FML Assignment 4

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```
library(readr)
Pharmaceuticals_Read <- read.csv("./Pharmaceuticals.csv")
View(Pharmaceuticals_Read)
```

```
library(ggplot2)
library(factoextra)
```

```
## Warning: package 'factoextra' was built under R version 4.3.2
```

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

```
library(flexclust)
```

```
## Warning: package 'flexclust' was built under R version 4.3.2
```

```
## Loading required package: grid
```

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

```
## Loading required package: modeltools
```

```
## Loading required package: stats4
```

```
library(cluster)
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----------------------- tidyverse 2.0.0 --
## v dplyr     1.1.3     v stringr   1.5.0
## v forcats   1.0.0     v tibble    3.2.1
## v lubridate 1.9.2     v tidyr     1.3.0
## v purrr     1.0.2
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
summary(Pharmaceuticals_Read)
```

```
##     Symbol              Name               Market_Cap         Beta
##  Length:21          Length:21          Min.   :  0.41   Min.   :0.1800
##  Class :character   Class :character   1st Qu.:  6.30   1st Qu.:0.3500
##  Mode  :character   Mode  :character   Median : 48.19   Median :0.4600
##                                        Mean   : 57.65   Mean   :0.5257
##                                        3rd Qu.: 73.84   3rd Qu.:0.6500
##                                        Max.   :199.47   Max.   :1.1100
##     PE_Ratio           ROE             ROA         Asset_Turnover    Leverage
##  Min.   : 3.60   Min.   : 3.9   Min.   : 1.40   Min.   :0.3   Min.   :0.0000
##  1st Qu.:18.90   1st Qu.:14.9   1st Qu.: 5.70   1st Qu.:0.6   1st Qu.:0.1600
##  Median :21.50   Median :22.6   Median :11.20   Median :0.6   Median :0.3400
##  Mean   :25.46   Mean   :25.8   Mean   :10.51   Mean   :0.7   Mean   :0.5857
##  3rd Qu.:27.90   3rd Qu.:31.0   3rd Qu.:15.00   3rd Qu.:0.9   3rd Qu.:0.6000
##  Max.   :82.50   Max.   :62.9   Max.   :20.30   Max.   :1.1   Max.   :3.5100
##    Rev_Growth     Net_Profit_Margin Median_Recommendation   Location
##  Min.   :-3.17   Min.   : 2.6       Length:21            Length:21
##  1st Qu.: 6.38   1st Qu.:11.2       Class :character     Class :character
##  Median : 9.37   Median :16.1       Mode  :character     Mode  :character
##  Mean   :13.37   Mean   :15.7
##  3rd Qu.:21.87   3rd Qu.:21.1
##  Max.   :34.21   Max.   :25.5
##    Exchange
##  Length:21
##  Class :character
##  Mode  :character
##
##
##
```

Question 1 : Use only the numerical variables (1 to 9) to cluster the 21 firms. Justify the various choices made in conducting the cluster analysis, such as weights for different variables, the specific clustering algorithm(s) used, the number of clusters formed, and so on.

```
K <- na.omit(Pharmaceuticals_Read)
K
```

```
##    Symbol                            Name Market_Cap Beta PE_Ratio  ROE  ROA
## 1     ABT             Abbott Laboratories      68.44 0.32     24.7 26.4 11.8
## 2     AGN                  Allergan, Inc.       7.58 0.41     82.5 12.9  5.5
## 3     AHM                     Amersham plc       6.30 0.46     20.7 14.9  7.8
## 4     AZN                  AstraZeneca PLC      67.63 0.52     21.5 27.4 15.4
## 5     AVE                         Aventis      47.16 0.32     20.1 21.8  7.5
## 6     BAY                        Bayer AG      16.90 1.11     27.9  3.9  1.4
## 7     BMY    Bristol-Myers Squibb Company      51.33 0.50     13.9 34.8 15.1
```

```
## 8    CHTT                         Chattem, Inc    0.41 0.85    26.0 24.1  4.3
## 9    ELN               Elan Corporation, plc    0.78 1.08     3.6 15.1  5.1
## 10   LLY               Eli Lilly and Company   73.84 0.18    27.9 31.0 13.5
## 11   GSK                 GlaxoSmithKline plc  122.11 0.35    18.0 62.9 20.3
## 12   IVX                    IVAX Corporation    2.60 0.65    19.9 21.4  6.8
## 13   JNJ                 Johnson & Johnson    173.93 0.46    28.4 28.6 16.3
## 14   MRX Medicis Pharmaceutical Corporation    1.20 0.75    28.6 11.2  5.4
## 15   MRK                 Merck & Co., Inc.    132.56 0.46    18.9 40.6 15.0
## 16   NVS                        Novartis AG   96.65 0.19    21.6 17.9 11.2
## 17   PFE                        Pfizer Inc   199.47 0.65    23.6 45.6 19.2
## 18   PHA               Pharmacia Corporation   56.24 0.40    56.5 13.5  5.7
## 19   SGP         Schering-Plough Corporation   34.10 0.51    18.9 22.6 13.3
## 20   WPI       Watson Pharmaceuticals, Inc.    3.26 0.24    18.4 10.2  6.8
## 21   WYE                             Wyeth   48.19 0.63    13.1 54.9 13.4
##      Asset_Turnover Leverage Rev_Growth Net_Profit_Margin Median_Recommendation
## 1               0.7     0.42       7.54              16.1         Moderate Buy
## 2               0.9     0.60       9.16               5.5         Moderate Buy
## 3               0.9     0.27       7.05              11.2           Strong Buy
## 4               0.9     0.00      15.00              18.0        Moderate Sell
## 5               0.6     0.34      26.81              12.9         Moderate Buy
## 6               0.6     0.00      -3.17               2.6                 Hold
## 7               0.9     0.57       2.70              20.6        Moderate Sell
## 8               0.6     3.51       6.38               7.5         Moderate Buy
## 9               0.3     1.07      34.21              13.3        Moderate Sell
## 10              0.6     0.53       6.21              23.4                 Hold
## 11              1.0     0.34      21.87              21.1                 Hold
## 12              0.6     1.45      13.99              11.0                 Hold
## 13              0.9     0.10       9.37              17.9         Moderate Buy
## 14              0.3     0.93      30.37              21.3         Moderate Buy
## 15              1.1     0.28      17.35              14.1                 Hold
## 16              0.5     0.06      -2.69              22.4                 Hold
## 17              0.8     0.16      25.54              25.2         Moderate Buy
## 18              0.6     0.35      15.00               7.3                 Hold
## 19              0.8     0.00       8.56              17.6                 Hold
## 20              0.5     0.20      29.18              15.1        Moderate Sell
## 21              0.6     1.12       0.36              25.5                 Hold
##         Location Exchange
## 1             US     NYSE
## 2         CANADA     NYSE
## 3             UK     NYSE
## 4             UK     NYSE
## 5         FRANCE     NYSE
## 6        GERMANY     NYSE
## 7             US     NYSE
## 8             US   NASDAQ
## 9        IRELAND     NYSE
## 10            US     NYSE
## 11            UK     NYSE
## 12            US     AMEX
## 13            US     NYSE
## 14            US     NYSE
## 15            US     NYSE
## 16   SWITZERLAND     NYSE
## 17            US     NYSE
```

