Lyft-Uber-Price-Prediction

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IMPORTING DATASETS AND CLEANING THEM

Importing dataset cab_rides

```
cab_rides <- read.csv("C:/Users/nisht/Desktop/MITA/Fall/MVA/Final
Project/cab_rides.csv")
summary(cab_rides)
```

```
##     distance      cab_type        time_stamp
##  Min.   :0.020   Lyft:307408   Min.   :1.543e+12
##  1st Qu.:1.280   Uber:385663   1st Qu.:1.543e+12
##  Median :2.160                 Median :1.544e+12
##  Mean   :2.189                 Mean   :1.544e+12
##  3rd Qu.:2.920                 3rd Qu.:1.545e+12
##  Max.   :7.860                 Max.   :1.545e+12
##
##                destination                      source           price
##  Financial District: 58851   Financial District: 58857   Min.   : 2.50
##  Theatre District  : 57798   Theatre District  : 57813   1st Qu.: 9.00
##  Back Bay          : 57780   Back Bay          : 57792   Median :13.50
##  Boston University : 57764   Boston University : 57764   Mean   :16.55
##  Haymarket Square  : 57764   North End         : 57763   3rd Qu.:22.50
##  Fenway            : 57757   Fenway            : 57757   Max.   :97.50
##  (Other)           :345357   (Other)           :345325   NA's   :55095
##  surge_multiplier                                    id
##  Min.   :1.000    00005b8c-5647-4104-9ac6-94fa6a40f3c3:     1
##  1st Qu.:1.000    00006eeb-0183-40c1-8198-c441d3c8a734:     1
##  Median :1.000    00008b42-5ecc-4f66-b4b9-b22a331634e6:     1
##  Mean   :1.014    000094c0-00c4-43f1-ae1b-4693eec2a580:     1
##  3rd Qu.:1.000    0000a8b2-e4d3-4227-8374-af8a2366e475:     1
##  Max.   :3.000    0000b5d6-59be-4534-b371-8214334d94f0:     1
##                   (Other)                              :693065
##                               product_id            name
##  6d318bcc-22a3-4af6-bddd-b409bfce1546: 55096   Black SUV: 55096
##  6f72dfc5-27f1-42e8-84db-ccc7a75f6969: 55096   UberXL   : 55096
##  9a0e7b09-b92b-4c41-9779-2ad22b4d779d: 55096   WAV      : 55096
##  6c84fd89-3f11-4782-9b50-97c468b19529: 55095   Black    : 55095
##  8cf7e821-f0d3-49c6-8eba-e679c0ebcf6a: 55095   Taxi     : 55095
##  55c66225-fbe7-4fd5-9072-eab1ece5e23e: 55094   UberX    : 55094
##  (Other)                             :362499   (Other)  :362499
```

```r
cab_data<-cab_rides
```

Creating a date_time column

```r
cab_data$date_time<-as.POSIXct((cab_data$time_stamp/1000),origin = "1970-01-01 00:53:20", tz="GMT")
```

Importing dataset weather

```r
weather <- read.csv("C:/Users/nisht/Desktop/MITA/Fall/MVA/Final Project/weather.xls")
summary(weather)
```

```
##     ï..temp                     location        clouds
##  Min.   :19.62   Back Bay           : 523   Min.   :0.0000
##  1st Qu.:36.08   Beacon Hill        : 523   1st Qu.:0.4400
##  Median :40.13   Boston University  : 523   Median :0.7800
##  Mean   :39.09   Fenway             : 523   Mean   :0.6778
##  3rd Qu.:42.83   Financial District: 523   3rd Qu.:0.9700
##  Max.   :55.41   Haymarket Square   : 523   Max.   :1.0000
##                  (Other)            :3138
##     pressure          rain          time_stamp           humidity
##  Min.   : 988.2   Min.   :0.000   Min.   :1.543e+09   Min.   :0.450
##  1st Qu.: 997.7   1st Qu.:0.005   1st Qu.:1.543e+09   1st Qu.:0.670
##  Median :1007.7   Median :0.015   Median :1.544e+09   Median :0.760
##  Mean   :1008.4   Mean   :0.058   Mean   :1.544e+09   Mean   :0.764
##  3rd Qu.:1018.5   3rd Qu.:0.061   3rd Qu.:1.545e+09   3rd Qu.:0.890
##  Max.   :1035.1   Max.   :0.781   Max.   :1.545e+09   Max.   :0.990
##                   NA's   :5382
##       wind
##  Min.   : 0.290
##  1st Qu.: 3.518
##  Median : 6.570
##  Mean   : 6.803
##  3rd Qu.: 9.920
##  Max.   :18.180
##
```

```r
str(weather)
```

```
## 'data.frame':    6276 obs. of  8 variables:
##  $ ï..temp   : num  42.4 42.4 42.5 42.1 43.1 ...
##  $ location  : Factor w/ 12 levels "Back Bay","Beacon Hill",..: 1 2 3 4 5
6 7 8 9 10 ...
##  $ clouds    : num  1 1 1 1 1 1 1 1 1 1 ...
##  $ pressure  : num  1012 1012 1012 1012 1012 ...
##  $ rain      : num  0.1228 0.1846 0.1089 0.0969 0.1786 ...
##  $ time_stamp: int  1545003901 1545003901 1545003901 1545003901 1545003901
1545003901 1545003901 1545003901 1545003901 1545003901 ...
```

```
##  $ humidity  : num  0.77 0.76 0.76 0.77 0.75 0.77 0.77 0.77 0.78 0.75 ...
##  $ wind      : num  11.2 11.3 11.1 11.1 11.5 ...

weather_data<-weather
```

creating a date_time column in weather_data

```
weather_data$date_time<-as.POSIXct(weather_data$time_stamp,origin = "1970-01-01 00:53:20", tz="GMT")
str(weather_data)

## 'data.frame':    6276 obs. of  9 variables:
##  $ ï..temp   : num  42.4 42.4 42.5 42.1 43.1 ...
##  $ location  : Factor w/ 12 levels "Back Bay","Beacon Hill",..: 1 2 3 4 5 6 7 8 9 10 ...
##  $ clouds    : num  1 1 1 1 1 1 1 1 1 1 ...
##  $ pressure  : num  1012 1012 1012 1012 1012 ...
##  $ rain      : num  0.1228 0.1846 0.1089 0.0969 0.1786 ...
##  $ time_stamp: int  1545003901 1545003901 1545003901 1545003901 1545003901 1545003901 1545003901 1545003901 1545003901 1545003901 ...
##  $ humidity  : num  0.77 0.76 0.76 0.77 0.75 0.77 0.77 0.77 0.78 0.75 ...
##  $ wind      : num  11.2 11.3 11.1 11.1 11.5 ...
##  $ date_time : POSIXct, format: "2018-12-17 00:38:21" "2018-12-17 00:38:21" ...
```

merge the datasets to reflect the same time for a location

```
cab_data$merge_date<-paste(cab_data$source,"-",as.Date(cab_data$date_time),"-",format(cab_data$date_time,"%H:%M:%S"))
weather_data$merge_date<-paste(weather_data$location,"-",as.Date(weather_data$date_time),"-",format(weather_data$date_time,"%H:%M:%S"))

#making those values as characters
weather_data$merge_date<-as.character(weather_data$merge_date)
cab_data$merge_date<-as.character(cab_data$merge_date)
```

verify that merge_date has unique values.

```
weather_data<-subset(weather_data,!duplicated(weather_data$merge_date))
isTRUE(duplicated(weather_data$merge_date))

## [1] FALSE
```

Merging both the dataframes.

```
merge_data<-merge(x=weather_data, y=cab_data,by='merge_date', all.x=TRUE)
#str(merge_data)
```

```
merge_data$rain<-as.numeric(merge_data$rain)
merge_data$rain[is.na(merge_data$rain)]<-0

for ( i in 1:length(merge_data$rain)){
  if(merge_data$rain[i]>0 & merge_data$rain[i]<=0.30){
    merge_data$rain[i]=1
  }
}

for ( i in 1:length(merge_data$rain)){
  if(merge_data$rain[i]>=0.30 & merge_data$rain[i]!=1){
    merge_data$rain[i]=2
  }
}

merge_data$rain = factor(merge_data$rain,
                         levels = c(0,1,2),
                         labels = c(0,1,2))

merge_data$location = factor(merge_data$location,
                         levels = c('Back Bay', 'Beacon Hill'),
                         labels = c(0,1))

#install.packages("dummies")
library(dummies)

## dummies-1.5.6 provided by Decision Patterns

# example data

merge_data <- cbind(merge_data, dummy(merge_data$rain, sep = "_"))
#names(merge_data$merge_data_0)<-("rain_0")
#names(merge_data$merge_data_1)<-("rain_1")
merge_data<-merge_data[-6]
merge_data<-merge_data[-23]
#View(merge_data)
```

Handling Missing values

```
#Extracting the numerical columns in a new dataframe "df"
merge_data$temp<-merge_data[,c(2)] #renaming a column
df<-merge_data[,c(3,4,5,7,8,9,10,11,21,22,23,15)]
#View(df)
df$cab_type<-factor(merge_data$cab_type)
df<-na.omit(df)
```

Checking for null values

```
any(is.na(df))
```

```
## [1] FALSE
```

Adding date and time column in the df data set

```
df$day<-weekdays(df$date_time)
df$time<-format(df$date_time.x,"%H:%M:%S")
df$date_time<-as.Date(df$date_time.x)
merge_data$day=weekdays(merge_data$date_time.x)
View(df)
```

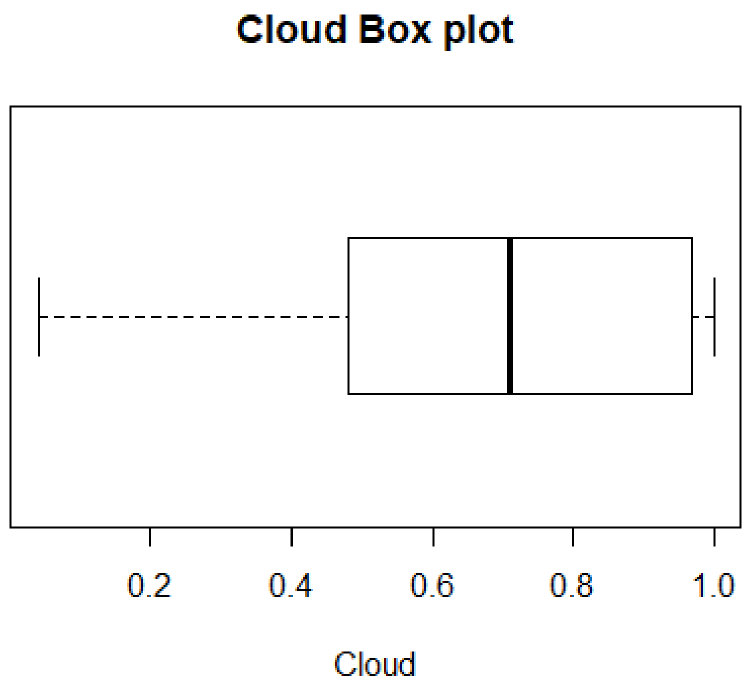
Creating a Numeric dataframe

```
x<-df[,c(2,3,4,5,11,12)]
head(x)
```

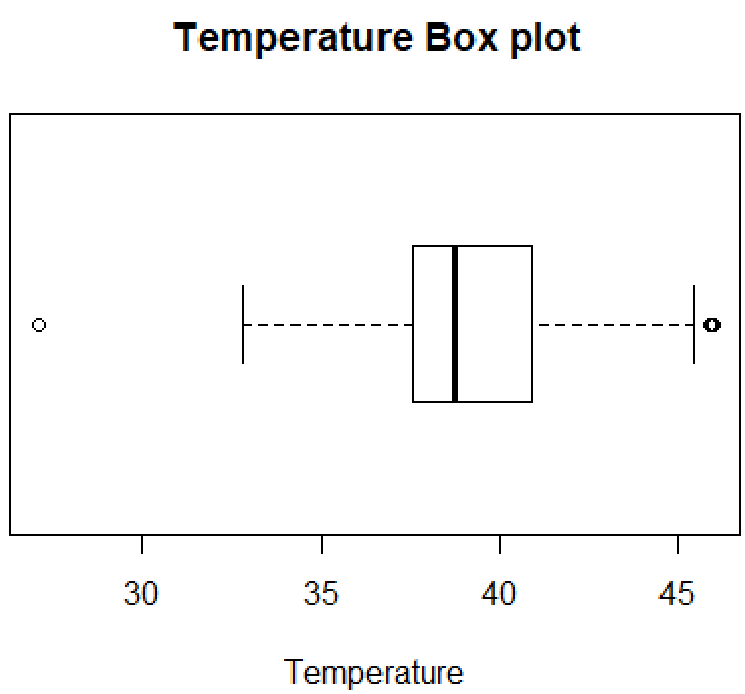
```
##    clouds pressure humidity wind  temp price
## 3    0.86  1014.17     0.93 2.59 40.63   8.5
## 4    0.86  1014.17     0.93 2.65 40.61  16.5
## 6    0.95  1013.78     0.92 2.59 40.72  26.5
## 7    0.95  1013.78     0.92 2.59 40.72   7.5
## 12   0.92  1013.76     0.92 3.02 40.64  22.5
## 19   1.00  1014.18     0.91 1.16 40.46  22.5
```

BOXPLOT

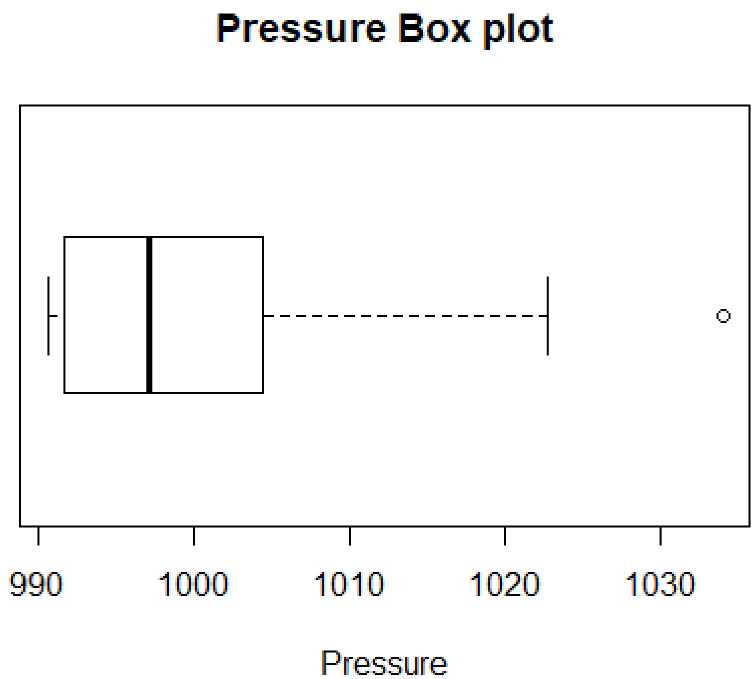
```
boxplot(x$clouds, main="Cloud Box plot",yaxt="n", xlab="Cloud",
horizontal=TRUE)
```



