

MC3_P2 Report

1. Indication Description:

- Indicator 1: bollinger value.

I use the equation:

$$bb_value[t] = (price[t] - SMA[t]) / (2 * stdev[t])$$

The SMA[t] is 5 days' moving average:

$$SMA[t] = (price[t-4] + price[t-3] + price[t-2] + price[t-1] + price[t]) / 5$$

Stdve[t] is 5 days' standard deviation:

General standard deviation formula $s_N = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2}$.

Substitute x by price in five days and N by 5 then stdve is calculated by previous formula.

The window chosen is 5 days to accommodate the fluctuation of price of IBM.

- Indicator 2: momentum:

$$momentum[t] = (price[t] / price[t-N]) - 1$$

The window chosen is 5 days to accommodate the fluctuation of price of IBM.

- Indicator 3: volatility:

Volatility[t] is 5 days' standard deviation:

General standard deviation formula $s_N = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2}$.

Substitute x by price in five days and N by 5 then stdve is calculated by previous formula.

- Y value:

I use 5 day return as Y:

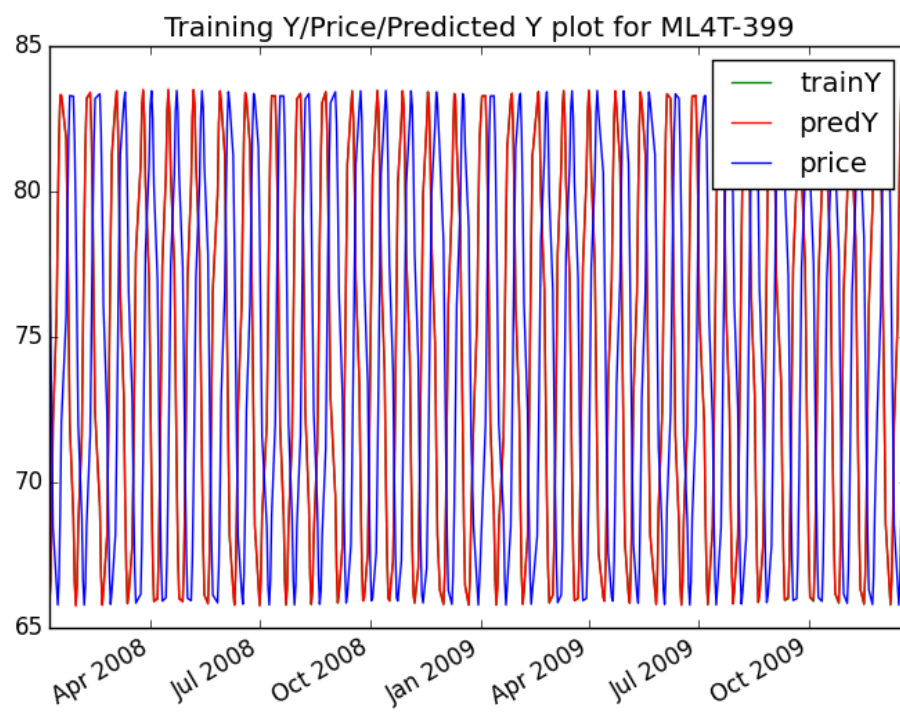
$$Y[t] = (price[t+5] / price[t]) - 1.0$$

