Simulating The Stock Market

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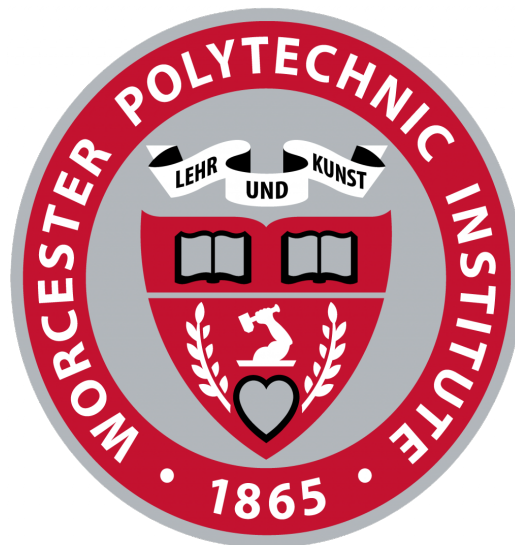
the Degree of Bachelor of Science

by

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Abstract

This project is a seven-week stock market simulation conducted to understand market trends and develop effective trading strategies. Three different trading methodologies were employed: index fund trading, options trading, and swing trading, each with an initial investment of $100,000. These strategies were applied to a diverse set of stocks, with trading decisions driven by market analysis and current financial data, aiming to gain a profit within a realistic trading environment.

The simulation's comprehensive approach involved testing both conservative (index fund) and active (options and swing trading) investment styles. The results demonstrated a spectrum of outcomes: the index trading strategy yielded a return of 4.5%, the options trading strategy ended with a net decrease of 9.53%, reflecting the high-risk nature of the strategy, and the swing trading approach, while actively managed, concluded with a slight loss of 2.63%, indicating the challenges of timing in a volatile market segment.

The S&P 500 index had a 4.9% increase for the same period. These findings contributed valuable insights into trading behavior, offering a foundation for future investment strategies, and enhancing the financial acumen of participants.

Comparatively, the S&P 500 index experienced an uptrend during the simulation period. The paper delves into the effectiveness of each trading strategy in relation to the broader market performance. These findings contribute valuable insights into trading behavior, offering a foundation for future investment strategies, and enhancing the financial acumen of participants.

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Chapter 1: Introduction

1.1 Objectives

This IQP aims to equip a novice investor with the knowledge and skills needed to navigate the stock market successfully. The initial two weeks of the project will involve thorough research, focusing on the historical context of the stock market, various investment and analysis methods, common trends, and key terminology. This foundation will enable the investor to develop a comprehensive understanding and analysis of the market, facilitating informed decisions regarding buying and selling stocks.

The subsequent six to nine weeks will be dedicated to data collection through a stock market simulation. Two distinct investment strategies - the buy & hold strategy and swing trading - will be examined using separate simulations. Each simulation will commence with nearly identical portfolios, allowing for comparative analysis and monitoring of progress.

The final three weeks of the project will be devoted to analyzing the results obtained from the simulations. The investor will strive to interpret the cause-and-effect relationships underlying successes and failures, to identify patterns and insights that can inform future investment decisions.

Upon completion of this IQP, the novice investor will have acquired the necessary tools and knowledge to embark on a successful investment journey in the stock market.

1.2 General Plan

Since the purpose of this project is to get experience and be able to teach a first-time trader how to operate the stock market, we will need to begin with research of the market to get a good understanding of how it works. We are going to spend the first 3 weeks researching the stock market, various stocks, and indexes, and three of the most common trading techniques. We will

gather our information from a variety of articles and published materials on the market, which will give us a good understanding of what we will be able to apply in the next part of the project.

The next part will be a 7-week simulation, where we will apply what we learned and use the three different methods to trade stocks. The three techniques that we will use are index fund trading, swing trading, and options trading. The options and swing trading methods will use the same companies to keep things as similar as possible, and all three will start out with the same amount of funding.

After the simulation, the remainder of the time will be spent analyzing the three portfolios, both in terms of profit and the effort and research needed to get to that profit. We will also compare them against the NASDAQ, which tracks the general market, to see how we performed against the market and if we were able to outperform it a significant amount. Using this, a new investor will gain all the tools necessary to perform well in the stock market.

1.3 Stock Market Background

The stock market has been a good way of tracking significant economic and technological changes for almost 500 years now, since it started in 1531 in Belgium. These first trades were for promissory notes and bonds, which slowly evolved with the creation of the first stock exchanges in the 1600s. These first trades and exchanges were done by the Dutch, British, and French, financing sea voyages to the East Indies and Asia, selling shares of the rewards amongst investors. In 1773, the London Stock Exchange (LSE) was established, creating the modern stock trading system we have today, although the New York Stock Exchange (NYSE) was much more influential due to having fewer regulations after its founding in 1792.

The stock market reflects the state of the economy, and is influenced by a variety of factors, such as economic growth, employment rate, inflation, and large banks' interest rates. With the

introduction and popularization of online stock trading platforms in the late 20th and early 21st century, the market became more popular, with a large influx of stock traders. This meant the market was more democratized, and not controlled by the wealthier private investment firms, but also introduced many regulatory issues.

Although the market became more democratized, this meant that it was more prone to overvaluation events, such as during the 2007 financial crisis, triggered by the collapse of the US housing market. Many people had money in real estate, and this event meant that many Americans were left with a fraction of their savings, which highlighted the need for stricter regulations in the markets worldwide. This market crash was led by investment firms over-investing and selling false promises, meaning there was much more oversight by federal agencies to prevent future crises.

Recently, the stock market has become more and more affected by large technological companies and their advancements, as well as different geopolitical events. With the rapid spread of information via social media, the market is now more aware than ever of what is happening in the corporate world. This means that if something large is announced, such as government funding for a specific company or sector, the corresponding stocks would go up rapidly.

The two most important industries in the current market are the Semiconductor and Artificial Intelligence sectors, and are each driving economies of large countries, with their governments subsidizing their growth. For the market, the importance of semiconductors and AI goes beyond their economic contributions. They are indicators of technological capability and drivers of competitive advantage. Companies and regions leading in these fields are likely to have a significant influence on global economic patterns and strategic investment decisions.

Chapter 2: Methodology

2.1 Reading Charts

Stock market charts are graphical representations of the price movements of thousands of stocks over time. They reflect the balance of supply and demand in the world's largest auction marketplace, where buyers and sellers determine the value of each stock. By learning how to read stock market charts, we can gain insights into the trends, patterns, and indicators that influence the stock market. Price patterns of historically great stocks can serve as models for our future selections. Below, we will explore many such price patterns.

2.1.1 Cup with Handle

A cup with a handle is a key price pattern that resembles a cup's outline from the side (see image below). As shown in Figure 1 below, the cup is measured using a depth and base length with a handle on the top right corner to indicate a pivot. A cup with a handle shows a stock rising from a dip. It lasts 7 to 65 weeks, with a 12% to 33% fall from top to bottom (O'Neil, 2024). Before the dip, the stock should rise 30% or more, with high strength and volume. The cup's bottom should be a "U" shape, not a "V" shape. This lets the stock correct itself, with some dips near the bottom. The "U" area helps get rid of weak holders and distract other buyers. Growth stocks form cup patterns when the market drops and corrects 1.5 to 2.5 times the averages. Pick stocks with stable base patterns in a market decline. Avoid stocks that drop more than 2.5 times the averages because of their risk (O'Neil, 2024).
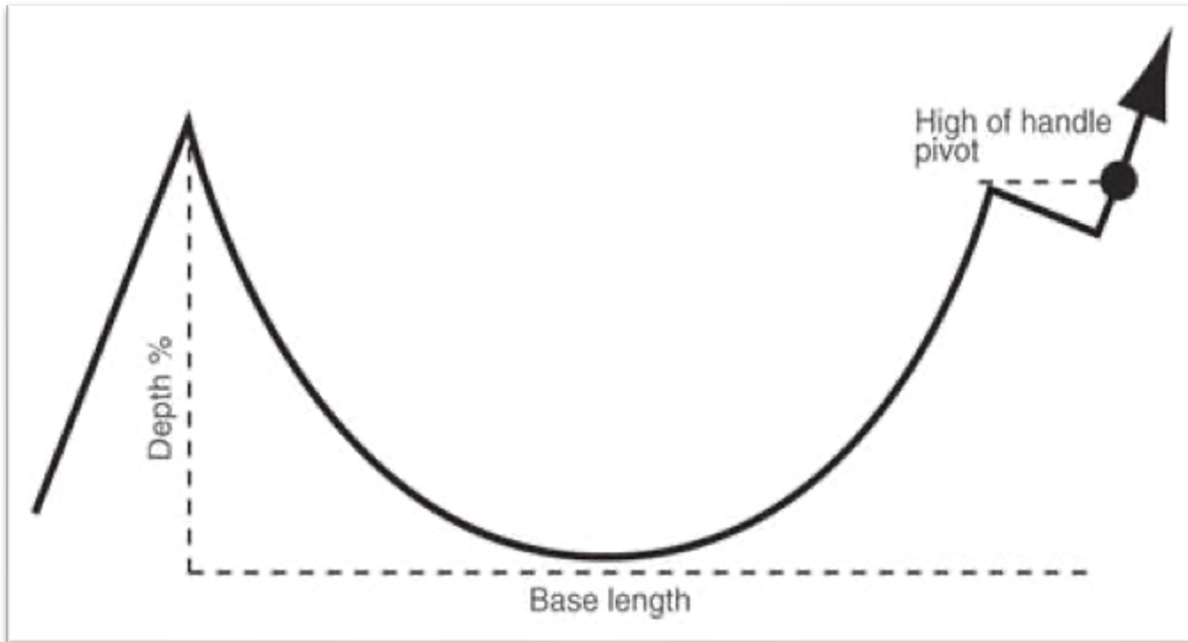
Figure 1: Cup-with-Handle Pattern (O'Neil, 2024)

A handle is a downward drift in the price of a stock that forms a cup pattern. It lasts more than a week and has a shakeout near the end. Volume should be low in the handle unless the cup is very large. A good handle is in the upper half of the base and above the 10-week average. A bad handle is in the lower half, below the 10-week average, or wedges up. Wedging handles are likely to fail. A proper handle drops 8% to 12% from the peak (O'Neil, 2024). Additionally, a saucer-with-handle pattern resembles a cup-with-handle, but with a more gradual and less deep curve. The saucer shows a longer consolidation phase before the breakout.

An example of cup-with-handle is Sea Containers as shown in Figure 2 below, a rare stock that dropped 50% in 1975, but then rose 554% in two years. It had a cup-with-handle pattern, high earnings growth, and huge quarterly results (O'Neil, 2024). Sea Containers' large cup explains the downturn during Handle.
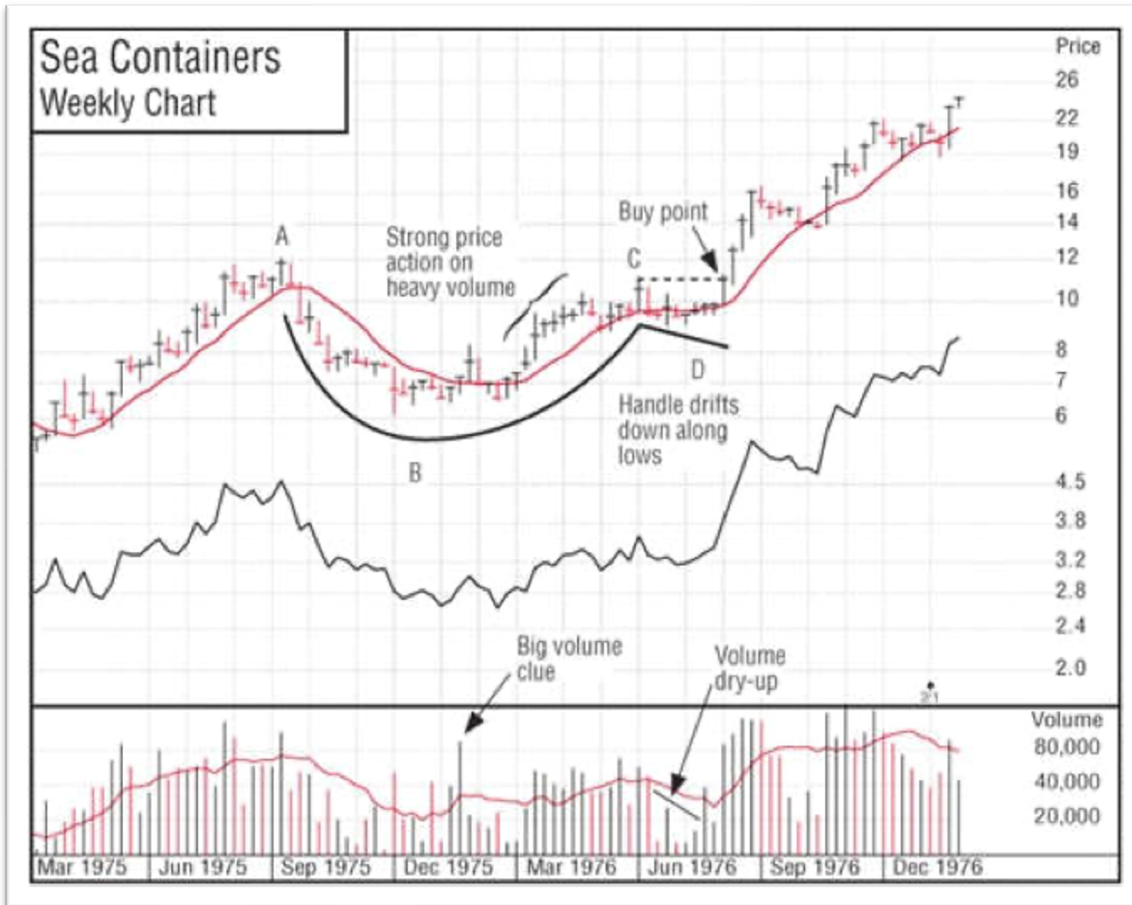
Figure 2: Cup-with-Handle Example of Sea Containers (O'Neil, 2024)

2.1.2 Volume Percent Change

After a cup-with-handle pattern, a sign of a strong stock is when the volume surges 40% to 50% or more which is caused by the institutional buying of the stock. Volume is important to study because it shows if a stock is bought or sold by institutions. Volume measures supply/demand, and sponsorship—two essential factors for stock analysis. We must find proper bases by looking at low volume for one or two weeks at the bottom of the base and the handle. Tight prices with dried-up volume during the handle are a symptom of healthy stocks.

Apple stock charts represent a cup-with-handle that consisted of Weeks with advancing prices on heavy volume, followed in other weeks by extreme volume dry-ups. The occurrence of

big daily and weekly volume spikes is also a very constructive sign (see below image). Overall, "It's usually a constructive sign when the number of weeks that the stock closes up in price on above-average weekly volume outnumbers the number of weeks that it closes down in price on above-average volume while still in its chart base" (O'Neil, 2024). Figure 3 presents an example of dried-up volume and a sudden spike in the price of Apple Computers.
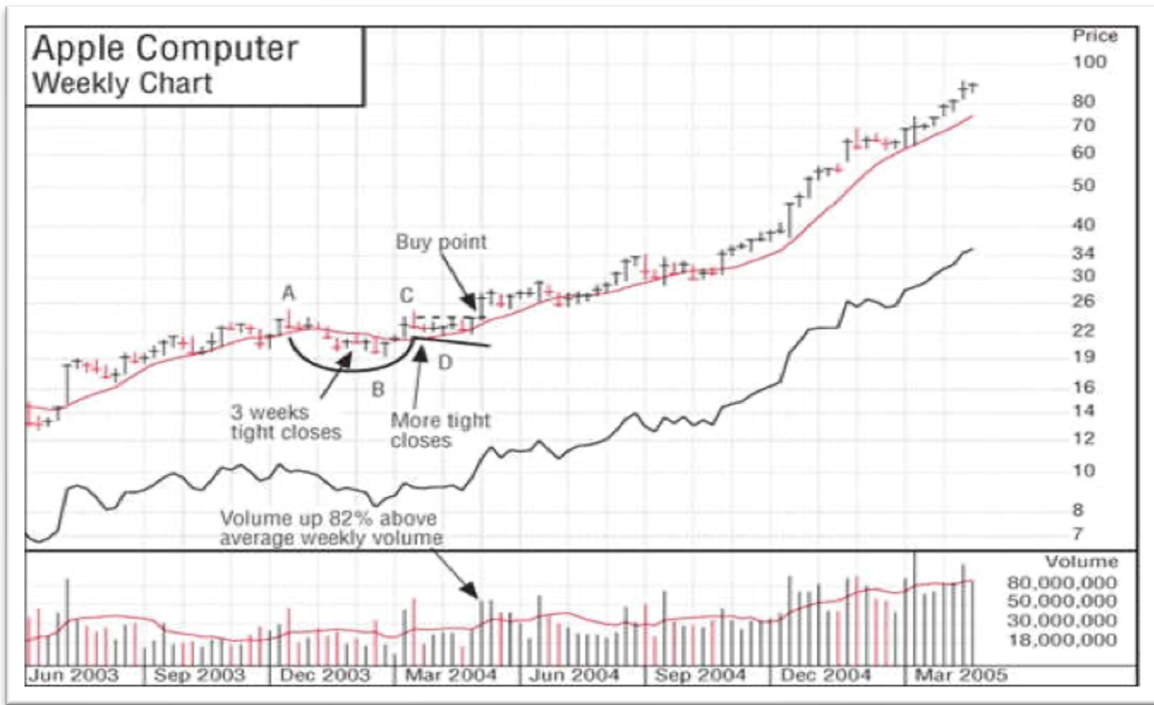
Figure 3: Volume Dry-Up & Spike-Up Example (O'Neil, 2024)

2.1.3 Double-Bottom

A double-bottom pattern is a W-shaped price movement that is less common than the cup with handle but still occurs frequently. It requires the second bottom to match or undercut the first bottom by one or two points, to shake out weak investors. Essentially, "the pivot point should be equal in price to the top of the middle peak of the W, which should stop somewhere a little below the pattern's peak price" (O'Neil, 2024). Otherwise, the pattern may fail (see below image). Some double bottoms have handles, but not all. A double bottom is like a cup in depth

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and length. The buy point is on the top right of the W, where the price rises after the second dip where it is equal to the middle peak of the W, which is lower than the pattern's peak. The peak of the handle, if any, is the buy point (O'Neil, 2024). Figure 4 below is how Double Bottom pattern looks like.
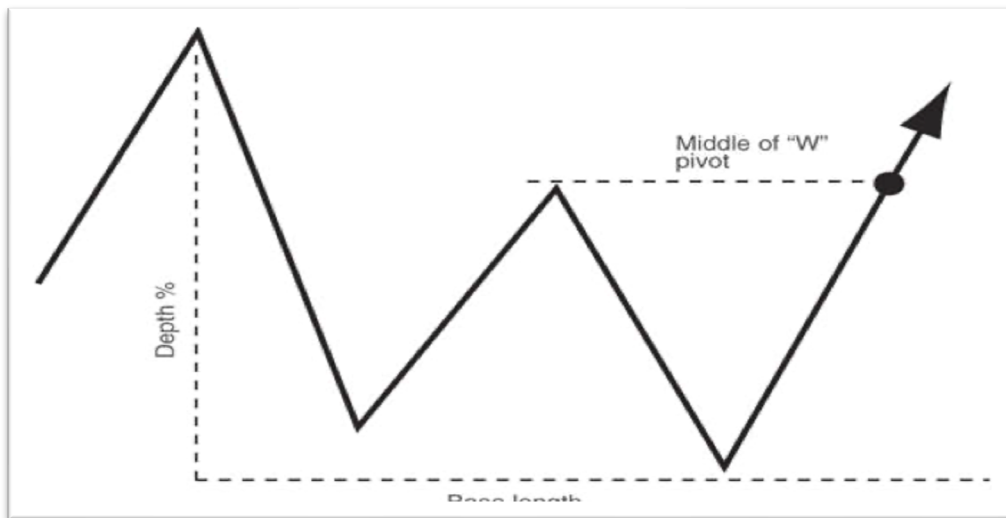
Figure 4: Double-Bottom Base Pattern (O'Neil, 2024)

