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| title: “USED CAR PRICES CASE STUDY” |
| author: “Miquel Parra i Xavier Alaman” |
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# R libraries imports, useful functions and data loading

In this first section we will load all required packages and libraries, and load our data.

## Load Required Packages

# Load Required Packages: to be increased over the course  
options(contrasts=c("contr.treatment","contr.treatment"))  
  
requiredPackages <- c("effects","FactoMineR","car","missMDA","mvoutlier","chemometrics", "factoextra","RColorBrewer","ggplot2","dplyr","ggmap","ggthemes","knitr")  
  
#use this function to check if each package is on the local machine  
#if a package is installed, it will be loaded  
#if any are not, the missing package(s) will be installed and loaded  
package.check <- lapply(requiredPackages, FUN = function(x) {  
 if (!require(x, character.only = TRUE)) {  
 install.packages(x, dependencies = TRUE)  
 library(x, character.only = TRUE)  
 }  
})

## Loading required package: effects

## Loading required package: carData

## lattice theme set by effectsTheme()  
## See ?effectsTheme for details.

## Loading required package: FactoMineR

## Loading required package: car

## Loading required package: missMDA

## Loading required package: mvoutlier

## Loading required package: sgeostat

## Loading required package: chemometrics

## Loading required package: rpart

## Loading required package: factoextra

## Loading required package: ggplot2

## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa

## Loading required package: RColorBrewer

## Loading required package: dplyr

##   
## Attaching package: 'dplyr'

## The following object is masked from 'package:car':  
##   
## recode

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

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

## Loading required package: ggmap

## Google's Terms of Service: https://cloud.google.com/maps-platform/terms/.

## Please cite ggmap if you use it! See citation("ggmap") for details.

## Loading required package: ggthemes

## Loading required package: knitr

#verify they are loaded  
search()

## [1] ".GlobalEnv" "package:knitr" "package:ggthemes"   
## [4] "package:ggmap" "package:dplyr" "package:RColorBrewer"  
## [7] "package:factoextra" "package:ggplot2" "package:chemometrics"  
## [10] "package:rpart" "package:mvoutlier" "package:sgeostat"   
## [13] "package:missMDA" "package:car" "package:FactoMineR"   
## [16] "package:effects" "package:carData" "package:stats"   
## [19] "package:graphics" "package:grDevices" "package:utils"   
## [22] "package:datasets" "package:methods" "Autoloads"   
## [25] "package:base"

## Sample load

# Clear plots  
if(!is.null(dev.list())) dev.off()  
  
# Clean workspace  
rm(list=ls())  
  
# Users file path  
miquel\_fp <- "C:/Users/Miquel/Documents/GitHub/ADEI/"  
xavi\_fp <- "~/Documents/FIB/ADEI/ADEI/"  
filepath <- xavi\_fp  
  
# Set working directory  
setwd(filepath)  
  
# Load data from file  
load(paste0(filepath,"MyOldCars-5000Clean.RData"))  
  
# Index reset  
row.names(df) <- NULL

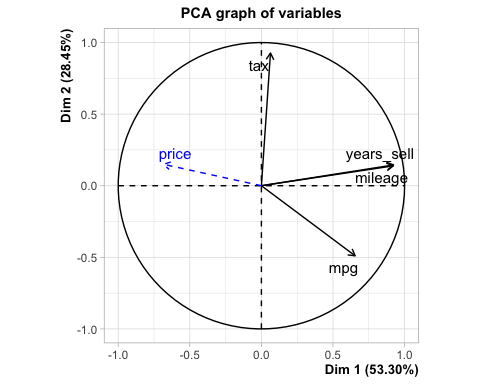
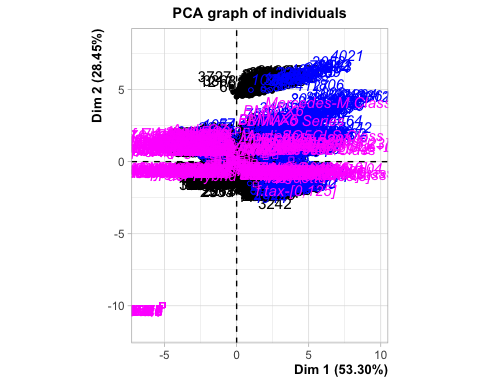
# PCA

We have done PCA in order to combine related variables, and focus on uncorrelated or independent ones, especially those along which the observations have high variance. Also, to obtain a smaller set of variables that explain most of the variance in the original data, in more compact and insightful form.

names(df)

## [1] "model" "year" "price" "transmission"   
## [5] "mileage" "fuelType" "tax" "mpg"   
## [9] "engineSize" "manufacturer" "years\_sell" "totalMOE"   
## [13] "aux\_price" "aux\_mileage" "aux\_tax" "aux\_mpg"   
## [17] "aux\_years\_sell" "Audi" "mout"

vars\_con<-names(df)[c(5,7,8,11)]  
vars\_res<-names(df)[c(3,18)]  
vars\_dis<-names(df)[c(1,2,4,6,9,10,13,14,15,16,17)]  
  
# Multivariant outliers should be included as supplementary observations  
ll <- which( df$mout == "YesMOut")  
res.pca<-PCA(df[,c(vars\_res, vars\_dis, vars\_con)],quali.sup=c(2:13),quanti.sup=c(1),ind.sup=ll)



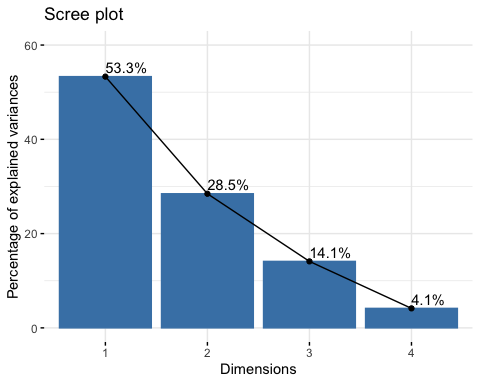
As we can see in the first two plots tax and years\_sell/mileage have almost an angle of 90 degrees, meaning that probably these variable are not that much related. Instead, years\_sell and mileage are positively related. Price although it doesn’t completely go in the opposite direction we can see that is inversely related to years\_sell and mileage.

## Eigenvalues and dominant axes analysis

res.pca$eig[,1:3]

## eigenvalue percentage of variance cumulative percentage of variance  
## comp 1 2.1320997 53.302492 53.30249  
## comp 2 1.1381377 28.453443 81.75594  
## comp 3 0.5642237 14.105591 95.86153  
## comp 4 0.1655389 4.138473 100.00000

fviz\_eig(res.pca, addlabels = TRUE, ylim = c(0, 60))



The eigenvalue of the first component is larger than the other ones. Starting from the second component with an eigenvalue of 1.138… the consequent eigenvalues get smaller.

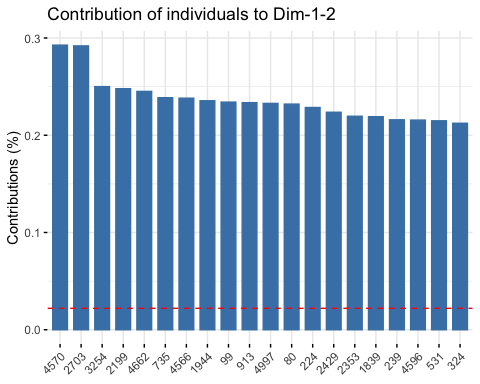
According to the Kaiser criteria we will use the first 2 dimensions (the ones with an eigenvalue > 1).

And according to Elbow’s rule (based on selecting dimensions until the difference in variance of that of the next factorial plane is almost the same as that of the current plane) we can also use the first two dimensions (Dim.1 and Dim.2). The difference between the dimensions 2 and 3 is significantly less that the one we can see between dimensions 1 and 2.

With the two dimensions we capture/retain an 81.76% of the total variance.

## Individuals point of view (contribution)

fviz\_contrib(res.pca, choice = "ind", axes = 1:2, top = 20)

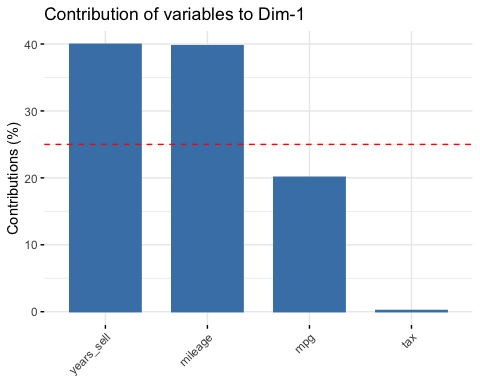


As we can see from the Contribution of individuals to Dim-1-2 plot, the 20 most contributive individuals in descending order are 4570, 2703, 3254, 2199, 4662, 735, 4566, 1944, 99, 913, 4997, 80, 224, 2429, 2353, 1839, 239, 4596, 531 and 324.

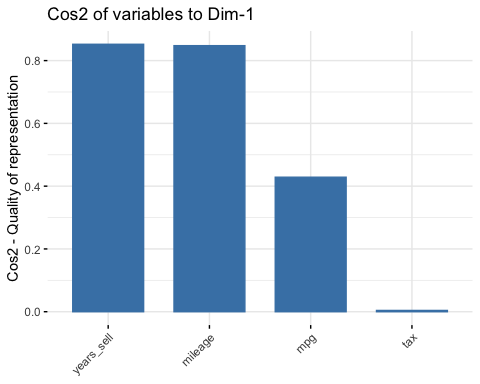
## Interpreting the axes

### Dimension 1

fviz\_contrib(res.pca, choice = "var", axes = 1)



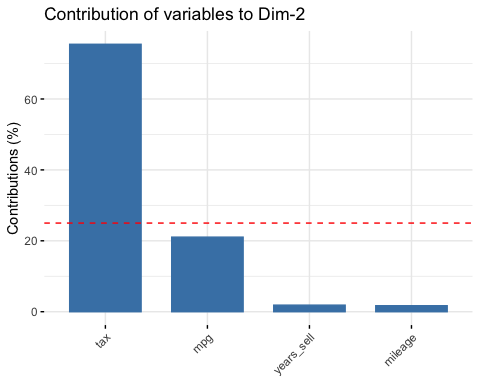
fviz\_cos2(res.pca, choice = "var", axes = 1)



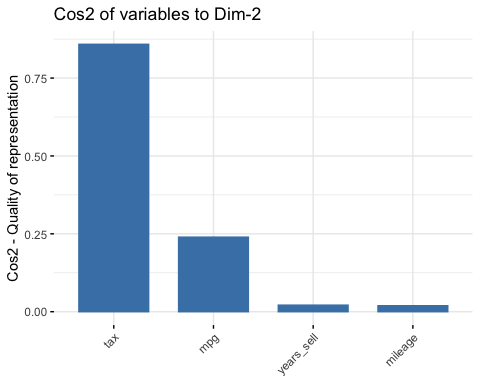
The years\_sell, mileage, mpg and tax variables have a positive first dimension. Dimension 1 shows a positive correlation to years\_sell and mileage. Price target variable (supplementary) is negatively associated to the first factorial axis. As we can see with cos2 years\_sell and mileage are the best represented in the first dimension.

### Dimension 2

fviz\_contrib(res.pca, choice = "var", axes = 2)



fviz\_cos2(res.pca, choice = "var", axes = 2)

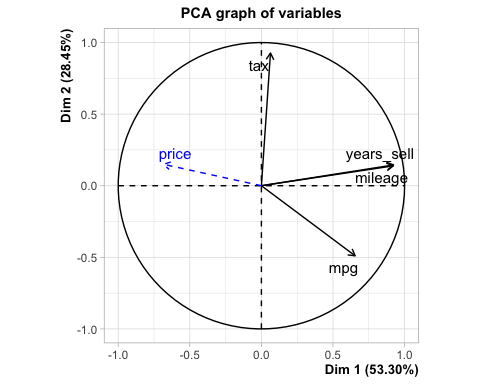
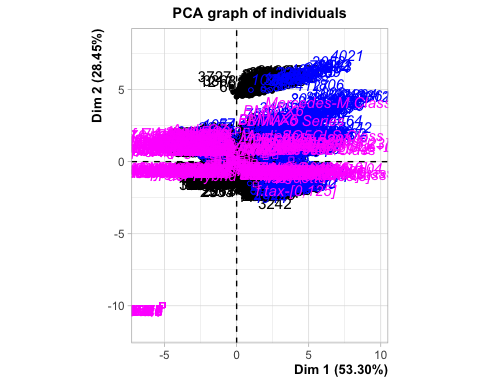


The tax, years\_sell and mileage variables have a positive second dimension and the mpg variable has a negative second dimension. Dimension 2 shows the greatest positive correlation to tax and the lowest negative correlation to mpg. As we can see with cos2 tax is the best represented in the second dimension.

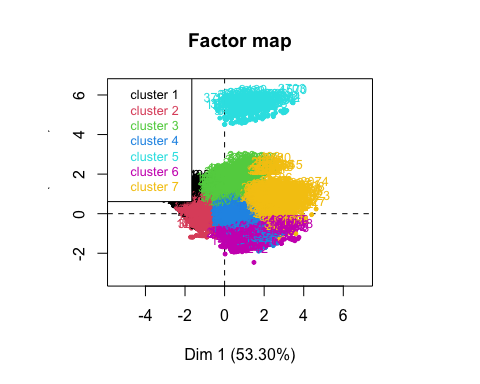
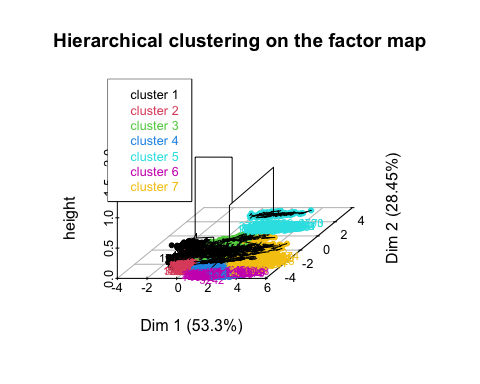
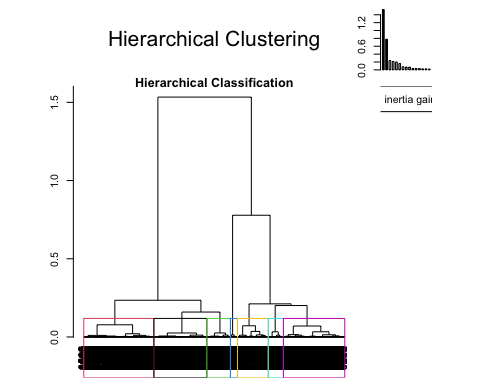
# Hierarchical Clustering

As we have seen previously in this report we should pick 2 clusters. But we will pick 7 because it distributes the data more proportionately among the clusters. But you also can see in the table below that the number of individuals for each cluster is still quite unbalanced.

res.pca<-PCA(df[,c(vars\_res, vars\_dis, vars\_con)],quali.sup=c(2:13),quanti.sup= c(1), ind.sup = ll )



res.hcpc<-HCPC(res.pca,nb.clust=7,graph=T)



table(res.hcpc$data.clust$clust)

##   
## 1 2 3 4 5 6 7   
## 1115 1085 572 950 123 263 429

res.hcpc$desc.var$test.chi2

## p.value df  
## year 0.000000e+00 48  
## engineSize 0.000000e+00 96  
## aux\_price 0.000000e+00 18  
## aux\_mileage 0.000000e+00 18  
## aux\_tax 0.000000e+00 12  
## aux\_mpg 0.000000e+00 18  
## aux\_years\_sell 0.000000e+00 18  
## model 1.400798e-299 462  
## fuelType 4.027676e-107 18  
## transmission 1.786437e-77 12  
## manufacturer 1.922873e-34 18  
## Audi 2.820428e-17 6