2. Trading Policy Description:

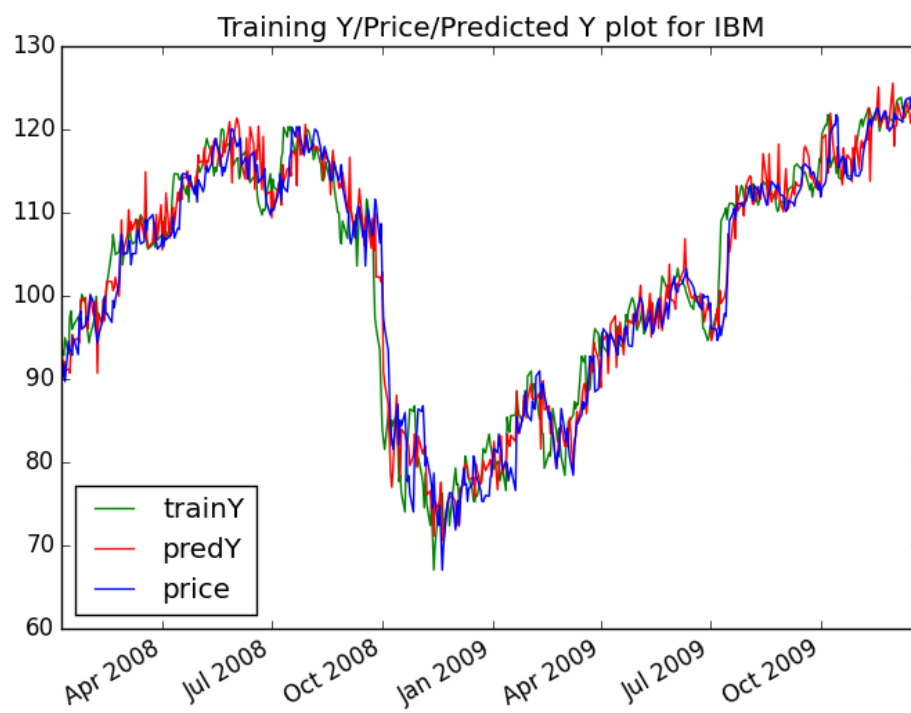
- If portfolio contains no stock and 5 days prediction is over 1%:
 - Buy 100 shares of the stock
 - Hold it for 5 days and sell the stock (end position) on 5th day.
- If portfolio contains no stock and 5 days prediction is lower than 1%:
 - Short 100 share of the stock
 - Hold it for 5 days and buy back the stock (end position) on 5th day.

3. The plots:

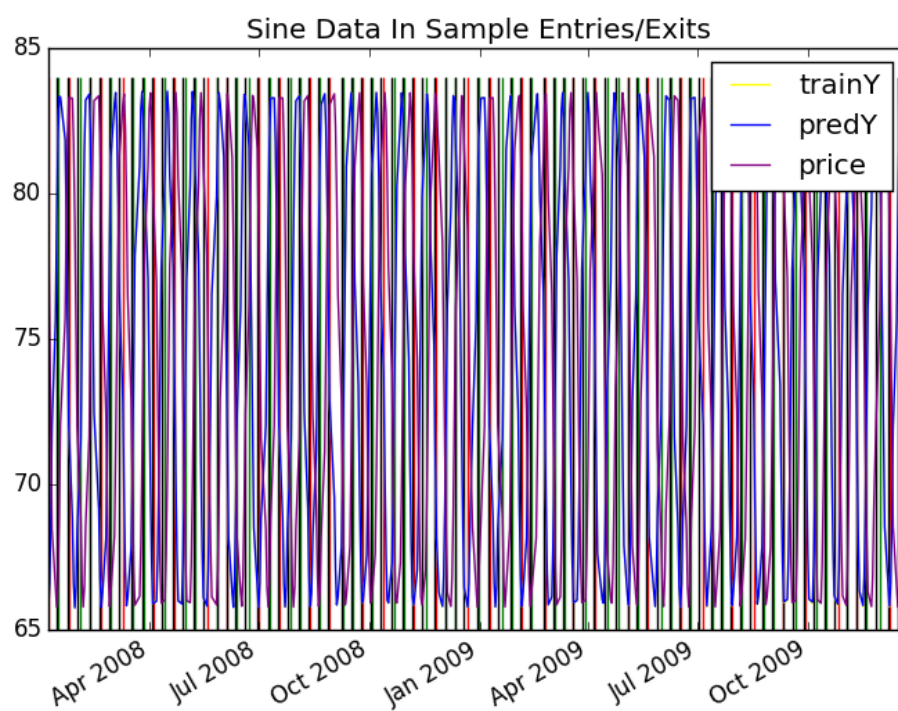
1. Training Y/Price/Predicted Y for ML4T-399 data:



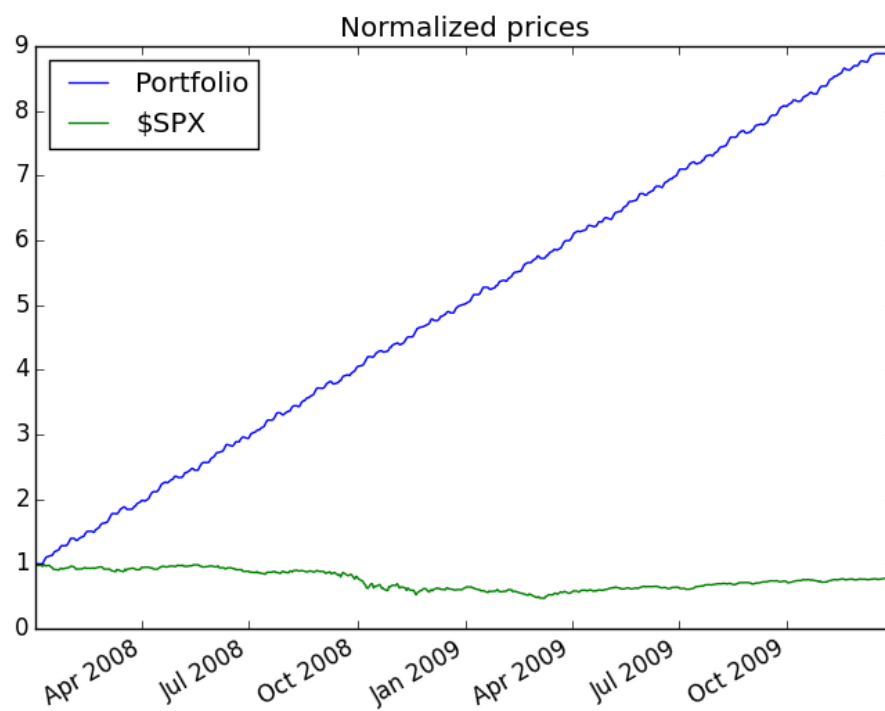
2. Training Y/Price/Predicted Y plot for IBM



3. Sine Data In Sample Entries/Exits:



4. Sine Data In Sample Backtest:



Data Range: 2008-01-01 to 2009-12-30

Sharpe Ratio of Fund: 10.8205036455

Sharpe Ratio of \$SPX: -0.185383572421

Cumulative Return of Fund: 7.88543668

Cumulative Return of \$SPX: -0.221634097128

Standard Deviation of Fund: 0.00641483796063

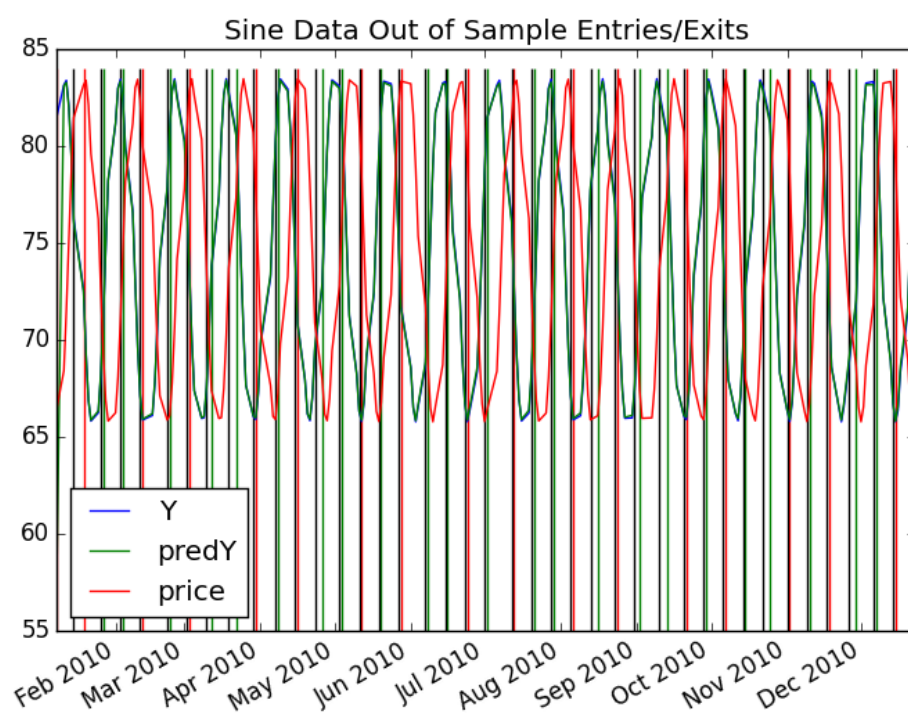
Standard Deviation of \$SPX: 0.0219827722595