Use the example in Figure 5 for double-bottom patterns: A= Beginning of base, B= Bottom of first leg, C= Middle of W as pivot point, D= Bottom of the second leg, E= Top of the handle as buy point, F= Bottom of the handle.
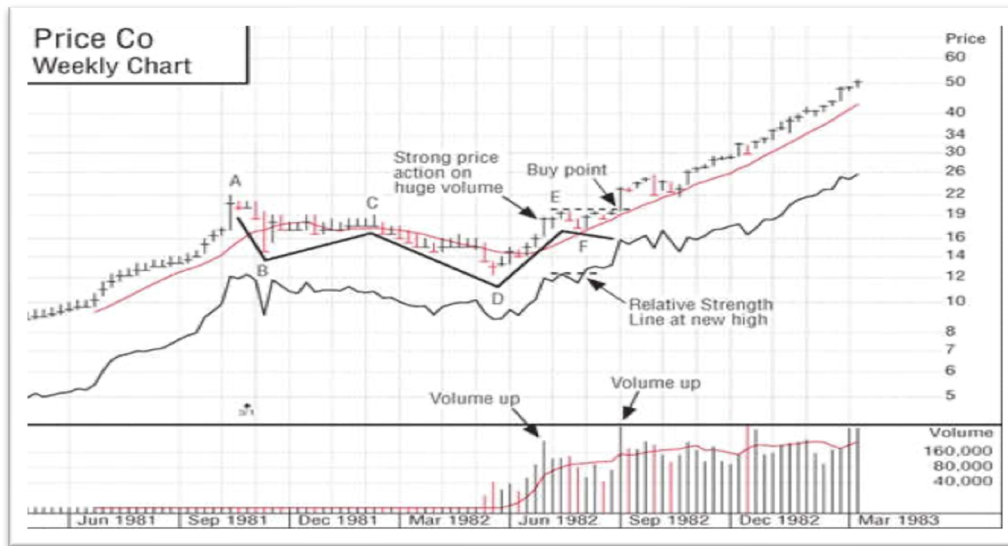
Figure 5: Double-Bottom Base Example of Price Co. (O'Neil, 2024)

2.1.4 Flat-base

A flat base is a profitable chart pattern that often follows a previous breakout from first-stage bases like cup-with-handle, saucer-with-handle, or double-bottom. These first-stage bases indicate a stock has risen by at least 20% from its low point. A flat base shows that a stock is consolidating its gains in a narrow price band for a minimum of five or six weeks, without dropping more than 10% to 15%. Flat base gives you another chance to buy a stock after it breaks out aka another entry point before the next rise in the stock price (see Figure 6 below).
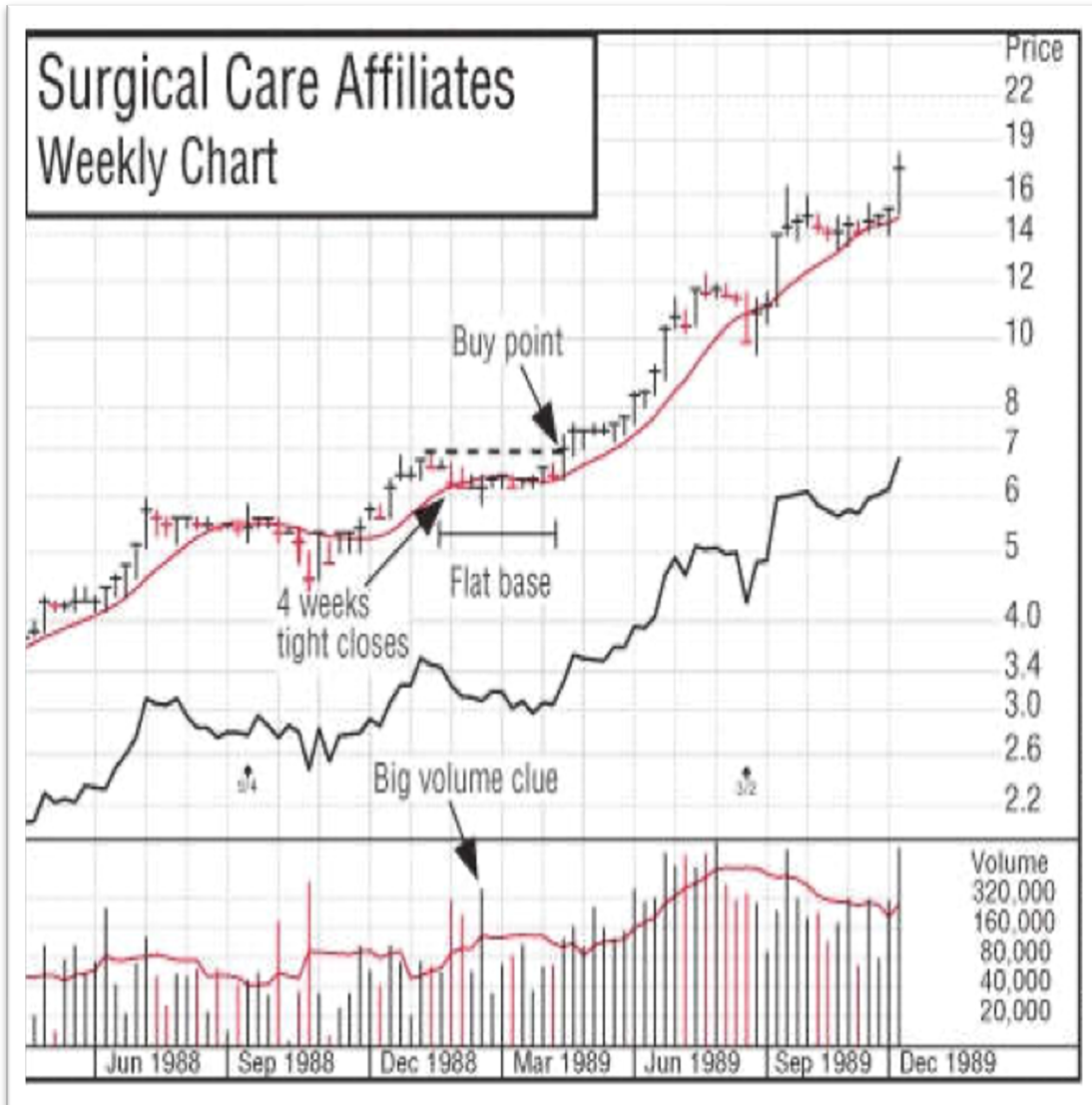
Figure 6: Flat-Base Example of Surgical Care Affiliates (O'Neil, 2024)

The above chart from Surgical Care Affiliates illustrates a double-bottom first base followed by a breakout period characterized by high volume. This was succeeded by a flat base marked by tight price and diminished volume, which anticipated a subsequent substantial price surge.

2.1.5 High, Tight Flags

A high, tight flag is a powerful but uncommon chart pattern that shows a stock soaring by at least 100% in less than two months, followed by a brief and mild pullback of no more than 25%. This

pattern signals a strong uptrend, but it's also hard to spot and risky to trade. Stocks that form this pattern can double or triple their value quickly (O'Neil, 2024).

2.2 Understanding Relative Strength Index (RSI)

RSI is used by fundamental securities analysts to evaluate whether to buy, sell or hold a stock. "RSI measures the speed and magnitude of a security's recent price changes to evaluate overvalued or undervalued conditions in the [security's] price" (Fernando, 2024).

2.2.1 How to Use RSI

The Relative Strength Index (RSI) is a momentum indicator that ranges from 0 to 100. An RSI value above 70 indicates an overbought condition, while an RSI value below 30 indicates an oversold condition. These are the traditional thresholds, but they can be modified to suit different securities and market conditions. For instance, if a security frequently reaches the overbought level of 70, it may be more appropriate to use 80 as the threshold.

The RSI can also provide trading signals based on divergences, failure swings, and trend identification. A divergence occurs when the price makes a new high or low that is not confirmed by the RSI, suggesting a potential reversal. A failure swing happens when the RSI fails to make a higher high or a lower low and then breaks a previous support or resistance level. A trend identification is based on the observation that the RSI tends to stay within certain ranges depending on the direction and strength of the market. In a bullish market, the RSI usually stays above 40 and below 90, with the 40-50 zone acting as a support. In a bearish market, the RSI usually stays below 60 and above 10, with the 50-60 zone acting as a resistance. These ranges may vary depending on the RSI settings and the market volatility (What, 2024).

2.2.2 RSI Formula

The RSI is a simple formula:

$$RSI = 100 - [100/(1 + Average\ Upward\ Price\ /Average\ Downward\ Price\ )]$$

2.2.3 Limitation of RSI

The RSI is a momentum indicator that shows whether a security is overbought or oversold. It works best when it agrees with the long-term trend. It can give false signals when the price reverses sharply or moves strongly in one direction. It is most effective in a ranging market where the price swings between highs and lows (Fernando, 2024).

2.3 Understanding Moving Average Convergence/Divergence

The Moving Average Convergence/Divergence (MACD) indicator is a tool that shows the strength and direction of a trend. It has two lines that move up and down without limits. When the lines cross, it means the trend is changing. It is like using two moving averages. As shown by Figure 7, shows a real example of MACD lines helping to the stock's movement in the short term.
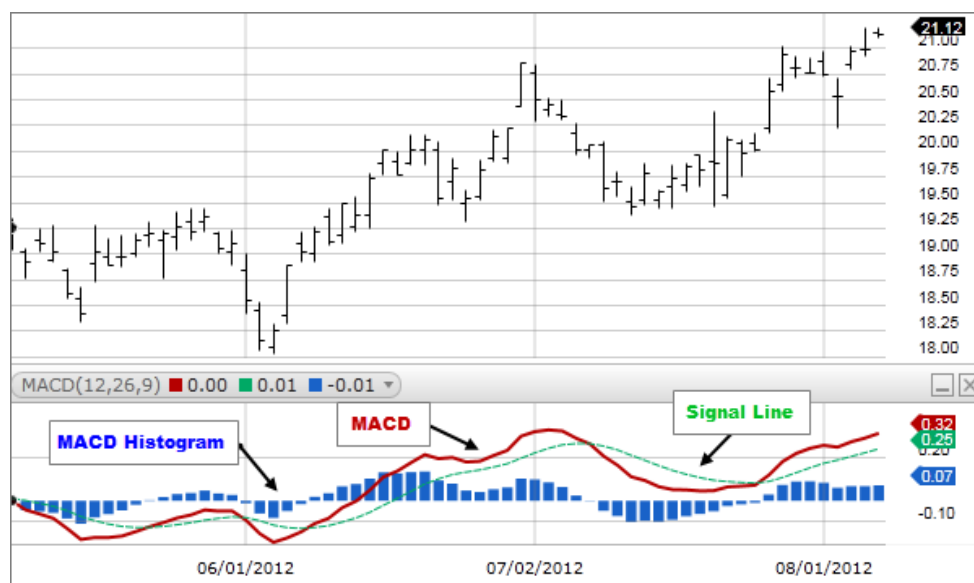
Figure 7: MACD with Signal Line Example (Dolan, 2024)

The MACD line is the difference between a fast and a slow-moving average, and the signal line is another moving average of the MACD line. The MACD line and the signal line oscillate around a zero line, which represents the equilibrium between the two moving averages. A positive MACD value means that the fast-moving average is above the slow-moving average, indicating an upward trend or a bullish momentum. A negative MACD value means that the fast-moving average is below the slow-moving average, indicating a downward trend or a bearish momentum. The MACD value becomes more positive or negative as the gap between the two moving averages widens, reflecting a stronger trend (FIDELITY, 2024).

A crossover occurs when the MACD line and the signal line intersect. A bullish crossover happens when the MACD line crosses above the signal line, signaling a potential change from a downtrend to an uptrend. A bearish crossover happens when the MACD line crosses below the signal line, signaling a potential change from an uptrend to a downtrend. The distance between the MACD line and the signal line at the time of the crossover indicates the strength of the signal with a larger distance means a stronger signal (FIDELITY, 2024).

A divergence occurs when the MACD and the price move in opposite directions. A bullish divergence happens when the MACD makes a higher low while the price makes a lower low, suggesting a weakening of the downtrend and a possible reversal. A bearish divergence happens when the MACD makes a lower high while the price makes a higher high, suggesting a weakening of the uptrend and a possible reversal. A divergence is more reliable when it is confirmed by a crossover (FIDELITY, 2024). See Figure 8 for an example of MACD divergence.
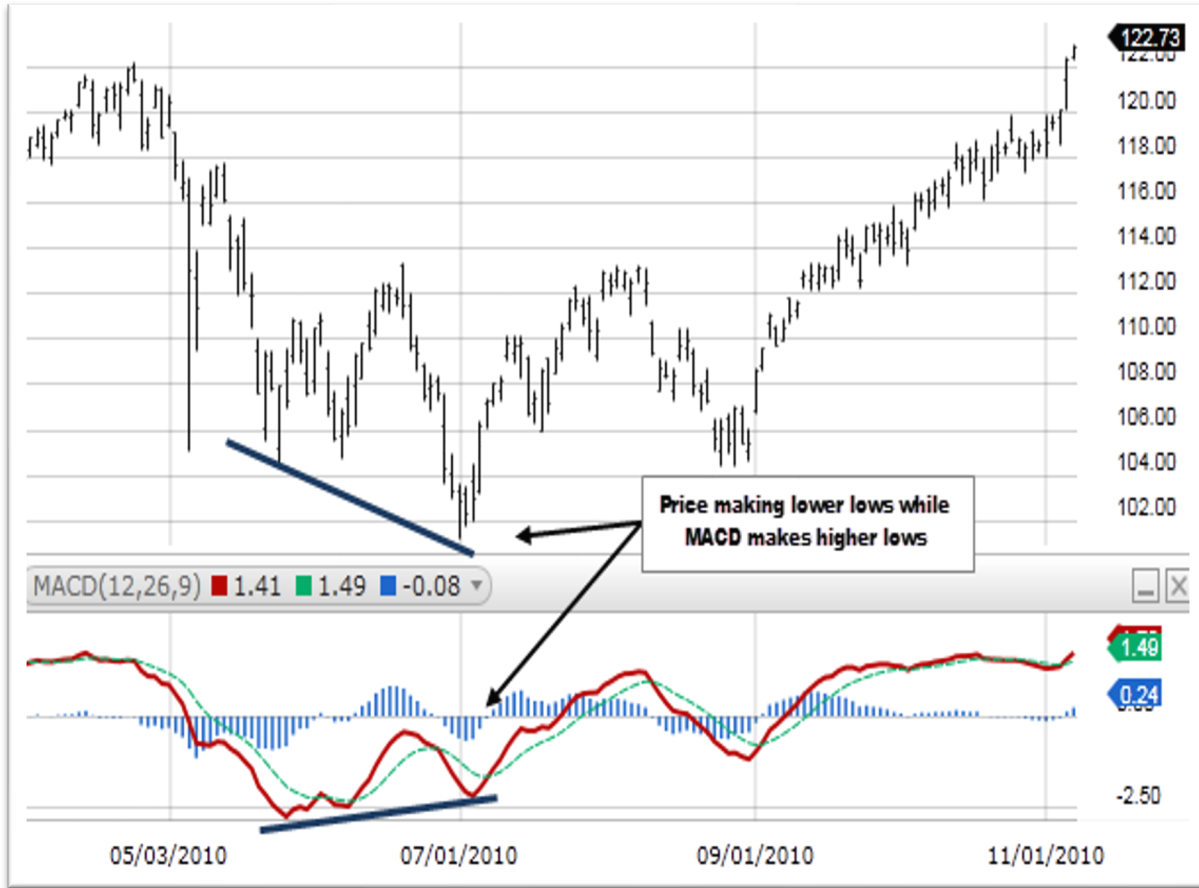
Figure 8: MACD Divergence Example (FIDELITY, 2024)

The MACD is not very useful in a sideways or ranging market, where the price fluctuates within a narrow range. In this situation, the MACD and the signal line will cross frequently, generating many false signals. MACD users usually avoid trading or reduce their exposure in a ranging market to avoid losses or volatility.

2.4 Understanding P/E Ratio

The price-to-earnings ratio (P/E ratio) is a measure of how expensive or cheap a stock is relative to its earnings. Generally, a lower P/E ratio means a better value for both the company and the investors. Value investors often use 20 to 25 as the benchmark for the average P/E ratio. The lower the P/E ratio, the more attractive the investment is.

2.5 Swing Trading

A style of trading that uses technical chart analysis to capture short-to-medium gains in a stock/security over a period of few days to several weeks. A swing trader holds a position for either long or short for more than a few days but no more than a couple of months, however some trades could last longer than a few months depending on the market conditions (Mitchell, 2024).

Swing trading is a strategy that aims to profit from the price changes of an asset over a short period of time where trades look for signals that indicate the future direction of the price, buy, or sell the asset accordingly, and theoretically exit the trade to make a profit. Some swing traders prefer more volatile stocks, while others like more stable ones.

Swing trading and day trading differ in how long they hold positions. Swing traders keep them for days or weeks, while day traders sell them before the market closes. Swing traders face overnight risk, which can cause price gaps. Therefore, they use smaller positions than day traders, who use larger positions and a 25% margin (Mitchell, 2024).

Swing traders understand how to look at multi day chart patterns as discussed above to devise a "plan and strategy that gives them an edge over many trades" and it "involves looking for trade setups that tend to lead to predictable movements in the asset's price" (Mitchell, 2024). The risk/reward ratio measures how much you can gain for every dollar you risk. A higher ratio means a better value. Although we don't need to win every trade to have a high ratio, we need to win enough trades to make more money than we lost.

2.6 Index Trading

When talking about different investing strategies, the concept of index fund investing is very popular since it is focused on long-term growth, minimizing costs, and reducing the impact of market volatility. This method allows for diversification in portfolios since many index funds

cover a broad portion of the market. "The Little Book of Common-Sense Investing," by John C

Bogle heavily advocates for this method and talks about the benefits of investing in index funds

and talks about the various benefits as well as how to best do this.

Diversification is important for all types of investing and serves to protect someone against

the unpredictability of the market. By spreading investments across a range of market sectors, an

investor can reduce the impact of a single investment or segment from performing poorly or

underperforming. Under certain conditions, some investments and stocks can go up, while others

go down, due to the nature of the economic conditions of their specific markets. This will lead to

a balance in an investor's portfolio, mitigating the potential losses.

When it comes to index funds, diversification is somewhat built into many different funds,

such as the S&P 500, which represents the 500 largest and most stable companies, which come

from various industries. This ensures that someone who invests in index funds will have a good

level of sector diversification in their portfolio. Another form of diversification is geographical,

which comes from investing in not only local markets, but also international and emerging markets,

as this can lead to more spread-out risks and can even improve the returns. This strategy

acknowledges the global nature of business and finance, offering protection against domestic

market fluctuations and economic downturns.

There are certain things to be careful of when attempting to make money on index funds,

such as a temptation to time the market. In his book, Bogle warns against attempting to predict the

market for short term movements, which lowers the effectiveness of investing in index funds long

term. This is because the risk of concentrating too much into one index, even though there is a

potential for short term performance, is against the main approach of index fund investing.

When choosing index funds for investment, it is important to understand the different metrics that they are measured by. One important one is the expense ratio, and it is important because it directly impacts the cost efficiency for the fund. The other main one is the tracking error, which measures how close a fund's performance is to its benchmark index. We want this to be as close as possible to ensure that the fund meets the market exposure it is intended to. Other factors that we must consider are the fund's yield, performance history, and the number of assets under management, all of which are important and give insights to the fund's performance.

The main limitation of investing in index funds is that it is passive by nature. Index funds are meant to mirror the performance of a market index, meaning that the funds composition reflects that of the index it tracks, regardless of current market conditions or the outlook of the securities within the fund. This means that the fund cannot outperform the stock market, as it is only meant to mirror the market, so if an investor wants greater returns, they should use a different method.

Another drawback has to do with market capitalization weighting, which is the cornerstone of index investing. Most conventional index funds use market capitalization to weigh their holdings, which means that a larger percentage of the index is made up of companies with higher market values. This strategy might result in concentration risk, where investors may suffer big losses if the largest companies in the fund underperform. The fund would be disproportionately weighted towards these companies. Although this risk can be reduced by diversifying across industries and regions, many index funds' market cap-weighted structure may nevertheless unintentionally result in concentration in some areas.

Another factor to examine is market efficiency. The efficient market theory, which holds that stock prices always accurately reflect all available information, is the foundation of index funds. But markets aren't always fully efficient, and active managers could be able to spot cheap

companies or industries and take advantage of these inefficiencies. Because index funds are not actively managed, investors are unable to take advantage of these possibilities.

Two more things that may reduce the efficacy of index fund investment are liquidity and size. Certain index funds may have reduced liquidity, making it more difficult to acquire or sell shares without affecting the price, particularly those that track less well-known or more specialized indexes. Also, it may be difficult to effectively duplicate the index due to the sheer scale of many index funds, particularly when buying or selling sizable positions in smaller, less liquid equities.

Other factors that may affect the efficacy of index fund investment include liquidity and size. Certain index funds may have less liquidity than others, particularly those that track less well-known or more specialized indexes, which makes it more difficult to acquire or sell shares without influencing the price. Replicating the index efficiently can also be difficult with some index funds due to their massive size, particularly when it comes to buying or selling significant positions in smaller, less liquid securities.

2.7 Options Trading

Options trading offers a unique technique that differs significantly from the long-term, cost-reduction plan of index fund investing. Buying and selling options contracts on a variety of securities provides a more complex and potentially lucrative investing channel than index funds, which strive for long-term gain and broad market exposure. This approach is inherently riskier and more sophisticated since it necessitates a thorough understanding of market dynamics and the capacity to predict short-term changes in stock values.