res.hcpc$desc.var$category

## $`1`  
## Cla/Mod Mod/Cla Global  
## aux\_years\_sell=f.years\_sell-[2,3] 54.4671690 90.7623318 40.9521710  
## aux\_mpg=f.mpg-[8.8,44.8] 78.3303730 79.1031390 24.8181618  
## year=f.Year-2019 52.7296082 73.6322870 34.3178312  
## aux\_price=f.price-(26,110] 58.4562012 60.4484305 25.4132687  
## aux\_mileage=f.mileage-[4,6e+03] 55.6203164 59.9103139 26.4712365  
## fuelType=f.Fuel-Petrol 38.7080366 68.2511211 43.3325986  
## aux\_tax=f.tax-(125,145] 32.4631861 86.9955157 65.8584968  
## year=f.Year-2020 63.4551495 17.1300448 6.6343399  
## engineSize=f.EngSize-1.5 47.4766355 22.7802691 11.7919330  
## transmission=f.Trans-SemiAuto 32.2816901 51.3901345 39.1227683  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 34.6787479 37.7578475 26.7577695  
## engineSize=f.EngSize-3 39.8706897 16.5919283 10.2270223  
## model=VW-Sharan 90.0000000 1.6143498 0.4408199  
## engineSize=f.EngSize-1.3 56.5789474 3.8565022 1.6751157  
## model=Audi-Q5 55.0000000 3.9461883 1.7632797  
## manufacturer=Audi 31.6666667 27.2645740 21.1593564  
## Audi=Audi Yes 31.6666667 27.2645740 21.1593564  
## transmission=f.Trans-Automatic 30.2573203 30.5829596 24.8402028  
## model=VW-Tiguan Allspace 85.7142857 1.0762332 0.3085739  
## model=Audi-Q2 48.1012658 3.4080717 1.7412387  
## model=Mercedes-X-CLASS 90.9090909 0.8968610 0.2424510  
## model=VW-T-Roc 50.7936508 2.8699552 1.3885828  
## model=Mercedes-GLC Class 42.7272727 4.2152466 2.4245096  
## engineSize=f.EngSize-2.3 90.0000000 0.8071749 0.2204100  
## model=VW-Amarok 78.5714286 0.9865471 0.3085739  
## model=VW-Touareg 58.0645161 1.6143498 0.6832709  
## model=BMW-M4 88.8888889 0.7174888 0.1983690  
## model=Audi-Q7 66.6666667 1.0762332 0.3967379  
## model=VW-Caravelle 100.0000000 0.5381166 0.1322460  
## model=BMW-Z4 75.0000000 0.8071749 0.2644920  
## model=Mercedes-GLE Class 46.9387755 2.0627803 1.0800088  
## aux\_price=f.price-(19.5,26] 28.1840592 30.7623318 26.8238924  
## model=BMW-M2 100.0000000 0.4484305 0.1102050  
## model=Audi-Q3 36.4285714 4.5739910 3.0857395  
## model=VW-Tiguan 33.7579618 4.7533632 3.4604364  
## model=VW-Golf SV 47.8260870 0.9865471 0.5069429  
## model=Mercedes-SL CLASS 44.8275862 1.1659193 0.6391889  
## model=Audi-TT 44.4444444 1.0762332 0.5951069  
## engineSize=f.EngSize-2 26.2526096 45.1121076 42.2305488  
## engineSize=f.EngSize-2.9 53.8461538 0.6278027 0.2865330  
## model=BMW-X4 50.0000000 0.7174888 0.3526559  
## model=Mercedes-GLS Class 54.5454545 0.5381166 0.2424510  
## engineSize=f.EngSize-2.5 66.6666667 0.3587444 0.1322460  
## model=Mercedes-S Class 0.0000000 0.0000000 0.2644920  
## model=Mercedes-GL Class 0.0000000 0.0000000 0.2644920  
## model=Mercedes-GLA Class 14.8148148 1.0762332 1.7853207  
## model=VW-Scirocco 4.7619048 0.0896861 0.4628609  
## model=Mercedes-E Class 17.1597633 2.6008969 3.7249284  
## fuelType=f.Fuel-Hybrid 9.5238095 0.3587444 0.9257218  
## year=f.Year-2018 20.1257862 8.6098655 10.5135552  
## model=Audi-A6 10.7142857 0.5381166 1.2342958  
## engineSize=f.EngSize-1.8 0.0000000 0.0000000 0.3967379  
## model=BMW-4 Series 12.2222222 0.9865471 1.9836897  
## model=BMW-1 Series 13.8888889 2.2421525 3.9673793  
## model=BMW-5 Series 5.6338028 0.3587444 1.5649107  
## engineSize=f.EngSize-1 15.7107232 5.6502242 8.8384395  
## model=BMW-3 Series 10.9523810 2.0627803 4.6286092  
## manufacturer=BMW 18.0921053 14.7982063 20.1013886  
## Audi=Audi No 22.6726307 72.7354260 78.8406436  
## model=Mercedes-A Class 9.9206349 2.2421525 5.5543311  
## model=VW-Up 0.0000000 0.0000000 1.8734847  
## year=f.Year-2013 0.0000000 0.0000000 1.8955257  
## aux\_mpg=f.mpg-(44.8,53.3] 17.7591463 20.8968610 28.9177871  
## model=VW-Polo 8.5798817 2.6008969 7.4498567  
## engineSize=f.EngSize-1.2 0.0000000 0.0000000 2.6669605  
## engineSize=f.EngSize-1.6 5.2287582 1.4349776 6.7445449  
## year=f.Year-2014 0.0000000 0.0000000 3.5706414  
## engineSize=f.EngSize-1.4 2.9411765 0.7174888 5.9951510  
## engineSize=f.EngSize-2.1 2.7472527 0.8968610 8.0229226  
## aux\_tax=f.tax-[0,125] 0.0000000 0.0000000 5.7747410  
## aux\_tax=f.tax-(145,580] 11.2665113 13.0044843 28.3667622  
## year=f.Year-2015 0.0000000 0.0000000 7.7363897  
## transmission=f.Trans-Manual 12.2935780 18.0269058 36.0370289  
## aux\_price=f.price-(14,19.5] 8.3050847 8.7892377 26.0083756  
## aux\_years\_sell=f.years\_sell-(3,5] 7.8866769 9.2376682 28.7855411  
## fuelType=f.Fuel-Diesel 13.7753077 31.1210762 55.5212696  
## aux\_years\_sell=f.years\_sell-(6,23] 0.0000000 0.0000000 13.3568437  
## year=f.Year-2017 0.8443908 0.6278027 18.2719859  
## aux\_years\_sell=f.years\_sell-(5,6] 0.0000000 0.0000000 16.9054441  
## year=f.Year-2016 0.0000000 0.0000000 16.9054441  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 0.0000000 0.0000000 19.9030196  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.1328958 2.3318386 26.8679744  
## aux\_mpg=f.mpg-(61.4,88.3] 0.0000000 0.0000000 21.7544633  
## aux\_price=f.price-[0.65,14] 0.0000000 0.0000000 21.7544633  
## aux\_mpg=f.mpg-(53.3,61.4] 0.0000000 0.0000000 24.5095878  
## p.value v.test  
## aux\_years\_sell=f.years\_sell-[2,3] 0.000000e+00 Inf  
## aux\_mpg=f.mpg-[8.8,44.8] 0.000000e+00 Inf  
## year=f.Year-2019 3.070798e-216 31.386725  
## aux\_price=f.price-(26,110] 3.426577e-192 29.571981  
## aux\_mileage=f.mileage-[4,6e+03] 6.734426e-172 27.949238  
## fuelType=f.Fuel-Petrol 1.961580e-83 19.351980  
## aux\_tax=f.tax-(125,145] 1.168407e-73 18.155182  
## year=f.Year-2020 7.800606e-50 14.842324  
## engineSize=f.EngSize-1.5 7.124526e-35 12.319374  
## transmission=f.Trans-SemiAuto 9.589759e-22 9.581228  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 1.019223e-20 9.334028  
## engineSize=f.EngSize-3 1.358027e-14 7.700248  
## model=VW-Sharan 1.121696e-09 6.091054  
## engineSize=f.EngSize-1.3 2.304898e-09 5.974717  
## model=Audi-Q5 5.055685e-09 5.845329  
## manufacturer=Audi 1.798473e-08 5.630347  
## Audi=Audi Yes 1.798473e-08 5.630347  
## transmission=f.Trans-Automatic 4.847435e-07 5.032255  
## model=VW-Tiguan Allspace 2.660194e-06 4.695451  
## model=Audi-Q2 5.445340e-06 4.546855  
## model=Mercedes-X-CLASS 6.861728e-06 4.497933  
## model=VW-T-Roc 7.186481e-06 4.488089  
## model=Mercedes-GLC Class 2.544234e-05 4.210840  
## engineSize=f.EngSize-2.3 2.567567e-05 4.208777  
## model=VW-Amarok 3.500141e-05 4.138218  
## model=VW-Touareg 8.202679e-05 3.938400  
## model=BMW-M4 9.516327e-05 3.902604  
## model=Audi-Q7 2.149759e-04 3.700735  
## model=VW-Caravelle 2.180825e-04 3.697093  
## model=BMW-Z4 3.652986e-04 3.563962  
## model=Mercedes-GLE Class 6.895772e-04 3.393690  
## aux\_price=f.price-(19.5,26] 7.097020e-04 3.385803  
## model=BMW-M2 8.904053e-04 3.323045  
## model=Audi-Q3 1.519800e-03 3.170876  
## model=VW-Tiguan 8.520028e-03 2.630736  
## model=VW-Golf SV 1.674905e-02 2.392171  
## model=Mercedes-SL CLASS 1.806534e-02 2.364276  
## model=Audi-TT 2.516003e-02 2.238937  
## engineSize=f.EngSize-2 2.519116e-02 2.238459  
## engineSize=f.EngSize-2.9 2.697003e-02 2.211951  
## model=BMW-X4 3.087581e-02 2.158670  
## model=Mercedes-GLS Class 3.827764e-02 2.071869  
## engineSize=f.EngSize-2.5 3.955736e-02 2.058342  
## model=Mercedes-S Class 3.373433e-02 -2.123233  
## model=Mercedes-GL Class 3.373433e-02 -2.123233  
## model=Mercedes-GLA Class 3.348628e-02 -2.126204  
## model=VW-Scirocco 2.342657e-02 -2.266405  
## model=Mercedes-E Class 1.910976e-02 -2.343383  
## fuelType=f.Fuel-Hybrid 1.584254e-02 -2.412523  
## year=f.Year-2018 1.545434e-02 -2.421553  
## model=Audi-A6 1.029583e-02 -2.565732  
## engineSize=f.EngSize-1.8 6.171855e-03 -2.738509  
## model=BMW-4 Series 3.691949e-03 -2.903349  
## model=BMW-1 Series 3.548332e-04 -3.571581  
## model=BMW-5 Series 2.786018e-05 -4.190287  
## engineSize=f.EngSize-1 6.959690e-06 -4.494918  
## model=BMW-3 Series 4.345937e-07 -5.053145  
## manufacturer=BMW 1.880334e-07 -5.210795  
## Audi=Audi No 1.798473e-08 -5.630347  
## model=Mercedes-A Class 1.540776e-09 -6.040038  
## model=VW-Up 2.988633e-11 -6.647130  
## year=f.Year-2013 2.240132e-11 -6.689448  
## aux\_mpg=f.mpg-(44.8,53.3] 3.708387e-12 -6.947871  
## model=VW-Polo 5.875836e-15 -7.806585  
## engineSize=f.EngSize-1.2 8.864362e-16 -8.041641  
## engineSize=f.EngSize-1.6 1.542555e-20 -9.290023  
## year=f.Year-2014 5.476292e-21 -9.399615  
## engineSize=f.EngSize-1.4 5.662246e-24 -10.097580  
## engineSize=f.EngSize-2.1 7.469337e-33 -11.938346  
## aux\_tax=f.tax-[0,125] 6.184918e-34 -12.143846  
## aux\_tax=f.tax-(145,580] 1.781394e-43 -13.825793  
## year=f.Year-2015 9.278471e-46 -14.199109  
## transmission=f.Trans-Manual 8.518581e-51 -14.990130  
## aux\_price=f.price-(14,19.5] 9.039267e-60 -16.305368  
## aux\_years\_sell=f.years\_sell-(3,5] 8.266194e-72 -17.919775  
## fuelType=f.Fuel-Diesel 5.628185e-80 -18.937229  
## aux\_years\_sell=f.years\_sell-(6,23] 2.417339e-81 -19.102272  
## year=f.Year-2017 1.252978e-100 -21.295376  
## aux\_years\_sell=f.years\_sell-(5,6] 2.997051e-105 -21.788279  
## year=f.Year-2016 2.997051e-105 -21.788279  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 2.039927e-126 -23.916968  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 7.040396e-134 -24.623712  
## aux\_mpg=f.mpg-(61.4,88.3] 5.656096e-140 -25.186326  
## aux\_price=f.price-[0.65,14] 5.656096e-140 -25.186326  
## aux\_mpg=f.mpg-(53.3,61.4] 6.907205e-161 -27.028119  
##   
## $`2`  
## Cla/Mod Mod/Cla Global  
## aux\_years\_sell=f.years\_sell-[2,3] 45.209903 77.4193548 40.9521710  
## year=f.Year-2019 46.885035 67.2811060 34.3178312  
## aux\_mpg=f.mpg-(44.8,53.3] 43.597561 52.7188940 28.9177871  
## aux\_tax=f.tax-(125,145] 32.061580 88.2949309 65.8584968  
## aux\_mileage=f.mileage-[4,6e+03] 44.046628 48.7557604 26.4712365  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 42.998353 48.1105991 26.7577695  
## year=f.Year-2018 44.863732 19.7235023 10.5135552  
## aux\_price=f.price-(19.5,26] 35.168447 39.4470046 26.8238924  
## engineSize=f.EngSize-1 41.645885 15.3917051 8.8384395  
## fuelType=f.Fuel-Diesel 28.384279 65.8986175 55.5212696  
## Audi=Audi No 26.251048 86.5437788 78.8406436  
## model=BMW-2 Series 51.538462 6.1751152 2.8653295  
## aux\_mpg=f.mpg-(53.3,61.4] 31.205036 31.9815668 24.5095878  
## aux\_price=f.price-(26,110] 30.182134 32.0737327 25.4132687  
## model=VW-T-Cross 76.000000 1.7511521 0.5510249  
## manufacturer=BMW 30.482456 25.6221198 20.1013886  
## year=f.Year-2020 36.544850 10.1382488 6.6343399  
## model=Mercedes-A Class 36.111111 8.3870968 5.5543311  
## engineSize=f.EngSize-1.6 34.313725 9.6774194 6.7445449  
## model=BMW-5 Series 45.070423 2.9493088 1.5649107  
## model=VW-Arteon 59.259259 1.4746544 0.5951069  
## engineSize=f.EngSize-1.3 43.421053 3.0414747 1.6751157  
## engineSize=f.EngSize-2 26.670146 47.0967742 42.2305488  
## model=BMW-X2 59.090909 1.1981567 0.4849019  
## model=BMW-4 Series 40.000000 3.3179724 1.9836897  
## model=VW-T-Roc 42.857143 2.4884793 1.3885828  
## model=VW-Up 38.823529 3.0414747 1.8734847  
## engineSize=f.EngSize-2.2 70.000000 0.6451613 0.2204100  
## model=Mercedes-B Class 41.379310 2.2119816 1.2783778  
## manufacturer=Mercedes 26.672039 30.5069124 27.3528764  
## transmission=f.Trans-SemiAuto 25.971831 42.4884793 39.1227683  
## model=Mercedes-C Class 29.673591 9.2165899 7.4278157  
## model=Mercedes-S Class 58.333333 0.6451613 0.2644920  
## model=BMW-X3 42.105263 1.4746544 0.8375579  
## model=Audi-A8 53.333333 0.7373272 0.3306149  
## model=BMW-3 Series 30.952381 5.9907834 4.6286092  
## model=Mercedes-E Class 30.769231 4.7926267 3.7249284  
## model=Audi-Q2 34.177215 2.4884793 1.7412387  
## model=Mercedes-X-CLASS 0.000000 0.0000000 0.2424510  
## model=Mercedes-GLS Class 0.000000 0.0000000 0.2424510  
## model=BMW-7 Series 0.000000 0.0000000 0.2424510  
## model=Mercedes-GL Class 0.000000 0.0000000 0.2644920  
## model=BMW-Z4 0.000000 0.0000000 0.2644920  
## transmission=f.Trans-Manual 22.079511 33.2718894 36.0370289  
## engineSize=f.EngSize-0 0.000000 0.0000000 0.2865330  
## model=Audi-A3 17.032967 2.8571429 4.0114613  
## model=VW-Tiguan Allspace 0.000000 0.0000000 0.3085739  
## model=VW-Amarok 0.000000 0.0000000 0.3085739  
## model=BMW-X4 0.000000 0.0000000 0.3526559  
## model=Mercedes-V Class 0.000000 0.0000000 0.3967379  
## model=Audi-Q7 0.000000 0.0000000 0.3967379  
## model=VW-Sharan 0.000000 0.0000000 0.4408199  
## model=Mercedes-SL CLASS 3.448276 0.0921659 0.6391889  
## model=VW-Scirocco 0.000000 0.0000000 0.4628609  
## model=BMW-X5 0.000000 0.0000000 0.5289839  
## model=Audi-TT 0.000000 0.0000000 0.5951069  
## model=VW-Touareg 0.000000 0.0000000 0.6832709  
## model=Audi-A1 10.000000 1.1981567 2.8653295  
## model=VW-Tiguan 9.554140 1.3824885 3.4604364  
## model=Mercedes-GLE Class 0.000000 0.0000000 1.0800088  
## model=Audi-Q5 3.750000 0.2764977 1.7632797  
## aux\_years\_sell=f.years\_sell-(3,5] 18.759571 22.5806452 28.7855411  
## engineSize=f.EngSize-1.4 9.926471 2.4884793 5.9951510  
## aux\_mpg=f.mpg-(61.4,88.3] 16.818642 15.2995392 21.7544633  
## engineSize=f.EngSize-2.1 11.538462 3.8709677 8.0229226  
## aux\_price=f.price-(14,19.5] 17.288136 18.8018433 26.0083756  
## model=Audi-Q3 4.285714 0.5529954 3.0857395  
## year=f.Year-2013 0.000000 0.0000000 1.8955257  
## engineSize=f.EngSize-1.2 1.652893 0.1843318 2.6669605  
## manufacturer=Audi 15.208333 13.4562212 21.1593564  
## Audi=Audi Yes 15.208333 13.4562212 21.1593564  
## engineSize=f.EngSize-3 10.560345 4.5161290 10.2270223  
## fuelType=f.Fuel-Petrol 17.955239 32.5345622 43.3325986  
## year=f.Year-2014 0.000000 0.0000000 3.5706414  
## aux\_price=f.price-[0.65,14] 10.638298 9.6774194 21.7544633  
## aux\_tax=f.tax-[0,125] 0.000000 0.0000000 5.7747410  
## year=f.Year-2015 0.000000 0.0000000 7.7363897  
## aux\_tax=f.tax-(145,580] 9.867910 11.7050691 28.3667622  
## year=f.Year-2017 3.739445 2.8571429 18.2719859  
## aux\_years\_sell=f.years\_sell-(6,23] 0.000000 0.0000000 13.3568437  
## aux\_years\_sell=f.years\_sell-(5,6] 0.000000 0.0000000 16.9054441  
## year=f.Year-2016 0.000000 0.0000000 16.9054441  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.789171 3.1336406 26.8679744  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 0.000000 0.0000000 19.9030196  
## aux\_mpg=f.mpg-[8.8,44.8] 0.000000 0.0000000 24.8181618  
## p.value v.test  
## aux\_years\_sell=f.years\_sell-[2,3] 1.802046e-174 28.160111  
## year=f.Year-2019 5.785152e-146 25.727312  
## aux\_mpg=f.mpg-(44.8,53.3] 5.114833e-82 19.183186  
## aux\_tax=f.tax-(125,145] 5.517244e-81 19.059142  
## aux\_mileage=f.mileage-[4,6e+03] 2.653358e-75 18.361865  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 4.931594e-69 17.560640  
## year=f.Year-2018 1.619144e-26 10.656894  
## aux\_price=f.price-(19.5,26] 1.053248e-25 10.481266  
## engineSize=f.EngSize-1 1.769201e-16 8.236771  
## fuelType=f.Fuel-Diesel 1.917669e-15 7.946557  
## Audi=Audi No 1.538197e-13 7.383813  
## model=BMW-2 Series 5.604083e-12 6.889368  
## aux\_mpg=f.mpg-(53.3,61.4] 1.283188e-10 6.429151  
## aux\_price=f.price-(26,110] 1.358003e-08 5.678602  
## model=VW-T-Cross 5.858820e-08 5.423057  
## manufacturer=BMW 3.459745e-07 5.096509  
## year=f.Year-2020 3.737191e-07 5.081879  
## model=Mercedes-A Class 7.910134e-06 4.467602  
## engineSize=f.EngSize-1.6 2.131118e-05 4.250691  
## model=BMW-5 Series 9.003901e-05 3.915977  
## model=VW-Arteon 1.041471e-04 3.880721  
## engineSize=f.EngSize-1.3 1.738740e-04 3.754232  
## engineSize=f.EngSize-2 2.086889e-04 3.708259  
## model=BMW-X2 5.088414e-04 3.476058  
## model=BMW-4 Series 6.544851e-04 3.407968  
## model=VW-T-Roc 9.088825e-04 3.317311  
## model=VW-Up 2.079432e-03 3.078647  
## engineSize=f.EngSize-2.2 2.927648e-03 2.975234  
## model=Mercedes-B Class 3.234960e-03 2.944482  
## manufacturer=Mercedes 7.990628e-03 2.652466  
## transmission=f.Trans-SemiAuto 9.439525e-03 2.595712  
## model=Mercedes-C Class 1.166698e-02 2.522060  
## model=Mercedes-S Class 1.300157e-02 2.483726  
## model=BMW-X3 1.359369e-02 2.467825  
## model=Audi-A8 1.603097e-02 2.408210  
## model=BMW-3 Series 1.708746e-02 2.384820  
## model=Mercedes-E Class 3.786949e-02 2.076265  
## model=Audi-Q2 3.790334e-02 2.075899  
## model=Mercedes-X-CLASS 4.927928e-02 -1.966167  
## model=Mercedes-GLS Class 4.927928e-02 -1.966167  
## model=BMW-7 Series 4.927928e-02 -1.966167  
## model=Mercedes-GL Class 3.746575e-02 -2.080652  
## model=BMW-Z4 3.746575e-02 -2.080652  
## transmission=f.Trans-Manual 2.921754e-02 -2.180539  
## engineSize=f.EngSize-0 2.848225e-02 -2.190579  
## model=Audi-A3 2.274406e-02 -2.277707  
## model=VW-Tiguan Allspace 2.165130e-02 -2.296430  
## model=VW-Amarok 2.165130e-02 -2.296430  
## model=BMW-X4 1.250870e-02 -2.497459  
## model=Mercedes-V Class 7.224689e-03 -2.686306  
## model=Audi-Q7 7.224689e-03 -2.686306  
## model=VW-Sharan 4.171619e-03 -2.864884  
## model=Mercedes-SL CLASS 3.929126e-03 -2.883797  
## model=VW-Scirocco 3.169581e-03 -2.950794  
## model=BMW-X5 1.389668e-03 -3.196789  
## model=Audi-TT 6.089000e-04 -3.427619  
## model=VW-Touareg 2.024412e-04 -3.715950  
## model=Audi-A1 4.621518e-05 -4.073986  
## model=VW-Tiguan 3.130672e-06 -4.662055  
## model=Mercedes-GLE Class 1.406442e-06 -4.824090  
## model=Audi-Q5 8.774816e-07 -4.917295  
## aux\_years\_sell=f.years\_sell-(3,5] 1.467824e-07 -5.256551  
## engineSize=f.EngSize-1.4 1.444467e-09 -6.050445  
## aux\_mpg=f.mpg-(61.4,88.3] 1.261615e-09 -6.072210  
## engineSize=f.EngSize-2.1 6.619362e-10 -6.174928  
## aux\_price=f.price-(14,19.5] 2.177960e-10 -6.348237  
## model=Audi-Q3 1.795469e-10 -6.377888  
## year=f.Year-2013 4.790495e-11 -6.577306  
## engineSize=f.EngSize-1.2 2.206914e-12 -7.020743  
## manufacturer=Audi 1.538197e-13 -7.383813  
## Audi=Audi Yes 1.538197e-13 -7.383813  
## engineSize=f.EngSize-3 1.747156e-14 -7.667988  
## fuelType=f.Fuel-Petrol 9.832501e-17 -8.306791  
## year=f.Year-2014 2.330472e-20 -9.246002  
## aux\_price=f.price-[0.65,14] 4.688957e-32 -11.784554  
## aux\_tax=f.tax-[0,125] 6.672042e-33 -11.947733  
## year=f.Year-2015 2.348438e-44 -13.970839  
## aux\_tax=f.tax-(145,580] 7.624179e-50 -14.843858  
## year=f.Year-2017 6.061011e-67 -17.285390  
## aux\_years\_sell=f.years\_sell-(6,23] 8.130952e-79 -18.796079  
## aux\_years\_sell=f.years\_sell-(5,6] 5.837475e-102 -21.438574  
## year=f.Year-2016 5.837475e-102 -21.438574  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 1.558050e-118 -23.147012  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 1.906170e-122 -23.532289  
## aux\_mpg=f.mpg-[8.8,44.8] 4.069569e-158 -26.791403  
##   
## $`3`  
## Cla/Mod Mod/Cla Global  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 30.1886792 64.3356643 26.86797443  
## aux\_tax=f.tax-(145,580] 25.8741259 58.2167832 28.36676218  
## year=f.Year-2017 29.1917973 42.3076923 18.27198589  
## aux\_mpg=f.mpg-(44.8,53.3] 23.6280488 54.1958042 28.91778708  
## aux\_years\_sell=f.years\_sell-(3,5] 23.6600306 54.0209790 28.78554111  
## engineSize=f.EngSize-3 33.6206897 27.2727273 10.22702226  
## engineSize=f.EngSize-1.4 41.9117647 19.9300699 5.99515098  
## aux\_years\_sell=f.years\_sell-(5,6] 22.2946545 29.8951049 16.90544413  
## year=f.Year-2016 22.2946545 29.8951049 16.90544413  
## fuelType=f.Fuel-Petrol 16.6327569 57.1678322 43.33259863  
## model=VW-Tiguan 33.7579618 9.2657343 3.46043641  
## aux\_price=f.price-(14,19.5] 18.1355932 37.4125874 26.00837558  
## model=Mercedes-GLE Class 44.8979592 3.8461538 1.08000882  
## model=Audi-Q3 30.0000000 7.3426573 3.08573948  
## engineSize=f.EngSize-1.8 61.1111111 1.9230769 0.39673793  
## year=f.Year-2015 21.0826211 12.9370629 7.73638968  
## model=VW-Scirocco 52.3809524 1.9230769 0.46286092  
## model=Mercedes-V Class 55.5555556 1.7482517 0.39673793  
## model=VW-Touareg 41.9354839 2.2727273 0.68327088  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 16.1683278 25.5244755 19.90301962  
## model=BMW-M3 80.0000000 0.6993007 0.11020498  
## manufacturer=Audi 15.6250000 26.2237762 21.15935640  
## Audi=Audi Yes 15.6250000 26.2237762 21.15935640  
## model=BMW-X3 31.5789474 2.0979021 0.83755786  
## aux\_mpg=f.mpg-[8.8,44.8] 15.2753108 30.0699301 24.81816178  
## model=Audi-Q5 25.0000000 3.4965035 1.76327970  
## engineSize=f.EngSize-4.2 or more 57.1428571 0.6993007 0.15428697  
## model=Mercedes-GLS Class 45.4545455 0.8741259 0.24245096  
## model=Audi-SQ5 100.0000000 0.3496503 0.04408199  
## model=VW-Shuttle 44.4444444 0.6993007 0.19836897  
## model=Mercedes-CLS Class 33.3333333 1.0489510 0.39673793  
## aux\_price=f.price-(19.5,26] 14.4617913 30.7692308 26.82389244  
## model=BMW-3 Series 17.6190476 6.4685315 4.62860921  
## aux\_years\_sell=f.years\_sell-(6,23] 15.1815182 16.0839161 13.35684373  
## model=BMW-7 Series 36.3636364 0.6993007 0.24245096  
## model=Mercedes-E Class 7.6923077 2.2727273 3.72492837  
## model=VW-T-Cross 0.0000000 0.0000000 0.55102491  
## model=Mercedes-A Class 8.3333333 3.6713287 5.55433106  
## model=BMW-5 Series 4.2253521 0.5244755 1.56491073  
## model=VW-T-Roc 3.1746032 0.3496503 1.38858276  
## model=Mercedes-GLA Class 3.7037037 0.5244755 1.78532070  
## model=Mercedes-GLC Class 4.5454545 0.8741259 2.42450959  
## model=Audi-A3 6.0439560 1.9230769 4.01146132  
## model=VW-Passat 2.5641026 0.3496503 1.71919771  
## Audi=Audi No 11.7975958 73.7762238 78.84064360  
## manufacturer=Mercedes 9.8307816 21.3286713 27.35287635  
## model=Mercedes-B Class 0.0000000 0.0000000 1.27837778  
## engineSize=f.EngSize-1.6 6.2091503 3.3216783 6.74454485  
## model=VW-Up 1.1764706 0.1748252 1.87348468  
## year=f.Year-2013 1.1627907 0.1748252 1.89552568  
## engineSize=f.EngSize-1.2 2.4793388 0.5244755 2.66696055  
## aux\_price=f.price-[0.65,14] 8.9159068 15.3846154 21.75446330  
## engineSize=f.EngSize-1.3 0.0000000 0.0000000 1.67511572  
## model=Mercedes-C Class 5.6379822 3.3216783 7.42781574  
## engineSize=f.EngSize-2.1 4.6703297 2.9720280 8.02292264  
## aux\_mpg=f.mpg-(53.3,61.4] 8.0935252 15.7342657 24.50958783  
## aux\_price=f.price-(26,110] 8.1526453 16.4335664 25.41326868  
## fuelType=f.Fuel-Diesel 9.4481937 41.6083916 55.52126956  
## model=VW-Polo 2.0710059 1.2237762 7.44985673  
## aux\_tax=f.tax-[0,125] 0.0000000 0.0000000 5.77474102  
## engineSize=f.EngSize-1.5 2.6168224 2.4475524 11.79193300  
## year=f.Year-2020 0.0000000 0.0000000 6.63433987  
## engineSize=f.EngSize-1 0.4987531 0.3496503 8.83843950  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 4.7775947 10.1398601 26.75776945  
## aux\_tax=f.tax-(125,145] 7.9986613 41.7832168 65.85849680  
## aux\_mpg=f.mpg-(61.4,88.3] 0.0000000 0.0000000 21.75446330  
## aux\_mileage=f.mileage-[4,6e+03] 0.0000000 0.0000000 26.47123650  
## year=f.Year-2019 0.0000000 0.0000000 34.31783117  
## aux\_years\_sell=f.years\_sell-[2,3] 0.0000000 0.0000000 40.95217104  
## p.value v.test  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.435623e-91 20.268584  
## aux\_tax=f.tax-(145,580] 4.327399e-58 16.067268  
## year=f.Year-2017 1.456410e-47 14.487356  
## aux\_mpg=f.mpg-(44.8,53.3] 3.473193e-42 13.610404  
## aux\_years\_sell=f.years\_sell-(3,5] 4.006287e-42 13.599964  
## engineSize=f.EngSize-3 2.048401e-36 12.602391  
## engineSize=f.EngSize-1.4 2.290340e-36 12.593584  
## aux\_years\_sell=f.years\_sell-(5,6] 1.091130e-16 8.294424  
## year=f.Year-2016 1.091130e-16 8.294424  
## fuelType=f.Fuel-Petrol 1.237524e-12 7.101117  
## model=VW-Tiguan 2.594591e-12 6.998099  
## aux\_price=f.price-(14,19.5] 1.244481e-10 6.433805  
## model=Mercedes-GLE Class 2.335002e-08 5.585149  
## model=Audi-Q3 3.311930e-08 5.524093  
## engineSize=f.EngSize-1.8 1.741718e-06 4.781292  
## year=f.Year-2015 3.428847e-06 4.643302  
## model=VW-Scirocco 1.390402e-05 4.345371  
## model=Mercedes-V Class 1.755580e-05 4.293905  
## model=VW-Touareg 4.933271e-05 4.058766  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 4.496551e-04 3.509083  
## model=BMW-M3 1.157564e-03 3.249135  
## manufacturer=Audi 1.905398e-03 3.104595  
## Audi=Audi Yes 1.905398e-03 3.104595  
## model=BMW-X3 2.206044e-03 3.060993  
## aux\_mpg=f.mpg-[8.8,44.8] 2.240698e-03 3.056323  
## model=Audi-Q5 2.342203e-03 3.043015  
## engineSize=f.EngSize-4.2 or more 6.920410e-03 2.700650  
## model=Mercedes-GLS Class 8.560110e-03 2.629140  
## model=Audi-SQ5 1.587049e-02 2.411880  
## model=VW-Shuttle 2.124516e-02 2.303599  
## model=Mercedes-CLS Class 2.352383e-02 2.264818  
## aux\_price=f.price-(19.5,26] 2.425359e-02 2.253088  
## model=BMW-3 Series 3.163045e-02 2.149050  
## aux\_years\_sell=f.years\_sell-(6,23] 4.421418e-02 2.012055  
## model=BMW-7 Series 4.739645e-02 1.982740  
## model=Mercedes-E Class 4.117496e-02 -2.041764  
## model=VW-T-Cross 3.409585e-02 -2.118936  
## model=Mercedes-A Class 2.921485e-02 -2.180575  
## model=BMW-5 Series 1.999853e-02 -2.326375  
## model=VW-T-Roc 1.203195e-02 -2.511206  
## model=Mercedes-GLA Class 7.150056e-03 -2.689773  
## model=Mercedes-GLC Class 4.760492e-03 -2.822809  
## model=Audi-A3 3.461902e-03 -2.923437  
## model=VW-Passat 2.220153e-03 -3.059083  
## Audi=Audi No 1.905398e-03 -3.104595  
## manufacturer=Mercedes 4.253072e-04 -3.523861  
## model=Mercedes-B Class 3.823670e-04 -3.551964  
## engineSize=f.EngSize-1.6 1.707725e-04 -3.758738  
## model=VW-Up 1.372640e-04 -3.813047  
## year=f.Year-2013 1.208687e-04 -3.844358  
## engineSize=f.EngSize-1.2 8.521546e-05 -3.929238  
## aux\_price=f.price-[0.65,14] 4.600481e-05 -4.075048  
## engineSize=f.EngSize-1.3 3.252555e-05 -4.155023  
## model=Mercedes-C Class 1.305403e-05 -4.359197  
## engineSize=f.EngSize-2.1 1.327104e-07 -5.275063  
## aux\_mpg=f.mpg-(53.3,61.4] 5.743292e-08 -5.426615  
## aux\_price=f.price-(26,110] 4.280801e-08 -5.478858  
## fuelType=f.Fuel-Diesel 9.775118e-13 -7.133637  
## model=VW-Polo 6.941994e-13 -7.180573  
## aux\_tax=f.tax-[0,125] 1.491918e-16 -8.257150  
## engineSize=f.EngSize-1.5 7.653835e-18 -8.604667  
## year=f.Year-2020 5.359536e-19 -8.904566  
## engineSize=f.EngSize-1 4.888317e-22 -9.650570  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 2.080141e-25 -10.416715  
## aux\_tax=f.tax-(125,145] 1.599169e-36 -12.621899  
## aux\_mpg=f.mpg-(61.4,88.3] 1.762414e-66 -17.223734  
## aux\_mileage=f.mileage-[4,6e+03] 2.274157e-83 -19.344359  
## year=f.Year-2019 2.672856e-114 -22.722697  
## aux\_years\_sell=f.years\_sell-[2,3] 7.497481e-144 -25.537823  
##   
## $`4`  
## Cla/Mod Mod/Cla Global  
## aux\_mpg=f.mpg-(61.4,88.3] 58.4599797 60.7368421 21.75446330  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 49.7949139 63.8947368 26.86797443  
## year=f.Year-2017 56.0916767 48.9473684 18.27198589  
## aux\_years\_sell=f.years\_sell-(3,5] 43.2618683 59.4736842 28.78554111  
## aux\_price=f.price-[0.65,14] 41.6413374 43.2631579 21.75446330  
## model=VW-Polo 52.6627219 18.7368421 7.44985673  
## engineSize=f.EngSize-1.2 76.0330579 9.6842105 2.66696055  
## aux\_years\_sell=f.years\_sell-(5,6] 39.3741851 31.7894737 16.90544413  
## year=f.Year-2016 39.3741851 31.7894737 16.90544413  
## transmission=f.Trans-Manual 31.3149847 53.8947368 36.03702887  
## aux\_mpg=f.mpg-(53.3,61.4] 33.5431655 39.2631579 24.50958783  
## aux\_price=f.price-(14,19.5] 30.9322034 38.4210526 26.00837558  
## engineSize=f.EngSize-2.1 39.8351648 15.2631579 8.02292264  
## engineSize=f.EngSize-1 37.6558603 15.8947368 8.83843950  
## fuelType=f.Fuel-Diesel 25.1290195 66.6315789 55.52126956  
## aux\_tax=f.tax-(125,145] 24.0963855 75.7894737 65.85849680  
## manufacturer=VW 26.0533708 39.0526316 31.38637866  
## model=VW-Up 45.8823529 4.1052632 1.87348468  
## model=Audi-A1 36.9230769 5.0526316 2.86532951  
## engineSize=f.EngSize-1.6 28.4313725 9.1578947 6.74454485  
## model=Audi-A3 30.7692308 5.8947368 4.01146132  
## model=Mercedes-A Class 28.5714286 7.5789474 5.55433106  
## model=BMW-1 Series 29.4444444 5.5789474 3.96737933  
## model=Mercedes-E Class 29.5857988 5.2631579 3.72492837  
## Audi=Audi No 21.6102880 81.3684211 78.84064360  
## model=BMW-i3 75.0000000 0.3157895 0.08816399  
## engineSize=f.EngSize-2.9 0.0000000 0.0000000 0.28653295  
## model=VW-Tiguan Allspace 0.0000000 0.0000000 0.30857395  
## model=VW-Amarok 0.0000000 0.0000000 0.30857395  
## manufacturer=Audi 18.4375000 18.6315789 21.15935640  
## Audi=Audi Yes 18.4375000 18.6315789 21.15935640  
## model=Audi-A8 0.0000000 0.0000000 0.33061494  
## model=BMW-X4 0.0000000 0.0000000 0.35265594  
## model=VW-Arteon 3.7037037 0.1052632 0.59510690  
## model=BMW-4 Series 11.1111111 1.0526316 1.98368966  
## engineSize=f.EngSize-1.8 0.0000000 0.0000000 0.39673793  
## model=Mercedes-V Class 0.0000000 0.0000000 0.39673793  
## model=Mercedes-CLS Class 0.0000000 0.0000000 0.39673793  
## model=Audi-Q7 0.0000000 0.0000000 0.39673793  
## model=VW-Sharan 0.0000000 0.0000000 0.44081993  
## model=Mercedes-GLC Class 10.9090909 1.2631579 2.42450959  
## model=BMW-X2 0.0000000 0.0000000 0.48490192  
## model=BMW-X5 0.0000000 0.0000000 0.52898391  
## model=VW-T-Cross 0.0000000 0.0000000 0.55102491  
## aux\_tax=f.tax-(145,580] 17.8710179 24.2105263 28.36676218  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 17.0542636 16.2105263 19.90301962  
## model=VW-Touareg 0.0000000 0.0000000 0.68327088  
## model=BMW-X3 0.0000000 0.0000000 0.83755786  
## model=VW-T-Roc 3.1746032 0.2105263 1.38858276  
## model=BMW-2 Series 7.6923077 1.0526316 2.86532951  
## model=Audi-Q2 3.7974684 0.3157895 1.74123870  
## model=Mercedes-GLE Class 0.0000000 0.0000000 1.08000882  
## model=Audi-Q3 7.1428571 1.0526316 3.08573948  
## manufacturer=BMW 15.3508772 14.7368421 20.10138858  
## transmission=f.Trans-Automatic 15.4392192 18.3157895 24.84020278  
## aux\_years\_sell=f.years\_sell-(6,23] 12.7062706 8.1052632 13.35684373  
## engineSize=f.EngSize-1.3 0.0000000 0.0000000 1.67511572  
## model=Audi-Q5 0.0000000 0.0000000 1.76327970  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 15.2388797 19.4736842 26.75776945  
## model=VW-Tiguan 4.4585987 0.7368421 3.46043641  
## year=f.Year-2013 0.0000000 0.0000000 1.89552568  
## engineSize=f.EngSize-2 16.2317328 32.7368421 42.23054882  
## year=f.Year-2014 2.4691358 0.4210526 3.57064139  
## fuelType=f.Fuel-Petrol 15.4628688 32.0000000 43.33259863  
## aux\_price=f.price-(19.5,26] 13.1470830 16.8421053 26.82389244  
## transmission=f.Trans-SemiAuto 14.8732394 27.7894737 39.12276835  
## aux\_tax=f.tax-[0,125] 0.0000000 0.0000000 5.77474102  
## year=f.Year-2020 0.0000000 0.0000000 6.63433987  
## engineSize=f.EngSize-3 0.8620690 0.4210526 10.22702226  
## aux\_price=f.price-(26,110] 1.2142238 1.4736842 25.41326868  
## aux\_mpg=f.mpg-[8.8,44.8] 0.0000000 0.0000000 24.81816178  
## aux\_mileage=f.mileage-[4,6e+03] 0.3330558 0.4210526 26.47123650  
## aux\_mpg=f.mpg-(44.8,53.3] 0.0000000 0.0000000 28.91778708  
## year=f.Year-2019 0.3853565 0.6315789 34.31783117  
## aux\_years\_sell=f.years\_sell-[2,3] 0.3229279 0.6315789 40.95217104  
## p.value v.test  
## aux\_mpg=f.mpg-(61.4,88.3] 4.614655e-204 30.481278  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 3.483871e-167 27.558670  
## year=f.Year-2017 1.288506e-141 25.335803  
## aux\_years\_sell=f.years\_sell-(3,5] 1.165581e-112 22.556265  
## aux\_price=f.price-[0.65,14] 2.108484e-65 17.079519  
## model=VW-Polo 3.088334e-41 13.449770  
## engineSize=f.EngSize-1.2 1.494476e-39 13.159817  
## aux\_years\_sell=f.years\_sell-(5,6] 2.108409e-38 12.958310  
## year=f.Year-2016 2.108409e-38 12.958310  
## transmission=f.Trans-Manual 7.814524e-37 12.678160  
## aux\_mpg=f.mpg-(53.3,61.4] 2.205144e-30 11.455567  
## aux\_price=f.price-(14,19.5] 1.717482e-21 9.520862  
## engineSize=f.EngSize-2.1 8.819806e-18 8.588388  
## engineSize=f.EngSize-1 7.196956e-16 8.067131  
## fuelType=f.Fuel-Diesel 5.299809e-15 7.819584  
## aux\_tax=f.tax-(125,145] 1.261159e-13 7.410193  
## manufacturer=VW 1.635732e-08 5.646683  
## model=VW-Up 2.277319e-07 5.175147  
## model=Audi-A1 2.233091e-05 4.240212  
## engineSize=f.EngSize-1.6 1.265265e-03 3.223744  
## model=Audi-A3 1.470743e-03 3.180395  
## model=Mercedes-A Class 3.086880e-03 2.958951  
## model=BMW-1 Series 5.915979e-03 2.752402  
## model=Mercedes-E Class 6.806730e-03 2.706155  
## Audi=Audi No 3.058544e-02 2.162425  
## model=BMW-i3 3.280477e-02 2.134465  
## engineSize=f.EngSize-2.9 4.693882e-02 -1.986852  
## model=VW-Tiguan Allspace 3.708209e-02 -2.084859  
## model=VW-Amarok 3.708209e-02 -2.084859  
## manufacturer=Audi 3.058544e-02 -2.162425  
## Audi=Audi Yes 3.058544e-02 -2.162425  
## model=Audi-A8 2.929345e-02 -2.179515  
## model=BMW-X4 2.313937e-02 -2.271126  
## model=VW-Arteon 1.584832e-02 -2.412390  
## model=BMW-4 Series 1.511297e-02 -2.429661  
## engineSize=f.EngSize-1.8 1.443566e-02 -2.446236  
## model=Mercedes-V Class 1.443566e-02 -2.446236  
## model=Mercedes-CLS Class 1.443566e-02 -2.446236  
## model=Audi-Q7 1.443566e-02 -2.446236  
## model=VW-Sharan 9.003667e-03 -2.611915  
## model=Mercedes-GLC Class 5.716365e-03 -2.763622  
## model=BMW-X2 5.614355e-03 -2.769493  
## model=BMW-X5 3.500078e-03 -2.920021  
## model=VW-T-Cross 2.763301e-03 -2.992911  
## aux\_tax=f.tax-(145,580] 1.247111e-03 -3.227880  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 1.124804e-03 -3.257293  
## model=VW-Touareg 6.683313e-04 -3.402251  
## model=BMW-X3 1.272461e-04 -3.831729  
## model=VW-T-Roc 5.903356e-05 -4.016641  
## model=BMW-2 Series 3.690155e-05 -4.126070  
## model=Audi-Q2 1.491090e-05 -4.330001  
## model=Mercedes-GLE Class 9.334924e-06 -4.432032  
## model=Audi-Q3 6.862020e-06 -4.497924  
## manufacturer=BMW 1.919396e-06 -4.761731  
## transmission=f.Trans-Automatic 8.433764e-08 -5.357594  
## aux\_years\_sell=f.years\_sell-(6,23] 2.059508e-08 -5.606927  
## engineSize=f.EngSize-1.3 1.485881e-08 -5.663186  
## model=Audi-Q5 5.699286e-09 -5.825351  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 5.265164e-09 -5.838567  
## model=VW-Tiguan 3.154182e-09 -5.923366  
## year=f.Year-2013 1.351397e-09 -6.061164  
## engineSize=f.EngSize-2 1.753241e-11 -6.725223  
## year=f.Year-2014 2.614903e-12 -6.997006  
## fuelType=f.Fuel-Petrol 1.125090e-15 -8.012381  
## aux\_price=f.price-(19.5,26] 6.033134e-16 -8.088647  
## transmission=f.Trans-SemiAuto 2.775839e-16 -8.182687  
## aux\_tax=f.tax-[0,125] 2.289411e-28 -11.046102  
## year=f.Year-2020 1.206237e-32 -11.898410  
## engineSize=f.EngSize-3 8.602897e-44 -13.878070  
## aux\_price=f.price-(26,110] 3.219729e-113 -22.613118  
## aux\_mpg=f.mpg-[8.8,44.8] 1.641438e-135 -24.775639  
## aux\_mileage=f.mileage-[4,6e+03] 6.059006e-137 -24.908232  
## aux\_mpg=f.mpg-(44.8,53.3] 9.160220e-163 -27.187372  
## year=f.Year-2019 2.242778e-187 -29.195025  
## aux\_years\_sell=f.years\_sell-[2,3] 4.818828e-240 -33.085408  
##   
## $`5`  
## Cla/Mod Mod/Cla Global  
## aux\_tax=f.tax-(145,580] 9.5571096 100.0000000 28.36676218  
## aux\_years\_sell=f.years\_sell-(6,23] 9.4059406 46.3414634 13.35684373  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 7.0874862 52.0325203 19.90301962  
## engineSize=f.EngSize-3 9.4827586 35.7723577 10.22702226  
## aux\_mpg=f.mpg-[8.8,44.8] 5.6838366 52.0325203 24.81816178  
## year=f.Year-2015 9.1168091 26.0162602 7.73638968  
## aux\_years\_sell=f.years\_sell-(5,6] 6.2581486 39.0243902 16.90544413  
## year=f.Year-2016 6.2581486 39.0243902 16.90544413  
## model=BMW-X5 37.5000000 7.3170732 0.52898391  
## aux\_price=f.price-(19.5,26] 4.6836483 46.3414634 26.82389244  
## aux\_mpg=f.mpg-(44.8,53.3] 4.4969512 47.9674797 28.91778708  
## model=Audi-Q5 13.7500000 8.9430894 1.76327970  
## year=f.Year-2014 9.2592593 12.1951220 3.57064139  
## year=f.Year-2013 11.6279070 8.1300813 1.89552568  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 4.1017227 40.6504065 26.86797443  
## engineSize=f.EngSize-2 3.6534447 56.9105691 42.23054882  
## model=BMW-6 Series 30.0000000 2.4390244 0.22040996  
## model=Mercedes-M Class 50.0000000 1.6260163 0.08816399  
## model=BMW-X6 50.0000000 1.6260163 0.08816399  
## manufacturer=Audi 4.0625000 31.7073171 21.15935640  
## Audi=Audi Yes 4.0625000 31.7073171 21.15935640  
## model=Audi-Q3 7.1428571 8.1300813 3.08573948  
## transmission=f.Trans-Automatic 3.9041704 35.7723577 24.84020278  
## model=Audi-A8 20.0000000 2.4390244 0.33061494  
## model=BMW-X4 18.7500000 2.4390244 0.35265594  
## model=Mercedes-CLS Class 16.6666667 2.4390244 0.39673793  
## model=Audi-Q7 16.6666667 2.4390244 0.39673793  
## model=Mercedes-S Class 16.6666667 1.6260163 0.26449196  
## model=BMW-Z4 16.6666667 1.6260163 0.26449196  
## model=Mercedes-GLC Class 0.0000000 0.0000000 2.42450959  
## model=Audi-A4 0.0000000 0.0000000 2.53471457  
## engineSize=f.EngSize-1.2 0.0000000 0.0000000 2.66696055  
## model=Audi-A1 0.0000000 0.0000000 2.86532951  
## engineSize=f.EngSize-1.4 0.7352941 1.6260163 5.99515098  
## manufacturer=Mercedes 1.7727639 17.8861789 27.35287635  
## model=Mercedes-E Class 0.0000000 0.0000000 3.72492837  
## aux\_price=f.price-[0.65,14] 1.5197568 12.1951220 21.75446330  
## Audi=Audi No 2.3483366 68.2926829 78.84064360  
## aux\_price=f.price-(26,110] 1.5611448 14.6341463 25.41326868  
## model=Mercedes-C Class 0.2967359 0.8130081 7.42781574  
## aux\_tax=f.tax-[0,125] 0.0000000 0.0000000 5.77474102  
## aux\_years\_sell=f.years\_sell-(3,5] 1.3782542 14.6341463 28.78554111  
## year=f.Year-2020 0.0000000 0.0000000 6.63433987  
## engineSize=f.EngSize-1.6 0.0000000 0.0000000 6.74454485  
## model=VW-Polo 0.0000000 0.0000000 7.44985673  
## engineSize=f.EngSize-1 0.0000000 0.0000000 8.83843950  
## transmission=f.Trans-Manual 1.2844037 17.0731707 36.03702887  
## year=f.Year-2018 0.0000000 0.0000000 10.51355521  
## engineSize=f.EngSize-1.5 0.0000000 0.0000000 11.79193300  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 0.7413509 7.3170732 26.75776945  
## aux\_mpg=f.mpg-(61.4,88.3] 0.0000000 0.0000000 21.75446330  
## aux\_mpg=f.mpg-(53.3,61.4] 0.0000000 0.0000000 24.50958783  
## aux\_mileage=f.mileage-[4,6e+03] 0.0000000 0.0000000 26.47123650  
## year=f.Year-2019 0.0000000 0.0000000 34.31783117  
## aux\_years\_sell=f.years\_sell-[2,3] 0.0000000 0.0000000 40.95217104  
## aux\_tax=f.tax-(125,145] 0.0000000 0.0000000 65.85849680  
## p.value v.test  
## aux\_tax=f.tax-(145,580] 6.369576e-70 17.676438  
## aux\_years\_sell=f.years\_sell-(6,23] 1.747650e-19 9.028046  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 9.893635e-16 8.028171  
## engineSize=f.EngSize-3 1.191617e-14 7.716934  
## aux\_mpg=f.mpg-[8.8,44.8] 5.773887e-11 6.549477  
## year=f.Year-2015 4.319601e-10 6.242018  
## aux\_years\_sell=f.years\_sell-(5,6] 3.330832e-09 5.914402  
## year=f.Year-2016 3.330832e-09 5.914402  
## model=BMW-X5 5.690657e-09 5.825604  
## aux\_price=f.price-(19.5,26] 2.778016e-06 4.686585  
## aux\_mpg=f.mpg-(44.8,53.3] 6.590133e-06 4.506514  
## model=Audi-Q5 9.140160e-06 4.436575  
## year=f.Year-2014 3.083755e-05 4.167191  
## year=f.Year-2013 1.083519e-04 3.871085  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 8.036222e-04 3.351544  
## engineSize=f.EngSize-2 9.523471e-04 3.304239  
## model=BMW-6 Series 2.125145e-03 3.072162  
## model=Mercedes-M Class 4.297143e-03 2.855483  
## model=BMW-X6 4.297143e-03 2.855483  
## manufacturer=Audi 5.625656e-03 2.768838  
## Audi=Audi Yes 5.625656e-03 2.768838  
## model=Audi-Q3 5.644753e-03 2.767734  
## transmission=f.Trans-Automatic 6.215898e-03 2.736170  
## model=Audi-A8 7.527234e-03 2.672571  
## model=BMW-X4 9.138136e-03 2.606843  
## model=Mercedes-CLS Class 1.295435e-02 2.485022  
## model=Audi-Q7 1.295435e-02 2.485022  
## model=Mercedes-S Class 4.386434e-02 2.015385  
## model=BMW-Z4 4.386434e-02 2.015385  
## model=Mercedes-GLC Class 4.685259e-02 -1.987630  
## model=Audi-A4 4.069296e-02 -2.046645  
## engineSize=f.EngSize-1.2 3.435337e-02 -2.115899  
## model=Audi-A1 2.663509e-02 -2.216824  
## engineSize=f.EngSize-1.4 2.253878e-02 -2.281163  
## manufacturer=Mercedes 1.392839e-02 -2.459105  
## model=Mercedes-E Class 8.788103e-03 -2.620189  
## aux\_price=f.price-[0.65,14] 6.270384e-03 -2.733297  
## Audi=Audi No 5.625656e-03 -2.768838  
## aux\_price=f.price-(26,110] 3.637814e-03 -2.907972  
## model=Mercedes-C Class 8.006980e-04 -3.352553  
## aux\_tax=f.tax-[0,125] 5.994214e-04 -3.431876  
## aux\_years\_sell=f.years\_sell-(3,5] 2.108001e-04 -3.705709  
## year=f.Year-2020 1.909925e-04 -3.730642  
## engineSize=f.EngSize-1.6 1.648160e-04 -3.767613  
## model=VW-Polo 6.389464e-05 -3.997946  
## engineSize=f.EngSize-1 9.679875e-06 -4.424203  
## transmission=f.Trans-Manual 3.084650e-06 -4.665101  
## year=f.Year-2018 9.552526e-07 -4.900639  
## engineSize=f.EngSize-1.5 1.583524e-07 -5.242573  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 3.867777e-08 -5.496785  
## aux\_mpg=f.mpg-(61.4,88.3] 4.916478e-14 -7.534118  
## aux\_mpg=f.mpg-(53.3,61.4] 5.527285e-16 -8.099308  
## aux\_mileage=f.mileage-[4,6e+03] 2.041982e-17 -8.491380  
## year=f.Year-2019 1.452254e-23 -10.004772  
## aux\_years\_sell=f.years\_sell-[2,3] 2.226146e-29 -11.253487  
## aux\_tax=f.tax-(125,145] 1.435974e-59 -16.277063  
##   
## $`6`  
## Cla/Mod Mod/Cla Global  
## aux\_tax=f.tax-[0,125] 100.00000000 99.6197719 5.7747410  
## aux\_mpg=f.mpg-(53.3,61.4] 16.54676259 69.9619772 24.5095878  
## aux\_years\_sell=f.years\_sell-(5,6] 16.81877445 49.0494297 16.9054441  
## year=f.Year-2016 16.81877445 49.0494297 16.9054441  
## engineSize=f.EngSize-2.1 21.70329670 30.0380228 8.0229226  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 14.17497231 48.6692015 19.9030196  
## aux\_price=f.price-(14,19.5] 11.69491525 52.4714829 26.0083756  
## aux\_years\_sell=f.years\_sell-(6,23] 13.20132013 30.4182510 13.3568437  
## model=Mercedes-GLC Class 24.54545455 10.2661597 2.4245096  
## model=Mercedes-GLA Class 27.16049383 8.3650190 1.7853207  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 9.51599672 44.1064639 26.8679744  
## model=BMW-X1 28.57142857 7.6045627 1.5428697  
## manufacturer=Mercedes 8.78323932 41.4448669 27.3528764  
## fuelType=f.Fuel-Diesel 7.26478761 69.5817490 55.5212696  
## year=f.Year-2015 11.96581197 15.9695817 7.7363897  
## year=f.Year-2013 18.60465116 6.0836502 1.8955257  
## model=Mercedes-GL Class 41.66666667 1.9011407 0.2644920  
## year=f.Year-2014 12.96296296 7.9847909 3.5706414  
## manufacturer=BMW 7.78508772 26.9961977 20.1013886  
## model=VW-Touran 17.64705882 2.2813688 0.7493939  
## aux\_price=f.price-[0.65,14] 7.39614995 27.7566540 21.7544633  
## Audi=Audi No 6.17836176 84.0304183 78.8406436  
## manufacturer=Audi 4.37500000 15.9695817 21.1593564  
## Audi=Audi Yes 4.37500000 15.9695817 21.1593564  
## model=VW-T-Roc 0.00000000 0.0000000 1.3885828  
## engineSize=f.EngSize-1.3 0.00000000 0.0000000 1.6751157  
## model=Audi-Q5 0.00000000 0.0000000 1.7632797  
## model=VW-Up 0.00000000 0.0000000 1.8734847  
## aux\_years\_sell=f.years\_sell-(3,5] 4.13476263 20.5323194 28.7855411  
## engineSize=f.EngSize-1.5 2.99065421 6.0836502 11.7919330  
## model=VW-Polo 2.07100592 2.6615970 7.4498567  
## aux\_price=f.price-(19.5,26] 3.86195563 17.8707224 26.8238924  
## fuelType=f.Fuel-Petrol 4.01831129 30.0380228 43.3325986  
## model=VW-Golf 1.53508772 2.6615970 10.0506943  
## engineSize=f.EngSize-3 1.29310345 2.2813688 10.2270223  
## year=f.Year-2020 0.00000000 0.0000000 6.6343399  
## manufacturer=VW 2.87921348 15.5893536 31.3863787  
## engineSize=f.EngSize-1 0.00000000 0.0000000 8.8384395  
## year=f.Year-2018 0.00000000 0.0000000 10.5135552  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 1.56507414 7.2243346 26.7577695  
## aux\_price=f.price-(26,110] 0.43365134 1.9011407 25.4132687  
## aux\_mpg=f.mpg-(61.4,88.3] 0.00000000 0.0000000 21.7544633  
## aux\_mpg=f.mpg-[8.8,44.8] 0.08880995 0.3802281 24.8181618  
## aux\_mileage=f.mileage-[4,6e+03] 0.00000000 0.0000000 26.4712365  
## aux\_tax=f.tax-(145,580] 0.00000000 0.0000000 28.3667622  
## year=f.Year-2019 0.00000000 0.0000000 34.3178312  
## aux\_years\_sell=f.years\_sell-[2,3] 0.00000000 0.0000000 40.9521710  
## aux\_tax=f.tax-(125,145] 0.03346720 0.3802281 65.8584968  
## p.value v.test  
## aux\_tax=f.tax-[0,125] 0.000000e+00 Inf  
## aux\_mpg=f.mpg-(53.3,61.4] 4.289299e-58 16.067817  
## aux\_years\_sell=f.years\_sell-(5,6] 1.006143e-35 12.476250  
## year=f.Year-2016 1.006143e-35 12.476250  
## engineSize=f.EngSize-2.1 1.130251e-27 10.901779  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 2.738265e-27 10.820982  
## aux\_price=f.price-(14,19.5] 4.361829e-21 9.423527  
## aux\_years\_sell=f.years\_sell-(6,23] 9.291914e-14 7.450597  
## model=Mercedes-GLC Class 6.260056e-11 6.537393  
## model=Mercedes-GLA Class 5.039742e-10 6.217862  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 5.874826e-10 6.193753  
## model=BMW-X1 1.202966e-09 6.079848  
## manufacturer=Mercedes 3.857900e-07 5.075839  
## fuelType=f.Fuel-Diesel 1.633256e-06 4.794200  
## year=f.Year-2015 4.209724e-06 4.600750  
## year=f.Year-2013 3.116050e-05 4.164815  
## model=Mercedes-GL Class 3.809536e-04 3.552938  
## year=f.Year-2014 4.991480e-04 3.481213  
## manufacturer=BMW 5.426874e-03 2.780539  
## model=VW-Touran 1.502677e-02 2.431733  
## aux\_price=f.price-[0.65,14] 1.780602e-02 2.369627  
## Audi=Audi No 3.006261e-02 2.169264  
## manufacturer=Audi 3.006261e-02 -2.169264  
## Audi=Audi Yes 3.006261e-02 -2.169264  
## model=VW-T-Roc 2.262183e-02 -2.279762  
## engineSize=f.EngSize-1.3 1.028050e-02 -2.566249  
## model=Audi-Q5 8.061550e-03 -2.649481  
## model=VW-Up 5.946842e-03 -2.750698  
## aux\_years\_sell=f.years\_sell-(3,5] 1.779870e-03 -3.124699  
## engineSize=f.EngSize-1.5 1.562562e-03 -3.162807  
## model=VW-Polo 7.284769e-04 -3.378631  
## aux\_price=f.price-(19.5,26] 4.797187e-04 -3.491833  
## fuelType=f.Fuel-Petrol 5.383407e-06 -4.549263  
## model=VW-Golf 2.706381e-06 -4.691931  
## engineSize=f.EngSize-3 3.833616e-07 -5.077039  
## year=f.Year-2020 8.223950e-09 -5.763803  
## manufacturer=VW 1.832350e-09 -6.012012  
## engineSize=f.EngSize-1 1.250816e-11 -6.774217  
## year=f.Year-2018 8.092862e-14 -7.468801  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 1.700696e-16 -8.241497  
## aux\_price=f.price-(26,110] 1.636107e-27 -10.868078  
## aux\_mpg=f.mpg-(61.4,88.3] 1.048457e-29 -11.319687  
## aux\_mpg=f.mpg-[8.8,44.8] 1.819404e-32 -11.864057  
## aux\_mileage=f.mileage-[4,6e+03] 4.304970e-37 -12.724814  
## aux\_tax=f.tax-(145,580] 3.353107e-40 -13.272261  
## year=f.Year-2019 1.502424e-50 -14.952397  
## aux\_years\_sell=f.years\_sell-[2,3] 2.588001e-63 -16.796517  
## aux\_tax=f.tax-(125,145] 1.403298e-127 -24.028430  
##   
## $`7`  
## Cla/Mod Mod/Cla Global  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 45.5149502 95.8041958 19.90301962  
## aux\_years\_sell=f.years\_sell-(6,23] 49.5049505 69.9300699 13.35684373  
## aux\_price=f.price-[0.65,14] 29.8885512 68.7645688 21.75446330  
## aux\_tax=f.tax-(145,580] 25.5633256 76.6899767 28.36676218  
## year=f.Year-2014 64.8148148 24.4755245 3.57064139  
## aux\_mpg=f.mpg-(61.4,88.3] 24.7213779 56.8764569 21.75446330  
## year=f.Year-2015 37.0370370 30.3030303 7.73638968  
## year=f.Year-2013 68.6046512 13.7529138 1.89552568  
## fuelType=f.Fuel-Diesel 13.4974196 79.2540793 55.52126956  
## transmission=f.Trans-Manual 14.6177370 55.7109557 36.03702887  
## aux\_years\_sell=f.years\_sell-(5,6] 15.2542373 27.2727273 16.90544413  
## year=f.Year-2016 15.2542373 27.2727273 16.90544413  
## engineSize=f.EngSize-1.6 18.9542484 13.5198135 6.74454485  
## engineSize=f.EngSize-2.1 17.8571429 15.1515152 8.02292264  
## year=f.Year-2012 85.7142857 1.3986014 0.15428697  
## model=VW-Passat 25.6410256 4.6620047 1.71919771  
## model=Audi-A3 17.5824176 7.4592075 4.01146132  
## model=Mercedes-SLK 100.0000000 0.6993007 0.06612299  
## model=BMW-3 Series 15.7142857 7.6923077 4.62860921  
## engineSize=f.EngSize-1.4 14.3382353 9.0909091 5.99515098  
## model=BMW-1 Series 15.0000000 6.2937063 3.96737933  
## model=VW-Touareg 0.0000000 0.0000000 0.68327088  
## model=BMW-2 Series 4.6153846 1.3986014 2.86532951  
## manufacturer=Mercedes 7.8968574 22.8438228 27.35287635  
## model=Audi-Q5 2.5000000 0.4662005 1.76327970  
## model=Mercedes-GLE Class 0.0000000 0.0000000 1.08000882  
## model=Audi-Q2 1.2658228 0.2331002 1.74123870  
## model=VW-T-Roc 0.0000000 0.0000000 1.38858276  
## engineSize=f.EngSize-1.3 0.0000000 0.0000000 1.67511572  
## engineSize=f.EngSize-1 4.4887781 4.1958042 8.83843950  
## model=Mercedes-GLC Class 0.0000000 0.0000000 2.42450959  
## engineSize=f.EngSize-3 4.3103448 4.6620047 10.22702226  
## engineSize=f.EngSize-1.5 3.7383178 4.6620047 11.79193300  
## aux\_tax=f.tax-[0,125] 0.0000000 0.0000000 5.77474102  
## year=f.Year-2020 0.0000000 0.0000000 6.63433987  
## aux\_mpg=f.mpg-(44.8,53.3] 4.5731707 13.9860140 28.91778708  
## transmission=f.Trans-SemiAuto 5.4084507 22.3776224 39.12276835  
## year=f.Year-2018 0.0000000 0.0000000 10.51355521  
## year=f.Year-2017 1.4475271 2.7972028 18.27198589  
## fuelType=f.Fuel-Petrol 4.1709054 19.1142191 43.33259863  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 1.4766202 4.1958042 26.86797443  
## aux\_mpg=f.mpg-[8.8,44.8] 0.6216696 1.6317016 24.81816178  
## aux\_years\_sell=f.years\_sell-(3,5] 0.9188361 2.7972028 28.78554111  
## aux\_price=f.price-(19.5,26] 0.4930156 1.3986014 26.82389244  
## aux\_price=f.price-(26,110] 0.0000000 0.0000000 25.41326868  
## aux\_mileage=f.mileage-[4,6e+03] 0.0000000 0.0000000 26.47123650  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 0.0000000 0.0000000 26.75776945  
## aux\_tax=f.tax-(125,145] 3.3467202 23.3100233 65.85849680  
## year=f.Year-2019 0.0000000 0.0000000 34.31783117  
## aux\_years\_sell=f.years\_sell-[2,3] 0.0000000 0.0000000 40.95217104  
## p.value v.test  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 9.891670e-299 36.941721  
## aux\_years\_sell=f.years\_sell-(6,23] 1.190092e-189 29.373713  
## aux\_price=f.price-[0.65,14] 2.196663e-109 22.220082  
## aux\_tax=f.tax-(145,580] 6.461240e-107 21.963313  
## year=f.Year-2014 3.367288e-71 17.841469  
## aux\_mpg=f.mpg-(61.4,88.3] 2.802331e-63 16.791796  
## year=f.Year-2015 2.895136e-50 14.908658  
## year=f.Year-2013 1.379575e-41 13.509230  
## fuelType=f.Fuel-Diesel 4.718653e-27 10.770997  
## transmission=f.Trans-Manual 2.843931e-18 8.717507  
## aux\_years\_sell=f.years\_sell-(5,6] 1.360434e-08 5.678296  
## year=f.Year-2016 1.360434e-08 5.678296  
## engineSize=f.EngSize-1.6 1.152278e-07 5.300909  
## engineSize=f.EngSize-2.1 1.910522e-07 5.207839  
## year=f.Year-2012 4.523182e-06 4.585769  
## model=VW-Passat 2.947729e-05 4.177467  
## model=Audi-A3 4.960550e-04 3.482878  
## model=Mercedes-SLK 8.400591e-04 3.339247  
## model=BMW-3 Series 3.183018e-03 2.949487  
## engineSize=f.EngSize-1.4 7.344760e-03 2.680795  
## model=BMW-1 Series 1.501424e-02 2.432036  
## model=VW-Touareg 4.550310e-02 -1.999974  
## model=BMW-2 Series 4.308395e-02 -2.022895  
## manufacturer=Mercedes 2.589983e-02 -2.227710  
## model=Audi-Q5 1.800941e-02 -2.365425  
## model=Mercedes-GLE Class 7.488184e-03 -2.674316  
## model=Audi-Q2 3.787305e-03 -2.895355  
## model=VW-T-Roc 1.830504e-03 -3.116438  
## engineSize=f.EngSize-1.3 4.927869e-04 -3.484647  
## engineSize=f.EngSize-1 1.171853e-04 -3.851941  
## model=Mercedes-GLC Class 1.562498e-05 -4.319688  
## engineSize=f.EngSize-3 1.391587e-05 -4.345184  
## engineSize=f.EngSize-1.5 1.132372e-07 -5.304089  
## aux\_tax=f.tax-[0,125] 2.195269e-12 -7.021482  
## year=f.Year-2020 3.482496e-14 -7.578992  
## aux\_mpg=f.mpg-(44.8,53.3] 2.626474e-14 -7.615512  
## transmission=f.Trans-SemiAuto 1.180600e-14 -7.718118  
## year=f.Year-2018 1.573773e-22 -9.766111  
## year=f.Year-2017 1.054585e-24 -10.261136  
## fuelType=f.Fuel-Petrol 1.457598e-28 -11.086577  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 7.890038e-38 -12.856673  
## aux\_mpg=f.mpg-[8.8,44.8] 3.074791e-45 -14.114894  
## aux\_years\_sell=f.years\_sell-(3,5] 6.145270e-49 -14.703235  
## aux\_price=f.price-(19.5,26] 1.044903e-51 -15.128860  
## aux\_price=f.price-(26,110] 1.369910e-58 -16.138426  
## aux\_mileage=f.mileage-[4,6e+03] 1.947890e-61 -16.538190  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 3.242714e-62 -16.645860  
## aux\_tax=f.tax-(125,145] 1.866950e-80 -18.995250  
## year=f.Year-2019 4.922035e-84 -19.423107  
## aux\_years\_sell=f.years\_sell-[2,3] 1.508111e-105 -21.819710

