Estatistica - Mercado Financeira

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Pacotes

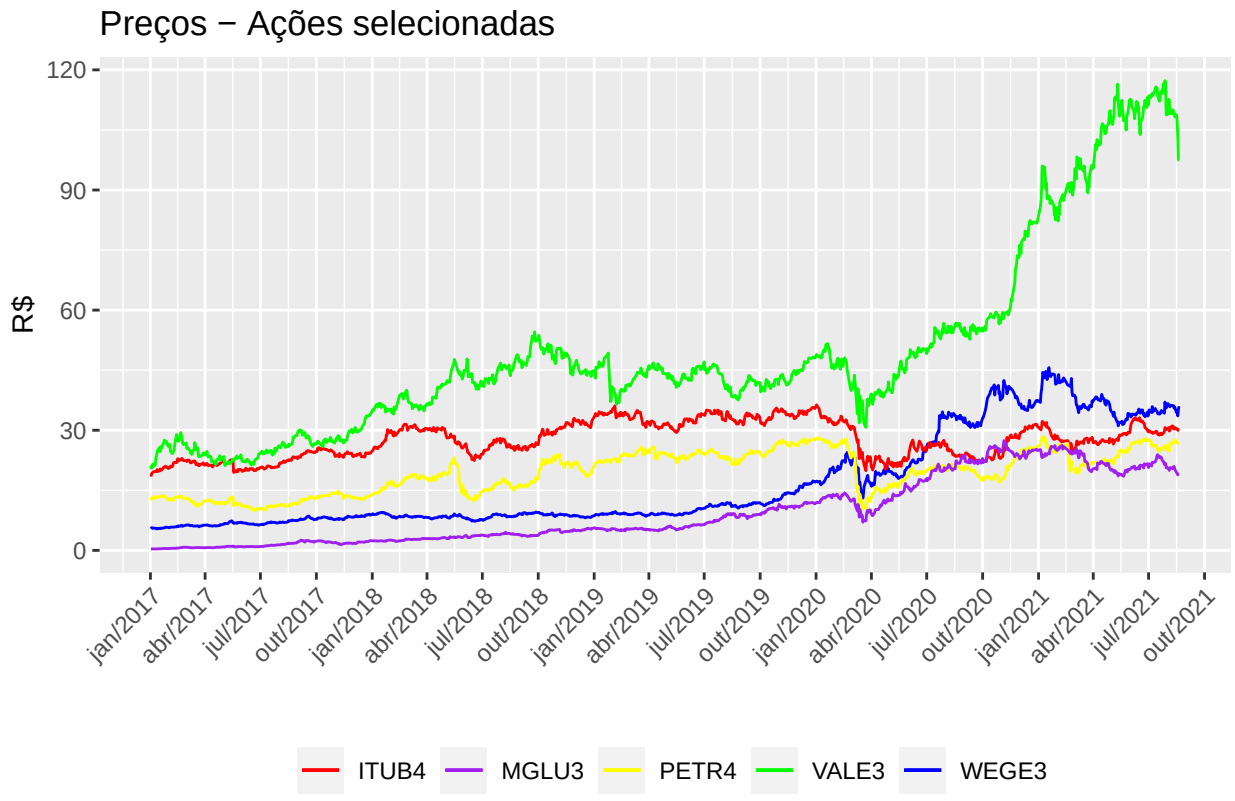
```
library(tidyverse)
library(tidyquant)
library(timetk)
library(scales)
library(quantmod)
library(gridExtra)
library(PerformanceAnalytics)
library(fPortfolio)
```

coleta de dados

```
symbols = c('WEGE3.SA', 'ITUB4.SA', 'VALE3.SA', 'PETR4.SA', 'MGLU3.SA')
w = c(rep(0.20, 5))

prices = getSymbols(symbols, src = 'yahoo',
                    from = '2017-01-01',
                    warning = FALSE) %>%
  map(~Ad(get(.))) %>%
  reduce(merge) %>%
  'colnames<-' (symbols) %>%
  tk_tbl(preserve_index = TRUE,
         rename_index = 'date') %>%
  drop_na()

returns = prices %>%
  gather(asset, prices, -date) %>%
  group_by(asset) %>%
  tq_transmute(mutate_fun = periodReturn,
               period = 'monthly',
               type = 'log') %>%
  spread(asset, monthly.returns) %>%
  select(date, symbols)
```

