

CS 7646- Manual Strategy Assignment

Indicators

I have used Bollinger bands, Simple moving Average and momentum as indicators.

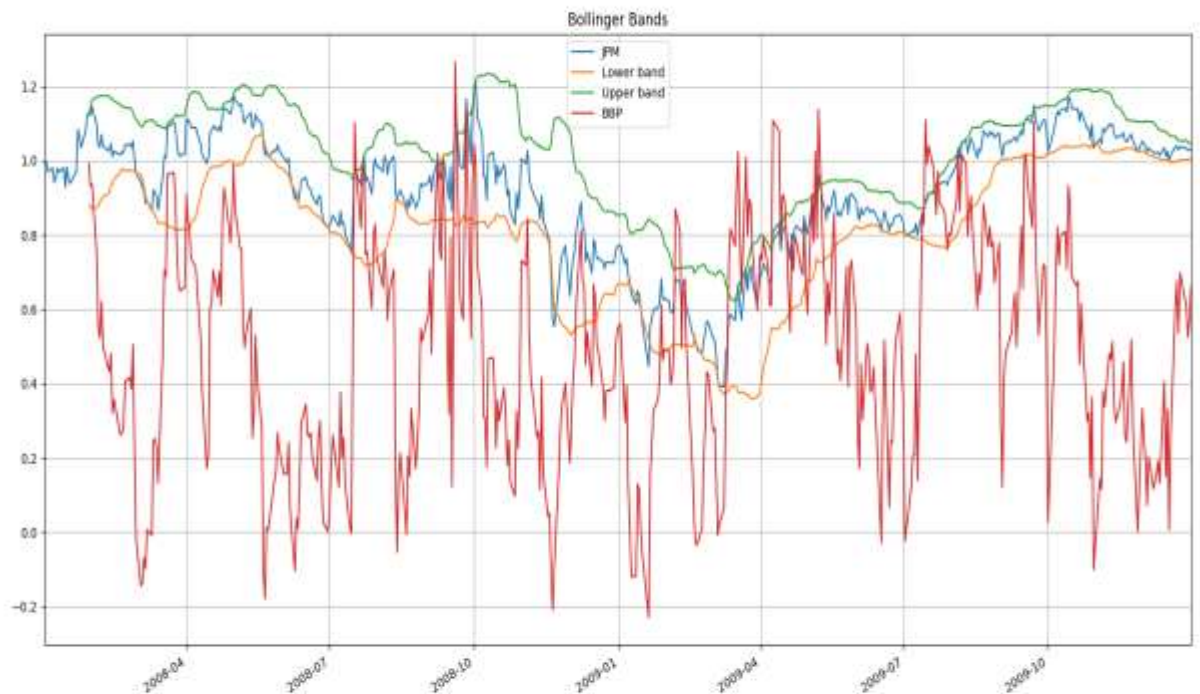
Simple Moving Average (SMA)

- SMA is calculated as the rolling mean of the normalized price of the stock. For rolling calculations, the lookback period has been taken as 20 days. This is calculated using `prices_normalized.rolling(window=rolling_days, min_periods = rolling_days).mean()` where `rolling_days` is the lookback period.



Bollinger bands:

- Bollinger bands are calculated as 2 standard deviations above and below the simple moving average calculated above. The standard deviation is also calculated on a rolling basis using `prices_normalized.rolling(window=rolling_days, min_periods = rolling_days).std()`

