

MATH 570 Project

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2022-05-14

R Markdown

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We looked at the entire S&P500 data at first from April 2018 to April 2022, but this was an extremely large data frame, so we decided to narrow down which stocks we would look at. In order to do so we selected four different sectors from the S&P500, specifically we are choosing to work with Technology, Financial, Consumer Discretionary, and Health Care. We then selected five different stocks within each of these sectors that are all on the NYSE (not NASDAQ). After doing so we were able to come up with a data frame that was 20,140 observations. Then, we were able to partition this data into the four different sectors we are choosing to examine closer to create four different data frames each with 5,035 observations (1,007 per stock). We chose to look at the years 2018 to 2022 to get a wider range of how the stock prices have been changing over the last four years, and how COVID-19 could have affected these prices. For the remainder of the questions we are choosing to respond to we plan to use a smaller time frame and more current dates, most likely data from 2021-2022 to be able to have the most up to date information.

Introduction: The New York Stock Exchange (NYSE) is the oldest American exchange and largest equities-based exchange in the world based on the total market capitalization of its listed securities, and the Nasdaq is a global electronic market for buying and selling trading securities. The NYSE is an auction market uses designated market makers (DMMs) to regulate the stock market, whereas, the Nasdaq is a dealer market with many market makers in competition with one another. Market makers at the Nasdaq use their own accounts in transactions with individual customers and other dealers using maintained inventories of stock to buy and sell. Market makers at the Nasdaq will state the bid and ask price for a security that they are making a market in, and over 260 market-making firms provide liquidity for Nasdaq-listed stocks. DMMs on the NYSE are what gives the NYSE a more personal touch, they are real people that sit on the trading floor and are the point of contact for the listed company on the floor. DMMs provide stability by taking the other side of the trade when imbalances occur, buying when investors are selling, and vice versa. They run the opening and closing auctions, using human input and algorithms to help promote price discovery when the volume is typically at its highest. We chose to work with S&P500 stocks exclusively on the NYSE. Stocks are split into sectors based on the characteristics of the company and what type of service or good they supply. We decided to work with four sectors more closely; Technology, Health, Financials, and Consumer Discretionary. Within each sector we selected five stocks. We decided to do so to be able to narrow down the sample size and try to present more coherent data that could then be replicated for other stocks, sectors, and those also on the Nasdaq. The questions we intend to answer are:

1. Did the average stock return of big companies in multiple sectors (Technology, Financial, Consumer Discretionary, Health Care) change during the years 2018 through 2021? Could this be a result of some of the patterns we saw due to the COVID-19 pandemic? (Hypothesis Test)
2. Can the price of a stock in a specific sector on the NYSE predict the price of a stock in that same sector on the NASDAQ? (Regression)

3. Do stocks in different sectors of the NYSE share similar hidden factors? (Factor Analysis)

4. Are there clear clusters of stocks in our subset of the S&P500? Do we find that different stocks of different sectors cluster together, or are clearly distinguished? (Cluster Analysis)
5. What are some independent factors that drive price or return of a group of stocks? (Independent component analysis)
6. How to embed/visualize stocks in a 2-dimensional or 3-dimensional map so that similar stocks, however it is defined, are close in the map. (PCA, Factor analysis, multidimensional scaling.).

```
####NEW DATA FOR RETURN#####
```

```
library(tidyr)
```

```
library(tidyverse)
```

```
## -- Attaching packages ----- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.6      v dplyr   1.0.9
```

```
## v tibble  3.1.7      v stringr 1.4.0
```

```
## v readr   2.1.2      v forcats 0.5.1
```

```
## v purrr   0.3.4
```

```
## -- Conflicts ----- tidyverse_conflicts() --
```

```
## x dplyr::filter() masks stats::filter()
```

```
## x dplyr::lag()     masks stats::lag()
```

```
library(dplyr)
```

```
library(tidyquant)
```

```
## Loading required package: lubridate
```

```
##
```

```
## Attaching package: 'lubridate'
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
##     date, intersect, setdiff, union
```

```
## Loading required package: PerformanceAnalytics
```

```
## Loading required package: xts
```

```
## Loading required package: zoo
```

```
##
```

```
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
##     as.Date, as.Date.numeric
```

```
##
```

```
## Attaching package: 'xts'
```

```
## The following objects are masked from 'package:dplyr':
```

```
##
```

```
##     first, last
```

```
##
```

```
## Attaching package: 'PerformanceAnalytics'
```

```
## The following object is masked from 'package:graphics':
```

```
##
```

```

##      legend
## Loading required package: quantmod
## Loading required package: TTR
## Registered S3 method overwritten by 'quantmod':
##      method      from
##      as.zoo.data.frame zoo

## == Need to Learn tidyquant? =====
## Business Science offers a 1-hour course - Learning Lab #9: Performance Analysis & Portfolio Optimization
## </> Learn more at: https://university.business-science.io/p/learning-labs-pro </>

library(timetk)
TWTR = tq_get("TWTR", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
TWTRreturn = TWTR %>% tq_transmute(select = adjusted,
                                   mutate_fun = periodReturn,
                                   period = "daily",
                                   col_rename = "Twitter") %>% dplyr::select(-date)

HPQ = tq_get("HPQ", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
HPQreturn = HPQ %>% tq_transmute(select = adjusted,
                                   mutate_fun = periodReturn,
                                   period = "daily",
                                   col_rename = "HP Inc") %>% dplyr::select(-date)

TEL = tq_get("TEL", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
TELreturn = TEL %>% tq_transmute(select = adjusted,
                                   mutate_fun = periodReturn,
                                   period = "daily",
                                   col_rename = "Te Connectivity") %>% dplyr::select(-date)

NOW = tq_get("NOW", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
NOWreturn = NOW %>% tq_transmute(select = adjusted,
                                   mutate_fun = periodReturn,
                                   period = "daily",
                                   col_rename = "Service Now") %>% dplyr::select(-date)

ORCL = tq_get("ORCL", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
ORCLreturn = ORCL %>% tq_transmute(select = adjusted,
                                   mutate_fun = periodReturn,
                                   period = "daily",
                                   col_rename = "Oracle Corporation") %>% dplyr::select(-date)
Technology = cbind(TWTRreturn, HPQreturn, TELreturn, NOWreturn, ORCLreturn)

NKE = tq_get("NKE", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
NKEreturn = NKE %>% tq_transmute(select = adjusted,
                                   mutate_fun = periodReturn,
                                   period = "daily",
                                   col_rename = "Nike") %>% dplyr::select(-date)

MCD = tq_get("MCD", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")

```

```

MCDreturn = MCD %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "McDonalds") %>% dplyr::select(-date)

CMG = tq_get("CMG", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
CMGreturn = CMG %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Chipotle") %>% dplyr::select(-date)

AAP = tq_get("AAP", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
AAPreturn = AAP %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Advanced Auto Parts") %>% dplyr::select(-date)

CCL = tq_get("CCL", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
CCLreturn = CCL %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Carnival Corporation") %>% dplyr::select(-date)

ConsumerDiscretionary = cbind(NKEreturn, MCDreturn, CMGreturn, AAPreturn, CCLreturn)

MA = tq_get("MA", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
MAreturn = MA %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Mastercard") %>% dplyr::select(-date)

WFC = tq_get("WFC", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
WFCreturn = WFC %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Wells Fargo") %>% dplyr::select(-date)

MS = tq_get("MS", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
MSreturn = MS %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Morgan Stanley") %>% dplyr::select(-date)

BRO = tq_get("BRO", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
BROreturn = BRO %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Brown and Brown") %>% dplyr::select(-date)

CB = tq_get("CB", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
CBreturn = CB %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,

```

```

        period = "daily",
        col_rename = "Chubb Limited") %>% dplyr::select(-date)

Finance = cbind(MAreturn, WFCreturn, MSreturn, BROreturn, CBreturn)

UNH = tq_get("UNH", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
UNHreturn = UNH %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "United Healthcare") %>% dplyr::select(-date)

LLY = tq_get("LLY", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
LLYreturn = LLY %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Eli Lilly and Co") %>% dplyr::select(-date)

PEN = tq_get("PEN", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
PENreturn = PEN %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "Penumbra") %>% dplyr::select(-date)

DVA = tq_get("DVA", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
DVAreturn = DVA %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "DaVita") %>% dplyr::select(-date)

CVS = tq_get("CVS", from = "2021-01-01", to = "2021-12-31", get = "stock.prices")
CVSreturn = CVS %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "CVS_returns") %>% dplyr::select(-date)
Health = cbind(UNHreturn, LLYreturn, PENreturn, DVAreturn, CVSreturn)
data1 = cbind(Technology, Finance, Health, ConsumerDiscretionary) %>% as.matrix

```

Do stocks in different sectors of the NYSE share similar hidden factors? (Factor Analysis) To begin we first collected all the data for each of the stocks we selected to use, and found the return for each stock to then compile them all into a matrix. For the factor analysis we chose to just look at the data from the year 2021. This matrix ends up being a 251x20 matrix with each stock being a column (20) and each day of trade being a row (251). Next, we scaled the data to account for the normality assumption that we need for the MLE estimation method. Then we looked at the scree plot and Kaiser's rule of thumb, which suggest using 5 factors to complete the rest of the factor analysis. The MLE method of estimation leads us to choose $m=5$ factors. With five factors it is more clear to see which factor certain stocks load more heavily on versus the other factors which is more ideal when trying to figure out if there are common underlying factors that stocks in different sectors hold. We want to be able to see that stocks load heavily on one factor over the others rather than being directly in the middle of multiple factors in order to come to this conclusion and $m=5$ factors allows us to do this. When viewing the MLE analysis for five factors each row of the matrix is one stock, which makes it easy to see which stocks load more heavily on the factors. For example, the first stock loads most heavily on factor three and stock 10 loads most heavily on both factors one and two. We plotted all the different combinations of factors against one another to analyze. Looking at factors one and two we can see WFC, MS, CCL, LLY, and CVS load more heavily on factor two, whereas, MCD, BRO, CMG, NOW, PEN, TWTR, MA, and ORCL all load more heavily on factor one. TEL, AAP, HPQ, UNH, NKE, DVA, and

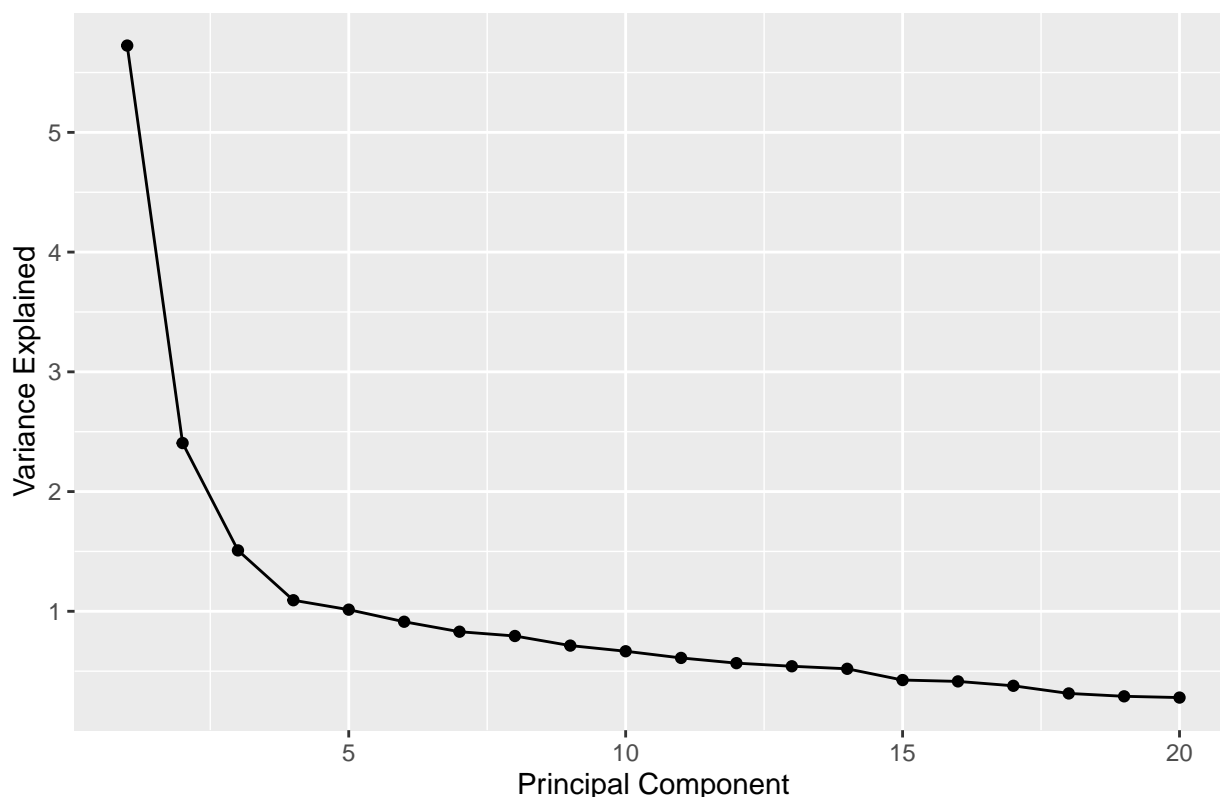
CB all seem to load just about equally on both factors one and two. Based on this plot, it would be safe to say that stocks within different sectors do have common underlying factors, for example the stocks TEL and NKE are in different sectors, yet both load heavily on factor two. Looking at factors one and three we can see NOW, CMG, TWTR, and PEN load more heavily on factor three. MCD, BRO, CB, AAP, HPQ, UNH, ORCL, WFC, DVA, and CVS all load more heavily on factor one and load negatively on factor three. MS and MA load more heavily on factor one. LLY does not seem to load very heavily on either factor. Lastly, CCL, NKE, and TEL load pretty equally on both factors one and three. Based on this plot, it would be safe to say that stocks within different sectors do have common underlying factors, for example the stocks TWTR and PEN are in different sectors, yet both load heavily on factor three. Looking at factors one and four MCD, BRO, TEL, MA, and AAP load most heavily on factor one. CCL, MS, WFC, PEN, HPQ, and CB load more heavily on factor one and load negatively on factor four. UNH, CVS, and LLY load heavily on factor four. And DVA, ORCL, NOW, NKE, TWTR, and CMG load pretty equally on both factors one and four. Based on this plot, it would be safe to say that stocks within different sectors do have common underlying factors, for example the stocks MCD and TEL are in different sectors, yet both load heavily on factor one. Looking at factors one and five BRO loads heavily on both factors one and five. MCD loads heavily on factor one and negatively on factor five. All the other stock seem to load more heavily on factor one. This is interesting as obviously not all our stocks are in the same sector and load more heavily on factor one, which confirms that stocks within different sectors do have common underlying factors. Looking at factors two and three NOW, CMG, TWTR, PEN, NKE, and MA load more heavily on factor three. MS, TEL, CCL, and HPQ load more heavily on factor two. WFC, CVS, CB, AAP, UNH, DVA, and ORCL load more heavily on factor two and load negatively on factor three. MCD and BRO don't seem to load on either factor two nor three. LLY loads heavily on both factors two and three. Based on this plot, it would be safe to say that stocks within different sectors do have common underlying factors, for example the stocks MA and PEN are in different sectors, yet both load heavily on factor three. Looking at factors two and four UNH loads heavily on factor four, and NOW and CMG load heavily on factor four and negatively on factor two. MCD, BRO, PEN, and TWTR don't seem to load on either factor. ORCL, MA, CVS, LLY, and DVA seem to load pretty equally on both factors two and four. NKE, TEL, AAP, HPQ, and CB load more heavily on factor two. Lastly, CCL, MS, and WFC load more heavily on factor two and load negatively on factor four. Based on this plot, it would be safe to say that stocks within different sectors do have common underlying factors, for example the stocks UNH and CMG are in different sectors, yet both load heavily on factor four. Looking at factors two and five we can see that BRO loads heavily on factor five, and MCD loads negatively on both factors two and five. NOW loads more heavily on factor five and loads negatively on factor two. PEN and CMG don't really load heavily on either factor. The rest of the stocks seem to load more heavily on factor two. Based on this plot, it would be safe to say that stocks within different sectors do have common underlying factors, for example the stocks BRO and NOW are in different sectors, yet both load heavily on factor five. Looking at factors three and four we can see UNH, CVS, ORCL, and AAP load more heavily on factor four and load negatively on factor three. CB, MCD, and BRO don't seem to load heavily on either factor three or four. LLY loads heavily on factor four. MA, NKE, TEL, NOW, CMG, and TWTR load more heavily on factor three. PEN, CCL, MS, and HOQ load more heavily on factor three and load negatively on factor four. Lastly MC and WFC load negatively on both factors three and four. Based on this plot, it would be safe to say that stocks within different sectors do have common underlying factors, for example the stocks TWTR and NKE are in different sectors, yet both load heavily on factor three. Looking at factors three and five we can see AAP, DVA, CVS, and MCD load negatively on both factors three and five. NOW loads heavily on factor three, and CMG loads more heavily on factor three and loads negatively on factor five. BRO loads heavily on factor five. CB, UNH, WFC, ORCL load slightly on factor five, but negatively on factor three. MS and LLY don't seem to load heavily on either factor three or five. The rest of the stocks load more heavily on factor three. Based on this plot, it would be safe to say that stocks within different sectors do have common underlying factors, for example the stocks CB and UNH are in different sectors, yet both load slightly on factor five and negatively on factor three. Looking at factors four and five BRO loads heavily on factor five. MS and WFC loads more heavily on factor five and load negatively on factor four. CB, HPQ, TEL, PEN, TWTR, and NKE don't seem to load on either factor four or five. CCL loads negatively on factor five. MCD loads negatively on factor five and does not load on factor four at all. CVS, DVA, AAP, ORCL, LLY, and UNH load more heavily on factor four. Lastly, MA and NOW seem to load pretty equally on both factors four and five. Based on this plot, it would be safe to say that stocks within different sectors do have common

underlying factors, for example the stocks ORCL and CVS are in different sectors, yet both load heavily on factor four. When it comes to the Principal Components method when we test the null hypothesis that Σ is of the form of the factor model using the Bartlett's improved χ^2 likelihood ratio test we fail to reject the null hypothesis with one factor, but we reject the null hypothesis for the remaining tests when increasing the factor by one for each test beginning with $m=2$ and ending with $m=5$. However, we still decide to use $m = 5$ factors, as we must take the results of this test with a grain of salt as the textbook mentions since these results cannot always be the most reliable.

```
#####FACTOR ANALYSIS#####
```

```
library(ggplot2)
library(dplyr)
lambda = data1 %>% cor %>% eigen %>% .$values
screes = qplot(c(1:length(lambda)), lambda) + geom_line() + xlab("Principal Component") + ylab("Variance Explained")
print(screes)
```

Scree Plot



```
lambda > mean(lambda)
```

```
## [1] TRUE TRUE TRUE TRUE TRUE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
```

```
#install.packages("ggrepel")
```

```
library(ggrepel)
```

```
X = scale(data1)
```

```
V = eigen(cov(X))$vectors
```

```
Lam = diag(eigen(cov(X))$values)
```

```
L = V %*% sqrt(Lam)
```

```
L_pc_1 = V[,1] * sqrt(Lam[1])
```

```
Psi_pc_1 = diag(cov(X) - L_pc_1 %*% t(L_pc_1))
```

```

Communality_pc_1 = t(L_pc_1) %*% L_pc_1
n = 251
p = 20
m = 1
L1 = L_pc_1
Psi1 = diag(Psi_pc_1)
(251 - 1 - (2*20 + 4*1 + 5)/6) * log(det(L1%*%t(L1) + Psi1)/ det((n-1)*cov(X)/n))>
qchisq(.05, ((p-m)^2 - p - m)/2)

```

```
## [1] TRUE
```

```

fa_mle1 = factanal(X, factors = 1, rotation = 'none')
data_frame(Loadings = matrix(fa_mle1$loadings), Communality = sum(fa_mle1$loadings^2), Uniqueness = fa_m

```

```

## Warning: `data_frame()` was deprecated in tibble 1.1.0.
## Please use `tibble()` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was generated.

```

```

## # A tibble: 20 x 3
##   Loadings[,1] Communality Uniqueness
##   <dbl>         <dbl>         <dbl>
## 1      0.274      5.05      0.925
## 2      0.530      5.05      0.719
## 3      0.707      5.05      0.500
## 4      0.264      5.05      0.930
## 5      0.343      5.05      0.882
## 6      0.594      5.05      0.647
## 7      0.643      5.05      0.587
## 8      0.712      5.05      0.493
## 9      0.656      5.05      0.570
## 10     0.717      5.05      0.485
## 11     0.480      5.05      0.770
## 12     0.111      5.05      0.988
## 13     0.215      5.05      0.954
## 14     0.351      5.05      0.877
## 15     0.419      5.05      0.824
## 16     0.432      5.05      0.814
## 17     0.555      5.05      0.692
## 18     0.384      5.05      0.853
## 19     0.596      5.05      0.645
## 20     0.455      5.05      0.793

```

```

V = eigen(cov(X))$vectors[,1:2]
Lam = diag(eigen(cov(X))$values[1:2])
L_pc_2 = V %*% sqrt(Lam)
Psi_pc_2 = diag(cov(X) - rowSums(L_pc_2^2))
Communality_pc_2 = rowSums(L_pc_2^2)
data_frame(Loadings1 = L_pc_2[,1], Loadings2 = L_pc_2[,2], communality = Communality_pc_2, uniqueness =

```

```

## # A tibble: 20 x 4
##   Loadings1 Loadings2 communality uniqueness
##   <dbl>         <dbl>         <dbl>         <dbl>
## 1    -0.334    -0.562      0.427      0.573
## 2    -0.570    -0.0262     0.326      0.674
## 3    -0.745    -0.170      0.583      0.417

```



```
## 4      -0.340 -0.718      0.631      0.369
## 5      -0.377  0.213      0.188      0.812
## 6      -0.651 -0.243      0.482      0.518
## 7      -0.641  0.310      0.507      0.493
## 8      -0.712  0.127      0.524      0.476
## 9      -0.688 -0.0239     0.475      0.525
## 10     -0.715  0.365      0.645      0.355
## 11     -0.528  0.296      0.366      0.634
## 12     -0.136  0.0226     0.0191     0.981
## 13     -0.264 -0.471      0.292      0.708
## 14     -0.387  0.285      0.232      0.768
## 15     -0.449  0.468      0.420      0.580
## 16     -0.487 -0.267      0.308      0.692
## 17     -0.604  0.000390    0.365      0.635
## 18     -0.465 -0.605      0.583      0.417
## 19     -0.618  0.366      0.516      0.484
## 20     -0.479 -0.109      0.242      0.758
```

```
n = 251
p = 20
m = 2
L2 = L_pc_2
Psi2 = diag(Psi_pc_2)
(251 - 1 - (2*20 + 4*2 + 5)/6) * log(det(L2%*%t(L2) + Psi2)/ det((n-1)*cov(X)/n))>
qchisq(.05, ((p-m)^2 - p - m)/2)
```

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

```
fa_mle2 = factanal(X, factors = 2, rotation = 'none')
data_frame(Loadings1 = matrix(fa_mle2$loadings[,1]), Loadings2 = matrix(fa_mle2$loadings[,2]), Communali
```

```
## # A tibble: 20 x 4
##   Loadings1[,1] Loadings2[,1] Communality Uniqeuness
##   <dbl>          <dbl>          <dbl>      <dbl>
## 1      0.311      0.455      0.304      0.696
## 2      0.521      0.0123     0.272      0.728
## 3      0.719      0.141      0.537      0.463
## 4      0.334      0.717      0.626      0.374
## 5      0.333     -0.125     0.127      0.873
## 6      0.614      0.219      0.425      0.575
## 7      0.629     -0.339      0.510      0.490
## 8      0.701     -0.183      0.525      0.475
## 9      0.661      0.0417     0.439      0.561
## 10     0.710     -0.364      0.636      0.364
## 11     0.470     -0.153      0.245      0.755
## 12     0.117      0.0346     0.0149     0.985
## 13     0.245      0.345      0.179      0.821
## 14     0.338     -0.187      0.149      0.851
## 15     0.401     -0.322      0.265      0.735
## 16     0.450      0.212      0.248      0.752
## 17     0.558      0.0137     0.312      0.688
## 18     0.440      0.565      0.513      0.487
## 19     0.581     -0.306      0.431      0.569
## 20     0.455      0.0174     0.208      0.792
```

```
V = eigen(cov(X))$vectors[,1:3]
Lam = diag(eigen(cov(X))$values[1:3])
L_pc_3 = V %%% sqrt(Lam)
Psi_pc_3 = diag(cov(X) - rowSums(L_pc_3^2))
Communality_pc_3 = rowSums(L_pc_3^2)
data_frame(Loadings1 = L_pc_3[,1], Loadings2 = L_pc_3[,2], Loadings3 = L_pc_3[,3], communality = Communality_pc_3)
```

```
## # A tibble: 20 x 5
##   Loadings1 Loadings2 Loadings3 communality uniqueness
##   <dbl>      <dbl>      <dbl>      <dbl>      <dbl>
## 1    -0.334   -0.562    -0.0145     0.428     0.572
## 2    -0.570   -0.0262   -0.127      0.342     0.658
## 3    -0.745   -0.170    -0.0956     0.593     0.407
## 4    -0.340   -0.718     0.249      0.693     0.307
## 5    -0.377    0.213     0.372      0.326     0.674
## 6    -0.651   -0.243     0.0860     0.490     0.510
## 7    -0.641    0.310    -0.352      0.631     0.369
## 8    -0.712    0.127    -0.364      0.656     0.344
## 9    -0.688   -0.0239     0.130      0.491     0.509
## 10   -0.715    0.365    -0.0842     0.652     0.348
## 11   -0.528    0.296     0.466      0.584     0.416
## 12   -0.136    0.0226     0.555      0.327     0.673
## 13   -0.264   -0.471     0.0246     0.292     0.708
## 14   -0.387    0.285     0.123      0.247     0.753
## 15   -0.449    0.468     0.291      0.505     0.495
## 16   -0.487   -0.267    -0.00598    0.308     0.692
## 17   -0.604    0.000390    0.0933     0.373     0.627
## 18   -0.465   -0.605     0.135      0.601     0.399
## 19   -0.618    0.366    -0.0313     0.517     0.483
## 20   -0.479   -0.109    -0.584      0.583     0.417
```

```
n = 251
p = 20
m = 3
L3 = L_pc_3
Psi3 = diag(Psi_pc_3)
(251 - 1 - (2*20 + 4*3 + 5)/6) * log(det(L3%*%t(L3) + Psi3)/ det((n-1)*cov(X)/n))>
qchisq(.05, ((p-m)^2 - p - m)/2)
```