```
## 18            US      NYSE
## 19            US      NYSE
## 20            US      NYSE
## 21            US      NYSE
```

```
row.names <- K[,1]
pharma1 <- K[,3:11]
head(pharma1)
```

```
##    Market_Cap Beta PE_Ratio  ROE  ROA Asset_Turnover Leverage Rev_Growth
## 1       68.44 0.32     24.7 26.4 11.8            0.7     0.42       7.54
## 2        7.58 0.41     82.5 12.9  5.5            0.9     0.60       9.16
## 3        6.30 0.46     20.7 14.9  7.8            0.9     0.27       7.05
## 4       67.63 0.52     21.5 27.4 15.4            0.9     0.00      15.00
## 5       47.16 0.32     20.1 21.8  7.5            0.6     0.34      26.81
## 6       16.90 1.11     27.9  3.9  1.4            0.6     0.00      -3.17
##    Net_Profit_Margin
## 1              16.1
## 2               5.5
## 3              11.2
## 4              18.0
## 5              12.9
## 6               2.6
```

```
pharma2 <- scale(pharma1)
head(pharma2)
```

```
##    Market_Cap        Beta    PE_Ratio         ROE        ROA Asset_Turnover
## 1  0.1840960 -0.80125356 -0.04671323  0.04009035  0.2416121      0.0000000
## 2 -0.8544181 -0.45070513  3.49706911 -0.85483986 -0.9422871      0.9225312
## 3 -0.8762600 -0.25595600 -0.29195768 -0.72225761 -0.5100700      0.9225312
## 4  0.1702742 -0.02225704 -0.24290879  0.10638147  0.9181259      0.9225312
## 5 -0.1790256 -0.80125356 -0.32874435 -0.26484883 -0.5664461     -0.4612656
## 6 -0.6953818  2.27578267  0.14948233 -1.45146000 -1.7127612     -0.4612656
##      Leverage Rev_Growth Net_Profit_Margin
## 1 -0.2120979 -0.5277675        0.06168225
## 2  0.0182843 -0.3811391       -1.55366706
## 3 -0.4040831 -0.5721181       -0.68503583
## 4 -0.7496565  0.1474473        0.35122600
## 5 -0.3144900  1.2163867       -0.42597037
## 6 -0.7496565 -1.4971443       -1.99560225
```

```
fviz_nbclust(pharma2, kmeans, method = "wss") + labs(subtitle = "Elbow Method")
```
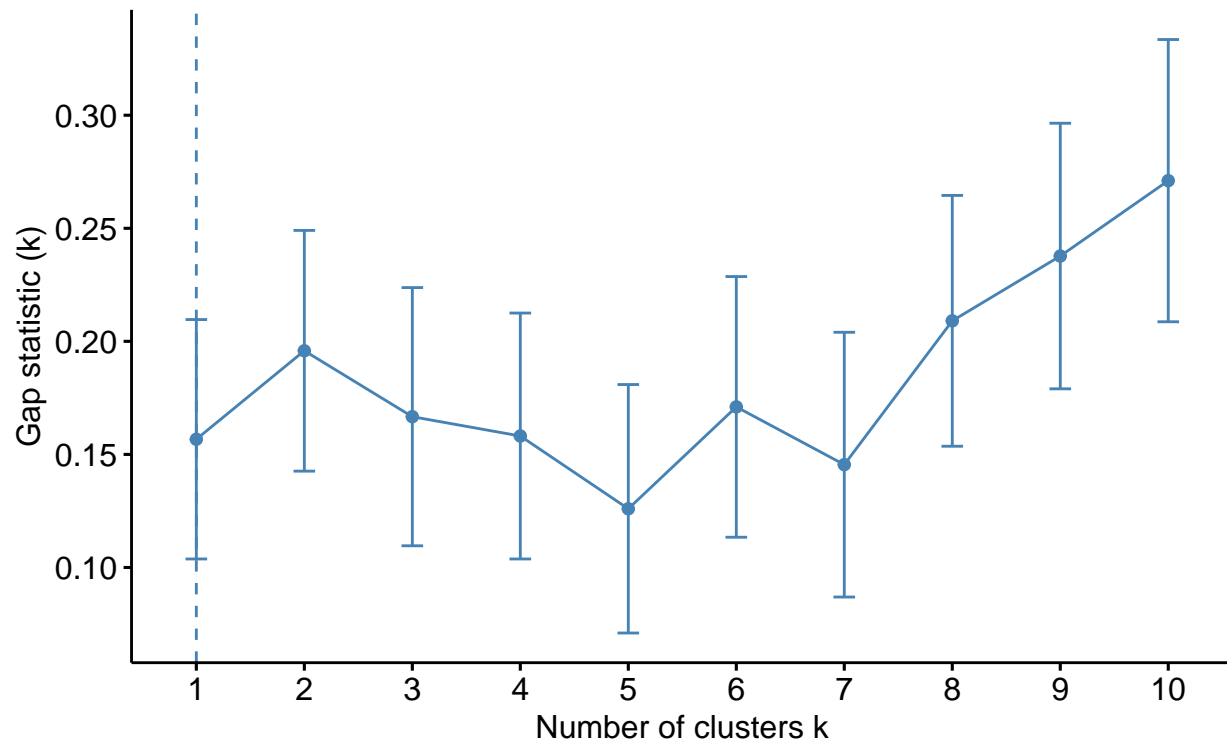
Optimal number of clusters
Elbow Method
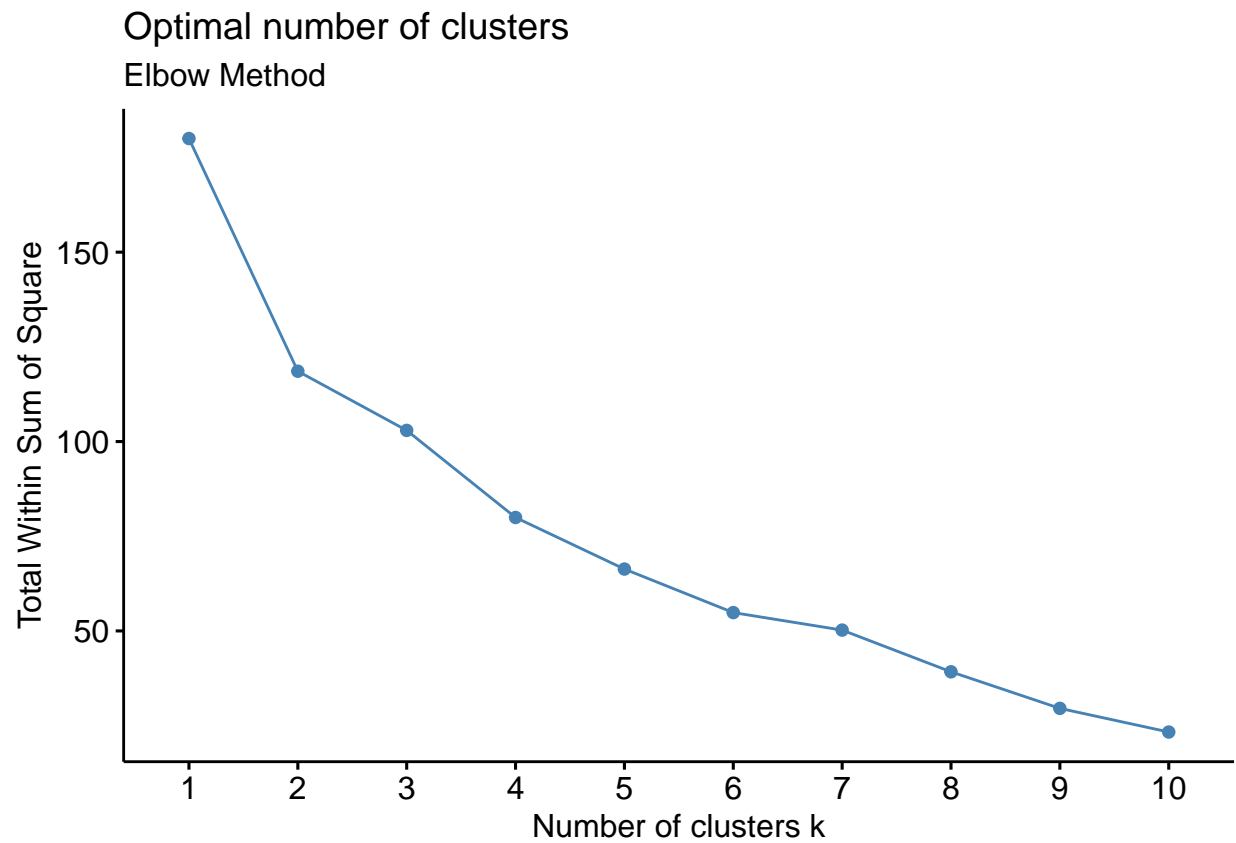

