Research on diversified fund allocation strategy

Yiling Hu*

School of Economics and Management, Tianjin University of Science and Technology, Tianjin, 300222, China

*Corresponding author: hayleyhu0371@outlook.com

Abstract. Money management is crucial in investing and is an important risk management tool. It can affect the magnitude of an investor's loss from a number of perspectives, including the reasonableness of position management, the effectiveness of capital allocation, the setting of stop-loss strategies, the degree of diversification of investments, and the regular evaluation and adjustment of capital flows. The purpose of this paper is to investigate the capital allocation issue in money management. Through a decade-long history of back-testing and evaluation of multiple indicators, this paper analyzes and compares three different methods of capital allocation. The methods mainly include the equal allocation of funds method, the profitability preference method, and the risk adjustment method. The results show that the Profit Preferred Method performs best in terms of strategy return and risk-adjusted return, while the Risk-Adjusted Method excels in the control of maximum retracement and is suitable for risk-averse investors. Despite the lower returns of the equal distribution method, its stability is still attractive.

Keywords: Capital allocation, stock market, risk control, portfolio.

1. Introduction

As the financial market expands, more and more investors are flocking to the field of quantitative investment, researching and refining multi-factor stock selection strategies in pursuit of higher investment returns. However, these strategies often neglect risk control in the pursuit of high returns. When unexpected events occur or the economic environment changes, the market may fluctuate drastically, resulting in uncontrollable portfolio losses and thus affecting the overall investment results. Therefore, optimizing investment portfolios to maximize returns and control risks has become a core issue of long-term concern for investors and scholars.

As a risk management tool, a money management strategy is crucial in the process of stock investment. The research on fund management strategies can be divided into several categories: first, Xia Yingci, in his research on fund management strategies for small and medium-sized investors based on trend analysis, combines technical and emotional indicators to establish a strategy and argues that for small and medium-sized investors with limited financial resources, good fund management is an important guarantee for the long-term survival of small and medium-sized investors in the stock market [1]. Secondly, based on the study of the volatility of stock indices, Chai Jiaqi combines the influence of macroeconomic factors with technical indicators, sets the index risk coefficient to determine the level of investment positions, and establishes a sound risk avoidance fund management strategy [2]. In addition, Don etal., and many other scholars in-depth study of the Kelly formula, focusing on how to maximize the long-term growth of investor's wealth, according to this goal to develop the formula to study the position management strategy adapted to a variety of different environments and has achieved significant results [3-5]. At present, the research on fund management strategies, basically in for position management how to design and optimization of the problem to explore, few investors and scholars on the capital allocation strategy research. However, traditional capital allocation methods, such as the equal capital allocation method, although simple and easy to implement, may not be able to fully utilize market information to achieve optimal allocation. Therefore, exploring more effective capital allocation strategies is of great theoretical and practical significance.

This study aims to fill this gap by systematically evaluating the performance differences among the three methods by applying the Equal Funding Allocation, Profit Preferences, and Risk-Adjusted

Methods to a unified stock selection strategy over a decade-long historical backtest. Specifically, the theme of this study is to compare the performance of different capital allocation strategies in terms of strategy returns, excess returns, risk-adjusted returns (e.g., Sharpe and Sortino ratios), and maximum retracements, with a view to providing investors with empirical evidence when selecting capital allocation strategies. Through this study, it is hoped to reveal the advantages and disadvantages of different capital allocation strategies, as well as their applicability under different market conditions, and to provide new perspectives and methodological guidance for portfolio management.

2. Method

2.1. Stock Selection Strategy

In this study, a stock picking strategy (https://www.joinquant.com/) with broad applicability is selected on the Polywidth platform. The core idea of the strategy is to optimize the risk and return of the portfolio by regularly screening and updating the list of stocks according to the rules and performing buy-sell operations based on the list. The specific steps are shown below in Fig.1:

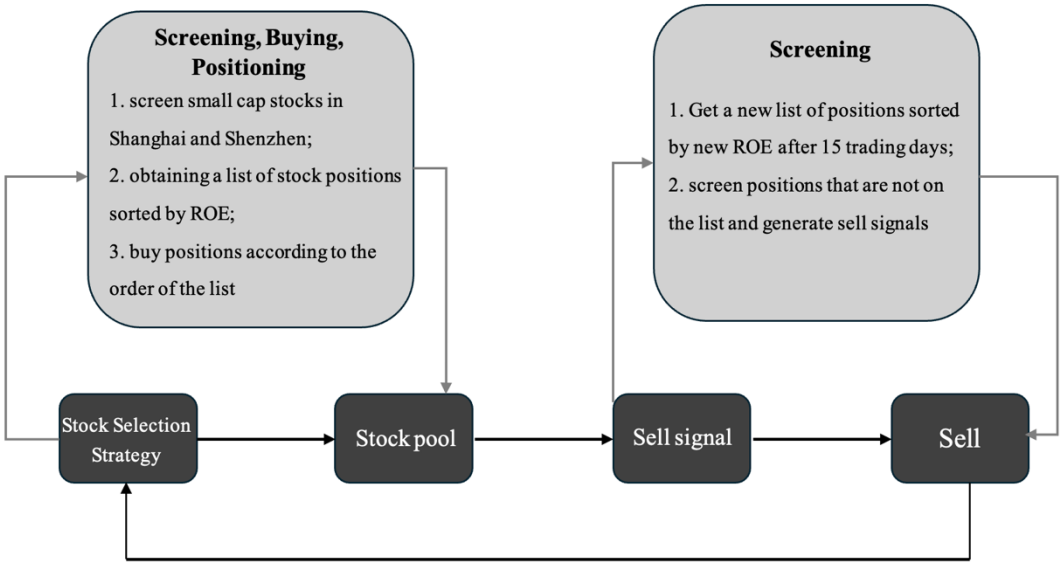

Fig. 1 Stock Picking Strategy

Among them, ROE refers to the return on equity, which has the advantage of more current data, shorter lag, and quarterly data are less likely to be manipulated, and can more accurately reflect the recent operating conditions of enterprises. The formula is [6]:

$$ROE = Net\ profit\ Margin \times Asset\ Turnover \times Equity\ Multiplier \quad (1)$$

Each of the three indicators measures the earning capacity of equity inputs from different perspectives. Net sales margin directly reflects the profitability of the enterprise; total asset turnover ratio measures the operating ability of the enterprise by calculating the flow rate from input assets to output, reflecting the capital efficiency; equity multiplier plays the role of financial leverage, representing the solvency of the enterprise. The return on equity obtained by combining the three indicators summarizes the three most important aspects of the enterprise's operation, directly and comprehensively reflecting the enterprise's balance sheet and income statement, and also indirectly reflecting the cash flow statement, so that it can effectively indicate the enterprise's growth potential and sustainable competitive advantage, and can help investors better balance the risk and return, which makes ROE become a valuable tool in the investment decision-making and capital allocation strategy [7]. This makes ROE a valuable tool in investment decisions and capital allocation strategies.

Its back-testing results are shown in Fig. 2 (The back-test is based on January 1, 2015, to October 18, 2024, against the CSI 300 index):

