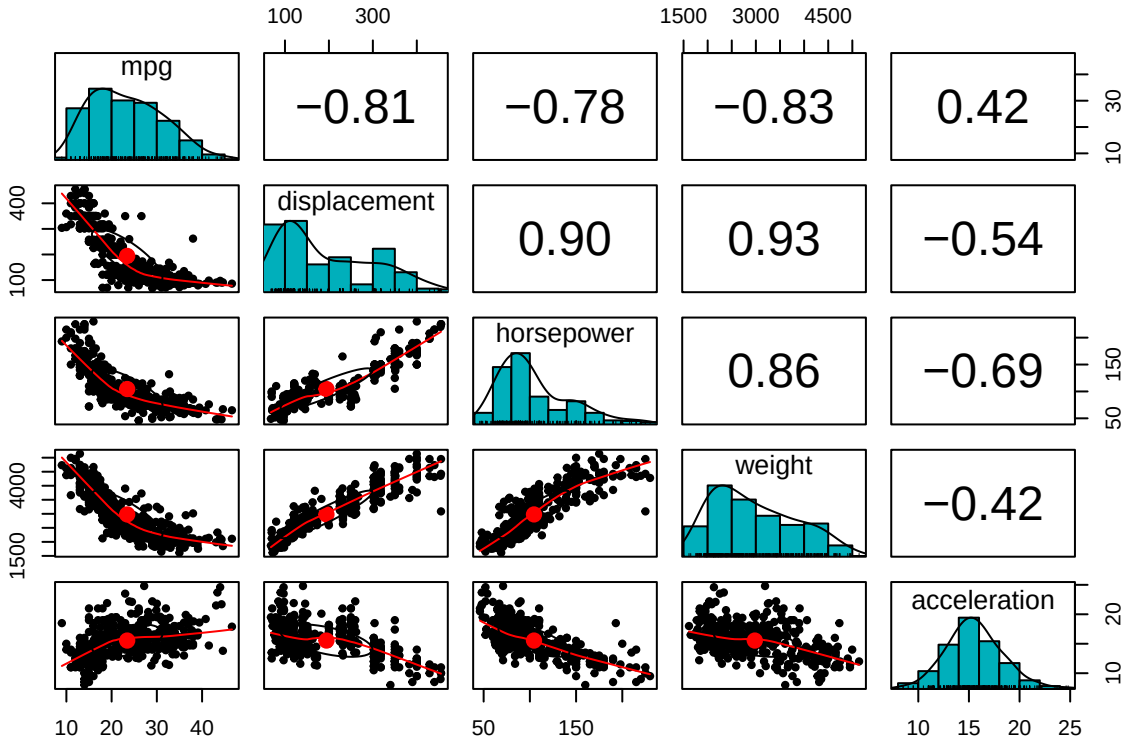
```
## 'data.frame':    398 obs. of  9 variables:
##  $ mpg         : num  18 15 18 16 17 15 14 14 14 15 ...
##  $ cylinder    : num  8 8 8 8 8 8 8 8 8 8 ...
##  $ displacement: num  307 350 318 304 302 429 454 440 455 390 ...
##  $ horsepower  : num  130 165 150 150 140 198 220 215 225 190 ...
##  $ weight      : int  3504 3693 3436 3433 3449 4341 4354 4312 4425 3850 ...
##  $ acceleration: num  12 11.5 11 12 10.5 10 9 8.5 10 8.5 ...
##  $ model_year  : int  70 70 70 70 70 70 70 70 70 70 ...
##  $ origin      : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ car_name    : chr  "chevrolet chevelle malibu" "buick skylark 320" "plymouth satellite" "amc rebel
```

##Choosing the necessary data:

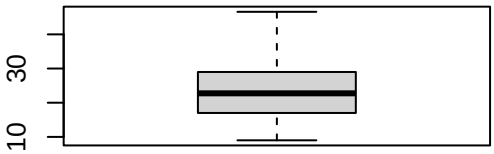
```
main_data = select(atodf_main,mpg,displacement,horsepower,weight,acceleration)
main_data = na.omit(main_data)
kable(summary(main_data),row.names = FALSE)
```

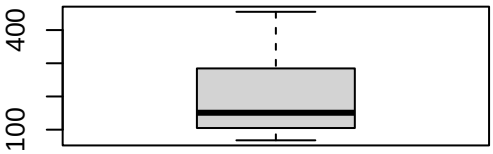
mpg	displacement	horsepower	weight	acceleration
Min. : 9.00	Min. : 68.0	Min. : 46.0	Min. :1613	Min. : 8.00
1st Qu.:17.00	1st Qu.:105.0	1st Qu.: 75.0	1st Qu.:2225	1st Qu.:13.78
Median :22.75	Median :151.0	Median : 93.5	Median :2804	Median :15.50
Mean :23.45	Mean :194.4	Mean :104.5	Mean :2978	Mean :15.54
3rd Qu.:29.00	3rd Qu.:275.8	3rd Qu.:126.0	3rd Qu.:3615	3rd Qu.:17.02
Max. :46.60	Max. :455.0	Max. :230.0	Max. :5140	Max. :24.80

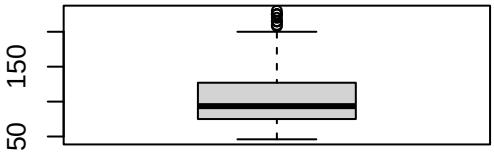
```
pairs.panels(main_data,method = "pearson",hist.col ="#00AFBB" ,density = TRUE,ellipses = TRUE)  #Import
```

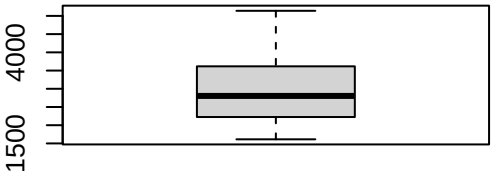


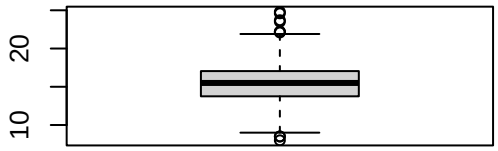

```
par(mfrow=c(2,2))
for (i in names(main_data)) {
   boxplot(main_data[,i], names = "names(main_data[,i])")
}
```


10
30


100
400


50
150


1500
4000



##300 and 98 records were split:

```
auto.three_hudrd = main_data[1:300,]
auto.nity_eight = na.omit(main_data[301:398,])
```

##Model of displacement for 300 records:

```
modelchk.dis = lm(mpg~displacement, data=auto.three_hudrd)
summary(modelchk.dis)
```

```
##
## Call:
## lm(formula = mpg ~ displacement, data = auto.three_hudrd)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.9282 -2.0043 -0.5401  1.9737 16.1501
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)  31.352035   0.435875   71.93   <2e-16 ***
## displacement -0.048913   0.001809  -27.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.412 on 298 degrees of freedom
```

```
## Multiple R-squared:  0.7104, Adjusted R-squared:  0.7094
## F-statistic: 731.1 on 1 and 298 DF,  p-value: < 2.2e-16
```

```
fnlchk_dis = summary(modelchk.dis)
fnlchk_dis$r.squared
```

```
## [1] 0.7104182
```

```
fnlchk_dis$adj.r.squared
```

```
## [1] 0.7094464
```

```
coef(fnlchk_dis)
```

```
##                 Estimate  Std. Error   t value      Pr(>|t|)
## (Intercept)  31.35203522 0.435875376  71.92890 2.258211e-190
## displacement -0.04891259 0.001809011 -27.03831  3.483733e-82
```

```
coef(modelchk.dis)
```

```
##  (Intercept) displacement
##  31.35203522  -0.04891259
```

