STOCK MARKET SIMULATION

An interactive Qualifying Project Report: Submitted to the Faculty of

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the requirements for the

Degree of Bachelor of Science

By

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Abstract:

This project is a ten-week simulation project designed to provide students with a comprehensive understanding of the stock market using Investopedia, a virtual trading platform. Each student is given a starting capital of $100,000 to invest in stocks based on their research and analysis. Throughout the project, students engage in independent research to identify potential investment opportunities, study market trends, and develop investment strategies. They actively manage their virtual portfolios, monitor stock performance, and make informed decisions. Two portfolios were managed simultaneously during a five-week period: a buy and hold strategy portfolio and a momentum trading portfolio. The respective returns for each portfolio were 6.82% and 5.94%. While both investment strategies outperformed the S&P 500 index for the duration of the simulation, the buy and hold strategy portfolio proved to be slightly more effective in generating returns compared to the momentum trading portfolio during the observed period.

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Chapter 1: Introduction

1.1 Project Goals and Scope

This IQP is designed for students to become familiar with the stock market, its indices and indicators, and a variety of different trading strategies. Students will first do background research on the stock market, stock market indicators, technical analysis and different trading strategies. With the information gathered from preliminary research, students will choose different trading strategies to implement in the corresponding simulation. After the first weeks of research, students will then begin their stock market simulations, buying and selling stocks depending on the kind of strategy being used. At the end of the six-week simulation, students will gather data and evaluate the success of each strategy based on their respective profits. Students will then report their research, findings, and stock market simulation results in a detailed written report.

1.2 The Stock Market: What is it and how does it work?

Companies seeking to raise capital and expand their operations often embark on the initial public offering (IPO) process. Through IPOs, these companies offer shares of their ownership to the public, allowing investors to participate in their growth and potential profits. Once a company has gone public, its shares are traded on regulated stock exchanges, such as the New York Stock Exchange (NYSE) or NASDAQ. These exchanges provide a centralized marketplace where buyers and sellers come together to execute trades. When both parties agree on a price for a stock, a trade is executed, and the ownership of the stock is transferred (Hayes 2023). The price of a stock is determined by the forces of supply and demand in the market. Factors such as company performance, earnings reports, economic conditions, industry trends, and investor sentiment all influence the demand for a stock.

To assess the overall performance of the market or specific sectors, stock market indices are used as benchmarks. Popular indices, such as the S&P 500 or Dow Jones Industrial Average, represent a collection of stocks that aim to reflect the overall market performance (Hayes 2023).

It is important to note that investing in the stock market carries risks. Market volatility, economic fluctuations, geopolitical events, and changes in investor sentiment can impact stock prices and overall market performance. It is essential for investors to conduct thorough research, assess their financial goals and risk tolerance, and make informed decisions when participating in the stock market.

1.3 Stock Market Indicators

A stock market indicator is a tool or metric used to assess and interpret the overall direction and health of the stock market. It provides insights into market trends, investor sentiment, and potential investment opportunities. Common examples of stock market indicators include stock market indexes, moving averages, relative strength index and put-call ratio.

Stock market indexes are benchmarks that represent a specific segment of the stock market or the overall market. They track the performance of a group of stocks to provide an indication of market trends and investor sentiment. Examples include the S&P 500, which represents 500 large-cap U.S. stocks, and the NASDAQ Composite, which includes stocks listed on the NASDAQ exchange.

Moving averages are technical indicators that help identify trends and smooth out price fluctuations over a specific period. They calculate the average price of a security over a set number of periods and are commonly used as reference points for support and resistance levels. The 50-day and 200-day moving averages are widely followed by traders and investors to assess the strength and direction of a stock's price movement.

The RSI (Relative Strength Index) is a momentum oscillator that measures the speed and change of price movements. It ranges from 0 to 100 and helps identify overbought or oversold conditions in a stock or market. An RSI reading above 70 typically suggests overbought conditions, indicating a potential price reversal, while a reading below 30 suggests oversold conditions, indicating a potential price rebound.

The put-call ratio is a sentiment indicator that measures the ratio of put options (bearish bets) to call options (bullish bets) traded on an exchange. It provides insights into investor sentiment and can indicate whether market participants are more inclined towards bullish or bearish expectations. A high put-call ratio suggests bearish sentiment, indicating more bets on a market decline, while a low ratio suggests bullish sentiment, indicating more bets on a market rise.

Relying solely on indicators can be risky as they have limitations and may not accurately predict future market movements. To make informed investment decisions, investors should consider various factors such as fundamental analysis, economic conditions, company performance, and risk management strategies in conjunction with stock market indicators.

1.4 Technical Analysis

Technical analysis is a methodology used to analyze and predict price movements in financial markets by examining historical price and volume data. It is based on the belief that market trends and patterns repeat over time, allowing traders and investors to make informed decisions (Hayes 2022).

Technical analysts utilize various tools and techniques to identify trends, support and resistance levels, chart patterns, and indicators. They study price charts and apply mathematical calculations to interpret patterns and signals. Key components of technical analysis include moving

averages, trend lines, candlestick patterns, and oscillators such as the Relative Strength Index (RSI). By analyzing these elements, technical analysts aim to anticipate future price movements and identify potential entry and exit points for trading or investing (Hayes 2022). While technical analysis does not focus on the fundamental aspects of a company or its underlying value, it aims to capture the psychological and behavioral factors that drive market participants.

1.5 Stock Market Indices

Stock market indices are statistical measures that track the performance of specific groups of stocks, providing a snapshot of how the overall market or sectors are faring. The indices act as benchmarks, allowing investors to evaluate their portfolio's performance relative to the broader market. Additionally, sector-specific indices offer insights into industry trends, aiding investors in making strategic investment decisions. By comparing their portfolio's performance to relevant indices, investors can assess the effectiveness of their diversification strategy and adjust their allocations accordingly. Furthermore, stock market indices serve as indicators of market sentiment, enabling investors to gauge overall market health and make informed decisions based on market trends (Young 2023).

For investors, stock market indices are indispensable tools for evaluating their investments and identifying potential opportunities or risks. They offer a basis for comparing portfolio performance against the broader market and specific sectors. Moreover, these indices aid in portfolio allocation decisions, guiding investors in diversifying their assets effectively. The movement of major indices can also provide insights into market sentiment, informing investors about the overall market mood. In essence, stock market indices serve as valuable resources for

investors to navigate the complexities of the financial markets and make well-informed investment choices.

1.5.1 S&P 500

The S&P 500, also known as the Standard & Poor's 500, is a stock market index that measures the performance of 500 of the largest publicly traded companies in the United States. The index is widely regarded as one of the most representative and influential benchmarks for the overall health and performance of the U.S. stock market. The companies included in the index are selected by a committee based on specific criteria, including market capitalization, liquidity, and other factors that reflect the overall importance of the company in the U.S. equity markets.

The index is calculated using a market-cap-weighted methodology, which means that each company's weight in the index is proportional to its market capitalization (Young 2023). Market capitalization is determined by multiplying a company's share price by its outstanding shares, giving more weight to larger companies with higher market values.

To calculate the value of the S&P 500, the market prices of the 500 constituent companies' stocks are multiplied by their respective weights in the index. The sum of these market values is then divided by a divisor to produce the index's final value.

The S&P 500 covers a broad range of industries and sectors, including technology, healthcare, finance, consumer goods, and more. As a result, it is considered a reliable indicator of the overall performance of the U.S. stock market and is closely watched by investors, financial professionals, and economists as a gauge of market trends and sentiment (Young 2023).

Due to its diversified nature and representation of large, well-established companies, the S&P 500 is often used as a benchmark for comparing the performance of investment portfolios and mutual funds, helping investors assess their returns relative to the overall market.

1.5.2 Nasdaq Composite

The Nasdaq Composite is a stock market index that represents the performance of all the common stocks and similar securities listed on the Nasdaq Stock Market. It is one of the most widely followed and recognized indices in the financial world, particularly for technology and growth-oriented companies.

Unlike the S&P 500, which includes 500 of the largest U.S. companies listed on various stock exchanges, the Nasdaq Composite covers a more extensive range of companies, including smaller and mid-cap firm (Chen 2019). As a result, the Nasdaq Composite is often considered a broader indicator of the performance of the technology sector and other innovative industries.

