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# Stock Market Simulation

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By

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## Abstract

The goal of this project was to learn how to trade in the stock market and to learn about what was the best way to trade in order to maximize profit while minimizing risk. Over the course of 9 weeks, the project consisted of conducting research on the stock market and conducting a 5-week simulation of trading stocks using active position trading and comparing the simulation to 4 other portfolios. One portfolio used the same stocks as the simulation but was traded passively and the other three portfolios were traded passively. Of the remaining three portfolios, two portfolios were indices and one portfolio was a mutual fund. At the end of the simulation, each portfolio had a positive return. In the order of the highest to lowest return, the passively traded portfolio had a return of 11.86%, the simulation had a return of 9.20%, the growth mutual fund had a return of 7.74%, and finally the two indexes had returns of 2.78% and 2.65%. This experience will help the project's participant become more familiar and experienced with the stock market.

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# 1. Introduction

The stock market is a very important part of modern-day finance and everyday billions of shares are traded each day, and trillions of dollars are traded daily. There are thousands of companies in the stock market that are publicly traded by everyday people. In the past, in order to invest in the stock market, one would have to talk to a stockbroker in person or over the phone and invest with them and their company. The broker would then manage your investments in hopes to make you the most money as safely as possible. This would result in a commission fee where the stockbroker would take a percentage of the money that you earn for themselves in order for their company to survive. However, with increased technology, one can now trade individually on apps through brokerage companies. These trades take much less time than they did in the past and are commission free since you are not relying on a stockbroker to handle your investments, only yourself. When doing this, you are not getting professional advice from the stockbrokers so these investments can be risky if you do not have knowledge of the stock market. While the stock market can result in people making millions and billions of dollars, it is possible for people to lose their entire life savings by making bad investing decisions. In this simulation, I aim to make the most profit by making trades in the stock market as one would do if they were trading with real money. The goal is to gain the most returns in the end for the amount of money I have at the beginning of the simulation (initial investment). In this chapter, I will go over the history of the stock market, the important stock exchanges and indexes, important depressions and crashes, and the different types of trading available in the stock market.



## **1.1 Beginning of the Stock Market**

The modern stock market first began back in 1611, in Amsterdam, Netherlands, when the Dutch East India Company needed to raise money and became the first publicly traded company (SoFi, 2021). The reason this company became so successful is because back in the 1600's, before the company was created, investors would invest in a boat that would travel to the other side of the world to search for gold or trade opportunities. However, most of the boats would get lost, not find anything, or become shipwrecked, so very few boats would successfully complete their trip. Thus, investors would lose a lot of money as boats were extremely costly and most investors would not be able to invest in multiple boats. With the Dutch East India Company, investors would be able to invest in the company which would sponsor multiple boats rather than just one boat, resulting in a higher chance for the Dutch East India Company to have a successful voyage (Hur, 2018). When investors invested into the Dutch East India Company, they would receive dividends of their shares where each share would earn a small amount of money based on a given fixed percentage based on the company's profits. This company was the only company being traded in that market. However, this led to numerous other companies in other countries following their lead and creating their own stock markets. The first stock market in the United States began in 1790, which was the Philadelphia Stock Exchange. The largest stock exchange in the world, the New York Stock Exchange, or NYSE, began two years later in 1792 by 24 investors who created the Buttonwood Agreement (Ritchie, 2021).

## **1.2 Important Stock Exchanges**

The two largest and most important stock exchanges are the New York Stock Exchange (NYSE) and the National Association of Securities Dealers Automated Quotation or NASDAQ.

The NYSE is the oldest stock exchange still in existence today and is the largest stock exchange in the world. The NYSE works as an auction house where different investment firms buy and sell a selection of 2800 companies. It is located on Wall Street in New York City. Companies that want to be listed on the NYSE need to go through a strict application phase and are generally very stable and well-established. NASDAQ was founded in 1971 and is a dealer market. NASDAQ is the first electronic exchange to ever be created in the world. It currently has about 3300 companies listed. Headquartered in New York City, all of their transactions are made electronically. Companies listed on NASDAQ are generally technological companies which include companies involved with the internet, biotechnology, and innovation. However, companies on the NASDAQ are mostly recently developed and are growth-oriented and more volatile than companies listed on the NYSE (Hayes, 2021).

### **1.3 Important Stock Market Depressions/Crashes**

Stock market depressions are extremely important because they are where you can lose a ton or all of your investments. If a depression is nearing it is important that you take your money out of the market as soon as possible so that you do not lose your entire life's savings. Depressions are also important because stock prices are at their lowest and will be very cheap so it is a good idea to invest any extra money you have at that time as stock prices will rise in the future and will lead to an immense profit. First, the most widely known crash is the stock market crash of 1929 where the stock market crashed on Black Tuesday, or October 29, 1929. On that day, 16,410,030 shares were traded on the New York Stock Exchange and billions of dollars were lost. Black Tuesday had a large impact on the Great Depression which ended in 1933. Stocks before the crash diminished to 20% of their value by the end of 1932 (History.com, 2021). Next, in 1987, the first

crash of the modern financial system occurred on October 19<sup>th</sup>, 1987, also known as Black Monday. The stock markets added new computerized trading to make larger and faster trades. These new machines, tensions between the United States and Iran, and dropping oil prices all resulted in the market downturn. At the end of the month, the United States market was down 22.68% (Hristova, 2018). About 10 years later, the dotcom bubble occurred. At the time, the internet was becoming increasingly popular and new websites were being created as well as an interest in investing in these websites. As a result, any company with a “.com” after their name had their stocks increase immensely because most people believed that all of these online companies would become extremely profitable. As a result, all of the stock prices for these companies were inflated and started to deflate. By 2000, NASDAQ reached its peak at 5048.62 and by October 2002 NASDAQ was worth over 75% less than its peak costing investors over \$5 trillion (Reisner, 2020). Next came the 2008 financial crisis where people were lent money to buy homes even though they were not qualified to repay their debt as interest rates were very low. As a result, people could not pay off their debts and banks soon went out of business, the first being the Lehman Brothers (and also Bear Stearns). Many other banks were also expected to go bankrupt, however the government aided those banks in order to escape another great depression. By September 2008, the stock market was down 20% (Hristova, 2018). This was one of the first times that the government took action on the financial market. Finally, the most recent depression was the Covid-19 crash of 2020. Covid-19 is disease caused by a virus which spread throughout the world closing restaurants and all non-essential businesses. More than 300,000 people died in the United States and about 31 million people were either unemployed or lived with an unemployed family member. The stock market crashed by around 12%-13% (Reisner, 2020).

## 1.4 Types of Trading

There are many different ways to invest and trade in the stock market. Some are involved with frequency and strategy of trading and others involve when you make the transaction. First, there is day trading. Day trading is when one buys and sells within the same day and are not held overnight. Day trading is a very aggressive strategy that is used when trading. Position trading is more passive than day trading but could be aggressive depending on the investor. Position trading is when one looks at trends of stocks and determines whether they want to buy into that trend if they think that it has good potential or sell out of the trend if they think that the share has reached its peak and is now declining in value (Zucchi, 2021). Short selling is where one would invest in those stocks decline. In doing so, they borrow and would then sell the stock and rebuying in the future when they believe that the price would be lower. This is a very risky investment option. Next are when the investor completes their order. The main types of orders are market orders and limit orders. Market order is where the investor buys or sells at the current market price that they place their order. A limit order is where the investor buys or sells at a specific price that they pre-determine, and the order will not execute until that price is reached (Folger, 2021).

## 2. Pre-Simulation Planning

When preparing for the simulation, I will need to choose the type of method I will use to trade. I will also need to decide on how aggressive or passive my trading will be and what types of stocks I will be trading with. It is also important on how I will be keeping track of the data that I will be trading with.

### 2.1 Simulation Plan

For the simulation I will be choosing 5 stocks and putting \$10,000 into each stock for a total of \$50,000. When choosing the stock, I will research the top stocks projected to have the highest percent increase in June and July. I will be focusing on companies in the Fortune 500 as I believe that if the stocks do poorly, the stocks in the Fortune 500 are much safer than others and will eventually rise back to the original market value at the time of purchase as they are the top 500 companies in the United States. All transactions taking place will be market transactions where I will buy or sell at the current price. All transactions will be made online so there will not be a commission fee. At the end of the simulation, I will compare my results to what would have been the results had I invested in different indexes or mutual funds. For the simulation, I will be keeping track of my trades using the following format (Table 2.1).

<b>Date</b>	<b>Symbol</b>	<b>buy/ Sell</b>	<b>Price</b>	<b>Shares</b>	<b>Net Cost/ Proceeds</b>	<b>Profit/ Loss</b>	<b>Total Cash</b>	<b>Total Profit</b>

*Table 2.1: Trading Format*

## **2.2 Trading Strategy**

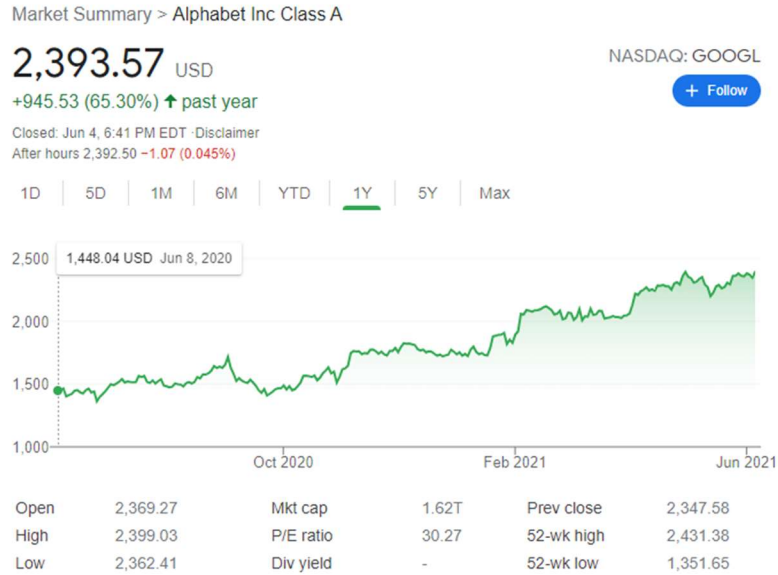
There are many different trading strategies for the stock market such as market orders, limit orders, shorting, and more. For the purpose of this simulation, I will be conducting solely market orders and I will be using position trading and execute trades when I think it is a good time to buy or sell a certain stock. Normally, the objective is to buy low and sell high, and I will be attempting to follow this strategy. At the end of the simulation, I will be comparing my results to what would have happened if I followed the buy and hold strategy, which is a more passive version of position trading, where you buy a selection of stocks and not take any action for a certain period of time. For this simulation it will be 5 weeks where I would sell all stock after the fifth week ends if I were to follow that strategy.

### **3. Selection of Stocks**

Between NASDAQ and the NYSE, I will be using NASDAQ because it is more volatile and has newer companies which I am more interested in investing in. In the NASDAQ Index, there are over 3300 companies available to be traded so it is hard to choose what company to invest in. Many people choose companies that they are most familiar with. When choosing stocks, one must evaluate the riskiness and potential growth to figure out if that company is worth investing in.

#### **3.1 Alphabet Inc (Class A)**

First is Alphabet Inc, the parent company of Google. Google is named Alphabet Inc. on NASDAQ because it is comprised of multiple companies, including Google, involving internet search and other things such as human health, artificial intelligence, fitness, urban innovation, autonomous driving, drones, and more. Alphabet Inc was created by Larry Page and Sergey Brin, in 2015 as a holding company when they restructured Google by removing Google's daughter companies and making Alphabet Inc the parent company. Alphabet Inc is currently the fourth largest technology company in the world. Alphabet Inc stock has increased 65.3% from one year ago as shown below. Figure 3.1 shows Alphabet Inc's price chart in the past year.



*Figure 3.1: Alphabet Incorporated Class A Stock Chart*

## 3.2 Microsoft

Next, Microsoft is a technological company that creates computer software, computers, laptops, operating systems, gaming consoles, and more. Microsoft was created by Bill Gates and Paul Allen in 1975 and is currently the largest computer software maker. Microsoft stock has increased 33.14% from one year ago. Figure 3.2 shows Microsoft's price chart in the past year.

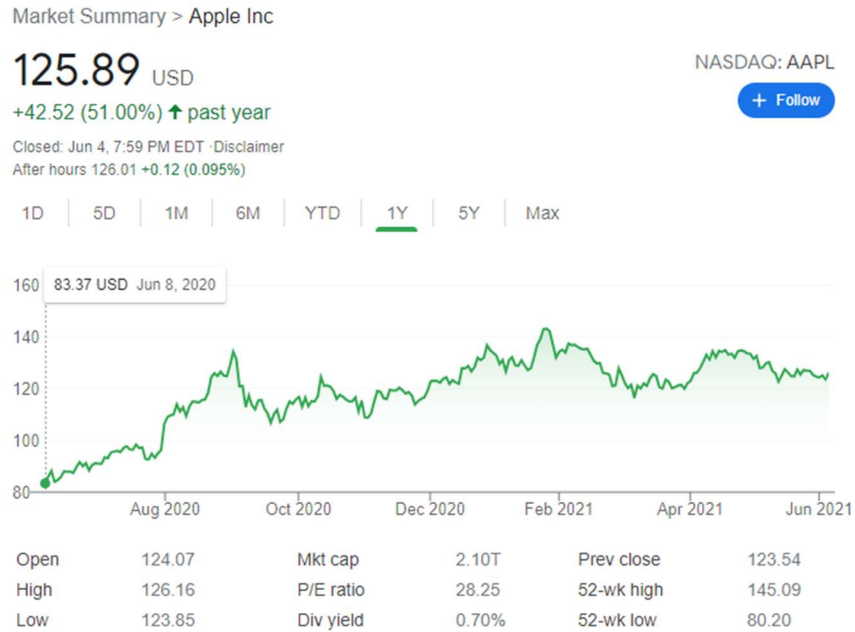




*Figure 3.2: Microsoft Corporation Stock Chart*

### 3.3 Apple

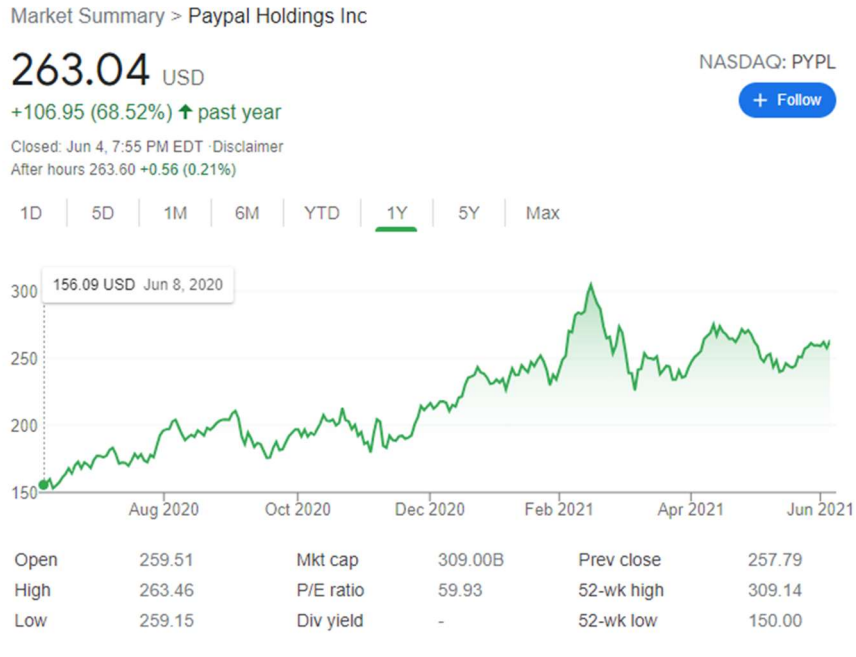
Apple Inc is a technology company created by Steve Jobs, Steve Wozniak, and Ronald Wayne in 1976 in 1976. Apple makes electronics, computer software, and online services. Apple is one of the Big Five American information technology companies which also includes Google and Microsoft. Apple is most widely known for their iPhones which makes up approximately 50% of the smartphone market share. Apple stock has increased 51% from one year ago. Figure 3.3 shows Apple's price chart in the past year.