##Model of horsepower for 300 records:

```
modelchk.hrp = lm(mpg~horsepower, data=auto.three_hudrd)
summary(modelchk.hrp)
```

```
##
## Call:
## lm(formula = mpg ~ horsepower, data = auto.three_hudrd)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -10.8442  -2.7816  -0.3376   2.4948  14.2360
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 34.903508   0.648037   53.86   <2e-16 ***
## horsepower  -0.125824   0.005455  -23.07   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.8 on 298 degrees of freedom
## Multiple R-squared:  0.641,  Adjusted R-squared:  0.6397
## F-statistic:   532 on 1 and 298 DF,  p-value: < 2.2e-16
```

```
finalchk_hrp = summary(modelchk.hrp)
finalchk_hrp$r.squared
```

```
## [1] 0.6409527
```

```
finalchk_hrp$adj.r.squared
```

```
## [1] 0.6397479
```

```
coef(finalchk_hrp)
```

```
##               Estimate  Std. Error   t value      Pr(>|t|)
## (Intercept) 34.9035083 0.648036714  53.86039 1.252684e-155
## horsepower  -0.1258239 0.005455289 -23.06457  3.004974e-68
```

```
coef(modelchk.hrp)
```

```
## (Intercept)  horsepower
##  34.9035083  -0.1258239
```

##Model of acceleration for 300 records:

```
modelchk.acc = lm(mpg~acceleration, data=auto.three_hudrd)
summary(modelchk.acc)
```

```
##
## Call:
## lm(formula = mpg ~ acceleration, data = auto.three_hudrd)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -15.202  -4.126  -1.012   3.268  16.154
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.0012     1.8352   2.725  0.00681 **
## acceleration   1.0379     0.1183   8.770  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.654 on 298 degrees of freedom
## Multiple R-squared:  0.2052, Adjusted R-squared:  0.2025
## F-statistic: 76.91 on 1 and 298 DF,  p-value: < 2.2e-16
```

```
finalchk_acc = summary(modelchk.acc)
finalchk_acc$r.squared
```

```
## [1] 0.2051531
```

```
finalchk_acc$adj.r.squared
```

```
## [1] 0.2024858
```

```
coef(finalchk_acc)
```

```
##              Estimate Std. Error  t value     Pr(>|t|)
## (Intercept)  5.001162  1.8351855 2.725153 6.807164e-03
## acceleration 1.037865  0.1183411 8.770118 1.397098e-16
```

```
coef(modelchk.acc)
```

```
##  (Intercept) acceleration
##     5.001162     1.037865
```

##Model of weight for 300 records:

```
modelchk.wght = lm(mpg~weight, data=auto.three_hudrd)
summary(modelchk.wght)
```

```
##
## Call:
## lm(formula = mpg ~ weight, data = auto.three_hudrd)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.2011 -1.9157 -0.0812  1.7341 15.0246
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) 40.5619792  0.6461532   62.77   <2e-16 ***
## weight      -0.0062905  0.0001984  -31.71   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.032 on 298 degrees of freedom
## Multiple R-squared:  0.7714, Adjusted R-squared:  0.7706
## F-statistic:  1005 on 1 and 298 DF,  p-value: < 2.2e-16
```

```
finalchk_wght = summary(modelchk.wght)
finalchk_wght$r.squared
```

```
## [1] 0.7713783
```

```
finalchk_wght$adj.r.squared
```

```
## [1] 0.7706111
```

```
coef(finalchk_wght)
```

```
##                 Estimate   Std. Error   t value      Pr(>|t|)
## (Intercept) 40.561979247 0.6461531581  62.77456 7.613401e-174
## weight      -0.006290453 0.0001983804 -31.70904  1.693958e-97
```

```
coef(modelchk.wght)
```

```
##  (Intercept)       weight
## 40.561979247 -0.006290453
```

##Examining 300 records for multiple linear regression:

```
mlrmodelchk = lm(mpg ~ displacement + horsepower + weight + acceleration,data = atodf_main[1:300,])
fnl_mlrchk = summary(mlrmodelchk)
fnl_mlrchk$r.squared
```

```
## [1] 0.7832027
```

```
fnl_mlrchk$adj.r.squared
```

```
## [1] 0.780243
```

```
summary(mlrmodelchk)$coefficient
```

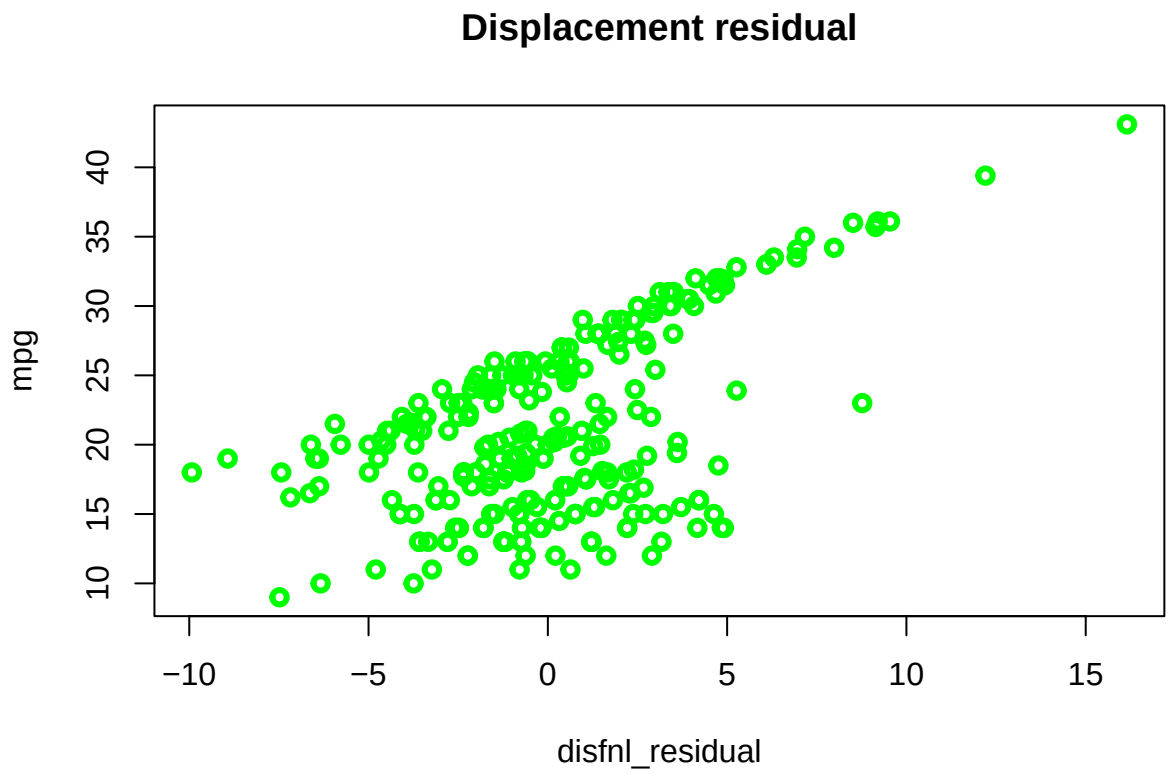
```
##                  Estimate   Std. Error    t value     Pr(>|t|)
## (Intercept)  40.308291079 2.0377624997 19.7806619 6.656804e-56
## displacement -0.006455423 0.0051082740 -1.2637190 2.073354e-01
## horsepower   -0.024507171 0.0123445766 -1.9852581 4.804789e-02
## weight       -0.004643803 0.0006042982 -7.6846219 2.326740e-13
## acceleration -0.053834647 0.1046996359 -0.5141818 6.075125e-01
```

```
confint(mlrmodelchk)
```

```
##                     2.5 %        97.5 %
## (Intercept)  36.297784046 44.3187981132
## displacement -0.016508984  0.0035981375
## horsepower   -0.048802452 -0.0002118908
## weight       -0.005833119 -0.0034544879
## acceleration -0.259893315  0.1522240211
```

