Research on Profitable Strategies for Individual Investors Base on improved momentum strategy

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Abstract. Momentum strategies did not receive widespread attention in the early days, and only gradually increased in stature as they were studied in depth, and have been widely recognized as efficient after decades of research, with many different improvement strategies proposed. The purpose of this paper is to explore strategies for evaluating and adjusting the profitability of individual investors. Using data from the S&P 500 as a pool of stocks and focusing on the large value stocks therein using a liquidity strategy that adjusts buying and selling on a monthly basis based on changes in the momentum of individual stocks, this paper successfully establishes a model of successful investing for the individual investor based on a momentum strategy, which contributes to a deeper understanding of the principle of excess returns of a momentum strategy as well as the investment risks that may be associated with it.

Keywords: Momentum strategies, excess earnings, individual investor, momentum effect, reversal effect

1. Introduction

Momentum strategies were first discovered by researchers in the late 1960s, but they did not attract widespread attention at that time. It was not until the early 1990s that momentum strategies gradually gained attention a. In the 1990s and early 2000s, scholars began to study the principles and effectiveness of momentum strategies in greater depth. They found that momentum strategies existed in different markets and asset classes, and to a certain extent could explain irrational market behaviours. From the late 2000s to the present, momentum strategies have gradually been recognised by academics, and have been proven to generate excess returns in many cases. Through extensive empirical research, academics have proposed various variants and improvements of momentum strategies. Up to now, momentum strategies have been widely used in practice, but there are still many factors that constrain their application for individual investors, and there is no stable and viable investment strategy in real-world environments. Therefore, this paper addresses the lack of these research areas and attempts to establish a stable and reliable profitability model based on individual investors.

The phenomenon of momentum effects in equities has been recognized since the 1980s by scholars such as De Bondt and Thaler [1]. Momentum effect can be used to predict the trend of stock price changes based on historical information of the stock market [2]. And accordingly analyse the possibility of obtaining a return that exceeds the average market return. In the field of behavioural finance, Barberis and Daniel [3] and Hong and Stein [4] suggest that cognitive biases in the marketplace cause investors to underreact to new information, which contributes to the sustained profitability of momentum trading strategies. Data from several empirical studies also support these behavioural doctrines.

It's worth mentioning that Chan et al. And Conrad et al. selected all stock trading data from the US stock exchange as their research samples and conducted an empirical study by constructing different combinations of momentum strategies. Data as research samples and conducted empirical studies by constructing different combinations of momentum strategies, and found that the U.S. stock market in the medium term there is a significant momentum effect, while in the long run it shows a significant reversal effect [5, 6.]. (Reversal effect refers to the fact that a stock that had a higher return in a past period will have a lower return in a future period [7]).

Momentum strategies also carry some risk the implementation of momentum strategies is limited by short selling restrictions make the results assumed in the study deviate from the actual, or make the investment unprofitable due to higher transaction costs, based on these limitations and disadvantages. [8]Scholars have investigated the combined use of momentum trading and inverse trading investment strategies, and then due to the overly large stock base and the limited amount of capital available to the individual investor, which also makes such an investment strategy unsuitable for personal investment [8].

Among the literature on momentum strategy, Fuertesa and Miffreb examines momentum and term structure in commodity futures markets signals combined into a profitable trading strategy. When the two strategies are tested individually, both momentum and term structure strategies. Both the momentum and term structure strategies appear profitable with annualized returns of 10.14% and 12.66%, respectively [11Ana-MariaFuertes]. And when the two are combined in a double-order strategy, 21% is obtained sorting strategy, a return of 21.02% annualized return was obtained and the authors note that the excess portfolio return cannot be explained by lack of liquidity, data mining or transaction costs [9].

Previous cutting-edge research has studies on the joint dynamics of momentum and inversion strategies, Momentum investors face uncertainty about whether past patterns of price movements will continue (momentum) or turn over (reversal), thereby increasing volatility of momentum returns and occasionally leading to momentum crashes. We argue that the forces driving reversal over momentum tend to be strong if losers' past returns are extremely low (in the time-series) or if losers are small and illiquid (in the cross-section) [10].Empirical tests for the U.S. stock market in the sample period of 1947 to 2015 document that momentum strategies in which investors implement stop-trading rules if losers' past returns are extremely low as well as buy-small-loser rules substantially outperform traditional momentum strategies. International stock markets and robustness checks confirm our U.S. tests.[10].Besides, another research shows that when capital structure is measured either as the ratio of debt to asset or the ratio of liability to asset, we all find out that momentum strategies tend to be more profitable for stocks with large capital structure[11]. And characterizes investors' increased psychological bias and the more limited arbitrage opportunity when the estimation of firm value becomes more difficult or less accurate [11].