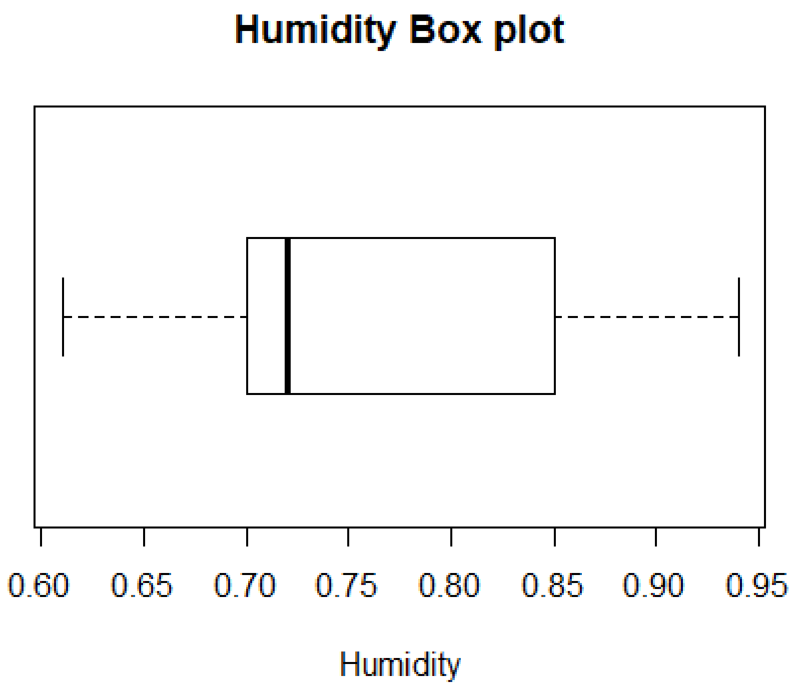

```
boxplot(x$temp, main="Temperature Box plot",yaxt="n", xlab="Temperature",
horizontal=TRUE)
```



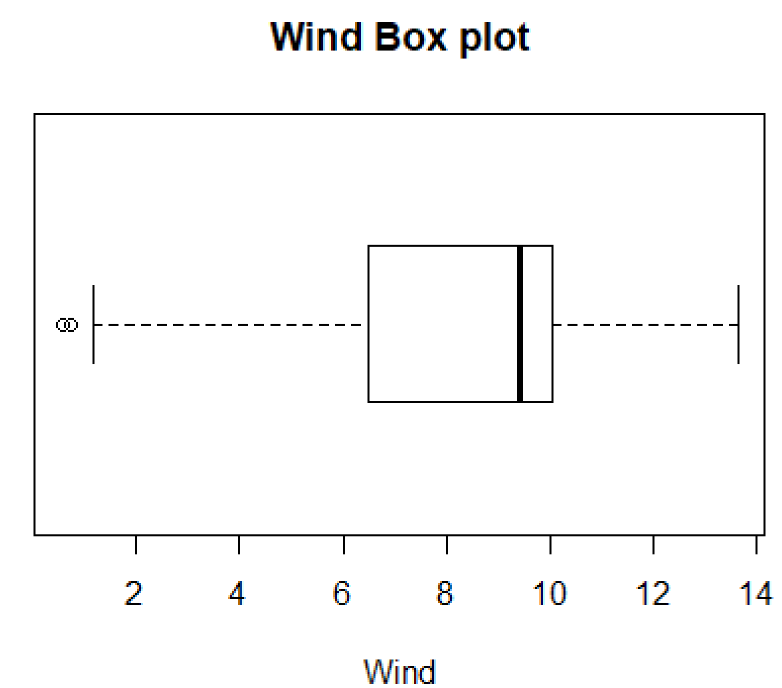
```
boxplot(x$pressure, main="Pressure Box plot",yaxt="n", xlab="Pressure",
horizontal=TRUE)
```




```
boxplot(x$humidity, main="Humidity Box plot",yaxt="n", xlab="Humidity",
horizontal=TRUE)
```




```
boxplot(x$wind, main="Wind Box plot",yaxt="n", xlab="Wind", horizontal=TRUE)
```



```
#boxplot(x$distance, main="Wind Box plot",yaxt="n", xlab="Wind",
horizontal=TRUE)
```

#Q-Q Plot to check normality..

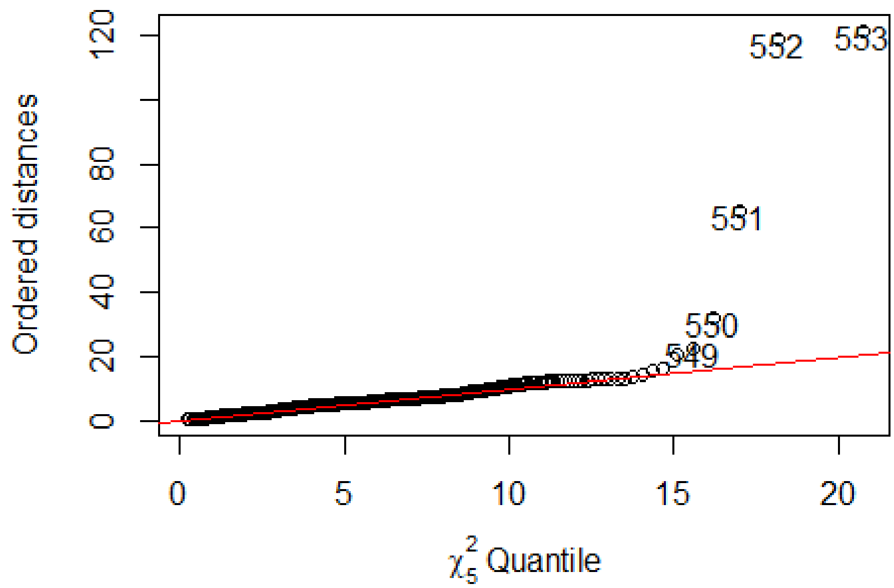
Deviation from normality can be observed in our variables. Let’s check for multivariate analysis using chi-squre plot

CORRELATION, COVARIANCE AND DISTANCE

```
#We are calculating for: clouds, pressure, rain, humidity, wind, distance,
temp
covariance<-cov(x) #variance-covariance matrix created
correlation<-cor(x) #standardized
#colmeans
cm<-colMeans(x)
distance<-dist(scale(x,center=FALSE))
#Calculating di(generalized distance for all observations of our data)
d <- apply(x, MARGIN = 1, function(x) + t(x - cm) %*% solve(covariance) %*%
(x - cm))
```

The sorted distance are now plotted against the appropriate quantiles of the chi-distribution

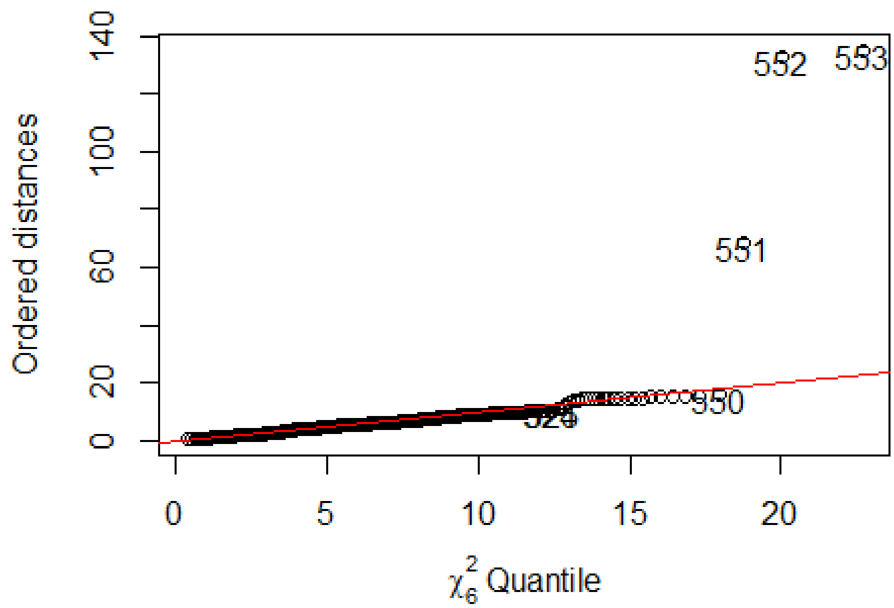
```
plot(qc <- qchisq((1:nrow(x) - 1/2) / nrow(x), df = 5), sd <- sort(d),xlab =
expression(paste(chi[5]^2, " Quantile")),ylab = "Ordered distances")
oups <- which(rank(abs(qc - sd), ties = "random") > nrow(x) - 5)
text(qc[oups], sd[oups] - 1.5,oups)
abline(a=0,b=1,col="red")
```




```
#Our observations seems to deviate from linearity after a certain point
```

There is a complete deviation from Normality. We will apply the log transformation on our dataset.

```
#x_new<-x+1
#x_new=log(x - (min(x) - 1))
x_new<-log(x+1)

covariance<-cov(x_new) #variance-covariance matrix created
#x_new$clouds
correlation<-cor(x_new) #standardized
#colmeans
cm<-colMeans(x_new)
distance<-dist(scale(x_new,center=FALSE))
#Calculating di(generalized distance for all observations of our data)
d <- apply(x_new, MARGIN = 1, function(x_new) + t(x_new - cm) %*%
solve(covariance) %*% (x_new - cm))

plot(qc <- qchisq((1:nrow(x_new) - 1/2) / nrow(x_new), df = 6), sd <-
sort(d),xlab = expression(paste(chi[6]^2, " Quantile")),ylab = "Ordered
distances")
oups <- which(rank(abs(qc - sd), ties = "random") > nrow(x) - 6)
text(qc[oups], sd[oups] - 1.5,oups)
abline(a=0,b=1,col="red")
```



We have normalized the data..

Pca || T-test || F-test

Get the Correlations between the measurements

```
x_new<-x_new[-7]
cor(x_new)

##               clouds    pressure    humidity        wind       temp
## clouds    1.00000000  0.56597486  0.16258638 -0.08549042 0.73863888
## pressure  0.56597486  1.00000000  0.64972406 -0.54652613 0.54005177
## humidity  0.16258638  0.64972406  1.00000000 -0.59098133 0.12722028
## wind     -0.08549042 -0.54652613 -0.59098133  1.00000000 0.09654736
## temp      0.73863888  0.54005177  0.12722028  0.09654736 1.00000000
## price     0.06790078  0.08269453  0.06668679 -0.06122460 0.04504944
##                price
## clouds    0.06790078
## pressure  0.08269453
## humidity  0.06668679
## wind     -0.06122460
## temp      0.04504944
## price     1.00000000

sapply(x_new, sd, na.rm = TRUE)
```

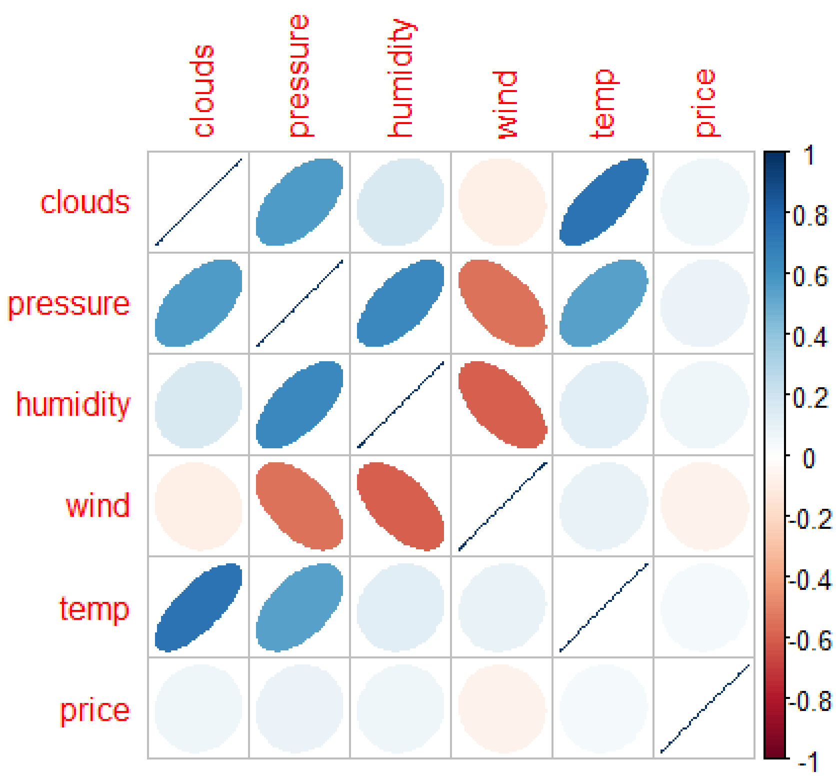
```
##      clouds    pressure    humidity        wind        temp       price
## 0.190348031 0.008331149 0.055919840 0.473834287 0.087131522 0.499397872
```

```r
#There are not considerable differences between these standard deviations.. Still let's see the PCAs.
library(corrplot)
```

```
## Warning: package 'corrplot' was built under R version 3.5.3
```

```
## corrplot 0.84 loaded
```

```r
corrplot(cor(x_new), method="ellipse")
```



Using prcomp to compute the principal components (eigenvalues and eigenvectors).

