

# Validation of Technical Analysis In Quantitative Investment Strategies:

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## Abstract

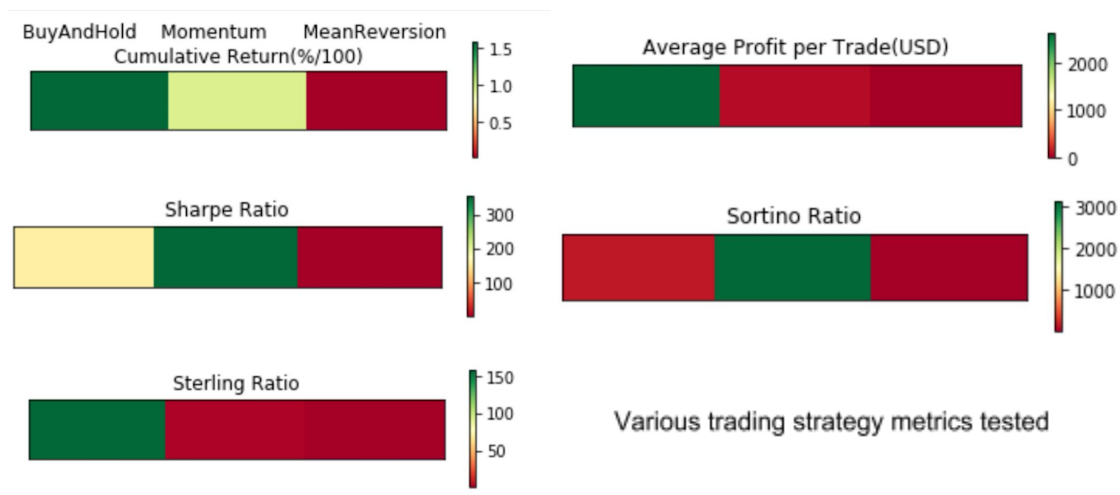
Throughout history investors have tried and failed numerous times to develop a method which will allow them to predict future movements within the stock market. One of the most recent and sophisticated techniques is *technical analysis*. *Technical analysis* trading strategies utilize sophisticated statistical analysis on previous stock prices in an attempt to predict future prices. The question is, do these technical strategies belong along side the study of astrology and other pseudosciences or can these techniques empirically provide larger returns for investors? To answer this question, various simple *technical analysis* trading strategies, such as *momentum* and *mean reversion*, were applied to time series data from S&P 500 market index in order to produce predicted returns. These returns were compared to the returns generated by a simple buy-and-hold strategy which acts as a control.

Generating and accumulating enough money for retirement is a pursuit that a majority of individuals and families throughout the globe participate in; throughout this pursuit one of most critical problems that will be faced is to determine how savings will be invested. A large majority of individuals solve this problem by allocating a percentage of their savings into one of the following retirement investment vehicles such as, 401ks, Roth IRA's, IRAs. Furthermore, this strategy is typically a passive one; meaning that individuals do not have an active involvement in how their money is invested or where it is invested. In most cases, this passive strategy closely mirrors a buy and hold strategy. A buy-and-hold a strategy diversifies investments within various stock market indexes and allows the money to grow up until the time of retirement; it is commonplace that larger proportions of investments are slowly allocated to safer investments such as corporate and government bonds. Furthermore, a buy-and-hold strategy will typically not utilize technical analysis techniques to determine when a particular stock should be bought or sold.

A passive strategy provides individuals with benefits and costs. One of the main, and most attractive, benefits is that the passive strategy requires little to no effort from the individuals who implement it. However, one of the most expensive costs is that an individual will be required to pay management fees, which can significantly reduce an individual's overall return on the money that they have invested for their retirement and could force them to put off retirement for a couple more years. This study will attempt to determine whether technical analysis can be utilized in an autonomous investment engine, which can beat the market by producing larger returns than those of a simple buy and hold strategy. This autonomous

investment engine will allow for individuals to reap the benefits of a passive strategy while avoiding the costs associated with management fees.

One of the datasets utilized was time series data collected from the S&P 500, which included historical price data for the index dating back to 1950. Once the raw data was imported into python preprocessing was performed and 50 day and 200 day moving averages were calculated. The 50 day and 200 day moving averages are statistical measures that are utilized by the *momentum* and *mean reversion* strategies; the moving averages help to signal when money should either be invested or divested. Once at this stage, the two simple technical analysis strategies were applied to the dataset. Returns utilizing the technical analysis strategies and the buy and hold strategy were generated and then compared. In order to compare the returns, four common investment metrics, Sharpe Ratio, Sortino Ratio, Sterling Ratio and Average Profit Per Trade, were used to assess each trading strategy. Lastly, the cumulative return for each strategy was calculated.



The study concludes that simple technical analysis strategies do not provide investors with greater returns when compared to a simple buy-and-hold strategy. The simple buy-and-hold strategy produced larger cumulative returns and outperformed all other strategies in most of the other metrics tested. Thus, these strategies could not be utilized by an autonomous investment engine in order to produce larger returns for investors. From a researcher's perspective this study demonstrates that simple technical analysis strategies alone will not provide larger returns for investors. However, future research utilizing a combination of strategies or more sophisticated technical analysis strategies may provide a different result.

Though the strategies assessed did not outperform the buy-and-hold strategy, it is important to note that each of the non-control strategies are parameterized. Therefore, some set of chosen parameters could outperform the buy-and-hold strategy. Parameter optimization was out of the scope of our project, and as such, we did not pursue it. It would be novel to enhance our current pipeline with parameter optimization and expand the list of explored strategies.