IE421.01Homework-3

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05/01/2022

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Installing required packages

```
library(dplyr)
library(lubridate)
library(corrplot)
library(PerformanceAnalytics)
library(ggplot2)
library(tidyr)
library(dygraphs)
library(knitr)
library(forcats)
library(readr)
```

Importing Data

```
dFIR <- read_delim("C:/Users/Selimhan/Desktop/files/dFIR.csv",
delim = ";", escape_double = FALSE, col_types = cols(ISE = col_number(),
SP = col_number(), DAX = col_number(), FTSE = col_number(), NIKKEI = col_number(),  BOVESPA =
col_number()), locale = locale(decimal_mark = ",", grouping_mark = "."), trim_ws = TRUE)
```

Converting Dates to Proper Format

```
dFIR = dFIR %>%
  mutate(date = dmy(date))

str(dFIR)
```

```
## spec_tbl_df [536 x 7] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
##  $ date   : Date[1:536], format: "2009-01-05" "2009-01-06" ...
##  $ ISE    : num [1:536] 0.03838 0.03181 -0.02635 -0.08472 0.00966 ...
##  $ SP     : num [1:536] -0.00468 0.00779 -0.03047 0.00339 -0.02153 ...
##  $ DAX    : num [1:536] 0.00219 0.00846 -0.01783 -0.01173 -0.01987 ...
##  $ FTSE   : num [1:536] 0.003894 0.012866 -0.028735 -0.000466 -0.01271 ...
##  $ NIKKEI : num [1:536] 0 0.00416 0.01729 -0.04006 -0.00447 ...
##  $ BOVESPA: num [1:536] 0.03119 0.01892 -0.0359 0.02828 -0.00976 ...
##  - attr(*, "spec")=
##   .. cols(
##   ..   date = col_character(),
##   ..   ISE = col_number(),
##   ..   SP = col_number(),
##   ..   DAX = col_number(),
##   ..   FTSE = col_number(),
##   ..   NIKKEI = col_number(),
##   ..   BOVESPA = col_number()
##   .. )
##  - attr(*, "problems")=<externalptr>
```

1.3 Correlation Analysis

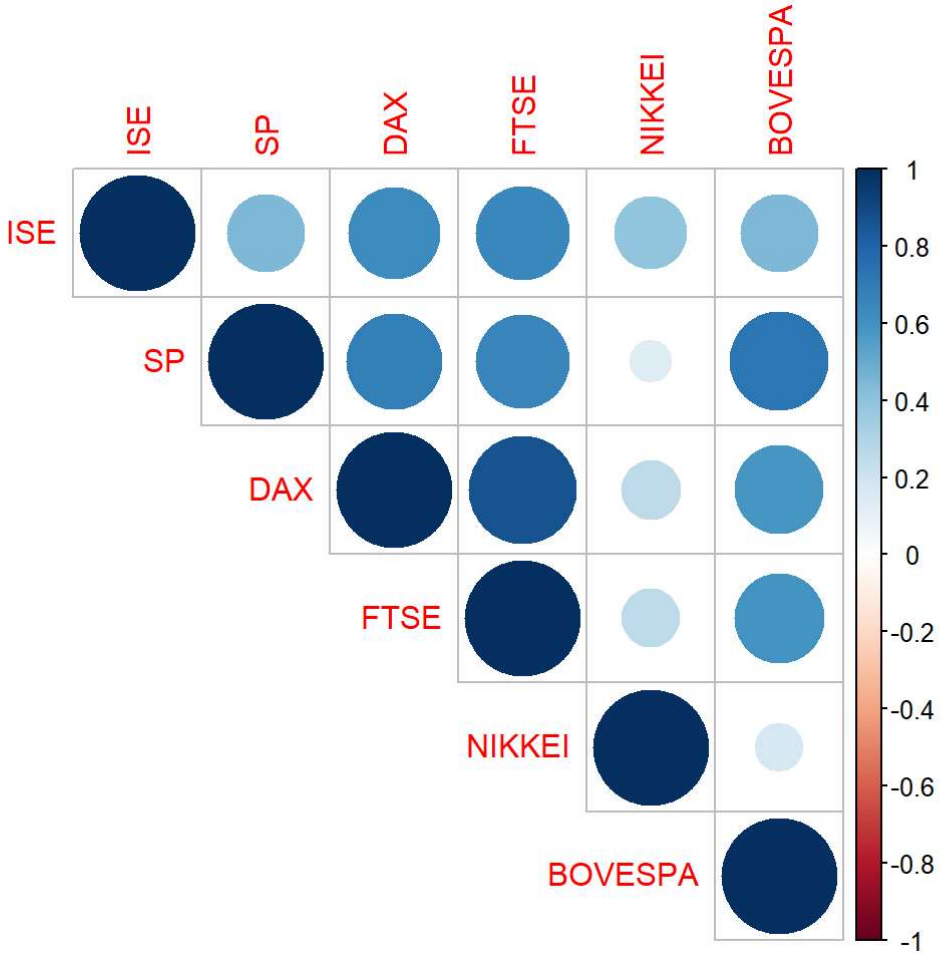
```
cor(dFIR[,-1])
```

```
##               ISE        SP       DAX      FTSE    NIKKEI   BOVESPA
## ISE     1.0000000 0.4495612 0.6292185 0.6487397 0.3932253 0.4468891
## SP      0.4495612 1.0000000 0.6858425 0.6576727 0.1312504 0.7220693
## DAX     0.6292185 0.6858425 1.0000000 0.8673693 0.2585375 0.5857911
## FTSE    0.6487397 0.6576727 0.8673693 1.0000000 0.2552364 0.5962870
## NIKKEI  0.3932253 0.1312504 0.2585375 0.2552364 1.0000000 0.1727524
## BOVESPA 0.4468891 0.7220693 0.5857911 0.5962870 0.1727524 1.0000000
```

FTSE and **DAX** seem to have highest correlation .