*Figure 3.3: Apple Incorporated Stock Chart*

## 3.4 PayPal

PayPal was created in 1999 and is an online payment system used for transferring money electronically. Over the last 12 months, PayPal was involved in the transferring of over one trillion dollars' worth of money with close to 400 million active member accounts. PayPal stock has increased 68.52% from one year ago. Figure 3.4 shows PayPal's price chart in the past year.



*Figure 3.4: PayPal Holdings Incorporated Stock Chart*

### 3.5 Nvidia

Nvidia was created in 1993 and is a technology company involved in gaming and entertainment, laptops, data centers, graphics processing units, and more. Nvidia is also involved in artificial intelligence, has been working with several companies on the creation of autonomous vehicles and is making virtual and augmented reality technology. Nvidia stock has increased 99.64% from one year ago. Figure 3.5 shows Nvidia's price chart in the past year.

Market Summary > NVIDIA Corporation

703.13 USD

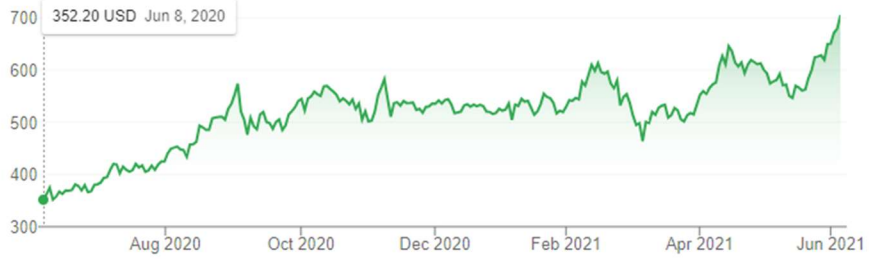
NASDAQ: NVDA

+350.93 (99.64%) ↑ past year

+ Follow

Closed: Jun 4, 7:56 PM EDT · Disclaimer  
After hours 703.70 +0.57 (0.081%)

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



Open	684.50	Mkt cap	438.05B	Prev close	678.79
High	706.44	P/E ratio	83.33	52-wk high	706.44
Low	683.82	Div yield	0.091%	52-wk low	347.10

Figure 3.5: Nvidia Corporation Stock Chart

## 4. Stock Market Simulation

Over the course of the next five weeks, I will be undergoing the simulation of buying and selling the five selected stocks of Alphabet Inc, Microsoft, Apple, PayPal, and Nvidia. At the end of each week, I will describe what happened that week and give a weekly report on how the stocks purchased compare to when they were first bought. This is also known as unrealized profit or loss and is used by stock brokerages to notify clients who have not sold their shares of how their shares are currently doing in comparison to how the stocks were doing when they were first transacted upon.

### 4.1 Week 1

Week one started on June 7 and ended on June 11. This week I started the simulation with \$50,000 cash and bought stock in Apple and Nvidia, investing approximately \$10,000 into both companies. 80 shares of stock of Apple were bought at \$124.98 per share and 14 shares of Nvidia were bought at \$698.43 per share. At the end of the week, Apple stock was up 1.9% from time of transaction and Nvidia stock was up 2.12% from time of transaction. Out of all 5 stocks, I invested in the two worst performing ones this week. Table 4.1 lists trades made in Week 1.

Date	Symbol	buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
06/07/21							\$50000	
06/07/21	AAPL	buy	\$124.98	80	\$9998.40		\$40001.6	
06/08/21	NVDA	buy	\$698.43	14	\$9778.02		\$30223.58	

*Table 4.1: Week 1 transactions*

This week, Google opened at \$2451.32 and closed at \$2513.93. By not investing in Google this week, I missed out on approximately 2.55% of profits which when multiplied by \$10000 would have been about \$255. Figure 4.1 shows Alphabet Inc's price chart in Week 1.



Figure 4.1: Alphabet Inc. Week 1

This week, Microsoft opened at \$251.04 and closed at \$257.98. By not investing in Microsoft this week, I missed out on about 2.76% of profits which would have been about \$276 had I invested \$10000. Figure 4.2 shows Microsoft's price chart in Week 1.



*Figure 4.2: Microsoft Week 1*

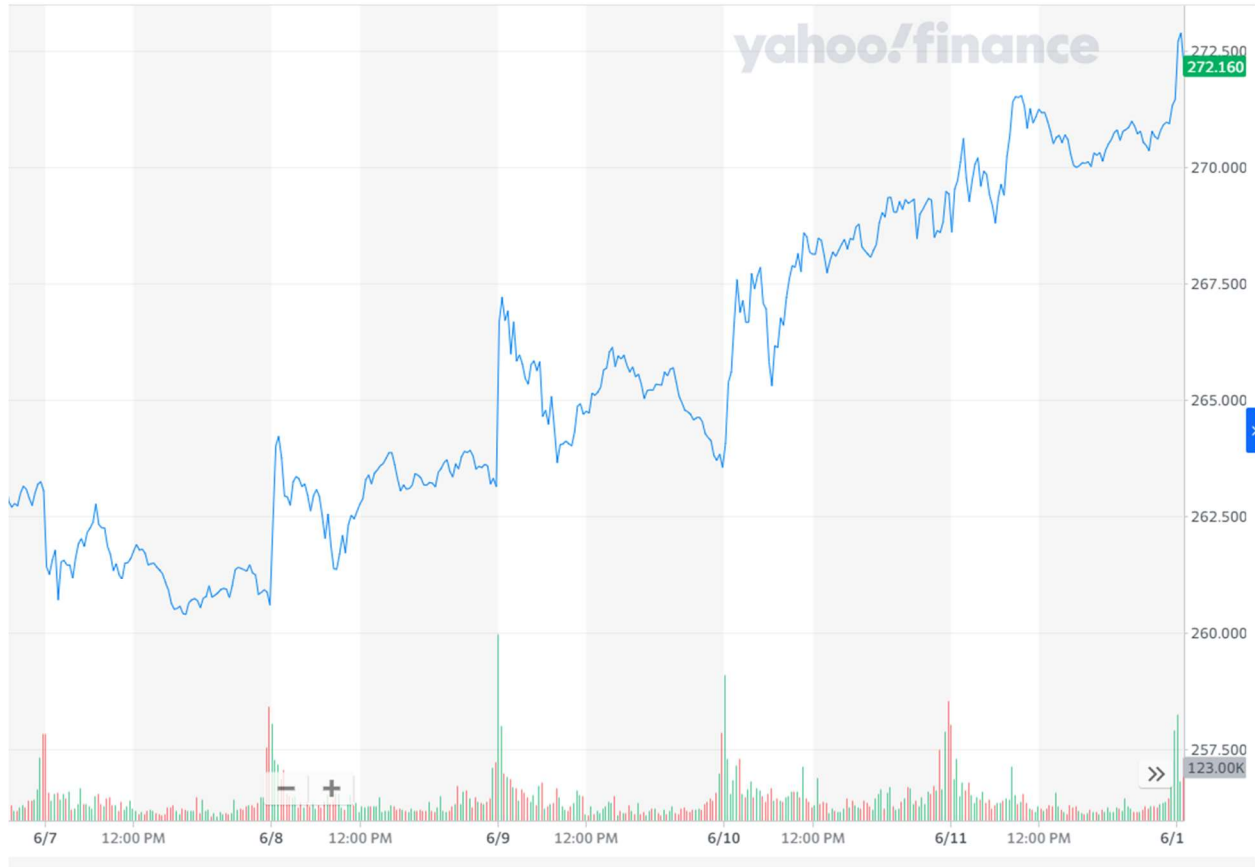
This week, Apple opened at \$125.77 and closed at \$127.35. This is a price difference of 1.26%. I invested in Apple on June 7 at \$124.98. This was a good move because I was able to get a cheaper price than what Apple opened with. However, I missed out on 2 key price changes where I could have sold and rebought stock on June 8 and June 10 where the stock rose and then dropped dramatically on both days. Figure 4.3 shows Apple's price chart in Week 1.



*Figure 4.3: Apple Week 1*

This week, PayPal opened \$261.42 and closed at \$271.45. By not investing in PayPal this week, I missed out on approximately 3.84% or about \$384 had I invested \$10000. This was the best performing stock this week out of the 5 stocks that I chose to trade with. Figure 4.4 shows PayPal's price chart in Week 1.





*Figure 4.4: PayPal Week 1*

This week, Nvidia stock opened at \$707.67 and closed at \$712.85. This is a price difference of .73%. I invested in Nvidia on June 8 for \$698.43. This was good because the price that I invested in was lower than the opening price for this week. By doing this, I was able to salvage 1.3% or \$130 had I invested at the beginning of the week. Of all the stocks, Nvidia was the worst performing stock. Figure 4.5 shows Nvidia's price chart in Week 1.



Figure 4.5: Nvidia Week 1

## 4.2 Week 2

This week, I sold Apple stock and bought stock in PayPal. All 80 shares of stock of Apple were sold at \$130.64 per share which is a profit of 4.53% or \$452.80. 38 shares of PayPal were bought at \$269.61 per share. At the end of the week, Nvidia stock was up 6.45% from time of transaction and PayPal was up 5.1% from time of transaction. Table 4.2 lists trades made in Week 2.

Date	Symbol	buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
06/16/21	AAPL	sell	\$130.64	80	\$10451.20	\$452.8	\$40674.78	\$452.80
06/16/21	PYPL	buy	\$269.61	38	\$10245.18		\$30429.60	

Table 4.2: Week 2 transactions

This week, Alphabet Inc opened at \$2424.63 and closed at \$2400.63. Alphabet Inc. stock declined by about 1%. This was the worst performing stock this week. Since I did not invest in Alphabet Inc. in week 1, this did not affect my portfolio and I was able to dodge the potential loss. However, there was a missed opportunity on June 16 where I could have bought under \$2400 and then sold on June 17 at around \$2450 when the stock reached a peak before rapidly declining on June 18. This potential profit would have been a profit for about 2.25%. Figure 4.6 shows Alphabet Inc’s price chart in Week 2.



Figure 4.6: Alphabet Inc. Week 2

This week, Microsoft opened at \$257.35 and closed at \$259.32. By not investing in Microsoft, I missed out on a profit of about .77% or \$77 had I invested \$10000. However, I missed out on a price drop on June 16 where the price was just under \$255. Figure 4.7 shows Microsoft's price chart in Week 2.



*Figure 4.7: Microsoft Week 2*

This week, Apple opened at \$127.40 and closed at \$130.40. This is a price change of 2.35%. I sold Apple stock on June 16 for \$130.64 which was good because I sold for a price higher than what Apple closed at. However, Apple stock rose on June 17 and I missed out on an increased profit had I sold then. Figure 4.8 shows Apple's price chart in Week 2.



*Figure 4.8: Apple Week 2*

This week, PayPal opened at \$272.70 and closed at \$283.38. This is a price change of about 3.9%. I invested in PayPal on June 16 for \$269.61. This was good because I bought PayPal for a lower price than what they opened at. However, PayPal dropped even lower that day to \$265.5 which would have been a better buy. I also could have sold PayPal on June 18 when it reached a peak at around \$286 which would have been a profit of 7.7% or around \$770 had I invested \$10000. Figure 4.9 shows PayPal's price chart in Week 2.



Figure 4.9: PayPal Week 2

This week, Nvidia opened at \$708.56 and closed at \$744.62. This is a price change of approximately 5.1%. Last week, I bought Nvidia at \$698.43 and it was the worst performing stock. This week, Nvidia was the best performing stock. I missed out on an opportunity to sell Nvidia stock on June 18 when the stock reached a peak of \$774. This would have resulted in a profit of 10.8% or \$1057.98. Figure 4.10 shows Nvidia's price chart in Week 2.



Figure 4.10: Nvidia Week 2

### 4.3 Week 3

This week I bought stock in Google and bought and sold stock in PayPal. 4 shares of Google were bought at \$2445.31 per share. All 38 shares of PayPal stock were bought and sold during this week. I sold them for \$294.13 for a profit of 9.1% or \$931.76. 38 Shares were rebought in PayPal for \$288.36 which saved me from a loss of 2% or \$219.26. At the end of the week, Nvidia stock was up 9% from time of purchase, Google was up .2% from time of purchase and PayPal was up .4% from time of purchase. Table 4.3 lists trades made in Week 3.

Date	Symbol	buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
06/23/21	GOOGL	buy	\$2445.31	4	\$9781.24		\$20648.36	
06/24/21	PYPL	sell	\$294.13	38	\$11176.94	\$931.76	\$31825.30	\$1384.56
06/25/21	PYPL	buy	\$288.36	38	\$10957.68		\$20867.62	

Table 2.3: Week 3 transactions

This week, Google opened at \$2401.85 and closed at \$2450.18. I bought stock on June 23 for 2445.31. This was not very good because I missed out on 1.8% had I bought at opening time.

Figure 4.11 shows Alphabet Inc.'s price chart in week 3.



Figure 4.11: Alphabet Inc. Week 3

This week, Microsoft opened at \$258.55 and closed at \$265.02. By not investing in Microsoft, I missed out on 2.5% or about \$250 had I invested \$10000. Figure 4.12 shows Microsoft's price chart in week 3.





*Figure 4.12: Microsoft Week 3*

This week, Apple opened at \$129.82 and closed at \$133.11. Last week I sold Apple at 130.64 and believed that the price would go down even further. However, that never happened, and I missed out on about 2.5% had I sold it on June 24. Figure 4.13 shows Apple's price chart in week 3.



*Figure 4.13: Apple Week 3*

This week PayPal opened at \$279.77 and closed at \$289.61. This is a price change of about 3.5%. This week I sold PayPal on June 24 for \$294.13 per share and rebought on June 25 for \$288.36 per share. This was good because I saved myself from a loss of about 2%. Figure 4.14 shows PayPal's price chart in week 3.



