Comparison of Long-Term Investment Strategies: DCA vs Lump-Sum Investing in the S&P 500 Index

Tengku Muhammad Elzafir Habsjah
NEOMA Business School, Mont-Saint-Aignan, France

Indra Surya Permana
Department of Economy Science, Universitas Nahdlatul Ulama Cirebon, Indonesia

Abstract: This research delves into the realm of long-term investments, a domain often navigated by unsophisticated investors who prefer a hands-off, 'set and forget' approach. Central to this investigation are two dominant investment strategies: Dollar-Cost Averaging and Lump-Sum investing. The study meticulously compares the performance of these strategies over a significant 21-year period, from January 2002 to December 2022, a timeline punctuated by major market upheavals such as the Dot Com Bubble and the 2020 Coronavirus crash. Drawing data from the reputable Yahoo! Finance on the S&P 500 index, the research offers a robust backtest of both strategies. The results are illuminating: Lump-Sum investments, especially those made during the nadir of February 2009, realized returns amplifying the initial investment by up to 5.2 times, clearly overshadowing the returns from Dollar-Cost Averaging. Intriguingly, a fusion of both strategies, a hybrid approach, showcased even more impressive gains, hinting at the merits of a diversified investment strategy. Conclusively, within the parameters of this research, Lump-Sum investing emerges as the more potent strategy. However, the study also paves the way for future inquiries, especially concerning the potential of these strategies in the turbulent waters of volatile assets, exemplified by Bitcoin.

Keywords: Dollar-Cost Averaging, Investment Strategies, Comparison Method

Introduction

Long-term investment is usually defined as an investment made with the intention of holding for at least one year (Kirkby & Nguyen, 2021). Longer term investments are usually done by unsophisticated investors (laymen) who do not have either the time or skillset to do shorter

term investments. In long term investments, the investors usually have a 'set and forget' mindset, with the idea of cashing out the investment when they need it in the future, like when they retire or when their children need to go to college (Chen et al., 2023; Gerrard et al., 2023). There are two main strategies of investing for the long term, the Dollar-Cost Averaging and the Lump-Sum strategies(Sun et al., 2023; Zhang et al., 2022). In dollar-cost averaging, investors invest small amounts of money regularly over a period of time in a regular interval, usually weekly or monthly. The advantage of dollar-cost averaging is that investors can start early even if they don't have much money. It is also thought that this method protects the investors from uncertainty in the market (Tan et al., 2023).

While Lump-Sum strategy requires the investor to put a large amount of money at the start of the period and leaving it there until they need to cash out (Chang et al., 2023; Grudniewicz & Ślepaczuk, 2023). This method is much more convenient as in it only requires minimal intervention by the investor. But the entry barrier of lump-sum is higher, as it will require the investor to gather the amount of money to invest. Therefore, this paper is intended to compare between both strategies using back testing, especially from the laymen perspective: is it better to start early and do dollar-cost averaging, or wait until enough money is collected before starting investing (Ma et al., 2022).

Research Method

Sample Period

This paper choses a 21 years period from January 2002 to November 2022 for a couple of reasons (Petkov et al., 2022; Sugozu et al., 2023). The first reason is that a 21 years period is a long time and it will contain several market bulls and bears, which shows a realistic market experience (Wang et al., 2023). Specifically for the chosen period, in 2002 the market just experienced the Dot Com Bubble, only to have another crash in 2008's Sub-prime Mortgage Crisis. Then came the rise of the Big Techs in the early 2010s and another crash in the 2015-2016 Stock Market Selloff and finally the 2020 Coronavirus crash. The second reason is that 21 years is a long enough time-span where the working class for plan for their future: saving for children's education and weddings, planning for retirement, saving to buy a house, etc (Hidayat et al., 2023; Li et al., 2023).