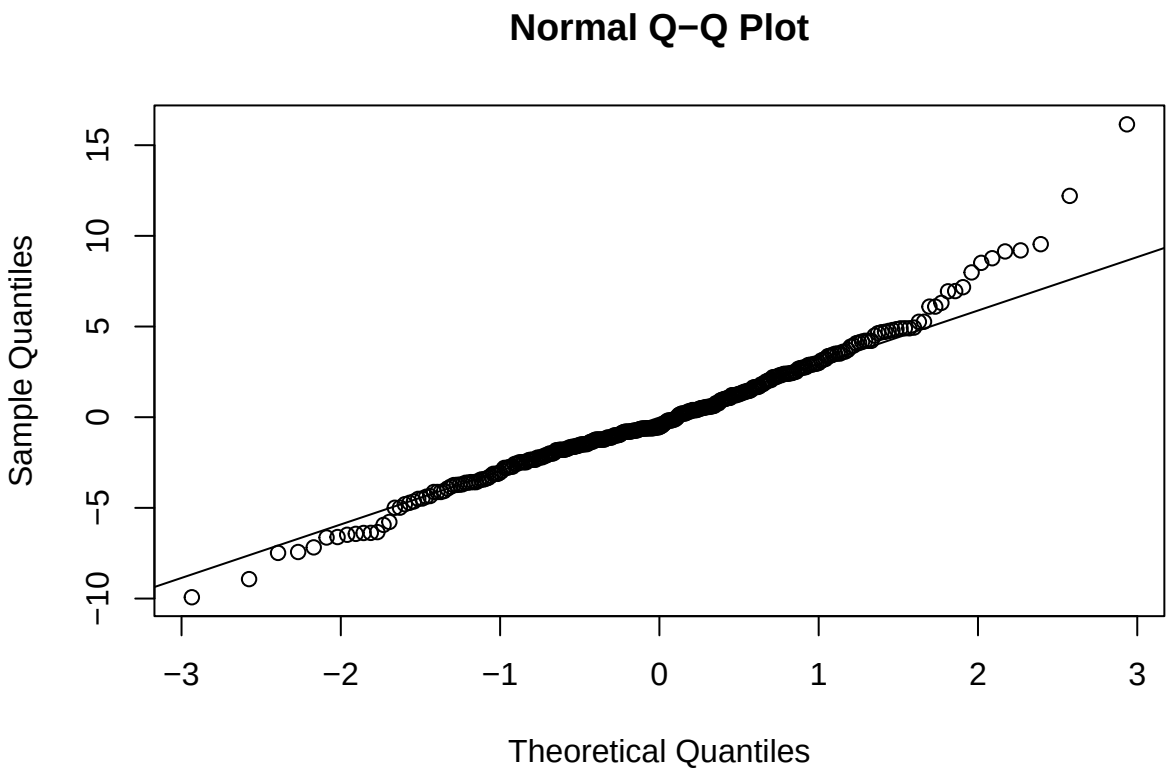
##Model of displacement 300 records residual:

```
mdlchk.dist = lm(mpg~displacement, data=auto.three_hudrd)
disfnl_residual = mdlchk.dist$residuals
plot(auto.three_hudrd$mpg~disfnl_residual ,lwd=3, col="green",main="Displacement residual",ylab = "mpg")
```

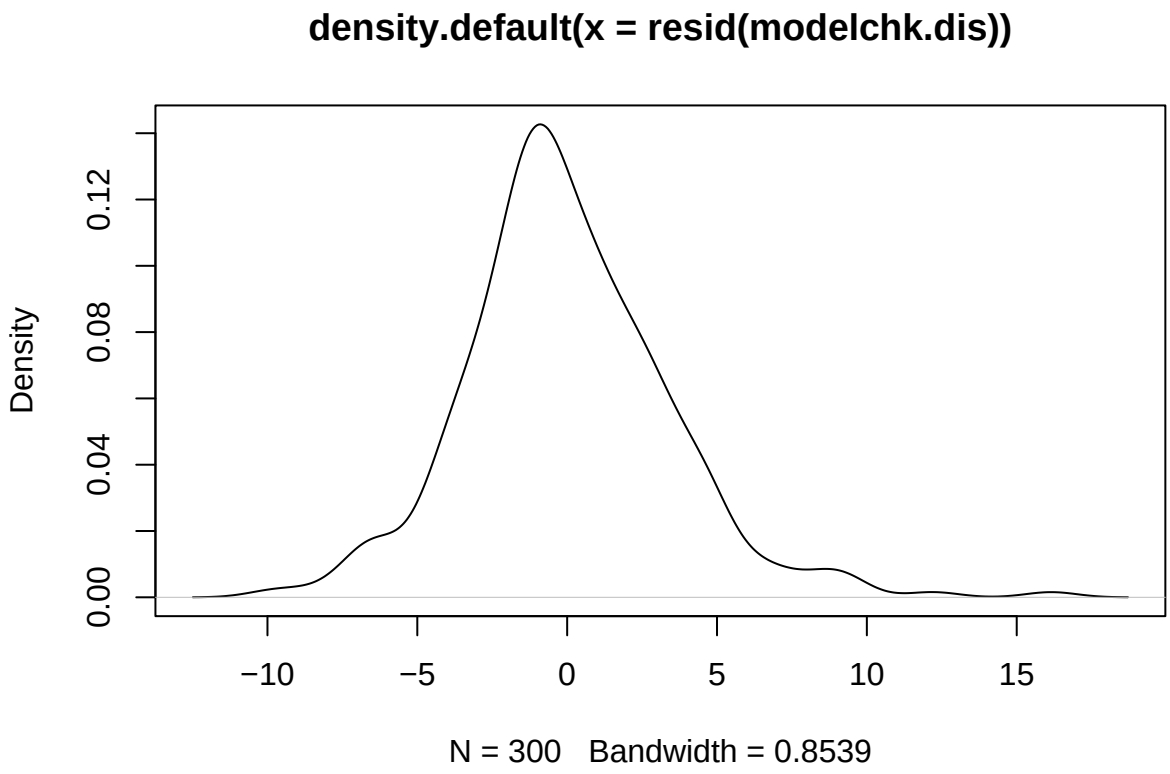


##Linear model of displacement 300 records residual:

```
qqnorm(resid(modelchk.dis))
qqline(resid(modelchk.dis))
```

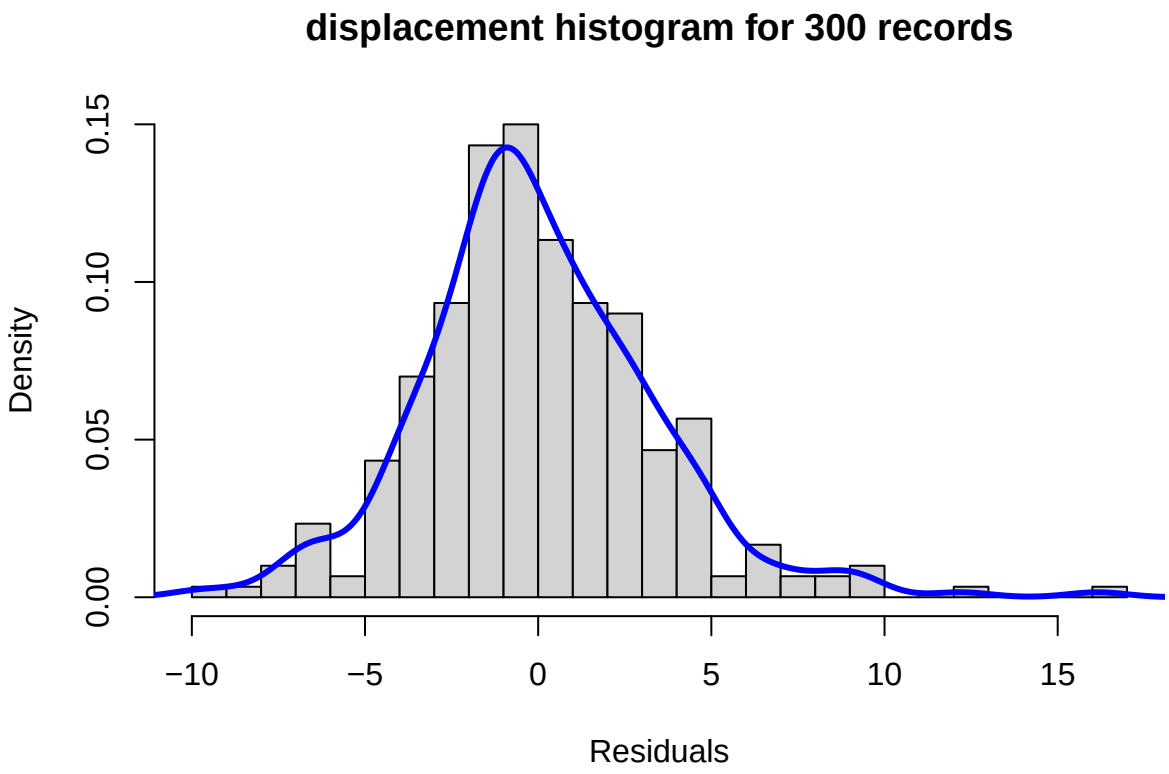



```
plot(density(resid(modelchk.dis)))
```



