

Data Driven Automated Algorithmic Trading

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Abstract — Various existing stock market price forecasting methods were analysed in this report. Three methods were applied towards the problem making use of Technical Analysis, these were Time Series Analysis, Machine Learning, and Bayesian Statistics. Through the results of this report, it was found that the Efficient Market Hypothesis remains true, that past data does not contain enough useful information to forecast future prices and gain an advantage over the market. However, the results proved that Technical Analysis and Machine Learning could still be used to guide an investors decision. It was also found that the Random Walk Hypothesis was not necessarily true, as some stocks showed signs of auto and partial correlation. A common application of technical analysis was demonstrated and shown to produce limited useful information in beating the market. Based on the findings, a number of automated trading algorithms were developed using machine learning and backtested to determine their effectiveness.

Keywords — machine learning, time series analysis, probabilistic, bayesian, statistics, inference

1. Introduction

The stock market retains its status as a prime location for investors to invest in the market and earn a profit, however this is not always easy due to the constantly thriving and changing nature which follows the stock market. Investors are constantly presented with numerous profit potential opportunities, however without intensive planning and analysis, these opportunities could easily turn into losses. This means that it is crucial for every investor to carry out stock market analysis prior to any investment by monitoring past price movements in order to forecast future trends. Even though past data is not a clear indication of future movement, it is still proven to provide some useful insight.

2. Conclusion

Three financial forecasting methods were presented in this report, two of which showed little to no potential of ever producing any statistically significant result when the correct methodology was applied. The third method, machine learning, showed some potential in the tests carried out, which is why this method was built into an automated algorithmic strategy to trade with. The algorithm proved to be successful in forecasting future prices, using both classification and regression methods. However, the backtesting proved this method to fail in forecasting price falls. Once this factor was removed from the equation, the algorithms were very successful and reported a profit by the end of the test. This is however not always ideal as stocks which could fall in

price could be catastrophic to the strategy. A stop loss would be ideal in insuring that no positions are held in downward falling stocks. It was also evident that regression methods were more successful in forecasting future price movements when compared to classification methods.

If there is anything that this report shows, is that profitable stock market prediction is an extremely tough problem. Even though the strategies reported a profit by the end of the backtest, they still did not beat the market. Whether it is at all possible to use such methods to outperform the markets returns, ultimately remains an open question. These findings support the Efficient Market Hypothesis, proving that casual investors are better off investing in passive buy and hold strategies consisting of index funds and ETFs. However, there was some evidence found showing that the Random Walk Hypothesis does not hold true for all cases, as some stocks did show signs of repeating trends.

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