Data Source

The source of the data of this paper comes from Yahoo! Finance, which was chosen for their ubiquity in the finance industry and also for ease of use in importing the data in Python. The specific data that was chosen for this paper is the Standard & Poor's 500 Index (S&P 500), noted by the index ticker ^GSPC in Yahoo! Finance. The S&P 500 was chosen because it is considered as one of the main indicators of the economic health not just in the United States but also the world. It contains the 500 (more or less) largest publicly listed corporation in the New York Stock Exchange, NASDAQ and Cboe. Naturally, since the companies included in the S&P 500 are mainly US-based companies, the findings of this paper will not be directly applicable to other countries with less robust markets (Jun et al., 2022).

Result and Discussion

We start by getting the historical data of S&P 500 index. The Adjusted Closing Price was specifically chosen since it reflects that stock's value after accounting for any corporate actions. It is often used to examine historical returns or doing an analysis of past performance.
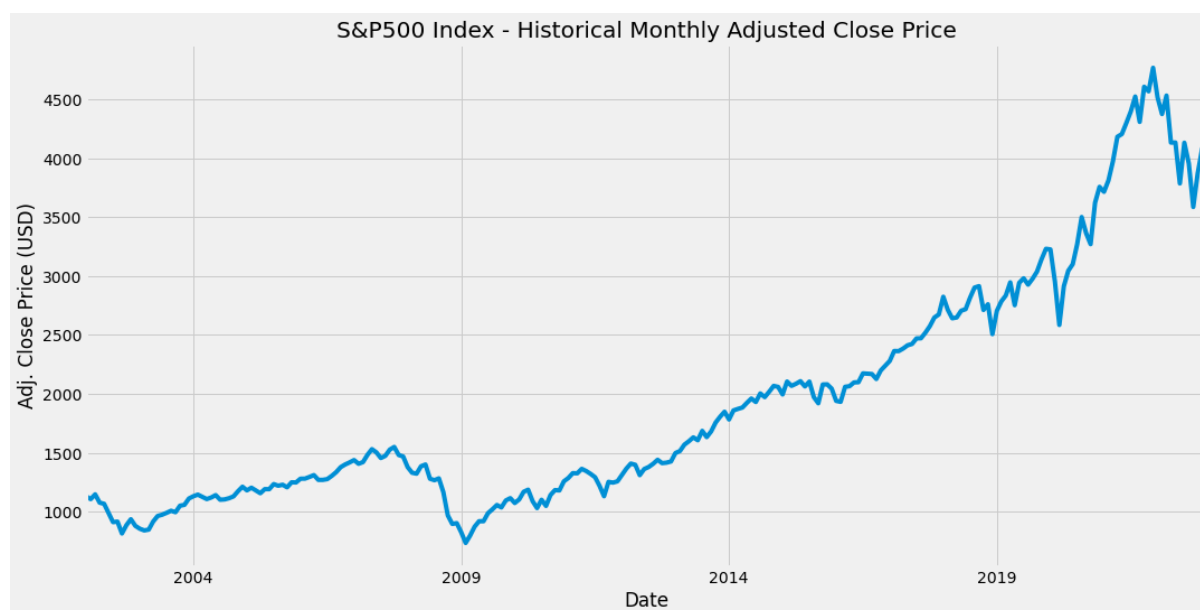

Figure 1 Historical Monthly Adjusted Close Price

From this graph, we can see that regardless of multiple market crashes during the 21 years period, in the long term, the index shows a healthy and steady increase. In January 1st 2002, the adjusted closing price is at 1130.2. While at the end of the chosen period, December 1st 2022, the price is at 3852.36. A calculation would show us that if someone invested a lump sum at the beginning of the period, their investment value would multiply by 3.4X or a ROI of

240%. This figure is already much better compared to just simply keeping the money in a savings or a 5-years certificate of deposit, which interest rates ranges from 5.15% p.a. in early 2002 at the highest to 0.26% p.a. in late 2021 at the lowest.

But as mentioned earlier, a lump sum strategy might not be available for everyone at their current situation. Therefore, it might be useful to raise questions regarding, is there a perfect time to invest using the lump-sum strategy?