```r
fviz_nbclust(pharma2, kmeans, method = "silhouette") + labs(subtitle = "Silhouette Method")
```

Optimal number of clusters
Silhouette Method
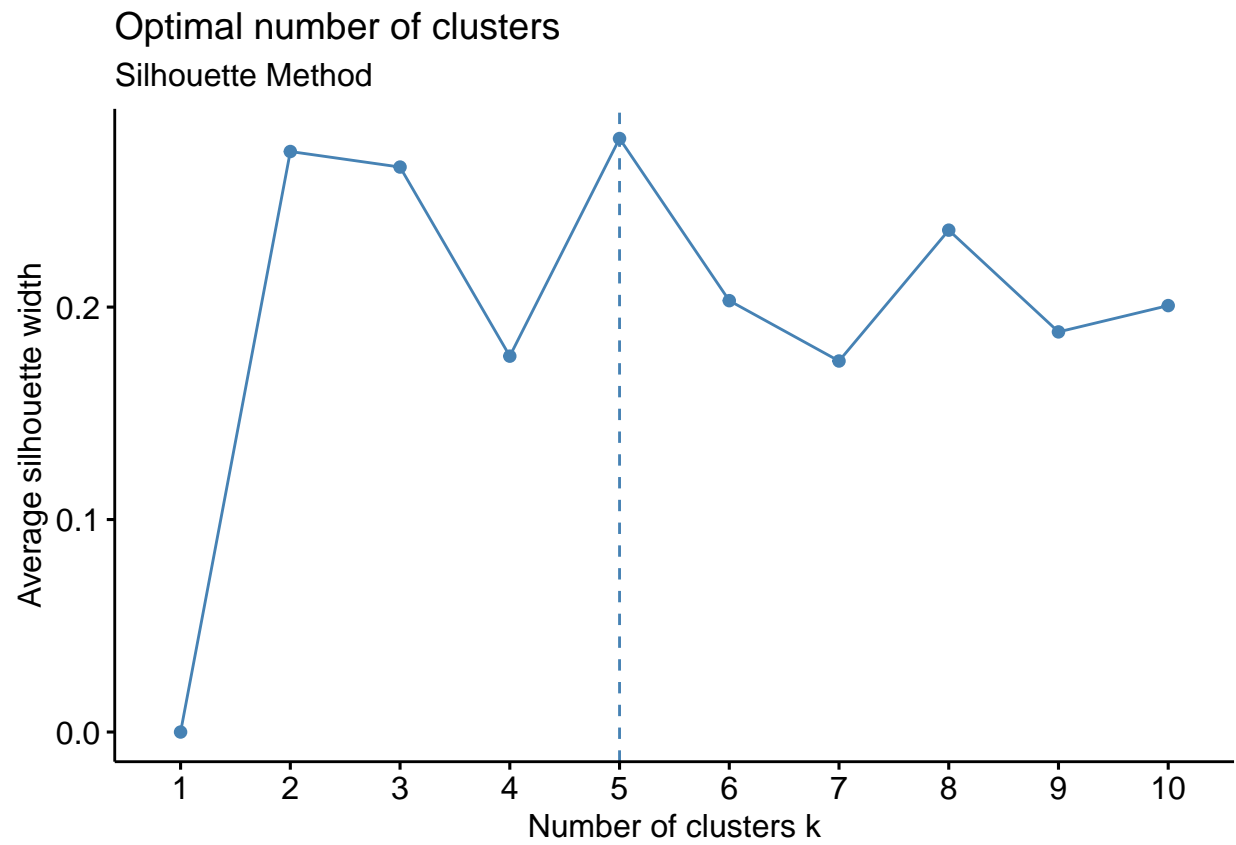

```r
fviz_nbclust(pharma2, kmeans, method = "gap_stat") + labs(subtitle= "Gap Stat Method")
```

Optimal number of clusters
Gap Stat Method


```
set.seed(64060)
k5 <- kmeans (pharma2, centers = 5, nstart =25)
k5 $centers
```

```
##     Market_Cap       Beta    PE_Ratio        ROE        ROA Asset_Turnover
## 1 -0.87051511  1.3409869 -0.05284434 -0.6184015 -1.1928478     -0.4612656
## 2 -0.43925134 -0.4701800  2.70002464 -0.8349525 -0.9234951      0.2306328
## 3 -0.76022489  0.2796041 -0.47742380 -0.7438022 -0.8107428     -1.2684804
## 4 -0.03142211 -0.4360989 -0.31724852  0.1950459  0.4083915      0.1729746
## 5  1.69558112 -0.1780563 -0.19845823  1.2349879  1.3503431      1.1531640
##       Leverage Rev_Growth Net_Profit_Margin
## 1  1.36644699 -0.6912914       -1.320000179
## 2 -0.14170336 -0.1168459       -1.416514761
## 3  0.06308085  1.5180158       -0.006893899
## 4 -0.27449312 -0.7041516        0.556954446
## 5 -0.46807818  0.4671788        0.591242521
```