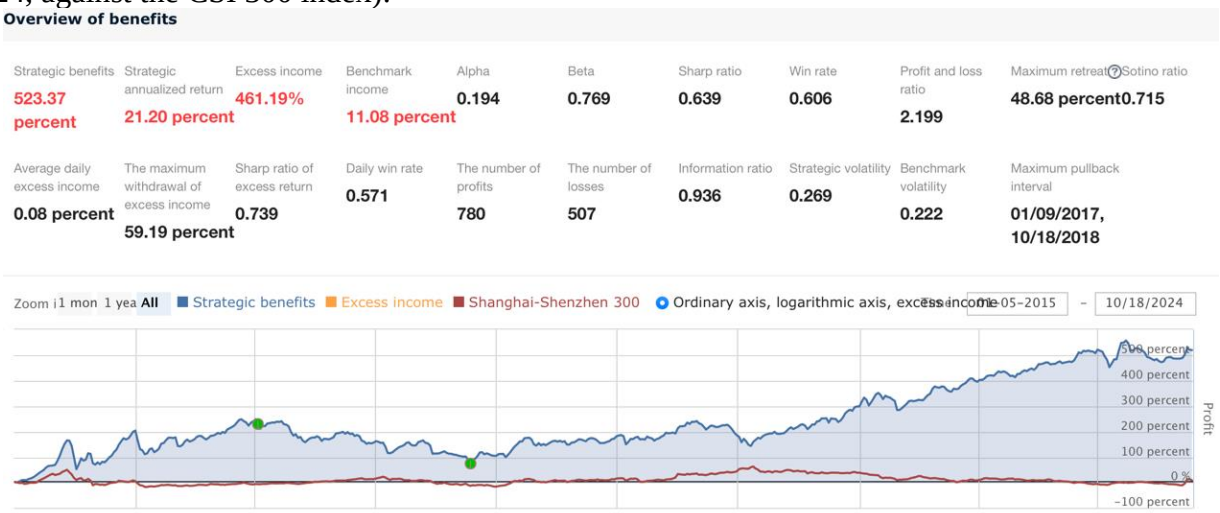

Fig. 2 Back-test results of stock picking strategy (applying equal allocation of funds method)

From the results, it can be seen that the strategy's returns substantially outperformed the benchmark, and the strategy's returns remained stable and retraced higher when the market was more exposed to downside risks, but in a bull market, the strategy's returns instead declined. In the nearly ten years of back-testing, the excess return of 461.19%, the shortcomings of the strategy's maximum retracement is too large, as high as 48.68%, for investors, the strategy has a greater risk, the need for effective risk management tools to control. Later, we will study the capital allocation strategy to supplement the risk control of this stock selection strategy.

2.2. Capital Allocation Strategy

This study is based on the premise of buying all positions, i.e., not retaining funds on hand aims to explore the optimal method of allocating funds without controlling the size of the positions.

2.2.1 Equal Allocation of Funds Method

The Equal Allocation of Funds (EAF) method, which allocates available funds equally according to the number of stocks required to be held without regard to the return and risk characteristics of individual assets, is simple and easy to implement and avoids the risk of over-concentration due to the underperformance of individual assets. However, as it ignores the characteristics of different assets, it may not be able to make full use of market information for optimization. Its calculation formula is as follows:

$$cash = \frac{capital}{stock\ number} \tag{2}$$

Where it refers to the total amount of money used by the investor for investment and the total number of stocks in which the investor wants to take a position. In this study, the strategy stipulates that one million dollars is invested and 20 stocks are held in the position.

2.2.2 Earnings Preferences Method

The Earnings Preferences methodology ranks companies based on their profitability metrics and assigns weights based on the rankings, and this study is based directly on the ROE metrics on which the stock picking strategy is based. This capital allocation method emphasizes a company's profitability, and a high ROE usually implies higher growth potential. The method performs better in bull markets, which can compensate for the poor returns of the original stock picking strategy in bull markets. However, it may ignore some potential risks such as financial leverage or industry cyclical effects. Its calculation formula is as follows:

$$cash = \frac{weight(i)}{total\ weight} \times capital \quad (3)$$

$$weight(i) = stock\ number - stock\ rank \quad (4)$$

$$total\ weight = \sum weight(i) \quad (5)$$

where it refers to the weight of the individual position required, the total weight of the group of stocks in which the position is held, and the rank of the individual stock in which the position is required.

2.2.3 Risk-adjusted Method

The risk-adjusted method assigns weights in a sorted manner based on a risk metric, the standard deviation, which represents volatility, and assigns greater weights to stocks with lower volatility, which can effectively control the risk of the portfolio. However, this method also has some limitations. Since the standard deviation is a reflection of historical data, it may not be able to accurately predict future volatility. Its calculation formula is as follows:

$$cash = ratio \times capital \quad (6)$$

$$ratio = initiate\ ratio(i) \times sum\ ratio \quad (7)$$

$$initiate\ ratio(i) = 1/standard\ deviation(i) \quad (8)$$

$$sum\ ratio = \sum standard\ deviation(i) \quad (10)$$

where refers to the standard deviation of the closing price of a stock to be held for the past n days, is the initial percentage of funds allocated to that stock, and refers to the normalized percentage.

2.3. Indicators of achievement

The strategy construction and back-testing in this study are based on the operation of the Polybroad quantitative platform, which automatically generates collection evaluation indicators after back-testing.

