HW6 Report

Part 1. Indicators

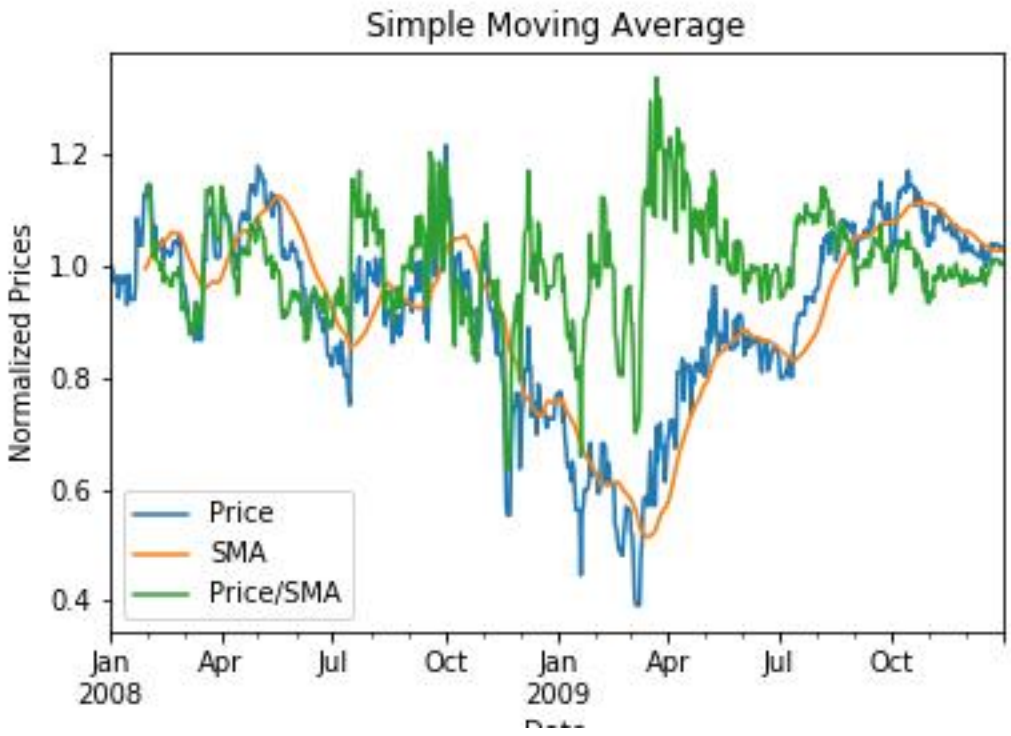
The three indicators that I used for this project were SMA, or simple moving average, Bollinger Bands, and Momentum.

SMA (Simple Moving Average): The simple moving average is the average stock price of a given stock from a certain fixed number of time units to the present. In this project, I used a window of 30 days to calculate the moving average. This means that the rolling average at any given time would be the average of the stock of the last thirty days. The formula for this calculation is given below:

SMA[t]= price[t-window ,t].mean()

The simple moving average is useful as an indicator, since it gives a good approximation of a stocks value. Therefore, if the actual price of the stock on a given day deviates significantly from the SMA, it would lead to buying and selling opportunities, as the stock price will eventually return to the mean. Moreover, if the price of the stock crosses the SMA line, this would be a useful signal to trade the stock. If price is tending upwards as it crosses the SMA, it indicates a buy opportunity, and if the price is tending downwards as it crosses the SMA, it indicates a sell opportunity.