With scale=TRUE, variable means are set to zero, and variances set to one

```r
x_pca <- prcomp(x_new,scale=TRUE)
#x_pca$rotation
summary(x_pca)
```

```
## Importance of components:
##                           PC1    PC2    PC3     PC4    PC5     PC6
## Standard deviation     1.6264 1.2426 0.9934 0.64988 0.4887 0.40330
## Proportion of Variance 0.4409 0.2573 0.1645 0.07039 0.0398 0.02711
## Cumulative Proportion  0.4409 0.6982 0.8627 0.93309 0.9729 1.00000

#x_pca$rotation
```

Each of these explains a percent of total vaiation in the dataset. PC1 explains 27.8% of total variance, PC2 explains 26% of total variance.. we need to go to PC5 to get a ver accurate view on where it stands in relation to other samples as PC1-PC5 can explain 89.9% of the variance.

sample scores stored in x_pca$x # singular values (square roots of eigenvalues) stored in x_pca$sdev

loadings (eigenvectors) are stored in x_pca$rotation # variable means stored in x_pca$center

variable standard deviations stored in x_pca$scale

A table containing eigenvalues and %'s accounted, follows

Eigenvalues are sdev^2

```
str(x_pca)

## List of 5
##  $ sdev    : num [1:6] 1.626 1.243 0.993 0.65 0.489 ...
##  $ rotation: num [1:6, 1:6] -0.442 -0.574 -0.43 0.348 -0.402 ...
##   ..- attr(*, "dimnames")=List of 2
##   .. ..$ : chr [1:6] "clouds" "pressure" "humidity" "wind" ...
##   .. ..$ : chr [1:6] "PC1" "PC2" "PC3" "PC4" ...
##  $ center  : Named num [1:6] 0.495 6.908 0.568 2.131 3.686 ...
##   ..- attr(*, "names")= chr [1:6] "clouds" "pressure" "humidity" "wind"
...
##  $ scale   : Named num [1:6] 0.19035 0.00833 0.05592 0.47383 0.08713 ...
##   ..- attr(*, "names")= chr [1:6] "clouds" "pressure" "humidity" "wind"
...
```

```
##  $ x       : num [1:553, 1:6] -2.76 -2.86 -3 -2.8 -2.85 ...
##   ..- attr(*, "dimnames")=List of 2
##   .. ..$ : chr [1:553] "3" "4" "6" "7" ...
##   .. ..$ : chr [1:6] "PC1" "PC2" "PC3" "PC4" ...
##  - attr(*, "class")= chr "prcomp"

eigen_x <- x_pca$sdev^2
names(eigen_x) <- paste("PC",1:6,sep="")
eigen_x

##       PC1       PC2       PC3       PC4       PC5       PC6
## 2.6452195 1.5440576 0.9869193 0.4223476 0.2388064 0.1626497

sumlambdas <- sum(eigen_x)
sumlambdas #total sample variance

## [1] 6

propvar <- eigen_x/sumlambdas
propvar

##        PC1        PC2        PC3        PC4        PC5        PC6
## 0.44086991 0.25734293 0.16448655 0.07039127 0.03980107 0.02710828

cumvar_x <- cumsum(propvar)
cumvar_x

##       PC1       PC2       PC3       PC4       PC5       PC6
## 0.4408699 0.6982128 0.8626994 0.9330907 0.9728917 1.0000000

matlambdas <- rbind(eigen_x,propvar,cumvar_x)
rownames(matlambdas) <- c("Eigenvalues","Prop. variance","Cum. prop.
variance")
round(matlambdas,4)

##                         PC1    PC2    PC3    PC4    PC5    PC6
## Eigenvalues          2.6452 1.5441 0.9869 0.4223 0.2388 0.1626
## Prop. variance       0.4409 0.2573 0.1645 0.0704 0.0398 0.0271
## Cum. prop. variance 0.4409 0.6982 0.8627 0.9331 0.9729 1.0000
```

Sample scores stored in x_pca$x

We need to calculate the scores on each of these components for each individual in our sample.

```
#x_pca$rotation
xtyp_pca <- cbind(data.frame(df$price),x_pca$x)
str(xtyp_pca)
```

```
## 'data.frame':    553 obs. of  7 variables:
##  $ df.price: num  8.5 16.5 26.5 7.5 22.5 22.5 15.5 16.5 27.5 38.5 ...
##  $ PC1     : num  -2.76 -2.86 -3 -2.8 -2.85 ...
##  $ PC2     : num  -1.22 -1.23 -1.1 -1.04 -1.01 ...
##  $ PC3     : num  -1.22372 -0.00427 0.89835 -1.44242 0.59623 ...
##  $ PC4     : num  0.172 0.134 0.293 0.326 0.122 ...
##  $ PC5     : num  0.14117 0.14754 0.02832 0.00016 0.02977 ...
##  $ PC6     : num  -0.0514 -0.065 -0.0366 -0.0418 -0.1333 ...

#xtyp_pca
```

Merging price column

```
colnames(xtyp_pca)[colnames(xtyp_pca)=="df.price"] <- "price"
str(xtyp_pca)

## 'data.frame':    553 obs. of  7 variables:
##  $ price: num  8.5 16.5 26.5 7.5 22.5 22.5 15.5 16.5 27.5 38.5 ...
##  $ PC1  : num  -2.76 -2.86 -3 -2.8 -2.85 ...
##  $ PC2  : num  -1.22 -1.23 -1.1 -1.04 -1.01 ...
##  $ PC3  : num  -1.22372 -0.00427 0.89835 -1.44242 0.59623 ...
##  $ PC4  : num  0.172 0.134 0.293 0.326 0.122 ...
##  $ PC5  : num  0.14117 0.14754 0.02832 0.00016 0.02977 ...
##  $ PC6  : num  -0.0514 -0.065 -0.0366 -0.0418 -0.1333 ...
```

Sample scores stoted. x_pca$x

T-Test– We see that true difference in all the means is different from zero.

```
t.test(xtyp_pca$PC1,xtyp_pca$price,var.equal = TRUE)

## 
##  Two Sample t-test
## 
## data:  xtyp_pca$PC1 and xtyp_pca$price
## t = -41.748, df = 1104, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -17.02935 -15.50049
## sample estimates:
##     mean of x     mean of y 
## -1.520487e-14  1.626492e+01

t.test(xtyp_pca$PC2,xtyp_pca$price,var.equal = TRUE)

## 
##  Two Sample t-test
```

```
##
## data:  xtyp_pca$PC2 and xtyp_pca$price
## t = -42.025, df = 1104, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -17.02431 -15.50552
## sample estimates:
##     mean of x     mean of y
## -2.815137e-15  1.626492e+01
```

```
t.test(xtyp_pca$PC3,xtyp_pca$price,var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  xtyp_pca$PC3 and xtyp_pca$price
## t = -42.167, df = 1104, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -17.02176 -15.50808
## sample estimates:
##     mean of x     mean of y
## -1.210148e-15  1.626492e+01
```

```
t.test(xtyp_pca$PC4,xtyp_pca$price,var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  xtyp_pca$PC4 and xtyp_pca$price
## t = -42.313, df = 1104, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -17.01916 -15.51068
## sample estimates:
##     mean of x     mean of y
## -1.244961e-15  1.626492e+01
```

```
t.test(xtyp_pca$PC5,xtyp_pca$price,var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  xtyp_pca$PC5 and xtyp_pca$price
## t = -42.36, df = 1104, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -17.01831 -15.51153
## sample estimates:
##    mean of x    mean of y
## 9.343221e-15 1.626492e+01
```

```r
t.test(xtyp_pca$PC6,xtyp_pca$price,var.equal = TRUE)

##
##  Two Sample t-test
##
## data:  xtyp_pca$PC6 and xtyp_pca$price
## t = -42.38, df = 1104, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -17.01796 -15.51188
## sample estimates:
##     mean of x     mean of y
## -2.113320e-14  1.626492e+01

#F-Test #Testing Variation
```

Variance Test- Test for variance

```r
var.test(xtyp_pca$PC1,xtyp_pca$price)

##
##  F test to compare two variances
##
## data:  xtyp_pca$PC1 and xtyp_pca$price
## F = 0.03254, num df = 552, denom df = 552, p-value < 2.2e-16
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.02753513 0.03845520
## sample estimates:
## ratio of variances
##         0.03254027

var.test(xtyp_pca$PC2,xtyp_pca$price)

##
##  F test to compare two variances
##
## data:  xtyp_pca$PC2 and xtyp_pca$price
## F = 0.018994, num df = 552, denom df = 552, p-value < 2.2e-16
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.01607270 0.02244693
## sample estimates:
## ratio of variances
##         0.01899428

var.test(xtyp_pca$PC3,xtyp_pca$price)

##
##  F test to compare two variances
##
```

```
## data:  xtyp_pca$PC3 and xtyp_pca$price
## F = 0.012141, num df = 552, denom df = 552, p-value < 2.2e-16
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.01027323 0.01434746
## sample estimates:
## ratio of variances
##         0.01214062
```

```
var.test(xtyp_pca$PC4,xtyp_pca$price)
```

```
##
##  F test to compare two variances
##
## data:  xtyp_pca$PC4 and xtyp_pca$price
## F = 0.0051955, num df = 552, denom df = 552, p-value < 2.2e-16
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.004396382 0.006139930
## sample estimates:
## ratio of variances
##        0.005195525
```

```
var.test(xtyp_pca$PC5,xtyp_pca$price)
```

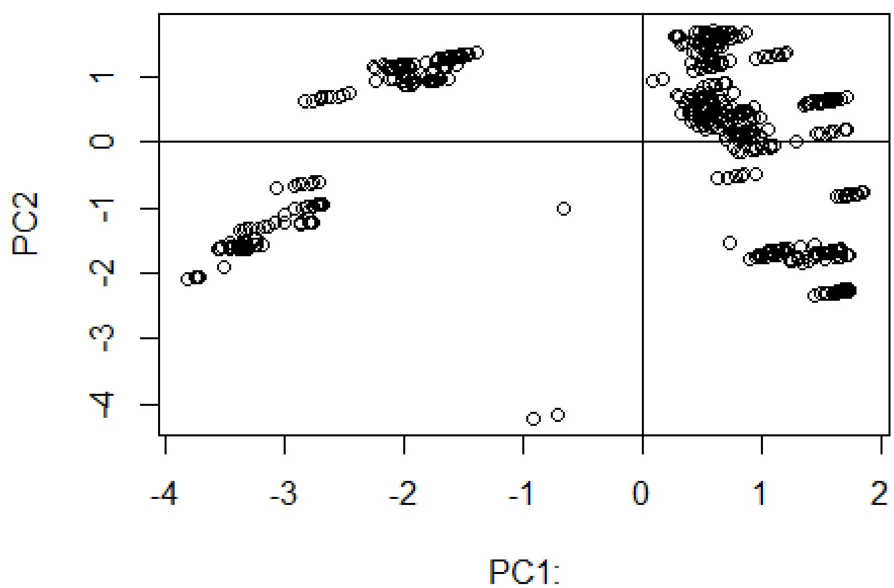
```
##
##  F test to compare two variances
##
## data:  xtyp_pca$PC5 and xtyp_pca$price
## F = 0.0029377, num df = 552, denom df = 552, p-value < 2.2e-16
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.002485830 0.003471678
## sample estimates:
## ratio of variances
##        0.002937686
```

```
var.test(xtyp_pca$PC6,xtyp_pca$price)
```

```
##
##  F test to compare two variances
##
## data:  xtyp_pca$PC6 and xtyp_pca$price
## F = 0.0020008, num df = 552, denom df = 552, p-value < 2.2e-16
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.001693084 0.002364539
## sample estimates:
## ratio of variances
##        0.002000841
```

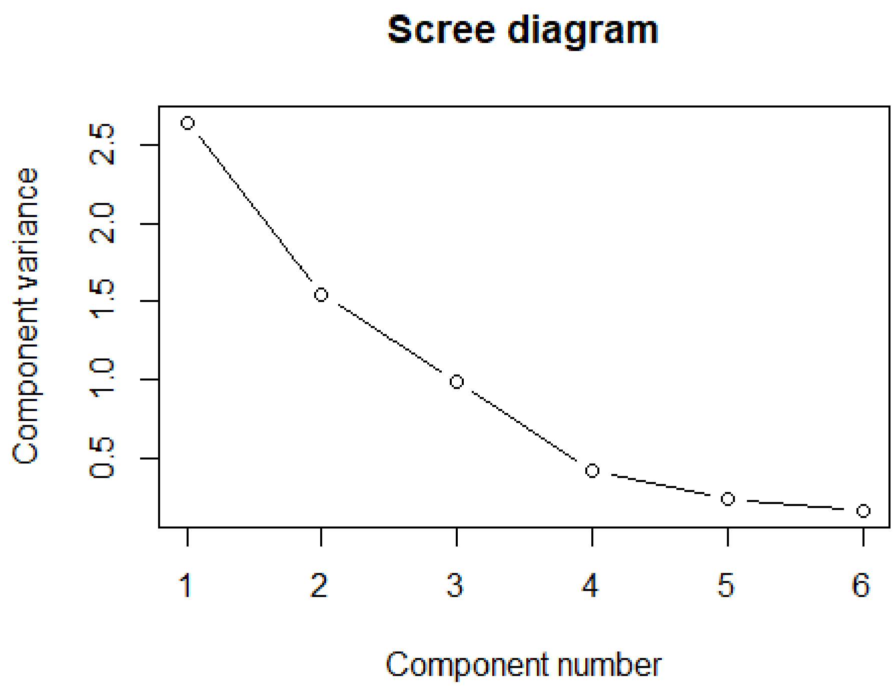
Plotting the scores of Pricipal Component 1 and Principal component 2

```
plot(xtyp_pca$PC1, xtyp_pca$PC2,xlab="PC1:", ylab="PC2")
abline(h=0)
abline(v=0)
```



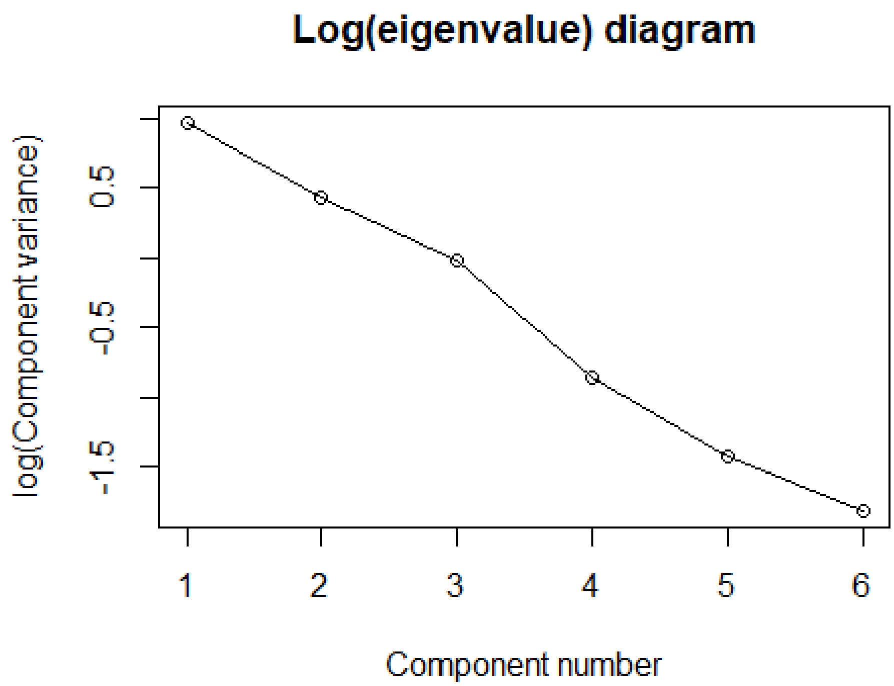
Plotting the Variance of Principal Components

```
plot(eigen_x, xlab = "Component number", ylab = "Component variance", type =
"b", main = "Scree diagram")
```