We start with the description of the categorical variables that characterize the clusters:

Cluster 1: Cluster one has cars with few years\_sell, low mpg, medium taxes, low mileage and high price. Also, cars with semiAuto transmission and cars with petrol as fuel predominate. We can say this because these categories are overrepresented in the cluster.

Cluster 2: Cluster two has cars with few years\_sell, low mpg and medium taxes and high price. Also, cars with diesel as fuel and non-Audi cars predominate.

Cluster 3: Cluster three has cars with high taxes, few years\_sell, low mpg and high mileage and medium price. Also, cars with petrol as fuel predominate.

Cluster 4: Cluster four has cars with high mpg, high mileage, few years\_sell, low price and medium taxes. Also, cars with manual transmission and cars with diesel as fuel predominate.

Cluster 5: Cluster five has cars high taxes, high years\_sell, high mileage, low mpg and medium-high price.

Cluster 6: Cluster six has cars with low taxes, high mpg, high years\_sell, high mileage and low price. Also, non-Audi cars predominate.

Cluster 7: Cluster seven has cars with high mileage, high years\_sell, low price, high taxes and high mpg. Also, cars with diesel as fuel and cars with manual transmission predominate.

Cluster 8: Cluster of multivariate outliers.

res.hcpc$desc.var$quanti.var

## Eta2 P-value  
## price 0.4588663 0  
## mileage 0.7666377 0  
## tax 0.9299117 0  
## mpg 0.7156411 0  
## years\_sell 0.7859983 0

res.hcpc$desc.var$quanti

## $`1`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price 36.976855 30102.827803 21432.746088 9015.830564 9014.199606  
## tax -2.662444 145.628274 146.384170 1.792052 10.914805  
## mileage -32.039923 5812.507623 19240.275517 4656.415718 16111.883519  
## years\_sell -35.496314 2.927354 4.523914 0.526530 1.729163  
## mpg -45.379436 39.915067 52.881019 5.380837 10.984473  
## p.value  
## price 2.697200e-299  
## tax 7.757544e-03  
## mileage 3.033028e-225  
## years\_sell 5.603063e-276  
## mpg 0.000000e+00  
##   
## $`2`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price 8.589204 23483.266359 21432.746088 6917.8501498 9014.199606  
## mpg 7.462959 55.052091 52.881019 6.0517425 10.984473  
## tax -3.231640 145.450007 146.384170 1.9954547 10.914805  
## mileage -29.232483 6766.554839 19240.275517 5011.2700906 16111.883519  
## years\_sell -29.935866 3.152995 4.523914 0.6240959 1.729163  
## p.value  
## price 8.757425e-18  
## mpg 8.460078e-14  
## tax 1.230818e-03  
## mileage 7.498773e-188  
## years\_sell 6.721228e-197  
##   
## $`3`  
## v.test Mean in category Overall mean sd in category Overall sd  
## years\_sell 14.983046 5.536713 4.523914 0.9700308 1.729163  
## mileage 12.801364 27303.145105 19240.275517 9058.2672706 16111.883519  
## tax 7.126435 149.424883 146.384170 5.3695727 10.914805  
## price -3.052076 20357.248252 21432.746088 6431.1260475 9014.199606  
## mpg -12.187832 47.647512 52.881019 6.2757653 10.984473  
## p.value  
## years\_sell 9.477153e-51  
## mileage 1.610955e-37  
## tax 1.030021e-12  
## price 2.272647e-03  
## mpg 3.608931e-34  
##   
## $`4`  
## v.test Mean in category Overall mean sd in category Overall sd  
## mpg 37.392552 64.731383 52.881019 5.7548139 10.984473  
## years\_sell 16.885568 5.366316 4.523914 0.8120942 1.729163  
## mileage 11.635725 24649.152848 19240.275517 8540.2117516 16111.883519  
## tax -5.614238 144.616203 146.384170 2.6134466 10.914805  
## price -24.094376 15166.460000 21432.746088 4574.8333275 9014.199606  
## p.value  
## mpg 5.163404e-306  
## years\_sell 5.746074e-64  
## mileage 2.712746e-31  
## tax 1.974307e-08  
## price 2.863163e-128  
##   
## $`5`  
## v.test Mean in category Overall mean sd in category Overall sd  
## tax 56.608581 201.341463 146.384170 2.215354 10.914805  
## years\_sell 13.508968 6.601626 4.523914 1.124305 1.729163  
## mileage 11.129509 35189.861789 19240.275517 12894.252868 16111.883519  
## mpg -8.894295 44.191057 52.881019 3.462083 10.984473  
## p.value  
## tax 0.000000e+00  
## years\_sell 1.384490e-41  
## mileage 9.013013e-29  
## mpg 5.879132e-19  
##   
## $`6`  
## v.test Mean in category Overall mean sd in category Overall sd  
## years\_sell 17.274191 6.311787 4.523914 1.093419e+00 1.729163  
## mileage 16.556216 35206.794677 19240.275517 1.360068e+04 16111.883519  
## mpg 5.038208 56.193536 52.881019 3.281298e+00 10.984473  
## price -9.151840 16494.889734 21432.746088 4.336134e+03 9014.199606  
## tax -32.732077 125.000000 146.384170 8.720414e-01 10.914805  
## p.value  
## years\_sell 7.359876e-67  
## mileage 1.443955e-61  
## mpg 4.699110e-07  
## price 5.597194e-20  
## tax 5.462959e-235  
##   
## $`7`  
## v.test Mean in category Overall mean sd in category Overall sd  
## mileage 39.657865 48598.22335 19240.275517 9424.304078 16111.883519  
## years\_sell 34.099871 7.23310 4.523914 1.118493 1.729163  
## mpg 18.635327 62.28618 52.881019 7.687089 10.984473  
## tax 3.072233 147.92488 146.384170 3.800915 10.914805  
## price -22.229546 12225.96503 21432.746088 3378.880783 9014.199606  
## p.value  
## mileage 0.000000e+00  
## years\_sell 7.408703e-255  
## mpg 1.661350e-77  
## tax 2.124637e-03  
## price 1.779241e-109

Regarding quantitative variables:

Cluster 1: As we can see price mean is greater in cluster 1 than in the overall mean. Also, we can see that tax, mileage, years\_sell and mpg means are lower in cluster 1 than in the overall means. So we can say that cluster 1 is a cluster of expensive cars with low tax, low mileage, few years\_sell and low mpg.

Cluster 2: As we can see price and mpg means are greater in cluster 2 than in the overall means. Also, we can see that tax, mileage and years\_sell means are lower in cluster 2 than in the overall means. So we can say that cluster 2 is a cluster of expensive cars with high mpg, low tax, low mileage and few years\_sell.

Cluster 3: As we can see years\_sell, mileage and tax means are greater in cluster 3 than in the overall means. Also, we can see that price and mpg means are lower in cluster 3 than in the overall means. So we can say that cluster 3 is a cluster of cheap cars with high years\_sell, high mileage, high tax and low mpg.

Cluster 4: As we can see mpg, years\_sell and mileage means are greater in cluster 4 than in the overall means. Also, we can see that tax and price means are lower in cluster 4 than in the overall means. So we can say that cluster 4 is a cluster of cheap cars with high mpg, many years\_sell, high mileage and low tax.

Cluster 5: As we can see tax, years\_sell and mileage means are greater in cluster 5 than in the overall means. Also, we can see that mpg mean is lower in cluster 5 than in the overall mean. So we can say that cluster 5 is a cluster of cars with high tax, many years\_sell, high mileage and low mpg.

Cluster 6: As we can see years\_sell, mileage and mpg means are greater in cluster 6 than in the overall means. Also, we can see that price and tax means are lower in cluster 6 than in the overall means. So we can say that cluster 6 is a cluster of cheap cars with many years\_sell, high mileage, high mpg and low tax.

Cluster 7: As we can see mileage, years\_sell, mpg and tax means are greater in cluster 7 than in the overall means. Also, we can see that price mean is lower in cluster 7 than in the overall mean. So we can say that cluster 7 is a cluster of cheap cars with high mileage, many years\_sell, high mpg and high tax.

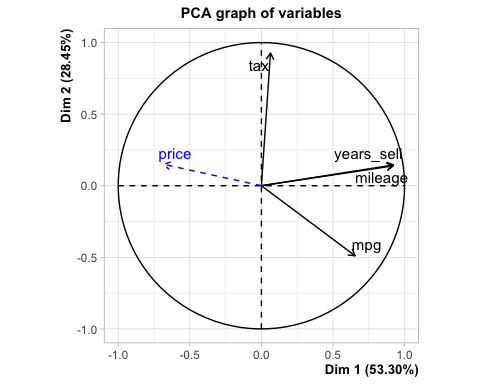
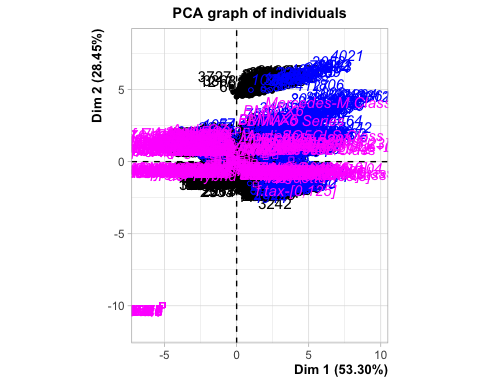
Cluster 8: Cluster of multivariate outliers.

