MIE 1622

Computational Finance and Risk Management

Midterm Report

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Q#1.

Part 1. Calculated VaR and CVaR of the portfolio under form 2015-16 is listed below

Historical 1-day VaR 95.0% = $1986.00, Historical 1-day CVaR 95.0% = $2864.69
Normal 1-day VaR 95.0% = $2124.85, Normal 1-day CVaR 95.0% = $2659.51
Historical 10-day VaR 95.0% = $5278.00, Historical 10-day CVaR 95.0% = $6482.56
Normal 10-day VaR 95.0% = $5783.03, Normal 10-day CVaR 95.0% = $7198.57

By observing the calculated results,

Var(10 days) ≠ 10*VaR (one day)
CVar(10 days) ≠ 10*CVaR (one day)

Since loss in gap of 10 days wouldn't be equal to 10 times of daily loss. Also, VaR is calculated as the certain position on the confidence interval which is based on the standard deviation of the data given. Therefore, there's on linear relation between these two sets of data.

Plot is shown in page 2

Part 2:

Historical 1-day MSFT VaR 95.0% = $114.00
Historical 1-day AAPL VaR 95.0% = $572.00
Historical 1-day IBM VaR 95.0% = $1470.00
Historical 1-day Simple Sum of VaR is $2156.0 and the portfolio would give $1986.00
Historical 1-day Difference of VaR in Portfolio and Sum at 95.0% is = $-170.00

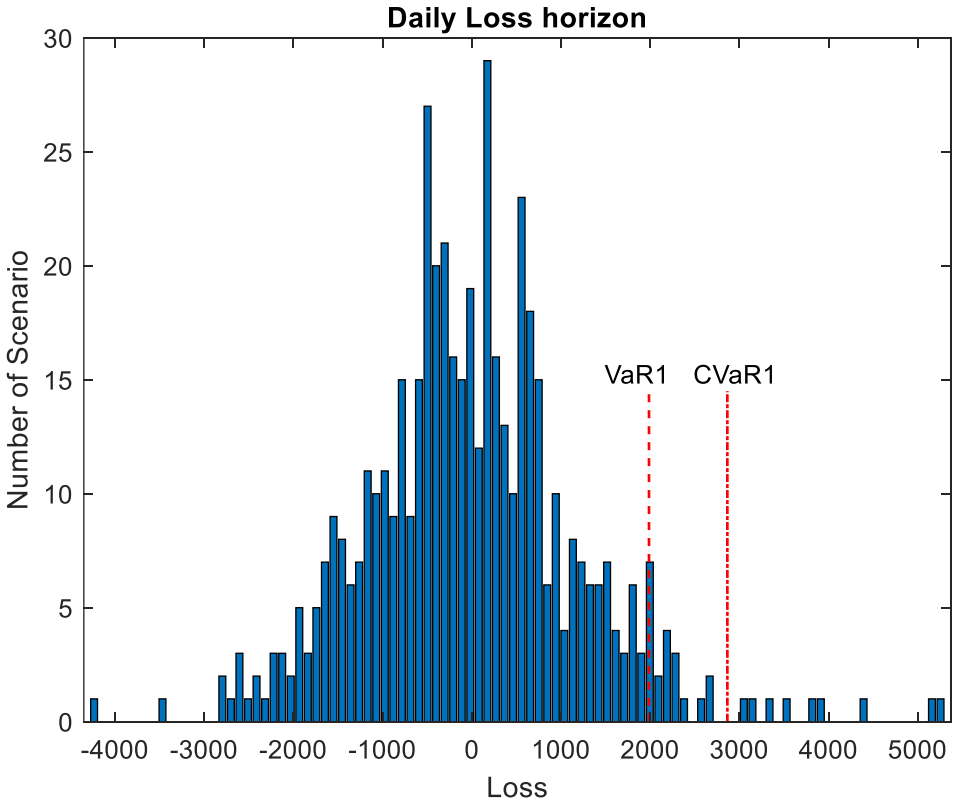
So, **VaR(Portfolio) ≠ VaR(MSFT)+ VaR(APPL)+ VaR(IBM)**