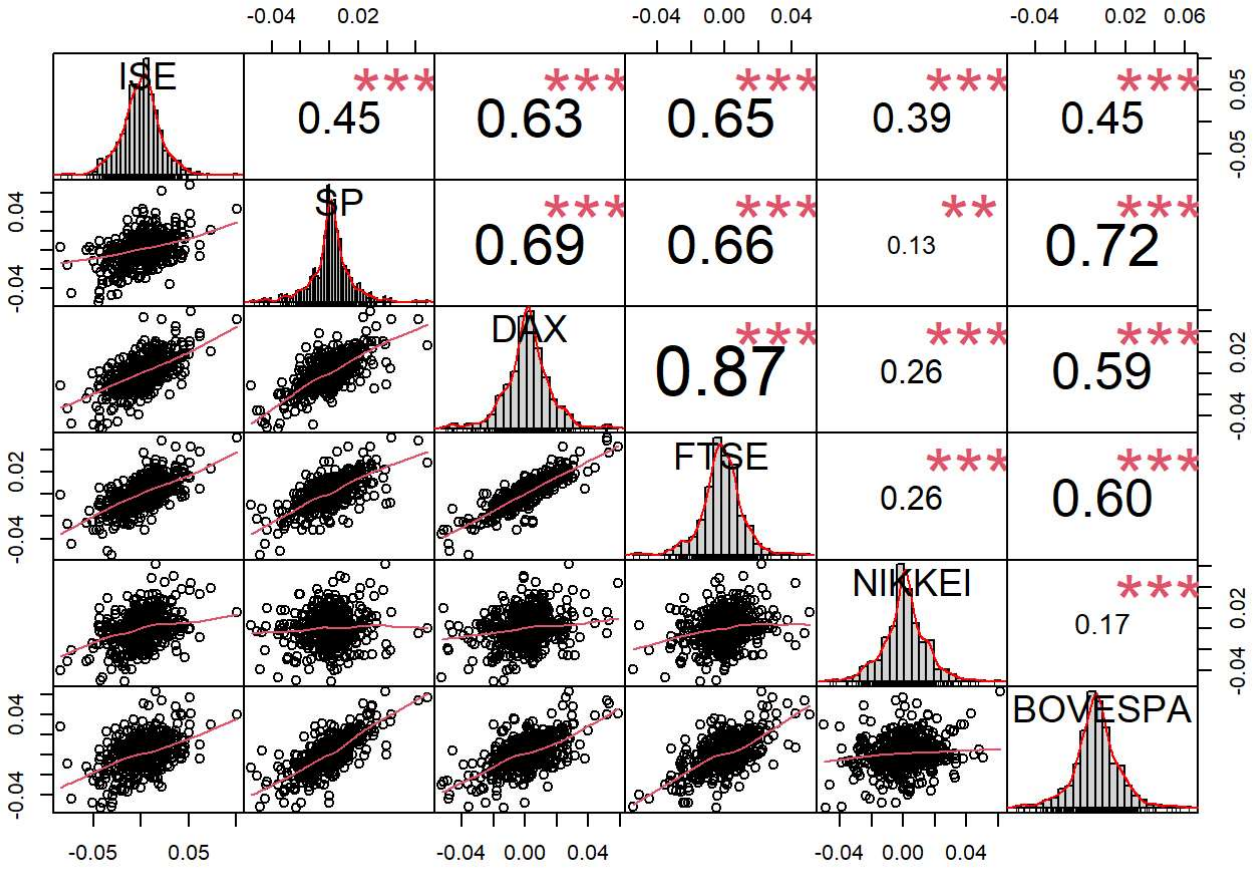
Correlation Plot

```
c = cor(dFIR[,-1])
corrplot(c , method = "circle" , type = "upper")
```



