

Final Project - Portfolio Selection Algorithm

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1 Objectives

Our aim is to select stocks with the highest chances of a significant move (in either direction) by Trend analysis using an M day Moving average. We slowly add the best picks to our portfolio over a period of time. We add X stocks every year till N continuous years after which we start rebalancing the portfolio throwing out the bottom P% of portfolio and replacing them.

An algorithm contains next steps:

1. Consider stocks constituting the S&P500 index (as of today) and download EOD data for the last 10 years for each.
2. Starting with the first year, consider 1 Year of Stock data at a time and using simple trend analysis predict the expected movement of each of the stocks for the next year.
3. Choose the top X stocks with the greatest expected movement in either direction (LONG or SHORT) and add those positions to the portfolio.
4. Continue adding stocks from the DJIA universe for N continuous years based on expected gains over the next year. This might lead to adding new stocks to the portfolio or adding to existing positions.

5. After N years, identify the worst performing stocks in the portfolio (based on annualized returns from these stocks since adding to portfolio) and exit positions (LONG or SHORT) in P% of the portfolio.
6. Actual returns are calculated from price of the stock at the date of buying to the current price. So, you drop the stocks that was bought, but did not actually perform well.
7. Replace these positions with new stocks based on highest future expected returns.
8. Continue this process for 10 years.
9. Calculate the CAGR, Drawdown and other KPI of such a trading system.

2 Data

To get all relevant tickers wikipedia is used [\[1\]\[2\]](#). The data for SP500 and DJIA are taken from yahoo finance.

To avoid NAs I downloaded data in advance (40 calendar days to have approximately 50 days MA as a result). After the data are downloaded and MAs are calculated, I just cat the first NAs having exactly 10 years.

3 Algorithm Details

Initially, I take the first year data and execute a linear regression to estimate coefficients(slopes). After that I take 15 stocks from SP500 and 5 from DJIA with the biggest absolute value of a slope. The ones with negative slope we sell, with the others - go long.

Since a stock potentially could come from both indices, I created a dictionary to account for this. The dictionary is used to determine weights: if the value for a stock is 1, the weight is 1 over 20, if the value is 2 then the weight must be multiplied by 2.

Finally, a stock return I calculate simply as $(\text{last} - \text{first}) / \text{first}$. The final result is represented by cumulative returns: investment of 1\$ in the beginning gives us about 1.5\$ in the end.

CAGR for this strategy = 0.0456