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

```
fa_mle3 = factanal(X, factors = 3, rotation = 'none')
data_frame(Loadings1 = matrix(fa_mle3$loadings[,1]), Loadings2 = matrix(fa_mle3$loadings[,2]), Loadings3 = matrix(fa_mle3$loadings[,3]))
```

```
## # A tibble: 20 x 5
##   Loadings1[,1] Loadings2[,1] Loadings3[,1] Communality Uniqueness
##   <dbl>      <dbl>      <dbl>      <dbl>      <dbl>
## 1      0.296      0.464     -0.0965     0.312     0.688
## 2      0.520      0.0347    -0.0844     0.279     0.721
## 3      0.713      0.173     -0.105     0.549     0.451
## 4      0.303      0.738      0.0993     0.647     0.353
## 5      0.331     -0.107      0.249     0.183     0.817
## 6      0.602      0.250      0.0859     0.432     0.568
## 7      0.656     -0.327     -0.267     0.609     0.391
## 8      0.729     -0.164     -0.302     0.650     0.350
```

```
## 9      0.656      0.0791      0.167      0.464      0.536
## 10     0.715     -0.320      0.0336     0.615     0.385
## 11     0.493     -0.149      0.518     0.534     0.466
## 12     0.118      0.0339      0.222     0.0645     0.935
## 13     0.229      0.355     -0.0964     0.188     0.812
## 14     0.346     -0.176      0.196     0.189     0.811
## 15     0.422     -0.320      0.319     0.383     0.617
## 16     0.440      0.229     -0.0176     0.246     0.754
## 17     0.547      0.0444      0.149     0.323     0.677
## 18     0.416      0.577      0.0148     0.506     0.494
## 19     0.593     -0.283      0.108     0.443     0.557
## 20     0.464      0.0396     -0.390     0.369     0.631
```

```
V = eigen(cov(X))$vectors[,1:4]
Lam = diag(eigen(cov(X))$values[1:4])
L_pc_4 = V %%% sqrt(Lam)
Psi_pc_4 = diag(cov(X) - rowSums(L_pc_4^2))
Communality_pc_4 = rowSums(L_pc_4^2)
data_frame(Loadings1 = L_pc_4[,1], Loadings2 = L_pc_4[,2], Loadings3 = L_pc_4[,3], Loadings4 = L_pc_4[,4],
```

```
## # A tibble: 20 x 6
##   Loadings1 Loadings2 Loadings3 Loadings4 communality uniqueness
##   <dbl>      <dbl>      <dbl>      <dbl>      <dbl>      <dbl>
## 1  -0.334 -0.562     -0.0145    0.00641    0.428    0.572
## 2  -0.570 -0.0262    -0.127    -0.271    0.416    0.584
## 3  -0.745 -0.170     -0.0956   -0.215    0.639    0.361
## 4  -0.340 -0.718      0.249     0.0415    0.695    0.305
## 5  -0.377  0.213      0.372    -0.00109   0.326    0.674
## 6  -0.651 -0.243      0.0860    0.232     0.544    0.456
## 7  -0.641  0.310     -0.352    -0.246     0.692    0.308
## 8  -0.712  0.127     -0.364    -0.163     0.683    0.317
## 9  -0.688 -0.0239      0.130     0.211     0.536    0.464
## 10 -0.715  0.365     -0.0842    0.0213    0.652    0.348
## 11 -0.528  0.296      0.466     0.138     0.603    0.397
## 12 -0.136  0.0226      0.555    -0.677     0.785    0.215
## 13 -0.264 -0.471      0.0246   -0.326     0.399    0.601
## 14 -0.387  0.285      0.123     0.0876    0.254    0.746
## 15 -0.449  0.468      0.291    -0.0790    0.511    0.489
## 16 -0.487 -0.267     -0.00598   0.0805    0.315    0.685
## 17 -0.604  0.000390   0.0933    0.395     0.529    0.471
## 18 -0.465 -0.605      0.135     0.0899    0.609    0.391
## 19 -0.618  0.366     -0.0313    0.119     0.531    0.469
## 20 -0.479 -0.109     -0.584    -0.0515    0.585    0.415
```

```
n = 251
p = 20
m = 4
L4 = L_pc_4
Psi4 = diag(Psi_pc_4)
(251 - 1 - (2*20 + 4*4 + 5)/6) * log(det(L4%*%t(L4) + Psi4)/ det((n-1)*cov(X)/n))>
qchisq(.05, ((p-m)^2 - p - m)/2)
```

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

```
fa_mle4 = factanal(X, factors = 4, rotation = 'none')
data_frame(Loadings1 = matrix(fa_mle4$loadings[,1]), Loadings2 = matrix(fa_mle4$loadings[,2]), Loadings3 = matrix(fa_mle4$loadings[,3]), Loadings4 = matrix(fa_mle4$loadings[,4]))
```

```
## # A tibble: 20 x 6
##   Loadings1[,1] Loadings2[,1] Loadings3[,1] Loadings4[,1] Communality
##           <dbl>           <dbl>           <dbl>           <dbl>           <dbl>
## 1      0.283      0.459      -0.146      0.149      0.334
## 2      0.514      0.0304     -0.127      0.0951     0.290
## 3      0.702      0.163      -0.175      0.156      0.575
## 4      0.314      0.729      0.0876     0.0527     0.641
## 5      0.340     -0.110      0.223      0.0113     0.177
## 6      0.610      0.248      0.0682     -0.0590     0.442
## 7      0.635     -0.334     -0.313      0.0213     0.614
## 8      0.715     -0.167     -0.322     -0.0486     0.645
## 9      0.722      0.0981      0.269     -0.375      0.744
## 10     0.722     -0.328      0.0175     -0.106      0.640
## 11     0.507     -0.163      0.463      0.238      0.555
## 12     0.116      0.0215      0.176      0.223      0.0946
## 13     0.229      0.353     -0.102      0.00798     0.187
## 14     0.345     -0.185      0.142      0.188      0.209
## 15     0.419     -0.353      0.248      0.355      0.487
## 16     0.433      0.221     -0.0602     0.0856      0.247
## 17     0.550      0.0379      0.115      0.00911     0.318
## 18     0.412      0.570     -0.0323     0.152      0.519
## 19     0.586     -0.290      0.0525     0.0833      0.437
## 20     0.440      0.0346     -0.427      0.0148      0.377
## # ... with 1 more variable: Uniqueness <dbl>
```

```
V = eigen(cov(X))$vectors[,1:5]
Lam = diag(eigen(cov(X))$values[1:5])
L_pc_5 = V %>% sqrt(Lam)
Psi_pc_5 = diag(cov(X) - rowSums(L_pc_5^2))
Communality_pc_5 = rowSums(L_pc_5^2)
data_frame(Loadings1 = L_pc_5[,1], Loadings2 = L_pc_5[,2], Loadings3 = L_pc_5[,3], Loadings4 = L_pc_5[,4],
```

```
## # A tibble: 20 x 7
##   Loadings1 Loadings2 Loadings3 Loadings4 Loadings5 communality uniqueness
##           <dbl>           <dbl>           <dbl>           <dbl>           <dbl>           <dbl>           <dbl>
## 1    -0.334   -0.562     -0.0145     0.00641    0.0852      0.435      0.565
## 2    -0.570   -0.0262     -0.127     -0.271    -0.0516     0.418      0.582
## 3    -0.745   -0.170     -0.0956     -0.215     0.0219     0.639      0.361
## 4    -0.340   -0.718      0.249      0.0415   -0.000956     0.695      0.305
## 5    -0.377    0.213      0.372    -0.00109   -0.503      0.579      0.421
## 6    -0.651   -0.243      0.0860      0.232    -0.170      0.572      0.428
## 7    -0.641    0.310     -0.352    -0.246    -0.103      0.702      0.298
## 8    -0.712    0.127     -0.364    -0.163    -0.0643     0.687      0.313
## 9    -0.688   -0.0239      0.130      0.211    -0.201      0.576      0.424
## 10   -0.715    0.365     -0.0842      0.0213   -0.0986     0.662      0.338
## 11   -0.528    0.296      0.466      0.138      0.229      0.656      0.344
## 12   -0.136    0.0226      0.555     -0.677    -0.0151     0.785      0.215
## 13   -0.264   -0.471      0.0246     -0.326      0.112      0.411      0.589
## 14   -0.387    0.285      0.123      0.0876      0.663      0.694      0.306
## 15   -0.449    0.468      0.291     -0.0790      0.231      0.564      0.436
## 16   -0.487   -0.267     -0.00598     0.0805   -0.126      0.331      0.669
## 17   -0.604    0.000390     0.0933      0.395      0.00783     0.529      0.471
## 18   -0.465   -0.605      0.135      0.0899      0.190      0.645      0.355
## 19   -0.618    0.366     -0.0313      0.119    -0.0561     0.534      0.466
## 20   -0.479   -0.109     -0.584     -0.0515      0.208      0.629      0.371
```

```

n = 251
p = 20
m = 5
L5 = L_pc_5
Psi5 = diag(Psi_pc_5)
(251 - 1 - (2*20 + 4*5 + 5)/6) * log(det(L5%*%t(L5) + Psi5)/ det((n-1)*cov(X)/n))>
qchisq(.05, ((p-m)^2 - p - m)/2)

```

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

```
fa_mle5 = factanal(X, factors = 5, rotation = 'none')
```

```
data_frame(Loadings1 = matrix(fa_mle5$loadings[,1]), Loadings2 = matrix(fa_mle5$loadings[,2]), Loadings3 = matrix(fa_mle5$loadings[,3]), Loadings4 = matrix(fa_mle5$loadings[,4]), Loadings5 = matrix(fa_mle5$loadings[,5]))
```

```
## # A tibble: 20 x 7
```

```

##   Loadings1[,1] Loadings2[,1] Loadings3[,1] Loadings4[,1] Loadings5[,1]
##   <dbl>         <dbl>         <dbl>         <dbl>         <dbl>
## 1      0.166      0.0891      0.548      0.0284      0.00340
## 2      0.349      0.358      0.181     -0.00613     0.0871
## 3      0.469      0.457      0.373      0.0167      0.0695
## 4      0.284     -0.152      0.707      0.162      0.140
## 5      0.318      0.143     -0.0936     0.190      0.0308
## 6      0.539      0.172      0.301      0.0738      0.0866
## 7      0.356      0.676     -0.0621     -0.184      0.0748
## 8      0.463      0.603      0.0791     -0.223      0.125
## 9      0.840     -0.0151     -0.00646     -0.00257     0.537
## 10     0.583      0.486     -0.180     -0.0167     0.0834
## 11     0.401      0.282     -0.114      0.577      0.123
## 12     0.00587     0.126      0.0760      0.315      0.0714
## 13     0.207     -0.0107      0.378     -0.0634     0.0177
## 14     0.266      0.264     -0.104      0.227     -0.0211
## 15     0.292      0.402     -0.219      0.391     -0.0842
## 16     0.316      0.205      0.322      0.0455     0.0216
## 17     0.836     -0.00976     -0.00352     -0.00167     -0.544
## 18     0.388     -0.00886      0.611      0.0788     -0.0726
## 19     0.455      0.448     -0.147      0.108     -0.0141
## 20     0.241      0.412      0.243     -0.290     -0.0212
## # ... with 2 more variables: Communality <dbl>, Uniqueuness <dbl>

```

```
x = fa_mle5$loadings[1:20,]
```

```

nr1 = x%>%data.frame()%>%ggplot(aes(x = Factor1, y = Factor2,label=rownames(x))) + geom_point()+geom_label()
nr2 = x%>%data.frame()%>%ggplot(aes(x = Factor1, y = Factor3,label=rownames(x))) + geom_point()+geom_label()
nr3 = x%>%data.frame()%>%ggplot(aes(x = Factor1, y = Factor4,label=rownames(x))) + geom_point()+geom_label()
nr4 = x%>%data.frame()%>%ggplot(aes(x = Factor1, y = Factor5,label=rownames(x))) + geom_point()+geom_label()
nr5 = x%>%data.frame()%>%ggplot(aes(x = Factor2, y = Factor3,label=rownames(x))) + geom_point()+geom_label()
nr6 = x%>%data.frame()%>%ggplot(aes(x = Factor2, y = Factor4,label=rownames(x))) + geom_point()+geom_label()
nr7 = x%>%data.frame()%>%ggplot(aes(x = Factor2, y = Factor5,label=rownames(x))) + geom_point()+geom_label()
nr8 = x%>%data.frame()%>%ggplot(aes(x = Factor3, y = Factor4,label=rownames(x))) + geom_point()+geom_label()
nr9 = x%>%data.frame()%>%ggplot(aes(x = Factor3, y = Factor5,label=rownames(x))) + geom_point()+geom_label()
nr10 = x%>%data.frame()%>%ggplot(aes(x = Factor4, y = Factor5,label=rownames(x))) + geom_point()+geom_label()

```

How to embed/visualize stocks in a 2-dimensional or 3-dimensional map so that similar stocks, however it is defined, are close in the map. (multidimensional scaling)

First we found the dissimilarity matrix by finding the correlation matrix and subtracting from one. This gives us a 20x20 matrix where each column is a stock and each row is also a stock and the data is one minus the correlation between each stock. This allows us to complete the MDS methods. Using classical scaling, it

seems TWTR, CMG, PEN, and NOW are clustered together. Also, TEL, HPQ, MCD, BRO, MA, NKE are clustered together, and WFC, CB, and AAP are clustered together. LLY and CCL definitely do not fit into any of the clusters it is very far away from all the clusters formed. And there is a cluster formed by CVS, UNH, and ORCL. MS seems to be between two different clusters and DVA looks to be in the middle of three different clusters, so it would be difficult to draw a conclusion about these stocks. Using Sammon mapping, there appears to not be any obvious clusters. The stocks look to be spread out across the entire plot, so it seems that Sammon mapping would not be very helpful for us in visualizing stocks in a 2-dimensional map. Using Shepard-Kruskal non-metric scaling, we see TWTR, CMG, NOW, and PEN being clustered together just as they were in classical scaling. We also see MCD, BRO, MA, TEL clustered together. There also could be a cluster including MS, HPQ, CCL, WFC, CB, and AAP. DVA could possibly be included in the cluster with AAP, but it is a bit further away and could just not be part of any cluster. There is also a cluster that contains CVS, UNH, and ORCL, also just as with classical scaling. NKE looks like it is between two clusters and it could be difficult to really say which cluster it belongs to. LLY is far away from all clusters formed and definitely cannot be considered in any of them. When comparing the scaling methods, it seems to us that classical scaling is the ideal method to use as when looking at the plot the clusters appear to be more clear and obvious than when looking at the non-metric scaling plot, and it is very clear that the Sammon-mapping gives no clusters at all. This makes sense since classical scaling focuses on approximating the actual dissimilarity and non-metric scaling only uses the rank order among the dissimilarities.

#####MULTIDIMENSIONAL SCALING#####

```
correlation = cor(data1)
1-correlation
```

##	Twitter	HP Inc	Te Connectivity	Service Now
## Twitter	0.0000000	0.8234706	0.6685434	0.5788851
## HP Inc	0.8234706	0.0000000	0.4682664	0.8445861
## Te Connectivity	0.6685434	0.4682664	0.0000000	0.6643234
## Service Now	0.5788851	0.8445861	0.6643234	0.0000000
## Oracle Corporation	0.9940062	0.7757109	0.7858231	0.9771701
## Mastercard	0.6270232	0.7188338	0.5810282	0.6156422
## Wells Fargo	0.9323279	0.6512795	0.5682800	1.0538837
## Morgan Stanley	0.8038666	0.6272355	0.4822838	0.9394699
## Brown and Brown	0.8635757	0.6662994	0.5774924	0.6888499
## Chubb Limited	0.9904785	0.7201752	0.5510044	1.0141152
## United Healthcare	0.9339784	0.7898106	0.7246065	0.9105718
## Eli Lilly and Co	0.9791997	0.9367051	0.8708737	0.8815894
## Penumbra	0.7969592	0.8415670	0.7836737	0.6777194
## DaVita	0.9820954	0.8090697	0.7731610	1.0517378
## CVS_returns	1.0502032	0.8017088	0.7619556	1.0639462
## Nike	0.7743647	0.7517387	0.6409992	0.6955255
## McDonalds	0.8656630	0.7597872	0.6511017	0.8397391
## Chipotle	0.6266356	0.8172759	0.6053607	0.4462422
## Advanced Auto Parts	0.9504271	0.7039812	0.6626383	1.0087806
## Carnival Corporation	0.8133143	0.7034876	0.6101498	0.8729720
##	Oracle Corporation	Mastercard	Wells Fargo	Morgan Stanley
## Twitter	0.9940062	0.6270232	0.9323279	0.8038666
## HP Inc	0.7757109	0.7188338	0.6512795	0.6272355
## Te Connectivity	0.7858231	0.5810282	0.5682800	0.4822838
## Service Now	0.9771701	0.6156422	1.0538837	0.9394699
## Oracle Corporation	0.0000000	0.7526768	0.8069822	0.8531065
## Mastercard	0.7526768	0.0000000	0.7131032	0.6393254
## Wells Fargo	0.8069822	0.7131032	0.0000000	0.3695849
## Morgan Stanley	0.8531065	0.6393254	0.3695849	0.0000000
## Brown and Brown	0.7183354	0.5050175	0.6697173	0.5521243
## Chubb Limited	0.7017153	0.6213965	0.4421802	0.4308203

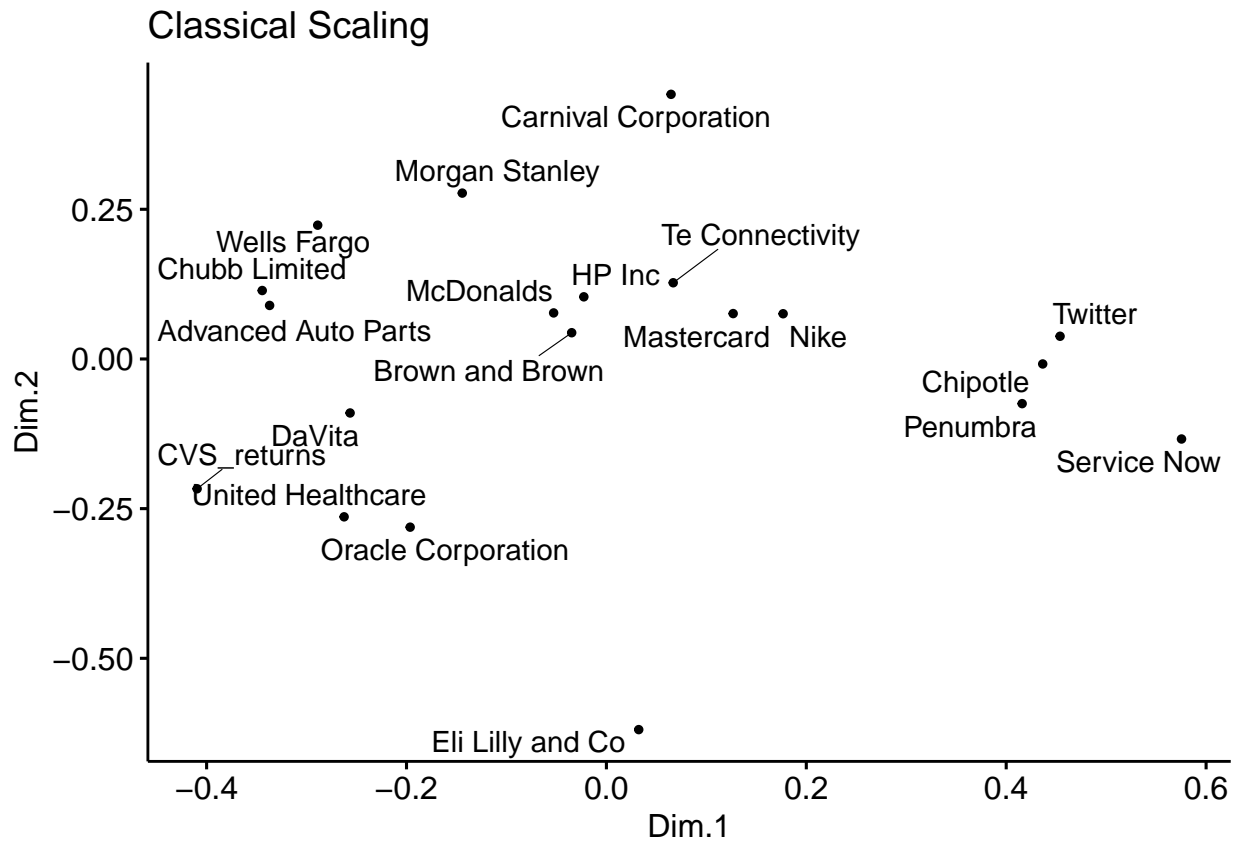
## United Healthcare	0.7494475	0.6860482	0.7761200	0.7544045
## Eli Lilly and Co	0.8236643	0.9391513	0.9384125	0.9610228
## Penumbra	1.0089953	0.8494674	0.9129997	0.8850652
## DaVita	0.8993136	0.8620399	0.7881936	0.8109893
## CVS_returns	0.7741904	0.8631404	0.6867083	0.7211120
## Nike	0.8858791	0.6849735	0.7665130	0.7077546
## McDonalds	0.7522954	0.5988626	0.7488637	0.6866736
## Chipotle	0.9301671	0.6618426	0.9207202	0.7774386
## Advanced Auto Parts	0.7378919	0.7176662	0.4870896	0.5831989
## Carnival Corporation	1.0088488	0.6988560	0.6286969	0.5504848
##	Brown and Brown	Chubb Limited	United Healthcare	
## Twitter	0.8635757	0.9904785	0.9339784	
## HP Inc	0.6662994	0.7201752	0.7898106	
## Te Connectivity	0.5774924	0.5510044	0.7246065	
## Service Now	0.6888499	1.0141152	0.9105718	
## Oracle Corporation	0.7183354	0.7017153	0.7494475	
## Mastercard	0.5050175	0.6213965	0.6860482	
## Wells Fargo	0.6697173	0.4421802	0.7761200	
## Morgan Stanley	0.5521243	0.4308203	0.7544045	
## Brown and Brown	0.0000000	0.4713300	0.6023459	
## Chubb Limited	0.4713300	0.0000000	0.6175915	
## United Healthcare	0.6023459	0.6175915	0.0000000	
## Eli Lilly and Co	0.9601902	0.9143371	0.8158817	
## Penumbra	0.8188202	0.9209914	1.0210803	
## DaVita	0.7915949	0.6928994	0.6268778	
## CVS_returns	0.8050632	0.6032714	0.5236749	
## Nike	0.7285326	0.7646853	0.8136146	
## McDonalds	0.5894606	0.5619073	0.7350175	
## Chipotle	0.7171701	0.9226089	0.8710256	
## Advanced Auto Parts	0.6310854	0.5075103	0.5932650	
## Carnival Corporation	0.8158346	0.6839212	0.9714411	
##	Eli Lilly and Co	Penumbra	DaVita	CVS_returns
## Twitter	0.9791997	0.7969592	0.9820954	1.0502032
## HP Inc	0.9367051	0.8415670	0.8090697	0.8017088
## Te Connectivity	0.8708737	0.7836737	0.7731610	0.7619556
## Service Now	0.8815894	0.6777194	1.0517378	1.0639462
## Oracle Corporation	0.8236643	1.0089953	0.8993136	0.7741904
## Mastercard	0.9391513	0.8494674	0.8620399	0.8631404
## Wells Fargo	0.9384125	0.9129997	0.7881936	0.6867083
## Morgan Stanley	0.9610228	0.8850652	0.8109893	0.7211120
## Brown and Brown	0.9601902	0.8188202	0.7915949	0.8050632
## Chubb Limited	0.9143371	0.9209914	0.6928994	0.6032714
## United Healthcare	0.8158817	1.0210803	0.6268778	0.5236749
## Eli Lilly and Co	0.0000000	0.8649387	0.9345869	0.8114002
## Penumbra	0.8649387	0.0000000	0.9988858	1.0445477
## DaVita	0.9345869	0.9988858	0.0000000	0.7120774
## CVS_returns	0.8114002	1.0445477	0.7120774	0.0000000
## Nike	0.9803332	0.8519071	0.9435372	0.8938965
## McDonalds	1.0359650	0.8380526	0.7689436	0.7133942
## Chipotle	0.9356925	0.6323669	0.8829395	0.9850626
## Advanced Auto Parts	0.9839316	0.9987843	0.7454937	0.6233216
## Carnival Corporation	1.1433054	0.8389545	0.8137362	0.9282821
##	McDonalds	Chipotle	Advanced Auto Parts	
## Twitter	0.8656630	0.6266356	0.9504271	

## HP Inc	0.7597872	0.8172759	0.7039812
## Te Connectivity	0.6511017	0.6053607	0.6626383
## Service Now	0.8397391	0.4462422	1.0087806
## Oracle Corporation	0.7522954	0.9301671	0.7378919
## Mastercard	0.5988626	0.6618426	0.7176662
## Wells Fargo	0.7488637	0.9207202	0.4870896
## Morgan Stanley	0.6866736	0.7774386	0.5831989
## Brown and Brown	0.5894606	0.7171701	0.6310854
## Chubb Limited	0.5619073	0.9226089	0.5075103
## United Healthcare	0.7350175	0.8710256	0.5932650
## Eli Lilly and Co	1.0359650	0.9356925	0.9839316
## Penumbra	0.8380526	0.6323669	0.9987843
## DaVita	0.7689436	0.8829395	0.7454937
## CVS_returns	0.7133942	0.9850626	0.6233216
## Nike	0.7510838	0.6493144	0.7747742
## McDonalds	0.0000000	0.6385697	0.6157531
## Chipotle	0.6385697	0.0000000	0.9103412
## Advanced Auto Parts	0.6157531	0.9103412	0.0000000
## Carnival Corporation	0.7913316	0.7747443	0.7858926
##	Carnival Corporation		
## Twitter		0.8133143	
## HP Inc		0.7034876	
## Te Connectivity		0.6101498	
## Service Now		0.8729720	
## Oracle Corporation		1.0088488	
## Mastercard		0.6988560	
## Wells Fargo		0.6286969	
## Morgan Stanley		0.5504848	
## Brown and Brown		0.8158346	
## Chubb Limited		0.6839212	
## United Healthcare		0.9714411	
## Eli Lilly and Co		1.1433054	
## Penumbra		0.8389545	
## DaVita		0.8137362	
## CVS_returns		0.9282821	
## Nike		0.8135644	
## McDonalds		0.7913316	
## Chipotle		0.7747443	
## Advanced Auto Parts		0.7858926	
## Carnival Corporation		0.0000000	

```

dissim = 1-correlation %>% as.matrix
dissim_cmds = dissim %>% cmdscale() %>% data.frame()
colnames(dissim_cmds) <- c("Dim.1", "Dim.2")
library(ggpubr)
p1 <- ggscatter(dissim_cmds, x = "Dim.1", y = "Dim.2",
  label = rownames(dissim_cmds), size = 1, repel = TRUE, title = "Classical Scaling")
print(p1)

```

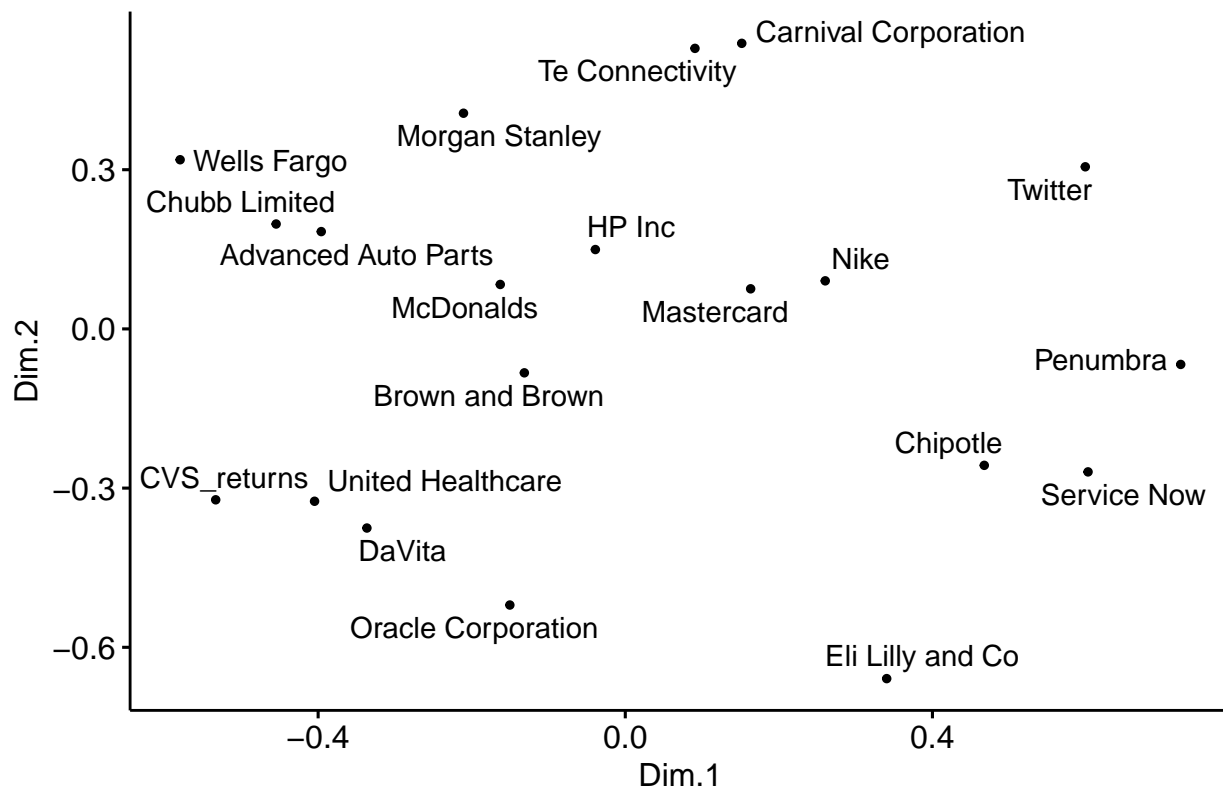



```
dissim_sammon <- dissim %>% as.matrix %>% MASS::sammon() %>% .$points %>% data.frame()
```

```
## Initial stress      : 0.20108
## stress after  10 iters: 0.10071, magic = 0.092
## stress after  11 iters: 0.09716
```

```
colnames(dissim_sammon) <- c("Dim.1", "Dim.2")
p2 <- ggscatter(dissim_sammon, x = "Dim.1", y = "Dim.2",
  label = rownames(dissim_sammon), size = 1, repel = TRUE, title = "Sammon Mapping")
print(p2)
```