To find out when is the best time to invest during the 20 years period, we need to define a few things. First, the amount of investment. Since we are going to compare the lump-sum to dollar-cost averaging strategy, we need to set the same amount of investment for both methods. Therefore, an amount was chosen to simplify the presentation. In the dollar-cost averaging strategy, it was decided that we will backtest the method using a monthly investment frequency. And to simplify calculations, it was decided to use $100 as the monthly amount. And since there are 251 months in the period between January 2021 and December 2022, we will use the amount of $25,100 as the initial investment amount for the lump-sum strategy. It is assumed that the index could be bought fractionally, i.e., that the investment vehicle allows for the investor to invest their money the entire amount.

As previously mentioned, a simple lump-sum investment in January 2002 will result in a return of 3.4X by December 2022. Which means an investment of $25,100 will result in an investment value of $85,555. But, as it turns out, waiting to invest for approximately 7 years will not only resulted in a similar investment value, but even higher. The crash of the 2008 Sub-prime Mortgage Crisis was so immense that the S&P 500 went to a lower level than of in 2002.
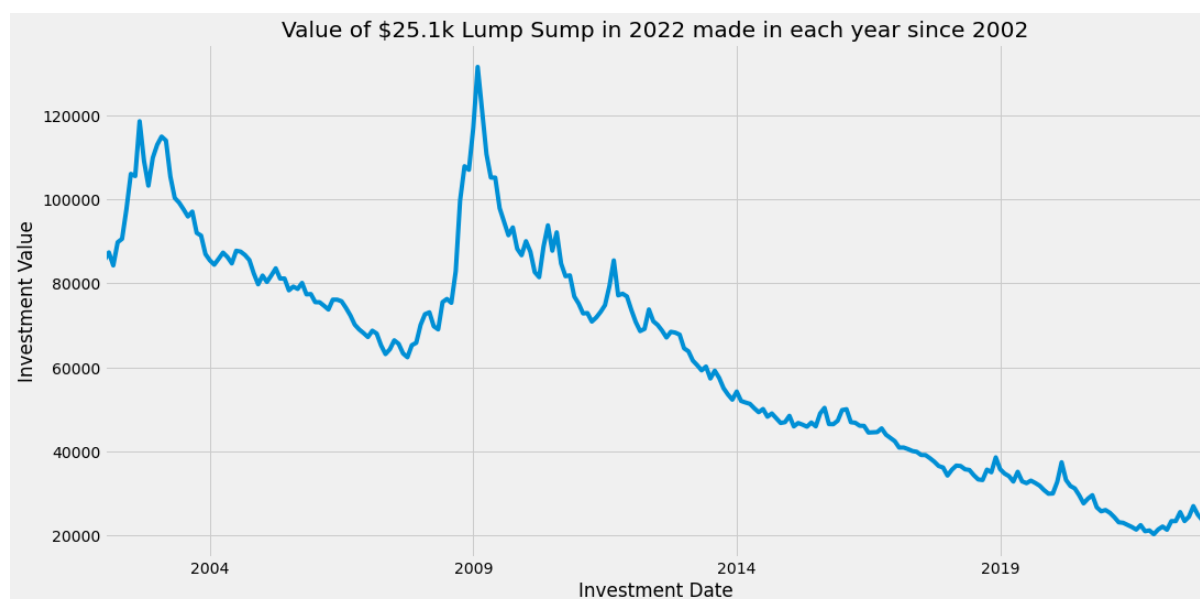

Figure 2 Lump Sump in 2022

This graph above shows the investment value in December 2022 (y-axis) of a $25,100 lump-sum investment if it was made in the corresponding years (x-axis). A lump-sum investment of $25,100 made in February 2009 will result in an investment value of $131,540 in December 2022, a return of 5.2X of the initial investment. In all cases, lump-sum investment shows that a 'set and forget' strategy could definitely work, if we accept that a return of 3.4X to 5.2X as acceptable over a period of 14-21 years.

