homework three

Yi Chen(yc3356)

February 10, 2018

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```
setwd("C:/Users/cheny/Desktop/study/second term/Statistical Method In Finance/homework/homework three")
data <- read.csv("hw3.csv")
```

First, we calculate the daily log-return of these three stocks

```
library(MASS)
```

```
## Warning: package 'MASS' was built under R version 3.4.3
```

```
library(quadprog)

price <- cbind(data$CAT_AC,data$IBM_AC,data$MSFT_AC)
n <- dim(price)[1]
return <- log(price[2:n,]/price[1:(n-1),])
mu <- colMeans(return)
sigma <- cov(return)
```
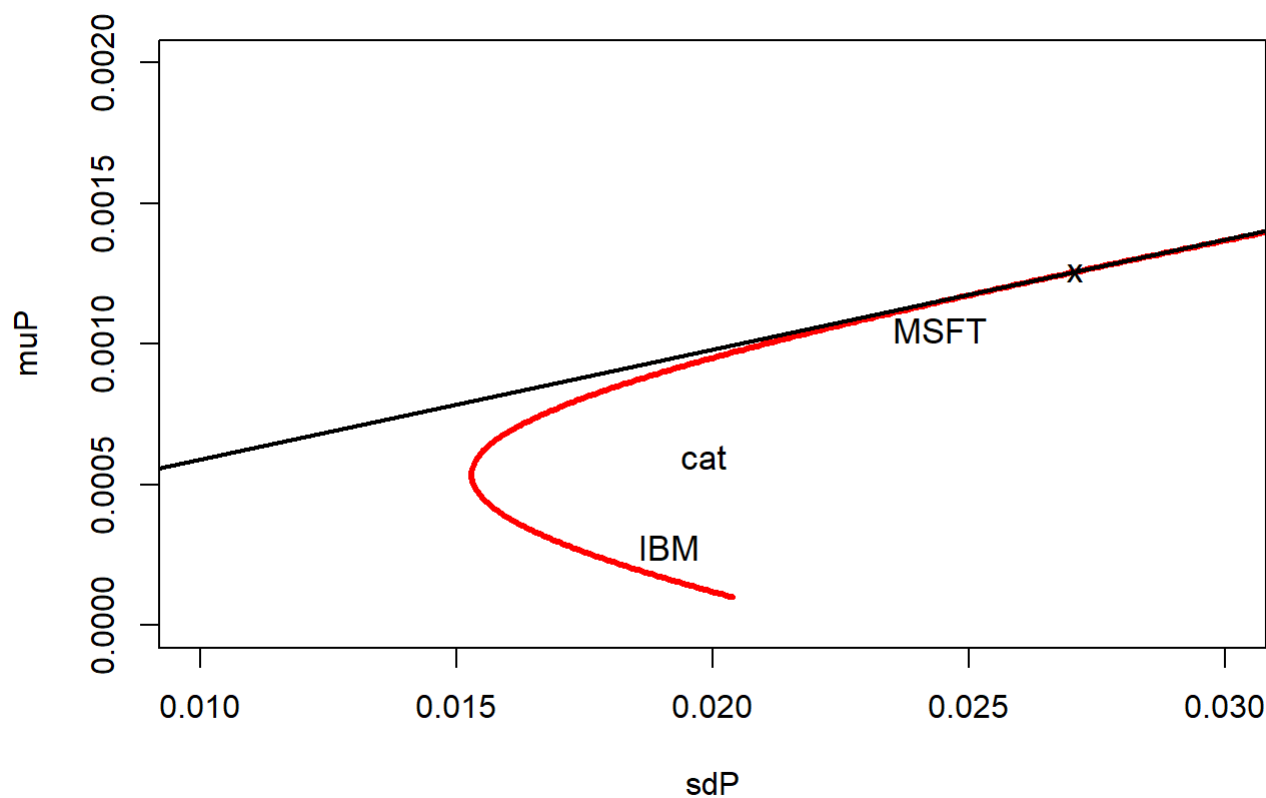
problem (a)/(b)

```
muP <- seq(0.0001, 0.002, length.out = 400) # target portfolio return
sdP <- muP
weight <- matrix(1, nrow = 400, ncol = 3)

for (i in 1:length(muP)) # find the optimal portfolios
{
        result = solve.QP(Dmat=2*sigma, dvec=rep(0,3),
        Amat=cbind(rep(1,3), mu), bvec=c(1, muP[i]), meq=2)
        sdP[i] = sqrt(result$value)
        weight[i,] = result$solution
}
par(mfrow = c(1,1))
plot(sdP, muP, type="l", xlim=c(.01,.03), ylim=c(0,0.002),, lwd=3, col="red")

# efficient frontier
text(sqrt(sigma[1,1]), mu[1], "cat", cex=1.1)
text(sqrt(sigma[2,2]), mu[2], "IBM", cex=1.1)
text(sqrt(sigma[3,3]), mu[3], "MSFT", cex=1.1)

rf = .05/253 # riskfree rate
points(0, rf, cex=1.1, pch="x") # show riskfree asset
sharpe =(muP-rf)/sdP # Sharpe's ratios
ind3 = (sharpe == max(sharpe)) # find maximum Sharpe's ratio
lines(c(0,1), rf+c(0,1)*sharpe[ind3], lwd=2, lty=1, col="black") # line of optimal portfolios
points(sdP[ind3], muP[ind3], cex=1.1, pch="x") # show tangency portfolio
```

problem (c)

```
muP = seq(min(mu),max(mu),length=400) # target portfolio return
for (i in 1:length(muP)) # find the optimal portfolios
{
result = solve.QP(Dmat=2*sigma,dvec=rep(0,3),
Amat=cbind(rep(1,3),mu,diag(1,3)),
bvec=c(1,muP[i],rep(0,3)),meq=2)
sdP[i] = sqrt(result$value)
weight[i,] = result$solution
}
par(mfrow = c(1,1))
plot(sdP,muP,type="l",xlim=c(.01,.03),ylim=c(0,.0015),lwd=3,col="blue") # efficient frontier
#lines(sdP,muP,type="l",xlim=c(0,.04),ylim=c(0,.001),lwd=3,col="blue") # efficient frontier
text(sqrt(sigma[1,1]),mu[1],"GM",cex=1.1)
text(sqrt(sigma[2,2]),mu[2],"Merck",cex=1.1)
text(sqrt(sigma[3,3]),mu[3],"Citi",cex=1.1)
```