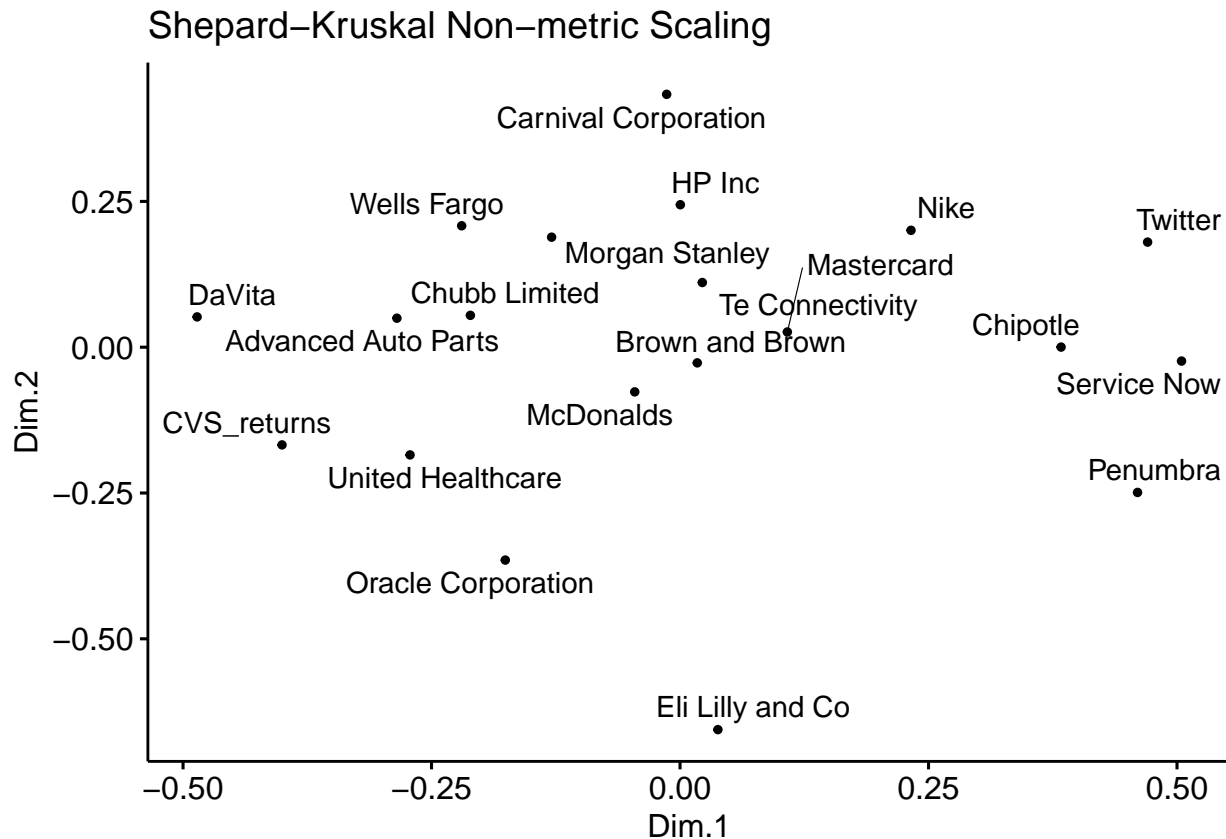
Sammon Mapping



```
dissim_NM <- dissim %>% MASS::isoMDS() %>% .$points %>% data.frame()
```

```
## initial value 22.826952
## iter 5 value 15.680301
## final value 15.514859
## converged
```

```
colnames(dissim_NM) <- c("Dim.1", "Dim.2")
p3 <- ggscatter(dissim_NM, x = "Dim.1", y = "Dim.2",
  label = rownames(dissim_NM), size = 1, repel = TRUE,
  title = "Shepard-Kruskal Non-metric Scaling")
print(p3)
```



Cluster Analysis & ICA

Prepare Data for Cluster Analysis and Independent Components Analysis: Choose the data from 2018 to 2021. Every row is a date and every column is a different ticker.

```
#tq_get need package "tidyquant"

###Technology Data###
##Twitter
TWTR_4 = tq_get("TWTR", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
TWTRreturn_4 = TWTR_4 %>% tq_transmute(select = adjusted,
                                       mutate_fun = periodReturn,
                                       period = "daily",
                                       col_rename = "TWTR")

##HP Inc.
HPQ_4 = tq_get("HPQ", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
HPQreturn_4 = HPQ_4 %>% tq_transmute(select = adjusted,
                                       mutate_fun = periodReturn,
                                       period = "daily",
                                       col_rename = "HPQ") %>% dplyr::select(-date)

##TE Connectivity Ltd.
TEL_4 = tq_get("TEL", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
TELreturn_4 = TEL_4 %>% tq_transmute(select = adjusted,
                                       mutate_fun = periodReturn,
                                       period = "daily",
                                       col_rename = "TEL") %>% dplyr::select(-date)

##Service Now
```

```

NOW_4 = tq_get("NOW", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
NOWreturn_4 = NOW_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,
                                     period = "daily",
                                     col_rename = "NOW") %>% dplyr::select(-date)

##Oracle Corporation
ORCL_4 = tq_get("ORCL", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
ORCLreturn_4 = ORCL_4 %>% tq_transmute(select = adjusted,
                                       mutate_fun = periodReturn,
                                       period = "daily",
                                       col_rename = "ORCL") %>% dplyr::select(-date)

#Summary of Technology Data
Technology_4 = cbind(TWTRreturn_4, HPQreturn_4, TELreturn_4, NOWreturn_4, ORCLreturn_4)

###Consumer Discretionary Data###
##Nike
NKE_4 = tq_get("NKE", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
NKEreturn_4 = NKE_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,
                                     period = "daily",
                                     col_rename = "NKE") %>% dplyr::select(-date)

##McDonald's Corporation
MCD_4 = tq_get("MCD", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
MCDreturn_4 = MCD_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,
                                     period = "daily",
                                     col_rename = "MCD") %>% dplyr::select(-date)

##Chipotle Mexican Grill
CMG_4 = tq_get("CMG", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
CMGreturn_4 = CMG_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,
                                     period = "daily",
                                     col_rename = "CMG") %>% dplyr::select(-date)

##Advance Auto Parts
AAP_4 = tq_get("AAP", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
AAPreturn_4 = AAP_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,
                                     period = "daily",
                                     col_rename = "AAP") %>% dplyr::select(-date)

##Carnival Corporation & plc
CCL_4 = tq_get("CCL", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
CCLreturn_4 = CCL_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,
                                     period = "daily",
                                     col_rename = "CCL") %>% dplyr::select(-date)

#Summary of Consumer Discretionary Data
ConsumerDiscretionary_4 = cbind(NKEreturn_4, MCDreturn_4, CMGreturn_4, AAPreturn_4, CCLreturn_4)

###Finance Data###
##Mastercard Incorporation
MA_4 = tq_get("MA", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
MAreturn_4 = MA_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,

```

```

                                period = "daily",
                                col_rename = "MA") %>% dplyr::select(-date)
##Wells Fargo
WFC_4 = tq_get("WFC", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
WFCreturn_4 = WFC_4 %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "WFC") %>% dplyr::select(-date)
##Morgan Staley
MS_4 = tq_get("MS", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
MSreturn_4 = MS_4 %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "MS") %>% dplyr::select(-date)
##Brown & Brown
BRO_4 = tq_get("BRO", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
BROreturn_4 = BRO_4 %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "BRO") %>% dplyr::select(-date)
##Chubb Ltd.
CB_4 = tq_get("CB", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
CBreturn_4 = CB_4 %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "CB") %>% dplyr::select(-date)
# Summary of Finance Data
Finance_4 = cbind(MAreturn_4, WFCreturn_4, MSreturn_4, BROreturn_4, CBreturn_4)

###Health Data###
##UnitedHealth Group
UNH_4 = tq_get("UNH", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
UNHreturn_4 = UNH_4 %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "UNH") %>% dplyr::select(-date)
##Eli Lilly and Company
LLY_4 = tq_get("LLY", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
LLYreturn_4 = LLY_4 %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "LLY") %>% dplyr::select(-date)
##Penumbra
PEN_4 = tq_get("PEN", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
PENreturn_4 = PEN_4 %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",
                                col_rename = "PEN") %>% dplyr::select(-date)
##DaVita
DVA_4 = tq_get("DVA", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
DVAreturn_4 = DVA_4 %>% tq_transmute(select = adjusted,
                                mutate_fun = periodReturn,
                                period = "daily",

```

```

col_rename = "DVA") %>% dplyr::select(-date)

##CVS
CVS_4 = tq_get("CVS", from = "2018-01-01", to = "2021-12-31", get = "stock.prices")
CVSreturn_4 = CVS_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,
                                     period = "daily",
                                     col_rename = "CVS") %>% dplyr::select(-date)

#Summary of Health Data
Health_4 = cbind(UNHreturn_4, LLYreturn_4, PENreturn_4, DVAreturn_4, CVSreturn_4)

##date##
date_tibble <- TWTR_4 %>% tq_transmute(select = adjusted,
                                     mutate_fun = periodReturn,
                                     period = "daily",
                                     col_rename = "TWTR") %>% dplyr::select(date)

library(dplyr) #pull needs this package
date4 = date_tibble %>% pull

###Conclusion###
data_4 = cbind(Technology_4, Finance_4, Health_4, ConsumerDiscretionary_4)
data4 = data_4[-1]
rownames(data4) <- date4

###Scale Data###
data4_scaled = data4 %>% scale

```

K-Means Cluster Analysis

1. Each row name of data represents a stock, each column name of data is a date. Therefore, the data is a 20 by 1007 matrix.

```

data_cluster <- t(data4_scaled)
head(data_cluster)

```

```

##      2018-01-02  2018-01-03  2018-01-04  2018-01-05  2018-01-08  2018-01-09
## TWTR -0.03474518 -0.10944788 -0.6088822  0.3850325  0.304048900 -0.55597155
## HPQ  -0.04095580  0.05756283  0.2735416  0.3882647  0.132858620 -0.09866611
## TEL  -0.04001153  0.81872920  0.1960293  1.1190572  0.067186705 -0.54430803
## NOW  -0.07541510  0.27749523  0.2032196  0.2660132  0.009211749 -0.03173937
## ORCL -0.04636938  1.18897400  0.4790631  0.2746795  0.514842913  0.24879097
## MA   -0.05234512  0.54515018  0.5624417  0.9327921  0.091301120  0.01629340
##      2018-01-10  2018-01-11  2018-01-12  2018-01-16  2018-01-17  2018-01-18
## TWTR  0.06626124  0.09109632  1.29369658 -0.93547018 -0.1584957 -0.68085888
## HPQ   0.42126775  0.64484065  0.91497220 -0.11425215  1.0238471 -0.34532748
## TEL  -0.19436506  0.34186871  0.42610668 -0.07045434  0.1935938 -0.34332995
## NOW   0.15145599  0.31500040  0.09926307  0.38073211  0.2064154  0.01973003
## ORCL -0.32903736  0.11757995  0.56382063  0.03980509  0.6850185 -0.08880749
## MA    0.05491088  0.26275227  0.36403740 -0.06405738  0.5420870  0.28311643
##      2018-01-19  2018-01-22  2018-01-23  2018-01-24  2018-01-25  2018-01-26
## TWTR -0.5171214 -0.47327567 -0.78064745 -0.5444710 -0.32122298  2.8709384
## HPQ   0.6984903  0.22490370 -0.11141204 -0.3055851 -0.64456157  1.0217743
## TEL   0.3465072  0.22749462 -0.32118381  0.8132501  0.08413142  0.8070310
## NOW   0.2428208  0.37595803  0.06968856  0.2000915 -0.04832933  1.0615111
## ORCL  0.3252868  0.09071957  0.38486736  0.2979427  0.10913663  1.1423417

```

##	MA	0.3353474	0.36067416	-0.36014977	-0.1035177	0.39723552	0.4409374
##		2018-01-29	2018-01-30	2018-01-31	2018-02-01	2018-02-02	2018-02-05
##	TWTR	1.1094688	0.4985081	0.19156574	1.537786027	-1.4065277	-0.9648422
##	HPQ	-0.2166454	-0.6936923	-0.25599318	-0.076977395	-1.5192480	-2.2645118
##	TEL	-0.2690143	-0.7986306	0.05935709	0.579832067	-0.8238499	-1.7616258
##	NOW	-0.7726411	-0.2093368	0.53735057	0.967270748	-0.8617591	-0.6988856
##	ORCL	-0.8653971	-1.0527221	0.61302518	-0.005017119	-1.5959681	-2.2168846
##	MA	-0.5517125	-0.4357872	0.46211631	1.052732084	-0.7063640	-1.7130081
##		2018-02-06	2018-02-07	2018-02-08	2018-02-09	2018-02-12	2018-02-13
##	TWTR	0.09883431	1.9843777	3.673511	1.3100868	-0.5770887	2.420381752
##	HPQ	0.23525585	-0.4721770	-2.595709	0.3597046	0.5856654	0.308904717
##	TEL	0.17628716	0.2010258	-2.255218	0.5630406	1.1730330	0.006350052
##	NOW	0.36028235	1.0217374	-3.437167	1.3474912	0.4891066	0.007531231
##	ORCL	1.40656068	-0.6186203	-2.261915	0.9670716	0.4229708	0.330268345
##	MA	1.30177967	-0.2067706	-2.336439	1.3027075	0.8077516	0.492961132
##		2018-02-14	2018-02-15	2018-02-16	2018-02-20	2018-02-21	2018-02-22
##	TWTR	0.24815450	-0.1613315	-0.53412361	-0.23782062	0.4670506	-1.1958007
##	HPQ	1.40820261	0.2747211	-0.13888177	-0.06057918	-0.4729790	0.3955569
##	TEL	0.44889768	0.8061791	0.31097029	0.16415002	-0.2086433	-0.4146912
##	NOW	-0.02468297	1.2045736	0.30941444	0.62285074	0.1306699	-0.4579351
##	ORCL	1.00958751	1.2371854	0.02736228	-0.90885076	-0.5381517	0.1262596
##	MA	0.61808156	0.5453840	0.20879397	-0.13350398	-0.8734899	0.1213837
##		2018-02-23	2018-02-26	2018-02-27	2018-02-28	2018-03-01	2018-03-02
##	TWTR	0.4879605	-0.50193077	-0.83181959	0.49140343	0.3292324	0.6846260
##	HPQ	1.4122255	2.48350959	0.06648039	-0.27312446	-0.1127956	0.3548034
##	TEL	0.5890935	1.03878186	-0.06434939	-0.67317254	-1.5244901	0.6204169
##	NOW	1.0228032	-0.03365689	0.60422300	-0.63740390	-0.4277617	1.6775394
##	ORCL	0.9323973	0.66126848	-0.50498466	-0.10946451	-1.0569044	0.6081464
##	MA	0.7197549	0.51814802	-0.57064711	-0.09826961	-0.6660984	0.3667452
##		2018-03-05	2018-03-06	2018-03-07	2018-03-08	2018-03-09	2018-03-12
##	TWTR	1.42635272	-0.1671207	1.14408049	-0.81131324	0.4030821	0.09474692
##	HPQ	0.17290164	0.4200696	0.11687641	-0.19819718	1.1867354	-1.43828106
##	TEL	0.06529606	0.1301428	0.07970574	0.28842190	1.4037326	-0.28521721
##	NOW	0.30988188	0.5730108	0.38287591	-0.09134899	-0.1277980	0.30541991
##	ORCL	0.98178561	0.1720191	0.18147718	0.37645495	0.8130787	-0.11686320
##	MA	0.90067323	-0.3185207	0.39736374	-0.04174038	1.0054546	-0.23388624
##		2018-03-13	2018-03-14	2018-03-15	2018-03-16	2018-03-19	2018-03-20
##	TWTR	-1.2296182	2.1929343	-0.7017731	-0.22227458	-0.5493601	-3.2015583
##	HPQ	-0.1668356	-0.2899367	-0.0409558	0.01271567	-0.5948304	0.1038880
##	TEL	-0.3395325	-0.3753386	0.2437331	-0.07407481	-0.5608880	0.5354403
##	NOW	-0.1815670	0.2371139	-0.4146952	-0.94798609	-0.1148164	0.4582014
##	ORCL	-0.3690169	-0.3101021	0.0046011	-0.14821302	-0.3728980	-5.0772294
##	MA	-0.4506617	-0.2859936	0.1666289	0.36785055	-0.5651748	0.4555629
##		2018-03-21	2018-03-22	2018-03-23	2018-03-26	2018-03-27	2018-03-28
##	TWTR	1.30856764	-1.461275	-0.2010213	0.8306929	-3.7070611	0.3783765
##	HPQ	-0.04095580	-1.502460	-1.1999739	0.6318914	-0.8545654	-0.1953139
##	TEL	0.02807926	-2.075063	-1.8867165	1.0730284	-0.6359843	-0.7990086
##	NOW	0.17180408	-1.083149	-1.0068800	1.5217947	-2.0584799	-0.8351952
##	ORCL	-0.08036136	-1.328206	-1.3248725	1.9661410	-1.3086629	-0.5165068
##	MA	-0.51061326	-1.427376	-1.0513847	1.4244764	-1.2995765	-0.6500824
##		2018-03-29	2018-04-02	2018-04-03	2018-04-04	2018-04-05	2018-04-06
##	TWTR	0.5659312	-1.0551187	-0.57890641	0.75199151	0.38654435	-0.6101263
##	HPQ	0.4044691	-1.5356609	0.31670293	0.39249692	-0.02146135	-1.5418146
##	TEL	1.8387319	-1.5617093	0.68922978	-0.01932731	0.19263801	-1.5221948

##	NOW	1.3481906	-0.9874182	-0.03884835	0.63571434	0.18294261	-0.7479966
##	ORCL	0.8666918	-0.9090904	-0.18858234	0.69030569	0.48103780	-1.3577479
##	MA	1.2894576	-1.0181781	0.18858912	0.28380407	0.52494668	-1.6359479
##		2018-04-09	2018-04-10	2018-04-11	2018-04-12	2018-04-13	2018-04-16
##	TWTR	-0.13248506	1.6212779	-0.17942448	-0.4396934	-0.28729605	-0.22573897
##	HPQ	0.18139219	1.6882985	-0.34995370	0.6399897	-0.36642981	0.11340450
##	TEL	0.14022028	1.4971430	-0.26560378	0.1556819	0.09851298	0.08789482
##	NOW	-0.08750527	0.8170606	-0.09433601	0.4143882	-0.46571968	0.52651834
##	ORCL	0.03690904	1.0465085	-0.29081912	0.2693750	0.18613939	0.13959500
##	MA	0.12688678	1.1695745	-0.69423346	0.6203879	-0.19642453	-0.16142700
##		2018-04-17	2018-04-18	2018-04-19	2018-04-20	2018-04-23	2018-04-24
##	TWTR	3.4461504	-0.32227465	-0.03474518	0.3232478	-0.6946154	-0.7678465
##	HPQ	0.3435255	-0.07904724	-0.74643989	-0.2930585	-0.3336120	-0.3945930
##	TEL	0.5877361	0.63050463	-0.60227439	-0.4375027	-0.1667787	-1.1940279
##	NOW	1.1080078	-0.12958553	-0.37151437	-1.0068823	-0.3996419	-1.6864813
##	ORCL	0.6601535	0.43374153	-0.34093324	-0.7184888	-0.5424784	-0.3608114
##	MA	1.1693776	0.24609141	-0.17150855	-0.5646988	-0.4951380	-0.6455741
##		2018-04-25	2018-04-26	2018-04-27	2018-04-30	2018-05-01	2018-05-02
##	TWTR	-0.7558445	0.4986536	-1.3150899	1.3437606	-0.04481333	0.21704165
##	HPQ	0.1769894	0.2941404	0.2132639	-0.2742105	0.60407216	-0.56072793
##	TEL	-1.7878197	-0.4117075	-0.2896322	-0.8471333	-0.01230330	-0.04001153
##	NOW	-0.7277019	1.7099222	-0.5477247	0.6392289	-0.24615027	-0.05636150
##	ORCL	0.2113594	0.1984653	-0.5454028	0.1176458	0.28064660	-0.55712406
##	MA	-0.2635654	1.5154380	-0.6444969	0.5769909	0.47546019	1.41612970
##		2018-05-03	2018-05-04	2018-05-07	2018-05-08	2018-05-09	2018-05-10
##	TWTR	0.08512448	0.3334048	0.2503635	0.47175379	0.54971551	0.3507074
##	HPQ	-0.48926776	0.6683268	0.1721597	0.28675440	1.14498176	0.2752931
##	TEL	-0.12307365	0.3926796	0.2405169	-0.05094773	0.25546370	0.4060687
##	NOW	0.69348176	0.5059809	1.0290478	-0.07317800	0.82205737	-0.3073680
##	ORCL	-0.57374727	0.7230332	0.3736838	-0.19686107	0.69668097	0.3543973
##	MA	0.11643876	0.3783243	0.1825173	0.30702803	-0.02740671	0.5509257
##		2018-05-11	2018-05-14	2018-05-15	2018-05-16	2018-05-17	2018-05-18
##	TWTR	-0.14615246	0.56160810	-0.61966792	-0.01610911	-0.21167792	0.01208716
##	HPQ	-0.11481542	-0.29990728	-1.02732618	0.32115012	0.09132097	-0.34234538
##	TEL	0.12176550	0.21264274	-0.13094539	0.19041005	0.02398664	-0.18384100
##	NOW	-0.09962852	-1.20752774	-0.14571394	-0.59110846	0.05349452	0.43623420
##	ORCL	-0.17139196	-0.04636938	-0.05775171	-0.13753384	-0.26322323	-0.29850496
##	MA	0.02150079	-0.35465069	-0.08203334	0.04170799	-0.34382743	-0.25117184
##		2018-05-21	2018-05-22	2018-05-23	2018-05-24	2018-05-25	2018-05-29
##	TWTR	0.9004850	-0.73345921	0.48531517	0.056568929	0.06539958	0.3372974
##	HPQ	-0.1358208	-0.07897396	-0.36452118	-0.002588301	-0.06011663	-1.2104234
##	TEL	0.3713751	-0.58059835	-0.01858044	-0.142228905	-0.14782048	-0.6504173
##	NOW	-0.6393966	-0.34886282	0.78074428	0.277880679	0.19393531	-0.1690474
##	ORCL	0.9784573	-0.99539967	0.56327547	-0.546754090	0.57355625	-0.8861533
##	MA	0.1473170	0.05204665	0.28742104	-0.318289547	-0.23558953	-0.4600155
##		2018-05-30	2018-05-31	2018-06-01	2018-06-04	2018-06-05	2018-06-06
##	TWTR	0.2521320	0.2672231	1.6801634	0.989411437	1.5120272	0.195278404
##	HPQ	1.6550168	-0.2873746	1.1984109	0.070169291	1.2151222	0.120460980
##	TEL	0.4848699	-0.5108371	0.7847865	0.008373415	0.3519823	1.052398801
##	NOW	0.4095060	-0.2652593	0.7896736	0.356519231	0.4806519	-0.005550422
##	ORCL	0.8644932	-0.4204612	0.6728544	-0.080148595	-0.2605434	0.655293848
##	MA	0.5067874	-0.4587650	1.2599135	0.521694153	0.3393961	0.865382873
##		2018-06-07	2018-06-08	2018-06-11	2018-06-12	2018-06-13	2018-06-14
##	TWTR	-0.33914753	1.12595880	0.12076193	1.4903492	0.3722345	1.82796173

