Stock Market Simulation

An Interactive Qualifying Project Report: Submitted to the

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By

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Abstract

The purpose of this IQP was to evaluate the effectiveness of two different trading methods: the Buy and Hold strategy and the Swing Trading strategy. This was accomplished by running two trading simulations simultaneously on Investopedia Simulator for six weeks, each with an initial $100,000 investment. By the end of the simulation, the Buy and Hold strategy and the Swing Trading strategy realized profits of 8% and 6.9% respectively, while the S&P 500 only grew 5.4%. The effectiveness of both trading strategies was validated as they both managed to outperform the market throughout the experiment.

Acknowledgments

I would like to express my warmest thanks to Professor Dalin Tang for the continuous guidance and support he gave me. The completion of this IQP would not have been possible without the detailed feedback and suggestions he provided throughout the project. My questions were always answered in a timely manner, and he was always willing to clarify any doubts I had. I would like to thank my parents for their unwavering support. I would also like to thank Worcester Polytechnic Institute (WPI) for giving me the opportunity to complete this project over the summer.

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Chapter 1: Introduction

1.1 Goal, Scope, Plan, and Outline

The purpose of this project is to investigate both an active and a passive stock market investment method in order to determine the effectiveness of each strategy in returning a profit for the investor. The first two weeks of the project will be spent researching the basics of the stock market so that the investor can make informed decisions when picking stock companies and conducting technical analysis.

Once a portfolio has been established, simulations can be run to collect data on the trends of the stocks over a period of six weeks. Two simulations will be run simultaneously, with the first one simulating a buy and hold (passive) strategy and the second one simulating a swing trading (active) strategy. The remaining few weeks of the projects will be spent analyzing the collected data and compiling the results into a final report. The completion of this project will provide a new investor with the knowledge required to eventually become a competent trader.

The 1st chapter explains the basics of the stock market including what it is, the purpose of it, factors which influence it, and the use of technical indicators. The 2nd chapter describes the methodology used to conduct the project, specifically explaining the trading platforms and the passive and active trading strategies. The 3rd chapter explains the reasoning behind picking the stock companies and gives a brief description of each company. The 4th chapter discusses the progress of the buy and hold simulation over the course of six weeks. Similarly, the 5th chapter discusses the progress of the swing trading simulation over the six-week span. The 6th chapter details a comparative analysis of the results of both trading simulations. Finally, the 7th chapter provides a conclusion to the entirety of the project.

1.2 History of the stock market

The stock market is a marketplace which enables buyers and sellers to trade stocks of publicly traded companies. Stocks are a security which represents partial ownership of a company, with a share referring to a unit of stocks. The stock market can trace its origins back to Amsterdam in 1602 when the first modern day stock exchange was established. At first the public could only trade shares of the Dutch East India Company, but as time went on other companies became available to trade. In the 19th century, stock exchanges became more formalized and regulated. The New York Stock Exchange (NYSE) was established in 1792 as a result of the Buttonwood Agreement, eventually becoming the largest exchange in the world by market capitalization. The latter half of the 20th century saw significant advancements in technology, leading to the globalization of financial markets and the emergence of electronic trading. Today there are stock markets around the world like the London Stock Exchange (LSE), Shanghai Stock Exchange (SSE), and Bombay Stock Exchange (BSE), among many others.

1.3 Significance of the stock market

Private companies can become publicly traded by listing their share of stocks on an exchange through a process known as initial public offering (IPO). Investors can then purchase those shares, allowing the company to raise money from the public to grow their business (capital formation) [1]. Investors can profit from their shares through a company performing well which raises its stock price or by receiving dividends from companies at a regular interval. Conversely, investors stand to lose money if a company performs poorly and the stock price decreases. The stock market facilitates the process of price discovery, where the value of stocks are determined by the forces of supply and demand from all market participants [1]. This mechanism helps establish fair market prices for a company's stock based on market sentiment and fundamental

factors. The stock market is important as it provides a platform for companies to grow through capital formation and for investors to make money through capital gains – this relationship resulting in the overall growth of a nation's economy.

The stock market can serve as an indicator of general economic health. When the stock market is performing well it can be seen as a positive sign of investor confidence and economic growth. A decline in the stock market may reflect concerns about the economy or specific industries. The performance of the stock market is categorized by indices such as the S&P 500, the Dow Jones Industrial Average, and the Nasdaq Composite. The Standard & Poor's 500 (S&P 500) is an index which consists of the top 500 companies in the United States. It represents roughly 80% of the U.S. stock market's total value [2]. By analyzing the S&P 500, we can get a good indication of the movement of the U.S. economy as a whole.

By looking at the chart below (Figure 1.3.1), we can see that the U.S. market has enjoyed a 54.14% growth over the past five years. The sharp drop in the S&P 500 in the beginning of 2020 shows the catastrophic effects that COVID-19 had on the economy as the virus disrupted many aspects of daily life and productivity. Fueled by excessive fiscal support by the government and the gradual dissipation of the virus, the market grew rapidly until 2022. The market plummeted throughout 2022 as inflation run rampant, a Russo-Ukrainian war disrupted global supply lines, and widespread fears of a recession negatively impacted market sentiment. Since then, the market has made a steady recovery into 2023, however the future outlook remains far from certain.

S&P 500

4,283.85 ↑54.15% +1,504.82 5Y

Jun 6, 5:14:09 PM UTC-4 · INDEXSP · Disclaimer

1D   5D   1M   6M   YTD   1Y   **5Y**   MAX   ⌁ Key events

Figure 1.3.1: Performance of the S&P 500 over the last five years.

1.4 Factors that influence the stock market

The stock market is fundamentally controlled by the relationship between the supply of stocks and demand from investors. When there is high demand for a particular stock, its price tends to rise. If there is more supply than demand, the price may decline. There are various factors that affect this dynamic, directly or indirectly affecting the movement of the stock market as a whole.

Economic conditions can exert a strong influence on the stock market. Signs of positive economic data (i.e., GDP growth, low unemployment rate, and higher consumer spending) boosts investor confidence and leads to higher stock prices as demand is increased. Negative economic indicators may drive stock prices down. Monetary policy can be used by central banks to artificially impact market movement. Lower interest rates reduces the cost of borrowing which

encourages spending, stimulating the economy and increasing corporate profits which can result in higher stock prices. Investors are more incentivized to invest in the stock market as fixed-income streams depreciate with lower interest rates. An increase in the interest rate will have the opposite effect on the economy, leading to lower stock prices.

Made clear in recent years, geopolitical events such as natural disasters, wars, or political turmoil can have a great impact on the stock market. These events create fear and uncertainty in the market, leading to panicked investors selling their stocks which drives stock prices down. Additionally, these events can negatively impact the economy – resulting in even further stock market contractions.

Market psychology and investor sentiment also play a large role in influencing the stock market. Fear, greed, and herding behavior can drive stock prices in the short term, potentially deviating the market from underlying fundamentals. Positive sentiment can create a bullish market as investors are optimistic and willing to buy stocks. On the other hand, negative sentiment can create bearish market conditions as investors are cautious and less willing to buy stocks.

1.5 Stock market indicators

In order to quantify the forces behind the stock market and attempt to forecast future movements, a variety of technical indicators can be used. Although they do not provide a guarantee to the investor, utilizing multiple technical indicators allows an investor to trade with much greater certainty.

1.5.1 Moving Average

The moving average (MA) is a simple technical analysis tool that smooths out price data. It does this by creating a constantly updating average price which is taken over a specific time period such as 10 minutes or 200 days [3]. The moving average is displayed as a solid line that follows the price movement on a graph. A moving average with a shorter time period (e.g., 5 days) will react quicker to price changes than a moving average which uses a longer time period such as 100 days. The moving average helps the trader get an idea of which way the price is moving. The direction of the moving average parallels the trend of the price, an upwards angled MA indicates that the price moving up while a downward angled MA indicates that the price is falling. A moving average can also act as a support or resistance level depending on the trend of the price. Figure 1.5.1 below shows the behavior of a moving average when a stock is trending upwards.

Figure 1.5.1: The moving average of a stock [3].

Seen on the chart above, the price bounces off the moving average as it trends upwards. The moving average points upwards showing the overall trend of the price. Generally, if a price is above a moving average the trend is up but if the price is below the moving average the trend is down [3].

There are two types of moving averages, the simple moving average (SMA) and the exponential moving average (EMA). The SMA adds up the daily closing prices and divides the figure by the number of days in the time period. The EMA uses a more complex calculation as it applies more weight to more recent prices [3]. The dynamic between moving averages of different types and time periods produces a simple trading strategy in the form of MA crossovers. A trader can apply multiple moving averages to the chart of a stock. When the shorter-term MA crosses above the longer-term MA, it indicates that the trend is shifting up – this is know as a "golden cross". When the shorter-term MA crosses below the longer-term MA, it indicates that the trend is shifting down – this is known as a "death cross" [3].

Figure 1.5.2 below shows the short-term MA (light blue) following the price movement closely, while the long-term MA (dark blue) lags behind the price movement representing the larger trend of the stock. When the short-term MA drops below the long-term MA (down arrow) the price falls and when the short-term MA rises above the long-term MA (up arrow) it is a signal to buy the stock once more. Although moving averages can prove useful to a trader looking to capitalize on trend reversals, they can often produce false signals and must be confirmed by other technical indicators.

Figure 1.5.2: Crossovers between a short-term MA and long-term MA [3].

1.5.2 Relative Strength Index

The relative strength index (RSI) is a momentum indicator that measures the speed and magnitude of a stock's recent price changes to evaluate whether it is currently overvalued or undervalued. The RSI is displayed as an oscillating line graph ranging from zero to 100, typically placed right below the price chart. A stock is generally considered overbought when the RSI is above 70 and considered oversold when under 30 [4]. When the RSI passes either of these points it indicates that the stock may be primed for a trend reversal. The RSI can be measured over any time scale, enabling the trader to understand if the stock is misvalued in either the short or the long term. The graph below (Figure 1.5.3) shows how the RSI of a stock changes in relation to its price movement.
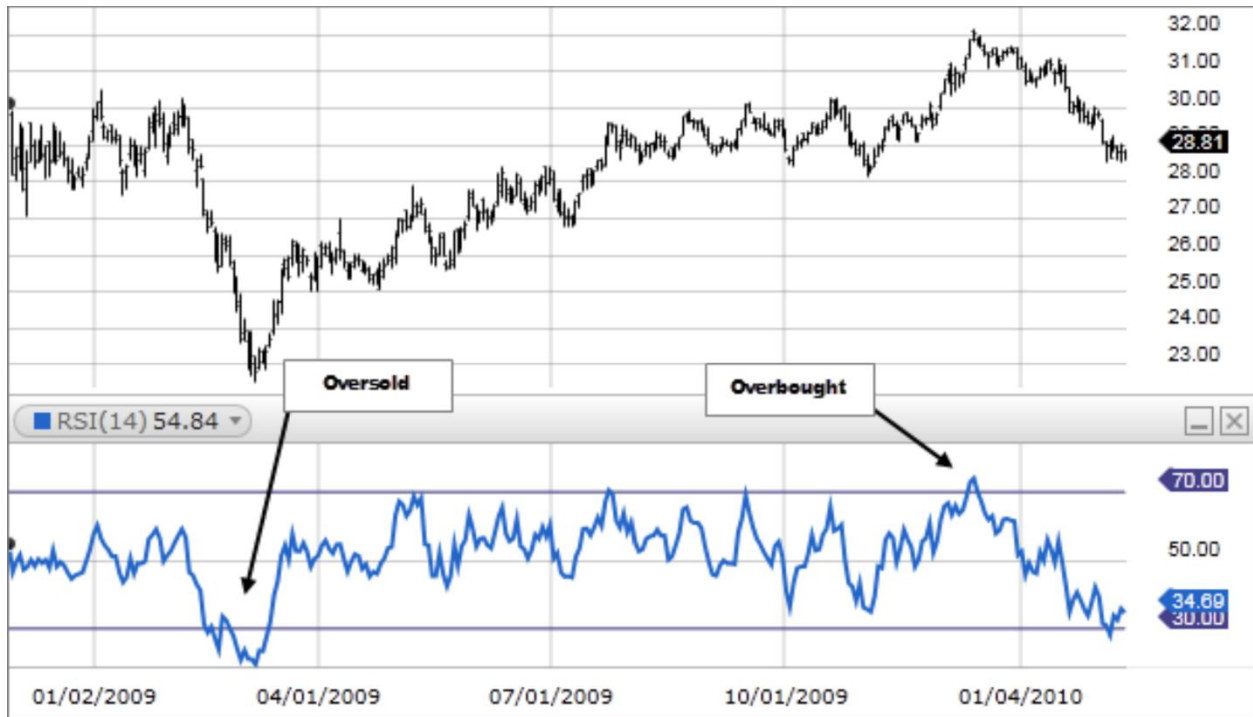
Figure 1.5.3: Chart displaying the RSI of a stock over a year long period [4].

The RSI can be seen dropping below 30 as the stock falls and reaches a new low. At this point the stock is considered oversold as its price is trading at a point below its intrinsic value. The stock reverses its trend and rallies upwards until it hits a new high, at which point the RSI peaks above 70. The stock is now consider overbought as its price is above its intrinsic value, and therefore the market reacts by selling the stock.

Of note, during the uptrend of the stock the RSI remained in the overbought range of 50-70. During uptrends, the RSI tends to remain in the 40 to 90 range with the 40-50 zone acting as support. During a downtrend the RSI typically fluctuates between the 10 to 60 range with the 50-60 zone acting as resistance [4]. The failure of the RSI to adhere to these ranges during a trend may signify that the trend is weakening and could potentially reverse. The RSI is a simple but powerful indicator that allows a trader to get a better understanding of the movement of a security.