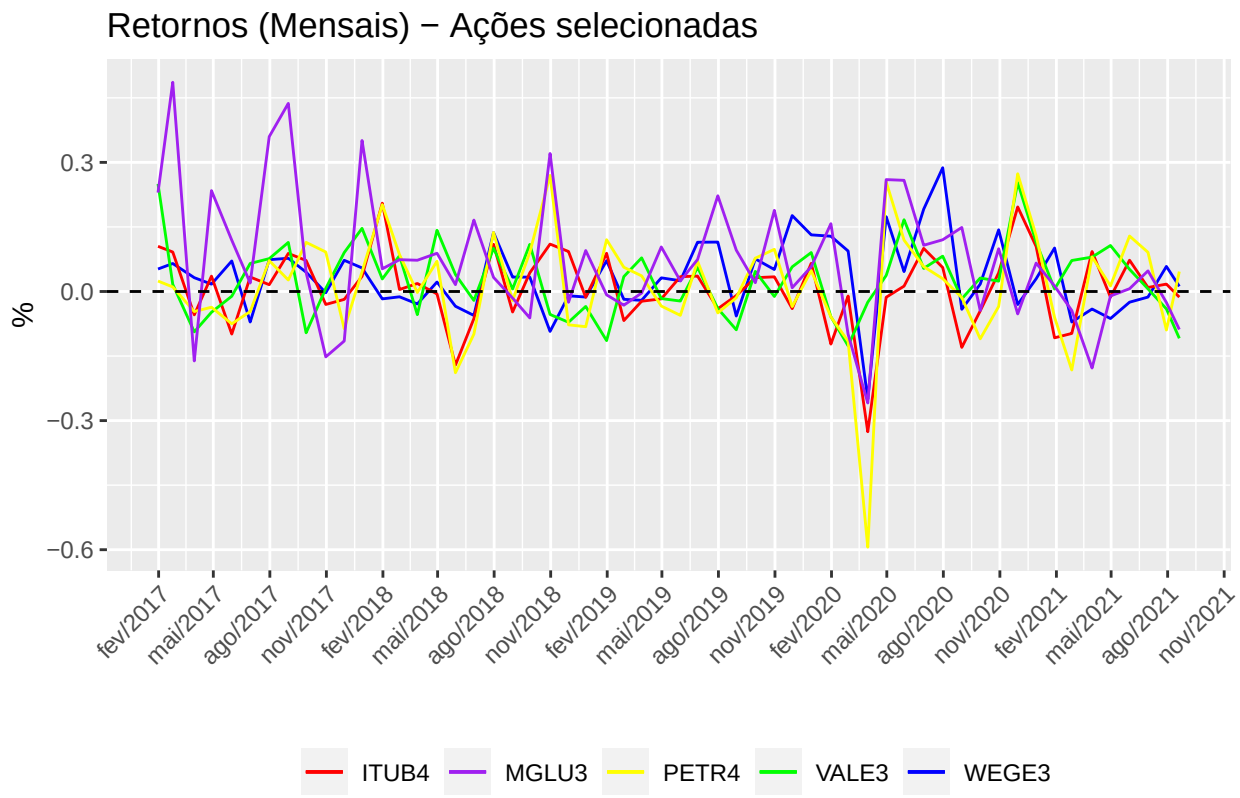
Visualização dos dados

```
ggplot(prices, aes(x=date))+
  geom_line(aes(y=WEGE3.SA, colour='WEGE3'))+
  geom_line(aes(y=ITUB4.SA, colour='ITUB4'))+
  geom_line(aes(y=VALE3.SA, colour='VALE3'))+
  geom_line(aes(y=PETR4.SA, colour='PETR4'))+
  geom_line(aes(y=MGLU3.SA, colour='MGLU3'))+
  scale_colour_manual('', values=c('WEGE3'='blue',
                                   'ITUB4'='red',
                                   'VALE3'='green',
                                   'PETR4'='yellow',
                                   'MGLU3'='purple'))+
  scale_x_date(breaks=date_breaks('3 month'), labels = date_format('%b/%Y'))+
  theme(axis.text.x = element_text(angle=45, hjust=1),
        legend.position = 'bottom')+
  labs(x='', y='R$',
       title='Preços - Ações selecionadas',
       caption='Fonte: Dados do Yahoo Finance')
```




```
ggplot(returns, aes(x=date))+
  geom_line(aes(y=WEGE3.SA, colour='WEGE3'))+
  geom_line(aes(y=ITUB4.SA, colour='ITUB4'))+
  geom_line(aes(y=VALE3.SA, colour='VALE3'))+
```