We have created a new variable indicating the cluster to which the individual belongs after the Hierarchical clustering.

df$claHC<-8  
df[ row.names(res.hcpc$data.clust), "claHC" ]<-res.hcpc$data.clust$clust  
df$claHC<-factor(df$claHC)  
levels( df$claHC ) <- paste0("claHCPC-",levels( df$claHC ) )

# K-Means Classification

res.pca<-PCA(df[,c(vars\_res, vars\_dis, vars\_con)],quali.sup=c(2:13),quanti.sup= c(1), ind.sup = ll,ncp =2 )



ppcc<-res.pca$ind$coord[,1:2]  
dim(ppcc)

## [1] 4537 2

dist<-dist(ppcc)  
kc<-kmeans(dist,7, iter.max = 30, trace=T)

## KMNS(\*, k=7): iter= 1, indx=5  
## QTRAN(): istep=4537, icoun=3  
## QTRAN(): istep=9074, icoun=23  
## QTRAN(): istep=13611, icoun=9  
## QTRAN(): istep=18148, icoun=486  
## QTRAN(): istep=22685, icoun=652  
## QTRAN(): istep=27222, icoun=23  
## QTRAN(): istep=31759, icoun=22  
## QTRAN(): istep=36296, icoun=297  
## QTRAN(): istep=40833, icoun=1209  
## QTRAN(): istep=45370, icoun=2236  
## KMNS(\*, k=7): iter= 2, indx=3  
## QTRAN(): istep=4537, icoun=175  
## QTRAN(): istep=9074, icoun=361  
## QTRAN(): istep=13611, icoun=320  
## QTRAN(): istep=18148, icoun=2661  
## QTRAN(): istep=22685, icoun=3244  
## KMNS(\*, k=7): iter= 3, indx=4537

We have created a new variable indicating the cluster to which the individual belongs after the K-Means classification.

df$claKM<-8  
df[ -ll, "claKM" ]<-kc$cluster  
df$claKM<-factor(df$claKM)  
  
100\*(kc$betweenss/kc$totss)

## [1] 90.47151

We get an explicability of the 90.47%.

catdes(df,21)

