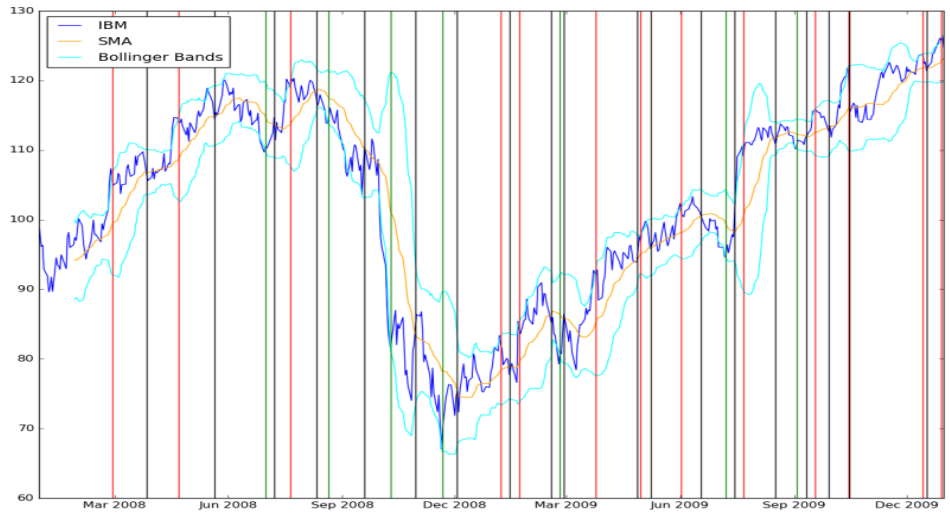
MC2-Project-2: Implement bollinger bands, and create a simple trading strategy

Xiaodong (Sheldon) Gu (xgu60@gatech.edu)

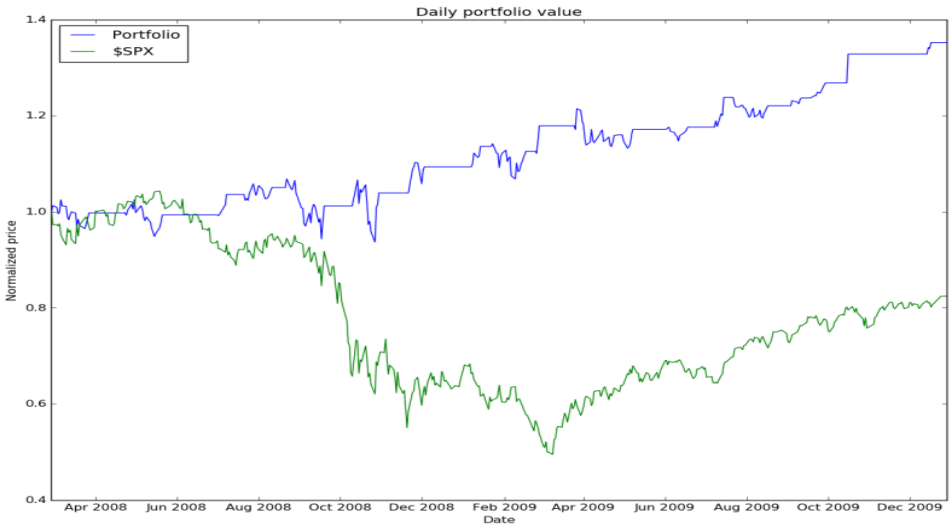
Part 1:

The following charts and performance metrics were generated by running bollinger_strategy.py

- **Bollinger Band strategy chart showing entry and exit points**



- **Bollinger Band strategy backtest chart**



- **Summary of Bollinger Band backtest performance metrics**

Data Range: 2008-02-28 00:00:00 to 2009-12-29 00:00:00 :

Sharpe Ratio of Fund: 1.00195922396
Sharpe Ratio of $SPX: -0.116052774605

Cumulative Return of Fund: 0.3524
Cumulative Return of $SPX: -0.176561768835

Standard Deviation of Fund: 0.0113472713465
Standard Deviation of $SPX: 0.0225771006222

Average Daily Return of Fund: 0.000716211380412
Average Daily Return of $SPX: -0.000165053001441

Final Portfolio Value: 13524.0

Part 2:

- **Description of my strategy idea**

My strategy contains two parts: 1. find more trading opportunities, 2. Reduce trading risks.