Average Daily Return of Fund: 0.00437253098631

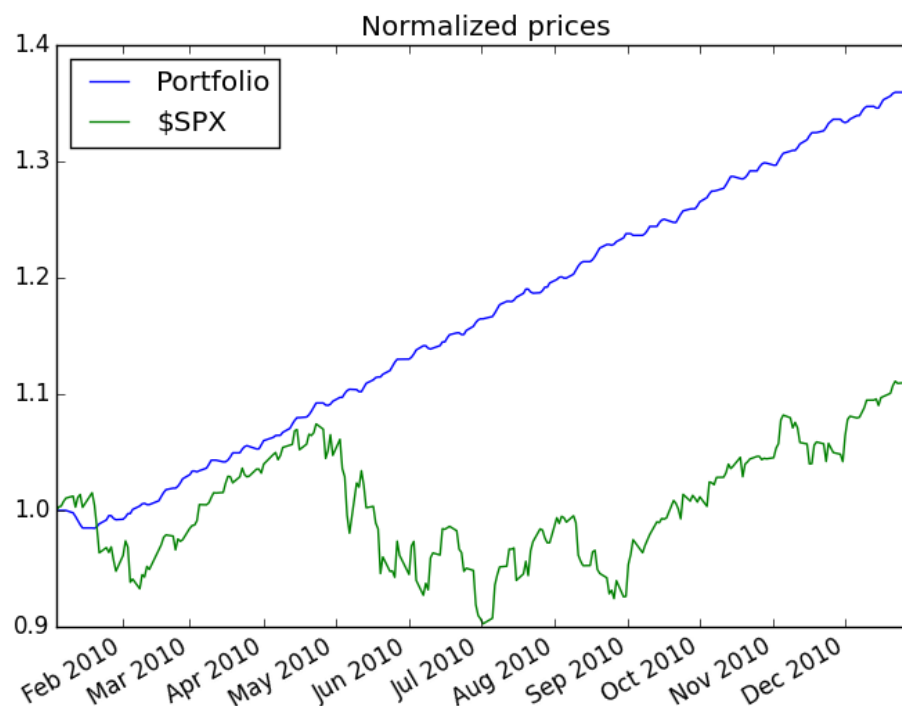
Average Daily Return of \$SPX: -0.000256716295552

Final Portfolio Value: 88854.3668

5. Sine Data Out of Sample Entries/Exits:



6. Sine Data Out of Sample Backtest:



Name: Portfolio Value, dtype: float64

Data Range: 2010-01-01 to 2010-12-30

Sharpe Ratio of Fund: 12.3238049662

Sharpe Ratio of \$SPX: 0.673867715984

Cumulative Return of Fund: 0.359412855

Cumulative Return of \$SPX: 0.110230452166

Standard Deviation of Fund: 0.0015846623318

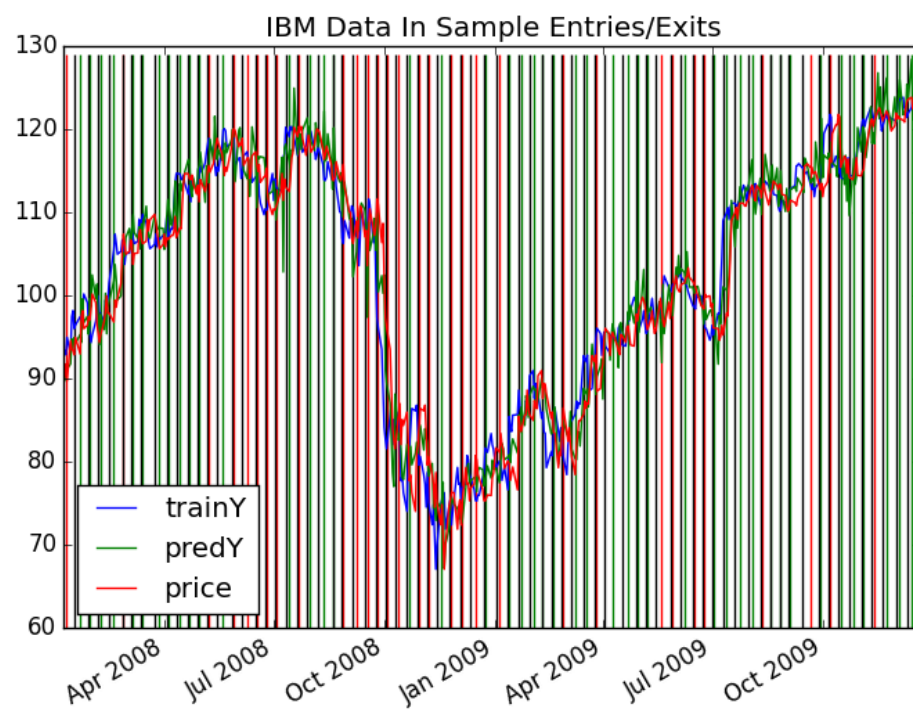
Standard Deviation of \$SPX: 0.0113745173984