##   
## Link between the cluster variable and the categorical variables (chi-square test)  
## =================================================================================  
## p.value df  
## year 0.000000e+00 77  
## aux\_price 0.000000e+00 21  
## aux\_mileage 0.000000e+00 21  
## aux\_tax 0.000000e+00 14  
## aux\_mpg 0.000000e+00 21  
## aux\_years\_sell 0.000000e+00 21  
## mout 0.000000e+00 7  
## claHC 0.000000e+00 49  
## engineSize 1.482696e-310 147  
## model 9.046692e-228 609  
## fuelType 5.100134e-93 21  
## transmission 3.798966e-71 14  
## manufacturer 1.511546e-32 21  
## Audi 6.895314e-13 7  
##   
## Description of each cluster by the categories  
## =============================================  
## $`1`  
## Cla/Mod Mod/Cla Global  
## aux\_years\_sell=f.years\_sell-(3,5] 38.5507246 73.2782369 27.60  
## year=f.Year-2018 58.8235294 39.9449036 9.86  
## claHC=claHCPC-2 34.2857143 51.2396694 21.70  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 32.0512821 55.0964187 24.96  
## claHC=claHCPC-3 44.0559441 34.7107438 11.44  
## mout=NoMOut 16.0017633 100.0000000 90.74  
## year=f.Year-2017 27.2829763 33.3333333 17.74  
## aux\_price=f.price-(19.5,26] 23.6144578 40.4958678 24.90  
## aux\_tax=f.tax-(125,145] 17.5863182 75.0688705 61.98  
## manufacturer=Mercedes 20.2812731 37.7410468 27.02  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 20.3200000 34.9862259 25.00  
## engineSize=f.EngSize-1.4 28.3737024 11.2947658 5.78  
## aux\_mpg=f.mpg-(53.3,61.4] 19.1919192 31.4049587 23.76  
## model=Mercedes-A Class 23.7037037 8.8154270 5.40  
## model=Mercedes-E Class 25.5555556 6.3360882 3.60  
## transmission=f.Trans-SemiAuto 16.8076110 43.8016529 37.84  
## model=Mercedes-V Class 50.0000000 1.2396694 0.36  
## fuelType=f.Fuel-Petrol 16.4514586 47.3829201 41.82  
## model=Mercedes-C Class 20.4359673 10.3305785 7.34  
## Audi=Audi No 15.2490421 82.2314050 78.30  
## model=Mercedes-GLA Class 26.1904762 3.0303030 1.68  
## model=VW-Shuttle 55.5555556 0.6887052 0.18  
## aux\_mpg=f.mpg-(44.8,53.3] 16.7634253 31.8181818 27.56  
## model=VW-Tiguan 21.3414634 4.8209366 3.28  
## model=VW-Scirocco 33.3333333 1.1019284 0.48  
## model=Audi-Q2 23.7500000 2.6170799 1.60  
## aux\_price=f.price-(14,19.5] 16.2921348 27.9614325 24.92  
## model=BMW-M3 50.0000000 0.4132231 0.12  
## model=BMW-3 Series 10.2880658 3.4435262 4.86  
## manufacturer=VW 13.0033003 27.1349862 30.30  
## year=f.Year-2011 0.0000000 0.0000000 0.42  
## year=f.Year-2010 0.0000000 0.0000000 0.42  
## engineSize=f.EngSize-1.6 10.7648725 5.2341598 7.06  
## model=VW-Sharan 0.0000000 0.0000000 0.44  
## engineSize=f.EngSize-1.2 8.0000000 1.3774105 2.50  
## model=Audi-A6 5.6338028 0.5509642 1.42  
## model=VW-T-Cross 0.0000000 0.0000000 0.50  
## model=BMW-X1 5.4054054 0.5509642 1.48  
## model=Audi-A3 8.5427136 2.3415978 3.98  
## manufacturer=BMW 12.0114395 17.3553719 20.98  
## transmission=f.Trans-Automatic 12.3381569 22.3140496 26.26  
## model=Audi-Q7 0.0000000 0.0000000 0.64  
## fuelType=f.Fuel-Diesel 13.3004926 52.0661157 56.84  
## Audi=Audi Yes 11.8894009 17.7685950 21.70  
## manufacturer=Audi 11.8894009 17.7685950 21.70  
## year=f.Year-2009 or before 0.0000000 0.0000000 0.84  
## aux\_price=f.price-(26,110] 11.6800000 20.1101928 25.00  
## model=VW-Golf 9.6311475 6.4738292 9.76  
## model=VW-Passat 3.1914894 0.4132231 1.88  
## claHC=claHCPC-4 9.6842105 12.6721763 19.00  
## aux\_tax=f.tax-(145,580] 11.0349127 24.3801653 32.08  
## year=f.Year-2013 0.0000000 0.0000000 2.42  
## claHC=claHCPC-5 0.0000000 0.0000000 2.46  
## year=f.Year-2019 10.2692549 22.5895317 31.94  
## claHC=claHCPC-6 1.5209125 0.5509642 5.26  
## year=f.Year-2014 0.0000000 0.0000000 3.94  
## aux\_tax=f.tax-[0,125] 1.3468013 0.5509642 5.94  
## aux\_mpg=f.mpg-[8.8,44.8] 7.3846154 13.2231405 26.00  
## aux\_years\_sell=f.years\_sell-[2,3] 8.5505735 22.5895317 38.36  
## aux\_price=f.price-[0.65,14] 6.5925338 11.4325069 25.18  
## year=f.Year-2015 1.1933174 0.6887052 8.38  
## year=f.Year-2020 0.0000000 0.0000000 6.42  
## claHC=claHCPC-7 0.0000000 0.0000000 8.58  
## aux\_mileage=f.mileage-[4,6e+03] 5.0319489 8.6776860 25.04  
## claHC=claHCPC-8 0.0000000 0.0000000 9.26  
## mout=YesMOut 0.0000000 0.0000000 9.26  
## aux\_years\_sell=f.years\_sell-(5,6] 2.9002320 3.4435262 17.24  
## year=f.Year-2016 2.9002320 3.4435262 17.24  
## aux\_years\_sell=f.years\_sell-(6,23] 0.5952381 0.6887052 16.80  
## claHC=claHCPC-1 0.5381166 0.8264463 22.30  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 0.7200000 1.2396694 25.00  
## p.value v.test  
## aux\_years\_sell=f.years\_sell-(3,5] 1.385074e-173 28.087687  
## year=f.Year-2018 2.093408e-134 24.672838  
## claHC=claHCPC-2 1.227258e-82 19.257250  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 1.631200e-80 19.002336  
## claHC=claHCPC-3 8.981878e-77 18.544809  
## mout=NoMOut 5.767959e-34 12.149554  
## year=f.Year-2017 1.309992e-28 11.096126  
## aux\_price=f.price-(19.5,26] 8.329662e-24 10.059647  
## aux\_tax=f.tax-(125,145] 8.272241e-16 8.050106  
## manufacturer=Mercedes 8.019335e-12 6.838202  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 7.129743e-11 6.517902  
## engineSize=f.EngSize-1.4 3.393863e-10 6.279627  
## aux\_mpg=f.mpg-(53.3,61.4] 3.423681e-07 5.098493  
## model=Mercedes-A Class 3.748128e-05 4.122481  
## model=Mercedes-E Class 7.601861e-05 3.956617  
## transmission=f.Trans-SemiAuto 3.774053e-04 3.555399  
## model=Mercedes-V Class 4.441305e-04 3.512369  
## fuelType=f.Fuel-Petrol 1.069829e-03 3.271488  
## model=Mercedes-C Class 1.369050e-03 3.201098  
## Audi=Audi No 4.734126e-03 2.824589  
## model=Mercedes-GLA Class 4.835981e-03 2.817761  
## model=VW-Shuttle 5.349599e-03 2.785192  
## aux\_mpg=f.mpg-(44.8,53.3] 6.041600e-03 2.745515  
## model=VW-Tiguan 1.640450e-02 2.399789  
## model=VW-Scirocco 2.089227e-02 2.309926  
## model=Audi-Q2 2.697430e-02 2.211889  
## aux\_price=f.price-(14,19.5] 4.228892e-02 2.030666  
## model=BMW-M3 4.853359e-02 1.972666  
## model=BMW-3 Series 4.848498e-02 -1.973093  
## manufacturer=VW 4.354934e-02 -2.018403  
## year=f.Year-2011 3.681690e-02 -2.087789  
## year=f.Year-2010 3.681690e-02 -2.087789  
## engineSize=f.EngSize-1.6 3.310545e-02 -2.130802  
## model=VW-Sharan 3.144854e-02 -2.151351  
## engineSize=f.EngSize-1.2 2.781294e-02 -2.199915  
## model=Audi-A6 2.156906e-02 -2.297872  
## model=VW-T-Cross 1.959615e-02 -2.333992  
## model=BMW-X1 1.547930e-02 -2.420967  
## model=Audi-A3 1.029640e-02 -2.565713  
## manufacturer=BMW 8.445558e-03 -2.633718  
## transmission=f.Trans-Automatic 8.213313e-03 -2.643173  
## model=Audi-Q7 6.491018e-03 -2.721888  
## fuelType=f.Fuel-Diesel 5.120986e-03 -2.799323  
## Audi=Audi Yes 4.734126e-03 -2.824589  
## manufacturer=Audi 4.734126e-03 -2.824589  
## year=f.Year-2009 or before 1.335148e-03 -3.208316  
## aux\_price=f.price-(26,110] 8.147130e-04 -3.347747  
## model=VW-Golf 7.700216e-04 -3.363352  
## model=VW-Passat 3.374736e-04 -3.584694  
## claHC=claHCPC-4 1.036027e-06 -4.884669  
## aux\_tax=f.tax-(145,580] 9.658149e-07 -4.898479  
## year=f.Year-2013 4.431858e-09 -5.867211  
## claHC=claHCPC-5 3.210942e-09 -5.920433  
## year=f.Year-2019 2.102194e-09 -5.989707  
## claHC=claHCPC-6 8.715465e-14 -7.459041  
## year=f.Year-2014 1.923529e-14 -7.655639  
## aux\_tax=f.tax-[0,125] 4.928751e-16 -8.113240  
## aux\_mpg=f.mpg-[8.8,44.8] 2.472275e-19 -8.990001  
## aux\_years\_sell=f.years\_sell-[2,3] 1.910987e-22 -9.746415  
## aux\_price=f.price-[0.65,14] 5.212827e-23 -9.877478  
## year=f.Year-2015 3.302454e-23 -9.923127  
## year=f.Year-2020 2.156026e-23 -9.965584  
## claHC=claHCPC-7 2.113714e-31 -11.656995  
## aux\_mileage=f.mileage-[4,6e+03] 2.340777e-33 -12.034489  
## claHC=claHCPC-8 5.767959e-34 -12.149554  
## mout=YesMOut 5.767959e-34 -12.149554  
## aux\_years\_sell=f.years\_sell-(5,6] 1.391476e-34 -12.265270  
## year=f.Year-2016 1.391476e-34 -12.265270  
## aux\_years\_sell=f.years\_sell-(6,23] 1.032227e-54 -15.577687  
## claHC=claHCPC-1 4.485925e-76 -18.458132  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 2.563329e-83 -19.338186  
##   
## $`2`  
## Cla/Mod Mod/Cla Global  
## claHC=claHCPC-1 61.7937220 93.9972715 22.30  
## aux\_mpg=f.mpg-[8.8,44.8] 49.3076923 87.4488404 26.00  
## aux\_years\_sell=f.years\_sell-[2,3] 37.2784150 97.5443383 38.36  
## aux\_mileage=f.mileage-[4,6e+03] 44.3290735 75.7162347 25.04  
## aux\_price=f.price-(26,110] 42.0800000 71.7598909 25.00  
## year=f.Year-2020 72.5856698 31.7871760 6.42  
## year=f.Year-2019 30.1815905 65.7571623 31.94  
## fuelType=f.Fuel-Petrol 23.1468197 66.0300136 41.82  
## aux\_tax=f.tax-(125,145] 19.7160374 83.3560709 61.98  
## mout=NoMOut 16.1560503 100.0000000 90.74  
## transmission=f.Trans-SemiAuto 21.0359408 54.2974079 37.84  
## engineSize=f.EngSize-3 25.9786477 19.9181446 11.24  
## model=Audi-Q5 43.0107527 5.4570259 1.86  
## Audi=Audi Yes 20.0921659 29.7407913 21.70  
## manufacturer=Audi 20.0921659 29.7407913 21.70  
## engineSize=f.EngSize-2 17.9413179 50.8867667 41.58  
## model=VW-Tiguan Allspace 71.4285714 1.3642565 0.28  
## engineSize=f.EngSize-1.5 21.1573237 15.9618008 11.06  
## model=VW-Amarok 62.5000000 1.3642565 0.32  
## model=Mercedes-X-CLASS 72.7272727 1.0914052 0.22  
## model=BMW-M4 72.7272727 1.0914052 0.22  
## model=Audi-Q3 28.1690141 5.4570259 2.84  
## model=BMW-M2 100.0000000 0.6821282 0.10  
## model=BMW-Z4 60.0000000 1.2278308 0.30  
## model=VW-T-Roc 33.3333333 2.8649386 1.26  
## model=VW-Caravelle 75.0000000 0.8185539 0.16  
## model=VW-Touareg 40.6250000 1.7735334 0.64  
## engineSize=f.EngSize-2.3 58.3333333 0.9549795 0.24  
## model=Mercedes-GLE Class 30.9090909 2.3192360 1.10  
## model=BMW-X2 40.9090909 1.2278308 0.44  
## model=Audi-TT 35.4838710 1.5006821 0.62  
## model=Audi-Q7 34.3750000 1.5006821 0.64  
## engineSize=f.EngSize-2.9 43.7500000 0.9549795 0.32  
## model=Mercedes-GLC Class 23.5294118 3.8199181 2.38  
## model=Audi-S4 75.0000000 0.4092769 0.08  
## model=Audi-Q2 25.0000000 2.7285130 1.60  
## engineSize=f.EngSize-1.3 25.0000000 2.5920873 1.52  
## model=VW-Tiguan 21.3414634 4.7748977 3.28  
## model=VW-Sharan 31.8181818 0.9549795 0.44  
## year=f.Year-2012 0.0000000 0.0000000 0.38  
## model=Mercedes-E Class 9.4444444 2.3192360 3.60  
## year=f.Year-2011 0.0000000 0.0000000 0.42  
## year=f.Year-2010 0.0000000 0.0000000 0.42  
## model=VW-Scirocco 0.0000000 0.0000000 0.48  
## model=BMW-1 Series 9.1370558 2.4556617 3.94  
## model=Audi-A3 9.0452261 2.4556617 3.98  
## engineSize=f.EngSize-1.8 0.0000000 0.0000000 0.52  
## model=VW-Golf 11.0655738 7.3669850 9.76  
## model=Mercedes-B Class 3.1746032 0.2728513 1.26  
## model=VW-Up 4.5454545 0.5457026 1.76  
## year=f.Year-2009 or before 0.0000000 0.0000000 0.84  
## model=BMW-5 Series 3.4883721 0.4092769 1.72  
## model=BMW-3 Series 7.4074074 2.4556617 4.86  
## model=VW-Polo 8.0459770 3.8199181 6.96  
## engineSize=f.EngSize-1 8.3538084 4.6384720 8.14  
## model=Mercedes-C Class 7.9019074 3.9563438 7.34  
## manufacturer=Mercedes 11.1769060 20.6002729 27.02  
## model=Mercedes-A Class 6.2962963 2.3192360 5.40  
## Audi=Audi No 13.1545338 70.2592087 78.30  
## year=f.Year-2013 0.0000000 0.0000000 2.42  
## claHC=claHCPC-5 0.0000000 0.0000000 2.46  
## engineSize=f.EngSize-1.2 0.0000000 0.0000000 2.50  
## engineSize=f.EngSize-1.6 3.6827195 1.7735334 7.06  
## year=f.Year-2014 0.0000000 0.0000000 3.94  
## engineSize=f.EngSize-1.4 1.3840830 0.5457026 5.78  
## year=f.Year-2018 3.6511156 2.4556617 9.86  
## claHC=claHCPC-6 0.0000000 0.0000000 5.26  
## aux\_tax=f.tax-[0,125] 0.0000000 0.0000000 5.94  
## aux\_tax=f.tax-(145,580] 7.6059850 16.6439291 32.08  
## aux\_mpg=f.mpg-(44.8,53.3] 6.6763425 12.5511596 27.56  
## engineSize=f.EngSize-2.1 0.4914005 0.2728513 8.14  
## year=f.Year-2015 0.0000000 0.0000000 8.38  
## claHC=claHCPC-7 0.0000000 0.0000000 8.58  
## claHC=claHCPC-8 0.0000000 0.0000000 9.26  
## mout=YesMOut 0.0000000 0.0000000 9.26  
## transmission=f.Trans-Manual 6.7409471 16.5075034 35.90  
## claHC=claHCPC-2 4.0552995 6.0027285 21.70  
## claHC=claHCPC-3 0.0000000 0.0000000 11.44  
## fuelType=f.Fuel-Diesel 8.4799437 32.8785812 56.84  
## aux\_price=f.price-(14,19.5] 2.4879615 4.2291951 24.92  
## aux\_years\_sell=f.years\_sell-(6,23] 0.0000000 0.0000000 16.80  
## aux\_years\_sell=f.years\_sell-(5,6] 0.0000000 0.0000000 17.24  
## year=f.Year-2016 0.0000000 0.0000000 17.24  
## year=f.Year-2017 0.0000000 0.0000000 17.74  
## claHC=claHCPC-4 0.0000000 0.0000000 19.00  
## aux\_years\_sell=f.years\_sell-(3,5] 1.3043478 2.4556617 27.60  
## aux\_mpg=f.mpg-(61.4,88.3] 0.0000000 0.0000000 22.68  
## aux\_price=f.price-[0.65,14] 0.3971406 0.6821282 25.18  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 0.2400000 0.4092769 25.00  
## aux\_mpg=f.mpg-(53.3,61.4] 0.0000000 0.0000000 23.76  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 0.0000000 0.0000000 25.00  
## p.value v.test  
## claHC=claHCPC-1 0.000000e+00 Inf  
## aux\_mpg=f.mpg-[8.8,44.8] 0.000000e+00 Inf  
## aux\_years\_sell=f.years\_sell-[2,3] 1.484659e-308 37.548606  
## aux\_mileage=f.mileage-[4,6e+03] 1.211501e-222 31.852602  
## aux\_price=f.price-(26,110] 8.380305e-190 29.385637  
## year=f.Year-2020 2.476815e-134 24.666032  
## year=f.Year-2019 3.311525e-93 20.479035  
## fuelType=f.Fuel-Petrol 2.169158e-46 14.300605  
## aux\_tax=f.tax-(125,145] 5.908612e-42 13.571517  
## mout=NoMOut 2.583412e-34 12.215050  
## transmission=f.Trans-SemiAuto 1.203069e-22 9.793298  
## engineSize=f.EngSize-3 6.706285e-14 7.493496  
## model=Audi-Q5 2.915968e-11 6.650753  
## Audi=Audi Yes 3.026714e-08 5.539884  
## manufacturer=Audi 3.026714e-08 5.539884  
## engineSize=f.EngSize-2 3.877292e-08 5.496352  
## model=VW-Tiguan Allspace 2.627088e-06 4.698010  
## engineSize=f.EngSize-1.5 1.191822e-05 4.379079  
## model=VW-Amarok 1.631788e-05 4.310103  
## model=Mercedes-X-CLASS 2.376760e-05 4.226195  
## model=BMW-M4 2.376760e-05 4.226195  
## model=Audi-Q3 2.572944e-05 4.208304  
## model=BMW-M2 6.692704e-05 3.986954  
## model=BMW-Z4 7.149032e-05 3.971271  
## model=VW-T-Roc 1.888055e-04 3.733542  
## model=VW-Caravelle 2.192125e-04 3.695780  
## model=VW-Touareg 3.702320e-04 3.560441  
## engineSize=f.EngSize-2.3 6.302370e-04 3.418256  
## model=Mercedes-GLE Class 2.138163e-03 3.070339  
## model=BMW-X2 2.984574e-03 2.969322  
## model=Audi-TT 4.058290e-03 2.873595  
## model=Audi-Q7 5.437668e-03 2.779894  
## engineSize=f.EngSize-2.9 5.716613e-03 2.763608  
## model=Mercedes-GLC Class 9.374435e-03 2.598088  
## model=Audi-S4 1.164132e-02 2.522834  
## model=Audi-Q2 1.428945e-02 2.449904  
## engineSize=f.EngSize-1.3 1.697687e-02 2.387208  
## model=VW-Tiguan 1.901836e-02 2.345171  
## model=VW-Sharan 4.240899e-02 2.029484  
## year=f.Year-2012 4.890371e-02 -1.969430  
## model=Mercedes-E Class 3.674265e-02 -2.088612  
## year=f.Year-2011 3.556827e-02 -2.101829  
## year=f.Year-2010 3.556827e-02 -2.101829  
## model=VW-Scirocco 2.205622e-02 -2.289398  
## model=BMW-1 Series 1.972403e-02 -2.331557  
## model=Audi-A3 1.701913e-02 -2.386294  
## engineSize=f.EngSize-1.8 1.603619e-02 -2.408091  
## model=VW-Golf 1.535439e-02 -2.423910  
## model=Mercedes-B Class 3.576024e-03 -2.913325  
## model=VW-Up 2.776146e-03 -2.991495  
## year=f.Year-2009 or before 1.245909e-03 -3.228156  
## model=BMW-5 Series 8.503236e-04 -3.335872  
## model=BMW-3 Series 4.443153e-04 -3.512259  
## model=VW-Polo 1.186598e-04 -3.848879  
## engineSize=f.EngSize-1 6.920615e-05 -3.978999  
## model=Mercedes-C Class 4.997198e-05 -4.055758  
## manufacturer=Mercedes 1.503975e-05 -4.328105  
## model=Mercedes-A Class 1.302203e-05 -4.359735  
## Audi=Audi No 3.026714e-08 -5.539884  
## year=f.Year-2013 3.624228e-09 -5.900490  
## claHC=claHCPC-5 2.616958e-09 -5.953982  
## engineSize=f.EngSize-1.2 1.889361e-09 -6.007044  
## engineSize=f.EngSize-1.6 4.114052e-12 -6.933207  
## year=f.Year-2014 1.382098e-14 -7.698002  
## engineSize=f.EngSize-1.4 1.075051e-15 -8.017972  
## year=f.Year-2018 7.743685e-17 -8.335094  
## claHC=claHCPC-6 2.283801e-19 -8.998713  
## aux\_tax=f.tax-[0,125] 7.359986e-22 -9.608519  
## aux\_tax=f.tax-(145,580] 2.744227e-24 -10.168384  
## aux\_mpg=f.mpg-(44.8,53.3] 8.870024e-26 -10.497498  
## engineSize=f.EngSize-2.1 1.459091e-26 -10.666573  
## year=f.Year-2015 5.771741e-31 -11.571130  
## claHC=claHCPC-7 1.007490e-31 -11.719935  
## claHC=claHCPC-8 2.583412e-34 -12.215050  
## mout=YesMOut 2.583412e-34 -12.215050  
## transmission=f.Trans-Manual 1.152172e-35 -12.465452  
## claHC=claHCPC-2 1.021641e-35 -12.475033  
## claHC=claHCPC-3 9.122395e-43 -13.707766  
## fuelType=f.Fuel-Diesel 2.000911e-45 -14.145149  
## aux\_price=f.price-(14,19.5] 3.749743e-58 -16.076149  
## aux\_years\_sell=f.years\_sell-(6,23] 1.474281e-64 -16.965662  
## aux\_years\_sell=f.years\_sell-(5,6] 2.048610e-66 -17.215024  
## year=f.Year-2016 2.048610e-66 -17.215024  
## year=f.Year-2017 1.541052e-68 -17.495847  
## claHC=claHCPC-4 5.920260e-74 -18.192477  
## aux\_years\_sell=f.years\_sell-(3,5] 9.761156e-84 -19.387916  
## aux\_mpg=f.mpg-(61.4,88.3] 2.540477e-90 -20.152852  
## aux\_price=f.price-[0.65,14] 1.384530e-91 -20.296366  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.035721e-94 -20.614462  
## aux\_mpg=f.mpg-(53.3,61.4] 2.732967e-95 -20.711417  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 4.311633e-101 -21.345303  
##   
## $`3`  
## Cla/Mod Mod/Cla Global  
## aux\_years\_sell=f.years\_sell-[2,3] 50.9906152 89.72477064 38.36  
## year=f.Year-2019 56.9818410 83.48623853 31.94  
## claHC=claHCPC-2 61.6589862 61.37614679 21.70  
## aux\_mpg=f.mpg-(44.8,53.3] 45.8635704 57.98165138 27.56  
## aux\_tax=f.tax-(125,145] 32.0103259 91.00917431 61.98  
## aux\_mileage=f.mileage-[4,6e+03] 46.4057508 53.30275229 25.04  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 39.0224359 44.67889908 24.96  
## mout=NoMOut 24.0246859 100.00000000 90.74  
## claHC=claHCPC-1 37.6681614 38.53211009 22.30  
## aux\_price=f.price-(19.5,26] 35.0200803 40.00000000 24.90  
## aux\_price=f.price-(26,110] 32.7200000 37.52293578 25.00  
## engineSize=f.EngSize-1.5 37.0705244 18.80733945 11.06  
## engineSize=f.EngSize-1.3 67.1052632 4.67889908 1.52  
## engineSize=f.EngSize-1 38.3292383 14.31192661 8.14  
## model=VW-T-Cross 80.0000000 1.83486239 0.50  
## model=Mercedes-B Class 53.9682540 3.11926606 1.26  
## model=VW-Arteon 59.2592593 1.46788991 0.54  
## model=BMW-2 Series 36.9565217 4.67889908 2.76  
## Audi=Audi No 23.0395913 82.75229358 78.30  
## fuelType=f.Fuel-Petrol 24.6293639 47.24770642 41.82  
## model=VW-T-Roc 44.4444444 2.56880734 1.26  
## model=Audi-Q2 41.2500000 3.02752294 1.60  
## model=Mercedes-C Class 29.1553134 9.81651376 7.34  
## manufacturer=VW 24.5544554 34.12844037 30.30  
## transmission=f.Trans-SemiAuto 24.0486258 41.74311927 37.84  
## model=VW-Golf 27.0491803 12.11009174 9.76  
## model=VW-Sharan 50.0000000 1.00917431 0.44  
## engineSize=f.EngSize-2.2 60.0000000 0.55045872 0.20  
## model=VW-Golf SV 40.0000000 0.91743119 0.50  
## engineSize=f.EngSize-4 7.1428571 0.18348624 0.56  
## model=Mercedes-GLE Class 10.9090909 0.55045872 1.10  
## model=Mercedes-GL Class 0.0000000 0.00000000 0.28  
## model=Audi-A7 0.0000000 0.00000000 0.28  
## model=BMW-Z4 0.0000000 0.00000000 0.30  
## model=VW-Scirocco 4.1666667 0.09174312 0.48  
## model=VW-Tiguan 14.6341463 2.20183486 3.28  
## model=Mercedes-E Class 14.4444444 2.38532110 3.60  
## year=f.Year-2012 0.0000000 0.00000000 0.38  
## year=f.Year-2011 0.0000000 0.00000000 0.42  
## year=f.Year-2010 0.0000000 0.00000000 0.42  
## model=Audi-TT 3.2258065 0.09174312 0.62  
## model=Audi-Q7 3.1250000 0.09174312 0.64  
## model=BMW-1 Series 13.7055838 2.47706422 3.94  
## model=Mercedes-GLA Class 9.5238095 0.73394495 1.68  
## model=BMW-X5 3.0303030 0.09174312 0.66  
## model=Audi-Q3 11.9718310 1.55963303 2.84  
## engineSize=f.EngSize-1.8 0.0000000 0.00000000 0.52  
## engineSize=f.EngSize-4.2 or more 0.0000000 0.00000000 0.56  
## model=Audi-A1 10.9489051 1.37614679 2.74  
## transmission=f.Trans-Manual 19.1643454 31.55963303 35.90  
## aux\_mpg=f.mpg-[8.8,44.8] 18.3076923 21.83486239 26.00  
## fuelType=f.Fuel-Diesel 19.7044335 51.37614679 56.84  
## Audi=Audi Yes 17.3271889 17.24770642 21.70  
## manufacturer=Audi 17.3271889 17.24770642 21.70  
## year=f.Year-2009 or before 0.0000000 0.00000000 0.84  
## model=Audi-Q5 5.3763441 0.45871560 1.86  
## engineSize=f.EngSize-3 13.3451957 6.88073394 11.24  
## aux\_mpg=f.mpg-(53.3,61.4] 15.9090909 17.33944954 23.76  
## aux\_price=f.price-(14,19.5] 14.5264848 16.60550459 24.92  
## year=f.Year-2013 0.0000000 0.00000000 2.42  
## claHC=claHCPC-5 0.0000000 0.00000000 2.46  
## engineSize=f.EngSize-1.2 0.0000000 0.00000000 2.50  
## engineSize=f.EngSize-1.4 2.7681661 0.73394495 5.78  
## year=f.Year-2014 0.0000000 0.00000000 3.94  
## engineSize=f.EngSize-2.1 3.9312039 1.46788991 8.14  
## claHC=claHCPC-6 0.0000000 0.00000000 5.26  
## aux\_tax=f.tax-[0,125] 0.0000000 0.00000000 5.94  
## year=f.Year-2015 0.0000000 0.00000000 8.38  
## claHC=claHCPC-7 0.0000000 0.00000000 8.58  
## claHC=claHCPC-8 0.0000000 0.00000000 9.26  
## mout=YesMOut 0.0000000 0.00000000 9.26  
## aux\_years\_sell=f.years\_sell-(3,5] 8.1159420 10.27522936 27.60  
## claHC=claHCPC-3 0.1748252 0.09174312 11.44  
## aux\_price=f.price-[0.65,14] 5.0833995 5.87155963 25.18  
## aux\_tax=f.tax-(145,580] 6.1097257 8.99082569 32.08  
## aux\_mpg=f.mpg-(61.4,88.3] 2.7336861 2.84403670 22.68  
## year=f.Year-2017 0.6764374 0.55045872 17.74  
## aux\_years\_sell=f.years\_sell-(6,23] 0.0000000 0.00000000 16.80  
## aux\_years\_sell=f.years\_sell-(5,6] 0.0000000 0.00000000 17.24  
## year=f.Year-2016 0.0000000 0.00000000 17.24  
## claHC=claHCPC-4 0.0000000 0.00000000 19.00  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 1.7600000 2.01834862 25.00  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 0.0000000 0.00000000 25.00  
## p.value v.test  
## aux\_years\_sell=f.years\_sell-[2,3] 0.000000e+00 Inf  
## year=f.Year-2019 0.000000e+00 Inf  
## claHC=claHCPC-2 1.084861e-246 33.544446  
## aux\_mpg=f.mpg-(44.8,53.3] 7.228788e-131 24.340951  
## aux\_tax=f.tax-(125,145] 3.656820e-129 24.179491  
## aux\_mileage=f.mileage-[4,6e+03] 1.434006e-118 23.150590  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 9.396875e-60 16.302997  
## mout=NoMOut 5.850783e-53 15.317404  
## claHC=claHCPC-1 4.426993e-44 13.925617  
## aux\_price=f.price-(19.5,26] 2.826505e-36 12.576974  
## aux\_price=f.price-(26,110] 1.239861e-25 10.465829  
## engineSize=f.EngSize-1.5 2.824253e-18 8.718294  
## engineSize=f.EngSize-1.3 1.978169e-17 8.495068  
## engineSize=f.EngSize-1 2.447959e-15 7.916243  
## model=VW-T-Cross 9.229130e-10 6.122201  
## model=Mercedes-B Class 2.432215e-08 5.578056  
## model=VW-Arteon 3.048507e-05 4.169812  
## model=BMW-2 Series 4.020121e-05 4.106320  
## Audi=Audi No 4.039098e-05 4.105232  
## fuelType=f.Fuel-Petrol 4.274947e-05 4.092094  
## model=VW-T-Roc 6.020425e-05 4.012009  
## model=Audi-Q2 8.535124e-05 3.928855  
## model=Mercedes-C Class 5.926305e-04 3.434965  
## manufacturer=VW 2.026870e-03 3.086267  
## transmission=f.Trans-SemiAuto 2.778798e-03 2.991204  
## model=VW-Golf 3.827081e-03 2.892074  
## model=VW-Sharan 4.007645e-03 2.877559  
## engineSize=f.EngSize-2.2 1.132554e-02 2.532491  
## model=VW-Golf SV 4.103438e-02 2.043182  
## engineSize=f.EngSize-4 4.753606e-02 -1.981493  
## model=Mercedes-GLE Class 4.026174e-02 -2.051054  
## model=Mercedes-GL Class 3.181900e-02 -2.146677  
## model=Audi-A7 3.181900e-02 -2.146677  
## model=BMW-Z4 2.486298e-02 -2.243525  
## model=VW-Scirocco 2.351124e-02 -2.265023  
## model=VW-Tiguan 1.971529e-02 -2.331723  
## model=Mercedes-E Class 1.179387e-02 -2.518253  
## year=f.Year-2012 9.263520e-03 -2.602173  
## year=f.Year-2011 5.652506e-03 -2.767286  
## year=f.Year-2010 5.652506e-03 -2.767286  
## model=Audi-TT 5.103131e-03 -2.800451  
## model=Audi-Q7 4.089077e-03 -2.871207  
## model=BMW-1 Series 3.451131e-03 -2.924407  
## model=Mercedes-GLA Class 3.287546e-03 -2.939488  
## model=BMW-X5 3.274209e-03 -2.940748  
## model=Audi-Q3 2.428369e-03 -3.032127  
## engineSize=f.EngSize-1.8 1.642387e-03 -3.148272  
## engineSize=f.EngSize-4.2 or more 1.001377e-03 -3.290139  
## model=Audi-A1 9.127842e-04 -3.316115  
## transmission=f.Trans-Manual 6.792431e-04 -3.397823  
## aux\_mpg=f.mpg-[8.8,44.8] 3.338111e-04 -3.587541  
## fuelType=f.Fuel-Diesel 4.040164e-05 -4.105171  
## Audi=Audi Yes 4.039098e-05 -4.105232  
## manufacturer=Audi 4.039098e-05 -4.105232  
## year=f.Year-2009 or before 3.116758e-05 -4.164763  
## model=Audi-Q5 1.310892e-05 -4.358279  
## engineSize=f.EngSize-3 6.780780e-08 -5.396885  
## aux\_mpg=f.mpg-(53.3,61.4] 7.842093e-09 -5.771818  
## aux\_price=f.price-(14,19.5] 1.310574e-13 -7.405094  
## year=f.Year-2013 7.923887e-14 -7.471578  
## claHC=claHCPC-5 4.778595e-14 -7.537829  
## engineSize=f.EngSize-1.2 2.881109e-14 -7.603552  
## engineSize=f.EngSize-1.4 1.039480e-21 -9.572900  
## year=f.Year-2014 3.018658e-22 -9.699876  
## engineSize=f.EngSize-2.1 4.399203e-26 -10.563505  
## claHC=claHCPC-6 1.107366e-29 -11.314894  
## aux\_tax=f.tax-[0,125] 1.470741e-33 -12.072783  
## year=f.Year-2015 9.724836e-48 -14.515077  
## claHC=claHCPC-7 6.403888e-49 -14.700444  
## claHC=claHCPC-8 5.850783e-53 -15.317404  
## mout=YesMOut 5.850783e-53 -15.317404  
## aux\_years\_sell=f.years\_sell-(3,5] 1.554844e-54 -15.551475  
## claHC=claHCPC-3 7.158559e-64 -16.872592  
## aux\_price=f.price-[0.65,14] 3.343542e-76 -18.474002  
## aux\_tax=f.tax-(145,580] 1.650812e-89 -20.060001  
## aux\_mpg=f.mpg-(61.4,88.3] 6.519345e-93 -20.446011  
## year=f.Year-2017 2.612390e-94 -20.602388  
## aux\_years\_sell=f.years\_sell-(6,23] 3.069886e-100 -21.253346  
## aux\_years\_sell=f.years\_sell-(5,6] 3.762842e-103 -21.565809  
## year=f.Year-2016 3.762842e-103 -21.565809  
## claHC=claHCPC-4 5.561127e-115 -22.791551  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.488876e-119 -23.225972  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 1.033657e-157 -26.756636  
##   
## $`4`  
## Cla/Mod Mod/Cla Global  
## claHC=claHCPC-5 100.00000000 99.1935484 2.46  
## aux\_tax=f.tax-(145,580] 7.73067332 100.0000000 32.08  
## aux\_years\_sell=f.years\_sell-(6,23] 6.90476190 46.7741935 16.80  
## engineSize=f.EngSize-3 7.82918149 35.4838710 11.24  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 5.20000000 52.4193548 25.00  
## aux\_mpg=f.mpg-[8.8,44.8] 4.92307692 51.6129032 26.00  
## year=f.Year-2015 7.63723150 25.8064516 8.38  
## aux\_years\_sell=f.years\_sell-(5,6] 5.56844548 38.7096774 17.24  
## year=f.Year-2016 5.56844548 38.7096774 17.24  
## model=BMW-X5 27.27272727 7.2580645 0.66  
## aux\_price=f.price-(19.5,26] 4.57831325 45.9677419 24.90  
## aux\_mpg=f.mpg-(44.8,53.3] 4.28156749 47.5806452 27.56  
## mout=NoMOut 2.73308354 100.0000000 90.74  
## model=Audi-Q5 11.82795699 8.8709677 1.86  
## year=f.Year-2014 7.61421320 12.0967742 3.94  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 4.00000000 40.3225806 25.00  
## engineSize=f.EngSize-2 3.41510342 57.2580645 41.58  
## year=f.Year-2013 8.26446281 8.0645161 2.42  
## model=BMW-6 Series 30.00000000 2.4193548 0.20  
## model=Audi-Q3 7.04225352 8.0645161 2.84  
## model=Audi-A8 18.75000000 2.4193548 0.32  
## model=Mercedes-CLS Class 16.66666667 2.4193548 0.36  
## model=BMW-X4 16.66666667 2.4193548 0.36  
## Audi=Audi Yes 3.59447005 31.4516129 21.70  
## manufacturer=Audi 3.59447005 31.4516129 21.70  
## model=BMW-X6 28.57142857 1.6129032 0.14  
## transmission=f.Trans-Automatic 3.42726580 36.2903226 26.26  
## model=Mercedes-M Class 25.00000000 1.6129032 0.16  
## transmission=f.Trans-SemiAuto 3.06553911 46.7741935 37.84  
## model=VW-Golf 3.89344262 15.3225806 9.76  
## model=Mercedes-GLC Class 0.00000000 0.0000000 2.38  
## engineSize=f.EngSize-1.2 0.00000000 0.0000000 2.50  
## model=Audi-A4 0.00000000 0.0000000 2.72  
## model=Audi-A1 0.00000000 0.0000000 2.74  
## engineSize=f.EngSize-1.4 0.69204152 1.6129032 5.78  
## manufacturer=Mercedes 1.62842339 17.7419355 27.02  
## Audi=Audi No 2.17113665 68.5483871 78.30  
## model=Mercedes-E Class 0.00000000 0.0000000 3.60  
## aux\_price=f.price-(26,110] 1.44000000 14.5161290 25.00  
## claHC=claHCPC-6 0.00000000 0.0000000 5.26  
## model=Mercedes-C Class 0.27247956 0.8064516 7.34  
## aux\_price=f.price-[0.65,14] 1.27084988 12.9032258 25.18  
## aux\_years\_sell=f.years\_sell-(3,5] 1.30434783 14.5161290 27.60  
## aux\_tax=f.tax-[0,125] 0.00000000 0.0000000 5.94  
## year=f.Year-2020 0.00000000 0.0000000 6.42  
## claHC=claHCPC-7 0.23310023 0.8064516 8.58  
## model=VW-Polo 0.00000000 0.0000000 6.96  
## engineSize=f.EngSize-1.6 0.00000000 0.0000000 7.06  
## engineSize=f.EngSize-1 0.00000000 0.0000000 8.14  
## claHC=claHCPC-8 0.00000000 0.0000000 9.26  
## mout=YesMOut 0.00000000 0.0000000 9.26  
## transmission=f.Trans-Manual 1.16991643 16.9354839 35.90  
## year=f.Year-2018 0.00000000 0.0000000 9.86  
## engineSize=f.EngSize-1.5 0.00000000 0.0000000 11.06  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 0.72115385 7.2580645 24.96  
## claHC=claHCPC-3 0.00000000 0.0000000 11.44  
## claHC=claHCPC-4 0.00000000 0.0000000 19.00  
## aux\_mpg=f.mpg-(61.4,88.3] 0.08818342 0.8064516 22.68  
## claHC=claHCPC-2 0.00000000 0.0000000 21.70  
## claHC=claHCPC-1 0.00000000 0.0000000 22.30  
## aux\_mpg=f.mpg-(53.3,61.4] 0.00000000 0.0000000 23.76  
## aux\_mileage=f.mileage-[4,6e+03] 0.00000000 0.0000000 25.04  
## year=f.Year-2019 0.00000000 0.0000000 31.94  
## aux\_years\_sell=f.years\_sell-[2,3] 0.00000000 0.0000000 38.36  
## aux\_tax=f.tax-(125,145] 0.00000000 0.0000000 61.98  
## p.value v.test  
## claHC=claHCPC-5 7.271869e-248 33.624846  
## aux\_tax=f.tax-(145,580] 2.094315e-63 16.809070  
## aux\_years\_sell=f.years\_sell-(6,23] 4.184290e-15 7.849281  
## engineSize=f.EngSize-3 6.029798e-13 7.199807  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 3.985859e-11 6.604602  
## aux\_mpg=f.mpg-[8.8,44.8] 8.282529e-10 6.139416  
## year=f.Year-2015 4.579058e-09 5.861789  
## aux\_years\_sell=f.years\_sell-(5,6] 9.535900e-09 5.738784  
## year=f.Year-2016 9.535900e-09 5.738784  
## model=BMW-X5 6.544170e-08 5.403257  
## aux\_price=f.price-(19.5,26] 2.737784e-07 5.140658  
## aux\_mpg=f.mpg-(44.8,53.3] 1.682204e-06 4.788276  
## mout=NoMOut 4.991816e-06 4.565131  
## model=Audi-Q5 1.763827e-05 4.292865  
## year=f.Year-2014 1.134463e-04 3.859872  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 1.518566e-04 3.788014  
## engineSize=f.EngSize-2 3.972387e-04 3.541912  
## year=f.Year-2013 9.325408e-04 3.310126  
## model=BMW-6 Series 1.640267e-03 3.148650  
## model=Audi-Q3 3.269376e-03 2.941205  
## model=Audi-A8 7.103710e-03 2.691943  
## model=Mercedes-CLS Class 1.009465e-02 2.572570  
## model=BMW-X4 1.009465e-02 2.572570  
## Audi=Audi Yes 1.057283e-02 2.556509  
## manufacturer=Audi 1.057283e-02 2.556509  
## model=BMW-X6 1.229328e-02 2.503612  
## transmission=f.Trans-Automatic 1.286622e-02 2.487451  
## model=Mercedes-M Class 1.625249e-02 2.403196  
## transmission=f.Trans-SemiAuto 4.038975e-02 2.049741  
## model=VW-Golf 4.667769e-02 1.989213  
## model=Mercedes-GLC Class 4.857224e-02 -1.972327  
## engineSize=f.EngSize-1.2 4.161974e-02 -2.037302  
## model=Audi-A4 3.133905e-02 -2.152741  
## model=Audi-A1 3.054011e-02 -2.163014  
## engineSize=f.EngSize-1.4 2.701161e-02 -2.211350  
## manufacturer=Mercedes 1.526728e-02 -2.425976  
## Audi=Audi No 1.057283e-02 -2.556509  
## model=Mercedes-E Class 1.000905e-02 -2.575516  
## aux\_price=f.price-(26,110] 4.362603e-03 -2.850679  
## claHC=claHCPC-6 1.129091e-03 -3.256213  
## model=Mercedes-C Class 8.388829e-04 -3.339636  
## aux\_price=f.price-[0.65,14] 7.452915e-04 -3.372352  
## aux\_years\_sell=f.years\_sell-(3,5] 5.128147e-04 -3.473972  
## aux\_tax=f.tax-[0,125] 4.567325e-04 -3.504927  
## year=f.Year-2020 2.401405e-04 -3.672552  
## claHC=claHCPC-7 1.781239e-04 -3.748178  
## model=VW-Polo 1.160457e-04 -3.854333  
## engineSize=f.EngSize-1.6 1.013765e-04 -3.887274  
## engineSize=f.EngSize-1 2.333207e-05 -4.230357  
## claHC=claHCPC-8 4.991816e-06 -4.565131  
## mout=YesMOut 4.991816e-06 -4.565131  
## transmission=f.Trans-Manual 2.785021e-06 -4.686069  
## year=f.Year-2018 2.167893e-06 -4.737108  
## engineSize=f.EngSize-1.5 4.019794e-07 -5.068018  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 2.944867e-07 -5.126942  
## claHC=claHCPC-3 2.346213e-07 -5.169579  
## claHC=claHCPC-4 3.117802e-12 -6.972309  
## aux\_mpg=f.mpg-(61.4,88.3] 3.527652e-13 -7.272550  
## claHC=claHCPC-2 4.358821e-14 -7.549813  
## claHC=claHCPC-1 1.653648e-14 -7.675042  
## aux\_mpg=f.mpg-(53.3,61.4] 1.514369e-15 -7.975767  
## aux\_mileage=f.mileage-[4,6e+03] 1.791654e-16 -8.235262  
## year=f.Year-2019 9.147008e-22 -9.586108  
## aux\_years\_sell=f.years\_sell-[2,3] 3.323699e-27 -10.803212  
## aux\_tax=f.tax-(125,145] 6.429876e-54 -15.460300  
##   
## $`5`  
## Cla/Mod Mod/Cla Global  
## claHC=claHCPC-4 55.36842105 68.0465718 19.00  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 44.64000000 72.1862872 25.00  
## year=f.Year-2017 46.33596392 53.1694696 17.74  
## aux\_years\_sell=f.years\_sell-(3,5] 34.13043478 60.9314360 27.60  
## aux\_mpg=f.mpg-(53.3,61.4] 29.62962963 45.5368693 23.76  
## claHC=claHCPC-3 37.58741259 27.8137128 11.44  
## mout=NoMOut 17.03769010 100.0000000 90.74  
## aux\_years\_sell=f.years\_sell-(5,6] 30.39443155 33.8939198 17.24  
## year=f.Year-2016 30.39443155 33.8939198 17.24  
## engineSize=f.EngSize-1.2 60.00000000 9.7024580 2.50  
## model=VW-Polo 38.21839080 17.2056921 6.96  
## engineSize=f.EngSize-1.4 35.29411765 13.1953428 5.78  
## aux\_price=f.price-(14,19.5] 22.55216693 36.3518758 24.92  
## aux\_price=f.price-[0.65,14] 22.47815727 36.6106080 25.18  
## transmission=f.Trans-Manual 19.83286908 46.0543338 35.90  
## aux\_mpg=f.mpg-(61.4,88.3] 21.51675485 31.5653299 22.68  
## engineSize=f.EngSize-1 26.28992629 13.8421734 8.14  
## manufacturer=VW 20.06600660 39.3272962 30.30  
## model=Audi-A1 28.46715328 5.0452781 2.74  
## model=VW-Up 30.68181818 3.4928849 1.76  
## engineSize=f.EngSize-2.1 21.37592138 11.2548512 8.14  
## fuelType=f.Fuel-Petrol 16.78622669 45.4075032 41.82  
## aux\_tax=f.tax-(145,580] 16.95760599 35.1875809 32.08  
## manufacturer=Mercedes 13.76757957 24.0620957 27.02  
## year=f.Year-2012 0.00000000 0.0000000 0.38  
## model=Audi-Q2 7.50000000 0.7761966 1.60  
## model=Audi-Q7 3.12500000 0.1293661 0.64  
## year=f.Year-2018 12.17038540 7.7619664 9.86  
## year=f.Year-2011 0.00000000 0.0000000 0.42  
## year=f.Year-2010 0.00000000 0.0000000 0.42  
## aux\_price=f.price-(19.5,26] 13.49397590 21.7335058 24.90  
## model=BMW-X2 0.00000000 0.0000000 0.44  
## aux\_tax=f.tax-[0,125] 10.77441077 4.1397154 5.94  
## model=VW-T-Cross 0.00000000 0.0000000 0.50  
## fuelType=f.Fuel-Diesel 14.28571429 52.5226391 56.84  
## transmission=f.Trans-SemiAuto 13.58350951 33.2470893 37.84  
## model=BMW-X5 0.00000000 0.0000000 0.66  
## year=f.Year-2009 or before 0.00000000 0.0000000 0.84  
## model=Audi-Q5 4.30107527 0.5174644 1.86  
## engineSize=f.EngSize-3 10.67615658 7.7619664 11.24  
## model=VW-T-Roc 1.58730159 0.1293661 1.26  
## manufacturer=BMW 11.91611058 16.1707633 20.98  
## year=f.Year-2015 9.30787589 5.0452781 8.38  
## transmission=f.Trans-Automatic 12.18583397 20.6985770 26.26  
## engineSize=f.EngSize-1.3 0.00000000 0.0000000 1.52  
## engineSize=f.EngSize-2 12.07311207 32.4708926 41.58  
## year=f.Year-2013 0.00000000 0.0000000 2.42  
## claHC=claHCPC-5 0.00000000 0.0000000 2.46  
## engineSize=f.EngSize-1.5 6.69077758 4.7865459 11.06  
## aux\_mpg=f.mpg-(44.8,53.3] 9.94194485 17.7231565 27.56  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 9.29487179 15.0064683 24.96  
## year=f.Year-2014 0.00000000 0.0000000 3.94  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 7.76000000 12.5485123 25.00  
## year=f.Year-2020 0.00000000 0.0000000 6.42  
## aux\_years\_sell=f.years\_sell-(6,23] 4.64285714 5.0452781 16.80  
## claHC=claHCPC-7 0.00000000 0.0000000 8.58  
## claHC=claHCPC-8 0.00000000 0.0000000 9.26  
## mout=YesMOut 0.00000000 0.0000000 9.26  
## aux\_price=f.price-(26,110] 3.28000000 5.3040103 25.00  
## aux\_mpg=f.mpg-[8.8,44.8] 3.07692308 5.1746442 26.00  
## claHC=claHCPC-2 0.00000000 0.0000000 21.70  
## claHC=claHCPC-1 0.00000000 0.0000000 22.30  
## aux\_mileage=f.mileage-[4,6e+03] 0.15974441 0.2587322 25.04  
## year=f.Year-2019 0.06261741 0.1293661 31.94  
## aux\_years\_sell=f.years\_sell-[2,3] 0.05213764 0.1293661 38.36  
## p.value v.test  
## claHC=claHCPC-4 1.617461e-249 33.737740  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.371996e-206 30.653522  
## year=f.Year-2017 5.759700e-139 25.094160  
## aux\_years\_sell=f.years\_sell-(3,5] 4.434566e-101 21.343988  
## aux\_mpg=f.mpg-(53.3,61.4] 2.904133e-48 14.597716  
## claHC=claHCPC-3 3.626343e-44 13.939863  
## mout=NoMOut 2.553771e-36 12.584989  
## aux\_years\_sell=f.years\_sell-(5,6] 3.236744e-35 12.382842  
## year=f.Year-2016 3.236744e-35 12.382842  
## engineSize=f.EngSize-1.2 9.486287e-31 11.528425  
## model=VW-Polo 3.988946e-27 10.786452  
## engineSize=f.EngSize-1.4 8.908322e-18 8.587240  
## aux\_price=f.price-(14,19.5] 1.113548e-14 7.725569  
## aux\_price=f.price-[0.65,14] 1.334814e-14 7.702450  
## transmission=f.Trans-Manual 2.729878e-10 6.313390  
## aux\_mpg=f.mpg-(61.4,88.3] 5.115225e-10 6.215528  
## engineSize=f.EngSize-1 3.920704e-09 5.887505  
## manufacturer=VW 5.694044e-09 5.825504  
## model=Audi-A1 8.756013e-05 3.922706  
## model=VW-Up 3.001921e-04 3.615134  
## engineSize=f.EngSize-2.1 9.322438e-04 3.310215  
## fuelType=f.Fuel-Petrol 2.834284e-02 2.192508  
## aux\_tax=f.tax-(145,580] 4.533316e-02 2.001550  
## manufacturer=Mercedes 4.261749e-02 -2.027439  
## year=f.Year-2012 4.087513e-02 -2.044794  
## model=Audi-Q2 3.645996e-02 -2.091760  
## model=Audi-Q7 3.592831e-02 -2.097738  
## year=f.Year-2018 2.993163e-02 -2.170994  
## year=f.Year-2011 2.917168e-02 -2.181159  
## year=f.Year-2010 2.917168e-02 -2.181159  
## aux\_price=f.price-(19.5,26] 2.549105e-02 -2.233879  
## model=BMW-X2 2.464272e-02 -2.246958  
## aux\_tax=f.tax-[0,125] 1.735642e-02 -2.379069  
## model=VW-T-Cross 1.485162e-02 -2.435977  
## fuelType=f.Fuel-Diesel 8.598250e-03 -2.627628  
## transmission=f.Trans-SemiAuto 3.982427e-03 -2.879550  
## model=BMW-X5 3.842619e-03 -2.890801  
## year=f.Year-2009 or before 8.372495e-04 -3.340177  
## model=Audi-Q5 7.810505e-04 -3.359424  
## engineSize=f.EngSize-3 5.526711e-04 -3.453837  
## model=VW-T-Roc 3.236648e-04 -3.595584  
## manufacturer=BMW 2.591861e-04 -3.653008  
## year=f.Year-2015 1.261954e-04 -3.833768  
## transmission=f.Trans-Automatic 9.907158e-05 -3.892854  
## engineSize=f.EngSize-1.3 2.576068e-06 -4.702015  
## engineSize=f.EngSize-2 1.640134e-08 -5.646221  
## year=f.Year-2013 1.140644e-09 -6.088372  
## claHC=claHCPC-5 8.078108e-10 -6.143385  
## engineSize=f.EngSize-1.5 4.416257e-11 -6.589394  
## aux\_mpg=f.mpg-(44.8,53.3] 5.285358e-12 -6.897694  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 3.760733e-13 -7.263905  
## year=f.Year-2014 2.067961e-15 -7.937200  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 2.889192e-20 -9.222994  
## year=f.Year-2020 5.382751e-25 -10.325872  
## aux\_years\_sell=f.years\_sell-(6,23] 2.191259e-26 -10.628708  
## claHC=claHCPC-7 1.424301e-33 -12.075423  
## claHC=claHCPC-8 2.553771e-36 -12.584989  
## mout=YesMOut 2.553771e-36 -12.584989  
## aux\_price=f.price-(26,110] 1.812783e-54 -15.541642  
## aux\_mpg=f.mpg-[8.8,44.8] 2.125306e-59 -16.253048  
## claHC=claHCPC-2 5.279934e-91 -20.230468  
## claHC=claHCPC-1 6.997160e-94 -20.554623  
## aux\_mileage=f.mileage-[4,6e+03] 1.278290e-102 -21.509149  
## year=f.Year-2019 3.338700e-141 -25.298254  
## aux\_years\_sell=f.years\_sell-[2,3] 4.566760e-179 -28.532993  
##   
## $`6`  
## Cla/Mod Mod/Cla Global  
## aux\_years\_sell=f.years\_sell-(5,6] 41.9953596 50.4178273 17.24  
## year=f.Year-2016 41.9953596 50.4178273 17.24  
## claHC=claHCPC-6 69.2015209 25.3481894 5.26  
## aux\_tax=f.tax-[0,125] 60.9427609 25.2089136 5.94  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 30.0800000 52.3676880 25.00  
## claHC=claHCPC-4 33.3684211 44.1504178 19.00  
## aux\_mpg=f.mpg-(61.4,88.3] 30.7760141 48.6072423 22.68  
## aux\_price=f.price-(14,19.5] 28.6516854 49.7214485 24.92  
## fuelType=f.Fuel-Diesel 20.0211119 79.2479109 56.84  
## year=f.Year-2015 38.9021480 22.7019499 8.38  
## mout=NoMOut 15.8254353 100.0000000 90.74  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 25.2000000 43.8718663 25.00  
## claHC=claHCPC-7 35.1981352 21.0306407 8.58  
## engineSize=f.EngSize-2.1 35.6265356 20.1949861 8.14  
## aux\_years\_sell=f.years\_sell-(6,23] 24.0476190 28.1337047 16.80  
## aux\_price=f.price-[0.65,14] 21.4455917 37.6044568 25.18  
## aux\_mpg=f.mpg-(53.3,61.4] 21.3804714 35.3760446 23.76  
## transmission=f.Trans-Manual 18.8857939 47.2144847 35.90  
## model=Mercedes-GLA Class 36.9047619 4.3175487 1.68  
## model=BMW-X1 33.7837838 3.4818942 1.48  
## model=Mercedes-GL Class 57.1428571 1.1142061 0.28  
## manufacturer=Mercedes 17.3205033 32.5905292 27.02  
## model=BMW-1 Series 22.8426396 6.2674095 3.94  
## model=VW-Jetta 100.0000000 0.4178273 0.06  
## engineSize=f.EngSize-1.6 19.5467422 9.6100279 7.06  
## model=Mercedes-A Class 20.3703704 7.6601671 5.40  
## Audi=Audi No 14.9936143 81.7548747 78.30  
## year=f.Year-2017 17.0236753 21.0306407 17.74  
## model=Mercedes-CL Class 24.5614035 1.9498607 1.14  
## model=Mercedes-GLC Class 21.0084034 3.4818942 2.38  
## model=Audi-Q5 7.5268817 0.9749304 1.86  
## model=BMW-X5 3.0303030 0.1392758 0.66  
## fuelType=f.Fuel-Hybrid 5.4545455 0.4178273 1.10  
## year=f.Year-2011 0.0000000 0.0000000 0.42  
## year=f.Year-2010 0.0000000 0.0000000 0.42  
## manufacturer=VW 12.8052805 27.0194986 30.30  
## model=BMW-X2 0.0000000 0.0000000 0.44  
## model=VW-T-Cross 0.0000000 0.0000000 0.50  
## model=VW-Arteon 0.0000000 0.0000000 0.54  
## Audi=Audi Yes 12.0737327 18.2451253 21.70  
## manufacturer=Audi 12.0737327 18.2451253 21.70  
## engineSize=f.EngSize-4.2 or more 0.0000000 0.0000000 0.56  
## engineSize=f.EngSize-4 0.0000000 0.0000000 0.56  
## model=Mercedes-GLE Class 3.6363636 0.2785515 1.10  
## model=Audi-Q7 0.0000000 0.0000000 0.64  
## year=f.Year-2009 or before 0.0000000 0.0000000 0.84  
## model=Audi-Q2 1.2500000 0.1392758 1.60  
## model=VW-T-Roc 0.0000000 0.0000000 1.26  
## aux\_years\_sell=f.years\_sell-(3,5] 11.1594203 21.4484680 27.60  
## year=f.Year-2013 2.4793388 0.4178273 2.42  
## engineSize=f.EngSize-1.3 0.0000000 0.0000000 1.52  
## engineSize=f.EngSize-1 6.3882064 3.6211699 8.14  
## transmission=f.Trans-SemiAuto 11.0465116 29.1086351 37.84  
## claHC=claHCPC-5 0.0000000 0.0000000 2.46  
## engineSize=f.EngSize-3 6.7615658 5.2924791 11.24  
## aux\_price=f.price-(19.5,26] 6.5060241 11.2813370 24.90  
## year=f.Year-2020 0.0000000 0.0000000 6.42  
## aux\_mpg=f.mpg-(44.8,53.3] 6.7489115 12.9526462 27.56  
## year=f.Year-2018 0.6085193 0.4178273 9.86  
## aux\_tax=f.tax-(125,145] 9.7773475 42.2005571 61.98  
## claHC=claHCPC-8 0.0000000 0.0000000 9.26  
## mout=YesMOut 0.0000000 0.0000000 9.26  
## fuelType=f.Fuel-Petrol 6.8866571 20.0557103 41.82  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 2.1634615 3.7604457 24.96  
## aux\_mpg=f.mpg-[8.8,44.8] 1.6923077 3.0640669 26.00  
## aux\_price=f.price-(26,110] 0.8000000 1.3927577 25.00  
## claHC=claHCPC-2 0.0000000 0.0000000 21.70  
## claHC=claHCPC-1 0.0000000 0.0000000 22.30  
## aux\_mileage=f.mileage-[4,6e+03] 0.0000000 0.0000000 25.04  
## year=f.Year-2019 0.0000000 0.0000000 31.94  
## aux\_years\_sell=f.years\_sell-[2,3] 0.0000000 0.0000000 38.36  
## p.value v.test  
## aux\_years\_sell=f.years\_sell-(5,6] 8.691034e-114 22.670845  
## year=f.Year-2016 8.691034e-114 22.670845  
## claHC=claHCPC-6 1.737909e-98 21.063006  
## aux\_tax=f.tax-[0,125] 1.218668e-83 19.376496  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 3.238225e-66 17.188496  
## claHC=claHCPC-4 9.493930e-65 16.991494  
## aux\_mpg=f.mpg-(61.4,88.3] 1.379169e-62 16.696959  
## aux\_price=f.price-(14,19.5] 3.869470e-55 15.640292  
## fuelType=f.Fuel-Diesel 6.289805e-42 13.566934  
## year=f.Year-2015 3.678725e-39 13.091580  
## mout=NoMOut 1.441926e-33 12.074411  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 3.381328e-33 12.004097  
## claHC=claHCPC-7 3.442139e-30 11.416921  
## engineSize=f.EngSize-2.1 1.424220e-29 11.292802  
## aux\_years\_sell=f.years\_sell-(6,23] 1.237768e-16 8.279420  
## aux\_price=f.price-[0.65,14] 1.321879e-15 7.992539  
## aux\_mpg=f.mpg-(53.3,61.4] 2.745718e-14 7.609776  
## transmission=f.Trans-Manual 1.739455e-11 6.726372  
## model=Mercedes-GLA Class 2.466582e-07 5.160221  
## model=BMW-X1 2.383677e-05 4.225541  
## model=Mercedes-GL Class 2.593923e-04 3.652804  
## manufacturer=Mercedes 3.501408e-04 3.575065  
## model=BMW-1 Series 1.140457e-03 3.253368  
## model=VW-Jetta 2.950579e-03 2.972840  
## engineSize=f.EngSize-1.6 5.523694e-03 2.774792  
## model=Mercedes-A Class 5.614217e-03 2.769501  
## Audi=Audi No 1.393252e-02 2.458998  
## year=f.Year-2017 1.418642e-02 2.452508  
## model=Mercedes-CL Class 3.998521e-02 2.053902  
## model=Mercedes-GLC Class 4.586719e-02 1.996613  
## model=Audi-Q5 4.695495e-02 -1.986706  
## model=BMW-X5 4.466727e-02 -2.007774  
## fuelType=f.Fuel-Hybrid 4.412896e-02 -2.012864  
## year=f.Year-2011 3.829501e-02 -2.071683  
## year=f.Year-2010 3.829501e-02 -2.071683  
## manufacturer=VW 3.758395e-02 -2.079364  
## model=BMW-X2 3.277266e-02 -2.134857  
## model=VW-T-Cross 2.053675e-02 -2.316394  
## model=VW-Arteon 1.503620e-02 -2.431506  
## Audi=Audi Yes 1.393252e-02 -2.458998  
## manufacturer=Audi 1.393252e-02 -2.458998  
## engineSize=f.EngSize-4.2 or more 1.286528e-02 -2.487477  
## engineSize=f.EngSize-4 1.286528e-02 -2.487477  
## model=Mercedes-GLE Class 1.196062e-02 -2.513304  
## model=Audi-Q7 6.892807e-03 -2.701979  
## year=f.Year-2009 or before 1.444788e-03 -3.185551  
## model=Audi-Q2 5.788200e-05 -4.021283  
## model=VW-T-Roc 5.369399e-05 -4.038937  
## aux\_years\_sell=f.years\_sell-(3,5] 4.856318e-05 -4.062436  
## year=f.Year-2013 1.085192e-05 -4.399463  
## engineSize=f.EngSize-1.3 6.941591e-06 -4.495472  
## engineSize=f.EngSize-1 1.892702e-07 -5.209578  
## transmission=f.Trans-SemiAuto 1.245606e-07 -5.286674  
## claHC=claHCPC-5 4.054885e-09 -5.881939  
## engineSize=f.EngSize-3 3.729325e-09 -5.895773  
## aux\_price=f.price-(19.5,26] 1.598754e-22 -9.764515  
## year=f.Year-2020 4.023639e-23 -9.903399  
## aux\_mpg=f.mpg-(44.8,53.3] 7.426252e-24 -10.070943  
## year=f.Year-2018 1.154380e-30 -11.511511  
## aux\_tax=f.tax-(125,145] 3.700223e-31 -11.609209  
## claHC=claHCPC-8 1.441926e-33 -12.074411  
## mout=YesMOut 1.441926e-33 -12.074411  
## fuelType=f.Fuel-Petrol 3.561132e-40 -13.267750  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 2.672666e-60 -16.379652  
## aux\_mpg=f.mpg-[8.8,44.8] 7.926833e-70 -17.664099  
## aux\_price=f.price-(26,110] 1.047479e-80 -19.025567  
## claHC=claHCPC-2 5.675164e-84 -19.415794  
## claHC=claHCPC-1 1.268838e-86 -19.726829  
## aux\_mileage=f.mileage-[4,6e+03] 5.048643e-99 -21.121482  
## year=f.Year-2019 1.229076e-132 -24.507490  
## aux\_years\_sell=f.years\_sell-[2,3] 1.460402e-167 -27.590159  
##   
## $`7`  
## Cla/Mod Mod/Cla Global  
## claHC=claHCPC-7 64.56876457 74.2627346 8.58  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 28.48000000 95.4423592 25.00  
## aux\_years\_sell=f.years\_sell-(6,23] 35.95238095 80.9651475 16.80  
## aux\_price=f.price-[0.65,14] 21.12787927 71.3136729 25.18  
## year=f.Year-2014 56.34517766 29.7587131 3.94  
## aux\_tax=f.tax-(145,580] 16.20947631 69.7050938 32.08  
## year=f.Year-2013 60.33057851 19.5710456 2.42  
## year=f.Year-2015 26.73031026 30.0268097 8.38  
## aux\_mpg=f.mpg-(61.4,88.3] 16.84303351 51.2064343 22.68  
## fuelType=f.Fuel-Diesel 10.59113300 80.6970509 56.84  
## mout=NoMOut 8.22129160 100.0000000 90.74  
## transmission=f.Trans-Manual 11.58774373 55.7640751 35.90  
## engineSize=f.EngSize-1.6 16.14730878 15.2815013 7.06  
## claHC=claHCPC-6 17.11026616 12.0643432 5.26  
## model=BMW-1 Series 17.25888325 9.1152815 3.94  
## aux\_tax=f.tax-[0,125] 15.15151515 12.0643432 5.94  
## model=Audi-A3 15.07537688 8.0428954 3.98  
## engineSize=f.EngSize-2.1 11.54791155 12.6005362 8.14  
## year=f.Year-2012 31.57894737 1.6085791 0.38  
## model=VW-Passat 13.82978723 3.4852547 1.88  
## model=BMW-3 Series 11.11111111 7.2386059 4.86  
## model=Audi-A1 12.40875912 4.5576408 2.74  
## model=BMW-6 Series 30.00000000 0.8042895 0.20  
## Audi=Audi Yes 8.94009217 26.0053619 21.70  
## manufacturer=Audi 8.94009217 26.0053619 21.70  
## model=VW-CC 27.27272727 0.8042895 0.22  
## Audi=Audi No 7.04980843 73.9946381 78.30  
## year=f.Year-2009 or before 0.00000000 0.0000000 0.84  
## model=Audi-Q5 2.15053763 0.5361930 1.86  
## model=Mercedes-C Class 4.63215259 4.5576408 7.34  
## model=Mercedes-GLE Class 0.00000000 0.0000000 1.10  
## model=VW-T-Roc 0.00000000 0.0000000 1.26  
## manufacturer=Mercedes 5.77350111 20.9115282 27.02  
## engineSize=f.EngSize-1.3 0.00000000 0.0000000 1.52  
## engineSize=f.EngSize-3 4.44839858 6.7024129 11.24  
## model=Audi-Q2 0.00000000 0.0000000 1.60  
## engineSize=f.EngSize-1.5 3.97830018 5.8981233 11.06  
## model=Mercedes-GLC Class 0.00000000 0.0000000 2.38  
## engineSize=f.EngSize-1 2.94840295 3.2171582 8.14  
## claHC=claHCPC-5 0.00000000 0.0000000 2.46  
## aux\_mpg=f.mpg-(44.8,53.3] 4.93468795 18.2305630 27.56  
## year=f.Year-2020 0.00000000 0.0000000 6.42  
## transmission=f.Trans-SemiAuto 4.22832981 21.4477212 37.84  
## claHC=claHCPC-8 0.00000000 0.0000000 9.26  
## mout=YesMOut 0.00000000 0.0000000 9.26  
## year=f.Year-2018 0.00000000 0.0000000 9.86  
## claHC=claHCPC-4 1.57894737 4.0214477 19.00  
## aux\_mpg=f.mpg-[8.8,44.8] 1.92307692 6.7024129 26.00  
## fuelType=f.Fuel-Petrol 3.25203252 18.2305630 41.82  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 1.36000000 4.5576408 25.00  
## year=f.Year-2017 0.11273957 0.2680965 17.74  
## aux\_price=f.price-(19.5,26] 0.80321285 2.6809651 24.90  
## claHC=claHCPC-2 0.00000000 0.0000000 21.70  
## claHC=claHCPC-1 0.00000000 0.0000000 22.30  
## aux\_price=f.price-(26,110] 0.24000000 0.8042895 25.00  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 0.00000000 0.0000000 24.96  
## aux\_mileage=f.mileage-[4,6e+03] 0.00000000 0.0000000 25.04  
## aux\_years\_sell=f.years\_sell-(3,5] 0.07246377 0.2680965 27.60  
## year=f.Year-2019 0.00000000 0.0000000 31.94  
## aux\_tax=f.tax-(125,145] 2.19425621 18.2305630 61.98  
## aux\_years\_sell=f.years\_sell-[2,3] 0.00000000 0.0000000 38.36  
## p.value v.test  
## claHC=claHCPC-7 1.166017e-254 34.086580  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 2.144778e-206 30.656803  
## aux\_years\_sell=f.years\_sell-(6,23] 8.459310e-184 28.911906  
## aux\_price=f.price-[0.65,14] 2.761398e-85 19.570467  
## year=f.Year-2014 6.360082e-78 18.686634  
## aux\_tax=f.tax-(145,580] 3.248724e-54 15.504213  
## year=f.Year-2013 3.500240e-53 15.350767  
## year=f.Year-2015 1.170398e-37 12.826148  
## aux\_mpg=f.mpg-(61.4,88.3] 3.899697e-36 12.551516  
## fuelType=f.Fuel-Diesel 6.738721e-24 10.080493  
## mout=NoMOut 4.072547e-17 8.410791  
## transmission=f.Trans-Manual 4.858579e-16 8.114982  
## engineSize=f.EngSize-1.6 1.076520e-08 5.718210  
## claHC=claHCPC-6 8.345514e-08 5.359494  
## model=BMW-1 Series 3.155896e-06 4.660404  
## aux\_tax=f.tax-[0,125] 3.165253e-06 4.659794  
## model=Audi-A3 1.886396e-04 3.733764  
## engineSize=f.EngSize-2.1 2.069129e-03 3.080126  
## year=f.Year-2012 2.225386e-03 3.058378  
## model=VW-Passat 3.054078e-02 2.163005  
## model=BMW-3 Series 3.526198e-02 2.105337  
## model=Audi-A1 3.756744e-02 2.079543  
## model=BMW-6 Series 3.776305e-02 2.077417  
## Audi=Audi Yes 3.932414e-02 2.060779  
## manufacturer=Audi 3.932414e-02 2.060779  
## model=VW-CC 4.991869e-02 1.960660  
## Audi=Audi No 3.932414e-02 -2.060779  
## year=f.Year-2009 or before 3.799926e-02 -2.074863  
## model=Audi-Q5 3.180642e-02 -2.146835  
## model=Mercedes-C Class 2.521705e-02 -2.238061  
## model=Mercedes-GLE Class 1.372919e-02 -2.464272  
## model=VW-T-Roc 7.327630e-03 -2.681576  
## manufacturer=Mercedes 4.858145e-03 -2.816292  
## engineSize=f.EngSize-1.3 2.635569e-03 -3.007326  
## engineSize=f.EngSize-3 2.355187e-03 -3.041352  
## model=Audi-Q2 1.923030e-03 -3.101869  
## engineSize=f.EngSize-1.5 4.142375e-04 -3.530843  
## model=Mercedes-GLC Class 8.774561e-05 -3.922196  
## engineSize=f.EngSize-1 6.672803e-05 -3.987661  
## claHC=claHCPC-5 6.383834e-05 -3.998154  
## aux\_mpg=f.mpg-(44.8,53.3] 1.421468e-05 -4.340519  
## year=f.Year-2020 6.535990e-12 -6.867449  
## transmission=f.Trans-SemiAuto 2.003552e-12 -7.034236  
## claHC=claHCPC-8 4.072547e-17 -8.410791  
## mout=YesMOut 4.072547e-17 -8.410791  
## year=f.Year-2018 3.078771e-18 -8.708517  
## claHC=claHCPC-4 9.257139e-19 -8.843735  
## aux\_mpg=f.mpg-[8.8,44.8] 3.438861e-23 -9.919087  
## fuelType=f.Fuel-Petrol 8.785181e-24 -10.054404  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 9.560380e-28 -10.916998  
## year=f.Year-2017 8.828911e-32 -11.731114  
## aux\_price=f.price-(19.5,26] 1.988650e-34 -12.236312  
## claHC=claHCPC-2 4.000788e-42 -13.600065  
## claHC=claHCPC-1 1.961284e-43 -13.818868  
## aux\_price=f.price-(26,110] 8.321861e-44 -13.880451  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 2.267259e-49 -14.770588  
## aux\_mileage=f.mileage-[4,6e+03] 1.491166e-49 -14.798801  
## aux\_years\_sell=f.years\_sell-(3,5] 2.786072e-53 -15.365563  
## year=f.Year-2019 4.510084e-66 -17.169276  
## aux\_tax=f.tax-(125,145] 1.530673e-72 -18.013354  
## aux\_years\_sell=f.years\_sell-[2,3] 4.022746e-83 -19.314930  
##   
## $`8`  
## Cla/Mod Mod/Cla Global  
## claHC=claHCPC-8 100.000000 100.0000000 9.26  
## mout=YesMOut 100.000000 100.0000000 9.26  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 27.760000 74.9460043 25.00  
## aux\_years\_sell=f.years\_sell-(6,23] 27.857143 50.5399568 16.80  
## aux\_tax=f.tax-(145,580] 19.763092 68.4665227 32.08  
## aux\_price=f.price-[0.65,14] 21.604448 58.7473002 25.18  
## year=f.Year-2009 or before 100.000000 9.0712743 0.84  
## year=f.Year-2011 100.000000 4.5356371 0.42  
## year=f.Year-2010 100.000000 4.5356371 0.42  
## engineSize=f.EngSize-4 82.142857 4.9676026 0.56  
## engineSize=f.EngSize-4.2 or more 75.000000 4.5356371 0.56  
## transmission=f.Trans-Automatic 14.166032 40.1727862 26.26  
## engineSize=f.EngSize-3 17.437722 21.1663067 11.24  
## year=f.Year-2013 28.925620 7.5593952 2.42  
## fuelType=f.Fuel-Diesel 11.365236 69.7624190 56.84  
## model=Audi-Q8 100.000000 1.7278618 0.16  
## aux\_mpg=f.mpg-[8.8,44.8] 13.384615 37.5809935 26.00  
## year=f.Year-2012 63.157895 2.5917927 0.38  
## model=BMW-X7 100.000000 1.5118790 0.14  
## model=Audi-Q7 43.750000 3.0237581 0.64  
## year=f.Year-2015 16.229117 14.6868251 8.38  
## aux\_mpg=f.mpg-(61.4,88.3] 12.962963 31.7494600 22.68  
## manufacturer=BMW 13.060057 29.5896328 20.98  
## model=BMW-M5 100.000000 0.8639309 0.08  
## year=f.Year-2014 17.766497 7.5593952 3.94  
## model=BMW-8 Series 80.000000 0.8639309 0.10  
## model=BMW-i8 100.000000 0.6479482 0.06  
## model=Audi-RS6 100.000000 0.6479482 0.06  
## fuelType=f.Fuel-Hybrid 23.636364 2.8077754 1.10  
## engineSize=f.EngSize-1.8 30.769231 1.7278618 0.52  
## model=Audi-A6 21.126761 3.2397408 1.42  
## model=BMW-X5 27.272727 1.9438445 0.66  
## model=Mercedes-M Class 50.000000 0.8639309 0.16  
## Audi=Audi Yes 11.520737 26.9978402 21.70  
## manufacturer=Audi 11.520737 26.9978402 21.70  
## model=Audi-SQ5 60.000000 0.6479482 0.10  
## model=Mercedes-SL CLASS 23.684211 1.9438445 0.76  
## model=Mercedes-CLC Class 100.000000 0.4319654 0.04  
## model=Audi-R8 100.000000 0.4319654 0.04  
## engineSize=f.EngSize-1.6 13.314448 10.1511879 7.06  
## engineSize=f.EngSize-2.5 40.000000 0.8639309 0.20  
## model=BMW-X3 20.833333 2.1598272 0.96  
## model=BMW-5 Series 17.441860 3.2397408 1.72  
## model=VW-Passat 17.021277 3.4557235 1.88  
## model=Audi-A4 15.441176 4.5356371 2.72  
## model=BMW-X6 42.857143 0.6479482 0.14  
## model=BMW-3 Series 13.580247 7.1274298 4.86  
## model=Audi-RS5 66.666667 0.4319654 0.06  
## year=f.Year-2020 6.230530 4.3196544 6.42  
## model=VW-Up 3.409091 0.6479482 1.76  
## engineSize=f.EngSize-1.4 5.882353 3.6717063 5.78  
## aux\_price=f.price-(26,110] 7.760000 20.9503240 25.00  
## model=Mercedes-CL Class 1.754386 0.2159827 1.14  
## model=VW-Golf 6.557377 6.9114471 9.76  
## model=VW-Tiguan 4.268293 1.5118790 3.28  
## engineSize=f.EngSize-1.2 3.200000 0.8639309 2.50  
## Audi=Audi No 8.633461 73.0021598 78.30  
## model=Audi-Q2 1.250000 0.2159827 1.60  
## engineSize=f.EngSize-2 7.840308 35.2051836 41.58  
## model=VW-T-Roc 0.000000 0.0000000 1.26  
## year=f.Year-2017 6.538895 12.5269978 17.74  
## engineSize=f.EngSize-1.3 0.000000 0.0000000 1.52  
## model=Audi-Q3 1.408451 0.4319654 2.84  
## aux\_mpg=f.mpg-(53.3,61.4] 6.397306 16.4146868 23.76  
## claHC=claHCPC-5 0.000000 0.0000000 2.46  
## model=VW-Polo 2.873563 2.1598272 6.96  
## manufacturer=VW 6.006601 19.6544276 30.30  
## year=f.Year-2018 3.245436 3.4557235 9.86  
## engineSize=f.EngSize-1.5 3.254973 3.8876890 11.06  
## aux\_price=f.price-(14,19.5] 5.296950 14.2548596 24.92  
## transmission=f.Trans-SemiAuto 6.183932 25.2699784 37.84  
## aux\_years\_sell=f.years\_sell-(3,5] 5.362319 15.9827214 27.60  
## engineSize=f.EngSize-1 1.474201 1.2958963 8.14  
## fuelType=f.Fuel-Petrol 5.978001 26.9978402 41.82  
## claHC=claHCPC-6 0.000000 0.0000000 5.26  
## aux\_mpg=f.mpg-(44.8,53.3] 4.789550 14.2548596 27.56  
## aux\_mileage=f.mileage-[4,6e+03] 4.073482 11.0151188 25.04  
## claHC=claHCPC-7 0.000000 0.0000000 8.58  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 2.724359 7.3434125 24.96  
## claHC=claHCPC-3 0.000000 0.0000000 11.44  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.480000 6.6954644 25.00  
## aux\_price=f.price-(19.5,26] 2.248996 6.0475162 24.90  
## year=f.Year-2019 2.504696 8.6393089 31.94  
## aux\_years\_sell=f.years\_sell-[2,3] 3.128259 12.9589633 38.36  
## claHC=claHCPC-4 0.000000 0.0000000 19.00  
## claHC=claHCPC-2 0.000000 0.0000000 21.70  
## claHC=claHCPC-1 0.000000 0.0000000 22.30  
## aux\_tax=f.tax-(125,145] 3.581801 23.9740821 61.98  
## mout=NoMOut 0.000000 0.0000000 90.74  
## p.value v.test  
## claHC=claHCPC-8 0.000000e+00 Inf  
## mout=YesMOut 0.000000e+00 Inf  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 1.554868e-126 23.928299  
## aux\_years\_sell=f.years\_sell-(6,23] 4.901088e-71 17.820484  
## aux\_tax=f.tax-(145,580] 5.062511e-64 16.893041  
## aux\_price=f.price-[0.65,14] 5.767433e-59 16.191740  
## year=f.Year-2009 or before 6.914535e-45 14.057649  
## year=f.Year-2011 1.309612e-22 9.784717  
## year=f.Year-2010 1.309612e-22 9.784717  
## engineSize=f.EngSize-4 6.632477e-20 9.133492  
## engineSize=f.EngSize-4.2 or more 8.600628e-17 8.322666  
## transmission=f.Trans-Automatic 6.897170e-12 6.859770  
## engineSize=f.EngSize-3 7.943877e-11 6.501659  
## year=f.Year-2013 4.202440e-10 6.246317  
## fuelType=f.Fuel-Diesel 2.200919e-09 5.982238  
## model=Audi-Q8 5.115807e-09 5.843361  
## aux\_mpg=f.mpg-[8.8,44.8] 8.579695e-09 5.756655  
## year=f.Year-2012 1.006358e-08 5.729654  
## model=BMW-X7 5.601584e-08 5.431074  
## model=Audi-Q7 3.098228e-07 5.117372  
## year=f.Year-2015 2.091759e-06 4.744351  
## aux\_mpg=f.mpg-(61.4,88.3] 2.343987e-06 4.721251  
## manufacturer=BMW 4.253532e-06 4.598593  
## model=BMW-M5 7.266462e-05 3.967388  
## year=f.Year-2014 1.422709e-04 3.804187  
## model=BMW-8 Series 3.432952e-04 3.580227  
## model=BMW-i8 7.893589e-04 3.356499  
## model=Audi-RS6 7.893589e-04 3.356499  
## fuelType=f.Fuel-Hybrid 1.539956e-03 3.167047  
## engineSize=f.EngSize-1.8 2.115019e-03 3.073587  
## model=Audi-A6 2.351547e-03 3.041817  
## model=BMW-X5 2.911931e-03 2.976885  
## model=Mercedes-M Class 4.048421e-03 2.874364  
## Audi=Audi Yes 4.528525e-03 2.838788  
## manufacturer=Audi 4.528525e-03 2.838788  
## model=Audi-SQ5 7.180295e-03 2.688365  
## model=Mercedes-SL CLASS 8.421713e-03 2.634678  
## model=Mercedes-CLC Class 8.557952e-03 2.629226  
## model=Audi-R8 8.557952e-03 2.629226  
## engineSize=f.EngSize-1.6 9.398039e-03 2.597225  
## engineSize=f.EngSize-2.5 1.082174e-02 2.548403  
## model=BMW-X3 1.462839e-02 2.441450  
## model=BMW-5 Series 1.638753e-02 2.400168  
## model=VW-Passat 1.670834e-02 2.393064  
## model=Audi-A4 1.911364e-02 2.343307  
## model=BMW-X6 2.282115e-02 2.276416  
## model=BMW-3 Series 2.361209e-02 2.263383  
## model=Audi-RS5 2.488450e-02 2.243191  
## year=f.Year-2020 4.530707e-02 -2.001792  
## model=VW-Up 4.031697e-02 -2.050487  
## engineSize=f.EngSize-1.4 3.364805e-02 -2.124264  
## aux\_price=f.price-(26,110] 3.250104e-02 -2.138194  
## model=Mercedes-CL Class 3.001385e-02 -2.169908  
## model=VW-Golf 2.525909e-02 -2.237417  
## model=VW-Tiguan 1.623524e-02 -2.403584  
## engineSize=f.EngSize-1.2 9.418223e-03 -2.596488  
## Audi=Audi No 4.528525e-03 -2.838788  
## model=Audi-Q2 4.062357e-03 -2.873279  
## engineSize=f.EngSize-2 3.294183e-03 -2.938863  
## model=VW-T-Roc 2.107941e-03 -3.074587  
## year=f.Year-2017 1.438391e-03 -3.186834  
## engineSize=f.EngSize-1.3 5.850247e-04 -3.438464  
## model=Audi-Q3 1.178440e-04 -3.850568  
## aux\_mpg=f.mpg-(53.3,61.4] 5.578170e-05 -4.029980  
## claHC=claHCPC-5 5.515425e-06 -4.544162  
## model=VW-Polo 1.482869e-06 -4.813531  
## manufacturer=VW 6.133813e-08 -5.414856  
## year=f.Year-2018 5.937028e-08 -5.420687  
## engineSize=f.EngSize-1.5 8.133131e-09 -5.765676  
## aux\_price=f.price-(14,19.5] 4.645667e-09 -5.859391  
## transmission=f.Trans-SemiAuto 1.998420e-09 -5.997935  
## aux\_years\_sell=f.years\_sell-(3,5] 7.634609e-10 -6.152344  
## engineSize=f.EngSize-1 1.688770e-11 -6.730676  
## fuelType=f.Fuel-Petrol 4.072047e-12 -6.934658  
## claHC=claHCPC-6 3.836788e-12 -6.943066  
## aux\_mpg=f.mpg-(44.8,53.3] 1.077617e-12 -7.120211  
## aux\_mileage=f.mileage-[4,6e+03] 3.386259e-15 -7.875779  
## claHC=claHCPC-7 1.070250e-19 -9.081565  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 1.424402e-24 -10.232071  
## claHC=claHCPC-3 1.931360e-26 -10.640478  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 1.025706e-26 -10.699281  
## aux\_price=f.price-(19.5,26] 1.077181e-28 -11.113607  
## year=f.Year-2019 1.216673e-35 -12.461109  
## aux\_years\_sell=f.years\_sell-[2,3] 1.127852e-36 -12.649363  
## claHC=claHCPC-4 1.934579e-45 -14.147521  
## claHC=claHCPC-2 1.098165e-52 -15.276416  
## claHC=claHCPC-1 2.479313e-54 -15.521565  
## aux\_tax=f.tax-(125,145] 1.927642e-68 -17.483090  
## mout=NoMOut 0.000000e+00 -Inf  
##   
##   
## Link between the cluster variable and the quantitative variables  
## ================================================================  
## Eta2 P-value  
## price 0.2982498 0  
## mileage 0.6964806 0  
## tax 0.6185937 0  
## mpg 0.4436024 0  
## years\_sell 0.6366584 0  
## totalMOE 0.3492559 0  
##   
## Description of each cluster by quantitative variables  
## =====================================================  
## $`1`  
## v.test Mean in category Overall mean sd in category Overall sd  
## mpg 5.707897 5.498795e+01 52.73678 9.1451284 1.149277e+01  
## tax -2.075033 1.461651e+02 146.98985 3.2692157 1.158247e+01  
## years\_sell -8.027318 4.196970e+00 4.78660 0.8486201 2.140435e+00  
## mileage -10.788987 1.494471e+04 22887.97553 7106.6113628 2.145413e+04  
## totalMOE -13.273108 6.749311e-02 0.28340 0.2508741 4.740089e-01  
## p.value  
## mpg 1.143805e-08  
## tax 3.798346e-02  
## years\_sell 9.962695e-16  
## mileage 3.880427e-27  
## totalMOE 3.315410e-40  
##   
## $`2`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price 29.011064 3.220756e+04 21470.24440 9252.6565545 1.084587e+04  
## tax -3.074651 1.457746e+02 146.98985 2.0564225 1.158247e+01  
## totalMOE -15.664948 3.001364e-02 0.28340 0.1706248 4.740089e-01  
## mileage -25.817761 3.986430e+03 22887.97553 3441.3981207 2.145413e+04  
## years\_sell -28.475797 2.706685e+00 4.78660 0.5063542 2.140435e+00  
## mpg -36.643573 3.836568e+01 52.73678 5.8090831 1.149277e+01  
## p.value  
## price 4.771613e-185  
## tax 2.107489e-03  
## totalMOE 2.626434e-55  
## mileage 5.602856e-147  
## years\_sell 2.336322e-178  
## mpg 5.792301e-294  
##   
## $`3`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price 11.671565 2.486124e+04 21470.24440 7293.6990803 1.084587e+04  
## tax -5.277011 1.453526e+02 146.98985 1.7826732 1.158247e+01  
## mpg -11.381390 4.923287e+01 52.73678 5.9034624 1.149277e+01  
## totalMOE -21.379976 1.192661e-02 0.28340 0.1085558 4.740089e-01  
## mileage -28.877313 6.292056e+03 22887.97553 4570.4458112 2.145413e+04  
## years\_sell -30.359561 3.045872e+00 4.78660 0.4237301 2.140435e+00  
## p.value  
## price 1.781158e-31  
## tax 1.313083e-07  
## mpg 5.176796e-30  
## totalMOE 2.052350e-101  
## mileage 2.301216e-183  
## years\_sell 1.878962e-202  
##   
## $`4`  
## v.test Mean in category Overall mean sd in category Overall sd  
## tax 52.523839 2.009455e+02 146.98985 4.914306e+00 1.158247e+01  
## years\_sell 9.705326 6.629032e+00 4.78660 1.160282e+00 2.140435e+00  
## mileage 6.627876 3.549942e+04 22887.97553 1.329314e+04 2.145413e+04  
## totalMOE -6.549321 8.064516e-03 0.28340 8.943981e-02 4.740089e-01  
## mpg -8.236646 4.434113e+01 52.73678 3.828775e+00 1.149277e+01  
## p.value  
## tax 0.000000e+00  
## years\_sell 2.861605e-22  
## mileage 3.405509e-11  
## totalMOE 5.779944e-11  
## mpg 1.771051e-16  
##   
## $`5`  
## v.test Mean in category Overall mean sd in category Overall sd  
## mpg 16.182267 5.888783e+01 52.73678 7.4035770 1.149277e+01  
## totalMOE 9.731508 4.359638e-01 0.28340 0.5138196 4.740089e-01  
## years\_sell 8.094620 5.359638e+00 4.78660 0.7029974 2.140435e+00  
## tax -4.317522 1.453359e+02 146.98985 5.6585490 1.158247e+01  
## price -13.762222 1.653353e+04 21470.24440 5581.1974101 1.084587e+04  
## p.value  
## mpg 6.727083e-59  
## totalMOE 2.212886e-22  
## years\_sell 5.744333e-16  
## tax 1.577907e-05  
## price 4.301035e-43  
##   
## $`6`  
## v.test Mean in category Overall mean sd in category Overall sd  
## mpg 22.79082 6.178377e+01 52.73678 8.0810658 1.149277e+01  
## years\_sell 18.05177 6.121170e+00 4.78660 0.8231151 2.140435e+00  
## totalMOE 17.82348 5.752089e-01 0.28340 0.5109371 4.740089e-01  
## mileage 15.26178 3.419728e+04 22887.97553 8964.2957270 2.145413e+04  
## price -16.27041 1.537512e+04 21470.24440 4106.3903423 1.084587e+04  
## tax -16.40878 1.404254e+02 146.98985 9.5662194 1.158247e+01  
## p.value  
## mpg 5.655160e-115  
## years\_sell 7.640095e-73  
## totalMOE 4.645423e-71  
## mileage 1.374451e-52  
## price 1.600768e-59  
## tax 1.654976e-60  
##   
## $`7`  
## v.test Mean in category Overall mean sd in category Overall sd  
## mileage 26.10795 5.079012e+04 22887.97553 9825.0311877 2.145413e+04  
## years\_sell 25.86314 7.544236e+00 4.78660 1.0617908 2.140435e+00  
## totalMOE 16.83713 6.809651e-01 0.28340 0.4885687 4.740089e-01  
## mpg 14.81617 6.121910e+01 52.73678 10.4800946 1.149277e+01  
## price -17.33829 1.210273e+04 21470.24440 3841.9262489 1.084587e+04  
## p.value  
## mileage 2.961352e-150  
## years\_sell 1.731510e-147  
## totalMOE 1.304120e-63  
## mpg 1.151664e-49  
## price 2.418448e-67  
##   
## $`8`  
## v.test Mean in category Overall mean sd in category Overall sd  
## mileage 37.630812 5.863228e+04 22887.97553 31918.640845 2.145413e+04  
## years\_sell 27.162493 7.360691e+00 4.78660 3.588067 2.140435e+00  
## totalMOE 20.252281 7.084233e-01 0.28340 0.605299 4.740089e-01  
## tax 11.573894 1.529250e+02 146.98985 15.573121 1.158247e+01  
## mpg -2.777691 5.132340e+01 52.73678 15.551143 1.149277e+01  
## p.value  
## mileage 0.000000e+00  
## years\_sell 1.802722e-162  
## totalMOE 3.391667e-91  
## tax 5.588725e-31  
## mpg 5.474665e-03