Just like the S&P500, the Nasdaq Composite index is market-cap-weighted. Larger companies have a more significant impact on the index's movements than smaller ones due to their higher market values (Chen 2019).

The index is managed by Nasdaq OMX, the company that operates the Nasdaq Stock Market, and is calculated based on the market prices of the listed securities. Companies included in the Nasdaq Composite span various sectors, including technology, telecommunications, biotechnology, retail, and more.

The Nasdaq Composite is closely monitored by investors, analysts, and financial professionals to assess the performance of technology and growth-oriented companies and to understand the overall sentiment in the stock market, especially in the context of technology-driven

industries. It is a valuable benchmark for investors seeking to compare the performance of technology-focused portfolios or funds against the broader market.

1.5.3 Dow Jones Industrial Average

The Dow Industrial Index, also known as the Dow Jones Industrial Average (DJIA), is one of the oldest and most well-known stock market indices in the world. It was created in 1896 by Charles Dow, the co-founder of Dow Jones & Company, and Edward Jones.

The DJIA represents the performance of 30 large and prominent publicly traded companies in the United States. These companies are leaders in their respective industries and are considered significant players in the U.S. economy.

Unlike other indices that use a market-cap-weighted methodology, the DJIA is price-weighted. This means that the weight of each company in the index is determined solely by its stock price, rather than its market capitalization (Mitchel 2023). Stocks with higher share prices have a more significant impact on the index's movements than those with lower prices.

The companies included in the Dow Industrial Index span various sectors, including technology, healthcare, financial services, retail, and more. Over the years, the composition of the DJIA has changed as companies have been added or removed to reflect the evolving U.S. economy. The Dow Industrial Index is widely regarded as a barometer of the overall health of the U.S. stock market and the broader economy. It is closely followed by investors, financial analysts, and the media as an important indicator of market trends and sentiment. However, it is essential to note that the DJIA's small size (only 30 companies) and its price-weighted methodology have led some experts to argue that it may not be as representative of the entire U.S. stock market as other broader indices like the S&P 500 or the Nasdaq Composite (Mitchel 2023). As a result, many investors use

the DJIA in conjunction with other indices to gain a more comprehensive view of the market's

performance.

Chapter 2: Methodology and Strategies

2.1 Trading Simulation Platform: Investopedia

To perform the corresponding simulations for this project, the Investopedia Market Simulator Platform was used. This is a virtual trading platform offered by Investopedia, a popular financial education website. It functions as a risk-free environment where users can practice investing and trading without using real money. When users register, they can create a virtual portfolio and are typically provided with a simulated cash balance, such as $100,000, which they can use to invest in a variety of securities. The simulator replicates the dynamics of the stock market by utilizing real-time market data (with a 15-minute delay) to reflect current prices and performance. Users can research and select securities, analyze historical data, and employ various trading strategies. Users also have access to a "Research" window, which allows them to see the most traded stocks, along with other useful stock information.

The platform also allows users to place different types of orders, monitor their positions, and manage their portfolios accordingly. The simulator also offers educational resources and articles to help users enhance their investing knowledge and skills. It fosters a sense of community, enabling users to interact with one another, share ideas, and discuss investment strategies. Additionally, Investopedia hosts trading competitions within the simulator, simulating real market conditions and motivating participants to make informed investment decisions.

2.2 Momentum Trading Strategy

Momentum trading is a popular strategy in financial markets that aims to take advantage of the persistent price trends exhibited by stocks. It is based on the belief that stocks that have

shown strong price momentum in the recent past will continue to exhibit similar price movements in the near future. Momentum traders aim to identify and invest in these trends to generate profits.

The strategy begins with identifying assets that display strong momentum. This is typically done by analyzing historical price data over a specified time, such as several months or a year. Common technical indicators used to identify momentum include moving averages, relative strength index (RSI), and stochastic oscillators (Barone 2021). These indicators help traders identify assets that are gaining positive momentum or losing momentum. If a stock has been consistently rising, a trader may initiate a long position with the expectation that the upward trend will continue. Conversely, if an asset has been declining, a trader may take a short position to profit from the downward momentum. This may include setting stop-loss orders, which automatically exit a position if the price moves against the expected momentum. Traders may also use trailing stop orders to lock in profits as the price continues to move in their favor. Risk management is crucial in momentum trading to limit potential losses and protect gains.

Behavioral biases play a role in momentum trading. The strategy relies on the presence of behavioral biases, such as herding and investor sentiment, which can lead to exaggerated price movements. Momentum traders seek to exploit these biases by entering positions when market participants are fueling the trend (Barone 2021). However, it is important to exercise discipline and adhere to the strategy's rules, as behavioral biases can also result in sudden reversals and volatility. Some momentum traders also combine fundamental analysis with technical indicators to enhance their decision-making process. It is worth noting that momentum trading, like any strategy, carries risks. Sudden shifts in market conditions or unexpected news events can disrupt the momentum and lead to losses. Traders need to remain vigilant, continuously monitor market dynamics, and adapt their strategies accordingly.

2.3 Buy and Hold Strategy

The buy and hold strategy is a popular and widely practiced investment approach in the stock market. It involves purchasing stocks with the intention of holding them for an extended period, often years or even decades. This strategy is based on the belief that, over time, the stock market tends to rise and that well-established companies with strong fundamentals will generate positive returns despite short-term market fluctuations. One of the key principles of the buy and hold strategy is patience. Investors who adopt this approach understand that short-term market movements can be unpredictable and volatile. Instead of trying to time the market or make frequent trades, they aim to capture the long-term growth potential of the companies they invest in. By holding stocks for the long term, they allow the power of compounding to work in their favor.

Another important aspect of the buy and hold strategy is conducting thorough research and selecting high-quality stocks. Investors look for companies with strong fundamentals, such as solid financials, competitive advantages, and a track record of consistent growth. They analyze factors like revenue and earnings growth, cash flow, industry position, and management competence to identify companies with long-term potential (Beers 2020). Investors focus on the long-term performance of the companies rather than short-term price fluctuations. By avoiding emotional reactions to market volatility, they aim to minimize the impact of market noise and take advantage of the upward trajectory of the stock market over time.

The buy and hold strategy aligns with the idea of being a business owner rather than a trader. Investors who adopt this approach view themselves as partial owners of the companies they invest in and are interested in participating in their long-term success. They often have confidence

in the companies' ability to generate value, pay dividends, and deliver growth, and they are willing to weather short-term market fluctuations to reap the benefits over the long run.

Risk management is also an essential aspect of the buy and hold strategy. While the intention is to hold stocks for the long term, investors regularly monitor their portfolio and adjust if necessary. This may involve periodically reviewing the company's fundamentals, reassessing the investment thesis, and rebalancing the portfolio to maintain diversification.

Chapter 3: Traded Stocks

3.1 ELF Beauty

ELF Beauty, also known as e.l.f. Cosmetics, is a beauty company that specializes in the production and distribution of affordable, high-quality cosmetics and skincare products. ELF Beauty was founded in 2004 and is headquartered in Oakland, California.

The company's mission is to make luxurious beauty accessible to all by offering products at affordable prices without compromising on quality. ELF Beauty's product range includes a wide variety of cosmetics, such as makeup brushes, foundation, eyeshadow palettes, lipsticks, and skincare items. They are known for their cruelty-free and vegan-friendly formulations, which have gained popularity among consumers who prioritize ethical beauty products.

ELF Beauty primarily sells its products through various channels, including its e-commerce website, major retailers, and international distributors. The company has also expanded its presence in brick-and-mortar stores, with its products available in popular retailers across the United States. Below, Figure 3.1 shows ELF Beauty's stock price fluctuations since August 2022, to July of 2023.

Figure 3.1: E.L.F Beauty's stock prices over the last year

Over the past month, share values of cosmetic companies have increased and approximate 28.9%, greatly outperforming the S&P 500, which has only increased 4.1%. Besides this, ELF Beauty is expected to report a EPS (earnings per share) of around $0.58 (%49 increase since last year). EFL Beauty is also reportedly earning %50.4 more in revenue than in last year's quarter (Zacks 2023).

