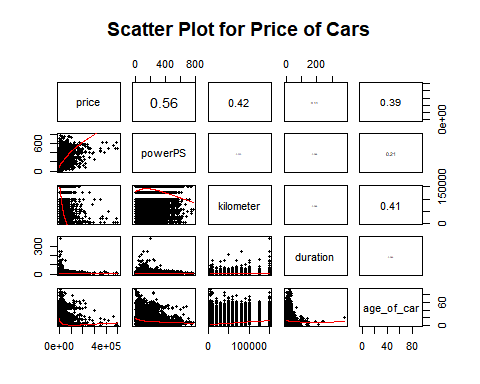
R Notebook

rm(list=ls())  
### Reading data and deleting NA values  
Cars<-read.csv("Cars\_Data.csv",header=TRUE)  
#View(Cars)  
### deleting NA values  
Cars = na.omit(Cars)  
  
#### convert german characters to english  
#summary(Cars)  
Cars$notRepairedDamage = factor(Cars$notRepairedDamage,labels=c("Yes","No"))  
  
  
### replacing year of registration with age of car  
  
Cars$year\_current=2016  
Cars$age\_of\_car=Cars$year\_current-Cars$yearOfRegistration  
Cars$yearOfRegistration=NULL  
Cars$year\_current=NULL  
#summary(Cars)  
#View(Cars)  
#View(Cars)

### find how Price of car varies with varies with the different numeric variables  
# subsetting data for numeric variables  
data\_sub=Cars[,c(4,7,9,14,15)]  
cor\_cars=cor(data\_sub)  
panel.cor <- function(x, y, digits=2, prefix="", cex.cor, ...)  
{  
 usr <- par("usr"); on.exit(par(usr))  
 par(usr = c(0, 1, 0, 1))  
 r <- abs(cor(x, y))  
 txt <- format(c(r, 0.123456789), digits=digits)[1]  
 txt <- paste(prefix, txt, sep="")  
 if(missing(cex.cor)) cex.cor <- 0.8/strwidth(txt)  
 text(0.5, 0.5, txt, cex = cex.cor \* r)  
}  
  
cor(data\_sub)

## price powerPS kilometer duration age\_of\_car  
## price 1.0000000 0.55613702 -0.42473512 0.10914275 -0.39264535  
## powerPS 0.5561370 1.00000000 -0.02189056 0.06597047 -0.21154027  
## kilometer -0.4247351 -0.02189056 1.00000000 -0.08629778 0.41499317  
## duration 0.1091428 0.06597047 -0.08629778 1.00000000 -0.06406992  
## age\_of\_car -0.3926453 -0.21154027 0.41499317 -0.06406992 1.00000000

pairs(price~., data=data\_sub,lower.panel=panel.smooth, upper.panel=panel.cor, pch=20, main="Scatter Plot for Price of Cars")



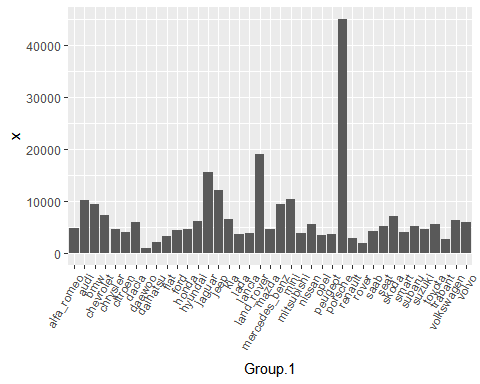
#View(data\_sub)

Price of cars has a high correlation with Power PS 56% , Price varies inversely with number of kilometeres driven, the price is negatively correlated by 42% with number of kilometres driven. The price Increases with year of reg - more recent cars are more expensive. Varies positively by 11% with duration - the longer the car has been on the web site the more expensive it is. The price of car also varies negatively with age of car by 39%.

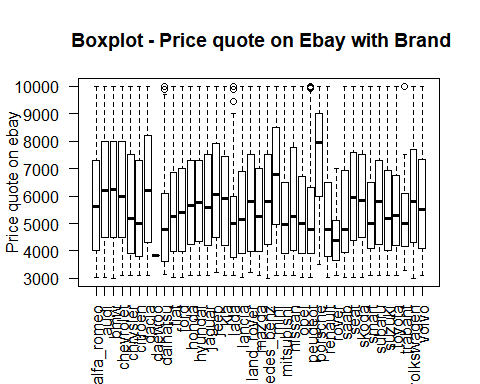
### find how price varies with different brands of car  
#install.packages("ggplot2")  
library(ggplot2)

## Warning: package 'ggplot2' was built under R version 3.4.2

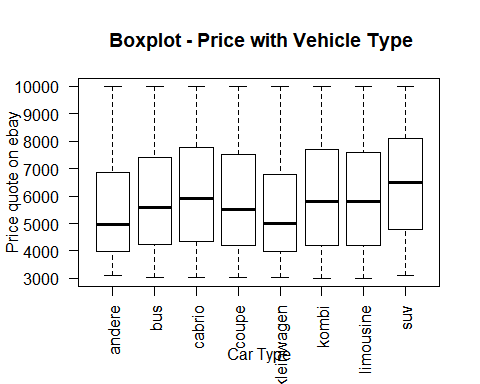
brand\_price=aggregate(Cars$price, by=list(Cars$brand), FUN=mean)  
brand\_price=brand\_price[order(brand\_price$x),]  
#View(brand\_price)  
## Bar plot showing average price of car with each category  
ggplot(data=brand\_price,aes(x=Group.1,y=x)) + geom\_bar(stat="identity")+theme(axis.text.x=element\_text(angle=60, hjust=1))

 Since we're students are budget is only between $(3000- 7000). ignoring the cheaper cars as they won't long lasting as well.

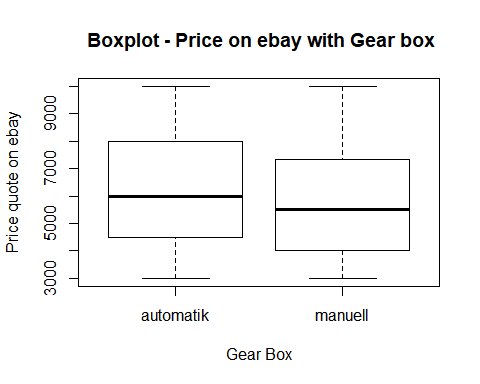
### subset data   
#### How does Price of Cars vary with categorical variables  
  
Cars\_sub\_price=Cars[Cars$price<10000 & Cars$price>3000,]  
#summary(Cars\_sub\_price)  
boxplot(Cars\_sub\_price$price~as.factor(Cars\_sub\_price$brand),main=" Boxplot - Price quote on Ebay with Brand",ylab="Price quote on ebay",las=2)



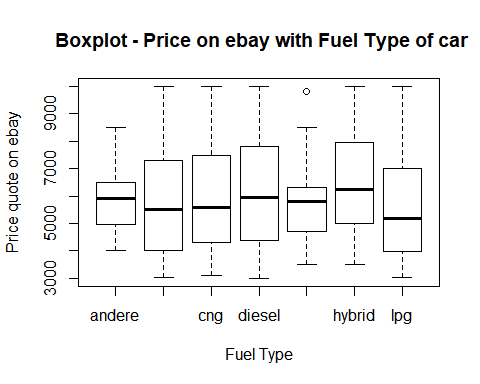
#axis(side=2, at=c(0:23))  
  
  
boxplot(Cars\_sub\_price$price ~as.factor(Cars\_sub\_price$vehicleType),main=" Boxplot - Price with Vehicle Type",xlab="Car Type",ylab="Price quote on ebay",las=2)



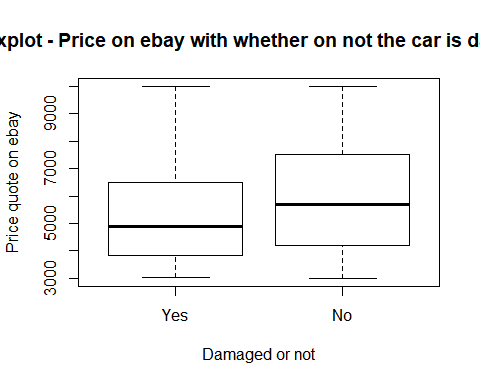
boxplot(Cars\_sub\_price$price ~as.factor(Cars\_sub\_price$gearbox),main=" Boxplot - Price on ebay with Gear box",xlab="Gear Box",ylab="Price quote on ebay")



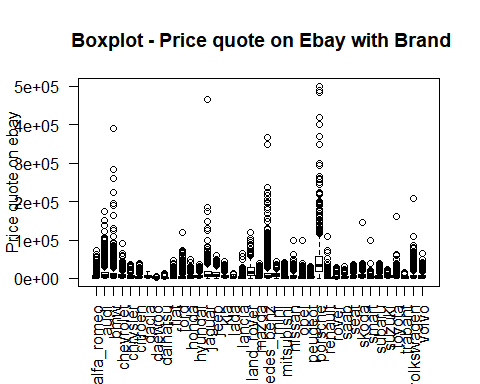
boxplot(Cars\_sub\_price$price ~as.factor(Cars\_sub\_price$fuelType),main=" Boxplot - Price on ebay with Fuel Type of car",xlab="Fuel Type",ylab="Price quote on ebay")



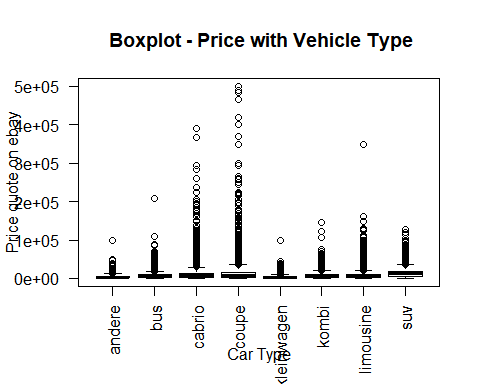
boxplot(Cars\_sub\_price$price ~as.factor(Cars\_sub\_price$notRepairedDamage),main=" Boxplot - Price on ebay with whether on not the car is damaged",xlab="Damaged or not",ylab="Price quote on ebay")



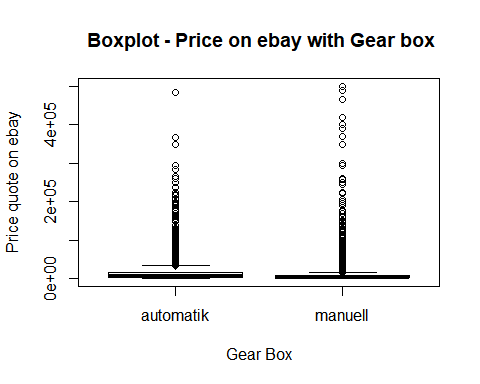
##### Boxplot with full data##############  
  
  
boxplot(Cars$price~as.factor(Cars$brand),main=" Boxplot - Price quote on Ebay with Brand",ylab="Price quote on ebay",las=2)



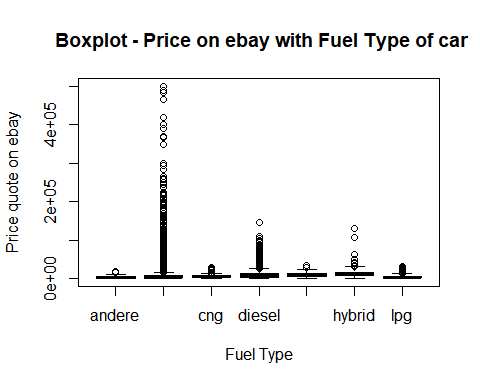
#axis(side=2, at=c(0:23))  
  
  
boxplot(Cars$price ~as.factor(Cars$vehicleType),main=" Boxplot - Price with Vehicle Type",xlab="Car Type",ylab="Price quote on ebay",las=2)



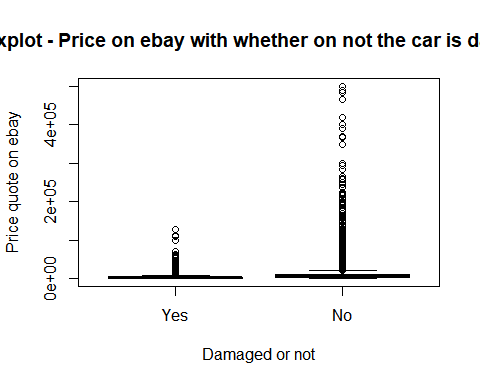
boxplot(Cars$price ~as.factor(Cars$gearbox),main=" Boxplot - Price on ebay with Gear box",xlab="Gear Box",ylab="Price quote on ebay")



boxplot(Cars$price ~as.factor(Cars$fuelType),main=" Boxplot - Price on ebay with Fuel Type of car",xlab="Fuel Type",ylab="Price quote on ebay")



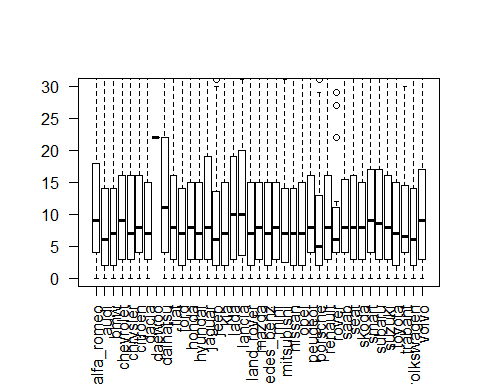
boxplot(Cars$price ~as.factor(Cars$notRepairedDamage),main=" Boxplot - Price on ebay with whether on not the car is damaged",xlab="Damaged or not",ylab="Price quote on ebay")



### fastest selling car brands  
summary(Cars\_sub\_price)

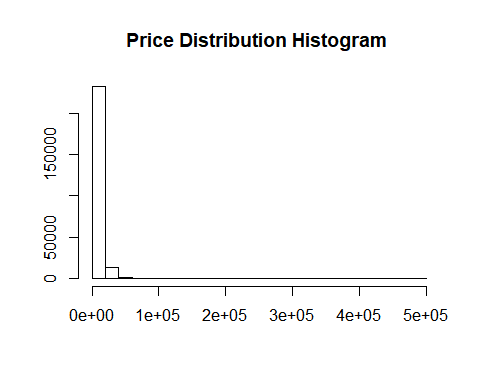
## name seller offerType   
## BMW\_116i : 334 privat:91253 Angebot:91253   
## BMW\_320i : 258   
## BMW\_318i : 231   
## MINI\_Mini\_One : 196   
## MINI\_Mini\_Cooper : 192   
## Audi\_A4\_Avant\_2.0\_TDI\_DPF: 187   
## (Other) :89855   
## price vehicleType gearbox powerPS   
## Min. :3001 limousine :26552 automatik:20848 Min. : 1.0   
## 1st Qu.:4200 kombi :19675 manuell :70405 1st Qu.: 98.0   
## Median :5600 kleinwagen:17236 Median :122.0   
## Mean :5938 bus :11380 Mean :130.5   
## 3rd Qu.:7500 cabrio : 7783 3rd Qu.:155.0   
## Max. :9999 coupe : 4228 Max. :776.0   
## (Other) : 4399   
## model kilometer monthOfRegistration fuelType   
## golf : 7052 Min. : 5000 Min. : 0.000 andere : 14   
## 3er : 6217 1st Qu.:100000 1st Qu.: 3.000 benzin :52190   
## andere : 6145 Median :150000 Median : 6.000 cng : 250   
## a4 : 3202 Mean :123328 Mean : 6.347 diesel :37070   
## passat : 3180 3rd Qu.:150000 3rd Qu.: 9.000 elektro: 27   
## 5er : 2580 Max. :150000 Max. :12.000 hybrid : 66   
## (Other):62877 lpg : 1636   
## brand notRepairedDamage duration age\_of\_car   
## volkswagen :19260 Yes: 4692 Min. : 0.000 Min. : 0.00   
## bmw :11657 No :86561 1st Qu.: 2.000 1st Qu.: 8.00   
## mercedes\_benz:10002 Median : 7.000 Median :10.00   
## audi : 8618 Mean : 9.599 Mean :11.04   
## opel : 7760 3rd Qu.: 15.000 3rd Qu.:13.00   
## ford : 4893 Max. :384.000 Max. :93.00   
## (Other) :29063

plot(Cars\_sub\_price$brand,Cars\_sub\_price$duration, ylim=c(0, 30),las=2)

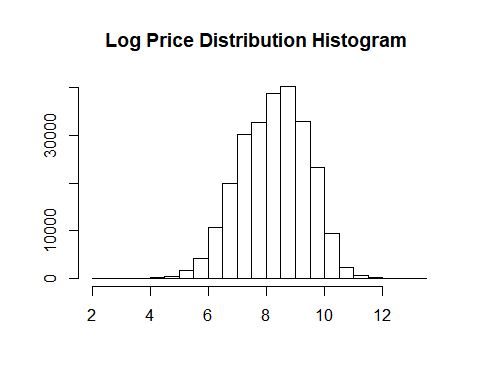


#axis(side=2, at=c(0:200))

### Anova model to compare means of the 2 groups - one with damage and the other without  
  
price=Cars$price  
damage=Cars$notRepairedDamage  
brand=Cars$brand  
fuel\_type=Cars$fuelType  
  
  
hist(price,xlab=" ", ylab = "",main="Price Distribution Histogram ")



hist(log(price),xlab=" ", ylab = "",main="Log Price Distribution Histogram ")



AOV\_damage = aov(log(price)~ damage)  
summary(AOV\_damage)

## Df Sum Sq Mean Sq F value Pr(>F)   
## damage 1 31573 31573 26675 <2e-16 \*\*\*  
## Residuals 247752 293243 1   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

AOV\_brand=aov(log(price)~brand)  
summary(AOV\_brand)

## Df Sum Sq Mean Sq F value Pr(>F)   
## brand 38 53723 1413.8 1292 <2e-16 \*\*\*  
## Residuals 247715 271094 1.1   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

AOV\_fuel=aov(log(price)~fuel\_type)  
summary(AOV\_fuel)

## Df Sum Sq Mean Sq F value Pr(>F)   
## fuel\_type 6 34093 5682 4842 <2e-16 \*\*\*  
## Residuals 247747 290724 1   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

As we can see that the p-value is very small and is significant at the 99% confidence interval.Hence we can reject the Null Hypothesis that that the means of car prices that are damaged and car prices that are not damaged are the same. Hence the means of the 2 groups are statistically significantly different.

#### Tukeys Pairwise analysis to   
pairwise\_dam=TukeyHSD(AOV\_damage)  
pairwise\_brand=TukeyHSD(AOV\_brand)  
pairwise\_fuel=TukeyHSD(AOV\_fuel)  
  
#### check if which brands prices are not significantly differnt from each other  
pairwise\_brand$brand[pairwise\_brand$brand[,4]>0.05,]

## diff lwr upr p adj  
## chrysler-alfa\_romeo -0.008071834 -0.174137966 0.1579942972 1.00000000  
## citroen-alfa\_romeo -0.044353398 -0.166352537 0.0776457414 0.99999793  
## honda-alfa\_romeo 0.004274901 -0.133716230 0.1422660316 1.00000000  
## lada-alfa\_romeo 0.025977965 -0.346266579 0.3982225102 1.00000000  
## mazda-alfa\_romeo 0.006974586 -0.113120785 0.1270699570 1.00000000  
## nissan-alfa\_romeo 0.014271332 -0.108571533 0.1371141968 1.00000000  
## saab-alfa\_romeo -0.052067966 -0.277309053 0.1731731212 1.00000000  
## seat-alfa\_romeo 0.105893083 -0.010636268 0.2224224349 0.15376644  
## smart-alfa\_romeo 0.113533965 -0.010105404 0.2371733347 0.13823278  
## subaru-alfa\_romeo -0.070465361 -0.274812155 0.1338814324 0.99999950  
## suzuki-alfa\_romeo 0.068094654 -0.074849779 0.2110390863 0.99886768  
## dacia-chevrolet 0.010009478 -0.182056185 0.2020751411 1.00000000  
## skoda-chevrolet 0.059321669 -0.070321862 0.1889651994 0.99950286  
## citroen-chrysler -0.036281563 -0.185171896 0.1126087691 1.00000000  
## honda-chrysler 0.012346735 -0.149906441 0.1745999119 1.00000000  
## lada-chrysler 0.034049800 -0.347854039 0.4159536388 1.00000000  
## mazda-chrysler 0.015046420 -0.132288027 0.1623808674 1.00000000  
## nissan-chrysler 0.022343166 -0.127239288 0.1719256205 1.00000000  
## peugeot-chrysler -0.136889494 -0.277015446 0.0032364579 0.06787323  
## saab-chrysler -0.043996131 -0.284865574 0.1968733113 1.00000000  
## seat-chrysler 0.113964918 -0.030477565 0.2584074008 0.45748423  
## smart-chrysler 0.121605800 -0.028631462 0.2718430614 0.39298933  
## subaru-chrysler -0.062393527 -0.283848157 0.1590611033 1.00000000  
## suzuki-chrysler 0.076166488 -0.090319703 0.2426526796 0.99950471  
## volvo-chrysler 0.141124593 -0.014029308 0.2962784950 0.15232539  
## honda-citroen 0.048628299 -0.068127529 0.1653841259 0.99993849  
## lada-citroen 0.070331363 -0.294574614 0.4352373402 1.00000000  
## mazda-citroen 0.051327984 -0.043610255 0.1462662224 0.98886192  
## nissan-citroen 0.058624730 -0.039766024 0.1570154837 0.95370484  
## saab-citroen -0.007714568 -0.220608716 0.2051795801 1.00000000  
## subaru-citroen -0.026111963 -0.216763433 0.1645395067 1.00000000  
## suzuki-citroen 0.112448052 -0.010122262 0.2350183653 0.13956617  
## hyundai-dacia -0.166714602 -0.339866115 0.0064369102 0.08121192  
## kia-dacia -0.158785605 -0.339759008 0.0221877982 0.21394060  
## skoda-dacia 0.049312191 -0.116710833 0.2153352145 0.99999999  
## rover-daewoo 0.210707258 -0.138683781 0.5600982974 0.94588551  
## lancia-daihatsu 0.220325482 -0.078306921 0.5189578857 0.62731256  
## rover-daihatsu -0.185724717 -0.505719519 0.1342700849 0.96755312  
## trabant-daihatsu 0.255462494 -0.110288853 0.6212138412 0.75030279  
## lada-fiat 0.355898491 -0.006297741 0.7180947224 0.06301576  
## lancia-fiat -0.167775559 -0.406932803 0.0713816843 0.74132255  
## mitsubishi-fiat 0.050609482 -0.055388059 0.1566070230 0.99881522  
## opel-fiat 0.017948928 -0.040654530 0.0765523857 0.99999998  
## trabant-fiat -0.132638548 -0.451682311 0.1864052155 0.99994106  
## lada-ford 0.219523264 -0.140233202 0.5792797305 0.93728325  
## mitsubishi-ford -0.085765745 -0.183100650 0.0115691597 0.20599065  
## peugeot-ford 0.048583970 -0.008068085 0.1052360252 0.25948556  
## saab-ford 0.141477333 -0.062464476 0.3454191415 0.76392473  
## subaru-ford 0.123079938 -0.057519969 0.3036798436 0.79736898  
## trabant-ford -0.269013775 -0.585285063 0.0472575138 0.27697096  
## lada-honda 0.021703065 -0.348856154 0.3922622829 1.00000000  
## mazda-honda 0.002699685 -0.112065429 0.1174647990 1.00000000  
## nissan-honda 0.009996431 -0.107640734 0.1276335965 1.00000000  
## saab-honda -0.056342867 -0.278787648 0.1661019142 1.00000000  
## seat-honda 0.101618182 -0.009409846 0.2126462105 0.14301125  
## smart-honda 0.109259065 -0.009209610 0.2277277392 0.13210129  
## subaru-honda -0.074740262 -0.276000654 0.1265201297 0.99999639  
## suzuki-honda 0.063819753 -0.074676615 0.2023161212 0.99942415  
## kia-hyundai 0.007928997 -0.114901782 0.1307597774 1.00000000  
## lada-hyundai -0.338943795 -0.705792576 0.0279049872 0.12959804  
## toyota-hyundai -0.021797679 -0.125775305 0.0821799463 1.00000000  
## jeep-jaguar 0.002499861 -0.249162153 0.2541618745 1.00000000  
## mini-jaguar 0.057364457 -0.145764024 0.2604929383 1.00000000  
## mini-jeep 0.054864596 -0.128827881 0.2385570736 0.99999999  
## lada-kia -0.346872792 -0.717477642 0.0237320582 0.11266369  
## toyota-kia -0.029726677 -0.146265395 0.0868120418 1.00000000  
## mazda-lada -0.019003380 -0.383277288 0.3452705288 1.00000000  
## mitsubishi-lada -0.305289009 -0.675272727 0.0646947092 0.34618157  
## nissan-lada -0.011706633 -0.376895559 0.3534822924 1.00000000  
## opel-lada -0.337949563 -0.697236131 0.0213370054 0.10661150  
## peugeot-lada -0.170939294 -0.532357782 0.1904791939 0.99901892  
## saab-lada -0.078045931 -0.489149482 0.3330576194 1.00000000  
## seat-lada 0.079915118 -0.283198737 0.4430289731 1.00000000  
## smart-lada 0.087556000 -0.277901625 0.4530136251 1.00000000  
## subaru-lada -0.096443327 -0.496481067 0.3035944143 1.00000000  
## suzuki-lada 0.042116688 -0.330315444 0.4145488203 1.00000000  
## toyota-lada 0.317146115 -0.047644100 0.6819363306 0.23164053  
## volkswagen-lada 0.217426251 -0.141373189 0.5762256914 0.94248110  
## volvo-lada 0.107074794 -0.260431362 0.4745809488 1.00000000  
## mitsubishi-lancia 0.218385041 -0.032409753 0.4691798353 0.22852388  
## opel-lancia 0.185724487 -0.049002834 0.4204518084 0.45025823  
## renault-lancia 0.039025944 -0.197551546 0.2756034338 1.00000000  
## trabant-lancia 0.035137012 -0.356591814 0.4268658373 1.00000000  
## nissan-mazda 0.007296746 -0.088723297 0.1033167891 1.00000000  
## saab-mazda -0.059042552 -0.270851490 0.1527663870 1.00000000  
## subaru-mazda -0.077439947 -0.266878832 0.1119989382 0.99996043  
## suzuki-mazda 0.061120068 -0.059555489 0.1817956247 0.99636655  
## opel-mitsubishi -0.032660554 -0.128244061 0.0629229530 0.99999961  
## trabant-mitsubishi -0.183248030 -0.511105872 0.1446098122 0.98125319  
## saab-nissan -0.066339298 -0.279718064 0.1470394681 0.99999997  
## smart-nissan 0.099262633 -0.001154716 0.1996799830 0.05831760  
## subaru-nissan -0.084736693 -0.275929168 0.1064557818 0.99974906  
## suzuki-nissan 0.053823322 -0.069586813 0.1772334561 0.99982393  
## trabant-opel -0.150587476 -0.466324156 0.1651492042 0.99884051  
## saab-peugeot 0.092893363 -0.113966178 0.2997529036 0.99966638  
## subaru-peugeot 0.074495967 -0.109392407 0.2583843422 0.99996812  
## trabant-peugeot -0.317597745 -0.635758296 0.0005628062 0.05120895  
## trabant-renault -0.003888933 -0.321003493 0.3132256279 1.00000000  
## seat-saab 0.157961049 -0.051846525 0.3677686232 0.57716134  
## smart-saab 0.165601931 -0.048236377 0.3794402394 0.50528832  
## subaru-saab -0.018397395 -0.287093767 0.2502989769 1.00000000  
## suzuki-saab 0.120162620 -0.105388348 0.3457135876 0.99124897  
## volvo-saab 0.185120725 -0.032200053 0.4024415025 0.27379312  
## smart-seat 0.007640882 -0.084946182 0.1002279464 1.00000000  
## subaru-seat -0.176358444 -0.363556956 0.0108400675 0.10473999  
## suzuki-seat -0.037798430 -0.154925632 0.0793287733 0.99999992  
## volvo-seat 0.027159676 -0.073208959 0.1275283106 1.00000000  
## subaru-smart -0.183999327 -0.375704534 0.0077058812 0.08434163  
## suzuki-smart -0.045439312 -0.169642313 0.0787636894 0.99999755  
## volvo-smart 0.019518794 -0.089023671 0.1280612586 1.00000000  
## suzuki-subaru 0.138560015 -0.066128294 0.3432483240 0.80926138  
## volvo-suzuki 0.064958105 -0.065149096 0.1950653068 0.99720761

While choosing between 2 brands we can see that the above list shows us brands where the prices are NOT significantly different from each other. Therefore, given a car of same age, damage type I will not select for example a volvo over a Suzuki as their prices are NOT significantly different from each other. I can use other parameters to select between the 2 cars.