We start with the description of the categorical variables that characterize the clusters:

Cluster 1: Cluster one has cars with few years\_sell, low mpg, medium taxes, low mileage and high price. Also, cars with semiAuto transmission and cars with petrol as fuel predominate. We can say this because these categories are overrepresented in the cluster.

Cluster 1: Cluster one has cars with high mileage and many years\_sell. Also, non-Audi cars predominate.

Cluster 2: Cluster two has cars with medium years\_sell, high mpg, low price and medium-high mileage . Also, cars with diesel as fuel predominate.

Cluster 3: Cluster three has cars with high taxes, many years\_sell, high mileage and low mpg. Also, non-Audi cars and cars with engineSize 2 predominate.

Cluster 4: Cluster four has cars with few years\_sell, medium taxes, low mileage, high price and medium-low mpg. Also, non-Audi cars and cars with diesel as fuel predominate.

Cluster 5: Cluster five has cars with high mileage, many years\_sell, low price, high taxes and high mpg. Also, cars with diesel as fuel and cars with manual transmission predominate.

Cluster 6: Cluster six has cars with low mpg, few years\_sell, low mileage, high price and medium taxes. Also, cars with petrol as fuel, cars with semiAuto transmission, cars with engineSize 2 and non-Audi cars predominate.

Cluster 7: Cluster seven has cars with medium-few years\_sell, medium taxes, medium mileage, medium price and medium mpg. Also, non-Audi cars predominate.

Cluster 8: Cluster of multivariate outliers.

Regarding quantitative variables:

Cluster 1: As we can see mpg, years\_sell and mileage means are greater in cluster 1 than in the overall means. Also, we can see that price and tax means are lower in cluster 1 than in the overall means. So we can say that cluster 1 is a cluster of cheap cars with high mpg, many years\_sell, high mileage and low tax.

Cluster 2: As we can see mpg and years\_sell means are greater in cluster 2 than in the overall means. Also, we can see that tax and price means are lower in cluster 2 than in the overall means. So we can say that cluster 2 is a cluster of cheap cars with high mpg, many years\_sell and low tax.

Cluster 3: As we can see tax, years\_sell and mileage means are greater in cluster 3 than in the overall means. Also, we can see that mpg mean is lower in cluster 3 than in the overall mean. So we can say that cluster 3 is a cluster of cars with high tax, many years\_sell, high mileage and low mpg.

Cluster 4: As we can see price mean is greater in cluster 4 than in the overall mean. Also, we can see that tax, mpg, mileage and years\_sell means are lower in cluster 4 than in the overall means. So we can say that cluster 4 is a cluster of expensive cars with low tax, low mpg, low mileage and few years\_sell.

Cluster 5: As we can see mileage, years\_sell and mpg means are greater in cluster 5 than in the overall means. Also, we can see that price mean is lower in cluster 5 than in the overall mean. So we can say that cluster 5 is a cluster of cheap cars with high mileage, many years\_sell and high mpg.

Cluster 6: As we can see price mean is greater in cluster 6 than in the overall mean. Also, we can see that tax, mileage, years\_sell and mpg means are lower in cluster 6 than in the overall means. So we can say that cluster 6 is a cluster of expensive cars and low tax, low mileage, few years\_sell and low mpg.

Cluster 7: As we can see mpg mean is greater in cluster 7 than in the overall mean. Also, we can see that tax, years\_sell and mileage means are lower in cluster 7 than in the overall means. So we can say that cluster 7 is a cluster of cars with high mpg, low tax, few years\_sell and low mileage.

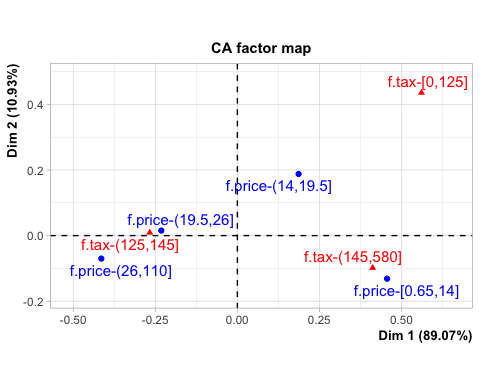
Cluster 8: Cluster of multivariate outliers.