On the other hand, dollar-cost averaging strategy is said to be more robust against market volatility. Which means, that the investor protects themselves against a sudden market drop. While that is true to some extent, in the long term, it might not be as rosy. For simulating the dollar-cost averaging strategy, we chose an amount of $100 per month for 251 months, which will result in a total amount invested of $25,100.
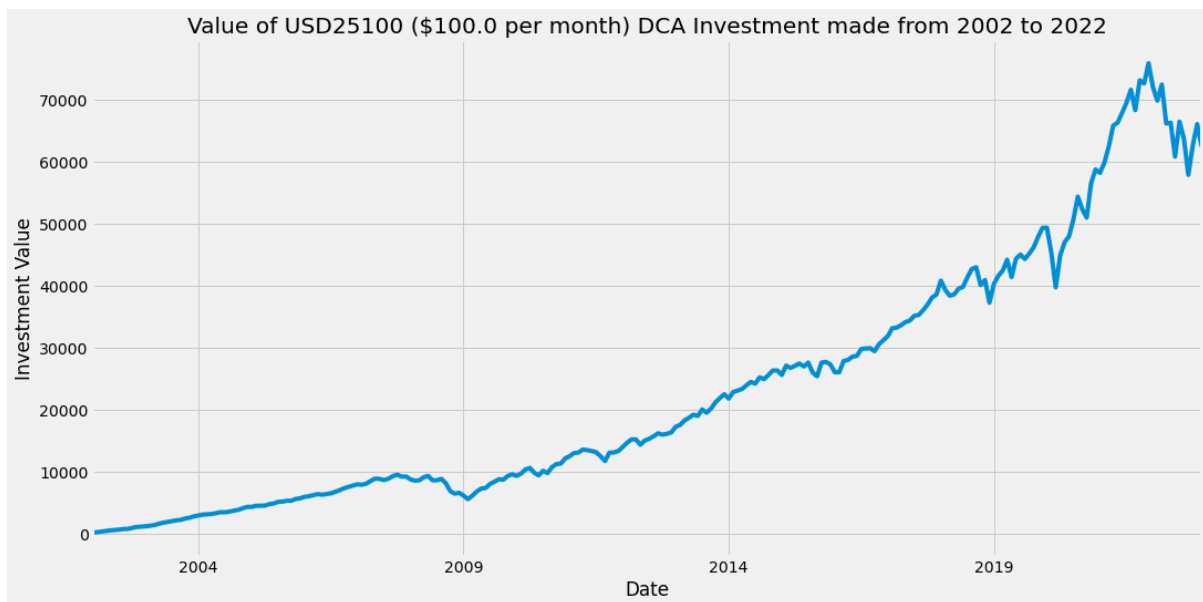

Figure 3 DCA Investment

From the graph above we can clearly see that dollar-cost averaging during the period of 21 years resulted in much less yield compared to lump-sum investing. From our simulation, using the dollar-cost averaging resulted in an investment value of only $62,478 in December 2022. This means that the strategy yielded ($23,077) less compared to a lump-sum investment made in January 2002 and ($69,062) less compared to a lump-sum investment made in February 2009.

Conclusions

Based on the findings of the back testing of both long-term investment methods, it is clear that lump-sum investment strategy is a clear winner compared to dollar-cost averaging, at least within the constraints of this paper, which were the period and index chosen. Another thing that should be mentioned is that there are no rules against using both strategy at the same time. Investors could benefit from the higher gains and convenience of lump-sum method and also the stability, lower barrier of entry and protection against massive drops from dollar-cost averaging. The hybrid method will be the best choice as we assume that the average investors will have a steady source of income that will increase steadily over the years. Therefore, a lump-sum of $25,100 in 2002 and a small monthly investment, just like the simulation shows of just $100, will net the investor $148,033 over 21 years. And this is without an increase of monthly contribution. In conclusion, both strategies are valid for the laymen and those who are not willing to go deeper into day trading and do not want to pick out stocks themselves. Now the question remains whether this conclusion would stand for much more volatile investment vehicles like Bitcoin, which will have much more significant increases and crashes.