1.5.3 Lorentzian Distance Classifier tool

The Lorentzian Distance Classifier (LDC) tool is a machine learning classification algorithm that was recently created by software engineer Justin Dehorty. Machine learning algorithms are designed to identify patterns, relationships, and structures within data and use that knowledge to make informed predictions or take actions. It has been hypothesized that Lorentzian space is well-suited for analyzing time-series data such as stock market price action [5]. This is because Lorentzian distance is more resistant to statistical outliers and noise than other distance metrics. In practice this tool can be used to predict the direction of future price movements by analyzing historical price data through machine learning. Figure 1.5.4 below shows how the LDC tool can be applied to stock charts in the TradingView platform.
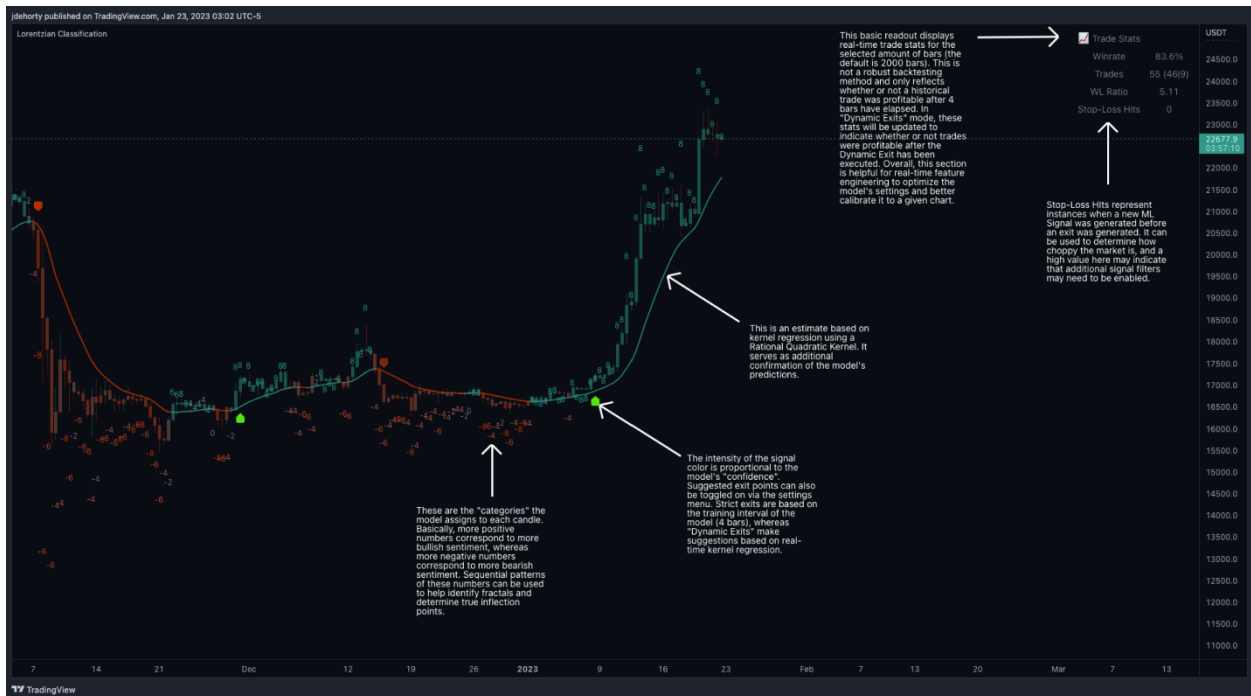
Figure 1.5.4: An image showing the LDC tool in use within TradingView [5].

The tool assigns a number –8 through +8 to each candlestick, where a more negative number corresponds to a more bearish sentiment while a more positive number corresponds to a

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more bullish sentiment. Sequential patterns of repeating numbers can be used to identify bullish or bearish trends [5]. The tool also generates a moving average using a rational quadratic kernel that is displayed in green when a bullish trend is occurring and highlighted in red when a bearish trend is occurring. By analyzing price movement data the tool is able to produce predictive buy or sell signals on top of the graph. A green arow indicates a point at which investors should buy while a red arrow indicates a point where they should sell, with the intensity of the color representing the model's confidence in its own prediction.

These indicators can be displayed using any time intervals, allowing the investor to see potential entries and exits into the stock in both short and long time periods. The combination of these statistics enables a trader using the LDC tool to enter and exit the market at the optimal conditions with a high degree of confidence. Nonetheless, the LDC tool cannot be relied upon as it is just a predictive model that is not 100% accurate and as such a winning strategy must cross-reference other indicators as well.

Chapter 2: Methodology

2.1 Simulation platform

I have decided to use Investopedia Simulator as my stock simulation platform. Investopedia Simulator offers paper trading which allows investors to buy and sell stocks using fake cash. The simulator emulates stock market conditions by using historical and current data, enabling the user to gain experience applicable to the real world. It provides $100,000 in paper money with each new account created. I will be using one account to run the buy and hold simulation and another account to run the swing trading simulation. This will ensure a fair experiment as both trading strategies will have the same amount of capital to start with.

2.2 Chart analysis platform

TradingView is an extremely powerful platform that has a wide range of tools and features for technical analysis, market data visualization, and social trading. I will be using TradingView to find ten promising stock companies and to subsequently conduct technical analysis on them. In order to do this the two main features I will be using are the stock screener and the price charts.

The stock screener is a tool that allows users to filter and scan for stocks based on a wide set of criteria. The criteria cover fundamental data, technical indicators, and market-specific filters. Examples of criteria include price, market capitalization, volume, sector, and many more. Users can then filter by criteria to find stocks that are above or below a specified value and list stocks from highest to lowest or vice versa. The two main criteria I will be using to find stocks will be Earnings Per Share (EPS) and Average Day Range (ADR). Once a specific stock is selected a more detailed overview of the company is provided allowing the user to get a more comprehensive understanding of the finical metrics of the stock.

The price chart is a tool that offers an interactive graphical representation of the price movement of a stock. Trading view supports a wide range of chart types including line charts, bar charts, and candlestick charts. It allows users to view price data across different timeframes ranging from minutes to years, allowing the trader to understand both the short and long-term trends in a security. The platform offers a vast selection of technical indicators that users can apply to the price charts. These indicators help analyze price trends, volatility, momentum, and other aspects of the market. Indicators such as moving averages, RSI, and MACD can be overlapped on top of the same chart in order gain insight into market condition. By cross-referencing the signals of multiple indicators, a trader can make an educated prediction of the future movement of a stock.

2.3 Buy and hold strategy

The buy and hold trading strategy is a passive investment approach where an investor buys stocks and holds on to them for an extended period of time regardless of fluctuations in the market. An investor who uses this strategy selects the securities that they want to purchase but they have no concern for short-term price movements or using technical indicators [6]. The core principle behind the buy and hold strategy is the notion that over a long enough time period the stock market will always trend upwards.

Referring to figure 1.3.1 from chapter 1, we can observe that the S&P 500 grew 54.15% over the past five years despite going through several contractions. This general upwards trend is not just limited to the last five years as the stock market has enjoyed constant growth since the S&P 500's inception in 1957. For nearly the last century, the U.S. stock market averages an approximate 10% return every year [7]. The main reason the stock market constantly trends upwards is because innovation and a growing population allows for the economy to expand and corporations to earn more money.

The buy and hold strategy offers a couple advantages that make it popular with investors from all walks of life. A major advantage of this strategy is the simplicity that it provides. Investors only have to pick a stock and invest in it, waiting for the security to provide a return to them over a long enough time frame. Even those unsure of which stocks to pick can benefit by simply placing their money in an index which tracks the overall market or a premade diverse portfolio. Investors do not need to bother with frequent monitoring of market conditions, timing optimal entries and exits, or making active trading decisions, making it accessible to both novice and experienced traders. In fact, some economists are critical of traders trying to time the market as studies have shown that markets can be incredibly random and subject to anomalies [8]. Additionally, investors using a buy and hold strategy benefit from lower transaction costs as they trade less frequently than those using an active strategy. This can potentially result in higher net returns over time.

The buy and hold strategy also comes with considerable drawbacks. A drawback of this strategy is the large opportunity cost attached to it. As buy and hold investors commit to a portfolio for the long term, a large amount of capital is tied up that cannot be used to take advantage of new investment opportunities that may arise. Passive investors are limited in their ability to quickly react to changing market conditions or individual stock movements [8]. This lack of flexibility means that investors must have enough self-discipline to hold their investments during market downturns and possess the emotional stability required to resist herd mentality and avoid panic – something easier said than done. Individual stocks and the greater market are not immune from failure. The stock market goes through up and down cycles and is liable to crash due to unforeseen events like the 2007-2008 financial crisis [8]. Fixed portfolios can experience significant losses during severe market crashes. Additionally, a stock company is not guaranteed to remain profitable

over time. Companies such as Blockbuster and Eastman Kodak Company, which were once thriving giants, suddenly ended up filing for bankruptcy after changes in their industry.

Simulation of a buy and hold strategy will be conducted by using Investopedia Simulator. A $100,000 cash account will be used to purchase approximately $10,000 worth of shares for each of the 10 stock companies at the start of the trading period (6/5/2023). For six weeks the stocks will be held and monitored in order to see the gains or losses of the portfolio. In order to track the trade history, stocks will be sold at the end of each Friday and then rebought on the following Monday for as similar as a price as possible. This will be repeated until the end of the six-week period. Because the experiment only lasts six weeks there may not be enough time to see long-term uptrends in the selected stock companies. Nonetheless, the experiment will prove useful as its performance can be compared with the swing trading simulation and the S&P 500 in order to generate an analysis.

2.4 Swing trading strategy

The swing trading strategy is an active investment approach that aims to capture short term gains in a stock over a period of a few days or weeks. Swing traders primarily use technical analysis in order to find trading opportunities in the market. The analysis of price charts, indicators, and patterns enables a trader to identify entry and exit points and spot potential movement reversals. The goal of swing trading is to capture a chunk of an expected price movement and then move on to another trade, maximizing profit [9].

The nature of swing trading offers several advantages to traders. Swing trading provides the potential of quick profits for a trader. Since traders take advantage of price fluctuations of a few days to weeks, they can realize gains quicker than those relying on a passive strategy [9]. The

shorter time frame of swing trading allows for traders to adapt to changing market conditions. They can adjust their investments based on emerging trends, providing an active trader with more flexibility than a passive trader. Finally, swing traders can rely more on technical analysis and ignore larger market forces or trends – somewhat simplifying the trading process.

There are also several downsides to the swing trading strategy. Because swing trading requires regular monitoring of their positions there is a larger time commitment required for this strategy. Frequent trading may incur higher transaction costs, eating into a trader's overall profit. The need to enter and exit trades at the right time puts a great deal of pressure on the trader, resulting in the potential for stress and emotional challenge. Short-term price swings can sometimes be unpredictable, and trades may not always go as anticipated. Swing traders are subject to abrupt market reversal which can result in substantial losses [9].

Simulation of a swing trading strategy will be carried out with Investopedia Simulator. A $100,000 cash account will be used to trade the same 10 companies used in the other simulation over a period of six weeks. The key difference will be that the swing trading strategy will buy and sell companies dynamically, based on predictions made through technical analysis. The three main indicators used to conduct technical analysis will be moving averages, RSI, and the LDC tool, covered in detail in chapter 1.5.

Looking at the charts below (Figures 2.4.1 & 2.4.2) we can see how the swing trading strategy will be implemented. The green circle in Figure 2.4.1 highlights the point at which the LDC tool prints a solid green buy signal on the price chart. The tool has identified the price to be moving out of the prior downtrend and into an uptrend. We can confirm this buy signal by looking at graph of the RSI. The green square in Figure 2.4.1 shows the value of the RSI at this point in time. The RSI has indeed dropped below 30, indicating that the stock is currently underbought. As

such, this would be an optimal time to buy into AAPL since more people are bound to buy the stock in the near future. We can add further confidence to our entry point by analyzing the moving averages of the stock. Figure 2.4.2 displays the moving averages of the price chart where the orange line is 8-day EMA, the blue line is the 21-day EMA, and the green line is the 20-day SMA. The green circle shows the area of the buy signal where we can see the 8-day EMA rise above the 21-day EMA, indicating a "golden cross". These three indicators all show that a reversal in the price trend is likely to occur and we can enter into the position with confidence.
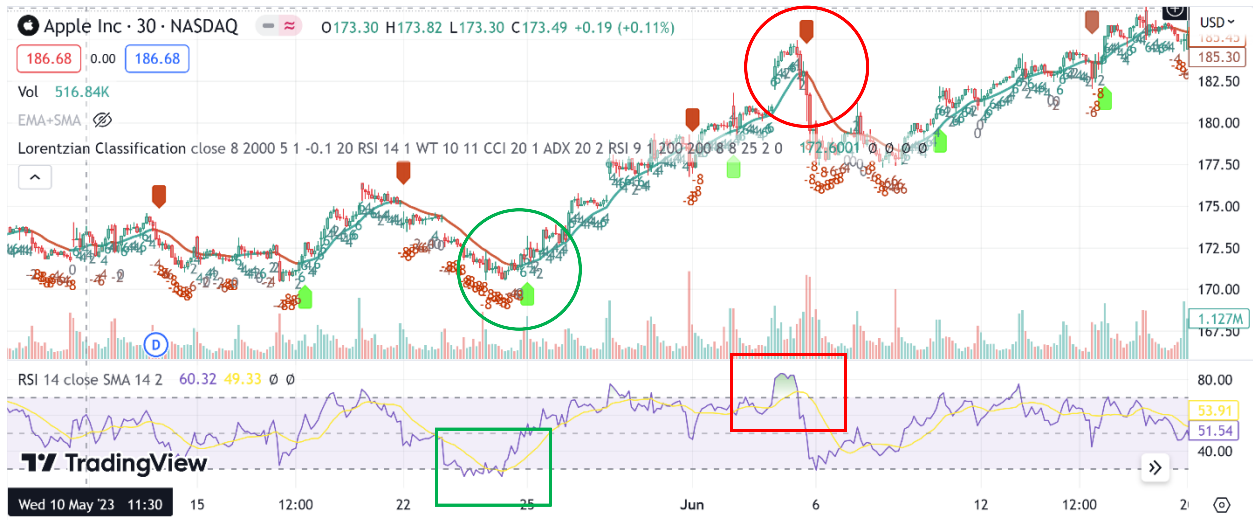
Figure 2.4.1: Price chart of AAPL for the last month with RSI and LDC.