```
fviz_cluster(k5, data= pharma2)
```

Cluster plot
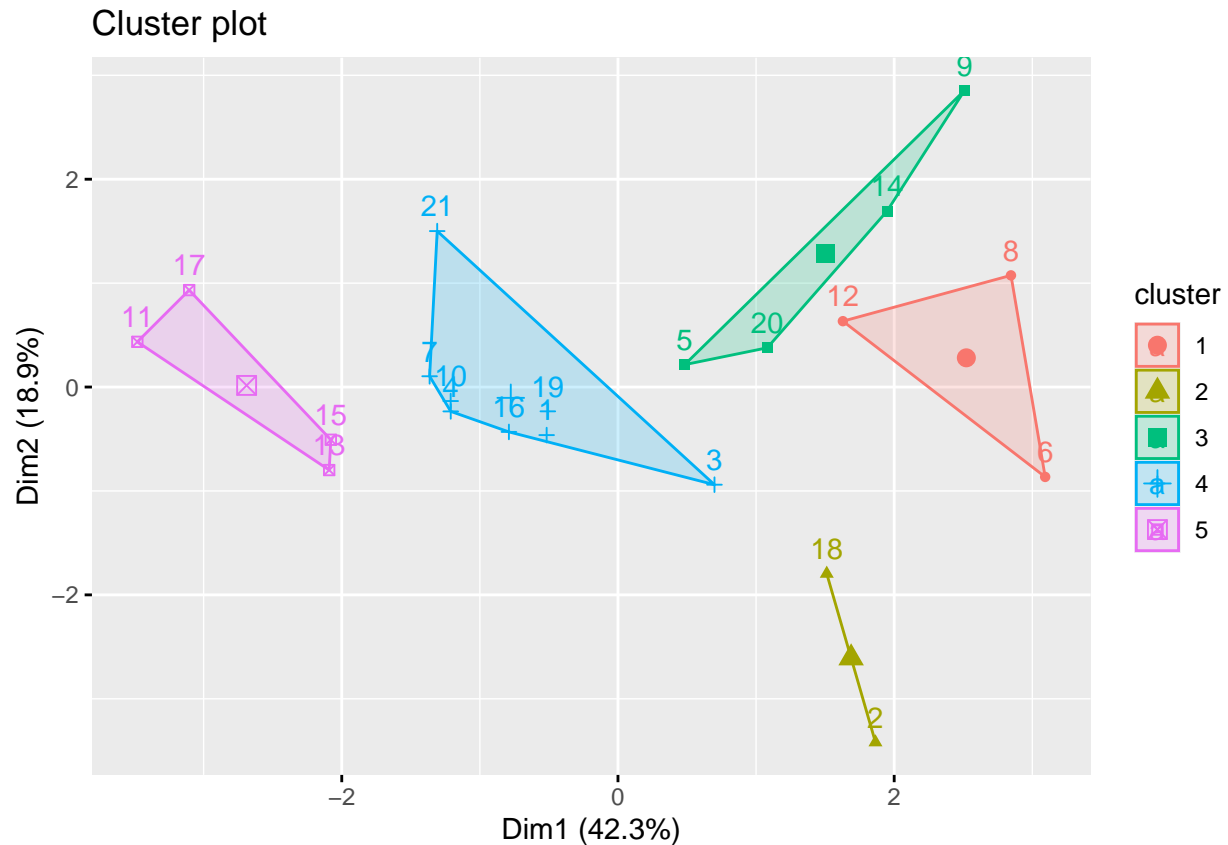

```
k5
```

```
## K-means clustering with 5 clusters of sizes 3, 2, 4, 8, 4
##
## Cluster means:
##     Market_Cap        Beta    PE_Ratio         ROE         ROA Asset_Turnover
## 1 -0.87051511   1.3409869 -0.05284434 -0.6184015 -1.1928478     -0.4612656
## 2 -0.43925134  -0.4701800  2.70002464 -0.8349525 -0.9234951      0.2306328
## 3 -0.76022489   0.2796041 -0.47742380 -0.7438022 -0.8107428     -1.2684804
## 4 -0.03142211  -0.4360989 -0.31724852  0.1950459  0.4083915      0.1729746
## 5  1.69558112  -0.1780563 -0.19845823  1.2349879  1.3503431      1.1531640
##       Leverage Rev_Growth Net_Profit_Margin
## 1   1.36644699 -0.6912914      -1.320000179
## 2  -0.14170336 -0.1168459      -1.416514761
## 3   0.06308085  1.5180158      -0.006893899
## 4  -0.27449312 -0.7041516       0.556954446
## 5  -0.46807818  0.4671788       0.591242521
##
## Clustering vector:
##  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21
##  4  2  4  4  3  1  4  1  3  4  5  1  5  3  5  4  5  2  4  3  4
##
## Within cluster sum of squares by cluster:
## [1] 15.595925  2.803505 12.791257 21.879320  9.284424
##  (between_SS / total_SS =  65.4 %)
##
```

8

```
## Available components:
##
## [1] "cluster"     "centers"     "totss"       "withinss"    "tot.withinss"
## [6] "betweenss"   "size"        "iter"        "ifault"
```

