Financial Engineering
# Portfolio Optimization
Project

Project Details:

A. In this project, I have tried to create an optimized portfolio using 10 different assets which are:

1. VLNS - Valens Growork Coorporation.
2. PFMT - Performant Financial coorporation
3. AXP - American Express company
4. DIS - Walt Disney Company
5. IBM - International Business Machines
6. INTC - Intel Coorporation
7. JPM - JP Morgan chase and co.
8. MSFT - Microsoft coorporation
9. WMT - Wallmart Inc.
10. AAPL - Apple Inc.

B. The closing price of all the assets is chosen and composed in a single sheet named as data which is also attached with the file.

C. After that simple returns are calculated and the mean, variance, and covariance are calculated after which w is calculated and then based on different values on mu sigma square is calculated and plotted.

D. The plot is also shown below.
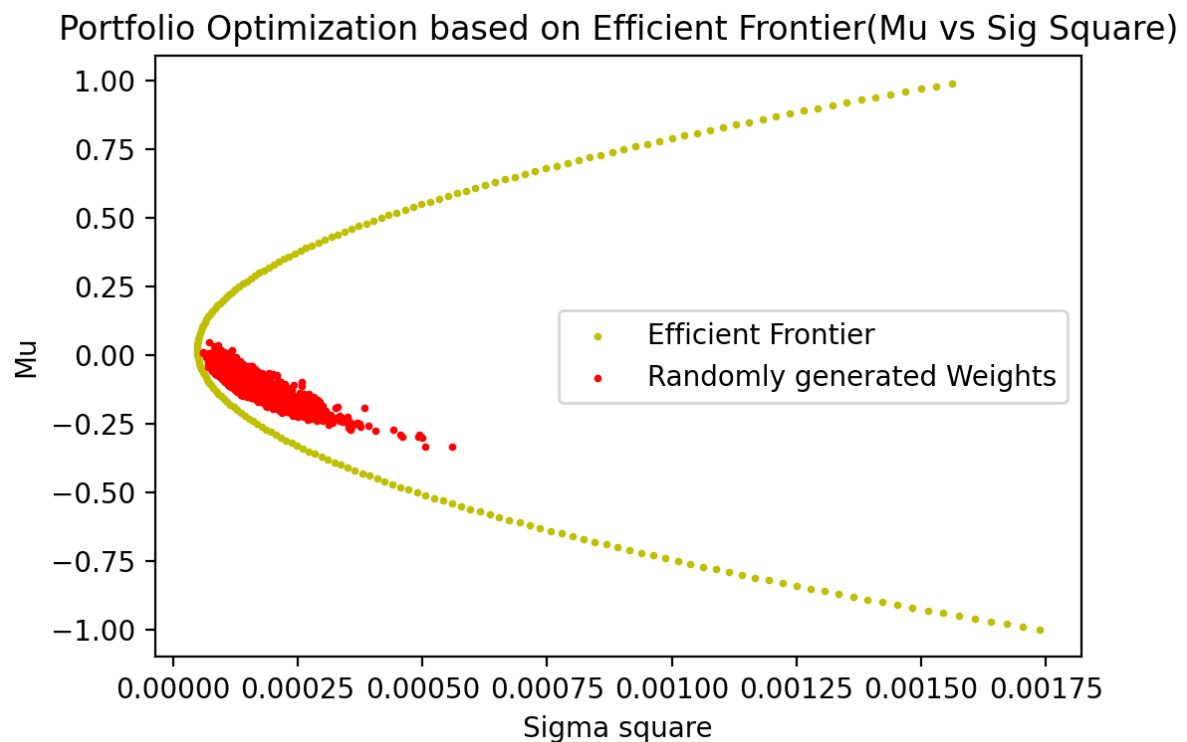
In this plot the markowitz bullet is shown and randomly generated weights are used to calculated mu and sigma square which lies inside the curve proving the curve to be markoqitz bullet and effiecient frontier..