Options trading allows for significant diversification in an investment portfolio, but in a different way than index funds. Index funds offer exposure to a diverse selection of companies within an index, whereas options trading uses a variety of tactics, including calls, puts, spreads,

and combinations, to diversify risk and potential gain. These techniques provide investors with the freedom to hedge their positions, speculate on market moves, or create income, all of which can be customized to suit varying market perspectives and risk tolerances. But this kind of diversification necessitates a deep comprehension of the options market and the elements—like volatility, time decay, and the price fluctuations of the underlying asset—that affect options pricing.

The dependence of options trading on timing and market forecasting is one of its most important features. Options trading necessitates active management and a calculated approach to timing market entrances and exits, in contrast to the passive index fund technique. Since options' leverage can increase both profits and losses, traders must have a clear risk management plan. The set-and-forget approach of investing in index funds, where market timing is discouraged, contrasts with this active involvement.

Like the factors involved in selecting index funds, choosing the appropriate options strategies, and managing them will require an awareness of numerous important variables. Nevertheless, the measurements used in options trading are more complex and comprise the price of the option, its intrinsic and extrinsic values, implied volatility, as well as the Greeks, delta, gamma, theta, and vega, which quantify how sensitive the option's price is to different variables. These measures shed light on the risk and possible profitability of an options strategy.

Options trading has substantial risks, most notably the chance to lose the entire investment in a short amount of time, along with the potential for large rewards. It is less appropriate for people looking for a passive investment method or for people who lack a thorough understanding of financial markets due to the complexity of the alternatives and the requirement for fast, informed selections.

Chapter 3: Company Evaluation

Intelligent stock or security selection involves more than just analyzing charts or numbers; it necessitates a thorough understanding of the company behind the investment. By digging beneath the surface and gaining insights into the company's fundamentals, investors can make informed decisions that align with their financial goals and risk tolerance.

3.1 Evaluation Strategies

The book "How to Make Money in Stocks: A Winning System in Good Times and Bad" by William O'Neil, 2024 teaches how to evaluate a company with acronym CANSLIM as follows:

3.1.1 Current Quarterly Earnings per Share: The Higher, the Better

The stocks we choose will have a significant rise in their current quarterly EPS (the latest reported quarter) versus the same quarter a year ago. The Earning-Per-Share (EPS) is the company's net income divided by the total shares outstanding. This EPS growth rate is a key factor in picking stocks since the higher the growth rate, the more valuable the stock is. "Current quarterly earnings per share should be up a major percentage– 25% to 50% at a minimum—over the same quarter the previous year" (O'Neil, 2024).

3.1.2 Annual Earnings Increases: Look for Significant Growth

One of our criteria for choosing growth stocks is to look for companies that have high annual earnings growth rates, preferably 25% to 50% or more (O'Neil, 2024). Besides the earnings growth rate, there are two other indicators of profitability and growth that you should pay attention to: return on equity and cash flow per share. These metrics show how efficiently a company uses its capital and generates cash from its operations. The "EPS Rating measures a company's two most recent quarters of earnings growth against the same quarters the year before and examines its

growth rate over the last three years. The results are then compared with those of all other publicly traded companies and rated on a scale from 1 to 99, with 99 being best. An EPS Rating of 99 means a company has outperformed 99% of all other companies in terms of both annual and recent quarterly earnings performance" (O'Neil, 2024).

3.1.3 New Products, New Management, New Highs: Buying at Right Time

The price of a stock surges when something new happens. This could be a new product or service that boosts sales and earnings, a new management that improves the company's performance, or a new industry trend that favors the company's business. These factors can create a competitive edge and drive up the stock value.

3.1.4 Supply and Demand: Shares Outstanding Plus Big Volume Demand

The law of supply and demand affects the price of everything, including stocks. Stocks with many shares are harder to move than stocks with a small number of shares. To find good stocks, look for these factors:

- A management team that is innovative and proactive
- A company that is buying back its own shares
- A low debt-to-equity ratio
- A high trading volume

3.1.5 Leader or Laggard: Which Is Your Stock?

The Relative Strength (RS) rating is a unique indicator that compares how well a stock has performed in price over the last year to all other stocks. It assigns a score from 1 to 99, where 99 is the highest. A stock with an RS Rating of 99 has beaten 99% of all other stocks in price performance. A stock with an RS Rating of 50 has matched the average price performance of all

other stocks (O'Neil, 2024). Buying cheap stocks that are underperforming the market is usually a bad idea. Focus on the stocks that are leading the market and buy them. Sell your losing stocks if they drop 8% from your purchase price to avoid bigger losses.

3.1.6 Institutional Sponsorship: Follow the Leaders

Institutional sponsorship means the amount of stock that is held by institutions. The price of a stock goes up when there is a lot of demand, and the main buyers of stocks are institutional investors. These include mutual funds, pension funds, hedge funds, insurance companies, big investment advisors, bank trusts, and public or nonprofit organizations.

3.1.7 Market Direction: How to Determine It

A successful investor should know how the economy changes over time and how long each cycle lasts. We will study the recent cycles and not assume they will repeat the past. The market does not change direction easily. It often tests the patience and confidence of the traders with several false moves. When most traders give up, the market reverses and starts a new trend. This is driven by the psychology of the crowd. The market usually bottoms out before the economy does because the market predicts the future based on all the available information. We will use the market as a leading indicator of the economy, not a lagging or a coincident one.

3.2 Our Companies

Our strategy is to capitalize on the recent boom in AI and the subsequent chip manufacturing boom is well-reflected in our stock picks. Companies like ARM and ASML are directly involved in the chip manufacturing process, while Apple, Netflix, and Palantir are significant consumers of chips and AI technologies. Super Micro Computer, Inc. provides the

necessary hardware infrastructure to support these technologies. This diversified approach could potentially offer a balanced risk-reward profile.

Here's a brief explanation of some companies we've picked for the Swing Trading strategy:

1. Apple Inc. (AAPL): Apple is a multinational technology company that designs, develops, and sells consumer electronics, computer software, and online services. Its products include the iPhone, iPad, Mac, Apple Watch, and Apple TV. Apple's strong brand and robust product ecosystem make it a staple in many portfolios.

2. ARM Holdings (ARM): ARM is a British semiconductor and software design company whose primary business is the design of CPU cores that implement the ARM architecture family of instruction sets. ARM's technology is at the heart of many digital devices, including smartphones and tablets.

3. Netflix Inc. (NFLX): Netflix is a subscription video on-demand over-the-top streaming service. It primarily distributes original and acquired films and television shows from various genres, and it is available internationally in multiple languages. Netflix's strong subscriber growth and expanding content library make it an attractive investment.

4. Palantir Technologies Inc. (PLTR): Palantir is a software company that develops data fusion platforms for big data analytics. Its recent AI-related products include Palantir Gotham, Palantir Apollo, and Palantir Foundry. Palantir's software is used by many government and corporate clients for data analysis.

5. Super Micro Computer, Inc. (SMCI): Super Micro Computer, Inc., together with its subsidiaries, develops and manufactures high-performance server and storage solutions based on modular and open architecture. It offers servers, motherboards, chassis, power supplies, and other accessories.

6. <u>ASML Holding NV (ASML):</u> ASML is a leading supplier of photolithography machines used in the semiconductor manufacturing industry. It is a key player in the global technology industry, with its products being crucial in the production of microchips.

Here's a brief explanation of some options holdings and the strategy we've used:

1. <u>Microsoft Corporation (MSFT):</u> Microsoft is a technology company that develops and supports software, services, and devices. It operates in three segments: Productivity and Business Processes, Intelligent Cloud, and More Personal Computing. We've taken a short position on Microsoft, indicating that we expect the stock's price to decrease.

2. <u>NVIDIA Corporation (NVDA):</u> NVIDIA is an American semiconductor company and a leading global manufacturer of high-end graphics processing units (GPUs). NVIDIA holds approximately 80% of the global market share in GPU semiconductor chips as of 2023. Like Microsoft, we've taken a short position on NVIDIA, suggesting that we anticipate a drop in the stock's price.

Our strategy involves capitalizing on recent earnings dates and overhyped AI stocks using the Relative Strength Index (RSI) for each stock. The RSI is a momentum indicator that measures the speed and change of price movements. Traditionally, an RSI reading of 70 or above indicates an overbought situation, while a reading of 30 or below indicates an oversold condition. By using the RSI, you can identify potential reversals in a stock's price trend, which can be particularly useful when dealing with overhyped stocks. This strategy allows us to potentially profit from price corrections in these overvalued stocks.

Here are the RSI values for our stocks:

1. <u>Microsoft Corporation (MSFT):</u> The 14-day RSI for Microsoft is 76.24. This is above the typical overbought threshold of 70, suggesting that the stock might be overpriced and could be due for a price correction (see Figure 9 for 2024 RSI chart of MSFT).

Figure 9: MSFT RSI Chart

2. <u>NVIDIA Corporation (NVDA):</u> The 14-day RSI for NVIDIA is 82.41. This is significantly above the overbought threshold, indicating that the stock might be overvalued and could experience a price drop (see Figure 10 for 2024 RSI chart of NVDA).

Figure 10: NVDA RSI Chart

These RSI values support your strategy of shorting these stocks. High RSI values can indicate that a stock is overvalued and may suggest that the stock's price could decrease soon. However, it's important to remember that while the RSI is a powerful tool for predicting market trends, it is not infallible and should be used in conjunction with other indicators and methods.

3.3 Our Index Funds

Domestic Market:

- <u>VFIAX</u>: Vanguard 500 Index Fund is noted for having cheap fees and is managed by Vanguard. Its goal is to give investors exposure to the 500 biggest American corporations. The fund is a desirable choice for investors on a tight budget because of its low expense ratio of 0.04%.

- <u>SWPPX</u>: Charles Schwab runs the Schwab S&P 500 Index Fund. which has an incredibly low expense ratio of 0.02%. This fund enables investors to follow the S&P 500's performance closely while paying very little in fees.

- <u>FXAIX</u>: Fidelity 500 Index Fund has an extremely low-cost ratio of 0.015%, this fund provides exposure to the S&P 500. It is intended for investors who want to buy large-cap American equities at a reasonable price.

- <u>FNILX</u>: Fidelity Zero Large Cap Index is a Fidelity fund that is unique for cost-saving because of its zero-expense ratio, which offers exposure to large-cap U.S. equities to investors at no direct cost.

- <u>PREIX</u>: T. Rowe Price Equity Index 500 Fund targets investors wanting T. Rowe Price's management style and competence, offers an opportunity to invest in the S&P 500 at a higher expense ratio of 0.20% than its peers.

All these funds are run by well-known financial institutions and provide relatively low expense ratios. When combining all of them, there is wide coverage of many different sectors, giving investors good opportunities to get started in the stock market with lower stakes than with other forms of trading.

International Markets:

- Vanguard European Stock Index Fund; Admiral (VEUSX): The Fund employs an indexing investment approach by investing all its assets in the common stocks included in the FTSE Developed Europe All Cap Index.

- Invesco International Dividend Achievers ETF (PID): The Fund will normally invest at least 90% of its assets in the securities that comprise this index. The companies within the index have increased their aggregate annual dividend payments over the course of the last five years.

- WisdomTree Japan Hedged Small-Cap Equity Fund (DXJS): The Index provides exposure to Japanese equity markets while at the same time neutralizing exposure to fluctuations of the value of the Japanese yen relative to the US dollar.

- Schwab International Index Fund (SWISX): Provides diversified exposure to international stocks across both growth and value sectors, focusing on developed markets.

Each fund has its own strategy for international exposure, from dividend-focused investments to broad market coverage, catering to different investor preferences for geographic and sector diversification.

Chapter 4: Swing Trading Simulation

The Swing trading strategy started with a total of $100,000 of cash. We plan to invest roughly between $5,000 - $10,000 into viable stocks which we anticipate rising within the next few weeks. Through Swing Trading, we will be testing our stock predictions in a short timeframe.

4.1 Week 1 (2/12 – 2/16)

As shown in Table 1, We bought into 5 stocks that we anticipate rising due to the overarching market conditions. Currently, we hold $54,602.61 in cash since we anticipate better trading conditions ahead hence, cash liquidity enables us to open positions in the upcoming weeks.

Table 1: Week 1 of Swing Trading Portfolio Transactions (2/12 - 2/16)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
							100,000	
2/16	AAPL	Buy	182.31	56	10209.36	0	89790.64	0
2/16	ARM	Buy	128.34	80	10267.2	0	79523.58	0
2/16	NFLX	Buy	583.95	17	9927.15	0	69596.43	0
2/16	PLTR	Buy	24.44	365	8920.60	0	60675.83	0
2/16	SMCI	Buy	803.32	6	4819.92	0	55,855.9	0

In general, the tech industry has performed well over the past year, with the global semiconductor industry recovery taking hold with more growth projected for 2024. The AI boom is driving impressive gains in tech stocks, and the demand for AI computing power is escalating.

We plan to focus on tech stocks and companies involved in the semiconductor industry due to AI compute demand seems to be in line with these trends.

This past February 2024, ARM's stock had been skyrocketing due to a combination of market conditions. The company joined a new partnership with major hardware and software providers to advance AI in the telecom industry. Additionally, bullish analyst coverage, likely contributed to the surge in ARM's stock (as showcased in the Figure 11 below).

Figure 11: Stock Performance of Arm Holding

Similarly, in February 2024, Super Micro Computer Inc (SMCI) had a significant surge in its stock price. The company's capacity accelerated its growth over the next three years. The healthy demand for AI servers will be a key growth driver for the company which aligns with our strategy of capitalizing on the rise of companies involved in the semiconductor industry.

Lasty, In the fourth quarter of 2023, Palantir achieved a record quarterly profit of $93 million, marking a remarkable threefold increase compared to the same period in the previous year.

Following this impressive earnings report, Palantir's stock experienced a significant surge, with shares jumping approximately 17% in after-hours trading. Over the past 12 months, the stock has doubled in value. The company's commercial sector also demonstrated robust growth. Commercial revenue for Q4 2023 reached $284 million, reflecting a substantial 32% increase year-over-year. Notably, sales from U.S. commercial customers surged by an impressive 70%. Looking ahead, Palantir's guidance for Q1 2024 is positive, with revenue projected to be in the range of $612 million to $616 million. These technical indicators suggest a promising outlook for the company.

4.2 Week 2 (2/19 – 2/23)

By the end of this week, we hold $8,635.64 in cash with our total net worth valued at $98,478.02 hence our overall gains from Swing Trading are -$1,521.98. This week was a result of tech stocks surging ahead by leveraging Artificial Intelligence. The week began with stocks lower because of Treasury bond yields being higher as the U.S. consumer price index (CPI) and producer price index (PPI) inflation reports for January came in hotter than expected (Fehr, 2024). Stocks recovered from a sharp drop after Tuesday's CPI inflation report, and the S&P 500 even approached new all-time highs last week. The AI chipmaker Nvidia's better-than-expected revenues, together with even higher forecasts for the next quarter, saw its stock surge by 16.4% to close at $785.37. Nvidia added $277 billion to its market capitalization, the largest single-session gain in value on record (Thompson, 2024).

During this week, as shown in Table 2, we predominantly purchased chipmakers stocks such as ASML and AMD considering the recent surge in AI stocks. However, we also purchased Software-As-A-Service (SaaS) stocks like Meta and HubSpot because of their recent success.

Table 2: Week 2 of Swing Trading Portfolio Transactions (2/19 - 2/23)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
2/23							54,602	
2/18	ASML	Buy	918.60	11	10,104.60	0	44,497.4	0
2/22	TSLA	Buy	196.85	52	10,236.20	0	34,261.2	0
2/22	AMD	Buy	183.08	53	9,703.24	0	24,557.9	0
2/22	FDX	Buy	243.74	21	5,118.54	0	19,439.4	0
2/22	META	Buy	489.18	11	5,380.98	0	14,058.4	0
2/22	HUBS	Buy	605.54	9	5,449.86	0	8,635.58	0

ASML's stock had a strong performance in this past month with the company's shares rising 18%. Since ASML has a dominant share in the markets it serves, hence giving it pricing power. With the rise in AI semiconductor industry, the stock was expected to outperform expectations and send its stock higher.

Similarly, AMD's stock is having a strong performance. The company's shares are up 123% over the last year and still have plenty of room left to run thanks to its potential in AI. Meta's shares jumped more than 20% in aftermarket trading after reporting their Q4 and full year 2023 results.

4.3 Week 3 (2/24 – 3/01)

In week 3, due to the strength of our portfolio, we made 2 swing sell trades which increased our cash to $18,395.61 (see Table 3 below). Our portfolio has witnessed 3.7% gain with the current net worth of $103,699.67. During this week, the tech-focused Nasdaq Composite rose 1.14% on

Friday, continuing its ascent after closing last month at its first record high since 2021. Technology stocks are riding high following Nvidia's latest blockbuster earnings report, which helped push the Nasdaq-100 and the S&P 500 technology sector to fresh record highs last week. Micron could win big from this market in the long run, especially considering that it has already landed a significant customer in the form of Nvidia, which dominates the global AI chip market hands down (MSN). Next week, we plan to investigate the possibility of adding Micron to our portfolio.

Table 3: Week 3 of Swing Trading Portfolio Transactions (2/14 – 3/01)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
2/23							8,635.58	
2/29	HUBS	Sell	616.15	1	616.15	10.74	9,251.73	10.74
2/29	PLTR	Sell	25.02	365	9,132.3	211.70	18,395.61	211.70

Palantir Technologies has been under the spotlight for its remarkable performance in the stock market, primarily driven by significant institutional support and solid fundamentals. Over the past year, PLTR has seen a surge in institutional volumes, with each green bar on the volume chart indicating a substantial increase in share trading, propelling the stock to new heights (see Figure 12 below). This interest from institutions is backed by a robust fundamental backdrop, as Palantir has demonstrated positive sales and EPS growth in recent years. The company's EPS is projected to climb by an impressive 20% this year, reflecting the optimism surrounding its forward earnings potential. Moreover, Palantir's inclusion in MAPsignals' Top 20 report, albeit only twice, underscores its potential as a top pick among stocks, cutting through market noise. The consistent

Big Money buying in PLTR shares is a testament to the stock's strength and its appeal for inclusion in a diversified portfolio, especially considering its historical gains and strong fundamentals.
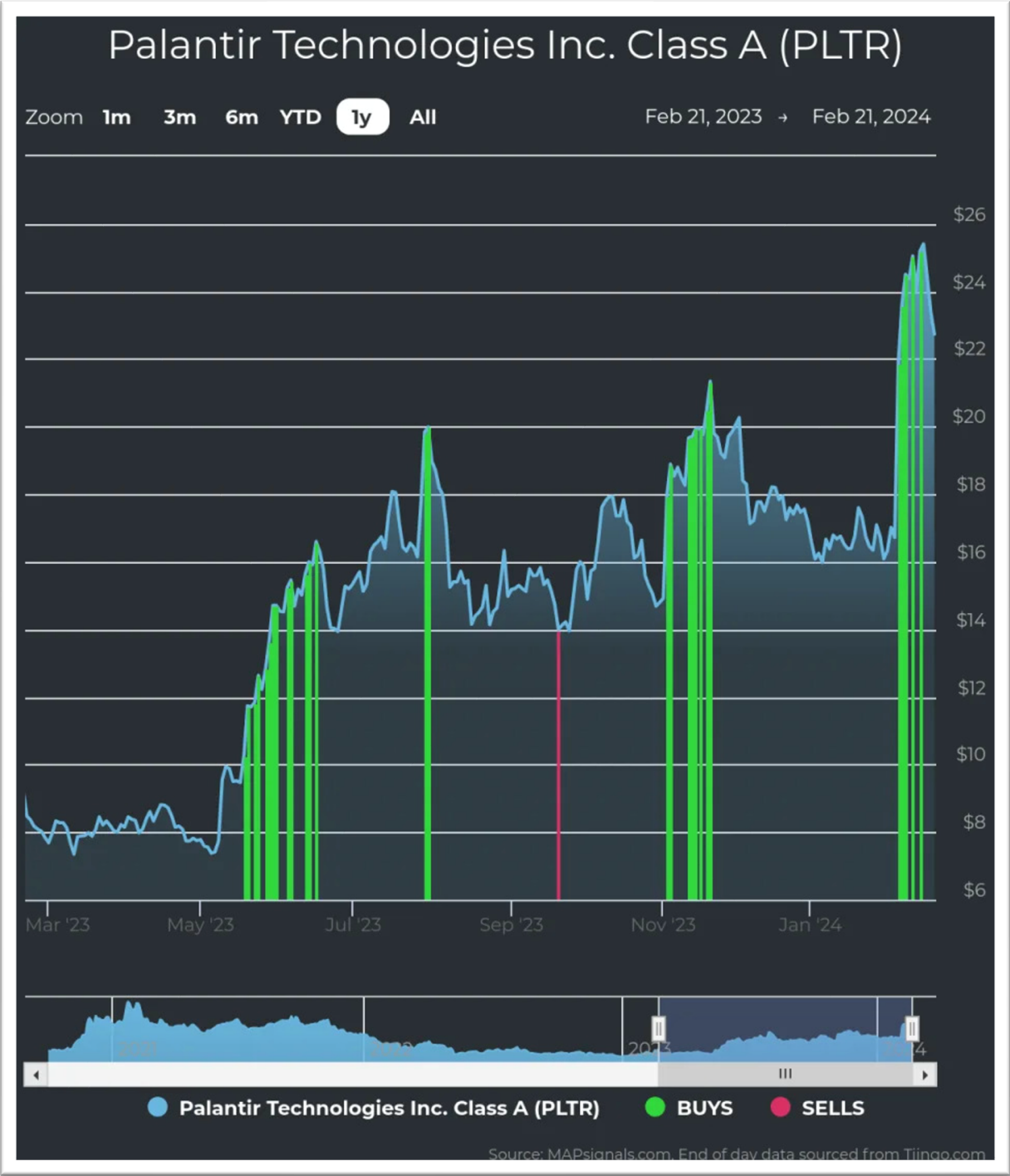
Figure 12: Palantir Stock Analysis

However, the Figure 13 demonstrates the relatively sluggish stock performance after a sudden rise earlier this month. The relatively stable stock performance alongside low volume trading days prompted us to sell the security in-order to reinvest our swing trading portfolio into more worthy picks.