### checking prices of which fuel types are significantly different from each other  
pairwise\_fuel=TukeyHSD(AOV\_fuel)  
pairwise\_fuel

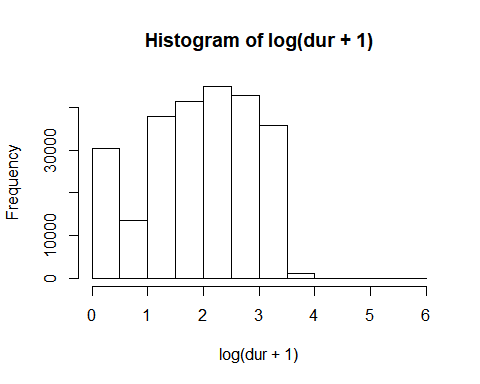
## Tukey multiple comparisons of means  
## 95% family-wise confidence level  
##   
## Fit: aov(formula = log(price) ~ fuel\_type)  
##   
## $fuel\_type  
## diff lwr upr p adj  
## benzin-andere 0.31680897 -0.12196922 0.75558716 0.3355261  
## cng-andere 0.62637373 0.16129812 1.09144933 0.0013956  
## diesel-andere 1.10038037 0.66153629 1.53922445 0.0000000  
## elektro-andere 1.16940820 0.54600951 1.79280689 0.0000007  
## hybrid-andere 1.62613333 1.13271171 2.11955494 0.0000000  
## lpg-andere 0.41064339 -0.03118109 0.85246786 0.0884886  
## cng-benzin 0.30956475 0.15497855 0.46415096 0.0000001  
## diesel-benzin 0.78357140 0.76994411 0.79719869 0.0000000  
## elektro-benzin 0.85259923 0.40962349 1.29557496 0.0000003  
## hybrid-benzin 1.30932435 1.08334545 1.53530326 0.0000000  
## lpg-benzin 0.09383441 0.04082083 0.14684800 0.0000038  
## diesel-cng 0.47400665 0.31923352 0.62877977 0.0000000  
## elektro-cng 0.54303447 0.07399661 1.01207234 0.0114424  
## hybrid-cng 0.99975960 0.72619885 1.27332035 0.0000000  
## lpg-cng -0.21573034 -0.37876241 -0.05269827 0.0018494  
## elektro-diesel 0.06902783 -0.37401317 0.51206882 0.9992993  
## hybrid-diesel 0.52575295 0.29964614 0.75185976 0.0000000  
## lpg-diesel -0.68973699 -0.74329317 -0.63618080 0.0000000  
## hybrid-elektro 0.45672513 -0.04043288 0.95388314 0.0960456  
## lpg-elektro -0.75876481 -1.20475816 -0.31277147 0.0000109  
## lpg-hybrid -1.21548994 -1.44732830 -0.98365158 0.0000000

#### check if which brands prices are not significantly differnt from each other  
pairwise\_fuel$fuel\_type[pairwise\_fuel$fuel\_type[,4]>0.05,]

## diff lwr upr p adj  
## benzin-andere 0.31680897 -0.12196922 0.7555872 0.33552609  
## lpg-andere 0.41064339 -0.03118109 0.8524679 0.08848860  
## elektro-diesel 0.06902783 -0.37401317 0.5120688 0.99929930  
## hybrid-elektro 0.45672513 -0.04043288 0.9538831 0.09604563

As we can see the prices of the above fuel prices are not significantly different from each other for example - I will not choose a benzin car over a andere car given all other variables constant.

dur=Cars$duration  
hist(log(dur+1))



AOV\_dur\_brand=aov(log(dur+1)~brand)  
summary(AOV\_dur\_brand)

## Df Sum Sq Mean Sq F value Pr(>F)   
## brand 38 763 20.072 19.1 <2e-16 \*\*\*  
## Residuals 247715 260382 1.051   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## to check if diff brands have diff means  
pairwise\_dur=TukeyHSD(AOV\_dur\_brand)  
  
  
#### check if which brands duration is not significantly differnt from each other  
pairwise\_dur$brand[pairwise\_dur$brand[,4]>0.05,]

## diff lwr upr  
## audi-alfa\_romeo -9.117923e-02 -1.931866e-01 0.0108281623  
## chevrolet-alfa\_romeo -4.253821e-02 -1.918568e-01 0.1067803423  
## chrysler-alfa\_romeo -8.579691e-02 -2.485492e-01 0.0769554038  
## dacia-alfa\_romeo -1.694970e-01 -3.501271e-01 0.0111331554  
## daihatsu-alfa\_romeo -1.948972e-01 -4.025619e-01 0.0127675325  
## honda-alfa\_romeo -6.525432e-02 -2.004919e-01 0.0699832252  
## hyundai-alfa\_romeo -1.092270e-01 -2.343716e-01 0.0159177446  
## jaguar-alfa\_romeo 1.058270e-01 -1.033907e-01 0.3150448041  
## jeep-alfa\_romeo -6.492468e-02 -2.561075e-01 0.1262581614  
## lada-alfa\_romeo -7.791856e-02 -4.427350e-01 0.2868979123  
## lancia-alfa\_romeo 3.292860e-03 -2.457545e-01 0.2523402135  
## land\_rover-alfa\_romeo -4.990093e-03 -1.939695e-01 0.1839893282  
## mini-alfa\_romeo 6.611047e-02 -5.778631e-02 0.1900072405  
## mitsubishi-alfa\_romeo -1.268164e-01 -2.605320e-01 0.0068991365  
## porsche-alfa\_romeo -3.767883e-02 -1.735425e-01 0.0981848115  
## rover-alfa\_romeo -7.024077e-02 -3.435863e-01 0.2031047788  
## saab-alfa\_romeo 5.168675e-03 -2.155778e-01 0.2259151172  
## seat-alfa\_romeo -1.094159e-01 -2.236199e-01 0.0047881492  
## skoda-alfa\_romeo -9.844630e-02 -2.139406e-01 0.0170479606  
## smart-alfa\_romeo -1.056153e-01 -2.267875e-01 0.0155568426  
## subaru-alfa\_romeo 4.231875e-02 -1.579503e-01 0.2425878378  
## suzuki-alfa\_romeo -1.376778e-01 -2.777698e-01 0.0024142088  
## trabant-alfa\_romeo -7.977438e-02 -4.035882e-01 0.2440394506  
## volvo-alfa\_romeo -6.484933e-02 -1.918331e-01 0.0621343954  
## bmw-audi -1.920176e-02 -5.384538e-02 0.0154418516  
## chevrolet-audi 4.864102e-02 -6.629350e-02 0.1635755385  
## chrysler-audi 5.382326e-03 -1.265352e-01 0.1372998277  
## citroen-audi -5.751103e-02 -1.296887e-01 0.0146666857  
## dacia-audi -7.831772e-02 -2.317490e-01 0.0751135313  
## daewoo-audi -1.933771e-01 -4.234607e-01 0.0367066183  
## daihatsu-audi -1.037180e-01 -2.882134e-01 0.0807774365  
## honda-audi 2.592492e-02 -7.000790e-02 0.1218577325  
## hyundai-audi -1.804772e-02 -9.913475e-02 0.0630393169  
## jeep-audi 2.625455e-02 -1.394705e-01 0.1919796013  
## kia-audi -6.419208e-02 -1.602941e-01 0.0319098992  
## lada-audi 1.326067e-02 -3.388827e-01 0.3654040691  
## lancia-audi 9.447209e-02 -1.356116e-01 0.3245557668  
## land\_rover-audi 8.618914e-02 -7.698909e-02 0.2493673683  
## mazda-audi -3.023325e-02 -9.927628e-02 0.0388097881  
## mercedes\_benz-audi -3.200525e-02 -6.774466e-02 0.0037341557  
## mitsubishi-audi -3.563718e-02 -1.294122e-01 0.0581378752  
## nissan-audi -6.970430e-02 -1.432437e-01 0.0038350733  
## porsche-audi 5.350040e-02 -4.331303e-02 0.1503138400  
## rover-audi 2.093847e-02 -2.352484e-01 0.2771253122  
## saab-audi 9.634791e-02 -1.027573e-01 0.2954531675  
## seat-audi -1.823665e-02 -8.113714e-02 0.0446638512  
## skoda-audi -7.267064e-03 -7.248084e-02 0.0579467077  
## smart-audi -1.443609e-02 -8.924656e-02 0.0603743793  
## subaru-audi 1.334980e-01 -4.263158e-02 0.3096275383  
## suzuki-audi -4.649856e-02 -1.491615e-01 0.0561643907  
## toyota-audi -6.334017e-02 -1.349536e-01 0.0082733021  
## trabant-audi 1.140485e-02 -2.980613e-01 0.3208710219  
## volvo-audi 2.632990e-02 -5.756752e-02 0.1102273336  
## chevrolet-bmw 6.784278e-02 -4.657183e-02 0.1822573903  
## chrysler-bmw 2.458409e-02 -1.068807e-01 0.1560488601  
## citroen-bmw -3.830926e-02 -1.096562e-01 0.0330376424  
## dacia-bmw -5.911596e-02 -2.121581e-01 0.0939262191  
## daewoo-bmw -1.741753e-01 -4.039997e-01 0.0556491093  
## daihatsu-bmw -8.451621e-02 -2.686882e-01 0.0996557609  
## honda-bmw 4.512668e-02 -5.018263e-02 0.1404359865  
## hyundai-bmw 1.154046e-03 -7.919436e-02 0.0815024492  
## jeep-bmw 4.545631e-02 -1.199086e-01 0.2108212168  
## kia-bmw -4.499031e-02 -1.404699e-01 0.0504892579  
## lada-bmw 3.246244e-02 -3.195116e-01 0.3844364834  
## lancia-bmw 1.136739e-01 -1.161505e-01 0.3434982579  
## land\_rover-bmw 1.053909e-01 -5.742154e-02 0.2682033502  
## mazda-bmw -1.103149e-02 -7.920553e-02 0.0571425546  
## mercedes\_benz-bmw -1.280349e-02 -4.683383e-02 0.0212268521  
## mitsubishi-bmw -1.643542e-02 -1.095725e-01 0.0767016852  
## nissan-bmw -5.050254e-02 -1.232267e-01 0.0222215873  
## peugeot-bmw -4.926109e-02 -1.008112e-01 0.0022890468  
## porsche-bmw 7.270217e-02 -2.349347e-02 0.1688978020  
## rover-bmw 4.014023e-02 -2.158138e-01 0.2960942461  
## saab-bmw 1.155497e-01 -8.325592e-02 0.3143552623  
## seat-bmw 9.651164e-04 -6.098027e-02 0.0629105074  
## skoda-bmw 1.193470e-02 -5.235834e-02 0.0762277379  
## smart-bmw 4.765671e-03 -6.924355e-02 0.0787748964  
## subaru-bmw 1.526997e-01 -2.309098e-02 0.3284904711  
## suzuki-bmw -2.729680e-02 -1.293774e-01 0.0747837607  
## toyota-bmw -4.413840e-02 -1.149144e-01 0.0266376356  
## trabant-bmw 3.060662e-02 -2.786668e-01 0.3398800685  
## volvo-bmw 4.553167e-02 -3.765209e-02 0.1287154245  
## chrysler-chevrolet -4.325869e-02 -2.144099e-01 0.1278925551  
## citroen-chevrolet -1.061520e-01 -2.369196e-01 0.0246154759  
## dacia-chevrolet -1.269587e-01 -3.151918e-01 0.0612742845  
## daewoo-chevrolet -2.420181e-01 -4.966335e-01 0.0125973600  
## daihatsu-chevrolet -1.523590e-01 -3.666697e-01 0.0619517143  
## honda-chevrolet -2.271610e-02 -1.679526e-01 0.1225203520  
## hyundai-chevrolet -6.668874e-02 -2.025770e-01 0.0691995623  
## jaguar-chevrolet 1.483652e-01 -6.745068e-02 0.3641811660  
## jeep-chevrolet -2.238647e-02 -2.207682e-01 0.1759952719  
## kia-chevrolet -1.128331e-01 -2.581813e-01 0.0325151496  
## lada-chevrolet -3.538035e-02 -4.040204e-01 0.3332597140  
## lancia-chevrolet 4.583108e-02 -2.087844e-01 0.3004465086  
## land\_rover-chevrolet 3.754812e-02 -1.587110e-01 0.2338072782  
## mazda-chevrolet -7.887427e-02 -2.079381e-01 0.0501895287  
## mercedes\_benz-chevrolet -8.064627e-02 -1.953974e-01 0.0341048840  
## mini-chevrolet 1.086487e-01 -2.609124e-02 0.2433885989  
## mitsubishi-chevrolet -8.427820e-02 -2.280985e-01 0.0595421164  
## nissan-chevrolet -1.183453e-01 -2.498693e-01 0.0131786788  
## peugeot-chevrolet -1.171039e-01 -2.382120e-01 0.0040042619  
## porsche-chevrolet 4.859384e-03 -1.409602e-01 0.1506790128  
## rover-chevrolet -2.770255e-02 -3.061307e-01 0.2507255754  
## saab-chevrolet 4.770689e-02 -1.793029e-01 0.2747166397  
## seat-chevrolet -6.687767e-02 -1.927625e-01 0.0590071834  
## skoda-chevrolet -5.590808e-02 -1.829646e-01 0.0711484341  
## smart-chevrolet -6.307711e-02 -1.953160e-01 0.0691617986  
## subaru-chevrolet 8.485696e-02 -1.222955e-01 0.2920094264  
## suzuki-chevrolet -9.513958e-02 -2.449067e-01 0.0546275870  
## toyota-chevrolet -1.119812e-01 -2.424381e-01 0.0184757482  
## trabant-chevrolet -3.723616e-02 -3.653517e-01 0.2908794115  
## volvo-chevrolet -2.231111e-02 -1.598949e-01 0.1152726824  
## citroen-chrysler -6.289335e-02 -2.088126e-01 0.0830259006  
## dacia-chrysler -8.370005e-02 -2.827577e-01 0.1153576212  
## daewoo-chrysler -1.987594e-01 -4.614784e-01 0.0639596765  
## daihatsu-chrysler -1.091003e-01 -3.329783e-01 0.1147777097  
## fiat-chrysler -8.404636e-02 -2.233303e-01 0.0552375746  
## ford-chrysler -1.273441e-01 -2.604163e-01 0.0057281392  
## honda-chrysler 2.054259e-02 -1.384729e-01 0.1795580347  
## hyundai-chrysler -2.343004e-02 -1.739555e-01 0.1270954146  
## jaguar-chrysler 1.916239e-01 -3.369538e-02 0.4169432572  
## jeep-chrysler 2.087222e-02 -1.878084e-01 0.2295528388  
## kia-chrysler -6.957440e-02 -2.286920e-01 0.0895431520  
## lada-chrysler 7.878348e-03 -3.664047e-01 0.3821613655  
## lancia-chrysler 8.908977e-02 -1.736293e-01 0.3518088250  
## land\_rover-chrysler 8.080682e-02 -1.258570e-01 0.2874706489  
## mazda-chrysler -3.561557e-02 -1.800100e-01 0.1087788411  
## mercedes\_benz-chrysler -3.738758e-02 -1.691454e-01 0.0943701971  
## mitsubishi-chrysler -4.101951e-02 -1.987426e-01 0.1167035640  
## nissan-chrysler -7.508663e-02 -2.216842e-01 0.0715109380  
## peugeot-chrysler -7.384518e-02 -2.111749e-01 0.0634845840  
## porsche-chrysler 4.811808e-02 -1.114302e-01 0.2076663391  
## renault-chrysler -1.098566e-01 -2.448426e-01 0.0251294618  
## rover-chrysler 1.555614e-02 -2.703014e-01 0.3014136336  
## saab-chrysler 9.096558e-02 -1.450974e-01 0.3270285203  
## seat-chrysler -2.361897e-02 -1.651791e-01 0.1179411877  
## skoda-chrysler -1.264939e-02 -1.552525e-01 0.1299537036  
## smart-chrysler -1.981842e-02 -1.670577e-01 0.1274208873  
## subaru-chrysler 1.281157e-01 -8.891989e-02 0.3451511990  
## suzuki-chrysler -5.188089e-02 -2.150449e-01 0.1112831046  
## toyota-chrysler -6.872249e-02 -2.143635e-01 0.0769184885  
## trabant-chrysler 6.022529e-03 -3.284205e-01 0.3404655210  
## volkswagen-chrysler -8.423280e-02 -2.147997e-01 0.0463340778  
## volvo-chrysler 2.094758e-02 -1.311103e-01 0.1730054128  
## dacia-citroen -2.080670e-02 -1.864308e-01 0.1448174290  
## daewoo-citroen -1.358660e-01 -3.742537e-01 0.1025216765  
## daihatsu-citroen -4.620694e-02 -2.409600e-01 0.1485461211  
## fiat-citroen -2.115301e-02 -1.060495e-01 0.0637434544  
## ford-citroen -6.445072e-02 -1.387179e-01 0.0098164250  
## honda-citroen 8.343594e-02 -3.099004e-02 0.1978619291  
## hyundai-citroen 3.946331e-02 -6.283678e-02 0.1417633984  
## jeep-citroen 8.376558e-02 -9.330784e-02 0.2608389900  
## kia-citroen -6.681049e-03 -1.212489e-01 0.1078867940  
## lada-citroen 7.077170e-02 -2.868526e-01 0.4283960453  
## lancia-citroen 1.519831e-01 -8.640458e-02 0.3903708251  
## land\_rover-citroen 1.437002e-01 -3.099195e-02 0.3183922824  
## mazda-citroen 2.727778e-02 -6.576599e-02 0.1203215420  
## mercedes\_benz-citroen 2.550577e-02 -4.637960e-02 0.0973911433  
## mitsubishi-citroen 2.187384e-02 -9.074926e-02 0.1344969434  
## nissan-citroen -1.219327e-02 -1.086207e-01 0.0842341113  
## peugeot-citroen -1.095183e-02 -9.260266e-02 0.0706990080  
## porsche-citroen 1.110114e-01 -4.153854e-03 0.2261767138  
## renault-citroen -4.696321e-02 -1.246074e-01 0.0306809905  
## rover-citroen 7.844949e-02 -1.852206e-01 0.3421195541  
## saab-citroen 1.538589e-01 -5.478695e-02 0.3625048200  
## seat-citroen 3.927438e-02 -4.930707e-02 0.1278558325  
## skoda-citroen 5.024396e-02 -3.999482e-02 0.1404827408  
## smart-citroen 4.307494e-02 -5.432531e-02 0.1404751796  
## suzuki-citroen 1.101247e-02 -1.091120e-01 0.1311369127  
## toyota-citroen -5.829139e-03 -1.007959e-01 0.0891376439  
## trabant-citroen 6.891588e-02 -2.467731e-01 0.3846048260  
## volkswagen-citroen -2.133944e-02 -9.101802e-02 0.0483391291  
## volvo-citroen 8.384093e-02 -2.070083e-02 0.1883826917  
## daewoo-dacia -1.150593e-01 -3.892130e-01 0.1590943228  
## daihatsu-dacia -2.540025e-02 -2.625927e-01 0.2117922585  
## fiat-dacia -3.463101e-04 -1.601554e-01 0.1594627547  
## ford-dacia -4.364403e-02 -1.980692e-01 0.1107811571  
## honda-dacia 1.042426e-01 -7.302787e-02 0.2815131520  
## hyundai-dacia 6.027001e-02 -1.094263e-01 0.2299663126  
## jeep-dacia 1.045723e-01 -1.183325e-01 0.3274770109  
## kia-dacia 1.412565e-02 -1.632365e-01 0.1914877599  
## lada-dacia 9.157840e-02 -2.908176e-01 0.4739743967  
## lancia-dacia 1.727898e-01 -1.013638e-01 0.4469434713  
## land\_rover-dacia 1.645069e-01 -5.651092e-02 0.3855246538  
## mazda-dacia 4.808448e-02 -1.161978e-01 0.2123667631  
## mercedes\_benz-dacia 4.631247e-02 -1.069815e-01 0.1996064184  
## mitsubishi-dacia 4.268054e-02 -1.334316e-01 0.2187926941  
## nissan-dacia 8.613424e-03 -1.576086e-01 0.1748354699  
## opel-dacia -5.700438e-02 -2.103752e-01 0.0963664503  
## peugeot-dacia 9.854870e-03 -1.482539e-01 0.1679636516  
## porsche-dacia 1.318181e-01 -4.593049e-02 0.3095667436  
## renault-dacia -2.615652e-02 -1.822339e-01 0.1299208703  
## rover-dacia 9.925619e-02 -1.971446e-01 0.3956569818  
## saab-dacia 1.746656e-01 -7.406039e-02 0.4233916531  
## seat-dacia 6.008108e-02 -1.017157e-01 0.2218778690  
## skoda-dacia 7.105066e-02 -9.165940e-02 0.2337607244  
## smart-dacia 6.388163e-02 -1.029067e-01 0.2306699283  
## subaru-dacia 2.118157e-01 -1.892950e-02 0.4425609110  
## suzuki-dacia 3.181916e-02 -1.491820e-01 0.2128202982  
## toyota-dacia 1.497756e-02 -1.504015e-01 0.1803565711  
## trabant-dacia 8.972258e-02 -2.537757e-01 0.4332208142  
## volkswagen-dacia -5.327473e-04 -1.528043e-01 0.1517388247  
## volvo-dacia 1.046476e-01 -6.640940e-02 0.2757046591  
## daihatsu-daewoo 8.965908e-02 -2.030142e-01 0.3823323328  
## fiat-daewoo 1.147130e-01 -1.196719e-01 0.3490979245  
## ford-daewoo 7.141530e-02 -1.593324e-01 0.3021629657  
## honda-daewoo 2.193020e-01 -2.731956e-02 0.4659235035  
## hyundai-daewoo 1.753293e-01 -6.590537e-02 0.4165640411  
## jeep-daewoo 2.196316e-01 -6.158694e-02 0.5008501455  
## kia-daewoo 1.291850e-01 -1.175024e-01 0.3758723614  
## lada-daewoo 2.066377e-01 -2.124375e-01 0.6257129554  
## lancia-daewoo 2.878491e-01 -3.550448e-02 0.6112027811  
## land\_rover-daewoo 2.795662e-01 -1.590430e-04 0.5592914340  
## mazda-daewoo 1.631438e-01 -7.431359e-02 0.4006012046  
## mercedes\_benz-daewoo 1.613718e-01 -6.862033e-02 0.3913639326  
## mitsubishi-daewoo 1.577399e-01 -8.805036e-02 0.4035301000  
## nissan-daewoo 1.236728e-01 -1.151308e-01 0.3624762609  
## opel-daewoo 5.805495e-02 -1.719884e-01 0.2880983338  
## peugeot-daewoo 1.249142e-01 -1.083147e-01 0.3581431285  
## porsche-daewoo 2.468775e-01 -8.795868e-05 0.4938428737  
## renault-daewoo 8.890282e-02 -1.429538e-01 0.3207594442  
## rover-daewoo 2.143155e-01 -1.281035e-01 0.5567345263  
## saab-daewoo 2.897250e-01 -1.237101e-02 0.5918209402  
## seat-daewoo 1.751404e-01 -6.060426e-02 0.4108850747  
## skoda-daewoo 1.861100e-01 -5.026241e-02 0.4224823897  
## smart-daewoo 1.789410e-01 -6.025703e-02 0.4181389599  
## suzuki-daewoo 1.468785e-01 -1.024381e-01 0.3961950738  
## toyota-daewoo 1.300369e-01 -1.081806e-01 0.3682543609  
## trabant-daewoo 2.047819e-01 -1.791300e-01 0.5886938571  
## volkswagen-daewoo 1.145266e-01 -1.147854e-01 0.3438385491  
## volvo-daewoo 2.197070e-01 -2.248688e-02 0.4619007943  
## fiat-daihatsu 2.505394e-02 -1.647785e-01 0.2148863398  
## ford-daihatsu -1.824378e-02 -2.035666e-01 0.1670790235  
## honda-daihatsu 1.296429e-01 -7.510632e-02 0.3343920955  
## hyundai-daihatsu 8.567025e-02 -1.125575e-01 0.2838980020  
## jeep-daihatsu 1.299725e-01 -1.153516e-01 0.3752966444  
## kia-daihatsu 3.952589e-02 -1.653026e-01 0.2443544152  
## lada-daihatsu 1.169786e-01 -2.789053e-01 0.5128625965  
## lancia-daihatsu 1.981901e-01 -9.448318e-02 0.4908633116  
## land\_rover-daihatsu 1.899071e-01 -5.370378e-02 0.4335180041  
## mazda-daihatsu 7.348472e-02 -1.201285e-01 0.2670979297  
## mercedes\_benz-daihatsu 7.171272e-02 -1.126685e-01 0.2560939488  
## mitsubishi-daihatsu 6.808079e-02 -1.356664e-01 0.2718279214  
## nissan-daihatsu 3.401367e-02 -1.612481e-01 0.2292754761  
## opel-daihatsu -3.160413e-02 -2.160493e-01 0.1528410236  
## peugeot-daihatsu 3.525511e-02 -1.531482e-01 0.2236583834  
## porsche-daihatsu 1.572184e-01 -4.794492e-02 0.3623816617  
## renault-daihatsu -7.562698e-04 -1.874581e-01 0.1859455107  
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## saab-daihatsu 2.000659e-01 -6.893605e-02 0.4690678071  
## seat-daihatsu 8.548132e-02 -1.060274e-01 0.2769900860  
## skoda-daihatsu 9.645091e-02 -9.583006e-02 0.2887318707  
## smart-daihatsu 8.928188e-02 -1.064622e-01 0.2850259461  
## subaru-daihatsu 2.372160e-01 -1.525336e-02 0.4896852648  
## suzuki-daihatsu 5.721941e-02 -1.507681e-01 0.2652069456  
## toyota-daihatsu 4.037780e-02 -1.541669e-01 0.2349224579  
## trabant-daihatsu 1.151228e-01 -2.433300e-01 0.4735756694  
## volkswagen-daihatsu 2.486750e-02 -1.586646e-01 0.2083996103  
## volvo-daihatsu 1.300479e-01 -6.934599e-02 0.3294417362  
## ford-fiat -4.329772e-02 -1.034907e-01 0.0168952682  
## honda-fiat 1.045890e-01 -1.245317e-03 0.2104232185  
## hyundai-fiat 6.061632e-02 -3.197361e-02 0.1532062417  
## jeep-fiat 1.049186e-01 -6.672809e-02 0.2765652553  
## kia-fiat 1.447196e-02 -9.151567e-02 0.1204595834  
## lada-fiat 9.192471e-02 -2.630440e-01 0.4468933798  
## lancia-fiat 1.731361e-01 -6.124878e-02 0.4075210330  
## land\_rover-fiat 1.648532e-01 -4.335834e-03 0.3340421846  
## mazda-fiat 4.843079e-02 -3.381718e-02 0.1306787521  
## mercedes\_benz-fiat 4.665878e-02 -1.056964e-02 0.1038872039  
## mitsubishi-fiat 4.302685e-02 -6.085553e-02 0.1469092298  
## nissan-fiat 8.959735e-03 -7.709738e-02 0.0950168460  
## opel-fiat -5.665807e-02 -1.140921e-01 0.0007759701  
## peugeot-fiat 1.020118e-02 -5.889618e-02 0.0792985383  
## renault-fiat -2.581020e-02 -9.012356e-02 0.0385031547  
## rover-fiat 9.960250e-02 -1.604542e-01 0.3596592003  
## saab-fiat 1.750119e-01 -2.904856e-02 0.3790724515  
## seat-fiat 6.042739e-02 -1.673646e-02 0.1375912372  
## skoda-fiat 7.139697e-02 -7.663912e-03 0.1504578522  
## smart-fiat 6.422794e-02 -2.291788e-02 0.1513737607  
## suzuki-fiat 3.216547e-02 -7.980536e-02 0.1441363120  
## toyota-fiat 1.532387e-02 -6.909340e-02 0.0997411406  
## trabant-fiat 9.006889e-02 -2.226084e-01 0.4027461918  
## volkswagen-fiat -1.864371e-04 -5.461703e-02 0.0542441575  
## jeep-ford 1.482163e-01 -1.842937e-02 0.3148619724  
## kia-ford 5.776967e-02 -3.991132e-02 0.1554506703  
## lada-ford 1.352224e-01 -2.173552e-01 0.4878000162  
## lancia-ford 2.164338e-01 -1.431382e-02 0.4471815073  
## mitsubishi-ford 8.632457e-02 -9.068038e-03 0.1817171712  
## nissan-ford 5.225745e-02 -2.333373e-02 0.1278486319  
## opel-ford -1.336035e-02 -5.344612e-02 0.0267254174  
## peugeot-ford 5.349890e-02 -2.022677e-03 0.1090204700  
## renault-ford 1.748751e-02 -3.195345e-02 0.0669284706  
## rover-ford 1.429002e-01 -1.138831e-01 0.3996835640  
## suzuki-ford 7.546319e-02 -2.867935e-02 0.1796057310  
## toyota-ford 5.862159e-02 -1.509731e-02 0.1323404837  
## trabant-ford 1.333666e-01 -1.765935e-01 0.4433267576  
## hyundai-honda -4.397263e-02 -1.642173e-01 0.0762720803  
## jaguar-honda 1.710813e-01 -3.524285e-02 0.3774055424  
## jeep-honda 3.296337e-04 -1.876823e-01 0.1883415394  
## kia-honda -9.011699e-02 -2.209576e-01 0.0407236502  
## lada-honda -1.266424e-02 -3.758290e-01 0.3505005340  
## lancia-honda 6.854718e-02 -1.780744e-01 0.3151687108  
## land\_rover-honda 6.026422e-02 -1.255066e-01 0.2460350995  
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## rover-honda -4.986449e-03 -2.761237e-01 0.2661507553  
## saab-honda 7.042299e-02 -1.475829e-01 0.2884289285  
## seat-honda -4.416156e-02 -1.529740e-01 0.0646509214  
## skoda-honda -3.319198e-02 -1.433579e-01 0.0769738950  
## smart-honda -4.036101e-02 -1.564657e-01 0.0757436460  
## subaru-honda 1.075731e-01 -8.967121e-02 0.3048173423  
## suzuki-honda -7.242348e-02 -2.081562e-01 0.0633092226  
## toyota-honda -8.926508e-02 -2.033360e-01 0.0248058296  
## trabant-honda -1.452006e-02 -3.364719e-01 0.3074317868  
## volvo-honda 4.049884e-04 -1.217525e-01 0.1225625205  
## jeep-hyundai 4.430227e-02 -1.365858e-01 0.2251902948  
## kia-hyundai -4.614436e-02 -1.665241e-01 0.0742353554  
## lada-hyundai 3.130839e-02 -3.282200e-01 0.3908367720  
## lancia-hyundai 1.125198e-01 -1.287149e-01 0.3537545152  
## land\_rover-hyundai 1.042369e-01 -7.432075e-02 0.2827944673  
## mazda-hyundai -1.218553e-02 -1.122986e-01 0.0879275391  
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## peugeot-hyundai -5.041514e-02 -1.400385e-01 0.0392082071  
## porsche-hyundai 7.154812e-02 -4.940033e-02 0.1924965700  
## rover-hyundai 3.898618e-02 -2.272607e-01 0.3052330350  
## saab-hyundai 1.143956e-01 -9.749725e-02 0.3262884998  
## seat-hyundai -1.889292e-04 -9.616892e-02 0.0957910612  
## skoda-hyundai 1.078065e-02 -8.673100e-02 0.1082923035  
## smart-hyundai 3.611626e-03 -1.005627e-01 0.1077859627  
## subaru-hyundai 1.515457e-01 -3.892033e-02 0.3420117237  
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## toyota-hyundai -4.529245e-02 -1.471952e-01 0.0566103224  
## trabant-hyundai 2.945257e-02 -2.883917e-01 0.3472968648  
## volkswagen-hyundai -6.080275e-02 -1.396735e-01 0.0180679534  
## volvo-hyundai 4.437762e-02 -6.650278e-02 0.1552580282  
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## land\_rover-jaguar -1.108171e-01 -3.557532e-01 0.1341189954  
## mini-jaguar -3.971656e-02 -2.387917e-01 0.1593585251  
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## rover-jaguar -1.760678e-01 -4.907077e-01 0.1385721049  
## saab-jaguar -1.006584e-01 -3.708610e-01 0.1695442952  
## subaru-jaguar -6.350828e-02 -3.172566e-01 0.1902399962  
## trabant-jaguar -1.856014e-01 -5.449562e-01 0.1737533970  
## volvo-jaguar -1.706764e-01 -3.716872e-01 0.0303344532  
## kia-jeep -9.044663e-02 -2.785449e-01 0.0976516492  
## lada-jeep -1.299388e-02 -4.004863e-01 0.3744985008  
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## mazda-jeep -5.648780e-02 -2.323068e-01 0.1193311777  
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## skoda-jeep -3.352161e-02 -2.078724e-01 0.1408292031  
## smart-jeep -4.069064e-02 -2.188534e-01 0.1374721436  
## subaru-jeep 1.072434e-01 -1.318528e-01 0.3463396302  
## suzuki-jeep -7.275311e-02 -2.642865e-01 0.1187803152  
## toyota-jeep -8.959472e-02 -2.664389e-01 0.0872494537  
## trabant-jeep -1.484970e-02 -3.640125e-01 0.3343131321  
## volkswagen-jeep -1.051050e-01 -2.697570e-01 0.0595469571  
## volvo-jeep 7.535465e-05 -1.820898e-01 0.1822405271  
## lada-kia 7.745275e-02 -2.857567e-01 0.4406622475  
## lancia-kia 1.586642e-01 -8.802321e-02 0.4053515530  
## land\_rover-kia 1.503812e-01 -3.547707e-02 0.3362395025  
## mazda-kia 3.395883e-02 -7.866048e-02 0.1465781392  
## mercedes\_benz-kia 3.218682e-02 -6.369578e-02 0.1280694269  
## mitsubishi-kia 2.855489e-02 -1.007120e-01 0.1578217871  
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## peugeot-kia -4.270779e-03 -1.076769e-01 0.0991353449  
## porsche-kia 1.176925e-01 -1.379520e-02 0.2491801591  
## renault-kia -4.028216e-02 -1.405547e-01 0.0599904135  
## rover-kia 8.513054e-02 -1.860666e-01 0.3563276448  
## saab-kia 1.605400e-01 -5.754044e-02 0.3786204114  
## seat-kia 4.595543e-02 -6.300622e-02 0.1549170791  
## skoda-kia 5.692501e-02 -5.338820e-02 0.1672382226  
## smart-kia 4.975598e-02 -6.648848e-02 0.1660004467  
## suzuki-kia 1.769352e-02 -1.181588e-01 0.1535458252  
## toyota-kia 8.519103e-04 -1.133613e-01 0.1150651198  
## trabant-kia 7.559693e-02 -2.464054e-01 0.3975992242  
## volkswagen-kia -1.465840e-02 -1.088978e-01 0.0795810392  
## volvo-kia 9.052198e-02 -3.176844e-02 0.2128124015  
## lancia-lada 8.121142e-02 -3.378638e-01 0.5002866478  
## land\_rover-lada 7.292847e-02 -3.134815e-01 0.4593384615  
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## saab-lada 8.308724e-02 -3.198128e-01 0.4859872895  
## seat-lada -3.149732e-02 -3.873653e-01 0.3243706644  
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## smart-lada -2.769677e-02 -3.858617e-01 0.3304682195  
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## toyota-lada -7.660084e-02 -4.341117e-01 0.2809100536  
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## volvo-lada 1.306923e-02 -3.471034e-01 0.3732418678  
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## mercedes\_benz-lancia -1.264773e-01 -3.564695e-01 0.1035147840  
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## opel-lancia -2.297942e-01 -4.598376e-01 0.0002491852  
## peugeot-lancia -1.629349e-01 -3.961639e-01 0.0702939800  
## porsche-lancia -4.097169e-02 -2.879371e-01 0.2059937252  
## renault-lancia -1.989463e-01 -4.308030e-01 0.0329102956  
## rover-lancia -7.353363e-02 -4.159526e-01 0.2688853777  
## saab-lancia 1.875815e-03 -3.002202e-01 0.3039717916  
## seat-lancia -1.127087e-01 -3.484534e-01 0.1230359261  
## skoda-lancia -1.017392e-01 -3.381116e-01 0.1346332412  
## smart-lancia -1.089082e-01 -3.481062e-01 0.1302898114  
## subaru-lancia 3.902589e-02 -2.484471e-01 0.3264988356  
## suzuki-lancia -1.409707e-01 -3.902872e-01 0.1083459253  
## toyota-lancia -1.578123e-01 -3.960297e-01 0.0804052123  
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## volvo-lancia -6.814219e-02 -3.103360e-01 0.1740516457  
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## mercedes\_benz-land\_rover -1.181944e-01 -2.812435e-01 0.0448547330  
## mini-land\_rover 7.110056e-02 -1.065847e-01 0.2487857737  
## mitsubishi-land\_rover -1.218263e-01 -3.064922e-01 0.0628395201  
## nissan-land\_rover -1.558934e-01 -3.311525e-01 0.0193656588  
## peugeot-land\_rover -1.546520e-01 -3.222359e-01 0.0129319253  
## porsche-land\_rover -3.268874e-02 -2.189159e-01 0.1535384195  
## rover-land\_rover -6.525067e-02 -3.668123e-01 0.2363109486  
## saab-land\_rover 1.015877e-02 -2.446953e-01 0.2650128763  
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## saab-daewoo 0.08513806  
## seat-daewoo 0.61032541  
## skoda-daewoo 0.46280248  
## smart-daewoo 0.59316815  
## suzuki-daewoo 0.96018137  
## toyota-daewoo 0.98700461  
## trabant-daewoo 0.99106805  
## volkswagen-daewoo 0.99718995  
## volvo-daewoo 0.15644585  
## fiat-daihatsu 1.00000000  
## ford-daihatsu 1.00000000  
## honda-daihatsu 0.90307418  
## hyundai-daihatsu 0.99985637  
## jeep-daihatsu 0.99202483  
## kia-daihatsu 1.00000000  
## lada-daihatsu 0.99999999  
## lancia-daihatsu 0.80864643  
## land\_rover-daihatsu 0.48835319  
## mazda-daihatsu 0.99999367  
## mercedes\_benz-daihatsu 0.99998826  
## mitsubishi-daihatsu 0.99999979  
## nissan-daihatsu 1.00000000  
## opel-daihatsu 1.00000000  
## peugeot-daihatsu 1.00000000  
## porsche-daihatsu 0.53229664  
## renault-daihatsu 1.00000000  
## rover-daihatsu 0.99997990  
## saab-daihatsu 0.60764019  
## seat-daihatsu 0.99970719  
## skoda-daihatsu 0.99695453  
## smart-daihatsu 0.99953519  
## subaru-daihatsu 0.10792886  
## suzuki-daihatsu 1.00000000  
## toyota-daihatsu 1.00000000  
## trabant-daihatsu 0.99999993  
## volkswagen-daihatsu 1.00000000  
## volvo-daihatsu 0.86685736  
## ford-fiat 0.68695361  
## honda-fiat 0.05852437  
## hyundai-fiat 0.86165297  
## jeep-fiat 0.93594156  
## kia-fiat 1.00000000  
## lada-fiat 1.00000000  
## lancia-fiat 0.62434401  
## land\_rover-fiat 0.07012499  
## mazda-fiat 0.96044116  
## mercedes\_benz-fiat 0.37514483  
## mitsubishi-fiat 0.99994601  
## nissan-fiat 1.00000000  
## opel-fiat 0.05988775  
## peugeot-fiat 1.00000000  
## renault-fiat 0.99997460  
## rover-fiat 0.99999202  
## saab-fiat 0.25933402  
## seat-fiat 0.47668170  
## skoda-fiat 0.16358546  
## smart-fiat 0.62982757  
## suzuki-fiat 1.00000000  
## toyota-fiat 1.00000000  
## trabant-fiat 1.00000000  
## volkswagen-fiat 1.00000000  
## jeep-ford 0.18916612  
## kia-ford 0.95805564  
## lada-ford 0.99999175  
## lancia-ford 0.11002240  
## mitsubishi-ford 0.16028011  
## nissan-ford 0.77067939  
## opel-ford 0.99999981  
## peugeot-ford 0.08045566  
## renault-ford 0.99999900  
## rover-ford 0.98245252  
## suzuki-ford 0.67010769  
## toyota-ford 0.43752281  
## trabant-ford 0.99987002  
## hyundai-honda 0.99999758  
## jaguar-honda 0.33460473  
## jeep-honda 1.00000000  
## kia-honda 0.77780195  
## lada-honda 1.00000000  
## lancia-honda 1.00000000  
## land\_rover-honda 0.99999991  
## mazda-honda 0.99720463  
## mercedes\_benz-honda 0.94335359  
## mitsubishi-honda 0.99885187  
## nissan-honda 0.33380661  
## peugeot-honda 0.14473692  
## porsche-honda 1.00000000  
## rover-honda 1.00000000  
## saab-honda 0.99999992  
## seat-honda 0.99996670  
## skoda-honda 0.99999999  
## smart-honda 0.99999938  
## subaru-honda 0.98719052  
## suzuki-honda 0.99102193  
## toyota-honda 0.47853157  
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## volvo-honda 1.00000000  
## jeep-hyundai 1.00000000  
## kia-hyundai 0.99999185  
## lada-hyundai 1.00000000  
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## land\_rover-hyundai 0.96483907  
## mazda-hyundai 1.00000000  
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## mitsubishi-hyundai 1.00000000  
## nissan-hyundai 0.99710583  
## peugeot-hyundai 0.97935398  
## porsche-hyundai 0.95791599  
## rover-hyundai 1.00000000  
## saab-hyundai 0.98911645  
## seat-hyundai 1.00000000  
## skoda-hyundai 1.00000000  
## smart-hyundai 1.00000000  
## subaru-hyundai 0.43607677  
## suzuki-hyundai 1.00000000  
## toyota-hyundai 0.99973295  
## trabant-hyundai 1.00000000  
## volkswagen-hyundai 0.51694122  
## volvo-hyundai 0.99997623  
## jeep-jaguar 0.76788854  
## lada-jaguar 0.99935924  
## lancia-jaguar 0.99999931  
## land\_rover-jaguar 0.99960855  
## mini-jaguar 1.00000000  
## porsche-jaguar 0.76267827  
## rover-jaguar 0.98091567  
## saab-jaguar 0.99999608  
## subaru-jaguar 1.00000000  
## trabant-jaguar 0.99484891  
## volvo-jaguar 0.28077733  
## kia-jeep 0.99863780  
## lada-jeep 1.00000000  
## lancia-jeep 1.00000000  
## land\_rover-jeep 1.00000000  
## mazda-jeep 0.99999993  
## mercedes\_benz-jeep 0.99999914  
## mini-jeep 0.65965905  
## mitsubishi-jeep 0.99999984  
## nissan-jeep 0.98900672  
## opel-jeep 0.06929505  
## peugeot-jeep 0.98223570  
## porsche-jeep 1.00000000  
## renault-jeep 0.49569624  
## rover-jeep 1.00000000  
## saab-jeep 1.00000000  
## seat-jeep 1.00000000  
## skoda-jeep 1.00000000  
## smart-jeep 1.00000000  
## subaru-jeep 0.99967472  
## suzuki-jeep 0.99999354  
## toyota-jeep 0.99634721  
## trabant-jeep 1.00000000  
## volkswagen-jeep 0.89395870  
## volvo-jeep 1.00000000  
## lada-kia 1.00000000  
## lancia-kia 0.88495176  
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## mazda-kia 0.99999999  
## mercedes\_benz-kia 0.99999976  
## mitsubishi-kia 1.00000000  
## nissan-kia 1.00000000  
## opel-kia 0.61704041  
## peugeot-kia 1.00000000  
## porsche-kia 0.17820580  
## renault-kia 0.99997397  
## rover-kia 0.99999996  
## saab-kia 0.63267404  
## seat-kia 0.99991765  
## skoda-kia 0.99492795  
## smart-kia 0.99988452  
## suzuki-kia 1.00000000  
## toyota-kia 1.00000000  
## trabant-kia 1.00000000  
## volkswagen-kia 1.00000000  
## volvo-kia 0.61926826  
## lancia-lada 1.00000000  
## land\_rover-lada 1.00000000  
## mazda-lada 1.00000000  
## mercedes\_benz-lada 1.00000000  
## mini-lada 0.99997496  
## mitsubishi-lada 1.00000000  
## nissan-lada 1.00000000  
## opel-lada 0.99991669  
## peugeot-lada 1.00000000  
## porsche-lada 1.00000000  
## renault-lada 0.99999981  
## rover-lada 1.00000000  
## saab-lada 1.00000000  
## seat-lada 1.00000000  
## skoda-lada 1.00000000  
## smart-lada 1.00000000  
## subaru-lada 0.99999998  
## suzuki-lada 1.00000000  
## toyota-lada 1.00000000  
## trabant-lada 1.00000000  
## volkswagen-lada 1.00000000  
## volvo-lada 1.00000000  
## land\_rover-lancia 1.00000000  
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## mercedes\_benz-lancia 0.98540083  
## mini-lancia 1.00000000  
## mitsubishi-lancia 0.99213747  
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## renault-lancia 0.25833254  
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## saab-lancia 1.00000000  
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## smart-lancia 0.99955230  
## subaru-lancia 1.00000000  
## suzuki-lancia 0.97771092  
## toyota-lancia 0.84436988  
## trabant-lancia 1.00000000  
## volkswagen-lancia 0.56729549  
## volvo-lancia 1.00000000  
## mazda-land\_rover 0.82331933  
## mercedes\_benz-land\_rover 0.66919145  
## mini-land\_rover 0.99997634  
## mitsubishi-land\_rover 0.85062144  
## nissan-land\_rover 0.18898296  
## peugeot-land\_rover 0.13124087  
## porsche-land\_rover 1.00000000  
## rover-land\_rover 1.00000000  
## saab-land\_rover 1.00000000  
## seat-land\_rover 0.93698341  
## skoda-land\_rover 0.98785379  
## smart-land\_rover 0.97335001  
## subaru-land\_rover 1.00000000  
## suzuki-land\_rover 0.74342849  
## toyota-land\_rover 0.26067577  
## trabant-land\_rover 1.00000000  
## volvo-land\_rover 0.99999981  
## mercedes\_benz-mazda 1.00000000  
## mitsubishi-mazda 1.00000000  
## nissan-mazda 0.99992751  
## peugeot-mazda 0.99841633  
## porsche-mazda 0.62158377  
## renault-mazda 0.05468723  
## rover-mazda 1.00000000  
## saab-mazda 0.93780518  
## seat-mazda 1.00000000  
## skoda-mazda 1.00000000  
## smart-mazda 1.00000000  
## subaru-mazda 0.20441634  
## suzuki-mazda 1.00000000  
## toyota-mazda 0.99999867  
## trabant-mazda 1.00000000  
## volkswagen-mazda 0.64657300  
## volvo-mazda 0.98435835  
## mitsubishi-mercedes\_benz 1.00000000  
## nissan-mercedes\_benz 0.99516263  
## peugeot-mercedes\_benz 0.75400395  
## porsche-mercedes\_benz 0.19762261  
## rover-mercedes\_benz 1.00000000  
## saab-mercedes\_benz 0.88145148  
## seat-mercedes\_benz 1.00000000  
## skoda-mercedes\_benz 0.99999291  
## smart-mercedes\_benz 1.00000000  
## subaru-mercedes\_benz 0.10700265  
## suzuki-mercedes\_benz 1.00000000  
## toyota-mercedes\_benz 0.99979266  
## trabant-mercedes\_benz 1.00000000  
## volvo-mercedes\_benz 0.75335876  
## porsche-mini 0.23621520  
## rover-mini 0.99538970  
## saab-mini 1.00000000  
## subaru-mini 1.00000000  
## trabant-mini 0.99945249  
## nissan-mitsubishi 0.99999999  
## peugeot-mitsubishi 0.99999991  
## porsche-mitsubishi 0.78330415  
## renault-mitsubishi 0.73963883  
## rover-mitsubishi 1.00000000  
## saab-mitsubishi 0.93998059  
## seat-mitsubishi 1.00000000  
## skoda-mitsubishi 1.00000000  
## smart-mitsubishi 1.00000000  
## subaru-mitsubishi 0.24874434  
## suzuki-mitsubishi 1.00000000  
## toyota-mitsubishi 1.00000000  
## trabant-mitsubishi 1.00000000  
## volkswagen-mitsubishi 0.99912100  
## volvo-mitsubishi 0.99520719  
## opel-nissan 0.18061637  
## peugeot-nissan 1.00000000  
## renault-nissan 0.99977921  
## rover-nissan 0.99999956  
## saab-nissan 0.44121702  
## seat-nissan 0.97238905  
## skoda-nissan 0.79171815  
## smart-nissan 0.97985949  
## suzuki-nissan 1.00000000  
## toyota-nissan 1.00000000  
## trabant-nissan 1.00000000  
## volkswagen-nissan 1.00000000  
## volvo-nissan 0.15095832  
## renault-opel 0.82659466  
## rover-opel 0.93749371  
## suzuki-opel 0.23952969  
## trabant-opel 0.99896744  
## renault-peugeot 0.94870875  
## rover-peugeot 0.99999949  
## saab-peugeot 0.38225210  
## seat-peugeot 0.79440217  
## skoda-peugeot 0.39171008  
## smart-peugeot 0.88477009  
## suzuki-peugeot 1.00000000  
## toyota-peugeot 1.00000000  
## trabant-peugeot 1.00000000  
## volkswagen-peugeot 1.00000000  
## rover-porsche 1.00000000  
## saab-porsche 1.00000000  
## seat-porsche 0.86182030  
## skoda-porsche 0.98626730  
## smart-porsche 0.96669967  
## subaru-porsche 0.99996891  
## suzuki-porsche 0.64179771  
## trabant-porsche 1.00000000  
## volvo-porsche 1.00000000  
## rover-renault 0.99828916  
## saab-renault 0.05111796  
## suzuki-renault 0.98770527  
## toyota-renault 0.99107659  
## trabant-renault 0.99999599  
## volkswagen-renault 0.94164753  
## saab-rover 1.00000000  
## seat-rover 1.00000000  
## skoda-rover 1.00000000  
## smart-rover 1.00000000  
## subaru-rover 0.99999777  
## suzuki-rover 1.00000000  
## toyota-rover 0.99999994  
## trabant-rover 1.00000000  
## volkswagen-rover 0.99998697  
## volvo-rover 1.00000000  
## seat-saab 0.98208326  
## skoda-saab 0.99689348  
## smart-saab 0.99231772  
## subaru-saab 1.00000000  
## suzuki-saab 0.87904973  
## toyota-saab 0.53309681  
## trabant-saab 1.00000000  
## volkswagen-saab 0.20028529  
## volvo-saab 0.99999987  
## skoda-seat 1.00000000  
## smart-seat 1.00000000  
## subaru-seat 0.34067084  
## suzuki-seat 1.00000000  
## toyota-seat 0.99561152  
## trabant-seat 1.00000000  
## volvo-seat 0.99959665  
## smart-skoda 1.00000000  
## subaru-skoda 0.54030240  
## suzuki-skoda 0.99999971  
## toyota-skoda 0.91718564  
## trabant-skoda 1.00000000  
## volvo-skoda 0.99999975  
## subaru-smart 0.46271245  
## suzuki-smart 1.00000000  
## toyota-smart 0.99664668  
## trabant-smart 1.00000000  
## volkswagen-smart 0.18864624  
## volvo-smart 0.99999191  
## suzuki-subaru 0.17410099  
## trabant-subaru 0.99999951  
## volvo-subaru 0.98116388  
## toyota-suzuki 1.00000000  
## trabant-suzuki 1.00000000  
## volkswagen-suzuki 0.99999994  
## volvo-suzuki 0.97417255  
## trabant-toyota 1.00000000  
## volkswagen-toyota 1.00000000  
## volvo-toyota 0.25135213  
## volkswagen-trabant 1.00000000  
## volvo-trabant 1.00000000