Thus, on the basis of the existing literature, this paper aims to construct a fairly profitable, momentum-forecast-compliant model of personal investing by building a model based on a momentum strategy, developing a buy-sell strategy, and adjusting the strategy each month based on instantaneous momentum. This model is a reasonably profitable model in line with the volume of personal investment as well as the setup of trading costs and trading frequency.

2. Data and method

2.1. Data and method

This article focuses on S&P 500 component data and trade stock picks within it. Unlike more mainstream multi-factor models, this article is inspired by Mr. Clifford Asness to look at the big value stocks in the S&P 500. First, in the current stock market, this article uses a liquid stock pooling strategy, which selects the top 60 stocks in the S&P 500 index constituents on the upside and downside rankings.

As for data preprocessing, the main operation is to build the dataset, eliminating four stocks that do not have five years of complete data, and making the 29th the last day of December to avoid changes or missing data due to year-end accounting policy changes.

2.2. Method

2.2.1. Trading strategy

This article uses the momentum strategy, which is analyzed by calculating the weighted average of the returns over a month to determine the momentum indicator, i.e., how the stock is performing in terms of momentum. Momentum strategy has several advantages.

Relative strength: Momentum strategies use the past performance of an asset to predict future movements, allowing for a better understanding of market trends, especially when markets are in a clear upward or downward trend. Womack showed that analysts gave higher ratings to stocks that showed strong upward momentum from their purchase recommendations [12], and when these stocks were recommended by the majority of analysts, their stock prices also showed an upward trend due to receiving more attention from the market, which also explains the relationship between momentum strategies and investor behaviour.

Simplicity: Momentum strategies are relatively simple and easy to implement, investors only need to track assets that have performed well in the market, without the need for complex fundamental analysis, suitable for investors who are not good at in-depth research.

Potential for high returns: Assets that have performed well in the past have the potential to continue to generate high returns, and momentum strategies can help investors capture these high return opportunities and realise asset appreciation. Rouwenhorst [13], studied the financial markets of developed countries in Western Europe and found that the momentum effect is prevalent and has a duration of about one year, and that factors affecting the magnitude of momentum gains are related to firm size and are negatively correlated. After taking into account transaction costs, the momentum effect can still lead to excess returns.

Risk Diversification: Momentum strategies usually involve multiple assets, and diversification can reduce overall portfolio risk by avoiding over-concentration in one asset.

Considering the time effect of the momentum strategy, this article uses the exponential decay method for weighting, i.e., the closer to the day's return, the greater the weight in front of the parameter. Immediately after that, this article sorts the stocks according to their momentum metric scores to get a preliminary ranking. Since this article used a liquid pool of stocks, we re-adjust the metrics every month to get a new ranking. Then set up to buy and sell stocks on the first day of each month. Regarding buying stocks, this article decided to buy stocks in the top 10% of the momentum indicator. As for selling stocks, this article intends to lock in a specific stock we bought and track its performance afterward, set a stop-loss line whose value is the gain the stock has given us, and sell the stock if it drops more than $500.

2.2.2. Model Improvements in momentum strategy

Traditional momentum strategy modelling is an investment strategy that is based on the idea that price trends are assumed to continue in the future, based on the performance of asset prices over a certain time horizon. This strategy usually involves selecting assets that have performed well in the past and holding them for a period of time in order to earn the expected return. The core idea of the traditional momentum model is "chasing the bull", which assumes that assets whose prices have risen are likely to continue to rise in the future, while assets whose prices have fallen are likely to continue to fall. In this paper, we make the following improvements based on the traditional momentum theory.

(1)Weight adjustment

From the previous averaging with the returns of the last 5 days first, followed by custom weights to weight them. Improved to a normalized weighting method, where the more recent data has a greater weight, with the following code:

$$weights = np.exp(np.linspace(-1, 0, 22)) \quad (1)$$

$$weights = weights / np.sum(weights) \quad (2)$$

(2)Adjustments to the selling policy

Originally we used to simply sell the stock when we encountered a negative return, but now we have adapted this to lock in a specific stock we bought and track its subsequent performance by setting a stop-loss line and selling the stock if it falls beyond the value of the stop-loss line.