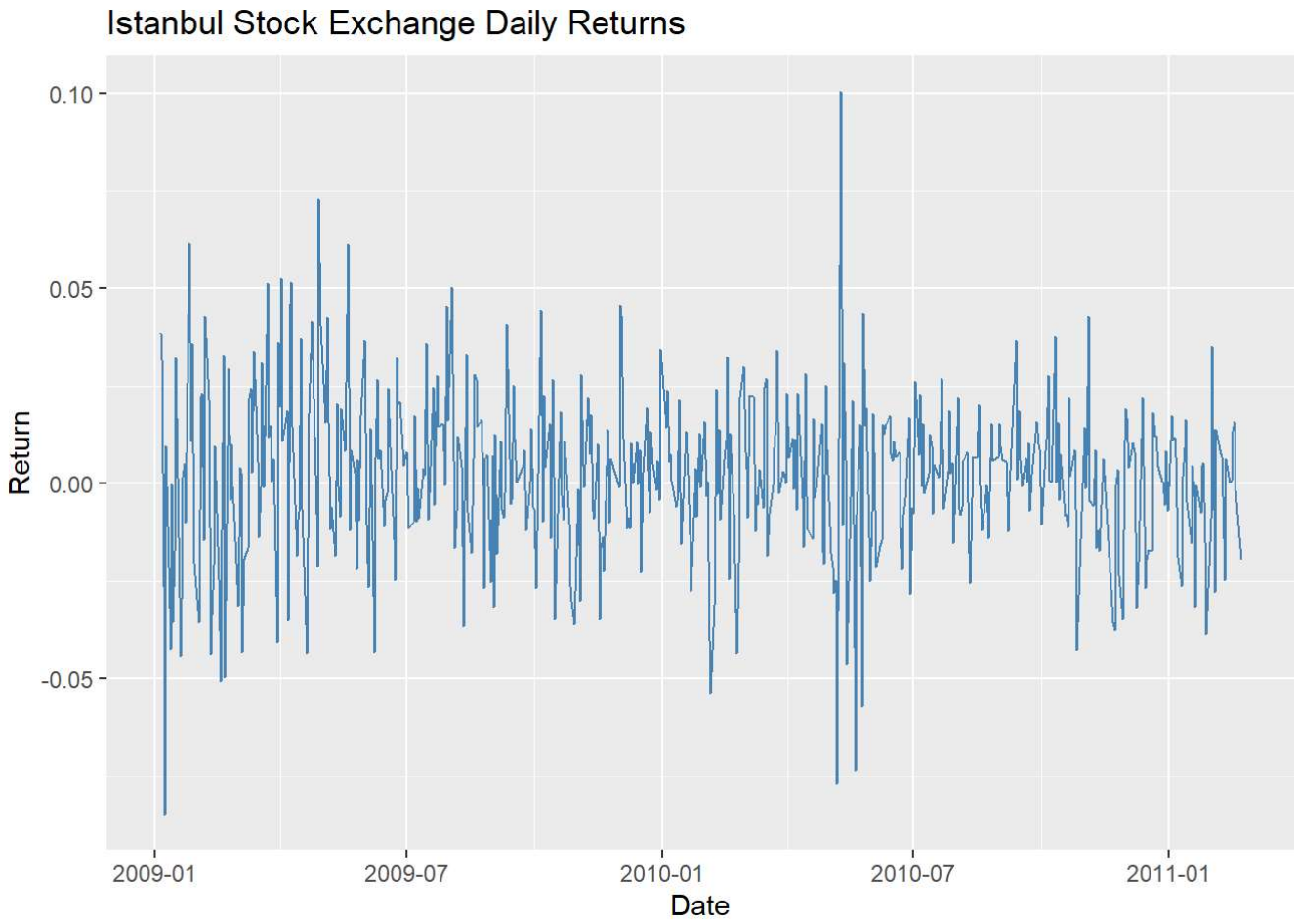
The darker the color , the higher the correlation

```
chart.Correlation(dFIR[,-1])
```



1.4 Time Series Plots

```
ggplot(dFIR , aes(x = date , y = ISE)) +
  geom_line(color = "steelblue") +
  labs(x = "Date" , y = "Return" ,
       title = "Istanbul Stock Exchange Daily Returns")
```