Figure 2.4.2: Price chart of AAPL for the last month with moving averages.

The price does in fact reverse after the buy signal and rallies upwards for a couple weeks. We can be sure that the price is continuing its bull run as the candle sticks form above the moving average (green line) generated by the LDC and they have positive numbers associated with them. In order to know when to exit a position we wait for the same three indicators to give the opposite signal. The red circle in Figure 2.4.1 shows the point at which the LDC prints a solid red sell signal on the price chart. The RSI confirms this signal as it has risen well above 70, indicating that the stock has become overbought (highlighted by red square in Figure 2.4.1). The moving averages also confirm the sell signal as we can see the 8-day EMA fall below the 21-day EMA in a "death cross" movement (highlighted by red circle in Figure 2.4.2). Since all three indicators point to the stock entering a downturn, we can comfortably exit the positions.

It should be noted that entering and exiting positions during live trading is more difficult for several reasons. The position of the price and its movements will not always be as apparent as it is in our example. Indicators can sometimes produce false signals like when a price rallies for an hour before abruptly being sold off. Analyzing the technical indicators may produce accurate buy and sell signals for the immediate future, but not factoring in the long-term trend of the stock

can result in incorrect predictions. In order to alleviate these issues a trader must wait for significant momentum in a price's movement to confirm that the indicators signals are accurate. However, this process is often easier said than done.

Chapter 3: Selected Companies

3.1 Criteria for selecting stock companies

With inflation still impacting consumers, the future of the U.S. stock market remains uncertain. As such, I decided to pick stock companies within sectors that should be resistant to recessionary pressures. I also wanted to capitalize on the ongoing AI and semiconductor boom. I selected two companies for each of the following sectors: retail trade, electronic technology, consumer goods, health care, and energy/infrastructure. When evaluating stock companies, I looked at the two key financial metrics of "Earnings Per Share" (EPS) and "Average Day Range" (ADR). EPS measures the profitability of a company on a per-share basis and is calculated by dividing the net income by the outstanding shares of its common stock. In general, the higher the EPS the more profitable a company can be considered. ADR is an indicator that measures the volatility of a particular stock, the higher the ADR the more the stock tends to move in a trading day. A company with a high ADR will prove beneficial to me as I can capitalize on the rapid appreciation of the price when swing trading. In order to choose strong stock companies, I decided to pick companies that were profitable (EPS > 10) and relatively volatile (ADR > 5).

3.2 Retail trade

Retail trade is a sector that involves the sale of goods and services directly to consumers. It is a critical component of the economy as it connects producers and manufactures with end consumers, driving economic activity. The retail industry benefits from consistent consumer demand for a wide range of products and services. People need to purchase items (especially essential ones like food, water, and clothing) regularly, regardless of market conditions. The two companies picked from this sector are AutoZone (AZO) and Costco Wholesale (COST).

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AutoZone is a retailer of automotive replacement parts and accessories. Founded in 1979, the company has grown to become the largest retailer of its kind in the United States boasting a market capitalization of $44.005 billion. AutoZone sports a staggeringly large EPS of 130.90 USD and ADR of 53.13 [10]. This means the company is both extremely profitable and volatile. As people need to maintain their vehicles, there will always be demand for spare parts. These factors make AutoZone a key investment in my portfolio. The graph of AutoZone's share price below (Figure 3.2.1) shows a strong ascending pattern that is primed for a bull run in the immediate future, making it an even more lucrative investment for the short term.

Autozone Inc

$2,381.23 ↑13.44% +282.17 1Y

After Hours: **$2,381.23** (0.00%) 0.00
Closed: Jun 2, 4:05:00 PM UTC-4 · USD · NYSE · Disclaimer

| 1D | 5D | 1M | 6M | YTD | 1Y | 5Y | MAX |

Key events

Figure 3.2.1: Graph of AutoZone's share price over the last year.

Costco Wholesale is a retail corporation that operates an international chain of warehouses. Costco sells all types of products such as groceries, appliances, sporting goods, furniture, and

apparel all in a single store. Costco has a market capitalization of $232.405 billion, making it the fifth largest retailer in the world. Costco's EPS is 13.52 USD, and its ADR is 8.87 [10]. It is relatively profitable and volatile, making it a solid investment for our trading strategies. The share price of Costco formed a triangle pattern over the last year, with the price breaking out of the triangle indicating a possible uptrend in the near future. Costco' share price over the past year is shown in Figure 3.2.2 below.

Costco Wholesale Corporation

$512.59 ↑8.49% +40.12 1Y

After Hours: **$512.60** (↑0.0019%) +0.0099
Closed: Jun 2, 7:14:34 PM UTC-4 · USD · NASDAQ · Disclaimer

| 1D | 5D | 1M | 6M | YTD | 1Y | 5Y | MAX | | Key events |

Figure 3.2.2: Graph of Costco's share price over the last year.

3.3 Electronic technology

The semiconductor industry is responsible for the design, fabrication, and sale of semiconductor devices. These chips are integral to our society as they serve as the building blocks of most modern electronic devices. With electronic devices becoming more and more prevalent in our daily life, the need for semiconductors continues to rise. This sector is also experiencing a "gold rush" due to the hype around artificial intelligence. This surge is led by chip manufacturer Nvidia who announced a second-quarter revenue target more than 50% above Wall Street's estimates due to huge demand for its AI chips [11]. To capitalize on the market boom, chip manufacturers Monolithic Power Systems (MPWR) and NXP Semiconductors (NXPI) were chosen.

Monolithic Power Systems is an American company that designs and develops integrated power semiconductor solutions and power delivery architectures for a variety of industries [10]. The company has a market capitalization of $23.996 billion, an EPS of 9.97 USD, and an ADR of 23.52 [10]. The solid profitability and very high volatility make MPWR an appealing stock to swing trade. Monolithic Power Systems has directly benefited from AI hype as they are a component supplier for Nvidia. Looking at the graph of MPWR's share price below (Figure 3.3.1) we can see a huge spike during the latter half of May, which coincides with Nvidia's announcement of their expected earnings.

Monolithic Power Systems Inc

$497.25 ↑6.68% +31.15 1Y

After Hours: **$497.25** (0.00%) 0.00

Closed: Jun 2, 4:33:19 PM UTC-4 · USD · NASDAQ · Disclaimer

| 1D | 5D | 1M | 6M | YTD | 1Y | 5Y | MAX | | ⟳ Key events |

Figure 3.3.1: Graph of Monolithic Power System's share price over the last year.

NXP Semiconductors is a Dutch company that engages in the provision of semiconductor solutions. Its products are used in many markets including automotive, industrial, internet of things, mobile, and communications infrastructure. NXPI has a market capitalization of $49.011 billion, an EPS 10.52 USD, and an ADR of 5.1 [10]. The solid profitability and lower ADR make it a decent investment for both strategies. NXPI has a similar price history to MPWR, however the changes in its price are less drastic. The graph of NXPI's share price over the past year is shown in Figure 3.3.2 below.

Figure 3.3.2: Graph of NXP Semiconductor's share price over the last year.

3.4 Consumer goods

The consumer goods sector refers to the segment of the economy that manufactures and sells goods and services primarily intended for personal use by consumers. Similar to the retail trade sector, popular consumer goods benefit from consistent demand as people buy these products on a regular basis. I decided to pick Coca-Cola Consolidated (Coke) and Cavco Industries (CVCO) as my two goods companies.

Coca-Cola Consolidated engages in the production, manufacturing, and distribution of various nonalcoholic beverages. It is the world's largest nonalcoholic beverage company, owning many popular brands such as Coca-Cola, Sprite, Dasani, and Powerade. The diversity of types of drinks that the company produces allows it to maintain a huge presence in the market and be

resilient to economic downturns. The company has a market capitalization of $6.131 billion, an EPS of 48.53 USD, and an ADR of 13.1 [10]. The profitability and popularity of Coca-Cola make it a very appealing investment. The strength of Coca-Cola is reflected in its share price, which has been steadily increasing for the better part of the last year. Coca-Cola's share price over the past year is shown in Figure 3.4.1 below.

Figure 3.4.1: Graph of Coca-Cola Consolidated share price over the last year.

Cavco Industries is a builder of manufactured homes, modular homes, park model RVs, commercial buildings, and vacation cabins in the United States. The firm owns many subsidiary house building companies like Fleetwood, Destiny, and Nationwide. Building modular houses off-site allows Cavco to provide consumers with finished houses at lower prices and within shorter completion times than regular construction methods. Cavco's business model has allowed it to

accumulate a market capitalization of $2.399 billion, an EPS of 27.17 USD, and an ADR of 10.54

[10]. As the demand for affordable housing will grow as the population expands, Cavco Industries

makes for a solid investment pick. Cavco Industries' share price has seen consistent growth in the

past year, with a relatively regular pattern of price fluctuations. Cavco Industries' share price in

the past year is shown in Figure 3.4.2 below.

Figure 3.4.2: Graph of Cavco Industries' share price over the last year.

3.5 Health care

The health care sector refers to a broad spectrum of companies dedicated to promoting,

maintaining, and restoring the health of humans. This sector makes for a good investment because

healthcare services are required for people to survive, so demand is highly inelastic. During

economic downturns people prioritize healthcare expenditures so the sector remains relatively

stable. This sector often benefits from government support as they spend money to ensure their population remains healthy. Additionally, as the global population continues to grow and more areas gain access to health services, the demand for health care is expected to rise. The two companies picked from this sector are Vertex Pharmaceuticals (VRTX) and HCA Healthcare (HCA).

Vertex Pharmaceuticals is a global biotechnology company which researches, develops, and commercializes small molecule drugs for patients with serious diseases. The firm focuses on providing treatment for cystic fibrosis, infectious diseases, autoimmune diseases, cancer, and neurological disorders. The company's innovative R&D has allowed it to accumulate a market capitalization of $89.37 billion. It has an EPS of 12.7 USD and an ADR of 6.75 [10]. What makes Vertex Pharmaceuticals unique is its monopoly on the cystic fibrosis treatment, which has propelled its growth. The company has grown 25 % over the last year, shown by Figure 3.5.1 below.

Vertex Pharmaceuticals Incorporated

$333.78 ↑24.54% +65.78 1Y

After Hours: **$333.78** (0.00%) 0.00

Closed: Jun 2, 4:26:10 PM UTC-4 · USD · NASDAQ · Disclaimer

| 1D | 5D | 1M | 6M | YTD | **1Y** | 5Y | MAX | ⚉ Key events |
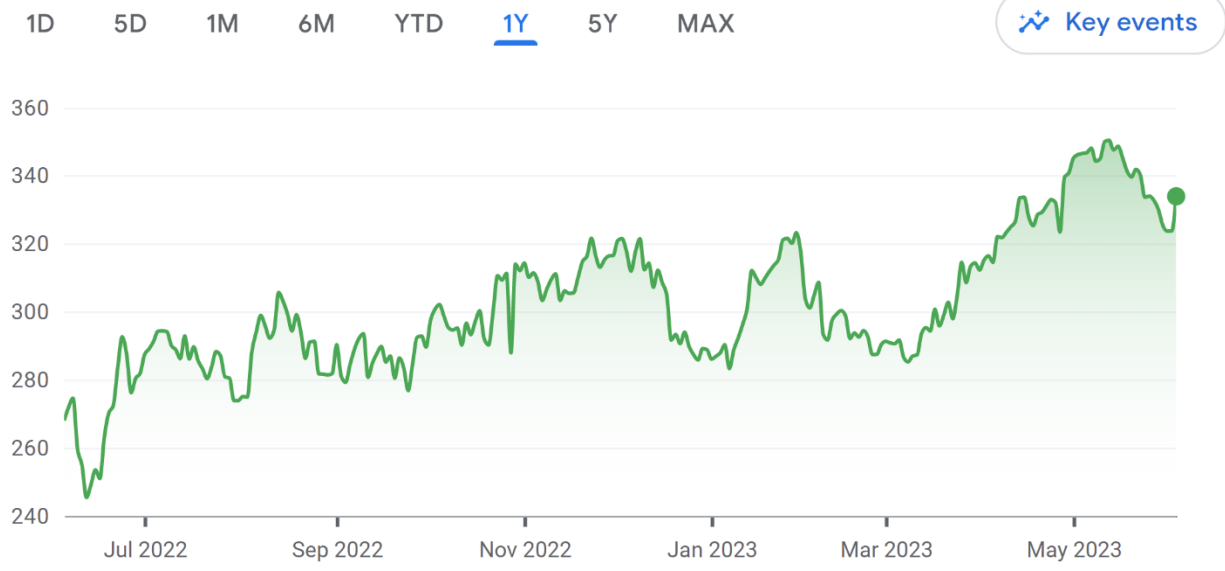
Figure 3.5.1: Graph of Vertex Pharmaceutical's share price over the last year.