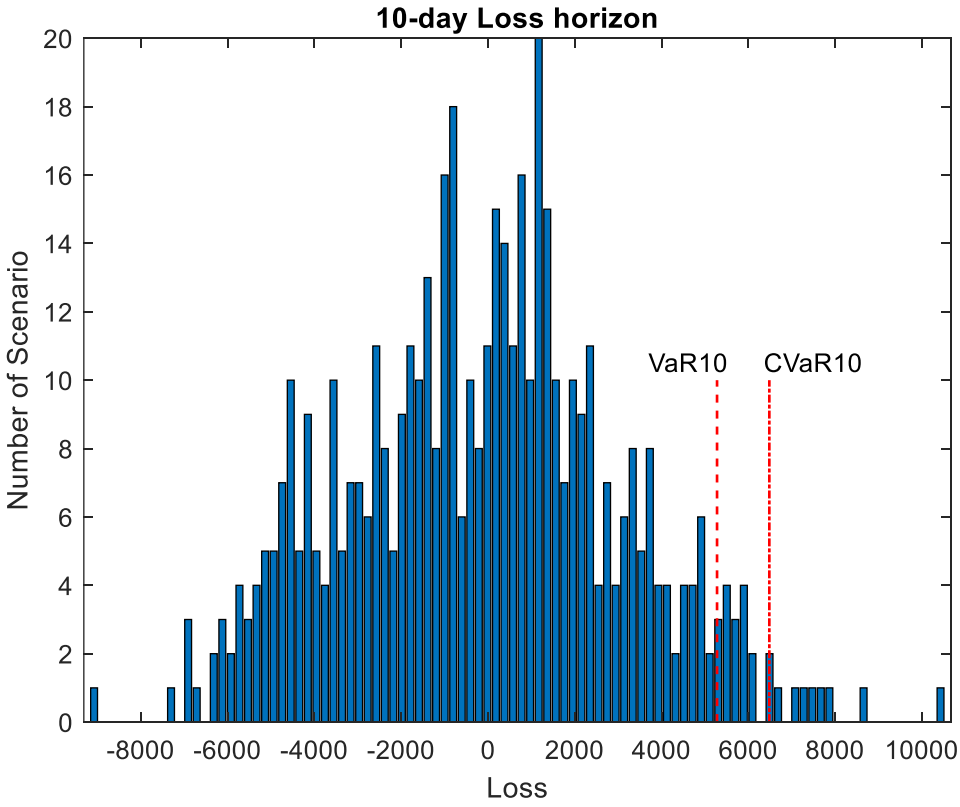
As each stock in the portfolio is corelated with the other stock, and VaR is determined by the standard deviation of single asset or the whole portfolio, so linearly add the VaR of each stock is not equal to the VaR of the portfolio.

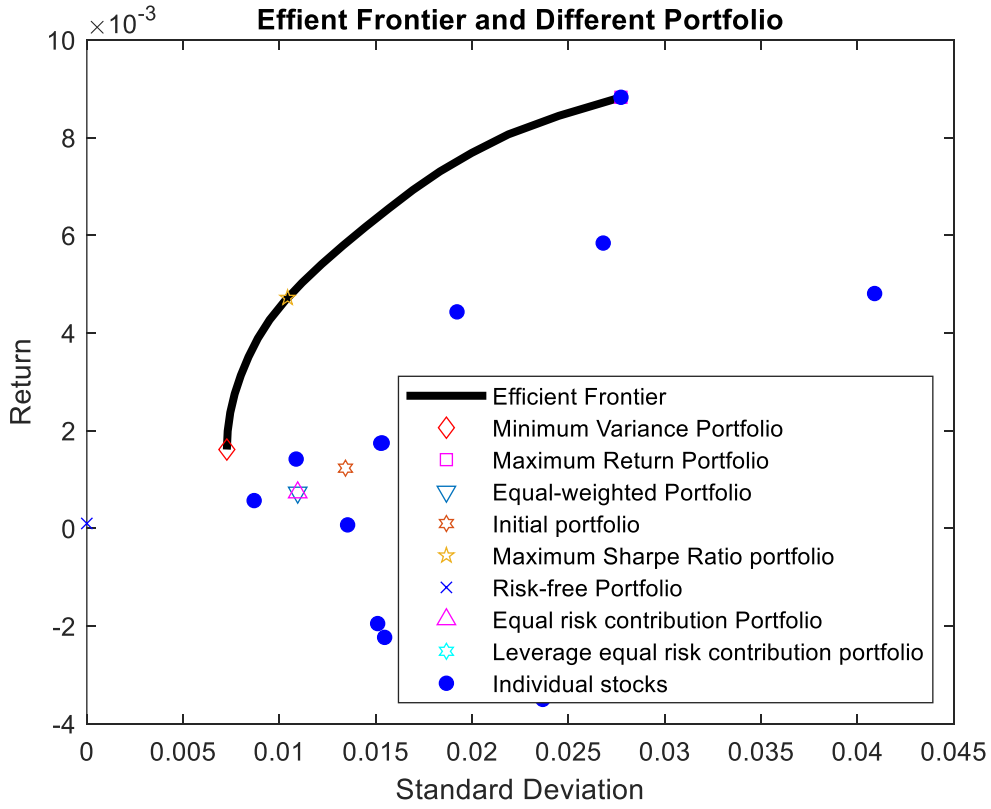
For *normal distribution model*, stocks in the portfolio is still corelated with each other, so the equation would still **not work**.