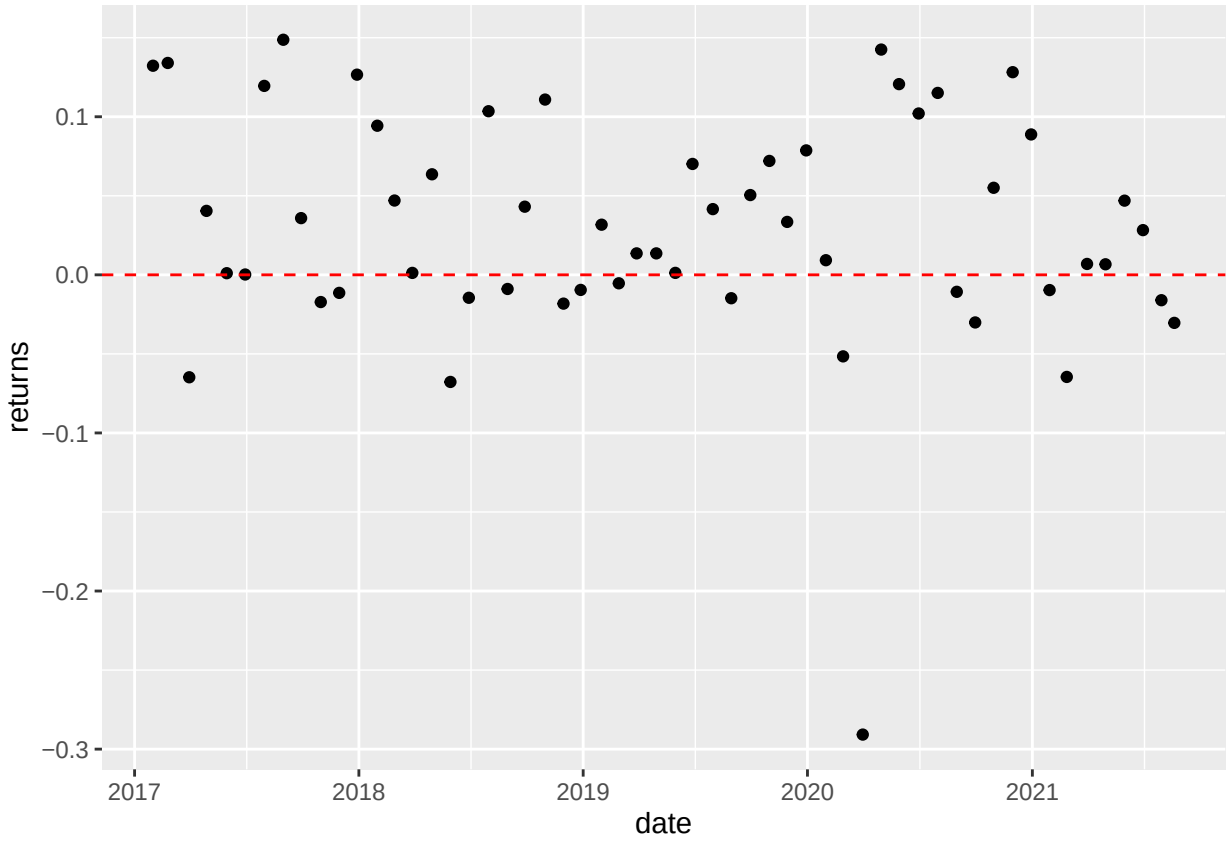
```
  geom_line(aes(y=PETR4.SA, colour='PETR4'))+
  geom_line(aes(y=MGLU3.SA, colour='MGLU3'))+
  geom_hline(yintercept=0, linetype='dashed', colour='black')+
  scale_colour_manual('', values=c('WEGE3'='blue',
                                   'ITUB4'='red',
                                   'VALE3'='green',
                                   'PETR4'='yellow',
                                   'MGLU3'='purple'))+
  scale_x_date(breaks=date_breaks('3 month'), labels = date_format('%b/%Y'))+
  theme(axis.text.x = element_text(angle=45, hjust=1),
        legend.position = 'bottom')+
  labs(x='', y='%',
       title='Retornos (Mensais) - Ações selecionadas',
       caption='Fonte: Dados do Yahoo Finance')
```