*Figure 4.14: PayPal Week 3*

This week, Nvidia opened at \$729.35 and closed at \$761.27. This is a price change of about 4.38%. There was a potential opportunity to sell on June 24, but I believe that Nvidia stock will keep rising. Figure 4.15 shows Nvidia's price chart in week 3.



Figure 4.15: Nvidia Week 3

## 4.4 Week 4

This week I bought sold and rebought stock in Nvidia saving on a loss of .9%. I also bought 37 shares of stock in Microsoft for \$270.26 per share. At the end of the week, Google was up 2.45%, PayPal was up .65%, Nvidia was up 3.25%, and Microsoft was up 2.7% from time of purchases, respectively. Table 4.4 lists trades made in Week 4.

Date	Symbol	buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
06/28/21	NVDA	sell	\$800.66	14	\$11209.24	\$1431.22	\$32076.86	\$2815.78
06/29/21	NVDA	buy	\$793.69	14	\$11111.66		\$20965.20	
06/30/21	MSFT	buy	\$270.26	37	\$9999.62		\$10965.58	

Table 4.4: Week 4 transactions

This week, Google opened at \$2535.30 and closed at \$2574.06. This is a price change of about 1.5%. I missed out on an opportunity of about 2% or had I sold on June 28 and rebought on June 30. Figure 4.16 shows Alphabet Inc's price chart in week 4.

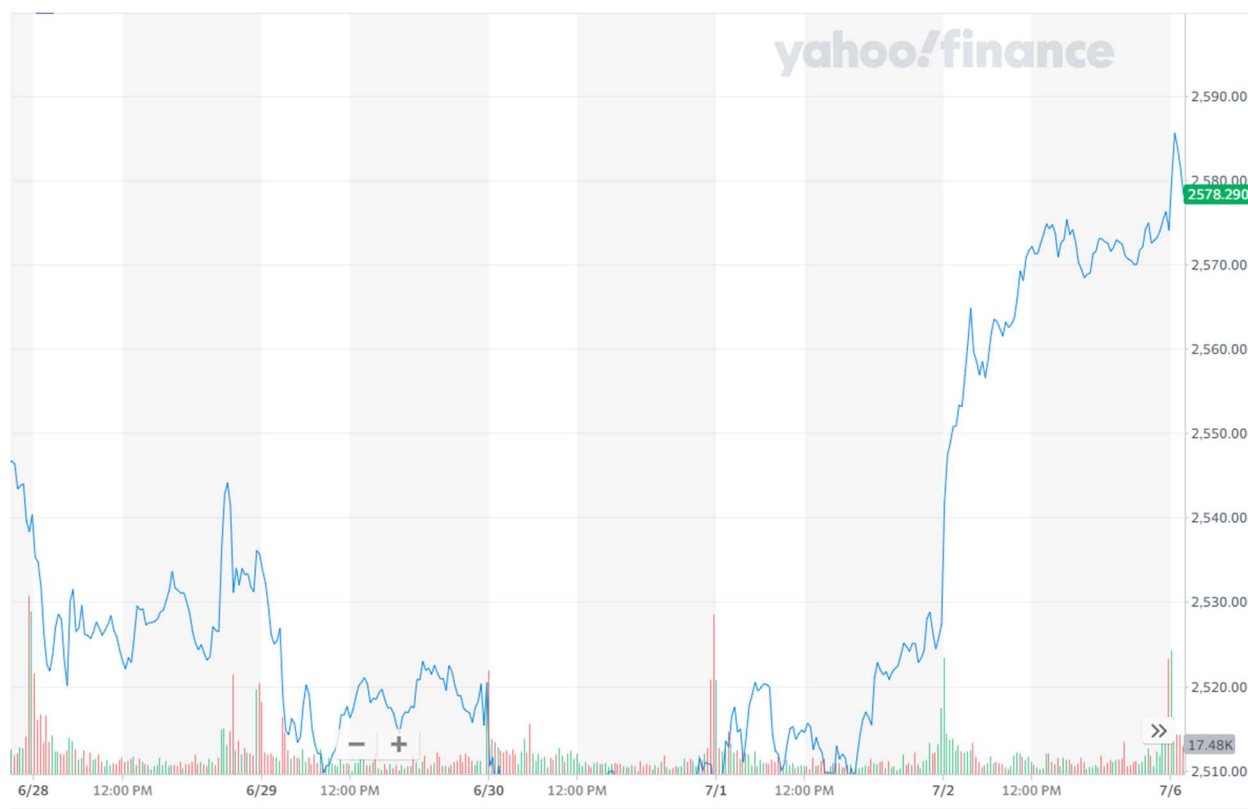
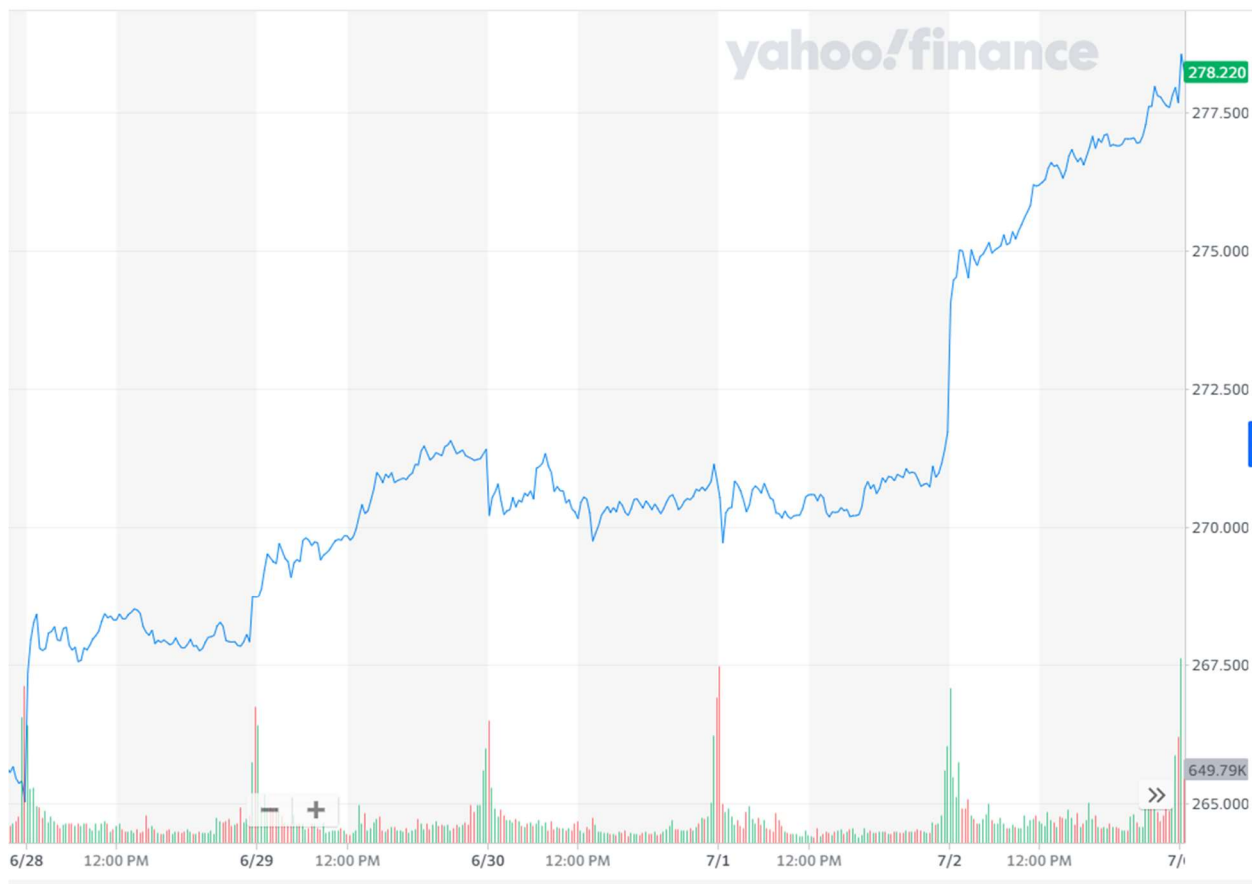


Figure 4.16: Alphabet Inc. Week 4

This week, Microsoft opened at \$267.36 and closed at \$276.38. This is a price change of about 3.4%. I bought stock on June 30, but I missed out on cheaper shares had I bought earlier. Figure 4.17 shows Microsoft's price chart in week 5.



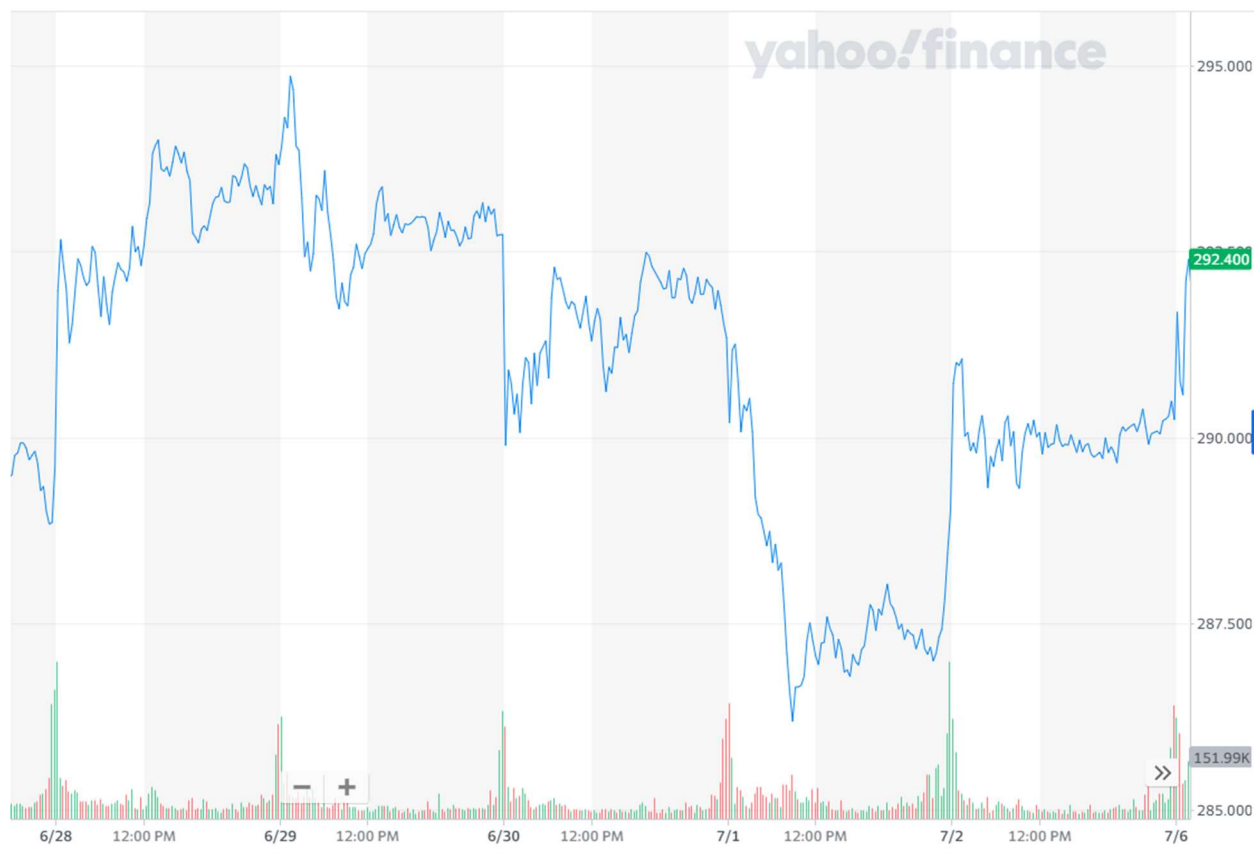
*Figure 4.17: Microsoft Week 4*

This week, Apple opened at \$134.07 and closed at \$139.96. By not owning shares of Apple, I missed out on about 4.4% which was the second highest performing stock this week. Figure 4.18 shows Apple's price chart in week 4.



*Figure 4.18: Apple Week 4*

This week, PayPal opened at \$291.97 and closed at \$289.01. This is a price change of about -1%. PayPal was the only stock to be negative over the duration of this week. I missed out on selling opportunities on June 28 and June 29 and rebuying opportunities on July 1 which would have given a profit of about 2.1%. Figure 4.19 is PayPal's price chart in week 4.



*Figure 4.19: PayPal Week 4*

This week Nvidia opened at \$783.49 and closed at \$819.48. This is a price change of about 4.6%. This is the best performing stock in week 4. My belief that Nvidia would continue increasing from last week held true. Figure 4.20 shows Nvidia's price chart in week 4.





Figure 4.20: Nvidia Week 4

## 4.5 Week 5

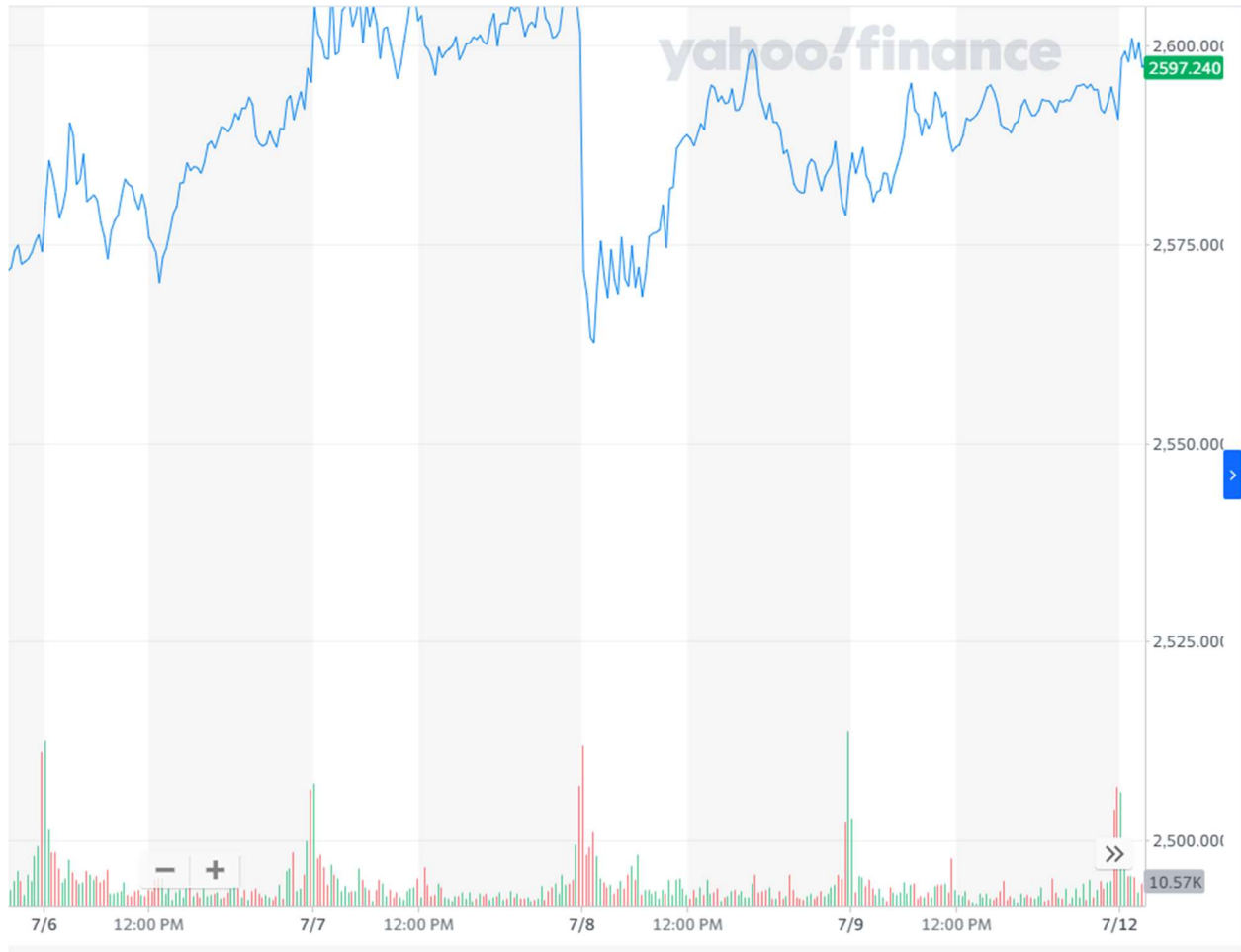
It is important to note that this week only had 4 days of trading as the market was closed on June 5 for Independence Day. This week I bought 77 shares of stock in Apple for \$140.56 per share. This was the last week of the simulation, so I sold all stocks at the end of the week. All 4 shares of Google were sold for a final price of \$2590.75 per share for a profit of 2.66% or \$1041.88. 38 shares of PayPal were sold at \$300.21 per share for a profit of 4.1% or \$450.30. 14 shares of Nvidia were sold at \$802.01 per share for a profit of 1.5% or \$116.48. 37 shares of Microsoft were