3.2 Rambus

RMBS (Rambus Inc.) is an American technology company specializing in the development and licensing of semiconductor and memory technologies. Founded in 1990 and headquartered in San Jose, California, Rambus has been a significant player in the semiconductor industry.

Rambus designs and licenses intellectual property (IP) cores and technologies that are used in a wide range of electronic devices, including computers, smartphones, gaming consoles, and

networking equipment. Their innovations focus on areas such as memory architectures, high-speed interfaces, security solutions, and advanced semiconductor designs.

One of the key areas of expertise for Rambus is memory interface technology. They have developed various high-speed memory interfaces, including DDR (Double Data Rate) memory, which is widely used in computer systems, and XDR (eXtreme Data Rate) memory, designed for high-performance applications such as gaming consoles. Rambus' memory interface technologies enable faster data transfer rates and improved system performance. Figure 3.2 below shows Rambus' stock prices from June 2022 to June 2023.

Figure 3.2: Rambus' stock prices over the last year

3.3 Toll Brothers

Toll Brothers is a renowned American luxury homebuilding company that specializes in the construction and development of high-end residential properties. Established in 1967 and

headquartered in Horsham, Pennsylvania, Toll Brothers has grown to become one of the largest and most recognized homebuilders in the United States.

The company primarily focuses on building luxury single-family homes, townhomes, and condominiums in upscale communities across various states. Toll Brothers' homes are known for their quality craftsmanship, architectural excellence, and attention to detail, often incorporating premium features and finishes.

Toll Brothers caters to a diverse range of homebuyers, including move-up, empty nesters, and active adults looking for upscale and customized living spaces. They offer a wide selection of floor plans, styles, and customizable options to suit the preferences and needs of their customers. Toll Brothers' reputation for delivering high-quality homes and its commitment to customer satisfaction have contributed to its success and prominent position in the luxury homebuilding market. The company has received numerous industry accolades and has built a strong brand recognized for its craftsmanship and innovation. Below, Figure 3.3 shows Toll Brother's stock price fluctuations from June 2022 to June 2023.

Figure 3.3: Toll Brothers' stock prices over the past year.

3.4 Nova Measuring Instruments

Nova Ltd., commonly known as Nova Measuring Instruments, is an Israeli company that specializes in the development, manufacturing, and sale of process control metrology systems for the semiconductor industry. It is listed on the NASDAQ stock exchange under the ticker symbol NVMI.

Nova Measuring Instruments provides advanced metrology solutions used in the fabrication of semiconductor devices. Their systems are designed to measure and monitor critical parameters during the semiconductor manufacturing process to ensure high precision, accuracy, and yield.

The company's product portfolio includes various metrology systems and components that address the complex needs of semiconductor manufacturers. These systems are used for process control and optimization, enabling semiconductor companies to improve production efficiency, reduce costs, and enhance overall device performance.

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Nova Measuring Instruments' metrology solutions cover multiple stages of semiconductor manufacturing, including thin film measurement, optical CD (critical dimension) and shape profiling, advanced overlay control, and more. Their technologies incorporate optical and x-ray technologies, advanced algorithms, and software analytics to provide comprehensive and accurate measurement data. By partnering with leading semiconductor manufacturers worldwide, Nova Measuring Instruments plays a vital role in helping chipmakers enhance the performance and yield of their semiconductor devices. Their metrology solutions contribute to the development of advanced technology nodes, such as those used in logic devices, memory chips, and other semiconductor components. Figure (3.4) shows NOVA's price changes as well as its volume traded from June 2022 to June 2023.

Figure 3.4: NOVA's stock prices over the past year.

3.5 Tesla

Tesla, Inc. is an American electric vehicle (EV) and clean energy company founded in 2003 by Elon Musk, JB Straubel, Martin Eberhard, Marc Tarpenning, and Ian Wright. Headquartered in Palo Alto, California, Tesla is known for its groundbreaking electric cars, energy storage products, solar energy solutions, and sustainable energy initiatives.

The primary focus of Tesla is the design, production, and sale of electric vehicles. They have revolutionized the automotive industry with their high-performance, fully electric cars that prioritize sustainability and energy efficiency. Tesla's vehicle lineup includes models like the Model S (luxury sedan), Model 3 (mass-market sedan), Model X (electric SUV), and Model Y (compact SUV). These vehicles offer impressive range capabilities, fast acceleration, cutting-edge technology features, and over-the-air software updates.

In addition to electric vehicles, Tesla is involved in renewable energy solutions. They develop and manufacture energy storage products such as the Powerwall (residential energy storage) and Powerpack (commercial and utility-scale energy storage). These battery systems are designed to store excess energy generated by solar panels or during off-peak hours for use during high-demand periods or as backup power.

Tesla is also committed to advancing sustainable energy infrastructure. They operate a network of Supercharger stations, which are fast-charging stations strategically located worldwide to enable long-distance travel for Tesla owners. The company has also expanded into the solar energy sector through its acquisition of SolarCity, offering solar panels and related services for residential and commercial applications. Figure 3.5 below shows Tesla's stock price and volume traded fluctuation from July 2022 to July 2023.

Figure 3.5: Tesla's volatile stock price over the past year

3.6 NVIDIA

NVIDIA Corporation is an American technology company that specializes in the design and manufacture of graphics processing units, system-on-a-chip units, and other software technologies. Founded in 1993 and headquartered in Santa Clara, California, NVIDIA has become a leading player in the field of visual computing and artificial intelligence.

NVIDIA is primarily known for its GPUs, which are essential components in computer graphics rendering, gaming, and professional visualization applications. Their GPUs are highly regarded for their powerful performance, advanced graphics capabilities, and parallel processing architecture. Over the years, NVIDIA has expanded its product portfolio to include data center platforms, automotive computing solutions, and AI-focused hardware and software technologies.

In the data center space, NVIDIA offers GPU-accelerated solutions for high-performance computing (HPC), deep learning, and scientific research. Their GPUs are widely used in areas such as machine learning, data analytics, and AI training and inference. NVIDIA's data center

offerings include the NVIDIA A100 Tensor Core GPU, the DGX systems for AI research and development, and the NVIDIA CUDA parallel computing platform. Below, Figure 3.6 shows Nvidia's stock price surge from early November 2022 to June 2023.

Figure 3.6: NVIDIA's stock price increase over the past year

Since the release of ChatGPT on 30th November 2022, Nvidia rose from $171.35 to an astonishing $434.45 as of June 19th. This rise can be attributed to a general increase in demand for NVIDIA GPU-accelerated solutions and HPC as companies across different industries seek implementation of AI technologies.

3.7 Coinbase

Coinbase is a leading cryptocurrency exchange and platform that allows individuals and businesses to buy, sell, and store various cryptocurrencies. It was founded in 2012 by Brian Armstrong and Fred Ehrsam and is based in San Francisco, California. Coinbase is one of the most well-known and reputable cryptocurrency exchanges globally.

The primary mission of Coinbase is to make cryptocurrencies easily accessible and user-friendly for everyone, regardless of their technical expertise. The platform provides a simple and secure way for people to enter the world of cryptocurrencies and participate in the growing digital asset ecosystem.

Coinbase allows users to buy and sell a wide range of cryptocurrencies, including popular ones like Bitcoin (BTC), Ethereum (ETH), Litecoin (LTC), Bitcoin Cash (BCH), and many others. Users can trade these digital assets against fiat currencies like USD, EUR, GBP, and more. The platform also offers a more advanced trading platform called Coinbase Pro (formerly known as GDAX), catering to experienced traders who require more robust trading tools, charts, and order types.

Coinbase offers a user-friendly mobile app for both Android and iOS devices, making it convenient for users to access and manage their cryptocurrency holdings on the go. Within the mobile application, users can securely store their cryptocurrencies. The wallet supports multiple digital assets and incorporates various security measures to protect users' funds. Figure 3.7 shows Coinbase's stock price over the past year, reaching a yearly high in late July 2023.