Average Daily Return of Fund: 0.00123021574456

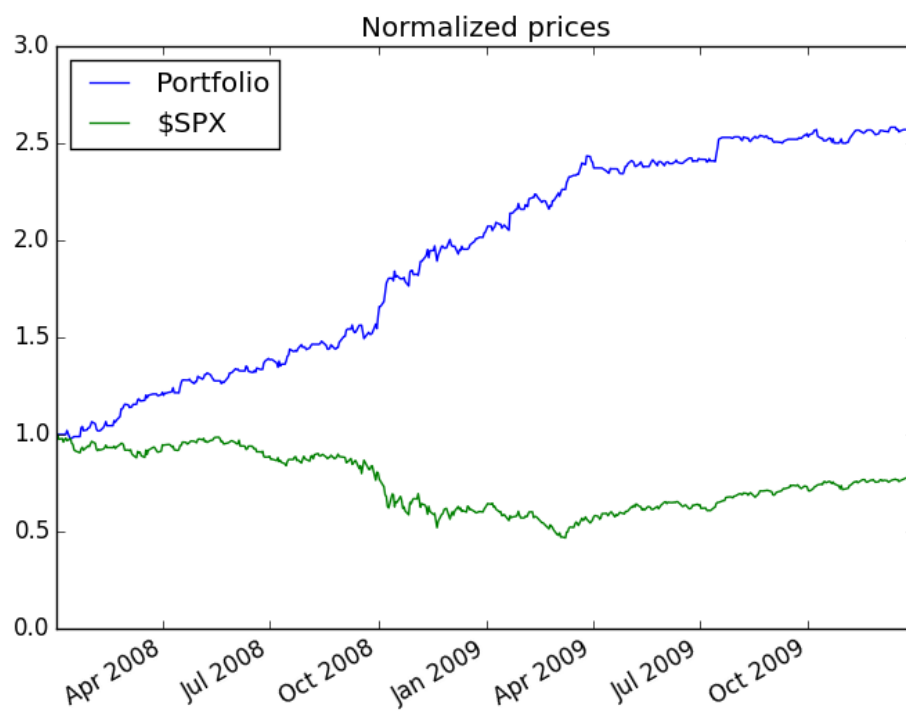
Average Daily Return of \$SPX: 0.000482844578504

Final Portfolio Value: 135941.2855

7. IBM Data In Sample Entries/Exits



8. IBM Data In Sample Backtest



Name: Portfolio Value, dtype: float64

Data Range: 2008-01-01 to 2009-12-30

Sharpe Ratio of Fund: 3.2470229434

Sharpe Ratio of \$SPX: -0.185383572421

Cumulative Return of Fund: 1.7477

Cumulative Return of \$SPX: -0.221634097128

Standard Deviation of Fund: 0.0100807645119

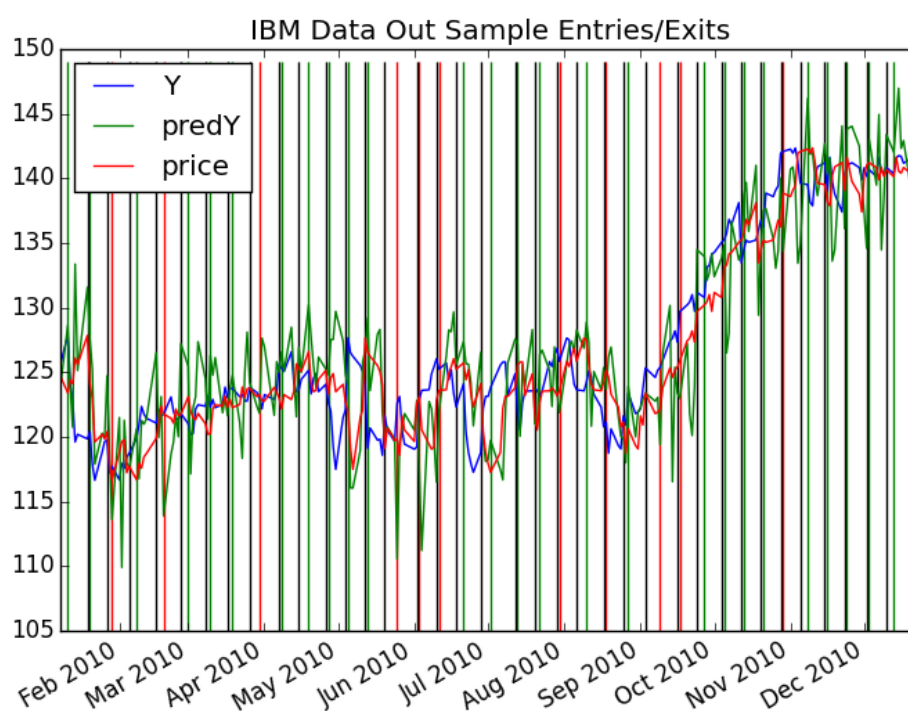
Standard Deviation of \$SPX: 0.0219827722595