```
Distance <- dist(pharma2,method = "euclidian")
fviz_dist(Distance)
```
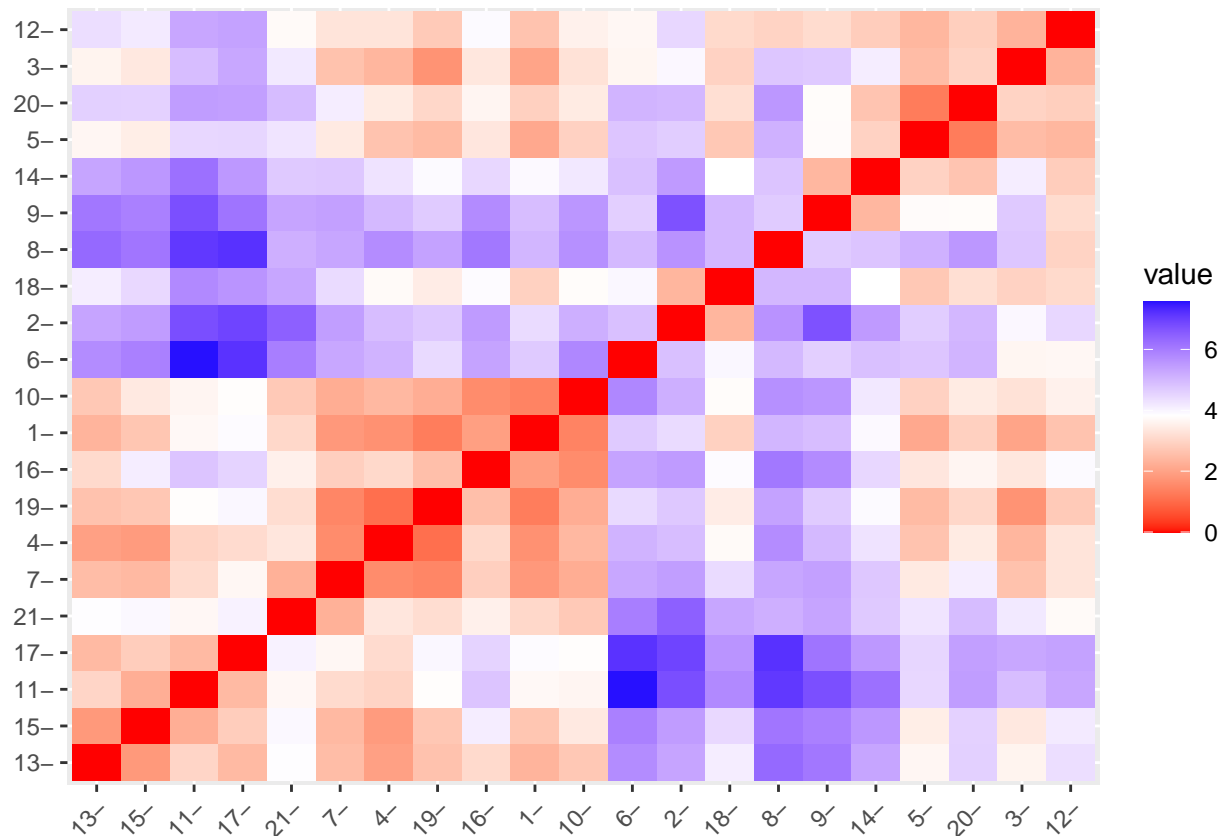


```
Fitting <- kmeans(pharma2,5)
aggregate(pharma2,by = list(Fitting$cluster), FUN = mean)
```

```
##   Group.1  Market_Cap        Beta    PE_Ratio         ROE         ROA
## 1       1  1.69558112 -0.1780563 -0.1984582   1.2349879   1.3503431
## 2       2 -0.66114002 -0.7233539 -0.3512251  -0.6736441  -0.5915022
## 3       3 -0.96247577  1.1949250 -0.3639982  -0.5200697  -0.9610792
## 4       4 -0.52462814  0.4451409  1.8498439  -1.0404550  -1.1865838
## 5       5  0.08926902 -0.4618336 -0.3208615   0.3260892   0.5396003
##   Asset_Turnover    Leverage Rev_Growth Net_Profit_Margin
## 1   1.153164e+00 -0.4680782  0.4671788         0.5912425
## 2  -1.537552e-01 -0.4040831  0.6917224        -0.4005718
## 3  -1.153164e+00  1.4773718  0.7120120        -0.3688236
## 4   1.480297e-16 -0.3443544 -0.5769454        -1.6095439
## 5   6.589509e-02 -0.2559803 -0.7230135         0.7343816
```

```r
pharma3 <- data.frame(pharma2,Fitting$cluster)
pharma3
```

```
##      Market_Cap        Beta    PE_Ratio         ROE         ROA Asset_Turnover
## 1    0.1840960 -0.80125356 -0.04671323  0.04009035  0.2416121      0.0000000
## 2   -0.8544181 -0.45070513  3.49706911 -0.85483986 -0.9422871      0.9225312
## 3   -0.8762600 -0.25595600 -0.29195768 -0.72225761 -0.5100700      0.9225312
## 4    0.1702742 -0.02225704 -0.24290879  0.10638147  0.9181259      0.9225312
## 5   -0.1790256 -0.80125356 -0.32874435 -0.26484883 -0.5664461     -0.4612656
## 6   -0.6953818  2.27578267  0.14948233 -1.45146000 -1.7127612     -0.4612656
## 7   -0.1078688 -0.10015669 -0.70887325  0.59693581  0.8617498      0.9225312
## 8   -0.9767669  1.26308721  0.03299122 -0.11237924 -1.1677918     -0.4612656
## 9   -0.9704532  2.15893320 -1.34037772 -0.70899938 -1.0174553     -1.8450624
## 10   0.2762415 -1.34655112  0.14948233  0.34502953  0.5610770     -0.4612656
## 11   1.0999201 -0.68440408 -0.45749769  2.45971647  1.8389364      1.3837968
## 12  -0.9393967  0.48409069 -0.34100657 -0.29136529 -0.6979905     -0.4612656
## 13   1.9841758 -0.25595600  0.18013789  0.18593083  1.0872544      0.9225312
## 14  -0.9632863  0.87358895  0.19240011 -0.96753478 -0.9610792     -1.8450624
## 15   1.2782387 -0.25595600 -0.40231769  0.98142435  0.8429577      1.8450624
## 16   0.6654710 -1.30760129 -0.23677768 -0.52338423  0.1288598     -0.9225312
## 17   2.4199899  0.48409069 -0.11415545  1.31287998  1.6322239      0.4612656
## 18  -0.0240846 -0.48965495  1.90298017 -0.81506519 -0.9047030     -0.4612656
## 19  -0.4018812 -0.06120687 -0.40231769 -0.21181593  0.5234929      0.4612656
## 20  -0.9281345 -1.11285216 -0.43297324 -1.03382590 -0.6979905     -0.9225312
## 21  -0.1614497  0.40619104 -0.75792214  1.92938746  0.5422849     -0.4612656
##        Leverage  Rev_Growth Net_Profit_Margin Fitting.cluster
## 1   -0.21209793 -0.52776752        0.06168225               5
## 2    0.01828430 -0.38113909       -1.55366706               4
## 3   -0.40408312 -0.57211809       -0.68503583               2
## 4   -0.74965647  0.14744734        0.35122600               5
## 5   -0.31449003  1.21638667       -0.42597037               2
## 6   -0.74965647 -1.49714434       -1.99560225               4
## 7   -0.02011273 -0.96584257        0.74744375               5
## 8    3.74279705 -0.63276071       -1.24888417               3
## 9    0.61983791  1.88617085       -0.36501379               3
## 10  -0.07130879 -0.64814764        1.17413980               5
## 11  -0.31449003  0.76926048        0.82363947               1
## 12   1.10620040  0.05603085       -0.71551412               3
## 13  -0.62166634 -0.36213170        0.33598685               1
## 14   0.44065173  1.53860717        0.85411776               3
## 15  -0.39128411  0.36014907       -0.24310064               1
## 16  -0.67286239 -1.45369888        1.02174835               5
## 17  -0.54487226  1.10143723        1.44844440               1
## 18  -0.30169102  0.14744734       -1.27936246               4
## 19  -0.74965647 -0.43544591        0.29026942               5
## 20  -0.49367621  1.43089863       -0.09070919               2
## 21   0.68383297 -1.17763919        1.49416183               5
```