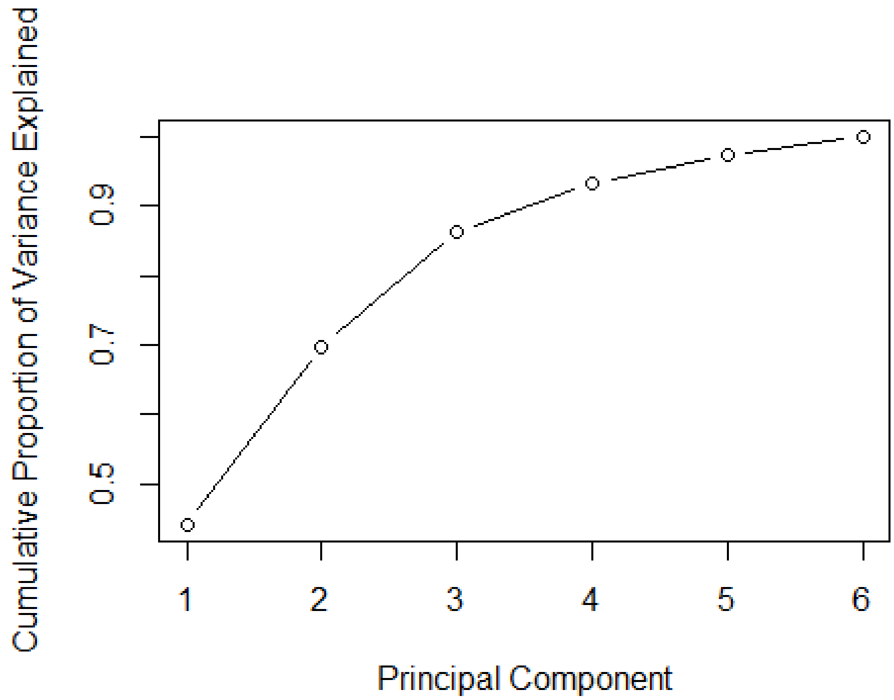
#Plotting the Log variance of COmponents

```
plot(log(eigen_x), xlab = "Component number",ylab = "log(Component
variance)", type="o",main = "Log(eigenvalue) diagram")
```



#Cumulative scree plot

```
plot(cumsum(propvar), xlab = "Principal Component",
              ylab = "Cumulative Proportion of Variance Explained",
              type = "b")
```

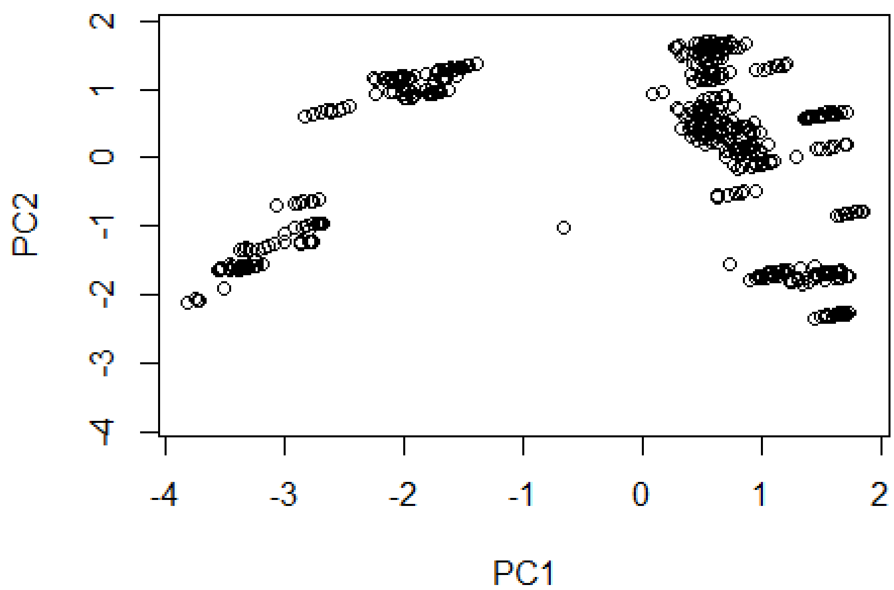


Variance of the principal components

```
#View(x_pca)
diag(cov(x_pca$x))

##       PC1       PC2       PC3       PC4       PC5       PC6
## 2.6452195 1.5440576 0.9869193 0.4223476 0.2388064 0.1626497

#x_pca$x[,1]
#x_pca$x
```

Plotting the scores

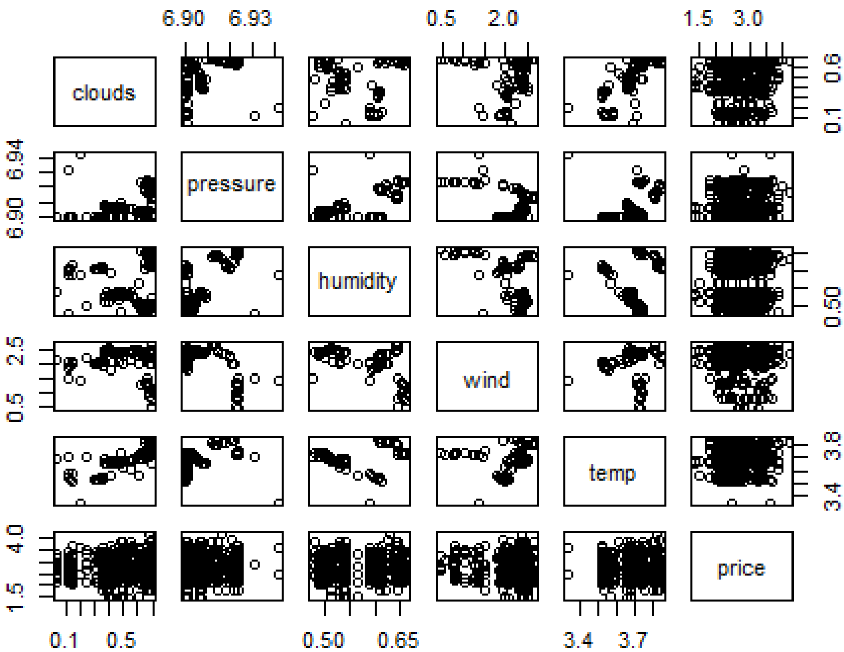
```
xlim <- range(x_pca$x[,1])
plot(x_pca$x,xlim=xlim,ylim=xlim)
```




```
#x_pca$rotation[,1]
#x_pca$rotation
```

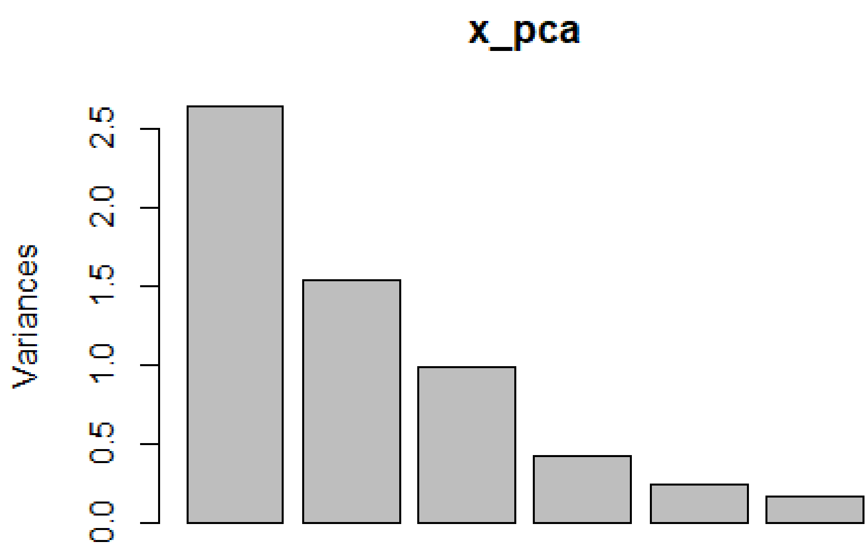
Scatter plot matrix of the actual data

```
plot(x_new)
```



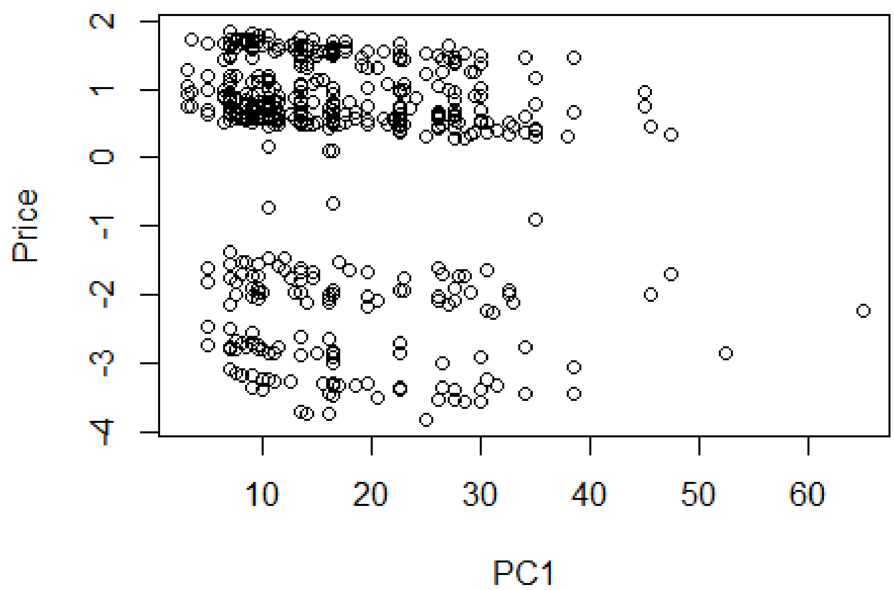
Variance plot for each component. We can see that all components play a dominant role.

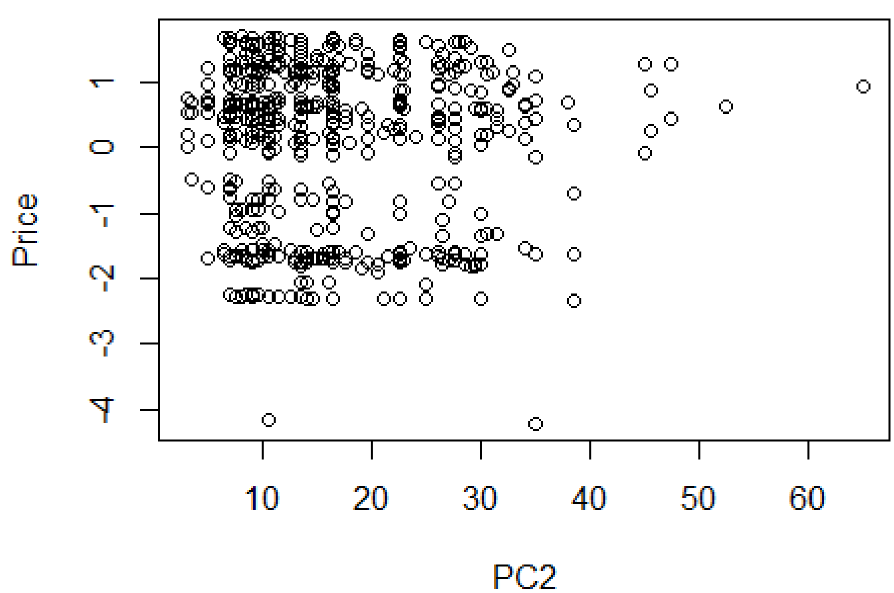
```
plot(x_pca)
```

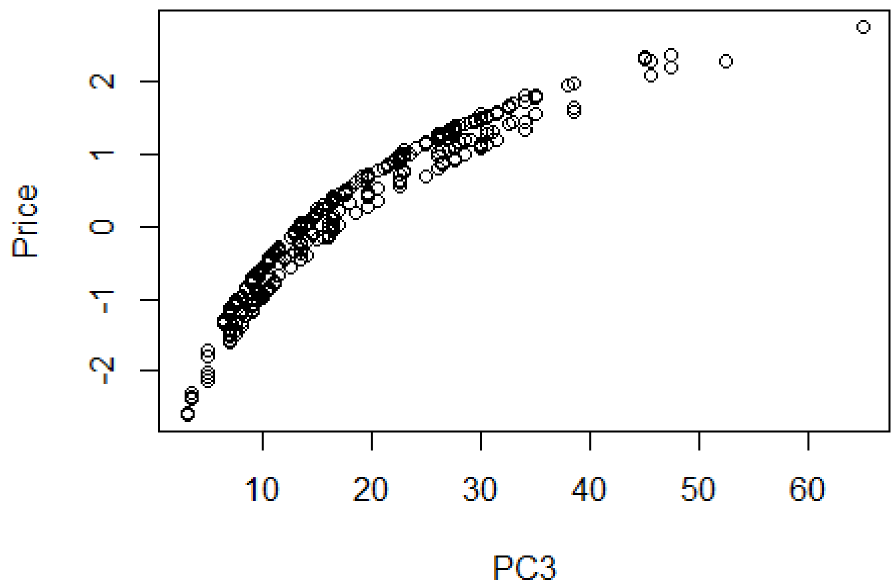


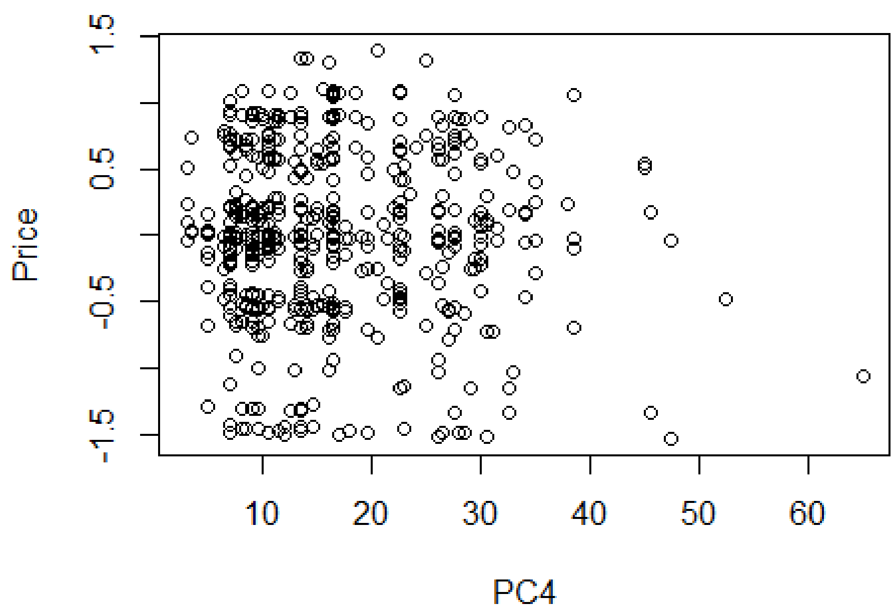
#Taking first 4 components

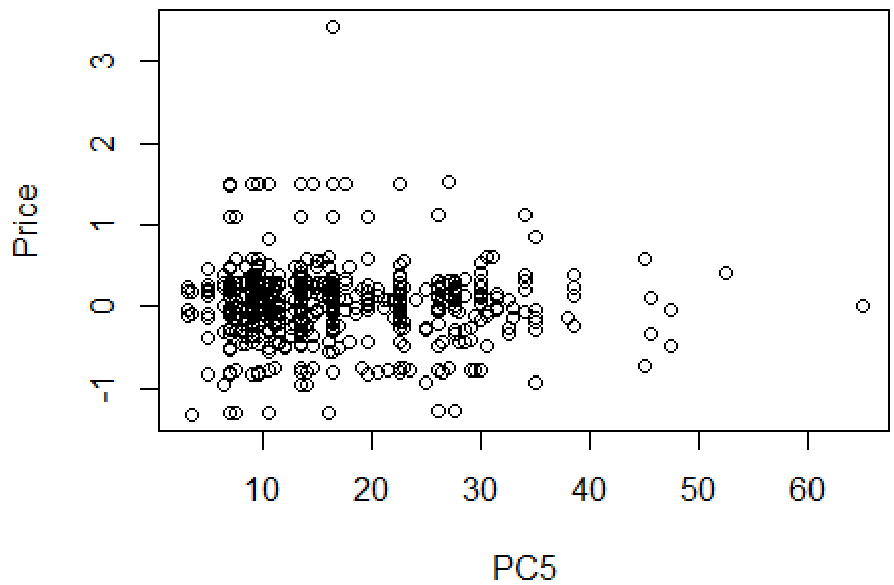
```
xtyp_pca<-xtyp_pca[1:5]

#get the original value of the data based on PCA
center <- x_pca$center
scale <- x_pca$scale
new_x <- as.matrix(x_new)
#drop(scale(new_x,center=center, scale=scale)%*%x_pca$rotation[,1])
#predict(x_pca)[,1]
#The aboved two gives us the same thing. predict is a good function to know.

x_new$price<-df$price
out <- sapply(1:6,
function(i){plot(x_new$price,x_pca$x[,i],xlab=paste("PC",i,sep=""),
                                    ylab="Price")})
```

