ML4T Final Project: Strategy Learner

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Write a report to describe your system:

Q1. Describe the steps you took to frame the trading problem.

Q1.1 What's your indicator?

Ans: I use 3 indicators, which are Simple Moving Average, Bollinger Band and Momentum.

#1. SMA:

```
smap['SMA/P']=prices.rolling(window_size).mean()/prices
```

#2. BB: Bollinger Band Index

```
bb['SMA']=norm_prices.rolling(window_size).mean()
bb['STD']=norm_prices.rolling(window_size).std()
bb['Upper BB']=bb['SMA']+2.0*bb['STD']
bb['Lower BB']=bb['SMA']-2.0*bb['STD']
bb['BBI']=(bb.ix[:, 0]-bb['Lower BB'])/(bb['Upper BB']-bb['Lower BB'])
```

#3. MM: Momentum

```
MM['Momentum'] = MM.divide(MM.shift(window_size)) – 1
```

Q1.2 Frame Work of my Algorithm?

Ans: I use DTLearner to build my model.

In this model, I choose window_size=20, bag=20, leaf_size=5.

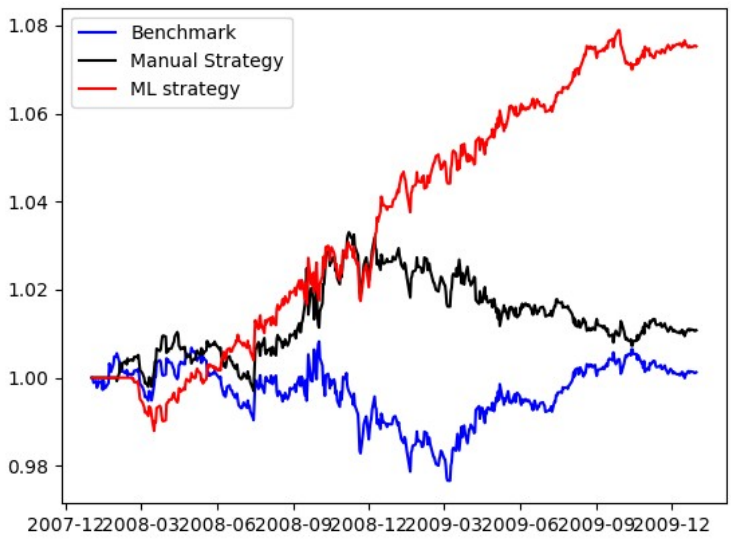
In discretization, I simply divide my output into 3 groups, SELL, BUY and HOLD.

Q2. Experiment 1

Assumptions: 1. No transaction fee
2. No market impact
3. Buy at adjusted close only
4. Only trade JPM
5. Positions are Short/Long 1000 shares and 0 shares.
6. Unlimited Leverage

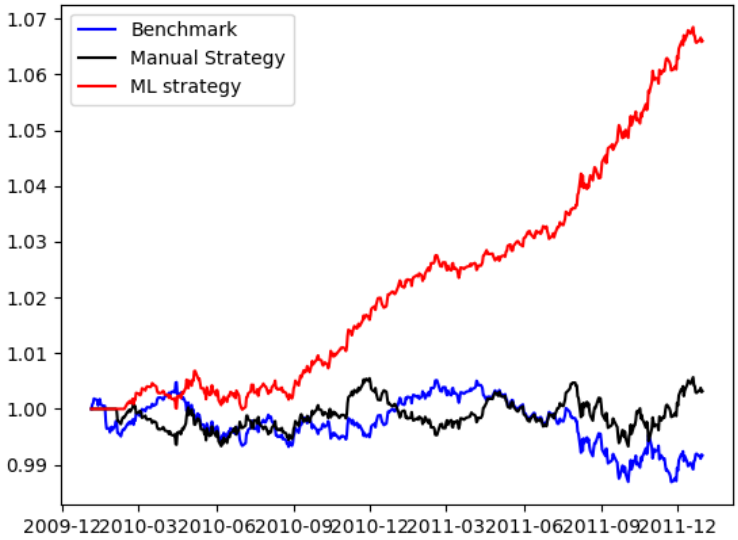
Result: As the figure blow

Training	Benchmark	Manual Strategy	ML Strategy
Cumulative Return	0.00123	0.01078	0.10254



I also run the testing period on 2010/1/1 – 2011/12/31: as you can see, my algorithm can also outperform manual strategy and our benchmark.

Testing	Benchmark	Manual Strategy	ML Strategy
Cumulative Return	-0.00834	0.00319	0.05816



Q3. Experiment 2: Provide an hypothesis regarding how changing the value of impact should affect in sample trading behavior and results (provide at least two metrics).

Ans:

My hypothesis is, while impact value increase,
because of the increased trading cost, my strategy learner will yield less return(result),
and try to reduce its trading frequency(behavior).

Figure 3.1: This is the plot of impact vs number of trades. (behavior)
We can easily find that while impact increase, number of trades decrease.
This is meet our hypothesis.

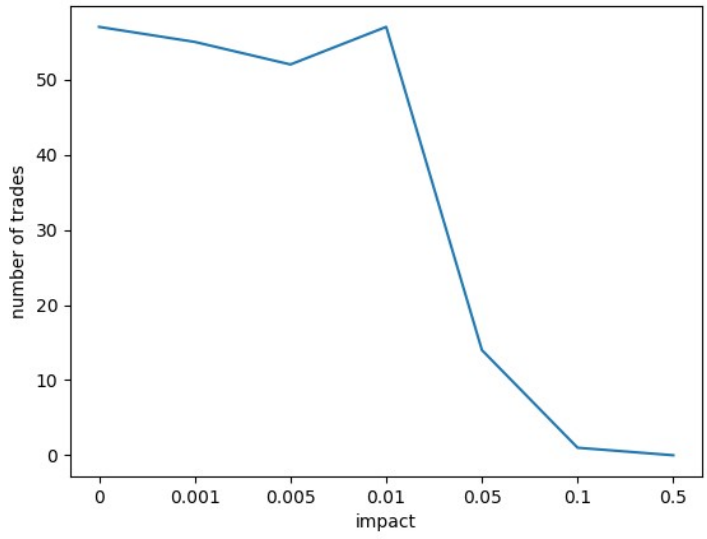


Figure 3.2: This is the plot of impact vs cumulative return. (result)
We can easily find that while impact increase from 0 to 0.5, our cumulative return are decrease together.
This is meet our hypothesis, too.