Even though the p-value of the anova test reveals the the mean duration of atleast one group is statistically diff from the other, after Tukeys pairwise analysis we can see that the means of most groups are not statistically significantly diff from the other. we can use this to decide which car to but based on its popularity (sold faster) keeping all other factioirs constant

#### Linear Regression with Price  
#colnames(Cars)  
car\_sub=Cars[,c(4,5,6,7,8,9,11,12,13,14,15)]  
model=lm(price~.,data=car\_sub)  
summary(model)

##   
## Call:  
## lm(formula = price ~ ., data = car\_sub)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -57964 -2035 -124 1650 420443   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 8.225e+03 9.050e+02 9.088 < 2e-16 \*\*\*  
## vehicleTypebus 1.631e+02 1.583e+02 1.030 0.302812   
## vehicleTypecabrio 2.033e+03 1.616e+02 12.580 < 2e-16 \*\*\*  
## vehicleTypecoupe 1.339e+03 1.627e+02 8.228 < 2e-16 \*\*\*  
## vehicleTypekleinwagen 6.606e+02 1.592e+02 4.150 3.32e-05 \*\*\*  
## vehicleTypekombi 1.502e+02 1.554e+02 0.967 0.333567   
## vehicleTypelimousine 1.904e+02 1.545e+02 1.233 0.217709   
## vehicleTypesuv 1.063e+03 1.825e+02 5.822 5.83e-09 \*\*\*  
## gearboxmanuell -6.836e+02 3.420e+01 -19.992 < 2e-16 \*\*\*  
## powerPS 5.766e+01 3.313e-01 174.022 < 2e-16 \*\*\*  
## model100 -3.931e+03 4.587e+02 -8.569 < 2e-16 \*\*\*  
## model145 -1.359e+03 1.183e+03 -1.148 0.250821   
## model147 -2.164e+03 4.742e+02 -4.563 5.04e-06 \*\*\*  
## model156 -3.274e+03 4.733e+02 -6.918 4.59e-12 \*\*\*  
## model159 -2.503e+03 5.760e+02 -4.346 1.39e-05 \*\*\*  
## model1er -1.016e+04 4.639e+02 -21.902 < 2e-16 \*\*\*  
## model2\_reihe -1.362e+03 2.176e+02 -6.261 3.84e-10 \*\*\*  
## model200 -4.342e+03 1.750e+03 -2.482 0.013083 \*   
## model3\_reihe -9.893e+02 2.359e+02 -4.193 2.75e-05 \*\*\*  
## model300c -5.910e+02 6.643e+02 -0.890 0.373697   
## model3er -1.141e+04 4.553e+02 -25.058 < 2e-16 \*\*\*  
## model4\_reihe -2.197e+03 3.313e+02 -6.632 3.32e-11 \*\*\*  
## model5\_reihe -1.162e+02 3.831e+02 -0.303 0.761699   
## model500 -1.950e+03 3.687e+02 -5.287 1.24e-07 \*\*\*  
## model5er -1.192e+04 4.594e+02 -25.937 < 2e-16 \*\*\*  
## model6\_reihe -1.328e+03 3.219e+02 -4.125 3.71e-05 \*\*\*  
## model601 -4.427e+03 1.312e+03 -3.375 0.000739 \*\*\*  
## model6er -6.001e+03 6.078e+02 -9.873 < 2e-16 \*\*\*  
## model7er -1.370e+04 4.970e+02 -27.571 < 2e-16 \*\*\*  
## model80 -3.456e+03 3.611e+02 -9.569 < 2e-16 \*\*\*  
## model850 -3.077e+03 6.095e+02 -5.049 4.45e-07 \*\*\*  
## model90 -2.680e+03 8.421e+02 -3.183 0.001460 \*\*   
## model900 1.730e+03 7.647e+02 2.263 0.023655 \*   
## model9000 1.230e+02 1.316e+03 0.093 0.925547   
## model911 2.736e+04 4.691e+02 58.329 < 2e-16 \*\*\*  
## modela\_klasse -5.983e+03 3.033e+02 -19.727 < 2e-16 \*\*\*  
## modela1 -3.158e+03 3.887e+02 -8.126 4.47e-16 \*\*\*  
## modela2 -2.724e+03 4.579e+02 -5.950 2.69e-09 \*\*\*  
## modela3 -3.525e+03 3.151e+02 -11.187 < 2e-16 \*\*\*  
## modela4 -4.325e+03 3.112e+02 -13.898 < 2e-16 \*\*\*  
## modela5 9.292e+02 3.595e+02 2.585 0.009743 \*\*   
## modela6 -5.229e+03 3.155e+02 -16.575 < 2e-16 \*\*\*  
## modela8 -7.862e+03 4.073e+02 -19.303 < 2e-16 \*\*\*  
## modelaccord -1.487e+03 5.867e+02 -2.535 0.011243 \*   
## modelagila -2.047e+03 4.687e+02 -4.367 1.26e-05 \*\*\*  
## modelalhambra -7.037e+02 9.429e+02 -0.746 0.455488   
## modelalmera -6.200e+02 4.640e+02 -1.336 0.181463   
## modelaltea -2.686e+03 9.473e+02 -2.835 0.004576 \*\*   
## modelamarok 1.753e+03 1.066e+03 1.644 0.100150   
## modelandere -1.025e+03 2.622e+02 -3.910 9.24e-05 \*\*\*  
## modelantara -3.074e+03 7.245e+02 -4.243 2.21e-05 \*\*\*  
## modelarosa -2.995e+02 9.169e+02 -0.327 0.743899   
## modelastra -2.262e+03 3.348e+02 -6.756 1.42e-11 \*\*\*  
## modelauris -3.486e+03 5.370e+02 -6.491 8.55e-11 \*\*\*  
## modelavensis -3.137e+03 4.369e+02 -7.180 7.00e-13 \*\*\*  
## modelaveo -3.590e+03 6.973e+02 -5.148 2.63e-07 \*\*\*  
## modelaygo -4.640e+03 4.653e+02 -9.972 < 2e-16 \*\*\*  
## modelb\_klasse -4.566e+03 3.629e+02 -12.582 < 2e-16 \*\*\*  
## modelb\_max -1.628e+03 1.213e+03 -1.342 0.179723   
## modelbeetle -4.182e+03 4.290e+02 -9.748 < 2e-16 \*\*\*  
## modelberlingo -1.345e+03 3.979e+02 -3.379 0.000728 \*\*\*  
## modelbora -5.132e+03 4.338e+02 -11.831 < 2e-16 \*\*\*  
## modelboxster -1.263e+04 5.209e+02 -24.247 < 2e-16 \*\*\*  
## modelbravo -2.182e+03 5.146e+02 -4.240 2.23e-05 \*\*\*  
## modelc\_klasse -6.168e+03 2.934e+02 -21.027 < 2e-16 \*\*\*  
## modelc\_max -1.441e+03 4.133e+02 -3.487 0.000488 \*\*\*  
## modelc\_reihe -3.270e+03 5.761e+02 -5.675 1.39e-08 \*\*\*  
## modelc1 -3.910e+03 4.457e+02 -8.773 < 2e-16 \*\*\*  
## modelc2 -2.391e+03 4.569e+02 -5.233 1.67e-07 \*\*\*  
## modelc3 -2.723e+03 4.229e+02 -6.438 1.21e-10 \*\*\*  
## modelc4 -3.224e+03 4.366e+02 -7.385 1.52e-13 \*\*\*  
## modelc5 -3.819e+03 4.300e+02 -8.879 < 2e-16 \*\*\*  
## modelcaddy -3.228e+03 4.087e+02 -7.898 2.85e-15 \*\*\*  
## modelcalibra -2.785e+03 6.423e+02 -4.336 1.45e-05 \*\*\*  
## modelcaptiva -1.490e+03 5.808e+02 -2.566 0.010300 \*   
## modelcarisma -8.875e+02 5.121e+02 -1.733 0.083094 .   
## modelcarnival -3.277e+03 5.951e+02 -5.507 3.65e-08 \*\*\*  
## modelcayenne -1.399e+04 5.321e+02 -26.294 < 2e-16 \*\*\*  
## modelcc -1.251e+03 5.908e+02 -2.118 0.034177 \*   
## modelceed -4.655e+02 5.558e+02 -0.838 0.402242   
## modelcharade -2.816e+03 1.723e+03 -1.635 0.102073   
## modelcherokee -4.262e+03 7.166e+02 -5.947 2.73e-09 \*\*\*  
## modelcitigo -5.566e+03 8.177e+02 -6.807 9.97e-12 \*\*\*  
## modelcivic -4.353e+02 5.020e+02 -0.867 0.385866   
## modelcl -7.463e+03 4.798e+02 -15.553 < 2e-16 \*\*\*  
## modelclio -1.596e+03 3.559e+02 -4.485 7.30e-06 \*\*\*  
## modelclk -8.729e+03 3.245e+02 -26.897 < 2e-16 \*\*\*  
## modelclubman -5.117e+03 8.424e+02 -6.074 1.25e-09 \*\*\*  
## modelcolt -1.097e+03 4.276e+02 -2.566 0.010288 \*   
## modelcombo -2.074e+03 4.779e+02 -4.339 1.43e-05 \*\*\*  
## modelcooper -5.336e+03 7.355e+02 -7.254 4.04e-13 \*\*\*  
## modelcordoba -8.196e+02 9.576e+02 -0.856 0.392055   
## modelcorolla -1.841e+03 4.297e+02 -4.284 1.83e-05 \*\*\*  
## modelcorsa -1.389e+03 3.310e+02 -4.196 2.71e-05 \*\*\*  
## modelcr\_reihe -4.935e+02 5.823e+02 -0.848 0.396668   
## modelcroma -4.329e+03 1.057e+03 -4.096 4.21e-05 \*\*\*  
## modelcrossfire -1.801e+03 8.796e+02 -2.047 0.040638 \*   
## modelcuore -1.301e+03 7.778e+02 -1.673 0.094372 .   
## modelcx\_reihe 2.869e+03 6.219e+02 4.614 3.95e-06 \*\*\*  
## modeldefender 1.855e+03 1.469e+03 1.263 0.206721   
## modeldelta 3.938e+03 1.311e+03 3.004 0.002665 \*\*   
## modeldiscovery -1.031e+04 1.479e+03 -6.972 3.12e-12 \*\*\*  
## modeldiscovery\_sport 9.548e+03 5.878e+03 1.624 0.104306   
## modeldoblo -1.439e+03 4.953e+02 -2.904 0.003681 \*\*   
## modelducato -1.246e+03 4.765e+02 -2.615 0.008925 \*\*   
## modelduster 5.297e+02 1.519e+03 0.349 0.727361   
## modele\_klasse -6.250e+03 2.952e+02 -21.174 < 2e-16 \*\*\*  
## modelelefantino 2.311e+02 2.945e+03 0.078 0.937434   
## modeleos -5.406e+03 4.559e+02 -11.859 < 2e-16 \*\*\*  
## modelescort -1.240e+03 4.141e+02 -2.995 0.002746 \*\*   
## modelespace -3.261e+03 4.555e+02 -7.159 8.17e-13 \*\*\*  
## modelexeo -2.179e+03 1.070e+03 -2.037 0.041663 \*   
## modelfabia -1.538e+03 5.476e+02 -2.809 0.004969 \*\*   
## modelfiesta -1.312e+03 3.314e+02 -3.957 7.58e-05 \*\*\*  
## modelfocus -1.625e+03 3.322e+02 -4.893 9.93e-07 \*\*\*  
## modelforester -1.105e+03 9.762e+02 -1.132 0.257559   
## modelforfour -1.963e+03 1.202e+03 -1.633 0.102387   
## modelfortwo -3.421e+03 1.156e+03 -2.959 0.003084 \*\*   
## modelfox -5.346e+03 4.428e+02 -12.072 < 2e-16 \*\*\*  
## modelfreelander -1.456e+04 1.442e+03 -10.097 < 2e-16 \*\*\*  
## modelfusion -1.871e+03 4.925e+02 -3.799 0.000145 \*\*\*  
## modelg\_klasse 1.159e+04 5.712e+02 20.285 < 2e-16 \*\*\*  
## modelgalant -2.480e+03 5.862e+02 -4.231 2.33e-05 \*\*\*  
## modelgalaxy -1.453e+03 3.922e+02 -3.705 0.000212 \*\*\*  
## modelgetz -2.816e+02 4.658e+02 -0.604 0.545581   
## modelgl 9.155e+03 8.360e+02 10.952 < 2e-16 \*\*\*  
## modelglk 2.075e+03 5.037e+02 4.120 3.80e-05 \*\*\*  
## modelgolf -3.551e+03 3.706e+02 -9.580 < 2e-16 \*\*\*  
## modelgrand -1.571e+03 4.266e+02 -3.682 0.000232 \*\*\*  
## modeli\_reihe -9.378e+02 3.704e+02 -2.532 0.011342 \*   
## modeli3 -9.285e+03 2.600e+03 -3.571 0.000355 \*\*\*  
## modelibiza -2.262e+03 8.915e+02 -2.537 0.011166 \*   
## modelimpreza -2.329e+03 9.165e+02 -2.541 0.011064 \*   
## modelinsignia -1.812e+03 4.048e+02 -4.477 7.58e-06 \*\*\*  
## modeljazz -1.619e+03 5.870e+02 -2.757 0.005829 \*\*   
## modeljetta -3.307e+03 5.296e+02 -6.244 4.27e-10 \*\*\*  
## modeljimny -5.195e+02 5.544e+02 -0.937 0.348695   
## modeljuke -1.455e+03 7.150e+02 -2.035 0.041803 \*   
## modeljusty -2.262e+03 1.016e+03 -2.226 0.026047 \*   
## modelka -2.206e+03 3.499e+02 -6.304 2.90e-10 \*\*\*  
## modelkadett 1.391e+03 5.416e+02 2.569 0.010197 \*   
## modelkaefer 7.136e+03 5.316e+02 13.424 < 2e-16 \*\*\*  
## modelkalina -7.061e+03 2.749e+03 -2.568 0.010223 \*   
## modelkalos -2.644e+03 9.053e+02 -2.920 0.003498 \*\*   
## modelkangoo -9.715e+02 4.145e+02 -2.344 0.019079 \*   
## modelkappa -4.877e+03 1.943e+03 -2.510 0.012070 \*   
## modelkuga 8.821e+02 4.504e+02 1.958 0.050184 .   
## modellaguna -3.182e+03 3.878e+02 -8.204 2.33e-16 \*\*\*  
## modellancer -1.117e+02 5.861e+02 -0.191 0.848853   
## modellanos -8.125e+02 1.055e+03 -0.770 0.441158   
## modellegacy -2.274e+03 9.689e+02 -2.347 0.018943 \*   
## modelleon -2.398e+03 9.000e+02 -2.665 0.007705 \*\*   
## modellodgy 3.947e+02 1.800e+03 0.219 0.826417   
## modellogan 6.685e+02 1.499e+03 0.446 0.655560   
## modellupo -3.009e+03 3.931e+02 -7.656 1.93e-14 \*\*\*  
## modellybra -5.622e+03 1.224e+03 -4.591 4.41e-06 \*\*\*  
## modelm\_klasse -5.458e+03 3.582e+02 -15.238 < 2e-16 \*\*\*  
## modelm\_reihe -3.132e+03 5.645e+02 -5.548 2.90e-08 \*\*\*  
## modelmateria -2.100e+03 1.783e+03 -1.178 0.238954   
## modelmatiz -2.478e+03 4.956e+02 -5.001 5.70e-07 \*\*\*  
## modelmegane -2.702e+03 3.618e+02 -7.468 8.15e-14 \*\*\*  
## modelmeriva -3.116e+03 3.942e+02 -7.903 2.73e-15 \*\*\*  
## modelmicra 1.087e+02 3.973e+02 0.274 0.784375   
## modelmii -5.425e+03 1.099e+03 -4.936 7.99e-07 \*\*\*  
## modelmodus -2.635e+03 5.099e+02 -5.168 2.37e-07 \*\*\*  
## modelmondeo -2.545e+03 3.413e+02 -7.455 9.00e-14 \*\*\*  
## modelmove 1.575e+02 1.328e+03 0.119 0.905618   
## modelmusa -2.996e+03 1.560e+03 -1.921 0.054756 .   
## modelmustang 5.507e+03 5.108e+02 10.781 < 2e-16 \*\*\*  
## modelmx\_reihe -1.249e+03 3.338e+02 -3.742 0.000183 \*\*\*  
## modelnavara 2.199e+03 6.969e+02 3.156 0.001601 \*\*   
## modelniva -4.630e+03 1.191e+03 -3.889 0.000101 \*\*\*  
## modelnote -1.163e+03 6.682e+02 -1.740 0.081783 .   
## modelnubira -2.699e+03 1.073e+03 -2.515 0.011912 \*   
## modeloctavia -4.722e+02 5.489e+02 -0.860 0.389648   
## modelomega -4.667e+03 3.830e+02 -12.187 < 2e-16 \*\*\*  
## modelone -5.106e+03 7.537e+02 -6.774 1.25e-11 \*\*\*  
## modeloutlander 6.274e+02 6.706e+02 0.936 0.349453   
## modelpajero -5.101e+00 5.807e+02 -0.009 0.992992   
## modelpanda -2.814e+03 4.004e+02 -7.026 2.13e-12 \*\*\*  
## modelpassat -4.728e+03 3.762e+02 -12.569 < 2e-16 \*\*\*  
## modelphaeton -8.001e+03 5.651e+02 -14.160 < 2e-16 \*\*\*  
## modelpicanto -1.015e+03 5.181e+02 -1.959 0.050169 .   
## modelpolo -3.418e+03 3.723e+02 -9.181 < 2e-16 \*\*\*  
## modelprimera -1.207e+03 4.604e+02 -2.622 0.008747 \*\*   
## modelptcruiser -5.532e+02 5.682e+02 -0.974 0.330212   
## modelpunto -7.649e+02 3.300e+02 -2.318 0.020467 \*   
## modelq3 5.476e+03 4.878e+02 11.225 < 2e-16 \*\*\*  
## modelq5 5.718e+03 4.154e+02 13.765 < 2e-16 \*\*\*  
## modelq7 5.391e+02 4.522e+02 1.192 0.233247   
## modelqashqai 1.778e+03 4.444e+02 4.001 6.30e-05 \*\*\*  
## modelr19 -9.060e+02 7.802e+02 -1.161 0.245531   
## modelrange\_rover -1.071e+04 1.528e+03 -7.010 2.38e-12 \*\*\*  
## modelrange\_rover\_evoque 1.238e+02 1.553e+03 0.080 0.936459   
## modelrange\_rover\_sport -6.299e+03 1.506e+03 -4.182 2.88e-05 \*\*\*  
## modelrangerover 7.896e+03 3.332e+03 2.370 0.017796 \*   
## modelrav -2.388e+03 4.887e+02 -4.886 1.03e-06 \*\*\*  
## modelrio -1.106e+03 5.321e+02 -2.079 0.037661 \*   
## modelroadster -2.512e+03 1.253e+03 -2.004 0.045103 \*   
## modelroomster -1.074e+03 6.565e+02 -1.636 0.101912   
## modelrx\_reihe -6.120e+03 5.905e+02 -10.365 < 2e-16 \*\*\*  
## models\_klasse -5.675e+03 3.579e+02 -15.856 < 2e-16 \*\*\*  
## models\_max -1.636e+02 4.396e+02 -0.372 0.709773   
## models\_type -1.586e+04 7.514e+02 -21.104 < 2e-16 \*\*\*  
## models60 -3.210e+03 6.276e+02 -5.114 3.16e-07 \*\*\*  
## modelsamara -2.660e+02 4.166e+03 -0.064 0.949091   
## modelsandero -3.615e+02 1.498e+03 -0.241 0.809374   
## modelsanta -4.806e+02 4.904e+02 -0.980 0.327066   
## modelscenic -2.156e+03 3.905e+02 -5.522 3.35e-08 \*\*\*  
## modelscirocco -4.105e+03 4.494e+02 -9.134 < 2e-16 \*\*\*  
## modelseicento -6.155e+02 4.240e+02 -1.452 0.146602   
## modelserie\_2 -5.975e+03 3.174e+03 -1.882 0.059807 .   
## modelserie\_3 -2.243e+03 3.575e+03 -0.628 0.530294   
## modelsharan -3.930e+03 4.164e+02 -9.439 < 2e-16 \*\*\*  
## modelsignum -4.990e+03 4.465e+02 -11.177 < 2e-16 \*\*\*  
## modelsirion -2.290e+03 8.943e+02 -2.561 0.010437 \*   
## modelsl 2.130e+03 3.813e+02 5.588 2.30e-08 \*\*\*  
## modelslk -6.517e+03 3.346e+02 -19.478 < 2e-16 \*\*\*  
## modelsorento -6.248e+02 5.328e+02 -1.173 0.240888   
## modelspark -5.137e+03 6.500e+02 -7.902 2.75e-15 \*\*\*  
## modelspider 2.375e+03 6.020e+02 3.946 7.95e-05 \*\*\*  
## modelsportage 2.096e+03 5.443e+02 3.850 0.000118 \*\*\*  
## modelsprinter -4.561e+03 4.002e+02 -11.399 < 2e-16 \*\*\*  
## modelstilo -2.397e+03 4.244e+02 -5.648 1.62e-08 \*\*\*  
## modelsuperb 1.156e+02 6.161e+02 0.188 0.851095   
## modelswift -1.688e+03 4.163e+02 -4.054 5.03e-05 \*\*\*  
## modelterios -1.780e+03 1.328e+03 -1.340 0.180236   
## modeltigra -3.835e+03 4.128e+02 -9.292 < 2e-16 \*\*\*  
## modeltiguan -7.656e+02 4.324e+02 -1.770 0.076656 .   
## modeltoledo -2.631e+03 9.714e+02 -2.708 0.006765 \*\*   
## modeltouareg -3.380e+03 4.499e+02 -7.512 5.83e-14 \*\*\*  
## modeltouran -3.720e+03 3.940e+02 -9.442 < 2e-16 \*\*\*  
## modeltransit -7.370e+02 4.194e+02 -1.757 0.078852 .   
## modeltransporter 1.995e+03 3.878e+02 5.144 2.69e-07 \*\*\*  
## modeltt -3.565e+03 3.483e+02 -10.237 < 2e-16 \*\*\*  
## modeltucson -1.136e+03 5.382e+02 -2.111 0.034763 \*   
## modeltwingo -1.057e+03 3.517e+02 -3.006 0.002645 \*\*   
## modelup -7.576e+03 4.932e+02 -15.361 < 2e-16 \*\*\*  
## modelv\_klasse -2.419e+03 6.119e+02 -3.954 7.68e-05 \*\*\*  
## modelv40 -3.015e+03 4.576e+02 -6.589 4.44e-11 \*\*\*  
## modelv50 -3.005e+03 5.448e+02 -5.515 3.49e-08 \*\*\*  
## modelv60 1.511e+03 9.424e+02 1.603 0.108857   
## modelv70 -3.681e+03 4.563e+02 -8.068 7.17e-16 \*\*\*  
## modelvectra -3.199e+03 3.475e+02 -9.204 < 2e-16 \*\*\*  
## modelverso -2.648e+03 4.977e+02 -5.319 1.04e-07 \*\*\*  
## modelviano 1.264e+03 4.270e+02 2.960 0.003072 \*\*   
## modelvito -5.169e+03 3.713e+02 -13.919 < 2e-16 \*\*\*  
## modelvivaro -6.373e+02 4.950e+02 -1.287 0.197930   
## modelvoyager -1.323e+02 5.824e+02 -0.227 0.820366   
## modelwrangler 4.608e+03 6.800e+02 6.776 1.24e-11 \*\*\*  
## modelx\_reihe -7.183e+03 4.740e+02 -15.156 < 2e-16 \*\*\*  
## modelx\_trail -2.498e+02 5.668e+02 -0.441 0.659396   
## modelx\_type -1.206e+04 6.842e+02 -17.627 < 2e-16 \*\*\*  
## modelxc\_reihe 1.898e+02 5.110e+02 0.371 0.710323   
## modelyaris -2.803e+03 3.955e+02 -7.087 1.37e-12 \*\*\*  
## modelyeti 1.352e+02 6.833e+02 0.198 0.843190   
## modelypsilon -2.205e+03 8.639e+02 -2.552 0.010705 \*   
## modelz\_reihe -7.409e+03 4.974e+02 -14.894 < 2e-16 \*\*\*  
## modelzafira -2.853e+03 3.614e+02 -7.893 2.95e-15 \*\*\*  
## kilometer -7.512e-02 3.565e-04 -210.685 < 2e-16 \*\*\*  
## fuelTypebenzin 7.136e+02 8.013e+02 0.891 0.373164   
## fuelTypecng 1.635e+03 8.492e+02 1.925 0.054228 .   
## fuelTypediesel 2.691e+03 8.016e+02 3.357 0.000787 \*\*\*  
## fuelTypeelektro -1.297e+03 1.134e+03 -1.144 0.252440   
## fuelTypehybrid 4.155e+03 9.060e+02 4.587 4.50e-06 \*\*\*  
## fuelTypelpg -9.496e+01 8.068e+02 -0.118 0.906305   
## brandaudi 4.804e+03 3.174e+02 15.134 < 2e-16 \*\*\*  
## brandbmw 1.142e+04 4.616e+02 24.730 < 2e-16 \*\*\*  
## brandchevrolet 1.164e+01 3.471e+02 0.034 0.973247   
## brandchrysler -2.215e+03 4.200e+02 -5.275 1.33e-07 \*\*\*  
## brandcitroen 1.231e+03 3.234e+02 3.806 0.000141 \*\*\*  
## branddacia -2.450e+03 1.456e+03 -1.683 0.092464 .   
## branddaewoo 7.688e+02 6.031e+02 1.275 0.202339   
## branddaihatsu 9.314e+02 6.832e+02 1.363 0.172810   
## brandfiat 6.872e+02 3.198e+02 2.149 0.031648 \*   
## brandford 7.921e+02 3.324e+02 2.383 0.017164 \*   
## brandhonda 3.882e+02 4.721e+02 0.822 0.410930   
## brandhyundai -1.040e+03 3.406e+02 -3.054 0.002258 \*\*   
## brandjaguar 9.616e+03 4.553e+02 21.118 < 2e-16 \*\*\*  
## brandjeep 1.934e+03 4.733e+02 4.086 4.40e-05 \*\*\*  
## brandkia -1.126e+03 4.091e+02 -2.752 0.005930 \*\*   
## brandlada 3.597e+02 1.019e+03 0.353 0.724082   
## brandlancia 1.938e+03 7.207e+02 2.689 0.007157 \*\*   
## brandland\_rover 1.509e+04 1.383e+03 10.904 < 2e-16 \*\*\*  
## brandmazda 1.143e+02 3.308e+02 0.345 0.729720   
## brandmercedes\_benz 6.124e+03 2.988e+02 20.496 < 2e-16 \*\*\*  
## brandmini 5.817e+03 7.286e+02 7.983 1.43e-15 \*\*\*  
## brandmitsubishi -2.379e+02 3.716e+02 -0.640 0.522093   
## brandnissan -1.304e+02 3.698e+02 -0.353 0.724336   
## brandopel 1.748e+03 3.396e+02 5.147 2.65e-07 \*\*\*  
## brandpeugeot -2.807e+02 3.283e+02 -0.855 0.392556   
## brandporsche 1.980e+04 4.320e+02 45.840 < 2e-16 \*\*\*  
## brandrenault 1.055e+03 3.527e+02 2.992 0.002773 \*\*   
## brandrover -8.879e+01 4.617e+02 -0.192 0.847499   
## brandsaab -1.417e+03 4.291e+02 -3.303 0.000956 \*\*\*  
## brandseat 1.756e+03 8.883e+02 1.977 0.048069 \*   
## brandskoda 1.096e+03 5.376e+02 2.039 0.041454 \*   
## brandsmart 1.253e+03 1.155e+03 1.084 0.278250   
## brandsubaru 1.019e+03 8.062e+02 1.264 0.206196   
## brandsuzuki 3.076e+02 3.447e+02 0.892 0.372305   
## brandtoyota 2.059e+03 3.547e+02 5.805 6.45e-09 \*\*\*  
## brandtrabant 6.749e+03 1.226e+03 5.504 3.72e-08 \*\*\*  
## brandvolkswagen 4.555e+03 3.812e+02 11.950 < 2e-16 \*\*\*  
## brandvolvo 2.028e+03 3.902e+02 5.197 2.02e-07 \*\*\*  
## notRepairedDamageNo 1.486e+03 3.919e+01 37.918 < 2e-16 \*\*\*  
## duration 3.746e+01 1.330e+00 28.167 < 2e-16 \*\*\*  
## age\_of\_car -2.377e+02 2.583e+00 -92.033 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 5714 on 247447 degrees of freedom  
## Multiple R-squared: 0.6352, Adjusted R-squared: 0.6347   
## F-statistic: 1408 on 306 and 247447 DF, p-value: < 2.2e-16