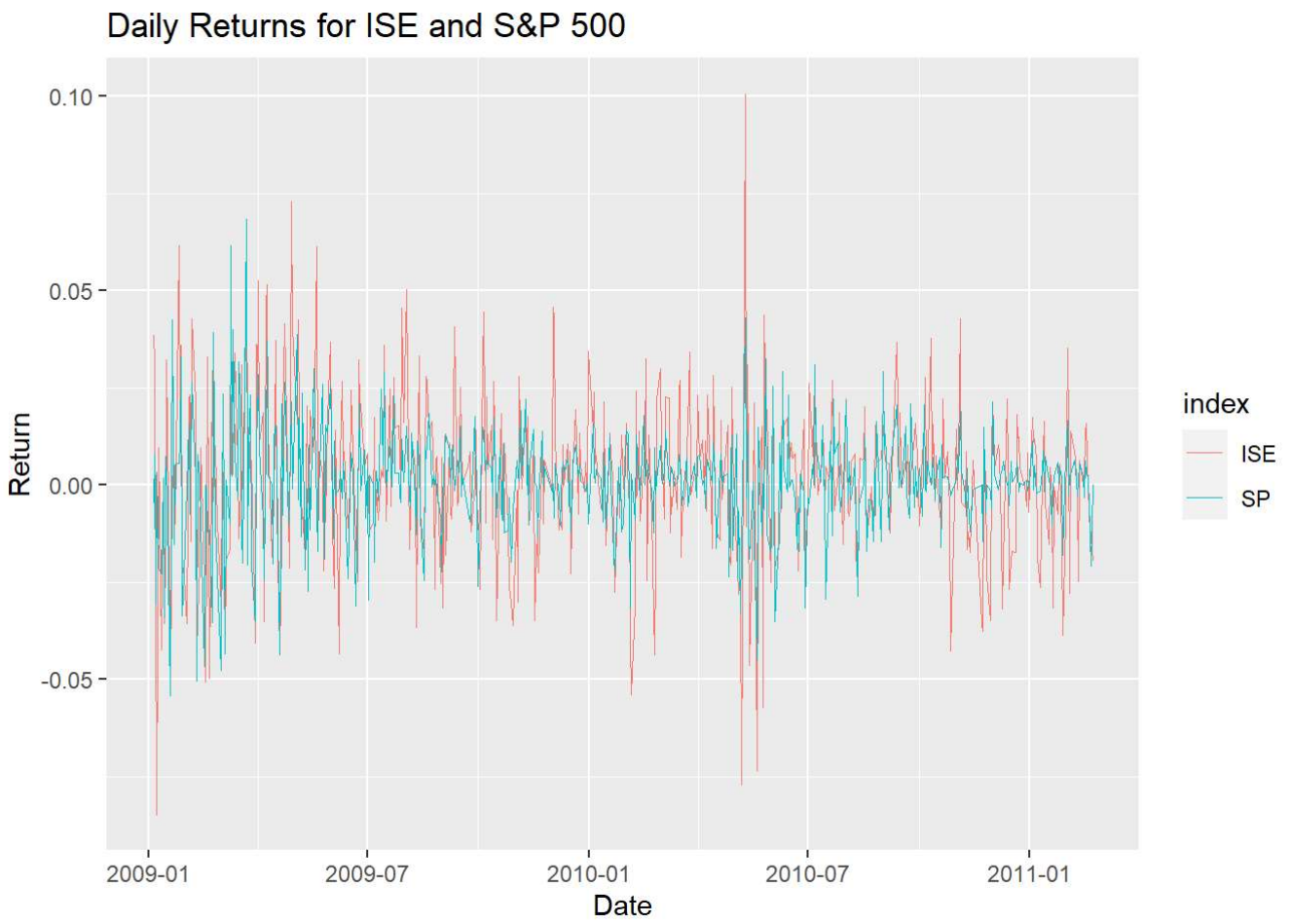


Pipe for gather

```
dG <- dFIR %>%
  select(date , ISE , SP) %>%
  gather(key = "index" , value = "value" , -date)
```

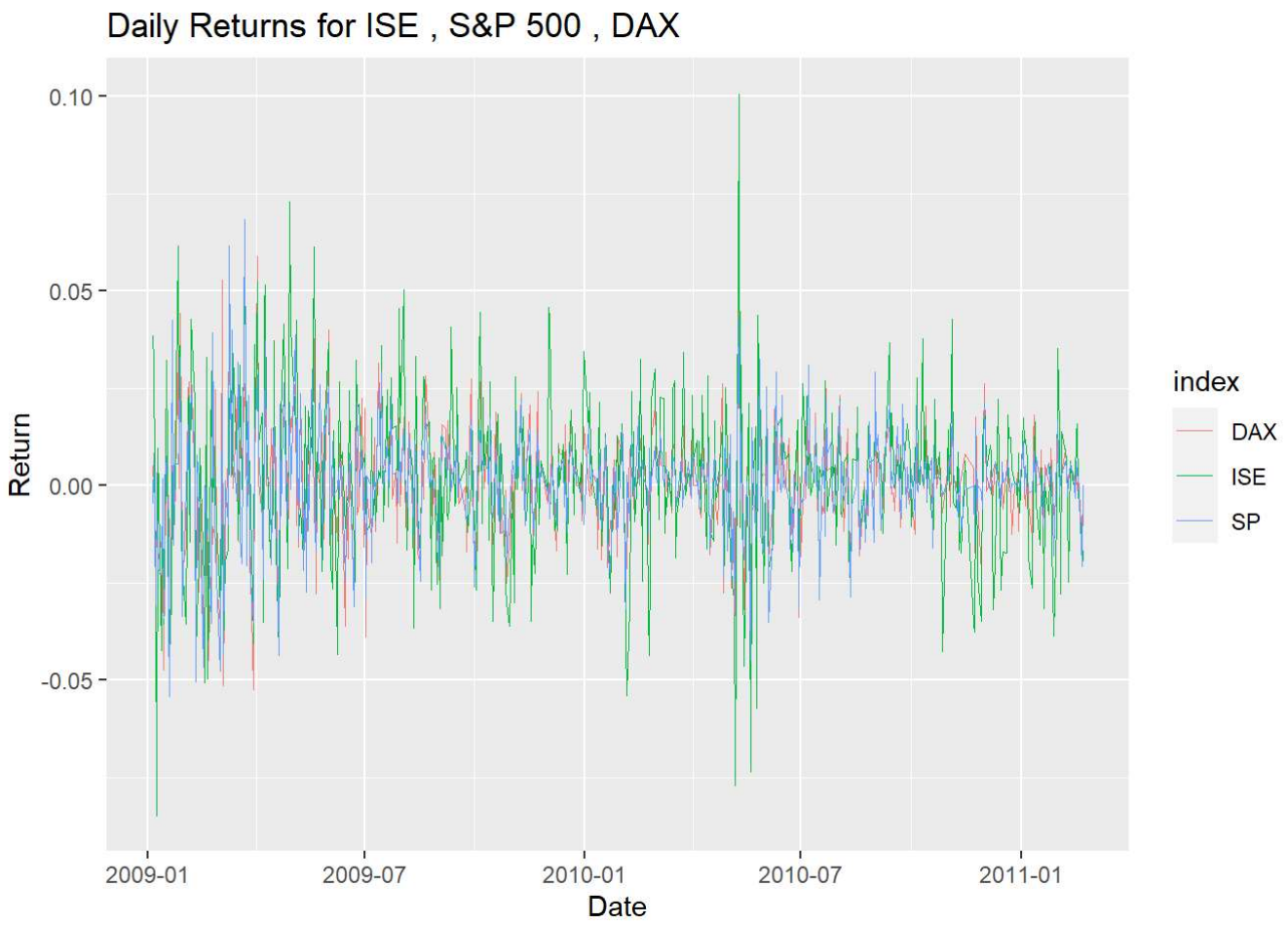
Daily Returns for ISE and S&P 500

```
ggplot(dG , aes(x = date , y = value)) +
  geom_line(aes(color = index) , size = 0.3) + labs(x = "Date" , y = "Return" , title = "Dail
y Returns for ISE and S&P 500")
```