1. Find more trading opportunities.
The fundamental law tells us that: $Performance = Skill \times \sqrt{\text{Breadth}}$, thus if we cannot increase our trading skills in a short period of time, we can try to increase our trading times (increase the Breadth). Beside the trading opportunities presented in bollinger_strategy, I consider following circumstances are good trading opportunities (*add Bollinger band of SPX, SMA of SPX, SMA of IBM, and 2% profit threshold as indicators*):

Short stock when:
a. IBM stock price > IBM upper Bollinger band, while SPX stock price < SPX simple moving average (SMA)
b. SPX stock price moves out of upper Bollinger band, and is moving back, while at same time IBM stock price > IBM SMA

Long stock when:
a. IBM stock price < IBM lower Bollinger band, while SPX stock price > SPX SMA
b. SPX stock price moves out of lower Bollinger band, and is moving back, while at same time IBM stock price < IBM SMA

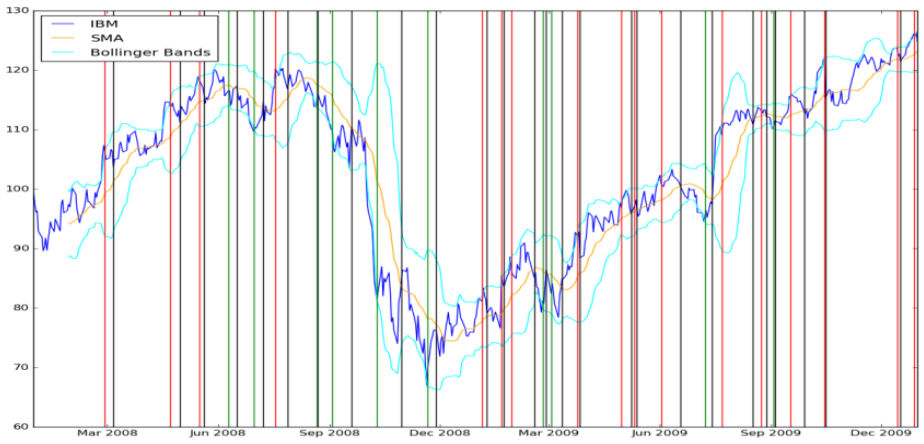
2. Reduce trading risk.
I tried to reduce trading risk by optimizing exit timing. Most of us will agree that shorting a stock is more risky compared with longing a stock since the loss is unlimited. Thus I put an extra 2% profit threshold for shorting stocks, that
a. long stock, when IBM stock price >= IBM SMA or SPX price > SPX SMA, exit

b. short stock, when IBM stock price <= IBM SMA or it reaches 2% profit line (current price <= 0.98 * sell price), exit

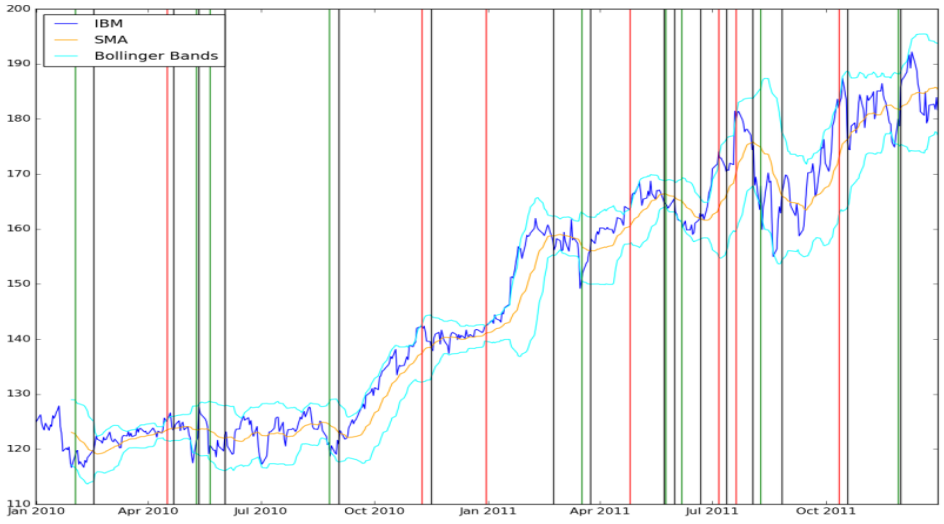
Adding 2% threshold for exiting shortstock reduced the shorting risk and at the same time increase other trading opportunities (exit earlier, trade more).

- **My strategy chart showing entry and exit points**: The following two charts represent my trading strategy. One in sample (2008-2009), the other out of sample (2010-2011).

(2008-2009)

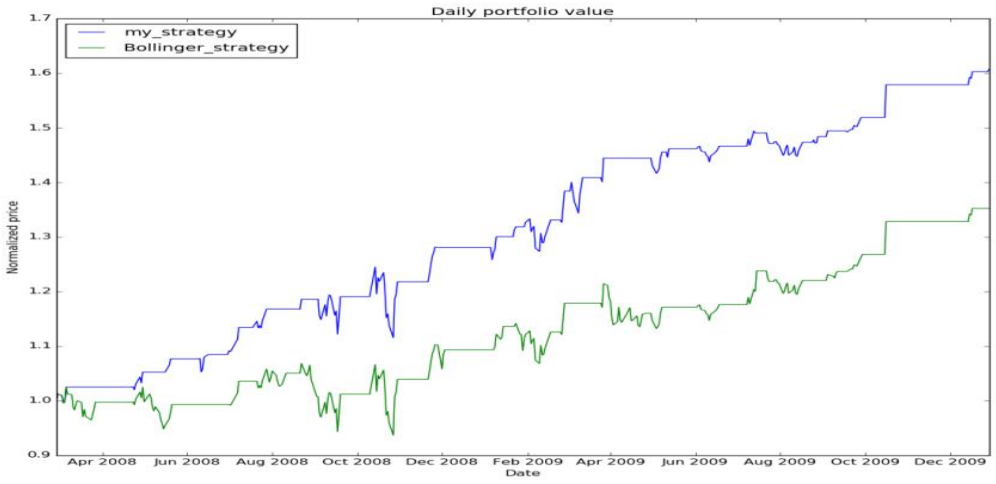


(2010-2011)