##	HPQ	0.03050004	0.24444464	0.49052641	-0.4826327	-0.1832252	0.42298921
##	TEL	-0.01391898	-0.17557715	-0.06616434	0.1116888	-0.2225378	1.09575292
##	NOW	-1.97109101	0.08887930	0.34245623	0.3096284	-0.2075765	0.81804640
##	ORCL	-0.12455947	0.51294420	-0.03529416	0.2414096	-0.2445160	-2.66517722
##	MA	-0.91058899	0.06672731	-0.42055520	0.3402871	-0.2233011	-0.07618418
##		2018-06-15	2018-06-18	2018-06-19	2018-06-20	2018-06-21	2018-06-22
##	TWTR	-0.6612608186	0.09851559	-0.7313182	0.76635701	-0.6235098	0.3969650
##	HPQ	-0.4115875958	0.06587797	-0.2718434	-0.43385614	0.3195985	0.4952748
##	TEL	-0.1987259319	-0.40976531	-0.8418632	-0.08732602	-0.6397696	-0.2369914
##	NOW	0.1392792565	-0.06273065	-0.6671857	0.17133841	-1.0328332	-0.8556218
##	ORCL	0.3952057346	0.23023637	-0.3330136	-4.02332702	0.3024107	1.1911440
##	MA	0.0001082966	0.32872967	-0.3925796	0.38790072	-0.2315400	0.1133334
##		2018-06-25	2018-06-26	2018-06-27	2018-06-28	2018-06-29	2018-07-02
##	TWTR	-1.1721343	0.42815179	-0.8105893	0.7264231	-0.7978316	0.8806833
##	HPQ	-1.2940426	-0.11372740	-0.4783166	-0.2987582	-0.0039063	0.2737654
##	TEL	-0.7294490	0.01959407	-1.1926968	-1.3523259	0.3067101	0.2027388
##	NOW	-1.2593339	-0.19954224	-0.7395286	0.9659803	-0.0617053	1.0964249
##	ORCL	0.1713482	0.11020583	-1.1993289	0.4323658	0.2212986	1.0310244
##	MA	-1.5854371	0.30836181	-0.8457429	0.9119673	-0.1921825	0.2257322
##		2018-07-03	2018-07-05	2018-07-06	2018-07-09	2018-07-10	2018-07-11
##	TWTR	-0.7742535	0.7787531	1.04207161	-1.6766886	-0.30437430	0.0489567
##	HPQ	-0.5370773	0.2565504	0.43910813	0.6162184	0.85773814	-1.4663480
##	TEL	-0.4894940	0.8499681	-0.06230155	0.8238952	0.38199840	-1.2901451
##	NOW	-0.1663665	0.4226329	0.52400798	0.5063714	0.08443242	0.2599668
##	ORCL	-0.3192846	0.7765859	0.64662460	0.8000657	0.25040562	0.6914185
##	MA	-0.3841018	0.5722638	0.16298131	0.2834875	0.08719016	0.4947457
##		2018-07-12	2018-07-13	2018-07-16	2018-07-17	2018-07-18	2018-07-19
##	TWTR	0.9321569	-0.5539151	-0.19250942	0.27552334	-0.96983044	0.03566612
##	HPQ	0.8151801	0.2803768	-0.28899613	-0.00530498	-0.14778957	-0.64791555
##	TEL	0.4837856	-0.2220272	-0.36659592	0.56167762	0.02054462	-0.11149306
##	NOW	1.4989553	-0.8040175	-0.48369560	0.36631128	0.09148637	-0.47962498
##	ORCL	0.5246278	0.4853346	-0.02434782	0.43791317	-0.32995895	-0.26568530
##	MA	0.8661899	-0.4800290	-0.47468290	0.48088537	0.40590030	-0.57690817
##		2018-07-20	2018-07-23	2018-07-24	2018-07-25	2018-07-26	2018-07-27
##	TWTR	-0.04879587	-0.11205358	-0.83800015	1.44875135	-0.9180844	-6.3029355
##	HPQ	-0.49378654	0.14214429	-0.13210749	0.50718063	0.2476127	-0.4350350
##	TEL	-0.38696732	-0.03446307	1.23520175	-0.04542363	0.1060438	-0.1802513
##	NOW	0.14018859	-0.19500055	-1.23147574	-0.29912965	1.7373750	-1.7900261
##	ORCL	0.04171803	0.11852058	-0.04636938	0.26049067	-0.1335436	-0.3083064
##	MA	0.09755882	0.20743089	0.34549752	0.98613936	-1.5590112	-1.0675365
##		2018-07-30	2018-07-31	2018-08-01	2018-08-02	2018-08-03	2018-08-06
##	TWTR	-2.485372	0.44177418	0.003555164	0.8355172	-0.8343879	0.93918867
##	HPQ	-0.276026	-0.07732381	-0.168346975	0.3241364	0.1943210	0.67891489
##	TEL	-0.451078	0.13993491	-0.534467444	-0.1223212	0.2787436	0.47338963
##	NOW	-1.176263	-0.70335169	0.367901736	1.0094758	-0.4977403	0.74789838
##	ORCL	-1.033483	-0.10224638	-0.415528124	0.5731793	0.5883352	0.17370521
##	MA	-1.239559	-0.02112266	0.715673101	0.1389681	-0.2428913	0.02796227
##		2018-08-07	2018-08-08	2018-08-09	2018-08-10	2018-08-13	2018-08-14
##	TWTR	-0.3215916	-0.810034064	0.08026603	0.01299567	0.71839811	0.3281042
##	HPQ	0.4013879	0.221686182	-0.14535940	-0.19795240	-0.37363145	0.5767566
##	TEL	0.4412134	-0.152494630	-0.60904331	-0.85436571	0.08138243	0.4388499
##	NOW	0.1550024	0.007307327	0.39236120	-0.25740123	-0.59028543	-0.1882700
##	ORCL	-0.2545792	-0.145396903	0.11897177	-0.28810163	-0.38857169	0.1980409
##	MA	0.2023089	0.003942203	0.12100880	-0.27407879	-0.13207070	0.3164299

##	2018-08-15	2018-08-16	2018-08-17	2018-08-20	2018-08-21	2018-08-22
## TWTR	-0.7794983	0.3893587	-0.12770032	-0.15595551	0.98559489	0.073953209
## HPQ	-0.2496668	0.1513240	0.65506820	-0.04095580	-0.12654546	-0.040955801
## TEL	-0.4435249	0.1193968	0.04764317	0.40852156	-0.12134221	-0.827459842
## NOW	-0.4512578	-0.2263364	-0.33513264	0.04005477	0.08533722	-0.008347456
## ORCL	-0.4776578	0.2434989	0.24193685	0.01979755	-0.05735953	0.383302383
## MA	-0.9007699	0.7450547	-0.14336540	0.30778016	-0.43761613	0.233122957
##	2018-08-23	2018-08-24	2018-08-27	2018-08-28	2018-08-29	2018-08-30
## TWTR	0.02843611	0.3255430	1.39850068	-0.37485479	-0.1551295	0.2156037
## HPQ	0.19916529	-0.8595645	0.27212926	0.23527769	0.9710084	-0.6271534
## TEL	-0.45570422	0.2729219	0.54317694	-0.09492397	-0.3093630	-0.3881852
## NOW	0.45157885	1.7809457	-0.13851190	0.13048845	1.1353367	-0.4256462
## ORCL	0.12851395	0.2804549	0.02943168	-0.79242720	0.2277677	-0.6027488
## MA	0.15931536	0.9155728	0.43103663	0.19478880	0.3812203	-0.2228763
##	2018-08-31	2018-09-04	2018-09-05	2018-09-06	2018-09-07	2018-09-10
## TWTR	-0.4286169	-0.32967501	-1.8829067	-1.8249020	-0.35169649	0.01529938
## HPQ	-0.1768395	0.23169362	-0.2610520	-0.0409558	0.01009713	-0.14294726
## TEL	0.1324870	-0.77757950	0.1063034	-0.6067376	0.36854554	0.42721034
## NOW	-0.4903294	0.70706809	-1.9443471	0.4243798	0.69955669	0.33059590
## ORCL	0.1741111	-0.04636938	-0.6392462	-0.4127653	0.06543268	1.12502611
## MA	0.3388519	0.22542912	-1.2928739	0.3099850	-0.42756746	0.07822872
##	2018-09-11	2018-09-12	2018-09-13	2018-09-14	2018-09-17	2018-09-18
## TWTR	0.31498421	-1.16096248	0.6217446	-0.305867630	-1.31133443	0.3459167
## HPQ	0.24866627	-0.17712244	0.6591287	0.009430125	-0.09128136	0.2109701
## TEL	-0.18503336	-0.12951763	0.5203619	-0.017846412	0.02092706	-1.2131164
## NOW	0.02158892	0.57034244	0.2762575	-0.385461764	-2.04555937	-0.2674768
## ORCL	0.01912043	0.41156322	-0.4571618	0.269564005	-0.12218122	-0.2090500
## MA	0.34727440	0.07678504	0.6559296	0.109552045	-0.37721519	0.7335722
##	2018-09-19	2018-09-20	2018-09-21	2018-09-24	2018-09-25	2018-09-26
## TWTR	0.2785676	0.3063953	-1.41489125	0.07233048	0.5094324	-0.1395781
## HPQ	0.1259960	0.6740949	0.18795099	0.02409270	-0.5443022	0.6328381
## TEL	1.2627561	0.2748006	-0.05099314	-1.15447139	-0.7135760	-0.2618500
## NOW	-1.2827064	0.2105328	0.41665333	0.63696683	0.8405602	-0.4542129
## ORCL	0.3887665	1.0326754	0.66225146	0.09976391	0.4532817	-0.1391846
## MA	-0.4540305	0.6446086	0.05713219	-0.17013906	0.1129627	-0.0223839
##	2018-09-27	2018-09-28	2018-10-01	2018-10-02	2018-10-03	2018-10-04
## TWTR	0.39654716	-1.03052802	-0.1955844	-0.16409617	0.85292954	-0.8552526
## HPQ	-0.59089094	0.18849054	-0.3180410	0.74662433	-0.07316828	0.5393137
## TEL	-0.55421150	-0.13235342	-0.6760524	0.00683909	-0.10437275	-0.4148861
## NOW	-0.20223723	0.03565992	-0.2808293	-0.42159100	0.59856368	-1.8344277
## ORCL	0.01560685	-0.18049810	0.2018930	-1.66295727	-0.55606718	-0.3465497
## MA	-0.04166445	0.01179056	0.1952913	-0.34966821	0.11006610	-1.5389065
##	2018-10-05	2018-10-08	2018-10-09	2018-10-10	2018-10-11	2018-10-12
## TWTR	0.1382134	0.02975129	0.8448172	-2.620363	0.2044653	1.0841955
## HPQ	-1.7580440	-0.58797578	-0.1081333	-1.235329	-2.2052632	1.1638750
## TEL	-1.2024922	-0.16079028	-1.0146015	-0.965773	-1.4355268	0.1215802
## NOW	-0.2519697	-1.41398932	0.1759274	-2.088596	0.5722777	2.0591463
## ORCL	-0.1757569	-0.03556336	-0.5758456	-1.650736	-0.7440447	0.6377498
## MA	-0.6334335	-1.16649948	0.2899301	-3.013372	-0.5790348	2.3199313
##	2018-10-15	2018-10-16	2018-10-17	2018-10-18	2018-10-19	2018-10-22
## TWTR	0.6412212	1.3092209	-0.3616739	-0.3032476	-0.51400940	0.33572992
## HPQ	-0.2361592	0.6721972	-0.1987280	-0.2169438	0.08275038	0.43476683
## TEL	-0.2268725	0.8912201	-0.3638934	-0.6407893	-0.72558114	-0.08591243
## NOW	-0.8315301	2.4964685	-0.5783056	-1.1273297	-1.78379922	0.30043111