Average Daily Return of Fund: 0.00206195202603

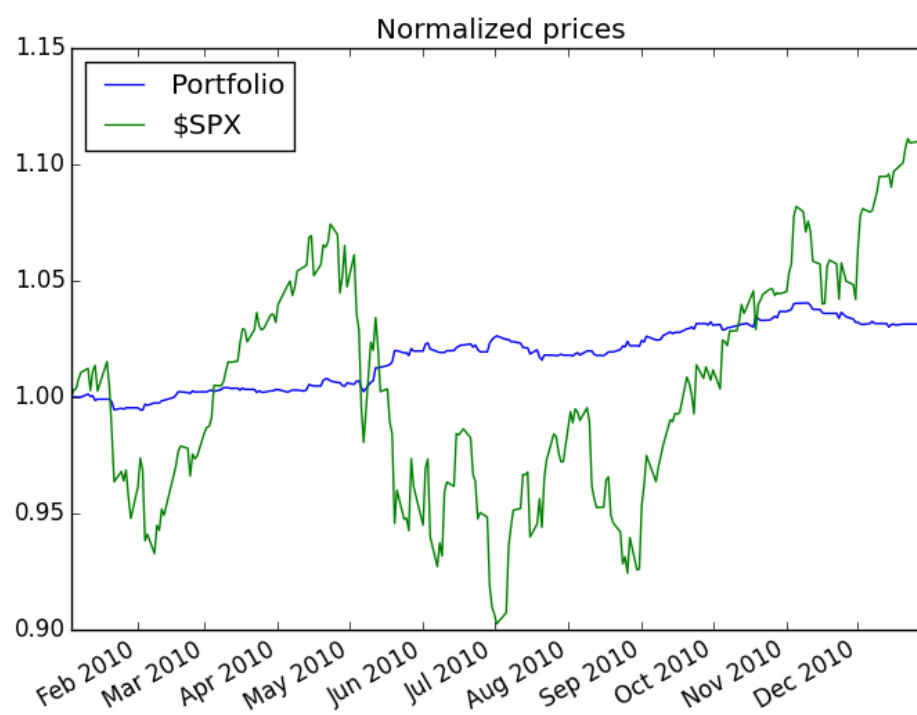
Average Daily Return of \$SPX: -0.000256716295552

Final Portfolio Value: 27477.0

9. IBM Data Out of Sample Entries/Exits:



10. IBM Data Out of Sample Backtest



Data Range: 2010-01-01 to 2010-12-31

Sharpe Ratio of Fund: 1.65020207206

Sharpe Ratio of \$SPX: 0.671461673758

Cumulative Return of Fund: 0.03139

Cumulative Return of \$SPX: 0.110018623289

Standard Deviation of Fund: 0.00119141366865

Standard Deviation of \$SPX: 0.0113518252015

Average Daily Return of Fund: 0.000123850976751

Average Daily Return of \$SPX: 0.00048016074666

Final Portfolio Value: 103139.0

4. Discussion:

1. The strategy works very well except for IBM out sample test. The reason is clear: for real world data, the indicator is not good enough to predict the future.

Also, the training data is too far away from the testing data, if we use data that is more close to testing data the result may also be better.

As a result, I will use indicators like SPY, bolliger value, and average return of same periods of year in the past as my indicators.