R square 63.5% - remove outliers to fit model better

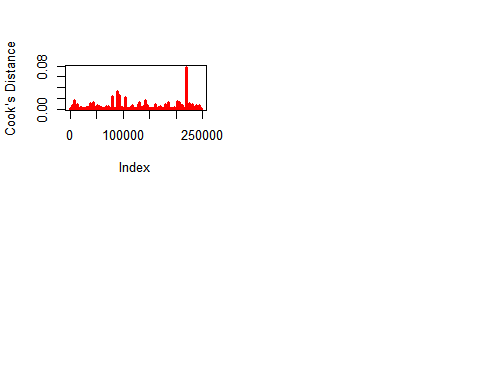
#### use cooks distance to identify outliers  
cook = cooks.distance(model)  
par(mfrow=c(2,2))  
## Check outliers  
#influencePlot(model\_1)  
plot(cook,type="h",lwd=3,col="red", ylab = "Cook's Distance")  
length(cook[cook>1])

## [1] 0

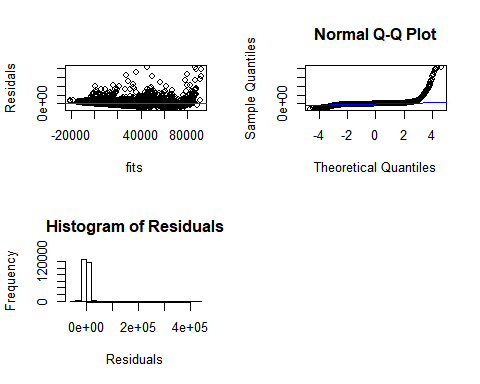
nrow(Cars)

## [1] 247754

#### Residual Plot  
resid=model$residuals  
fit=model$fitted.values  
par(mfrow =c(2,2))



plot(fit,resid,xlab="fits",ylab="Residals")  
abline(0,0,col="red")  
  
### qq norm plot  
  
#### QQ norm plot  
qqnorm(resid)  
qqline(resid,col="blue")  
hist(resid, xlab="Residuals", main= "Histogram of Residuals")

 Constant variation assumption holds. However the normality assumption is heavily violated.

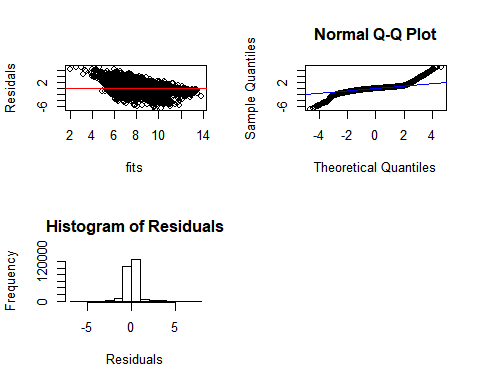
#### test   
  
### using log to plot  
colnames(Cars)

## [1] "name" "seller" "offerType"   
## [4] "price" "vehicleType" "gearbox"   
## [7] "powerPS" "model" "kilometer"   
## [10] "monthOfRegistration" "fuelType" "brand"   
## [13] "notRepairedDamage" "duration" "age\_of\_car"

car\_sub=Cars[,c(4,5,6,7,8,9,11,12,13,14,15)]  
model\_1=lm(log(price)~.,data=car\_sub)  
summary(model\_1)

##   
## Call:  
## lm(formula = log(price) ~ ., data = car\_sub)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -6.6900 -0.2602 0.0374 0.2925 7.2100   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 8.232e+00 8.691e-02 94.720 < 2e-16 \*\*\*  
## vehicleTypebus 5.674e-02 1.520e-02 3.732 0.000190 \*\*\*  
## vehicleTypecabrio 4.619e-01 1.552e-02 29.763 < 2e-16 \*\*\*  
## vehicleTypecoupe 2.080e-01 1.563e-02 13.308 < 2e-16 \*\*\*  
## vehicleTypekleinwagen -2.637e-02 1.529e-02 -1.725 0.084554 .   
## vehicleTypekombi 3.503e-02 1.492e-02 2.348 0.018899 \*   
## vehicleTypelimousine 8.076e-02 1.484e-02 5.443 5.26e-08 \*\*\*  
## vehicleTypesuv 2.638e-01 1.753e-02 15.048 < 2e-16 \*\*\*  
## gearboxmanuell -5.060e-02 3.284e-03 -15.409 < 2e-16 \*\*\*  
## powerPS 5.226e-03 3.182e-05 164.215 < 2e-16 \*\*\*  
## model100 1.847e-01 4.406e-02 4.191 2.77e-05 \*\*\*  
## model145 -6.273e-01 1.136e-01 -5.519 3.41e-08 \*\*\*  
## model147 -3.291e-01 4.554e-02 -7.227 4.96e-13 \*\*\*  
## model156 -6.774e-01 4.546e-02 -14.902 < 2e-16 \*\*\*  
## model159 1.347e-01 5.532e-02 2.434 0.014928 \*   
## model1er -4.705e-02 4.456e-02 -1.056 0.290999   
## model2\_reihe 2.001e-01 2.089e-02 9.575 < 2e-16 \*\*\*  
## model200 1.158e+00 1.680e-01 6.890 5.58e-12 \*\*\*  
## model3\_reihe 1.576e-01 2.266e-02 6.953 3.58e-12 \*\*\*  
## model300c 7.156e-01 6.380e-02 11.215 < 2e-16 \*\*\*  
## model3er -2.302e-01 4.373e-02 -5.264 1.41e-07 \*\*\*  
## model4\_reihe 1.646e-01 3.182e-02 5.172 2.32e-07 \*\*\*  
## model5\_reihe 7.163e-01 3.680e-02 19.467 < 2e-16 \*\*\*  
## model500 5.916e-01 3.541e-02 16.707 < 2e-16 \*\*\*  
## model5er -2.067e-01 4.412e-02 -4.685 2.81e-06 \*\*\*  
## model6\_reihe 2.804e-01 3.091e-02 9.072 < 2e-16 \*\*\*  
## model601 -7.098e-01 1.260e-01 -5.634 1.76e-08 \*\*\*  
## model6er 9.494e-02 5.837e-02 1.626 0.103863   
## model7er -2.287e-01 4.773e-02 -4.792 1.65e-06 \*\*\*  
## model80 -6.857e-02 3.468e-02 -1.977 0.048042 \*   
## model850 -4.355e-01 5.854e-02 -7.439 1.02e-13 \*\*\*  
## model90 5.011e-01 8.088e-02 6.195 5.82e-10 \*\*\*  
## model900 5.997e-01 7.344e-02 8.166 3.20e-16 \*\*\*  
## model9000 5.679e-01 1.264e-01 4.494 7.01e-06 \*\*\*  
## model911 4.704e-01 4.505e-02 10.442 < 2e-16 \*\*\*  
## modela\_klasse -5.647e-01 2.913e-02 -19.386 < 2e-16 \*\*\*  
## modela1 3.964e-01 3.733e-02 10.620 < 2e-16 \*\*\*  
## modela2 5.876e-01 4.397e-02 13.363 < 2e-16 \*\*\*  
## modela3 2.538e-01 3.026e-02 8.386 < 2e-16 \*\*\*  
## modela4 1.768e-01 2.989e-02 5.915 3.33e-09 \*\*\*  
## modela5 3.722e-01 3.452e-02 10.780 < 2e-16 \*\*\*  
## modela6 1.341e-01 3.030e-02 4.425 9.64e-06 \*\*\*  
## modela8 3.183e-02 3.912e-02 0.814 0.415792   
## modelaccord 3.424e-01 5.635e-02 6.076 1.23e-09 \*\*\*  
## modelagila -3.321e-01 4.501e-02 -7.377 1.63e-13 \*\*\*  
## modelalhambra 8.937e-01 9.056e-02 9.869 < 2e-16 \*\*\*  
## modelalmera -2.105e-01 4.456e-02 -4.723 2.33e-06 \*\*\*  
## modelaltea 9.136e-01 9.098e-02 10.041 < 2e-16 \*\*\*  
## modelamarok -3.522e-01 1.024e-01 -3.440 0.000581 \*\*\*  
## modelandere 2.610e-01 2.518e-02 10.366 < 2e-16 \*\*\*  
## modelantara -9.904e-02 6.958e-02 -1.423 0.154647   
## modelarosa 4.585e-01 8.806e-02 5.206 1.93e-07 \*\*\*  
## modelastra -2.844e-01 3.215e-02 -8.844 < 2e-16 \*\*\*  
## modelauris 1.518e-01 5.158e-02 2.942 0.003259 \*\*   
## modelavensis 1.556e-01 4.196e-02 3.709 0.000208 \*\*\*  
## modelaveo -4.226e-02 6.697e-02 -0.631 0.528043   
## modelaygo -1.462e-02 4.469e-02 -0.327 0.743623   
## modelb\_klasse -7.677e-02 3.486e-02 -2.203 0.027629 \*   
## modelb\_max 2.833e-01 1.165e-01 2.431 0.015048 \*   
## modelbeetle -2.500e-01 4.120e-02 -6.068 1.30e-09 \*\*\*  
## modelberlingo 2.877e-01 3.822e-02 7.529 5.14e-14 \*\*\*  
## modelbora -4.517e-01 4.166e-02 -10.842 < 2e-16 \*\*\*  
## modelboxster -5.840e-01 5.002e-02 -11.673 < 2e-16 \*\*\*  
## modelbravo 4.814e-02 4.942e-02 0.974 0.330052   
## modelc\_klasse -4.166e-01 2.817e-02 -14.787 < 2e-16 \*\*\*  
## modelc\_max 2.944e-01 3.969e-02 7.417 1.20e-13 \*\*\*  
## modelc\_reihe -3.202e-02 5.533e-02 -0.579 0.562862   
## modelc1 3.253e-01 4.281e-02 7.600 2.98e-14 \*\*\*  
## modelc2 3.615e-01 4.388e-02 8.238 < 2e-16 \*\*\*  
## modelc3 4.132e-01 4.062e-02 10.172 < 2e-16 \*\*\*  
## modelc4 4.168e-01 4.193e-02 9.941 < 2e-16 \*\*\*  
## modelc5 1.744e-01 4.130e-02 4.222 2.42e-05 \*\*\*  
## modelcaddy -1.877e-01 3.925e-02 -4.783 1.72e-06 \*\*\*  
## modelcalibra -5.891e-02 6.168e-02 -0.955 0.339552   
## modelcaptiva 7.755e-02 5.578e-02 1.390 0.164434   
## modelcarisma -2.004e-01 4.918e-02 -4.075 4.61e-05 \*\*\*  
## modelcarnival 4.801e-02 5.715e-02 0.840 0.400843   
## modelcayenne -7.748e-01 5.110e-02 -15.163 < 2e-16 \*\*\*  
## modelcc -1.166e-01 5.674e-02 -2.054 0.039969 \*   
## modelceed 7.647e-01 5.337e-02 14.326 < 2e-16 \*\*\*  
## modelcharade -1.446e-01 1.654e-01 -0.874 0.382149   
## modelcherokee -1.025e-01 6.882e-02 -1.490 0.136306   
## modelcitigo 5.248e-01 7.853e-02 6.683 2.35e-11 \*\*\*  
## modelcivic 1.840e-01 4.821e-02 3.817 0.000135 \*\*\*  
## modelcl -3.884e-01 4.608e-02 -8.428 < 2e-16 \*\*\*  
## modelclio -1.626e-01 3.418e-02 -4.756 1.98e-06 \*\*\*  
## modelclk -4.136e-01 3.117e-02 -13.270 < 2e-16 \*\*\*  
## modelclubman -4.496e-01 8.090e-02 -5.558 2.73e-08 \*\*\*  
## modelcolt 1.375e-01 4.107e-02 3.347 0.000816 \*\*\*  
## modelcombo -2.975e-01 4.589e-02 -6.482 9.09e-11 \*\*\*  
## modelcooper -5.435e-01 7.064e-02 -7.693 1.44e-14 \*\*\*  
## modelcordoba 2.125e-01 9.197e-02 2.311 0.020832 \*   
## modelcorolla 3.084e-02 4.127e-02 0.747 0.454997   
## modelcorsa -3.314e-01 3.178e-02 -10.425 < 2e-16 \*\*\*  
## modelcr\_reihe 5.533e-01 5.592e-02 9.894 < 2e-16 \*\*\*  
## modelcroma 1.807e-01 1.015e-01 1.780 0.075116 .   
## modelcrossfire 6.277e-01 8.448e-02 7.430 1.09e-13 \*\*\*  
## modelcuore -1.347e-01 7.470e-02 -1.803 0.071381 .   
## modelcx\_reihe 5.741e-01 5.973e-02 9.612 < 2e-16 \*\*\*  
## modeldefender -6.379e-01 1.411e-01 -4.521 6.16e-06 \*\*\*  
## modeldelta 6.382e-01 1.259e-01 5.069 4.01e-07 \*\*\*  
## modeldiscovery -1.323e+00 1.420e-01 -9.317 < 2e-16 \*\*\*  
## modeldiscovery\_sport -1.573e+00 5.645e-01 -2.787 0.005323 \*\*   
## modeldoblo 2.112e-01 4.757e-02 4.440 9.00e-06 \*\*\*  
## modelducato 3.667e-01 4.577e-02 8.012 1.13e-15 \*\*\*  
## modelduster 3.134e-01 1.459e-01 2.148 0.031731 \*   
## modele\_klasse -3.320e-01 2.835e-02 -11.711 < 2e-16 \*\*\*  
## modelelefantino -1.346e+00 2.828e-01 -4.760 1.94e-06 \*\*\*  
## modeleos -3.989e-01 4.378e-02 -9.111 < 2e-16 \*\*\*  
## modelescort -5.466e-01 3.977e-02 -13.745 < 2e-16 \*\*\*  
## modelespace -3.293e-01 4.375e-02 -7.527 5.21e-14 \*\*\*  
## modelexeo 9.647e-01 1.027e-01 9.390 < 2e-16 \*\*\*  
## modelfabia 7.478e-01 5.259e-02 14.219 < 2e-16 \*\*\*  
## modelfiesta -8.352e-02 3.183e-02 -2.624 0.008695 \*\*   
## modelfocus -6.000e-02 3.190e-02 -1.881 0.060024 .   
## modelforester 1.957e-01 9.375e-02 2.088 0.036810 \*   
## modelforfour 4.058e-01 1.154e-01 3.515 0.000440 \*\*\*  
## modelfortwo 2.159e-01 1.110e-01 1.945 0.051818 .   
## modelfox -4.815e-01 4.253e-02 -11.322 < 2e-16 \*\*\*  
## modelfreelander -1.620e+00 1.385e-01 -11.699 < 2e-16 \*\*\*  
## modelfusion 1.433e-01 4.730e-02 3.030 0.002445 \*\*   
## modelg\_klasse 8.683e-01 5.486e-02 15.828 < 2e-16 \*\*\*  
## modelgalant -2.380e-01 5.630e-02 -4.227 2.37e-05 \*\*\*  
## modelgalaxy 1.073e-01 3.766e-02 2.849 0.004390 \*\*   
## modelgetz 4.264e-01 4.474e-02 9.531 < 2e-16 \*\*\*  
## modelgl -8.501e-02 8.029e-02 -1.059 0.289673   
## modelglk -1.559e-01 4.838e-02 -3.223 0.001270 \*\*   
## modelgolf -3.389e-01 3.560e-02 -9.520 < 2e-16 \*\*\*  
## modelgrand 2.395e-01 4.097e-02 5.845 5.08e-09 \*\*\*  
## modeli\_reihe 6.768e-01 3.557e-02 19.027 < 2e-16 \*\*\*  
## modeli3 -3.783e-01 2.497e-01 -1.515 0.129740   
## modelibiza 7.170e-01 8.562e-02 8.374 < 2e-16 \*\*\*  
## modelimpreza -1.266e-02 8.803e-02 -0.144 0.885680   
## modelinsignia 1.200e-01 3.888e-02 3.085 0.002033 \*\*   
## modeljazz 4.551e-01 5.638e-02 8.072 6.93e-16 \*\*\*  
## modeljetta -7.818e-02 5.086e-02 -1.537 0.124286   
## modeljimny 5.861e-01 5.325e-02 11.008 < 2e-16 \*\*\*  
## modeljuke 3.468e-01 6.867e-02 5.050 4.42e-07 \*\*\*  
## modeljusty -4.673e-01 9.762e-02 -4.787 1.69e-06 \*\*\*  
## modelka -4.900e-01 3.361e-02 -14.580 < 2e-16 \*\*\*  
## modelkadett 7.564e-01 5.201e-02 14.542 < 2e-16 \*\*\*  
## modelkaefer 2.153e+00 5.106e-02 42.163 < 2e-16 \*\*\*  
## modelkalina -1.093e+00 2.641e-01 -4.140 3.48e-05 \*\*\*  
## modelkalos 4.950e-02 8.695e-02 0.569 0.569186   
## modelkangoo -1.349e-01 3.981e-02 -3.389 0.000702 \*\*\*  
## modelkappa -3.012e-01 1.866e-01 -1.614 0.106489   
## modelkuga 2.737e-01 4.326e-02 6.328 2.49e-10 \*\*\*  
## modellaguna -4.849e-01 3.725e-02 -13.018 < 2e-16 \*\*\*  
## modellancer 5.467e-01 5.629e-02 9.712 < 2e-16 \*\*\*  
## modellanos -4.152e-01 1.013e-01 -4.098 4.16e-05 \*\*\*  
## modellegacy -1.875e-01 9.305e-02 -2.015 0.043892 \*   
## modelleon 8.456e-01 8.644e-02 9.783 < 2e-16 \*\*\*  
## modellodgy 3.195e-01 1.729e-01 1.848 0.064575 .   
## modellogan 1.485e-01 1.439e-01 1.032 0.302254   
## modellupo -5.370e-01 3.775e-02 -14.224 < 2e-16 \*\*\*  
## modellybra -1.198e+00 1.176e-01 -10.189 < 2e-16 \*\*\*  
## modelm\_klasse -3.094e-01 3.440e-02 -8.994 < 2e-16 \*\*\*  
## modelm\_reihe -2.063e-01 5.422e-02 -3.806 0.000141 \*\*\*  
## modelmateria 7.019e-01 1.712e-01 4.099 4.16e-05 \*\*\*  
## modelmatiz -2.986e-01 4.759e-02 -6.274 3.53e-10 \*\*\*  
## modelmegane -2.924e-01 3.475e-02 -8.414 < 2e-16 \*\*\*  
## modelmeriva -6.398e-02 3.786e-02 -1.690 0.091094 .   
## modelmicra -9.331e-02 3.815e-02 -2.446 0.014463 \*   
## modelmii 6.626e-01 1.056e-01 6.277 3.47e-10 \*\*\*  
## modelmodus -3.029e-02 4.897e-02 -0.619 0.536206   
## modelmondeo -3.180e-01 3.278e-02 -9.701 < 2e-16 \*\*\*  
## modelmove -2.232e-01 1.276e-01 -1.750 0.080175 .   
## modelmusa 2.602e-04 1.498e-01 0.002 0.998614   
## modelmustang 1.314e+00 4.906e-02 26.792 < 2e-16 \*\*\*  
## modelmx\_reihe 5.125e-01 3.206e-02 15.984 < 2e-16 \*\*\*  
## modelnavara 5.064e-01 6.693e-02 7.566 3.88e-14 \*\*\*  
## modelniva -4.575e-01 1.143e-01 -4.001 6.30e-05 \*\*\*  
## modelnote 2.914e-01 6.418e-02 4.540 5.62e-06 \*\*\*  
## modelnubira -3.947e-01 1.031e-01 -3.830 0.000128 \*\*\*  
## modeloctavia 8.828e-01 5.272e-02 16.747 < 2e-16 \*\*\*  
## modelomega -8.140e-01 3.678e-02 -22.131 < 2e-16 \*\*\*  
## modelone -4.577e-01 7.239e-02 -6.322 2.58e-10 \*\*\*  
## modeloutlander 7.592e-01 6.440e-02 11.789 < 2e-16 \*\*\*  
## modelpajero 7.418e-01 5.577e-02 13.300 < 2e-16 \*\*\*  
## modelpanda 2.198e-01 3.846e-02 5.716 1.09e-08 \*\*\*  
## modelpassat -3.846e-01 3.613e-02 -10.645 < 2e-16 \*\*\*  
## modelphaeton -3.942e-01 5.427e-02 -7.263 3.80e-13 \*\*\*  
## modelpicanto 5.920e-01 4.976e-02 11.896 < 2e-16 \*\*\*  
## modelpolo -4.631e-01 3.576e-02 -12.950 < 2e-16 \*\*\*  
## modelprimera -2.683e-01 4.421e-02 -6.069 1.29e-09 \*\*\*  
## modelptcruiser 1.770e-01 5.457e-02 3.243 0.001182 \*\*   
## modelpunto -4.386e-02 3.170e-02 -1.384 0.166496   
## modelq3 3.034e-01 4.685e-02 6.476 9.46e-11 \*\*\*  
## modelq5 4.630e-01 3.990e-02 11.606 < 2e-16 \*\*\*  
## modelq7 3.974e-01 4.343e-02 9.149 < 2e-16 \*\*\*  
## modelqashqai 5.325e-01 4.268e-02 12.478 < 2e-16 \*\*\*  
## modelr19 -5.067e-01 7.493e-02 -6.763 1.36e-11 \*\*\*  
## modelrange\_rover -1.331e+00 1.468e-01 -9.071 < 2e-16 \*\*\*  
## modelrange\_rover\_evoque -1.368e+00 1.491e-01 -9.172 < 2e-16 \*\*\*  
## modelrange\_rover\_sport -1.403e+00 1.447e-01 -9.696 < 2e-16 \*\*\*  
## modelrangerover 1.522e+00 3.200e-01 4.757 1.96e-06 \*\*\*  
## modelrav 2.248e-01 4.693e-02 4.789 1.67e-06 \*\*\*  
## modelrio 4.705e-01 5.111e-02 9.206 < 2e-16 \*\*\*  
## modelroadster 4.416e-01 1.204e-01 3.668 0.000244 \*\*\*  
## modelroomster 8.826e-01 6.305e-02 13.999 < 2e-16 \*\*\*  
## modelrx\_reihe 2.792e-01 5.671e-02 4.923 8.52e-07 \*\*\*  
## models\_klasse -8.393e-02 3.437e-02 -2.442 0.014624 \*   
## models\_max 4.821e-01 4.222e-02 11.419 < 2e-16 \*\*\*  
## models\_type -7.012e-01 7.217e-02 -9.717 < 2e-16 \*\*\*  
## models60 -5.629e-02 6.028e-02 -0.934 0.350344   
## modelsamara 4.172e-03 4.001e-01 0.010 0.991679   
## modelsandero 2.623e-01 1.439e-01 1.822 0.068404 .   
## modelsanta 6.575e-01 4.710e-02 13.961 < 2e-16 \*\*\*  
## modelscenic -2.615e-01 3.750e-02 -6.972 3.13e-12 \*\*\*  
## modelscirocco -7.430e-02 4.316e-02 -1.722 0.085121 .   
## modelseicento -3.373e-01 4.072e-02 -8.284 < 2e-16 \*\*\*  
## modelserie\_2 8.394e-01 3.049e-01 2.753 0.005901 \*\*   
## modelserie\_3 1.102e+00 3.433e-01 3.208 0.001335 \*\*   
## modelsharan -2.568e-01 3.999e-02 -6.422 1.34e-10 \*\*\*  
## modelsignum -1.819e-01 4.288e-02 -4.242 2.21e-05 \*\*\*  
## modelsirion 2.916e-01 8.589e-02 3.395 0.000685 \*\*\*  
## modelsl 4.829e-01 3.662e-02 13.186 < 2e-16 \*\*\*  
## modelslk -3.368e-01 3.213e-02 -10.482 < 2e-16 \*\*\*  
## modelsorento 6.945e-01 5.117e-02 13.574 < 2e-16 \*\*\*  
## modelspark -2.235e-01 6.243e-02 -3.580 0.000344 \*\*\*  
## modelspider 7.583e-01 5.782e-02 13.115 < 2e-16 \*\*\*  
## modelsportage 7.526e-01 5.228e-02 14.396 < 2e-16 \*\*\*  
## modelsprinter -1.079e-01 3.843e-02 -2.809 0.004974 \*\*   
## modelstilo -1.513e-01 4.076e-02 -3.711 0.000207 \*\*\*  
## modelsuperb 9.637e-01 5.917e-02 16.288 < 2e-16 \*\*\*  
## modelswift 2.795e-01 3.998e-02 6.991 2.73e-12 \*\*\*  
## modelterios 6.516e-01 1.276e-01 5.108 3.26e-07 \*\*\*  
## modeltigra -4.865e-01 3.964e-02 -12.272 < 2e-16 \*\*\*  
## modeltiguan -1.645e-01 4.153e-02 -3.961 7.47e-05 \*\*\*  
## modeltoledo 3.988e-01 9.329e-02 4.275 1.91e-05 \*\*\*  
## modeltouareg -3.146e-01 4.321e-02 -7.281 3.32e-13 \*\*\*  
## modeltouran -9.485e-02 3.784e-02 -2.507 0.012184 \*   
## modeltransit 2.417e-01 4.028e-02 6.001 1.97e-09 \*\*\*  
## modeltransporter 4.612e-01 3.724e-02 12.384 < 2e-16 \*\*\*  
## modeltt 3.159e-01 3.345e-02 9.444 < 2e-16 \*\*\*  
## modeltucson 7.021e-01 5.169e-02 13.583 < 2e-16 \*\*\*  
## modeltwingo -3.406e-01 3.378e-02 -10.085 < 2e-16 \*\*\*  
## modelup -4.396e-01 4.737e-02 -9.281 < 2e-16 \*\*\*  
## modelv\_klasse -2.404e-01 5.876e-02 -4.091 4.30e-05 \*\*\*  
## modelv40 -6.667e-01 4.395e-02 -15.171 < 2e-16 \*\*\*  
## modelv50 7.349e-02 5.232e-02 1.404 0.160184   
## modelv60 2.493e-01 9.050e-02 2.755 0.005873 \*\*   
## modelv70 -1.619e-01 4.382e-02 -3.694 0.000221 \*\*\*  
## modelvectra -5.424e-01 3.338e-02 -16.250 < 2e-16 \*\*\*  
## modelverso 2.701e-01 4.780e-02 5.650 1.60e-08 \*\*\*  
## modelviano 1.648e-01 4.101e-02 4.018 5.88e-05 \*\*\*  
## modelvito -2.571e-01 3.566e-02 -7.210 5.62e-13 \*\*\*  
## modelvivaro 2.123e-01 4.754e-02 4.465 8.03e-06 \*\*\*  
## modelvoyager 6.604e-02 5.594e-02 1.181 0.237757   
## modelwrangler 5.494e-01 6.531e-02 8.412 < 2e-16 \*\*\*  
## modelx\_reihe -3.060e-02 4.552e-02 -0.672 0.501416   
## modelx\_trail 2.704e-01 5.444e-02 4.966 6.83e-07 \*\*\*  
## modelx\_type -4.582e-01 6.571e-02 -6.973 3.12e-12 \*\*\*  
## modelxc\_reihe 1.446e-01 4.908e-02 2.946 0.003217 \*\*   
## modelyaris 1.270e-01 3.799e-02 3.343 0.000828 \*\*\*  
## modelyeti 7.902e-01 6.563e-02 12.041 < 2e-16 \*\*\*  
## modelypsilon -4.946e-01 8.297e-02 -5.961 2.51e-09 \*\*\*  
## modelz\_reihe 6.042e-02 4.777e-02 1.265 0.205968   
## modelzafira -1.065e-01 3.471e-02 -3.067 0.002165 \*\*   
## kilometer -7.163e-06 3.424e-08 -209.186 < 2e-16 \*\*\*  
## fuelTypebenzin 1.142e-01 7.696e-02 1.484 0.137880   
## fuelTypecng 2.617e-01 8.156e-02 3.209 0.001332 \*\*   
## fuelTypediesel 4.185e-01 7.699e-02 5.436 5.46e-08 \*\*\*  
## fuelTypeelektro 5.549e-04 1.089e-01 0.005 0.995933   
## fuelTypehybrid 3.520e-01 8.701e-02 4.046 5.22e-05 \*\*\*  
## fuelTypelpg 1.642e-01 7.748e-02 2.119 0.034108 \*   
## brandaudi 8.323e-02 3.048e-02 2.730 0.006332 \*\*   
## brandbmw 4.648e-01 4.433e-02 10.484 < 2e-16 \*\*\*  
## brandchevrolet 8.364e-03 3.333e-02 0.251 0.801853   
## brandchrysler -4.900e-01 4.034e-02 -12.147 < 2e-16 \*\*\*  
## brandcitroen -3.956e-01 3.106e-02 -12.736 < 2e-16 \*\*\*  
## branddacia -3.494e-01 1.399e-01 -2.498 0.012490 \*   
## branddaewoo -5.190e-01 5.792e-02 -8.960 < 2e-16 \*\*\*  
## branddaihatsu -4.362e-01 6.562e-02 -6.647 2.99e-11 \*\*\*  
## brandfiat -3.091e-01 3.072e-02 -10.064 < 2e-16 \*\*\*  
## brandford -1.092e-01 3.192e-02 -3.421 0.000624 \*\*\*  
## brandhonda -2.334e-01 4.534e-02 -5.148 2.63e-07 \*\*\*  
## brandhyundai -6.421e-01 3.271e-02 -19.630 < 2e-16 \*\*\*  
## brandjaguar 5.214e-01 4.373e-02 11.923 < 2e-16 \*\*\*  
## brandjeep 1.920e-01 4.546e-02 4.223 2.41e-05 \*\*\*  
## brandkia -6.645e-01 3.929e-02 -16.913 < 2e-16 \*\*\*  
## brandlada 1.548e-02 9.786e-02 0.158 0.874341   
## brandlancia 9.345e-02 6.922e-02 1.350 0.176970   
## brandland\_rover 1.848e+00 1.329e-01 13.909 < 2e-16 \*\*\*  
## brandmazda -4.274e-01 3.177e-02 -13.453 < 2e-16 \*\*\*  
## brandmercedes\_benz 5.965e-01 2.869e-02 20.790 < 2e-16 \*\*\*  
## brandmini 9.648e-01 6.998e-02 13.787 < 2e-16 \*\*\*  
## brandmitsubishi -4.591e-01 3.569e-02 -12.864 < 2e-16 \*\*\*  
## brandnissan -1.557e-01 3.552e-02 -4.385 1.16e-05 \*\*\*  
## brandopel 1.362e-01 3.261e-02 4.175 2.98e-05 \*\*\*  
## brandpeugeot -3.782e-01 3.153e-02 -11.997 < 2e-16 \*\*\*  
## brandporsche 1.056e+00 4.149e-02 25.461 < 2e-16 \*\*\*  
## brandrenault -3.359e-02 3.387e-02 -0.992 0.321401   
## brandrover -7.221e-01 4.434e-02 -16.285 < 2e-16 \*\*\*  
## brandsaab -4.004e-01 4.121e-02 -9.714 < 2e-16 \*\*\*  
## brandseat -6.902e-01 8.531e-02 -8.090 5.99e-16 \*\*\*  
## brandskoda -6.014e-01 5.163e-02 -11.648 < 2e-16 \*\*\*  
## brandsmart -3.301e-01 1.110e-01 -2.975 0.002928 \*\*   
## brandsubaru -1.122e-02 7.743e-02 -0.145 0.884769   
## brandsuzuki -3.006e-01 3.311e-02 -9.079 < 2e-16 \*\*\*  
## brandtoyota 3.315e-02 3.406e-02 0.973 0.330482   
## brandtrabant 1.507e+00 1.178e-01 12.796 < 2e-16 \*\*\*  
## brandvolkswagen 5.081e-01 3.661e-02 13.879 < 2e-16 \*\*\*  
## brandvolvo 1.908e-01 3.747e-02 5.091 3.56e-07 \*\*\*  
## notRepairedDamageNo 6.724e-01 3.764e-03 178.648 < 2e-16 \*\*\*  
## duration 7.804e-03 1.277e-04 61.103 < 2e-16 \*\*\*  
## age\_of\_car -6.636e-02 2.481e-04 -267.490 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 0.5488 on 247447 degrees of freedom  
## Multiple R-squared: 0.7706, Adjusted R-squared: 0.7703   
## F-statistic: 2716 on 306 and 247447 DF, p-value: < 2.2e-16

