CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

S0810

Project Title

Improving the Rationale for Stock Market Investments to Help Middle Income Households

Abstract

Objectives/Goals

Many families lost decades of wealth during the last economic recession and turning away from financial markets resulted in them being unable to recover their losses fast enough. This paper develops a new investment strategy that helps remedy the systemic problems that put these middle income people#s financial security in peril in addition to a machine learning algorithms to do middle-term stock market predictions.

Methods/Materials

The CAPE ratio was used to do downside management for an aggressive portfolio, a moderate portfolio, and a fluid portfolio. All of the portfolios were dynamically allocated and targeted different risk tolerances. These tolerances represented three possible use cases that were tested with a baseline portfolio, a portfolio using CAPE, and a portfolio with CAPE and 3-year rebalancing. Machine learning algorithms were also used to make one-year forecasts of the market using economic data from the Federal Research Economic Dataset and predicted the NYSE closing price one year in advance.

Results

Both the aggressive and moderate portfolios successfully avoided large losses during economic downturns. The aggressive portfolio (100% stock allocation) beat the market by nearly 1% annually, the moderate portfolio (60% stocks and 40% one-year treasury bills) did not beat the market but beat the original strategy by 0.4% annually, and the fluid portfolio was close but did not beat the original or the market. The Nu Support Vector Regression model was able to predict normalized NYSE closing prices one year in advance with 80.7% accuracy and with an R2 value of 0.594 (out of 1.0); however, it was a better predictor of long-term trends than middle term trends as it predicted movement about an average, but not the absolute magnitude of the prices itself.

Conclusions/Discussion

These results demonstrate correlation between economic trends and changes in markets. They also show that CAPE downside management is effective in combination with a delay, dynamic asset allocation, and half standard deviation CAPE bands. The fact that Nu-SVR can predict middle term trends but not the magnitude of changes also supports the idea that market movement is driven by economic trends but how far up or down the market goes is determined by the information released on that day.

Summary Statement

I made a practical way of applying economic theory to investing, in a way that solved the problems of past attempts and beat the market by 1% annually, in tandem with machine learning algorithms that predict changes in market prices.

Help Received

None. I designed the experiments, gathered the data, and created the algorithms by myself. I learned what was needed to accomplish this using online resources. In order to learn about financial theory I also learned from online lecture series and books such as Shiller's book Irrational Exuberance.