References

Chang, S., Ma, H., & Hou, P. (2023). Direct or Indirect? Implications of the retailer's investment choices on the manufacturer's encroachment strategy. *Computers & Industrial Engineering*, *179*, 109201. https://doi.org/https://doi.org/10.1016/j.cie.2023.109201

Chen, L., Gao, F., Guo, T., & Huang, X. (2023). Mixed ownership reform and the short-term debt for long-term investment of non-state-owned enterprises: Evidence from China. *International Review of Financial Analysis*, *90*, 102861. https://doi.org/https://doi.org/10.1016/j.irfa.2023.102861

Gerrard, R., Kyriakou, I., Nielsen, J. P., & Vodička, P. (2023). On optimal constrained investment strategies for long-term savers in stochastic environments and probability hedging. *European Journal of Operational Research*, *307*(2), 948-962. https://doi.org/https://doi.org/10.1016/j.ejor.2022.10.003

Grudniewicz, J., & Ślepaczuk, R. (2023). Application of machine learning in algorithmic investment strategies on global stock markets. *Research in International Business and Finance*, *66*, 102052. https://doi.org/https://doi.org/10.1016/j.ribaf.2023.102052

Hidayat, T., Mahardiko, R., & Rosyad, A. M. (2023). The Analysis of Data Preparation to Validate Model Values of Information Technology. *Virtual Economics*, *6*(2), 23-34. https://doi.org/10.34021/ve.2023.06.02(2)

Jun, S. Y., Kim, D. S., Jung, S. Y., Jun, S. G., & Kim, J. W. (2022). Stock investment strategy combining earnings power index and machine learning. *International Journal of Accounting Information Systems*, *47*, 100576. https://doi.org/https://doi.org/10.1016/j.accinf.2022.100576

Kirkby, J. L., & Nguyen, D. (2021). Equity-linked Guaranteed Minimum Death Benefits with dollar cost averaging. *Insurance: Mathematics and Economics*, *100*, 408-428. https://doi.org/https://doi.org/10.1016/j.insmatheco.2021.04.012

Li, J., Wang, X., Ahmad, S., Huang, X., & Khan, Y. A. (2023). Optimization of investment strategies through machine learning. *Heliyon*, *9*(5), e16155. https://doi.org/https://doi.org/10.1016/j.heliyon.2023.e16155

Ma, X., Zhao, Y., Luo, Q., & Bai, Q. (2022). Preservation technology investment and carbon abatement strategies in a supplier-retailer cold chain based on a differential game. *Computers & Industrial Engineering*, *172*, 108540. https://doi.org/https://doi.org/10.1016/j.cie.2022.108540

Petkov, I., Mavromatidis, G., Knoeri, C., Allan, J., & Hoffmann, V. H. (2022). MANGOret: An optimization framework for the long-term investment planning of building multi-energy system and envelope retrofits. *Applied Energy*, *314*, 118901. https://doi.org/https://doi.org/10.1016/j.apenergy.2022.118901

Sugozu, I. H., Yasar, S., & Verberi, C. (2023). The relationship between long-term portfolio investments and growth in the context of asset characteristics and development level. *Borsa Istanbul Review*, *23*(1), 34-43. https://doi.org/https://doi.org/10.1016/j.bir.2022.09.004

Sun, B., Fan, B., Zhang, Y., & Xie, J. (2023). Investment decisions and strategies of China's energy storage technology under policy uncertainty: A real options approach. *Energy*, *278*, 127905. https://doi.org/https://doi.org/10.1016/j.energy.2023.127905

Tan, B. Q., Kang, K., & Zhong, R. Y. (2023). Electric vehicle charging infrastructure investment strategy analysis: State-owned versus private parking lots. *Transport Policy*, *141*, 54-71. https://doi.org/https://doi.org/10.1016/j.tranpol.2023.07.003

Wang, H., Wang, C., Li, M., & Xie, Y. (2023). Blockchain technology investment strategy for shipping companies under competition. *Ocean & Coastal Management*, *243*, 106696. https://doi.org/https://doi.org/10.1016/j.ocecoaman.2023.106696

Zhang, W., Zhang, T., Li, H., & Zhang, H. (2022). Dynamic spillover capacity of R&D and digital investments in China's manufacturing industry under long-term technological progress based on the industry chain perspective. *Technology in Society*, *71*, 102129. https://doi.org/https://doi.org/10.1016/j.techsoc.2022.102129