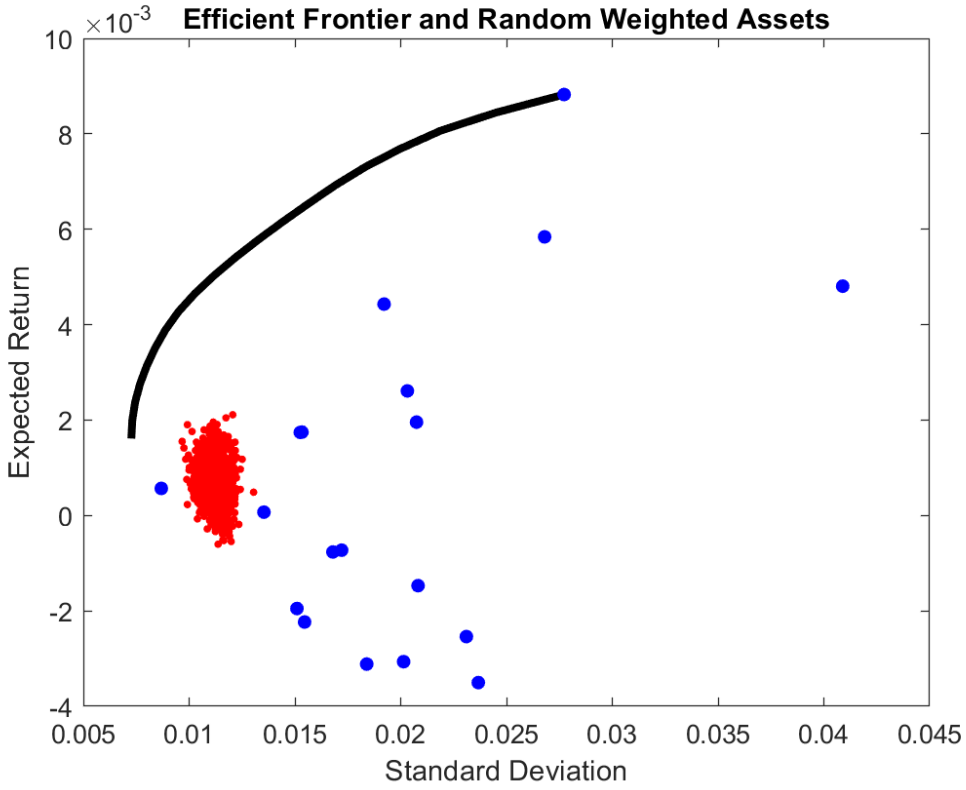
Question 2: Plot of efficient frontier and different portfolios

Plots shown in Page 3.


Daily Loss horizon
Number of Scenario
Loss
VaR1
CVaR1
0
5
10
15
20
25
30
-4000
-3000
-2000
-1000
0
1000
2000
3000
4000
5000


10-day Loss horizon
Number of Scenario
Loss
VaR10
CVaR10
0
2
4
6
8
10
12
14
16
18
20
-8000
-6000
-4000
-2000
0
2000
4000
6000
8000
10000


Effient Frontier and Different Portfolio
×10^-3
Return
Standard Deviation
Efficient Frontier
Minimum Variance Portfolio
Maximum Return Portfolio
Equal-weighted Portfolio
Initial portfolio
Maximum Sharpe Ratio portfolio
Risk-free Portfolio
Equal risk contribution Portfolio
Leverage equal risk contribution portfolio
Individual stocks


Efficient Frontier and Random Weighted Assets
×10^-3
Expected Return
Standard Deviation