Figure 3.7: Coinbase's stock price fluctuations over the past year

3.8 Mastercard

Mastercard is a global financial technology company that provides payment processing services, including credit, debit, and prepaid card transactions. Established in 1966 and headquartered in Purchase, New York, Mastercard operates as a major player in the payments industry, enabling secure and convenient electronic transactions worldwide.

As a payment network, Mastercard does not issue credit cards directly to consumers; rather, it partners with financial institutions, such as banks and credit unions, to issue Mastercard-branded payment cards to their customers. These cards are widely accepted at millions of merchants and retailers globally, allowing cardholders to make purchases both in-store and online.

Mastercard's primary role is to facilitate transactions between merchants, cardholders, and issuing banks. When a cardholder makes a purchase, Mastercard processes the payment by securely transmitting the necessary transaction data between the merchant and the cardholder's

bank. This process ensures that the payment is authenticated and approved, enabling a seamless and secure payment experience.

In addition to traditional credit and debit card payments, Mastercard has expanded its services to include contactless payments, mobile payments, and digital wallet solutions. The company has invested in developing innovative technologies to enhance the payment experience, such as tokenization, biometric authentication, and advanced fraud detection. Figure 3.8 shows Master Card's stock price increase from November 2022 to July 2023.

Figure 3.8: Mastercard's price fluctuations over the past year

3.9 Trxade Health

Trxade Health, Inc. (formerly known as Trxade Group, Inc.) is a technology-enabled healthcare services company based in Tampa, Florida. Trxade Health operates several subsidiaries that offer solutions for independent pharmacies and healthcare providers, with a focus on

enhancing supply chain efficiency and reducing healthcare costs.Trxade Health's primary services include: Trxade Marketplace, Bonum Health, and DelivMeds.

Trxade Health operates an online platform called Trxade Marketplace, which serves as a B2B pharmaceutical marketplace connecting independent pharmacies with drug wholesalers and manufacturers. Through the platform, independent pharmacies can compare drug prices and purchase medications at competitive rates, helping them reduce costs and increase their profitability.

Bonum Health is a telemedicine subsidiary of Trxade Health that provides virtual healthcare services to patients. Through the Bonum Health platform, patients can access medical consultations with licensed healthcare providers, receive prescriptions, and access healthcare resources without needing to visit a physical clinic.

DelivMeds is another subsidiary of Trxade Health that focuses on pharmacy services. DelivMeds provides last-mile delivery services for prescription medications, allowing pharmacies to offer convenient and timely delivery options to their patients.

Trxade Health aims to empower independent pharmacies by leveraging technology to improve their purchasing power, streamline operations, and enhance patient care. By enabling pharmacies to access a wide range of pharmaceutical products at competitive prices and providing value-added services like telemedicine and prescription delivery, Trxade Health aims to support pharmacies in providing better healthcare services to their communities. Figure 3.9 shows MEDS' constant decrease in stock price since August 2022, with a sharp increase in July 2023.

Figure 3.9: MEDS stock price fluctuations this past year

Chapter 4: Buy and Hold Trading Simulation

The stocks chosen for the buy and hold trading strategy were meticulously chosen based on extensive research on the companies' historical earnings, cashflow, and their position in their respective industry.

Rambus has demonstrated strong historical earnings growth with a rate of 32.6%. While the projected growth for this year is 1.7%, it still outperforms the industry average, which is expected to have negative earnings growth of -14.6%. This indicates promising prospects for the company's stock price. Rambus shows robust cash flow growth, with a year-over-year increase of 19.2%, surpassing the industry average of 17.3%. The company's historical annualized cash flow growth rate of 15.4% over the past 3-5 years also exceeds the industry average of 14.7%, indicating consistent performance in this area. Based on the information outlined above, 400 stocks were purchased at $74.18.

A closer look at TOL's chart pattern over the past six months reveals a well-defined upward trendline. By June 12th, the stock price is approaching this trendline, suggesting a strong level of support. Historically, when TOL's stock price has neared this trendline, it has bounced back upwards, indicating a consistent pattern of buying interest at these levels. Therefore, this touchpoint provides an opportune moment for entry, allowing investors to capitalize on potential upside momentum.

The moving average convergence divergence (MACD) provides further evidence of a potential positive shift. While the stock has been in a short-term downtrend, the MACD line has recently crossed above the signal line. This bullish crossover, combined with the stock trading near its upward trendline support, reinforces the argument for an impending upward price movement.

The following Figure 4.1 shows the MACD line has been increasingly separating from the signal line since the beginning of June, suggesting an upward price trend in the near future.

Figure 4.1 shows TOL stocks MACD line diverging from its signal line.

Using PVT (Price Volume Trend), the purchase of EFL stocks on June 12th can be justified. Consistently increasing PVT over several weeks indicates a bullish trend where the upward price movement is backed by robust trading volume. When both price and volume trend upwards in tandem, it demonstrates that the market's buying interest is strong, and the upward price move isn't just a fluke but is supported by genuine demand.

An increasing PVT serves as a confirmation of the stock's strength. The PVT integrates both price change and volume, meaning that it filters out "noise." This means that even on days where the price might show minor fluctuations or pullbacks, a consistently rising PVT underscores that the broader momentum remains bullish.

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Historically, securities that exhibit a sustained increase in PVT tend to maintain their bullish trajectory. The combined weight of continued buying interest and price appreciation suggests that there is still a lot of positive sentiment surrounding EFL, which could result in further price gains in the near to medium term. The following Figure 4.2 shows the PVT for EFL over the last few months. There is a sharp increase in late mate and then a steady increase over the period of June and July

Figure 4.2 shows an increasing PVT of ELF stocks.

As for the Tesla stock, by June 12th, MACD line was way above the signal line, with the difference only getting bigger, A bullish crossover in which the MACD line continues to widen its gap from the signal line is a particularly strong indicator of increasing bullish momentum. This divergence between the two lines suggests that not only has the short-term momentum of Tesla stock become more bullish compared to its long-term momentum, but this bullish momentum is intensifying.

As the MACD line diverges further from the signal line, it implies that the upward trend isn't just a fleeting occurrence. Instead, the market might be recognizing sustained positive developments or sentiment concerning Tesla, driving more investors to buy the stock and push its price higher. Figure 4.3 below shows the MACD line continuously diverging from the signal line since late May, with the gap widening in the first week of June, suggesting a bullish trend in the coming weeks in tesla stock prices.

Figure 4.3 shows the divergence in MACD and signal lines for Tesla stocks.

Considering an investment in NVMI stocks on June 12th, 2023, presents a compelling case when analyzing its Awesome Oscillator (AO) reading. On this date, the AO stood at 15.43, a value substantially above the zero line. Traditionally, the AO serves as a momentum indicator, offering insights into the market's driving forces and potential shifts in sentiment.

A positive reading, especially one as significant as 15.45, indicates strong bullish momentum. Such a high value above the zero line suggests that the short-term moving average is

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substantially exceeding the longer-term moving average, underscoring increasing buyer interest and potential for the upward trend to continue. Furthermore, such strong positive momentum can often attract more investors, leading to a self-reinforcing upward trajectory for the stock.

Moreover, if this AO reading was accompanied by other bullish signals, such as a recent bullish crossover (where the AO crosses from below to above the zero line) or a consistent sequence of increasing green bars on the histogram, the case for investment becomes even stronger. These factors, combined with NVMI's own business fundamentals and broader market conditions, make the argument for investing in the stock on June 12th, 2023, based on its AO reading, quite persuasive. As Figure 4.4 below shows, for June 12th, AO read at 15.45, indicating strong bullish momentum for NVMI stock prices.

Figure 4.4 shows a high AO for NVMI stocks.

4.1 Week 1

In the first week of the simulation, the performance of each stock in the investment portfolio showed a mixed picture. Starting with e.l.f. Beauty Inc. (ELF), the stock experienced a decline in price from $106.98 to $104.08, resulting in a week loss of $232.00. As a result, the total asset value for ELF on Friday stood at $8,326.40, reflecting a total weekly loss of $232.00. Table 4.1 below shows all changes in stock values during this week.

Table 4.1: Stock values for first week of buy and hold strategy.