sold for \$277.94 per share for a profit of 2.8% or \$284.16. Finally, 77 shares of Apple were sold at \$145.11 for a profit of 3.2% or \$350.35. Table 4.5 lists trades made in Week 5.

<b>Date</b>	<b>Symbol</b>	<b>buy/ Sell</b>	<b>Price</b>	<b>Shares</b>	<b>Net Cost/ Proceeds</b>	<b>Profit/ Loss</b>	<b>Total Cash</b>	<b>Total Profit</b>
07/06/21	AAPL	buy	\$140.56	77	\$10823.12		\$142.46	
07/09/21	GOOGL	sell	\$2590.75	4	\$10363.00	\$581.76	\$10505.46	\$3397.54
07/09/21	MSFT	sell	\$277.94	37	\$10283.78	\$284.16	\$20789.24	\$3681.70
07/09/21	AAPL	sell	\$145.11	77	\$11173.47	\$350.35	\$31962.71	\$4032.05
07/09/21	PYPL	sell	\$300.21	38	\$11407.98	\$450.30	\$43370.69	\$4482.35
07/09/21	NVDA	sell	\$802.01	14	\$11228.14	\$116.48	\$54598.83	\$4598.83

*Table 4.5: Week 5 transactions*

This week, Google opened at \$2580.27 and closed at \$2590.75. This is a price change of .4%. I sold 4 shares on July 9 for \$2590.75 per share. I missed out on an opportunity to sell on July 7 when shares reached \$2605. Figure 4.21 shows Alphabet Inc's price chart in week 5.



*Figure 4.21: Alphabet Inc. Week 5*

This week, Microsoft opened at \$278.54 and closed at \$277.94. This is a price change of -.22%. I sold 37 shares of stock for a price of 277.94 per share on July 9. Figure 4.22 shows Microsoft's price chart in week 5.

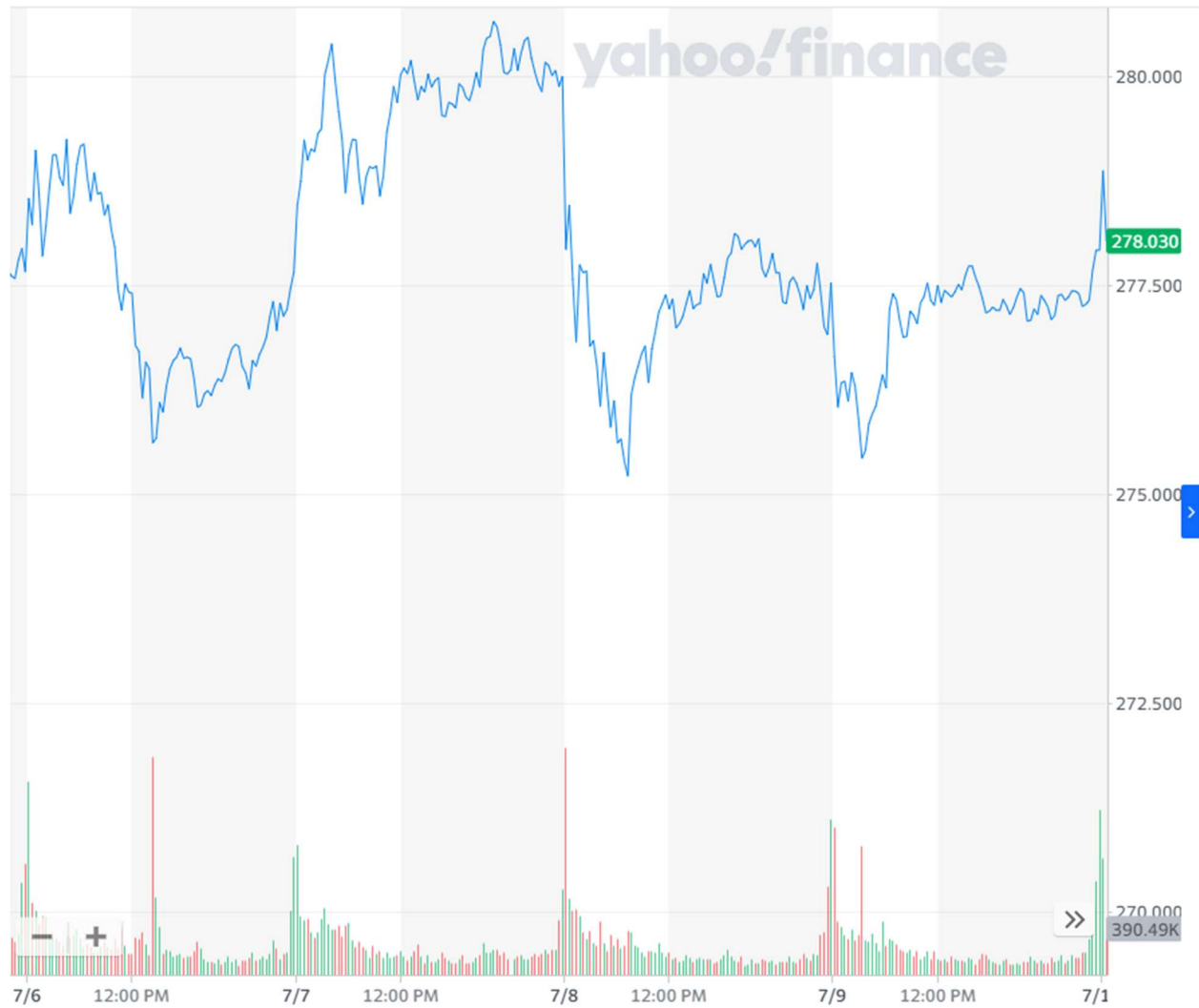


Figure 4.22: Microsoft Week 5

This week Apple opened at \$140.42 and closed at \$145.11. This is a price change of about 3.33%. I bought 77 shares of stock on July 6 for \$140.56 per share and sold all shares on July 9 for \$145.11 per share. Figure 4.23 shows Apple’s price chart in week 5.

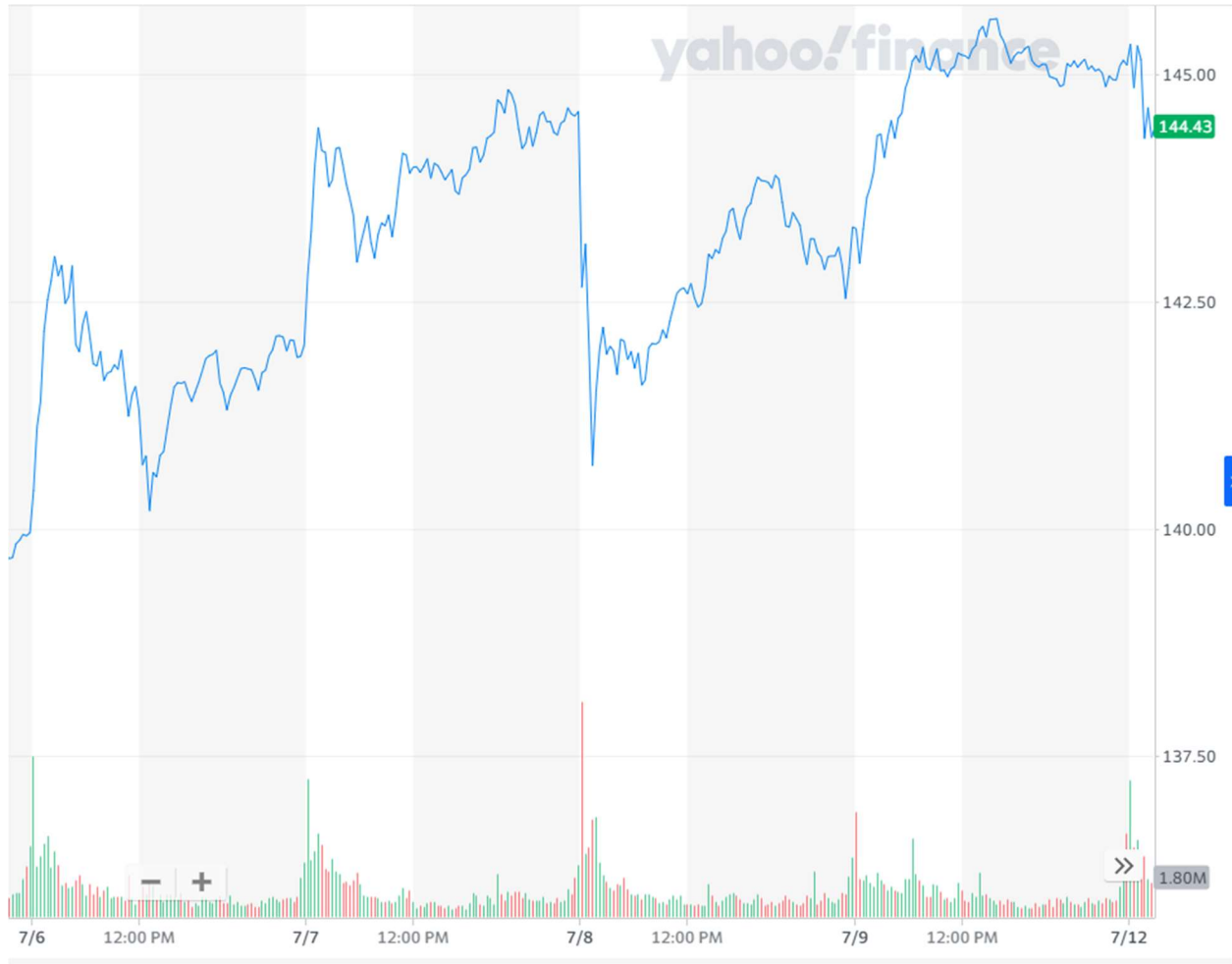


Figure 4.23: Apple Week 5

This week, PayPal opened at \$291.69 and closed at \$300.21. This is a price change of 2.9%. I sold 38 shares on July 9 for \$300.21 per share. I missed out on an opportunity to sell on July 7 at \$297 and rebuy on July 8 at \$291 which would have resulted in a profit of 2%. Figure 4.24 shows PayPal's price chart in week 5.

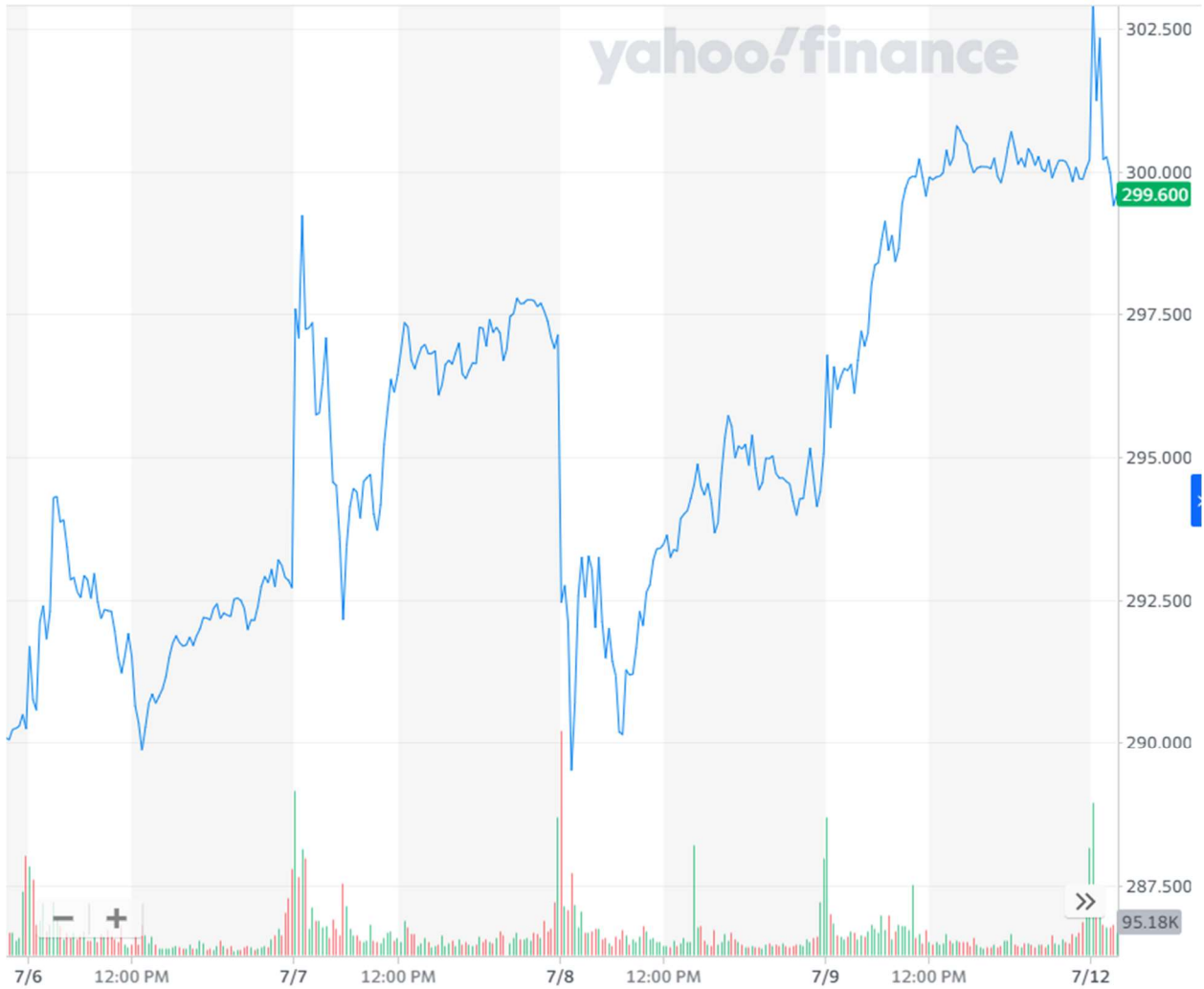


Figure 4.24: PayPal Week 5

This week, Nvidia opened at \$828.00 and closed at \$802.01. This is a price change of about -3.24%. This is the worst performing stock this week. I sold 14 shares on July 9 for \$802.01 per share. I missed out on an opportunity to sell on July 6 for \$830 which would have saved me from a loss of about 3.5%. Figure 4.25 shows Nvidia's price chart in week 5.



