Does Active Investment Outperform Passive Investment? Evidence From the U.S. Stock Market

Xin Mei *

Department of Marketing and Management, The Hong Kong Polytechnic University, Hong Kong, China

* Corresponding Author Email: 23113737g@connect.polyu.hk

Abstract. The U.S. stock market, whose performance reflects the overall economic health of the nation, is significantly influenced by trade policies and geopolitical factors, prompting investors to optimize their portfolio further. This paper selected 5 representative stocks in different industries from January 1, 2015, to December 31, 2024. By establishing the maximum Sharpe ratio, the investment portfolio is constructed. This paper aims to identify the investment portfolio with the highest Sharpe ratio and compare it against to see if the return exceeds 1/N portfolio method and passive investment (S&P 500 ETF index). A comparative analysis of these three methods demonstrates that the Maximum Sharpe ratio approach, yielding a 3.53% monthly return, outperforms both the 1/N portfolio method (0.83% monthly return) and a passive investment in the S&P 500 ETF (0.59% monthly return). This result remains significant after the robustness check, which offers new insight for investors, indicating that active investment methods can achieve better performance during certain periods in the U.S stock market.

Keywords: Active investment; mean-variance methods; passive investment.

1. Introduction

In recent years, trade isolationism and conflict arising from geopolitical tensions have continually impacted financial markets, leading to ongoing volatility. This volatility has affected the stability of the exchange rate and commodity prices, as well as reflecting the dramatic fluctuations in the stock prices. Currently. There is existing literature conducting research in this area, for example, Yilmazkuday found that the estimation results indicate that a positive unit shock in global geopolitical risk leads to a decrease in stock prices [1]. He, Brian and Wang noted that trade policy uncertainty can influence stock market [2]. From the perspective of individual and institutional investors, systematic risk is difficult to avoid, while unsystematic risk can be mitigated as much as possible through diversified investment portfolios. Therefore, portfolio construction becomes one of the core topics.

Normally, individual and institutional investors are willing to build portfolios using either passive or active investing strategies, and the significance of portfolio construction is high lightened in the following aspects: Firstly, a portfolio effectively reduces risk and avoids significant losses that could arise from a single investment, Diversification has been a key element of investment decision-making amid risk and uncertainty even prior to the emergence of portfolio theory [3]. Secondly, a well-though-out asset allocation can seize opportunities in various market conditions, optimizing overall returns. Lastly, holding a diversified portfolio for the long-term helps to achieve stable returns, allowing investors to remain composed in the face of market fluctuations. Through a scientific portfolio strategy, investors can not only enhance their return but also achieve better financial planning through effectiveness risk management, Therefore, constructing a portfolio is a crucial means of achieving investment goals.

Mean-Variance model is a classical model to constructing portfolio. The earliest research on the Mean-Variance model was proposed by Harry Markowitz in his 1952 paper titled ‘Portfolio Selection [4]. Subsequently, the Mean-Variance Model has become the standard decision-making method for constructing and evaluating investment portfolio [5]. After 75 years of development, Markowitz’s

Mean-Variance model is continuously being innovated, including dynamic portfolio optimization and portfolio optimization that consider practical factors [6].

Previous studies have mostly focused on Mean-Variance portfolio theory reviews and optimization. This paper explores the issue from a different perspective: Whether active portfolio investment yields higher cumulative return than passive investment, thereby providing insights for investors.

In this paper, three investment methods are discussed: 1/N portfolio methods, the maximum Sharpe ratio methods and passive investment methods. The 1/N portfolio is often regarded as the easiest investment strategy to implement, and investors tend to have a stronger preference for this approach [7]. The Sharpe ratio remains one of the most popular metrics used to rank portfolios and investment companies [8]. Passive investments provide a low-cost option for many investors to participate in the financial market without having to pay for specific market timing or stock picking skills [9].

Taking into account that adding securities with varying return correlations to a portfolio can create a diversification effect [10]. This paper constructs a portfolio consisting of five stocks from different industries and derives the asset weights that maximize the Sharpe ratio, then compares the cumulative returns of this portfolio with those of 1/N portfolio and the corresponding index returns to determine whether passive or active investment yields more return. The results indicate that the investment portfolio targeting the maximum Sharpe ratio outperforms the index (S&P 500 ETF), while the 1/N portfolio also exceeds the index, but the margin of cumulative return is not significant. Additionally, to validate the results, robust tests were conducted to demonstrate the method's reliability.

This paper offers some valuable insights for the investment industry, which shows that while passive investment seeks to replicate the return of a market index, active investing remains a better choice for investors who can tolerate more risk in the U.S stock market during a certain period.