Retorno do Portfolio (Mesmos pesos ativos)

```
asset_returns_long =
  returns %>%
  gather(asset, returns, -date) %>%
  group_by(asset)

portfolio_return =
  asset_returns_long %>%
  tq_portfolio(assets_col = asset,
               returns_col = returns,
```

```
                weights = w,
                col_rename = 'returns',
                rebalance_on = 'months')

ggplot(portfolio_return, aes(x = date, y = returns))+
  geom_point()+
  geom_hline(yintercept = 0, colour = 'red', linetype = 'dashed')
```



Estatisticas basicas

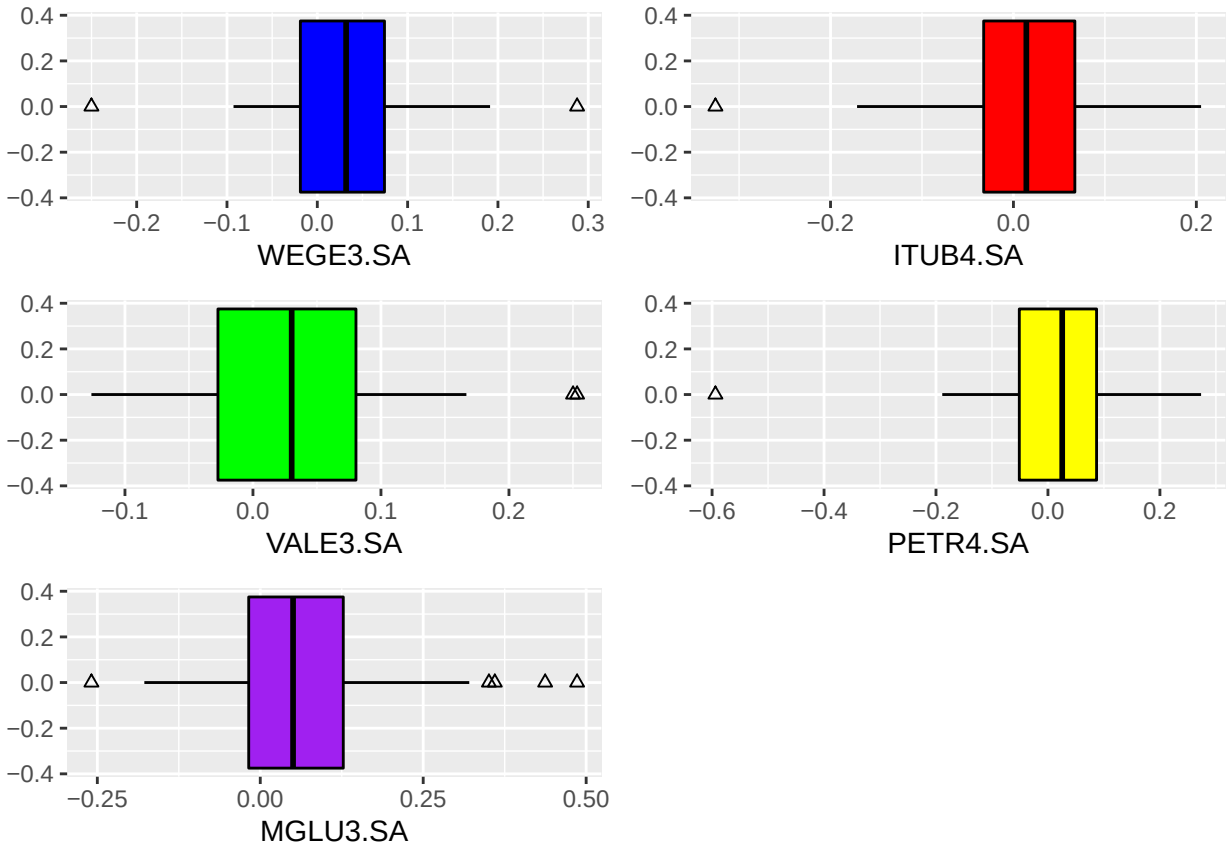
```
summary(returns[,-1])
```

```
##     WEGE3.SA           ITUB4.SA            VALE3.SA           PETR4.SA
##  Min.   :-0.25011   Min.   :-0.325867   Min.   :-0.12620   Min.   :-0.59404
##  1st Qu.:-0.01877   1st Qu.:-0.032540   1st Qu.:-0.02735   1st Qu.:-0.05118
##  Median : 0.03189   Median : 0.014123   Median : 0.03024   Median : 0.02549
##  Mean   : 0.03382   Mean   : 0.008575   Mean   : 0.02809   Mean   : 0.01360
##  3rd Qu.: 0.07436   3rd Qu.: 0.067137   3rd Qu.: 0.08048   3rd Qu.: 0.08687
##  Max.   : 0.28766   Max.   : 0.205199   Max.   : 0.25324   Max.   : 0.27359
##     MGLU3.SA
##  Min.   :-0.25906
##  1st Qu.:-0.01774
```

```
##  Median : 0.05031
##  Mean   : 0.06976
##  3rd Qu.: 0.12735
##  Max.   : 0.48612
```