Figure 13: Palantir (PLTR) Stock Chart

4.4 Week 4 (3/04 – 3/08)

There were a few headlines to describe this week's stock market: S&P500 Record Height, Jobs Reports, Tech Sector Gains, and Late-Semiconductor Sell-off. The S&P500 hit a new all-time closing high on Thursday (3/07) with a 1% gain influenced by the Federal Reserve's positive job expectation (Bromberg, 2024). Additionally, the tech sector with NASDAQ hit a record peak with AI-influenced semiconductor stocks reaching a 52-week high. As shown in Table 4, our swing

trading portfolio reached a peak value of $104,124.25 on Thursday (3/07) which corresponds to market conditions. However, on the last trading day, stocks experienced a decline after the jobs report, with significant losses in the tech sector, particularly affecting companies like Nvidia. On Friday (3/08), the semiconductor industry saw a downturn with companies like Broadcom and Marvell Technology forecasting disappointing earnings, leading to a drop in stock prices. Table 4 showcases how our portfolio faced the consequences of the market downturn on Friday (3/08).

Table 4: Week 4 Portfolio Overview

Date	Cash	Net Worth	% Return
3/8/24	$51.65	$101,764.27	1.76%
3/7/24	$8,000.30	$104,124.25	4.12%
3/6/24	$18,403.53	$102,687.19	2.69%
3/5/24	$18,400.89	$101,762.88	1.76%
3/4/24	$18,398.25	$103,497.54	3.50%
3/3/24	$18,395.61	$103,699.67	3.70%

With $18,395.61 in cash, our goal was to reallocate our portfolio, emphasizing the tech sector and specifically targeting the high-growth semiconductor industry. This strategy allowed us to balance a stable performer (tech) with a leading riser (AI & Semiconductor). Firstly, we divested all our holdings in non-tech-focused stocks, including HubSpot ($HUBS) and FedEx ($FDX), due to insufficient volume support. Figure 14 displays the monthly chart for HUBS and FDX, highlighting the day we sold our positions. Although our swing trade in HUBS yielded a net profit, the absence of clear leading patterns prompted us to exit. Similarly, with FDX, we identified a Cup-with-Handle pattern and sold at the peak of the handle. While we recognize FedEx's growth

potential, it does not align with our tech-focused portfolio. Consequently, any losses within FedEx would not be offset by additional stocks from the broader industry. Our market research supports diversification within the tech sector rather than venturing outside of it.
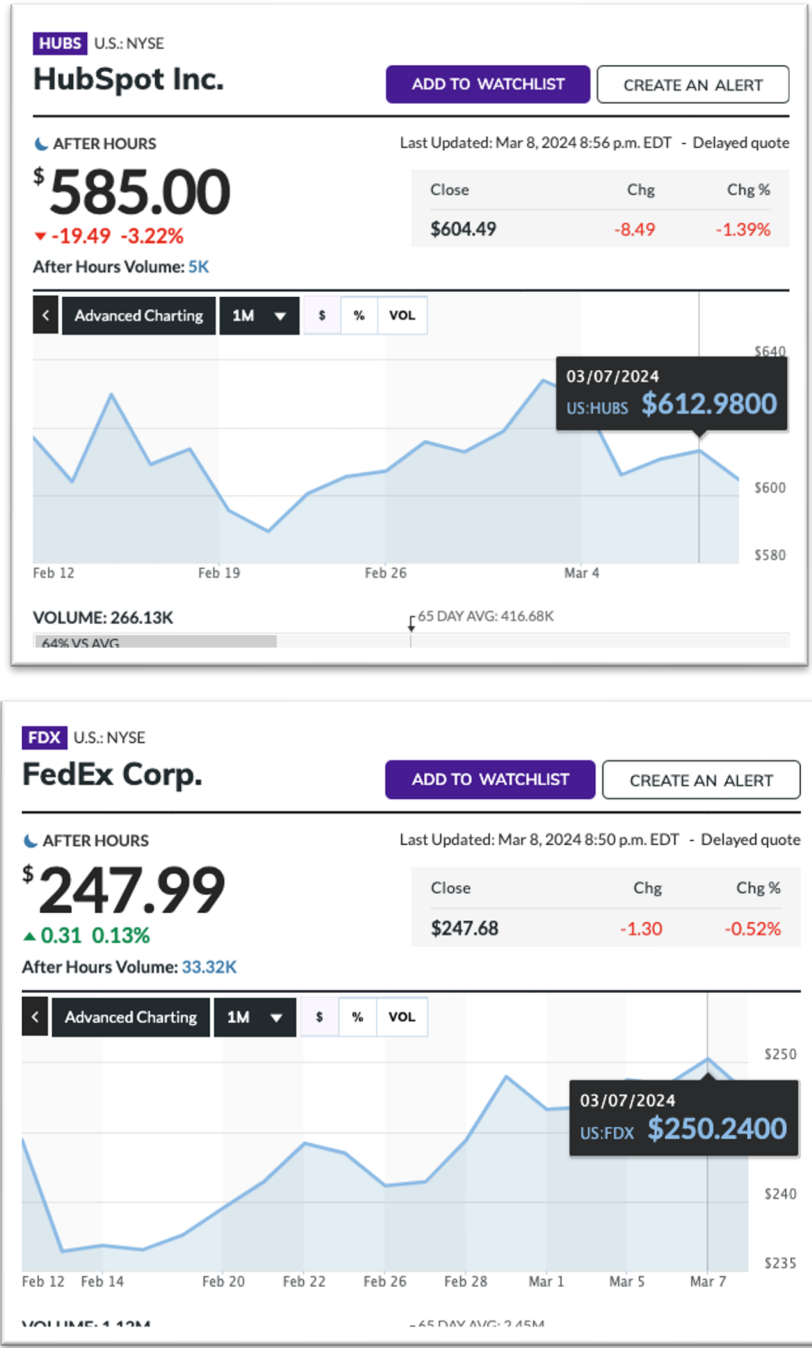
Figure 14: Monthly Stock Charts of HubSpot & FedEx

Table 5 contains our week's swing transactions which represent how we further invested in the semiconductor industry. Taiwan Semiconductor Manufacturing (TSM) reported an 11% revenue increase in February year over year, indicating strong AI-related demand (Bowman, 2024). With a dominant share in the contract chip-manufacturing market and advanced chip-manufacturing segment, TSMC is expected to grow as AI demand persists. Additionally, Qualcomm (QCOM) is a leader in the smartphone semiconductor industry which is expected to make AI investments.

Table 5: Week 4 of Swing Trading Portfolio Transactions (3/04 – 3/08)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
3/03							18,395.6	
3/07	HUBS	Sell	614.57	8	4,916.56	72.24	23,312.2	83.0
3/07	FDX	Sell	250.05	21	5,251.05	132.51	28,563.2	132.51
3/07	TSM	Buy	150.35	137	20,597.95	0	7,965.26	0
3/08	QCOM	Buy	172.80	46	7,948.80	0	51.65	0

4.5 Week 5 (3/11 – 3/15)

In the past week, we actively managed my stock portfolio, making strategic decisions based on market trends and individual stock performance. Our net worth stands at $97,116.51. with overall gains showing a slight decline of -$2,883.49, resulting in an overall return of -2.88%. We currently have $1,235.34 in remaining cash. As shown in Figure 15, the past week was disappointing due to our inability to sell our holdings during the stock market's record week.

Figure 15: Swing Trading Performance Chart

During this week, we simply held all our positions due to poor market conditions except for buying Microsoft. According to 41 analysts, the average rating for MSFT stock is "Strong Buy" (Citation). Microsoft has outperformed the S&P 500 in 2024, over the past year, and over the long haul. Analysts predict that Microsoft's AI technology means more growth ahead. Microsoft Corporation develops and supports software, services, devices, and solutions worldwide. As shown by Figure 16, $MSFT stock witness a double-bottom chart pattern which predicts it is bound to rise if volume persists.
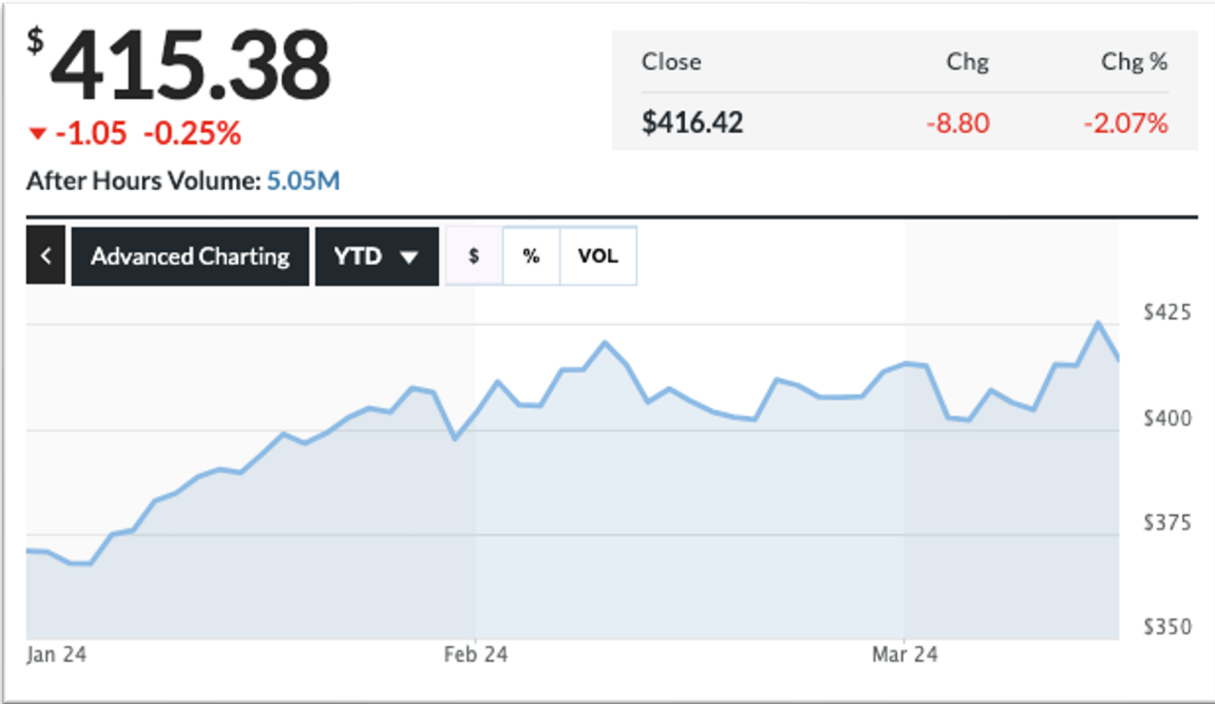
Figure 16: Microsoft (MSFT) Stock Chart

Table 6 listed the trades executed across the past week due to the poor market timing and market conditions in the tech sector. Due to the lack of volume support within $ARM, we sold $ARM to capitalize into a stable FAANG stock.

Table 6: Week 5 of Swing Trading Portfolio Transactions (3/11 – 3/15)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
3/10							51.65	
3/11	ARM	Sell	126.60	80	10,120	-139.2	10179.7	-139.2
3/14	MSFT	Buy	426.06	21	8947.26	0	1,235.34	0

4.6 Week 6 (3/18 – 3/22)

Over the past week, Nasdaq index rose by 2.4% during the week, contributing to a three-week gain of 12%—the strongest performance since April 2020. However, over the last 7 days, the tech industry declined by 1.5%, primarily driven by a pullback from NVIDIA (Harring, 2024). During this week, tech stocks were relatively stable, with little to no movement. Our stock picks experienced a small uptick. Our current net worth is $98,004.62, with roughly $38,000 in cash liquidity. Figure 17 represents our overall swing trading performance, which shows a small gain relative to last week (as shown in Figure 15).
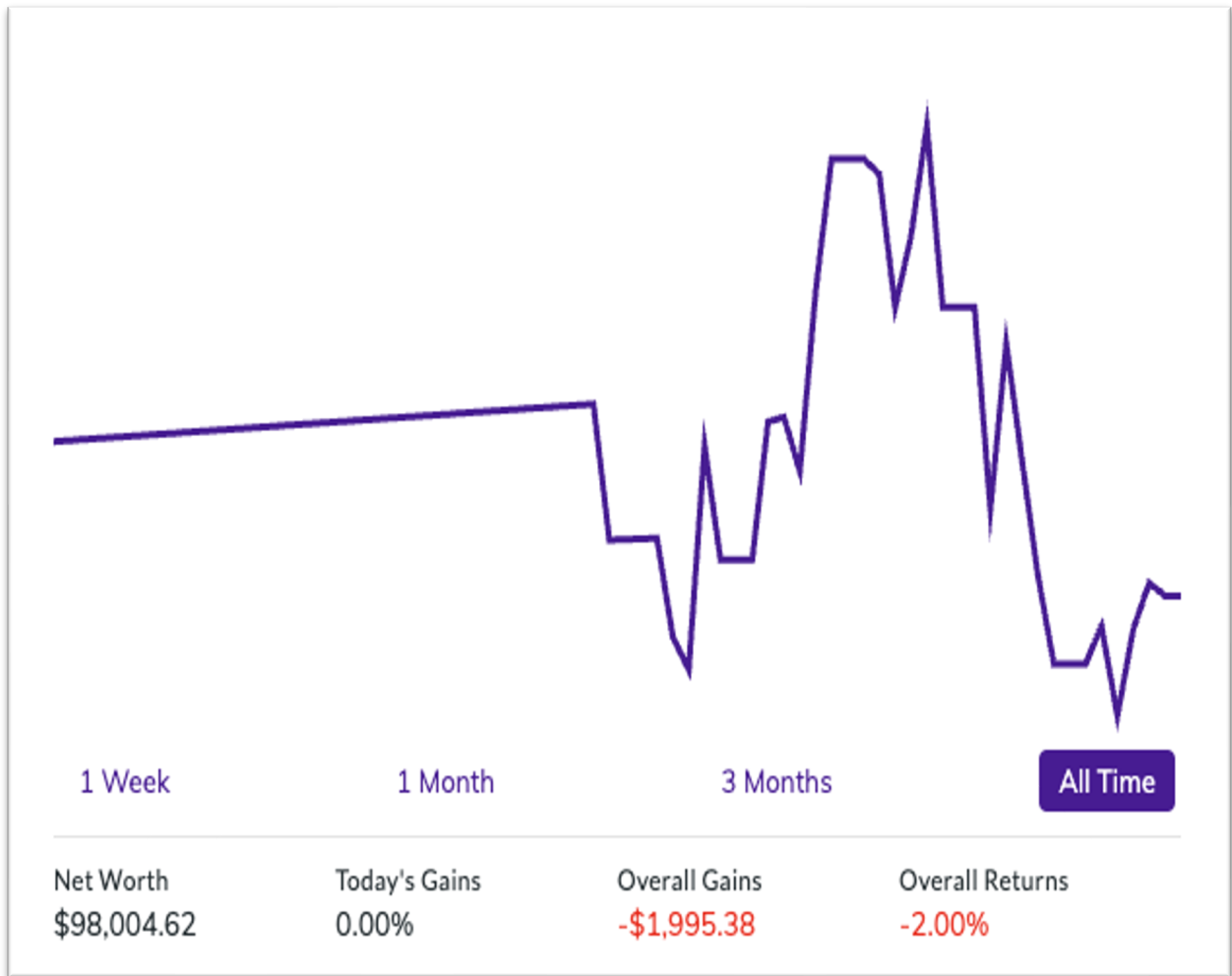
Figure 17: Swing Trading Performance Chart Update

Table 7 represents our few strategical transactions performed during the week in-order to position ourselves with considerable liquidity to have the ability to perform day trades during the upcoming last week of our Stock Market Trading simulation.

Table 7: Week 6 of Swing Trading Portfolio Transactions (3/18 – 3/22)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
3/21							1,235.34	
3/22	NFLX	Sell	627.71	17	10,671.07	743.92	11,906.4	743.92
3/22	QCOM	Sell	171.22	46	7,876.12	-72.68	27,658.6	-72.68
3/22	ASML	Sell	983.00	11	10,813	709	38,471.6	709

4.7 Week 7 (3/25 – 3/29)

As the last week of our trading simulation, we aimed to capitalize as much as possible from our initial investment of $100,000. Over the last week, according to Piper Sandler, stocks are likely to continue rallying despite rising recession risks (Harring, 2024). The investment firm believes that "softer macro data" leading to lower interest rates will set up stocks for "another leg higher". This is an unusual take, as higher rates are typically seen as the biggest threat to the market rally and the most likely catalyst for a correction (Harring, 2024). On Wednesday (March 27), the Invesco S&P 500 Equal Weight ETF (RSP) was up 0.9%, nearly triple the gain of the S&P 500, while the tech-heavy Nasdaq-100 was flat. If the RSP can continue to outperform the major benchmarks, it could be a sign that the rally is broadening out and closing the gap between the "Magnificent Seven" stocks and the rest of the market (Harring, 2024).

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Morgan Stanley's head of global auto and shared mobility research, Adam Jonas, cut his forecast for Tesla vehicle deliveries, expecting the EV giant to raise prices to compensate. Jonas now expects first-quarter deliveries of 425,400, down 9% from his previous estimate. Overall, the tech-heavy Nasdaq Composite slipped 0.12% to finish at 16,379.46 on March 29th, while the S&P 500 rose 0.1% to a fresh record close (Harring, 2024). The market appears to be broadening out, with equal-weighted ETFs outperforming, even as some individual tech stocks like Tesla face headwinds.

Some notable tech stocks movements:

- Micron Technology (MU) rallied after delivering robust earnings results and providing stronger-than-expected revenue guidance, buoyed by demand for its AI-supporting hardware (Vaiman, 2024).

- Super Micro Computer (SMCI) fell after announcing plans to issue an additional 2 million shares, though analysts remain bullish on the company's prospects to capitalize on Nvidia's AI advancements (Vaiman, 2024).