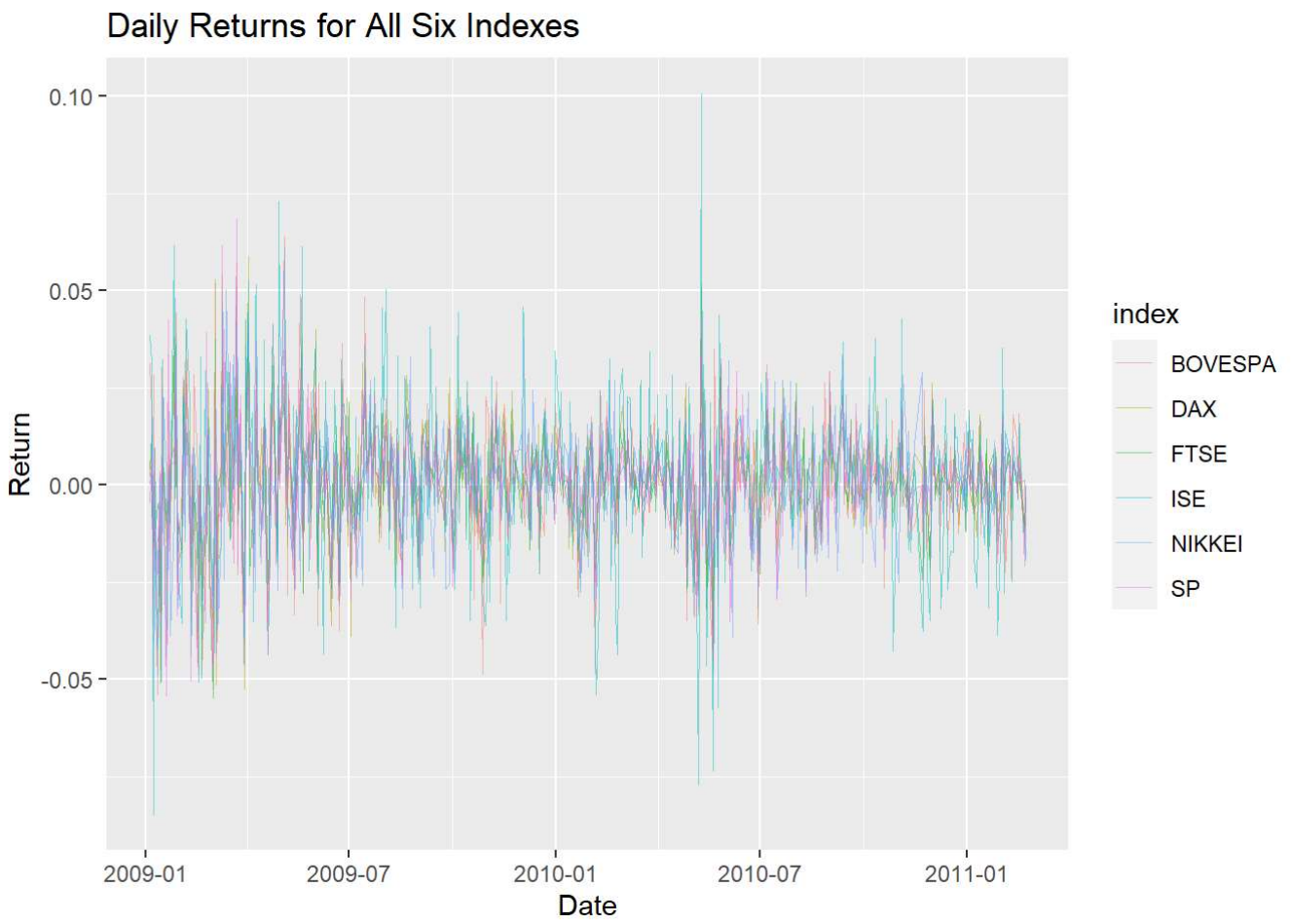

```
dG2 <- dFIR %>%
  select(date , ISE , SP , DAX) %>%
  gather(key = "index" , value = "value" , -date)


ggplot(dG2 , aes(x = date , y = value )) +
  geom_line(aes(color = index) , size = 0.3) + labs(x = "Date" , y = "Return" , title = "Dail
y Returns for ISE , S&P 500 , DAX")
```