The graph displays the price, the normalized SMA, and Price/SMA

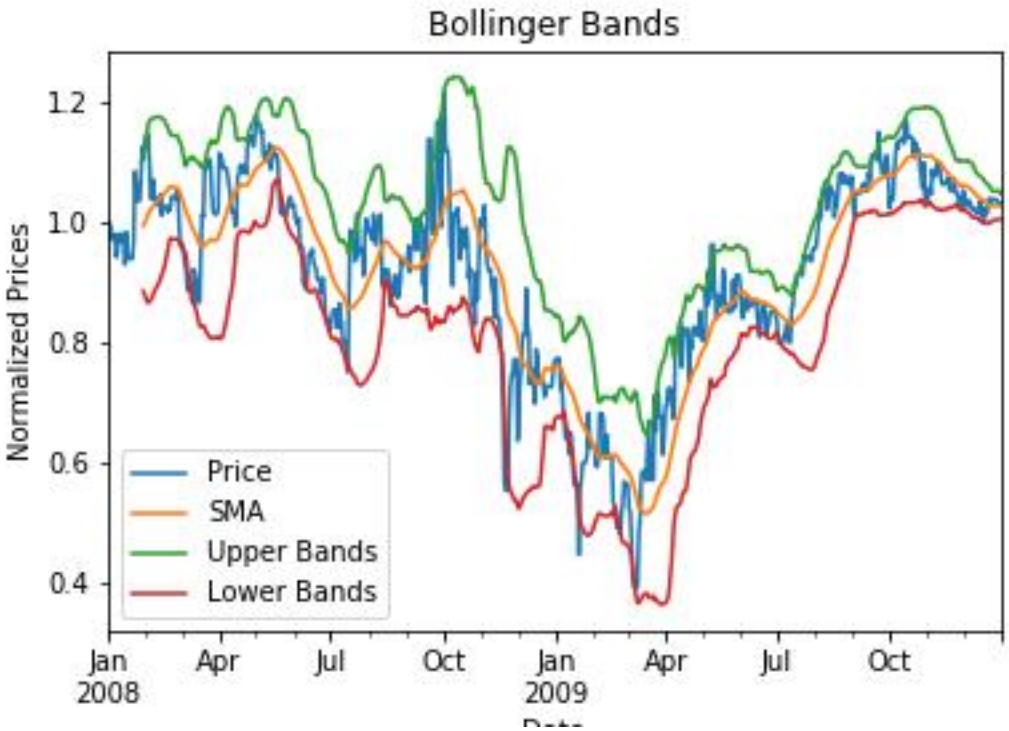


Bollinger Bands: This indicators has the given formula below:

BB[t]=(price[t]-SMA[t]) / 2*std[t]

This indicator essentially plots two lines, one +2 standard deviations and one -2 standard deviations from the stock price. This approaches not only considers the simply moving average but also the volatility of stocks when making a trading decision. This approach works as an indicator as highlights buy and sell opportunities when the deviation from the SMA is high.

Here are the Bollinger Bands for the data given:

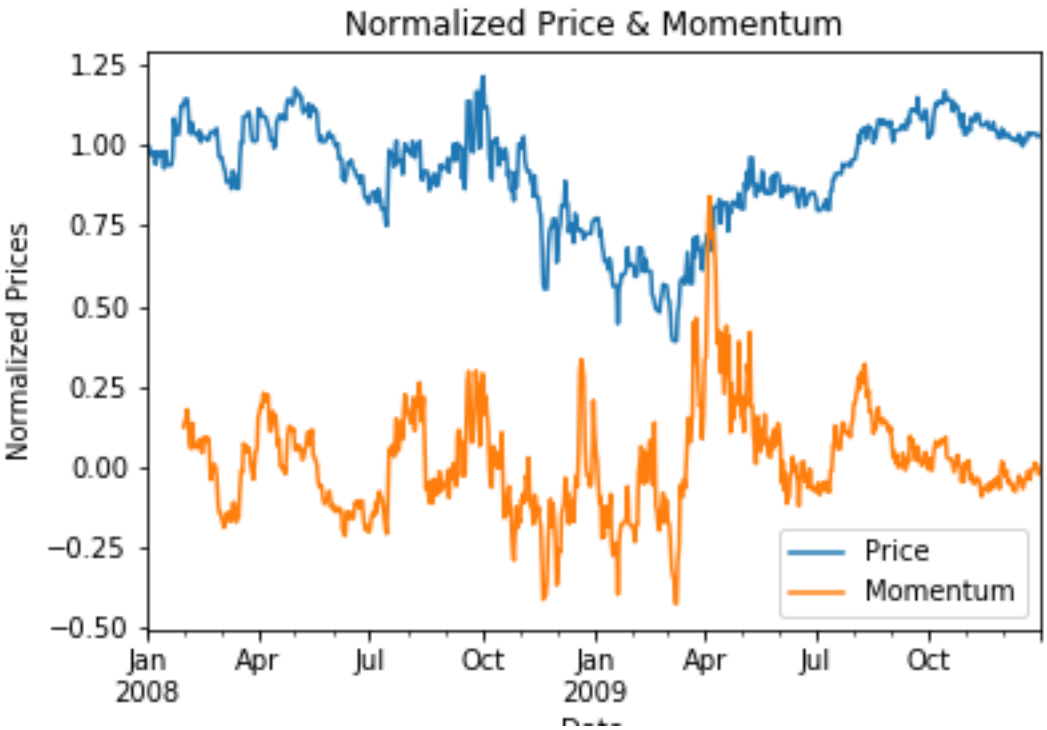


Momentum: Momentum measure the speed at which a stock is rising, and is represented by the following formula:

Momentum[t]= (price[t]/price[t-N])-1

This is basically the slope between two data points (of distance N) in the stock price. If the momentum is high and positive, it may be a buy opportunity as the stock is rising fast, and conversely, if the momentum is negative it indicates a sell opportunity.

The following this graph of the momentum:



Part 1. Theoretically Optimal Strategy

Knowing the future, allows us to make the theoretically optimal strategy, as we know when the stock price is going rise and fall. Therefore, the best strategy goes as follows:

If the price[t]<price[t+1] our holdings are less than 1000, it is a long position, so we should buy shares in the market.

Else if the price[t]>price[t+1] our holdings are more than -1000, it is a short position, so we should sell shares in the market.

Using this formula and comparing it with a benchmark of investing 1000 shares at the beginning and holding revealed this:

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Best Policy
Cumulative Return: 5.7861
Average Daily Return: 0.0038167861508578197
Standard Deviation: 0.004547823197907996
Sharpe Ratio: 13.322769848217227
Final Value: 678610.0

Benchmark
Cumulative Return: 0.012299999999999978
Average Daily Return: 0.00016808697819094035
Standard Deviation: 0.017004366271213767
Sharpe Ratio: 0.15691840642403027
Final Value: 101230.0
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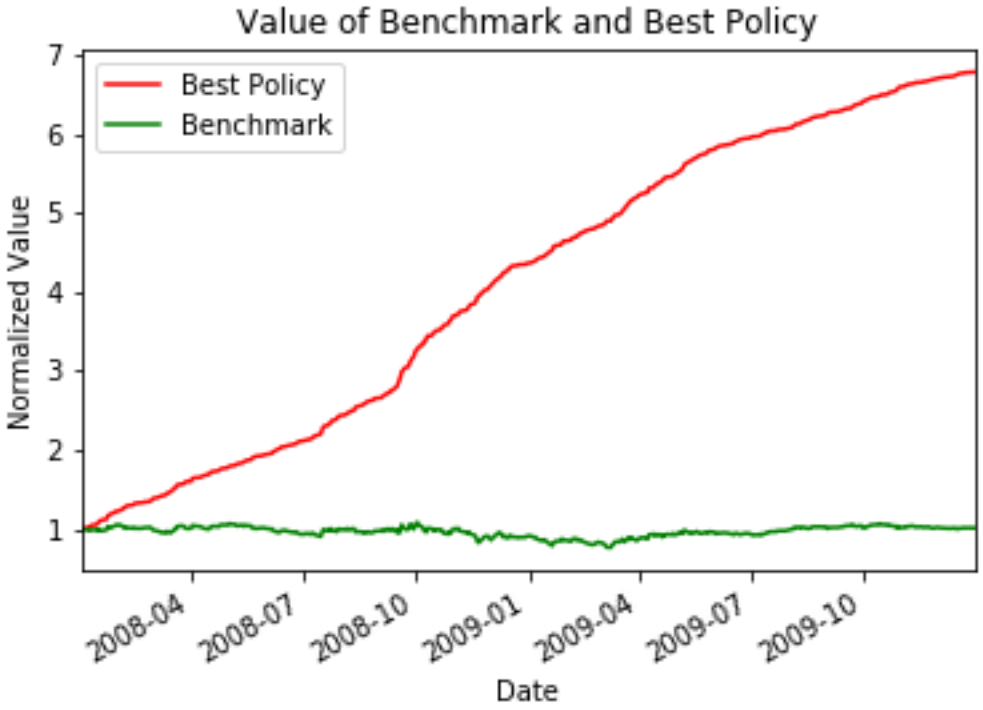
The overall portfolio value over time between the two methods is displayed by the graph below:



This shows that the portfolio value constantly increases with the theoretically best approach and provides us bounds for further analysis.