Figure 4.25: Nvidia Week 5

## **5. Simulation Results**

At the end of the simulation, I ended with a total of \$54,598.83 and a profit of \$4,598.83. The total, \$54,598.83, is the sum of the original starting investment of \$50,000 and the profit of \$4,598.83. During the five-week simulation, I was able to make a profit of about 9.2%. However, this just tells us the final results of the simulation and not what actually happened to my portfolio during the five-week simulation.

### **5.1 Results of Simulation**

In order to show what happened over the duration of the simulation, I configured data from the end of each week along with the stocks owned and compiled a chart using the data. Figure 5.1 shows all of the transactions and end of week data used for figure 5.2. Note that the simulation total is the sum the starting cash of \$50,000, the Cost column, and the Stock Total when Cost is equal to 0.



	A	B	C	D	E	F	G
1	Week 0				\$50,000		
2	Week 1						
3	Company	Shares	Cost	End of Week Pri	Stock Total		Simulation Total
4	Apple	80	-\$9,998.40	\$127.35	\$10,188.00		\$50,391
5	Nvidia	14	-\$9,778.02	\$712.85	\$9,979.90		
6							
7	Week 2						
8	Company	Shares	Cost/Profit	End of Week Pri	Stock Total		Simulation Total
9	Apple	80	\$10,451.20				
10	Nvidia	14	\$0.00	\$744.62	\$10,424.68		\$51,623
11	PayPal	38	-\$10,245.18	\$283.38	\$10,768.44		
12							
13	Week 3						
14	Company	Shares	Cost/Profit	End of Week Pri	Stock Total		Simulation Total
15	Google	4	-\$9,781.24	\$2,450.18	\$9,800.72		\$52,331.30
16	Nvidia	14	\$0.00	\$761.27	\$10,657.78		
17	PayPal	38	\$11,176.94				
18	PayPal	38	-\$10,957.68	\$289.61	\$11,005.18		
19							
20	Week 4						
21	Company	Shares	Cost/Profit	End of Week Pri	Stock Total		Simulation Total
22	Nvidia	14	\$11,209.24				\$53,942.98
23	Nvidia	14	-\$11,111.66	\$819.48	\$11,472.72		
24	Google	4	\$0.00	\$2,574.06	\$10,296.24		
25	PayPal	38	\$0.00	\$289.01	\$10,982.38		
26	Microsoft	37	-\$9,999.62	\$276.38	\$10,226.06		
27							
28	Week 5						
29	Company	Shares	Cost/Profit	End of Week Pri	Stock Total		Simulation Total
30	Apple	77	-\$10,823.12				\$54,598.83
31	Apple	77	\$11,173.47				
32	Google	4	\$10,363.00				
33	Microsoft	37	\$10,283.78				
34	PayPal	38	\$11,407.98				
35	Nvidia	14	\$11,228.14				

Figure 5.1: Total Transactions Spreadsheet

Figure 5.2 is the chart created from figure 5.1. This chart shows the portfolio's balance at the time that the market closes for each week. Week 0 represents the beginning balance of \$50,000 before the simulation begins and week 5 represents the final balance of the portfolio at the end of the simulation. From Week 0 to Week 1, the portfolio increased by .78%. Week 2 increased by 2.44% from Week 1. Week 3 increased by 1.37% from Week 2. Week 4 increased by about 3.1%

from Week 3. Week 5 increased by 1.2% from Week 4. The portfolio increased the most in week 4 and the least in week 1. The portfolio did not take any losses from previous weeks and was strictly positive over the duration of the simulation.

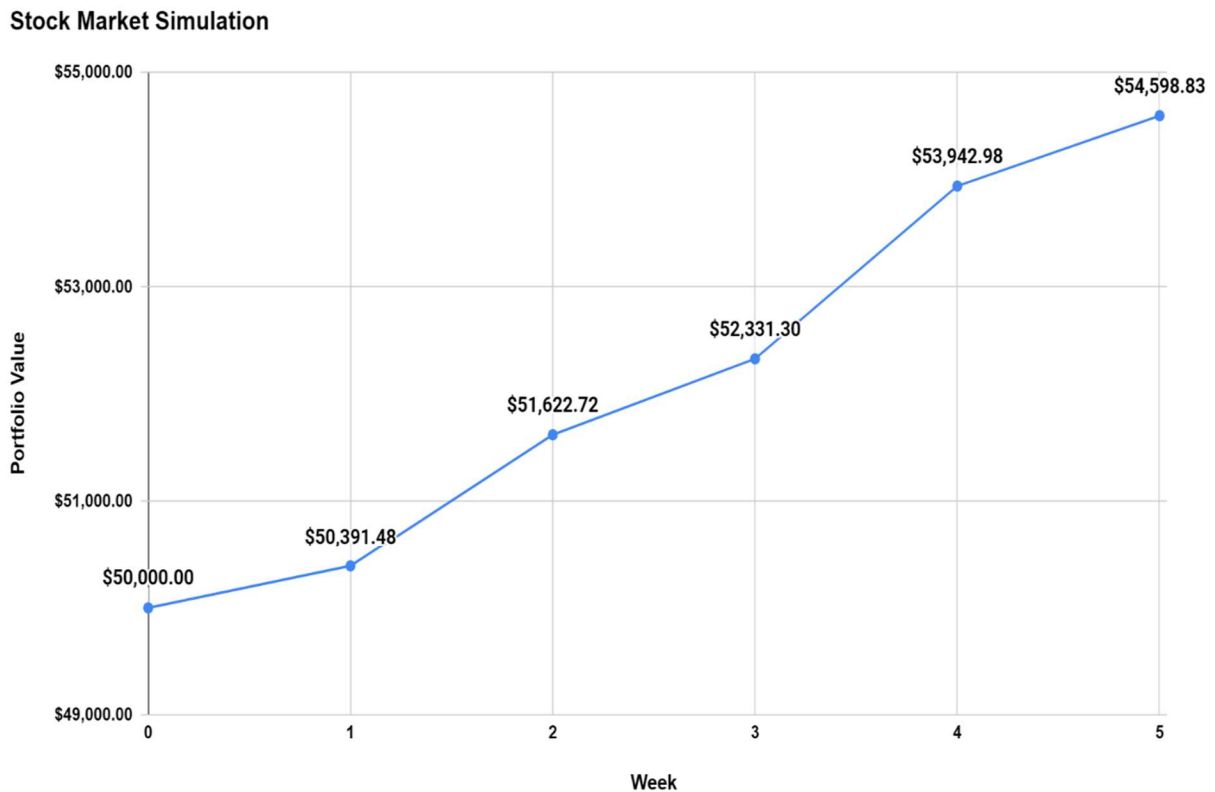


Figure 5.2: Simulation Chart

## 5.2 How Other Indexes and Mutual Funds did

In order to see how good the results of my simulation are, I will be comparing my simulation to other indexes, mutual funds, and strategies. First, I will be looking at what would have happened had I bought into all stocks at the beginning of the simulation and not traded with them until the end when I would sell all shares of each stock. Figure 5.3 is a spreadsheet of each stock where I bought \$10,000 worth of each stock and sold at the end of the simulation. Note that

since I used whole stocks there was an extra \$626.99 that was not invested. Figure 5.3 shows the data used for figure 5.4.

	A	B	C	D	E	F	G
1	Week 0	\$50,000.00		Extra Money	\$626.99		
2	Week 1						
3	Company	Shares	Cost	End of Week Pri	Stock Total		Simulation Total
4	Google	4	-\$9,805.28	\$2,513.93	\$10,055.72		\$51,099.58
5	Microsoft	39	-\$9,790.56	\$257.98	\$10,061.22		
6	Apple	79	-\$9,935.83	\$127.35	\$10,060.65		
7	PayPal	38	-\$9,933.96	\$271.45	\$10,315.10		
8	Nvidia	14	-\$9,907.38	\$712.85	\$9,979.90		
9							
10	Week 2						
11	Company	Shares	Cost	End of Week Pri	Stock Total		Simulation Total
12	Google	4	\$0.00	\$2,400.63	\$9,602.52		\$51,837.71
13	Microsoft	39	\$0.00	\$259.32	\$10,113.48		
14	Apple	79	\$0.00	\$130.40	\$10,301.60		
15	PayPal	38	\$0.00	\$283.38	\$10,768.44		
16	Nvidia	14	\$0.00	\$744.62	\$10,424.68		
17							
18	Week 3						
19	Company	Shares	Cost	End of Week Pri	Stock Total		Simulation Total
20	Google	4	\$0.00	\$2,450.18	\$9,800.72		\$52,942.14
21	Microsoft	39	\$0.00	\$265.02	\$10,335.78		
22	Apple	79	\$0.00	\$133.11	\$10,515.69		
23	PayPal	38	\$0.00	\$289.61	\$11,005.18		
24	Nvidia	14	\$0.00	\$761.27	\$10,657.78		
25							
26	Week 4						
27	Company	Shares	Cost	End of Week Pri	Stock Total		Simulation Total
28	Google	4	\$0.00	\$2,574.06	\$10,296.24		\$55,213.99
29	Microsoft	39	\$0.00	\$276.38	\$10,778.82		
30	Apple	79	\$0.00	\$139.96	\$11,056.84		
31	PayPal	38	\$0.00	\$289.01	\$10,982.38		
32	Nvidia	14	\$0.00	\$819.48	\$11,472.72		
33							
34	Week 5						
35	Company	Shares	Cost	End of Week Pri	Stock Total		Simulation Total
36	Google	4	\$0.00	2590.75	\$10,363.00		\$55,929.46
37	Microsoft	39	\$0.00	277.94	\$10,839.66		
38	Apple	79	\$0.00	145.11	\$11,463.69		
39	PayPal	38	\$0.00	300.21	\$11,407.98		
40	Nvidia	14	\$0.00	802.01	\$11,228.14		
41							

Figure 5.3: Passive Simulation

Figure 5.4 was made using the data from figure 5.3. In the graph, the final portfolio value is close to \$56,000. In Week 1, the simulation increased by 2.2% from the start of the simulation. From Week 1 to Week 2, the chart increased by 1.4%. From Week 2 to Week 3, the chart increased by 2.13%. From Week 3 to Week 4, the chart increased by 4.3%. In the last week, the portfolio increased by 1.3%. The portfolio increased the most in Week 4 and the least in Week 5. The portfolio did not take any losses from previous weeks and was strictly positive over the duration of the five weeks.

### Passive Simulation



*Figure 5.4: Passive Simulation Chart*

When comparing portfolios in the stock market, the first thing that you need to know is how the market did. So, since all of the stocks selected were part of NASDAQ, I will be going over how NASDAQ did for each week during the five weeks. During Week 1, NASDAQ opened

at \$170.91 and closed at \$172.95. Over the week, the price remained stagnant at around \$169 and then increased on June 11 to around \$173 for a 1.2% increase from its starting point at the beginning of the week. Figure 5.5 shows the NASDAQ's price chart in week 1.

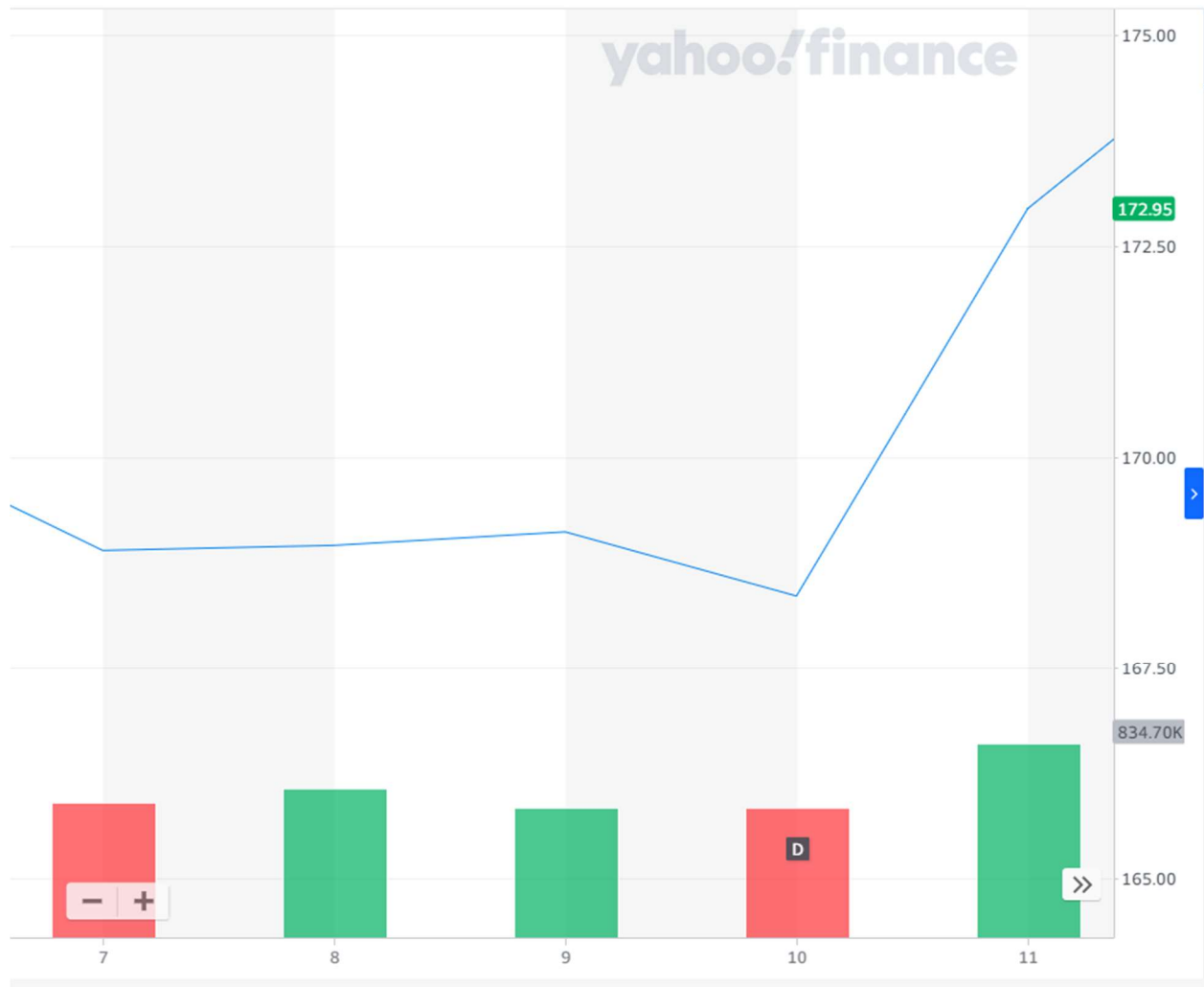


Figure 5.5: NASDAQ Week 1

During Week 2, NASDAQ opened at \$172.49 and closed at \$175.80. NASDAQ increased by 1.9% over the duration of the week after spiking at \$180.53 and then decreasing to \$175.80 at the end of the week. Figure 5.6 shows NASDAQ's price chart in week 2.