Within our swing trading portfolio, we experienced a $700 loss over the past week, which reduced our net worth to $97,372.46. Consequently, our overall gains stand at -$2,627.54, equivalent to a -2.63% return on our initial $100,000 investment. Figure 18 below illustrates our portfolio's overall performance chart, revealing both rapid ascents and steady declines despite our strategic market bets. The fluctuations in our portfolio's value are closely tied to the overall tech sector. Although we peaked simultaneously with the tech-heavy NASDAQ, the subsequent flat market prevented us from fully capitalizing on the broader market conditions.
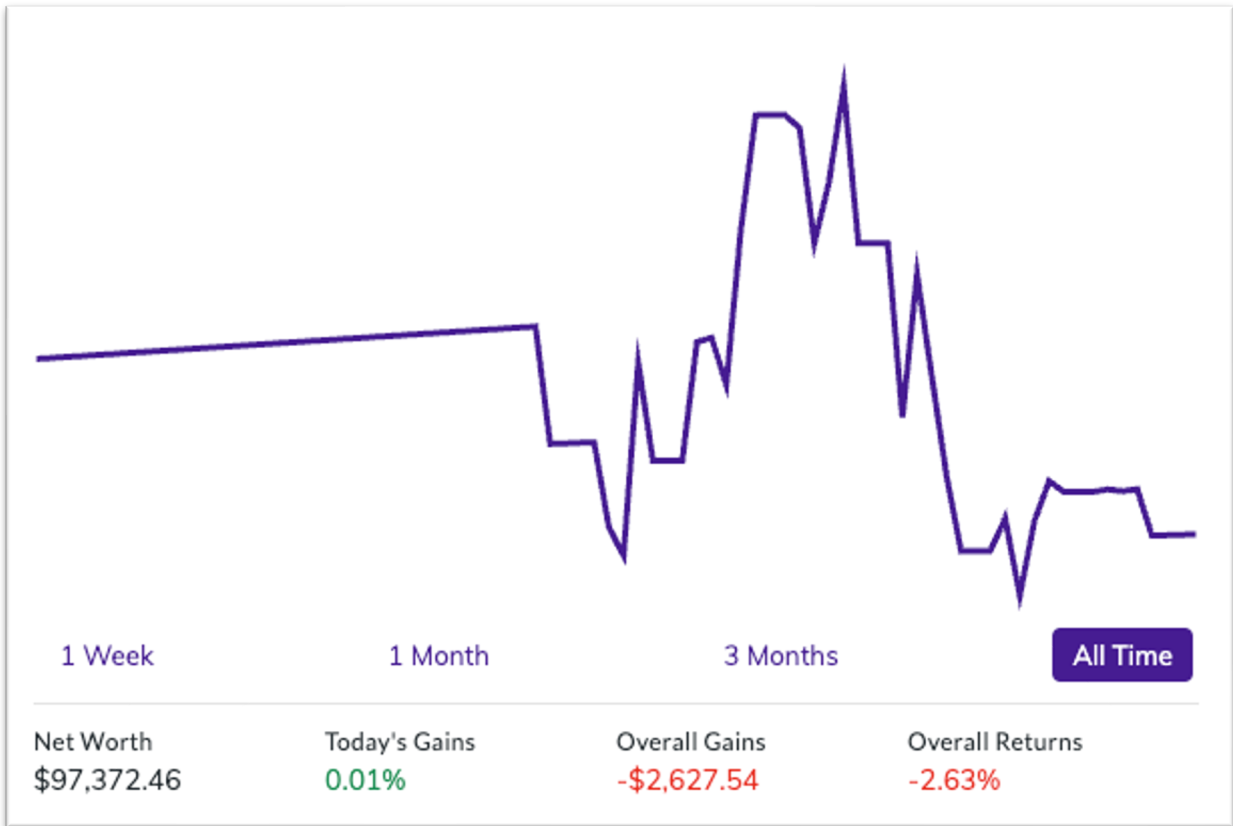
Figure 18: Swing Trading All-Time Performance Chart

Table 8 below represents our transactions from the past week which mainly include all the sold shares which we had purchased across the duration of our trading simulation.

Table 8: Week 7 of Swing Trading Portfolio Transactions (3/25 – 3/29)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
3/24							48,471.6	
3/25	MU	Buy	118.80	101	12,000	0	36.471.0	0
3/25	AMD	Sell	181.72	53	9,631.16	-72	46,102.0	-72
3/29	META	Sell	485.58	11	5,341.38	-39.57	51,443.0	-40
3/29	MU	Sell	117.89	101	11,906.89	-92	63,000	-92
3/29	SMCI	Sell	1,010.03	6	6,060.18	-207.30	69,000	-207
3/29	TSLA	Sell	175.79	52	9,141.08	-1,095	78,200	-1095
3/29	TSM	Sell	136.05	137	18,638.85	-1,930	97,372	-2000

Figure 19 contains the stock chart of Super Micro Computer Inc (SMCI) whose price has seen a significant rise in the past 2 months. The stock price has increased from around $413 at the 200-day simple moving average (SMA) to the current price of $1,009.54, a gain of over 140%. The 50-day SMA has risen from $824.33 to $1,009.54, indicating a strong upward trend in the medium-term. The MACD (Moving Average Convergence Divergence) indicator is at 45.44, signaling a buy signal for SMCI stock. The Relative Strength Index (RSI) is at 54.06, which is in the neutral range but trending higher, implying the stock is not overbought. The Bollinger Bands (25) and (100) are both in the buy range, further confirming the bullish technical outlook for SMCI. However, despite all these indicators, we remained relatively neutral in the 4 weeks where we held the stock because of our inability to time the market. As shown by Figure 19, we invested in mid-

February when the stock was trading roughly at $1,000. The stock peaked in early-March around $1,250 in relation with the overall semiconductor industry peaks (see the middle label in Figure 19). However, our inability to capitalize on this stock rise by remaining adamant and holding onto the stock till the end of the simulation period. We eventually completed our stock position on March 28th when the SMCI trading price was slightly lower than our buy price.

Figure 19: Super Micro Computer Inc ($SMCI) Chart with Labels

Similarly, another missed opportunity was Advanced Micro Devices (AMD) stock. Figure 20 contains the chart of our trading period of AMD. In the past 2 months, the stock price has increased from around $133.46 at the 200-day simple moving average (SMA) to the current price of $170.48, a gain of over 27%. The 50-day SMA has risen from $181.69 to $170.48, indicating a bullish medium-term trend. The 20-day SMA has increased from $184.37 to the current stock price

of $170.48, suggesting the short-term trend is also bullish. The MACD (Moving Average Convergence Divergence) indicator is at -2.98, signaling a sell signal for AMD stock. The Relative Strength Index (RSI) is at 40.23, which is in the oversold range, implying the stock is undervalued. The Bollinger Bands (25) and (100) are both in the buy range, further confirming the bullish technical outlook for AMD. In summary, the technical analysis indicates that AMD stock has seen a strong and sustained rally over the past 2 months, with multiple technical indicators pointing to a continued bullish trend, despite the recent sell signal from the MACD.

Our inability to time the market our swing trade led us to miss out of 16% rise in our investment. Initially, we invested into AMD on February 22nd for roughly $170 and sold the stock on March 28th for also roughly $170. However, in early March, the stock peaked at around $210 which was in-correlation with the overall semiconductor industry.
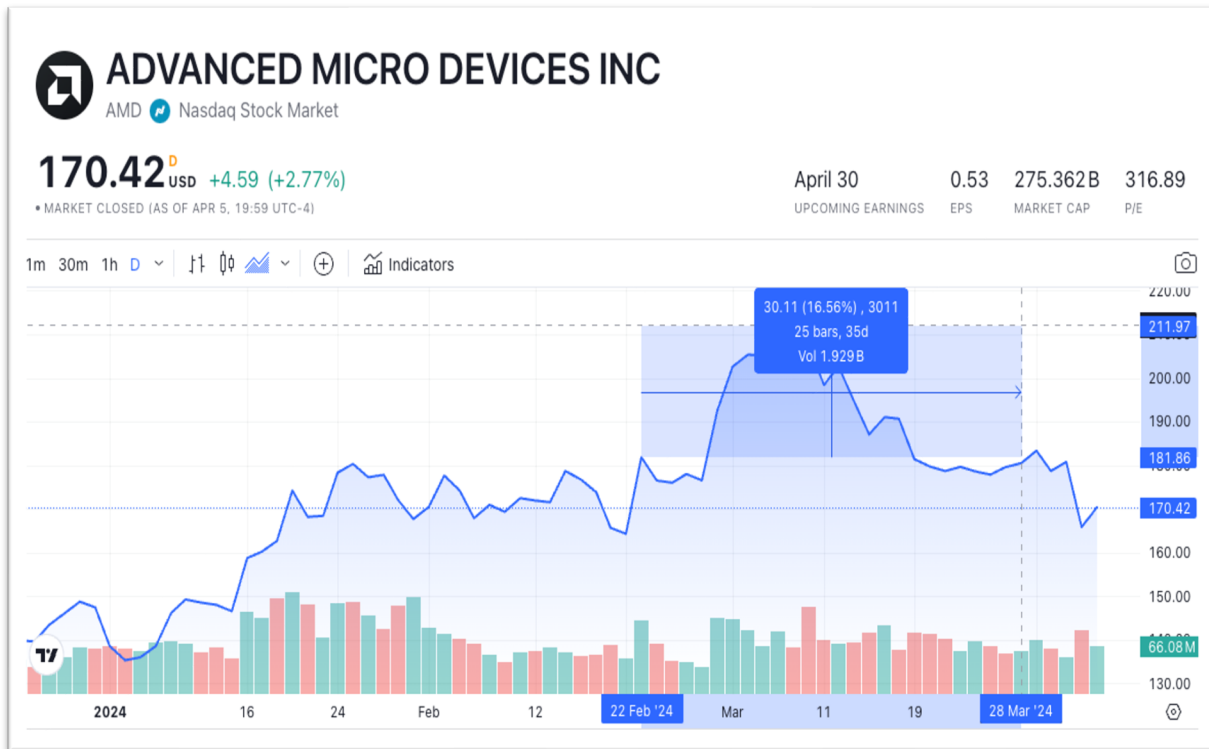
Figure 20: Advanced Micro Devices ($AMD) Chart with Labels

4.8 Chapter Summary

The swing trading portfolio started with $100,000 in cash and was focused on short-term trades in stocks predicted to increase in price. Initial investments were between $5,000 and $10,000, targeted mainly tech stocks in line with sector growth trends and AI compute demand, while maintaining a small cash reserve for upcoming opportunities.

Throughout the simulation, the swing trading approach required constant market analysis and relied on the tech sector's momentum, especially in AI and semiconductor industries. While there were fluctuations in the portfolio's net worth, strategic sell trades and the reinvestment of proceeds demonstrated an active management style. The simulation saw both gains from successful trades and losses from market downturns, emphasizing the importance of market timing.

As the simulation ended, the portfolio did not realize the anticipated growth, with a net loss from the initial capital. Despite our efforts, this simulation highlighted the challenges of swing trading, especially in a sector as volatile as tech. The final net worth of $97,372.46 represented a return of -2.63%, showing the difficulty of market timing, stock selection, and sector performance.

Chapter 5: Options Trading Simulation

The options trading strategy started with a total of $100,000 of cash. We want to invest around $10,000 in each company, with both put and call options depending on what our research informs us to do. Although our research will not always tell us the correct thing to do, since the market is always changing, it gives us a good idea for what should be done, and we should be able to make money in the long run, though it is a much more involved approach.

5.1 Week 1 (2/12 – 2/16)

In week 1 of options trading, we purchased 5 different options, all done on Friday morning, around an hour after the market opened. For the stocks that we think will go up, we purchased puts, such as for AMD and UBER, as they are performing well, while other companies such as HOOD, MSFT, and TSLA are underperforming, so a call was purchased. More details on the pricing can be seen in Table 9.

Table 9: Week 1 of Options Trading Portfolio Transactions (2/12 - 2/16)

Date 2024	Symbol	Buy Sell	Put Call	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
2/16								100,000	
2/16	AMD	Buy	Put	8.35	12	9060.00	0	90,940	0
2/16	HOOD	Buy	Call	1.23	88	10384	0	80,556	0
2/16	MSFT	Buy	Call	4.65	21	8190	0	72,366	0
2/16	TSLA	Buy	Call	11.55	9	9900	0	62,466	0
2/16	UBER	Buy	Put	3.75	24	10200	0	52,266	0

5.2 Week 2 (2/19 – 2/23)

In week 2, we simply bought 3 options because of the volatile nature of the stock market. Additionally, we bought to sell aka sold 2 options contracts: one at a small profit and another at a massive loss. Currently, our net worth has plummeted to $70,659 from our original $100,000 however, we still hold $27,000 cash which gives us ample liquidity for potential profits. As shown in Table 10, we redistributed our investments from $AMD and $MSFT into more risky options.

Table 10: Week 2 of Options Trading Portfolio Transactions (2/19 - 2/23)

Date 2024	Symbol	Buy Sell	Put Call	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
2/19								52,266	
2/22	BA	Buy	Call	7.55	14	10,570	0	41,696	0
2/22	AMD	Sell	Call	2.48	12	0	-7.044	44,672	-7.044
2/22	MSFT	Sell	Call	5.55	21	0	1,890	56,327	1,890
2/22	AAPL	Buy	Call	1.81	55	9,955	0	46,372	0
2/22	RIVN	Buy	Call	1.63	50	8,150	0	38,222	0

5.3 Week 3 (2/24 – 3/01)

In week 3, we simply bought 2 options and closed 1 option because my account value had recovered to $98,000 with expiring contracts for the next week hence, we were hoping to close my options when need be. Currently, my account value is $81,946.00 which is a $10k increase from the previous week. And our buying power aka cash has increased to $37,616.00. Because of the

increased number of expiring contracts during the next week, we plan to reallocate our cash into

viable opportunities hence, we hold increased cash amounts (see Table 11).

Table 11: Week 3 of Options Trading Portfolio Transactions (2/24 – 3/01)

Date 2024	Symbol	Buy Sell	Put Call	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
2/19								48,222	
2/29	HOOD	Sell	Call	3.25	88	10,384	18216	66438	18216
2/29	ARM	Buy	Call	13.75	12	16,500	0	49938	0
2/29	PANW	Buy	Put	11.05	11	12,155	0	37783	0

5.4 Week 4 (3/04 – 3/08)

During Week 4, our portfolio primarily consisted of expiring options, resulting in a net

worth of $98,416.00, with a substantial cash reserve of $81,676.00. As the markets soared to record

heights, we strategically leveraged technology-related call options. However, we encountered

challenges in managing losses and missed opportunities.

For instance, our Apple ($AAPL) Call option at a strike price of $140, expiring on 3/08,

incurred nearly $10,000 in losses due to Apple's declining stock price over the past month.

Unfortunately, we failed to cut our losses promptly. Similarly, we held onto Boeing and Uber

options for too long, missing potential gains.

To offset these setbacks, we capitalized on Rivian ($RIVN) Call options. Rivian's recent

successful product launches, including multiple new cars, generated significant positive public

interest, resulting in approximately 60,000+ preorders and a subsequent stock rally. Our profit from Rivian options amounted to roughly $5,300 (see Table 12).

Conversely, we also seized an opportunity with a Put option on Palo Alto Networks ($PANW). The stock had experienced substantial growth in recent months, partly fueled by insights from Senator Pelosi—an alleged insider trader—who acquired various Call options for the company. Figure 21 illustrates a brief peak in $PANW following news related to Senator Pelosi. However, overall stock performance declined due to the company's reduced full-year billings and revenue guidance from the previous quarterly earnings.
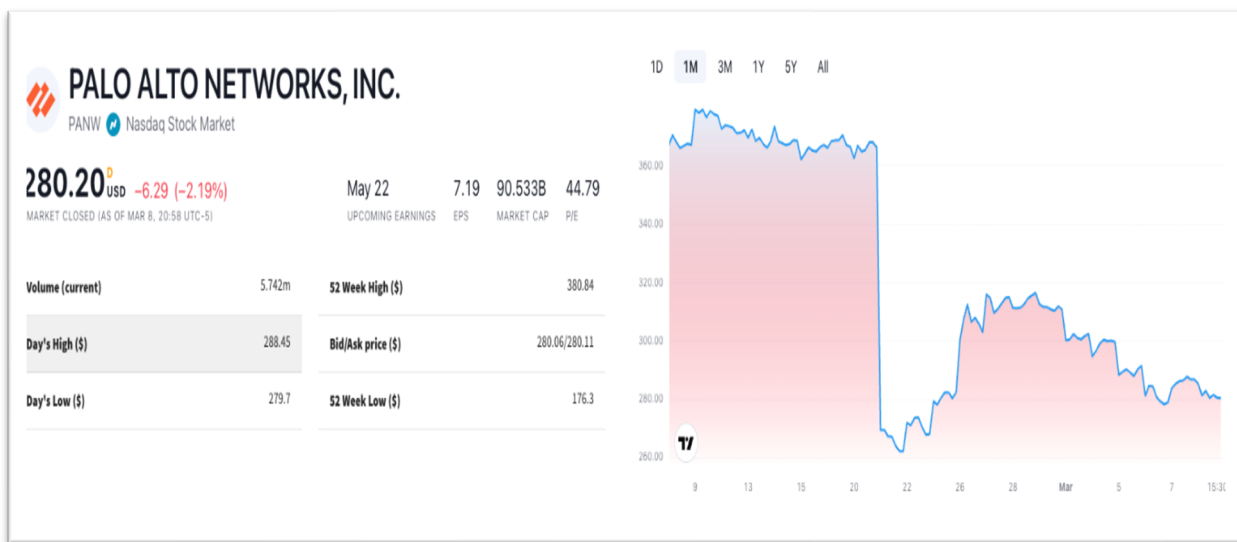
Figure 21: Monthly Stock Chart of Palo Alto Networks

Figure 22 presents the trading chart of Rivian Automotive which represents the immense volatility involved. During mid-February, Rivian investors lost confidence in its ability compete against the behemoth Tesla which led to a massive falling-off (as shown by the below figure) which began the potential Cup-with-Handle stock pattern.
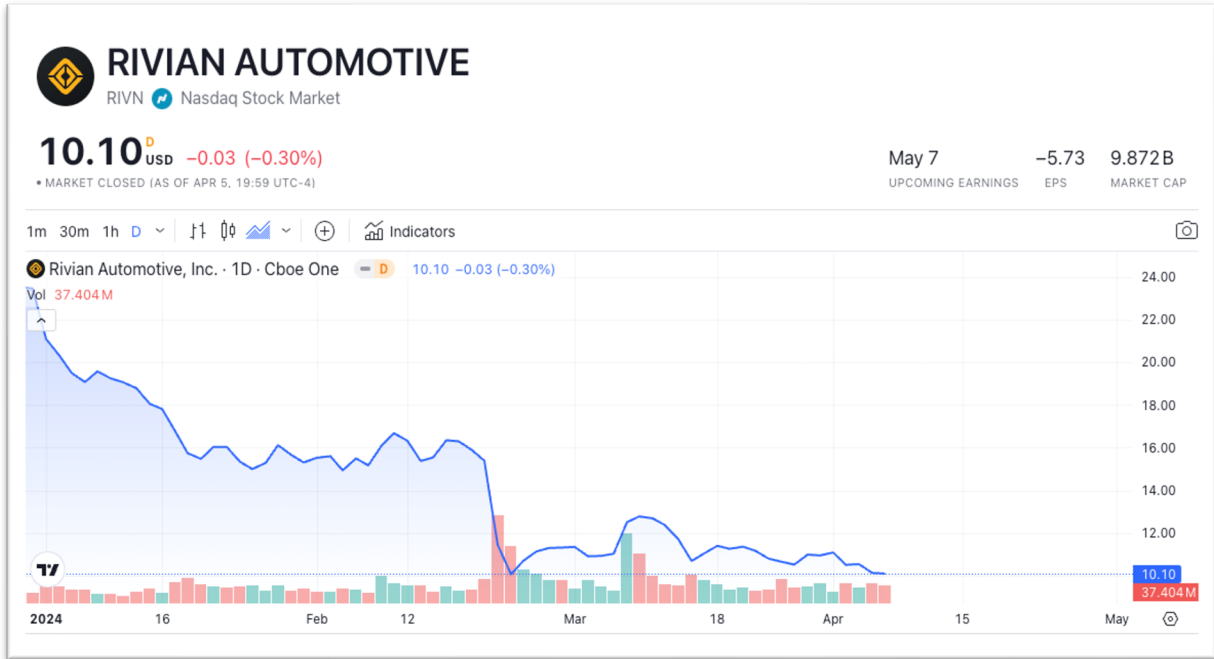
Figure 22: Monthly Stock Chart of Rivian (RIVN)

To capitalize on a potential upturn, Figure 23 below represents the duration of our call option where Rivian stock increased by a solid 14% hence, we timely exercised our call option.

Figure 23: Monthly Stock Chart of Rivian (RIVN) with Labels

Table 12 represents all our transactions from the Week 4 which simply consists of all our expiring contracts being completed because we had bought many contracts with the strike date of Friday (3/08).

Table 12: Week 4 of Options Trading Portfolio Transactions (3/04 – 3/08)

Date 2024	Symbol	Buy Sell	Put Call	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
3/03								37,783	
3/05	PANW	Sell	Put	26.95	11	29,645	17,490	67,428	17,490
3/08	RIVN	Sell	Call	2.69	50	13,450	5,300	80,878	5,300
3/08	AAPL	Sell	Call	0.00	55	0	-9,955	80,878	-9,955
3/08	BA	Sell	Call	0.00	14	0	-10570	80,878	-10570

5.5 Week 5 (3/11 – 3/15)

Despite the challenging market conditions, our net worth of $91,826.00 with $77,371 remaining cash is relatively stable. There's a concern that the hype around AI has driven the 'Magnificent Seven' stocks (which include tech giants like Microsoft, Apple, and Nvidia) beyond the levels seen in the 90's tech bubble (Bromberg, 2024). With 10 stocks accounting for 33% of the S&P 500 market cap and 25% of the index's earnings, market concentration is at a multi-decade high2. However, history shows that the S&P 500 has continued rising in the year after market concentration peaked (Bromberg, 2024).

During this week, we capitalized on the downturn of certain AI semiconductor stocks like Taiwan Semiconductors by buying and selling a short Put option for a few days (see Table 13).

Additionally, with Tesla down 33% YTD, we bought a call option with the hope of its rise. Similarly, Meta is expected to jump with further AI and VR technological advances.