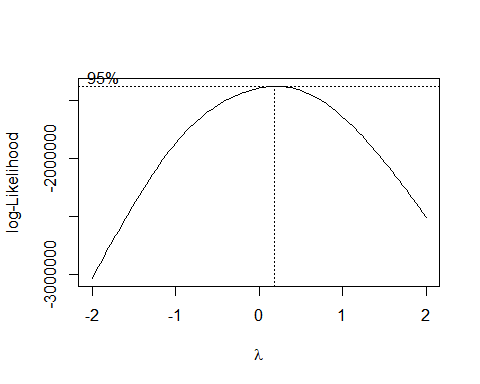
#### resid vs fitted  
resid\_1=model\_1$residuals  
fit\_1=model\_1$fitted.values  
par(mfrow =c(2,2))  
plot(fit\_1,resid\_1,xlab="fits",ylab="Residals")  
abline(0,0,col="red")  
  
### qqnorm  
qqnorm(resid\_1)  
qqline(resid\_1,col="blue")  
hist(resid\_1, xlab="Residuals", main= "Histogram of Residuals")

 taking log fixes the normality a bit but messes up with the constant variance - so we try box cox

#### test   
  
#### Using Box Cox Transformation to fix the non constant variance assumption  
library(MASS)

## Warning: package 'MASS' was built under R version 3.4.2

# run the box-cox transformation  
bc <- boxcox(model)



(lambda <- bc$x[which.max(bc$y)])

## [1] 0.1818182

lambda

## [1] 0.1818182

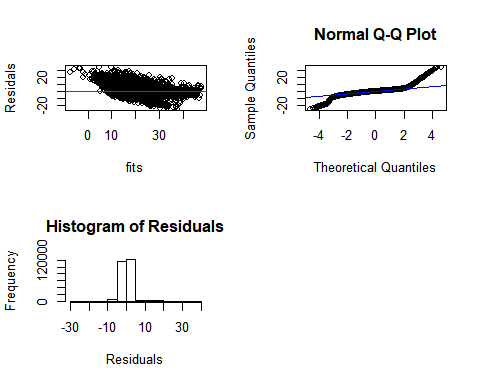
#[1] 0.1818182  
  
  
  
  
# re-run with transformation  
colnames(Cars)

## [1] "name" "seller" "offerType"   
## [4] "price" "vehicleType" "gearbox"   
## [7] "powerPS" "model" "kilometer"   
## [10] "monthOfRegistration" "fuelType" "brand"   
## [13] "notRepairedDamage" "duration" "age\_of\_car"

m\_new = lm(((price^lambda-1)/lambda) ~ .,data=car\_sub)  
summary(m\_new)

##   
## Call:  
## lm(formula = ((price^lambda - 1)/lambda) ~ ., data = car\_sub)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -25.441 -1.185 0.067 1.206 35.467   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 2.029e+01 3.669e-01 55.305 < 2e-16 \*\*\*  
## vehicleTypebus 2.128e-01 6.419e-02 3.315 0.000918 \*\*\*  
## vehicleTypecabrio 1.999e+00 6.552e-02 30.511 < 2e-16 \*\*\*  
## vehicleTypecoupe 9.486e-01 6.597e-02 14.380 < 2e-16 \*\*\*  
## vehicleTypekleinwagen -2.233e-02 6.453e-02 -0.346 0.729367   
## vehicleTypekombi 1.441e-01 6.300e-02 2.287 0.022213 \*   
## vehicleTypelimousine 3.113e-01 6.264e-02 4.970 6.69e-07 \*\*\*  
## vehicleTypesuv 1.132e+00 7.401e-02 15.301 < 2e-16 \*\*\*  
## gearboxmanuell -3.186e-01 1.386e-02 -22.980 < 2e-16 \*\*\*  
## powerPS 2.599e-02 1.343e-04 193.487 < 2e-16 \*\*\*  
## model100 1.888e-01 1.860e-01 1.015 0.310002   
## model145 -2.525e+00 4.798e-01 -5.264 1.41e-07 \*\*\*  
## model147 -1.773e+00 1.923e-01 -9.222 < 2e-16 \*\*\*  
## model156 -3.092e+00 1.919e-01 -16.111 < 2e-16 \*\*\*  
## model159 1.314e-01 2.335e-01 0.563 0.573775   
## model1er -1.315e+00 1.881e-01 -6.993 2.69e-12 \*\*\*  
## model2\_reihe 4.331e-01 8.820e-02 4.910 9.10e-07 \*\*\*  
## model200 3.813e+00 7.094e-01 5.375 7.67e-08 \*\*\*  
## model3\_reihe 4.154e-01 9.566e-02 4.343 1.41e-05 \*\*\*  
## model300c 2.773e+00 2.693e-01 10.296 < 2e-16 \*\*\*  
## model3er -2.264e+00 1.846e-01 -12.264 < 2e-16 \*\*\*  
## model4\_reihe 2.642e-01 1.343e-01 1.967 0.049165 \*   
## model5\_reihe 2.693e+00 1.553e-01 17.338 < 2e-16 \*\*\*  
## model500 1.921e+00 1.495e-01 12.852 < 2e-16 \*\*\*  
## model5er -2.195e+00 1.863e-01 -11.786 < 2e-16 \*\*\*  
## model6\_reihe 8.151e-01 1.305e-01 6.247 4.20e-10 \*\*\*  
## model601 -3.347e+00 5.319e-01 -6.293 3.12e-10 \*\*\*  
## model6er -2.780e-01 2.464e-01 -1.128 0.259259   
## model7er -2.455e+00 2.015e-01 -12.187 < 2e-16 \*\*\*  
## model80 -6.759e-01 1.464e-01 -4.616 3.91e-06 \*\*\*  
## model850 -2.062e+00 2.471e-01 -8.345 < 2e-16 \*\*\*  
## model90 1.547e+00 3.414e-01 4.530 5.91e-06 \*\*\*  
## model900 2.455e+00 3.100e-01 7.918 2.43e-15 \*\*\*  
## model9000 2.094e+00 5.335e-01 3.924 8.69e-05 \*\*\*  
## model911 3.277e+00 1.902e-01 17.230 < 2e-16 \*\*\*  
## modela\_klasse -2.987e+00 1.230e-01 -24.288 < 2e-16 \*\*\*  
## modela1 1.202e+00 1.576e-01 7.627 2.41e-14 \*\*\*  
## modela2 1.653e+00 1.856e-01 8.903 < 2e-16 \*\*\*  
## modela3 4.773e-01 1.278e-01 3.736 0.000187 \*\*\*  
## modela4 9.859e-02 1.262e-01 0.781 0.434553   
## modela5 1.625e+00 1.457e-01 11.153 < 2e-16 \*\*\*  
## modela6 -1.719e-01 1.279e-01 -1.344 0.178851   
## modela8 -7.787e-01 1.651e-01 -4.715 2.42e-06 \*\*\*  
## modelaccord 1.032e+00 2.379e-01 4.340 1.42e-05 \*\*\*  
## modelagila -1.809e+00 1.900e-01 -9.519 < 2e-16 \*\*\*  
## modelalhambra 3.048e+00 3.823e-01 7.974 1.54e-15 \*\*\*  
## modelalmera -1.126e+00 1.881e-01 -5.984 2.18e-09 \*\*\*  
## modelaltea 2.894e+00 3.841e-01 7.536 4.85e-14 \*\*\*  
## modelamarok -1.140e+00 4.322e-01 -2.637 0.008360 \*\*   
## modelandere 7.567e-01 1.063e-01 7.118 1.09e-12 \*\*\*  
## modelantara -7.830e-01 2.937e-01 -2.666 0.007682 \*\*   
## modelarosa 1.409e+00 3.717e-01 3.789 0.000151 \*\*\*  
## modelastra -1.544e+00 1.357e-01 -11.378 < 2e-16 \*\*\*  
## modelauris 9.546e-02 2.177e-01 0.438 0.661062   
## modelavensis 6.256e-02 1.771e-01 0.353 0.723950   
## modelaveo -8.872e-01 2.827e-01 -3.138 0.001702 \*\*   
## modelaygo -9.382e-01 1.887e-01 -4.973 6.61e-07 \*\*\*  
## modelb\_klasse -7.795e-01 1.471e-01 -5.298 1.17e-07 \*\*\*  
## modelb\_max 8.365e-01 4.919e-01 1.700 0.089047 .   
## modelbeetle -1.602e+00 1.739e-01 -9.213 < 2e-16 \*\*\*  
## modelberlingo 6.748e-01 1.613e-01 4.182 2.89e-05 \*\*\*  
## modelbora -2.628e+00 1.759e-01 -14.941 < 2e-16 \*\*\*  
## modelboxster -3.321e+00 2.112e-01 -15.728 < 2e-16 \*\*\*  
## modelbravo -1.495e-01 2.086e-01 -0.716 0.473767   
## modelc\_klasse -2.359e+00 1.189e-01 -19.830 < 2e-16 \*\*\*  
## modelc\_max 7.397e-01 1.676e-01 4.415 1.01e-05 \*\*\*  
## modelc\_reihe -5.626e-01 2.336e-01 -2.408 0.016027 \*   
## modelc1 3.845e-01 1.807e-01 2.128 0.033356 \*   
## modelc2 6.810e-01 1.852e-01 3.676 0.000237 \*\*\*  
## modelc3 9.067e-01 1.715e-01 5.288 1.24e-07 \*\*\*  
## modelc4 9.749e-01 1.770e-01 5.508 3.64e-08 \*\*\*  
## modelc5 -1.411e-02 1.744e-01 -0.081 0.935508   
## modelcaddy -1.233e+00 1.657e-01 -7.443 9.84e-14 \*\*\*  
## modelcalibra -7.844e-01 2.604e-01 -3.012 0.002592 \*\*   
## modelcaptiva 1.113e-01 2.355e-01 0.473 0.636540   
## modelcarisma -9.073e-01 2.076e-01 -4.370 1.24e-05 \*\*\*  
## modelcarnival -4.229e-01 2.413e-01 -1.753 0.079631 .   
## modelcayenne -4.230e+00 2.157e-01 -19.609 < 2e-16 \*\*\*  
## modelcc -5.201e-01 2.395e-01 -2.171 0.029926 \*   
## modelceed 2.752e+00 2.253e-01 12.215 < 2e-16 \*\*\*  
## modelcharade -8.560e-01 6.984e-01 -1.226 0.220330   
## modelcherokee -1.091e+00 2.905e-01 -3.754 0.000174 \*\*\*  
## modelcitigo 9.212e-01 3.315e-01 2.779 0.005457 \*\*   
## modelcivic 5.677e-01 2.035e-01 2.789 0.005281 \*\*   
## modelcl -2.268e+00 1.945e-01 -11.661 < 2e-16 \*\*\*  
## modelclio -9.673e-01 1.443e-01 -6.704 2.04e-11 \*\*\*  
## modelclk -2.632e+00 1.316e-01 -20.000 < 2e-16 \*\*\*  
## modelclubman -2.365e+00 3.415e-01 -6.923 4.42e-12 \*\*\*  
## modelcolt 2.763e-01 1.734e-01 1.594 0.111038   
## modelcombo -1.700e+00 1.937e-01 -8.772 < 2e-16 \*\*\*  
## modelcooper -2.781e+00 2.982e-01 -9.324 < 2e-16 \*\*\*  
## modelcordoba 5.621e-01 3.882e-01 1.448 0.147660   
## modelcorolla -3.678e-01 1.742e-01 -2.111 0.034790 \*   
## modelcorsa -1.596e+00 1.342e-01 -11.894 < 2e-16 \*\*\*  
## modelcr\_reihe 1.968e+00 2.361e-01 8.336 < 2e-16 \*\*\*  
## modelcroma -4.920e-02 4.285e-01 -0.115 0.908591   
## modelcrossfire 2.269e+00 3.566e-01 6.363 1.99e-10 \*\*\*  
## modelcuore -7.267e-01 3.153e-01 -2.305 0.021194 \*   
## modelcx\_reihe 2.633e+00 2.521e-01 10.442 < 2e-16 \*\*\*  
## modeldefender -2.341e+00 5.956e-01 -3.930 8.49e-05 \*\*\*  
## modeldelta 2.816e+00 5.316e-01 5.298 1.17e-07 \*\*\*  
## modeldiscovery -6.266e+00 5.996e-01 -10.451 < 2e-16 \*\*\*  
## modeldiscovery\_sport -5.599e+00 2.383e+00 -2.349 0.018812 \*   
## modeldoblo 3.705e-01 2.008e-01 1.845 0.065033 .   
## modelducato 1.052e+00 1.932e-01 5.442 5.26e-08 \*\*\*  
## modelduster 1.313e+00 6.160e-01 2.131 0.033065 \*   
## modele\_klasse -2.012e+00 1.197e-01 -16.813 < 2e-16 \*\*\*  
## modelelefantino -4.013e+00 1.194e+00 -3.361 0.000776 \*\*\*  
## modeleos -2.145e+00 1.848e-01 -11.607 < 2e-16 \*\*\*  
## modelescort -2.127e+00 1.679e-01 -12.671 < 2e-16 \*\*\*  
## modelespace -1.769e+00 1.847e-01 -9.576 < 2e-16 \*\*\*  
## modelexeo 3.316e+00 4.337e-01 7.646 2.07e-14 \*\*\*  
## modelfabia 2.171e+00 2.220e-01 9.779 < 2e-16 \*\*\*  
## modelfiesta -6.414e-01 1.344e-01 -4.773 1.81e-06 \*\*\*  
## modelfocus -6.348e-01 1.347e-01 -4.713 2.44e-06 \*\*\*  
## modelforester 4.657e-01 3.958e-01 1.177 0.239323   
## modelforfour 1.201e+00 4.873e-01 2.464 0.013748 \*   
## modelfortwo 3.198e-01 4.686e-01 0.682 0.494952   
## modelfox -2.857e+00 1.795e-01 -15.914 < 2e-16 \*\*\*  
## modelfreelander -7.980e+00 5.847e-01 -13.648 < 2e-16 \*\*\*  
## modelfusion -5.062e-02 1.997e-01 -0.254 0.799882   
## modelg\_klasse 4.396e+00 2.316e-01 18.982 < 2e-16 \*\*\*  
## modelgalant -1.210e+00 2.377e-01 -5.092 3.54e-07 \*\*\*  
## modelgalaxy 2.477e-02 1.590e-01 0.156 0.876210   
## modelgetz 1.292e+00 1.889e-01 6.841 7.91e-12 \*\*\*  
## modelgl 5.115e-01 3.389e-01 1.509 0.131297   
## modelglk -2.516e-01 2.042e-01 -1.232 0.217955   
## modelgolf -1.840e+00 1.503e-01 -12.246 < 2e-16 \*\*\*  
## modelgrand 6.201e-01 1.730e-01 3.585 0.000337 \*\*\*  
## modeli\_reihe 2.396e+00 1.502e-01 15.955 < 2e-16 \*\*\*  
## modeli3 -2.553e+00 1.054e+00 -2.422 0.015431 \*   
## modelibiza 2.149e+00 3.614e-01 5.947 2.74e-09 \*\*\*  
## modelimpreza -3.215e-01 3.716e-01 -0.865 0.386952   
## modelinsignia 2.348e-01 1.641e-01 1.431 0.152487   
## modeljazz 1.304e+00 2.380e-01 5.478 4.29e-08 \*\*\*  
## modeljetta -8.108e-01 2.147e-01 -3.776 0.000159 \*\*\*  
## modeljimny 2.052e+00 2.248e-01 9.127 < 2e-16 \*\*\*  
## modeljuke 1.115e+00 2.899e-01 3.847 0.000119 \*\*\*  
## modeljusty -2.079e+00 4.121e-01 -5.045 4.55e-07 \*\*\*  
## modelka -2.250e+00 1.419e-01 -15.862 < 2e-16 \*\*\*  
## modelkadett 2.884e+00 2.196e-01 13.133 < 2e-16 \*\*\*  
## modelkaefer 9.011e+00 2.155e-01 41.807 < 2e-16 \*\*\*  
## modelkalina -5.232e+00 1.115e+00 -4.694 2.68e-06 \*\*\*  
## modelkalos -4.846e-01 3.671e-01 -1.320 0.186774   
## modelkangoo -8.151e-01 1.680e-01 -4.850 1.23e-06 \*\*\*  
## modelkappa -1.902e+00 7.878e-01 -2.414 0.015763 \*   
## modelkuga 1.169e+00 1.826e-01 6.404 1.51e-10 \*\*\*  
## modellaguna -2.280e+00 1.572e-01 -14.499 < 2e-16 \*\*\*  
## modellancer 1.979e+00 2.376e-01 8.330 < 2e-16 \*\*\*  
## modellanos -1.564e+00 4.277e-01 -3.656 0.000256 \*\*\*  
## modellegacy -1.066e+00 3.928e-01 -2.715 0.006634 \*\*   
## modelleon 2.704e+00 3.649e-01 7.411 1.25e-13 \*\*\*  
## modellodgy 1.345e+00 7.297e-01 1.844 0.065217 .   
## modellogan 4.374e-01 6.077e-01 0.720 0.471678   
## modellupo -2.668e+00 1.594e-01 -16.739 < 2e-16 \*\*\*  
## modellybra -5.237e+00 4.965e-01 -10.549 < 2e-16 \*\*\*  
## modelm\_klasse -1.758e+00 1.452e-01 -12.105 < 2e-16 \*\*\*  
## modelm\_reihe -1.319e+00 2.289e-01 -5.764 8.22e-09 \*\*\*  
## modelmateria 2.186e+00 7.229e-01 3.024 0.002495 \*\*   
## modelmatiz -1.769e+00 2.009e-01 -8.804 < 2e-16 \*\*\*  
## modelmegane -1.549e+00 1.467e-01 -10.562 < 2e-16 \*\*\*  
## modelmeriva -9.062e-01 1.598e-01 -5.670 1.43e-08 \*\*\*  
## modelmicra -5.399e-01 1.611e-01 -3.352 0.000802 \*\*\*  
## modelmii 1.555e+00 4.457e-01 3.490 0.000483 \*\*\*  
## modelmodus -7.173e-01 2.067e-01 -3.470 0.000521 \*\*\*  
## modelmondeo -1.631e+00 1.384e-01 -11.787 < 2e-16 \*\*\*  
## modelmove -7.379e-01 5.386e-01 -1.370 0.170681   
## modelmusa -7.063e-01 6.323e-01 -1.117 0.263971   
## modelmustang 5.638e+00 2.071e-01 27.224 < 2e-16 \*\*\*  
## modelmx\_reihe 1.697e+00 1.353e-01 12.538 < 2e-16 \*\*\*  
## modelnavara 2.151e+00 2.826e-01 7.612 2.72e-14 \*\*\*  
## modelniva -2.534e+00 4.827e-01 -5.249 1.53e-07 \*\*\*  
## modelnote 6.776e-01 2.709e-01 2.501 0.012376 \*   
## modelnubira -1.805e+00 4.351e-01 -4.148 3.35e-05 \*\*\*  
## modeloctavia 2.970e+00 2.225e-01 13.347 < 2e-16 \*\*\*  
## modelomega -3.759e+00 1.553e-01 -24.210 < 2e-16 \*\*\*  
## modelone -2.547e+00 3.056e-01 -8.335 < 2e-16 \*\*\*  
## modeloutlander 2.955e+00 2.719e-01 10.870 < 2e-16 \*\*\*  
## modelpajero 2.692e+00 2.355e-01 11.435 < 2e-16 \*\*\*  
## modelpanda 1.712e-01 1.624e-01 1.054 0.291750   
## modelpassat -2.171e+00 1.525e-01 -14.238 < 2e-16 \*\*\*  
## modelphaeton -2.402e+00 2.291e-01 -10.485 < 2e-16 \*\*\*  
## modelpicanto 1.799e+00 2.101e-01 8.566 < 2e-16 \*\*\*  
## modelpolo -2.312e+00 1.510e-01 -15.315 < 2e-16 \*\*\*  
## modelprimera -1.396e+00 1.866e-01 -7.478 7.55e-14 \*\*\*  
## modelptcruiser 3.971e-01 2.304e-01 1.724 0.084767 .   
## modelpunto -3.690e-01 1.338e-01 -2.757 0.005825 \*\*   
## modelq3 1.765e+00 1.978e-01 8.926 < 2e-16 \*\*\*  
## modelq5 2.433e+00 1.684e-01 14.447 < 2e-16 \*\*\*  
## modelq7 1.671e+00 1.834e-01 9.113 < 2e-16 \*\*\*  
## modelqashqai 2.242e+00 1.802e-01 12.442 < 2e-16 \*\*\*  
## modelr19 -1.914e+00 3.163e-01 -6.052 1.43e-09 \*\*\*  
## modelrange\_rover -6.513e+00 6.196e-01 -10.511 < 2e-16 \*\*\*  
## modelrange\_rover\_evoque -5.341e+00 6.295e-01 -8.485 < 2e-16 \*\*\*  
## modelrange\_rover\_sport -6.125e+00 6.107e-01 -10.031 < 2e-16 \*\*\*  
## modelrangerover 6.825e+00 1.351e+00 5.052 4.37e-07 \*\*\*  
## modelrav 4.725e-01 1.981e-01 2.385 0.017091 \*   
## modelrio 1.486e+00 2.158e-01 6.886 5.74e-12 \*\*\*  
## modelroadster 1.329e+00 5.082e-01 2.615 0.008915 \*\*   
## modelroomster 2.858e+00 2.662e-01 10.739 < 2e-16 \*\*\*  
## modelrx\_reihe 2.294e-01 2.394e-01 0.958 0.337896   
## models\_klasse -9.743e-01 1.451e-01 -6.714 1.90e-11 \*\*\*  
## models\_max 1.793e+00 1.782e-01 10.061 < 2e-16 \*\*\*  
## models\_type -4.448e+00 3.047e-01 -14.600 < 2e-16 \*\*\*  
## models60 -7.190e-01 2.545e-01 -2.826 0.004719 \*\*   
## modelsamara -2.438e-01 1.689e+00 -0.144 0.885210   
## modelsandero 7.787e-01 6.075e-01 1.282 0.199908   
## modelsanta 2.343e+00 1.988e-01 11.783 < 2e-16 \*\*\*  
## modelscenic -1.391e+00 1.583e-01 -8.786 < 2e-16 \*\*\*  
## modelscirocco -7.470e-01 1.822e-01 -4.100 4.13e-05 \*\*\*  
## modelseicento -1.370e+00 1.719e-01 -7.967 1.63e-15 \*\*\*  
## modelserie\_2 2.712e+00 1.287e+00 2.107 0.035083 \*   
## modelserie\_3 4.167e+00 1.449e+00 2.875 0.004041 \*\*   
## modelsharan -1.592e+00 1.688e-01 -9.428 < 2e-16 \*\*\*  
## modelsignum -1.600e+00 1.810e-01 -8.837 < 2e-16 \*\*\*  
## modelsirion 5.784e-01 3.626e-01 1.595 0.110625   
## modelsl 2.160e+00 1.546e-01 13.976 < 2e-16 \*\*\*  
## modelslk -2.005e+00 1.357e-01 -14.779 < 2e-16 \*\*\*  
## modelsorento 2.452e+00 2.160e-01 11.350 < 2e-16 \*\*\*  
## modelspark -1.759e+00 2.636e-01 -6.674 2.49e-11 \*\*\*  
## modelspider 3.073e+00 2.441e-01 12.592 < 2e-16 \*\*\*  
## modelsportage 3.126e+00 2.207e-01 14.165 < 2e-16 \*\*\*  
## modelsprinter -1.006e+00 1.622e-01 -6.202 5.60e-10 \*\*\*  
## modelstilo -1.092e+00 1.721e-01 -6.347 2.19e-10 \*\*\*  
## modelsuperb 3.452e+00 2.498e-01 13.821 < 2e-16 \*\*\*  
## modelswift 7.955e-01 1.688e-01 4.713 2.44e-06 \*\*\*  
## modelterios 2.097e+00 5.385e-01 3.894 9.85e-05 \*\*\*  
## modeltigra -2.517e+00 1.673e-01 -15.042 < 2e-16 \*\*\*  
## modeltiguan -6.675e-01 1.753e-01 -3.807 0.000141 \*\*\*  
## modeltoledo 9.282e-01 3.938e-01 2.357 0.018429 \*   
## modeltouareg -1.603e+00 1.824e-01 -8.788 < 2e-16 \*\*\*  
## modeltouran -9.097e-01 1.597e-01 -5.695 1.23e-08 \*\*\*  
## modeltransit 5.780e-01 1.700e-01 3.400 0.000675 \*\*\*  
## modeltransporter 1.882e+00 1.572e-01 11.974 < 2e-16 \*\*\*  
## modeltt 8.106e-01 1.412e-01 5.741 9.42e-09 \*\*\*  
## modeltucson 2.452e+00 2.182e-01 11.235 < 2e-16 \*\*\*  
## modeltwingo -1.511e+00 1.426e-01 -10.594 < 2e-16 \*\*\*  
## modelup -2.737e+00 2.000e-01 -13.688 < 2e-16 \*\*\*  
## modelv\_klasse -1.493e+00 2.481e-01 -6.018 1.77e-09 \*\*\*  
## modelv40 -2.977e+00 1.855e-01 -16.048 < 2e-16 \*\*\*  
## modelv50 -2.269e-01 2.209e-01 -1.027 0.304280   
## modelv60 1.212e+00 3.821e-01 3.172 0.001512 \*\*   
## modelv70 -1.192e+00 1.850e-01 -6.446 1.15e-10 \*\*\*  
## modelvectra -2.613e+00 1.409e-01 -18.547 < 2e-16 \*\*\*  
## modelverso 5.974e-01 2.018e-01 2.960 0.003075 \*\*   
## modelviano 8.967e-01 1.731e-01 5.180 2.22e-07 \*\*\*  
## modelvito -1.645e+00 1.506e-01 -10.923 < 2e-16 \*\*\*  
## modelvivaro 5.568e-01 2.007e-01 2.774 0.005535 \*\*   
## modelvoyager 1.623e-01 2.361e-01 0.687 0.491834   
## modelwrangler 2.546e+00 2.757e-01 9.234 < 2e-16 \*\*\*  
## modelx\_reihe -8.926e-01 1.922e-01 -4.645 3.40e-06 \*\*\*  
## modelx\_trail 8.103e-01 2.298e-01 3.526 0.000422 \*\*\*  
## modelx\_type -3.083e+00 2.774e-01 -11.115 < 2e-16 \*\*\*  
## modelxc\_reihe 6.120e-01 2.072e-01 2.954 0.003140 \*\*   
## modelyaris -1.303e-01 1.604e-01 -0.813 0.416480   
## modelyeti 2.852e+00 2.770e-01 10.296 < 2e-16 \*\*\*  
## modelypsilon -2.264e+00 3.502e-01 -6.464 1.02e-10 \*\*\*  
## modelz\_reihe -6.921e-01 2.017e-01 -3.432 0.000600 \*\*\*  
## modelzafira -1.010e+00 1.465e-01 -6.896 5.37e-12 \*\*\*  
## kilometer -3.640e-05 1.446e-07 -251.828 < 2e-16 \*\*\*  
## fuelTypebenzin 5.094e-01 3.249e-01 1.568 0.116887   
## fuelTypecng 1.139e+00 3.443e-01 3.308 0.000940 \*\*\*  
## fuelTypediesel 1.895e+00 3.250e-01 5.830 5.56e-09 \*\*\*  
## fuelTypeelektro -1.952e-01 4.596e-01 -0.425 0.671029   
## fuelTypehybrid 1.797e+00 3.673e-01 4.893 9.94e-07 \*\*\*  
## fuelTypelpg 5.486e-01 3.271e-01 1.677 0.093514 .   
## brandaudi 8.464e-01 1.287e-01 6.577 4.81e-11 \*\*\*  
## brandbmw 3.040e+00 1.872e-01 16.246 < 2e-16 \*\*\*  
## brandchevrolet 1.791e-02 1.407e-01 0.127 0.898705   
## brandchrysler -2.184e+00 1.703e-01 -12.826 < 2e-16 \*\*\*  
## brandcitroen -1.325e+00 1.311e-01 -10.109 < 2e-16 \*\*\*  
## branddacia -1.739e+00 5.904e-01 -2.945 0.003233 \*\*   
## branddaewoo -1.814e+00 2.445e-01 -7.419 1.18e-13 \*\*\*  
## branddaihatsu -1.601e+00 2.770e-01 -5.779 7.53e-09 \*\*\*  
## brandfiat -1.124e+00 1.297e-01 -8.666 < 2e-16 \*\*\*  
## brandford -2.917e-01 1.348e-01 -2.165 0.030414 \*   
## brandhonda -8.985e-01 1.914e-01 -4.695 2.67e-06 \*\*\*  
## brandhyundai -2.636e+00 1.381e-01 -19.090 < 2e-16 \*\*\*  
## brandjaguar 2.850e+00 1.846e-01 15.438 < 2e-16 \*\*\*  
## brandjeep 9.814e-01 1.919e-01 5.114 3.16e-07 \*\*\*  
## brandkia -2.690e+00 1.659e-01 -16.218 < 2e-16 \*\*\*  
## brandlada 1.746e-02 4.131e-01 0.042 0.966289   
## brandlancia 5.680e-01 2.922e-01 1.944 0.051898 .   
## brandland\_rover 8.726e+00 5.609e-01 15.556 < 2e-16 \*\*\*  
## brandmazda -1.682e+00 1.341e-01 -12.539 < 2e-16 \*\*\*  
## brandmercedes\_benz 2.897e+00 1.211e-01 23.916 < 2e-16 \*\*\*  
## brandmini 4.402e+00 2.954e-01 14.900 < 2e-16 \*\*\*  
## brandmitsubishi -1.807e+00 1.507e-01 -11.991 < 2e-16 \*\*\*  
## brandnissan -5.733e-01 1.499e-01 -3.824 0.000131 \*\*\*  
## brandopel 7.640e-01 1.377e-01 5.549 2.87e-08 \*\*\*  
## brandpeugeot -1.566e+00 1.331e-01 -11.763 < 2e-16 \*\*\*  
## brandporsche 5.882e+00 1.752e-01 33.582 < 2e-16 \*\*\*  
## brandrenault -5.129e-02 1.430e-01 -0.359 0.719853   
## brandrover -2.719e+00 1.872e-01 -14.527 < 2e-16 \*\*\*  
## brandsaab -1.716e+00 1.740e-01 -9.863 < 2e-16 \*\*\*  
## brandseat -2.305e+00 3.602e-01 -6.401 1.55e-10 \*\*\*  
## brandskoda -1.958e+00 2.180e-01 -8.983 < 2e-16 \*\*\*  
## brandsmart -1.358e+00 4.684e-01 -2.899 0.003742 \*\*   
## brandsubaru 5.325e-02 3.269e-01 0.163 0.870591   
## brandsuzuki -1.201e+00 1.398e-01 -8.590 < 2e-16 \*\*\*  
## brandtoyota 3.571e-01 1.438e-01 2.483 0.013024 \*   
## brandtrabant 6.524e+00 4.972e-01 13.122 < 2e-16 \*\*\*  
## brandvolkswagen 2.469e+00 1.545e-01 15.978 < 2e-16 \*\*\*  
## brandvolvo 9.434e-01 1.582e-01 5.964 2.46e-09 \*\*\*  
## notRepairedDamageNo 2.565e+00 1.589e-02 161.426 < 2e-16 \*\*\*  
## duration 3.502e-02 5.391e-04 64.958 < 2e-16 \*\*\*  
## age\_of\_car -2.851e-01 1.047e-03 -272.230 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 2.317 on 247447 degrees of freedom  
## Multiple R-squared: 0.799, Adjusted R-squared: 0.7987   
## F-statistic: 3214 on 306 and 247447 DF, p-value: < 2.2e-16