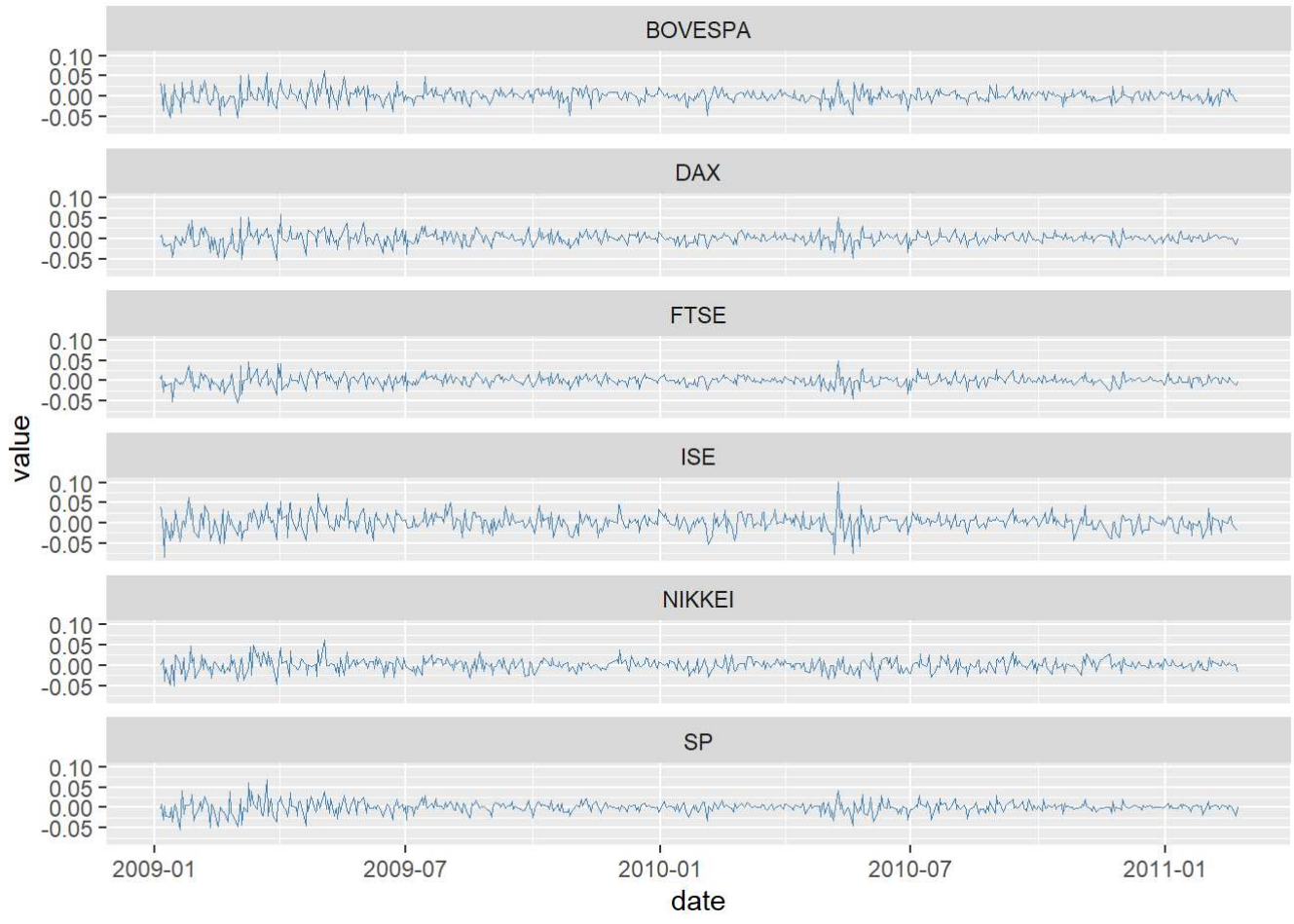



```
dG3 <- dFIR %>%
  gather(key = "index" , value = "value" , -date)


ggplot(dG3 , aes(x = date , y = value )) +
  geom_line(aes(color = index) , size = 0.3 , alpha = 0.5) + labs(x = "Date" , y = "Return" ,
title = "Daily Returns for All Six Indexes")
```

