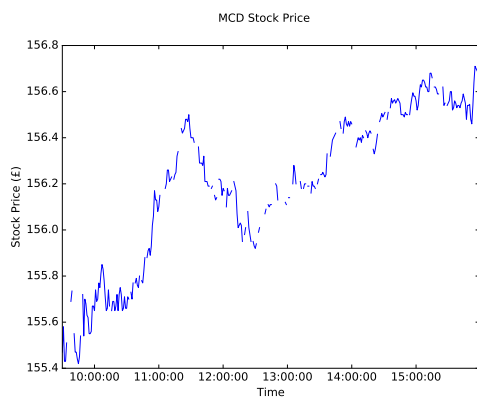
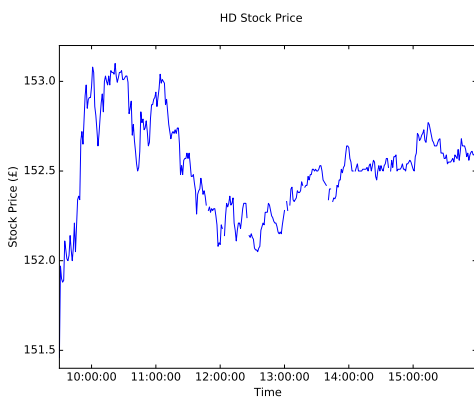
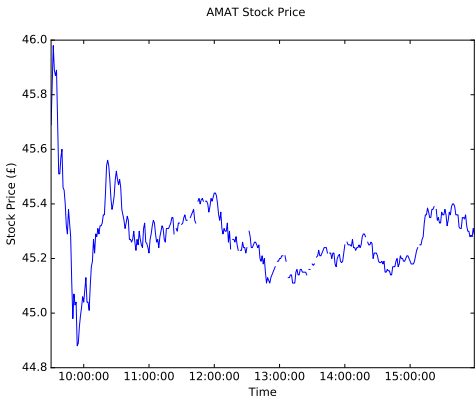
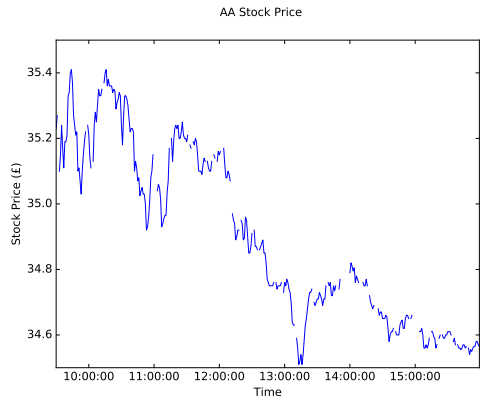


When would you buy and sell?



Introduction

Algorithmic trading is characterised by an entirely hands off approach to stock trading. Using this technique, can the average interest rate of high street banks, standing at 1.23%, be beaten? Two possibilities will be tested, statistical methodology and a machine learning based approach.

Simulation

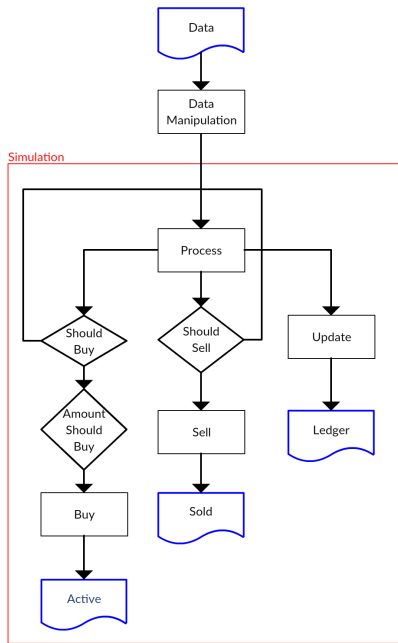


Figure 1: A flow diagram showing the underlying logic of the simulation.