E. After this the optimised portfolio is created as:

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Optimised Risky Portfoliois:
For Asset 1 Weight Associated is: 0.01158760874285754
For Asset 2 Weight Associated is: -0.133908298882596
For Asset 3 Weight Associated is: 0.013813375436387122
For Asset 4 Weight Associated is: 0.09965644129341936
For Asset 5 Weight Associated is: 0.013339869714147867
For Asset 6 Weight Associated is: 0.19035653221641802
For Asset 7 Weight Associated is: -0.03516734920789496
For Asset 8 Weight Associated is: 0.24647538462678323
For Asset 9 Weight Associated is: 0.25441788789804876
For Asset 10 Weight Associated is: 0.3394285481624292
For this portfolio the Expected Return is: 4.834073714862045e-05
For this Portfolio the Risk assciated is: 0.020000000000000753
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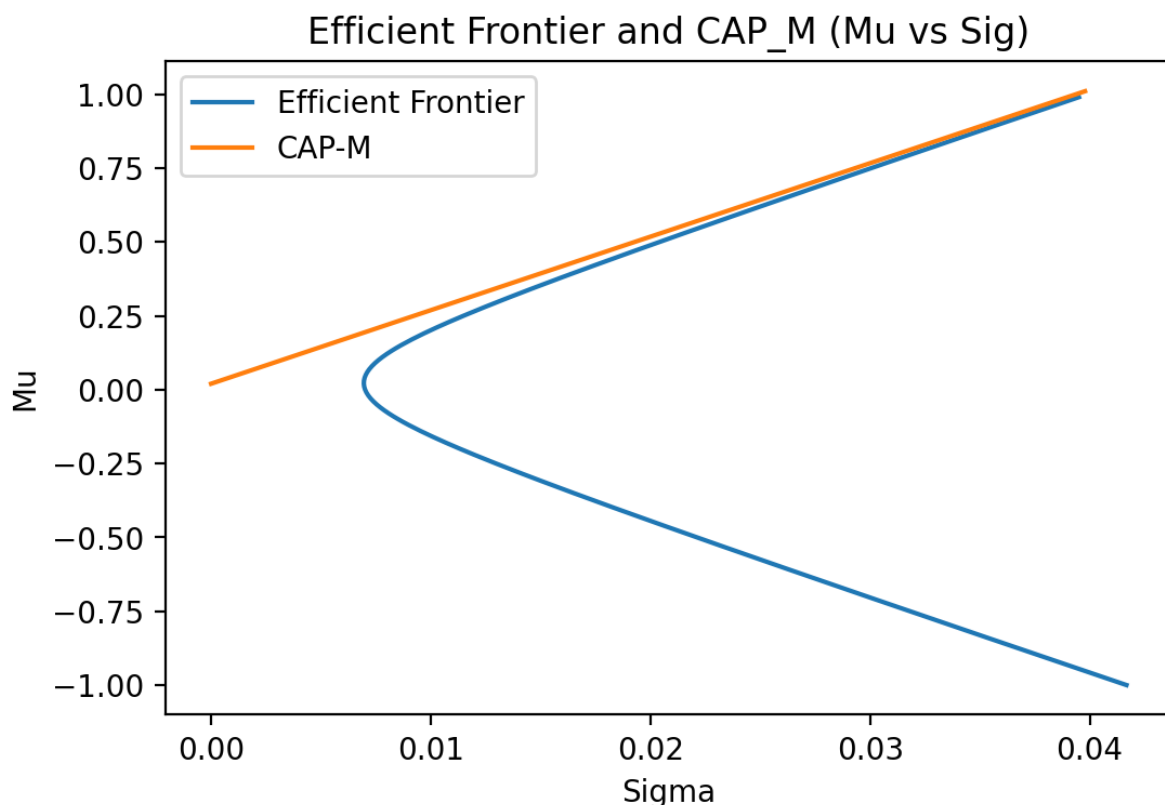
F. After this a risk free asset is chosen and the rate is fixed at 0.02 and then CAP-M model is created for the same and both efficient frontier and CAP-M are plotted. And the CAP-M line is tangent to the efficient frontier curve.