##Model of displacement for 300 records histogram:

```
hist(disfnl_residual ,prob=T,breaks=20,main="displacement histogram for 300 records",xlab="Residuals")
lines(density(disfnl_residual ),col="blue",lwd=3)
```



##Model of displacement predictions for 98 records:

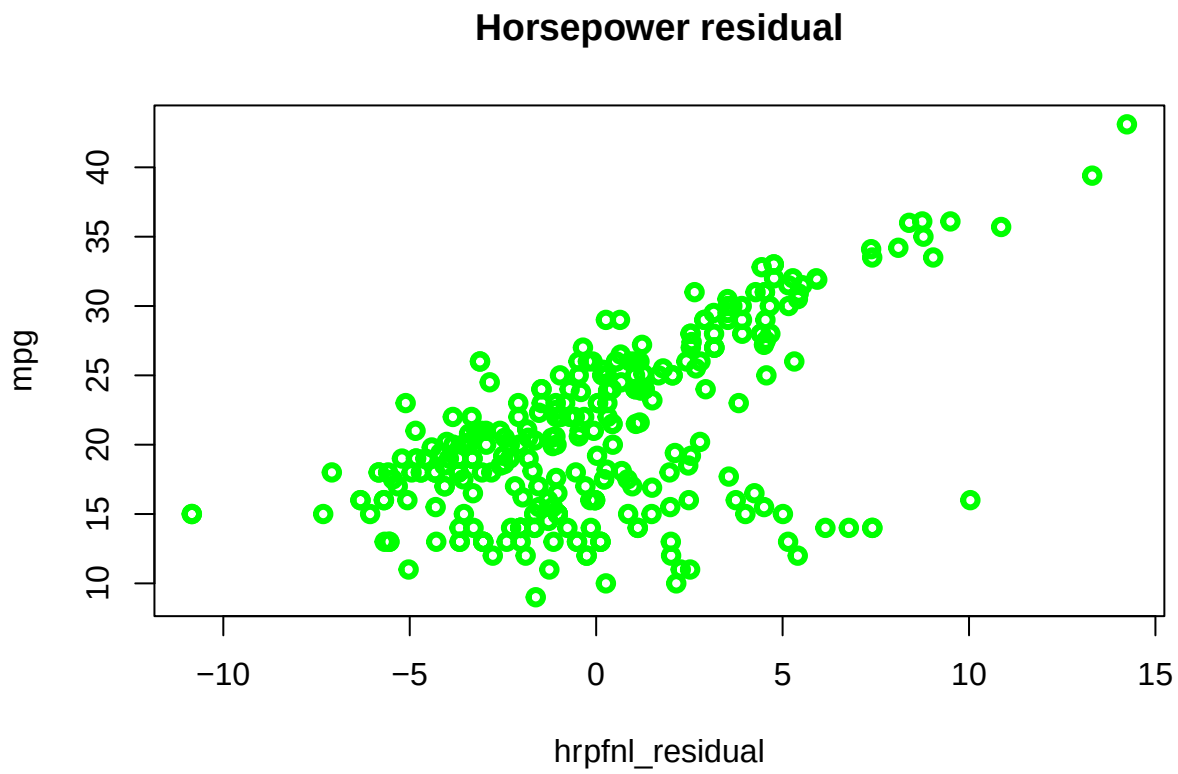
```
fnlpdct_dis = modelchk.dis %>% predict(auto.nity_eight)
data.frame( Prediction_DISPLACEMENT_R2 = R2(fnlpdct_dis, auto.nity_eight$mpg),Prediction_DISPLACEMENT_RI
```

```
##   Prediction_DISPLACEMENT_R2 Prediction_DISPLACEMENT_RMSE
## 1                   0.370789                     8.371337
##   Prediction_DISPLACEMENT_MAE
## 1                    7.050203
```

##DISPLACEMENT MODEL PREDICTION REPORT: All estimated values in this output are statistically significant, with a p-value of 2.2e-16. It is shown that the plot of MPG vs. displacement is not linear and that there is some kind of relationship between the variable and the residual. There is no question that this model is insufficient. On the diagnostic plot, the following data points, which total 112,245,248 are outliers. According to the R square, only 38% of displacement may explain MPG.

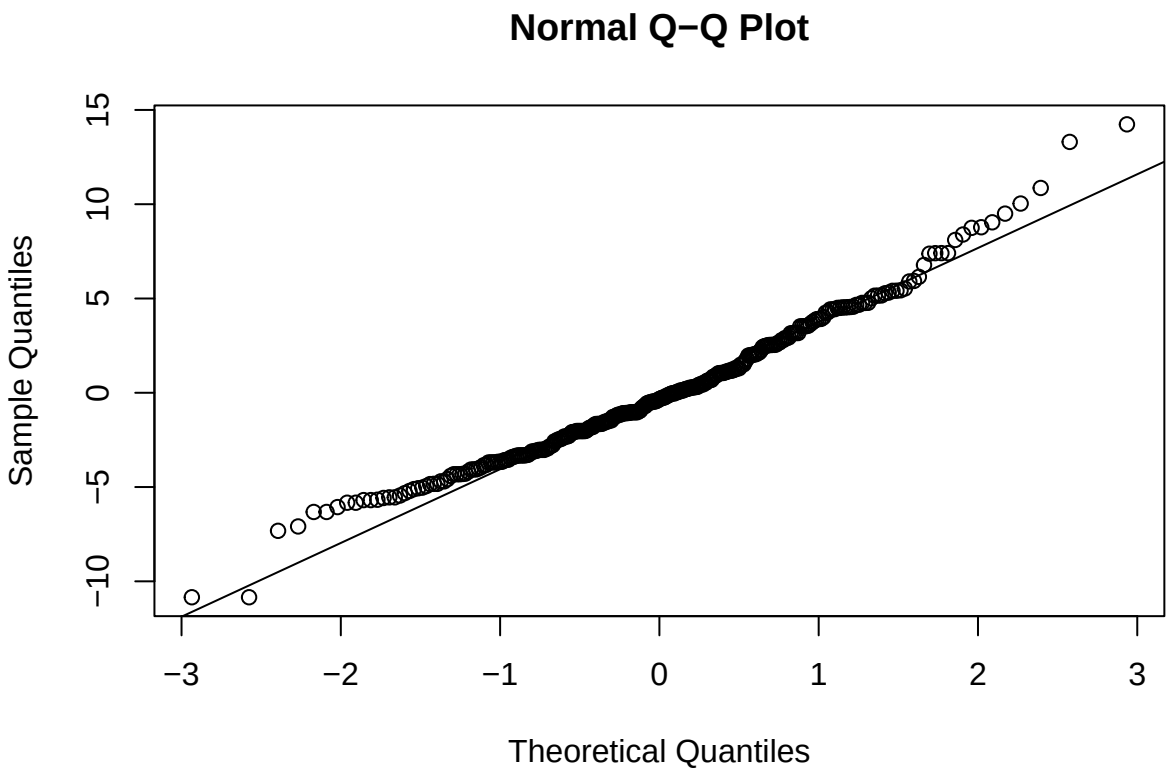
##Model of Horsepower 300 records Residual:

```
hrpfnl_residual = modelchk.hrp$residuals
plot(auto.three_hudrd$mpg~hrpfnl_residual ,lwd=3, col="green",main="Horsepower residual",ylab = "mpg")
```