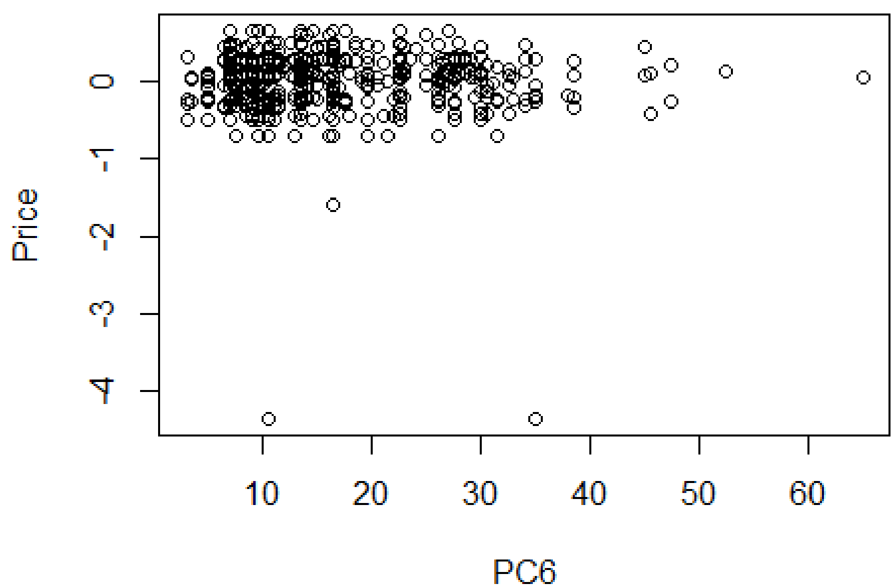

2
1
0
-1
-2
-3
-4
Price
10
20
30
40
50
60
PC1


1
0
-1
-2
-3
-4
Price
10
20
30
40
50
60
PC2

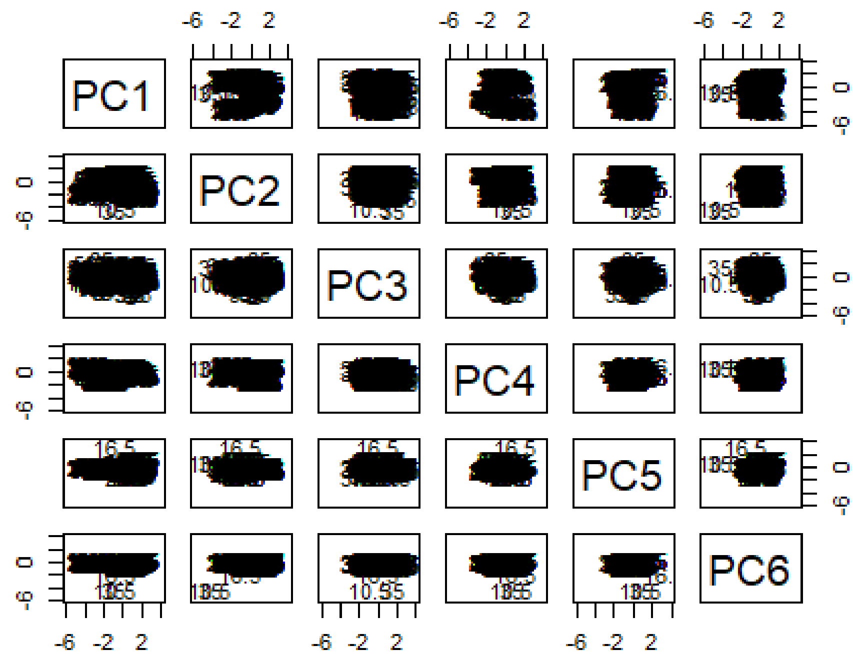

Price
-2
-1
0
1
2
10
20
30
40
50
60
PC3


Price
-1.5
-0.5
0.5
1.5
10
20
30
40
50
60
PC4






```
pairs(x_pca$x[,1:6], ylim = c(-6,4),xlim = c(-
6,4),panel=function(x,y,...){text(x,y,x_new$price)})
```



Factor Analysis

```
library(psych)

## Warning: package 'psych' was built under R version 3.5.3

#install.packages("psych",
lib="/Library/Frameworks/R.framework/Versions/3.5/Resources/library")
fit.pc <- principal(x_new, nfactors=4, rotate="varimax")
fit.pc

## Principal Components Analysis
## Call: principal(r = x_new, nfactors = 4, rotate = "varimax")
## Standardized loadings (pattern matrix) based upon correlation matrix
##           RC1   RC4   RC2   RC3   h2      u2 com
## clouds   0.93  0.00 -0.15  0.04 0.89 0.11026 1.1
## pressure 0.60  0.59 -0.41  0.04 0.88 0.11847 2.8
## humidity 0.07  0.93 -0.28  0.04 0.96 0.04317 1.2
## wind     0.02 -0.36  0.92 -0.02 0.97 0.02998 1.3
## temp     0.91  0.16  0.20  0.01 0.90 0.09918 1.2
## price    0.04  0.03 -0.02  1.00 1.00 0.00011 1.0
##
##                        RC1  RC4  RC2  RC3
## SS loadings           2.07 1.37 1.15 1.00
## Proportion Var        0.34 0.23 0.19 0.17
## Cumulative Var        0.34 0.57 0.77 0.93
## Proportion Explained  0.37 0.25 0.21 0.18
## Cumulative Proportion 0.37 0.61 0.82 1.00
```

```
##
## Mean item complexity =  1.4
## Test of the hypothesis that 4 components are sufficient.
##
## The root mean square of the residuals (RMSR) is  0.04
##  with the empirical chi square  24.65  with prob <  NA
##
## Fit based upon off diagonal values = 0.99
```

```
round(fit.pc$values, 3)
```

```
## [1] 2.647 1.544 0.985 0.422 0.239 0.163
```

```
fit.pc$loadings
```

```
##
## Loadings:
##          RC1    RC4    RC2    RC3
## clouds    0.931         -0.148
## pressure  0.601  0.592 -0.411
## humidity         0.933 -0.283
## wind            -0.357  0.918
## temp      0.914  0.158  0.202
## price                          0.998
##
##                  RC1   RC4   RC2   RC3
## SS loadings    2.068 1.374 1.154 1.002
## Proportion Var 0.345 0.229 0.192 0.167
## Cumulative Var 0.345 0.574 0.766 0.933
```

The first 4 factors have an Eigenvalue >1 and which explains almost 88% of the variance. We can effectively reduce dimensionality from 6 to 4 while only losing about 11% of the variance.

Communalities

```
fit.pc$communality
```

```
##    clouds  pressure  humidity      wind      temp     price
## 0.8897446 0.8815262 0.9568320 0.9700165 0.9008220 0.9998854
```

```
sum(fit.pc$communality)
```

```
## [1] 5.598827
```