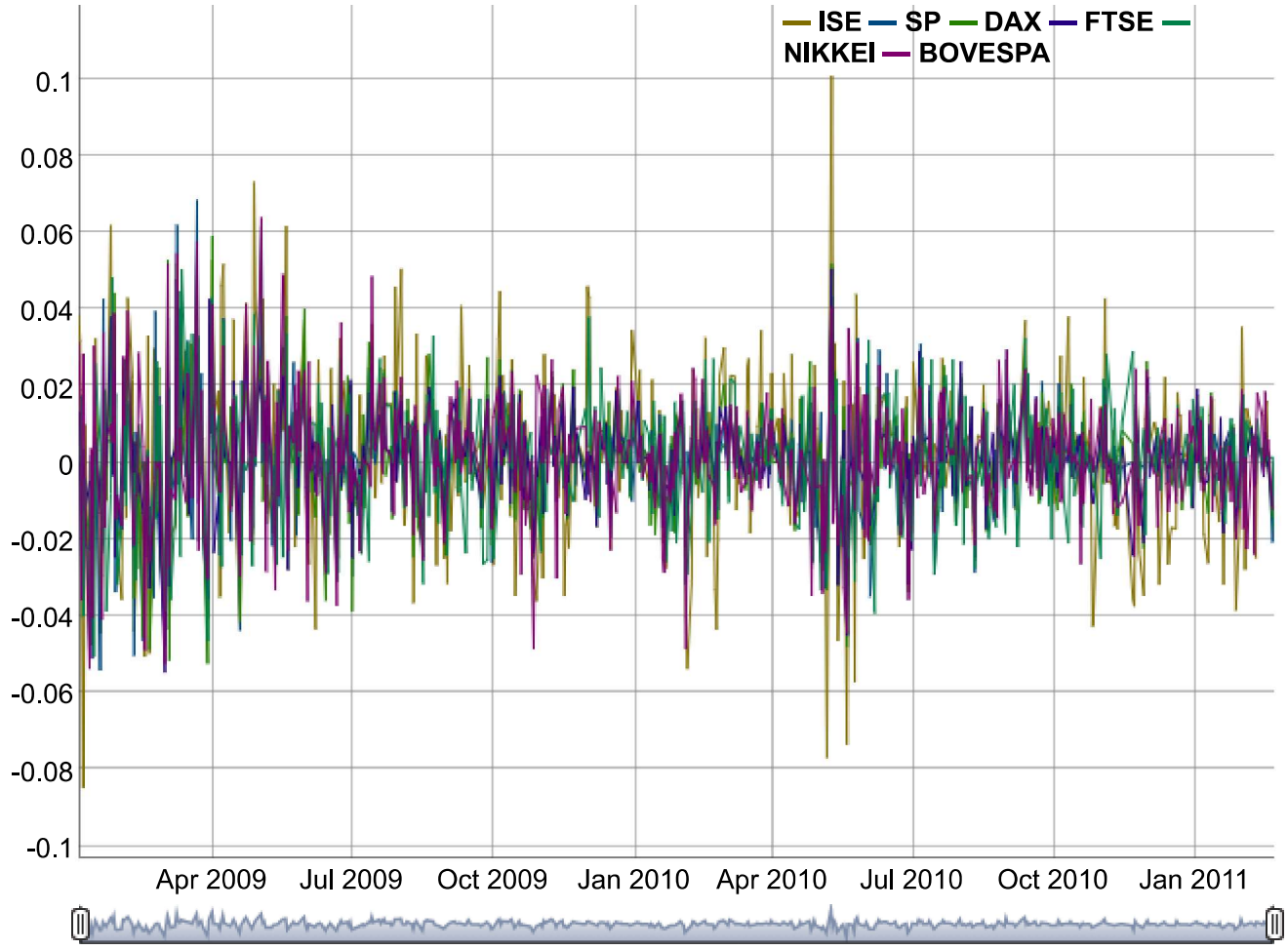



```
ggplot(dG3 , aes(x = date , y = value)) +
  geom_line(color = "steelblue" , size = 0.3) + facet_wrap(~index , nrow = 6)
```



```
d3 = xts(dFIR[,-1] , order.by = dFIR$date)

dygraph(d3) %>%
  dyRangeSelector(height = 20)
```



Volatility Analysis

2.1

ISE seems to vary more than others

2.2

```
d.month.volatility <- dFIR %>%
  group_by(month = cut(date , "month")) %>%
  summarize(
    ISE = sd(ISE) ,
    SP = sd(SP) ,
    DAX = sd(DAX) ,
    FTSE = sd(FTSE) ,
    NIKKEI = sd(NIKKEI) ,
    BOVESPA = sd(BOVESPA)
  )
```