Table 13: Week 5 of Options Trading Portfolio Transactions (3/11 – 3/15)

Date 2024	Symbol	Buy Sell	Put Call	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
3/10								80,878	
3/14	TSLA	Buy	Call	2.85	33	9,405	0	71,473	0
3/14	TSM	Buy	Put	0.62	150	9,300	0	62,173	0
3/14	Meta	Buy	Call	9.75	10	9,750	0	52,423	0
3/15	TSM	Sell	Put	0.73	150	0	1,650	63,473	1,650

5.6 Week 6 (3/18 – 3/22)

Throughout this week, we capitalized on short-term options, resulting in an increase in our net worth to $110,831.00, with an equal amount of $110,831.00 in cash liquidity. In the preceding weeks, we purchased $TSLA and $META call options, leveraging their recent sluggish stock market performance as a rationale for a short rally in the upcoming weeks. We observed a modest upward movement in these securities, contributing to the enhancement of our options portfolio during the past week (see Table 14). By holding all potential cash liquidity for the last week of the stock market simulation, we plan to purchase many options contracts on the first trading day of the next week which will expire at the end of the week. Hence, we will be further experimenting with day-trading options.

Table 14: Week 6 of Options Trading Portfolio Transactions (3/18 – 3/22)

Date 2024	Symbol	Buy Sell	Put Call	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
								73,473	
3/18	TSLA	Sell	Call	6.70	33	22,110	12,705	95,583,	12,705
3/21	META	Sell	Call	11.35	10	11,350	1,600	106,900	1,600

Figure 24 represents the duration of our Tesla Call Option which lasted for 4 days where the stock witnessed a 7% spike despite dried up volume. Due to timing of the option, we were able to more than double our initial investment into the security. However, this was a risky bet because of the market speculation behind Tesla so far this year.

Figure 24: Stock Chart of Tesla (TSLA) with Labels

5.7 Week 7 (3/25 – 3/29)

Over the past week in tech options market, calls were slightly outnumbering puts in the overall options market, with the March 28th $360 call on RH (RH) seeing the most active trading volume. Unusual call activity was seen in the iShares Silver Trust (SLV), with heavy buying of the April 5th $23.50 and $23.00 call options, suggesting bullish sentiment. Estee Lauder (EL) saw an increase in put volume, particularly in the April 19th $146 put, following an upgrade to "Buy" by Bank of America (Time). Investors remain focused on upcoming economic data releases, particularly the Core PCE report, which is the Federal Reserve's preferred inflation measure and can influence interest rate policy (TipRanks). Overall, the tech stock options market saw a mix of bullish and bearish activity, with some individual stocks like Micron and Super Micro Computer performing well, while others like Nike and Lululemon faced headwinds. Macroeconomic factors, such as inflation data and interest rate expectations, continue to play a significant role in shaping the tech sector's performance.

Earlier this week, semiconductor chip stock was on the rise which prompted us to make a short-term call option within ARM which has witnessed a rapid rise since its recent IPO. As showcased in Figure 25, ARM rose roughly 10% prior to our Call Option with increasing volume which indicate strong market backing. However, we were unable to capitalize as ARM incrementally fell for the rest of the week. Overall, leading to falling 10% by the end of the week. On the other hand, we made a risky Call option in tremulous company Boeing as a response to the stock falling roughly 15% prior to the option. This drastic fall was as result of Boeing recent catastrophic manufacturing failures which led to near-death accidents. Hence, we anticipated a small pull-back from institutional investors however the stock continued to plunge.

Figure 25: ARM Stock Chart with Labels

Our Options trading simulation concluded with a net worth of $90,466, reflecting a roughly 10% decline from our initial investment. Table 15 below details our transactions from the past week. Overall, our simulation highlighted that while Options Trading is considered less risky, it demands greater technical expertise due to the significant swings that can occur within the options market, even in response to minor fluctuations in the stock market.

Table 15: Week 7 of Options Trading Portfolio Transactions (3/25 – 3/29)

Date 2024	Symbol	Buy Sell	Put Call	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
								106,900	
3/25-3/29	ARM	Buy - Sell	Call	3.10	25	7,750	-6,000	101,000	-6,000
3/25-3/29	BA	Buy - Sell	Call	1.83	80	15,000	-9,000	90,000	-9,000

5.8 Chapter Summary

The options trading strategy started with $100,000 in capital and focused on active engagement in the market through strategic investments in both put and call options. The goal was to distribute around $10,000 per company based on market research and predictions. The strategy's inherent risk was known, understanding that market volatility can lead to both significant gains and losses.

Over the course of the simulation, the portfolio took various trades in response to market conditions, which included scaling back on transactions during more volatile periods and reallocating resources in response to the market. The strategy was hands-on, requiring close monitoring and quick response to the changing market dynamics.

The net result of this active management was a portfolio that went through substantial fluctuations in value. Initially, the portfolio's value decreased, but later weeks saw a recovery and even an increase in net worth, with the portfolio momentarily surpassing the initial investment before settling at a net decline by the simulation's end.

The simulation showed the complexity and high-risk nature of options trading. Despite the market's unpredictability, the strategy-maintained liquidity, and the capacity for reinvestment, to keep an agile and responsive approach. The transactions, influenced by market performance and specific stock movements, showed the connections between market research, investment decisions, and timing.

The active strategy, while demonstrating periods of success, ultimately resulted in a net loss. The simulation highlighted the complexities and demanding nature of maintaining an options trading portfolio, requiring a high level of market insight and adaptability.

Chapter 6: Index Trading Simulation

The index trading strategy started with a total of $100,000 of cash, which was doubled for purchasing power. We invested between $10,000 and $15,000 in each company, investing more in the larger and more well-known index funds for the local market, as the UK, a large portion of Europe's economy, and Japan, a large part of Asia's economy, have both entered recession. Since it is more likely that the index funds will go up with time, it didn't feel as important to keep some cash in case of unforeseen circumstances. At the end of the simulation, all funds will be sold to check how much money is made, and no more trades will be made until then to not fall into the pitfall of trying to "time the market," which often is more detrimental to how the index trading strategy works.

6.1 Week 1 (2/12 – 2/16)

For index trading, our transactions were made at the end of the first week, along with first day of trading of our other methods, as can be seen in Table 16 below. These "buys" were with the prices of Friday, 2/16, at market open, as the trades were placed at market close on Thursday.

Table 16: Week 1 of Index Trading Portfolio Investments (2/12 - 2/16)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
2/16							100,000	
2/16	VFAIX	Buy	48.26	315.19	15211.07	0	84788.93	0
2/16	VEUSX	Buy	80.39	188.87	15202.15	0	69586.78	0
2/16	PID	Buy	18.16	552	10024.32	0	59562.46	0
2/16	SWISX	Buy	444.84	22.73	10111.21	0	49451.25	0
2/16	DXJS	Buy	31.73	317	10058.41	0	39392.84	0
2/16	FXAIX	Buy	174.01	57.55	10014.28	0	29378.56	0
2/16	PREIX	Buy	131.84	75.95	10013.25	0	19365.31	0
2/16	FNILX	Buy	564.33	17.73	10005.57	0	9359.74	0
2/16	SWPPX	Buy	130.29	77.22	10060.99	0	-701.25	0

6.2 Week 2 (2/19 – 2/23)

During this week of Index fund trading, we experienced roughly 1.5% portfolio increase from our starting net worth of $100,000. Our current net worth is $102,092.28 with no changes in the index funds that we initially invested in. This represents how index funds are associated with stability and marginal yet consistent growth unlike Swing or Option trading. Our largest growth

was the Japanese index fund, DXJS, which is interesting as we expected Japan to be entering a recession while the US market has been performing very well this past week. Our worst-performing index fund was PID, which is understandable, as it tracks Europe's market, which is suffering as the UK falls into recession. The average growth across all our stocks was still 1.58%, while the NASDAQ increased by around 1.4% (from 15775-15996).

6.3 Week 3 (2/26 - 3/01)

During this week of index fund trading, the portfolio to a 2.7% gain from the starting net worth, ending at $102,789.78. Once again, no trade was made to keep in line with index fund trading methodology. All our index funds ended up this week but fluctuated up and down during the week. This is fine as it followed the general market, subject to small fluctuations but will gradually go up as we were warned in our research into this methodology. Although we only saw roughly a 1% increase in our portfolio, the NASDAQ saw a 0.8% increase, so we were able to outperform it with our chosen index funds.

6.4 Week 4 (3/04 – 3/08)

During this week, we saw a small jump in our portfolio, increasing by around 0.7%. Overall, we are up 3.57%, and outperforming both swing and options trading. Our current net worth is at $103,573.69, giving us a total gain of $3,573.69 over the past 4 weeks, as can be seen in Figure 26.
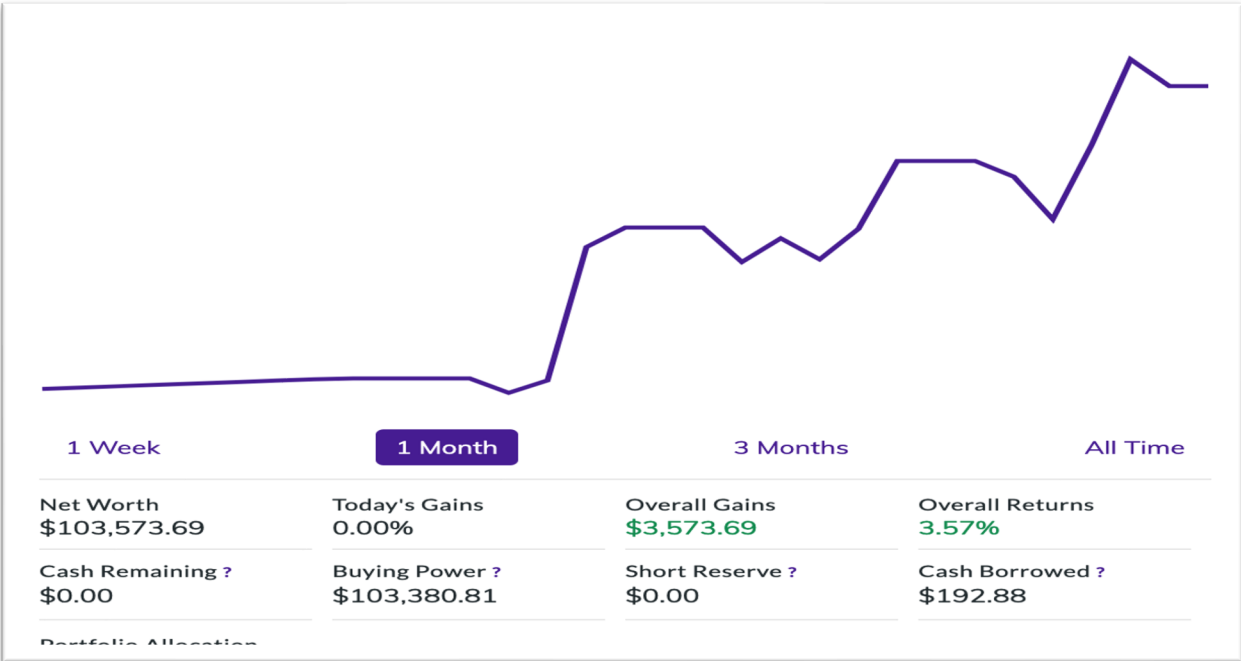
Figure 26: Index Trading Performance Chart of Week 4

In Figure 27 below, we can see the performance of each of our index funds since we initially bought them. All of them have gone up since our first purchase, and the two that had more invested in are substantially up. Our best performing index fund is SWISX, the Schwab International Index Fund, and the second best is VEUSX, the Vanguard European Stock Index Fund. This is surprising, as it is an international index fund, meaning that it includes companies from outside the US, including some from the UK, which is currently entering a recession. Despite this, many semiconductor companies are international, and those stocks performed very well, leading to an increase in this index fund. Our worst performing fund is the Schwab S&P 500, which focuses on US companies. Over the past few weeks, many US companies have released their quarterly reports, and the market has not been going as well as many would like, so it would make sense that the US companies are not performing as well as other markets, although certain companies, such as NVIDIA, have been going up and up, with record profits due to their position in the semiconductor industry. Although it is surprising that the European market is performing so well, it is not as

surprising to see it do better than the US market. Many of the other funds are sitting from 2-3%, which is expected of them, as they follow the general market.

Symbol Shares	% Holdings Type	Price Chg/Chg %	Value Gain/Loss
SWISX 444.84 Shares	10% Buy	$23.71 -0.10 -0.42%	$10,547.15 $435.94 4.31%
VEUSX 188.87 Shares	15% Buy	$83.66 -0.30 -0.36%	$15,800.81 $598.72 3.94%
DXJS 317 Shares	10% Buy	$32.92 0.12 0.37%	$10,435.64 $377.23 3.75%
PID 552 Shares	10% Buy	$18.72 0.03 0.16%	$10,333.44 $309.12 3.08%
VFAIX 315.19 Shares	15% Buy	$49.59 0.11 0.22%	$15,630.38 $419.21 2.76%
FXAIX 57.55 Shares	10% Buy	$178.27 -1.16 -0.65%	$10,258.96 $245.15 2.45%
PREIX 75.95 Shares	10% Buy	$135.06 -0.88 -0.65%	$10,258.24 $244.57 2.44%
FNILX 564.33 Shares	10% Buy	$18.15 -0.12 -0.66%	$10,242.66 $237.02 2.37%
SWPPX 130.29 Shares	10% Buy	$78.74 -0.51 -0.64%	$10,259.28 $198.05 1.97%

Figure 27: Index Funds Individual Performance till Week 4

The next figures are in the same order as the above figure but show a more detailed view of how the fund has been performing. This first one, Figure 28, is for SWISX, our best performing index, and as can be seen, has been consistently going up. Although there are some days during the week where it goes below the day before, it will grow due to the nature of index funds, and how they follow the market.
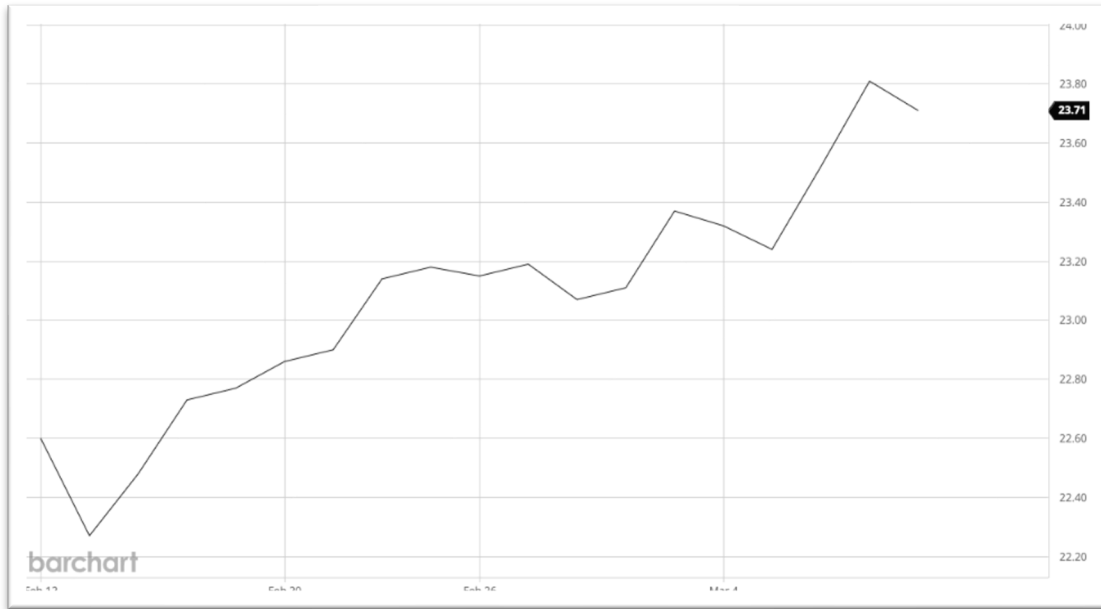
Figure 28: SWISX Index Fund Price Chart 2/12 - 3/09

Figure 29, shows VEUSX, an index fund that has been going up, and performing very similarly to SWISX. They both follow a very similar line, as this has been the pace of the general market, but SWISX was able to outperform it by investing more in better performing companies.
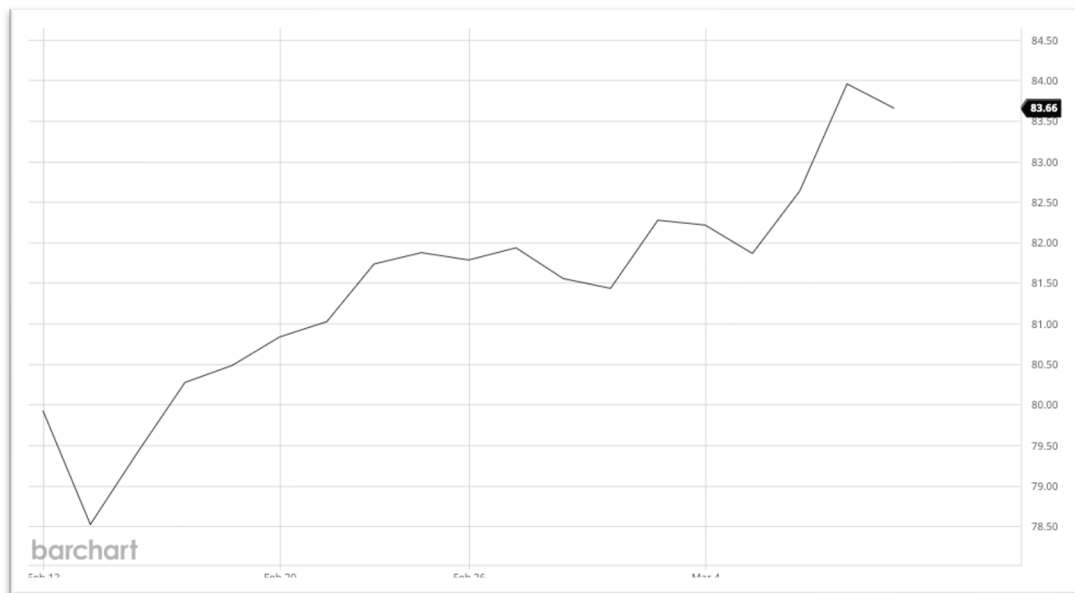

Figure 29: VEUSX Index Fund Price Chart 2/12 - 3/09

Figure 30 shows the price chart for the index fund DXJS, a fund that focuses on the Asian market, heavily invested in Japanese companies. Many Japanese companies have been performing well, although the Japanese Yen is losing value to the US dollar. This market attempts to counteract the various fluctuations that the Yen's value sees relative to the dollar and has been doing well. This index fund hasn't seen as many drops in value compared to the previous funds that track other markets.
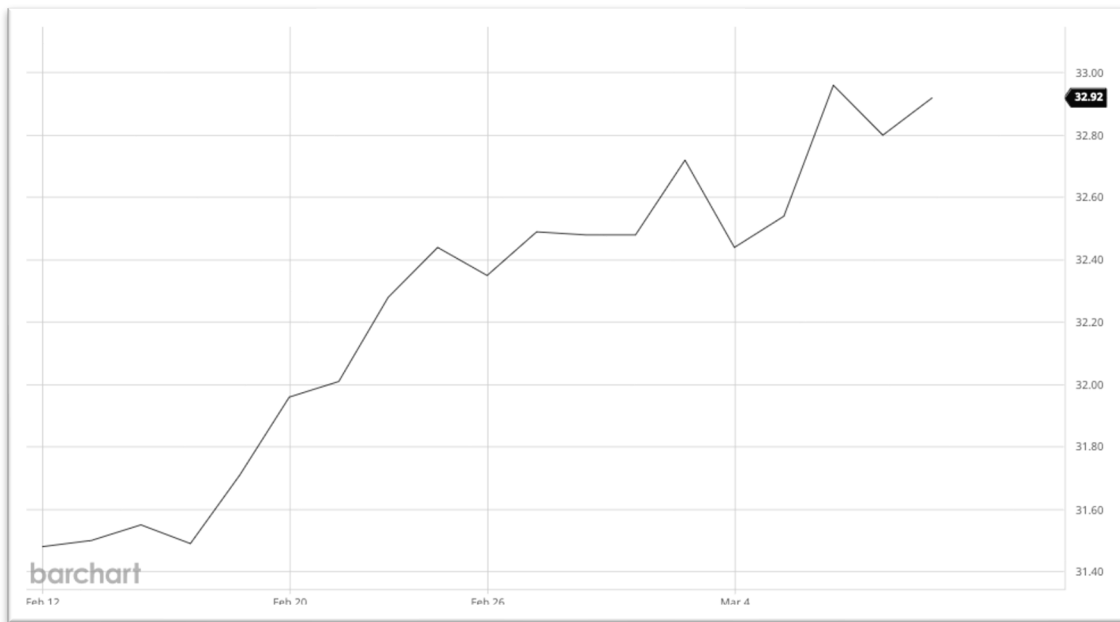
Figure 30: DXJS Index Fund Price Chart 2/12 - 3/09