2. Data

This paper selects five representative companies from different industries in the U.S. Stock market. The ticker symbols for these five stocks are NVDA(NVDIA), JNJ (Johnson & Johnson), TGT(Target Corporation), JPM(JP Morgan Chase) and DIS (Walt Disney). The reasons for selecting these five companies are as follows: first, these companies represent different industries; second, they have strong management capabilities, making them appealing choices for both individual and institution investors. The selected time frame is from January 1, 2015, to December 31, 2024. In the subsequent processing, the data will be divided into a training set and a validation set. The training set consists of data from January 1, 2015 to December 31,2021, used to construct the optimal portfolio. The validation set, covering the period from January 1, 2022, to December 31, 2024, is utilized to assess the performance of the selected asset allocations by comparing their cumulative returns to the S&P 500 ETF Index. Basic information about the five stocks is provided in Table 1 and Table 2. According to Table 2, it can be observed that NVDA has the highest return among these five stocks, while JNJ has the lowest standard deviation among these five stocks, indicating that this stock has the lowest volatility.

Table 1. Selected Stocks and Industry

Company	Industry	Ticker Symbol
NVDIA Corporation	Technology	NVDA
Johnson & Johnson	Pharmaceuticals	JNJ
Target Corporation	Retailer	TGT
JP Morgan Chase	Financial	JPM
The Walt Disney Company	Media and entertainment	DIS

Table 2. Descriptive statistics for the monthly return of the 5 stocks

	Max	Min	Mean	Std Dev	Cumulative Return
NVDA	38.40%	-32.03%	5.66%	13.40%	4.78%
JNJ	14.42%	-12.15%	0.37%	4.56%	0.27%
TGT	23.89%	-29.20%	0.86%	8.63%	0.48%
JPM	20.46%	-22.46%	1.37%	7.03%	1.13%
DIS	24.87%	-18.61%	0.49%	8.44%	0.14%

3. Methods

Modern portfolio theory typically predicts investment returns using the mean and variance for decision-making, known as mean-variance analysis. Using Variance to measure risk primarily emphasizes the uncertainty of returns, which includes both the cases where returns are below the mean and those where returns are above the mean. The following are the return and variance of the portfolio.

$$R_p = \sum_i w_i R_i \tag{1}$$

Equation (1) represents the sum of the returns of assets from the first asset to the i-th asset, where each return is multiplied by its respective weight in the portfolio, thereby obtaining the overall return of the portfolio.

$$\sigma_p^2 = \sum_i \mu_i^2 w_i^2 + \sum_i \sum_q \sigma_i \sigma_q w_q \, w_i \rho_{iq} \tag{2}$$

Equation (2) represents the variance of the portfolio, specifically, σ_i represents the standard deviation of asset i's returns, and ρ_{ij} denotes the correlation coefficient between the returns on assets i and q. This paper exams two specific portfolios: the 1/N portfolio and the maximum Sharpe ratio portfolio. The1/N portfolio, characterized by an equal allocation of funds to each asset, is a widely adopted strategy among investors. The Sharpe ratio is a key metric widely used in investment analysis to measure and assess risk-adjusted returns. The calculation is as follows.

$$SR = \frac{R_p - R_f}{\sigma_p} \tag{3}$$

Where R_f is the risk-free rate, R_p is the portfolio expected return and σ_p is the standard deviation. A higher Sharpe ratio indicates the excess return per unit of risk is greater, which is typically seen as a sign of better investment performance. On the contrary, a lower Sharpe ratio indicates that the risk is higher while the returns are relatively lower, which may suggest that the investment is not worth pursuing.

4. Result

By using the training set, this paper found the portfolio that maximizes the Sharpe ratio. Meanwhile, the 1/N portfolio is also compared to the maximum Sharpe ratio portfolio. Specifically, the portfolio weights that maximize the Sharpe ratio are as follows: TGT：7.20%，JNJ: 8.58%, JPM: 12.24%, NVDA: 76.07%, DIS: -4.09%. The specific meaning of the weights in this portfolio is too short 4.09% of DIS, while the remaining stocks are long positions followed by weight. The weights of the 1/N portfolio are relatively simple: TGT: 20.00%, JNJ: 20.00%, JP Morgan Chase: 20.00%, NVDA: 20.00%, DIS: 20.00%. Table 3 shows a comparison of the weights from the two methods.