Machine Learning Approach

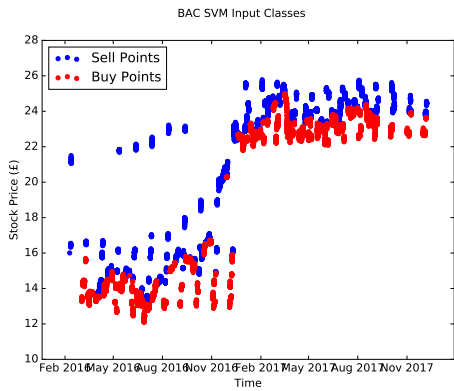


Figure 2: A flow diagram showing the underlying logic of the simulation.

Method	Parameters	Result
SVM	Differentiation + Sigmoid Function	18.41%
SVM	Median + Sigmoid Function	17.98%
SVM	Rolling Average + Sigmoid Function	16.17%

Figure 3: The results of different SVM configurations.

The input data for a support vector machine or SVM will allow for this shallow machine learning approach to maximise the support vectors or distance between two classifications of data. An example of this data separation is shown in Figure 2.

Statistical Approach

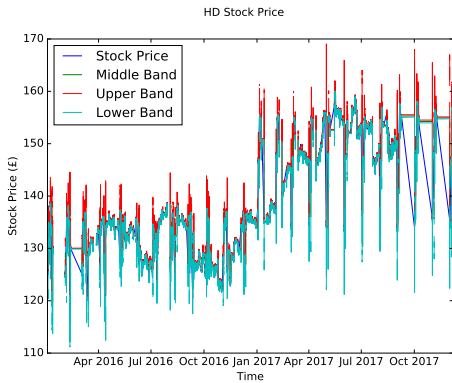


Figure 4: Showing the change in Bollinger Bands over a year.

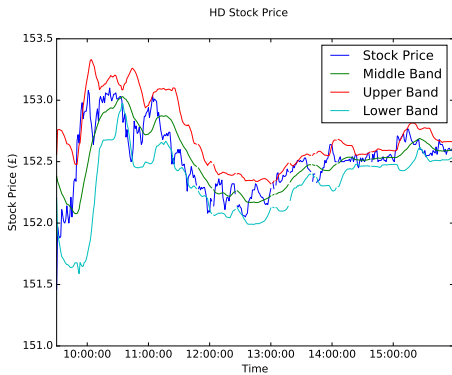


Figure 5: Showing the change in Bollinger Bands over a day.

An example of statistical methodology; the Bollinger Band. This statistical method is based around the work performed by John Bollinger on the volatility measures of stock market data. This method falls into the category of technical overlay, this is a method with an output value range that is dependant on the range of the input value. This, along with 9 other technical overlays and 27 technical indicators made up the statistical methods that were implemented and tested. A technical indicator is uniquely different to a technical overlay in that the input value range has no bearing on the range of the output values. The change in the range of the output is shown Figures 4 and 5

Results - Statistical Approach

Method	Parameters	Result
Parabolic SAR	Default	8.94%
KAMA	Default	8.29%
Ichimoku Cloud	Default	8.02%
MACD	Default	7.12%
Mass Index	Default	6.78%
Bollinger Bands	25	5.83%
StockCharts Technical Rank	Default	5.41%
DecisionPoint Price Momentum Oscillator	Default	5.16%
Stochastic Oscillator	14, 4	4.92%
Pivot Points	Default	2.19%

Figure 6: The results of individual statistical methods.

Methods	Parameters	Result
MACD + KAMA	Default, Default	11.39%
Bollinger Bands + DecisionPoint Price Momentum Oscillator	25, Default	11.23%
MACD + Parabolic SAR	Default, Default	10.86%
MACD + Mass Index	Default, Default	10.84%
Stochastic Oscillator + KAMA	14, 4, Default	10.83%
MACD + Pivot Points	Default, Default	10.44%
Stochastic Oscillator + Parabolic SAR	14, 4, Default	8.18%
Bollinger Bands + KAMA	25, Default	6.96%
StockCharts Technical Rank + Parabolic SAR	Default, Default	6.19%
Bollinger Bands + Pivot Points	25, Default	6.02%

Figure 7: The results of a conjunction of 2 or more statistical methods.

References