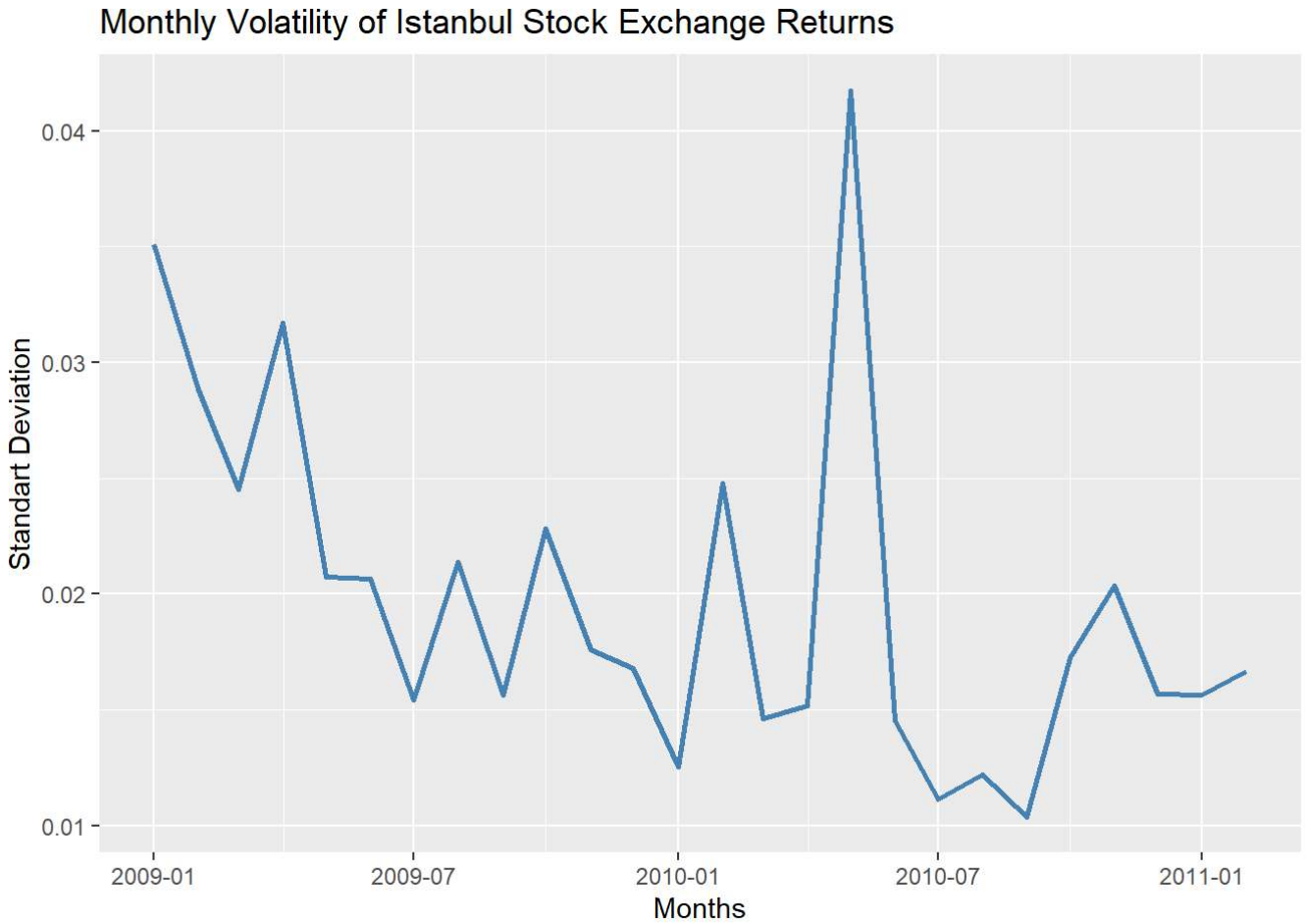
```
head(d.month.volatility , n = 10)
```

```
## # A tibble: 10 x 7
##    month         ISE      SP    DAX    FTSE NIKKEI BOVESPA
##    <fct>       <dbl>   <dbl>  <dbl>   <dbl>  <dbl>   <dbl>
##  1 2009-01-01 0.0351 0.0234  0.0203 0.0185  0.0265 0.0273
##  2 2009-02-01 0.0288 0.0223  0.0231 0.0152  0.0152 0.0207
##  3 2009-03-01 0.0245 0.0306  0.0264 0.0259  0.0263 0.0273
##  4 2009-04-01 0.0317 0.0193  0.0195 0.0171  0.0200 0.0190
##  5 2009-05-01 0.0207 0.0191  0.0176 0.0126  0.0198 0.0245
##  6 2009-06-01 0.0206 0.0129  0.0177 0.0125  0.0142 0.0183
##  7 2009-07-01 0.0154 0.0127  0.0164 0.0120  0.0134 0.0142
##  8 2009-08-01 0.0214 0.0103  0.0140 0.0104  0.0141 0.0126
##  9 2009-09-01 0.0156 0.00957 0.0118 0.00801 0.0143 0.00930
## 10 2009-10-01 0.0228 0.0115  0.0148 0.0121  0.0108 0.0190
```

```
d.month.volatility = d.month.volatility %>%
  mutate(month = ymd(month))
```

2.3

```
ggplot(d.month.volatility , aes(x = month , y = ISE)) + geom_line(color = "steelblue" , size
 = 1) + labs(x = "Months" , y = "Standart Deviation" , title = "Monthly Volatility of Istanbu
l Stock Exchange Returns")
```



```
dm <- d.month.volatility %>%
  gather(key = "index" , value = "value" , -month)


ggplot(dm , aes(x = month , y = value)) +
  geom_line(aes(color = index) , size = 0.5) + labs(x = "Months" , y = "Standart Deviation" ,
title = "Monthly Volatility of All Six Index Returns")
```