```r
library(cluster)
clusplot(pharma2,Fitting$cluster,color=TRUE, shade = TRUE, labels = 2, lines=0)
```

CLUSPLOT(pharma2)
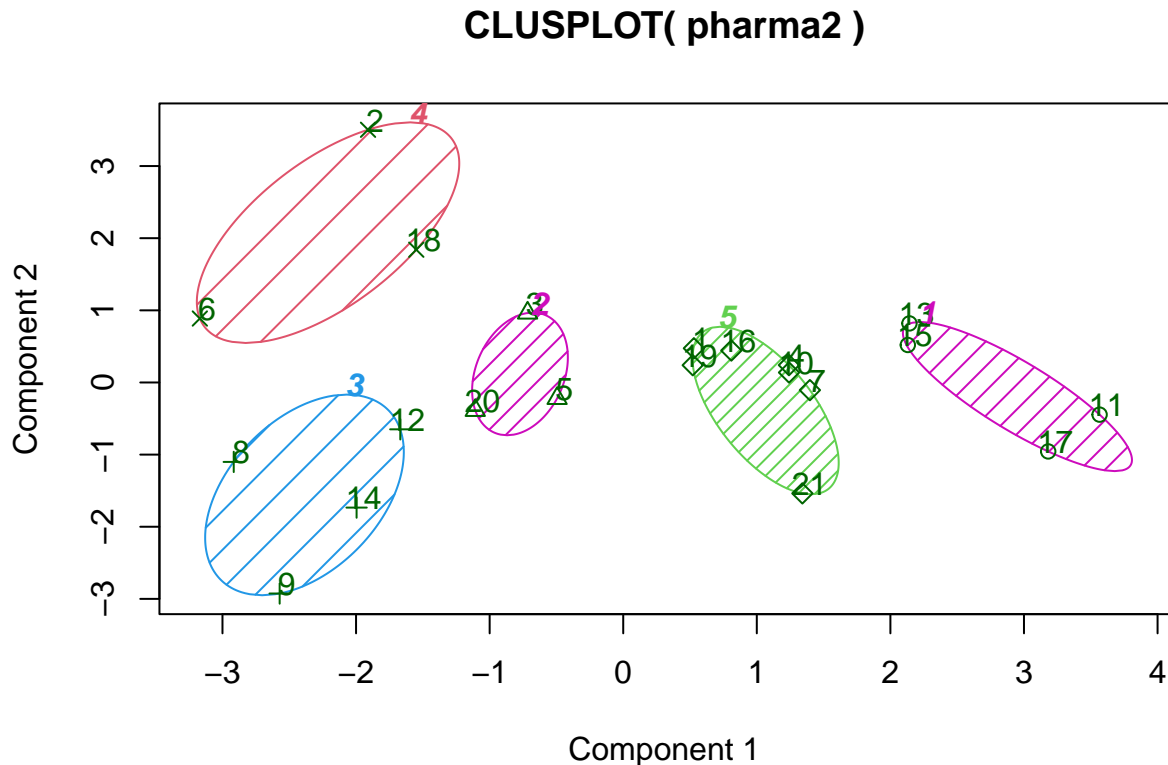
These two components explain 61.23 % of the point variability.

Question 2: Interpret the clusters with respect to the numerical variables used in forming the clusters. Is there a pattern in the clusters with respect to the numerical variables (10 to 12)? (those not used in forming the clusters)

```r
aggregate(pharma2, by=list(Fitting$cluster), FUN= mean)
```

```
##   Group.1  Market_Cap        Beta   PE_Ratio         ROE        ROA
## 1       1  1.69558112 -0.1780563 -0.1984582  1.2349879  1.3503431
## 2       2 -0.66114002 -0.7233539 -0.3512251 -0.6736441 -0.5915022
## 3       3 -0.96247577  1.1949250 -0.3639982 -0.5200697 -0.9610792
## 4       4 -0.52462814  0.4451409  1.8498439 -1.0404550 -1.1865838
## 5       5  0.08926902 -0.4618336 -0.3208615  0.3260892  0.5396003
##   Asset_Turnover   Leverage Rev_Growth Net_Profit_Margin
## 1   1.153164e+00 -0.4680782  0.4671788         0.5912425
## 2  -1.537552e-01 -0.4040831  0.6917224        -0.4005718
## 3  -1.153164e+00  1.4773718  0.7120120        -0.3688236
## 4   1.480297e-16 -0.3443544 -0.5769454        -1.6095439
## 5   6.589509e-02 -0.2559803 -0.7230135         0.7343816
```

```r
pharmacy <- data.frame(pharma2,k5$cluster)
pharmacy
```

```
##      Market_Cap        Beta    PE_Ratio         ROE        ROA Asset_Turnover
## 1    0.1840960 -0.80125356 -0.04671323  0.04009035  0.2416121      0.0000000
## 2   -0.8544181 -0.45070513  3.49706911 -0.85483986 -0.9422871      0.9225312
## 3   -0.8762600 -0.25595600 -0.29195768 -0.72225761 -0.5100700      0.9225312
## 4    0.1702742 -0.02225704 -0.24290879  0.10638147  0.9181259      0.9225312
## 5   -0.1790256 -0.80125356 -0.32874435 -0.26484883 -0.5664461     -0.4612656
## 6   -0.6953818  2.27578267  0.14948233 -1.45146000 -1.7127612     -0.4612656
## 7   -0.1078688 -0.10015669 -0.70887325  0.59693581  0.8617498      0.9225312
## 8   -0.9767669  1.26308721  0.03299122 -0.11237924 -1.1677918     -0.4612656
## 9   -0.9704532  2.15893320 -1.34037772 -0.70899938 -1.0174553     -1.8450624
## 10   0.2762415 -1.34655112  0.14948233  0.34502953  0.5610770     -0.4612656
## 11   1.0999201 -0.68440408 -0.45749769  2.45971647  1.8389364      1.3837968
## 12  -0.9393967  0.48409069 -0.34100657 -0.29136529 -0.6979905     -0.4612656
## 13   1.9841758 -0.25595600  0.18013789  0.18593083  1.0872544      0.9225312
## 14  -0.9632863  0.87358895  0.19240011 -0.96753478 -0.9610792     -1.8450624
## 15   1.2782387 -0.25595600 -0.40231769  0.98142435  0.8429577      1.8450624
## 16   0.6654710 -1.30760129 -0.23677768 -0.52338423  0.1288598     -0.9225312
## 17   2.4199899  0.48409069 -0.11415545  1.31287998  1.6322239      0.4612656
## 18  -0.0240846 -0.48965495  1.90298017 -0.81506519 -0.9047030     -0.4612656
## 19  -0.4018812 -0.06120687 -0.40231769 -0.21181593  0.5234929      0.4612656
## 20  -0.9281345 -1.11285216 -0.43297324 -1.03382590 -0.6979905     -0.9225312
## 21  -0.1614497  0.40619104 -0.75792214  1.92938746  0.5422849     -0.4612656
##        Leverage  Rev_Growth Net_Profit_Margin k5.cluster
## 1  -0.21209793 -0.52776752        0.06168225          4
## 2   0.01828430 -0.38113909       -1.55366706          2
## 3  -0.40408312 -0.57211809       -0.68503583          4
## 4  -0.74965647  0.14744734        0.35122600          4
## 5  -0.31449003  1.21638667       -0.42597037          3
## 6  -0.74965647 -1.49714434       -1.99560225          1
## 7  -0.02011273 -0.96584257        0.74744375          4
## 8   3.74279705 -0.63276071       -1.24888417          1
## 9   0.61983791  1.88617085       -0.36501379          3
## 10 -0.07130879 -0.64814764        1.17413980          4
## 11 -0.31449003  0.76926048        0.82363947          5
## 12  1.10620040  0.05603085       -0.71551412          1
## 13 -0.62166634 -0.36213170        0.33598685          5
## 14  0.44065173  1.53860717        0.85411776          3
## 15 -0.39128411  0.36014907       -0.24310064          5
## 16 -0.67286239 -1.45369888        1.02174835          4
## 17 -0.54487226  1.10143723        1.44844440          5
## 18 -0.30169102  0.14744734       -1.27936246          2
## 19 -0.74965647 -0.43544591        0.29026942          4
## 20 -0.49367621  1.43089863       -0.09070919          3
## 21  0.68383297 -1.17763919        1.49416183          4
```

#CLuster 1:- JNJ, MRK, GSK, PFE #Highest Market_Cap and lowest Beta/PE Ratio #Cluster 2:- AHM, WPI, AVE #Highest Revenue Growth and lowest PE/Asset Turnover Ratio #Cluster 3:- CHTT, IVX, MRX, ELN #Highest Beta/leverage/Asset Turnover Ratio and lowest Net_Profit_Margin, PE ratio and Market #Cluster 4:- AGN,BAY, PHA #Highest PE ratio and lowest Leverage/Asset_Turnover #Cluster 5:- ABT, WYE, AZN, SGP, BMY, NVS, LLY #Highest Net_Proft_Margin and lowest Leverage