Table 3. Asset weights under two criteria

	NVDA	JNJ	TGT	JPM	DIS
Maximum Sharpe ratio portfolio	76.07%	8.58%	7.20%	12.24%	-4.90%
1/N portfolio	20%	20%	20%	20%	20%

Table 4 clearly shows the monthly return of the maximum Sharpe ratio portfolio reached 4.05%, with a Sharpe ratio of 39.41%, while the 1/N portfolio had a monthly return of 1.72% and a Sharpe ratio of 28.72%. Considering the risk-return relationship, the standard deviation of the maximum Sharpe Ratio portfolio is 9.63%, while the standard deviation of the 1/N portfolio is 5.13%.

Table 4. Two portfolio key indicator comparison

	Sharp ratio	Std Dev	Monthly Return
Maximum Sharpe ratio portfolio	39.41%	9.64%	4.05%
1/N portfolio	28.72%	5.13%	1.72%

To validate the performance of these two portfolios, this paper uses monthly return from Jan 1, 2022, to Dec 31, 2024, and calculates the actual risk and return over these 36 months by applying the weights of each asset in the optimal portfolio. Then, this paper compares these results with the cumulative return of the S&P 500 ETF over the same 36 months. If the cumulative return of the maximum Sharpe ratio exceeds that of the S&P 500 ETF, it indicates that the portfolio is effective.

Table 5 reflects this result. It is clear that the cumulative monthly return of maximum Sharpe ratio portfolio is significantly higher than S&P 500 ETF investment. Additionally, the cumulative monthly return of the 1/N portfolio is slightly higher than that of an investment in the S&P 500 ETF investment.

Table 5. Cumulative return comparison

	Cumulative monthly return
Maximum Sharpe ratio portfolio	3.53%
1/N portfolio	0.83%
S&P 500 ETF investment	0.59%

Next, robust analysis will be conducted. DIS will be excluded from portfolio. There are two reasons: first, the long-term short-selling risk in the portfolio cannot be ignored; second, the absolute value of its proportion is relatively small. The adjusted stock weights are re-estimated, as shown in Table 6.

Table 6. Adjusted portfolio weight

	NVDA	**JNJ**	**TGT**	**JPM**
Maximum Sharpe ratio portfolio	76.78%	7.24%	6.50%	7.24%
1/N portfolio	25.00%	25.00%	25.00%	25.00%

Table 7 reflects the adjusted three indicators. Compared to Table 5, the adjusted Maximum Sharpe ratio portfolio is stable. With no significant changes in these three-phase indicators. The adjusted 1/N portfolio has experienced a notable change in both the Sharpe ratio and the monthly return, specifically with the monthly return increasing from 1.72% to the adjusted 2.00%, and the Sharpe ratio rising from 28.72% to the adjusted 33.09%. In terms of risk, the change in standard deviation is relatively small, increasing from 5.13% to the adjusted 5.30%.

Table 7. Adjusted two portfolio key indicator comparison

	Sharp ratio	Std Dev	Monthly Return
Maximum Sharpe ratio portfolio	39.40%	9.67%	4.06%
1/N portfolio	33.09%	5.30%	2.00%

The recalculated cumulative return is shown in Table 8.

Table 8. Adjusted portfolio cumulative return comparison

	Cumulative monthly return
Maximum Sharpe ratio portfolio	3.50%
1/N portfolio	1.19%
S&P 500 ETF investment	0.59%

This paper found that the Maximum Sharpe ratio portfolio significantly outperform the S&P 500 ETF investment. Additionally, the adjusted cumulative return of the 1/N portfolio exceeds that of the S&P 500 ETF investment. Therefore, the method demonstrates robustness and effectiveness.

5. Conclusion

This paper presents three methods of portfolio investment: the best Sharpe ratio portfolio method, 1/N portfolio method, and passive investment method. Based on data from Yahoo Finance, this paper selects the monthly return performance of five representative stocks in the U.S equity market from different industries (Technology, Pharmaceuticals, Retailed, Financial, Media and entertainment) over the past ten years (January 1, 2015, to December 31, 2024), the first seven years are used for training to construct the best Sharpe ratio portfolio, with the following three years considered the validation test. By comparing the cumulative of the three methods, this paper found that both the best Sharpe ratio and the 1/N portfolio method outperform the S&P 500 ETF investments. After the robustness test, this result remains significant.

While the study holds significant theoretical value, it does have some limitations that future researchers in the same fields should take into account. Firstly, these companies selected in this paper are all well-known and presentative; to enhance the generalizability of the research, future studies could consider investment portfolios of other companies. Additionally, the scope of this paper is limited to the U.S stock market, so results may difference by different countries. Therefore, future research will be conducted in a broader range of countries.

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