HCA Healthcare is a company which operates a wide range of health service facilities such hospitals, walk-in clinics, and therapy centers among many others. The company's variety of health services facilities has allowed it to gain a market capitalization of $81.291 billion, an EPS of 20.34 USD, and an ADR of 5.11 [10]. The company is highly profitable while being relatively less volatile than the other stocks in our portfolio. HCA Healthcare has enjoyed recent growth due to hospitals returning to their normal operations after being overrun with cases of COVID-19. As seen in Figure 3.5.2 below, HCA Healthcare grew a substantial 34 % in the past year.

HCA Healthcare Inc

$274.26 ↑33.90% +69.44 1Y

After Hours: **$274.26** (0.00%) 0.00

Closed: Jun 2, 4:26:10 PM UTC-4 · USD · NYSE · Disclaimer

| 1D | 5D | 1M | 6M | YTD | **1Y** | 5Y | MAX |

⚡ Key events

Figure 3.5.2: Graph of HCA Healthcare's share price over the last year.

3.6 Resources

The resources sector is a section of the economy that explores, extracts, processes, and distributes natural resources. It encompasses various industries that extract and produce commodities made from raw materials. Investing in this sector makes sense as natural resources are needed to keep the whole world running. Raw materials will always be in demand for construction, energy, manufacturing, and agricultural purposes. The two companies selected from this sector are Alpha Metallurgical Resources (AMR) and Martin Marietta Materials (MLM).

Alpha Metallurgical Resources is a mining company that focuses on extracting metallurgical coal and thermal coal. It operates mines such as Deep Mine 41, Black Eagle, and Road Fork 52. The company has a market capitalization of $2.388 billion and boasts an EPS of

77.6 and an ADR of 5.4 [10]. The high demand for coal has enabled AMR to remain highly profitable, making it a good investment choice. The share price of AMR has been fluctuating between highs and lows for the past year in a relatively stable pattern, seen in Figure 3.6.1 below.

Figure 3.6.1: Graph of Alpha Metallurgical Resources' share price over the last year.

Martin Marietta Materials engages in the provision of non-energy minerals including crushed stone, sand, and gravel through its network of quarries. One half of the company (East Group) solely provides raw materials while the other half (West Group) also provides concrete, asphalt, and paving services. The company has a significant market capitalization of 27.414 billion, an EPS of 15.52, and an ADR of 7.11 [10]. Martin Marietta Materials grew 19 % over the past year, continuing its long-term trend of consistent growth as shown by Figure 3.6.2 below. As such, it is an attractive investment opportunity.

Martin Marietta Materials Inc

$415.08 ↑19.35% +67.31 1Y

After Hours: $415.08 (0.00%) 0.00

Closed: Jun 2, 4:26:10 PM UTC-4 · USD · NYSE · Disclaimer

| 1D | 5D | 1M | 6M | YTD | 1Y | 5Y | MAX |

⚹ Key events

Figure 3.6.2: Graph of Martin Marietta Materials share price over the last year.

Chapter 4: Buy and hold simulation

4.1 Outline of the buy and hold simulation

The buy and hold simulation began with purchasing of stocks from the ten companies mentioned in the previous chapter. As per the buy and hold strategy, the buying and selling in this simulation is only conducted to measure the asset changes and not for any active trading purposes. At the beginning of each trading week (Monday), an amount of shares equivalent to $10,000 is purchased for each company. The stocks are tracked before ultimately being sold at the end of the trading week (Friday). This is repeated for all six trading weeks. To ensure that stocks are bought and sold at similar prices buy and sell orders are placed at the same on Investopedia Simulator. The number of shares purchased and sold for each company is kept constant between all trading weeks. By buying and selling the stocks, the profits of individual stocks and the total account value can be tracked for each week.

4.2 Week One

On June 5th 2023, approximately $10,000 worth of shares were purchased from each company for a total price of $97,658. As a result, only $2342 in cash was left of the original $100,000 in the trading account. Table 4.2.1 below shows all the transactions conducted in the first week of the buy and hold trading simulation. The price of each stock, the number of shares purchased, and the net cost are displayed for each day. The total profit, total value in assets, and cash remaining is also shown.

Table 4.2.1: Trade history of buy and hold portfolio for week 1 (6/5/23 – 6/9/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
6/5/2023							$100,000		$100,000
6/5/2023	AZO	Buy	$2,391.00	4	$9,564.00	0	$90,436	0	
6/5/2023	COST	Buy	$516.45	19	$9,812.55	0	$80,623	0	
6/5/2023	MPWR	Buy	$480.94	20	$9,618.80	0	$71,005	0	
6/5/2023	NXPI	Buy	$178.04	55	$9,792.20	0	$61,212	0	
6/5/2023	COKE	Buy	$691.69	14	$9,683.66	0	$51,529	0	
6/5/2023	CVCO	Buy	$265.42	36	$9,555.12	0	$41,974	0	
6/5/2023	VRTX	Buy	$335.17	30	$10,055.10	0	$31,919	0	
6/5/2023	HCA	Buy	$273.22	36	$9,835.92	0	$22,083	0	
6/5/2023	AMR	Buy	$144.28	68	$9,811.04	0	$12,272	0	
6/5/2023	MLM	Buy	$413.74	24	$9,929.76	0	$2,342	0	
6/9/2023	AMR	Sell	$149.66	68	$10,176.88	$365.84	$12,518.73	$365.84	
6/9/2023	COST	Sell	$517.90	19	$9,840.10	$27.55	$22,358.83	$393.39	
6/9/2023	AZO	Sell	$2,374.61	4	$9,498.44	($65.56)	$31,857.27	$327.83	
6/9/2023	MPWR	Sell	$500.20	20	$10,004.00	$385.20	$41,861.27	$713.03	
6/9/2023	NXPI	Sell	$185.70	55	$10,213.50	$421.30	$52,074.77	$1,134.33	
6/9/2023	COKE	Sell	$666.34	14	$9,328.76	($354.90)	$61,403.53	$779.43	
6/9/2023	CVCO	Sell	$277.91	36	$10,004.76	$449.64	$71,408.29	$1,229.07	
6/9/2023	VRTX	Sell	$334.31	30	$10,029.30	($25.80)	$81,437.59	$1,203.27	
6/9/2023	HCA	Sell	$272.79	36	$9,820.44	($15.48)	$91,258.03	$1,187.79	
6/9/2023	MLM	Sell	$427.01	24	$10,248.24	$318.48	$101,506.27	$1,506.27	$101,506.27

As we can see from the table above, about half the stocks appreciated in value while the other half depreciated in value by the end of the week. Importantly, the majority of meaningful asset changes were positive. The semi-conductor stocks NXPI and MPWR enjoyed 4% gains thanks to AI hype continuing to unfold. AMR and CVCO enjoyed increases of a similar percentage as their share price recovered after falling in the previous weeks. MLM also gained a considerable amount, continuing its strong upward trend. Only COKE experienced a substantial loss of 3.5% after reaching an all-time high share price. This resulted in a total profit of $1,506 and the total assets rising to $101,506 a gain of around 1.5%. The portfolio significantly outperformed the S&P 500, which only rose 0.6 % this week.

4.3 Week Two

On June 12th, 2023, around $10,000 worth of shares were purchased from each company for a total price of $99,413. The stocks were subsequently sold on the Friday of June 16th. Table 4.3.1 below shows all the transactions conducted in the second week of the buy and hold trading simulation.

Table 4.3.1: Trade history of buy and hold portfolio for week 2 (6/12/23 – 6/16/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
6/12/2023							$101,506.27	$1,506.27	$101,506.27
6/12/2023	HCA	Buy	$272.93	36	$9,825.48	0	$91,680.79	$1,506.27	
6/12/2023	VRTX	Buy	$335.51	30	$10,065.30	0	$81,615.49	$1,506.27	
6/12/2023	CVCO	Buy	$276.97	36	$9,970.92	0	$71,644.57	$1,506.27	
6/12/2023	COKE	Buy	$669.86	14	$9,378.04	0	$62,266.53	$1,506.27	
6/12/2023	NXPI	Buy	$186.06	55	$10,233.30	0	$52,033.23	$1,506.27	
6/12/2023	MPWR	Buy	$510.06	20	$10,201.20	0	$41,832.03	$1,506.27	
6/12/2023	COST	Buy	$517.94	19	$9,840.86	0	$31,991.17	$1,506.27	
6/12/2023	AZO	Buy	$2,403.05	4	$9,612.20	0	$22,378.97	$1,506.27	
6/12/2023	MLM	Buy	$425.00	24	$10,200.00	0	$12,178.97	$1,506.27	
6/12/2023	AMR	Buy	$148.32	68	$10,085.76	0	$2,093.21	$1,506.27	
6/16/2023	VRTX	Sell	$350.39	30	$10,511.70	$446.40	$12,604.91	$1,952.67	
6/16/2023	NXPI	Sell	$195.31	55	$10,742.05	$508.75	$23,346.96	$2,461.42	
6/16/2023	HCA	Sell	$289.36	36	$10,416.96	$591.48	$33,763.92	$3,052.90	
6/16/2023	CVCO	Sell	$272.35	36	$9,804.60	($166.32)	$43,568.52	$2,886.58	
6/16/2023	COST	Sell	$521.95	19	$9,917.05	$76.19	$53,485.57	$2,962.77	
6/16/2023	COKE	Sell	$656.48	14	$9,190.72	($187.32)	$62,676.29	$2,775.45	
6/16/2023	MPWR	Sell	$510.77	20	$10,215.40	$14.20	$72,891.69	$2,789.65	
6/16/2023	MLM	Sell	$423.53	24	$10,164.72	($35.28)	$83,056.41	$2,754.37	
6/16/2023	AZO	Sell	$2,493.83	4	$9,975.32	$363.12	$93,031.73	$3,117.49	
6/16/2023	AMR	Sell	$156.33	68	$10,630.44	$544.68	$103,662.17	$3,662.17	$103,662.17

In the second week of trading the majority of stocks appreciated in value. The stock that rose the most was HCA which enjoyed a 6% increase as it finally broke out of the monthlong downtrend it had endured. The other health care stock VRTX saw a significant 4.5% increase as well. AMR's uptrend from last week grew stronger as it gained an additional 5.5% in value. NXPI continued its bull run from last week, having its share price rise 5% by the end of the week.

Meanwhile, the other semiconductor company MPWR only saw negligible gains. Unlike the week prior, AZO experienced significant gains showing promising signs of a bull run in the immediate future. COST had marginal gains in its share price, continuing its slow increase seen last week. COKE's share price fell further once again, losing an additional 2% of its value this week. CVCO experienced an immediate retraction of 1.5% in its share price after last week's gains. The portfolio gained $2156 this week, resulting in a total profit of $3662 and the value of total assets rising to $103,662 – an increase of 2.1 % from last week. Once again, the portfolio outperformed the S&P 500, albeit by a lower margin, which rose 1.6 % in the same time period.

4.4 Week Three

The markets were closed on June 19th in honor of Juneteenth, meaning this week only had four trading days instead of the usual five. On June 20th 2023 approximately $10,000 worth of shares were purchased from each company for a total price of $101,569. The stocks were then sold on Friday the 23rd. Table 4.4.1 below shows all the transactions conducted in the third week of the buy and hold trading simulation.

Table 4.4.1: Trade history of buy and hold portfolio for week 3 (6/19/23 – 6/23/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
6/20/2023							$103,662.17	$3,662.17	$103,662.17
6/20/2023	AMR	Buy	$156.33	68	$10,630.44	0	$93,031.73	$3,662.17	
6/20/2023	AZO	Buy	$2,493.83	4	$9,975.32	0	$83,056.41	$3,662.17	
6/20/2023	COKE	Buy	$656.48	14	$9,190.72	0	$73,865.69	$3,662.17	
6/20/2023	COST	Buy	$521.95	19	$9,917.05	0	$63,948.64	$3,662.17	
6/20/2023	MLM	Buy	$423.53	24	$10,164.72	0	$53,783.92	$3,662.17	
6/20/2023	MPWR	Buy	$510.77	20	$10,215.40	0	$43,568.52	$3,662.17	
6/20/2023	NXPI	Buy	$195.31	55	$10,742.05	0	$32,826.47	$3,662.17	
6/20/2023	CVCO	Buy	$272.35	36	$9,804.60	0	$23,021.87	$3,662.17	
6/20/2023	HCA	Buy	$289.36	36	$10,416.96	0	$12,604.91	$3,662.17	
6/20/2023	VRTX	Buy	$350.39	30	$10,511.70	0	$2,093.21	$3,662.17	
6/23/2023	AMR	Sell	$168.41	68	$11,451.88	$821.44	$13,545.09	$4,483.61	
6/23/2023	AZO	Sell	$2,467.73	4	$9,870.92	($104.40)	$23,416.01	$4,379.21	
6/23/2023	COKE	Sell	$643.19	14	$9,004.66	($186.06)	$32,420.67	$4,193.15	
6/23/2023	COST	Sell	$523.48	19	$9,946.12	$29.07	$42,366.79	$4,222.22	
6/23/2023	MPWR	Sell	$518.59	20	$10,371.80	$156.40	$52,738.59	$4,378.62	
6/23/2023	CVCO	Sell	$284.26	36	$10,233.36	$428.76	$62,971.95	$4,807.38	
6/23/2023	HCA	Sell	$294.58	36	$10,604.88	$187.92	$73,576.83	$4,995.30	
6/23/2023	MLM	Sell	$445.01	24	$10,680.24	$515.52	$84,257.07	$5,510.82	
6/23/2023	NXPI	Sell	$193.97	55	$10,668.35	($73.70)	$94,925.42	$5,437.12	
6/23/2023	VRTX	Sell	$345.02	30	$10,350.60	($161.10)	$105,276.02	$5,276.02	$105,276.02

In the third week of trading more than half the stocks appreciated in value while the rest depreciated. The majority of asset changes were profitable. AMR experienced the biggest gain by far, its share price increasing by a staggering 8%. This marks AMR's third consecutive week of growth, suggesting investors believe AMR's real value is above its current market price. MLM grew 5%, continuing its long-term uptrend. CVCO experienced significant growth, increasing by 4% after last week's downturn. HCA grew at a slower rate than the week prior, its share price increasing by 2%. Meanwhile, VRTX experienced a slight drop off as its share price fell by 1.5% by the end of the week. The semiconductor stocks swapped positions this week, as MPWR's share price increased by 1.5% while NXPI's share price fell by less than 1%. COST once again had marginal gains in its share price. COKE's share price fell for a third week straight, dropping by an

additional 2% this week. AZO experienced a retraction of 1% in its share price following last week's uptrend. The portfolio gained $1,614 this week, resulting in a total profit of $5,276 and the total assets being valued at $105,276. The portfolio experienced growth of 1.6%, significantly outperforming the S&P 500 which decreased 0.9% in the same week.