# CA

par(mfrow=c(1,1))  
  
tt<-table(df[,c("aux\_price","aux\_tax")])  
tt

## aux\_tax  
## aux\_price f.tax-[0,125] f.tax-(125,145] f.tax-(145,580]  
## f.price-[0.65,14] 95 495 669  
## f.price-(14,19.5] 147 671 428  
## f.price-(19.5,26] 50 912 283  
## f.price-(26,110] 5 1021 224

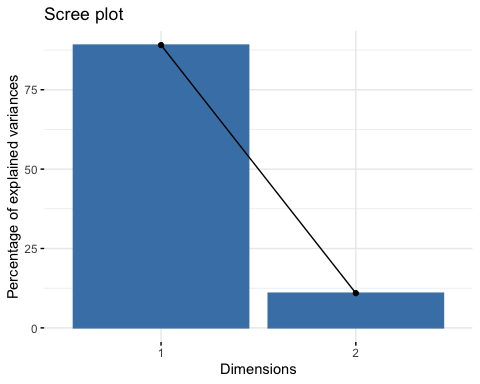
res.ca<-CA(tt)



chisq.test(tt)

##   
## Pearson's Chi-squared test  
##   
## data: tt  
## X-squared = 659.26, df = 6, p-value < 2.2e-16

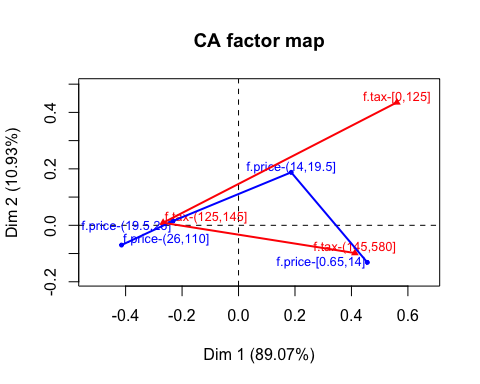
fviz\_eig(res.ca) #Same outputs as PCA



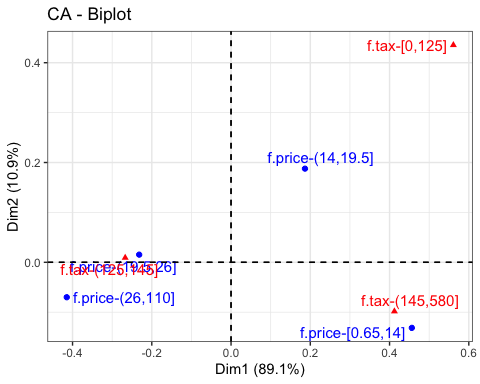
summary(res.ca,dig=2)

##   
## Call:  
## CA(X = tt)   
##   
## The chi square of independence between the two variables is equal to 659.2639 (p-value = 3.804822e-139 ).  
##   
## Eigenvalues  
## Dim.1 Dim.2  
## Variance 0.117 0.014  
## % of var. 89.071 10.929  
## Cumulative % of var. 89.071 100.000  
##   
## Rows  
## Iner\*1000 Dim.1 ctr cos2 Dim.2 ctr cos2   
## f.price-[0.65,14] | 56.763 | 0.456 44.631 0.923 | -0.131 30.173 0.077 |  
## f.price-(14,19.5] | 17.452 | 0.187 7.385 0.497 | 0.188 60.917 0.503 |  
## f.price-(19.5,26] | 13.441 | -0.232 11.395 0.996 | 0.015 0.407 0.004 |  
## f.price-(26,110] | 44.197 | -0.415 36.589 0.972 | -0.070 8.503 0.028 |  
##   
## Columns  
## Iner\*1000 Dim.1 ctr cos2 Dim.2 ctr cos2   
## f.tax-[0,125] | 29.957 | 0.561 15.920 0.624 | 0.435 78.140 0.376 |  
## f.tax-(125,145] | 44.281 | -0.267 37.661 0.999 | 0.009 0.359 0.001 |  
## f.tax-(145,580] | 57.614 | 0.412 46.419 0.946 | -0.098 21.501 0.054 |

plot( res.ca, cex=0.8, graph.type = "classic" )  
lines( res.ca$row$coord[,1], res.ca$row$coord[,2], col="blue", lwd = 2 )  
lines( res.ca$col$coord[,1], res.ca$col$coord[,2], col="red", lwd = 2 )



fviz\_ca\_biplot(res.ca,repel=TRUE)+theme\_bw()

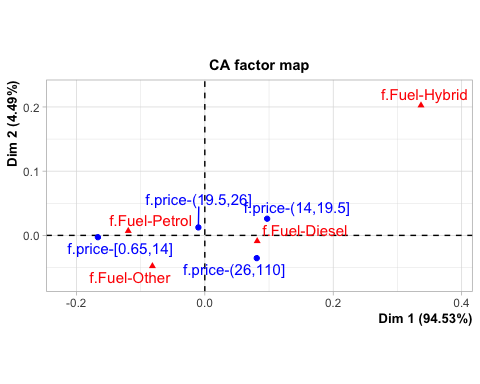


As we can see aux\_price and aux\_tax variables are not independent because the p-value is less than 0.05. Also, we can see that the cheapest cars have the highest taxes and the most expensive cars have average/medium taxes.

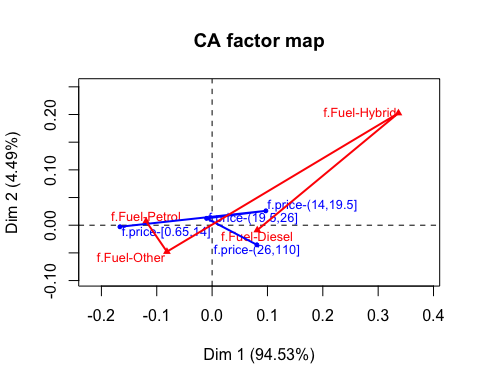
par(mfrow=c(1,1))  
  
tt<-table(df[,c("aux\_price","fuelType")])  
tt

## fuelType  
## aux\_price f.Fuel-Diesel f.Fuel-Hybrid f.Fuel-Other f.Fuel-Petrol  
## f.price-[0.65,14] 624 6 3 626  
## f.price-(14,19.5] 755 21 2 468  
## f.price-(19.5,26] 698 15 4 528  
## f.price-(26,110] 765 13 3 469

res.ca<-CA(tt)



plot( res.ca, cex=0.8, graph.type = "classic" )  
lines( res.ca$row$coord[,1], res.ca$row$coord[,2], col="blue", lwd = 2 )  
lines( res.ca$col$coord[,1], res.ca$col$coord[,2], col="red", lwd = 2 )



summary(res.ca)

##   
## Call:  
## CA(X = tt)   
##   
## The chi square of independence between the two variables is equal to 58.13151 (p-value = 3.066754e-09 ).  
##   
## Eigenvalues  
## Dim.1 Dim.2 Dim.3  
## Variance 0.011 0.001 0.000  
## % of var. 94.530 4.486 0.984  
## Cumulative % of var. 94.530 99.016 100.000  
##   
## Rows  
## Iner\*1000 Dim.1 ctr cos2 Dim.2 ctr cos2   
## f.price-[0.65,14] | 6.995 | -0.167 63.516 0.998 | -0.003 0.386 0.000 |  
## f.price-(14,19.5] | 2.541 | 0.097 21.368 0.924 | 0.026 32.221 0.066 |  
## f.price-(19.5,26] | 0.140 | -0.010 0.227 0.178 | 0.012 7.348 0.273 |  
## f.price-(26,110] | 1.950 | 0.081 14.889 0.839 | -0.035 60.045 0.161 |  
## Dim.3 ctr cos2   
## f.price-[0.65,14] -0.007 10.918 0.002 |  
## f.price-(14,19.5] -0.010 21.491 0.010 |  
## f.price-(19.5,26] 0.018 67.525 0.550 |  
## f.price-(26,110] -0.001 0.066 0.000 |  
##   
## Columns  
## Iner\*1000 Dim.1 ctr cos2 Dim.2 ctr cos2   
## f.Fuel-Diesel | 3.826 | 0.082 34.405 0.988 | -0.009 8.554 0.012 |  
## f.Fuel-Hybrid | 1.699 | 0.337 11.345 0.734 | 0.202 86.477 0.265 |  
## f.Fuel-Other | 0.134 | -0.082 0.145 0.119 | -0.048 1.052 0.041 |  
## f.Fuel-Petrol | 5.967 | -0.119 54.105 0.997 | 0.007 3.917 0.003 |  
## Dim.3 ctr cos2   
## f.Fuel-Diesel -0.001 0.201 0.000 |  
## f.Fuel-Hybrid 0.011 1.078 0.001 |  
## f.Fuel-Other 0.217 98.563 0.840 |  
## f.Fuel-Petrol -0.001 0.158 0.000 |

chisq.test(tt)

## Warning in chisq.test(tt): Chi-squared approximation may be incorrect

##   
## Pearson's Chi-squared test  
##   
## data: tt  
## X-squared = 58.132, df = 9, p-value = 3.067e-09

As we can see aux\_price and fuelType variables are not independent because the p-value is less than 0.05. Also, we can see that hybrid cars cause noise. We can see that diesel cars have the highest prices and petrol and other cars have the lowest prices.

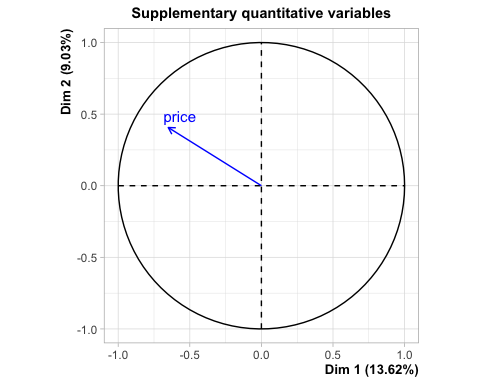
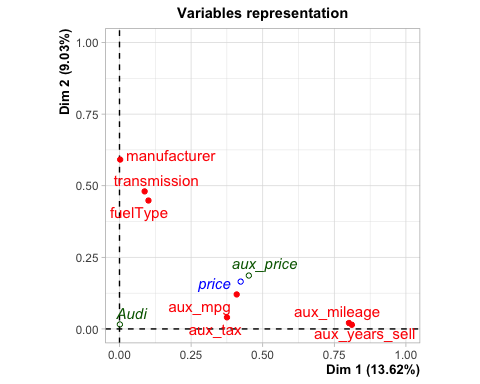
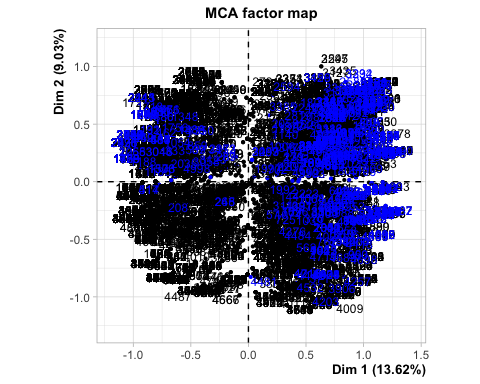
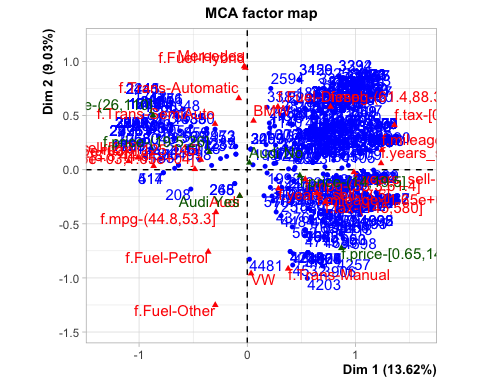
# MCA

The objectives of MCA are close to PCA objectives: similarity among individuals/ similarity among variables. Also, generalization of CA objectives: relationships among the categories.

par(mfrow=c(1,1))  
llvout<-which(df$mout=="YesMOut");length(llvout) #Multivariate outliers

## [1] 463

res.mca<-MCA(df[,c(vars\_dis[c(3:4,6:11)],"price", "Audi") ],quali.sup=c(4,10),quanti.sup=9 , ind.sup=llvout)



We can see that supplementary variable price is in the second quadrant (i.e. has a negative first dimension and a positive second dimension).

## Eigenvalues and dominant axes analysis

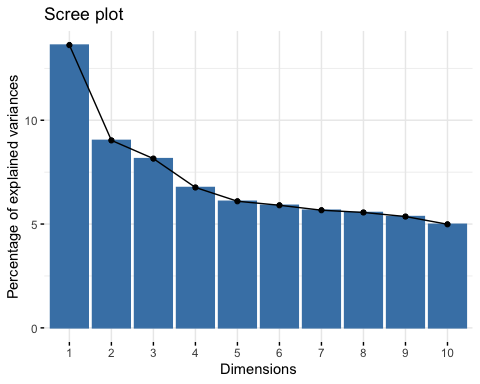
mean(res.mca$eig[,1])

## [1] 0.1428571

summary(res.mca)

##   
## Call:  
## MCA(X = df[, c(vars\_dis[c(3:4, 6:11)], "price", "Audi")], ind.sup = llvout,   
## quanti.sup = 9, quali.sup = c(4, 10))   
##   
##   
## Eigenvalues  
## Dim.1 Dim.2 Dim.3 Dim.4 Dim.5 Dim.6 Dim.7  
## Variance 0.370 0.245 0.221 0.184 0.166 0.160 0.154  
## % of var. 13.620 9.031 8.152 6.762 6.099 5.906 5.668  
## Cumulative % of var. 13.620 22.651 30.803 37.566 43.664 49.570 55.237  
## Dim.8 Dim.9 Dim.10 Dim.11 Dim.12 Dim.13 Dim.14  
## Variance 0.151 0.146 0.135 0.132 0.125 0.123 0.102  
## % of var. 5.559 5.362 4.990 4.849 4.605 4.533 3.758  
## Cumulative % of var. 60.796 66.159 71.148 75.997 80.601 85.134 88.892  
## Dim.15 Dim.16 Dim.17 Dim.18 Dim.19  
## Variance 0.084 0.079 0.066 0.049 0.023  
## % of var. 3.088 2.915 2.441 1.816 0.847  
## Cumulative % of var. 91.980 94.895 97.337 99.153 100.000  
##   
## Individuals (the 10 first)  
## Dim.1 ctr cos2 Dim.2 ctr cos2 Dim.3 ctr  
## 1 | 0.665 0.026 0.155 | -0.733 0.048 0.188 | -0.165 0.003  
## 2 | 0.865 0.045 0.229 | -0.594 0.032 0.108 | 0.892 0.079  
## 3 | 0.330 0.007 0.045 | 0.370 0.012 0.057 | -0.581 0.034  
## 4 | -0.677 0.027 0.229 | -0.584 0.031 0.171 | 0.336 0.011  
## 5 | -0.070 0.000 0.002 | -0.298 0.008 0.038 | -0.447 0.020  
## 6 | 0.038 0.000 0.001 | -0.752 0.051 0.264 | -0.492 0.024  
## 7 | 0.601 0.022 0.140 | -0.041 0.000 0.001 | -0.341 0.012  
## 8 | 0.130 0.001 0.007 | -0.557 0.028 0.120 | -0.298 0.009  
## 9 | -0.540 0.017 0.154 | 0.167 0.003 0.015 | -0.009 0.000  
## 10 | -0.827 0.041 0.334 | -0.096 0.001 0.005 | 0.104 0.001  
## cos2   
## 1 0.010 |  
## 2 0.243 |  
## 3 0.140 |  
## 4 0.057 |  
## 5 0.086 |  
## 6 0.113 |  
## 7 0.045 |  
## 8 0.034 |  
## 9 0.000 |  
## 10 0.005 |  
##   
## Supplementary individuals (the 10 first)  
## Dim.1 cos2 Dim.2 cos2 Dim.3 cos2   
## 14 | 0.905 0.254 | 0.416 0.054 | 0.566 0.099 |  
## 31 | -0.768 0.270 | 0.380 0.066 | 0.442 0.089 |  
## 37 | -0.370 0.065 | 0.208 0.020 | -0.327 0.051 |  
## 39 | 0.823 0.217 | -0.296 0.028 | 1.082 0.376 |  
## 57 | 0.154 0.009 | -0.240 0.022 | 0.436 0.071 |  
## 72 | 0.588 0.120 | 0.290 0.029 | 0.587 0.120 |  
## 79 | 0.528 0.088 | 0.213 0.014 | 1.148 0.416 |  
## 87 | -0.105 0.005 | 0.144 0.010 | -0.453 0.097 |  
## 138 | 0.605 0.128 | 0.066 0.002 | 0.608 0.130 |  
## 149 | 1.012 0.336 | -0.039 0.000 | 0.521 0.089 |  
##   
## Categories (the 10 first)  
## Dim.1 ctr cos2 v.test Dim.2 ctr cos2  
## f.Trans-Manual | 0.378 1.988 0.080 19.102 | -0.915 17.583 0.472  
## f.Trans-SemiAuto | -0.298 1.342 0.057 -16.087 | 0.423 4.087 0.115  
## f.Trans-Automatic | -0.079 0.060 0.002 -3.055 | 0.661 6.318 0.144  
## f.Fuel-Diesel | 0.283 1.719 0.100 21.300 | 0.581 10.927 0.422  
## f.Fuel-Hybrid | -0.018 0.000 0.000 -0.118 | 0.942 0.479 0.008  
## f.Fuel-Other | -0.296 0.007 0.000 -0.937 | -1.251 0.201 0.003  
## f.Fuel-Petrol | -0.361 2.180 0.100 -21.249 | -0.758 14.523 0.440  
## Audi | -0.070 0.040 0.001 -2.434 | -0.242 0.724 0.016  
## BMW | 0.058 0.026 0.001 1.947 | 0.452 2.396 0.051  
## Mercedes | -0.029 0.009 0.000 -1.195 | 0.955 14.535 0.343  
## v.test Dim.3 ctr cos2 v.test   
## f.Trans-Manual -46.256 | -0.010 0.002 0.000 -0.518 |  
## f.Trans-SemiAuto 22.858 | -0.079 0.157 0.004 -4.255 |  
## f.Trans-Automatic 25.579 | 0.139 0.310 0.006 5.381 |  
## f.Fuel-Diesel 43.728 | -0.035 0.043 0.002 -2.620 |  
## f.Fuel-Hybrid 6.132 | -0.360 0.077 0.001 -2.342 |  
## f.Fuel-Other -3.959 | 0.199 0.006 0.000 0.631 |  
## f.Fuel-Petrol -44.663 | 0.051 0.074 0.002 3.021 |  
## Audi -8.455 | 0.311 1.318 0.026 10.835 |  
## BMW 15.279 | 0.250 0.812 0.016 8.448 |  
## Mercedes 39.461 | -0.348 2.135 0.046 -14.370 |  
##   
## Categorical variables (eta2)  
## Dim.1 Dim.2 Dim.3   
## transmission | 0.088 0.480 0.007 |  
## fuelType | 0.101 0.448 0.003 |  
## manufacturer | 0.002 0.591 0.067 |  
## aux\_mileage | 0.801 0.021 0.583 |  
## aux\_tax | 0.375 0.040 0.143 |  
## aux\_mpg | 0.409 0.120 0.139 |  
## aux\_years\_sell | 0.811 0.014 0.606 |  
##   
## Supplementary categories  
## Dim.1 cos2 v.test Dim.2 cos2 v.test Dim.3  
## f.price-[0.65,14] | 0.869 0.210 30.878 | -0.725 0.146 -25.729 | 0.170  
## f.price-(14,19.5] | 0.486 0.083 19.386 | -0.054 0.001 -2.147 | -0.163  
## f.price-(19.5,26] | -0.351 0.045 -14.302 | 0.163 0.010 6.653 | -0.174  
## f.price-(26,110] | -0.871 0.258 -34.241 | 0.503 0.086 19.776 | 0.204  
## Audi No | 0.019 0.001 2.434 | 0.065 0.016 8.455 | -0.083  
## Audi Yes | -0.070 0.001 -2.434 | -0.242 0.016 -8.455 | 0.311  
## cos2 v.test   
## f.price-[0.65,14] 0.008 6.047 |  
## f.price-(14,19.5] 0.009 -6.489 |  
## f.price-(19.5,26] 0.011 -7.094 |  
## f.price-(26,110] 0.014 8.026 |  
## Audi No 0.026 -10.835 |  
## Audi Yes 0.026 10.835 |  
##   
## Supplementary categorical variables (eta2)  
## Dim.1 Dim.2 Dim.3   
## aux\_price | 0.452 0.186 0.032 |  
## Audi | 0.001 0.016 0.026 |  
##   
## Supplementary continuous variable  
## Dim.1 Dim.2 Dim.3   
## price | -0.650 | 0.407 | 0.048 |

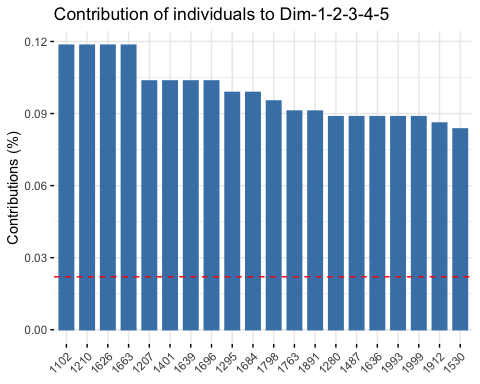
fviz\_eig(res.mca)



According to Elbow’s rule we can pick up to 5 dimensions, the ones that brings more variability among planes.

## Individuals point of view

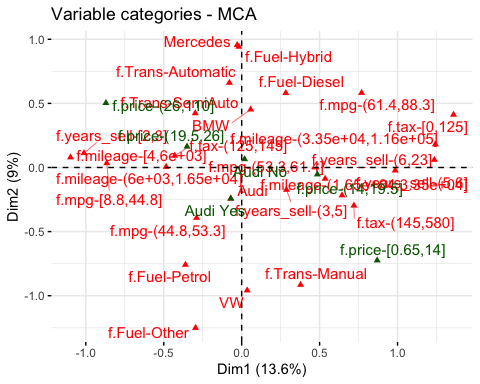
fviz\_contrib(res.mca, choice = "ind", axes = 1:5, top = 20)



As we can see from the Contribution of individuals to Dim-1-2-3-4-5 plot, the 20 most contributive individuals in descending order are 1102, 1210, 1626, 1663, 1207, 1401, 1639, 1696, 1295, 1684, 1798, 1763, 1891, 1280, 1487, 1636, 1993, 1999, 1912 and 1530.

## Interpreting map of categories

fviz\_mca\_var(res.mca, repel=TRUE)



As we can see all the categories are sparse around the center of mass. In the first dimension we have as extremes f.mileage-[4,6e+03], f.years\_sell-[2,3] in the negative side and in the other one we have f.mileage-(3.35e+04,1.16e+05], f.years\_sell-(6,23]. For the dimension 2 as extremes we can find f.Fuel-Hybrid (positive side) and f.Fuel-Other (negative side). These extremes are going to be poorly represented in that dimensions.

## Interpreting the axes association to factor map

We can see/distinguish four clouds of variables (variables in the same cloud means they are related): First: manufacturer, transmission and fuelType variables. Second: Audi variable. Third: aux\_price, price, aux\_mpg and aux\_tax variables. Forth: aux\_mileage and aux\_years\_sell variables.

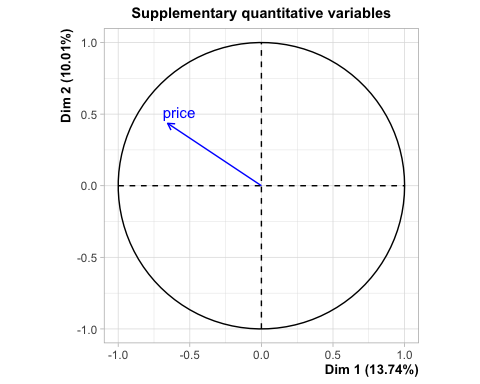
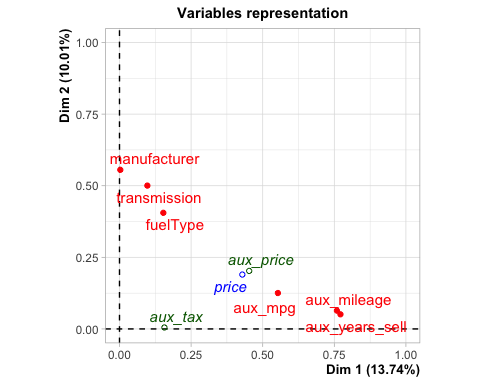
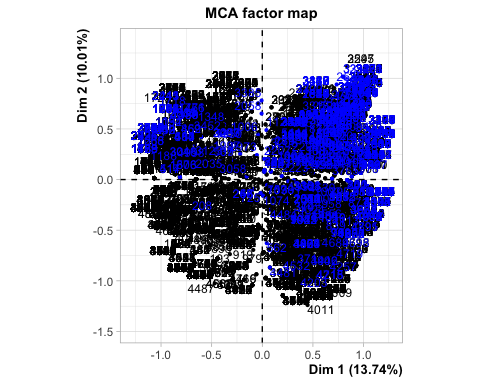
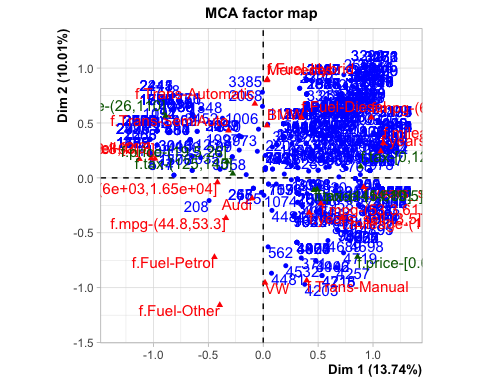
As we can see the cheapest cars are VW, have manual transmission, high taxes, medium years\_sell, medium-high mileage and medium-high mpg. As we can see the most expensive cars are Mercedes, hybrid, have automatic or semi-automatic transmission, medium taxes, few years\_sell, low mileage and low mpg.

As we can see Audi cars are petrol or other and have medium-low mpg.

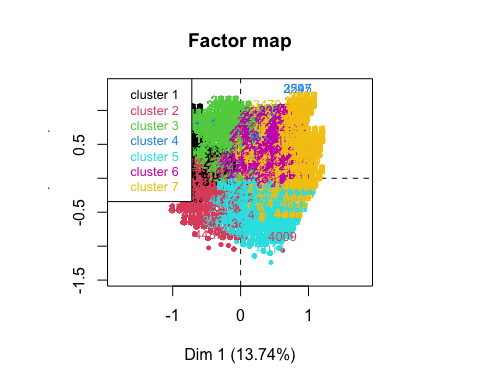
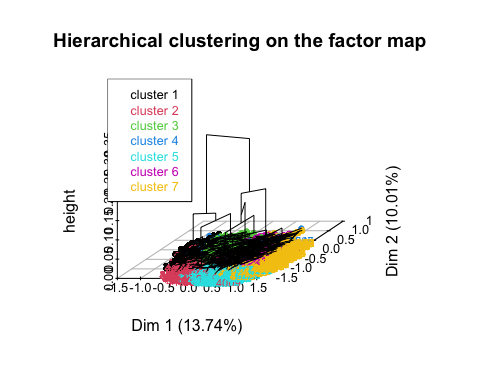
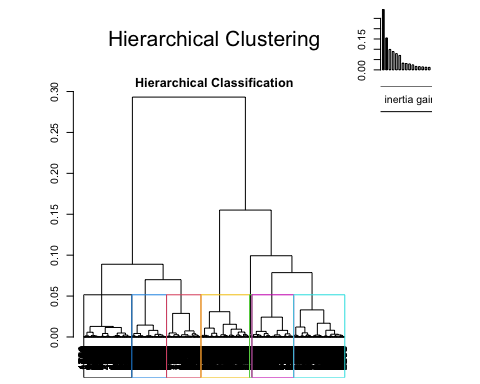
As we can see supplementary variable price is in the second quadrant (i.e. has a negative first dimension and a positive second dimension) which corresponds to the most expensive cars.

## Hierarchical Clustering (from MCA)

res.mca<-MCA(df[,c(vars\_dis[c(3:4,6:11)],"price") ],quali.sup=c(4,6),quanti.sup=9 , ind.sup=llvout, ncp = 5)



res.hcmc<-HCPC(res.mca,nb.clust=7,order=TRUE)