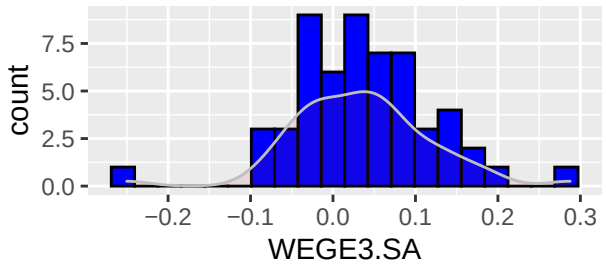
Grafico Boxplot dos Retornos

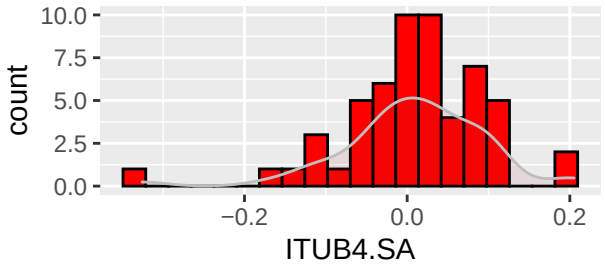
```
g1 <- ggplot(returns, aes(WEGE3.SA))+
  geom_boxplot(fill = 'blue', colour = 'black', outlier.shape = 2)

g2 <- ggplot(returns, aes(ITUB4.SA))+
  geom_boxplot(fill = 'red', colour = 'black', outlier.shape = 2)

g3 <- ggplot(returns, aes(VALE3.SA))+
  geom_boxplot(fill = 'green', colour = 'black', outlier.shape = 2)

g4 <- ggplot(returns, aes(PETR4.SA))+
  geom_boxplot(fill = 'yellow', colour = 'black', outlier.shape = 2)

g5 <- ggplot(returns, aes(MGLU3.SA))+
  geom_boxplot(fill = 'purple', colour = 'black', outlier.shape = 2)

grid.arrange(g1, g2, g3, g4, g5, ncol= 2)
```