4.5 Week Four

On June 26th approximately $10,000 worth of shares were purchased from each company for a total price of $103,195. On Friday the 30th of June the stocks were then sold. Table 4.5.1 below shows all the transactions conducted in the third week of the buy and hold trading simulation.

Table 4.5.1: Trade history of buy and hold portfolio for week 4 (6/26/23 – 6/30/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
6/26/2023							$105,276.02	$5,276.02	$105,276.02
6/26/2023	AMR	Buy	$168.41	68	$11,451.88	0	$93,824.14	$5,276.02	
6/26/2023	AZO	Buy	$2,465.68	4	$9,862.72	0	$83,961.42	$5,276.02	
6/26/2023	COKE	Buy	$643.19	14	$9,004.66	0	$74,956.76	$5,276.02	
6/26/2023	COST	Buy	$523.40	19	$9,944.60	0	$65,012.16	$5,276.02	
6/26/2023	CVCO	Buy	$284.26	36	$10,233.36	0	$54,778.80	$5,276.02	
6/26/2023	HCA	Buy	$294.58	36	$10,604.88	0	$44,173.92	$5,276.02	
6/26/2023	MLM	Buy	$445.40	24	$10,689.60	0	$33,484.32	$5,276.02	
6/26/2023	MPWR	Buy	$518.59	20	$10,371.80	0	$23,112.52	$5,276.02	
6/26/2023	NXPI	Buy	$194.03	55	$10,671.65	0	$12,440.87	$5,276.02	
6/26/2023	VRTX	Buy	$345.34	30	$10,360.20	0	$2,080.67	$5,276.02	
6/30/2023	NXPI	Sell	$205.54	55	$11,304.70	$633.05	$13,385.37	$5,909.07	
6/30/2023	COST	Sell	$537.25	19	$10,207.75	$263.15	$23,593.12	$6,172.22	
6/30/2023	CVCO	Sell	$294.39	36	$10,598.04	$364.68	$34,191.16	$6,536.90	
6/30/2023	HCA	Sell	$300.44	36	$10,815.84	$210.96	$45,007.00	$6,747.86	
6/30/2023	AMR	Sell	$165.47	68	$11,251.96	($199.92)	$56,258.96	$6,547.94	
6/30/2023	MLM	Sell	$458.03	24	$10,992.72	$303.12	$67,251.68	$6,851.06	
6/30/2023	AZO	Sell	$2,468.55	4	$9,874.20	$11.48	$77,125.88	$6,862.54	
6/30/2023	MPWR	Sell	$545.23	20	$10,904.60	$532.80	$88,030.48	$7,395.34	
6/30/2023	COKE	Sell	$634.49	14	$8,882.86	($121.80)	$96,913.34	$7,273.54	
6/30/2023	VRTX	Sell	$348.77	30	$10,463.10	$102.90	$107,376.44	$7,376.44	$107,376.44

In the fourth week of trading the overwhelming majority of stocks enjoyed significant uptrends. The semiconductor stocks saw the biggest increases in the share price by far. By the end of the week, NXPI had its share price grow by 6% while MPWR saw its share price rise 5%. CVCO built upon its momentum from last week, having its share price increase by 3.5%. MLM followed closely behind, growing 3% by the week's end. COST finally had a significant spike its price movement, increasing by 2.5%. HCA enjoyed similar gains as last week, growing by an identical 2%. VRTX had its share price grow by approximately 1% after falling the week prior. AZO fluctuated throughout the week, ending up with negligible gains of 0.1% by the end of the week. Only two stocks lost value this week. COKE saw its share price drop for the fourth straight week, falling an additional 1%. AMR experienced a retraction after last week's bull run, dropping 2% in its share price. The portfolio gained $2,100 this week, resulting in a total profit of $7,376 and the value of total assets rising to $107,376. The portfolio grew 2% this week, performing worse than the S&P 500 which grew 2.8% over the same time period.

4.6 Week Five

In honor of the U.S. Independence Day, the markets closed early on July 3rd (at 1pm) and were completely closed on July 4th. As such, there were only three and half trading days available this week. On July 3rd approximately $10,000 worth of shares were purchased from each company for a total price of $105,296. The stocks were then sold on Friday the 7th of July. Table 4.6.1 below shows all the transactions conducted in the third week of the buy and hold trading simulation.

Table 4.6.1: Trade history of buy and hold portfolio for week 5 (7/3/23 – 7/7/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
7/3/2023							$107,376.44	$7,376.44	$107,376.44
7/3/2023	CVCO	Buy	$294.39	36	$10,598.04	0	$96,778.40	$7,376.44	
7/3/2023	HCA	Buy	$300.44	36	$10,815.84	0	$85,962.56	$7,376.44	
7/3/2023	AMR	Buy	$165.47	68	$11,251.96	0	$74,710.60	$7,376.44	
7/3/2023	MLM	Buy	$458.03	24	$10,992.72	0	$63,717.88	$7,376.44	
7/3/2023	AZO	Buy	$2,468.55	4	$9,874.20	0	$53,843.68	$7,376.44	
7/3/2023	MPWR	Buy	$545.23	20	$10,904.60	0	$42,939.08	$7,376.44	
7/3/2023	COKE	Buy	$634.49	14	$8,882.86	0	$34,056.22	$7,376.44	
7/3/2023	COST	Buy	$537.25	19	$10,207.75	0	$23,848.47	$7,376.44	
7/3/2023	VRTX	Buy	$348.77	30	$10,463.10	0	$13,385.37	$7,376.44	
7/3/2023	NXPI	Buy	$205.54	55	$11,304.70	0	$2,080.67	$7,376.44	
7/7/2023	AMR	Sell	$158.55	68	$10,781.40	($470.56)	$12,862.07	$6,905.88	
7/7/2023	AZO	Sell	$2,464.20	4	$9,856.80	($17.40)	$22,718.87	$6,888.48	
7/7/2023	COKE	Sell	$636.52	14	$8,911.28	$28.42	$31,630.15	$6,916.90	
7/7/2023	COST	Sell	$525.06	19	$9,976.14	($231.61)	$41,606.29	$6,685.29	
7/7/2023	CVCO	Sell	$264.96	36	$9,538.56	($1,059.48)	$51,144.85	$5,625.81	
7/7/2023	HCA	Sell	$291.82	36	$10,505.52	($310.32)	$61,650.37	$5,315.49	
7/7/2023	MLM	Sell	$439.55	24	$10,549.20	($443.52)	$72,199.57	$4,871.97	
7/7/2023	MPWR	Sell	$519.42	20	$10,388.40	($516.20)	$82,587.97	$4,355.77	
7/7/2023	NXPI	Sell	$206.15	55	$11,338.25	$33.55	$93,926.22	$4,389.32	
7/7/2023	VRTX	Sell	$339.02	30	$10,170.60	($292.50)	$104,096.82	$4,096.82	$104,096.82

In the fifth week of trading almost all the stocks experienced significant decreases in their share price. The downtrend of the portfolio reflects the markets pulling back after enjoying a bull run for the past several weeks. CVCO experienced the greatest depreciation in value, falling a staggering 10% in just one week. MPWR had its stock price reverse its movement from last week, decreasing by 5%. AMR and MLM followed closely behind, both falling 4.5% by the end of the week. The health care stocks performed identically – HCA and VRTX both had their share price depreciate by 3%. COST fell almost 2.5% by the week's end. AZO's share price continued to fluctuate like last week, only decreasing by a negligible 0.2%. Investors are unsure whether AZO has reached the apex of its uptrend or if it still has additional gains to be made. Only two stocks appreciated in value. COKE and NXPI both had their share price increase by a marginal 0.3%. The portfolio lost $3280 this week, resulting in a total profit of $4,097 and the value of the total assets

falling to $104,097. The portfolio fell by 3%, performing much worse than the S&P 500 which only fell 1.3% in the same time period.

4.7 Week Six

On July 10th approximately $10,000 worth of shares were purchased from each company for a total price of $102,016. The stocks were then sold on Friday the 14th of July. Table 4.7.1 below shows all the transactions conducted in the third week of the buy and hold trading simulation.

Table 4.7.1: Trade history of buy and hold portfolio for week 6 (7/10/23 – 7/14/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
7/10/2023							$104,096.82	$4,096.82	$104,096.82
7/10/2023	AMR	Buy	$158.55	68	$10,781.40	0	$93,315.42	$4,096.82	
7/10/2023	AZO	Buy	$2,464.20	4	$9,856.80	0	$83,458.62	$4,096.82	
7/10/2023	COKE	Buy	$636.52	14	$8,911.28	0	$74,547.34	$4,096.82	
7/10/2023	COST	Buy	$525.06	19	$9,976.14	0	$64,571.20	$4,096.82	
7/10/2023	HCA	Buy	$291.82	36	$10,505.52	0	$54,065.68	$4,096.82	
7/10/2023	CVCO	Buy	$264.96	36	$9,538.56	0	$44,527.12	$4,096.82	
7/10/2023	MLM	Buy	$439.55	24	$10,549.20	0	$33,977.92	$4,096.82	
7/10/2023	MPWR	Buy	$519.42	20	$10,388.40	0	$23,589.52	$4,096.82	
7/10/2023	NXPI	Buy	$206.15	55	$11,338.25	0	$12,251.27	$4,096.82	
7/10/2023	VRTX	Buy	$339.02	30	$10,170.60	0	$2,080.67	$4,096.82	
7/14/2023	AMR	Sell	$154.11	68	$10,479.48	($301.92)	$12,560.15	$3,794.90	
7/14/2023	AZO	Sell	$2,553.36	4	$10,213.44	$356.64	$22,773.59	$4,151.54	
7/14/2023	COKE	Sell	$630.75	14	$8,830.50	($80.78)	$31,604.09	$4,070.76	
7/14/2023	COST	Sell	$545.75	19	$10,369.25	$393.11	$41,973.34	$4,463.87	
7/14/2023	CVCO	Sell	$296.63	36	$10,678.68	$1,140.12	$52,652.02	$5,603.99	
7/14/2023	HCA	Sell	$297.04	36	$10,693.44	$187.92	$63,345.46	$5,791.91	
7/14/2023	MLM	Sell	$456.49	24	$10,955.76	$406.56	$74,301.22	$6,198.47	
7/14/2023	MPWR	Sell	$571.76	20	$11,435.20	$1,046.80	$85,736.42	$7,245.27	
7/14/2023	NXPI	Sell	$213.49	55	$11,741.95	$403.70	$97,478.37	$7,648.97	
7/14/2023	VRTX	Sell	$351.87	30	$10,556.10	$385.50	$108,034.47	$8,034.47	$108,034.47

In the final week of trading almost all the stocks experienced significant growth. The uptrend experienced by the portfolio this week reflects the market recovering from last week's downtrend. Such a strong reaction to a pullback suggests the market is in the midst of a long-term

bull run and that investors have an optimistic outlook on the future. Bouncing back from its drop in value, CVCO grew more than 11% this week. Following closely behind, MPWR grew more than 10% by the end of the week. The other semiconductor stock NXPI experienced smaller gains of 4%. MLM and COST both enjoyed their share price increasing by approximately 4%. The healthcare stocks performed decently, with VRTX growing less than 4% and HCA growing less than 2% by week's end. AZO finally broke free of its two-week holding pattern, increasing its share price by 3.5% in a week. Only two stocks depreciated in value. AMR had its share price drop by 3%, while COKE fell less than 1%. The portfolio gained $3,938 this week, raising the total profit to $8,034 and the value of the total assets rising to $108,034. The portfolio grew 3.8% this week, significantly outperforming the S&P 500 which only managed to grow 2% in the same time frame.