(3)Time Screening

Improved from taking historical data for the past year to selecting data for the past 5 years

(4)Liquid Stock Pool

Originally using a strategy of obtaining the day's top performing stocks in the S&P 500 and locking them in, we are now focusing on the entire S&P 500 data and adopting a liquid stock pooling strategy by selecting the top 60 stocks on the list of top gainers and losers among the constituents of the S&P 500 on the first or early trading day of each month as the stock pool.

3. Results and discussion

3.1. Portfolio construction

3.1.1. Quantitative Momentum Performance and Ranking

This is the calculation of our momentum indicator as well as a month-by-month update that uses an exponential decay function to get how stocks are performing on the momentum indicator and to rank them. This is where this article sort momentum indicators, a key step in our trading strategy.

Table 1. Ranking Stocks and Their Momentum Indicators.

Rank	Name of the stock	momentum indicator
1	ILMN	0.0170
2	ENPH	0.0153
3	ANSS	0.0137
……	.....	.....
495	AON	-0.0064
496	EG	-0.0067

3.1.2. Lengthening the time dimension

This is where this article is cycling through the trades for each stock as well as stretching out to a 5 year time horizon.

3.1.3. Buying strategy And Selling strategy

Purchase the top ten per cent of stocks in the Momentum Index each month, and if we already own the stock, increase the quantity from the original one.

The selling strategy is to lock in a buy of a specific stock and track its subsequent performance, while at the same time setting a stop-loss line with a value of $500, and selling the stock if the amount of loss exceeds $500.

3.2. Results of the portfolio

3.2.1. Return of the portfolio

Total return of 47,706.15 over 5 years, with an average annual rate of return of 9%.

Table 2. Annual return of the strategy.

Year	profit
2018	66.9700
2019	23079.9976
2020	7033.7449
2021	25719.2020
2022	-8267.6559

3.2.2. Risk metrics of the portfolio

Three metrics were selected to assess the risk of the portfolio: standard deviation, Sharpe ratio, and maximum retracement. (Tip: This article sets the risk-free rate of return to 0)

(1)Standard deviation

Standard deviation measures the degree of volatility or variability in the return or price of a portfolio or asset. The higher the standard deviation, the higher the volatility of the portfolio or asset, and the higher the risk. In our portfolio, the standard deviation is 13055.07.

(2)Sharpe Ratio:

In general, a higher Sharpe Ratio indicates a higher excess return per unit of risk taken. As such, it is seen as a measure of how well an investment balances return against risk, and a higher Sharpe Ratio generally means a better performing investment.

In our portfolio, we assume a risk-free rate of 2%. Our Sharpe Ratio is 0.727133, a value that implies an investment's excess return is positive relative to the risk it takes, but less than 1% for each unit of risk taken. While this is not the highest risk-adjusted return, it shows that investments can still generate positive excess returns when risk is taken into account.

(3)Maximum Drawdown

The maximum amount by which a portfolio or net asset value can fall from its highest point to its lowest point over a period of time. It is used to measure the extent to which a portfolio or asset may lose money over a period of time. In our portfolio, the maximumDrawdown is 40525.804.

Table 3. Risk metrics of the portfolio.

risk metrics	values
Standard deviation	13055.07
Sharpe Ratio	0.7271
maximumDrawdown	40525.804

3.2.3. Risk assessment

(1)Financial Indicators: Check the company's financial statements, including the income statement, balance sheet and cash flow statement, to assess the company's profitability, financial position and cash flow position (you can get the relevant data through Enterprise Alert Pass), which can be used as a stock selection criterion, or a secondary screening after the conditions for sale have been met.

(2)Industry and Market Risk: Understand the overall level of risk in the industry in which you are investing and the impact of the macroeconomic environment on that industry and market.

Industry Risk:

Competition risk: the level of competition in the market may affect the profitability and market share of companies in the industry.

Technology risk: rapid technological development may render products or services in certain industries obsolete, thereby affecting the profitability of businesses.

Regulatory risk: The extent to which industries are subject to government regulation and changes in policies may affect the operations and growth of businesses.

Cyclical risk: Certain industries are subject to seasonal or cyclical fluctuations, e.g., retail sales may be higher during the holiday season but may be lower during other seasons.

Market Risk:

Market volatility: volatility in equity, commodity and bond markets may affect investors' investment returns.

Liquidity Risk: Certain markets may lack sufficient liquidity, resulting in large gaps between bids and ask prices or large slippage when buying and selling.

Concentration Risk: Certain stocks or assets in the market are highly concentrated and when these stocks or assets are affected by unfavourable factors, the market as a whole may be more affected.