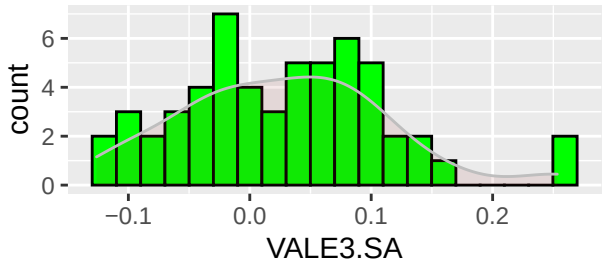


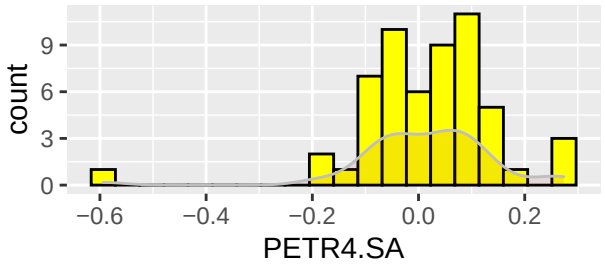
Histograma dos Retornos

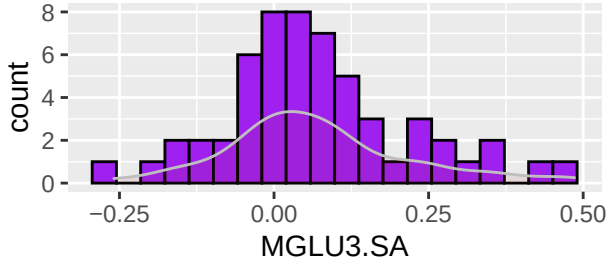
```
g6 <- ggplot(returns, aes(WEGE3.SA))+
  geom_histogram(bins = 20, fill = 'blue', colour = 'black')+
  geom_density(alpha = 0.1, colour = 'gray', fill = 'brown')

g7 <- ggplot(returns, aes(ITUB4.SA))+
  geom_histogram(bins = 20, fill = 'red', colour = 'black')+
  geom_density(alpha = 0.1, colour = 'gray', fill = 'brown')

g8 <- ggplot(returns, aes(VALE3.SA))+
  geom_histogram(bins = 20, fill = 'green', colour = 'black')+
  geom_density(alpha = 0.1, colour = 'gray', fill = 'brown')

g9 <- ggplot(returns, aes(PETR4.SA))+
  geom_histogram(bins = 20, fill = 'yellow', colour = 'black')+
  geom_density(alpha = 0.1, colour = 'gray', fill = 'brown')

g10 <- ggplot(returns, aes(MGLU3.SA))+
  geom_histogram(bins = 20, fill = 'purple', colour = 'black')+
  geom_density(alpha = 0.1, colour = 'gray', fill = 'brown')

grid.arrange(g6, g7, g8, g9, g10, ncol= 2)
```











Correlação dos Ativos

```
correlacao =cor(returns[,2:6])
correlacao
```

```
##           WEGE3.SA  ITUB4.SA  VALE3.SA  PETR4.SA  MGLU3.SA
## WEGE3.SA 1.0000000 0.2879920 0.1015967 0.3102895 0.3036740
## ITUB4.SA 0.2879920 1.0000000 0.2988321 0.7592564 0.2759303
## VALE3.SA 0.1015967 0.2988321 1.0000000 0.2914845 0.1706069
## PETR4.SA 0.3102895 0.7592564 0.2914845 1.0000000 0.3223164
## MGLU3.SA 0.3036740 0.2759303 0.1706069 0.3223164 1.0000000
```

Portfolio de Minima Variancia

```
ret <- as.timeSeries(returns[,2:6])

cart_w <- minvariancePortfolio(ret)
getWeights(cart_w)
```

```
##   WEGE3.SA   ITUB4.SA   VALE3.SA   PETR4.SA   MGLU3.SA
## 0.36643644 0.22949827 0.38534248 0.00000000 0.01872281
```