The variance in clouds accounted by all fators is 0.87, This is the extent to which an item correlates with all other items. All comunalities are high, which means that the extracted components represent the variables well. If they are low , you may need to extract another component.

```
# Rotated factor scores, Notice the columns ordering: RC1, RC3, RC2 and RC4
fit.pc$scores

##              RC1        RC4          RC2          RC3
## 3     0.619089220  1.32061241 -1.479355625 -0.958518169
## 4     0.590941419  1.30915291 -1.430982396 -0.067642265
## 6     0.709488130  1.06974017 -1.549040428  1.046816282
## 7     0.772255638  1.12287429 -1.582772087 -1.067715746
## 12    0.674527040  1.18935514 -1.291654864  0.604741073
## 19    0.767537852  0.57782494 -2.774865419  0.593506606
## 20    0.790662723  0.59740067 -2.787292872 -0.185531509
## 22    0.788768777  0.59827196 -2.774485276 -0.074228005
## 24    0.752817381  0.57399486 -2.734972041  1.150178044
## 25    0.716478298  0.54323300 -2.715443186  2.374380797
## 26    0.808977783  0.62153592 -2.765152999 -0.741771665
## 27    0.769335147  0.58797752 -2.743848793  0.593722247
## 28    0.789156465  0.60475672 -2.754500896 -0.074024709
## 37    0.868450657  0.95109656 -2.119531512 -1.133666263
## 41    0.818444816  0.82954131 -2.483065594 -0.691137276
## 42    0.742463096  0.76522105 -2.442232533  1.868559389
## 43    0.821748369  0.83233784 -2.484840944 -0.802428436
## 48    0.787366704  0.81918367 -2.569283695  0.975875059
## 49    0.840223553  0.86392820 -2.597689303 -0.804783491
## 50    0.843527106  0.86672473 -2.599464653 -0.916074650
## 51    0.820402235  0.84714900 -2.587037200 -0.137036535
## 52    0.820402235  0.84714900 -2.587037200 -0.137036535
## 54    0.779107822  0.81219234 -2.564845319  1.254102957
## 55    0.780052779  0.68722004 -3.324064343 -0.145727701
## 56    0.776775431  0.97020556 -2.060687677  1.426734913
## 60    0.684555594  1.20585924 -1.627812219 -0.065569467
## 62    0.930265047  1.29951893 -1.054147999 -1.129706691
## 63    0.826203126  1.21142815 -0.998224459  2.375964829
## 64    0.918702612  1.28973107 -1.047934272 -0.740187633
## 75    1.301449854  1.06978427  0.204160433  3.928010287
## 76    1.445154412  1.19143345  0.126932687 -0.913155145
## 77    1.362565585  1.12152013  0.171316449  1.869123839
## 78    1.400556445  1.15368025  0.150899919  0.589275506
## 79    1.430288423  1.17884905  0.134921764 -0.412344928
## 80    1.509710885  1.09872462  0.610901492 -1.128102612
## 81    1.425132383  1.06317980  0.778350002  0.265208112
## 82    1.387141523  1.03101967  0.798766532  1.545056445
## 85    1.390141002  1.04877934  0.790625278 -0.889774478
```

```
## 86    1.365364354  1.02780534  0.803940407 -0.055090783
## 87    1.375275013  1.03619494  0.798614355 -0.388964261
## 88    1.329025270  0.99704348  0.823469262  1.169111970
## 89    1.403355214  1.05996547  0.783523876 -1.334939115
## 90    1.355453695  1.01941574  0.809266458  0.278782695
## 96    1.214128418  1.44296600  1.052510252 -0.834296876
## 97    1.136494922  1.37724747  1.094230988  1.781045368
## 98    1.192655323  1.42478853  1.064050030 -0.110904341
## 99    1.030781224  1.28775842  1.151042202  5.342362467
## 100   1.214128418  1.44296600  1.052510252 -0.834296876
## 106   0.955876493  1.65305872  1.435289424  1.734631984
## 107   0.972394258  1.66704138  1.426412672  1.178176187
## 108   1.018644001  1.70619284  1.401557766 -0.379900044
## 109   0.912930303  1.61670379  1.458368981  3.181417055
## 111   1.035270515  1.72554258  1.407740925 -0.991679994
## 112   1.030315186  1.72134778  1.410403951 -0.824743255
## 113   1.031966962  1.72274604  1.409516276 -0.880388835
## 114   1.020404527  1.71295818  1.415730002 -0.490869777
## 115   1.017100974  1.71016165  1.417505353 -0.379578618
## 116   1.045181175  1.73393217  1.402414874 -1.325553472
## 117   1.030315186  1.72134778  1.410403951 -0.824743255
## 118   0.954333465  1.65702752  1.451237012  1.734953410
## 120   1.038388090  1.51949428  1.188269400  0.675121026
## 125   1.058802001  1.71079292  1.688519170 -0.264666459
## 126   1.030721800  1.68702239  1.703609649  0.681308396
## 127   1.083578649  1.73176692  1.675204042 -1.099350154
## 129   1.067060884  1.71778425  1.684080794 -0.542894357
## 130   1.058802001  1.71079292  1.688519170 -0.264666459
## 131   1.062105554  1.71358945  1.686743820 -0.375957618
## 132   1.062019935  1.64356379  1.877393208  0.018359561
## 133   0.961261566  1.55826954  1.931541397  3.412739921
## 134   1.083493030  1.66174126  1.865853430 -0.705032975
## 135   1.078537700  1.65754646  1.868516456 -0.538096236
## 136   1.095055465  1.67152912  1.859639703 -1.094552033
## 137   1.032287957  1.61839500  1.893371362  1.019979995
## 138   1.017421968  1.60581060  1.901360439  1.520790212
## 184  -1.307202957  0.28260754  0.669618996 -0.623972624
## 185  -1.295640521  0.29239540  0.663405269 -1.013491682
## 186  -1.320417169  0.27142141  0.676720397 -0.178807987
## 188  -1.295640521  0.29239540  0.663405269 -1.013491682
## 197  -1.739110780  0.57271197  0.193547498  0.737394839
## 198  -1.702771696  0.60347383  0.174018643 -0.486807914
## 199  -1.686253931  0.61745649  0.165141891 -1.043263710
## 200  -1.752324992  0.56152583  0.200648900  1.182559477
## 201  -1.719289462  0.58949116  0.182895396  0.069647883
## 203  -1.717637685  0.59088943  0.182007720  0.014002304
## 205  -1.735997738  0.61965148  0.208782894 -0.208402343
## 207  -1.742604844  0.61405841  0.212333595  0.014179975
## 208  -1.717828197  0.63503241  0.199018467 -0.820503720
## 209  -1.778943928  0.58329655  0.231862451  1.238382728
```

```
## 210  -1.716176420  0.63643067  0.198130792 -0.876149299
## 211  -1.747560174  0.60986361  0.214996621  0.181116714
## 212  -1.742604844  0.61405841  0.212333595  0.014179975
## 213  -1.716176420  0.63643067  0.198130792 -0.876149299
## 215  -1.778943928  0.58329655  0.231862451  1.238382728
## 216  -1.722783526  0.63083761  0.201681493 -0.653566981
## 217  -1.717828197  0.63503241  0.199018467 -0.820503720
## 226  -1.152931561 -0.11306710 -0.835888339  0.854421760
## 228  -1.454335162  0.31095966 -0.380584946  0.804476315
## 229  -1.413040748  0.34591632 -0.402776827 -0.586663177
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## 947  -1.306080297  0.28855310  0.674367004 -0.790500268
## 948  -1.307732073  0.28715483  0.675254680 -0.734854688
## 949  -1.320946285  0.27596870  0.682356081 -0.289690051
## 950  -1.307732073  0.28715483  0.675254680 -0.734854688
## 959  -1.741618242  0.61201200  0.203173837 -0.041504588
## 960  -1.739966465  0.61341027  0.202286162 -0.097150167
## 961  -1.733359359  0.61900333  0.198735461 -0.319732486
## 962  -1.781260878  0.57845360  0.224478042  1.293989324
## 963  -1.746098649  0.61246653  0.215280373  0.070006730
## 964  -1.808537708  0.64895914  0.227740380 -0.317681602
## 965  -1.823403697  0.63637474  0.235729457  0.183128615
## 966  -1.859742780  0.60561288  0.255258312  1.407331368
## 967  -1.795323496  0.66014527  0.220638978 -0.762846239
## 969  -1.793671719  0.66154354  0.219751303 -0.818491819
## 970  -1.820100144  0.63917127  0.233954107  0.071837456
## 971  -1.811841261  0.64616261  0.229515731 -0.206390443
## 972  -1.796975272  0.65874700  0.221526653 -0.707200660
## 982  -1.433376628  0.44407172 -0.375616393 -0.699200878
## 983  -1.477721246  0.40825900 -0.350540080  0.747724571
## 985  -1.433123280  0.44601220 -0.374507311 -0.754706080
## 986  -1.419909067  0.45719833 -0.381608713 -1.199870717
## 987  -1.447989268  0.43342780 -0.366518234 -0.253895863
## 988  -1.457899927  0.42503820 -0.361192183  0.079977615
## 990  -1.426516173  0.45160526 -0.378058012 -0.977288399
## 991  -1.434775056  0.44461393 -0.373619636 -0.699060500
## 992  -1.500846117  0.38868327 -0.338112626  1.526762687
## 993  -1.502497894  0.38728501 -0.337224951  1.582408266
## 994  -1.422769297  0.35067440 -0.385833670 -0.585650605
## 995  -1.411206861  0.36046226 -0.392047396 -0.975169663
## 997  -1.525166122  0.51721649 -0.063630722  1.139815602
## 998  -2.108714298  0.61970199 -0.170608074  1.580128316
## 999  -2.083937650  0.64067599 -0.183923203  0.745444621
## 1000 -2.032732578  0.68402225 -0.211441135 -0.979568349
## 1001 -2.054205672  0.66584479 -0.199901357 -0.256175814
## 1005 -2.073250314  0.76216991 -0.142228122 -0.588131242
```

```
## 1006 -2.112892950  0.72861152 -0.120923916  0.747362671
## 1009 -2.056191175  0.75408467 -0.135153918 -0.698164487
## 1010 -2.094182035  0.72192454 -0.114737388  0.581683845
## 1011 -2.054539398  0.75548293 -0.136041594 -0.753810067
## 1012 -2.052887621  0.75688120 -0.136929269 -0.809455647
## 1013 -2.114385074  0.96817137  0.076377134 -0.748876489
## 1014 -2.111081521  0.97096790  0.074601784 -0.860167649
## 1015 -2.119340403  0.96397657  0.079040160 -0.581939750
## 1016 -2.167241923  0.92342684  0.104782742  1.031782060
## 1017 -2.139161722  0.94719737  0.089692263  0.085807206
## 1018 -2.130902839  0.95418870  0.085253887 -0.192420692
## 1020 -2.119340403  0.96397657  0.079040160 -0.581939750
## 1021 -1.614942600  0.42044572 -0.211194655 -0.743241790
## 1023 -1.652933460  0.38828559 -0.190778124  0.536606543
## 1024 -1.614942600  0.42044572 -0.211194655 -0.743241790
## 1025 -1.681013661  0.36451506 -0.175687645  1.482581397
## 1026 -1.682665437  0.36311679 -0.174799970  1.538226977
## 1027 -1.608335494  0.42603878 -0.214745356 -0.965824108
## 1028 -1.631460365  0.40646305 -0.202317902 -0.186785993
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## 1031 -1.671996768  0.44898130 -0.192219910 -0.242687674
## 1032 -1.690166309  0.43360036 -0.182455482  0.369413703
## 1033 -0.462475058 -0.82183713 -0.837070934  0.031177687
## 1034 -0.444305516 -0.80645620 -0.846835361 -0.580923689
## 1035 -0.421180645 -0.78688047 -0.859262815 -1.359961805
## 1036 -0.434394857 -0.79806660 -0.852161413 -0.914797167
## 1037 -0.495510588 -0.84980246 -0.819317429  1.144089281
## 1038 -0.500465918 -0.85399726 -0.816654403  1.311026020
## 1039 -0.432743080 -0.79666833 -0.853049088 -0.970442747
## 1040 -0.432743080 -0.79666833 -0.853049088 -0.970442747
## 1042 -0.444305516 -0.80645620 -0.846835361 -0.580923689
## 1047 -0.193785042 -1.15434304 -0.399554658  0.895327516
## 1048 -0.335334406 -0.77612914  0.663332451  0.349859005
## 1049 -0.302298875 -0.74816381  0.645578946 -0.763052588
## 1050 -0.295691769 -0.74257074  0.642028245 -0.985634907
## 1051 -0.284661798 -0.74128358  0.639022559 -0.986597838
## 1052 -0.273099362 -0.73149571  0.632808832 -1.376116895
## 1053 -0.278054692 -0.73569051  0.635471858 -1.209180156
## 1054 -0.316045552 -0.76785064  0.655888388  0.070668176
## 1055 -0.291268904 -0.74687664  0.642573260 -0.764015519
## 1056 -0.306134893 -0.75946104  0.650562337 -0.263205302
## 1057 -0.352384635 -0.79861250  0.675417243  1.294870929
## 1058 -0.316045552 -0.76785064  0.655888388  0.070668176
## 1059 -0.306134893 -0.75946104  0.650562337 -0.263205302
## 1060 -0.360643518 -0.80560383  0.679855620  1.573098827
## 1061 -0.304028547 -0.67179442  0.700925932 -0.769469178
## 1062 -0.318894536 -0.68437882  0.708915009 -0.268658961
## 1063 -0.373403162 -0.73052161  0.738208292  1.567645169
## 1064 -0.318894536 -0.68437882  0.708915009 -0.268658961
## 1066 -0.584221566 -0.83831038  0.278401681  0.389409249
```

```
## 1067 -0.574310906 -0.82992078  0.273075630  0.055535771
## 1070  0.317366968 -1.52210950  0.297456158  1.555449512
## 1071  0.381786252 -1.46757711  0.262836824 -0.614728095
## 1073  0.401401711 -1.47315087  0.263778129 -0.725741002
## 1074  0.401401711 -1.47315087  0.263778129 -0.725741002
## 1075  0.383232169 -1.48853181  0.273542557 -0.113639626
## 1077  0.859823532 -1.74439676 -0.086174886 -0.784813894
## 1078  0.866430638 -1.73880369 -0.089725587 -1.007396213
## 1079  0.835046884 -1.76537076 -0.072859757  0.049869801
## 1080  0.815225566 -1.78214995 -0.062207654  0.717616757
## 1082  0.747519836 -1.50048364  0.154387159 -1.008319614
## 1083  0.709528976 -1.53264377  0.174803690  0.271528719
## 1084  0.742564507 -1.50467844  0.157050185 -0.841382875
## 1085  0.735957401 -1.51027151  0.160600886 -0.618800556
## 1086  0.716136082 -1.52705070  0.171252989  0.048946400
## 1087  0.696314764 -1.54382990  0.181905091  0.716693356
## 1088  0.716136082 -1.52705070  0.171252989  0.048946400
## 1089  0.684752328 -1.55361777  0.188118818  1.106212414
## 1094  0.918846411 -1.70515712 -0.077580420 -0.505527965
## 1095  0.819869192 -1.47206477  0.043351369 -0.004367083
## 1097  0.836386957 -1.45808211  0.034474617 -0.560822879
## 1098  0.776923002 -1.50841970  0.066430925  1.442417989
## 1099  0.844645840 -1.45109077  0.030036241 -0.839050778
## 1101  0.931833376 -1.52918096  0.003387219 -0.620825098
## 1102  0.875672974 -1.57672202  0.033568176  1.271124611
## 1103  0.945047588 -1.51799482 -0.003714183 -1.065989735
## 1104  0.872369421 -1.57951855  0.035343527  1.382415771
## 1105  0.883931857 -1.56973068  0.029129800  0.992896713
## 1107  0.919137329 -1.74303356 -0.305839140 -1.013282749
## 1109  0.710851619 -1.34996533  0.057101528 -0.842894522
## 1110  0.745410746 -1.62209672 -0.135543617 -0.508441952
## 1112  0.543785115 -1.17372192  0.137295274 -1.007026755
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## 1115  0.771562770 -1.65259810 -0.082531108  1.834497860
## 1119  0.599843868 -1.22835744  0.053183206 -0.725411681
## 1120  0.568854306 -1.22117781  0.081612806 -0.335418310
## 1121  0.575461412 -1.21558475  0.078062106 -0.558000629
## 1123  0.485067473 -1.06573092  0.190991640 -0.224333285
## 1124  0.455335495 -1.09089972  0.206969794  0.777287149
## 1126  0.503237015 -1.05034999  0.181227213 -0.836434662
## 1127  0.456987272 -1.08950145  0.206082119  0.721641569
## 1128  0.476808590 -1.07272225  0.195430016  0.053894613
## 1129  0.503237015 -1.05034999  0.181227213 -0.836434662
## 1130  0.488371026 -1.06293439  0.189216290 -0.335624445
## 1131  0.415692859 -1.12445811  0.228274000  2.112781061
## 1132  0.488371026 -1.06293439  0.189216290 -0.335624445
## 1133  0.456987272 -1.08950145  0.206082119  0.721641569
## 1136  0.252112132 -0.74691071  0.348469704  0.054896260
## 1137  0.276888780 -0.72593671  0.335154575 -0.779787435
## 1138  0.232290814 -0.76368991  0.359121806  0.722643216
```

```
## 1139  0.207514166 -0.78466390  0.372436935  1.557326911
## 1141  0.264849287 -0.70449833  0.158707322 -0.285238831
## 1142  0.183912237 -0.77301339  0.202203409  2.441394573
## 1143  0.279735060 -0.68774902  0.155424570 -0.841496794
## 1144  0.279735060 -0.68774902  0.155424570 -0.841496794
## 1146  0.196774884 -0.51823898  0.252078118 -0.898840992
## 1147  0.175301790 -0.53641644  0.263617896 -0.175448456
## 1148  0.195123108 -0.51963724  0.252965794 -0.843195413
## 1149  0.176953566 -0.53501817  0.262730221 -0.231094036
## 1150  0.195123108 -0.51963724  0.252965794 -0.843195413
## 1151  0.125748494 -0.57836443  0.290248153  1.493918934
## 1152  0.198426661 -0.51684071  0.251190443 -0.954486572
## 1153  0.122444941 -0.58116097  0.292023504  1.605210093
## 1154  0.206685544 -0.50984938  0.246752067 -1.232714470
## 1155  0.093701338 -0.48397561  0.324049460  0.047860576
## 1156  0.125085092 -0.45740855  0.307183631 -1.009405438
## 1159 -0.079028413 -0.22216214  0.487514228 -0.786577077
## 1160 -0.107108614 -0.24593267  0.502604707  0.159397777
## 1161 -0.083983743 -0.22635694  0.490177254 -0.619640338
## 1163  0.002968692 -0.34448703  0.382922187  0.158554453
## 1165 -0.029769376 -0.46460903  0.323635891 -0.285543123
## 1169 -0.144731835 -0.32665395  0.457956987 -0.785726491
## 1170 -0.169508483 -0.34762795  0.471272116  0.048957205
## 1171 -0.169508483 -0.34762795  0.471272116  0.048957205
## 1172 -0.189329802 -0.36440715  0.481924219  0.716704161
## 1174 -0.185889056 -0.29774097  0.484716994 -0.729970722
## 1175 -0.175978397 -0.28935138  0.479390943 -1.063844200
## 1176 -0.192496162 -0.30333404  0.488267695 -0.507388404
## 1183 -0.095714164 -0.58049606  0.082159157  0.665381245
## 1184 -0.148317272 -0.43394660  0.173804047  0.552751471
## 1185 -0.110326412 -0.40178647  0.153387517 -0.727096861
## 1187 -0.108674636 -0.40038821  0.152499842 -0.782742441
## 1188 -0.179701026 -0.46051367  0.190669877  1.610017485
## 1189 -0.131799507 -0.41996394  0.164927295 -0.003704325
## 1192 -0.316929605 -0.27778261  0.362149737  0.720259788
## 1193 -0.252510320 -0.22325022  0.327530403 -1.449917819
## 1194 -0.278938744 -0.24562248  0.341733207 -0.559588545
## 1195 -0.265724532 -0.23443635  0.334631805 -1.004753182
## 1196 -0.297108286 -0.26100341  0.351497634  0.052512832
## 1197 -0.333447370 -0.29176528  0.371026489  1.276715585
## 1198 -0.307018945 -0.26939301  0.356823685  0.386386310
## 1199 -0.287197627 -0.25261381  0.346171583 -0.281360646
## 1200 -0.278938744 -0.24562248  0.341733207 -0.559588545
## 1201 -0.272331638 -0.24002942  0.338182506 -0.782170863
## 1202 -0.290501180 -0.25541035  0.347946933 -0.170069487
## 1203 -0.373890003 -0.10088073  0.459022789  0.051089605
## 1204 -0.373890003 -0.10088073  0.459022789  0.051089605
## 1205 -0.363979344 -0.09249114  0.453696737 -0.282783873
## 1206 -0.335899143 -0.06872061  0.438606258 -1.228758728
## 1207 -0.342506249 -0.07431367  0.442156959 -1.006176409
```

```
## 1208 -0.373890003 -0.10088073  0.459022789  0.051089605
## 1209 -0.349113355 -0.07990674  0.445707660 -0.783594090
## 1210 -0.354068685 -0.08410154  0.448370686 -0.616657351
## 1211 -0.418487969 -0.13863393  0.482990020  1.553520256
## 1212 -0.340635435 -0.32214631  0.268633897  0.216590758
## 1213 -0.309251681 -0.29557925  0.251768068 -0.840675255
## 1214 -0.324117670 -0.30816365  0.259757145 -0.339865038
## 1221 -0.013185909 -0.28314886  0.308279986 -0.952422985
## 1222 -0.019793015 -0.28874193  0.311830687 -0.729840666
## 1223 -0.052828546 -0.31670726  0.329584192  0.383070927
## 1225 -0.074301641 -0.33488472  0.341123970  1.106463463
## 1227  0.618565351 -0.98092959 -0.191144511 -0.614913889
## 1228  0.598744033 -0.99770879 -0.180492408  0.052833067
## 1229  0.618565351 -0.98092959 -0.191144511 -0.614913889
## 1294 -0.047693247 -0.51428413 -1.777021493 -0.034107902
```

```r
fit.pc$scores<-data.frame(fit.pc$scores)
fit.pc$scores[1]
```

```
##                RC1
## 3      0.619089220
## 4      0.590941419
## 6      0.709488130
## 7      0.772255638
## 12     0.674527040
## 19     0.767537852
## 20     0.790662723
## 22     0.788768777
## 24     0.752817381
## 25     0.716478298
## 26     0.808977783
## 27     0.769335147
## 28     0.789156465
## 37     0.868450657
## 41     0.818444816
## 42     0.742463096
## 43     0.821748369
## 48     0.787366704
## 49     0.840223553
## 50     0.843527106
## 51     0.820402235
## 52     0.820402235
## 54     0.779107822
## 55     0.780052779
## 56     0.776775431
## 60     0.684555594
## 62     0.930265047
## 63     0.826203126
## 64     0.918702612
## 75     1.301449854
```

```
## 76    1.445154412
## 77    1.362565585
## 78    1.400556445
## 79    1.430288423
## 80    1.509710885
## 81    1.425132383
## 82    1.387141523
## 85    1.390141002
## 86    1.365364354
## 87    1.375275013
## 88    1.329025270
## 89    1.403355214
## 90    1.355453695
## 96    1.214128418
## 97    1.136494922
## 98    1.192655323
## 99    1.030781224
## 100   1.214128418
## 106   0.955876493
## 107   0.972394258
## 108   1.018644001
## 109   0.912930303
## 111   1.035270515
## 112   1.030315186
## 113   1.031966962
## 114   1.020404527
## 115   1.017100974
## 116   1.045181175
## 117   1.030315186
## 118   0.954333465
## 120   1.038388090
## 125   1.058802001
## 126   1.030721800
## 127   1.083578649
## 129   1.067060884
## 130   1.058802001
## 131   1.062105554
## 132   1.062019935
## 133   0.961261566
## 134   1.083493030
## 135   1.078537700
## 136   1.095055465
## 137   1.032287957
## 138   1.017421968
## 184  -1.307202957
## 185  -1.295640521
## 186  -1.320417169
## 188  -1.295640521
## 197  -1.739110780
## 198  -1.702771696
```

```
## 199  -1.686253931
## 200  -1.752324992
## 201  -1.719289462
## 203  -1.717637685
## 205  -1.735997738
## 207  -1.742604844
## 208  -1.717828197
## 209  -1.778943928
## 210  -1.716176420
## 211  -1.747560174
## 212  -1.742604844
## 213  -1.716176420
## 215  -1.778943928
## 216  -1.722783526
## 217  -1.717828197
## 226  -1.152931561
## 228  -1.454335162
## 229  -1.413040748
## 230  -1.426254961
## 232  -1.452683385
## 233  -1.472708581
## 235  -1.408289296
## 236  -1.408289296
## 238  -1.507237140
## 244  -2.070710413
## 245  -2.080621072
## 249  -2.058155476
## 250  -2.043289487
## 251  -2.121349335
## 252  -2.207241715
## 253  -2.104831570
## 255  -2.104831570
## 256  -1.645133392
## 257  -1.580714108
## 259  -1.521293609
## 260  -1.519641832
## 261  -1.521293609
## 262  -1.496516961
## 263  -1.590668223
## 264  -1.557632693
## 265  -1.557632693
## 268  -0.414471223
## 269  -0.302150419
## 270  -0.315590727
## 271  -0.305680068
## 272  -0.376706459
## 273  -0.351929811
## 274  -0.295769409
## 275  -0.284206973
## 276  -0.284206973
```

```
## 277  -0.295769409
## 279  -0.370709039
## 280  -0.380619698
## 281  -0.400441016
## 282  -0.426869440
## 283  -0.345932391
## 284  -0.281072815
## 285  -0.335581441
## 286  -0.274465709
## 287  -0.319063675
## 289  -0.303176434
## 290  -0.278399786
## 291  -0.329604858
## 292  -0.278399786
## 294  -0.308543842
## 295  -0.565262871
## 296  -0.623075050
## 297  -0.555352212
## 298  -0.533879117
## 299  -0.596646625
## 300  -0.535530894
## 303   0.362882555
## 305   0.338105907
## 306   0.364534331
## 307   0.265427740
## 310   0.873772876
## 311   0.835782015
## 312   0.855603334
## 313   0.852299781
## 314   0.860558663
## 315   0.858906887
## 316   0.852299781
## 318   0.822567803
## 319   0.804398261
## 321   0.778951735
## 325   0.936514705
## 326   0.906091293
## 327   0.841875065
## 328   0.833616182
## 329   0.797277098
## 330   0.833616182
## 336   0.689836654
## 337   0.694791984
## 338   0.665060006
## 339   0.704702643
## 340   0.648542241
## 341   0.743912817
## 342   0.758778806
## 343   0.743912817
## 344   0.724091499
```

```
## 345   0.700966628
## 350   0.873875635
## 351   0.849098988
## 352   0.860661423
## 353   0.875527412
## 354   0.882134518
## 357   0.597883623
## 358   0.566499869
## 359   0.616053165
## 360   0.596270716
## 363   0.449598726
## 364   0.485937810
## 365   0.514018011
## 366   0.525580446
## 367   0.525580446
## 369   0.300711436
## 373   0.296286132
## 374   0.218652635
## 375   0.295335034
## 376   0.239984913
## 377   0.200531200
## 378   0.226959625
## 379   0.195575871
## 380   0.225307848
## 381   0.215397189
## 382   0.215397189
## 383   0.240173837
## 384   0.215397189
## 386   0.212093636
## 388   0.164192117
## 389   0.137763692
## 390   0.217048966
## 391   0.050675101
## 392   0.120049715
## 393   0.121701491
## 394   0.096924843
## 398   0.071527486
## 399   0.059965050
## 400   0.038491955
## 401   0.048402614
## 402   0.053357944
## 403  -0.032534436
## 404  -0.073828849
## 405  -0.002802458
## 406   0.066572156
## 407   0.028581296
## 410  -0.007757788
## 411   0.059965050
## 412   0.048402614
## 413   0.038491955
```

```
## 414   0.028581296
## 415   0.018670637
## 416  -0.020972000
## 418   0.011379161
## 419  -0.064602559
## 420  -0.087058841
## 421  -0.060622203
## 422  -0.077905680
## 423  -0.084512786
## 424  -0.086164562
## 425  -0.087816339
## 426  -0.135717858
## 427  -0.072950350
## 429  -0.077905680
## 430  -0.162146282
## 431  -0.071298573
## 433  -0.074602126
## 435  -0.236694783
## 443  -0.167937750
## 444  -0.091956030
## 445  -0.124991560
## 446  -0.091956030
## 447  -0.062224052
## 448  -0.052313393
## 449  -0.108473795
## 450  -0.190093147
## 453  -0.315245032
## 454  -0.264039959
## 455  -0.295423713
## 456  -0.295423713
## 457  -0.275602395
## 462  -0.278125991
## 466  -0.061905125
## 467  -0.045387360
## 468  -0.094940655
## 469  -0.033824924
## 471   0.603271611
## 640  -1.808384506
## 641  -1.889321556
## 749   0.614458041
## 750   0.614458041
## 751   0.596288499
## 752   0.612806264
## 758   0.733149990
## 759   0.736453543
## 760   0.731498213
## 761   0.708373342
## 762   0.663775375
## 763   0.738105319
## 764   0.724891107
```

```
## 770   0.755522704
## 773   0.781334938
## 774   0.768120726
## 775   0.786290268
## 777   0.753201545
## 779   0.802754841
## 780   0.817620829
## 781   0.789540628
## 783   0.789731408
## 792   0.770342480
## 801   0.815968381
## 802   0.779629298
## 803   0.771370415
## 805   0.815968381
## 806   0.784160572
## 808   0.782508795
## 809   0.746169712
## 810   0.781258270
## 811   0.839070449
## 813   0.844025778
## 814   0.804383142
## 815   0.844025778
## 817   0.656229280
## 821   0.896898327
## 822   0.934889187
## 823   0.915067868
## 824   0.928282081
## 825   0.906808986
## 833   1.478777552
## 834   1.450697351
## 835   1.472170446
## 836   1.442438469
## 837   1.420965374
## 842   1.443006674
## 843   1.438051345
## 844   1.421533579
## 845   1.414926473
## 846   1.436399568
## 848   1.367024954
## 851   1.331496682
## 852   1.346362671
## 853   1.367835766
## 854   1.366183989
## 856   1.310023587
## 857   1.136265556
## 858   1.197381288
## 859   1.197381288
## 860   1.197381288
## 861   1.167649311
## 865   1.160150128
```

```
## 866   1.203096317
## 876   1.019251795
## 877   1.007689359
## 878   1.091929962
## 879   1.040724890
## 882   1.079683790
## 884   1.116330355
## 885   1.056866400
## 886   1.113026802
## 887   1.084946601
## 888   1.099812590
## 889   1.117982132
## 890   1.106419696
## 891   1.079991272
## 892   1.050259294
## 893   1.106419696
## 894   1.051911071
## 941  -1.334160498
## 942  -1.311035626
## 943  -1.299473191
## 944  -1.365544252
## 945  -1.330856945
## 946  -1.350678263
## 947  -1.306080297
## 948  -1.307732073
## 949  -1.320946285
## 950  -1.307732073
## 959  -1.741618242
## 960  -1.739966465
## 961  -1.733359359
## 962  -1.781260878
## 963  -1.746098649
## 964  -1.808537708
## 965  -1.823403697
## 966  -1.859742780
## 967  -1.795323496
## 969  -1.793671719
## 970  -1.820100144
## 971  -1.811841261
## 972  -1.796975272
## 982  -1.433376628
## 983  -1.477721246
## 985  -1.433123280
## 986  -1.419909067
## 987  -1.447989268
## 988  -1.457899927
## 990  -1.426516173
## 991  -1.434775056
## 992  -1.500846117
## 993  -1.502497894
```

```
## 994  -1.422769297
## 995  -1.411206861
## 997  -1.525166122
## 998  -2.108714298
## 999  -2.083937650
## 1000 -2.032732578
## 1001 -2.054205672
## 1005 -2.073250314
## 1006 -2.112892950
## 1009 -2.056191175
## 1010 -2.094182035
## 1011 -2.054539398
## 1012 -2.052887621
## 1013 -2.114385074
## 1014 -2.111081521
## 1015 -2.119340403
## 1016 -2.167241923
## 1017 -2.139161722
## 1018 -2.130902839
## 1020 -2.119340403
## 1021 -1.614942600
## 1023 -1.652933460
## 1024 -1.614942600
## 1025 -1.681013661
## 1026 -1.682665437
## 1027 -1.608335494
## 1028 -1.631460365
## 1030 -1.628105897
## 1031 -1.671996768
## 1032 -1.690166309
## 1033 -0.462475058
## 1034 -0.444305516
## 1035 -0.421180645
## 1036 -0.434394857
## 1037 -0.495510588
## 1038 -0.500465918
## 1039 -0.432743080
## 1040 -0.432743080
## 1042 -0.444305516
## 1047 -0.193785042
## 1048 -0.335334406
## 1049 -0.302298875
## 1050 -0.295691769
## 1051 -0.284661798
## 1052 -0.273099362
## 1053 -0.278054692
## 1054 -0.316045552
## 1055 -0.291268904
## 1056 -0.306134893
## 1057 -0.352384635
```

```
## 1058 -0.316045552
## 1059 -0.306134893
## 1060 -0.360643518
## 1061 -0.304028547
## 1062 -0.318894536
## 1063 -0.373403162
## 1064 -0.318894536
## 1066 -0.584221566
## 1067 -0.574310906
## 1070  0.317366968
## 1071  0.381786252
## 1073  0.401401711
## 1074  0.401401711
## 1075  0.383232169
## 1077  0.859823532
## 1078  0.866430638
## 1079  0.835046884
## 1080  0.815225566
## 1082  0.747519836
## 1083  0.709528976
## 1084  0.742564507
## 1085  0.735957401
## 1086  0.716136082
## 1087  0.696314764
## 1088  0.716136082
## 1089  0.684752328
## 1094  0.918846411
## 1095  0.819869192
## 1097  0.836386957
## 1098  0.776923002
## 1099  0.844645840
## 1101  0.931833376
## 1102  0.875672974
## 1103  0.945047588
## 1104  0.872369421
## 1105  0.883931857
## 1107  0.919137329
## 1109  0.710851619
## 1110  0.745410746
## 1112  0.543785115
## 1114  0.834330278
## 1115  0.771562770
## 1119  0.599843868
## 1120  0.568854306
## 1121  0.575461412
## 1123  0.485067473
## 1124  0.455335495
## 1126  0.503237015
## 1127  0.456987272
## 1128  0.476808590
```