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## ORCL -0.1255061 1.2100931 -0.4555449 -0.5812921 0.19002197 0.34589832
## MA -0.9598598 1.7173619 -0.1438309 -0.9139493 -0.18303976 0.28465035
##      2018-10-23 2018-10-24 2018-10-25 2018-10-26 2018-10-29 2018-10-30
## TWTR -0.463524853 -1.339415 4.6856794 0.5026554 -0.006456063 1.3502320
## HPQ -0.337120618 -1.585005 1.2887797 -1.2062957 -0.240708358 1.1451002
## TEL -0.538724787 -1.743136 1.1050482 -0.6837554 0.516914593 1.6327797
## NOW 0.572245120 -2.582974 0.4847216 -1.4150506 -0.673127923 0.9489149
## ORCL 0.009264788 -1.413425 1.3224209 -0.7581196 -0.384512161 1.7118699
## MA -0.533361150 -1.634584 2.0142130 -1.6138913 -1.604379350 -0.8757108
##      2018-10-31 2018-11-01 2018-11-02 2018-11-05 2018-11-06 2018-11-07
## TWTR 0.7673727 -0.1489087 -0.31681625 -0.28385910 0.3240604 0.4706169
## HPQ 0.7931139 0.5680615 0.19915965 -0.02389375 0.3681845 0.9551375
## TEL -1.8286370 1.1936372 0.08503623 0.76753875 -0.2145075 1.1467402
## NOW 2.8565682 0.5099709 -1.13683926 0.28378306 -0.7392779 2.9142961
## ORCL 0.2501295 -0.3193841 0.21707601 0.16115641 0.2038989 1.0474391
## MA 2.4638223 0.4380939 -0.52587181 0.01014956 0.2284855 2.1167070
##      2018-11-08 2018-11-09 2018-11-12 2018-11-13 2018-11-14 2018-11-15
## TWTR -0.741189184 -0.1240253 -1.888308 0.42286411 0.3597422 0.1878023
## HPQ 0.008523816 -0.8645808 -1.737957 -0.11098365 -0.4268099 0.7379031
## TEL -0.001985697 -0.7745770 -1.627011 0.06610346 -0.5297733 0.4611860
## NOW -1.039541861 -1.8890879 -1.233435 -0.92109070 -0.3767251 1.2403308
## ORCL 0.134044351 0.1440109 -1.511271 0.26787759 -0.7681531 1.9084598
## MA 0.089156107 -0.7895386 -1.549951 -0.28381971 -0.1938279 0.7004703
##      2018-11-16 2018-11-19 2018-11-20 2018-11-21 2018-11-23 2018-11-26
## TWTR 0.44394229 -1.566463 -0.91264601 0.50563380 -0.5077953 1.6322897
## HPQ -0.05833869 -1.101520 -1.71757742 0.05193466 -0.3190123 0.5188629
## TEL 0.50262387 -2.023940 -0.18310451 0.76417563 -0.1618015 0.2787731
## NOW -0.50362067 -3.365988 0.03513845 0.40063568 0.2934544 1.5506963
## ORCL 0.52249409 -1.734981 -1.35961038 0.27367266 0.0413908 -0.5282616
## MA -0.44774327 -2.382566 -0.60970268 0.10007975 -1.3336907 2.3549460
##      2018-11-27 2018-11-28 2018-11-29 2018-11-30 2018-12-03 2018-12-04
## TWTR -0.2300056 0.07755034 -1.3680393 0.1115023 2.1096609 -1.032018
## HPQ -0.1882815 1.25264096 -1.0628300 0.2162807 1.6940361 -1.286200
## TEL -1.0241094 1.34154844 -0.2273884 0.7861046 0.5547870 -2.430894
## NOW -0.4334396 2.80793378 0.1970246 1.2818151 0.5242474 -1.591894
## ORCL -0.9526393 0.79685404 -0.3673331 0.9112508 1.1240654 -1.202369
## MA 0.2275598 2.23776825 -1.3726367 1.0132929 2.0250966 -2.174104
##      2018-12-06 2018-12-07 2018-12-10 2018-12-11 2018-12-12 2018-12-13
## TWTR 0.3401493 -0.1551051 0.5229726 0.8963624 1.5597332 -0.33780706
## HPQ 1.3688527 -1.9470932 -0.0409558 -0.7370793 0.2592147 -0.52526569
## TEL 1.0087623 -1.6317664 0.4869108 -0.2046889 0.5864821 -0.84249861
## NOW 1.3950318 -1.1716455 0.4689440 -0.3907614 0.8310059 0.03166397
## ORCL -2.3111538 -0.8233490 0.7305029 -0.2863788 0.9409366 -0.14781747
## MA 0.5402073 -1.5716904 0.3249172 -0.1291172 0.5604725 -0.36790475
##      2018-12-14 2018-12-17 2018-12-18 2018-12-19 2018-12-20 2018-12-21
## TWTR -0.05175079 -2.1105853 0.24824003 -0.76736153 -3.4079690 -2.0976627
## HPQ -0.56860866 -1.1669339 -0.06056385 -1.72821614 -1.0220946 -0.9199724
## TEL -0.44078239 -0.7295182 0.75781950 -0.63782911 -0.5183270 0.2369258
## NOW -1.36736274 -2.3507376 0.40708398 0.03126277 -1.0080501 -1.9117195
## ORCL -0.75783413 -1.0421434 0.09358459 0.65161840 -0.2875022 -2.6301868
## MA -0.91936367 -1.2395811 0.23710284 -1.16591851 -1.1723131 -2.0082222
##      2018-12-24 2018-12-26 2018-12-27 2018-12-28 2018-12-31 2019-01-02
## TWTR -0.9957186 2.515031 -0.01344960 -0.3007543 0.2980067 0.03958081
## HPQ -0.6181321 2.018113 0.06235007 -0.1233950 0.2068504 0.30805795

```

##	TEL	-0.9369486	1.699791	1.39893338	-0.3509841	0.5585293	-0.30218642
##	NOW	-0.8244466	2.549900	1.94429327	0.3954939	-0.5735314	-0.01567137
##	ORCL	-1.6343656	2.327500	0.40818567	-0.2242759	0.3463334	0.03632795
##	MA	-0.1988267	3.152918	0.52374348	-0.6895284	0.5832805	0.22222884
##		2019-01-03	2019-01-04	2019-01-07	2019-01-08	2019-01-09	2019-01-10
##	TWTR	-0.9033169	2.102179	1.3815483	0.4131677	0.3970940	0.760104835
##	HPQ	-1.4662200	1.624054	0.4253238	0.4803418	-0.0409558	0.473953800
##	TEL	-1.9388243	1.293709	0.9654595	-0.2076957	0.9828936	0.652673702
##	NOW	-2.1080174	2.279744	1.5599942	0.2285005	0.4188549	-0.172630773
##	ORCL	-0.5653552	2.252444	0.7986298	0.4369750	-0.1577771	-0.001708983
##	MA	-2.1962395	2.198075	0.3132912	0.2936878	0.8101924	0.234092306
##		2019-01-11	2019-01-14	2019-01-15	2019-01-16	2019-01-17	2019-01-18
##	TWTR	-0.2376365	-0.4989460	0.57803817	-0.54304558	0.3223907	0.3554228
##	HPQ	-0.6278903	-0.7949356	0.40353586	0.03900697	0.3182372	0.9878999
##	TEL	0.1812648	-0.5584100	-0.26260407	0.72932246	0.7632096	0.9292712
##	NOW	0.2750120	-0.7515940	-0.08586829	0.18395305	-0.7112871	0.6764935
##	ORCL	0.4778571	-0.1678688	0.38710169	-0.39916373	0.5307283	0.7111927
##	MA	-0.3056986	-0.1663719	0.21270994	0.24992552	0.3176979	0.5890184
##		2019-01-22	2019-01-23	2019-01-24	2019-01-25	2019-01-28	2019-01-29
##	TWTR	-0.9703296	-1.2459461	0.59588646	1.2106327	0.1785916	-1.40720937
##	HPQ	-0.8713993	0.1954772	0.60556046	0.5957840	-0.2690399	-0.23205970
##	TEL	-1.1475921	-2.2661298	1.80636895	0.8572831	-0.2303073	-0.74041209
##	NOW	-0.9852640	-0.4445618	0.29722315	1.0659771	-0.7228238	-0.72944675
##	ORCL	-0.4036098	0.2805841	-0.08969119	0.6040751	-0.3462560	0.05058024
##	MA	-0.6498861	-0.3167991	0.29265193	0.6969038	-0.7033295	-0.27076342
##		2019-01-30	2019-01-31	2019-02-01	2019-02-04	2019-02-05	2019-02-06
##	TWTR	0.5632396	1.1950014	-0.3711930	0.6548427	0.3518819	-0.22119988
##	HPQ	0.5733805	-0.3626143	0.3975819	0.5062721	0.4247348	0.45647303
##	TEL	0.9413278	0.3906828	0.2237906	-0.2899385	0.4497671	0.73116360
##	NOW	1.8814346	5.2086691	0.1913847	0.5702062	0.4863017	-0.55677346
##	ORCL	0.7599656	-0.1840602	0.5695203	0.1845725	0.1731268	-0.02555834
##	MA	1.0877434	1.6037552	0.5418693	0.2010738	0.1577148	-0.17562773
##		2019-02-07	2019-02-08	2019-02-11	2019-02-12	2019-02-13	2019-02-14
##	TWTR	-3.0363752	-0.81747424	0.188968378	0.12677052	0.69829703	-0.19164463
##	HPQ	-0.4233068	0.06928767	-0.150910690	0.85940356	-0.09492979	-0.20306014
##	TEL	-1.2836565	-0.38539480	-0.248675772	0.82344179	-0.15238081	-0.29029207
##	NOW	0.1691153	0.20232098	0.002151277	0.89484616	-0.52537852	0.27444875
##	ORCL	-1.1285154	0.81391652	0.162671320	-0.05677858	0.16190028	0.01586269
##	MA	-0.3459054	0.52732088	0.061750325	0.34385044	0.30149336	-0.20964383
##		2019-02-15	2019-02-19	2019-02-20	2019-02-21	2019-02-22	2019-02-25
##	TWTR	0.23138863	0.37566009	-0.30471697	-0.62815077	0.9077355	0.23471772
##	HPQ	0.04945351	-0.09508408	0.19391141	-0.02298955	0.5875822	0.25984092
##	TEL	0.76482603	-0.02143340	0.33741459	0.03408130	0.5087394	0.39307095
##	NOW	0.06935905	-0.12740956	-0.92858789	0.01213312	0.7792941	0.25987925
##	ORCL	0.20228958	0.26301442	-0.30270686	0.30392900	0.3323372	0.03493791
##	MA	0.44489662	-0.37755405	0.05967975	-0.43920756	0.8165664	-0.05234512
##		2019-02-26	2019-02-27	2019-02-28	2019-03-01	2019-03-04	2019-03-05
##	TWTR	-0.969607068	-0.62519787	0.33655238	-0.1933758	-0.1543408	0.4955436
##	HPQ	-0.058525754	-0.12882869	-7.29714155	-0.3177206	-0.1909740	-0.4065939
##	TEL	-0.408956408	-0.62490136	-0.28654895	0.6227032	-0.1928645	-0.2730352
##	NOW	-0.206737553	0.60841578	-0.21804465	0.5959021	-1.1350859	-0.2366811
##	ORCL	-0.005775471	-0.26944791	-0.30094509	0.3424300	-0.5237725	0.2816129
##	MA	0.092356717	0.06858426	-0.01003629	0.4719898	-0.2530980	-0.0670545
##		2019-03-06	2019-03-07	2019-03-08	2019-03-11	2019-03-12	2019-03-13

##	TWTR	-0.26094145	-0.70848552	-0.115798465	0.8084221	0.25193355	0.1023629
##	HPQ	-0.64846276	-0.61335476	-0.219513446	0.6314920	0.35950482	1.1711519
##	TEL	-0.58827749	-0.36386282	0.003861785	1.0057682	-0.23636409	0.5020479
##	NOW	-0.55786230	-0.03147444	0.022499755	0.9198272	-0.26430200	0.2018535
##	ORCL	-0.05656253	0.18797388	0.146362814	-0.1575515	0.09542988	0.2162821
##	MA	-0.41995014	-0.48845767	-0.167730262	0.7551357	0.22144230	0.2743190
##		2019-03-14	2019-03-15	2019-03-18	2019-03-19	2019-03-20	2019-03-21
##	TWTR	-0.29798516	0.15210902	-0.17158978	0.15181039	1.23393189	0.002733882
##	HPQ	0.02330188	0.60067009	-0.01988874	0.06431282	-0.06195736	0.442335444
##	TEL	-0.11924937	0.21026653	-0.25869177	0.03929274	-0.54556573	0.716729538
##	NOW	0.12125026	-0.02649236	-0.22362902	0.08480392	0.35281229	0.949015622
##	ORCL	-0.05642488	-0.15696463	0.47753584	0.53230033	-1.42816666	1.372177942
##	MA	0.15771052	0.29136170	-0.21268210	0.07553618	-0.28274982	1.183803993
##		2019-03-22	2019-03-25	2019-03-26	2019-03-27	2019-03-28	2019-03-29
##	TWTR	0.3489334	-0.432144396	0.4053535	-0.7547385	0.5230235	-0.02545931
##	HPQ	-1.8690508	-0.844567032	0.3133261	-0.4801037	0.1143696	0.90968214
##	TEL	-1.3615525	-0.419655670	0.7061861	-0.6271002	-0.8590443	0.43022443
##	NOW	-1.6045134	0.004615488	0.4624852	-0.6591360	0.2445027	0.43621482
##	ORCL	-1.2998606	-0.076687791	0.4997460	-0.5168731	0.3374205	0.47507236
##	MA	-1.0818734	-0.122358541	0.5395605	-0.2091958	0.4258858	0.06703635
##		2019-04-01	2019-04-02	2019-04-03	2019-04-04	2019-04-05	2019-04-08
##	TWTR	0.4849998	0.24815450	0.53489823	0.0007571745	0.231235674	0.08830547
##	HPQ	1.2993888	-0.73229956	0.02294344	-0.0196860677	0.022818768	0.27742198
##	TEL	1.7922064	0.36107916	0.80415434	0.2446817563	0.001271236	0.19572859
##	NOW	-0.1968892	0.09934280	-0.02433839	-1.6870705957	-0.083726166	-0.03717658
##	ORCL	0.8175918	-0.46658323	-0.13500872	-0.2831736132	0.062651958	-0.25406149
##	MA	0.6742502	-0.01060012	-0.11788636	-0.6231626571	0.062399788	-0.05837814
##		2019-04-09	2019-04-10	2019-04-11	2019-04-12	2019-04-15	2019-04-16
##	TWTR	0.21036602	-0.3734313	-0.1840331	-0.2200711	0.26713529	-0.25454181
##	HPQ	-0.77825203	0.7738317	-0.1040505	0.5278109	-0.06173685	0.72844003
##	TEL	-0.84367957	0.4249033	0.4443126	0.5743096	-0.26546724	0.59872181
##	NOW	0.18201506	0.7331210	0.2657482	-0.3110572	-0.15766196	-0.71859246
##	ORCL	0.06284232	0.3318497	-0.2242702	0.6576593	0.08085481	-0.08542631
##	MA	-0.12475995	0.1793116	-0.2568135	0.5093596	0.01132662	0.13444202
##		2019-04-17	2019-04-18	2019-04-22	2019-04-23	2019-04-24	2019-04-25
##	TWTR	-0.0170330	-1.055475e-01	-0.04361893	4.73929217	-0.4030610	-0.663873354
##	HPQ	-0.1838975	2.734312e-05	-1.35105709	0.40276922	-0.5009338	-0.611735333
##	TEL	0.1664300	1.941531e-01	-0.49483136	0.63688455	3.3679862	-0.209785062
##	NOW	-0.6635542	1.197105e-01	0.79417602	0.07234086	-0.2129136	2.844872421
##	ORCL	-0.1538467	-7.204910e-03	0.05146122	0.26611868	0.1866295	-0.210694397
##	MA	0.1277759	-7.403899e-02	0.37376201	0.03368895	0.2989533	0.009649745
##		2019-04-26	2019-04-29	2019-04-30	2019-05-01	2019-05-02	2019-05-03
##	TWTR	0.1159327	0.84121596	0.06498292	-0.50881781	0.47787714	0.61454185
##	HPQ	-0.4481475	0.50005427	0.57865499	-0.08305954	0.19087958	0.48304878
##	TEL	-0.5723362	-0.20140581	0.73712224	-0.69913058	0.01384242	0.57326101
##	NOW	0.8902790	0.60461023	-0.10151529	-0.23648244	-1.20166780	0.80200522
##	ORCL	0.3414633	-0.36402267	0.19571442	-0.48015220	-0.31850205	0.13923888
##	MA	0.1546742	0.03435421	1.31484887	-1.07850684	-0.35036660	0.09375719
##		2019-05-06	2019-05-07	2019-05-08	2019-05-09	2019-05-10	2019-05-13
##	TWTR	-0.46107878	-1.2560153	-6.634981e-02	0.13136284	-0.30222729	-1.510970
##	HPQ	-0.45499257	-1.0445624	-2.123120e-01	-0.55714421	-0.41114224	-1.908331
##	TEL	-1.04996077	-0.9619414	-5.426438e-01	-0.17946225	-0.02883293	-1.589161
##	NOW	0.10505135	-0.7969042	9.865349e-02	0.59260514	0.56690555	-2.193600
##	ORCL	0.01204749	-0.8729315	-5.624520e-02	0.21047944	0.34690375	-1.237059

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## MA      0.07989784 -0.7365692  1.114766e-05 -0.05621417  0.35833386 -1.214301
##      2019-05-14 2019-05-15 2019-05-16 2019-05-17 2019-05-20 2019-05-21
## TWTR 0.24881949  0.7668017  0.28732693 -0.6721661 -0.3195648  0.2281154
## HPQ  0.02801735  0.9460403  0.43000849  0.1364645 -0.1734699  1.0224629
## TEL  0.43876609  0.4800066  0.20888290 -0.4790821 -0.8065774  0.5826333
## NOW  1.73450209  0.1982640  0.49980884 -0.7798458 -1.2169627  0.8356469
## ORCL 0.65241115  0.3773381  0.03183751 -0.1830349 -0.8684515  0.4605647
## MA      0.84540262  0.5678858  0.76209031 -0.2154805  0.1245313  0.2982164
##      2019-05-22 2019-05-23 2019-05-24 2019-05-28 2019-05-29 2019-05-30
## TWTR 0.86926909 -1.13422968  0.14577847 -0.1326323 -0.39482507  0.20541315
## HPQ -0.55952695 -0.06283963  1.79772196 -0.8168908 -1.45108604  0.26855779
## TEL -0.51842389 -0.75667281 -0.07518522 -0.2629263 -0.06357528  0.31956353
## NOW  0.24126421 -1.31472581  0.54353573 -0.4123327 -0.43887476 -0.31252176
## ORCL -0.01682871 -1.14853932 -0.35787448 -1.0773361 -0.10821032 -0.01540273
## MA      0.23424518 -1.37865419  0.28066913  0.3161392 -0.02796720  0.06571849
##      2019-05-31 2019-06-03 2019-06-04 2019-06-05 2019-06-06 2019-06-07
## TWTR -0.6099093 -1.71801255  1.445435  0.15968507  0.1836486  1.08283324
## HPQ -1.0504806 -0.08592701  1.602322  0.32731198  0.1737935  0.06588207
## TEL -1.5794424  0.58171304  1.653536  0.24276429  0.5740756  0.66881029
## NOW -0.1759351 -2.11347891  1.379093  0.79650831  0.7087837  0.81380339
## ORCL -1.2013942 -0.42584338  1.843360  0.03566477  0.4552565  0.63315188
## MA      -0.5571057 -1.79643819  1.305068  1.29788574  0.2387903  1.41663043
##      2019-06-10 2019-06-11 2019-06-12 2019-06-13 2019-06-14 2019-06-17
## TWTR -0.268065343 -0.3833669  0.19489012 -0.97083765 -0.1942963  0.21006011
## HPQ  0.321328283  0.2572637  0.08594695  0.10664648 -0.2090561 -0.06205736
## TEL  0.295545612 -0.1511410  0.27180743  0.09280169 -0.8403629 -0.15218293
## NOW  0.114001881 -1.4435361  0.15982170  0.79376861 -0.2970151  0.25886292
## ORCL 0.704723639 -0.1155070 -0.36279376  0.17247803 -0.6011511 -0.19652426
## MA      0.001294929 -0.4881042 -0.01808794 -0.52962489 -0.2524774 -0.21679157
##      2019-06-18 2019-06-19 2019-06-20 2019-06-21 2019-06-24 2019-06-25
## TWTR 0.1411212 -0.3344994 -0.7495189 -0.3963966  0.4532427 -0.7723583
## HPQ  1.2677431  0.1842210  0.4273394 -0.3631324 -0.1221253 -0.1629535
## TEL  1.2245848  0.3274261  1.3538254 -0.4374614 -0.1414974 -0.3557723
## NOW  1.0840004  0.3246324  0.3785639 -0.4928493 -0.5221365 -1.0711524
## ORCL -0.2772611 -0.2681912  4.3174058 -0.8606081  0.5428826 -0.6761861
## MA      -0.1238425  0.1422891  1.2130945 -0.4656028  0.0967990 -1.0500552
##      2019-06-26 2019-06-27 2019-06-28 2019-07-01 2019-07-02 2019-07-03
## TWTR 0.40472144 -0.44198012  0.09698275  0.9970469  0.08366635 -0.2032527
## HPQ  0.34647358 -0.14198445  0.06031643  0.3631280  0.09912223  0.1584980
## TEL  0.36388394 -0.04001153  0.29124503  0.7933814 -0.69806179 -0.1722976
## NOW -0.07827502  0.37816708 -0.63275462  1.2073545  0.59160029  0.5859624
## ORCL 0.51487243  0.05718534  0.14153705  0.9273132  0.36737981  0.3185793
## MA      0.23490923 -0.08871533  0.57192692  0.3500573  0.62456346  0.3884891
##      2019-07-05 2019-07-08 2019-07-09 2019-07-10 2019-07-11 2019-07-12
## TWTR 0.1601135  0.1336229  0.9699161 -0.18064190 -0.2464977  0.4819295
## HPQ -0.0409558 -0.8746999 -0.2637286 -0.12240511  0.4894588  0.7245923
## TEL -0.2787264 -0.6742791 -0.1533497 -0.16983814 -0.6148652  0.9198996
## NOW  0.1100469 -0.2800717  0.5995779  0.02108952  0.3940528 -0.2291920
## ORCL 0.3342218  0.1785665  0.0163470  0.44584522 -0.1882507 -0.2064076
## MA      -0.2159107 -0.1537435  0.3173300  0.30231973  0.4549968  0.1559613
##      2019-07-15 2019-07-16 2019-07-17 2019-07-18 2019-07-19 2019-07-22
## TWTR 0.64268381 -0.5791187 -0.26769683 -0.06712430 -0.75592790 0.637500594
## HPQ  0.19648216 -0.1196541 -0.29720254  0.35568300 -0.02130723 0.057234679
## TEL -0.53530309 -1.9264785 -1.07322880  0.26542360 -0.06292273 0.395560765

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##	NOW	-0.07933989	-0.8081415	0.06590752	-0.32516799	-0.73586619	0.477999896
##	ORCL	-0.29607078	-0.6580917	-0.61059309	0.07319701	-0.57863282	0.009238774
##	MA	-0.08124404	-0.5201180	-0.28254776	0.20659308	-0.25493894	0.466654048
##		2019-07-23	2019-07-24	2019-07-25	2019-07-26	2019-07-29	2019-07-30
##	TWTR	0.225108457	0.63355785	-0.5153838	2.6870898	-0.04944487	-0.40241461
##	HPQ	0.331290151	-0.15747401	-0.5083293	0.3332142	-0.07999515	0.03719553
##	TEL	0.943081166	0.06034114	0.2771261	0.8999711	0.15543458	-0.39694900
##	NOW	-0.450866472	0.76394154	-1.5971599	0.4209576	-0.55063537	-0.74250767
##	ORCL	-0.185268224	0.56639327	0.1188350	0.1457961	-0.44753951	-0.57000868
##	MA	0.009061749	0.16570510	-0.2049613	0.4103537	-0.15847726	-0.60617080
##		2019-07-31	2019-08-01	2019-08-02	2019-08-05	2019-08-06	2019-08-07
##	TWTR	0.9402970	-0.2006345	0.52365858	-1.800931	0.6833813	0.2680571
##	HPQ	-1.0160014	-0.1407797	-1.74196037	-2.084892	0.1563540	-0.3900757
##	TEL	-0.5574192	-0.8213593	-0.41442663	-1.520638	0.4992627	0.1206534
##	NOW	-0.5815464	-0.5568914	-1.24582703	-1.416509	0.6762902	-0.2289614
##	ORCL	-1.1504056	-0.4442692	-0.08454743	-2.033146	0.1520579	-0.6592120
##	MA	-1.0586015	0.2775329	-0.86874740	-2.276295	1.3982260	0.7789435
##		2019-08-08	2019-08-09	2019-08-12	2019-08-13	2019-08-14	2019-08-15
##	TWTR	0.2138920	-0.4264489	-0.8062925	0.9678996	-0.8814130	-0.45514704
##	HPQ	0.9272003	-0.5786561	-0.8688578	1.3814425	-0.5998796	-1.45710067
##	TEL	0.7206945	-0.2936054	-0.9461787	0.8883774	-1.0536925	-0.44448709
##	NOW	0.8948125	-0.5606667	-0.8594144	0.4761464	-1.5600002	-0.07853879
##	ORCL	1.2635646	-0.7783512	-0.6895841	0.6748150	-1.6770276	0.22887838
##	MA	1.4881136	-0.5804760	-0.9078847	0.7449508	-1.3298274	0.79082616
##		2019-08-16	2019-08-19	2019-08-20	2019-08-21	2019-08-22	2019-08-23
##	TWTR	0.3382450	0.8075052	0.3970239	0.33327056	-0.47680684	-0.8884565
##	HPQ	0.9736595	0.2452377	-0.6969370	0.07010726	-0.10742033	-2.5261813
##	TEL	1.5326105	0.4797764	-0.4930173	0.38320932	0.15124161	-0.8469538
##	NOW	0.6460363	-0.2901061	-0.1108782	1.54503854	-0.24439714	-0.3091429
##	ORCL	0.9678288	0.2323178	-0.9275629	0.21537567	-0.09645993	-1.6608233
##	MA	0.3793572	0.5902686	-0.2283909	0.80018634	-0.26130575	-1.5553059
##		2019-08-26	2019-08-27	2019-08-28	2019-08-29	2019-08-30	2019-09-03
##	TWTR	0.29274890	0.48073732	-0.3678631	0.5583085	0.08016774	-0.5284502
##	HPQ	0.02979521	-0.29996479	0.1012003	0.6673911	0.42344405	-0.3624865
##	TEL	-0.23361246	0.36581500	-0.3122021	1.4707821	-0.37774630	-1.2494781
##	NOW	0.44874120	-0.12862281	-0.9470886	0.6010794	-0.51433617	0.1562984
##	ORCL	0.52236253	0.21965214	-0.4943134	0.1692309	-0.14861728	-0.2205518
##	MA	0.74115593	-0.01624059	0.2224999	0.4839441	-0.05403891	-0.2651477
##		2019-09-04	2019-09-05	2019-09-06	2019-09-09	2019-09-10	2019-09-11
##	TWTR	0.9834448	1.3306162	0.04609273	-0.81412023	-0.7311227	-0.0347451797
##	HPQ	0.4450668	1.2173501	0.38108383	-0.23887109	0.2710092	0.1138875324
##	TEL	1.0390616	1.9558928	0.14289135	0.08863498	0.3182254	0.0821065827
##	NOW	0.6934375	0.0859771	-0.96967358	-1.39413454	-0.3074539	0.0008340912
##	ORCL	1.0637627	0.8296584	-0.72002202	1.33823586	0.8631201	0.7420986117
##	MA	0.9638785	0.9409206	-0.16622143	-1.36034430	-1.9021359	-0.4676535677
##		2019-09-12	2019-09-13	2019-09-16	2019-09-17	2019-09-18	2019-09-19
##	TWTR	-0.07002374	-0.4373943	0.0583128	0.3078197	-0.03474518	-0.25352860
##	HPQ	-0.72414511	0.6983293	-0.5032660	-0.0409558	-0.39713441	0.04885582
##	TEL	0.49494545	-0.2024975	-0.8760819	-0.3340437	0.05677526	-0.22786663
##	NOW	0.41225333	-0.8194496	1.3615539	0.3620780	0.19315323	0.35286004
##	ORCL	-2.32047464	-0.1849279	-0.6516882	-0.3173698	-0.35911383	0.77561622
##	MA	1.08309162	-0.0660807	-0.4375897	0.3239029	-0.25017332	0.08756854
##		2019-09-20	2019-09-23	2019-09-24	2019-09-25	2019-09-26	2019-09-27
##	TWTR	0.17850823	0.07114228	-1.4135500	0.7609562	-0.07782810	-0.81851250

##	HPQ	-0.66822558	0.07275763	-0.8801525	0.5607689	-0.01813949	0.20988247
##	TEL	-0.68644279	-0.91848536	-0.1455054	0.6721583	0.19592444	-0.24755431
##	NOW	0.28082450	-0.68125775	-1.4771841	0.2122226	-0.28654371	-1.25584569
##	ORCL	0.05357289	0.50225533	-0.7078944	0.4435097	0.07250550	0.08213406
##	MA	-0.86873562	0.29464003	-0.4055011	0.2333530	0.14626880	-0.87822052
##		2019-09-30	2019-10-01	2019-10-02	2019-10-03	2019-10-04	2019-10-07
##	TWTR	-0.1454439	-0.7384045	-0.4517409	0.1958578	0.2399047	0.2979413
##	HPQ	0.8431278	-0.7736030	-0.0409558	-0.4702683	-4.0588218	0.3629342
##	TEL	0.2177441	-0.9403136	-1.4397913	0.1598971	0.2615407	-0.8262069
##	NOW	0.4897410	-0.6527529	-0.5920361	1.6035677	1.3191068	0.1714795
##	ORCL	0.8805403	-1.2385311	-0.6907757	0.6661304	1.2212128	-0.3752591
##	MA	0.3784829	-0.1625808	-1.1853867	0.6322384	0.9696624	-0.3766067
##		2019-10-08	2019-10-09	2019-10-10	2019-10-11	2019-10-14	2019-10-15
##	TWTR	-0.8574942	-0.1884818	-0.003841558	0.5981223	-0.4732900	0.3488215
##	HPQ	-1.2910974	0.2167510	-0.988628639	0.5093287	0.7349984	0.6447255
##	TEL	-1.7462418	0.9051397	0.514400686	1.1607651	0.1122590	0.8596532
##	NOW	-1.5475701	0.5182936	0.099002043	0.9949129	-0.2051189	0.6264315
##	ORCL	-0.7763477	0.6672946	0.892641130	1.2993164	-0.4495125	-0.1502946
##	MA	-0.8896260	0.8675766	0.225195084	0.3086224	0.0286129	0.3224830
##		2019-10-16	2019-10-17	2019-10-18	2019-10-21	2019-10-22	2019-10-23
##	TWTR	-0.3150604	-0.2641348	-0.5124083	0.8261975	-1.00908218	-0.01901826
##	HPQ	0.5337792	-0.2381696	-0.3133875	0.3329664	0.25555431	-0.04095580
##	TEL	0.3025521	0.1575617	-0.1438879	0.4858853	0.04132496	-0.24572864
##	NOW	-2.8968786	-0.1202913	-1.8275325	-0.4158847	-2.12949286	-1.51264804
##	ORCL	-0.4912329	-0.8290542	-0.5404187	0.5207405	-1.03319833	-0.02665726
##	MA	-0.1018217	-0.3529038	-1.0628848	0.5920927	-2.31145832	-0.12693346
##		2019-10-24	2019-10-25	2019-10-28	2019-10-29	2019-10-30	2019-10-31
##	TWTR	-6.3848322	-0.48133002	-0.2764605	-0.2479337	-0.024520853	0.07767146
##	HPQ	-0.0409558	0.47429044	0.6861908	-0.1124280	0.006776963	-0.63694068
##	TEL	0.1447886	0.07913997	0.2085377	-0.1099181	-2.344416505	-0.40659794
##	NOW	3.1066511	0.49454897	0.4929528	-0.6646815	1.380891752	-0.49941286
##	ORCL	0.0817249	-0.13483844	0.4164134	0.1098020	0.002307153	-0.39644615
##	MA	1.3868590	0.20229682	0.9571889	-0.3347780	0.443149473	-0.11062907
##		2019-11-01	2019-11-04	2019-11-05	2019-11-06	2019-11-07	2019-11-08
##	TWTR	-0.3911261	0.4082683	-0.27847148	-0.31114274	-0.540946142	0.13333228
##	HPQ	0.9505175	0.4787942	0.89248752	2.62999635	-0.427303596	0.24067681
##	TEL	1.1074862	1.5876969	0.01921761	-0.37337338	-0.002129406	-0.09949246
##	NOW	0.8439465	-1.2011345	-0.70692281	-0.15848926	-0.150504946	1.16100772
##	ORCL	0.4528409	0.3900244	0.16524704	-0.01762428	0.221756478	0.43954961
##	MA	0.3321918	-0.5155483	-1.31290123	0.09957941	0.463619981	0.31347761
##		2019-11-11	2019-11-12	2019-11-13	2019-11-14	2019-11-15	2019-11-18
##	TWTR	0.1010708	-0.33637551	-0.003229605	-0.23413230	0.34552459	0.21564713
##	HPQ	0.2172660	-0.27621247	-0.040955801	1.24950816	0.06338038	-0.39480994
##	TEL	-0.1862094	-0.28436882	0.210983194	-0.44180305	0.06944588	-0.39498616
##	NOW	-0.0595570	0.55544486	0.144558805	-0.08937737	0.87284410	0.88693211
##	ORCL	-0.1030182	0.10486686	-0.404531408	-0.16023828	0.26743137	-0.26379766
##	MA	0.3124201	-0.02832408	0.107118836	0.21425128	0.14309114	-0.03880881
##		2019-11-19	2019-11-20	2019-11-21	2019-11-22	2019-11-25	2019-11-26
##	TWTR	-0.08648467	-0.31461958	0.61387668	0.2111083	0.4835181	0.38493049
##	HPQ	0.16897021	-0.89735137	-0.14756936	0.5789698	0.4014220	-0.22857944
##	TEL	0.04248170	-0.46277590	-0.32937020	-0.1855190	1.3855332	0.05279759
##	NOW	1.61550293	0.67071104	-0.61555959	0.0459740	-0.1077808	-0.20075557
##	ORCL	0.02957123	-0.07480798	-0.05585463	0.1054018	0.1144292	-0.09352435
##	MA	0.70059657	-0.04068712	-0.20719952	-0.3664342	0.7952525	0.24011837

##	2019-11-27	2019-11-29	2019-12-02	2019-12-03	2019-12-04	2019-12-05
## TWTR	0.17224800	-0.28929463	-0.5185082	-0.48617463	-0.00419705	0.005944588
## HPQ	-0.60632273	0.57457280	-0.5639222	-0.46460977	0.83637867	0.545940395
## TEL	0.01993647	-0.42102380	-0.9997059	-0.80578588	0.47641586	0.325152271
## NOW	0.26648229	0.17109822	-0.8674216	0.16038558	-0.81108650	-0.171818965
## ORCL	0.04802007	-0.48920434	-0.7209197	-0.85465105	-0.22224602	0.218306122
## MA	0.32863259	0.03400161	-0.9890130	0.05049672	-0.09372460	0.446331906
##	2019-12-06	2019-12-09	2019-12-10	2019-12-11	2019-12-12	2019-12-13
## TWTR	0.11763446	-0.01453086	-0.40849884	0.691351645	-0.2844716	0.05589808
## HPQ	0.33112757	-0.10242630	-0.23551265	-0.311289457	0.7124987	-0.20543313
## TEL	0.51778079	-0.36553742	-0.05667278	0.859857519	0.6695358	-0.28224088
## NOW	-0.23263937	-0.41429563	-0.50196311	0.001374959	-0.3186061	1.01165931
## ORCL	0.09995937	0.42055571	0.44543181	0.421854149	0.1051664	-1.89763073
## MA	0.03782704	-0.27162663	-0.12632174	0.184748852	0.3015556	0.57864879
##	2019-12-16	2019-12-17	2019-12-18	2019-12-19	2019-12-20	2019-12-23
## TWTR	0.54767032	-0.30079010	0.939398153	0.30240023	0.06053167	0.25018909
## HPQ	0.30993940	-0.34800449	-0.123442217	-0.10294345	0.49704372	-0.04095580
## TEL	0.61445526	0.08814095	-0.008052023	-0.09324114	0.23175342	-0.48524230
## NOW	1.19606352	-0.86534125	0.111483076	0.07084173	0.51169228	0.01937223
## ORCL	-0.55517466	-1.18246265	0.508804303	-0.19623367	0.31429499	0.06309701
## MA	0.08728211	-0.20597980	-0.254623029	0.39749039	0.11376949	-0.25926870
##	2019-12-24	2019-12-26	2019-12-27	2019-12-30	2019-12-31	2020-01-02
## TWTR	0.03112468	0.08732201	-0.10956547	-0.522260181	-0.01569019	0.2032935
## HPQ	0.02033840	0.16304810	-0.36579185	-0.122801560	0.08205362	0.4496079
## TEL	0.02414788	0.01874003	0.06667164	-0.002736425	0.09827800	0.3154275
## NOW	0.04835024	0.20183391	0.01818987	-0.634347099	-0.14367371	1.1693473
## ORCL	-0.31450262	0.08337986	-0.15588567	-0.804624837	0.23700820	0.9301746
## MA	-0.01876801	0.22241402	0.19225665	-0.529551588	0.08652252	0.7115857
##	2020-01-03	2020-01-06	2020-01-07	2020-01-08	2020-01-09	2020-01-10
## TWTR	-0.77167674	0.08143366	0.83330061	0.4435396	0.12222538	-0.43893989
## HPQ	-0.56626867	0.12273133	0.06094389	0.5079914	0.58119796	0.23590853
## TEL	-0.64057259	-0.39185923	1.01214805	0.4859295	0.01204522	0.11599519
## NOW	-0.09435124	0.16413285	-0.07003306	0.2931200	0.41230178	-0.13201351
## ORCL	-0.23421207	0.23143320	0.07206786	0.1613617	0.19996958	0.02228892
## MA	-0.51597438	0.07418864	-0.21325897	0.7861406	0.57068536	0.26590187
##	2020-01-13	2020-01-14	2020-01-15	2020-01-16	2020-01-17	2020-01-21
## TWTR	-0.11853074	0.08661254	0.346479405	0.8468639	-0.007966649	-0.15067690
## HPQ	0.11621312	-0.15838836	-0.001703979	0.4492949	0.540562583	-0.06007868
## TEL	-0.11777815	1.20612608	-0.790082750	0.2994876	0.307454094	-0.38511863
## NOW	0.57970921	-0.38011606	0.364943053	0.5900973	0.242282852	-0.01742352
## ORCL	0.08097337	0.24679732	-0.162996844	0.6062287	-0.335043446	0.04069578
## MA	0.56462838	-0.74132275	0.499911100	0.8625320	0.446165432	-0.30634745
##	2020-01-22	2020-01-23	2020-01-24	2020-01-27	2020-01-28	2020-01-29
## TWTR	-0.09740753	-0.15135846	-0.6650667	-0.4117199	0.56106234	0.15701335
## HPQ	-0.09833211	0.28466036	-0.2690377	-0.8053734	0.07583416	-0.44858523
## TEL	-0.32104612	0.68961566	-1.0379268	-0.8460444	0.62150462	-0.05555342
## NOW	-0.09177978	-0.25045917	-0.3372498	-0.2995311	0.74676940	-0.21591674
## ORCL	-0.52931426	0.20705641	-0.9291737	-1.4076778	0.73309489	-0.30576923
## MA	0.29897629	0.04582289	-0.2439015	-1.2122239	0.62487715	-0.04492358
##	2020-01-30	2020-01-31	2020-02-03	2020-02-04	2020-02-05	2020-02-06
## TWTR	-0.40678772	-0.7145250	0.51958894	0.7865342	-0.5469490	4.55325068
## HPQ	0.15505591	-0.4506658	-0.08035914	0.4520590	0.4073588	0.07475964
## TEL	-1.20648454	-1.9714035	0.96381774	0.6793602	0.8293114	-1.26178205
## NOW	3.53658279	-0.4663626	0.50349142	0.9382089	-1.5896114	0.29702552

##	ORCL	0.06391042	-0.9068069	0.60445449	0.9080569	0.6445252	-0.07559653
##	MA	0.56184042	-1.3001969	1.23817592	0.6212660	-0.1678554	0.08949976
##		2020-02-07	2020-02-10	2020-02-11	2020-02-12	2020-02-13	2020-02-14
##	TWTR	-1.13114944	-0.91653625	-0.29781646	0.9410991	0.2721615	-0.2400504
##	HPQ	-0.25252862	0.28767602	0.59198659	0.4314315	-0.5267787	0.2426094
##	TEL	-0.79756708	-0.06182472	0.10730444	0.7597572	-0.2435474	-0.7068716
##	NOW	-0.14920698	0.12211221	0.01653688	0.6389752	0.1509672	0.4117159
##	ORCL	-0.03661964	0.21680437	0.10882518	0.5145641	-0.4483381	0.1079283
##	MA	-0.38425943	0.42432139	0.03974831	0.4129197	0.1865673	0.6707196
##		2020-02-18	2020-02-19	2020-02-20	2020-02-21	2020-02-24	2020-02-25
##	TWTR	0.91605618	0.53453303	0.18564706	-0.61303446	-1.962444	-0.6129359
##	HPQ	-0.28505770	0.31790105	0.35230455	0.07036609	-1.151216	2.3348826
##	TEL	-0.75932353	0.73384237	-0.04001605	-0.69112787	-2.057526	-1.0442756
##	NOW	0.07170297	-0.05006680	-0.60185486	-1.01976538	-1.324302	-0.5289608
##	ORCL	-0.06560370	-0.05598901	0.02097220	-0.84387598	-2.026516	-1.7584334
##	MA	-0.01192856	0.41000225	-0.06751287	-0.70766930	-2.154917	-3.2402325
##		2020-02-26	2020-02-27	2020-02-28	2020-03-02	2020-03-03	2020-03-04
##	TWTR	-0.5374304	-1.462320	0.1409058	2.373489	-0.7929736	0.9000594
##	HPQ	-1.1922652	-1.576143	-2.1335181	2.120910	-2.1738584	1.6797249
##	TEL	-0.1518789	-1.792588	-0.2355919	1.481520	-1.4398889	1.6751499
##	NOW	0.4682470	-1.745490	0.6618175	2.136737	-1.7650043	1.7699602
##	ORCL	1.0944817	-1.347785	-1.4328352	1.506514	-2.1945388	1.7988750
##	MA	-0.8132723	-2.000772	0.6841984	2.647482	-2.3359202	1.6336836
##		2020-03-05	2020-03-06	2020-03-09	2020-03-10	2020-03-11	2020-03-12
##	TWTR	-0.9078571	-1.3524481	-0.9467764	1.704494	-2.7119505	-4.441608
##	HPQ	-0.1576355	-0.2944720	-4.8476813	2.208668	-0.9536424	-4.054853
##	TEL	-2.6650792	-1.7145553	-2.9798144	3.087064	-3.7288352	-3.794506
##	NOW	-1.8724734	-1.5217172	-3.1987177	2.717948	-2.8677193	-3.940162
##	ORCL	-2.7269454	-0.7464173	-1.5776929	2.932918	-4.2843729	-5.914414
##	MA	-1.8802023	-0.6604024	-4.1916801	3.313920	-1.8832781	-5.030658
##		2020-03-13	2020-03-16	2020-03-17	2020-03-18	2020-03-19	2020-03-20
##	TWTR	2.8254703	-5.504597	0.5237930	-3.1262924	2.9198116	-0.2623838
##	HPQ	-0.8325886	-6.691324	-0.2152481	-3.8038927	4.0922472	-1.3536055
##	TEL	1.9229863	-6.752856	1.7287165	-8.0864307	1.4159179	0.8539175
##	NOW	3.7647965	-3.121238	3.1885066	-1.3446982	-0.1462324	-3.3332029
##	ORCL	10.8488996	-5.844137	5.1225452	0.4203039	-2.5287465	0.6400267
##	MA	5.5577158	-6.099636	0.3973578	-2.0400497	-0.2149684	-3.3431618
##		2020-03-23	2020-03-24	2020-03-25	2020-03-26	2020-03-27	2020-03-30
##	TWTR	0.90814650	1.399001	0.1069166	0.4822867	-1.3288959	0.3272532
##	HPQ	-0.79373477	5.385953	-0.2853299	6.9507539	-2.5696787	2.4006128
##	TEL	-0.85444170	5.437616	2.4198258	3.7317294	-4.0805696	0.7212504
##	NOW	0.02048827	2.498387	-1.1371067	4.3991240	-2.8464326	1.7060830
##	ORCL	-1.75223026	4.359174	-2.1646962	5.2246540	-0.7331619	0.5209393
##	MA	-1.87749183	7.841366	3.8384384	1.1890379	-2.8565268	1.0222361
##		2020-03-31	2020-04-01	2020-04-02	2020-04-03	2020-04-06	2020-04-07
##	TWTR	-1.2630410	-1.5754825	-0.4273253	0.05805062	2.397064	0.7976372
##	HPQ	-1.1711401	-6.1384299	1.7988749	-2.77980834	1.467503	0.2950827
##	TEL	-0.6304576	-3.1561076	-0.1518074	-0.29858134	5.963369	-0.4894032
##	NOW	-0.0492817	-1.9326761	-2.1053608	-1.50983303	3.141770	-1.1845763
##	ORCL	-2.1963774	0.3729969	1.1471738	-0.47478553	2.210216	-0.8025690
##	MA	-2.2459182	-2.5999513	2.0824815	-0.42037452	5.743700	-1.2781564
##		2020-04-08	2020-04-09	2020-04-13	2020-04-14	2020-04-15	2020-04-16
##	TWTR	2.646327	-0.1333281	-0.6501325	0.7839668	-0.5043999	-1.0996645
##	HPQ	1.625908	0.6270608	-1.1719639	0.9861914	-2.4683708	0.6311212

##	TEL	3.102450	1.5133988	-1.5044895	0.5852151	-3.3534451	-1.4002691
##	NOW	1.681571	0.5010590	0.7038555	2.4990945	-0.8800738	-0.6052908
##	ORCL	1.653415	1.0279556	-0.2569937	0.9907639	-0.8760528	0.4954293
##	MA	2.201728	-0.3242035	-1.1212994	1.2794119	-2.4361208	-1.9706435
##		2020-04-17	2020-04-20	2020-04-21	2020-04-22	2020-04-23	2020-04-24
##	TWTR	0.1376671	0.3195658	-1.458324	3.1531999	-0.6570942	0.9291652
##	HPQ	0.7307882	-0.4739999	-2.611561	1.0368389	-0.5237730	1.0508272
##	TEL	2.9789024	-0.6883559	-1.590176	2.1102615	0.6174297	1.4520670
##	NOW	0.9569459	0.3019988	-1.858614	1.4034929	-0.3778509	0.6706269
##	ORCL	0.8674123	-0.7396883	-2.618750	0.9515609	-0.3524933	1.0209832
##	MA	2.4916566	-1.5585857	-1.256752	2.1866890	-0.2465717	0.4862744
##		2020-04-27	2020-04-28	2020-04-29	2020-04-30	2020-05-01	2020-05-04
##	TWTR	1.3031417	-1.26557887	2.4031868	-2.4002941	-0.9285357	0.39274978
##	HPQ	0.0430516	1.32846694	2.0159829	-2.0276758	-2.2075496	0.50160034
##	TEL	2.3662077	0.08455516	3.2252065	-3.2314422	-2.0332822	-0.84680543
##	NOW	0.6606635	-1.68398123	3.3838074	3.5401775	-1.4236170	1.68028603
##	ORCL	0.3158640	-0.21626911	0.6353868	-0.9472033	-1.2345544	-0.08756364
##	MA	1.1156603	-0.14554492	3.3761491	-1.5130445	-1.1290278	0.03961567
##		2020-05-05	2020-05-06	2020-05-07	2020-05-08	2020-05-11	2020-05-12
##	TWTR	-0.2077048	-0.4587373	1.1669547	1.1956759	-0.27944764	-0.5897797
##	HPQ	-0.2946814	-0.4663936	0.7899780	1.9539203	-0.68471062	-1.5391819
##	TEL	0.9554696	0.6850700	1.0146332	2.3384552	-1.45763274	-2.2206312
##	NOW	1.7020306	-0.6334625	1.6971757	-0.5469437	0.59188793	-1.9289716
##	ORCL	0.2628306	-0.2410679	0.7147116	0.9372269	-0.08620307	-1.3018247
##	MA	0.7806666	-0.3194592	0.9994654	0.6251399	-0.25593449	-1.5934092
##		2020-05-13	2020-05-14	2020-05-15	2020-05-18	2020-05-19	2020-05-20
##	TWTR	-1.1025642	0.4317362	0.43539903	0.6387227	0.21235251	2.3653203
##	HPQ	-2.3290512	1.3034429	0.97225347	3.5206984	1.54854925	1.3901729
##	TEL	-1.9338630	0.7734598	0.09829328	4.4823681	0.02664954	1.2781482
##	NOW	-0.5398607	0.6377407	0.20627617	0.3935729	0.76639955	0.6736727
##	ORCL	-0.6790305	1.2547947	-0.03629298	0.1854512	-0.85923171	0.5243068
##	MA	-0.5675313	1.3865672	0.22698698	1.8148348	0.08371384	1.2667347
##		2020-05-21	2020-05-22	2020-05-26	2020-05-27	2020-05-28	2020-05-29
##	TWTR	0.06940691	0.22946654	1.2656225	-0.8781886	-1.3912419	-0.6431460
##	HPQ	-0.33230842	-0.48105668	0.1072926	0.1067816	-5.2179585	0.3228446
##	TEL	-1.07160958	-0.07999555	2.8879371	1.5996664	-0.3088384	-0.9797131
##	NOW	-0.73378234	0.36821554	-0.8157076	-1.0596446	0.6485002	0.9616776
##	ORCL	-0.73199181	0.36218318	0.1158190	0.3780633	0.3747126	0.1028358
##	MA	-0.77439135	0.05262912	1.3044285	-0.6100681	0.3487207	-0.2739855
##		2020-06-01	2020-06-02	2020-06-03	2020-06-04	2020-06-05	2020-06-08
##	TWTR	0.87178498	0.3193187	2.4436644	-1.0496308	1.006002	1.5142746
##	HPQ	-0.06870129	1.7913773	2.8054773	-1.0126008	2.356411	1.7926903
##	TEL	2.01245225	1.0065497	1.6278238	-0.1997752	1.230745	0.3006591
##	NOW	-0.53851575	0.9039369	-0.5577259	-1.2062943	1.336586	-0.4608475
##	ORCL	-0.75065650	0.1747751	0.1638638	-0.6845402	1.094045	1.0602945
##	MA	0.02819750	0.2929459	0.4923832	-0.9344620	1.604917	-0.2763321
##		2020-06-09	2020-06-10	2020-06-11	2020-06-12	2020-06-15	2020-06-16
##	TWTR	-0.6344165	-0.6974092	-1.867129	0.3071022	0.6139593	0.4304736
##	HPQ	-1.1941429	-1.5051319	-3.099921	1.6220719	1.4813307	0.9052125
##	TEL	-2.5751991	-1.1726951	-3.784213	-0.2205175	0.8333476	1.3973659
##	NOW	0.1477344	1.2245497	-2.685476	0.9834392	0.6785026	0.5228175
##	ORCL	-0.9369374	-0.1152762	-2.806381	0.5253590	1.3832285	1.2958220
##	MA	0.1129980	0.2009070	-3.375729	1.0147545	-0.1512884	1.1166186
##		2020-06-17	2020-06-18	2020-06-19	2020-06-22	2020-06-23	2020-06-24

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## TWTR -0.2902991 -0.31023048 -0.5907322 0.0200595 -0.54533094 -1.1289276