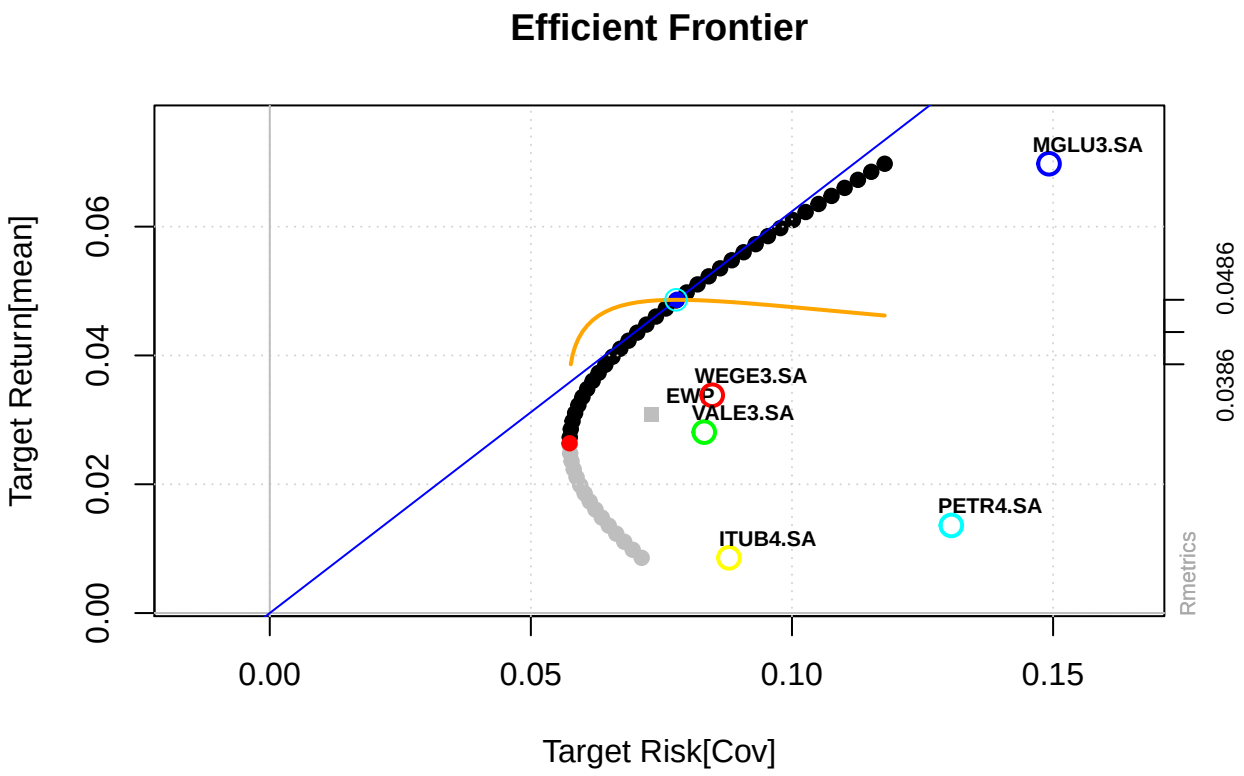
Portfolio Eficiente.

```
cart_w2 <- tangencyPortfolio(ret)
getWeights(cart_w2)
```

```
##  WEGE3.SA  ITUB4.SA  VALE3.SA  PETR4.SA  MGLU3.SA
## 0.3740569 0.0000000 0.3558736 0.0000000 0.2700695
```