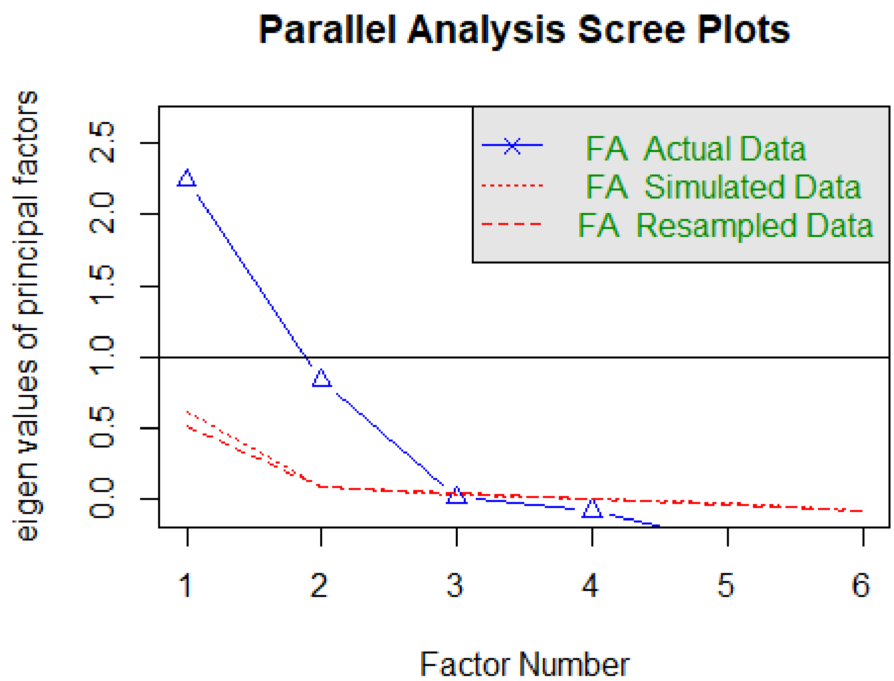
```
## 1129  0.503237015
## 1130  0.488371026
## 1131  0.415692859
## 1132  0.488371026
## 1133  0.456987272
## 1136  0.252112132
## 1137  0.276888780
## 1138  0.232290814
## 1139  0.207514166
## 1141  0.264849287
## 1142  0.183912237
## 1143  0.279735060
## 1144  0.279735060
## 1146  0.196774884
## 1147  0.175301790
## 1148  0.195123108
## 1149  0.176953566
## 1150  0.195123108
## 1151  0.125748494
## 1152  0.198426661
## 1153  0.122444941
## 1154  0.206685544
## 1155  0.093701338
## 1156  0.125085092
## 1159 -0.079028413
## 1160 -0.107108614
## 1161 -0.083983743
## 1163  0.002968692
## 1165 -0.029769376
## 1169 -0.144731835
## 1170 -0.169508483
## 1171 -0.169508483
## 1172 -0.189329802
## 1174 -0.185889056
## 1175 -0.175978397
## 1176 -0.192496162
## 1183 -0.095714164
## 1184 -0.148317272
## 1185 -0.110326412
## 1187 -0.108674636
## 1188 -0.179701026
## 1189 -0.131799507
## 1192 -0.316929605
## 1193 -0.252510320
## 1194 -0.278938744
## 1195 -0.265724532
## 1196 -0.297108286
## 1197 -0.333447370
## 1198 -0.307018945
## 1199 -0.287197627
```

```
## 1200 -0.278938744
## 1201 -0.272331638
## 1202 -0.290501180
## 1203 -0.373890003
## 1204 -0.373890003
## 1205 -0.363979344
## 1206 -0.335899143
## 1207 -0.342506249
## 1208 -0.373890003
## 1209 -0.349113355
## 1210 -0.354068685
## 1211 -0.418487969
## 1212 -0.340635435
## 1213 -0.309251681
## 1214 -0.324117670
## 1221 -0.013185909
## 1222 -0.019793015
## 1223 -0.052828546
## 1225 -0.074301641
## 1227  0.618565351
## 1228  0.598744033
## 1229  0.618565351
## 1294 -0.047693247
```