Symbol	Buy Price ($)	Shares	Net Cost ($)	Price Last Friday ($)	Price This Friday ($)	Asset This Friday ($)	Week Gain/ Loss ($)	Total Asset Gain/Loss ($)
ELF	106.98	80	8,558.40	106.98	104.08	8,326.40	(232.00)	(232.00)
TOL	74.18	300	22,254.00	74.18	73.49	22,047.00	(207.00)	(207.00)
RBMS	64.42	400	25,768.00	64.42	60.38	24,152.00	(1,616.00)	(1,616.00)
NVMI	117.21	200	23,442.00	117.21	112.99	22,598.00	(844.00)	(844.00)
TSLA	260.17	60	15,610.20	260.17	260.54	15,632.40	22.20	22.20
						92,755.80	(2,876.80)	(2,876.80)

Toll Brothers Inc. (TOL) also faced a similar trend, with the stock price declining from $74.18 to $73.49, leading to a week loss of $207.00. Consequently, the total asset value for TOL on Friday amounted to $22,047.00, indicating a total weekly loss of $207.00.

Rambus Inc. (RBMS) experienced a more substantial decline in stock price during the week, with the value decreasing from $64.42 to $60.38. This decline resulted in a weekly loss of $1,616.00, making it the most significant weekly loss among the portfolio holdings. Therefore, the total asset value for RBMS on Friday was $24,152.00, reflecting a total weekly loss of $1,616.00.

Nova Measuring Instruments Ltd. (NVMI) also faced a decline in stock price from $117.21 to $112.99, leading to a week loss of $844.00. The total asset value for NVMI on Friday amounted to $22,598.00, indicating a total weekly loss of $844.00.

On the other hand, Tesla Inc. (TSLA) was the only stock in the portfolio to exhibit a gain in stock price, rising from $260.17 to $260.54, resulting in a week gain of $22.20. The total asset value for TSLA on Friday stood at $15,632.40, reflecting a total weekly gain of $22.20.

In summary, the overall performance of the investment portfolio showed a week loss of $2,876.80, with the total asset value on Friday standing at $92,755.80. The week's performance varied significantly among the stocks, with ELF and TOL facing losses, RBMS and NVMI experiencing more substantial declines, and TSLA being the sole stock to register a modest gain.

4.2 Week 2

In the second week of the simulation, the investment portfolio displayed a mix of performances across its five different stocks. e.l.f. Beauty Inc. (ELF) showed a positive trend with its stock price increasing from $104.08 to $108.45, resulting in a week gain of $349.60 and a total asset gain of $117.60. Table 4.2 below shows all the changes in stock values during this week.

Table 4.2: Stock values for second week of buy and hold strategy.

Symbol	Buy Price ($)	Shares	Net Cost ($)	Price Last Friday ($)	Price This Friday ($)	Asset This Friday ($)	Week Gain/ Loss ($)	Total Asset Gain/Loss ($)
ELF	106.98	80	8,558.40	104.08	108.45	8,676.00	349.60	117.60
TOL	74.18	300	22,254.00	73.49	76.10	22,830.00	783.00	576.00
RBMS	64.42	400	25,768.00	60.38	59.27	23,708.00	(444.00)	(2,060.00)
NVMI	117.21	200	23,442.00	112.99	112.68	22,536.00	(62.00)	(906.00)
TSLA	260.17	60	15,610.20	260.54	256.60	15,396.00	(236.40)	(214.20)
						93,146.00	390.20	(2,486.60)

Toll Brothers Inc. (TOL) also had a noteworthy week, as its stock price rose from $73.49 to $76.10, leading to a week gain of $783.00 and a total asset gain of $576.00. On the other hand, Rambus Inc. (RBMS) and Nova Measuring Instruments Ltd. (NVMI) faced challenges during the week. RBMS encountered a decline in its stock price from $60.38 to $59.27, resulting in a week loss of $444.00 and a total asset loss of $2,060.00. Similarly, NVMI experienced a slight dip in its stock price from $112.99 to $112.68, leading to a weekly loss of $62.00 and a total asset loss of $906.00. Tesla Inc. (TSLA) exhibited a more volatile performance, with its stock price fluctuating from $260.17 to $260.54 during the week. This resulted in a week loss of $236.40 and a total asset loss of $214.20.

As of the end of the week, the overall portfolio value stood at $93,146.00, showing a week gain of $390.20. However, considering the total asset gain/loss, the portfolio experienced a week loss of $2,486.60.

4.3 Week 3

The investment portfolio displayed significant fluctuations across its five different stocks in the third week. e.l.f. Beauty Inc. (ELF) showed remarkable progress with its stock price rising from $108.45 to $114.23, resulting in a weekly gain of $462.40 and a total asset gain of $580.00. Table 4.3 below shows all the changes in stock values during this week.

Table 4.3: Stock values for third week of buy and hold strategy.

Symbol	Buy Price ($)	Shares	Net Cost ($)	Price Last Friday ($)	Price This Friday ($)	Asset This Friday ($)	Week Gain/ Loss ($)	Total Asset Gain/Loss ($)
ELF	106.98	80	8,558.40	108.45	114.23	9,138.40	462.40	580.00
TOL	74.18	300	22,254.00	76.10	79.07	23,721.00	891.00	1,467.00
RBMS	64.42	400	25,768.00	59.27	64.17	25,668.00	1,960.00	(100.00)
NVMI	117.21	200	23,442.00	112.68	117.30	23,460.00	924.00	18.00
TSLA	260.17	60	15,610.20	256.60	261.77	15,706.20	310.20	96.00
						97,693.60	4,547.60	2,061.00

Toll Brothers Inc. (TOL) also gave an impressive performance, as its stock price increased from $76.10 to $79.07, leading to a weekly gain of $891.00 and a total asset gain of $1,467.00. Rambus Inc. (RBMS) rebounded strongly, with its stock price rising from $59.27 to $64.17, resulting in a weekly gain of $1,960.00. Although RBMS faced a slight loss previously, the current gain contributed to a total asset gain of $100.00. Nova Measuring Instruments Ltd. (NVMI) also experienced growth in its stock price, from $112.68 to $117.30, resulting in a weekly gain of $924.00 and a total asset gain of $18.00. Tesla Inc. (TSLA) showcased notable improvement, with its stock price increasing from $256.60 to $261.77, leading to a week gain of $310.20 and a total asset gain of $96.00.

As of the end of the week, the overall portfolio value stood at $97,693.60, showing a significant weekly gain of $4,547.60. The total asset gain for the portfolio now amounts to $2,061.00, making this the first week in which the portfolio saw profit.

4.4 Week 4

Throughout the fourth week of our portfolio, each stock exhibited varying performances, resulting in a mixed outcome for the portfolio. ELF, with 80 shares bought at $106.98 each, ended the week with a value of $110.00 per share, leading to a weekly loss of $338.40 but still yielding an overall gain of $241.60. Table 4.4 below shows all the changes in stock values during this week.

Table 4.4: Stock values for fourth week of buy and hold strategy.

Symbol	Buy Price ($)	Shares	Net Cost ($)	Price Last Friday ($)	Price This Friday ($)	Asset This Friday ($)	Week Gain/ Loss ($)	Total Asset Gain/Loss ($)
ELF	106.98	80	8,558.40	114.23	110.00	8,800.00	(338.40)	241.60
TOL	74.18	300	22,254.00	79.07	76.81	23,043.00	(678.00)	789.00
RBMS	64.42	400	25,768.00	64.17	60.30	24,120.00	(1,548.00)	(1,648.00)
NVMI	117.21	200	23,442.00	117.30	111.59	22,318.00	(1,142.00)	(1,124.00)
TSLA	260.17	60	15,610.20	261.77	274.43	16,465.80	759.60	855.60
						94,746.80	(2,946.80)	(885.80)

Similarly, TOL, purchased at $74.18 per share with 300 shares, experienced a weekly loss of $678.00, though it managed to generate a total gain of $789.00. However, RBMS and NVMI faced challenges, as both stocks saw their prices drop significantly. RBMS, with 400 shares purchased at $64.42 each, suffered a weekly loss of $1,548.00, resulting in a total loss of $1,648.00. NVMI, acquired at $117.21 per share with 200 shares, experienced a weekly loss of $1,142.00, leading to a total loss of $1,124.00.

