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## Project 8

### Strategy Learner.

Steps for framing the problem.

*Describe the steps you took to frame the trading problem as a learning problem for your learner. What are your indicators? (They should be the same ones used for Manual Strategy assignment) Describe how you discretized (standardized) or otherwise adjusted your data. If not, tell us why not.*

I started framing the trading problem as a learning problem with the classification trader hints. I used Random Forest learner with the Random Tree learners and a Bags Learner.

- My first step was to create an empty X data array and populate it with my indicators - **SMA ratio**, **Bollinger Bands** and **Momentum** for each day. The same indicators that were used for the manual strategy.
- Next step was to create a Y data array and trained the model using bagging. Originally I started with 5 for the leaf size and 10 bags but had to tweak them a little to improve the performance. At the end twenty bags with a leaf size 6 were sufficient for me. Having leaf size larger than 6 helps to avoid overfitting.
- After data is trained we'd test in on out of sample dates by quiring the model with the X test data ( that is also created by implementing the same indicators as X train ) and using YBUY and YSELL values for signaling what operation to perform. I had to try using a few YBUY and YSELL to get an optimal results.
- At the end we will get the data frame with all the trading actions such as BUY and SELL.

### Experiment 1.

*Using exactly the same indicators that you used in manual\_strategy (trade JPM), compare your manual strategy with your learning strategy in sample.*

For the first experiment I used the Manual Strategy with the same indicators I used for it previously - Bollinger Bands, SPA ratio and momentum. For the impact in this case I've used 0 and set the random seed.

Before the experiment I expected that Strategy Learner would beat the performance of the Manual Strategy since the model should be more flexible and use the training data to make a better trading choices. The the plot and statistics below confirmed the suggestion. It seem to have a more steady growth with a less volatility.



I would expect the similar relation trend every time with a slight potential changes since the random seed if changed would affect it and the random tree learner itself has an element of randomness. The trend would stay similar in sample because the same indicators are used to learn the policy.

Manual Strategy Portfolio Cumulative: 1.812762  
 Manual Strategy Portfolio Std of Daily Returns: 0.034088  
 Manual Strategy Portfolio Mean of Daily Returns: 0.003115

Strategy Learner Portfolio Cumulative: 2.355465  
 Strategy Learner Portfolio Std of Daily Returns: 0.008533  
 Strategy Learner Portfolio Mean of Daily Returns: 0.002441

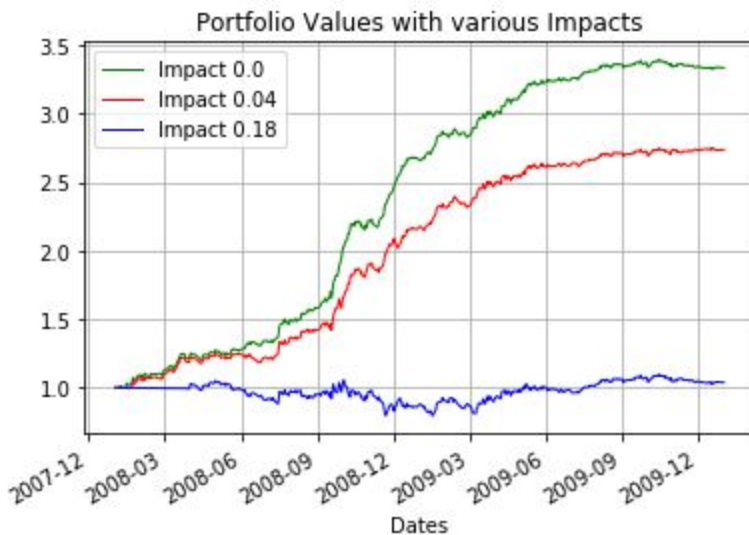
## Experiment 2.

*Provide a hypothesis regarding how changing the value of `impact` should affect in sample trading behavior and results (provide at least two metrics). Conduct an experiment with JPM on the in sample period to test that hypothesis. Provide charts, graphs or tables that illustrate the results of your experiment.*

Applying the impact defines how much trading would affect the market. My original hypothesis was that the higher the impact the more performance of the trading behavior would go down because the market would change and be harder to predict.

To illustrate it I used 'JPM' applied the Strategy Learner. Then plotted the normalized portfolio values for and created a table with std of daily returns, mean of daily returns and portfolio cumulative. Plot show how much the performance decrease with an increased impact. It can be also be seen in the table below that std of daily returns do not vary as much as the portfolio cumulative or mean.

Symbol: 'JPM'



<i>Impact</i>	<i>Portfolio Cumulative</i>	<i>Portfolio Std of Daily Returns</i>	<i>Portfolio Mean of Daily Returns</i>
<b>0.0</b>	2.336536	0.008167	0.002427
<b>0.04</b>	1.736620	0.009276	0.002042
<b>0.18</b>	0.038817	0.016378	0.000209