Figure 5.6: NASDAQ Week 2

During Week 3, NASDAQ opened at \$176.82 and closed at \$178.07. Over this week, NASDAQ reached a high of \$179.74 and a low of \$175.89. The price change this week was a .7%. Figure 5.7 shows NASDAQ's price chart in week 3.



*Figure 5.7: NASDAQ Week 3*

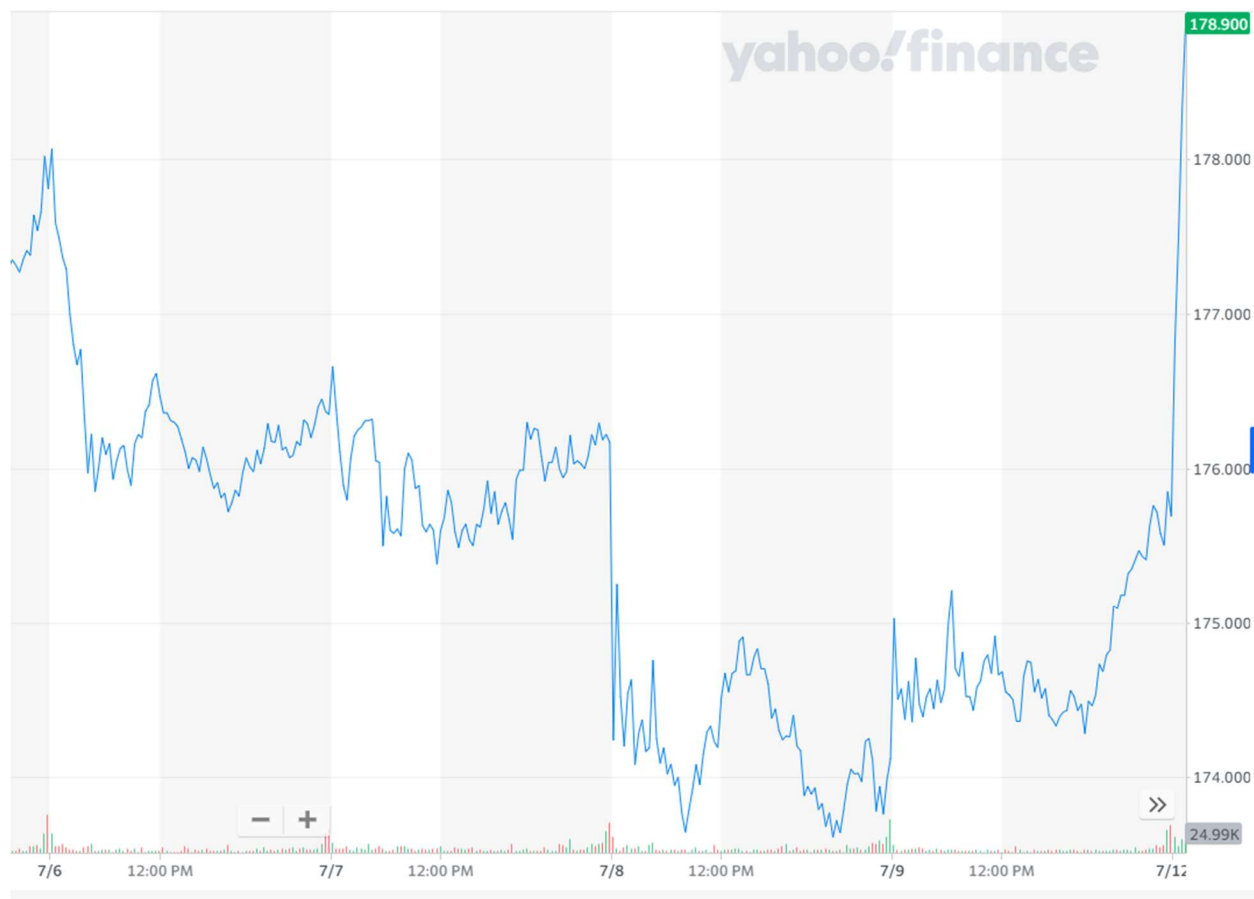
During Week 4, NASDAQ opened at \$178.51 and closed at \$177.88. Over this week, NASDAQ reached a high of \$178.71 and a low of \$175.18. At the end of the week, NASDAQ's price decreased by .35%. Figure 5.8 shows NASDAQ's price chart in Week 4.



*Figure 5.8: NASDAQ Week 4*

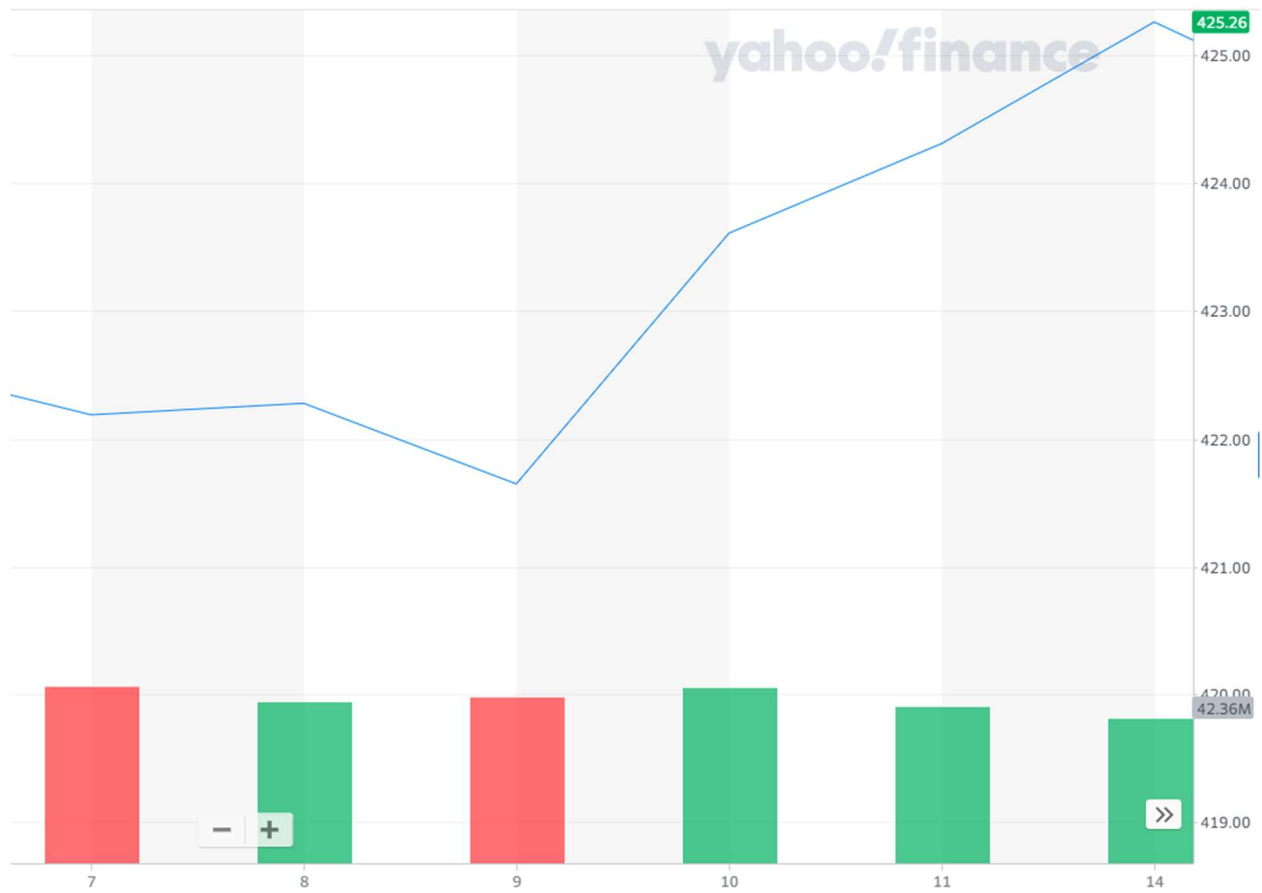
During Week 5, NASDAQ opened at \$178.28 and closed at \$175.77. This week NASDAQ reached a high of \$178.41 and a low of \$173.57. This week NASDAQ's price decreased by 1.43%. Figure 5.9 shows NASDAQ's price chart in Week 5.





*Figure 5.9: NASDAQ Week 5*

Next, the Standard and Poor's 500 or S&P 500 is an index made up of the 500 largest companies in the United States. The S&P 500 is important because it makes up a large portion of the stock market and is a good representation of how the United States economy is doing. I will be using SPY, to track the S&P 500 data. In Week 1, the S&P 500 opened at \$422.59 and closed at \$424.31 which is a price change of .4%. The high was \$424.63 and the low was \$420.32. Figure 5.10 shows the price chart for the S&P 500 in Week 1.



*Figure 5.10: SPY Week 1*

In Week 2, the S&P 500 opened at \$424.43 and closed at \$414.92. During this week, the price dropped by 2.3%. The high this week was \$425.46 and the low was \$414.70. Figure 5.11 shows the S&P 500 price chart in Week 2.

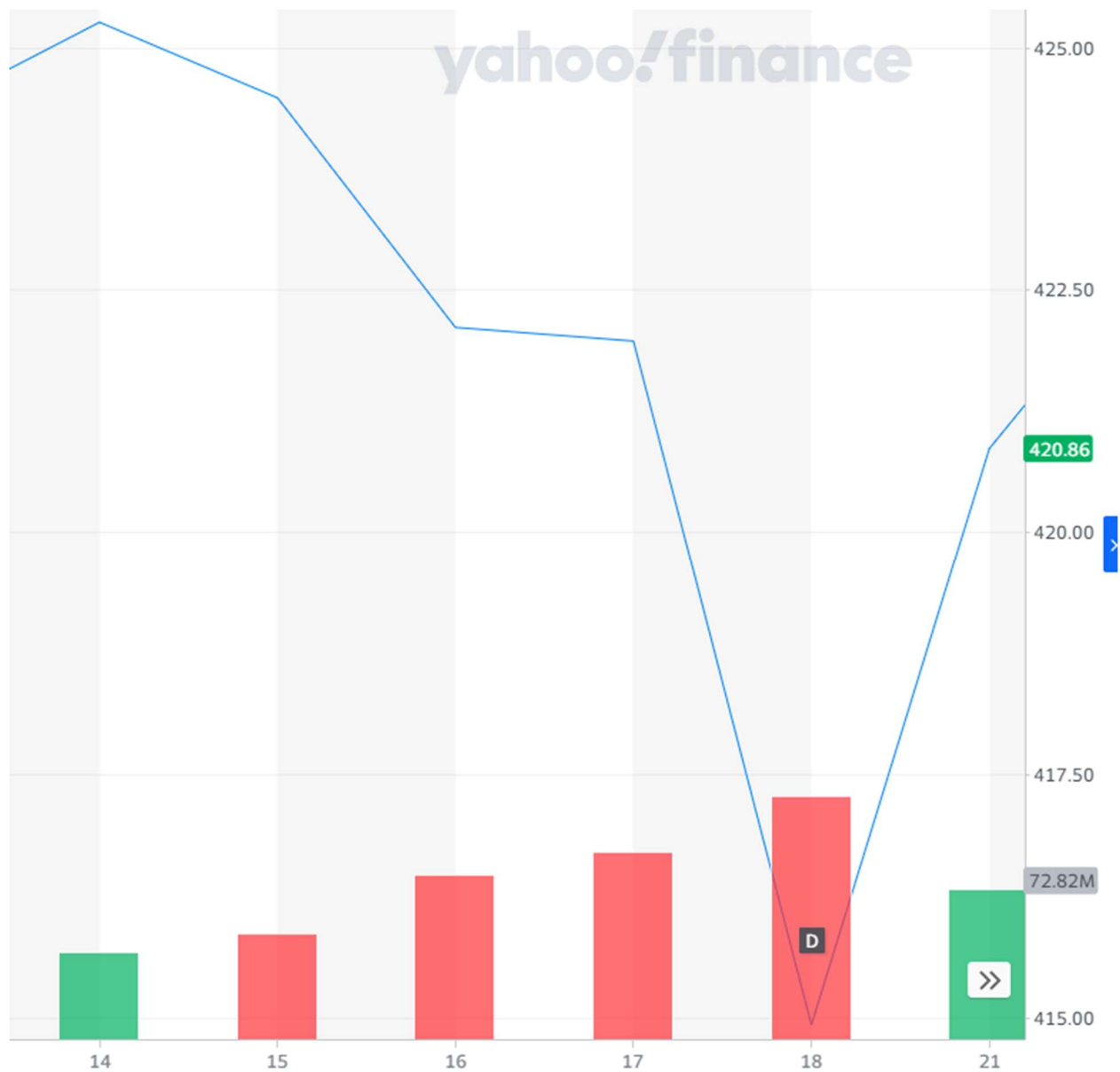


Figure 5.11: SPY Week 2

In Week 3, the S&P 500 opened at \$416.80 and closed at \$426.61. This is a price change of 2.35%. The high was \$427.09 and the low was \$415.93. This is the first week where the stock of the S&P 500 significantly increased, recovering from the previous week. Figure 5.12 shows the price chart for the S&P 500 in Week 3.



