**MMAI 823 Analytics For Financial Markets**

**Assignment #1**

Your assignment is to construct an optimal stock portfolio for your team. To achieve this start by selecting a number of publicly traded stocks that you will use to construct your portfolio. The number of stocks and the specific names are up to you. Next use Bloomberg (or a reputable alternative) to download daily historical stock price data for all the stocks you have chosen. The amount of historical data you choose to include is up to you.

From this data calculate the daily historical returns for each of the stocks. For example if the price of a stock on day is then the return on stock can be approximated as: . Do this for all stocks and then use Excel or another statistical package to calculate the covariance matrix for this data. Since you used daily returns to calculate this covariance matrix you will want to convert these covariances to annual values. To do this multiply your covariance matrix by 252 (the number of trading days in a year).

Next you will need to estimate the expected returns on all of the stocks you have chosen. Estimating expected future returns from historical data is extremely unreliable as we will see next class. Instead, use Bloomberg’s estimate for the betas of all the stocks you have chosen, and then calculate the expected return on each stock according to the CAPM pricing model formula. Assume that the risk free interest rate is 1.8% and assume that the expected return on the index is 7.8%.

Develop a mean-variance portfolio optimization tool (similar to what we did in class) and use this tool to calculate the efficient frontier of your portfolio. Unlike in class, assume that you cannot borrow money for your investment (although you can invest money at the risk free rate of 1.8%) and that you cannot short the stocks either.

Examining the efficient frontier that you have calculated, as a group try to reach a consensus on the risk/reward trade-off that is optimal for your team and then report the portfolio of stocks/bond that corresponds to your team’s optimal portfolio.

Write a clear report summarizing what you did and how you arrived at your answer. Be sure to briefly describe how you chose the initial stocks that you included and any other assumptions that you made such as the amount of historical data you used. Your report should summarize the parameter estimates that you found and should show your efficient frontier plots. Submit your data and all accompanying spread sheets.