2.3.1 Strategy/Benchmark Annualized Return

Strategy/Benchmark Annualized Return refers to the average return of an investment strategy or benchmark index over a one-year period. This metric can be used to assess the overall performance of a strategy.

$$Annualized\ Return = \left(\frac{R_{end}}{R_{start}}\right)^{(250/N)} - 1 \quad (11)$$

where represents the total net worth at the end of the strategy or the final index of the benchmark, represents the beginning of the strategy or the initial index of the benchmark, and represents N time series.

2.3.2 Excess return

Excess return, also known as tracking error or excess return, is the difference between the annualized return of an investment strategy and the annualized return of a benchmark. It reflects the performance of the investment strategy relative to the benchmark over a certain time period. A positive excess return indicates that the strategy outperformed the benchmark, while a negative excess return indicates that the strategy underperformed the benchmark. By analyzing the excess return, the relative performance of the investment strategy and the skill of the manager can be assessed.

$$excess\ return = Strategy\ Annualized\ Return - Benchmark\ Annualized\ Return \quad (12)$$

2.3.3 Sharpe Ratio

The Sharpe Ratio (SR) is a measure of a portfolio's risk-adjusted return. It assesses the risk-adjusted return of a portfolio by comparing the difference between the actual return of the portfolio and the risk-free return. In general, the larger the Sharpe Ratio, the better the strategy composite [8].

$$Sharpe\ Ratio = \frac{Strategy\ Annualized\ Return - Risk\ free\ Return}{Strategy\ Portfolio\ Standard\ Deviation} \tag{13}$$

$$Strategy\ Portfolio\ Standard\ Deviation = \sqrt{\frac{250\sum_{i=1}^{n}(r_p - \bar{r}_p)^2}{(n-1)}} \tag{14}$$

where the risk-free rate of return defaults to 4%, is the daily return of the strategy, is the average of the daily returns of the strategy, and is the number of days of execution.

2.3.4 Sortino Ratio

The Sortino Ratio is a risk-adjusted return indicator that is similar to the Sharpe Ratio, but it only takes into account downside risk (negative returns) rather than all volatility (positive and negative returns) like the Sharpe Ratio, which provides a better picture of an investor's risk tolerance. In general, a higher Sortino Ratio indicates better risk-adjusted returns.

$$Sharpe\ Ratio = \frac{R-T}{TDD} \tag{15}$$

$$TDD = \frac{1}{N}\sum_{i=1}^{N}(Min(0, X_i - T))^2 \tag{16}$$

Where R is the average period return. T is the desired target return, usually, it applies risk risk-free rate. TDD is the target downside deviation, which is defined as the root-mean-square, or RMS [9]. Downside bias is a measure of the volatility of a portfolio's return below a target return (usually the risk-free rate of return).

2.3.5 Maximum Drawdown

Maximum Drawdown (MDD) is a measure of investment risk used to indicate the extent of potential loss that an investment may suffer. Given a fixed time period, the MDD may be defined as the largest percentage loss of an investment over this period [10]. The higher the ratio, the more volatile and significant losses the portfolio will experience over the period.

3. Empirical results and analysis

Fig. 3 and Fig. 4 below show the return movements of the Profit Preferred and Risk Adjusted methods against the CSI 300 benchmark over the interval January 1, 2015, to October 18, 2024, respectively. The original stock selection strategy has applied the equal distribution method and its return trend is shown in Fig. 2.

As can be seen from the chart below, the return trends of applying the Profit Preferred and Risk Adjusted Methods are roughly similar, with both of their historical back-tested returns being much higher than those of the benchmark index. The Profitability Preferred Approach rises slightly more than the other two approaches during the volatile upward range of the strategy's returns, mainly because the Profitability Preferred Approach focuses more on consistently pursuing high returns and is better able to capture the growth potential of the strategy. However, as can be observed from the chart, the strategy has certain drawbacks; when the market benchmark index returns are in an uptrend, the strategy returns instead decline, and when the market is in a bear market, the strategy can again hedge downside risks well and show a better uptrend.