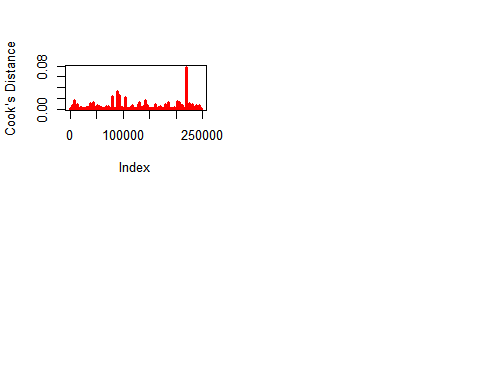
# resid plot  
resid\_3=m\_new$residuals  
fit\_3=m\_new$fitted.values  
par(mfrow =c(2,2))  
plot(fit\_3,resid\_3,xlab="fits",ylab="Residals")  
abline(0,0,col="red")  
  
### qqnorm  
qqnorm(resid\_3)  
qqline(resid\_3,col="blue")  
hist(resid\_3, xlab="Residuals", main= "Histogram of Residuals")

 BOX cox also messes up with the constant variance and does not do much to fix the normality

#### use cooks distance to identify outliers  
cook = cooks.distance(model)  
par(mfrow=c(2,2))  
## Check outliers  
#influencePlot(model\_1)  
plot(cook,type="h",lwd=3,col="red", ylab = "Cook's Distance")  
length(cook[cook>4/nrow(Cars)])

## [1] 6766

### removing outliers based on cooks distance  
Cars\_rem\_outliers=Cars[-as.integer(row.names(as.data.frame(cook[cook>4/nrow(Cars)]))),]  
#nrow(Cars)

 Using cooks plot we get 6766 outliers, hence we subset the data and run the model again.

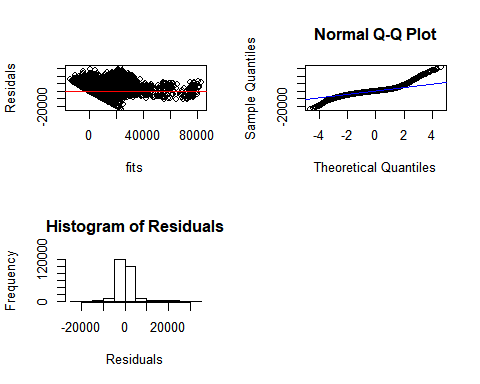
### test   
#Cars\_sub\_price=Cars[Cars$price<10000 & Cars$price>3000,]  
### since even box cox is not helping we subset out data by price and run the model again  
colnames(Cars\_sub\_price)

## [1] "name" "seller" "offerType"   
## [4] "price" "vehicleType" "gearbox"   
## [7] "powerPS" "model" "kilometer"   
## [10] "monthOfRegistration" "fuelType" "brand"   
## [13] "notRepairedDamage" "duration" "age\_of\_car"

car\_sub=Cars\_rem\_outliers[,c(4,5,6,7,8,9,11,12,13,14,15)]  
model\_4=lm(price~.,data=car\_sub)  
summary(model\_4)

##   
## Call:  
## lm(formula = price ~ ., data = car\_sub)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -23717 -1732 -200 1344 32221   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 8.596e+03 6.274e+02 13.702 < 2e-16 \*\*\*  
## vehicleTypebus 3.704e+01 8.801e+01 0.421 0.673847   
## vehicleTypecabrio 1.942e+03 9.005e+01 21.565 < 2e-16 \*\*\*  
## vehicleTypecoupe 1.080e+03 9.078e+01 11.897 < 2e-16 \*\*\*  
## vehicleTypekleinwagen 4.754e+02 8.855e+01 5.368 7.95e-08 \*\*\*  
## vehicleTypekombi 7.256e+00 8.648e+01 0.084 0.933134   
## vehicleTypelimousine 1.631e+02 8.604e+01 1.896 0.057960 .   
## vehicleTypesuv 1.110e+03 1.025e+02 10.836 < 2e-16 \*\*\*  
## gearboxmanuell -9.015e+02 1.882e+01 -47.893 < 2e-16 \*\*\*  
## powerPS 4.400e+01 1.937e-01 227.159 < 2e-16 \*\*\*  
## model100 -1.594e+03 2.534e+02 -6.290 3.18e-10 \*\*\*  
## model145 8.174e+02 8.825e+02 0.926 0.354307   
## model147 -9.663e+02 2.607e+02 -3.706 0.000210 \*\*\*  
## model156 -1.452e+03 2.605e+02 -5.571 2.53e-08 \*\*\*  
## model159 -6.769e+02 3.174e+02 -2.132 0.032990 \*   
## model1er -1.251e+04 3.305e+02 -37.858 < 2e-16 \*\*\*  
## model2\_reihe -1.328e+03 1.178e+02 -11.273 < 2e-16 \*\*\*  
## model200 6.421e+01 1.272e+03 0.050 0.959753   
## model3\_reihe -6.465e+02 1.277e+02 -5.061 4.18e-07 \*\*\*  
## model300c 3.374e+02 3.799e+02 0.888 0.374481   
## model3er -1.334e+04 3.270e+02 -40.796 < 2e-16 \*\*\*  
## model4\_reihe -1.601e+03 1.801e+02 -8.887 < 2e-16 \*\*\*  
## model5\_reihe 4.174e+01 2.095e+02 0.199 0.842068   
## model500 -2.310e+03 2.018e+02 -11.444 < 2e-16 \*\*\*  
## model5er -1.350e+04 3.288e+02 -41.060 < 2e-16 \*\*\*  
## model6\_reihe -8.452e+02 1.743e+02 -4.848 1.25e-06 \*\*\*  
## model601 -7.629e+03 1.028e+03 -7.424 1.14e-13 \*\*\*  
## model6er -7.073e+03 4.577e+02 -15.454 < 2e-16 \*\*\*  
## model7er -1.564e+04 3.460e+02 -45.207 < 2e-16 \*\*\*  
## model80 -1.377e+03 1.979e+02 -6.957 3.47e-12 \*\*\*  
## model850 -1.700e+03 3.364e+02 -5.053 4.35e-07 \*\*\*  
## model90 -2.802e+02 4.766e+02 -0.588 0.556613   
## model900 2.273e+03 5.153e+02 4.411 1.03e-05 \*\*\*  
## model9000 1.951e+03 8.874e+02 2.199 0.027883 \*   
## model911 2.837e+04 4.635e+02 61.213 < 2e-16 \*\*\*  
## modela\_klasse -5.127e+03 1.648e+02 -31.116 < 2e-16 \*\*\*  
## modela1 -1.912e+03 2.128e+02 -8.987 < 2e-16 \*\*\*  
## modela2 -2.070e+03 2.496e+02 -8.296 < 2e-16 \*\*\*  
## modela3 -2.289e+03 1.733e+02 -13.206 < 2e-16 \*\*\*  
## modela4 -2.889e+03 1.712e+02 -16.875 < 2e-16 \*\*\*  
## modela5 2.792e+03 1.984e+02 14.074 < 2e-16 \*\*\*  
## modela6 -3.495e+03 1.736e+02 -20.135 < 2e-16 \*\*\*  
## modela8 -6.505e+03 2.293e+02 -28.363 < 2e-16 \*\*\*  
## modelaccord -1.037e+03 3.257e+02 -3.185 0.001450 \*\*   
## modelagila -2.817e+03 2.558e+02 -11.010 < 2e-16 \*\*\*  
## modelalhambra -1.347e+03 5.661e+02 -2.379 0.017369 \*   
## modelalmera -1.210e+03 2.533e+02 -4.778 1.77e-06 \*\*\*  
## modelaltea -2.828e+03 5.659e+02 -4.997 5.83e-07 \*\*\*  
## modelamarok 3.501e+03 8.528e+02 4.105 4.04e-05 \*\*\*  
## modelandere -7.434e+02 1.421e+02 -5.233 1.67e-07 \*\*\*  
## modelantara -2.770e+03 4.030e+02 -6.874 6.28e-12 \*\*\*  
## modelarosa -1.014e+03 5.512e+02 -1.840 0.065815 .   
## modelastra -2.539e+03 1.831e+02 -13.867 < 2e-16 \*\*\*  
## modelauris -2.983e+03 2.960e+02 -10.076 < 2e-16 \*\*\*  
## modelavensis -2.713e+03 2.390e+02 -11.352 < 2e-16 \*\*\*  
## modelaveo -4.064e+03 3.988e+02 -10.193 < 2e-16 \*\*\*  
## modelaygo -5.064e+03 2.542e+02 -19.922 < 2e-16 \*\*\*  
## modelb\_klasse -3.568e+03 1.973e+02 -18.085 < 2e-16 \*\*\*  
## modelb\_max -1.528e+03 7.507e+02 -2.036 0.041755 \*   
## modelbeetle -3.362e+03 2.373e+02 -14.168 < 2e-16 \*\*\*  
## modelberlingo -1.057e+03 2.161e+02 -4.888 1.02e-06 \*\*\*  
## modelbora -4.243e+03 2.399e+02 -17.685 < 2e-16 \*\*\*  
## modelboxster -1.527e+04 4.521e+02 -33.777 < 2e-16 \*\*\*  
## modelbravo -1.802e+03 2.811e+02 -6.412 1.44e-10 \*\*\*  
## modelc\_klasse -4.685e+03 1.594e+02 -29.383 < 2e-16 \*\*\*  
## modelc\_max -1.537e+03 2.251e+02 -6.828 8.66e-12 \*\*\*  
## modelc\_reihe -2.664e+03 3.208e+02 -8.305 < 2e-16 \*\*\*  
## modelc1 -3.862e+03 2.416e+02 -15.986 < 2e-16 \*\*\*  
## modelc2 -2.436e+03 2.479e+02 -9.827 < 2e-16 \*\*\*  
## modelc3 -2.566e+03 2.299e+02 -11.162 < 2e-16 \*\*\*  
## modelc4 -2.581e+03 2.372e+02 -10.883 < 2e-16 \*\*\*  
## modelc5 -2.873e+03 2.343e+02 -12.265 < 2e-16 \*\*\*  
## modelcaddy -2.689e+03 2.266e+02 -11.867 < 2e-16 \*\*\*  
## modelcalibra -1.649e+03 3.684e+02 -4.475 7.65e-06 \*\*\*  
## modelcaptiva -9.170e+02 3.216e+02 -2.851 0.004357 \*\*   
## modelcarisma -7.910e+02 2.792e+02 -2.833 0.004608 \*\*   
## modelcarnival -2.596e+03 3.244e+02 -8.004 1.21e-15 \*\*\*  
## modelcayenne -1.661e+04 4.965e+02 -33.446 < 2e-16 \*\*\*  
## modelcc 1.939e+02 3.349e+02 0.579 0.562556   
## modelceed -2.570e+02 3.023e+02 -0.850 0.395285   
## modelcharade -9.497e+01 3.114e+03 -0.030 0.975671   
## modelcherokee -1.363e+03 4.182e+02 -3.259 0.001119 \*\*   
## modelcitigo -5.716e+03 4.512e+02 -12.668 < 2e-16 \*\*\*  
## modelcivic -3.494e+02 2.800e+02 -1.248 0.212202   
## modelcl -5.553e+03 2.940e+02 -18.886 < 2e-16 \*\*\*  
## modelclio -1.556e+03 1.942e+02 -8.013 1.12e-15 \*\*\*  
## modelclk -6.783e+03 1.763e+02 -38.467 < 2e-16 \*\*\*  
## modelclubman -4.773e+03 5.784e+02 -8.252 < 2e-16 \*\*\*  
## modelcolt -1.579e+03 2.318e+02 -6.812 9.62e-12 \*\*\*  
## modelcombo -2.695e+03 2.606e+02 -10.339 < 2e-16 \*\*\*  
## modelcooper -4.629e+03 5.327e+02 -8.691 < 2e-16 \*\*\*  
## modelcordoba -1.014e+03 5.719e+02 -1.774 0.076099 .   
## modelcorolla -2.055e+03 2.354e+02 -8.729 < 2e-16 \*\*\*  
## modelcorsa -2.028e+03 1.810e+02 -11.207 < 2e-16 \*\*\*  
## modelcr\_reihe 1.797e+02 3.263e+02 0.551 0.581685   
## modelcroma -3.231e+03 7.285e+02 -4.436 9.19e-06 \*\*\*  
## modelcrossfire -6.376e+01 5.181e+02 -0.123 0.902068   
## modelcuore -1.403e+03 4.452e+02 -3.151 0.001630 \*\*   
## modelcx\_reihe 4.313e+03 3.859e+02 11.176 < 2e-16 \*\*\*  
## modeldefender 8.336e+02 3.099e+03 0.269 0.787977   
## modeldelta 6.415e+03 1.856e+03 3.455 0.000550 \*\*\*  
## modeldiscovery -1.145e+04 3.207e+03 -3.570 0.000357 \*\*\*  
## modeldoblo -1.486e+03 2.694e+02 -5.514 3.51e-08 \*\*\*  
## modelducato -8.532e+02 2.640e+02 -3.232 0.001232 \*\*   
## modelduster 7.484e+02 1.202e+03 0.622 0.533616   
## modele\_klasse -4.302e+03 1.604e+02 -26.813 < 2e-16 \*\*\*  
## modelelefantino 2.580e+02 3.132e+03 0.082 0.934356   
## modeleos -4.267e+03 2.519e+02 -16.943 < 2e-16 \*\*\*  
## modelescort -6.034e+02 2.259e+02 -2.672 0.007551 \*\*   
## modelespace -2.750e+03 2.485e+02 -11.066 < 2e-16 \*\*\*  
## modelexeo -1.853e+03 6.302e+02 -2.941 0.003277 \*\*   
## modelfabia -1.848e+03 3.026e+02 -6.108 1.01e-09 \*\*\*  
## modelfiesta -1.641e+03 1.808e+02 -9.073 < 2e-16 \*\*\*  
## modelfocus -1.707e+03 1.813e+02 -9.419 < 2e-16 \*\*\*  
## modelforester -8.815e+02 6.985e+02 -1.262 0.206994   
## modelforfour -1.387e+03 8.887e+02 -1.561 0.118535   
## modelfortwo -2.845e+03 8.705e+02 -3.269 0.001081 \*\*   
## modelfox -5.628e+03 2.446e+02 -23.011 < 2e-16 \*\*\*  
## modelfreelander -1.573e+04 3.171e+03 -4.961 7.01e-07 \*\*\*  
## modelfusion -2.306e+03 2.688e+02 -8.581 < 2e-16 \*\*\*  
## modelg\_klasse 1.394e+04 5.627e+02 24.780 < 2e-16 \*\*\*  
## modelgalant -1.716e+03 3.236e+02 -5.303 1.14e-07 \*\*\*  
## modelgalaxy -1.069e+03 2.138e+02 -5.000 5.75e-07 \*\*\*  
## modelgetz -6.793e+02 2.526e+02 -2.689 0.007158 \*\*   
## modelgl 1.011e+04 8.426e+02 12.000 < 2e-16 \*\*\*  
## modelglk 3.265e+03 2.905e+02 11.236 < 2e-16 \*\*\*  
## modelgolf -2.811e+03 2.065e+02 -13.613 < 2e-16 \*\*\*  
## modelgrand -8.309e+02 2.383e+02 -3.487 0.000488 \*\*\*  
## modeli\_reihe -7.955e+02 2.007e+02 -3.964 7.36e-05 \*\*\*  
## modelibiza -2.895e+03 5.387e+02 -5.374 7.70e-08 \*\*\*  
## modelimpreza -8.213e+02 6.710e+02 -1.224 0.220952   
## modelinsignia -1.076e+03 2.231e+02 -4.823 1.42e-06 \*\*\*  
## modeljazz -1.925e+03 3.262e+02 -5.902 3.60e-09 \*\*\*  
## modeljetta -2.236e+03 2.940e+02 -7.608 2.80e-14 \*\*\*  
## modeljimny -4.001e+02 3.033e+02 -1.319 0.187124   
## modeljuke -1.830e+03 3.987e+02 -4.589 4.45e-06 \*\*\*  
## modeljusty -1.809e+03 7.407e+02 -2.442 0.014613 \*   
## modelka -2.561e+03 1.907e+02 -13.425 < 2e-16 \*\*\*  
## modelkadett 2.977e+03 3.307e+02 9.001 < 2e-16 \*\*\*  
## modelkaefer 1.093e+04 3.417e+02 31.994 < 2e-16 \*\*\*  
## modelkalina -8.865e+03 2.481e+03 -3.573 0.000353 \*\*\*  
## modelkalos -2.700e+03 5.306e+02 -5.088 3.62e-07 \*\*\*  
## modelkangoo -8.827e+02 2.258e+02 -3.909 9.29e-05 \*\*\*  
## modelkappa -3.516e+03 1.474e+03 -2.384 0.017106 \*   
## modelkuga 1.596e+03 2.474e+02 6.453 1.10e-10 \*\*\*  
## modellaguna -2.490e+03 2.115e+02 -11.774 < 2e-16 \*\*\*  
## modellancer -4.173e+02 3.303e+02 -1.263 0.206472   
## modellanos -1.651e+02 6.195e+02 -0.267 0.789829   
## modellegacy -1.401e+03 6.928e+02 -2.022 0.043225 \*   
## modelleon -2.330e+03 5.428e+02 -4.293 1.76e-05 \*\*\*  
## modellodgy 1.081e+03 1.356e+03 0.797 0.425518   
## modellogan 3.257e+02 1.193e+03 0.273 0.784925   
## modellupo -2.965e+03 2.183e+02 -13.586 < 2e-16 \*\*\*  
## modellybra -4.675e+03 8.042e+02 -5.813 6.15e-09 \*\*\*  
## modelm\_klasse -4.600e+03 1.977e+02 -23.273 < 2e-16 \*\*\*  
## modelm\_reihe -3.577e+03 4.242e+02 -8.432 < 2e-16 \*\*\*  
## modelmateria -2.268e+03 1.593e+03 -1.423 0.154728   
## modelmatiz -2.777e+03 2.718e+02 -10.218 < 2e-16 \*\*\*  
## modelmegane -2.320e+03 1.973e+02 -11.758 < 2e-16 \*\*\*  
## modelmeriva -3.487e+03 2.152e+02 -16.206 < 2e-16 \*\*\*  
## modelmicra -8.632e+02 2.170e+02 -3.978 6.96e-05 \*\*\*  
## modelmii -6.025e+03 6.480e+02 -9.297 < 2e-16 \*\*\*  
## modelmodus -2.666e+03 2.772e+02 -9.617 < 2e-16 \*\*\*  
## modelmondeo -2.291e+03 1.862e+02 -12.303 < 2e-16 \*\*\*  
## modelmove 1.222e+02 8.268e+02 0.148 0.882498   
## modelmusa -3.185e+03 1.208e+03 -2.637 0.008356 \*\*   
## modelmustang 8.060e+03 4.459e+02 18.075 < 2e-16 \*\*\*  
## modelmx\_reihe -4.755e+02 1.808e+02 -2.630 0.008538 \*\*   
## modelnavara 1.952e+03 4.075e+02 4.790 1.67e-06 \*\*\*  
## modelniva -7.444e+03 1.230e+03 -6.050 1.45e-09 \*\*\*  
## modelnote -1.905e+03 3.716e+02 -5.128 2.94e-07 \*\*\*  
## modelnubira -2.192e+03 6.639e+02 -3.301 0.000964 \*\*\*  
## modeloctavia -2.576e+02 3.034e+02 -0.849 0.395773   
## modelomega -4.161e+03 2.092e+02 -19.893 < 2e-16 \*\*\*  
## modelone -5.079e+03 5.401e+02 -9.405 < 2e-16 \*\*\*  
## modeloutlander 4.473e+02 3.932e+02 1.137 0.255340   
## modelpajero 3.423e-01 3.249e+02 0.001 0.999159   
## modelpanda -2.961e+03 2.171e+02 -13.643 < 2e-16 \*\*\*  
## modelpassat -3.814e+03 2.094e+02 -18.213 < 2e-16 \*\*\*  
## modelphaeton -5.892e+03 3.418e+02 -17.240 < 2e-16 \*\*\*  
## modelpicanto -1.367e+03 2.813e+02 -4.859 1.18e-06 \*\*\*  
## modelpolo -3.147e+03 2.074e+02 -15.177 < 2e-16 \*\*\*  
## modelprimera -1.581e+03 2.514e+02 -6.289 3.20e-10 \*\*\*  
## modelptcruiser -5.552e+02 3.123e+02 -1.778 0.075451 .   
## modelpunto -8.746e+02 1.791e+02 -4.883 1.05e-06 \*\*\*  
## modelq3 6.967e+03 2.750e+02 25.337 < 2e-16 \*\*\*  
## modelq5 7.808e+03 2.399e+02 32.552 < 2e-16 \*\*\*  
## modelq7 1.979e+03 2.814e+02 7.035 2.00e-12 \*\*\*  
## modelqashqai 1.372e+03 2.425e+02 5.658 1.53e-08 \*\*\*  
## modelr19 2.409e+02 4.456e+02 0.541 0.588795   
## modelrange\_rover -1.105e+04 3.275e+03 -3.375 0.000737 \*\*\*  
## modelrange\_rover\_evoque -4.420e+01 3.202e+03 -0.014 0.988988   
## modelrange\_rover\_sport -7.345e+03 3.226e+03 -2.277 0.022780 \*   
## modelrav -1.913e+03 2.696e+02 -7.095 1.30e-12 \*\*\*  
## modelrio -1.162e+03 2.904e+02 -4.003 6.26e-05 \*\*\*  
## modelroadster -1.764e+03 9.108e+02 -1.937 0.052733 .   
## modelroomster -1.341e+03 3.608e+02 -3.717 0.000202 \*\*\*  
## modelrx\_reihe -5.069e+03 3.474e+02 -14.592 < 2e-16 \*\*\*  
## models\_klasse -4.828e+03 1.996e+02 -24.189 < 2e-16 \*\*\*  
## models\_max 1.054e+03 2.433e+02 4.332 1.48e-05 \*\*\*  
## models\_type -1.556e+04 5.277e+02 -29.484 < 2e-16 \*\*\*  
## models60 -2.664e+03 3.556e+02 -7.492 6.81e-14 \*\*\*  
## modelsandero -5.508e+02 1.193e+03 -0.462 0.644310   
## modelsanta -3.645e+02 2.686e+02 -1.357 0.174854   
## modelscenic -1.911e+03 2.127e+02 -8.984 < 2e-16 \*\*\*  
## modelscirocco -2.755e+03 2.484e+02 -11.089 < 2e-16 \*\*\*  
## modelseicento -5.156e+02 2.305e+02 -2.237 0.025287 \*   
## modelsharan -3.005e+03 2.311e+02 -13.002 < 2e-16 \*\*\*  
## modelsignum -4.770e+03 2.436e+02 -19.576 < 2e-16 \*\*\*  
## modelsirion -2.557e+03 5.120e+02 -4.995 5.90e-07 \*\*\*  
## modelsl 3.255e+03 2.255e+02 14.433 < 2e-16 \*\*\*  
## modelslk -4.605e+03 1.820e+02 -25.309 < 2e-16 \*\*\*  
## modelsorento -3.195e+02 2.930e+02 -1.091 0.275492   
## modelspark -5.214e+03 3.541e+02 -14.726 < 2e-16 \*\*\*  
## modelspider 3.422e+03 4.498e+02 7.609 2.77e-14 \*\*\*  
## modelsportage 2.883e+03 2.993e+02 9.631 < 2e-16 \*\*\*  
## modelsprinter -3.730e+03 2.200e+02 -16.951 < 2e-16 \*\*\*  
## modelstilo -2.267e+03 2.302e+02 -9.846 < 2e-16 \*\*\*  
## modelsuperb 4.626e+02 3.401e+02 1.360 0.173815   
## modelswift -1.642e+03 2.259e+02 -7.268 3.67e-13 \*\*\*  
## modelterios -1.729e+03 9.738e+02 -1.775 0.075845 .   
## modeltigra -4.079e+03 2.251e+02 -18.121 < 2e-16 \*\*\*  
## modeltiguan 2.903e+02 2.400e+02 1.209 0.226490   
## modeltoledo -2.700e+03 5.778e+02 -4.672 2.98e-06 \*\*\*  
## modeltouareg -2.916e+03 2.578e+02 -11.309 < 2e-16 \*\*\*  
## modeltouran -3.072e+03 2.190e+02 -14.025 < 2e-16 \*\*\*  
## modeltransit -7.615e+02 2.294e+02 -3.320 0.000901 \*\*\*  
## modeltransporter 2.658e+03 2.158e+02 12.316 < 2e-16 \*\*\*  
## modeltt -1.839e+03 1.918e+02 -9.588 < 2e-16 \*\*\*  
## modeltucson -1.194e+03 2.961e+02 -4.033 5.50e-05 \*\*\*  
## modeltwingo -1.183e+03 1.919e+02 -6.162 7.19e-10 \*\*\*  
## modelup -7.218e+03 2.716e+02 -26.580 < 2e-16 \*\*\*  
## modelv\_klasse -3.831e+03 4.840e+02 -7.916 2.46e-15 \*\*\*  
## modelv40 -2.235e+03 2.528e+02 -8.841 < 2e-16 \*\*\*  
## modelv50 -2.360e+03 3.014e+02 -7.829 4.95e-15 \*\*\*  
## modelv60 2.749e+03 5.862e+02 4.690 2.74e-06 \*\*\*  
## modelv70 -2.821e+03 2.531e+02 -11.145 < 2e-16 \*\*\*  
## modelvectra -3.180e+03 1.900e+02 -16.740 < 2e-16 \*\*\*  
## modelverso -2.396e+03 2.727e+02 -8.786 < 2e-16 \*\*\*  
## modelviano 2.180e+03 2.415e+02 9.028 < 2e-16 \*\*\*  
## modelvito -4.154e+03 2.024e+02 -20.531 < 2e-16 \*\*\*  
## modelvivaro -1.230e+03 2.746e+02 -4.480 7.47e-06 \*\*\*  
## modelvoyager 1.420e+02 3.199e+02 0.444 0.657157   
## modelwrangler 7.187e+03 4.309e+02 16.678 < 2e-16 \*\*\*  
## modelx\_reihe -9.695e+03 3.352e+02 -28.922 < 2e-16 \*\*\*  
## modelx\_trail -1.603e+03 3.159e+02 -5.075 3.88e-07 \*\*\*  
## modelx\_type -1.264e+04 4.904e+02 -25.773 < 2e-16 \*\*\*  
## modelxc\_reihe 1.143e+03 3.018e+02 3.787 0.000153 \*\*\*  
## modelyaris -3.030e+03 2.167e+02 -13.981 < 2e-16 \*\*\*  
## modelyeti 4.113e+02 3.766e+02 1.092 0.274800   
## modelypsilon -1.817e+03 5.811e+02 -3.126 0.001770 \*\*   
## modelz\_reihe -1.116e+04 3.453e+02 -32.316 < 2e-16 \*\*\*  
## modelzafira -3.057e+03 1.975e+02 -15.478 < 2e-16 \*\*\*  
## kilometer -5.628e-02 2.048e-04 -274.764 < 2e-16 \*\*\*  
## fuelTypebenzin 6.709e+02 5.825e+02 1.152 0.249376   
## fuelTypecng 9.377e+02 6.023e+02 1.557 0.119546   
## fuelTypediesel 1.954e+03 5.825e+02 3.354 0.000796 \*\*\*  
## fuelTypeelektro -1.678e+03 8.359e+02 -2.008 0.044692 \*   
## fuelTypehybrid 2.354e+03 6.428e+02 3.662 0.000250 \*\*\*  
## fuelTypelpg -2.403e+00 5.847e+02 -0.004 0.996721   
## brandaudi 5.103e+03 1.802e+02 28.312 < 2e-16 \*\*\*  
## brandbmw 1.528e+04 3.328e+02 45.902 < 2e-16 \*\*\*  
## brandchevrolet 1.123e+03 1.956e+02 5.739 9.53e-09 \*\*\*  
## brandchrysler -7.500e+02 2.360e+02 -3.178 0.001482 \*\*   
## brandcitroen 1.867e+03 1.814e+02 10.292 < 2e-16 \*\*\*  
## branddacia -1.557e+03 1.179e+03 -1.321 0.186519   
## branddaewoo 1.937e+03 3.409e+02 5.681 1.34e-08 \*\*\*  
## branddaihatsu 2.106e+03 3.970e+02 5.305 1.13e-07 \*\*\*  
## brandfiat 1.593e+03 1.794e+02 8.879 < 2e-16 \*\*\*  
## brandford 2.092e+03 1.870e+02 11.187 < 2e-16 \*\*\*  
## brandhonda 1.766e+03 2.681e+02 6.586 4.53e-11 \*\*\*  
## brandhyundai 9.062e+00 1.899e+02 0.048 0.961938   
## brandjaguar 1.186e+04 3.881e+02 30.556 < 2e-16 \*\*\*  
## brandjeep 1.245e+03 2.810e+02 4.431 9.40e-06 \*\*\*  
## brandkia -6.361e+01 2.272e+02 -0.280 0.779511   
## brandlada 3.622e+03 1.178e+03 3.073 0.002117 \*\*   
## brandlancia 2.863e+03 5.196e+02 5.510 3.59e-08 \*\*\*  
## brandland\_rover 1.725e+04 3.162e+03 5.456 4.88e-08 \*\*\*  
## brandmazda 1.111e+03 1.847e+02 6.015 1.80e-09 \*\*\*  
## brandmercedes\_benz 6.441e+03 1.687e+02 38.188 < 2e-16 \*\*\*  
## brandmini 6.881e+03 5.318e+02 12.939 < 2e-16 \*\*\*  
## brandmitsubishi 1.242e+03 2.067e+02 6.010 1.86e-09 \*\*\*  
## brandnissan 1.723e+03 2.073e+02 8.308 < 2e-16 \*\*\*  
## brandopel 3.282e+03 1.912e+02 17.170 < 2e-16 \*\*\*  
## brandpeugeot 7.091e+02 1.834e+02 3.865 0.000111 \*\*\*  
## brandporsche 2.332e+04 4.145e+02 56.249 < 2e-16 \*\*\*  
## brandrenault 1.967e+03 1.978e+02 9.942 < 2e-16 \*\*\*  
## brandrover 1.050e+03 2.587e+02 4.060 4.91e-05 \*\*\*  
## brandsaab -2.278e+02 2.400e+02 -0.949 0.342389   
## brandseat 3.283e+03 5.392e+02 6.089 1.14e-09 \*\*\*  
## brandskoda 2.165e+03 3.008e+02 7.197 6.16e-13 \*\*\*  
## brandsmart 1.419e+03 8.715e+02 1.628 0.103573   
## brandsubaru 2.135e+03 6.259e+02 3.412 0.000646 \*\*\*  
## brandsuzuki 1.325e+03 1.925e+02 6.880 6.01e-12 \*\*\*  
## brandtoyota 3.203e+03 2.002e+02 15.997 < 2e-16 \*\*\*  
## brandtrabant 1.366e+04 9.912e+02 13.781 < 2e-16 \*\*\*  
## brandvolkswagen 5.236e+03 2.169e+02 24.141 < 2e-16 \*\*\*  
## brandvolvo 2.916e+03 2.217e+02 13.152 < 2e-16 \*\*\*  
## notRepairedDamageNo 1.234e+03 2.144e+01 57.530 < 2e-16 \*\*\*  
## duration 3.582e+01 7.362e-01 48.647 < 2e-16 \*\*\*  
## age\_of\_car -3.788e+02 1.549e+00 -244.494 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 3089 on 240687 degrees of freedom  
## Multiple R-squared: 0.7972, Adjusted R-squared: 0.7969   
## F-statistic: 3153 on 300 and 240687 DF, p-value: < 2.2e-16