On a more positive note, TSLA outperformed other stocks in the portfolio, demonstrating its potential for growth. With 60 shares bought at $260.17 each, the stock gained $759.60 during the week, contributing significantly to the overall portfolio. Nevertheless, despite TSLA's gains,

the portfolio faced a weekly loss of $2,946.80 in total and a total loss of $885.80 since the initial investments were made.

4.5 Week 5

Throughout the fifth week, the portfolio experienced a range of performances, with each stock showing different weekly changes. ELF started the week strong at $106.98 per share and steadily increased to $110.00 per share last Friday. However, the real surge occurred on Friday, reaching $115.60 per share. This led to a remarkable weekly gain of $448.00 per share and contributed to a total asset gain of $689.60 since its purchase. Table 4.5 below shows all the changes in stock values during this week.

Table 4.5: Stock values for fifth week of buy and hold strategy.

Symbol	Buy Price ($)	Shares	Net Cost ($)	Price Last Friday ($)	Price This Friday ($)	Asset This Friday ($)	Week Gain/ Loss ($)	Total Asset Gain/Loss ($)
ELF	106.98	80	8,558.40	110.00	115.60	9,248.00	448.00	689.60
TOL	74.18	300	22,254.00	76.81	83.52	25,056.00	2,013.00	2,802.00
RBMS	64.42	400	25,768.00	60.30	61.82	24,728.00	608.00	(1,040.00)
NVMI	117.21	200	23,442.00	111.59	115.83	23,166.00	848.00	(276.00)
TSLA	260.17	60	15,610.20	274.43	281.38	16,882.80	417.00	1,272.60
						99,080.80	4,334.00	3,448.20

TOL demonstrated steady growth throughout the week, starting at $74.18 per share and rising to $76.81 per share last Friday. The true breakthrough happened on Friday when the price surged to $83.52 per share. The stock achieved an impressive weekly gain of $2,013.00 per share, contributing significantly to a total asset gain of $2,802.00. Meanwhile, RBMS faced challenges, opening at $64.42 per share and experiencing fluctuations throughout the week, ultimately ending

at $61.82 per share last Friday. Although the stock had a weekly gain of $608.00 per share, its total asset gain remained negative at -$1,040.00. NVMI began the week at $117.21 per share and displayed moderate fluctuations, ending at $115.83 per share last Friday. The stock achieved a weekly gain of $848.00 per share, but the total asset gain remained negative at -$276.00 due to previous losses. TSLA had an impressive week, climbing from $260.17 per share to $274.43 per share last Friday, with a significant surge to $281.38 per share on Friday. TSLA achieved a notable weekly gain of $417.00 per share, contributing to a total asset gain of $1,272.60.

Overall, the portfolio had a remarkable week, with the total weekly asset change amounting to $4,334.00, resulting in a total asset change of $3,448.20 since the initial investments were made.

Chapter 5: Momentum Trading Simulation

5.1 Week 1

The following table (5.1) shows the transactions that were executed during the first week

of the momentum trading strategy.

Table 5.1: Table for transactions on first week of momentum trading strategy.

Date of Transaction	Symbol	Buy/ Sell	Price ($)	Sha res	Net Cost/Procee ds ($)	Profit/ Loss ($)	Total Cash ($)	Total Profit ($)
							100,000.00	-
06/12/23	TOL	buy	74.80	400	29,920.00	-	70,080.00	-
06/12/23	NVMI	buy	118.48	200	23,696.00	-	46,384.00	-
06/12/23	NVDA	buy	389.66	70	27,276.20	-	19,107.80	-
06/12/23	FCNCA	short	1,252.58	3	3,757.74	-	22,865.54	-
06/14/23	TSLA	buy	260.17	60	15,610.20	-	7,255.34	-

On June 12th, 2023, a series of stock transactions were executed. Similarly, to the buy and

hold strategy, TOL stocks were bought at a price of $74.80 per share for a total of 400 shares,

resulting in a net cost of $29,920.00. The purchase of these stocks can be justified by the

divergence of MACD line from its signal line (see Figure 4.1 for further clarification).

This was followed by the acquisition of 200 shares of NVMI at $118.48 each, costing

$23,696.00. Again, this purchase was made in reference to the one made for the buy and hold

strategy. NVMI's AO read a value above 15, indicating a bullish trend in the future price for this

stock (see Figure 4.4 for reference).

The same day, 70 shares of NVDA were purchased at $389.66 each, amounting to

$27,276.20. Based on the reading of the volume oscillator on NVIDIA's stock (-1.74%), the stock

might seem bearish; however, the noteworthy aspect is that it's steadily increasing. In the realm of technical analysis, an increasing Volume Oscillator, even from a negative standpoint, can indicate a potential shift in momentum. It suggests that the trading volume for NVDA is catching up and could soon overtake its longer-term average, hinting at rising interest and trading activity. The following figure (5.1) shows the volume oscillator steadily increasing as of the date the stock was purchased.

Figure 5.1 shows NVIDIA's volume oscillator steadily increasing since the stocks purchase date.

Interestingly, there was also a short position taken on FCNCA with 3 shares at a rate of $1,252.58 per share, which led to net proceeds of $3,757.74. Two days later, on June 14th, an investment in TSLA was made, purchasing 60 shares at $260.17 each, costing $15,610.20. The decision to purchase these tesla stocks are further discussed in Figure 4.3, showing a clear divergence in MACD and signal lines for tesla stocks at the purchase date.

5.2 Week 2

The following table (5.2) shows the transactions that were executed during the second week of the momentum trading strategy.

Table 5.2: Table for transactions on second week of momentum trading strategy

Date of Transaction	Symbol	Buy /Sell	Price ($)	Shares	Net Cost/Proceeds ($)	Profit/Loss ($)	Total Cash ($)	Total Profit ($)
						-	7,255.34	-
06/21/23	NVDA	buy	435.01	15	6,525.15	-	730.19	-
06/22/23	TOL	sell	76.30	400	30,520.00	600.00	31,250.19	600.0

On June 21st, 2023, 15 shares of NVDA were purchased at a price of $435.01 each, resulting in a net cost of $6,525.15, which left a total cash balance of $730.19. The following day, June 22nd, 400 shares of TOL were sold at $76.30 per share, generating proceeds of $30,520.00 and a profit of $600.00 from the sale. After this transaction, the total cash position stood at $31,250.19, and the total profit from the two transactions amounted to $600.00.

Selling TOL stocks when its Relative Strength Index (RSI) reads 69.7 can be justified from a technical analysis standpoint. The RSI is a momentum oscillator that measures the magnitude of recent price changes to evaluate overbought or oversold conditions in a traded asset, like a stock. Traditionally, an RSI value above 70 indicates that an asset might be overbought, suggesting that it could be overvalued, and a price pullback or bearish reversal could be imminent. As the following figure (5.2) shows, as of June 22nd, the RSI of TOL stocks read at 69. 7, nearing the 70 benchmarks for commonly oversold stocks.

Figure 5.2: TOL's RSI nearing 70, suggesting the stock might be overbought.

In the case of TOL with an RSI of 69.7, the stock is nearing the commonly accepted overbought threshold. This proximity to the overbought level can signal that the stock's recent upward momentum might be losing steam and that there's an increasing risk of a price decline. Traders and investors often use such an RSI value as a preemptive measure, selling before the asset becomes technically overbought, thereby potentially maximizing profits or avoiding upcoming downturns.

5.3 Week 3

The following table (5.3) shows the transactions that were executed during the third week of the momentum trading strategy.

Table 5.3: table for transactions in the third week of momentum trading strategy.