Figure 31 shows the activity of PID, which saw a major drop at the beginning of the simulation, which is likely why it hasn't performed as well as the other funds. The lowest point that we can see has the fund valued at 17.64, while it is currently at 18.72. Had this simulation started at the drop, the fund would have seen an increase of about 6%, making it the best performing fund by far. The fact that it is still up by 3% shows that the purpose of index fund trading isn't to take larger risks for a larger reward, but rather to simply invest once at the start, and not try to time the market.
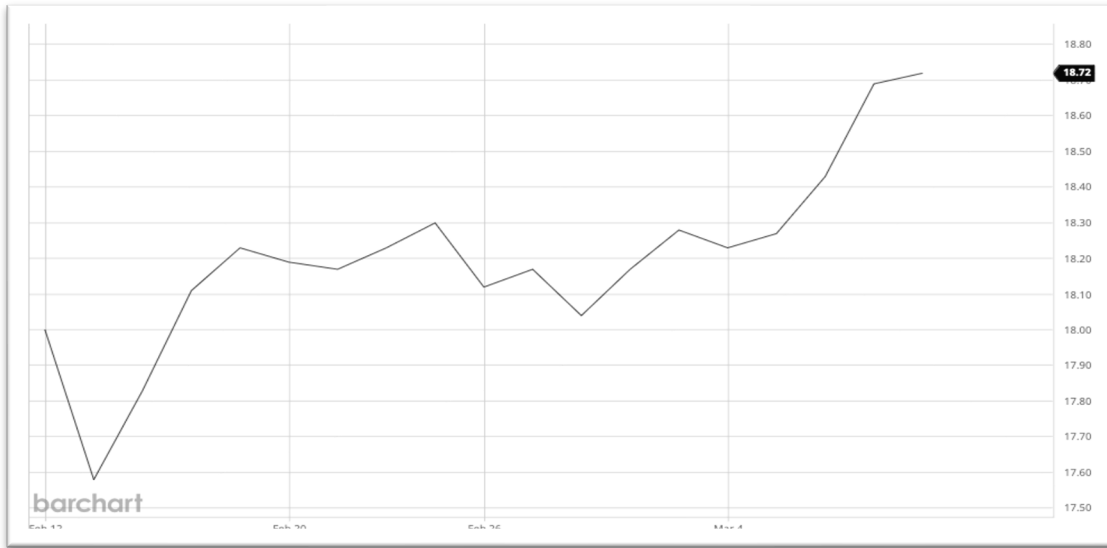
Figure 31: PID Index Fund Price Chart 2/12 - 3/09

Figure 32 below shows the price chart for VFAIX, another fund that is performing well, but is overshadowed by other funds due to experiencing a large drop at the beginning of the simulation. Compared to PID, this fund has been going up more steadily, with less flatline times before a large jump. This shows the different kinds of strategies that different companies use when managing their index funds. It is like VEUSX, another Vanguard fund, but this one tracks the US market rather than the European market.
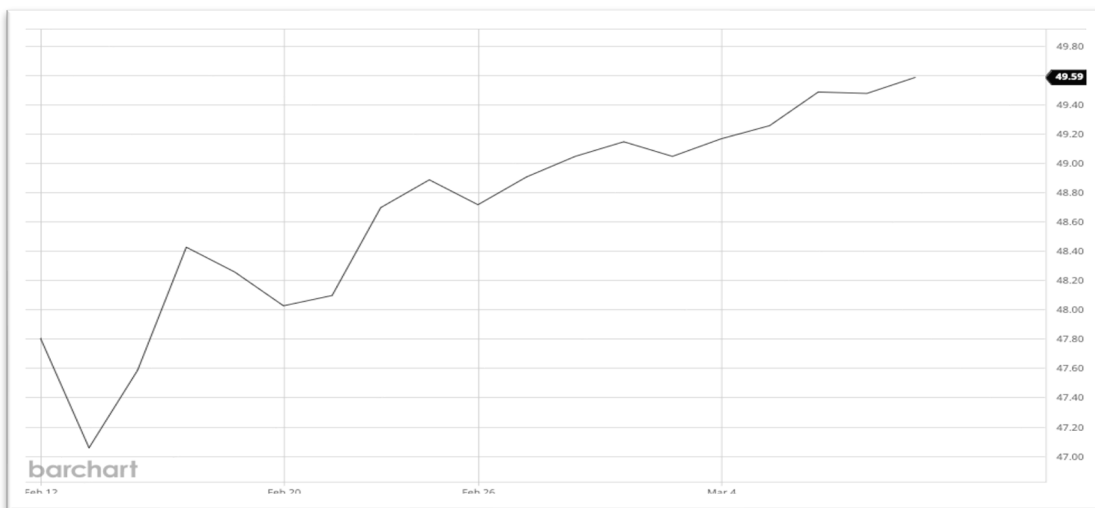
Figure 32: VFAIX Index Fund Price Chart 2/12 - 3/09

Figure 33 shows price chart of FXAIX, an index fund that performs well, but is heavily subject to the volatility of the market. This can be seen in the constant ups and downs over the month that we have held this fund. This is one of the most volatile funds that we have invested in, but has still seen a return of almost 2.5%, once again showing that timing the market is not important when trading index funds. In the long run, index funds will go up, although the day to day may be down or almost the same, they will eventually go up, as was told to us in our research.
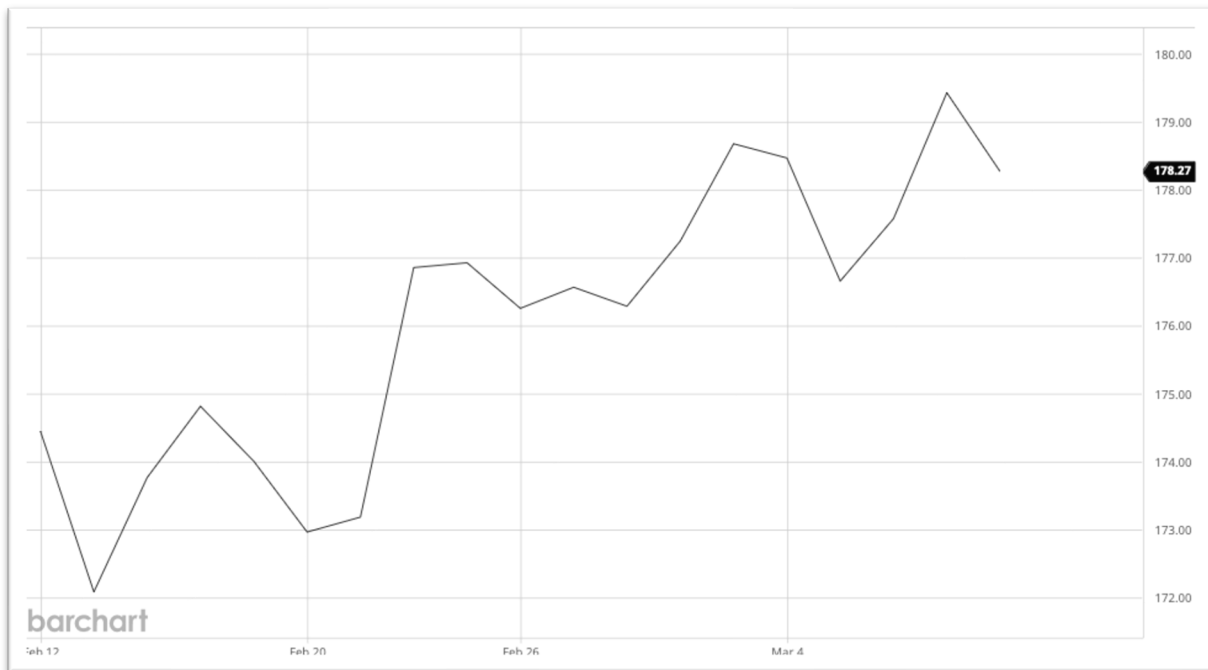
Figure 33: FXAIX Index Fund Price Chart 2/12 - 3/09

Figure 34 shows the price chart for PREIX, an index fund that only invests in companies that are in the S&P 500 index, meaning it invests in the largest companies within the US market, and doesn't invest in smaller companies as is the case with many of the other funds. This fund is well rated, with a very low risk factor and is expected to give a constant return, which it has done for us, but not nearly as well as the other funds. It followed an almost identical shape to FXAIX, and is only being outperformed by 0.01%, showing that the investing strategy is very similar.
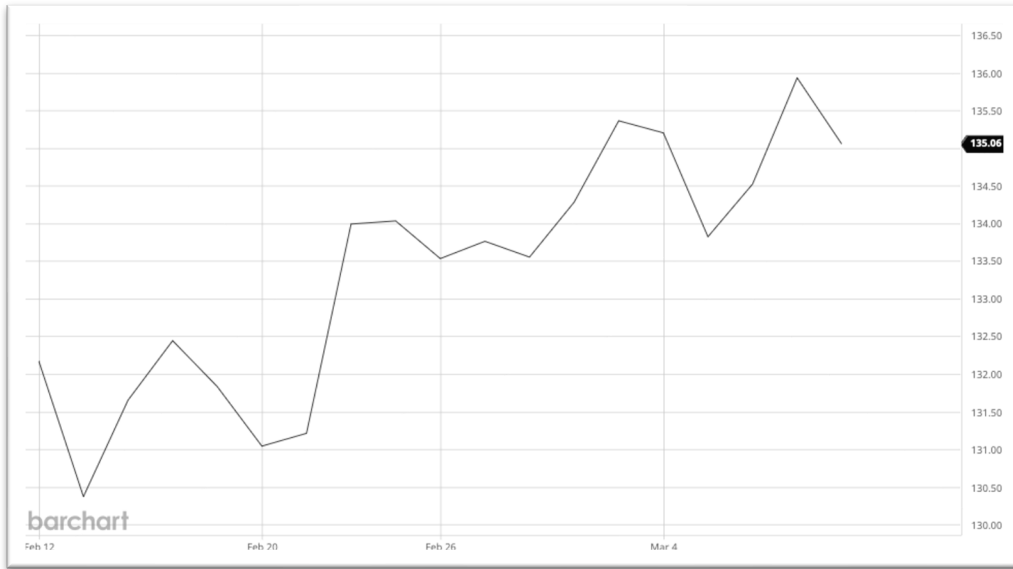
Figure 34: PREIX Index Fund Price Chart 2/12 - 3/09

Next, there is FNILX, another fidelity fund, but this one is not doing as well as the other one, though it is similar, only losing by about 0.07% (Figure 35). Once again, it follows a similar shape to the previous two, and is performing very similarly to them as well. Fidelity is a large financial institution, so it tracks that they can keep their funds very consistent, and that they are risk adverse, as many people trust Fidelity to handle their retirement plans and other investments.
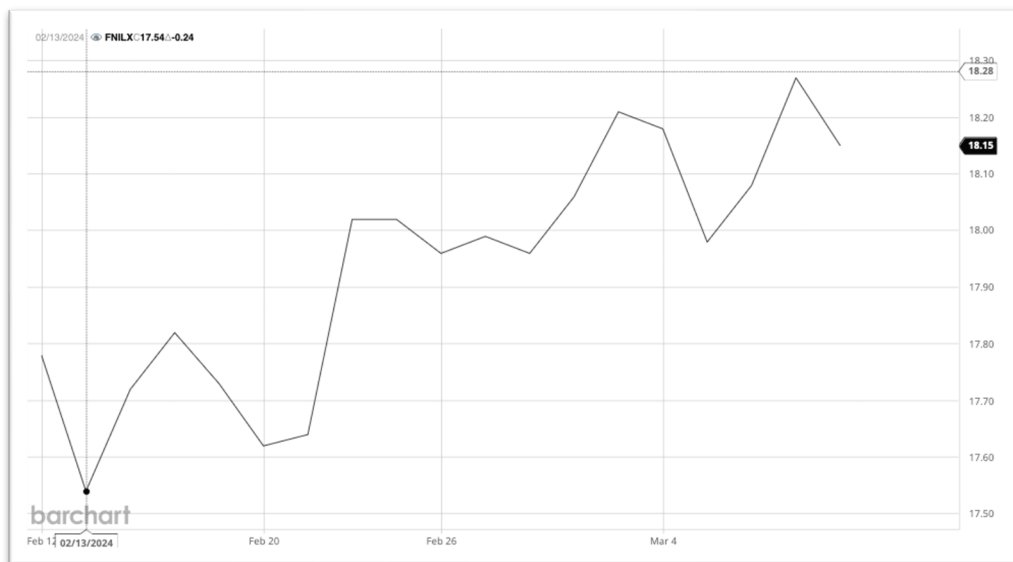
Figure 35: FNILX Index Fund Price Chart 2/12 - 3/09

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Lastly, there is SWPPX, the Schwab S&P 500 index fund, another index fund that follows a similar shape to the previous funds due to it investing heavily in the S&P500 companies (see Figure 36 below compared to Figure 35 above). All these funds are investing in the same companies, so they have roughly the same shape. Schwab appears to be more careful, with less drastic changes being made, both on the ups and downs, which can be seen by it having the worst return of all our index funds, being beat by the next worse by 0.4%. The fact that it still goes up slowly shows that the index fund method will work for a long-term investor, someone who doesn't constantly want to make trades and wants to simply grow their investment over time.
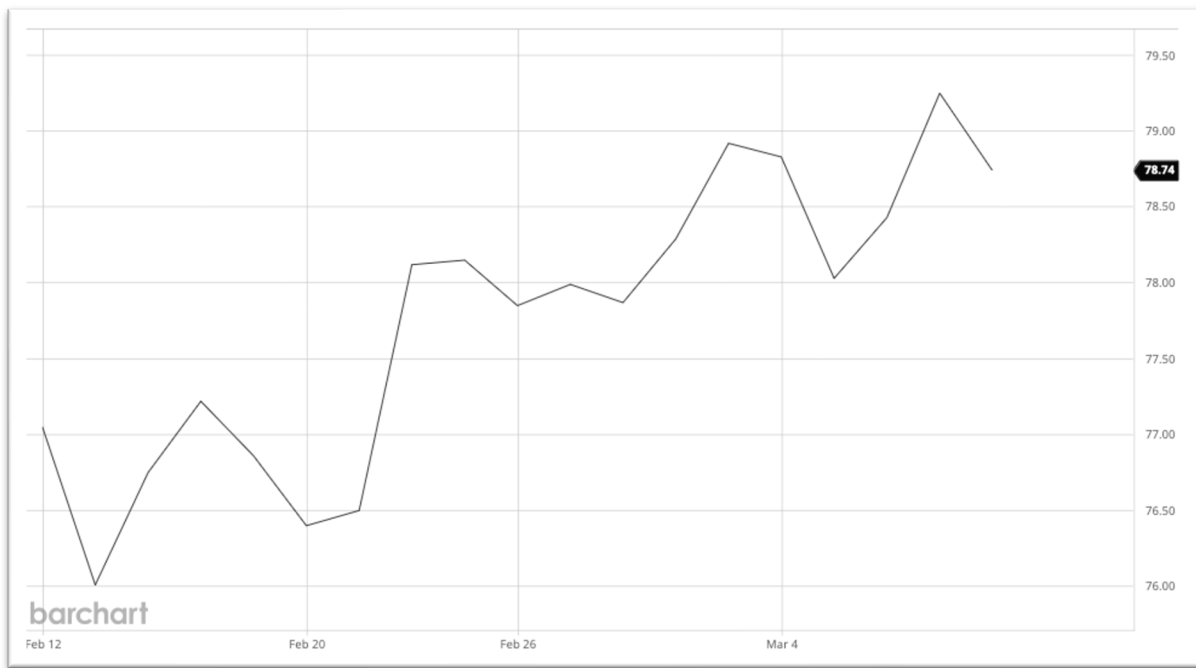
Figure 36: FNILX Index Fund Price Chart 2/12 - 3/09

6.5 Week 5 (3/11 - 3/15)

During this week of trading, out portfolio saw a slight loss. Recently the market was at a large high, and that affected us by it only having one way to go, which was down. Luckily, the loss was not too large, and the index fund's portfolio is still up by over 3%, and the loss was only

0.27%. Although much of the market saw a loss, the overall impact on the index funds was not too great, since we invested a while ago, meaning we have had time to grow our portfolio. The order of our best performing index funds also changed, with DXJS coming out on top as the Japanese market was not as affected by the US market going down, and PID becoming our worse performing fund, with the other international markets taking a heavy hit this week. The rest of the index funds remain relatively unchanged, with their overall returns being down except for DXJS, which saw an increase of almost 0.4% (see Figure 37 below).

| Symbol | % Holdings | Price | Value |
Shares	Type	Chg/Chg %	Gain/Loss
DXJS 317 Shares	10% Buy	$32.99 0.52 1.60%	$10,457.83 $399.42 3.97%
SWISX 444.84 Shares	10% Buy	$23.58 -0.02 -0.08%	$10,489.32 $378.11 3.74%
VEUSX 188.87 Shares	15% Buy	$83.35 -0.67 -0.80%	$15,742.26 $540.17 3.55%
VFAIX 315.19 Shares	15% Buy	$49.64 0.00 0.00%	$15,646.14 $434.97 2.86%
FXAIX 57.55 Shares	10% Buy	$178.11 -1.15 -0.64%	$10,249.76 $235.94 2.36%
PREIX 75.95 Shares	10% Buy	$134.93 -0.87 -0.64%	$10,248.37 $234.70 2.34%
FNILX 564.33 Shares	10% Buy	$18.13 -0.12 -0.66%	$10,231.38 $225.73 2.26%
SWPPX 130.29 Shares	10% Buy	$78.67 -0.51 -0.64%	$10,250.16 $188.93 1.88%
PID 552 Shares	10% Buy	$18.43 -0.05 -0.27%	$10,173.36 $149.04 1.49%

Figure 37: Index Fund Portfolio Week 5 Update

6.6 Week 6 (3/18 – 3/22)

In this week of the simulation, we saw another increase of about $1,500, an increase of 1.45%. Overall, the market went up by 2.5%, measured by the Dow Jones Industrial average. This means that the index funds are growing a little bit slower than the market. The only index fund that went down over the past week is PID, by 0.71%, although other stocks in the European market went up, many of the stocks that PID invests in went down. The US and Asian markets went up, and our index funds went up alongside them. Our best performing index fund stayed with DXJS, with the Vanguard funds not performing as well as some Fidelity funds, leading to a reorganization of the best performing funds, as can be seen in Figure 38 below.

Symbol Shares	% Holdings Type	Price Chg/Chg %	Value Gain/Loss
DXJS 317 Shares	10% Buy	$33.73 0.15 0.45%	$10,692.41 $634.00 6.30%
SWISX 444.84 Shares	10% Buy	$23.82 -0.06 -0.25%	$10,596.09 $484.88 4.80%
FXAIX 57.55 Shares	10% Buy	$182.22 -0.25 -0.14%	$10,486.27 $472.46 4.72%
PREIX 75.95 Shares	10% Buy	$138.04 -0.18 -0.13%	$10,484.58 $470.91 4.70%
FNILX 564.33 Shares	10% Buy	$18.55 -0.02 -0.11%	$10,468.40 $462.75 4.62%
VFAIX 315.19 Shares	15% Buy	$50.39 -0.88 -1.72%	$15,882.54 $671.36 4.41%
SWPPX 130.29 Shares	10% Buy	$80.48 -0.11 -0.14%	$10,485.99 $424.76 4.22%
VEUSX 188.87 Shares	15% Buy	$83.61 -0.21 -0.25%	$15,791.36 $589.27 3.88%
PID 552 Shares	10% Buy	$18.30 -0.09 -0.49%	$10,101.60 $77.28 0.77%

Figure 38: Index Fund Portfolio Week 6 Update

6.7 Week 7 (3/25 – 3/29)

Table 17 represents the returns from our 7-week index trading simulation. We bought these index funds immediately when our simulation began and didn't make any more trades as suggested by Bogle in his book. Over the last week of the simulation, we witnessed another $600 rise in our portfolio's valuation despite moderate market conditions which marks our overall gains to $4,569.40 hence marking a 4.5% overall return.

Table 17: Week 7 of Index Trading Portfolio Update (3/25 – 3/29)

Date 2024	Symbol	Buy/Sell	Price ($)	Shares	Net Cost / Proceeds	Profit / Loss	Total Cash	Total Profit
3/29							-701.25	
3/29	VFAIX	Sell	50.92	315.18	16048.97	837.90	15347.72	837.90
3/29	VEUSX	Sell	83.72	188.86	15811.36	609.21	31158.08	1447.11
3/29	PID	Sell	18.50	552	10212	187.68	41370.08	1634.79
3/29	SWISX	Sell	23.87	444.83	10618.09	506.88	51988.17	2141.67
3/29	DXJS	Sell	33.40	317	10587.80	529.39	62575.97	2671.06
3/29	FXAIX	Sell	182.58	57.55	10507.48	493.20	73083.45	3164.26
3/29	PREIX	Sell	137.90	75.95	10473.51	460.26	83556.96	3624.52
3/29	FNILX	Sell	18.58	564.29	10484.51	478.94	94041.47	4103.46
3/29	SWPPX	Sell	80.81	130.28	10527.93	466.94	104569.40	4570.40

Below is the weekly review on each of the index funds picked:

- DXJS, which tracks the performance of Japanese equities while hedging currency exposure, saw a 1.2% gain over the past week (Vaiman, 2024). This outperformance was likely driven by the continued strength of the Japanese market.