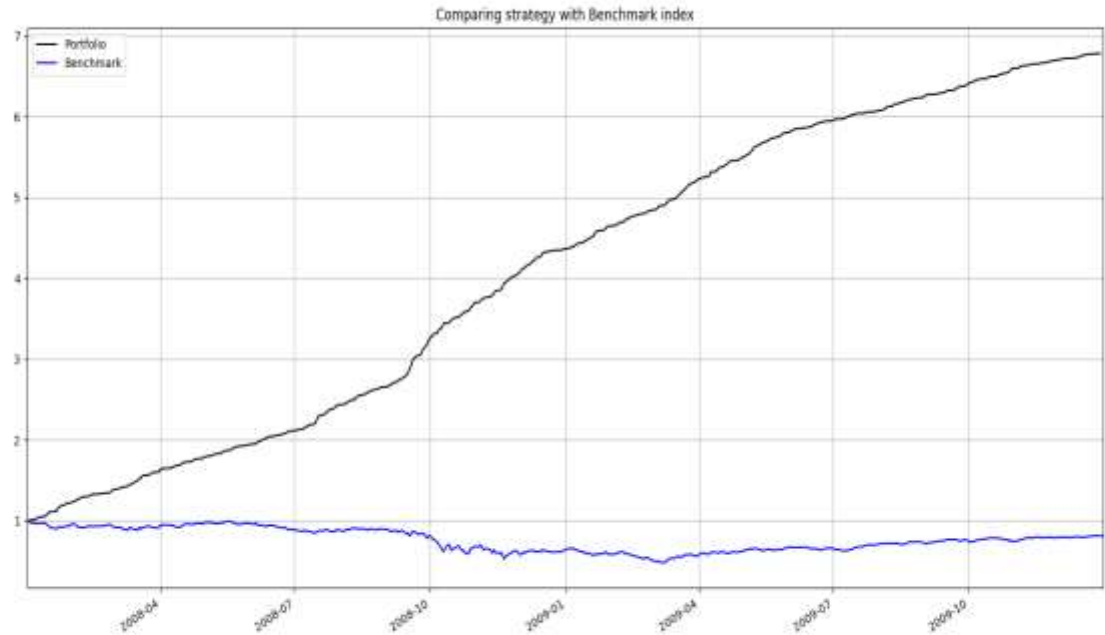


Momentum:

- The momentum is calculated as the difference in the price of a stock over the lookback period taking the old price as the standard denominator. This is calculated in python as `prices_normalized.diff(rolling_days)/prices_normalized.shift(rolling_days)` where `prices_normalized` is the normalized price of a stock.

Best Possible Strategy

- To evaluate the best possible strategy, we look ahead in the future by a day.
- We long a stock if the future price of the stock is greater than the current price of the stock (adjusted close at the end of the day we assume) and we have capacity to long a stock, i.e., our net holding is -1000 or 0.
- We short a stock if the future price of the stock is less than the current price of the stock and we have capacity to short the stock, i.e., our net holding is 0 or +1000.
- We do nothing otherwise and remove the rows with 0 shares in the `df_trades` dataframe after processing.



Performance criteria:

In Sample stats:

Sharpe Ratio of Fund: 13.3650848389

Sharpe Ratio of SPY : -0.137143508209

Cumulative Return of Fund: 5.7844

Cumulative Return of SPY : -0.194324631101

Standard Deviation of Fund: 0.00455089300911

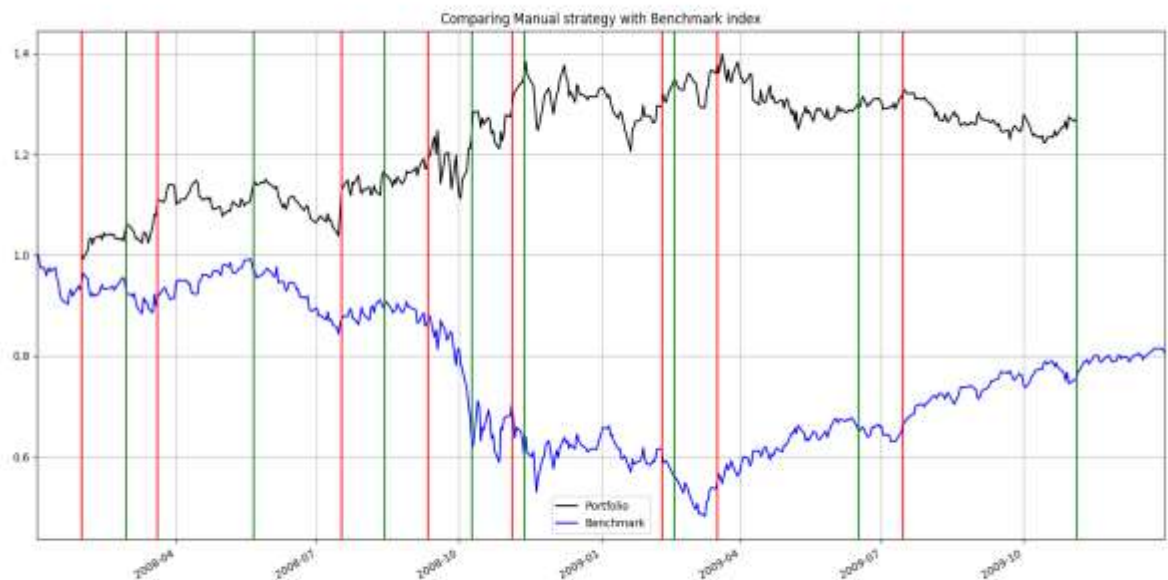
Standard Deviation of SPY : 0.0219321223021