Date of Transaction	Symbol	Buy/Sell	Price ($)	Shares	Net Cost/Proceeds ($)	Profit/Loss ($)	Total Cash ($)	Total Profit ($)
							31,250.19	600.00
6/26/23	FCNC	cover	1,208.30	3	3,624.90	132.84	27,625.29	732.84
6/26/23	MEDS	buy	15.51	500	7,755.00	-	19,870.29	732.84
6/26/23	VERA	buy	17.56	500	8,780.00	-	11,090.29	732.84
6/26/23	NVDA	sell	403.12	70	28,218.40	942.20	39,308.69	1,675.04
6/26/23	MA	buy	377.37	80	30,189.60	-	9,119.09	1,675.04
6/28/23	COIN	buy	69.00	100	6,900.00	-	2,219.09	1,675.04

On June 26, 2023, a series of stock transactions occurred. Initially, there was a cover operation for FCNC with 3 shares at $1,208.30 each, adding a profit of $132.84 to the portfolio. Then, two buying moves were executed: 500 shares of MEDS at $15.51 and another 500 shares of VERA at $17.56. For the purchase of MEDS stocks, there was an important surge in volume being traded on Friday June 23rd, as the figure (5.3) below shows, making the investment attractive for the portfolio.

Figure 5.3 shows an important trading volume on June 23rd for Meds volume.

However, between the time the trade was executed and the stocks were purchased, the price of the stock had already peaked.

These purchases were followed by selling 70 shares of NVDA at $403.12 each, resulting in a profit of $942.20. The -2.6% reading on NVDA's volume oscillator suggests its recent trading volume is lower than its longer-term average. This reduced volume could indicate a rising stock price without the backing of robust support, hinting at a potential lack of conviction behind its momentum. Furthermore, the negative volume may be a sign of the current trend's potential exhaustion, suggesting that the momentum could be waning. This dynamic also makes the stock more susceptible to significant price drops, especially when faced with negative news or broader market downturns. As the figure (5.4) below shows, declining volume might be indicative of a shift in sentiment among traders, pointing towards decreased interest or increased uncertainty.

Figure 5.4 shows NVDA volume oscillator at a negative 2.6%

The buying spree continued with the acquisition of 80 MA shares at $377.37 each. On June 28, 100 shares of COIN were purchased at $69.00 apiece. The Relative Strength Index (RSI) for Coinbase currently stands at 69.05, near the traditionally overbought threshold of 70. While this might typically be a cause for caution, the Moving Average (MA) of the RSI is at 51.11, significantly below the RSI value. As the figure (5.5) below shows, the growing distance between the RSI and its MA indicates a strengthening upward momentum.

Figure 5.5 shows RSI moving away from RSI MA for Coinbase stocks.

When the RSI moves away from its MA, it suggests that recent price changes are becoming more pronounced compared to the historical average, hinting at increasing buying pressure and enthusiasm among traders. This divergence acts as a reinforcement of the perceived direction of the market. If the RSI is above its MA and continues to rise, it adds confidence that the bullish trend is not only in place but also gathering strength. Historically, significant divergence between

the RSI and its MA, especially with the RSI approaching or crossing the 70 mark while its MA lags, can foreshadow a continued price surge. After all these transactions, the total cash stood at $2,219.09, with an accumulated profit of $1,675.04.

5.4 Week 4

The following table (5.4) shows the transactions that were executed during the fourth week of the momentum trading strategy.

Table 5.4: table of transactions on fourth week of momentum trading strategy

Date	Symbol	Buy/ Sell	Price ($)	Shar es	Net Cost/ Proceeds ($)	Profit/ Loss ($)	Total Cash ($)	Total Profit ($)
							2,219.09	1,675.04
07/07/23	VERA	sell	15.51	500	7,755.00	(1,025.00)	9,974.09	650.04
07/07/23	MEDS	sell	12.11	500	6,055.00	(1,700.00)	16,029.09	(1,049.96)
07/07/23	TSLA	sell	278.64	60	16,718.40	1,108.20	32,747.49	58.24

On July 7th, 2023, three significant stock transactions were made. The first was the sale of VERA stocks at a price of $15.51 per share, selling 500 shares. This transaction resulted in net proceeds of $7,755.00, but there was a loss of $1,025.00, bringing the total cash to $9,974.09 and the total profit to $650.04. Following this, MEDS stocks were sold at a price of $12.11 per share, offloading 500 shares. This sale led to net proceeds of $6,055.00. However, it incurred a loss of $1,700.00, adjusting the total cash to $16,029.09 and pushing the total profit into the negative territory at $(1,049.96). Lastly, 60 shares of TSLA were sold at a price of $278.64 per share. At the date of Tesla stocks sales, the RSI read at 66.2, which is approaching the overbought threshold,

suggesting potential decreased upside momentum. Furthermore, considering the RSI MA (Moving Average of the RSI), which is at 69.8, it provides an additional layer of smoothing to the RSI and can help pinpoint trend changes. The fact that the RSI MA is slightly higher than the RSI itself and both are nearing the overbought level might indicate that the momentum has been on the higher side for some time. This divergence where RSI is below the RSI MA, but both are nearing the overbought zone might hint at a potential slowing down of bullish momentum. The figure (5.6) below shows Tesla's RSI and RSI MA closing in on July 7th.

Figure 5.6 shows Tesla's RSI and RSI MA on July 7th

This transaction yielded $16,718.40 in net proceeds and a profit of $1,108.20. The final total cash stood at $32,747.49, with a cumulative profit of $58.24.

5.5 Week 5

The following table (5.5) shows the transactions that were executed during the fifth week of the momentum trading strategy.

Table 5.5: table of transactions on fifth week of momentum trading strategy

Date	Symbol	Buy/ Sell	Price ($)	Shares	Net Cost/ Proceeds ($)	Profit/ Loss ($)	Total Cash ($)	Total Profit ($)
							32,747.49	58.24
07/13/23	MA	sell	402.30	80	32,184.00	1,994.40	64,931.49	2,052.64
07/13/23	COIN	sell	106.70	100	10,670.00	3,770.00	75,601.49	5,822.64
07/14/23	NVMI	sell	116.32	200	23,264.00	(432.00)	98,865.49	5,390.64
07/14/23	NVDA	sell	471.74	15	7,076.10	550.95	105,941.59	5,941.59

On the last week of the momentum strategy simulation, several notable stock transactions were made. On the 13th of July, stocks of MA were sold at a price of $402.30 each for 80 shares, netting proceeds of $32,184. This particular transaction led to a profit of $1,994.40, the second highest out of all the stocks that were bought for this portfolio. On the same day, COIN stocks were sold for $106.70 each, resulting in proceeds of $10,670 from 100 shares. This sale generated a significant profit of $3,770, making it the most successful trade, not only for the momentum trading strategy, but for the buy and hold strategy as well. Just a day later, on the 14th of July, NVMI stocks were sold at $116.32 per share for 200 shares. Unlike the previous sales, this transaction resulted in a loss of $432. Additionally, NVDA stocks were also sold on the 14th, priced at $471.74 per share for 15 shares. This brought in $7,076.10, and a profit of $550.95. By

the end of these transactions, the total cash stood at $105,941.59 with an accumulated profit of

$5,941.59.

Chapter 6: Analysis and Comparisons

6.1 Strategy Evaluation: Momentum Trading

The investor started with an initial cash balance of $100,000 and ended with $105,941.59, yielding a total profit of $5,941.59 within a relatively short timeframe. This represents a return of approximately 5.94% in just over a month. While this is a decent return for such a short period, especially when compared to traditional bank savings or bonds, it also points to a strategy with high liquidity and active trading, often involving daily transactions. This type of active trading can be riskier due to its reliance on short-term market fluctuations, and the returns must be considered against the backdrop of potential broker fees, taxes, and the time spent monitoring the market.

Among the stocks traded, COIN and TSLA yielded the most significant profit margins. COIN was particularly notable: purchased at $69.00 per share and sold at $106.70, yielding a return of approximately 54.64% on that particular investment. Similarly, TSLA also performed well with a buy-in at $260.17 and a sale at $278.64, delivering a profit of $1,108.20. Such returns indicate a good sense of timing and stock selection for these trades, capturing value as the stock prices increased.

On the other hand, MEDS and VERA were the least successful trades. MEDS was acquired at $15.51 per share and sold at a significant loss at $12.11, resulting in a loss of $1,700. Similarly, VERA was bought at $17.56 and sold at $15.51, resulting in a $1,025 loss. These trades indicate either a misjudgment in the potential value of these stocks or an adverse market movement that was unpredicted.