Chapter 5: Swing trading simulation

5.1 Outline of swing trading simulation

The swing trading simulation differed from the buy and hold simulation as it was a lot more dynamic in nature. A number of shares of a company were purchased, held for a period of days or weeks, and then sold in order to make a profit. The specific entry and exit positions for each stock were determined by using the methodology outlined in section 2.4. The ten companies were monitored on a daily basis to find any indications of buy or sell signals. As a majority of price movement typically occurred at the start of the trading day, a lot of attention was focused on analyzing stocks every morning (9 am to 12 pm). The indicators covered in section 1.5 were primarily used to conduct technical analysis of each stock. The number of shares purchased for each company was based on my confidence in the buy/sell signals produced by the indicators. A high confidence in the indicators meant that I purchased proportionately more shares for that particular company while low confidence meant that I purchased less shares. The weekly performance of the swing trading portfolio is quantified in the tables below.

5.2 Week One

The first week of the swing trading simulation began on Monday the 5th of June and ended on Friday the 9th of June. The first trading week was quite successful as many of the stocks were experiencing strong uptrends which could be capitalized upon. The majority of the stocks were purchased at the start of the week and sold in the following days. A few stocks were purchased in the latter half of the week. I benefited from strong buy signals and the confirmation of multiple indicators, which allowed me to buy shares with a high degree of confidence. Table 5.2.1 below shows all the transactions conducted in the first week of the swing trading simulation. The price

of each stock, the number of shares purchased, and the net cost are displayed for each day. The

total profit, total value in assets, and cash remaining is also shown.

Table 5.2.1: Trade history of swing trading portfolio for week 1 (6/5/23 – 6/9/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
6/5/2023							$100,000		$100,000
6/5/2023	COST	Buy	$516.95	19	$9,822.05	0	$90,177.95	0	
6/5/2023	AMR	Buy	$144.65	69	$9,980.85	0	$80,197.10	0	
6/6/2023	COKE	Buy	$679.00	15	$10,185.00	0	$70,012.10	0	
6/6/2023	NXPI	Buy	$179.13	56	$10,031.28	0	$59,980.82	0	
6/6/2023	MPWR	Buy	$495.69	19	$9,418.11	0	$50,562.71	0	
6/6/2023	CVCO	Buy	$270.86	36	$9,750.96	0	$40,811.75	0	
6/6/2023	COST	Sell	$516.52	19	$9,813.88	($8.17)	$50,625.63	($8.17)	
6/7/2023	COKE	Sell	$673.72	15	$10,105.80	($79.20)	$60,731.43	($87.37)	
6/7/2023	MPWR	Sell	$501.99	19	$9,537.81	$119.70	$70,269.24	$32.33	
6/7/2023	NXPI	Sell	$187.38	56	$10,493.28	$462.00	$80,762.52	$494.33	
6/7/2023	AMR	Sell	$153.81	69	$10,612.89	$632.04	$91,375.41	$1,126.37	
6/8/2023	VRTX	Buy	$326.50	30	$9,795.00	0	$81,580.41	$1,126.37	
6/8/2023	CVCO	Sell	$287.97	36	$10,366.92	$615.96	$91,947.33	$1,742.33	
6/8/2023	AZO	Buy	$2,344.13	3	$7,032.39	0	$84,914.94	$1,742.33	
6/9/2023	AZO	Buy	$2,374.95	7	$16,624.65	0	$68,290.29	$1,742.33	
6/9/2023	VRTX	Sell	$331.72	30	$9,951.60	$156.60	$78,241.89	$1,898.93	$101,898.93

Most of the stocks that were bought and sold in the first week produced significant profits.

AMR and CVCO were the most profitable stocks, rising approximately 6% in value by the time

they were sold. NXPI closely followed by, growing $462 in the one day that it was held for. I

managed to return profit on VRTX and MPWR as well, which rose $157 and $120 respectively

over a one-day period. Two trades I made resulted in losses, although they were relatively minor.

I sold COKE for a loss of $79 after holding it for day. I also sold COST as it did not increase as

expected, resulting in a negligible loss of less than 0.1%. As the technical indicators were showing

strong signs of a long-term trend reversal, I decided to buy 10 shares of AZO for a total price of

$23,657 in the latter half of the week. Adding up the profit and losses of all the trades resulted in

a total profit of $1,899 and the total assets rising to $101,899 by the end of the week. The portfolio

experienced a growth of 1.9%, performing more than three times as good as the S&P 500 which

only rose 0.6% in the same time period.

5.3 Week Two

The second week of the swing trading simulation began on Monday the 12th of June and

ended on Friday the 16th of June. The second week of trading was unsuccessful as more than half

the trades ended up as losses. The key issue was that I relied upon short-term indicators (5 min

time frame) to make my buy and sell decisions, without considering the bigger picture. This

resulted in me making several rash decisions, panic selling stocks when they showed any hint of a

downtrend. I missed out on stocks that experienced growth over a several day period as I sold the

stocks prematurely. Table 5.3.1 below shows all the transactions conducted in the second week of

the swing trading simulation.

Table 5.3.1: Trade history of swing trading portfolio for week 2 (6/12/23 – 6/16/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
6/12/2023							$78,241.89	$1,898.93	$101,898.83
6/12/2023	AZO	Buy	$2,401.45	4	$9,605.80	0	$68,636.09	$1,898.93	
6/13/2023	HCA	Buy	$279.75	36	$10,071.00	0	$58,565.09	$1,898.93	
6/13/2023	VRTX	Buy	$340.20	29	$9,865.80	0	$48,699.29	$1,898.93	
6/13/2023	CVCO	Buy	$283.90	35	$9,936.50	0	$38,762.79	$1,898.93	
6/14/2023	AMR	Buy	$151.80	66	$10,018.80	0	$28,743.99	$1,898.93	
6/14/2023	COST	Buy	$526.08	19	$9,995.52	0	$18,748.47	$1,898.93	
6/14/2023	CVCO	Sell	$282.23	35	$9,878.05	($58.45)	$28,626.52	$1,840.48	
6/14/2023	HCA	Sell	$286.48	36	$10,313.28	$242.28	$38,939.80	$2,082.76	
6/14/2023	VRTX	Sell	$339.54	29	$9,846.66	($19.14)	$48,786.46	$2,063.62	
6/14/2023	AMR	Sell	$149.12	66	$9,841.92	($176.88)	$58,628.38	$1,886.74	
6/15/2023	VRTX	Buy	$343.59	30	$10,307.70	0	$48,320.68	$1,886.74	
6/15/2023	CVCO	Buy	$276.38	36	$9,949.68	0	$38,371.00	$1,886.74	
6/15/2023	CVCO	Sell	$272.05	36	$9,793.80	($155.88)	$48,164.80	$1,730.86	
6/16/2023	HCA	Buy	$290.80	34	$9,887.20	0	$38,277.60	$1,730.86	
6/16/2023	VRTX	Sell	$348.32	30	$10,449.60	$141.90	$48,727.20	$1,872.76	
6/16/2023	COKE	Buy	$648.87	15	$9,733.05	0	$38,994.15	$1,872.76	
6/16/2023	COKE	Buy	$650.25	15	$9,753.75	$0.00	$29,240.40	$1,872.76	$103,521.00

In the second week, more than half the trades carried out resulted in losses. The largest loss was AMR which fell $177 in less than a day. The sudden price change prompted me to sell the stock almost immediately after buying it, causing me to miss out on the stock growing by the end of the week. At the start of the week, I bought CVCO and sold it a day later for a loss of $58. Later on, I bought CVCO once again before selling it on the same day for a loss of $156. In this case, ignoring the overbought indications from the month-long RSI resulted in a bad trading decision. I also lost on a trade with VRTX, although the loss was a negligible 0.1%. Nevertheless, I did manage to make two successful trades. HCA experienced a $242 rise in its value by the time I sold it. I also bought VRTX again, this time selling it for a profit of $142 at the end of the week. Because AZO continued to show signs of an uptrend spotted in the last week, I bought an additional 4 shares of the company. I also bought $20,000 in shares of COKE at the end of the week as a potential trend reversal was spotted. The profits and losses incurred this week resulted in the total loss being $26 this week, bringing the total profit to a value of $1873 – a decrease of 1.4%. Despite this, the total account value managed to increase to $103,521 thanks to the large investment in AZO realizing significant gains by the end of the week. The overall portfolio experienced a 1.6% gain in value, mirroring the performance of the S&P 500 in the same time period.

5.4 Week Three

The third week of the swing trading simulation began on Monday the 19th of June and ended on Friday. However, the markets were closed on Monday in honor of Juneteenth meaning that there were only four days to trade. The third week of trading was more successful than the week prior, with more trades resulting in profits. Putting less focus on short-term technical indicators and also following the momentum of the markets allowed me to make better trades.

Table 5.4.1 below shows all the transactions conducted in the third week of the swing trading simulation.

Table 5.4.1: Trade history of swing trading portfolio for week 3 (6/19/23 – 6/23/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
6/20/2023							$29,240.40	$1,872.76	$103,521
6/20/2023	COST	Sell	$519.46	19	$9,869.74	($125.78)	$39,110.14	$1,746.98	
6/20/2023	AMR	Buy	$163.34	62	$10,127.08	0	$28,983.06	$1,746.98	
6/20/2023	HCA	Sell	$287.23	34	$9,765.82	($121.38)	$38,748.88	$1,625.60	
6/21/2023	CVCO	Buy	$274.77	18	$4,945.86	0	$33,803.02	$1,625.60	
6/21/2023	CVCO	Buy	$274.77	18	$4,945.86	0	$28,857.16	$1,625.60	
6/21/2023	VRTX	Buy	$345.61	30	$10,368.30	0	$18,488.86	$1,625.60	
6/21/2023	COKE	Sell	$660.17	30	$19,805.10	$318.30	$38,293.96	$1,943.90	
6/22/2023	CVCO	Sell	$276.69	36	$9,960.84	$69.12	$48,254.80	$2,013.02	
6/22/2023	AMR	Sell	$163.66	62	$10,146.92	$19.84	$58,401.72	$2,032.86	
6/22/2023	COST	Buy	$521.36	19	$9,905.84	0	$48,495.88	$2,032.86	
6/22/2023	HCA	Buy	$290.44	34	$9,874.96	0	$38,620.92	$2,032.86	
6/22/2023	MPWR	Buy	$514.85	20	$10,297.00	0	$28,323.92	$2,032.86	
6/22/2023	NXPI	Buy	$195.09	52	$10,144.68	0	$18,179.24	$2,032.86	
6/23/2023	HCA	Sell	$293.45	34	$9,977.30	$102.34	$28,156.54	$2,135.20	$102,804.58

More than half the trades conducted this week were profitable. COKE was the most profitable, its value increasing by $318.30 since last week. HCA was sold after accumulating a 1% increase in its value over the span of a day. CVCO and AMR were also bought and sold for marginal profits of $69 and $20 respectively. Two trades resulted in losses this week. COST was sold after purchasing it last week for a loss of $126. Similarly, HCA was sold after a weeklong hold for a loss of $121. In the latter half of the week $10000 worth of shares each were purchased for COST, HCA, MPWR, and NXPI to be held until the next week. The addition of the profits and losses resulted in the total gain being $262 this week, bringing the total profit value to $2135.20 – an increase of 14%. Although the trades proved profitable this week, the poor performance of AZO reduced the value of the total assets to $102,805 – a decrease of 0.7%. The overall portfolio performed slightly better than the S&P 500, which fell 0.9% in the same week.

5.5 Week Four

The fourth week of the swing trading simulation began on Monday the 26th of June and ended on Friday the 30th of June. The fourth week of trading was highly successful with the vast majority of trades returning a profit. The experience gained from the prior weeks of trading helped make me enter and exit trades at optimal times. Table 5.5.1 below shows all the transactions conducted in the fourth week of the swing trading simulation.

Table 5.5.1: Trade history of swing trading portfolio for week 4 (6/26/23 – 6/30/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
6/26/2023							$28,156.54	$2,135.20	$102,804.58
6/26/2023	CVCO	Buy	$284.26	35	$9,949.10	0	$18,207.44	$2,135.20	
6/26/2023	AMR	Buy	$167.48	59	$9,881.32	0	$8,326.12	$2,135.20	
6/26/2023	VRTX	Sell	$347.75	30	$10,432.50	$64.20	$18,758.62	$2,199.40	
6/27/2023	AMR	Sell	$162.31	59	$9,576.29	($305.03)	$28,334.91	$1,894.37	
6/27/2023	CVCO	Sell	$292.88	35	$10,250.80	$301.70	$38,585.71	$2,196.07	
6/27/2023	MPWR	Sell	$527.95	20	$10,559.00	$262.00	$49,144.71	$2,458.07	
6/27/2023	COST	Sell	$530.98	19	$10,088.62	$182.78	$59,233.33	$2,640.85	
6/27/2023	NXPI	Sell	$199.16	52	$10,356.32	$211.64	$69,589.65	$2,852.49	
6/28/2023	VRTX	Buy	$349.54	28	$9,787.12	0	$59,802.53	$2,852.49	
6/29/2023	COKE	Buy	$650.55	30	$19,516.50	0	$40,286.03	$2,852.49	
6/29/2023	HCA	Buy	$301.33	33	$9,943.89	0	$30,342.14	$2,852.49	
6/29/2023	CVCO	Buy	$294.74	33	$9,726.42	0	$20,615.72	$2,852.49	
6/30/2023	VRTX	Sell	$352.39	28	$9,866.92	$79.80	$30,482.64	$2,932.29	
6/30/2023	HCA	Sell	$302.75	33	$9,990.75	$46.86	$40,473.39	$2,979.15	
6/30/2023	CVCO	Sell	$296.23	33	$9,775.59	$49.17	$50,248.98	$3,028.32	
6/30/2023	AZO	Sell	$2,499.36	14	$34,991.04	$1,728.20	$85,240.02	$4,756.52	$104,756.52

Almost all the trades conducted in the fourth week were highly profitable. AZO was the most profitable by far, returning $1728 in profits after holding it for a few weeks. CVCO was sold for a profit of $302 after holding it for a day. CVCO was bought and sold again, for a lower profit of $49 later on in the week. All the stocks purchased from late last week enjoyed uptrends. The semiconductor stocks were both sold for profit, with MPWR and NXPI returning $262 and $212 respectively since their purchase. COST accumulated an increase of $183 to its value since

its purchase last week. The healthcare stocks VRTX and HCA were both bought and sold towards the later half of the week for profits of less than 1%. The only trade that resulted in a loss was AMR, which fell $305 in only a day. The sudden drop off prompted me to sell the stock long before I had intended. Once again, $20000 worth of shares of COKE was purchased at the end. The trading activity of this week returned a net profit of $2621, raising the total profits to $4757 – a significant increase of 123%. The value of the total assets rose to $104,757, an increase of 1.9% since last week. In spite of the trading successes the portfolio performed worse than the S&P 500, which rose 2.8% in the same trading week.