### residual vs fitted  
resid\_4=model\_4$residuals  
fit\_4=model\_4$fitted.values  
par(mfrow =c(2,2))  
plot(fit\_4,resid\_4,xlab="fits",ylab="Residals")  
abline(0,0,col="red")  
  
  
### qqnorm  
qqnorm(resid\_4)  
qqline(resid\_4,col="blue")  
hist(resid\_4, xlab="Residuals", main= "Histogram of Residuals")

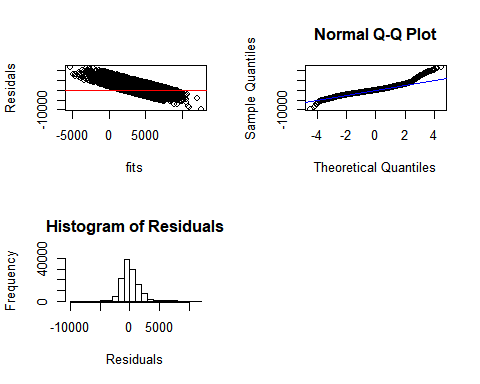
 This is a good model with r square of 79% and constant variance and normality is better than before - exploring further.

### test   
  
Cars\_sub\_price=Cars\_rem\_outliers[Cars\_rem\_outliers$price<8900 & Cars\_rem\_outliers$price>1699,]  
### since even box cox is not helping we subset out data by price and run the model again  
car\_sub\_1=Cars\_sub\_price[,c(4,5,6,7,8,9,11,12,13,14,15)]  
model\_5=lm(price~.,data=car\_sub\_1)  
summary(model\_5)

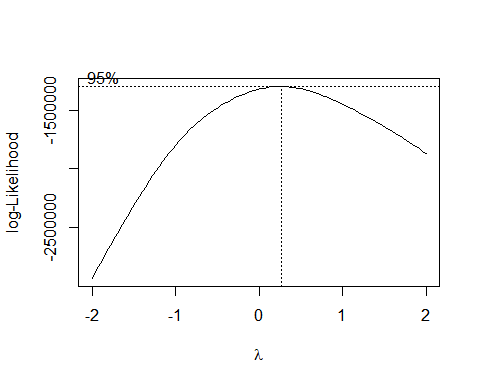
##   
## Call:  
## lm(formula = price ~ ., data = car\_sub\_1)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -9541.4 -896.8 -144.9 769.4 11751.1   
##   
## Coefficients: (2 not defined because of singularities)  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 5.750e+03 4.104e+02 14.011 < 2e-16 \*\*\*  
## vehicleTypebus 2.213e+02 5.285e+01 4.187 2.83e-05 \*\*\*  
## vehicleTypecabrio 1.250e+03 5.539e+01 22.572 < 2e-16 \*\*\*  
## vehicleTypecoupe 5.098e+02 5.644e+01 9.032 < 2e-16 \*\*\*  
## vehicleTypekleinwagen 9.900e+01 5.454e+01 1.815 0.069531 .   
## vehicleTypekombi 1.353e+02 5.308e+01 2.549 0.010791 \*   
## vehicleTypelimousine 2.438e+02 5.288e+01 4.611 4.01e-06 \*\*\*  
## vehicleTypesuv 8.099e+02 6.731e+01 12.032 < 2e-16 \*\*\*  
## gearboxmanuell -1.051e+02 1.219e+01 -8.622 < 2e-16 \*\*\*  
## powerPS 1.517e+01 1.515e-01 100.173 < 2e-16 \*\*\*  
## model100 1.545e+03 1.787e+02 8.646 < 2e-16 \*\*\*  
## model147 -7.748e+02 1.580e+02 -4.905 9.35e-07 \*\*\*  
## model156 -8.922e+02 1.730e+02 -5.157 2.52e-07 \*\*\*  
## model159 9.416e+02 1.795e+02 5.246 1.56e-07 \*\*\*  
## model1er -5.877e+03 4.280e+02 -13.733 < 2e-16 \*\*\*  
## model2\_reihe 2.278e+02 8.112e+01 2.809 0.004974 \*\*   
## model200 2.128e+03 6.962e+02 3.057 0.002238 \*\*   
## model3\_reihe 5.830e+02 8.774e+01 6.644 3.06e-11 \*\*\*  
## model300c 3.165e+03 2.819e+02 11.228 < 2e-16 \*\*\*  
## model3er -7.243e+03 4.263e+02 -16.992 < 2e-16 \*\*\*  
## model4\_reihe 6.569e+02 1.107e+02 5.932 3.00e-09 \*\*\*  
## model5\_reihe 1.633e+03 1.372e+02 11.902 < 2e-16 \*\*\*  
## model500 1.766e+03 1.259e+02 14.021 < 2e-16 \*\*\*  
## model5er -7.385e+03 4.268e+02 -17.303 < 2e-16 \*\*\*  
## model6\_reihe 5.696e+02 1.175e+02 4.848 1.25e-06 \*\*\*  
## model601 -2.920e+03 6.441e+02 -4.533 5.81e-06 \*\*\*  
## model6er -1.470e+03 6.713e+02 -2.190 0.028516 \*   
## model7er -7.398e+03 4.315e+02 -17.143 < 2e-16 \*\*\*  
## model80 9.862e+02 1.428e+02 6.906 5.02e-12 \*\*\*  
## model850 7.849e+01 2.586e+02 0.303 0.761529   
## model90 1.982e+03 3.146e+02 6.300 2.99e-10 \*\*\*  
## model900 2.342e+03 3.378e+02 6.932 4.17e-12 \*\*\*  
## model9000 1.744e+03 4.373e+02 3.989 6.63e-05 \*\*\*  
## modela\_klasse -1.834e+03 1.089e+02 -16.839 < 2e-16 \*\*\*  
## modela1 5.746e+02 4.719e+02 1.218 0.223353   
## modela2 7.577e+02 1.418e+02 5.345 9.04e-08 \*\*\*  
## modela3 4.765e+02 1.180e+02 4.036 5.43e-05 \*\*\*  
## modela4 1.935e+02 1.168e+02 1.656 0.097694 .   
## modela5 1.912e+03 6.965e+02 2.745 0.006057 \*\*   
## modela6 -3.273e+02 1.184e+02 -2.765 0.005696 \*\*   
## modela8 -7.849e+02 1.545e+02 -5.081 3.77e-07 \*\*\*  
## modelaccord 8.967e+02 2.034e+02 4.408 1.04e-05 \*\*\*  
## modelagila -1.781e+03 1.780e+02 -10.006 < 2e-16 \*\*\*  
## modelalhambra 1.184e+03 5.375e+02 2.202 0.027672 \*   
## modelalmera -6.427e+02 1.729e+02 -3.717 0.000201 \*\*\*  
## modelaltea 1.333e+03 5.364e+02 2.484 0.012983 \*   
## modelandere 6.905e+02 9.594e+01 7.198 6.17e-13 \*\*\*  
## modelantara 6.264e+02 3.086e+02 2.030 0.042401 \*   
## modelarosa 2.260e+02 5.433e+02 0.416 0.677437   
## modelastra -1.193e+03 1.289e+02 -9.252 < 2e-16 \*\*\*  
## modelauris 3.191e+02 1.801e+02 1.772 0.076361 .   
## modelavensis -2.889e+02 1.468e+02 -1.968 0.049028 \*   
## modelaveo -1.135e+02 1.990e+02 -0.570 0.568482   
## modelaygo -1.469e+03 1.462e+02 -10.050 < 2e-16 \*\*\*  
## modelb\_klasse 1.826e+02 1.293e+02 1.412 0.157940   
## modelb\_max 8.306e+02 9.787e+02 0.849 0.396044   
## modelbeetle -1.200e+03 1.445e+02 -8.306 < 2e-16 \*\*\*  
## modelberlingo 2.006e+02 1.399e+02 1.433 0.151843   
## modelbora -2.258e+03 1.433e+02 -15.754 < 2e-16 \*\*\*  
## modelboxster 4.454e+03 5.361e+02 8.309 < 2e-16 \*\*\*  
## modelbravo 5.007e+02 1.675e+02 2.989 0.002803 \*\*   
## modelc\_klasse -1.627e+03 1.065e+02 -15.280 < 2e-16 \*\*\*  
## modelc\_max 1.239e+02 1.399e+02 0.885 0.376011   
## modelc\_reihe 2.918e+02 1.948e+02 1.498 0.134098   
## modelc1 -7.264e+02 1.412e+02 -5.143 2.71e-07 \*\*\*  
## modelc2 -5.972e+02 1.460e+02 -4.091 4.29e-05 \*\*\*  
## modelc3 -1.195e+02 1.390e+02 -0.859 0.390112   
## modelc4 2.818e+02 1.450e+02 1.944 0.051885 .   
## modelc5 -1.441e+02 1.519e+02 -0.948 0.342983   
## modelcaddy -9.242e+02 1.405e+02 -6.576 4.84e-11 \*\*\*  
## modelcalibra -3.701e+02 2.393e+02 -1.546 0.122041   
## modelcaptiva 1.845e+03 2.281e+02 8.088 6.13e-16 \*\*\*  
## modelcarisma -7.153e+02 2.550e+02 -2.805 0.005026 \*\*   
## modelcarnival -8.582e+00 2.018e+02 -0.043 0.966075   
## modelceed 1.693e+03 1.828e+02 9.260 < 2e-16 \*\*\*  
## modelcharade 2.096e+03 1.397e+03 1.500 0.133551   
## modelcherokee 1.392e+03 2.395e+02 5.812 6.20e-09 \*\*\*  
## modelcitigo -7.893e+01 3.541e+02 -0.223 0.823621   
## modelcivic 1.008e+03 1.792e+02 5.625 1.86e-08 \*\*\*  
## modelcl -1.294e+03 2.016e+02 -6.417 1.40e-10 \*\*\*  
## modelclio -5.472e+02 1.230e+02 -4.448 8.67e-06 \*\*\*  
## modelclk -1.563e+03 1.148e+02 -13.620 < 2e-16 \*\*\*  
## modelclubman -2.527e+02 3.958e+02 -0.639 0.523144   
## modelcolt -2.593e+02 1.511e+02 -1.717 0.086016 .   
## modelcombo -1.663e+03 1.615e+02 -10.299 < 2e-16 \*\*\*  
## modelcooper -8.551e+02 3.505e+02 -2.440 0.014695 \*   
## modelcordoba 1.231e+02 5.863e+02 0.210 0.833754   
## modelcorolla -6.818e+02 1.457e+02 -4.678 2.90e-06 \*\*\*  
## modelcorsa -1.236e+03 1.288e+02 -9.593 < 2e-16 \*\*\*  
## modelcr\_reihe 1.611e+03 2.034e+02 7.920 2.39e-15 \*\*\*  
## modelcroma 5.485e+02 3.606e+02 1.521 0.128270   
## modelcrossfire 3.409e+03 3.723e+02 9.157 < 2e-16 \*\*\*  
## modelcuore -8.210e+02 3.236e+02 -2.537 0.011167 \*   
## modelcx\_reihe 5.993e+03 9.763e+02 6.139 8.34e-10 \*\*\*  
## modeldelta 5.615e+03 1.031e+03 5.446 5.15e-08 \*\*\*  
## modeldiscovery 3.468e+03 9.810e+02 3.535 0.000408 \*\*\*  
## modeldoblo 3.858e+02 1.539e+02 2.507 0.012166 \*   
## modelducato 9.926e+02 1.545e+02 6.425 1.33e-10 \*\*\*  
## modelduster 1.085e+03 5.998e+02 1.810 0.070369 .   
## modele\_klasse -1.093e+03 1.073e+02 -10.188 < 2e-16 \*\*\*  
## modeleos -4.486e+02 1.770e+02 -2.534 0.011264 \*   
## modelescort 6.473e+02 1.999e+02 3.238 0.001202 \*\*   
## modelespace -7.326e+02 1.551e+02 -4.723 2.33e-06 \*\*\*  
## modelexeo 2.822e+03 6.040e+02 4.672 2.98e-06 \*\*\*  
## modelfabia 4.394e+01 3.166e+02 0.139 0.889613   
## modelfiesta -2.395e+02 1.223e+02 -1.958 0.050231 .   
## modelfocus -2.740e+02 1.224e+02 -2.239 0.025156 \*   
## modelforester 3.123e+02 4.196e+02 0.744 0.456677   
## modelforfour 1.050e+03 6.277e+02 1.672 0.094536 .   
## modelfortwo 8.693e+02 6.221e+02 1.397 0.162339   
## modelfox -2.964e+03 1.429e+02 -20.739 < 2e-16 \*\*\*  
## modelfreelander 5.048e+02 1.976e+02 2.554 0.010635 \*   
## modelfusion -6.615e+02 1.524e+02 -4.340 1.43e-05 \*\*\*  
## modelgalant 1.715e+02 2.773e+02 0.618 0.536262   
## modelgalaxy -1.000e+02 1.387e+02 -0.721 0.470756   
## modelgetz 3.654e+02 1.528e+02 2.392 0.016761 \*   
## modelgolf -1.185e+03 1.295e+02 -9.145 < 2e-16 \*\*\*  
## modelgrand 1.363e+03 1.520e+02 8.967 < 2e-16 \*\*\*  
## modeli\_reihe 1.560e+03 1.294e+02 12.054 < 2e-16 \*\*\*  
## modelibiza 9.153e+02 5.294e+02 1.729 0.083845 .   
## modelimpreza 2.456e+02 4.202e+02 0.585 0.558832   
## modelinsignia 3.845e+02 1.919e+02 2.003 0.045143 \*   
## modeljazz 6.411e+02 1.912e+02 3.353 0.000800 \*\*\*  
## modeljetta -1.008e+02 1.784e+02 -0.565 0.571890   
## modeljimny 1.756e+03 1.773e+02 9.903 < 2e-16 \*\*\*  
## modeljuke 2.544e+03 8.031e+02 3.168 0.001535 \*\*   
## modeljusty -1.287e+03 5.116e+02 -2.516 0.011882 \*   
## modelka -1.448e+03 1.332e+02 -10.872 < 2e-16 \*\*\*  
## modelkadett 2.847e+03 2.273e+02 12.524 < 2e-16 \*\*\*  
## modelkaefer 6.539e+03 1.953e+02 33.482 < 2e-16 \*\*\*  
## modelkalina -4.509e+03 1.486e+03 -3.034 0.002411 \*\*   
## modelkalos -2.735e+02 5.239e+02 -0.522 0.601616   
## modelkangoo -2.262e+02 1.399e+02 -1.616 0.106033   
## modelkappa 1.184e+03 1.031e+03 1.148 0.250887   
## modelkuga 1.124e+03 2.755e+02 4.079 4.53e-05 \*\*\*  
## modellaguna -6.978e+02 1.374e+02 -5.077 3.83e-07 \*\*\*  
## modellancer 1.060e+03 2.074e+02 5.111 3.21e-07 \*\*\*  
## modellegacy -3.758e+02 4.431e+02 -0.848 0.396369   
## modelleon 1.146e+03 5.309e+02 2.158 0.030902 \*   
## modellodgy 8.921e+02 8.372e+02 1.065 0.286654   
## modellogan -8.563e+02 5.776e+02 -1.483 0.138177   
## modellupo -2.159e+03 1.408e+02 -15.339 < 2e-16 \*\*\*  
## modellybra -1.870e+03 1.416e+03 -1.320 0.186692   
## modelm\_klasse -1.610e+03 1.350e+02 -11.923 < 2e-16 \*\*\*  
## modelmateria 1.339e+03 7.333e+02 1.826 0.067845 .   
## modelmatiz -1.386e+03 1.652e+02 -8.388 < 2e-16 \*\*\*  
## modelmegane -6.273e+02 1.242e+02 -5.049 4.44e-07 \*\*\*  
## modelmeriva -1.386e+03 1.403e+02 -9.878 < 2e-16 \*\*\*  
## modelmicra -3.369e+02 1.445e+02 -2.332 0.019695 \*   
## modelmii 7.971e+02 5.565e+02 1.432 0.152055   
## modelmodus -7.971e+02 1.504e+02 -5.299 1.17e-07 \*\*\*  
## modelmondeo -6.440e+02 1.265e+02 -5.092 3.54e-07 \*\*\*  
## modelmusa -5.270e+02 5.965e+02 -0.884 0.376909   
## modelmustang 6.839e+03 5.331e+02 12.828 < 2e-16 \*\*\*  
## modelmx\_reihe 1.143e+03 1.174e+02 9.735 < 2e-16 \*\*\*  
## modelnavara 2.417e+03 3.496e+02 6.912 4.79e-12 \*\*\*  
## modelniva -3.333e+03 5.973e+02 -5.581 2.40e-08 \*\*\*  
## modelnote 4.173e+02 2.013e+02 2.073 0.038201 \*   
## modelnubira -1.570e+02 1.429e+03 -0.110 0.912497   
## modeloctavia 8.994e+02 3.179e+02 2.829 0.004670 \*\*   
## modelomega -2.158e+03 1.579e+02 -13.668 < 2e-16 \*\*\*  
## modelone -9.630e+02 3.521e+02 -2.735 0.006239 \*\*   
## modeloutlander 1.508e+03 2.843e+02 5.306 1.13e-07 \*\*\*  
## modelpajero 1.470e+03 1.865e+02 7.880 3.29e-15 \*\*\*  
## modelpanda -4.017e+02 1.273e+02 -3.155 0.001607 \*\*   
## modelpassat -1.510e+03 1.311e+02 -11.516 < 2e-16 \*\*\*  
## modelphaeton -1.434e+03 2.612e+02 -5.489 4.04e-08 \*\*\*  
## modelpicanto 3.805e+02 1.651e+02 2.304 0.021210 \*   
## modelpolo -1.530e+03 1.303e+02 -11.741 < 2e-16 \*\*\*  
## modelprimera -5.702e+02 1.722e+02 -3.312 0.000926 \*\*\*  
## modelptcruiser 5.843e+02 1.818e+02 3.214 0.001311 \*\*   
## modelpunto 1.694e+02 1.199e+02 1.413 0.157787   
## modelqashqai 3.023e+03 2.272e+02 13.304 < 2e-16 \*\*\*  
## modelr19 3.093e+02 4.993e+02 0.619 0.535617   
## modelrange\_rover 4.133e+03 9.812e+02 4.212 2.53e-05 \*\*\*  
## modelrav 3.132e+02 1.649e+02 1.900 0.057492 .   
## modelrio 1.033e+03 1.885e+02 5.480 4.25e-08 \*\*\*  
## modelroadster 1.800e+03 6.337e+02 2.841 0.004505 \*\*   
## modelroomster 9.980e+02 3.320e+02 3.006 0.002649 \*\*   
## modelrx\_reihe -3.840e+01 1.813e+02 -0.212 0.832207   
## models\_klasse -9.482e+02 1.287e+02 -7.366 1.77e-13 \*\*\*  
## models\_max 1.943e+03 1.667e+02 11.655 < 2e-16 \*\*\*  
## models\_type -6.881e+03 8.198e+02 -8.394 < 2e-16 \*\*\*  
## models60 -5.180e+02 1.991e+02 -2.601 0.009285 \*\*   
## modelsandero -6.776e+02 5.765e+02 -1.175 0.239889   
## modelsanta 1.468e+03 1.617e+02 9.077 < 2e-16 \*\*\*  
## modelscenic -6.657e+02 1.334e+02 -4.991 6.01e-07 \*\*\*  
## modelscirocco 7.812e+02 1.967e+02 3.971 7.15e-05 \*\*\*  
## modelseicento -1.191e+03 2.900e+02 -4.108 3.99e-05 \*\*\*  
## modelsharan -1.396e+03 1.417e+02 -9.847 < 2e-16 \*\*\*  
## modelsignum -1.490e+03 1.488e+02 -10.010 < 2e-16 \*\*\*  
## modelsirion -3.461e+02 3.143e+02 -1.101 0.270830   
## modelsl 3.025e+03 3.322e+02 9.107 < 2e-16 \*\*\*  
## modelslk -1.272e+03 1.214e+02 -10.479 < 2e-16 \*\*\*  
## modelsorento 1.749e+03 1.781e+02 9.818 < 2e-16 \*\*\*  
## modelspark -6.810e+02 1.803e+02 -3.777 0.000159 \*\*\*  
## modelspider 1.484e+03 2.599e+02 5.708 1.15e-08 \*\*\*  
## modelsportage 1.918e+03 2.269e+02 8.455 < 2e-16 \*\*\*  
## modelsprinter -7.537e+02 1.315e+02 -5.732 9.95e-09 \*\*\*  
## modelstilo -5.485e+02 1.488e+02 -3.686 0.000228 \*\*\*  
## modelsuperb 4.592e+02 3.397e+02 1.352 0.176424   
## modelswift 8.566e+02 1.394e+02 6.146 7.99e-10 \*\*\*  
## modelterios 1.676e+03 4.877e+02 3.437 0.000589 \*\*\*  
## modeltigra -2.115e+03 1.478e+02 -14.311 < 2e-16 \*\*\*  
## modeltiguan -7.379e+02 2.888e+02 -2.555 0.010632 \*   
## modeltoledo 1.442e+02 5.466e+02 0.264 0.791877   
## modeltouareg -7.097e+02 1.945e+02 -3.649 0.000263 \*\*\*  
## modeltouran -9.468e+02 1.354e+02 -6.991 2.74e-12 \*\*\*  
## modeltransit 5.311e+01 1.428e+02 0.372 0.709865   
## modeltransporter 4.963e+02 1.347e+02 3.686 0.000228 \*\*\*  
## modeltt 7.178e+02 1.326e+02 5.411 6.26e-08 \*\*\*  
## modeltucson 2.154e+03 1.623e+02 13.272 < 2e-16 \*\*\*  
## modeltwingo -9.932e+02 1.252e+02 -7.932 2.17e-15 \*\*\*  
## modelup -1.627e+03 1.622e+02 -10.030 < 2e-16 \*\*\*  
## modelv\_klasse -2.842e+02 2.404e+02 -1.182 0.237107   
## modelv40 -1.165e+03 1.808e+02 -6.442 1.18e-10 \*\*\*  
## modelv50 3.071e+02 1.703e+02 1.804 0.071309 .   
## modelv70 -2.988e+02 1.569e+02 -1.904 0.056891 .   
## modelvectra -1.683e+03 1.340e+02 -12.555 < 2e-16 \*\*\*  
## modelverso 2.254e+02 1.613e+02 1.397 0.162345   
## modelviano 1.493e+03 3.413e+02 4.375 1.22e-05 \*\*\*  
## modelvito -1.106e+03 1.268e+02 -8.722 < 2e-16 \*\*\*  
## modelvivaro 3.865e+01 1.658e+02 0.233 0.815685   
## modelvoyager 1.192e+03 2.025e+02 5.888 3.93e-09 \*\*\*  
## modelwrangler 4.962e+03 3.267e+02 15.191 < 2e-16 \*\*\*  
## modelx\_reihe -6.229e+03 4.338e+02 -14.357 < 2e-16 \*\*\*  
## modelx\_trail 7.995e+02 1.787e+02 4.474 7.67e-06 \*\*\*  
## modelx\_type -5.869e+03 8.137e+02 -7.214 5.48e-13 \*\*\*  
## modelxc\_reihe 9.812e+02 2.713e+02 3.617 0.000299 \*\*\*  
## modelyaris -6.444e+02 1.363e+02 -4.729 2.26e-06 \*\*\*  
## modelyeti 9.461e+02 8.540e+02 1.108 0.267961   
## modelypsilon -1.874e+02 4.386e+02 -0.427 0.669212   
## modelz\_reihe -5.765e+03 4.357e+02 -13.232 < 2e-16 \*\*\*  
## modelzafira -1.039e+03 1.344e+02 -7.731 1.08e-14 \*\*\*  
## kilometer -2.142e-02 1.467e-04 -146.014 < 2e-16 \*\*\*  
## fuelTypebenzin 1.074e+02 3.834e+02 0.280 0.779375   
## fuelTypecng 2.851e+02 3.917e+02 0.728 0.466730   
## fuelTypediesel 5.375e+02 3.834e+02 1.402 0.160879   
## fuelTypeelektro -6.718e+02 5.105e+02 -1.316 0.188178   
## fuelTypehybrid 8.143e+02 4.426e+02 1.840 0.065786 .   
## fuelTypelpg 1.195e+02 3.844e+02 0.311 0.755780   
## brandaudi 9.638e+02 1.106e+02 8.717 < 2e-16 \*\*\*  
## brandbmw 8.239e+03 4.253e+02 19.374 < 2e-16 \*\*\*  
## brandchevrolet -3.208e+02 1.157e+02 -2.773 0.005559 \*\*   
## brandchrysler -1.309e+03 1.394e+02 -9.390 < 2e-16 \*\*\*  
## brandcitroen -6.064e+01 1.139e+02 -0.532 0.594497   
## branddacia 1.128e+02 5.682e+02 0.198 0.842705   
## branddaewoo -1.057e+03 3.951e+02 -2.676 0.007451 \*\*   
## branddaihatsu -3.578e+02 2.561e+02 -1.397 0.162416   
## brandfiat -4.804e+02 1.043e+02 -4.606 4.10e-06 \*\*\*  
## brandford 4.353e+02 1.149e+02 3.788 0.000152 \*\*\*  
## brandhonda -1.866e+02 1.628e+02 -1.146 0.251864   
## brandhyundai -1.471e+03 1.142e+02 -12.883 < 2e-16 \*\*\*  
## brandjaguar 6.179e+03 7.983e+02 7.741 9.98e-15 \*\*\*  
## brandjeep -4.156e+02 1.754e+02 -2.370 0.017803 \*   
## brandkia -1.116e+03 1.390e+02 -8.034 9.52e-16 \*\*\*  
## brandlada 1.597e+03 5.681e+02 2.810 0.004948 \*\*   
## brandlancia 5.851e+01 3.456e+02 0.169 0.865582   
## brandland\_rover NA NA NA NA   
## brandmazda -5.661e+02 1.090e+02 -5.193 2.07e-07 \*\*\*  
## brandmercedes\_benz 2.297e+03 1.000e+02 22.963 < 2e-16 \*\*\*  
## brandmini 2.849e+03 3.455e+02 8.247 < 2e-16 \*\*\*  
## brandmitsubishi -3.736e+02 1.308e+02 -2.857 0.004284 \*\*   
## brandnissan -7.497e+01 1.263e+02 -0.593 0.552945   
## brandopel 1.377e+03 1.238e+02 11.119 < 2e-16 \*\*\*  
## brandpeugeot -7.493e+02 1.077e+02 -6.960 3.43e-12 \*\*\*  
## brandporsche NA NA NA NA   
## brandrenault 2.165e+02 1.136e+02 1.905 0.056729 .   
## brandrover -8.754e+02 2.033e+02 -4.306 1.66e-05 \*\*\*  
## brandsaab -7.479e+02 1.371e+02 -5.455 4.91e-08 \*\*\*  
## brandseat -3.612e+02 5.277e+02 -0.684 0.493729   
## brandskoda 2.763e+02 3.136e+02 0.881 0.378159   
## brandsmart -1.255e+03 6.211e+02 -2.020 0.043371 \*   
## brandsubaru 8.417e+02 3.782e+02 2.226 0.026027 \*   
## brandsuzuki -4.969e+02 1.146e+02 -4.337 1.45e-05 \*\*\*  
## brandtoyota 9.955e+02 1.213e+02 8.206 2.30e-16 \*\*\*  
## brandtrabant 6.626e+03 6.221e+02 10.651 < 2e-16 \*\*\*  
## brandvolkswagen 2.367e+03 1.262e+02 18.750 < 2e-16 \*\*\*  
## brandvolvo 8.748e+02 1.325e+02 6.603 4.04e-11 \*\*\*  
## notRepairedDamageNo 9.810e+02 1.596e+01 61.458 < 2e-16 \*\*\*  
## duration 2.216e+01 4.676e-01 47.390 < 2e-16 \*\*\*  
## age\_of\_car -2.129e+02 1.078e+00 -197.472 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 1373 on 120983 degrees of freedom  
## Multiple R-squared: 0.5333, Adjusted R-squared: 0.5322   
## F-statistic: 495.5 on 279 and 120983 DF, p-value: < 2.2e-16

### residual vs fitted  
resid\_5=model\_5$residuals  
fit\_5=model\_5$fitted.values  
par(mfrow =c(2,2))  
plot(fit\_5,resid\_5,xlab="fits",ylab="Residals")  
abline(0,0,col="red")  
  
  
### qqnorm  
qqnorm(resid\_5)  
qqline(resid\_5,col="blue")  
hist(resid\_5, xlab="Residuals", main= "Histogram of Residuals")  
#hist(log(car\_sub\_1$price))  
summary(car\_sub\_1)

## price vehicleType gearbox powerPS   
## Min. :1700 limousine :36017 automatik:23807 Min. : 1.0   
## 1st Qu.:2700 kleinwagen:26739 manuell :97456 1st Qu.: 88.0   
## Median :3999 kombi :25814 Median :116.0   
## Mean :4427 bus :13980 Mean :121.2   
## 3rd Qu.:5990 cabrio : 8895 3rd Qu.:149.0   
## Max. :8899 coupe : 5392 Max. :450.0   
## (Other) : 4426   
## model kilometer fuelType brand   
## golf : 9953 Min. : 5000 andere : 13 volkswagen :25848   
## 3er : 8293 1st Qu.:125000 benzin :75334 bmw :13807   
## andere : 8205 Median :150000 cng : 306 mercedes\_benz:12545   
## passat : 4234 Mean :129695 diesel :43134 opel :11881   
## polo : 3856 3rd Qu.:150000 elektro: 17 audi :10129   
## a4 : 3763 Max. :150000 hybrid : 41 ford : 7613   
## (Other):82959 lpg : 2418 (Other) :39440   
## notRepairedDamage duration age\_of\_car   
## Yes: 8043 Min. : 0.000 Min. : 0.00   
## No :113220 1st Qu.: 2.000 1st Qu.: 9.00   
## Median : 6.000 Median :12.00   
## Mean : 9.061 Mean :12.43   
## 3rd Qu.: 14.000 3rd Qu.:15.00   
## Max. :149.000 Max. :61.00   
##

 Subsetting the data further ruins our constant variance assumption. we stick to the previous model.

