4. First we look at the case where are allowed to have short sale in this portfolio meaning our weights can be less than and equal to 1 with the total sum of weights of 1. From the graph, we can see that the portfolio’s standard deviation achieves its minimum at 4.6995% with a return of 1%. Additionally, the portfolio is optimal at standard deviation of 7.9523% with a return of 3.5067%.

Additionally, for q.5., we add one more constraint stating that all our weights have be between 0 and 1 such that the sum of all our weights is 1. We combine explanation for questions 4 and 5 since the results are identical.

6) To find the CAL, in particular the Sharpe Ratio, we use the Canadian 1-month Treasury Bill of 0.42% and divide by 12 to get monthly Treasury Bill Yield of 0.035%. Risk free rate is the Returns-axis intercept of CAL since the risk (standard deviation) of risk free rate is 0. As seen from the two graphs below, both Short Sell and No Short Sell portfolio have the same CAL equation, as well as the efficient frontiers. The Sharpe Ratio of CAL is maximized at standard deviation of 7.9523% with return of 3.5067%. The investor desires to maximize his Sharpe ratio so as to get the maximum amount of return for the same amount of risk.

From the graph, we can see that Short Sell Efficient Frontier overlaps the No Short Sell Efficient Frontier. This suggests that no matter what strategy the investor chooses, he or she will be indifferent to either of them when investing with JPMorgan, Microsoft, Pfizer, and Monsanto