res.hcmc$desc.var

##   
## Link between the cluster variable and the categorical variables (chi-square test)  
## =================================================================================  
## p.value df  
## transmission 0.000000e+00 12  
## fuelType 0.000000e+00 18  
## manufacturer 0.000000e+00 18  
## aux\_price 0.000000e+00 18  
## aux\_mileage 0.000000e+00 18  
## aux\_mpg 0.000000e+00 18  
## aux\_years\_sell 0.000000e+00 18  
## aux\_tax 2.991422e-231 12  
##   
## Description of each cluster by the categories  
## =============================================  
## $`1`  
## Cla/Mod Mod/Cla Global  
## aux\_mpg=f.mpg-[8.8,44.8] 61.4564831 87.0440252 24.8181618  
## aux\_years\_sell=f.years\_sell-[2,3] 40.3659849 94.3396226 40.9521710  
## aux\_mileage=f.mileage-[4,6e+03] 49.6253122 74.9685535 26.4712365  
## aux\_price=f.price-(26,110] 47.6149176 69.0566038 25.4132687  
## fuelType=f.Fuel-Petrol 28.7385554 71.0691824 43.3325986  
## manufacturer=Audi 35.0000000 42.2641509 21.1593564  
## aux\_tax=f.tax-(125,145] 22.6907631 85.2830189 65.8584968  
## transmission=f.Trans-SemiAuto 26.0281690 58.1132075 39.1227683  
## transmission=f.Trans-Automatic 23.1588287 32.8301887 24.8402028  
## manufacturer=BMW 14.0350877 16.1006289 20.1013886  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 14.3327842 21.8867925 26.7577695  
## fuelType=f.Fuel-Hybrid 0.0000000 0.0000000 0.9257218  
## aux\_tax=f.tax-(145,580] 9.0909091 14.7169811 28.3667622  
## aux\_tax=f.tax-[0,125] 0.0000000 0.0000000 5.7747410  
## manufacturer=VW 9.0589888 16.2264151 31.3863787  
## aux\_mpg=f.mpg-(44.8,53.3] 7.5457317 12.4528302 28.9177871  
## aux\_years\_sell=f.years\_sell-(6,23] 1.3201320 1.0062893 13.3568437  
## aux\_years\_sell=f.years\_sell-(5,6] 1.3037810 1.2578616 16.9054441  
## fuelType=f.Fuel-Diesel 9.1306074 28.9308176 55.5212696  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 0.8859358 1.0062893 19.9030196  
## aux\_price=f.price-(14,19.5] 2.4576271 3.6477987 26.0083756  
## transmission=f.Trans-Manual 4.4036697 9.0566038 36.0370289  
## aux\_years\_sell=f.years\_sell-(3,5] 2.0673813 3.3962264 28.7855411  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 1.3945857 2.1383648 26.8679744  
## aux\_mpg=f.mpg-(61.4,88.3] 0.0000000 0.0000000 21.7544633  
## aux\_price=f.price-[0.65,14] 0.0000000 0.0000000 21.7544633  
## aux\_mpg=f.mpg-(53.3,61.4] 0.3597122 0.5031447 24.5095878  
## p.value v.test  
## aux\_mpg=f.mpg-[8.8,44.8] 0.000000e+00 Inf  
## aux\_years\_sell=f.years\_sell-[2,3] 8.947635e-273 35.288077  
## aux\_mileage=f.mileage-[4,6e+03] 1.749928e-227 32.200264  
## aux\_price=f.price-(26,110] 5.067290e-187 29.167125  
## fuelType=f.Fuel-Petrol 7.441118e-68 17.405912  
## manufacturer=Audi 3.643550e-51 15.046433  
## aux\_tax=f.tax-(125,145] 3.064926e-41 13.450332  
## transmission=f.Trans-SemiAuto 8.189115e-33 11.930691  
## transmission=f.Trans-Automatic 2.099937e-08 5.603560  
## manufacturer=BMW 1.598442e-03 -3.156191  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 5.289272e-04 -3.465662  
## fuelType=f.Fuel-Hybrid 2.940636e-04 -3.620474  
## aux\_tax=f.tax-(145,580] 4.602972e-23 -9.889941  
## aux\_tax=f.tax-[0,125] 2.256269e-23 -9.961068  
## manufacturer=VW 2.087998e-26 -10.633210  
## aux\_mpg=f.mpg-(44.8,53.3] 2.768158e-33 -12.020641  
## aux\_years\_sell=f.years\_sell-(6,23] 1.120750e-42 -13.692819  
## aux\_years\_sell=f.years\_sell-(5,6] 3.382046e-55 -15.648864  
## fuelType=f.Fuel-Diesel 1.895983e-62 -16.677955  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 2.087366e-71 -17.868168  
## aux\_price=f.price-(14,19.5] 4.734562e-74 -18.204721  
## transmission=f.Trans-Manual 1.491716e-80 -19.007027  
## aux\_years\_sell=f.years\_sell-(3,5] 1.509707e-89 -20.064444  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.077178e-92 -20.389390  
## aux\_mpg=f.mpg-(61.4,88.3] 3.830551e-95 -20.695147  
## aux\_price=f.price-[0.65,14] 3.830551e-95 -20.695147  
## aux\_mpg=f.mpg-(53.3,61.4] 1.852422e-100 -21.277049  
##   
## $`2`  
## Cla/Mod Mod/Cla Global  
## aux\_mpg=f.mpg-(44.8,53.3] 35.0609756 75.9075908 28.9177871  
## aux\_years\_sell=f.years\_sell-[2,3] 28.5791173 87.6237624 40.9521710  
## manufacturer=VW 30.6179775 71.9471947 31.3863787  
## transmission=f.Trans-Manual 25.9938838 70.1320132 36.0370289  
## aux\_mileage=f.mileage-[4,6e+03] 27.9766861 55.4455446 26.4712365  
## fuelType=f.Fuel-Petrol 21.1088505 68.4818482 43.3325986  
## aux\_tax=f.tax-(125,145] 17.4364123 85.9735974 65.8584968  
## aux\_price=f.price-(19.5,26] 21.3640099 42.9042904 26.8238924  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 21.1696870 42.4092409 26.7577695  
## fuelType=f.Fuel-Other 80.0000000 1.3201320 0.2204100  
## aux\_price=f.price-(14,19.5] 16.6949153 32.5082508 26.0083756  
## fuelType=f.Fuel-Hybrid 0.0000000 0.0000000 0.9257218  
## manufacturer=BMW 10.0877193 15.1815182 20.1013886  
## aux\_price=f.price-[0.65,14] 8.6119554 14.0264026 21.7544633  
## aux\_tax=f.tax-[0,125] 1.1450382 0.4950495 5.7747410  
## transmission=f.Trans-Automatic 7.0984916 13.2013201 24.8402028  
## manufacturer=Audi 6.2500000 9.9009901 21.1593564  
## aux\_mpg=f.mpg-[8.8,44.8] 6.3055062 11.7161716 24.8181618  
## aux\_mpg=f.mpg-(53.3,61.4] 5.9352518 10.8910891 24.5095878  
## aux\_tax=f.tax-(145,580] 6.3714064 13.5313531 28.3667622  
## aux\_price=f.price-(26,110] 5.5507372 10.5610561 25.4132687  
## aux\_years\_sell=f.years\_sell-(3,5] 5.2067381 11.2211221 28.7855411  
## aux\_years\_sell=f.years\_sell-(6,23] 0.8250825 0.8250825 13.3568437  
## transmission=f.Trans-SemiAuto 5.6901408 16.6666667 39.1227683  
## fuelType=f.Fuel-Diesel 7.2647876 30.1980198 55.5212696  
## aux\_years\_sell=f.years\_sell-(5,6] 0.2607562 0.3300330 16.9054441  
## aux\_mpg=f.mpg-(61.4,88.3] 0.9118541 1.4851485 21.7544633  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 0.4429679 0.6600660 19.9030196  
## manufacturer=Mercedes 1.4504432 2.9702970 27.3528764  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 0.7383101 1.4851485 26.8679744  
## p.value v.test  
## aux\_mpg=f.mpg-(44.8,53.3] 2.901152e-149 26.020527  
## aux\_years\_sell=f.years\_sell-[2,3] 4.020107e-145 25.651963  
## manufacturer=VW 3.499265e-109 22.199160  
## transmission=f.Trans-Manual 1.779691e-75 18.383539  
## aux\_mileage=f.mileage-[4,6e+03] 3.361859e-60 16.365692  
## fuelType=f.Fuel-Petrol 5.683146e-41 13.404597  
## aux\_tax=f.tax-(125,145] 7.321830e-33 11.940006  
## aux\_price=f.price-(19.5,26] 3.004438e-20 9.218800  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 2.578805e-19 8.985363  
## fuelType=f.Fuel-Other 3.525329e-06 4.637568  
## aux\_price=f.price-(14,19.5] 1.224549e-04 3.841159  
## fuelType=f.Fuel-Hybrid 2.355318e-03 -3.041335  
## manufacturer=BMW 8.738152e-04 -3.328288  
## aux\_price=f.price-[0.65,14] 2.508189e-07 -5.157089  
## aux\_tax=f.tax-[0,125] 2.198655e-13 -7.336126  
## transmission=f.Trans-Automatic 5.093915e-14 -7.529489  
## manufacturer=Audi 5.140521e-15 -7.823425  
## aux\_mpg=f.mpg-[8.8,44.8] 1.075290e-17 -8.565584  
## aux\_mpg=f.mpg-(53.3,61.4] 2.474226e-19 -8.989915  
## aux\_tax=f.tax-(145,580] 2.384043e-20 -9.243571  
## aux\_price=f.price-(26,110] 2.287907e-22 -9.728116  
## aux\_years\_sell=f.years\_sell-(3,5] 1.932095e-28 -11.061331  
## aux\_years\_sell=f.years\_sell-(6,23] 2.696356e-33 -12.022812  
## transmission=f.Trans-SemiAuto 1.631422e-37 -12.800384  
## fuelType=f.Fuel-Diesel 1.427930e-41 -13.506693  
## aux\_years\_sell=f.years\_sell-(5,6] 2.188978e-49 -14.772956  
## aux\_mpg=f.mpg-(61.4,88.3] 1.586688e-55 -15.696959  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 2.496357e-56 -15.813873  
## manufacturer=Mercedes 3.923842e-64 -16.908065  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 5.896455e-74 -18.192698  
##   
## $`3`  
## Cla/Mod Mod/Cla Global  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 42.9159802 67.0527671 26.7577695  
## fuelType=f.Fuel-Diesel 26.6772529 86.4864865 55.5212696  
## manufacturer=Mercedes 35.6970185 57.0141570 27.3528764  
## aux\_years\_sell=f.years\_sell-[2,3] 29.6555436 70.9137709 40.9521710  
## aux\_price=f.price-(26,110] 34.6053773 51.3513514 25.4132687  
## transmission=f.Trans-SemiAuto 29.2394366 66.7953668 39.1227683  
## aux\_tax=f.tax-(125,145] 22.8246319 87.7734878 65.8584968  
## aux\_price=f.price-(19.5,26] 24.9794577 39.1248391 26.8238924  
## manufacturer=BMW 24.8903509 29.2149292 20.1013886  
## transmission=f.Trans-Automatic 21.7391304 31.5315315 24.8402028  
## aux\_mpg=f.mpg-(44.8,53.3] 20.4268293 34.4916345 28.9177871  
## aux\_mileage=f.mileage-[4,6e+03] 20.1498751 31.1454311 26.4712365  
## aux\_mpg=f.mpg-(53.3,61.4] 19.1546763 27.4131274 24.5095878  
## fuelType=f.Fuel-Hybrid 0.0000000 0.0000000 0.9257218  
## aux\_mpg=f.mpg-[8.8,44.8] 11.2788632 16.3449163 24.8181618  
## aux\_tax=f.tax-[0,125] 1.5267176 0.5148005 5.7747410  
## aux\_tax=f.tax-(145,580] 7.0707071 11.7117117 28.3667622  
## aux\_price=f.price-(14,19.5] 6.1864407 9.3951094 26.0083756  
## manufacturer=Audi 3.9583333 4.8906049 21.1593564  
## aux\_years\_sell=f.years\_sell-(6,23] 0.6600660 0.5148005 13.3568437  
## manufacturer=VW 4.8455056 8.8803089 31.3863787  
## aux\_years\_sell=f.years\_sell-(5,6] 0.6518905 0.6435006 16.9054441  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 1.1074197 1.2870013 19.9030196  
## fuelType=f.Fuel-Petrol 5.3407935 13.5135135 43.3325986  
## aux\_price=f.price-[0.65,14] 0.1013171 0.1287001 21.7544633  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 0.3281378 0.5148005 26.8679744  
## transmission=f.Trans-Manual 0.7951070 1.6731017 36.0370289  
## p.value v.test  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 2.555052e-152 26.289103  
## fuelType=f.Fuel-Diesel 2.075781e-90 20.162849  
## manufacturer=Mercedes 1.802930e-83 19.356326  
## aux\_years\_sell=f.years\_sell-[2,3] 4.689318e-77 18.579722  
## aux\_price=f.price-(26,110] 9.446817e-67 17.259781  
## transmission=f.Trans-SemiAuto 4.651756e-66 17.167481  
## aux\_tax=f.tax-(125,145] 7.023825e-52 15.154979  
## aux\_price=f.price-(19.5,26] 1.655429e-16 8.244723  
## manufacturer=BMW 1.956959e-11 6.709199  
## transmission=f.Trans-Automatic 3.416919e-06 4.644022  
## aux\_mpg=f.mpg-(44.8,53.3] 2.038820e-04 3.714157  
## aux\_mileage=f.mileage-[4,6e+03] 1.367217e-03 3.201484  
## aux\_mpg=f.mpg-(53.3,61.4] 4.044369e-02 2.049188  
## fuelType=f.Fuel-Hybrid 3.601255e-04 -3.567702  
## aux\_mpg=f.mpg-[8.8,44.8] 5.036070e-10 -6.217976  
## aux\_tax=f.tax-[0,125] 4.403798e-17 -8.401615  
## aux\_tax=f.tax-(145,580] 9.019985e-34 -12.112942  
## aux\_price=f.price-(14,19.5] 2.605585e-36 -12.583403  
## manufacturer=Audi 4.043395e-43 -13.766686  
## aux\_years\_sell=f.years\_sell-(6,23] 7.333277e-47 -14.375879  
## manufacturer=VW 3.038982e-59 -16.231113  
## aux\_years\_sell=f.years\_sell-(5,6] 1.585045e-60 -16.411401  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 1.527820e-66 -17.231998  
## fuelType=f.Fuel-Petrol 1.058377e-84 -19.501872  
## aux\_price=f.price-[0.65,14] 2.597887e-90 -20.151746  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 1.052208e-109 -22.253117  
## transmission=f.Trans-Manual 2.093488e-144 -25.587653  
##   
## $`4`  
## Cla/Mod Mod/Cla Global p.value  
## fuelType=f.Fuel-Hybrid 100.0000000 100.000000 0.9257218 4.426488e-103  
## manufacturer=BMW 2.9605263 64.285714 20.1013886 5.416173e-10  
## transmission=f.Trans-Automatic 2.3957409 64.285714 24.8402028 7.678985e-08  
## aux\_mpg=f.mpg-(53.3,61.4] 1.9784173 52.380952 24.5095878 1.101042e-04  
## aux\_mpg=f.mpg-[8.8,44.8] 0.3552398 9.523810 24.8181618 1.446723e-02  
## manufacturer=VW 0.4213483 14.285714 31.3863787 1.236833e-02  
## manufacturer=Audi 0.2083333 4.761905 21.1593564 3.860339e-03  
## aux\_mpg=f.mpg-(61.4,88.3] 0.2026342 4.761905 21.7544633 2.976962e-03  
## aux\_price=f.price-[0.65,14] 0.2026342 4.761905 21.7544633 2.976962e-03  
## transmission=f.Trans-Manual 0.0000000 0.000000 36.0370289 6.341645e-09  
## fuelType=f.Fuel-Petrol 0.0000000 0.000000 43.3325986 3.770847e-11  
## fuelType=f.Fuel-Diesel 0.0000000 0.000000 55.5212696 1.313682e-15  
## v.test  
## fuelType=f.Fuel-Hybrid 21.558291  
## manufacturer=BMW 6.206546  
## transmission=f.Trans-Automatic 5.374513  
## aux\_mpg=f.mpg-(53.3,61.4] 3.867173  
## aux\_mpg=f.mpg-[8.8,44.8] -2.445448  
## manufacturer=VW -2.501457  
## manufacturer=Audi -2.889354  
## aux\_mpg=f.mpg-(61.4,88.3] -2.970107  
## aux\_price=f.price-[0.65,14] -2.970107  
## transmission=f.Trans-Manual -5.807490  
## fuelType=f.Fuel-Petrol -6.612813  
## fuelType=f.Fuel-Diesel -7.993305  
##   
## $`5`  
## Cla/Mod Mod/Cla Global  
## transmission=f.Trans-Manual 37.30886850 78.4061697 36.0370289  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 42.82198523 67.0951157 26.8679744  
## fuelType=f.Fuel-Petrol 33.36724313 84.3187661 43.3325986  
## aux\_years\_sell=f.years\_sell-(3,5] 38.20826953 64.1388175 28.7855411  
## manufacturer=VW 35.74438202 65.4241645 31.3863787  
## aux\_price=f.price-[0.65,14] 41.84397163 53.0848329 21.7544633  
## aux\_mpg=f.mpg-(53.3,61.4] 34.17266187 48.8431877 24.5095878  
## aux\_years\_sell=f.years\_sell-(5,6] 29.98696219 29.5629820 16.9054441  
## aux\_tax=f.tax-(145,580] 24.78632479 41.0025707 28.3667622  
## manufacturer=Audi 22.08333333 27.2493573 21.1593564  
## aux\_price=f.price-(14,19.5] 21.18644068 32.1336761 26.0083756  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 14.08566722 21.9794344 26.7577695  
## fuelType=f.Fuel-Hybrid 0.00000000 0.0000000 0.9257218  
## aux\_mpg=f.mpg-(61.4,88.3] 11.85410334 15.0385604 21.7544633  
## aux\_years\_sell=f.years\_sell-(6,23] 7.92079208 6.1696658 13.3568437  
## aux\_tax=f.tax-(125,145] 13.88888889 53.3419023 65.8584968  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 8.08416390 9.3830334 19.9030196  
## aux\_price=f.price-(19.5,26] 8.46343468 13.2390746 26.8238924  
## aux\_mpg=f.mpg-[8.8,44.8] 6.83836590 9.8971722 24.8181618  
## manufacturer=BMW 3.94736842 4.6272494 20.1013886  
## transmission=f.Trans-Automatic 4.17036380 6.0411311 24.8402028  
## transmission=f.Trans-SemiAuto 6.81690141 15.5526992 39.1227683  
## manufacturer=Mercedes 1.69218372 2.6992288 27.3528764  
## aux\_price=f.price-(26,110] 1.04076323 1.5424165 25.4132687  
## aux\_mileage=f.mileage-[4,6e+03] 0.99916736 1.5424165 26.4712365  
## fuelType=f.Fuel-Diesel 4.80349345 15.5526992 55.5212696  
## aux\_years\_sell=f.years\_sell-[2,3] 0.05382131 0.1285347 40.9521710  
## p.value v.test  
## transmission=f.Trans-Manual 3.717752e-157 26.708821  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 7.746897e-152 26.246937  
## fuelType=f.Fuel-Petrol 5.390946e-148 25.908147  
## aux\_years\_sell=f.years\_sell-(3,5] 3.920826e-115 22.806851  
## manufacturer=VW 4.858213e-104 21.660322  
## aux\_price=f.price-[0.65,14] 7.481019e-103 21.533988  
## aux\_mpg=f.mpg-(53.3,61.4] 2.747558e-60 16.377971  
## aux\_years\_sell=f.years\_sell-(5,6] 1.843823e-22 9.750047  
## aux\_tax=f.tax-(145,580] 6.778181e-17 8.350835  
## manufacturer=Audi 8.211719e-06 4.459588  
## aux\_price=f.price-(14,19.5] 2.630161e-05 4.203331  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 7.952001e-04 -3.354460  
## fuelType=f.Fuel-Hybrid 3.561028e-04 -3.570645  
## aux\_mpg=f.mpg-(61.4,88.3] 2.591507e-07 -5.150964  
## aux\_years\_sell=f.years\_sell-(6,23] 2.854463e-12 -6.984709  
## aux\_tax=f.tax-(125,145] 1.965129e-15 -7.943526  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 5.432678e-18 -8.643899  
## aux\_price=f.price-(19.5,26] 2.671912e-23 -9.944245  
## aux\_mpg=f.mpg-[8.8,44.8] 3.295473e-30 -11.420706  
## manufacturer=BMW 7.620494e-41 -13.382816  
## transmission=f.Trans-Automatic 3.297226e-50 -14.899971  
## transmission=f.Trans-SemiAuto 7.598189e-55 -15.597263  
## manufacturer=Mercedes 5.615007e-87 -19.768008  
## aux\_price=f.price-(26,110] 1.712382e-89 -20.058180  
## aux\_mileage=f.mileage-[4,6e+03] 1.128337e-94 -20.643001  
## fuelType=f.Fuel-Diesel 4.667683e-141 -25.285026  
## aux\_years\_sell=f.years\_sell-[2,3] 1.112797e-199 -30.148782  
##   
## $`6`  
## Cla/Mod Mod/Cla Global  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 47.4979491 74.709677 26.8679744  
## fuelType=f.Fuel-Diesel 27.9079000 90.709677 55.5212696  
## aux\_years\_sell=f.years\_sell-(3,5] 34.1500766 57.548387 28.7855411  
## aux\_mpg=f.mpg-(61.4,88.3] 35.3596758 45.032258 21.7544633  
## manufacturer=Mercedes 32.3932313 51.870968 27.3528764  
## aux\_years\_sell=f.years\_sell-(5,6] 37.4185137 37.032258 16.9054441  
## aux\_price=f.price-(14,19.5] 28.2203390 42.967742 26.0083756  
## aux\_tax=f.tax-[0,125] 41.9847328 14.193548 5.7747410  
## transmission=f.Trans-Automatic 24.3123336 35.354839 24.8402028  
## aux\_mpg=f.mpg-(53.3,61.4] 23.2913669 33.419355 24.5095878  
## transmission=f.Trans-SemiAuto 21.1830986 48.516129 39.1227683  
## aux\_price=f.price-(19.5,26] 21.7748562 34.193548 26.8238924  
## manufacturer=BMW 21.1622807 24.903226 20.1013886  
## fuelType=f.Fuel-Hybrid 0.0000000 0.000000 0.9257218  
## manufacturer=Audi 12.6041667 15.612903 21.1593564  
## aux\_tax=f.tax-(125,145] 15.3279786 59.096774 65.8584968  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 12.2923588 14.322581 19.9030196  
## aux\_price=f.price-(26,110] 9.1066782 13.548387 25.4132687  
## aux\_years\_sell=f.years\_sell-(6,23] 5.6105611 4.387097 13.3568437  
## aux\_price=f.price-[0.65,14] 7.2948328 9.290323 21.7544633  
## aux\_mpg=f.mpg-[8.8,44.8] 7.8152753 11.354839 24.8181618  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 6.6721582 10.451613 26.7577695  
## transmission=f.Trans-Manual 7.6452599 16.129032 36.0370289  
## aux\_mpg=f.mpg-(44.8,53.3] 6.0213415 10.193548 28.9177871  
## manufacturer=VW 4.1432584 7.612903 31.3863787  
## aux\_mileage=f.mileage-[4,6e+03] 0.3330558 0.516129 26.4712365  
## fuelType=f.Fuel-Petrol 3.6622584 9.290323 43.3325986  
## aux\_years\_sell=f.years\_sell-[2,3] 0.4305705 1.032258 40.9521710  
## p.value v.test  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 3.337919e-213 31.163415  
## fuelType=f.Fuel-Diesel 4.459588e-120 23.299746  
## aux\_years\_sell=f.years\_sell-(3,5] 6.518196e-77 18.562040  
## aux\_mpg=f.mpg-(61.4,88.3] 1.287292e-58 16.142265  
## manufacturer=Mercedes 6.228426e-58 16.044675  
## aux\_years\_sell=f.years\_sell-(5,6] 1.197608e-51 15.119880  
## aux\_price=f.price-(14,19.5] 7.913032e-30 11.344330  
## aux\_tax=f.tax-[0,125] 1.000515e-22 9.811915  
## transmission=f.Trans-Automatic 5.445100e-13 7.213702  
## aux\_mpg=f.mpg-(53.3,61.4] 7.222057e-10 6.161146  
## transmission=f.Trans-SemiAuto 5.505570e-09 5.831123  
## aux\_price=f.price-(19.5,26] 6.207012e-07 4.984662  
## manufacturer=BMW 3.332463e-04 3.587983  
## fuelType=f.Fuel-Hybrid 3.683043e-04 -3.561812  
## manufacturer=Audi 2.028692e-05 -4.261709  
## aux\_tax=f.tax-(125,145] 1.622508e-05 -4.311364  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 1.086008e-05 -4.399300  
## aux\_price=f.price-(26,110] 1.676024e-18 -8.777195  
## aux\_years\_sell=f.years\_sell-(6,23] 3.169007e-19 -8.962673  
## aux\_price=f.price-[0.65,14] 2.496693e-23 -9.950997  
## aux\_mpg=f.mpg-[8.8,44.8] 2.668963e-24 -10.171093  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 6.809665e-34 -12.135972  
## transmission=f.Trans-Manual 1.424694e-40 -13.336238  
## aux\_mpg=f.mpg-(44.8,53.3] 1.711519e-42 -13.662027  
## manufacturer=VW 6.368853e-67 -17.282533  
## aux\_mileage=f.mileage-[4,6e+03] 2.462196e-107 -22.007105  
## fuelType=f.Fuel-Petrol 1.324903e-113 -22.652275  
## aux\_years\_sell=f.years\_sell-[2,3] 2.849808e-183 -28.869916  
##   
## $`7`  
## Cla/Mod Mod/Cla Global  
## aux\_years\_sell=f.years\_sell-(6,23] 83.0033003 65.8376963 13.3568437  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 76.4119601 90.3141361 19.9030196  
## aux\_price=f.price-[0.65,14] 41.9452888 54.1884817 21.7544633  
## aux\_tax=f.tax-(145,580] 35.6643357 60.0785340 28.3667622  
## aux\_mpg=f.mpg-(61.4,88.3] 34.5491388 44.6335079 21.7544633  
## fuelType=f.Fuel-Diesel 24.2159587 79.8429319 55.5212696  
## aux\_years\_sell=f.years\_sell-(5,6] 29.3350717 29.4502618 16.9054441  
## transmission=f.Trans-Manual 23.8532110 51.0471204 36.0370289  
## aux\_tax=f.tax-[0,125] 38.5496183 13.2198953 5.7747410  
## aux\_price=f.price-(14,19.5] 23.8983051 36.9109948 26.0083756  
## manufacturer=BMW 22.9166667 27.3560209 20.1013886  
## manufacturer=Audi 19.8958333 25.0000000 21.1593564  
## manufacturer=VW 15.1685393 28.2722513 31.3863787  
## aux\_mpg=f.mpg-(44.8,53.3] 14.3292683 24.6073298 28.9177871  
## fuelType=f.Fuel-Hybrid 0.0000000 0.0000000 0.9257218  
## manufacturer=Mercedes 11.9258662 19.3717277 27.3528764  
## transmission=f.Trans-SemiAuto 10.1971831 23.6910995 39.1227683  
## aux\_mpg=f.mpg-[8.8,44.8] 5.9502664 8.7696335 24.8181618  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 5.9064807 9.4240838 26.8679744  
## fuelType=f.Fuel-Petrol 7.7822991 20.0261780 43.3325986  
## aux\_price=f.price-(19.5,26] 4.4371405 7.0680628 26.8238924  
## aux\_years\_sell=f.years\_sell-(3,5] 2.7565084 4.7120419 28.7855411  
## aux\_price=f.price-(26,110] 1.2142238 1.8324607 25.4132687  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 0.1647446 0.2617801 26.7577695  
## aux\_mileage=f.mileage-[4,6e+03] 0.0000000 0.0000000 26.4712365  
## aux\_tax=f.tax-(125,145] 6.8273092 26.7015707 65.8584968  
## aux\_years\_sell=f.years\_sell-[2,3] 0.0000000 0.0000000 40.9521710  
## p.value v.test  
## aux\_years\_sell=f.years\_sell-(6,23] 0.000000e+00 Inf  
## aux\_mileage=f.mileage-(3.35e+04,1.16e+05] 0.000000e+00 Inf  
## aux\_price=f.price-[0.65,14] 2.478491e-107 22.006806  
## aux\_tax=f.tax-(145,580] 1.127937e-91 20.306438  
## aux\_mpg=f.mpg-(61.4,88.3] 8.844579e-56 15.733998  
## fuelType=f.Fuel-Diesel 3.235704e-53 15.355864  
## aux\_years\_sell=f.years\_sell-(5,6] 1.201687e-21 9.557901  
## transmission=f.Trans-Manual 1.222353e-20 9.314754  
## aux\_tax=f.tax-[0,125] 4.113948e-18 8.675595  
## aux\_price=f.price-(14,19.5] 2.603905e-13 7.313439  
## manufacturer=BMW 1.032035e-07 5.320991  
## manufacturer=Audi 5.001813e-03 2.806917  
## manufacturer=VW 4.095927e-02 -2.043942  
## aux\_mpg=f.mpg-(44.8,53.3] 3.594861e-03 -2.911684  
## fuelType=f.Fuel-Hybrid 4.166346e-04 -3.529316  
## manufacturer=Mercedes 2.488781e-08 -5.574054  
## transmission=f.Trans-SemiAuto 7.099919e-23 -9.846462  
## aux\_mpg=f.mpg-[8.8,44.8] 1.377489e-34 -12.266088  
## aux\_mileage=f.mileage-(1.65e+04,3.35e+04] 2.123447e-38 -12.957765  
## fuelType=f.Fuel-Petrol 2.124634e-49 -14.774966  
## aux\_price=f.price-(19.5,26] 1.039630e-50 -14.976894  
## aux\_years\_sell=f.years\_sell-(3,5] 8.986352e-75 -18.295506  
## aux\_price=f.price-(26,110] 1.269419e-84 -19.492570  
## aux\_mileage=f.mileage-(6e+03,1.65e+04] 5.132464e-111 -22.388169  
## aux\_mileage=f.mileage-[4,6e+03] 2.295913e-114 -22.729373  
## aux\_tax=f.tax-(125,145] 8.514697e-132 -24.428517  
## aux\_years\_sell=f.years\_sell-[2,3] 1.985688e-198 -30.053154  
##   
##   
## Link between the cluster variable and the quantitative variables  
## ================================================================  
## Eta2 P-value  
## price 0.5187428 0  
##   
## Description of each cluster by quantitative variables  
## =====================================================  
## $`1`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price 34.0206 31311.47 21432.75 8552.083 9014.2  
## p.value  
## price 1.105008e-253  
##   
## $`2`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price -4.072999 20044.33 21432.75 5446.497 9014.2  
## p.value  
## price 4.641166e-05  
##   
## $`3`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price 21.4862 27758.81 21432.75 7101.876 9014.2  
## p.value  
## price 2.095881e-102  
##   
## $`4`  
## NULL  
##   
## $`5`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price -23.2499 14592.72 21432.75 5035.004 9014.2  
## p.value  
## price 1.426001e-119  
##   
## $`6`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price -3.888949 20285.96 21432.75 5683.481 9014.2  
## p.value  
## price 0.0001006793  
##   
## $`7`  
## v.test Mean in category Overall mean sd in category Overall sd  
## price -25.47222 13856.5 21432.75 4417.114 9014.2  
## p.value  
## price 4.005977e-143

We start with the description of the categorical variables that characterize the clusters:

Cluster 1: Cluster one has cars with few years\_sell, low mpg, medium taxes, low mileage and high price. Also, cars with semiAuto transmission and cars with petrol as fuel predominate. We can say this because these categories are overrepresented in the cluster.

Cluster 1: Cluster one has cars with low mpg, few years\_sell, high price, low mileage and medium taxes. Also, cars with semiAuto transmission and cars with petrol as fuel predominate.

Cluster 2: Cluster two has cars with years\_sell, low mileage, medium-low mpg and medium price. Also, cars with Manual transmission, VW cars and cars with petrol as fuel predominate.

Cluster 3: Cluster three has cars with few years\_sell, high price, medium taxes and low mileage. Also, cars with diesel as fuel, Mercedes cars and cars with semiAuto transmission predominate.

Cluster 4: Cluster four has cars medium-high mpg. Also, BMW cars, cars with Hybrid as fuel and cars with Automatic transmission predominate.

Cluster 5: Cluster five has cars with medium years\_sell, low price and medium-high mileage. Also, cars with petrol as fuel, VW cars and cars with Manual transmission predominate.

Cluster 6: Cluster six has cars with medium years\_sell, medium taxes and medium-high mileage. Also, cars with diesel as fuel and Mercedes cars predominate.

Cluster 7: Cluster seven has cars with many years\_sell, high mileage, low price and high taxes. Also, cars with diesel as fuel and cars with Manual transmission predominate.

Cluster 8: Cluster of multivariate outliers.

Regarding quantitative variables:

Cluster 1: As we can see price mean is greater in cluster 1 than in the overall mean. So we can say that cluster 1 is a cluster of expensive cars.

Cluster 2: As we can see price mean is lower in cluster 2 than in the overall mean. So we can say that cluster 2 is a cluster of cheap cars.

Cluster 3: As we can see price mean is greater in cluster 3 than in the overall mean. So we can say that cluster 3 is a cluster of expensive cars.

Cluster 4:

Cluster 5: As we can see price mean is lower in cluster 5 than in the overall mean. So we can say that cluster 5 is a cluster of cheap cars.

Cluster 6: As we can see price mean is lower in cluster 6 than in the overall mean. So we can say that cluster 6 is a cluster of cheap cars.

Cluster 7: As we can see price mean is lower in cluster 7 than in the overall mean. So we can say that cluster 7 is a cluster of cheap cars.

Cluster 8: Cluster of multivariate outliers.

res.hcmc$desc.ind$para

## Cluster: 1  
## 160 426 432 471 501   
## 0.2160579 0.2160579 0.2160579 0.2160579 0.2160579   
## ------------------------------------------------------------   
## Cluster: 2  
## 3498 3508 3516 3517 3518   
## 0.3057169 0.3057169 0.3057169 0.3057169 0.3057169   
## ------------------------------------------------------------   
## Cluster: 3  
## 2532 2148 2348 2388 2403   
## 0.1690883 0.3052584 0.3052584 0.3052584 0.3052584   
## ------------------------------------------------------------   
## Cluster: 4  
## 1798 1566 1910 1912 1196   
## 0.5046765 0.5308641 0.6060830 0.6225019 0.8208252   
## ------------------------------------------------------------   
## Cluster: 5  
## 3321 3374 3643 3814 36   
## 0.2480597 0.2480597 0.2502881 0.2502881 0.3025934   
## ------------------------------------------------------------   
## Cluster: 6  
## 2167 2239 2265 2650 2686   
## 0.1562898 0.1562898 0.1562898 0.1562898 0.1562898   
## ------------------------------------------------------------   
## Cluster: 7  
## 3558 4083 4988 3278 4094   
## 0.1830092 0.1830092 0.1830092 0.3034436 0.3458925

res.hcmc$desc.ind$dist

## Cluster: 1  
## 35 40 46 69 91   
## 1.513956 1.513956 1.513956 1.513956 1.513956   
## ------------------------------------------------------------   
## Cluster: 2  
## 4487 4010 4663 4009 4026   
## 2.615673 2.385078 2.294474 1.981549 1.928640   
## ------------------------------------------------------------   
## Cluster: 3  
## 2266 2274 2285 2287 2384   
## 1.24873 1.24873 1.24873 1.24873 1.24873   
## ------------------------------------------------------------   
## Cluster: 4  
## 1530 1989 2023 1910 1102   
## 3.762245 3.762245 3.762245 3.681187 3.672630   
## ------------------------------------------------------------   
## Cluster: 5  
## 4011 174 317 1 73   
## 1.953666 1.582628 1.582628 1.423799 1.423799   
## ------------------------------------------------------------   
## Cluster: 6  
## 1092 1279 1529 1544 1866   
## 1.474618 1.474618 1.474618 1.474618 1.474618   
## ------------------------------------------------------------   
## Cluster: 7  
## 3552 3575 3590 3618 3647   
## 1.804655 1.804655 1.804655 1.804655 1.804655

The parangons of cluster 1 are 160, 426, 432, 471 and 501. The parangons of cluster 2 are 3498, 3508, 3516, 3517 and 3518. The parangons of cluster 3 are 2532, 2148, 2348, 2388 and 2403. The parangons of cluster 4 are 1798, 1566, 1910, 1912 and 1196. The parangons of cluster 5 are 3321, 3374, 3643, 3814 and 36. The parangons of cluster 6 are 2167, 2239, 2265, 2650 and 2686. The parangons of cluster 7 are 3558, 4083, 4988, 3278 and 4094.

The distant ones of cluster 1 are 35, 40, 46, 69 and 91. The distant ones of cluster 2 are 4487, 4010, 4663, 4009 and 4026. The distant ones of cluster 3 are 2266, 2274, 2285, 2287 and 2384. The distant ones of cluster 4 are 1530, 1989, 2023, 1910 and 1102. The distant ones of cluster 5 are 4011, 174, 317, 1 and 73. The distant ones of cluster 6 are 1092, 1279, 1529, 1544 and 1866. The distant ones of cluster 7 are 3552, 3575, 3590, 3618 and 3647.

We have created a new variable indicating the cluster to which the individual belongs after the Hierarchical clustering.

df$clamHC<-8  
df[ row.names(res.hcmc$data.clust), "clamHC" ]<-res.hcmc$data.clust$clust  
df$clamHC<-factor(df$clamHC)  
levels( df$clamHC ) <- paste0("claHCMC-",levels( df$clamHC ) )

## Comparisons

tt<-table(df$clamHC,df$claHC)  
100\*sum(diag(tt)/sum(tt))

## [1] 41.72

We have a concordance of the 41.72% so we can say that they are different, if we had a greater concordance, this would mean that they would be more similar.

ta<-table(df$clamHC,df$claKM)  
100\*sum(diag(ta)/sum(ta))

## [1] 39.58

We have a concordance of the ?% so we can say that they are different, if we had a greater concordance, this would mean that they would be more similar.