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# ***Cases in Financial Modeling & Engineering – Assignment 4 (due on August 13th by 12pm)***

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**You will submit your assignment electronically:**

To: [stephen.d.young@wellsfargo.com](mailto:stephen.d.young@wellsfargo.com).

Cc: cc yourself and each of your team members

Subject: Assignment 4, MSF FIN 6281

**Part I.**

**Markowitz Optimization:**

In the zip file with the assignment you will see a folder entitled Markowitz Optimization. This folder has two files one which are the inputs (i.e. expected returns, covariance matrix) for six cases. Using the six cases you are to do the optimization and create graphs and tables around your findings. The goal is to understand how sensitive the algorithm is to using different expected return and covariance inputs. After getting your results you are to write about 2 – 3 pages that include:

Short discussion of portfolio optimization. Markowitz’ approach including mathematical expression of objective function and constraints. Then, you present your results and including a discussion of your findings. Is the model more sensitive to changes in expected returns or the covariance matrix? Is the model reasonably stable or do the assets included and weights change drastically for the different inputs?

**Part II.**

In the zip file with the assignment there is a folder entitled Black Litterman. The folder has four files one which is a “teaching note” and there is a single spreadsheet file. The spreadsheet file replicates, step-by-step, the calculations made in the “teaching note.” You are to read the teaching note and any other papers you may wish to review (i.e. I included another paper on Black Litterman) and then reproduce the spreadsheet results in R, Python, or Matlab. Then, you are to write about 3 pages that explains the Black Litterman model. The writeup should seek to shed light on the mathematical construction of the model, the meaning of the different inputs, and provide your thoughts around this approach to portfolio optimization.

For all of your work (Parts I and II) you should include your code in an Appendix. The code must be well commented and easy to follow.

Email me should you have any questions.