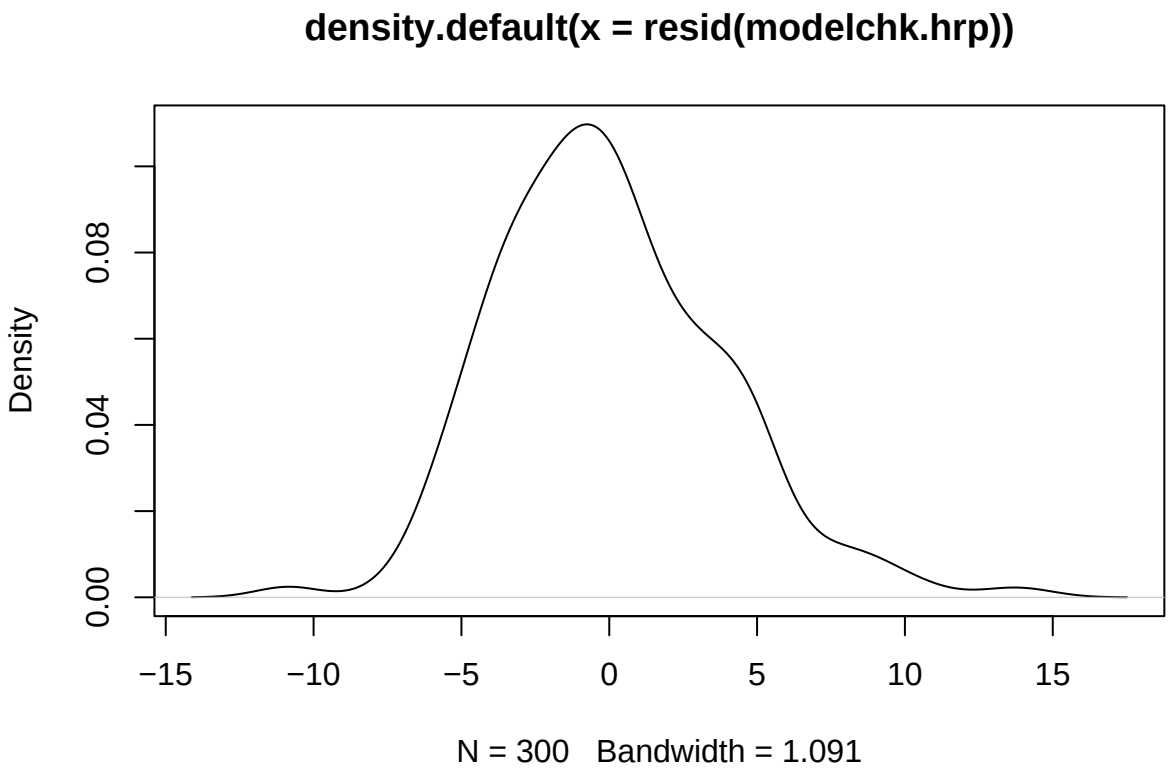


Linear Models of Horsepower for 300 records:

```
qqnorm(resid(modelchk.hrp))
qqline(resid(modelchk.hrp))
```

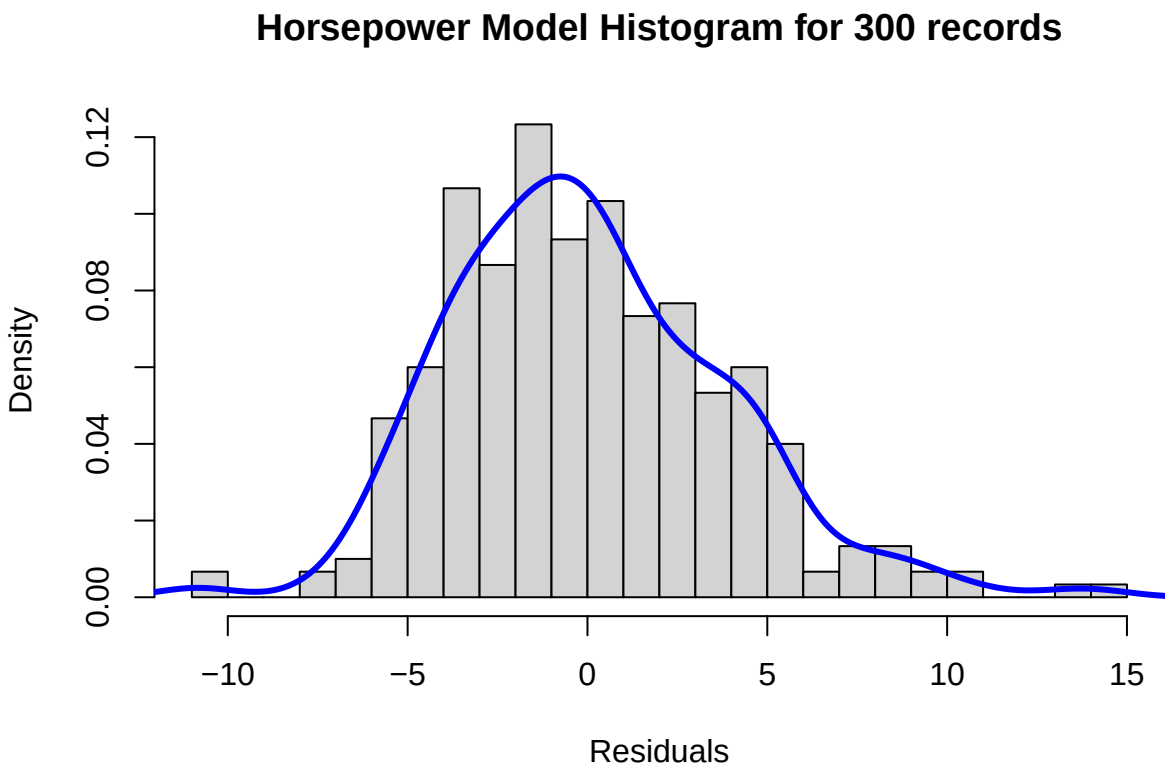



```
plot(density(resid(modelchk.hrp)))
```



##Histogram of Horsepower Model for 300 records:

```
hist(hrpfnl_residual ,prob=T,breaks=20,main="Horsepower Model Histogram for 300 records",xlab="Residuals
lines(density(hrpfnl_residual ),col="blue",lwd=3)
```



##Horsepower Model predictions for 98 records:

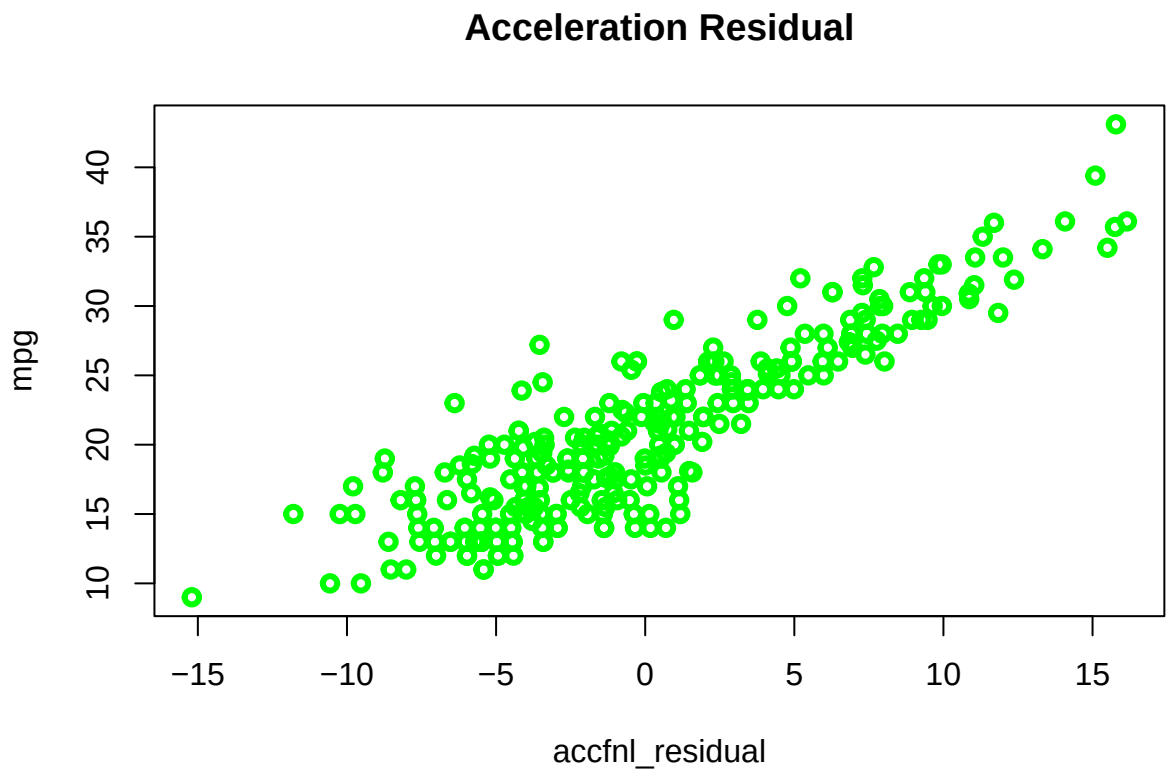
```
pdctfnl_hrp = modelchk.hrp %>% predict(auto.nity_eight)
data.frame( Prediction_HORSEPOWER_R2 = R2(pdctfnl_hrp, auto.nity_eight$mpg),Prediction_HORSEPOWER_RMSE =
```

```
##   Prediction_HORSEPOWER_R2 Prediction_HORSEPOWER_RMSE Prediction_HORSEPOWER_MAE
## 1                0.4483999                   8.592932                  7.508721
```

##REPORT ON PROJECTIONS FOR THE POWER MODEL: The R square corrected is 0.225. It is clear from this that the model is incorrect because just 22.5% of horsepower explains mpg. Nevertheless, we discovered that it was significant with a p-value of 2.2e-16. There is an unbalanced relationship between mpg and horsepower.