#### Using Box Cox Transformation to fix the non constant variance assumption  
library(MASS)  
# run the box-cox transformation  
bc <- boxcox(model\_4)



(lambda <- bc$x[which.max(bc$y)])

## [1] 0.2626263

lambda

## [1] 0.2626263

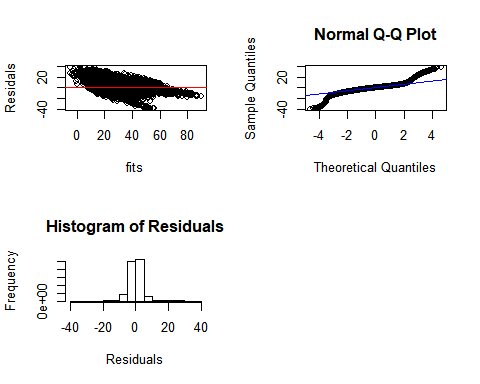
#[1] 0.1818182  
  
  
  
  
# re-run with transformation  
colnames(Cars)

## [1] "name" "seller" "offerType"   
## [4] "price" "vehicleType" "gearbox"   
## [7] "powerPS" "model" "kilometer"   
## [10] "monthOfRegistration" "fuelType" "brand"   
## [13] "notRepairedDamage" "duration" "age\_of\_car"

m\_new = lm((price^lambda-1)/lambda ~ .,data=car\_sub)  
summary(m\_new)

##   
## Call:  
## lm(formula = (price^lambda - 1)/lambda ~ ., data = car\_sub)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -39.879 -2.082 0.046 2.032 39.410   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 3.127e+01 7.844e-01 39.865 < 2e-16 \*\*\*  
## vehicleTypebus 3.413e-01 1.100e-01 3.101 0.001926 \*\*   
## vehicleTypecabrio 3.782e+00 1.126e-01 33.595 < 2e-16 \*\*\*  
## vehicleTypecoupe 1.665e+00 1.135e-01 14.668 < 2e-16 \*\*\*  
## vehicleTypekleinwagen 1.893e-01 1.107e-01 1.710 0.087264 .   
## vehicleTypekombi 1.303e-01 1.081e-01 1.205 0.228127   
## vehicleTypelimousine 5.774e-01 1.076e-01 5.368 7.97e-08 \*\*\*  
## vehicleTypesuv 2.386e+00 1.281e-01 18.623 < 2e-16 \*\*\*  
## gearboxmanuell -7.151e-01 2.353e-02 -30.385 < 2e-16 \*\*\*  
## powerPS 5.280e-02 2.421e-04 218.064 < 2e-16 \*\*\*  
## model100 9.138e-01 3.168e-01 2.884 0.003921 \*\*   
## model145 -2.481e+00 1.103e+00 -2.249 0.024524 \*   
## model147 -1.761e+00 3.260e-01 -5.404 6.54e-08 \*\*\*  
## model156 -3.699e+00 3.257e-01 -11.355 < 2e-16 \*\*\*  
## model159 1.660e+00 3.969e-01 4.183 2.88e-05 \*\*\*  
## model1er -7.479e+00 4.132e-01 -18.101 < 2e-16 \*\*\*  
## model2\_reihe 1.705e-01 1.472e-01 1.158 0.246768   
## model200 8.844e+00 1.591e+00 5.559 2.71e-08 \*\*\*  
## model3\_reihe 5.315e-01 1.597e-01 3.328 0.000875 \*\*\*  
## model300c 5.055e+00 4.749e-01 10.644 < 2e-16 \*\*\*  
## model3er -8.727e+00 4.088e-01 -21.349 < 2e-16 \*\*\*  
## model4\_reihe 5.712e-02 2.252e-01 0.254 0.799773   
## model5\_reihe 3.806e+00 2.619e-01 14.532 < 2e-16 \*\*\*  
## model500 1.291e+00 2.523e-01 5.116 3.12e-07 \*\*\*  
## model5er -8.727e+00 4.110e-01 -21.231 < 2e-16 \*\*\*  
## model6\_reihe 1.021e+00 2.179e-01 4.684 2.81e-06 \*\*\*  
## model601 -1.175e+01 1.285e+00 -9.146 < 2e-16 \*\*\*  
## model6er -3.186e+00 5.722e-01 -5.568 2.58e-08 \*\*\*  
## model7er -9.732e+00 4.326e-01 -22.498 < 2e-16 \*\*\*  
## model80 -1.357e-01 2.474e-01 -0.549 0.583210   
## model850 -2.500e+00 4.205e-01 -5.945 2.76e-09 \*\*\*  
## model90 3.508e+00 5.958e-01 5.887 3.94e-09 \*\*\*  
## model900 4.692e+00 6.442e-01 7.283 3.27e-13 \*\*\*  
## model9000 5.992e+00 1.110e+00 5.401 6.64e-08 \*\*\*  
## model911 8.234e+00 5.795e-01 14.209 < 2e-16 \*\*\*  
## modela\_klasse -6.909e+00 2.060e-01 -33.536 < 2e-16 \*\*\*  
## modela1 1.049e+00 2.660e-01 3.943 8.05e-05 \*\*\*  
## modela2 2.297e+00 3.120e-01 7.361 1.83e-13 \*\*\*  
## modela3 1.491e-01 2.167e-01 0.688 0.491231   
## modela4 -4.444e-01 2.140e-01 -2.076 0.037868 \*   
## modela5 2.979e+00 2.480e-01 12.011 < 2e-16 \*\*\*  
## modela6 -1.095e+00 2.170e-01 -5.046 4.51e-07 \*\*\*  
## modela8 -2.996e+00 2.867e-01 -10.450 < 2e-16 \*\*\*  
## modelaccord 1.565e+00 4.072e-01 3.843 0.000122 \*\*\*  
## modelagila -3.937e+00 3.198e-01 -12.309 < 2e-16 \*\*\*  
## modelalhambra 3.994e+00 7.078e-01 5.643 1.67e-08 \*\*\*  
## modelalmera -2.476e+00 3.167e-01 -7.818 5.39e-15 \*\*\*  
## modelaltea 3.505e+00 7.075e-01 4.954 7.28e-07 \*\*\*  
## modelamarok -1.953e-01 1.066e+00 -0.183 0.854634   
## modelandere 9.160e-01 1.776e-01 5.157 2.51e-07 \*\*\*  
## modelantara -1.984e+00 5.039e-01 -3.938 8.22e-05 \*\*\*  
## modelarosa 1.570e+00 6.891e-01 2.278 0.022738 \*   
## modelastra -3.025e+00 2.290e-01 -13.214 < 2e-16 \*\*\*  
## modelauris -1.152e+00 3.701e-01 -3.112 0.001857 \*\*   
## modelavensis -8.695e-01 2.988e-01 -2.909 0.003621 \*\*   
## modelaveo -2.521e+00 4.985e-01 -5.057 4.27e-07 \*\*\*  
## modelaygo -3.696e+00 3.178e-01 -11.630 < 2e-16 \*\*\*  
## modelb\_klasse -3.038e+00 2.467e-01 -12.315 < 2e-16 \*\*\*  
## modelb\_max 9.012e-01 9.386e-01 0.960 0.336986   
## modelbeetle -3.569e+00 2.967e-01 -12.031 < 2e-16 \*\*\*  
## modelberlingo 1.057e+00 2.702e-01 3.911 9.21e-05 \*\*\*  
## modelbora -5.156e+00 3.000e-01 -17.188 < 2e-16 \*\*\*  
## modelboxster -1.100e+01 5.652e-01 -19.456 < 2e-16 \*\*\*  
## modelbravo -6.659e-01 3.514e-01 -1.895 0.058131 .   
## modelc\_klasse -5.572e+00 1.993e-01 -27.953 < 2e-16 \*\*\*  
## modelc\_max 8.741e-01 2.814e-01 3.107 0.001892 \*\*   
## modelc\_reihe -7.688e-01 4.011e-01 -1.917 0.055271 .   
## modelc1 -5.580e-01 3.021e-01 -1.847 0.064706 .   
## modelc2 3.571e-01 3.099e-01 1.152 0.249235   
## modelc3 7.309e-01 2.874e-01 2.543 0.010989 \*   
## modelc4 1.268e+00 2.966e-01 4.277 1.90e-05 \*\*\*  
## modelc5 -4.475e-01 2.929e-01 -1.528 0.126495   
## modelcaddy -2.786e+00 2.833e-01 -9.831 < 2e-16 \*\*\*  
## modelcalibra -6.418e-01 4.606e-01 -1.393 0.163513   
## modelcaptiva 2.677e-01 4.021e-01 0.666 0.505528   
## modelcarisma -1.751e+00 3.490e-01 -5.016 5.27e-07 \*\*\*  
## modelcarnival -1.377e+00 4.055e-01 -3.395 0.000687 \*\*\*  
## modelcayenne -1.313e+01 6.207e-01 -21.158 < 2e-16 \*\*\*  
## modelcc -9.726e-01 4.187e-01 -2.323 0.020179 \*   
## modelceed 4.076e+00 3.779e-01 10.785 < 2e-16 \*\*\*  
## modelcharade 8.896e+00 3.893e+00 2.285 0.022323 \*   
## modelcherokee 1.174e+00 5.228e-01 2.246 0.024699 \*   
## modelcitigo -6.620e-01 5.641e-01 -1.174 0.240552   
## modelcivic 9.488e-01 3.501e-01 2.710 0.006731 \*\*   
## modelcl -5.286e+00 3.676e-01 -14.380 < 2e-16 \*\*\*  
## modelclio -2.096e+00 2.427e-01 -8.636 < 2e-16 \*\*\*  
## modelclk -6.289e+00 2.204e-01 -28.528 < 2e-16 \*\*\*  
## modelclubman -4.653e+00 7.231e-01 -6.435 1.23e-10 \*\*\*  
## modelcolt -4.655e-01 2.898e-01 -1.606 0.108184   
## modelcombo -3.439e+00 3.258e-01 -10.556 < 2e-16 \*\*\*  
## modelcooper -5.222e+00 6.660e-01 -7.841 4.49e-15 \*\*\*  
## modelcordoba 5.545e-01 7.150e-01 0.776 0.438039   
## modelcorolla -1.398e+00 2.943e-01 -4.748 2.05e-06 \*\*\*  
## modelcorsa -3.162e+00 2.263e-01 -13.973 < 2e-16 \*\*\*  
## modelcr\_reihe 3.645e+00 4.079e-01 8.936 < 2e-16 \*\*\*  
## modelcroma -6.034e-01 9.108e-01 -0.662 0.507667   
## modelcrossfire 4.887e+00 6.478e-01 7.543 4.59e-14 \*\*\*  
## modelcuore -1.669e+00 5.566e-01 -2.999 0.002713 \*\*   
## modelcx\_reihe 4.999e+00 4.825e-01 10.362 < 2e-16 \*\*\*  
## modeldefender -1.941e-01 3.875e+00 -0.050 0.960053   
## modeldelta 1.670e+01 2.321e+00 7.196 6.21e-13 \*\*\*  
## modeldiscovery -8.665e+00 4.010e+00 -2.161 0.030710 \*   
## modeldoblo -9.682e-03 3.369e-01 -0.029 0.977072   
## modelducato 1.510e+00 3.301e-01 4.574 4.78e-06 \*\*\*  
## modelduster 9.629e-01 1.503e+00 0.641 0.521783   
## modele\_klasse -4.742e+00 2.006e-01 -23.638 < 2e-16 \*\*\*  
## modelelefantino -5.969e+00 3.916e+00 -1.524 0.127421   
## modeleos -4.773e+00 3.149e-01 -15.158 < 2e-16 \*\*\*  
## modelescort -2.563e+00 2.824e-01 -9.075 < 2e-16 \*\*\*  
## modelespace -3.555e+00 3.107e-01 -11.443 < 2e-16 \*\*\*  
## modelexeo 4.465e+00 7.879e-01 5.666 1.46e-08 \*\*\*  
## modelfabia 2.755e+00 3.783e-01 7.282 3.31e-13 \*\*\*  
## modelfiesta -1.394e+00 2.261e-01 -6.167 6.96e-10 \*\*\*  
## modelfocus -1.356e+00 2.266e-01 -5.985 2.16e-09 \*\*\*  
## modelforester 2.929e-01 8.733e-01 0.335 0.737316   
## modelforfour 2.166e+00 1.111e+00 1.950 0.051220 .   
## modelfortwo 5.993e-01 1.088e+00 0.551 0.581878   
## modelfox -6.863e+00 3.058e-01 -22.443 < 2e-16 \*\*\*  
## modelfreelander -1.337e+01 3.964e+00 -3.372 0.000746 \*\*\*  
## modelfusion -6.508e-01 3.360e-01 -1.937 0.052769 .   
## modelg\_klasse 1.319e+01 7.036e-01 18.747 < 2e-16 \*\*\*  
## modelgalant -2.284e+00 4.046e-01 -5.645 1.66e-08 \*\*\*  
## modelgalaxy 2.116e-01 2.673e-01 0.791 0.428679   
## modelgetz 1.400e+00 3.158e-01 4.434 9.27e-06 \*\*\*  
## modelgl 2.391e+00 1.053e+00 2.269 0.023246 \*   
## modelglk -1.249e+00 3.632e-01 -3.438 0.000586 \*\*\*  
## modelgolf -3.699e+00 2.581e-01 -14.331 < 2e-16 \*\*\*  
## modelgrand 2.090e+00 2.979e-01 7.015 2.31e-12 \*\*\*  
## modeli\_reihe 3.235e+00 2.509e-01 12.894 < 2e-16 \*\*\*  
## modelibiza 1.989e+00 6.735e-01 2.954 0.003137 \*\*   
## modelimpreza -5.448e-01 8.389e-01 -0.649 0.516120   
## modelinsignia 3.878e-01 2.789e-01 1.390 0.164424   
## modeljazz 1.311e+00 4.078e-01 3.214 0.001308 \*\*   
## modeljetta -1.500e+00 3.675e-01 -4.081 4.48e-05 \*\*\*  
## modeljimny 3.222e+00 3.792e-01 8.498 < 2e-16 \*\*\*  
## modeljuke 4.172e-01 4.984e-01 0.837 0.402515   
## modeljusty -4.629e+00 9.260e-01 -4.999 5.78e-07 \*\*\*  
## modelka -4.286e+00 2.385e-01 -17.974 < 2e-16 \*\*\*  
## modelkadett 7.100e+00 4.135e-01 17.172 < 2e-16 \*\*\*  
## modelkaefer 2.303e+01 4.272e-01 53.906 < 2e-16 \*\*\*  
## modelkalina -1.640e+01 3.102e+00 -5.288 1.24e-07 \*\*\*  
## modelkalos -1.645e+00 6.633e-01 -2.479 0.013161 \*   
## modelkangoo -1.413e+00 2.824e-01 -5.003 5.64e-07 \*\*\*  
## modelkappa -1.933e+00 1.843e+00 -1.049 0.294292   
## modelkuga 2.224e+00 3.093e-01 7.192 6.42e-13 \*\*\*  
## modellaguna -4.124e+00 2.644e-01 -15.595 < 2e-16 \*\*\*  
## modellancer 2.465e+00 4.130e-01 5.970 2.38e-09 \*\*\*  
## modellanos -2.154e+00 7.745e-01 -2.781 0.005420 \*\*   
## modellegacy -2.216e+00 8.662e-01 -2.558 0.010531 \*   
## modelleon 3.198e+00 6.786e-01 4.712 2.45e-06 \*\*\*  
## modellodgy 1.489e+00 1.696e+00 0.878 0.379852   
## modellogan -6.034e-01 1.492e+00 -0.404 0.685866   
## modellupo -5.376e+00 2.729e-01 -19.701 < 2e-16 \*\*\*  
## modellybra -8.254e+00 1.005e+00 -8.210 2.23e-16 \*\*\*  
## modelm\_klasse -5.000e+00 2.471e-01 -20.233 < 2e-16 \*\*\*  
## modelm\_reihe -6.916e+00 5.304e-01 -13.039 < 2e-16 \*\*\*  
## modelmateria 2.707e+00 1.992e+00 1.359 0.174191   
## modelmatiz -3.583e+00 3.398e-01 -10.542 < 2e-16 \*\*\*  
## modelmegane -3.097e+00 2.467e-01 -12.552 < 2e-16 \*\*\*  
## modelmeriva -2.415e+00 2.690e-01 -8.979 < 2e-16 \*\*\*  
## modelmicra -1.586e+00 2.713e-01 -5.845 5.09e-09 \*\*\*  
## modelmii 7.642e-02 8.102e-01 0.094 0.924850   
## modelmodus -2.017e+00 3.466e-01 -5.819 5.94e-09 \*\*\*  
## modelmondeo -2.924e+00 2.328e-01 -12.561 < 2e-16 \*\*\*  
## modelmove -1.046e+00 1.034e+00 -1.012 0.311732   
## modelmusa -1.779e+00 1.510e+00 -1.178 0.238698   
## modelmustang 1.193e+01 5.575e-01 21.398 < 2e-16 \*\*\*  
## modelmx\_reihe 2.980e+00 2.261e-01 13.183 < 2e-16 \*\*\*  
## modelnavara 3.608e+00 5.095e-01 7.083 1.41e-12 \*\*\*  
## modelniva -1.210e+01 1.538e+00 -7.867 3.65e-15 \*\*\*  
## modelnote 1.227e-01 4.646e-01 0.264 0.791704   
## modelnubira -2.694e+00 8.301e-01 -3.245 0.001174 \*\*   
## modeloctavia 4.673e+00 3.793e-01 12.320 < 2e-16 \*\*\*  
## modelomega -6.729e+00 2.615e-01 -25.734 < 2e-16 \*\*\*  
## modelone -4.835e+00 6.752e-01 -7.160 8.08e-13 \*\*\*  
## modeloutlander 4.395e+00 4.916e-01 8.940 < 2e-16 \*\*\*  
## modelpajero 4.365e+00 4.062e-01 10.748 < 2e-16 \*\*\*  
## modelpanda -8.835e-01 2.714e-01 -3.256 0.001131 \*\*   
## modelpassat -4.457e+00 2.618e-01 -17.027 < 2e-16 \*\*\*  
## modelphaeton -4.802e+00 4.273e-01 -11.238 < 2e-16 \*\*\*  
## modelpicanto 2.096e+00 3.517e-01 5.960 2.52e-09 \*\*\*  
## modelpolo -4.737e+00 2.592e-01 -18.271 < 2e-16 \*\*\*  
## modelprimera -2.878e+00 3.143e-01 -9.159 < 2e-16 \*\*\*  
## modelptcruiser 8.165e-01 3.905e-01 2.091 0.036523 \*   
## modelpunto -1.058e+00 2.239e-01 -4.727 2.28e-06 \*\*\*  
## modelq3 3.321e+00 3.438e-01 9.660 < 2e-16 \*\*\*  
## modelq5 5.815e+00 2.999e-01 19.391 < 2e-16 \*\*\*  
## modelq7 3.634e+00 3.518e-01 10.331 < 2e-16 \*\*\*  
## modelqashqai 3.326e+00 3.031e-01 10.973 < 2e-16 \*\*\*  
## modelr19 -1.846e+00 5.571e-01 -3.313 0.000924 \*\*\*  
## modelrange\_rover -6.829e+00 4.094e+00 -1.668 0.095325 .   
## modelrange\_rover\_evoque -6.693e+00 4.003e+00 -1.672 0.094551 .   
## modelrange\_rover\_sport -7.955e+00 4.033e+00 -1.973 0.048544 \*   
## modelrav 9.489e-03 3.371e-01 0.028 0.977541   
## modelrio 1.676e+00 3.631e-01 4.617 3.90e-06 \*\*\*  
## modelroadster 2.937e+00 1.139e+00 2.579 0.009913 \*\*   
## modelroomster 3.993e+00 4.510e-01 8.853 < 2e-16 \*\*\*  
## modelrx\_reihe -1.354e+00 4.343e-01 -3.117 0.001825 \*\*   
## models\_klasse -3.234e+00 2.495e-01 -12.961 < 2e-16 \*\*\*  
## models\_max 4.126e+00 3.042e-01 13.565 < 2e-16 \*\*\*  
## models\_type -1.135e+01 6.597e-01 -17.198 < 2e-16 \*\*\*  
## models60 -1.234e+00 4.446e-01 -2.775 0.005524 \*\*   
## modelsandero -3.768e-01 1.492e+00 -0.253 0.800554   
## modelsanta 3.355e+00 3.358e-01 9.989 < 2e-16 \*\*\*  
## modelscenic -2.764e+00 2.659e-01 -10.394 < 2e-16 \*\*\*  
## modelscirocco -2.045e+00 3.106e-01 -6.585 4.56e-11 \*\*\*  
## modelseicento -2.341e+00 2.882e-01 -8.123 4.56e-16 \*\*\*  
## modelsharan -3.327e+00 2.890e-01 -11.513 < 2e-16 \*\*\*  
## modelsignum -3.634e+00 3.046e-01 -11.931 < 2e-16 \*\*\*  
## modelsirion -1.762e-01 6.401e-01 -0.275 0.783095   
## modelsl 3.996e+00 2.820e-01 14.173 < 2e-16 \*\*\*  
## modelslk -4.934e+00 2.275e-01 -21.688 < 2e-16 \*\*\*  
## modelsorento 3.914e+00 3.663e-01 10.685 < 2e-16 \*\*\*  
## modelspark -4.159e+00 4.427e-01 -9.396 < 2e-16 \*\*\*  
## modelspider 7.177e+00 5.623e-01 12.763 < 2e-16 \*\*\*  
## modelsportage 5.375e+00 3.742e-01 14.362 < 2e-16 \*\*\*  
## modelsprinter -3.178e+00 2.751e-01 -11.550 < 2e-16 \*\*\*  
## modelstilo -2.617e+00 2.878e-01 -9.092 < 2e-16 \*\*\*  
## modelsuperb 5.501e+00 4.252e-01 12.938 < 2e-16 \*\*\*  
## modelswift 6.793e-01 2.824e-01 2.405 0.016177 \*   
## modelterios 3.267e+00 1.218e+00 2.683 0.007295 \*\*   
## modeltigra -4.942e+00 2.815e-01 -17.557 < 2e-16 \*\*\*  
## modeltiguan -1.763e+00 3.001e-01 -5.877 4.19e-09 \*\*\*  
## modeltoledo 5.455e-01 7.224e-01 0.755 0.450184   
## modeltouareg -3.437e+00 3.224e-01 -10.661 < 2e-16 \*\*\*  
## modeltouran -2.459e+00 2.738e-01 -8.980 < 2e-16 \*\*\*  
## modeltransit 1.082e+00 2.868e-01 3.773 0.000162 \*\*\*  
## modeltransporter 3.930e+00 2.698e-01 14.567 < 2e-16 \*\*\*  
## modeltt 8.898e-01 2.398e-01 3.710 0.000207 \*\*\*  
## modeltucson 3.277e+00 3.701e-01 8.853 < 2e-16 \*\*\*  
## modeltwingo -2.908e+00 2.400e-01 -12.118 < 2e-16 \*\*\*  
## modelup -6.874e+00 3.395e-01 -20.246 < 2e-16 \*\*\*  
## modelv\_klasse -2.337e+00 6.051e-01 -3.862 0.000113 \*\*\*  
## modelv40 -4.419e+00 3.161e-01 -13.979 < 2e-16 \*\*\*  
## modelv50 -6.269e-02 3.768e-01 -0.166 0.867880   
## modelv60 3.415e+00 7.328e-01 4.660 3.16e-06 \*\*\*  
## modelv70 -1.696e+00 3.164e-01 -5.360 8.31e-08 \*\*\*  
## modelvectra -4.802e+00 2.375e-01 -20.217 < 2e-16 \*\*\*  
## modelverso -7.597e-02 3.409e-01 -0.223 0.823668   
## modelviano 8.891e-01 3.019e-01 2.945 0.003233 \*\*   
## modelvito -4.290e+00 2.530e-01 -16.958 < 2e-16 \*\*\*  
## modelvivaro 5.775e-01 3.433e-01 1.682 0.092567 .   
## modelvoyager 8.776e-01 3.999e-01 2.194 0.028208 \*   
## modelwrangler 8.778e+00 5.387e-01 16.294 < 2e-16 \*\*\*  
## modelx\_reihe -6.311e+00 4.191e-01 -15.057 < 2e-16 \*\*\*  
## modelx\_trail 3.250e-01 3.950e-01 0.823 0.410557   
## modelx\_type -8.086e+00 6.131e-01 -13.187 < 2e-16 \*\*\*  
## modelxc\_reihe 2.551e+00 3.774e-01 6.760 1.38e-11 \*\*\*  
## modelyaris -1.625e+00 2.710e-01 -5.997 2.02e-09 \*\*\*  
## modelyeti 4.139e+00 4.709e-01 8.790 < 2e-16 \*\*\*  
## modelypsilon -2.761e+00 7.266e-01 -3.800 0.000145 \*\*\*  
## modelz\_reihe -6.102e+00 4.317e-01 -14.135 < 2e-16 \*\*\*  
## modelzafira -2.404e+00 2.469e-01 -9.735 < 2e-16 \*\*\*  
## kilometer -6.421e-05 2.561e-07 -250.731 < 2e-16 \*\*\*  
## fuelTypebenzin 1.623e+00 7.282e-01 2.229 0.025811 \*   
## fuelTypecng 2.323e+00 7.531e-01 3.084 0.002040 \*\*   
## fuelTypediesel 3.715e+00 7.283e-01 5.101 3.37e-07 \*\*\*  
## fuelTypeelektro 6.808e-02 1.045e+00 0.065 0.948063   
## fuelTypehybrid 4.029e+00 8.037e-01 5.013 5.36e-07 \*\*\*  
## fuelTypelpg 1.602e+00 7.310e-01 2.191 0.028456 \*   
## brandaudi 4.328e+00 2.253e-01 19.207 < 2e-16 \*\*\*  
## brandbmw 1.240e+01 4.161e-01 29.811 < 2e-16 \*\*\*  
## brandchevrolet 1.337e+00 2.446e-01 5.465 4.62e-08 \*\*\*  
## brandchrysler -2.511e+00 2.950e-01 -8.512 < 2e-16 \*\*\*  
## brandcitroen -4.480e-01 2.268e-01 -1.975 0.048271 \*   
## branddacia -7.916e-01 1.474e+00 -0.537 0.591135   
## branddaewoo -9.735e-01 4.262e-01 -2.284 0.022357 \*   
## branddaihatsu -3.649e-01 4.963e-01 -0.735 0.462210   
## brandfiat 1.698e-01 2.243e-01 0.757 0.448846   
## brandford 1.421e+00 2.338e-01 6.077 1.23e-09 \*\*\*  
## brandhonda 7.225e-01 3.352e-01 2.155 0.031159 \*   
## brandhyundai -2.686e+00 2.374e-01 -11.316 < 2e-16 \*\*\*  
## brandjaguar 9.328e+00 4.852e-01 19.225 < 2e-16 \*\*\*  
## brandjeep 9.989e-01 3.514e-01 2.843 0.004472 \*\*   
## brandkia -2.820e+00 2.841e-01 -9.928 < 2e-16 \*\*\*  
## brandlada 7.651e+00 1.473e+00 5.193 2.07e-07 \*\*\*  
## brandlancia 1.912e+00 6.497e-01 2.943 0.003249 \*\*   
## brandland\_rover 1.646e+01 3.953e+00 4.163 3.15e-05 \*\*\*  
## brandmazda -7.427e-01 2.310e-01 -3.216 0.001300 \*\*   
## brandmercedes\_benz 8.706e+00 2.109e-01 41.286 < 2e-16 \*\*\*  
## brandmini 9.927e+00 6.648e-01 14.931 < 2e-16 \*\*\*  
## brandmitsubishi -6.581e-01 2.584e-01 -2.547 0.010857 \*   
## brandnissan 1.494e+00 2.592e-01 5.764 8.25e-09 \*\*\*  
## brandopel 3.624e+00 2.390e-01 15.165 < 2e-16 \*\*\*  
## brandpeugeot -8.051e-01 2.293e-01 -3.510 0.000447 \*\*\*  
## brandporsche 1.909e+01 5.183e-01 36.838 < 2e-16 \*\*\*  
## brandrenault 1.943e+00 2.473e-01 7.856 3.99e-15 \*\*\*  
## brandrover -2.668e+00 3.234e-01 -8.248 < 2e-16 \*\*\*  
## brandsaab -1.555e+00 3.000e-01 -5.185 2.17e-07 \*\*\*  
## brandseat -8.275e-01 6.741e-01 -1.228 0.219616   
## brandskoda -1.002e+00 3.760e-01 -2.666 0.007679 \*\*   
## brandsmart -1.133e+00 1.090e+00 -1.040 0.298269   
## brandsubaru 2.618e+00 7.825e-01 3.345 0.000822 \*\*\*  
## brandsuzuki -4.029e-02 2.407e-01 -0.167 0.867087   
## brandtoyota 3.372e+00 2.503e-01 13.469 < 2e-16 \*\*\*  
## brandtrabant 2.307e+01 1.239e+00 18.616 < 2e-16 \*\*\*  
## brandvolkswagen 7.146e+00 2.712e-01 26.352 < 2e-16 \*\*\*  
## brandvolvo 3.190e+00 2.772e-01 11.506 < 2e-16 \*\*\*  
## notRepairedDamageNo 4.327e+00 2.681e-02 161.392 < 2e-16 \*\*\*  
## duration 6.416e-02 9.205e-04 69.700 < 2e-16 \*\*\*  
## age\_of\_car -7.194e-01 1.937e-03 -371.367 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 3.862 on 240687 degrees of freedom  
## Multiple R-squared: 0.8434, Adjusted R-squared: 0.8432   
## F-statistic: 4321 on 300 and 240687 DF, p-value: < 2.2e-16

# resid plot  
resid\_3=m\_new$residuals  
fit\_3=m\_new$fitted.values  
par(mfrow =c(2,2))  
plot(fit\_3,resid\_3,xlab="fits",ylab="Residals")  
abline(0,0,col="red")  
  
### qqnorm  
qqnorm(resid\_3)  
qqline(resid\_3,col="blue")  
hist(resid\_3, xlab="Residuals", main= "Histogram of Residuals")

 The best model is (above) - removed outliers (using cooks) - and box cox (to fix normality). Susetting ruins our variance assumption so we stick to this model even though the assumptions are slightly violated. We get a good r square of 84%.

#### model seclection  
### stepwise to select best model  
#backward.model\_sub=step(model\_sub,direction="backward")  
#summary(backward.model\_sub)