Average Daily Return of Fund: 0.0038314933396

Average Daily Return of SPY : -0.000189476626317

Manual Strategy

- The trading strategy used here is based on momentum and Bollinger bands.
- We long a stock if the momentum value drops below 0.05 and Bollinger bands percentage value drops below 20% and if our net holdings for the stock is 0 or -1000. Bollinger bands percentage value is calculated as $(\text{prices} - \text{Bollinger bands lower band value}) / (\text{upper band} - \text{lower band})$ divided by the difference between the upper and lower bands.
- We short a stock if the momentum value is above 0.05 and Bollinger bands percentage value is greater than 80% and if our net holdings for the stock is 0 or +1000.



The statistics returned from our manual strategy compared to the benchmark index:

Sharpe Ratio of Fund: 0.729916263063

Sharpe Ratio of SPY : -0.137143508209

Cumulative Return of Fund: 0.2699

Cumulative Return of SPY : -0.194324631101

Standard Deviation of Fund: 0.0137185043907

Standard Deviation of SPY : 0.0219321223021

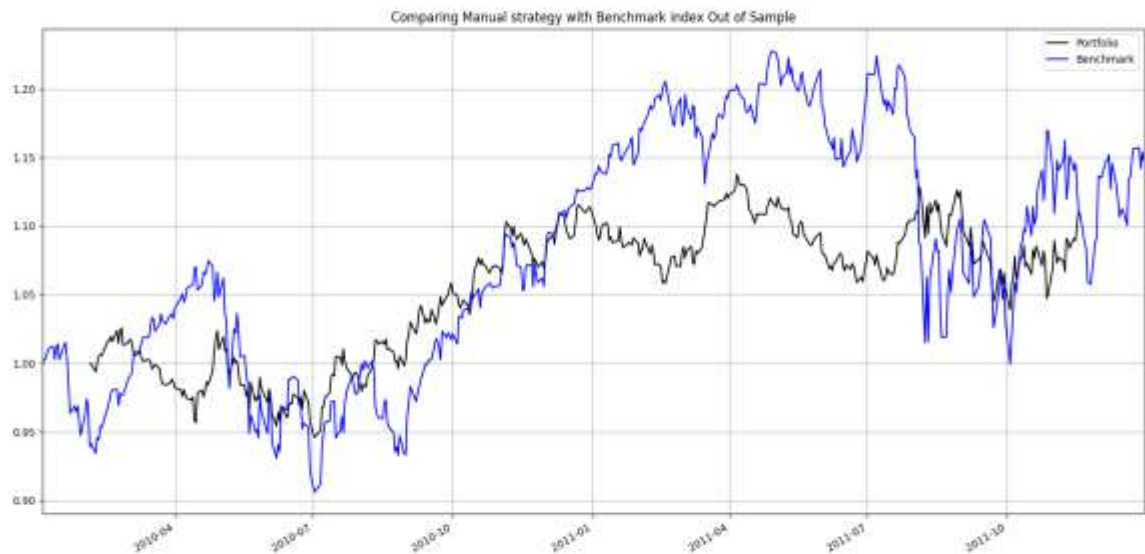
Average Daily Return of Fund: 0.000630782355205

Average Daily Return of SPY : -0.000189476626317

Our strategy results in higher cumulative returns than the benchmark index.

Comparative Analysis

Given below is the chart for out of sample performance comparison of our trading strategy with the benchmark index.



	In Sample	Out of Sample
Sharpe Ratio	0.729916263063	0.550139436105
Cumulative Return	0.2699	0.1111
Standard Deviation	0.0137185043907	0.00754545769384
Average daily return	0.000630782355205	0.000261491812898

We do better on the in sample data as compared to the out of sample data because our strategy is fit to the data provide in the sample period for the stock and doesn't work the same way for the stock prices in the out-of-sample period.