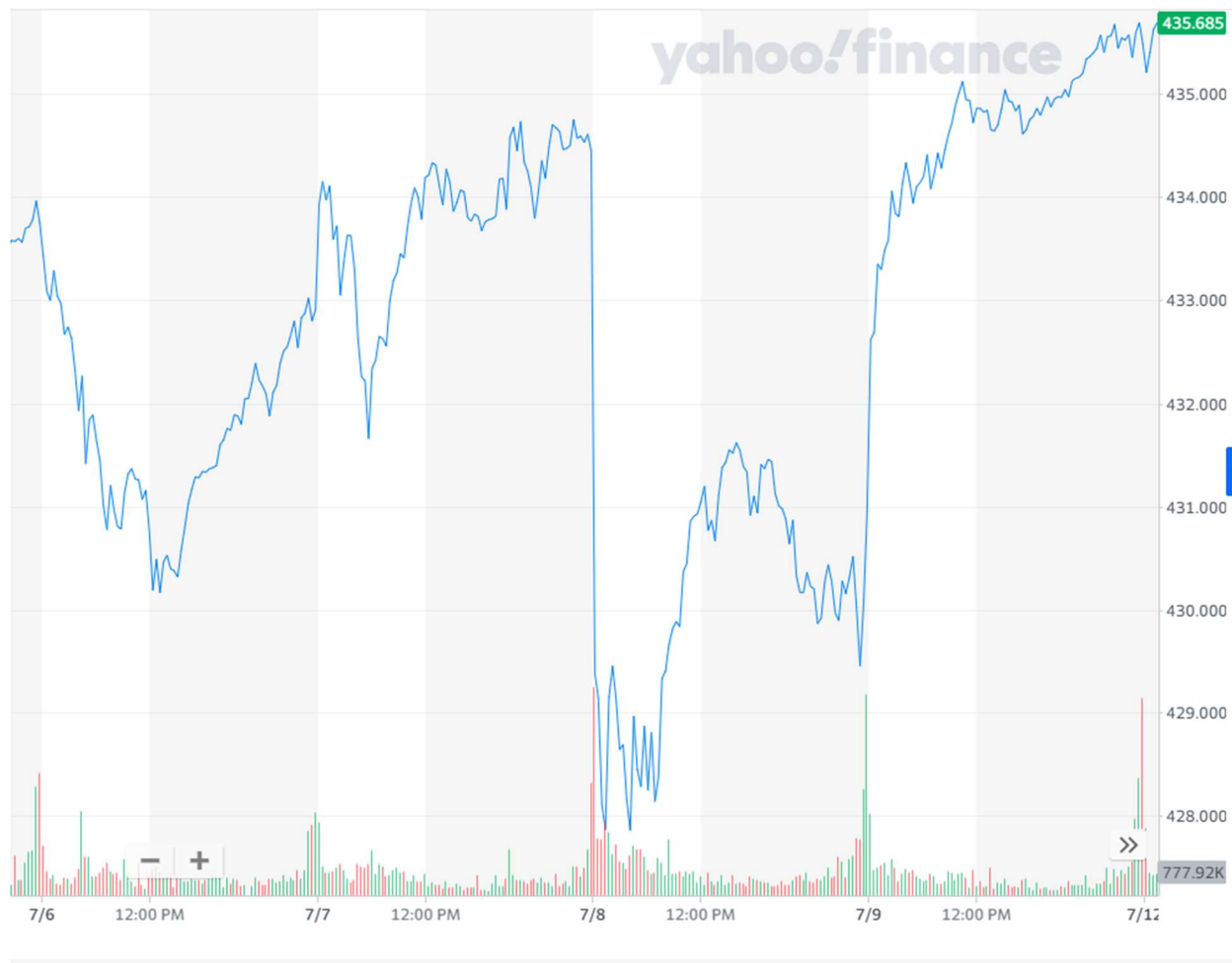
Figure 5.12: SPY Week 3

In Week 4, the S&P 500 opened at \$427.17 and closed at \$433.72. This is a price change of about 1.5%. The high this week was \$434.10 and the low was \$425.89. Figure 5.13 shows the price chart for the S&P 500 in Week 4.



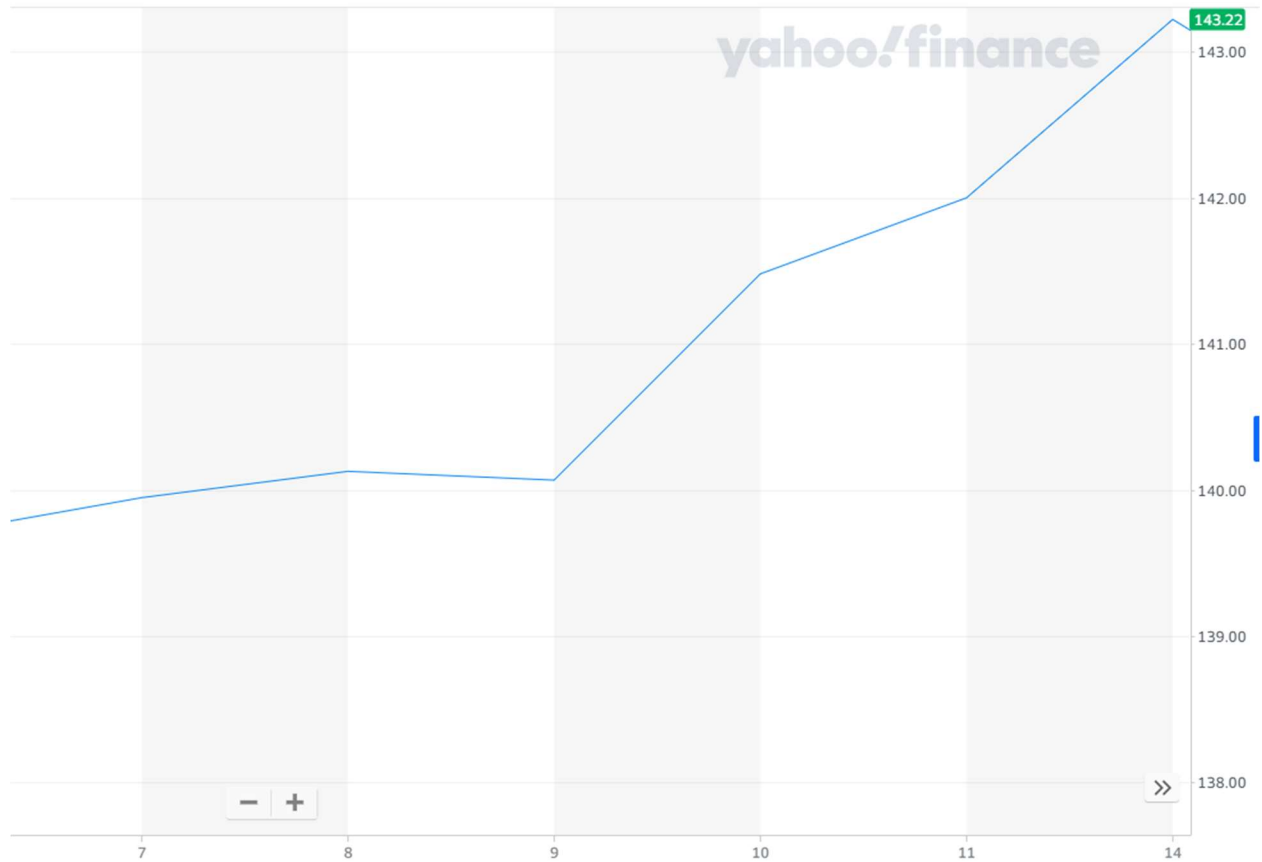
*Figure 5.13: SPY Week 4*

In Week 5, the S&P 500 opened at \$433.78 and closed at \$435.52. This is a price change of .4%. This week the high was \$435.84 and the low was \$427.52. Figure 5.14 shows the price chart for the S&P 500 in Week 5.



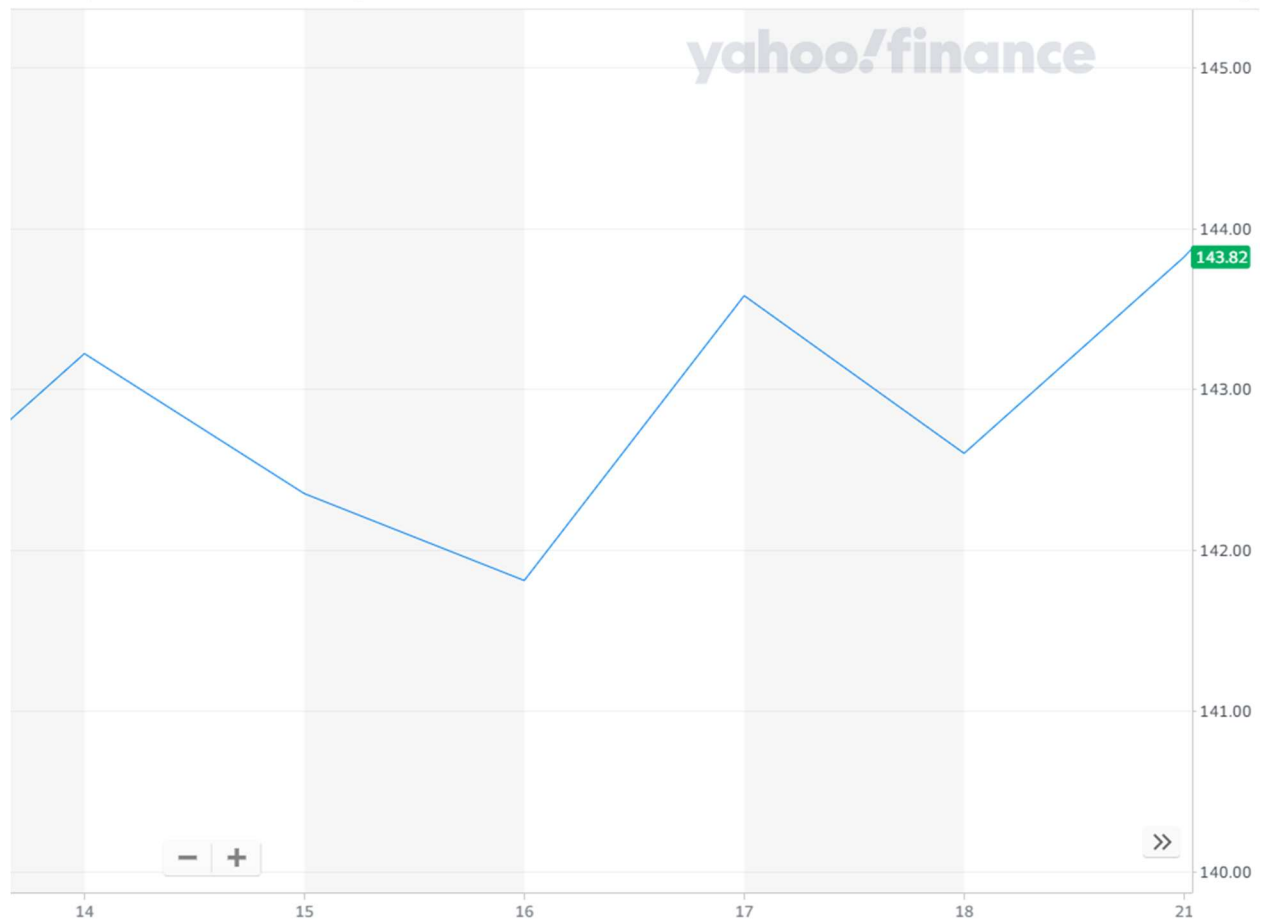
*Figure 5.14: SPY Week 5*

Finally, I will be analyzing the Vanguard Growth Index Fund (VIGAX) which is a mutual fund created by the stock brokerage, The Vanguard Group, Inc., that takes on more risk than most of the other mutual funds. In Week 1, VIGAX opened at \$139.95 and closed at \$142.00. This is a price change of 1.46%. The high was \$142.00 and the low was \$139.95. Figure 5.15 shows the VIGAX's price chart in Week 1.



*Figure 5.15: VIGAX Week 1*

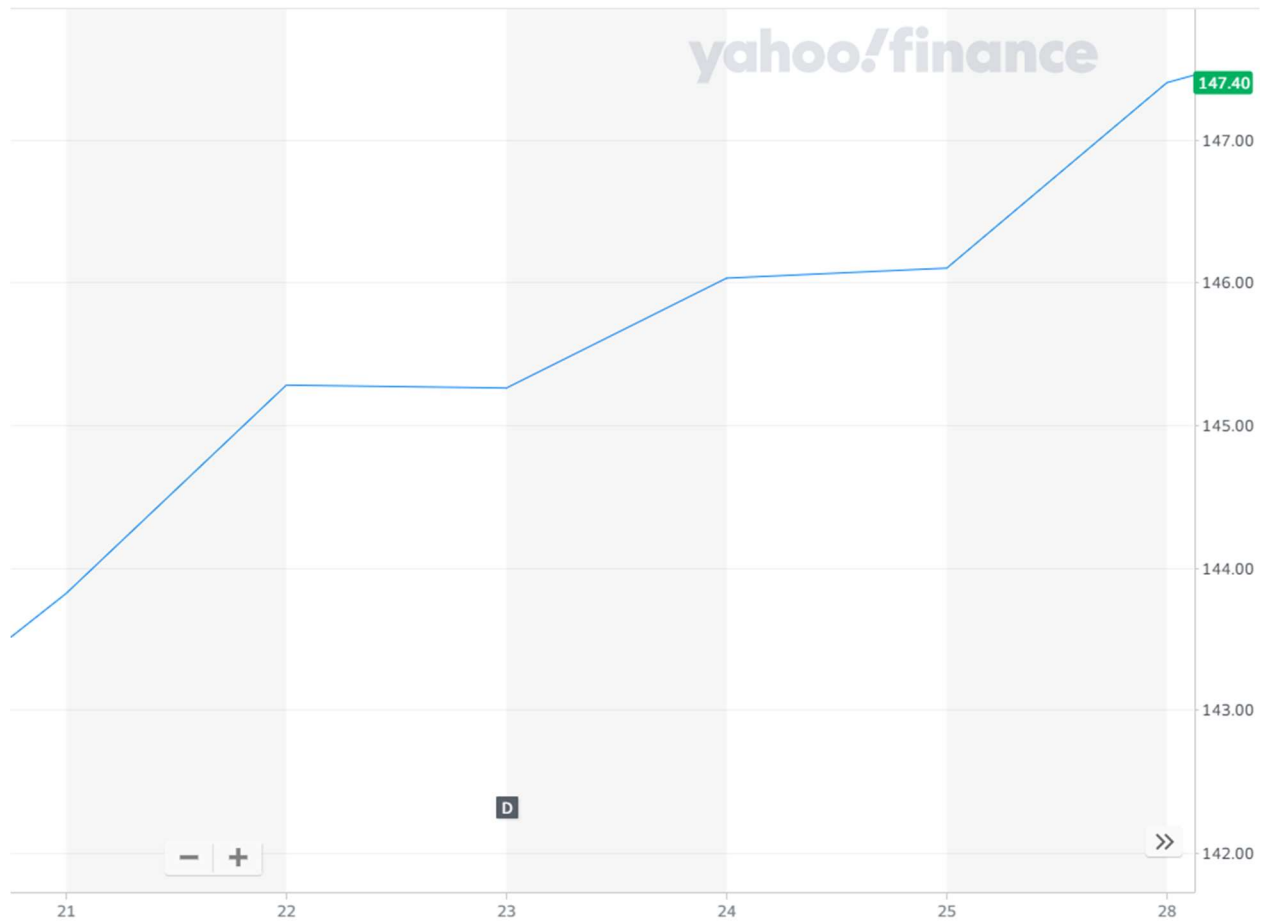
In Week 2, VIGAX opened at \$143.22 and closed at \$142.60. This week, the stock decreased by .43%. The high this week was \$143.58 and the low was \$141.81. Figure 5.16 shows the price chart for VIGAX in Week 2.