- SWISX, an international equity index fund, increased by 0.8% over the past week (Vaiman, 2024). This modest gain reflects the mixed performance of global markets outside the U.S.

- FXAIX, which tracks the S&P 500 index, rose 0.1% during the week, underperforming the broader U.S. market (Vaiman, 2024). This was likely due to the tech-heavy Nasdaq Composite slipping 0.12% on March 29th.

- PREIX, another S&P 500 index fund, saw a similar 0.1% gain over the past week, in line with the broader market performance (Vaiman, 2024).

- FNILX, which tracks the Nasdaq Composite, was flat for the week, reflecting the index's modest 0.12% decline on March 29th (Vaiman, 2024).

- SWPPX, another S&P 500 index fund, saw a 0.1% gain, in line with the index's performance (Vaiman, 2024).

- VEUSX, which invests in European equities, rose 0.6% over the past week, outperforming international markets (Vaiman, 2024).

- PID, an international dividend-focused ETF, increased by 0.7% during the week, reflecting the mixed performance of global markets (Vaiman, 2024).

Overall, the tech-heavy Nasdaq Composite and S&P 500 index funds saw modest gains or were flat, while international and sector-specific funds like DXJS and VEUSX outperformed the broader market. Figure 39 represents the all-time performance chart of our constant diversified index funds portfolio. Figure 39 demonstrates that index funds have a constant slow

change depending on the overarching market direction aka bullish or bearish. Additionally, the green color gradient in Figure 39 is associated with the performance of each of the 9 chosen index funds where, darker color represents stronger change in the corresponding direction with green and red colors representing positive and negative change correspondingly.

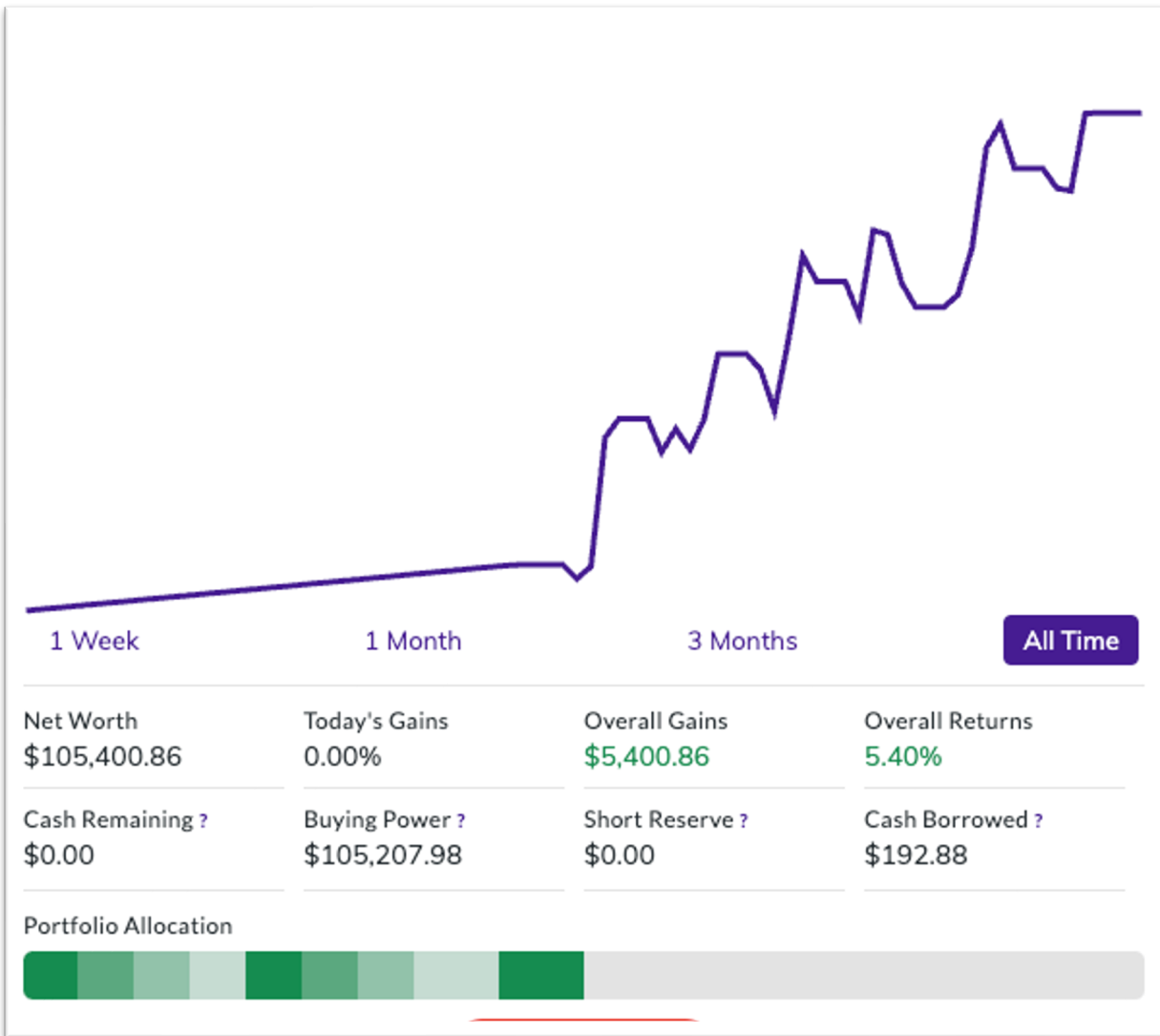|	1 Week	1 Month	3 Months	All Time
Net Worth	Today's Gains	Overall Gains	Overall Returns	
$105,400.86	0.00%	$5,400.86	5.40%	
Cash Remaining ?	Buying Power ?	Short Reserve ?	Cash Borrowed ?	
$0.00	$105,207.98	$0.00	$192.88	

Portfolio Allocation

Figure 39: Index Fund Portfolio All-Time Performance Chart

6.8 Chapter Summary

The index fund trading strategy yielded a 4.5% return in the simulation, aligned with the expected outcomes of a diversified and passively managed investment approach. Starting with a $100,000 investment, the strategy highlights the principles of index fund investing, where a broad representation of the market is better than trying to "time the market." Investments were weighted towards larger, established funds, a decision based on the anticipation of steady returns despite speculative recessions in the UK and Japan.

The incremental growth of the portfolio, though moderate, demonstrated the advantages of diversification, particularly in mitigating the impact of regional market fluctuations. Specific index funds within the portfolio showed robustness, indicative of the strategy's ability to deal with economic adversities. The passiveness of this investment methodology, characterized by the lack of daily or weekly trades, confirmed the foundational investment philosophy that underpins index funds: a commitment to steady, long-term growth over reactive trading and speculation.

Chapter 7: Results & Analysis

In-order to analyze the performance of our stock market simulation, we must employ a benchmark for comparison hence, we have incorporated S&P500 Index Fund as default stock market performance. Firstly, we will analyze the performance of S&P500 across the duration of our stock market simulation which lasted from February-March 2024. Next, we will individually compare Index, Swing, and Options portfolio with the overall S&P500 market.

7.1 S&P 500 Index Performance

In February 2024, S&P 500 index continued its positive momentum, reaching a new peak and reflecting a robust economic outlook. The tech sector, spearheaded by Nvidia, played a pivotal role in driving the index's performance, showcasing the market's confidence in technological innovation. The S&P 500 index concluded February on a high note, setting a record at 5,096.27, which translates to a monthly increment of 5.17% (Market). This surge contributed to a commendable year-to-date return of 6.84%, signaling a sustained bullish trend in the market. The market's trajectory was shaped by a confluence of factors, including proactive government fiscal policies, the Federal Reserve's anticipated interest rate decisions, and unfolding geopolitical dynamics. Notably, the legislative branch took decisive action to prevent a government shutdown and extended substantial support to Ukraine amidst ongoing conflicts.

The index's success was mirrored across all sectors, with Consumer Discretionary leading the charge, boasting an 8.60% rise. Even the Utilities sector, which saw the least growth, managed a respectable 0.53% increase (Market).

Nvidia emerged as a standout performer within the tech sector, registering a staggering monthly gain of 28.6% and an impressive year-to-date hike of 59.8% (Market). The company's

valuation momentarily eclipsed the USD 2 trillion threshold, underscoring its significant impact on the index's overall gains. Nvidia's remarkable earnings report catalyzed a historic market capitalization increase of USD 273 billion in a single day, highlighting the tech sector's robust growth prospects (Market). This sector's performance is indicative of the market's optimism regarding the future of leading tech enterprises.

In March 2024, the S&P 500 index experienced a notable upswing, closing the month with a 3.10% increase (Market). This positive trend contributed to an impressive 10.16% return for the year-to-date. The index also achieved eight new closing highs in March, bringing the total to 22 for the year so far.

The tech sector played a pivotal role in this growth, with major players like Nvidia, Microsoft, Meta Platforms, and Amazon.com driving 47% of the year-to-date return. These tech giants now boast a combined market capitalization of USD 9.5 trillion, underscoring their significant impact on the index's performance (Market).

A broader look at the market reveals that the remaining 493 companies in the S&P 500 collectively saw a 6.4% increase year-to-date (Market). Economic factors such as strong earnings reports, lower peak interest rates, and sustained high employment levels have fostered a conducive environment for positive trades throughout March. Investor sentiment remained buoyant, with money managers actively investing and additional funds poised to enter the market. Figure 40 below is a chart of S&P500's 2024 Year-To-Date performance.
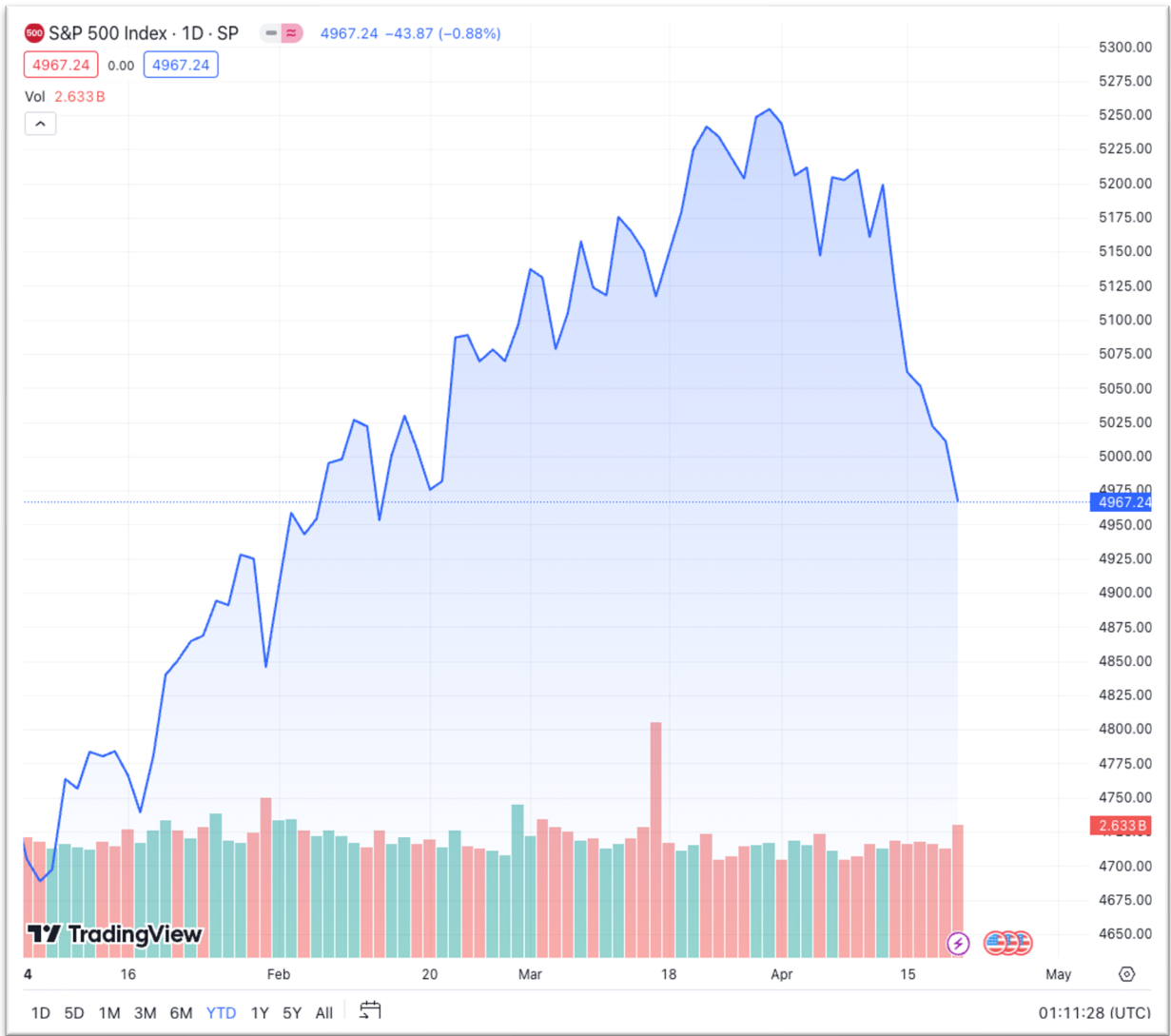
Figure 40: S&P500 YTD Chart

To sum up, the S&P 500's robust performance in March, especially within the tech sector, mirrors a vigorous market buoyed by optimistic investor sentiment and favorable economic conditions. The tech sector's significant contribution to the index's returns emphasizes its crucial influence on the market's overall health.

7.2 Index vs S&P500

The index fund portfolio during the simulation saw an increase of 4.5%, while the S&P 500 saw an increase of 4.9% over the same time frame (Market). This gap can be explained by the S&P's pricing being heavily influenced by companies that grew disproportionately to the rest of the market, such as NVIDIA. The index funds, however, are much more spread out and diversified, being part of markets outside the US, which explains the difference between the two price changes.

This diversification in the index funds allows for a cushioning in case of certain markets underperforming but doesn't account for a specific sector to increase exponentially compared to the rest. In his book, Bogle describes this as something that one who is trading index funds must deal with at times, not being able to take advantage of these large market swings. Although we would have been protected from a crash in a specific sector, the fact that it didn't occur during this simulation means that we were not able to take advantage of all the growth in smaller sectors, and instead diversified our assets.

The international index funds provided another layer of balance and showed the importance of being diversified, as every week saw a steady increase, while some weeks the S&P500 didn't perform as well. This is an essential part of index trading, with diversification being a keystone in protecting your assets for longer term trading goals and risk management. When the goal of trading is more long term, it is ok to miss out on the market swings of smaller sectors to focus on the bigger picture.

In conclusion, while the index funds portfolio was not able to take advantage of the rapid growth in the technology sector, we were still able to achieve a positive return with a steady

increase over time. This indicates that the index fund trading method can generate a constant return, even with little effort put into it to maintain it. Therefore, the findings show a tradeoff between the potential for higher short-term returns through sector specific investments in the pursuit of a more stable, though potentially lower, return through diversification across a few index funds.

7.3 Swing vs S&P500

In February, the S&P 500 index reached new heights, driven by the robust performance of the technology sector, particularly Nvidia's impressive gains. The index closed the month at a record 5,096.27, reflecting a 5.17% monthly increase and a 6.84% year-to-date return (Market). During the same period, our swing trading portfolio focused on capitalizing on the AI boom and the semiconductor industry's recovery. We invested in tech stocks like Apple, ARM, Netflix, Palantir, and Super Micro Computer, aligning with market trends. By the end of February, our portfolio's net worth stood at $103,699.67, representing a 3.7% gain from the initial $100,000 investment.

In March, the S&P 500 continued its upward trajectory, closing the month with a 3.10% increase and a 10.16% year-to-date return. The tech sector, led by giants like Nvidia, Microsoft, Meta Platforms, and Amazon.com, contributed significantly to this growth, accounting for 47% of the year-to-date return.

Our swing trading portfolio also capitalized on the tech sector's momentum. We invested in semiconductor stocks like Taiwan Semiconductor Manufacturing (TSM) and Qualcomm (QCOM), as well as Microsoft (MSFT), due to its strong AI integration and growth prospects. However, our portfolio experienced a slight decline, with a net worth of $97,116.51 by the end of

March, reflecting a -2.88% overall return. While the S&P 500 outperformed our portfolio in March, our tech-focused strategy aligned with the market's broader trends, positioning us to potentially benefit from the sector's continued growth.

The swing trading simulation concluded with a net worth of $98,004.62, reflecting a slight decline from the initial $100,000 investment. Despite underperforming the S&P 500 index, our portfolio's focus on the technology sector, particularly semiconductors and AI, proved to be a strategic approach, capitalizing on market trends and industry growth prospects. While the S&P 500 index provides a broad market benchmark, our concentrated portfolio aimed to capitalize on specific industry trends and opportunities.

Overall, the comparison highlights the importance of diversification and risk management strategies in portfolio construction, as well as the potential benefits of aligning investments with broader market trends and emerging technologies.

7.4 Options vs S&P500

In February, the S&P 500 index reached new heights, driven by the robust performance of the technology sector, particularly Nvidia's impressive gains. The index closed the month at a record 5,096.27, reflecting a 5.17% monthly increase and a 6.84% year-to-date return.

During the same period, our options trading portfolio focused on capitalizing on market trends by purchasing put and call options on various stocks. We initiated positions in AMD, UBER (puts), and HOOD, MSFT, TSLA (calls). By the end of February, our portfolio's net worth stood at $52,266, reflecting a significant decline of 47.73% from the initial $100,000 investment. While the S&P 500 experienced substantial gains, our options trading strategy underperformed significantly due to the inherent risks and volatility associated with options trading.

In March, the S&P 500 continued its upward trajectory, closing the month with a 3.10% increase and a 10.16% year-to-date return. The tech sector, led by giants like Nvidia, Microsoft, Meta Platforms, and Amazon.com, contributed significantly to this growth.

Our options trading portfolio experienced a rollercoaster ride during March. We made strategic trades involving call options on stocks like Boeing (BA), Apple (AAPL), and Rivian (RIVN), as well as put options on Palo Alto Networks (PANW) and Taiwan Semiconductor Manufacturing (TSM). However, our portfolio's net worth fluctuated significantly, ending the month at $91,826 with a -8.17% overall return. While the S&P 500 continued to outperform, our options trading strategy demonstrated the potential for both substantial gains and losses, highlighting the high-risk nature of this trading approach.

The options trading simulation concluded with a net worth of $90,466, reflecting a 9.53% decline from the initial $100,000 investment. Our portfolio experienced significant volatility, with gains from trades like Rivian (RIVN) call options and Palo Alto Networks (PANW) put options, offset by losses from positions in ARM and Boeing (BA). In contrast, the S&P 500 index delivered consistent positive returns throughout the simulation period, reinforcing the benefits of a diversified portfolio and a long-term investment strategy.

While our options trading strategy aimed to capitalize on market trends and individual stock movements, the inherent risks and complexities of options trading proved challenging. The comparison with the S&P 500 index highlights the importance of risk management, diversification, and a well-defined investment strategy aligned with one's risk tolerance and investment objectives.

Chapter 8: Conclusion

As a result of our Stock Market Simulation IQP, we have learned the following key traits for being successful in the stock market:

- **Importance of Research and Analysis**

  The simulations highlighted the critical role of thorough research and analysis in making informed trading decisions. Evaluating factors such as company financials, industry trends, market conditions, and technical indicators like chart patterns, RSI, and MACD proved invaluable in identifying potential trading opportunities and managing risks effectively.

- **Diversification and Risk Management**

  Diversifying investments across different sectors, industries, and asset classes emerged as a crucial strategy for mitigating risks and capitalizing on various market trends. The swing trading simulation demonstrated the benefits of a diversified portfolio, while the options trading simulation underscored the high-risk nature of concentrated positions in individual stocks.

- **Timing and Liquidity Management**

  Timing played a pivotal role in the success of trades, as evidenced by the varying performance of positions across different weeks. Effective liquidity management, maintaining sufficient cash reserves, and exercising prudence in capital allocation were essential for navigating market volatility and capitalizing on emerging opportunities.

- **Importance of Discipline and Emotional Control**

  The simulations reinforced the importance of maintaining discipline and emotional control in trading. Adhering to predefined strategies, setting stop-losses, and avoiding impulsive decisions based on fear or greed were crucial for mitigating losses and maximizing gains.

- **Continuous Learning and Adaptation**

  The dynamic nature of the stock market necessitates continuous learning and adaptation. As market conditions evolve, it becomes imperative to stay updated on industry developments, economic indicators, and emerging trends to refine trading strategies and capitalize on new opportunities effectively.

Overall, the stock market simulations provided invaluable hands-on experience, reinforcing the significance of thorough research, diversification, risk management, discipline, and continuous learning in navigating the complexities of the financial markets successfully.

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