See factor recommendation

```
fa.parallel(x_new, fm='minres', fa='fa')
```

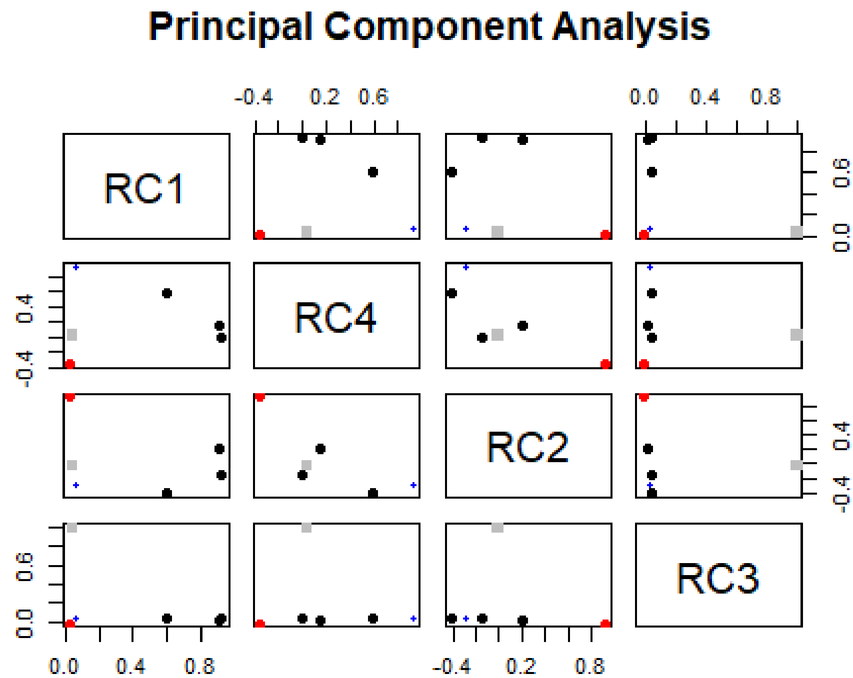
```
## Warning in fac(r = r, nfactors = nfactors, n.obs = n.obs, rotate =
## rotate, : A loading greater than abs(1) was detected. Examine the loadings
## carefully.

## Warning in fa.stats(r = r, f = f, phi = phi, n.obs = n.obs, np.obs
## = np.obs, : The estimated weights for the factor scores are probably
## incorrect. Try a different factor extraction method.

## Warning in fac(r = r, nfactors = nfactors, n.obs = n.obs, rotate =
## rotate, : An ultra-Heywood case was detected. Examine the results
carefully
```




```
## Parallel analysis suggests that the number of factors =  2  and the number
of components =  NA
```

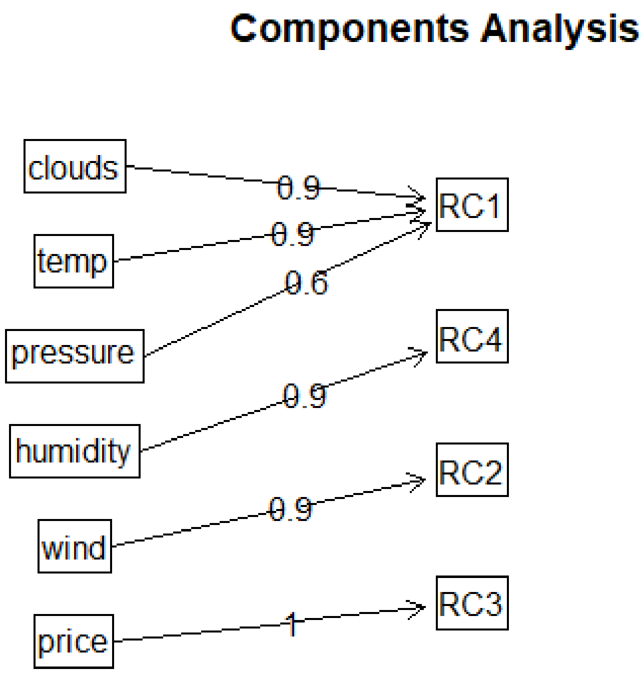
Blue line shows the eigen values of actual data and the two red lines show simulated and resampled data. Here factors between 2-4 will be a good choice..

```
fa.plot(fit.pc) # See Correlations within Factors
```



Visualize the relationship

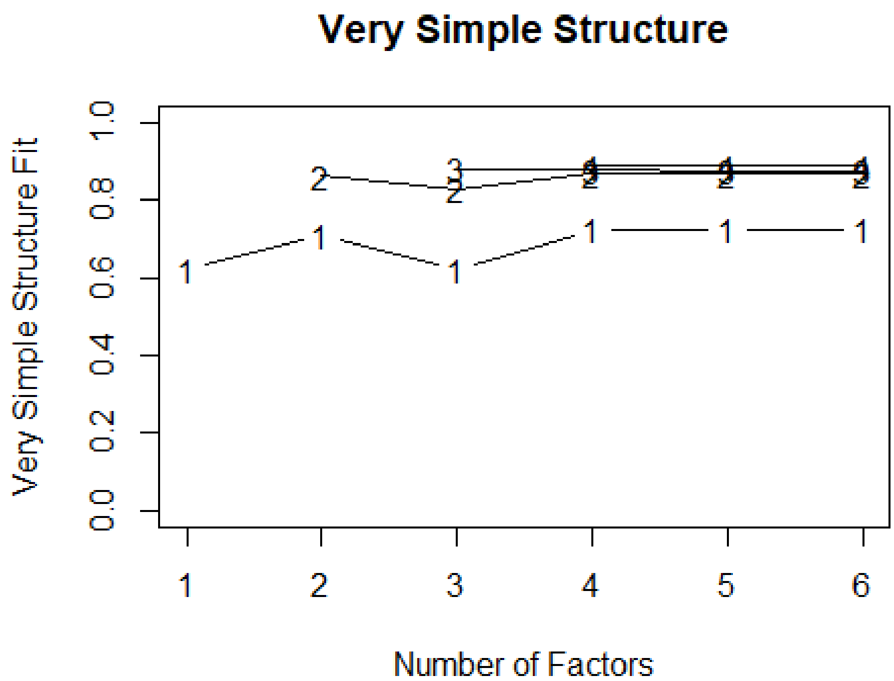
```
fa.diagram(fit.pc)
```



#Red dotted line means Wind marginally falls under the RC1 bucket.

See Factor recommendations for a simple structure

```
vss(x_new)

## Warning in fac(r = r, nfactors = nfactors, n.obs = n.obs, rotate =
## rotate, : A loading greater than abs(1) was detected. Examine the loadings
## carefully.

## Warning in fa.stats(r = r, f = f, phi = phi, n.obs = n.obs, np.obs
## = np.obs, : The estimated weights for the factor scores are probably
## incorrect. Try a different factor extraction method.

## Warning in fac(r = r, nfactors = nfactors, n.obs = n.obs, rotate =
## rotate, : An ultra-Heywood case was detected. Examine the results
carefully
```




```
##
## Very Simple Structure
## Call: vss(x = x_new)
## Although the VSS complexity 1 shows  5  factors, it is probably more
reasonable to think about  2  factors
## VSS complexity 2 achieves a maximimum of 0.87  with  6  factors
##
## The Velicer MAP achieves a minimum of NA  with  2  factors
## BIC achieves a minimum of  NA  with  2  factors
## Sample Size adjusted BIC achieves a minimum of  NA  with  2  factors
##
## Statistics by number of factors
##   vss1 vss2  map dof   chisq     prob sqresid  fit RMSEA BIC SABIC complex
## 1 0.62 0.00 0.16   9 6.0e+02 2.2e-123     4.0 0.62 0.346 543 571.6     1.0
## 2 0.71 0.86 0.13   4 2.0e+01  4.3e-04     1.5 0.86 0.086  -5   7.7     1.3
## 3 0.62 0.83 0.23   0 5.2e-01       NA     1.3 0.88    NA  NA    NA     1.6
## 4 0.72 0.87 0.45  -3 1.9e-09       NA     1.2 0.89    NA  NA    NA     1.3
## 5 0.72 0.87 1.00  -5 4.8e-13       NA     1.2 0.89    NA  NA    NA     1.3
## 6 0.72 0.87   NA  -6 4.8e-13       NA     1.2 0.89    NA  NA    NA     1.3
##    eChisq    SRMR eCRMS eBIC
## 1 5.7e+02 1.8e-01 0.239  510
## 2 4.3e+00 1.6e-02 0.031  -21
## 3 3.1e-01 4.3e-03    NA   NA
## 4 2.0e-10 1.1e-07    NA   NA
## 5 1.4e-13 2.9e-09    NA   NA
## 6 1.4e-13 2.9e-09    NA   NA
```

Regression analysis using the factors scores as the independent variable:

Let's combine the dependent variable and the factor scores into a dataset and label them.

```
cab<-cbind(fit.pc$scores[1], df[,c(1,4,5,7,8,9,10,12)])
cab<-data.frame(cab)
#View(cab)
names(cab)[names(cab) == "RC1"] <- "Temp"
names(cab)[names(cab) == "merge_data_0"] <- "No rain"
names(cab)[names(cab) == "merge_data_1"] <- "Medium rain"
#Labelling the data
#names(cab)<-c("Price","Wind_Pressure","Temperature","Humidity","Distance")
head(cab)
```

```
##          Temp location humidity wind distance cab_type
## 3  0.6190892        0     0.93 2.59     1.44     Uber
## 4  0.5909414        0     0.93 2.65     1.36     Lyft
## 6  0.7094881        0     0.92 2.59     1.34     Uber
## 7  0.7722556        0     0.92 2.59     1.10     Uber
## 12 0.6745270        0     0.92 3.02     2.28     Lyft
## 19 0.7675379        0     0.91 1.16     2.64     Lyft
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_0
## 3
1
## 4
1
## 6
1
## 7
1
## 12
1
## 19
1
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_1
## 3
0
## 4
0
## 6
0
## 7
```

```
0
## 12
0
## 19
0
##    price
## 3    8.5
## 4   16.5
## 6   26.5
## 7    7.5
## 12  22.5
## 19  22.5
```

Let’s split the dataset into training and testing dataset. (80:20)

```
set.seed(101)
Atrain<-sample(nrow(cab),nrow(cab)*0.80)
cab_train<-cab[Atrain,]
cab_test<-cab[-Atrain,]
dim(cab_train)

## [1] 442   9

dim(cab_test)

## [1] 111   9
```

Performing multiple regression (Taking alpha=0.1)

```
fit3 <- lm(price~., data=cab_train)
#show the results
summary(fit3)

##
## Call:
## lm(formula = price ~ ., data = cab_train)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -17.988  -6.608  -1.678   4.753  47.263
##
## Coefficients:
##
Estimate
## (Intercept)
0.1097
## Temp
0.4161
## location1
-1.8046
```

```
## humidity
11.9681
## wind
0.1391
## distance
2.8853
## cab_typeUber
-0.9246
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_0   1.7434
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_1   1.4068
##
Std. Error
## (Intercept)
9.5568
## Temp
0.4256
## location1
0.8214
## humidity
7.3182
## wind
0.2432
## distance
0.5527
## cab_typeUber
0.8436
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_0     3.1061
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_1     2.7055
##
t value
## (Intercept)
0.011
## Temp
0.978
## location1
-2.197
## humidity
1.635
## wind
0.572
## distance
5.221
```

```
## cab_typeUber
-1.096
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_0   0.561
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_1   0.520
##
Pr(>|t|)
## (Intercept)
0.9908
## Temp
0.3288
## location1
0.0286
## humidity
0.1027
## wind
0.5676
## distance
2.77e-07
## cab_typeUber
0.2737
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_0   0.5749
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_1   0.6033
##
## (Intercept)
## Temp
## location1
*
## humidity
## wind
## distance
***
## cab_typeUber
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_0
##
C..Users.nisht.Desktop.MITA.Fall.MVA.Final.Project.Uber.Lyft.price.predict.Mu
ltiple.Regression.Rmd_1
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.556 on 433 degrees of freedom
```

```
## Multiple R-squared:  0.07858,	Adjusted R-squared:  0.06156 
## F-statistic: 4.616 on 8 and 433 DF,  p-value: 2.009e-05
```