While the strategy showed a positive return in a month, its sustainability over the long term is uncertain. The active trading approach requires constant market monitoring, which might be

resource-intensive, both in terms of time and potential transaction fees. Additionally, while some trades showed excellent returns, others led to significant losses, showcasing the volatile nature of such a strategy. A balanced approach, potentially blending active trades with longer-term investments, might offer more stability and reduced risk.

Evaluating portfolio returns against a benchmark index, such as the S&P 500 or NASDAQ, provides a critical frame of reference for the performance of the investment. These indices reflect the broader market's performance or a specific segment of the market, offering insight into general market trends and the average returns an investor might expect if they were to invest passively in a broad market portfolio. By comparing a portfolio's returns against such an index, investors can gauge the effectiveness of their investment strategy, discerning whether they are outperforming, matching, or underperforming the broader market. Without this comparative measure, it's challenging to determine if positive portfolio returns are genuinely indicative of skillful investing or if they simply mirror a general upward trend in the market. Likewise, if a portfolio is declining in value, comparing it to an index can help determine if the losses are due to broader market downturns or specific choices within the portfolio.

On June 5th, 2023, the first day of the stock market simulation, the S&P500 index sat at $4,273.79 as shown in Figure 6.1 below. By the end of the investing simulation on July 14th, 2023,

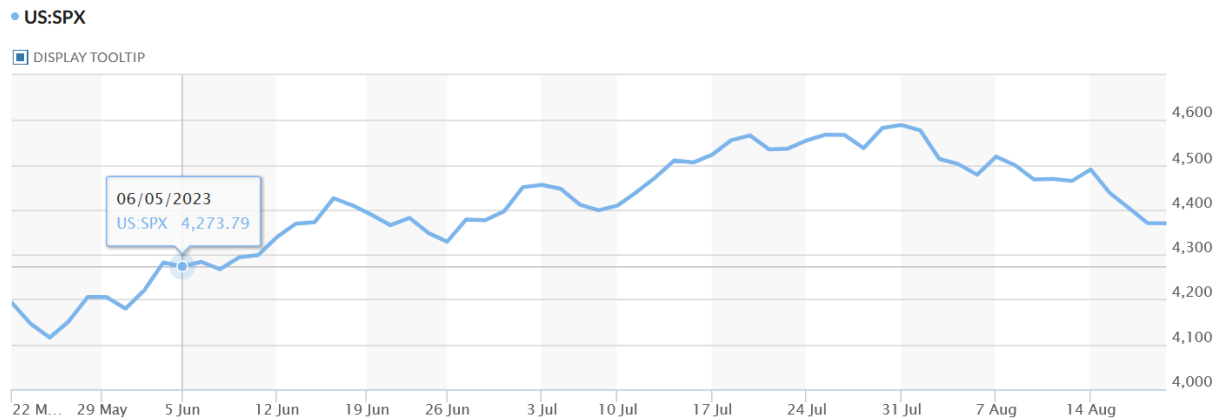the value of the S&P500 sat at $4,505.42, representing an increase in value of roughly 5.42%.

Figure 6.6 shows S&P500 index value on the first day of the market simulation.

Comparatively, as previously mentioned above, the momentum trading portfolio outperformed the S&P 500 by 0.52. This means the portfolio achieved a return that was 0.52 percentage points higher than the market's (as represented by the S&P 500) return. In other words, the choice of trades executed surpassed the average market returns. This could be due to a combination of effective stock picking, correct timing, and strategic asset allocation aided by the correct usage of technical analysis tools.

6.2 Strategy Evaluation: Buy and Hold Trading

The diversified buy and hold portfolio consisting of investments across five distinct stocks: ELF, TOL, RBMS, NVMI, and TSLA, over the observation period, displayed varied performances, with their values swaying between gains and losses.

The portfolio was initiated with a cumulative investment of $92,755.80. By the end of the evaluation period, its worth had climbed to $99,080.80, marking a notable appreciation. This translates to a growth of $6,324.80, or an encouraging return rate of roughly 6.82% over the brief duration, a commendable figure given the inherent unpredictability of the stock market.

ELF began with a purchase price of $106.98 per share and experienced fluctuations throughout but ended on a positive note at $115.60. The overall gain from ELF was a healthy $689.60. TOL, acquired at $74.18, showcased a consistent positive momentum. It recorded the most substantial weekly gain of $2,013 and closed the period at a promising $83.52. With a cumulative gain of $2,802, TOL emerged as the portfolio's star performer in monetary terms. On the other hand, RBMS was more tumultuous. Although it was bought at $64.42, it faced significant drops, with a maximum weekly downturn of $1,548. The period ended with the stock priced at $61.82, resulting in a net depreciation of $1,040. NVMI's journey started at $117.21, and it largely trended downwards. Nevertheless, a slight resurgence in the last phase meant it concluded at $115.83, marking a minor overall loss of $276. Lastly, TSLA, beginning at $260.17, generally moved on an ascending path and finished strong at $281.38. It secured a respectable net profit of $1,272.60 for the period.

In summary, the portfolio's buy and hold strategy has proven effective, with a positive yield of 6.82% during the review phase. While TOL stood out as the most lucrative pick, TSLA wasn't far behind in terms of profitability. The portfolio did experience some turbulence, primarily from

RBMS and NVMI, but its overall trajectory remained upward, underscoring the benefits of diversified investment choices.

When compared with the S&P 500's performance, which stood at 5.42% for the same duration, the portfolio outperformed the benchmark index by a margin of 1.4%. Although this margin is not vast, it indicates that the strategic stock selections and diversification within the portfolio were able to yield results that exceeded the general market trend represented by the S&P 500.

Chapter 7: Conclusions

The study and application of the two distinct investment strategies, momentum trading and buy and hold trading, provided a unique window into the dynamic and multifaceted world of stock market investing. Both strategies were tested over a short time frame, presenting varied outcomes, each with its set of advantages and challenges.

Momentum trading, a strategy characterized by swift and frequent trading decisions based on market trends and stock price fluctuations, showed a return of approximately 5.94%. The method's agility in capitalizing on market volatility allowed the investor to achieve significant gains, particularly with stocks like COIN and TSLA. However, this approach also exhibited the inherent risks of such a strategy. Stocks like MEDS and VERA demonstrated substantial losses. Active trading, such as momentum trading, demands continual market surveillance, which could be resource-taxing, both in time and financial outlays for broker fees.

On the contrary, the buy and hold strategy, a more traditional and passive approach that emphasizes the longer-term appreciation of assets, demonstrated a return of 6.82%. Here, patience and diversification played pivotal roles. With assets spread across ELF, TOL, RBMS, NVMI, and TSLA, the portfolio demonstrated the power of diversification. Although certain stocks like RBMS and NVMI faced downturns, the portfolio's overall trajectory was promising. Stocks like TOL and TSLA were the stars, proving the significance of a well-balanced and diversified investment portfolio.

In terms of raw figures, the buy and hold strategy yielded a slightly higher return rate, outpacing the momentum trading approach by 0.88%. This difference might seem minimal in isolation, but when applied to vast sums and extended over a longer timeframe, the compounded

effects could be considerable. However, while the buy and hold strategy exhibited a higher return within this period, it's essential to recognize that both strategies have their merits, and their relative success might differ based on market conditions, investment horizons, and individual risk appetites.

A noteworthy observation from this study was the performance of each portfolio relative to the broader market, represented by the S&P 500. The momentum trading portfolio slightly outperformed the S&P 500 by 0.52%, while the buy and hold strategy surpassed the index by a more pronounced 1.4%. This comparative analysis accentuates the value of effective stock selection, timely decision-making, and strategic portfolio management. While both portfolios trumped the general market trend, the buy and hold portfolio's more significant margin of outperformance underscores its potential benefits, especially for investors seeking a more hands-off approach.

In conclusion, while the buy and hold strategy emerged as the more profitable approach in this evaluation, it's paramount to emphasize that no single investment strategy guarantees success universally. Market dynamics, investment goals, risk tolerance, and time horizons will always play crucial roles in determining the best approach for individual investors. This study's insights serve as a testament to the importance of diligence, research, and adaptability in the ever-evolving realm of stock market investments.

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