## HPQ -1.0880306 0.20877116 -0.3885099 0.3345368 0.15753032 -2.0411875
## TEL -0.5286376 -0.08997474 -0.4338506 0.1174894 0.40591839 -2.2751839
## NOW 0.1411179 -0.03804809 -0.1893736 0.2152341 -0.25928560 -0.8624930
## ORCL -3.0459159 2.20017355 0.6589630 0.6595588 0.02137334 -0.7711931
## MA -0.1647222 0.11817531 -1.3539760 1.2202298 0.32852759 -2.0453026
## 2020-06-25 2020-06-26 2020-06-29 2020-06-30 2020-07-01 2020-07-02
## TWTR -0.38097689 -2.2916303 0.4274689 0.2756990 1.0101300 0.02468536
## HPQ 0.39983998 0.5748752 1.2740662 0.6946852 -1.0772248 0.13200085
## TEL 0.55262364 -0.2331285 1.2006729 0.5592436 -0.9689524 0.48072868
## NOW 0.79789437 -0.2392277 -0.6092869 0.9740432 1.0654733 -0.31929136
## ORCL 0.04179986 -0.3887085 0.5246106 0.4503789 0.1659404 0.38617068
## MA 0.59417910 -1.4348816 0.5372709 0.3970335 0.8267224 0.14489661
## 2020-07-06 2020-07-07 2020-07-08 2020-07-09 2020-07-10 2020-07-13
## TWTR 1.4184235 0.5786075 2.20381248 0.23241565 -0.3081290 -1.3967855
## HPQ 0.9187324 -2.0377500 0.26215100 -0.89359162 1.4436785 0.1815535
## TEL 0.9783549 -1.0691935 -0.50547970 -0.69386948 -0.2264982 0.6183547
## NOW 0.1366897 -0.5200572 1.21249877 0.03299017 -0.3951223 -2.0354421
## ORCL 0.5829246 -0.3196519 0.28515195 0.77260808 -0.1761658 -0.3995300
## MA 0.4426300 -0.9325694 0.04919579 -0.93262700 0.1234873 -0.9362963
## 2020-07-14 2020-07-15 2020-07-16 2020-07-17 2020-07-20 2020-07-21
## TWTR 0.4705566 1.1102890 -0.36839894 0.4236970 1.0304797 -0.07591948
## HPQ 1.7051474 -0.0409558 0.05348595 -0.7005972 0.1983912 -0.44553390
## TEL 1.0304815 2.4687214 -0.49794546 0.4761000 -0.2657724 0.52092325
## NOW 1.0382573 0.9094393 -0.97579171 0.6794380 2.4893501 -1.13209465
## ORCL 0.3576287 -0.5872034 -0.79998583 -0.9254424 0.4393890 0.44464332
## MA 1.3838739 1.0238139 -1.04250167 0.6953583 1.1823392 -0.71650829
## 2020-07-22 2020-07-23 2020-07-24 2020-07-27 2020-07-28 2020-07-29
## TWTR -0.09246280 1.2044223 -0.7492313 -0.5956541 -0.23349373 0.4237109
## HPQ 0.55980035 -0.2067988 -0.4215162 0.7031277 -2.65888628 0.9148440
## TEL 0.33773710 0.8563806 -0.6387678 1.5155007 -1.75284619 1.7032895
## NOW 0.31925905 -1.0344701 -0.5929680 0.7232931 0.03629014 0.8908551
## ORCL 0.04903139 -0.2844445 -0.1515892 -0.3434882 -0.03672649 0.2909056
## MA 0.83905791 -0.5785473 -0.5093167 0.2480312 -0.44160933 0.4084000
## 2020-07-30 2020-07-31 2020-08-03 2020-08-04 2020-08-05 2020-08-06
## TWTR -0.39608149 -0.3006839 -0.043131365 -0.06828992 0.3346463 0.7117850
## HPQ 0.35252755 0.7874514 0.413014378 0.24270080 0.1468867 0.6602980
## TEL -0.43028093 -0.1141050 0.370972511 0.68477435 0.6131707 -0.3321497
## NOW -1.34030077 0.6369122 -0.007243519 -0.23749485 -0.2921152 -0.5645562
## ORCL -0.47728550 0.1467065 0.463437226 -0.02731093 -0.5225929 -0.2577948
## MA -0.09845313 -0.1246184 0.572988133 0.22130652 2.0048571 0.2576962
## 2020-08-07 2020-08-10 2020-08-11 2020-08-12 2020-08-13 2020-08-14
## TWTR -0.480065162 0.2117537 -0.1651578 0.0962272 0.2749857 0.02980760
## HPQ 0.418863698 1.1188907 -0.9483275 0.4792969 -0.9793682 -0.49802353
## TEL 0.353607582 0.9667062 0.3861518 0.1793196 0.1943542 -0.63915205
## NOW 0.005150037 0.6070744 -1.6308948 0.4640808 0.9659386 -0.31714275
## ORCL -0.094616357 -0.3264284 -0.6968220 -0.1446561 -0.1940590 0.13135374
## MA -0.357505221 -0.7969904 0.7806973 -0.1839799 -0.2612032 0.03652203
## 2020-08-17 2020-08-18 2020-08-19 2020-08-20 2020-08-21 2020-08-24
## TWTR 0.02161706 -0.002599514 0.67176909 0.02018307 0.20023784 0.9213296
## HPQ -0.57236904 0.637675142 -0.27124858 -0.01779908 0.14419832 0.9267883
## TEL -0.04001153 -0.426325736 0.03027693 -0.74548275 0.59284328 0.5796222
## NOW 0.52494754 -0.502009032 -0.11592879 1.38553794 -0.41607753 -0.1911296
## ORCL -0.25302325 1.129241297 0.93956128 -0.93848527 -0.11393266 0.7461049

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##	MA	0.44642628	0.058463104	0.14864510	0.65104087	-0.08334664	0.8696134
##		2020-08-25	2020-08-26	2020-08-27	2020-08-28	2020-08-31	2020-09-01
##	TWTR	0.01047345	0.3641172	-0.5473187	0.4790279	-0.3988322	0.3939005
##	HPQ	-0.51393459	-0.2915284	0.8069399	2.5422283	-0.6757892	-0.6640511
##	TEL	0.08349829	0.4367517	-0.2257702	1.2863162	-0.7356343	0.9652636
##	NOW	0.78884028	2.4857886	-0.6530040	0.5247034	-0.5478221	1.1644802
##	ORCL	0.02980499	1.2849330	-0.3339863	0.6065923	-0.6545703	0.3637814
##	MA	0.50356714	0.4069217	0.6218611	1.2985324	-1.0816374	-0.2234890
##		2020-09-02	2020-09-03	2020-09-04	2020-09-08	2020-09-09	2020-09-10
##	TWTR	1.8340668	-1.460294	-1.3249016	-1.3206200	1.0599852	-0.5052988
##	HPQ	1.2239897	-1.184230	-0.1933148	0.8320403	0.4989586	-1.5121967
##	TEL	1.0593057	-1.459591	0.4381118	-1.7647839	1.3722716	-0.6881770
##	NOW	0.1226836	-2.507724	-1.6291471	-0.7061526	1.2634845	-0.5242427
##	ORCL	1.2209109	-1.790243	-1.3260863	-0.4387637	1.5252072	0.3095302
##	MA	0.4536331	-2.273604	-1.2727233	-0.7800341	1.3536517	-0.9981853
##		2020-09-11	2020-09-14	2020-09-15	2020-09-16	2020-09-17	2020-09-18
##	TWTR	-0.05041557	-0.16016645	0.21713257	0.3633972	-0.2274003	0.5856709
##	HPQ	0.57773818	0.04614158	-0.19306762	0.2861841	-0.6252624	-0.4579267
##	TEL	0.50097252	0.86946135	0.65946670	0.4233420	-0.4293068	-1.2973632
##	NOW	-0.69118628	0.99897093	1.29212058	-1.5674755	-0.2663504	-0.1370537
##	ORCL	-0.35339486	2.25555511	1.28123076	-0.4927418	-0.2670239	-0.4274792
##	MA	-0.44207018	1.16393318	0.02343107	0.3273952	-0.3887610	-0.6361514
##		2020-09-21	2020-09-22	2020-09-23	2020-09-24	2020-09-25	2020-09-28
##	TWTR	-0.2247611	2.12971116	1.8221031	-1.50907480	0.4604246	0.1810440
##	HPQ	-1.3930914	0.18807619	-0.3142971	-0.43075238	0.3061958	1.2444498
##	TEL	-1.1848500	-0.06111401	-1.2908883	0.07903242	0.6024005	0.8769280
##	NOW	0.6888939	0.66581802	-0.9210083	-0.10536106	1.6242120	0.2726134
##	ORCL	0.9087905	-0.22176661	-1.5069387	0.26120507	0.4033592	-0.2425920
##	MA	-1.1026739	1.02896985	-1.5801220	0.48652015	0.4645516	0.8944107
##		2020-09-29	2020-09-30	2020-10-01	2020-10-02	2020-10-05	2020-10-06
##	TWTR	0.37306391	-0.1984474	1.47393952	-0.41375304	0.7526523	-1.13775539
##	HPQ	0.09267357	0.1144477	-0.01883747	0.15801826	0.4431260	-0.80230933
##	TEL	0.14850459	0.1112926	0.38133771	-0.13803867	1.5158655	0.19070124
##	NOW	0.23132744	-0.3160064	0.53544192	-0.02502047	0.6148240	-0.88017431
##	ORCL	-0.14484573	0.1599116	-0.06424027	-0.80602880	0.6154698	-0.09114196
##	MA	-0.35568151	0.2218509	0.67837742	-0.68066997	0.5675769	-0.85810579
##		2020-10-07	2020-10-08	2020-10-09	2020-10-12	2020-10-13	2020-10-14
##	TWTR	0.1459457	0.05839387	-0.1077011	1.52764826	-0.8253297	-0.69701953
##	HPQ	0.5572049	0.33039271	-0.1059130	0.95657477	-0.3586923	-0.42514255
##	TEL	1.3180470	0.66998997	0.6026457	-0.04948163	-0.4900325	-0.38889416
##	NOW	0.6026558	-0.35119470	0.8855076	-0.03823330	0.6373211	-0.18259015
##	ORCL	1.1415017	0.21771796	0.1813805	0.22402136	-0.4716057	-0.05512056
##	MA	0.8588482	0.17592556	0.9444776	-0.09954375	-0.8892748	-0.48380912
##		2020-10-15	2020-10-16	2020-10-19	2020-10-20	2020-10-21	2020-10-22
##	TWTR	-0.001561238	-0.18059751	-0.0280843	0.31823861	2.52641032	-0.01045038
##	HPQ	0.088287800	0.04494603	-0.5553015	-0.01926019	-0.36624689	0.24316674
##	TEL	0.672213140	0.25897648	-1.1393333	0.24450450	-0.09755721	0.14723084
##	NOW	0.213455038	0.24162007	-0.2945909	-0.35922281	-0.67679889	-0.40894909
##	ORCL	-0.431346606	-0.24907279	-0.6391051	0.06993080	-0.11778730	-0.02849302
##	MA	-0.625030176	0.06414488	-1.1346637	-0.04518117	0.19119476	-0.02668871
##		2020-10-23	2020-10-26	2020-10-27	2020-10-28	2020-10-29	2020-10-30
##	TWTR	0.06236401	-0.905955	1.3789813	-1.665629	2.4176478	-6.47797086
##	HPQ	-0.54024676	-1.952264	-0.6623994	-1.512762	1.0000893	0.38429071
##	TEL	-0.03522363	-1.154439	-1.1647296	-2.440360	-0.4703947	0.39933614

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## NOW 0.55140777 -1.025834 -0.2167884 -1.317684 2.0846903 -1.08003647
## ORCL 0.14128871 -2.192321 -0.4267556 -1.438671 0.3662025 0.03932141
## MA -0.62072562 -1.717555 -0.1942789 -3.908173 0.2412204 -0.78822534
## 2020-11-02 2020-11-03 2020-11-04 2020-11-05 2020-11-06 2020-11-09
## TWTR -1.4292399 1.7125920 0.7184779 0.6432428 -0.44665945 0.014794697
## HPQ 1.0115020 0.4381912 -0.8079579 1.9122153 0.22254010 1.006436931
## TEL 1.3349542 1.1250247 -0.2548142 1.6806536 0.21231191 0.230375774
## NOW -1.7833063 0.2597902 2.6763513 1.2670223 0.22873324 -2.520893794
## ORCL 0.2768295 0.2843280 -0.3374650 0.1141411 0.08541661 -0.008805339
## MA 0.1666196 0.8359099 1.8476002 1.3909146 -0.48621982 4.632497836
## 2020-11-10 2020-11-11 2020-11-12 2020-11-13 2020-11-16 2020-11-17
## TWTR -0.5858656 0.8431194 -0.6082859 0.4428551 -0.561134837 0.05095401
## HPQ 0.2571068 -1.1190875 -0.9739193 1.4679344 1.437033128 0.37288347
## TEL 0.4498726 0.7877016 -1.1119063 1.4948741 0.660847616 0.01950701
## NOW -1.6985154 1.7320299 0.4270679 -0.2122043 -0.519787710 0.77326604
## ORCL -0.2058953 0.4524668 -0.7457242 0.3882699 0.178563860 -0.07436724
## MA -1.4011825 -0.3916031 -0.6385116 0.9232860 0.007230722 0.09640571
## 2020-11-18 2020-11-19 2020-11-20 2020-11-23 2020-11-24 2020-11-25
## TWTR 0.3071002 0.16949464 0.7068318 0.1428349 0.1621804 0.7748917
## HPQ -0.1434015 0.06174032 -0.1434015 1.4790238 1.0691272 0.9246742
## TEL -0.4378692 0.65899499 -0.3413887 1.0119302 1.7421924 -0.9096306
## NOW -0.5345728 0.48471635 0.2102971 0.2325756 -0.6353081 0.2713326
## ORCL -0.8587596 0.14327468 -0.7550121 0.3175144 1.3707602 -0.1946158
## MA -0.1314325 -0.34374933 -1.6008910 1.2776627 1.4289272 -0.2008507
## 2020-11-27 2020-11-30 2020-12-01 2020-12-02 2020-12-03 2020-12-04
## TWTR 0.070416356 -0.08714668 0.07023548 0.3314287 0.3270864 -0.07305914
## HPQ -0.003200551 -0.68224619 0.82097489 0.7848759 0.7321349 0.93506755
## TEL 0.128091178 -0.63084329 0.25887770 0.5010556 0.8859124 0.68834286
## NOW 0.551333298 0.45263852 0.29604286 -1.0296955 -0.1711939 -0.04090987
## ORCL 0.278805781 -0.08330531 0.89618207 0.2623513 0.1251677 0.57455662
## MA -0.365601367 -0.41113472 0.28233749 0.1355632 -0.7619108 1.25359263
## 2020-12-07 2020-12-08 2020-12-09 2020-12-10 2020-12-11 2020-12-14
## TWTR 0.07394698 -0.33417827 -0.1634256 2.53683836 0.1023142 0.30933797
## HPQ -0.21759911 0.01985578 -0.6303106 -0.07718534 -0.1497251 0.14080018
## TEL -0.46915811 0.10568522 -0.1126520 -0.18977418 -0.2073816 -0.43184202
## NOW 0.49039719 0.58951462 -1.1114738 0.67150290 -0.1222826 -0.43319756
## ORCL -0.18869222 -0.73315132 0.5861171 -0.26960855 0.9669290 0.08562758
## MA -0.52018067 -0.07602838 -0.6017576 -0.80428248 -0.6400497 0.48901972
## 2020-12-15 2020-12-16 2020-12-17 2020-12-18 2020-12-21 2020-12-22
## TWTR 0.4345599 0.6643273 0.3041406 0.6579233 -0.7065793 0.1160510
## HPQ 0.8639368 0.4373768 0.3794453 0.3752776 -0.8309079 0.2390750
## TEL 0.2810938 -1.0015795 0.1709602 0.5421107 -0.2304148 -0.1529441
## NOW -0.4527516 1.2408587 0.5802397 0.7323354 -1.0933853 0.7041986
## ORCL 0.9192552 0.7468752 0.6587870 1.1694606 -0.5218601 0.5078462
## MA 0.3064161 -0.2731121 0.6345021 0.4314703 -0.8845550 -0.3550643
## 2020-12-23 2020-12-24 2020-12-28 2020-12-29 2020-12-30 2020-12-31
## TWTR -0.37375691 -0.22020383 0.225354658 -0.07399061 -0.05158599 -0.1358492
## HPQ 0.04596811 0.04580116 -0.023640888 -0.42172335 0.43062003 0.4253864
## TEL 1.20503805 0.03222475 0.002415139 -0.79043037 0.65280801 0.5161239
## NOW -0.89320507 0.19890318 -0.797366019 0.08688505 0.02560858 0.1441045
## ORCL 0.07643603 -0.32408621 -0.120257894 -0.38348311 -0.09601160 0.1938091
## MA -0.48287043 0.92483241 1.145590074 0.24977446 1.16631706 0.1334441
## 2021-01-04 2021-01-05 2021-01-06 2021-01-07 2021-01-08 2021-01-11
## TWTR 0.1794044 -0.3985028 -0.38590257 -0.5676082 -0.5304291 -1.99093512

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##	HPQ	-0.8609003	0.5688239	0.81768252	1.2885274	-0.3998317	0.37037679
##	TEL	-0.3633614	0.9362564	1.41962075	0.9798207	0.6752389	-0.04001153
##	NOW	-1.7645859	0.3089579	-1.90614780	0.2476840	1.3289558	-0.56486734
##	ORCL	-0.8214010	-0.7073343	-0.17393185	0.3798533	0.2157940	-0.34091762
##	MA	-0.7779268	-0.6026056	-0.03457018	0.3241410	0.4896218	-0.81113094
##		2021-01-12	2021-01-13	2021-01-14	2021-01-15	2021-01-19	2021-01-20
##	TWTR	-0.7568052	0.08202738	-0.95890198	-0.4412779	0.47183787	1.07482589
##	HPQ	0.1708580	-0.36519607	-0.18799280	-0.7787454	-0.09102597	0.05929368
##	TEL	-0.4063134	0.10914664	0.07348201	-0.9186242	0.58384401	0.29759187
##	NOW	-0.8173192	0.57709599	-0.63196244	-0.1198429	0.35861332	1.65165052
##	ORCL	-0.5625633	-0.35397871	-0.44172196	0.1094893	-0.46940445	0.18859623
##	MA	-0.7729456	0.42020450	-2.71428504	-0.5858041	0.34163341	1.25546287
##		2021-01-21	2021-01-22	2021-01-25	2021-01-26	2021-01-27	2021-01-28
##	TWTR	-0.34247460	0.5740331	-0.17443878	1.1325886	-0.9440362	2.105657721
##	HPQ	0.22574540	-0.1900255	-0.45651709	-0.7125003	0.3514605	-0.007148176
##	TEL	-0.06731889	-0.7891320	-0.31325208	-1.6962675	-1.5256967	-0.073919746
##	NOW	0.08008455	-0.3099165	-0.30913870	-0.4724024	-1.2563082	2.803279243
##	ORCL	-0.34962232	-0.7870349	0.43079958	0.7418662	0.6009255	-1.180475735
##	MA	-0.11903946	-0.8267430	-0.02345728	-0.2674407	-1.8229716	1.271664514
##		2021-01-29	2021-02-01	2021-02-02	2021-02-03	2021-02-04	2021-02-05
##	TWTR	-0.6501661	1.2516255	0.7417872	0.2930264	1.04434684	0.11106092
##	HPQ	-0.9361199	0.2006509	0.6625580	0.5328311	1.15776395	0.28277963
##	TEL	0.1933095	1.7039969	-0.1747413	1.7980056	0.03900854	-0.36742214
##	NOW	-0.8630168	1.0415967	1.6843919	-0.5385836	0.76697511	-0.02524732
##	ORCL	-0.7346509	0.9068704	0.6993585	-0.2174013	0.96598061	0.16411930
##	MA	-1.2232315	0.7394470	1.8407613	-0.2726328	1.09135573	-0.34236056
##		2021-02-08	2021-02-09	2021-02-10	2021-02-11	2021-02-12	2021-02-16
##	TWTR	0.7284387	0.8409008	3.99199261	0.3209892	1.4519153	0.83958064
##	HPQ	1.8062935	-0.3640660	0.05207427	0.3148847	0.1277982	-0.54519514
##	TEL	0.7262434	-0.5093656	-0.94798243	0.4101739	0.8205708	0.54375432
##	NOW	-0.1970012	-0.4861956	0.43788574	0.2661733	-0.2861616	-0.44520549
##	ORCL	-0.4573030	0.4269144	-0.38145674	-0.5268796	0.2768841	-0.84118097
##	MA	-0.2936352	-0.5585287	0.05738811	1.1790140	-0.3115162	-0.02308364
##		2021-02-17	2021-02-18	2021-02-19	2021-02-22	2021-02-23	2021-02-24
##	TWTR	-0.93010594	0.16504330	-0.02630012	-0.790482301	1.125481680	-0.55607503
##	HPQ	-1.40193907	0.16683138	1.05648571	-0.009958286	0.361745172	0.86418942
##	TEL	-0.64038448	-0.29180945	1.39523574	-0.920578465	-0.388282761	0.62192118
##	NOW	-0.39826405	-0.42399081	-0.42231254	-1.488442614	0.031264041	-0.06970157
##	ORCL	-0.08929174	-0.06355093	-0.85412027	2.850396359	-0.004985421	0.11901874
##	MA	-0.59272182	0.10684147	-0.79508414	1.015984666	1.309148804	2.23949282
##		2021-02-25	2021-02-26	2021-03-01	2021-03-02	2021-03-03	2021-03-04
##	TWTR	1.0981687	0.9757921	0.1909804	-1.59143156	-1.1987394	-1.804758
##	HPQ	0.2894390	1.1212884	0.8435138	0.61226061	-0.3485808	-2.506030
##	TEL	-1.8991510	1.6111353	1.5826512	0.19112855	-1.3602028	-1.368287
##	NOW	-1.7203245	0.2725229	1.6239155	-0.58303716	-2.4637685	-2.012438
##	ORCL	0.4482595	-0.6916373	1.3261210	0.34859971	0.1536683	-1.082659
##	MA	-1.7018406	-0.1488380	1.1630451	-0.06282539	-0.3889537	-1.470396
##		2021-03-05	2021-03-08	2021-03-09	2021-03-10	2021-03-11	2021-03-12
##	TWTR	0.05668884	-1.6164089	1.9073913	-1.2505243	1.6739549	-0.1952184
##	HPQ	2.47305281	0.5379355	0.1468768	0.1823274	0.0700962	-0.1240238
##	TEL	0.82684747	-1.1699266	0.8636788	0.2271405	0.5735898	-0.2137973
##	NOW	-0.37011346	-1.9289295	2.0385563	-1.2800104	2.3241496	-1.1448167
##	ORCL	3.49804950	1.6230479	0.3084218	-0.4281884	-3.5296994	-0.2441871
##	MA	1.49498015	1.3237315	0.6118458	0.6014348	0.2813057	-0.2588103

##	2021-03-15	2021-03-16	2021-03-17	2021-03-18	2021-03-19	2021-03-22
## TWTR	0.9421438	-0.48198522	0.3838923	-1.5475304	-0.2588617	-0.504728797
## HPQ	0.6665224	-0.53208488	0.3869617	-0.6285307	-0.3597015	0.503655919
## TEL	1.1883300	-0.18378349	-0.1234797	-0.7620961	-1.0924808	-0.291965430
## NOW	0.5325885	0.10064540	-1.1799760	-1.6041851	0.3184039	0.410730923
## ORCL	0.4063155	-0.73937363	-0.5490149	0.3724603	-0.4299734	0.001930535
## MA	-0.1703056	0.02483178	-0.5121710	-1.5180838	-1.4106521	0.199583263
##	2021-03-23	2021-03-24	2021-03-25	2021-03-26	2021-03-29	2021-03-30
## TWTR	-0.47464137	-1.0840915	-0.45763019	-0.004828477	0.8021444	-0.01050114
## HPQ	-1.26787549	-0.3391651	0.70274726	2.446451991	-0.8237376	0.62149451
## TEL	-1.92320530	0.4283514	0.37115986	1.110904762	-0.4980855	-0.08384534
## NOW	0.05022074	-0.5574051	-0.08709392	1.828608345	-0.8402745	0.10152577
## ORCL	0.71765488	-0.3952341	1.39021084	1.212648077	0.6217694	-0.48128089
## MA	-0.46735931	0.5335275	-0.22279837	0.979346011	-0.4715645	-0.66909855
##	2021-03-31	2021-04-01	2021-04-05	2021-04-06	2021-04-07	2021-04-08
## TWTR	0.2753131	0.06117409	0.1612703	1.27636593	0.87164138	0.95165907
## HPQ	0.2119238	0.35594038	0.4963943	-0.26094788	-0.05396527	0.08917921
## TEL	0.6100728	0.62156513	0.7296757	-0.29657966	-1.04069711	0.52534403
## NOW	0.9378519	0.46814709	0.4692960	-0.45404413	0.05227827	0.95129941
## ORCL	-0.3336580	1.20021360	1.6991185	0.03992314	0.03295594	0.82495132
## MA	-0.3375784	0.91529146	0.6042956	0.10893269	0.14181561	0.85797213
##	2021-04-09	2021-04-12	2021-04-13	2021-04-14	2021-04-15	2021-04-16
## TWTR	-0.04759924	-0.17620460	0.6500024	-1.17622011	0.8272804	-0.71137625
## HPQ	0.73739073	-0.34663239	0.3439402	0.16245112	0.4904316	0.40882815
## TEL	0.19296228	0.08367083	-0.2019468	-0.25662863	0.6436881	0.25129901
## NOW	0.37265663	0.44492377	0.7998306	-0.36895479	0.9737914	-0.24727353
## ORCL	0.16617911	0.33471482	0.3390159	0.05797851	0.9742745	0.40327139
## MA	0.24203955	-0.08234830	-0.2662879	-0.02845933	0.9738921	-0.09168716
##	2021-04-19	2021-04-20	2021-04-21	2021-04-22	2021-04-23	2021-04-26
## TWTR	-0.9834921	-1.0408867	0.7223652	-1.40352789	1.25121125	-0.171343915
## HPQ	-0.3870801	-0.4522791	0.6261946	-0.20204042	0.76754108	-0.150779205
## TEL	-1.2024462	-0.8044968	1.9835466	-0.60747613	1.00371944	0.129820817
## NOW	-0.6088104	-0.6914291	0.3391104	0.07021571	0.22698349	0.388625824
## ORCL	-0.1814794	0.2854967	-1.7829781	-1.29179225	0.02487533	-0.380755744
## MA	-0.5458094	-0.7399975	0.7640119	-0.02009751	0.40630507	-0.002003838
##	2021-04-27	2021-04-28	2021-04-29	2021-04-30	2021-05-03	2021-05-04
## TWTR	-0.35948632	-0.1780611	-0.3180806	-4.66215866	-0.3884317	-0.13538609
## HPQ	0.08139818	-0.1751578	0.4241341	-0.75516088	0.4146847	-0.67444316
## TEL	-0.04753310	0.2496587	0.8053614	-1.40507595	-0.4710391	-0.05526846
## NOW	0.16552723	-0.4528405	-3.7688029	0.03146374	-1.3241517	-0.63947181
## ORCL	0.46911241	-0.3654684	0.7383287	-0.10262119	1.0374114	0.78131345
## MA	0.14388262	0.7513417	-0.8570790	-0.89415131	-0.3831995	-0.48947931
##	2021-05-05	2021-05-06	2021-05-07	2021-05-10	2021-05-11	2021-05-12
## TWTR	-0.5059574	0.1076958	-0.04608752	-1.1580542	0.5954946	-1.2928032
## HPQ	0.5651199	0.6052758	0.66752868	-0.4188438	-2.0190613	-2.0918026
## TEL	0.5016401	0.3487342	0.80648808	-0.5926523	-1.0494101	-1.8070828
## NOW	-0.3468651	0.4064081	-0.26435520	-1.4369715	1.1652397	-1.4492000
## ORCL	0.4018972	0.3240700	0.39509984	-0.2122153	-1.6834203	-0.6917132
## MA	-0.9081828	0.7638288	-0.06247002	-1.1992321	0.1123935	-1.4730238
##	2021-05-13	2021-05-14	2021-05-17	2021-05-18	2021-05-19	2021-05-20
## TWTR	-0.3898689	0.9518204	0.47848407	0.30755146	-0.18965217	0.99746723
## HPQ	0.5375172	0.6463694	0.11216632	-0.93089063	-0.74233697	0.27606216
## TEL	0.9048647	0.9881161	-0.05515804	-1.14280593	0.52167602	0.45994401
## NOW	-0.9003013	0.3878436	-0.58293025	0.16908327	0.14344880	0.89888597

##	ORCL	0.9195998	0.4655695	0.08209648	-0.30941998	-0.01247115	-0.05992199
##	MA	0.4007152	0.4611225	-0.13200178	-0.08243008	-0.32589886	0.83231168
##		2021-05-21	2021-05-24	2021-05-25	2021-05-26	2021-05-27	2021-05-28
##	TWTR	-0.17976886	1.4280322	-0.06683463	0.4203253	0.08658467	-0.07678006
##	HPQ	-0.53913934	0.8214306	-0.62598347	0.3677537	-0.13235642	-3.79653296
##	TEL	-0.27232192	0.5912614	-0.26675339	0.2370912	0.20539283	0.09523657
##	NOW	-0.21422884	0.5027801	0.21735937	0.3769257	-0.57781117	-0.51442073
##	ORCL	0.16366895	0.1898467	-0.41592213	0.2445684	-0.23479143	-0.20844137
##	MA	-0.06526909	0.5655806	-0.71083643	-0.6437386	-0.13752009	-0.23875792
##		2021-06-01	2021-06-02	2021-06-03	2021-06-04	2021-06-07	2021-06-08
##	TWTR	-0.3293884	-0.1835023	-0.11482820	1.03047186	0.2911102	-0.45439269
##	HPQ	0.8643858	-0.1534954	0.17062071	0.94145148	-0.1506663	0.04760367
##	TEL	0.6494872	-0.1694162	-0.05854353	0.79055518	-0.1677021	-0.42770438
##	NOW	-0.4669909	-0.2567946	-0.73426856	0.04898617	-0.1771901	0.03605698
##	ORCL	0.5158534	0.4228512	0.49850012	1.13759066	0.6292728	0.37935741
##	MA	-0.1564559	0.8801449	-0.70392663	0.49927908	-0.3042192	0.10167693
##		2021-06-09	2021-06-10	2021-06-11	2021-06-14	2021-06-15	2021-06-16
##	TWTR	0.4322646	0.26679179	0.06647113	0.131709809	-0.3357479	-0.1867453
##	HPQ	-0.5518645	-0.15278132	0.11321544	-1.004498247	0.2448890	-0.8359106
##	TEL	-0.8729463	0.42835086	-0.01773577	-0.002890288	-0.2068895	-0.2967364
##	NOW	0.2623263	1.99485971	0.63982690	0.820889038	-0.3778510	0.2870411
##	ORCL	-0.1031065	-1.44731542	0.34247768	-0.226518125	-0.6790321	-3.0255170
##	MA	-0.3034462	0.07452438	0.10419289	0.080267967	0.1551028	-0.6074381
##		2021-06-17	2021-06-18	2021-06-21	2021-06-22	2021-06-23	2021-06-24
##	TWTR	0.3624330	0.035626891	0.521925595	0.86164194	1.26189729	0.77303364
##	HPQ	-0.6052648	0.003044032	0.750204984	-0.14161769	0.04553686	0.34744085
##	TEL	-0.8440104	-1.806817788	0.936209019	-0.02456937	0.14918484	0.52546202
##	NOW	1.4940451	0.172671104	-0.000862972	0.75562795	0.22545696	0.05848594
##	ORCL	0.2857808	-0.961005482	1.185085681	0.42552054	-0.43954955	-0.29222941
##	MA	0.4009003	-0.035525379	0.680997453	0.57814500	-0.41688658	-0.10174857
##		2021-06-25	2021-06-28	2021-06-29	2021-06-30	2021-07-01	2021-07-02
##	TWTR	-0.17782650	0.12698003	0.28253010	-0.11877718	-0.3451870	0.4536256
##	HPQ	0.30112766	0.10042720	0.42404183	0.02873143	0.1816581	0.4434498
##	TEL	0.02085692	-0.33260284	0.77405208	-0.02119824	0.5315366	0.5326312
##	NOW	-0.58066268	0.44362343	0.38265222	-0.71300470	-0.3894164	0.4058769
##	ORCL	0.44761804	-0.01917226	-0.31815023	-0.22394158	1.1185024	1.4825292
##	MA	0.56393549	-1.54579099	-0.01098246	-0.42812747	0.6791695	0.5014414
##		2021-07-06	2021-07-07	2021-07-08	2021-07-09	2021-07-12	2021-07-13
##	TWTR	0.41065643	-0.66498198	-0.8913037	0.9424419	0.3590455	-0.14832087
##	HPQ	-0.75243897	0.09822825	-0.5403582	0.1275142	-1.2015439	-1.50774582
##	TEL	-0.94087960	0.42041643	-0.7856753	1.0744229	0.1957818	-0.41773812
##	NOW	0.40006380	0.15667133	-0.1672882	0.3393150	-0.3842647	-0.25770022
##	ORCL	0.77501654	1.88603721	-0.3561486	1.3059170	-0.4596506	-0.05249172
##	MA	0.08576798	-0.33030555	-0.4709630	0.3006727	0.2815044	0.97890724
##		2021-07-14	2021-07-15	2021-07-16	2021-07-19	2021-07-20	2021-07-21
##	TWTR	0.2590202	-0.9901508	-0.7789405	-0.21396025	0.8527428	0.68392525
##	HPQ	0.5550711	-0.7608741	-0.9079594	0.06588928	0.9029708	0.42063701
##	TEL	0.2481734	-0.5947642	-0.9946045	-0.77059901	1.1659505	1.37811091
##	NOW	0.1788586	-0.4015411	-0.2109101	-0.16534364	0.6456811	0.05561846
##	ORCL	0.8943358	-1.2789003	0.7267194	-0.35728105	0.9838298	0.57327137
##	MA	0.8257288	-0.1216573	-0.4310743	-2.71246024	1.1101662	0.66734581
##		2021-07-22	2021-07-23	2021-07-26	2021-07-27	2021-07-28	2021-07-29
##	TWTR	-0.02158058	0.8951840	-1.31176689	-0.1946806	0.693220645	0.1440986
##	HPQ	-1.10138600	0.5634326	0.37611126	-0.1589489	0.062583117	0.4164170

##	TEL	-0.52543950	0.1000198	0.07390652	-0.4103505	1.540851262	1.4788508
##	NOW	0.58938906	0.5722069	-0.20848938	-0.2042233	-0.003696823	0.1325967
##	ORCL	0.54831447	-1.8107484	0.05703022	-0.0827908	-0.423016221	0.2289423
##	MA	0.21022753	1.3279326	-0.10793603	-0.3584250	-0.884000787	0.6131816
##		2021-07-30	2021-08-02	2021-08-03	2021-08-04	2021-08-05	2021-08-06
##	TWTR	-0.30361487	-0.3060048	-0.25546386	-0.003619440	0.22289191	-0.876063226
##	HPQ	0.09040308	0.3518819	0.52122299	-0.695281021	0.19023638	0.088382262
##	TEL	0.41216708	0.3150929	0.26812286	-0.196553600	-0.18337790	0.336544421
##	NOW	0.02267097	-0.2912036	-0.07608961	0.518243206	0.05934695	-0.394297095
##	ORCL	-0.34460829	0.2351829	1.25661787	0.137882586	-0.41360052	0.007301236
##	MA	-0.40312135	-1.3673857	-1.02236982	0.000654169	0.45513603	0.278569623
##		2021-08-09	2021-08-10	2021-08-11	2021-08-12	2021-08-13	2021-08-16
##	TWTR	-0.19781469	-0.64043222	-0.13696312	-0.27250119	-0.09582388	-0.52436653
##	HPQ	-0.04095580	0.54642261	0.48181053	0.37769471	-1.96157073	0.58165941
##	TEL	-0.04340951	0.08912509	0.48878538	0.32901547	-0.06665047	0.24990643
##	NOW	-0.25683132	-0.89021523	-0.45857373	0.71017708	0.34865449	-0.58544968
##	ORCL	0.18005239	-0.20063034	-0.05232329	0.06075099	0.29214070	0.21329425
##	MA	-0.54084129	-0.41643241	-0.51743077	-0.34720022	0.04874305	0.05376636
##		2021-08-17	2021-08-18	2021-08-19	2021-08-20	2021-08-23	2021-08-24
##	TWTR	-0.46536365	-0.40358501	-0.06913281	0.19640414	0.75110855	-0.10612196
##	HPQ	-1.12532170	-0.71467648	-0.69588162	0.62434314	0.46512814	0.45910332
##	TEL	-1.03406559	-0.41176646	-0.66170557	0.31963929	0.67766994	0.29860191
##	NOW	0.06174471	-0.09503637	0.26104400	0.83748929	1.16517274	0.07850105
##	ORCL	0.02998008	-1.22512278	-0.18430342	0.09192229	0.06157717	-0.38750519
##	MA	-0.09547698	-0.35063759	-0.53157257	-0.36090155	0.75353200	0.04901467
##		2021-08-25	2021-08-26	2021-08-27	2021-08-30	2021-08-31	2021-09-01
##	TWTR	0.05587823	-0.77661441	0.3649282	0.57625819	-0.12907627	0.4620375
##	HPQ	0.67123723	-0.45543014	-0.3007816	1.15005544	-0.04095580	-0.7754055
##	TEL	-0.15437769	-0.02652040	0.5835066	-0.04333988	-0.86246381	0.0479792
##	NOW	-0.12482976	0.11235156	0.4530105	0.50083890	0.04676965	0.3659053
##	ORCL	-0.00421005	0.01381849	0.3323771	0.01332252	-0.23717622	0.4443302
##	MA	-0.40437723	-0.87811449	0.3341771	-0.41036019	-0.97032882	0.4060788
##		2021-09-02	2021-09-03	2021-09-07	2021-09-08	2021-09-09	2021-09-10
##	TWTR	-0.4770165	-0.006398787	0.1162797	-1.3074441	0.058367338	-0.47446414
##	HPQ	0.5053108	0.328005179	-1.4795389	-0.7153796	-0.011156579	-0.35364394
##	TEL	0.1627131	-0.514514082	-0.3661167	-0.6143887	-0.475710164	-0.16906436
##	NOW	0.4972166	1.017639515	-1.0936784	-0.5098586	-0.292947877	-0.20932738
##	ORCL	-0.1353049	0.072414970	-0.8049397	0.4045230	-0.004642962	0.03702666
##	MA	-1.1793038	-0.198549786	0.5733877	0.8203057	-0.002262325	-0.59596338
##		2021-09-13	2021-09-14	2021-09-15	2021-09-16	2021-09-17	2021-09-20
##	TWTR	-0.976614890	0.2363535	0.80181173	0.18731957	0.05343882	-0.7772644
##	HPQ	0.529109409	-1.2546299	0.55345858	0.09430129	-0.58025217	-0.7086608
##	TEL	0.288679138	-0.5958894	0.05131592	-0.46428335	-0.73304271	-0.8609233
##	NOW	-0.616531517	0.3154220	0.33539338	0.17830853	-0.39474231	-0.2146026
##	ORCL	-0.516220208	-1.5464611	0.78094564	-0.33819033	-0.57210337	-0.1821976
##	MA	0.006474497	-0.3283349	-0.19663860	0.16269348	-0.50106072	-0.5164199
##		2021-09-21	2021-09-22	2021-09-23	2021-09-24	2021-09-27	2021-09-28
##	TWTR	0.8815017	0.6798037	1.12417272	0.20777615	-0.8746080	-1.3978846
##	HPQ	-0.6731899	1.1488981	0.55280446	-0.17606788	1.1940383	-0.2311544
##	TEL	-0.5136663	0.8058838	1.21169442	-0.02235827	0.2599935	-1.4329997
##	NOW	0.2567775	0.4334596	0.01792427	0.04855132	-1.0657967	-2.3219623
##	ORCL	0.4178667	0.8863556	0.54465576	0.26379904	0.6059702	-0.3686044
##	MA	-0.3755051	0.7970027	1.42278957	0.49658945	-0.2367705	-0.7969243
##		2021-09-29	2021-09-30	2021-10-01	2021-10-04	2021-10-05	2021-10-06

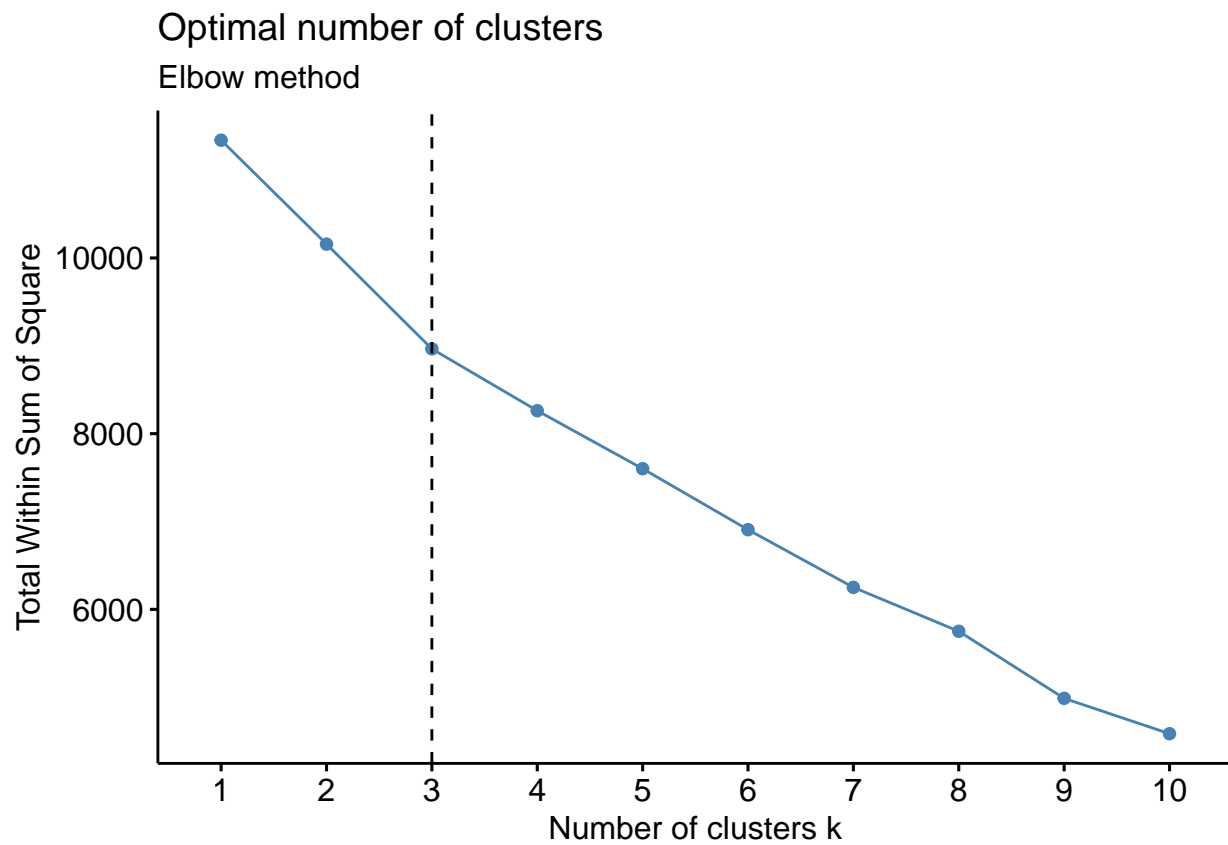
##	TWTR	-1.1977468	0.12781966	0.7687217	-1.80232330	0.7335269	0.6942673
##	HPQ	-1.9075131	0.03595058	1.0490816	-0.02599098	0.2881409	-0.8573048
##	TEL	-0.8409038	-0.58615456	1.6310190	-0.55658097	1.1668155	0.2325744
##	NOW	0.2783431	0.19551078	0.5912570	-0.99870755	0.9095607	-0.3279365
##	ORCL	0.4015967	-2.45458278	1.5513609	-0.33165893	1.2861628	-0.1338167
##	MA	0.2196441	-0.79370790	1.6561666	-2.16070585	-0.1890312	0.7064308
##		2021-10-07	2021-10-08	2021-10-11	2021-10-12	2021-10-13	2021-10-14
##	TWTR	1.2996387	-0.17308868	-0.79190961	-0.3541602	0.33771083	0.4411547
##	HPQ	0.4131506	-0.28055612	-0.35723618	-1.7557484	-0.15170196	1.5611937
##	TEL	0.6712657	-0.29697814	-0.05397869	-1.4783901	-0.07234268	1.9301205
##	NOW	0.4604292	-1.33158422	-0.18577905	0.7741334	0.56833227	0.7637813
##	ORCL	0.5200574	1.34518583	0.46219954	0.1103574	0.41685135	-0.6660578
##	MA	0.7200019	0.08864067	-1.09792757	-0.3001182	-0.46378884	0.2571955
##		2021-10-15	2021-10-18	2021-10-19	2021-10-20	2021-10-21	2021-10-22
##	TWTR	-0.22797875	0.97161396	0.5629752	-0.177841131	-0.2202567	-1.50924574
##	HPQ	1.16616976	0.43434599	0.3409044	-0.433931033	2.8680889	-0.17836171
##	TEL	0.09843348	-0.06072001	-0.1194382	0.004949888	0.4990324	-0.41611218
##	NOW	0.53692888	0.10517882	0.7542542	-0.025608552	0.2271035	-0.05762074
##	ORCL	-0.01837900	0.61384577	0.2575896	-0.277172375	-0.2340190	1.03366742
##	MA	1.52259633	0.27336428	0.4328909	-0.751847291	-0.1269377	0.27584203
##		2021-10-25	2021-10-26	2021-10-27	2021-10-28	2021-10-29	2021-11-01
##	TWTR	-0.098485276	-0.3688507	-3.3233601	-0.32426557	-0.4563223	0.8601185
##	HPQ	0.179614899	-0.7129241	-0.6541633	1.01977252	-0.2064935	1.2331782
##	TEL	-0.009014717	-0.3085272	-1.4485537	0.79288669	0.2471558	1.7464359
##	NOW	0.050808881	-0.7697300	-0.7711276	1.28412702	0.5009039	-0.9663908
##	ORCL	-0.241803456	-0.5422000	-0.5688514	0.06471716	-0.2071089	-0.9136468
##	MA	0.237811958	-0.5185187	-2.9250043	-0.43311755	0.3029640	-0.2605515
##		2021-11-02	2021-11-03	2021-11-04	2021-11-05	2021-11-08	2021-11-09
##	TWTR	-0.6549324	0.27047527	-0.51042918	-0.3360439	0.49922288	-0.2491742
##	HPQ	-0.3635530	0.28413811	0.06657751	0.7902932	-0.50110096	0.1850178
##	TEL	0.2694908	0.43146394	0.46026237	1.2165282	-0.29614256	0.9446542
##	NOW	0.1909013	-0.01344636	0.73009179	-0.6211214	-0.06004254	-0.1328939
##	ORCL	0.7956818	0.10940920	-0.33483045	-0.4256363	0.06036170	-0.3547093
##	MA	-0.8447168	0.08508818	0.81317090	1.8404046	0.06755062	-0.7345819
##		2021-11-10	2021-11-11	2021-11-12	2021-11-15	2021-11-16	2021-11-17
##	TWTR	-0.8132863	-0.23885100	0.1237672	0.37408974	-0.5188606	-0.9131724
##	HPQ	-0.3714921	0.18558999	0.1313573	-0.66139145	-0.2285381	-0.4178007
##	TEL	-0.1883752	0.79580542	0.2963828	-0.06476752	0.1674085	0.3145616
##	NOW	-1.2357815	0.41432685	0.6292968	-0.57856367	0.5006169	-0.5088937
##	ORCL	-0.4749157	0.07300269	-0.3299571	0.22732797	0.8556364	-0.2025716
##	MA	1.7801124	-0.53028834	1.1761194	-0.33211815	1.0260145	-1.3883802
##		2021-11-18	2021-11-19	2021-11-22	2021-11-23	2021-11-24	2021-11-26
##	TWTR	-1.2467266	-0.16032524	-0.7219990	-0.1444023	0.2112524	-0.32372778
##	HPQ	0.6109137	0.01253697	0.6001356	0.3010826	4.1999769	-1.06025319
##	TEL	-0.4699682	0.30069345	-0.8737983	-0.5999183	-0.1633633	-1.42235694
##	NOW	-0.5982688	-0.06784021	-1.2171634	-1.2440408	0.6916083	-0.06085363
##	ORCL	-0.4212337	-0.43515831	0.3168938	-0.9878449	0.3209196	-0.75882598
##	MA	-1.5011230	-1.21232886	-2.6290061	1.0865132	1.5365066	-2.26487371
##		2021-11-29	2021-11-30	2021-12-01	2021-12-02	2021-12-03	2021-12-06
##	TWTR	-0.8710825	-1.2612737	-0.8125904	-0.15589779	-0.4497432	1.7061576
##	HPQ	1.5989080	-0.8008597	1.3639734	1.31849918	-0.1413925	-0.7345096
##	TEL	1.0648318	-1.7816493	-0.4396652	1.54798143	-0.5371716	0.5403013
##	NOW	1.3359789	-1.5463205	-3.0029771	1.48845594	-0.7238494	0.1449886
##	ORCL	0.3060172	-1.3089259	-0.6282973	0.09626059	-1.0835995	0.3767563