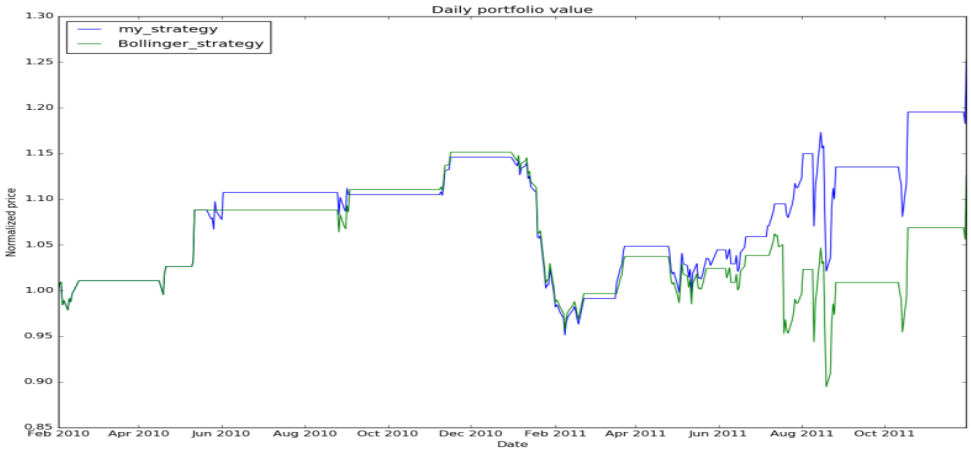


- **2 backtest charts of my strategy:** One in sample, the other out of sample**.**

(2008-2009)



(2010-2011)



- **Summary of my strategy backtest performance metrics:** One in sample, the other out of sample**.**

(2008-2009)

Data Range: 2008-02-28 00:00:00 to 2009-12-29 00:00:00 :

Sharpe Ratio of Fund (my_strategy): 1.94104670409
Sharpe Ratio of Fund (Bollinger_strategy): 1.00195922396

Cumulative Return of Fund (my_strategy): 0.6073
Cumulative Return of Fund (Bollinger_strategy): 0.3524

Standard Deviation of Fund (my_strategy): 0.0086933388232
Standard Deviation of Fund (Bollinger_strategy): 0.0113472713465

Average Daily Return of Fund (my_strategy): 0.00106297321544
Average Daily Return of Fund (Bollinger_strategy): 0.000716211380412

Final Portfolio Value (my_strategy): 16073.0
Final Portfolio Value (Bollinger_strategy): 13524.0

Cumulative Return ratio 1.72332576617

(2010-2011)

Data Range: 2010-02-01 00:00:00 to 2011-11-30 00:00:00 :

Sharpe Ratio of Fund (my_strategy): 0.794917437629
Sharpe Ratio of Fund (Bollinger_strategy): 0.427702655439

Cumulative Return of Fund (my_strategy): 0.2525
Cumulative Return of Fund (Bollinger_strategy): 0.126

Standard Deviation of Fund (my_strategy): 0.01089588386
Standard Deviation of Fund (Bollinger_strategy): 0.0123726224413

Average Daily Return of Fund (my_strategy): 0.000545612383803
Average Daily Return of Fund (Bollinger_strategy): 0.00033335228515

Final Portfolio Value (my_strategy): 12525.0
Final Portfolio Value (Bollinger_strategy): 11260.0

Cumulative Return ratio 2.00396825397

Summary

My strategy outperforms bollinger_strategy both in sample (cumulative average return ratio = **1.72**) and out of sample (cumulative average return ratio = **2.00**).

- **What do you think of refining and testing your strategy over the same 2 years? Is that a good practice? Why or why not? Does the strategy continue to work as well out of sample? Why?**

Refining and testing strategy over the same 2 years is generally not a good practice, and the reason is that you may include some special factors that will not present in future, and over fit the data. However, refining and testing strategy over the same 2 years do provide me very valuable information, and my strategy continues to work and even better for out of sample. I am thinking that depends on what you are refining over the sample. If you are refining your strategy based on some of your observations of the sample stock e.g. if you observed the stock price increased a lot in sample period, thus intentionally long stock, thus your strategy will not perform well in future. In my case, I refined my strategy by searching more trading opportunities, and reducing shorting risks, thus my strategy continuously work well in the future.