(3)More specialised evaluation criteria such as: assessing the company's governance structure, the quality of the management team, and the company's ethics and moral hazard; understanding the competitive environment in which the company operates, including the strength of competitors,

market share, and competitive strategy; understanding the competitive environment in which the company operates, including the strength of competitors, market share, and competitive strategy.

(4)Investment Objective and Risk Tolerance: Selection of an appropriate portfolio to diversify risk based on the investor's investment objective and risk tolerance. (Stock selection process)

3.3. Backtesting

Backtesting allows us to safely test models of the market for issues such as trading losses, bid/ask pass-through, latency, liquidity and other market microstructure issues.

3.3.1. Data backtesting

To backtest our strategy, this article uses the 2012-2017 data for the S&P 500 as a new dataset to test how well our strategy works out of sample. The rest of the operations and steps remain unchanged.

The results of the test were better and met our mental expectations for the strategy with the sharp ratio1.51&average annual rate of return18%.

Table 4. Ranking Stocks and Their Momentum Indicators (Backtest).

Year	profit
2012	15150.4139
2013	40527.3144
2014	14189.5997
2015	3464.5819
2016	18591.6734
Sharpe Ratio	1.5102

3.3.2. Analyze the bias of the backtested data:

As can be seen from the data, committing our strategy to an earlier time dimension delivers better total returns as well as Sharpe ratio performance.

There are following reflections on the even better performance of the backtested data:

(1) The data is overfitted and the model may have been over-optimized on the training set. Overoptimization is probably the most common occurrence of all backtest deviations. Optimization and introduction of additional trading parameters, in general, when the strategy backtest performance on the backtest data set is very attractive, it is often overoptimized, and once the firm order, the strategy performance will be very different from the backtest.

(2) Changes in market conditions, the 2012-2017 data chosen for backtesting, may have been more favorable and in a bull market at the time, which would have resulted in superior backtesting data. Due to the many parameters involved in the strategy, including the entry and exit conditions, the backtracking period, the average period (such as the moving average period), it is often difficult to eliminate over-optimization. One way to avoid over-optimization is to reduce the number of parameters while increasing the number of data points in the training set. However, adding data points can also cause problems, because the backtest cycle is too long, and the data from a long time ago may be very different from the current environment. (For example, using historical data from bull markets to evaluate the performance of strategies in bear markets is obviously not reasonable.)

(3) Possible under-improvement in data pre-processing. Survivor bias is very dangerous for strategies and often results in strategies that perform much better than they actually do. Usually, this bias occurs when our current data set does not include some of the historical objects that should have existed, we only consider the objects that are still tradable, and some of the historical delisted or ST stocks were not added to our initial stock pool.

(4) Impact of external factors: External macro-factors such as policies may lead to rapid changes in the market. Here are a few ways in which policy changes may affect the market:

Monetary Policy Adjustments: Central banks may adjust interest rates or take other monetary policy measures to control inflation, promote economic growth, or address other economic challenges.

Changes in Fiscal Policy: Government fiscal policies, such as tax policy and spending policy, can also have an impact on the market.

Changes in regulatory policies: The government may influence market behaviour through regulatory means, such as enacting new regulatory legislation and strengthening regulation.

Trade Policy Adjustment: Adjustment of trade policies, especially the implementation or change of measures such as tariffs and trade barriers, will directly affect international trade, the operation of multinational corporations and the supply chain structure of the global market.

4. Conclusion

This article is based on a traditional momentum strategy model. After considerable improvements for research purposes, it has achieved better results in the S&P 500 environment and remains feasible in the backtesting of changing data samples, and it can be argued that our specified strategy is reasonable and feasible, and the risk control is relatively successful, which makes it a worthwhile trading strategy to be put into practice, and at the same time verifies the feasibility of the momentum strategy.

This article stablishes a successful investment model for individual investor based on a momentum strategy, which can help to gain a deep understanding of the principles of excess returns from momentum strategies and the investment risks that may be associated with them.

Although considerable results have been achieved and the objectives of the study have been met. There remain some parts of the research in this paper that could be improved. The parameters of the momentum indicator can be further improved, such as adding a market size factor, the stock's P/B ratio, P/E ratio, and whether it is a growth stock to further assess its momentum performance. The consideration of the timing of the buy is underdeveloped and overly simplistic. For the sell strategy, although it is enough for our strategy to gain profit due to the low transaction cost result from low transaction frequency. But our stop-loss conditions are not reasonable.

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