```
Read <- Pharmaceuticals_Read[12:14] %>% mutate(Clusters=k5$cluster)
ggplot(Read,mapping= aes(factor(Clusters),
                         fill = Median_Recommendation))+
  geom_bar(position ='dodge')+labs(x= 'Clusters')
```
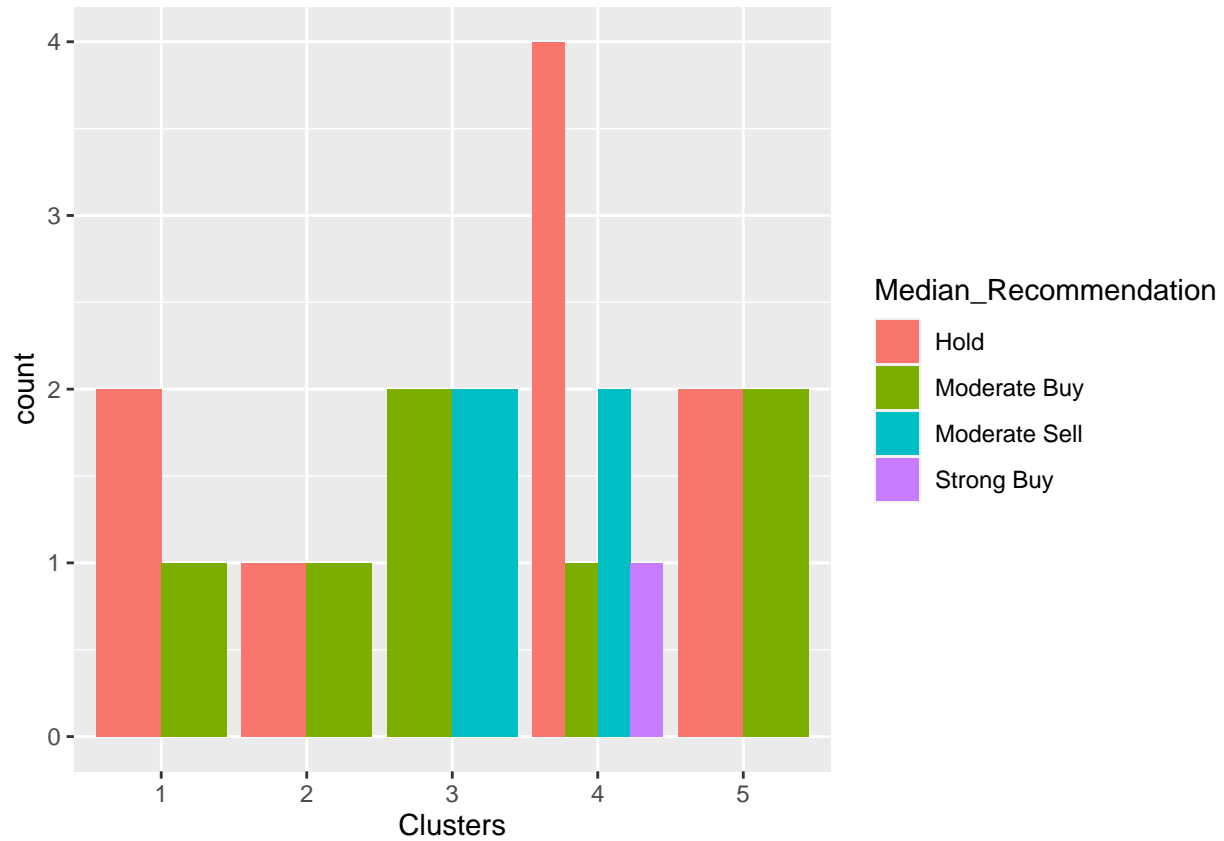