*Figure 5.16: VIGAX Week 2*

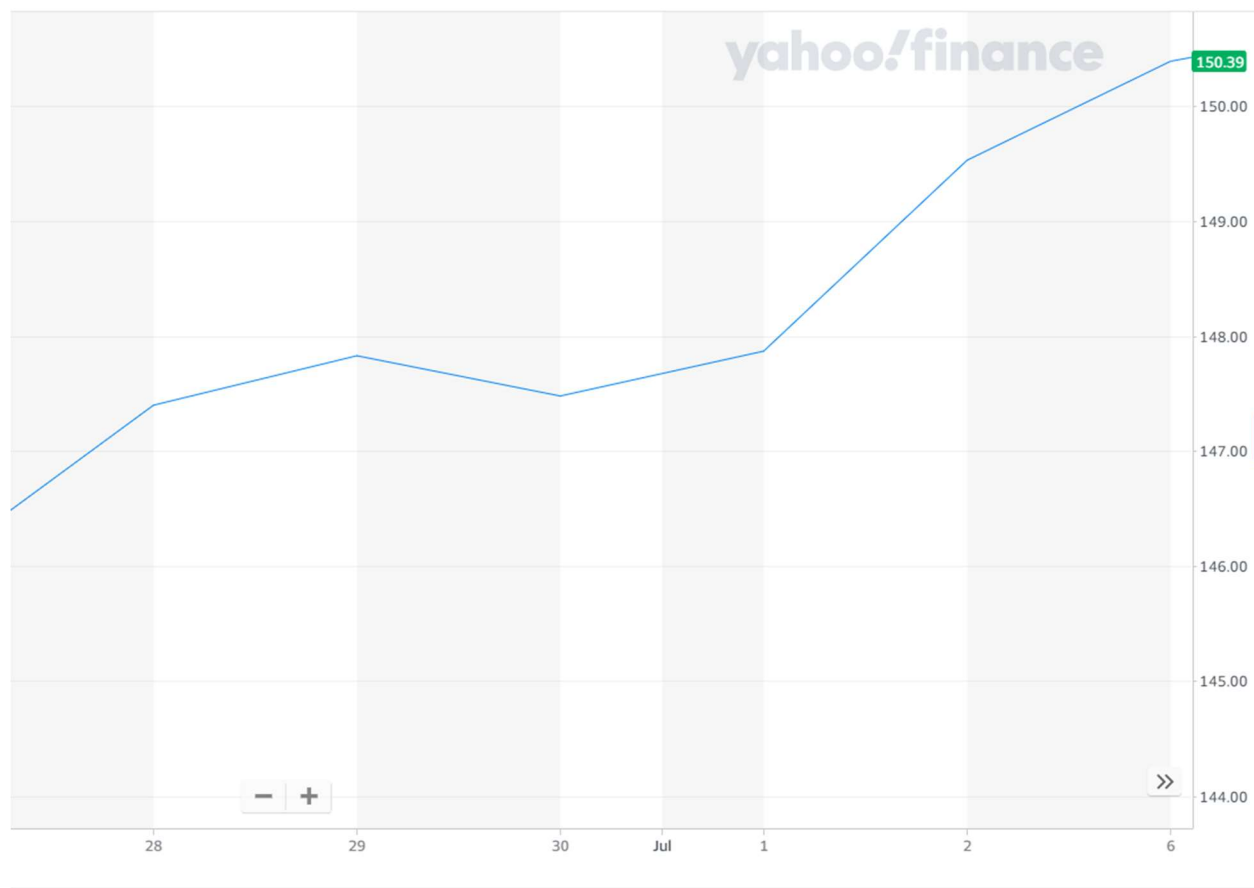
In Week 3, VIGAX opened at \$143.82 and closed at \$146.10. This is a price change of about 1.59%. The high this week was \$146.10 and the low this week was \$143.82. Figure 5.17 shows the price chart for VIGAX in Week 3.





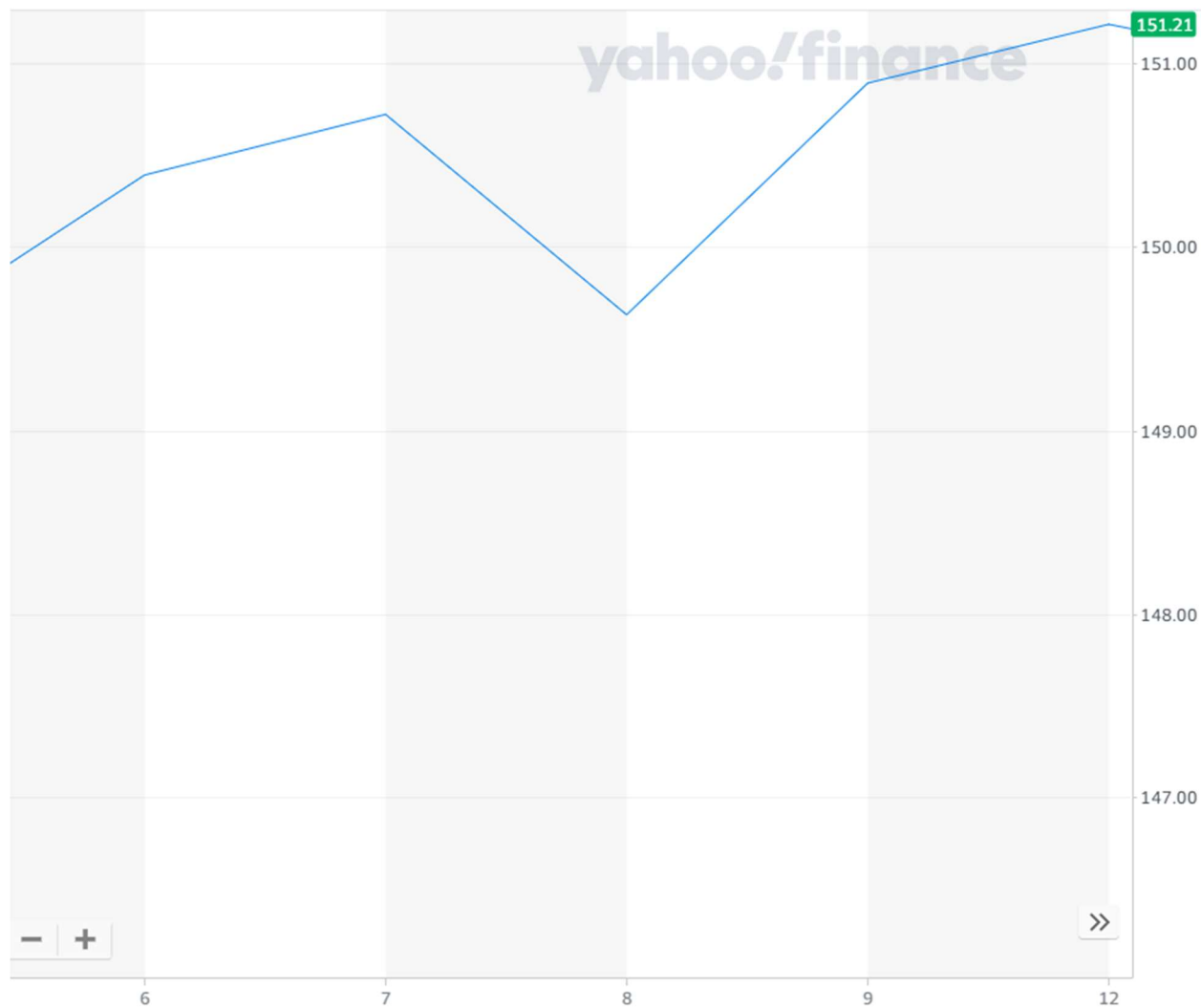
*Figure 5.17: VIGAX Week 3*

In Week 4, VIGAX opened at \$147.40 and closed at \$149.53. This is a price change of about .145%. The high this week was \$149.53 and the low this week was \$147.40. Figure 5.18 shows the price chart for VIGAX in Week 4.



*Figure 5.18: VIGAX Week 4*

In Week 5, VIGAX opened at \$150.39 and closed at \$150.89. This is a price change of .33%. The high this week was \$150.89 and the low this week was \$149.63. Figure 5.19 shows the price chart of VIGAX in Week 5.



*Figure 5.19: VIGAX Week 5*

### 5.3 Simulation Comparison

By using the data from earlier in this chapter, I am able to compare my portfolio to the indexes and mutual funds. When doing so, I used the stock price at the beginning of Week 1 and the end of week prices for every week in order to see the weekly comparison. Using \$50,000 as the original investment, I will be using a passive strategy for each index and mutual fund. I will also only be comparing whole shares so I will have 292 shares of NASDAQ, 118 shares of SPY

and 357 shares of VIGAX. Then I used the end of the week prices and multiplied them by the number of shares to get the weekly values of the portfolios shown in Figure 5.20. The bolded values in Week 5 are the final values.

	A	B	C	D	E	F	G	H
1	0	1	2	3	4	5		
2	\$50,000.00	\$50,391.48	\$51,622.72	\$52,331.30	\$53,942.98	<b>\$54,598.83</b>	Stock Market Simulation	
3	\$50,000.00	\$51,099.58	\$51,837.71	\$52,942.14	\$55,213.99	<b>\$55,929.46</b>	Passive Simulation	
4	\$50,000.00	\$50,501.40	\$51,333.60	\$51,996.44	\$51,940.96	<b>\$51,324.84</b>	NASDAQ	
5	\$50,000.00	\$50,068.58	\$48,960.56	\$50,339.98	\$51,178.96	<b>\$51,391.36</b>	SPY	
6	\$50,000.00	\$50,694.00	\$50,908.20	\$52,157.70	\$53,382.21	<b>\$53,867.73</b>	VIGAX	
7								

*Figure 5.20: Weekly Comparison Data*

The values from each week in Figure 5.20 were used to create the chart in Figure 5.21. Week 0 represents the start of the simulation where each portfolio is valued at \$50000. In Week 1, the best performing portfolio was the Passive Simulation. During Week 2, the Stock Market Simulation was the best performing portfolio. SPY was the best performing portfolio in Week 3. The Passive Simulation was the best performing portfolio in Week 4 and in Week 5. Figure 5.22 shows the weekly change for each portfolio.

### Simulation Comparison

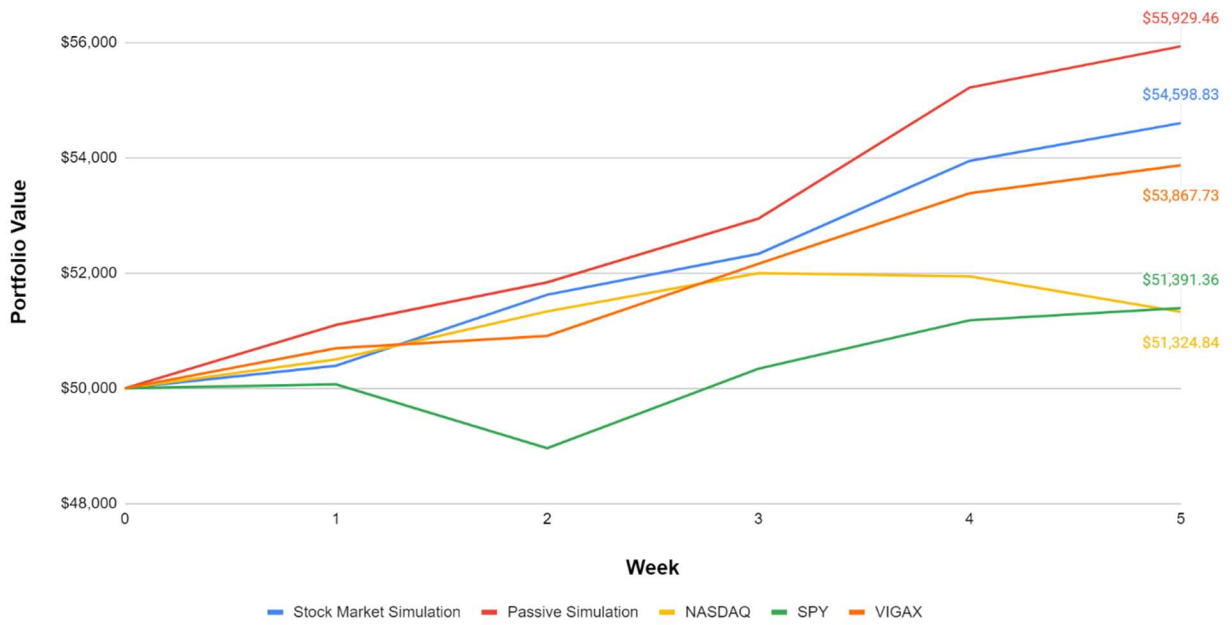


Figure 5.21: Comparison Chart

	1	2	3	4	5
Stock Market Simulation	1.0078296	1.024433496	1.013726127	1.03079763	1.012158209
Passive Simulation	1.0219916	1.014444933	1.021305532	1.042911941	1.012958129
NASDAQ	1.010028	1.016478751	1.0129124	0.9989330039	0.9881380706
SPY	1.0013716	0.9778699536	1.028174106	1.016666276	1.004150143
VIGAX	1.01388	1.004225352	1.02454418	1.02347707	1.009095165

Figure 5.22: Weekly Change Comparison

## 6. Conclusion

There are many different ways to trade and tactics to use in the stock markets around the world. Of all the different ways, I simulated position trading and compared it to passive trading of five chosen stocks, Alphabet Inc, Microsoft, Apple, PayPal, and Nvidia. I also compared these two types of trading to two market indexes, NASDAQ and the S&P 500, and a mutual fund, the Vanguard Growth Mutual Fund or VIGAX, to see what had the best outcome. Over the course of the five-week simulation, the most profitable way of trading was the Passive Simulation with a 11.86% return, followed by the Stock Market Simulation with a 9.20% return. At the end of the five weeks, the worst performing portfolios were the S&P 500 with a 2.78% return and the NASDAQ with a 2.65% return. VIGAX's performance landed in the middle of the five portfolios during the last three weeks of the simulation and finished with a 7.74% return. While the Passive Simulation had the most success, having the largest percent increase in Weeks 1,4, and 5, it is safe to say that my simulation was also a success as it beat the market by a considerable amount, about 6.5%. In retrospect, the simulation would have been more of a success had I traded in missed opportunities mentioned in Chapter 4. It is interesting that the two market indexes had the lowest gain because they are the least risky options and had the economy been in a depression, the chart in Figure 5.21 might have been inverted with NASDAQ and S&P 500 decreasing the least and the two simulations decreasing the most since they are the portfolios with higher risk.

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