prices.rmd

```
setwd("/Users/siri/Desktop")
d0 = read.csv("prices.csv", header = T)

#names(d0)
prices = d0
names = names(d0)
n = nrow(prices)
M = ncol(prices)
returns = prices[2:n, ] / prices[1:(n-1), ] - 1
#head(returns)
```

```
cova = cov(returns)
#round(cova,7)
#minimum variance portfolio
b = rep(1, M)
weight = solve(cova)%*%b          # weight is matrix
weight = weight / sum(weight)
head(weight)    #weights of the minimum variance portfolio
```

```
##              [,1]
## MMM   0.011828184
## ACE  -0.030337796
## ABT  -0.005496412
## ANF   0.002084453
## ADBE -0.005125743
## AMD   0.007304238
```

```
tail(weight)
```

```
##              [,1]
## XLNX -0.007784369
## XL    0.013127003
## YHOO -0.000406324
## YUM   0.018510068
## ZMH  -0.002454086
## ZION  0.017283185
```

```
weight = as.numeric(weight)
minvar = t(weight)%*%cova%*%weight #variance of min variance portfolio
minsd = sqrt(minvar)
minsd
```

```
##            [,1]
## [1,] 0.00317156
```

```
annual_vola = sqrt(252)*minsd
annual_vola #portfolio's annual volatility
```

```
##             [,1]
## [1,] 0.05034696
```

```
weight = round(weight,6)
w1 = data.frame(names, weight)
head(w1)
```

```
##   names    weight
## 1   MMM  0.011828
## 2   ACE -0.030338
## 3   ABT -0.005496
## 4   ANF  0.002084
## 5  ADBE -0.005126
## 6   AMD  0.007304
```

```
d1 = apply(w1,2,sort,decreasing = T)
head(d1) #names of 6 companies with smallest weights
```

```
##      names  weight
## [1,] "ZMH"  "-0.075572"
## [2,] "ZION" "-0.067060"
## [3,] "YUM"  "-0.058052"
## [4,] "YHOO" "-0.048837"
## [5,] "XRX"  "-0.038727"
## [6,] "XRAY" "-0.038632"
```

```
tail(d1) #names of 6 companies with largest weights
```

```
##        names  weight
## [447,] "ACE"  " 0.000347"
## [448,] "ABT"  " 0.000236"
## [449,] "ABC"  " 0.000195"
## [450,] "AAPL" " 0.000189"
## [451,] "AA"   " 0.000110"
## [452,] "A"    " 0.000063"
```

```
#Portfolio
pret = as.matrix(returns)
pret = pret%*%weight
ploss = -100000 * pret
head(ploss)
```

```
##        [,1]
## 2 -232.3495
## 3 -646.2693
## 4  684.9878
## 5 -268.3842
## 6  183.5590
## 7 -102.4189
```

```r
#VaR of portfolio
aux = n * 0.01
aux2 = floor(aux)
aux2
```

```
## [1] 12
```

```r
d2 = data.frame(ploss)
d2$ID <- seq.int(nrow(d2))
d2 = d2[order(-ploss),]
#head(d2)
#tail(d2)
pvar = d2[aux2,2]
pvar  #portfolio value at risk
```

```
## [1] 695
```

```r
pvar_10 = sqrt(10)*pvar
pvar_10 # portfolio 10 day value at risk
```

```
## [1] 2197.783
```

```r
#CVaR
pcvar = mean(d2$ploss[1:aux2])
pcvar
```

```
## [1] 885.7896
```

```r
pcvar_10 = sqrt(10)*pcvar
pcvar_10 # portfolio 10 day conditional value at risk
```

```
## [1] 2801.113
```