5.6 Week Five

The fifth week of the swing trading simulation began on Monday the 3rd of July and ended on Friday the 7th of July. The markets closed early on July 3rd (1 pm) and were shut down on July 4th in honor of the U.S. Independence Day. The markets were only open for three and half days, meaning there were less opportunities to actively trade this week. This week saw the market suffer a sharp decline after weeks of growth. As a result, most of the stocks within the portfolio experienced a decrease in their share price throughout the week. Table 5.6.1 below shows all the transactions conducted in the fifth week of the swing trading simulation.

Table 5.6.1: Trade history of swing trading portfolio for week 5 (7/3/23 – 7/7/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
7/7/2023							$85,240.02	$4,756.52	$104,756.52
7/7/2023	MPWR	Buy	$518.32	19	$9,848.08	0	$75,391.94	$4,756.52	
7/7/2023	CVCO	Buy	$274.16	36	$9,869.76	0	$65,522.18	$4,756.52	
7/7/2023	NXPI	Buy	$205.81	100	$20,581.00	0	$44,941.18	$4,756.52	$104,756.52

Because of the market decline and the limited trading days, only a few stocks were purchased at the end of the week. NXPI showed strong signs of beginning an uptrend after a lull in its growth, and so $20,000 worth of shares were purchased. The other semi-conductor stock MPWR showed similar signs as NXPI, so $10,000 worth of shares were purchased for it. $10,000 worth of shares were also purchased for CVCO as technical indicators produced strong buy signals for the company as well. The lack of trading this week meant there were no profits, resulting in the total profits of $4756.52 and the total assets of $104,756.52 remaining unchanged. The portfolio changed 0% this week, outperforming the S&P 500 which fell 1.3% in the same period.

5.7 Week Six

The sixth week of the swing trading simulation began on Monday the 10th of July and ended on Friday the 14th of July. The final week of trading was very successful, with every trade expect one returning a significant profit. The experience gathered from the previous weeks of trading and the upswing in the market were the key factors which contributed to the portfolio's success. I had more faith in my technical indicators after several weeks of trading, which allowed me to enter and exit trades with greater confidence. Table 5.7.1 below shows all the transactions conducted in the sixth week of the swing trading simulation.

Table 5.7.1: Trade history of swing trading portfolio for week 6 (7/10/23 – 7/14/23).

Date	Symbol	Buy/Sell	Price	Shares	Net cost	Profit/Loss	Total Cash	Total Profit	Total Assets
7/10/2023							$44,941.18	$4,756.52	$104,756.52
7/10/2023	MLM	Buy	$443.08	23	$10,190.84	0	$34,750.34	$4,756.52	
7/10/2023	VRTX	Buy	$343.67	29	$9,966.43	0	$24,783.91	$4,756.52	
7/10/2023	AZO	Buy	$2,517.63	4	$10,070.52	0	$14,713.39	$4,756.52	
7/10/2023	HCA	Buy	$294.64	34	$10,017.76	0	$4,695.63	$4,756.52	
7/10/2023	NXPI	Sell	$210.34	100	$21,034.00	$453.00	$25,729.63	$5,209.52	
7/10/2023	MPWR	Sell	$539.38	19	$10,248.22	$400.14	$35,977.85	$5,609.66	
7/11/2023	AZO	Buy	$2,539.72	4	$10,158.88	0	$25,818.97	$5,609.66	
7/11/2023	COST	Buy	$528.75	38	$20,092.50	0	$5,726.47	$5,609.66	
7/12/2023	CVCO	Sell	$292.64	36	$10,535.04	$665.28	$16,261.51	$6,274.94	
7/12/2023	VRTX	Sell	$346.09	29	$10,036.61	$70.18	$26,298.12	$6,345.12	
7/14/2023	HCA	Sell	$297.04	34	$10,099.36	$81.60	$36,397.48	$6,426.72	
7/14/2023	MLM	Sell	$456.49	23	$10,499.27	$308.43	$46,896.75	$6,735.15	
7/14/2023	AZO	Sell	$2,550.69	8	$20,405.52	$176.12	$67,302.27	$6,911.27	
7/14/2023	COST	Sell	$544.17	38	$20,678.46	$585.96	$87,980.73	$7,497.23	
7/14/2023	COKE	Sell	$630.41	30	$18,912.30	($604.20)	$106,893.03	$6,893.03	$106,893.03

Almost all the trades conducted in the final week of trading produced substantial profits. The purchase of CVCO last week paid off, as the stock returned a sizeable profit of $665.28 by the end of the week. $20,000 worth of COST shares were purchased and sold in the latter half of the week, producing a profit of $585.96. The semiconductor stocks purchased last week proved to be good investments as well. After only a day of holding, NXPI and MPWR grew by $453 and $400 respectively. MLM grew steadily throughout the week, producing $308.43 in profits after being sold. A large investment in AZO proved to be less successful than hoped for, returning a profit of only $176.12. The healthcare stocks HCA and VRTX were bought and sold, both resulting in marginal gains of less than 1%. Unfortunately, this week's successes were marred by a single bad investment. After holding $20,000 worth of COKE for a couple weeks the stock showed no signs of an upswing. COKE had to be sold by the end of the experiment for a significant loss of $604.20. The trading activity of this week produced a net profit of $2,137, raising the total profit to $6,893 – an increase of 45%. The value of the total assets rose to $106,893, an increase of 2%

since last week. The portfolio performed identically to the S&P 500, which also grew by 2% this week.

Chapter 6: Simulation results and analysis

6.1 Overview

After six weeks of trading both simulations ended with their respective portfolios increasing in value by a significant margin. The buy and hold strategy was the most profitable, the portfolio growing 8% by the end of the experiment. The swing trading strategy was slightly less profitable, increasing the portfolio's value by 6.9%. The profitability of both trading simulations reflected the overall market experiencing a strong uptrend for the majority of the six-week trading period. Regardless, both simulations managed to outperform the S&P 500 which only grew 5.4% over the span of the experiment. A more detailed analysis of the outcomes of both trading simulations can be found in the sections below.

6.2 Buy and hold simulation

The buy and hold simulation was successful. The portfolio managed to grow every week except for one. This was because the stocks within the portfolio enjoyed substantial increases in value for most of the trading period. The success of the portfolio can mainly be attributed to a good selection of companies and the uptrend which the market as a whole was experiencing. Selecting two companies each from five different sectors ensured that the portfolio was diverse. This allowed the portfolio to benefit from the movement of the entire market, rather than focusing all the resources on one specific field. Additionally, many of the companies selected were in the midst of long-term growth or at the beginning of a trend reversal. This maximized the chances that the portfolio would be profitable in the immediate future. Figure 6.2.1 below shows the value of the buy and hold portfolio over the span of the six-week trading period.
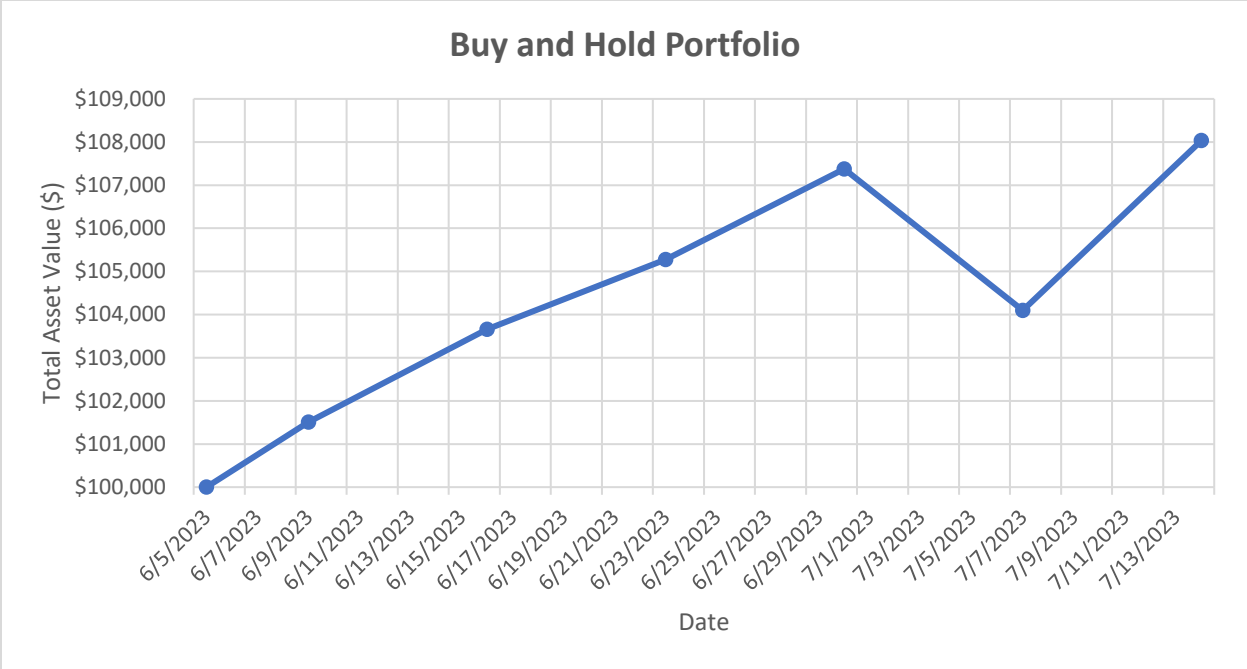
Figure 6.2.1: Graph showing the value of the buy and hold portfolio over time.

The buy and hold strategy experienced strong growth over most of the trading period. After six weeks, the value of the total assets had risen to $108,034 from the starting point of $100,000. The portfolio grew a substantial 8% by the end of the experiment. On average, the portfolio grew by 1.33% each week. The portfolio plummeted in value in the fifth week, shown by the sharp downtrend between 7/1/2023 and 7/7/2023 on the graph. In just one week the portfolio lost $3,280, a decrease of 3%. This large drop is a result of the market pulling back after several weeks of growth. Although the portfolio managed to recover quickly, this drop highlights the sensitivity of the buy and hold strategy to larger market movements.

6.3 Swing trading simulation

The swing trading simulation was also successful. Like the buy and hold strategy, the portfolio grew every week expect for one. The success of the swing trading strategy can mainly be attributed to the proper use of technical indicators and the overall positive market conditions. The strategy relied on finding stocks that showed strong signs of growth in the immediate future and investing in them. By identifying optimal entry and exit points I could maximize profits while keeping losses to a minimum. The downside of this strategy is that it leaves a lot of room for user error. There were several instances when I made poor trades due to emotionally trading or missing out on the bigger picture. As the weeks went on, I became more confident in my trading ability and was able to make better trades. Figure 6.3.1 below shows the value of the swing trading portfolio over the span of the six-week trading period.
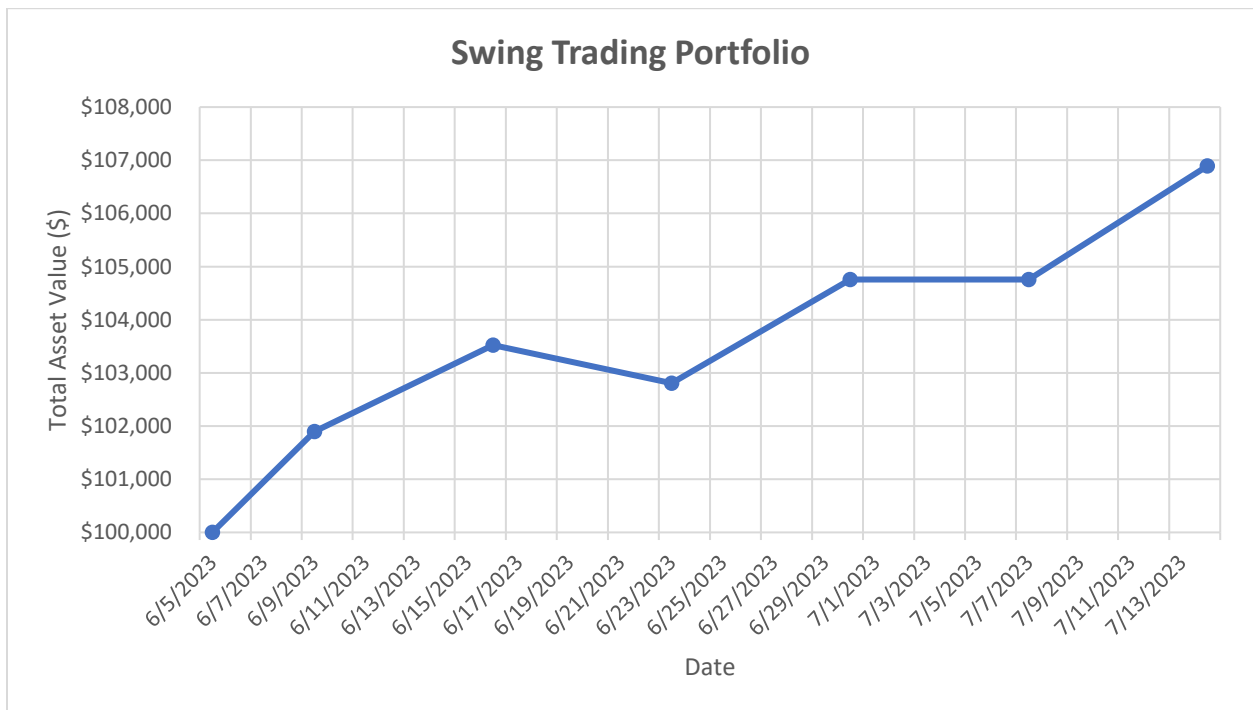

Figure 6.3.1: Graph showing the value of the swing trading portfolio over time.