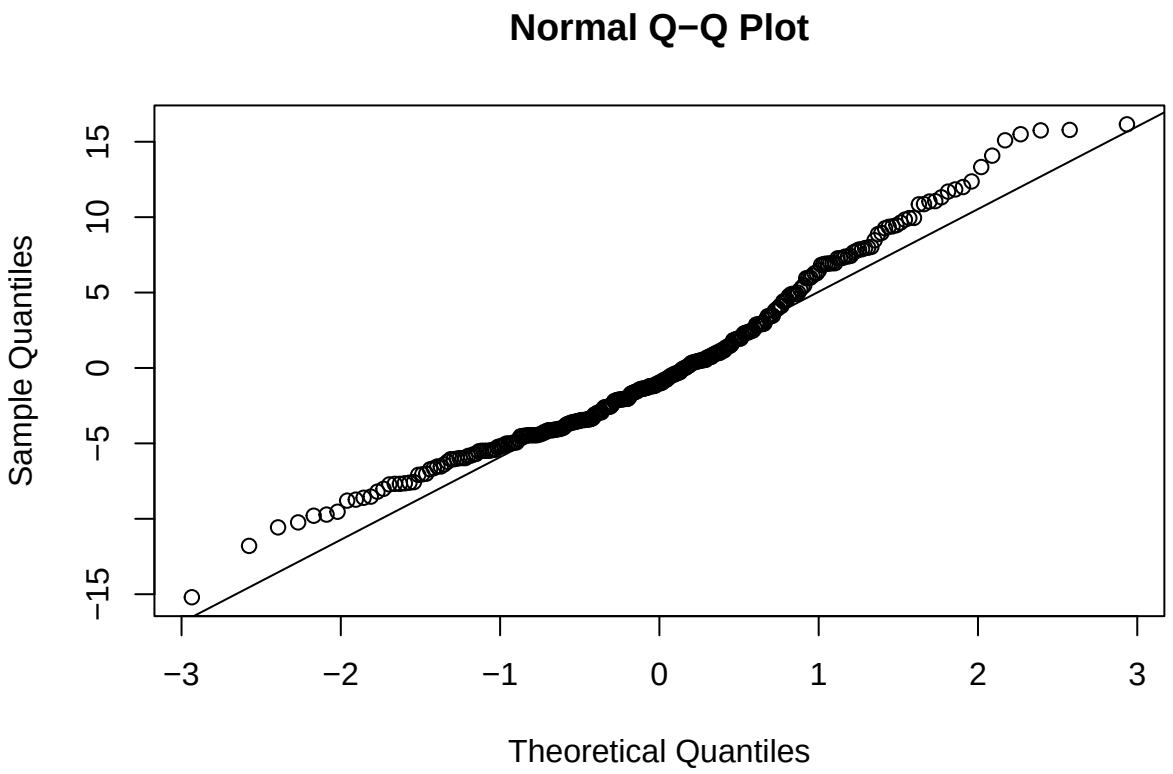
##Model of Acceleration Residual for 300 records:

```
accfnl_residual = modelchk.acc$residuals
plot(auto.three_hudrd$mpg~accfnl_residual ,lwd=3, col="green",main="Acceleration Residual",ylab = "mpg"
```

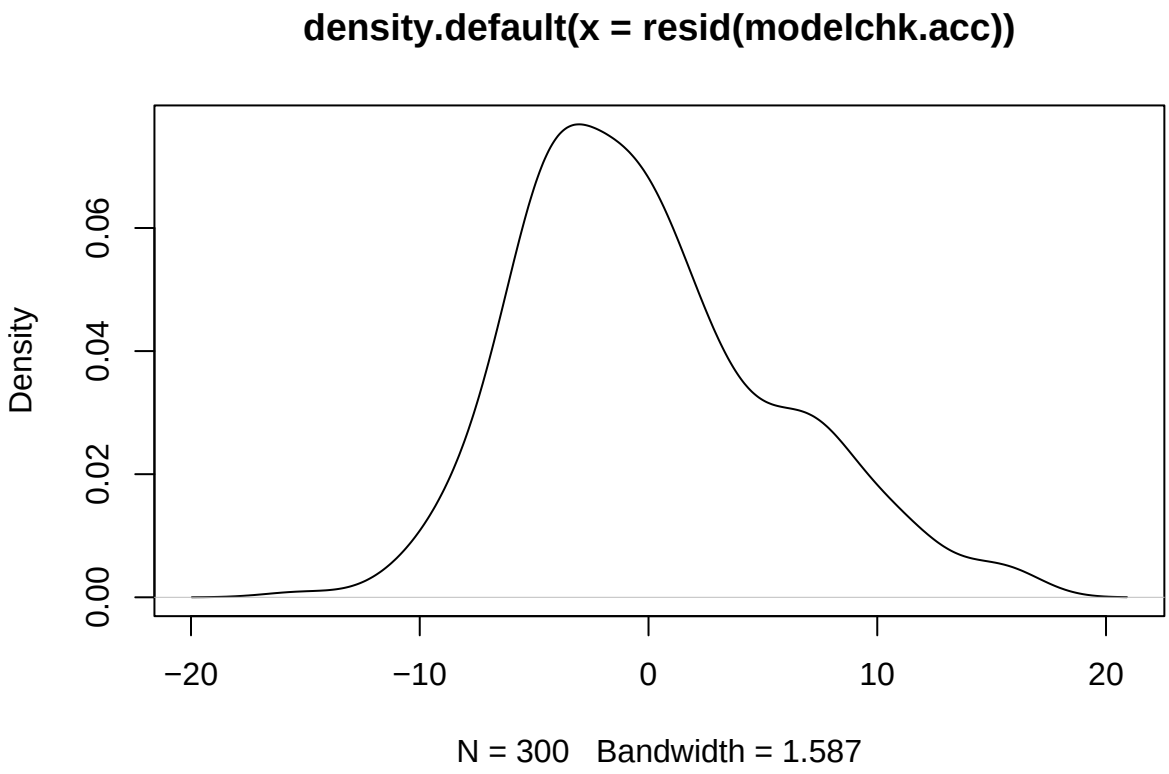


##Linear Model of Acceleration Residual for 300 records:

```
qqnorm(resid(modelchk.acc))
qqline(resid(modelchk.acc))
```