```
ggplot(Read,mapping= aes(factor(Clusters),
                         fill = Location))+
  geom_bar(position ='dodge')+labs(x= 'Clusters')
```
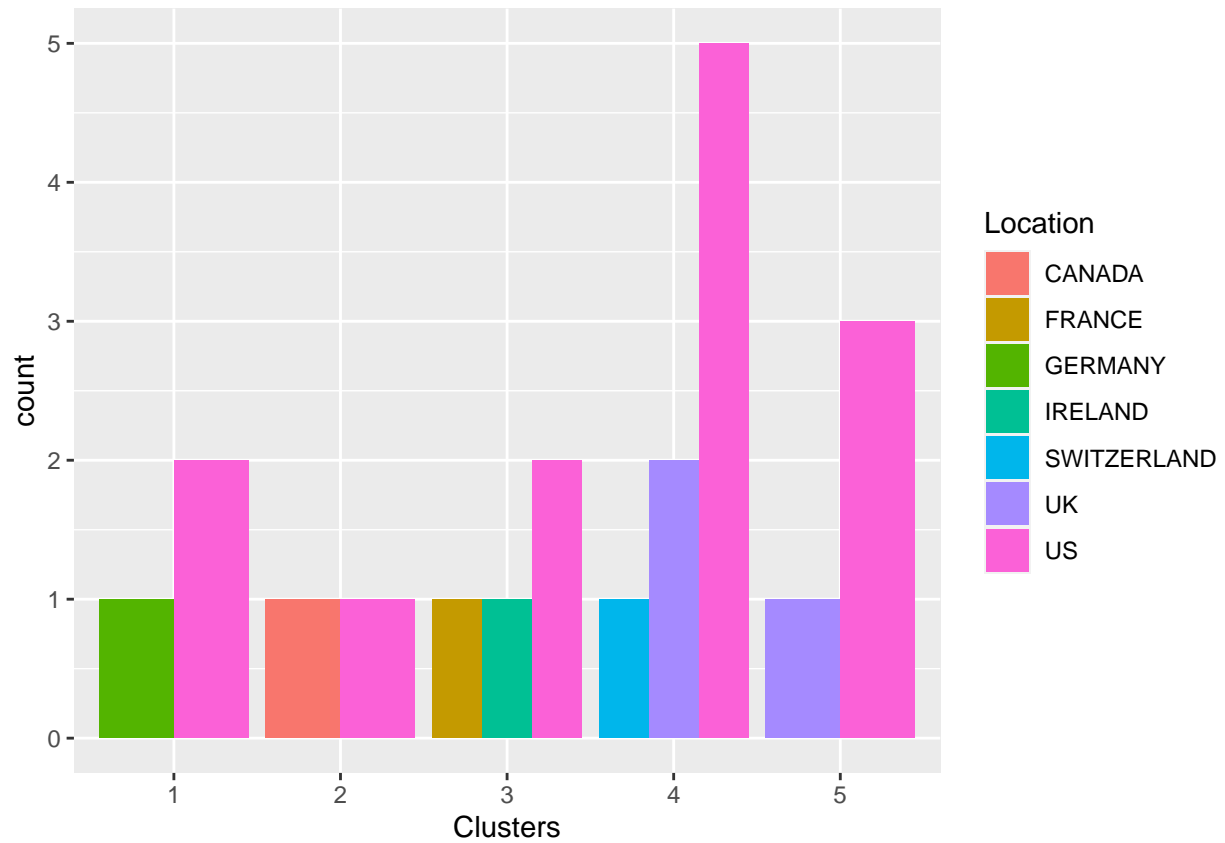
```
ggplot(Read,mapping= aes(factor(Clusters),
                         fill = Exchange))+
  geom_bar(position ='dodge')+labs(x= 'Clusters')
```

14
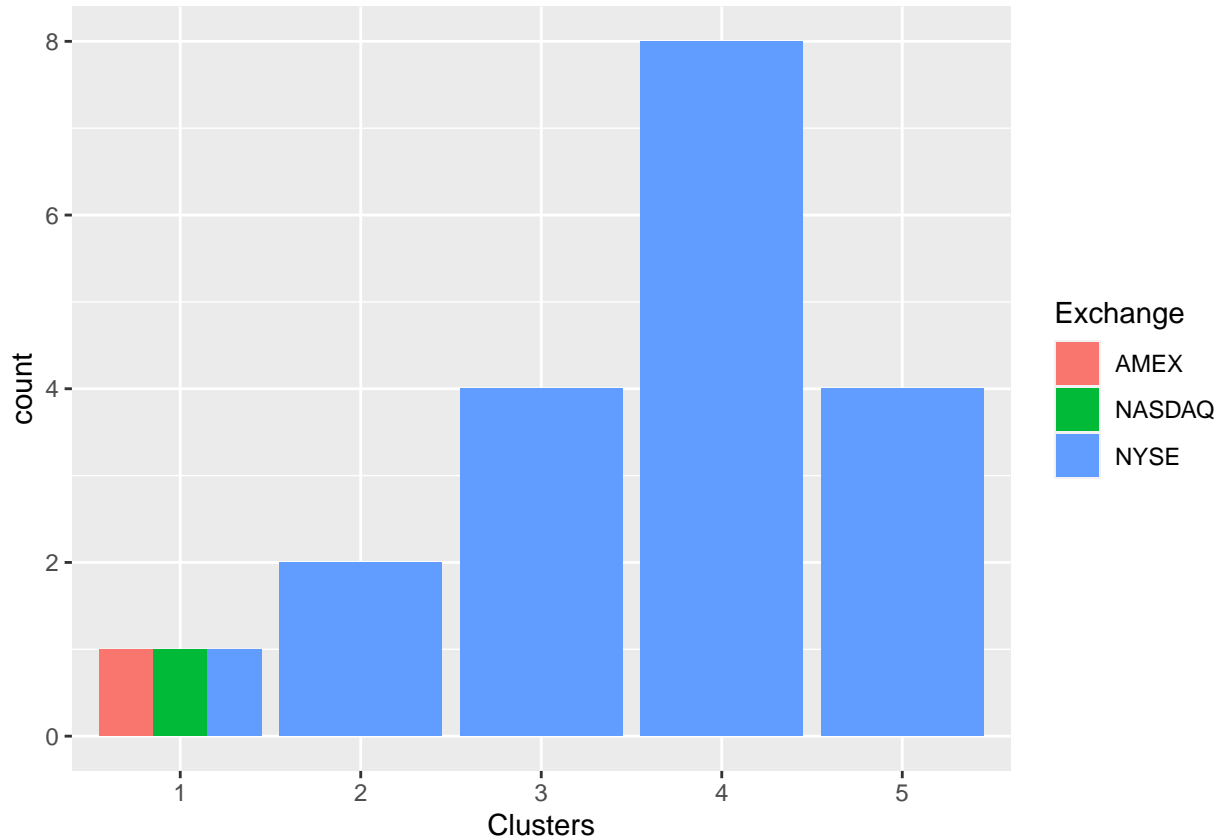
#The above graphs indicate that there is a slim pattern in the clusters.

#The firms are evenly distributed throughout AMEX, NASDAQ, and NYSE, despite the fact that cluster 1 has a different Hold and Moderate Buy median, a different count from the US and Germany, and a distinct nation count.

#The cluster 2 is equally distributed throughout the US and Canada, has equal Hold and Moderate Buy medians, and is completely listed on the NYSE.

#The Cluster 3 is listed on the NYSE and has equal Moderate Buy and Sell medians and also a separate count from France, Ireland, and the US.

#In Cluster 4, the Hold median is the highest, followed by the medians for Moderate Buy, Strong Buy, and Hold. They are listed on the NYSE and originate from the US, the UK, and Switzerland.

#The Cluster 5 has the same hold and moderate buy medians, is listed on the NYSE, and distributes throughout the US and the UK.

Question 3: Provide an appropriate name for each cluster using any or all of the variables in the dataset.

#Cluster1 :- Buy Cluster #Cluster2 :- Sceptical Cluster #Cluster3 :- Moderate Buy Cluster #Cluster4 :- Hold Cluster #Cluster5 :- High Hold Cluster