The swing trading strategy experienced relatively constant growth over the entirety of the trading period. After six weeks, the value of the total assets had risen to $106,893 from the original $100,000. The portfolio grew a solid 6.9% by the end of the simulation. On average, the portfolio grew by 1.15% each week. The portfolio only depreciated in value during the third week. This is shown by the downturn occurring between 6/17/23 and 6/23/23 on the graph. The portfolio lost $716 during this week, decreasing by 0.7% in value. This drop was primarily caused by the poor performance of AZO, which had more than 1/3 of the account invested in it. I was eventually able to make a profit as I held onto AZO until it recovered its value, but I could have easily lost on the trade if I sold early. When swing trading, the misallocation of resources can result in losses if the investor is not careful.

6.4 Comparative analysis

By comparing the results from both trading simulations, we can identify the strengths and weaknesses of each strategy. Figure 6.4.1 below shows the value of the buy and hold portfolio compared with the value of the swing trading portfolio over the course of the six-week trading period.
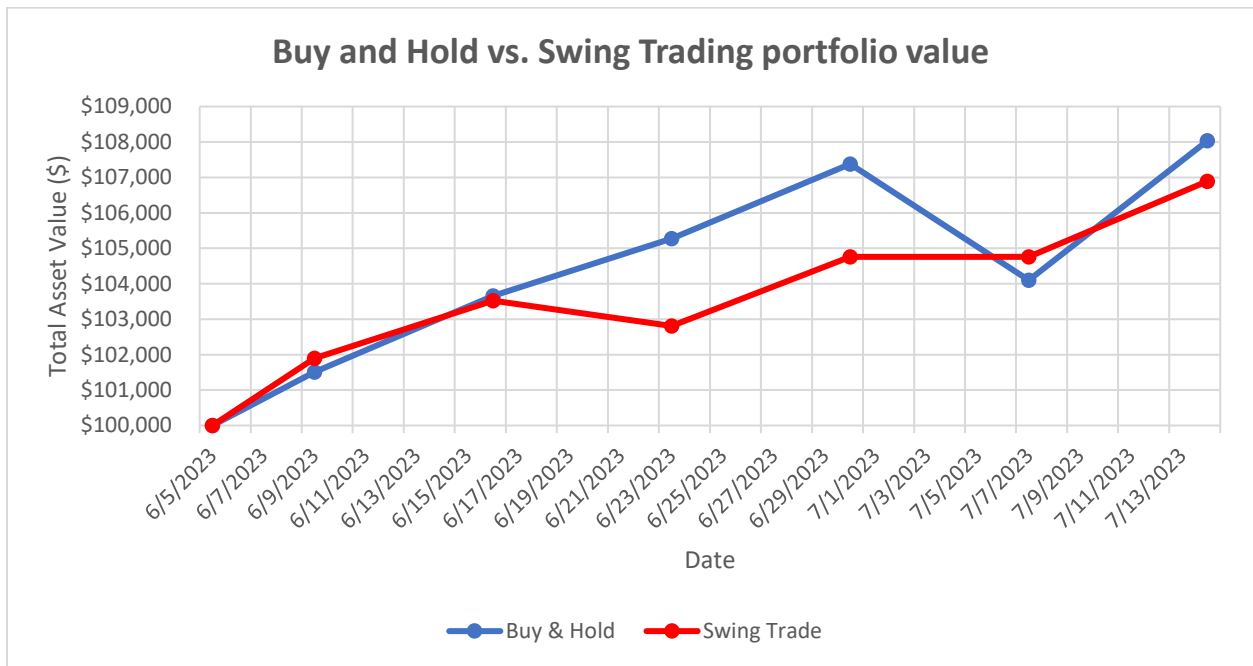

Figure 6.4.1: Graph showing the value of buy and hold portfolio vs. swing trading portfolio over time.

By the end of the experiment, the buy and hold strategy managed to grow more than the swing trading strategy. The buy and hold portfolio grew by 8% while the swing trading portfolio saw gains of 6.9% - a difference of slightly more than 1%. Although it may appear as if the buy and hold strategy is better at first glance, analyzing the weekly performance of both strategies paints a more nuanced picture.

In the initial two weeks, the swing trading portfolio slightly outperformed the buy and hold portfolio. During weeks three to four, the buy and hold simulation significantly outperformed the swing trading one. The diverging performances of each strategy can clearly be seen from 6/17/23 to 6/30/23 on the graph. The poor performance of the swing trading portfolio was mainly a result of individual stocks (namely AZO) which were heavily invested in, experiencing downtrends. Additionally, an overreliance on short-term indicators without gauging the bigger picture resulted in even more losses. The buy and hold portfolio enjoyed continued growth as the majority of its stocks were in the middle of a bull run. This highlights how an investor's errors can result in them missing out on potential profits when actively trading.

In week five the market experienced a drawback which had differing effects on each portfolio. The buy and hold portfolio was heavily affected by the market drawback, dropping 3% in just one week. Meanwhile, the swing trading strategy saw no change in its total value as trading was intentionally withheld. The sharp contrast in portfolio performances can be seen on the graph from day 7/1/23 to day 7/7/23. The buy and hold strategy had no choice but to accept the major loss in total asset value during this period. On the other hand, the swing trading strategy could maintain its total asset value as I chose not to invest in any stocks during the market downturn. When technical indicators showed signs of a market reversal near the end of the week, I could invest in stocks that would be profitable. This highlights how the swing trading strategy outperforms the buy and hold strategy during changing market conditions. By being more adaptable, an investor swing trading can maintain their profits in all market scenarios whereas someone choosing to buy and hold their investments would not have that choice.

In the final week the market once again experienced strong growth. This week saw large gains for both portfolios, but the buy and hold strategy benefited the most. The buy and hold portfolio

surpassed the swing trading portfolio after starting the week at a lower position. This can be seen on the graph from day 7/7/23 to day 7/14/23. The buy and hold portfolio grew 3.8%, while the swing trading portfolio only grew 2%. The success of the buy and hold strategy can be explained by the fact that almost all the stocks within the portfolio saw growth during this period. The swing trading strategy was invested in fewer total stocks which meant it saw proportionally less gains.

The performance of both trading simulations can also be compared to the performance of the S&P 500 in order to assess the validity of each strategy. Figure 6.4.2 below shows the relative performance (in total percentage change) of the buy and hold portfolio, the swing trading portfolio, and the S&P 500 over the six-week trading period.
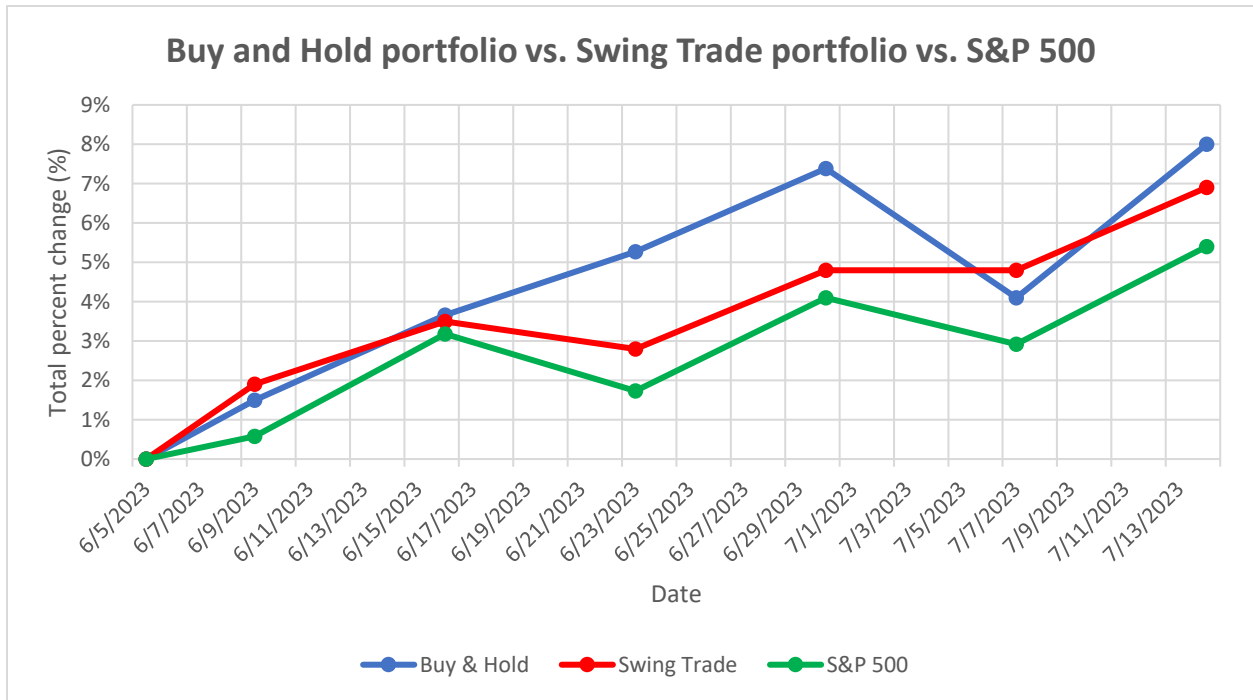

Figure 6.4.2: Graph showing the relative performance of the buy and hold portfolio, swing trading portfolio, and the S&P 500 over time.

The buy and hold portfolio and the swing portfolio both outperformed the S&P 500 throughout the entirety of the experiment. By the end of the six weeks the buy and hold portfolio

grew by 8%, the swing trading portfolio grew by 6.9%, and the S&P 500 grew by 5.4%. The buy and hold strategy outperformed the S&P 500 by 2.6% while the swing trading strategy outperformed the S&P 500 by 1.5%. The data clearly shows how the market experienced a bull run during the simulation's trading period. Interestingly, the swing trading strategy resembled the performance of the S&P 500 while the buy and hold differed significantly. One would expect the opposite performance trends if all things were considered equal. This is likely due to the composition of the stocks within each portfolio and the coincidental rise and fall of individual stocks during certain weeks.

The success of both strategies over the S&P 500 validates the effectiveness of both trading methods. As the S&P 500 reflects the performance of the overall market, an improvement upon this performance represents the "trading edge" which a strategy provides. The success of the buy and hold strategy validates the stock selections which I made. It indicates that the method I used to select each stock is sound. The success of the swing trading strategy validates the utility of technical indicators for making trading decisions. The combination of moving averages, RSI, and the LDC tool proved to be an effective method for assessing entry and exit points in the market.

Each trading strategy excelled at different things. The buy and hold strategy excelled at generating profits during positive market movements. The swing trading strategy excelled at being profitable throughout all market conditions. The buy and hold strategy proved to be more effective in this scenario for a few reasons. The buy and hold strategy benefited the most from the bull market as it was equally invested in all the stocks throughout the experiment. If market conditions had been more volatile the swing trading strategy would have likely enjoyed greater success as it could easily adapt to changing trends in the market. Having to keep track of ten different companies at once proved to be a limiting factor in the swing trading strategy. Focusing on one company

meant losing out on potential trading opportunities in another stock. Additionally, it took a significant amount of time to process trades on Investopedia Simulator. This meant that it was harder to capitalize on short term price movements when swing trading.

Chapter 7: Conclusion

The results from the trading simulations demonstrate that both the buy and hold strategy and the swing trading strategy proved to be effective trading methods. Both strategies outperformed the S&P 500 index by a significant margin throughout the entirety of the experiment. During the six-week long trading period, the U.S. stock market experienced a near continuous bull run. The unique market conditions allowed us to gain insights into the strengths and weakness of each trading method.

The buy and hold strategy is able to generate large profits from market uptrends over the long term. By being equally invested in several different sectors, the buy and hold portfolio can capitalize on the growth of the entire market. Additionally, the investor gains the benefit of not having to make any trading decisions. However, the lack of active trading comes at a cost. During market downswings, the buy and hold portfolio is forced to lose its value.

The swing trading strategy can generate profits during all market conditions. As investors make decisions daily on whether to buy or sell stocks, they can easily adapt to sudden changes in market conditions. During market downswings, a swing trading portfolio can maintain its value. On the other hand, actively trading means that investors are constantly at risk of making trading errors. Individuals can make bad trading decisions for a variety of reasons, which can result in minimized profits or even losses.

Although the buy and hold strategy enjoyed the greatest success in our experiment, both trading strategies provide investors with effective methods of generating profits from the stock market. The choice of trading strategy depends on what qualities the investor values the most.

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