G. After this the optimised portfolio is obtained which also consist of riskfree asset.
For the portfolio:
The Expected return is considered as 0.4
For Risky Asset 1 Weight associated is: -0.10681486383146771
For Risky Asset 2 Weight associated is: 0.22938740951905634
For Risky Asset 3 Weight associated is: 0.6172134172220903
For Risky Asset 4 Weight associated is: -0.27027683473423475
For Risky Asset 5 Weight associated is: -0.15230938062377583

For Risky Asset 6 Weight associated is: -0.1265930167035024
For Risky Asset 7 Weight associated is: -0.09755122387642884
For Risky Asset 8 Weight associated is: -0.6829260203154535
For Risky Asset 9 Weight associated is: 0.32539900329174826
For Risky Asset 10 Weight associated is: 0.29385424291020307
For Risk free Asset Weight associated is: 0.9706172671417651
For Risk free the expected return is: 0.02
For the portfolio the risk associated is 0.00044872489711662286

H. In the end three different Assets are chosen by the user from 0 to 9 and SML's are drawn.
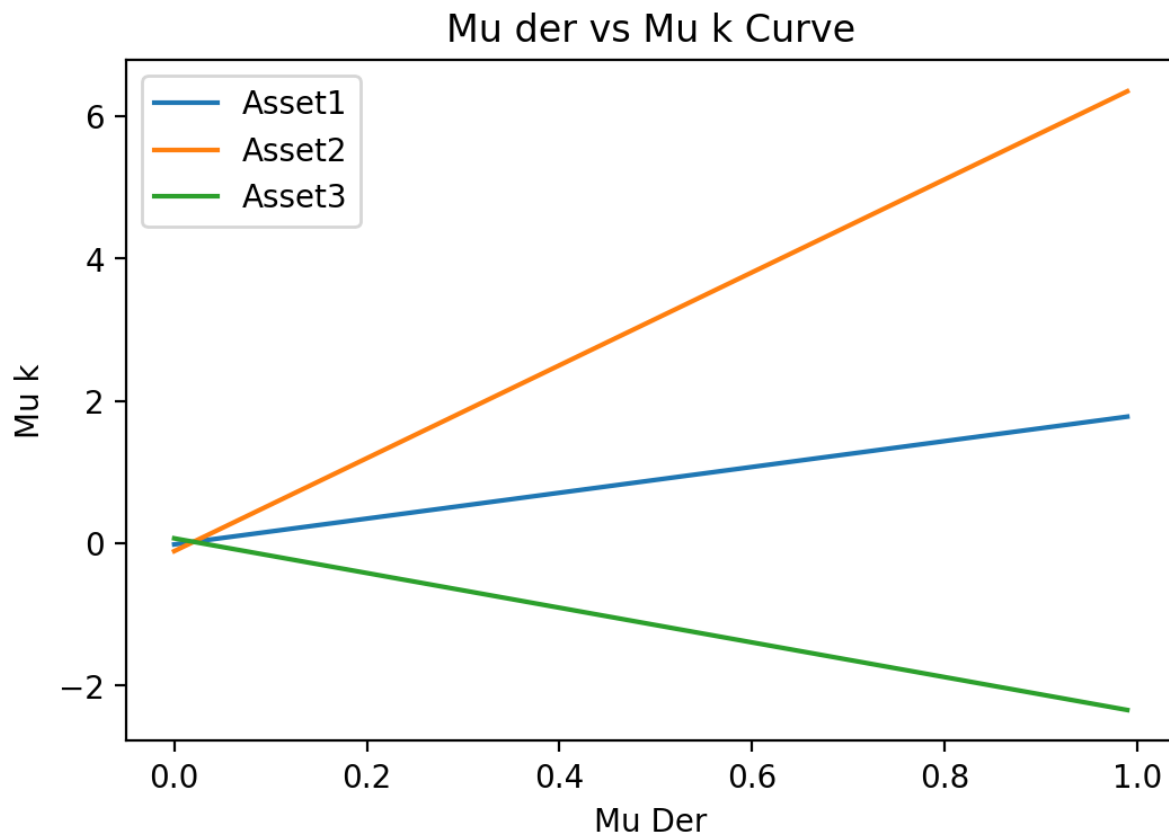
Running the Project:
1. Open the Assignemnt1.ipynb file in google colab.
2. Upload the Data.csv file provided with the Assignment1.ipynb file.
3. Use the Run all option provided in the Runtime option of google colab
4. For SML's user will be prompted to enter 3 different asset numbers from 0 ot 9..