Fig. 3 Results of back-testing by applying the profitability preference method

Fig. 4 Results of back-testing by applying the risk-adjustment method

The evaluation metrics of the strategies applying the three different capital allocation methods are summarized in Table 1. As can be seen from the table, the strategy applying the Profitability Preferred Approach has better returns (568.84%), excess returns (502.13%), Sharpe Ratio (0.667), and Sortino Ratio (0.759) than the results of applying the other two allocation methods. This suggests that the Profitability Preferred Method is better able to capture market opportunities and achieve higher total returns and that allocating capital weights based on the Profitability Indicator effectively balances return and risk to a certain extent, judging from its superior performance in terms of return and risk-adjusted return (Sharpe Ratio and Sortino Ratio). In terms of the maximum retracement indicator, the risk-adjusted method has the best performance with a performance of 48.50%, which is lower than the results of the other two strategies (Equal Allocation of Funds method: 48.68% and Profitability Preferred method: 49.31%), showing that it is more effective in controlling portfolio volatility and protecting investors from significant losses and that it is able to effectively minimize extreme market Losses. Although the Risk-Adjusted Approach slightly underperforms the Profitable Preferred Approach in terms of strategy return, its lower maximum retracement indicates that the approach has an advantage in risk control and is suitable for investors who are more concerned about stability, such as risk-averse investors.

Table 1. The evaluation metrics

2015.1.1-2024.10.18	Equal Allocation of Funds	Earnings Preferences	risk-adjusted
Strategy Return	523.37%	**568.84%**	544.03%
Excess Return	461.19%	**502.13%**	479.79%
Sharpe Ratio	0.639	**0.667**	0.661
Sortino Ratio	0.715	**0.759**	0.758
Maximum Drawdown	48.68%	49.31%	**47.50%**

4. Conclusion

This study systematically analyzes the performance differences among the three capital allocation strategies by comparing the historical backtests of the Equal Capital Allocation Method, Profitability Preferred Method, and Risk-Adjusted Method under the Unified Stock Selection Strategy. The results of the study show that the Earnings Preferred Approach performs the best in terms of strategy returns and risk-adjusted returns, indicating that high ROE companies have had strong profitability and market performance in the past decade. The risk-adjusted approach excels in maximum retracement control and is suitable for risk-averse investors. The Equal Distribution Approach is slightly inferior in terms of returns but still provides more stable returns.

However, this study has some limitations. First, the strategy backtest is based on a single stock selection strategy, which may not fully reflect the applicability of each capital allocation method under different market conditions. Second, the capital allocation methodology used is relatively simple, which is effective but fails to fully consider the impact of complex factors such as market sentiment and technical indicators. Therefore, future research can incorporate multi-strategy for validation by analyzing the effectiveness of strategies based on multiple stock selection strategies in different market environments in order to improve the generalizability of the results, and it can also incorporate technical indicators and market sentiment indicators to construct a more complex capital allocation model. By expanding the depth and breadth of the research, this study expects to provide investors with more comprehensive and practical portfolio management strategy recommendations to better meet the investment needs of different risk preferences.

References

[1] Xia Y. Research on fund management strategy of small and medium investors based on trend analysis. Zhejiang University, 2018.

[2] Chai J. Exploration of the macro influencing factors of the volatility of SSE composite index and its position capital management. Yunnan University of Finance and Economics, 2017.

[3] Dong H., Dong Y. Position control of multiple investment processes - further research and analysis based on the Kelly formula . National Circulation Economy, 2017(11): 70-72.

[4] Zhang C. Position management and portfolio selection under the objective of long-term return maximization. Northeast University of Finance and Economics, 2019.

[5] Wang Z., Zhang C. Position management strategy based on Kelly formula and empirical evidence. Research on Financial Issues, 2017(12): 37-44.

[6] Chen X. Research on the effectiveness of financial quality factor in CSI 300 stock pool. Shanghai University of Finance and Economics, 2023.

[7] Wu J. A theoretical and empirical study on the effectiveness of ROE in constructing investment portfolios: stock selection criteria based on the core concept of moat. Financial Economy, 2021(09): 59-66.

[8] Kourtis A. The Sharpe ratio of estimated efficient portfolios. Finance Research Letters, 2016, 17: 72-78.

[9] Rollinger T. N., Hoffman S. T. Sortino: A Sharper Ratio. Red Rock Capital, Chicago, IL, 2013.

[10] Mendes B. V. de Melo, Lavrado R. C. Implementing and testing Maximum Drawdown at Risk. Finance Research Letters, 2017.