Fronteira Eficiente

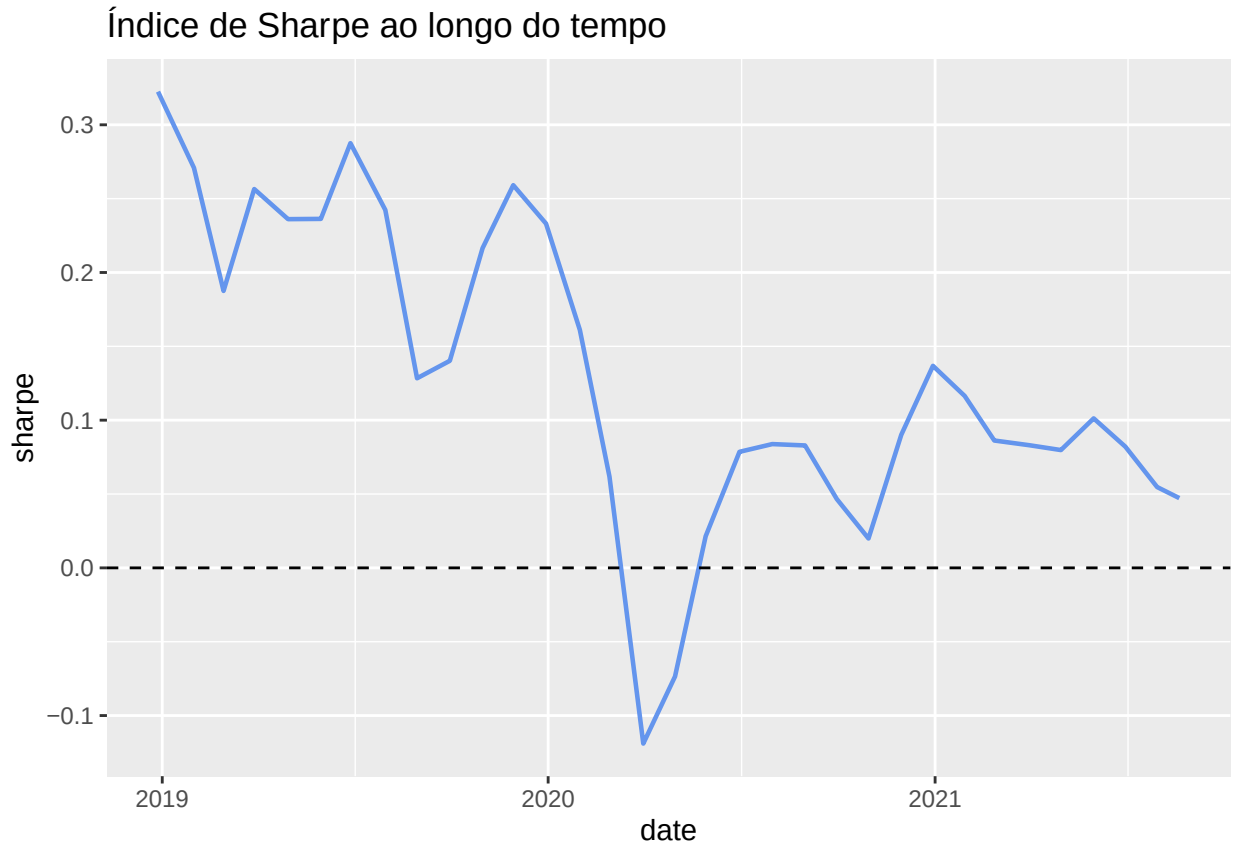
```
tailoredFrontierPlot(portfolioFrontier(ret,
                                       spec = portfolioSpec(optim = list(solver = "solveRshortExact")),
                                       constraints = "Short"))
```



Índice de Sharp ao longo do tempo

```
portfolio_returns_xts <- xts(portfolio_return$returns,
                             order.by = portfolio_return$date)

rfr <- 2/100
Sharpe_Ratio =
  SharpeRatio(portfolio_returns_xts,
              Rf = rfr,
              FUN = 'StdDev')

window = 24
rolling_sharpe =
  rollapply(portfolio_returns_xts,
            window,
            function(x)
              SharpeRatio(x,
                          Rf = rfr,
                          FUN = 'StdDev')) %>%
  `colnames<-`('sharpe') %>%
  na.omit()

rolling_sharpe %>%
```

```
  tk_tbl(preserve_index = TRUE, rename_index = 'date') %>%
  ggplot(aes(x=date, y=sharpe))+
  geom_line(colour='cornflowerblue', size=.8)+
  geom_hline(yintercept=0, colour='black', linetype='dashed')+
  labs(title='Índice de Sharpe ao longo do tempo')
```



Covariancia do Retorno dos Ativos e o Mercado

```
market_returns_xts =
  getSymbols('^BVSP', src = 'yahoo',
             from='2016-12-01',
             auto.assign = TRUE,
             warnings = FALSE)

market_returns_xts = BVSP$BVSP.Adjusted %>%
  `colnames<-`('BVSP') %>%
  to.monthly(indexAt = 'lastof', OHLC = FALSE) %>%
  Return.calculate(method = "log") %>%
  na.omit()

cov(portfolio_returns_xts, market_returns_xts)/
  var(market_returns_xts)
```

```
##           BVSP
## [1,] 0.9007922
```

CAPM

```
market_return_tidy =
  market_returns_xts %>%
  tk_tbl(preserve_index = TRUE,
         rename_index = 'date') %>%
  na.omit() %>%
  select(date, returns = BVSP)

portfolio_return =
  portfolio_return %>%
  mutate(market_returns = market_return_tidy$returns)

ggplot(portfolio_return,
       aes(x=market_returns, y=returns))+
  geom_point()+
  geom_smooth(method = 'lm', se=FALSE, colour='red')+
  labs(x='Retorno do Mercado', y='Retorno do Portfólio')
```