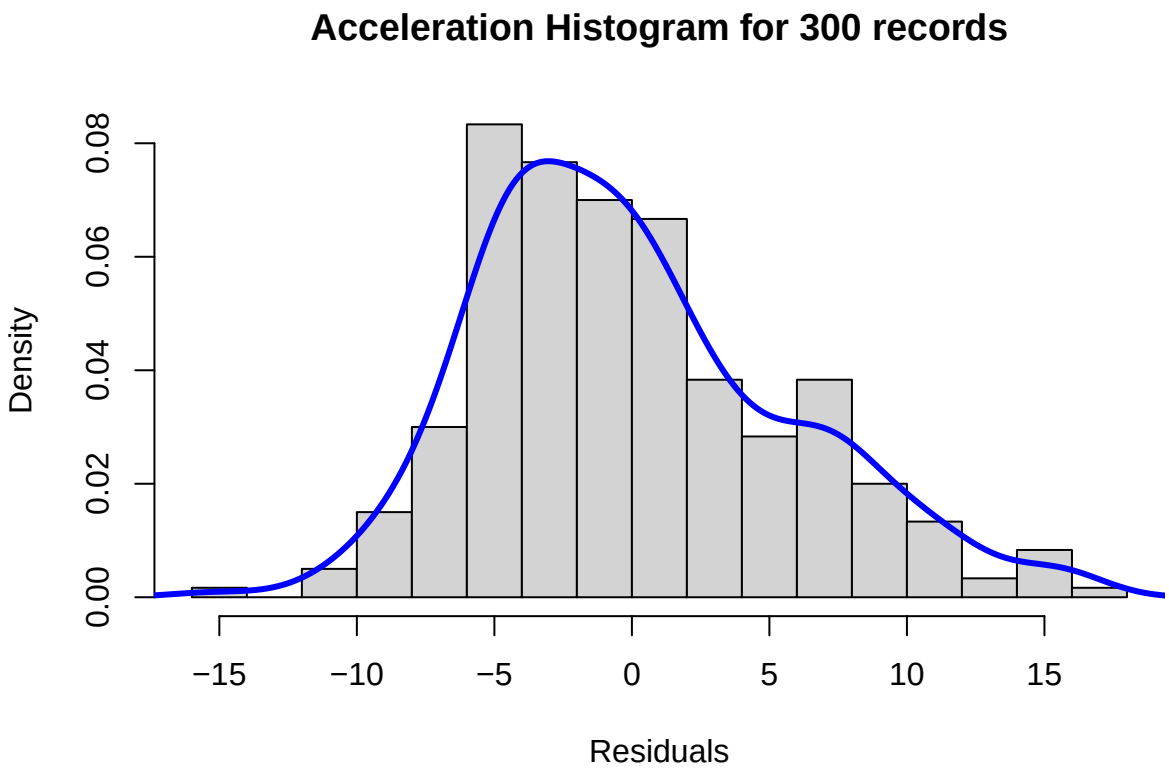



```
plot(density(resid(modelchk.acc)))
```



##Model of Acceleration Histogram for 300 records:

```
hist(accfnl_residual ,prob=T,breaks=20,main="Acceleration Histogram for 300 records",xlab="Residuals")
lines(density(accfnl_residual ),col="blue",lwd=3)
```



##Model of Acceleration predictions for 98 records:

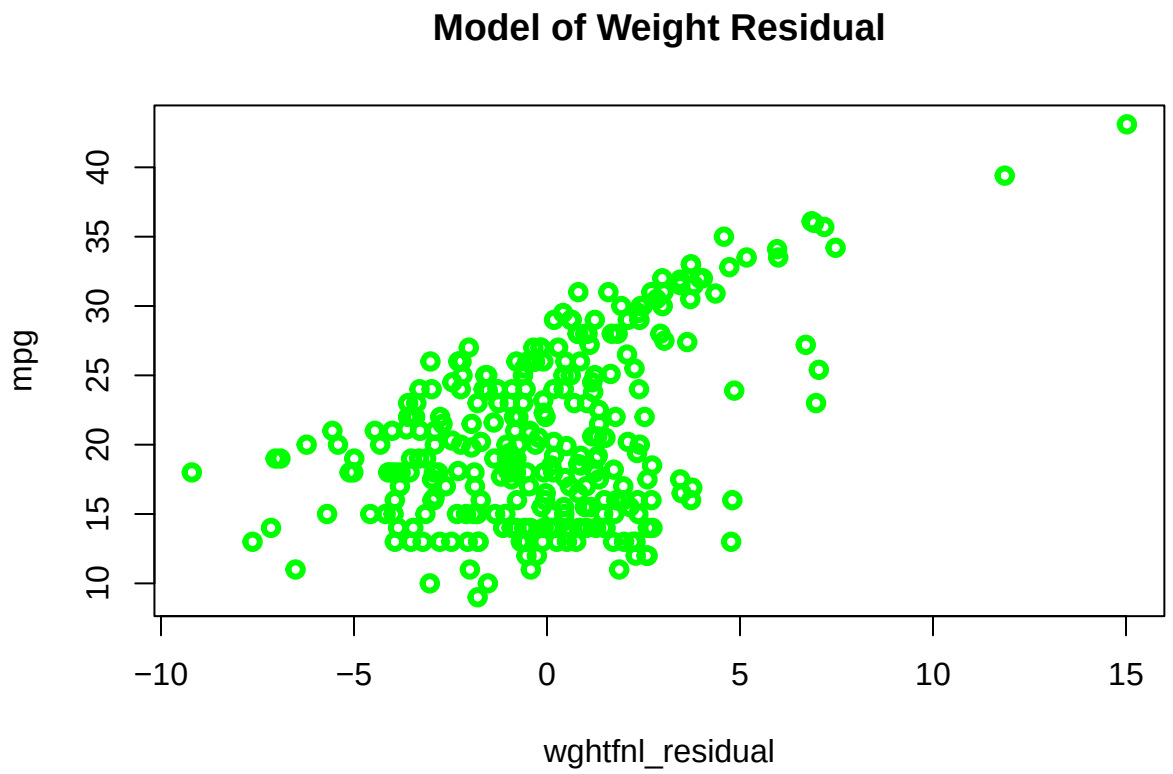
```
pdctfnl_acc = modelchk.acc %>% predict(auto.nity_eight)
data.frame( Prediction_ACCELERATION_R2 = R2(pdctfnl_acc, auto.nity_eight$mpg),Prediction_ACCELERATION_R
```

```
##   Prediction_ACCELERATION_R2 Prediction_ACCELERATION_RMSE
## 1                 0.03597167                      11.51665
##   Prediction_ACCELERATION_MAE
## 1                    10.16914
```

##ACCELERATION MODEL PREDICTION REPORT: All estimated values in this output are statistically significant, with a p-value of 2.2e-16. It has been established that there is no conclusive evidence linking these two variables. It looks like the residual vs. acceleration plot is in good shape. In the future, we'll comment on this genre of story.

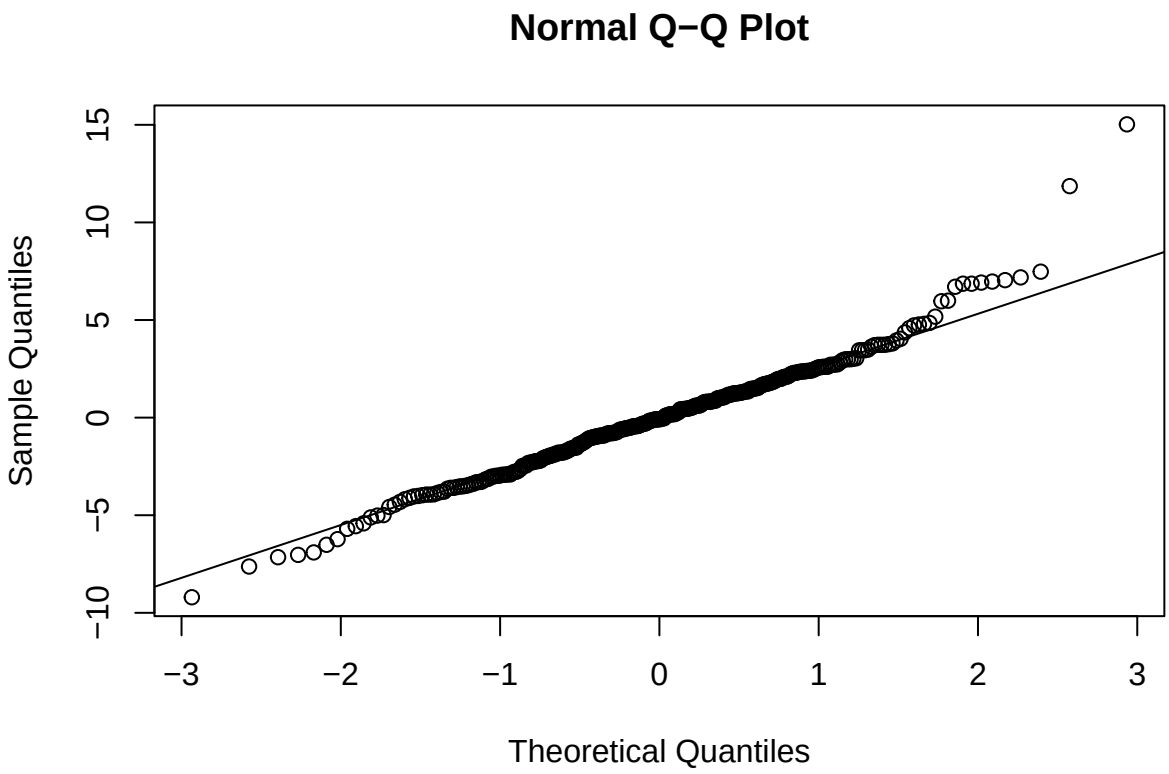
##Model of Weight Residual for 300 records:

```
wghtfnl_residual = modelchk.wght$residuals
plot(auto.three_hudrd$mpg~wghtfnl_residual ,lwd=3, col="Green",main="Model of Weight Residual",ylab = "
```