```
## MA -0.2223915 -1.2425462 -1.3561120 2.10742523 0.2311188 1.6029513
## 2021-12-07 2021-12-08 2021-12-09 2021-12-10 2021-12-13 2021-12-14
## TWTR -0.04160883 0.83009808 0.4591786 -0.6258956 -0.6777652 -0.2058022
## HPQ 0.65759897 -0.69429559 -0.6817217 0.2843907 -1.3669401 0.3400364
## TEL 0.44027420 -0.14858159 -0.5968207 1.0018127 -0.7628881 -0.3552045
## NOW 2.91831604 0.06830168 -1.4754151 0.2221399 0.4689590 -1.9523534
## ORCL 0.61929361 -0.70382712 -0.1483213 8.2813717 -0.9506548 -0.5750366
## MA 0.82870882 0.34376748 0.2502680 0.6925040 -0.6784127 -0.7074141
## 2021-12-15 2021-12-16 2021-12-17 2021-12-20 2021-12-21 2021-12-22
## TWTR -0.2274076 -0.6856537 -0.07719879 -0.09851325 0.9450800 -0.3511922
## HPQ 0.7377862 0.4687613 -0.18974732 -0.54634855 0.9937643 0.2540504
## TEL 1.1412424 -0.2582473 -1.19942007 -1.12570478 1.2055583 -0.0594687
## NOW 1.3341223 -2.3928191 0.35479873 -0.73200183 1.6133948 0.7115023
## ORCL 1.9613252 -0.2676485 -3.45680553 -2.79548442 -0.1220326 -1.0080838
## MA 0.7570047 0.8490937 -0.53843819 -1.72431225 1.8822291 0.8608502
## 2021-12-23 2021-12-27 2021-12-28 2021-12-29 2021-12-30
## TWTR 0.1459893 0.08273391 -0.654302287 -0.505529391 1.17849594
## HPQ 0.3759414 0.46109079 -0.206324417 -0.007755591 -0.29532796
## TEL 0.5081106 1.35257614 -0.102473046 -0.090045344 -0.61594901
## NOW 0.2084714 0.81813840 -0.626624366 -0.040474762 -0.07782492
## ORCL -0.1294639 -0.15338091 -0.576522590 -0.311098650 -0.16730336
## MA 0.3597496 -0.08792665 0.009641287 0.014828435 -0.09180517
```

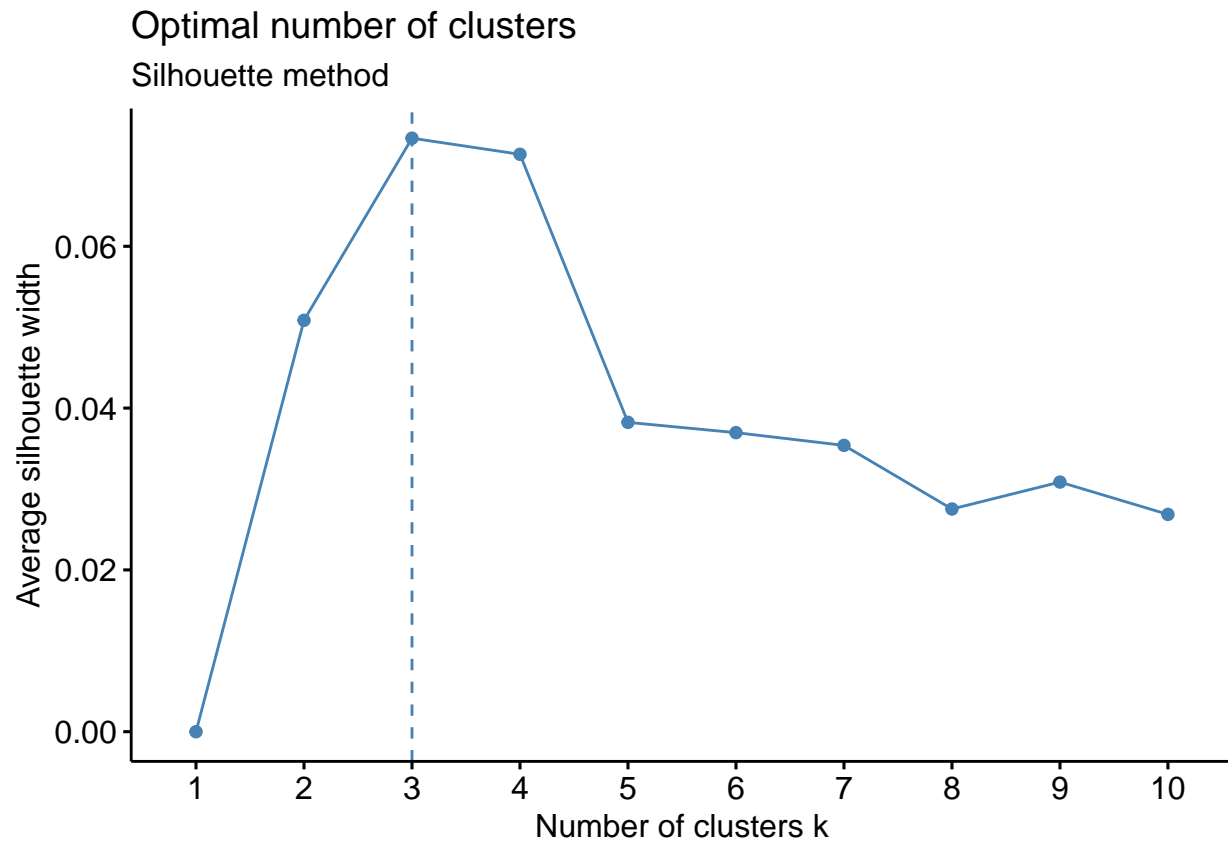
2. Determine Optimal Clusters: From both Elbow and Silhouette methods, it seems that k=3 is good.