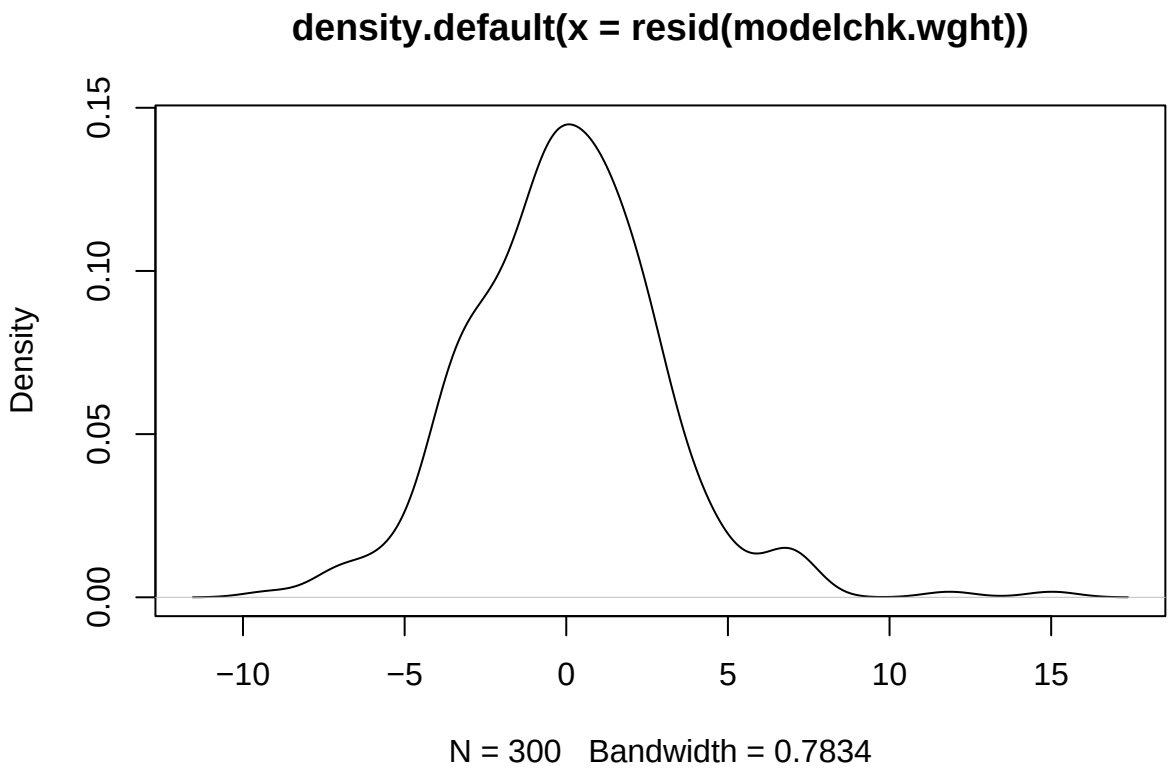


##Linear Models of Weight for 300 records:

```
qqnorm(resid(modelchk.wght))
qqline(resid(modelchk.wght))
```

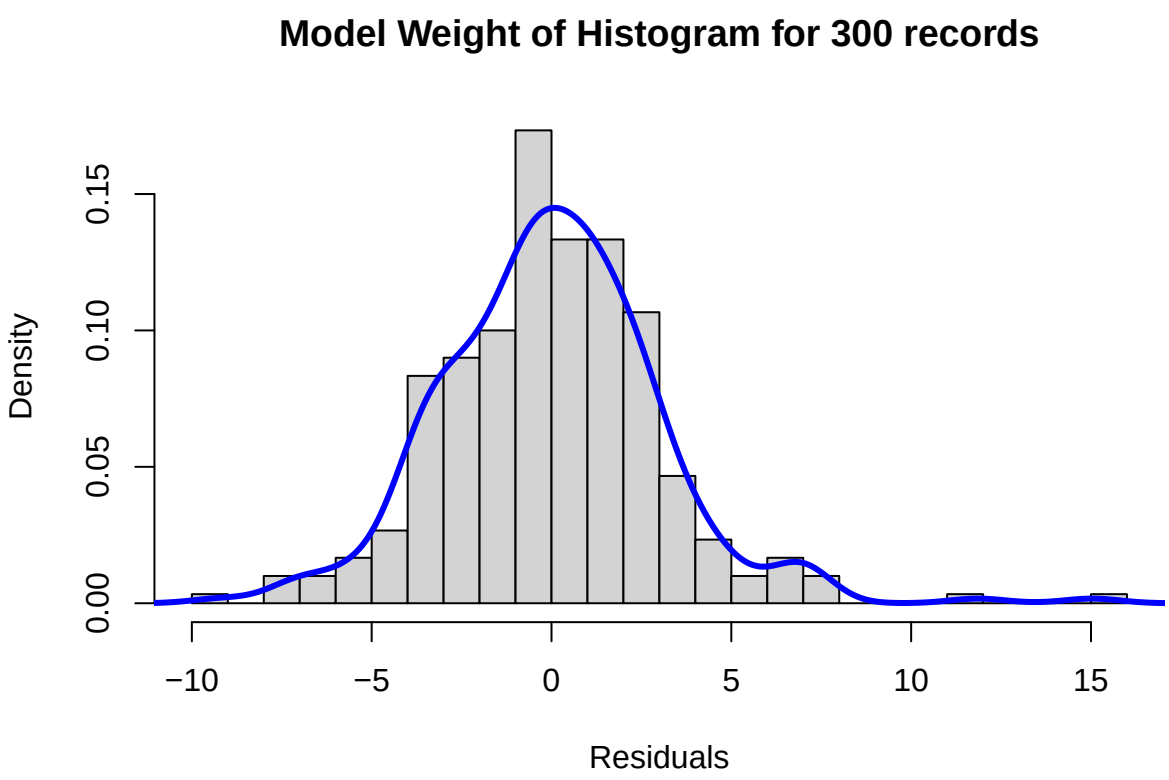



```
plot(density(resid(modelchk.wght)))
```



##Model Weight of Histogram for 300 records:

```
hist(wghtfnl_residual ,prob=T,breaks=20,main="Model Weight of Histogram for 300 records",xlab="Residuals
lines(density(wghtfnl_residual ),col="blue",lwd=3)
```



##Model Weight predictions for 98 records:

```
pdctfnl_wght = modelchk.wght %>% predict(auto.nity_eight)
data.frame( Prediction_WEIGHTMODEL_R2 = R2(pdctfnl_wght, auto.nity_eight$mpg),Prediction_WEIGHTMODEL_RM
```

```
##   Prediction_WEIGHTMODEL_R2 Prediction_WEIGHTMODEL_RMSE
## 1                 0.5006516                    8.157758
##   Prediction_WEIGHTMODEL_MAE
## 1                   6.983514
```

##REPORT ON PROJECTION FOR THE WEIGHT MODEL: The results of the regression show unequivocally that our model is reliable. A 2.2e-16 5% P-value is used. The coefficient of the model is statistically significant in explaining the mpg as a result. This model is the best option since it has the greatest R squared (0.7733) among the alternatives. Weight accounts for 77.33% of the mpg, per this Rsquared. In order to choose the best regression, we compared the R squared adjusted (0.7733>0.7129>0.2127) at this stage and selected the model with the greatest R squared adjusted.