```
library(factoextra)
```

```
## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
# Elbow Method
fviz_nbclust(data_cluster, kmeans, method = "wss") +
  geom_vline(xintercept = 3, linetype = 2) +
  labs(subtitle = "Elbow method")
```



```
# Silhouette method  
fviz_nbclust(data_cluster, kmeans, method = "silhouette") +  
  labs(subtitle = "Silhouette method")
```



3. Cluster Result:

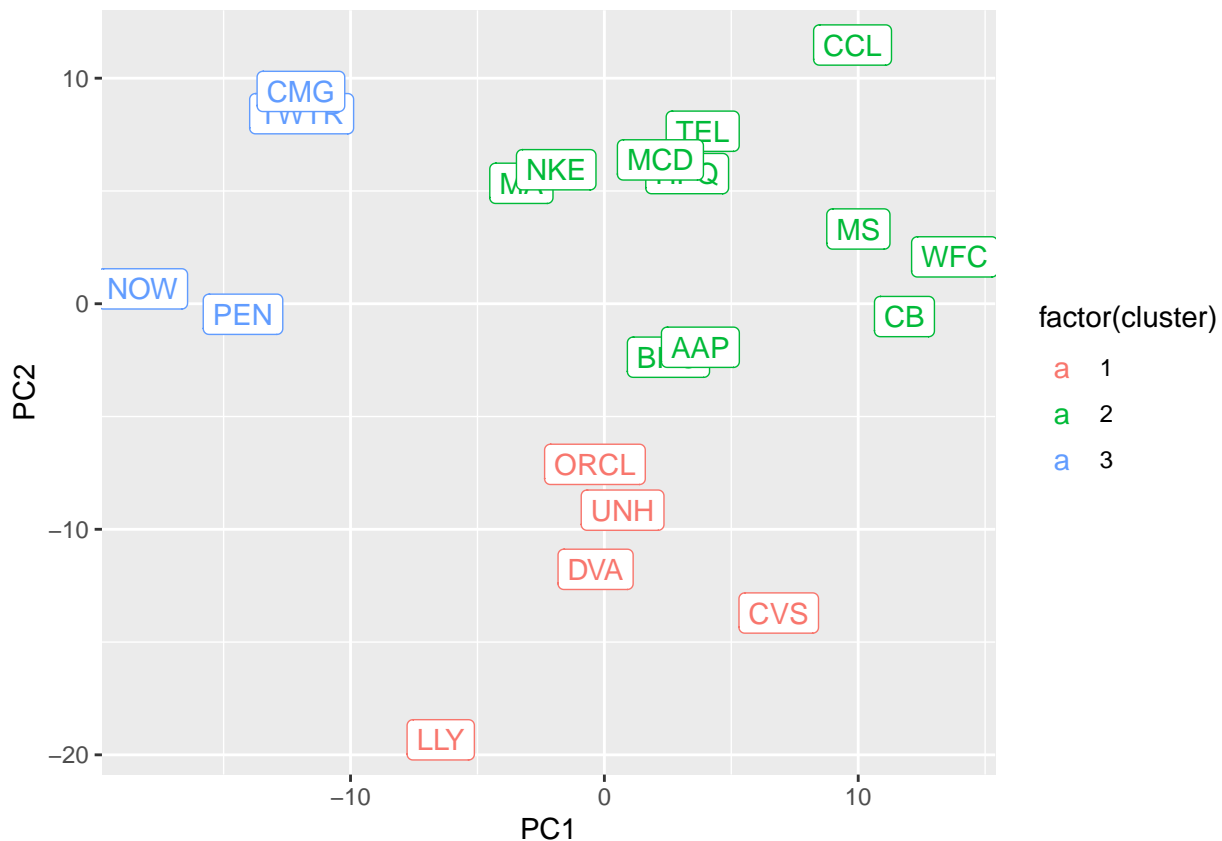
```
km3 <- kmeans(data_cluster,centers = 3)$cluster
km3
```

```
## TWTR  HPQ  TEL  NOW ORCL  MA  WFC  MS  BRO  CB  UNH  LLY  PEN  DVA  CVS  NKE
##      3   2   2   3   1   2   2   2   2   2   1   1   3   1   1   2
## MCD  CMG  AAP  CCL
##      2   3   2   2
```

4. Visualize Data

```
#Use regular PCA to reduce the dimension
PC <- prcomp(x=data_cluster, scale = FALSE)$x[,1:2] %>% data.frame()

#Visualize data for k=3
PC %>% mutate(cluster = km3,stock_name=row.names(PC)) %>%
  ggplot(aes(x=PC1, y=PC2, color = factor(cluster),label = stock_name)) +
  geom_point() +
  geom_label()
```



5. Problem:

Are there clear clusters of stocks in our subset of the S&P500?

Answer: Yes, there is three clear clusters of stocks.

Do we find that different stocks of different sectors cluster together, or are clearly distinguished?

Answer: A few different stocks of different sectors cluster together with common features and they forms three clusters. Two of them are clearly distinguished, and the other one needs more information to analyze.

Recall Cluster Result:

Cluster 1: Twitter (TWTR, Technology), Service Now (NOW, Technology), Penumbra (PEN, Health), Chipotle (CMG, Consumer Discretionary)

Cluster 2: NKE (Nike, Consumer Discretionary), MCD (McDonald's, consumer Discretionary), AAP (Advance Auto Parts, Consumer Discretionary), CCL (Carnival, Consumer Discretionary), MA (Master-Card, Finance), BRO (Brown & Brown, Finance), MS (Morgan Stanley, Finance), WFC (Wells Fargo, Finance), CB (Chubb Limited, Finance), TEL (TE Connectivity, Technology), HPQ (HP, Technology)

Cluster 3: LLY (Eli Lilly, Health), UNH (UnitedHealth, Health), DVA (DaVita, Health), CVS (CVS, Health), ORCL (Oracle, Technology)

Detailed Analysis for the data:

We have no idea about cluster 1 it may need more information to decided the common feature of stocks here.

Cluster 2 includes all stocks from consumer discretionary category except Chipotle, all stocks from finance category, and two stocks from technology. Since consumer discretionary and finance can be both consider as economic components, we assume that this cluster is related to people's daily economical behavior. This feature is also shown by TE connectivity and HP. TE connectivity primary focus is on reliable design and enabling people to achieve their potential, helping to drive technological innovation in connected transportation data communications and smart homes, transforming the way people live, work and connect. HP mainly produces computers to the market.

We assume that cluster 3 is highly related to health, because except for Oracle, other stocks in cluster 3

are all belong to health category, and Oracle focuses on database which may contain database related to medical field.

ICA

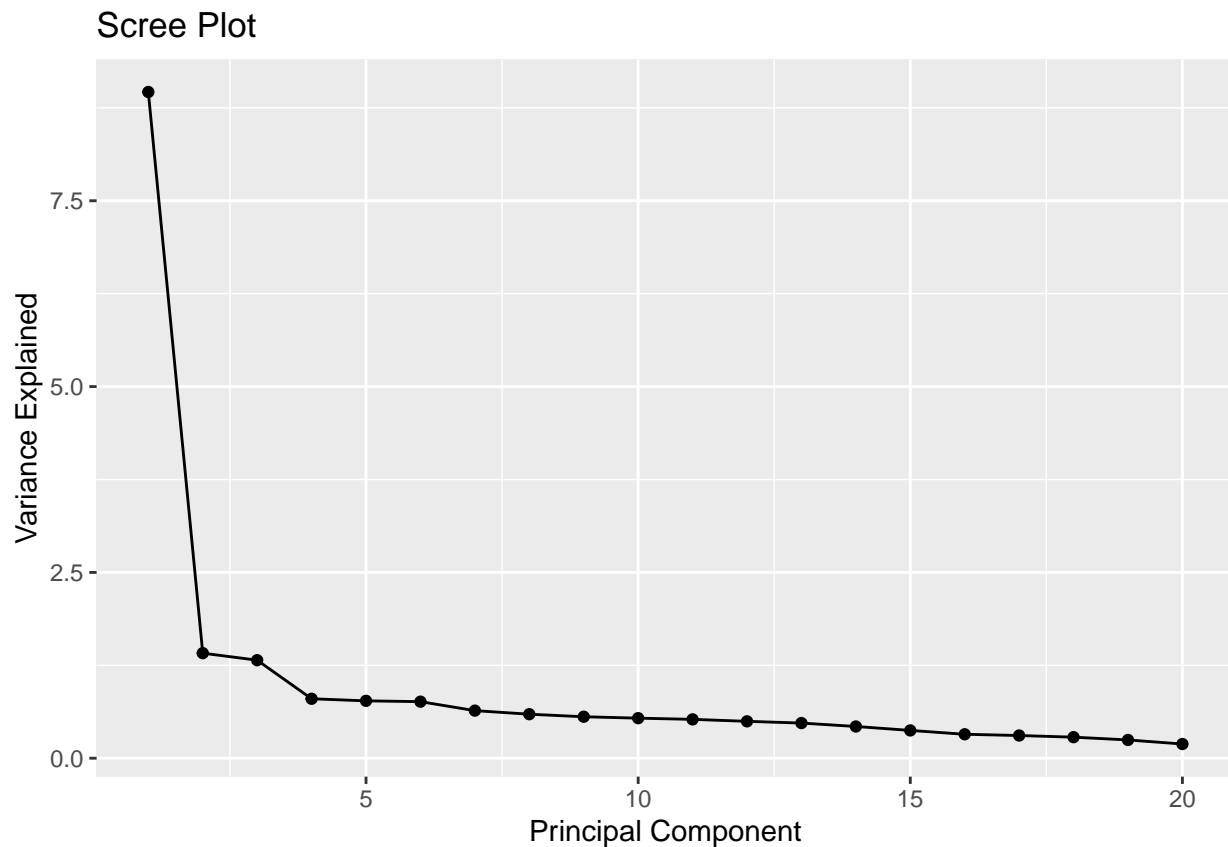
1. Each row name of data represents a date, each column name of data is a stock. Therefore, the data is a 1007 by 20 matrix.

```
head(data4_scaled)
```

```
##           TWTR           HPQ           TEL           NOW           ORCL
## 2018-01-02 -0.03474518 -0.04095580 -0.04001153 -0.075415097 -0.04636938
## 2018-01-03 -0.10944788  0.05756283  0.81872920  0.277495234  1.18897400
## 2018-01-04 -0.60888215  0.27354158  0.19602935  0.203219606  0.47906308
## 2018-01-05  0.38503247  0.38826473  1.11905718  0.266013249  0.27467953
## 2018-01-08  0.30404890  0.13285862  0.06718670  0.009211749  0.51484291
## 2018-01-09 -0.55597155 -0.09866611 -0.54430803 -0.031739367  0.24879097
##           MA           WFC           MS           BRO           CB
## 2018-01-02 -0.05234512 -0.007206238 -0.04356738 -0.0747807 -0.03019723
## 2018-01-03  0.54515018  0.312298722  0.07361064  0.6610451  0.39133985
## 2018-01-04  0.56244169  0.512250602  0.62433137  0.1008471  0.18642140
## 2018-01-05  0.93279206  0.272632119 -0.06001067  0.5382213  0.06651025
## 2018-01-08  0.09130112 -0.477103955 -0.22454503 -0.2730725 -0.30123884
## 2018-01-09  0.01629340  0.140059974  0.29510226  0.4473420  0.83555639
##           UNH           LLY           PEN           DVA           CVS
## 2018-01-02 -0.05480159 -0.07480881 -0.05595107 -0.03158289 -0.03394196
## 2018-01-03  0.48223364  0.20683924  0.02580954  0.21179294 -0.26715003
## 2018-01-04  0.16738725  0.15656869 -2.48289791  1.23800575  1.37882277
## 2018-01-05  0.92139116  0.56174340  0.18416813  0.40189557  2.33393893
## 2018-01-08 -0.94334133 -0.33831484  0.61637049  0.05054493 -0.49839918
## 2018-01-09  0.20029663 -0.11693980  1.22205693  1.10987859 -0.08905982
##           NKE           MCD           CMG           AAP           CCL
## 2018-01-02 -0.06128976 -0.04128655 -0.08541396 -0.04971217  0.003324735
## 2018-01-03 -0.06941506 -0.30917733  2.18788602  0.37744931  0.055515139
## 2018-01-04 -0.09376897  0.40461426 -0.33920853  1.69208656 -0.014030293
## 2018-01-05  0.37763198  0.08679026  0.81711187  0.45210888 -0.187747872
## 2018-01-08  0.39811921 -0.08510615  0.53343057 -0.38214052 -0.084246730
## 2018-01-09 -0.42877310 -0.18380629  0.03184516 -0.43111549  0.558870648
```

2. Use Elbow Method on Factor Analysis to Determine Optimal Clusters: It seems that k=4 is resonable.

```
lambda = data4_scaled %>% cor %>% eigen %>% .$values
qplot(c(1:length(lambda)), lambda) +
  geom_line() + xlab("Principal Component") +
  ylab("Variance Explained") +
  ggtitle("Scree Plot")
```

3. Visualize Data by 4 Independent Components:

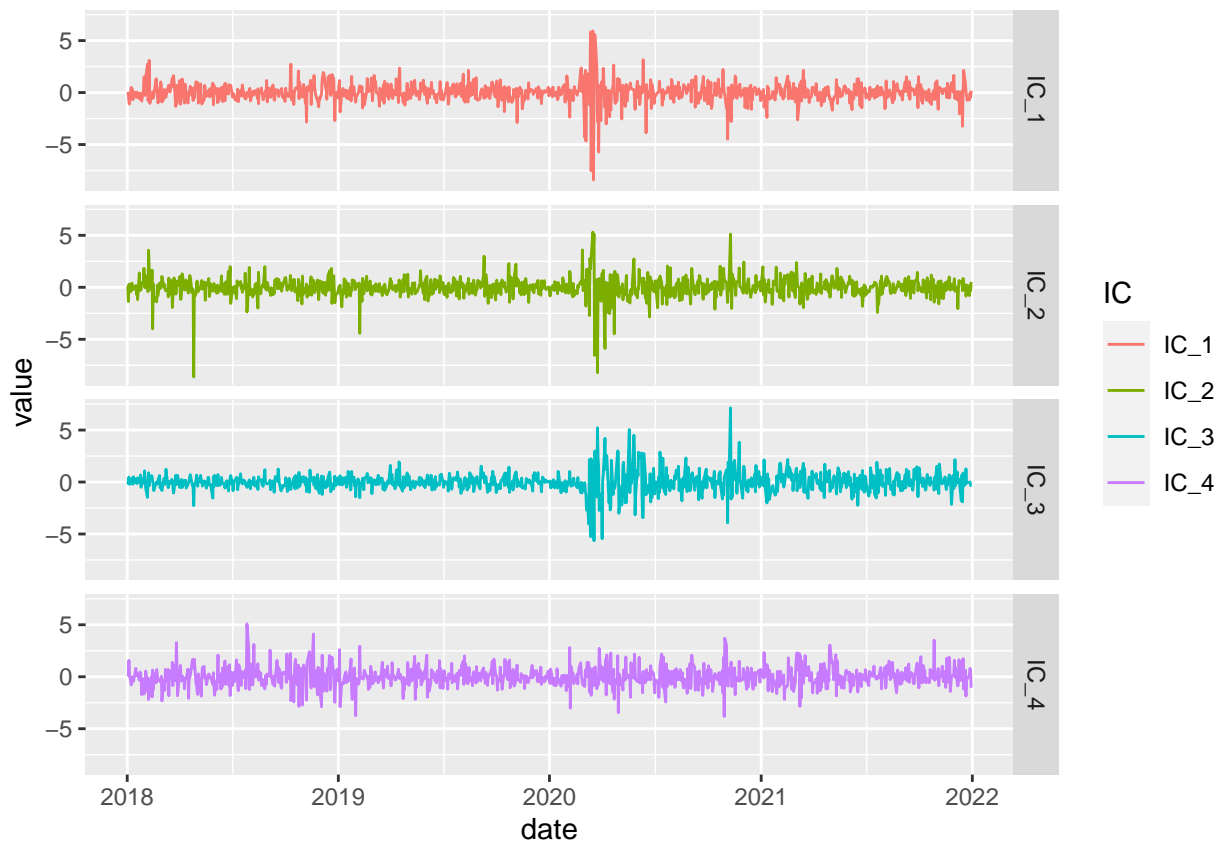
```
library(fastICA) #fastICA needs this package
```

```
ICA_mod <- fastICA(data4_scaled, n.comp = 4)
```

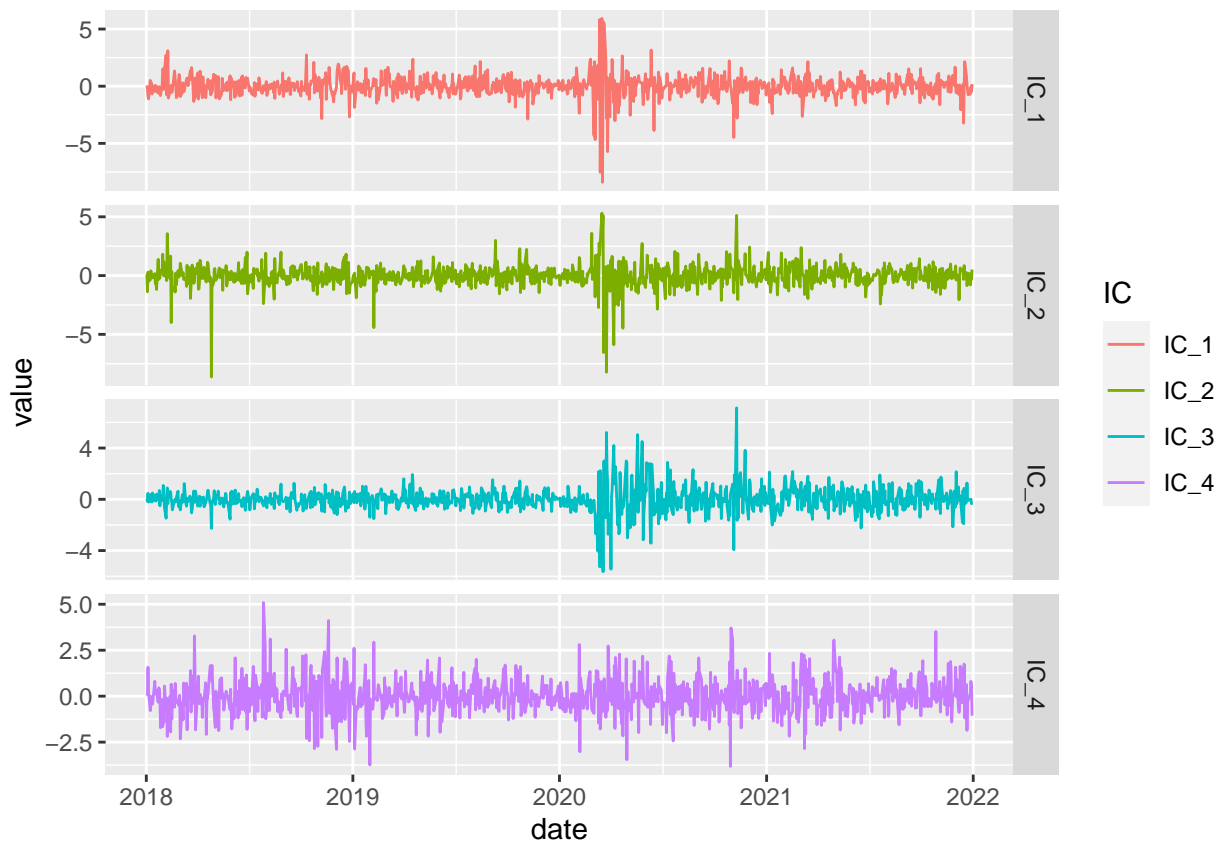
```
ICA_scores <- ICA_mod$S %>% data.frame()
colnames(ICA_scores) <- paste0("IC_",1:4)
ICA_scores$date = date_tibble$date
head(ICA_scores)
```

```
##           IC_1      IC_2      IC_3      IC_4      date
## 2018-01-02  0.06596292  0.08630711  0.02669883  0.030924536 2018-01-02
## 2018-01-03 -0.19323288 -1.37255372 -0.15987228  0.118851918 2018-01-03
## 2018-01-04 -0.91281065  0.29566620  0.47023940  1.575679579 2018-01-04
## 2018-01-05 -1.11063315 -0.47280987 -0.21199261  0.189498127 2018-01-05
## 2018-01-08  0.50355280 -0.36903952 -0.13947945 -0.787110420 2018-01-08
## 2018-01-09 -0.46256808  0.40636462  0.02902587 -0.007482585 2018-01-09
```

```
library(tidyr) #pivot_longer needs this package
p_ica <- ICA_scores %>%
  pivot_longer(IC_1:IC_4, names_to = "IC") %>%
  ggplot( aes(x=date, y=value, color = IC) ) +
  geom_line()
p_ica + facet_grid(vars(IC))
```



```
#If getting the different version of plot, use codes below, or try more times
#knitr::include_graphics("fixscaledica.jpg")
p_ica + facet_grid(vars(IC), scales = "free")
```



#If getting the different version of plot, use codes below, or try more times
#knitr::include_graphics("freescaledica.jpg")

4.Problem:

What are some independent factors that drive price or return of a group of stocks? (Independent component analysis)

Answer: we think the factors should be some big real world events, and the possible one to explain our data here is the pandemic of covid-19 happened in March of 2020.

Detailed Analysis for the data: Covid-19 started from March 2020 and from both plots (fix scaled one and free scaled one), we see that the amplitude of IC_1 , IC_2 and IC_3 has suddenly changed a lot from that time, whereas the amplitude for IC_4 wasn't change much. So we assume that IC_4 is the noise term. Since the sudden change on the amplitude for IC_1 and IC_2 went back to the trend before the covid-19, so we consider the covid only caused a short term influence on these two independent components. Because the amplitude of IC_3 after the covid-19 was still obviously bigger than it has been before the covid-19, therefore we think that covid-19 has create a long term effect on IC_3 .