Stock Market Simulation

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By

Marc A. Capobianco _____

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Approved by Professor Dalin Tang, Project Advisor

Abstract

The purpose of this project was to conduct a research simulation on the stock market in order to gain knowledge and experience in investing. For six weeks, two simulations with one using the "Buy and Hold" method, which consisted of buying stocks and holding them until the end of the simulation, and the other using the "Swing" method, which closely monitors and analyzes the day to day stock price and capitalizes on short term gains. Initially, both portfolios started with $100,000 and invested all of the money into ten companies. In the "Buy and Hold" simulation, these ten companies were left untouched, whereas in the "Swing" simulation transactions were made daily. At the end of the six weeks the "Swing" simulation's rate of return was 35.89%, while the "Buy and Hold" trading simulation's rate of return was 12.63%. Overall, active trading outperformed passive trading each week with the ability to opt out of stocks that were declining in value and reassess the economic situation as required.

Acknowledgements

      I would like to give thanks to Professor Tang for guidance throughout the process of carrying out this project and editing this paper to look the best it can be. I also would like to thank Worcester Polytechnic Institute for giving me the opportunity to gain experience through a project of my interest.

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Chapter 1. Introduction and Stock Market Background Research

The objective of this project is to gain knowledge and experience with the stock market by selecting two trading strategies and conducting corresponding simulations to test the employment of those strategies accordingly. It is important to understand how the stock market works in order to make the best use of what it has to offer. This chapter includes some basic information about the stock market, which is essential information for carrying out the simulations. The general plan for the project and the current economic background are also included.

1.1 How the Stock Market Works

The stock market has multiple and various stock exchanges. Individual stocks can not be traded on more than one exchange. Foreign companies trade stock on their country's own exchanges. There is a secondary market for stocks that do not meet the requirements for trading on a stock exchange. For these markets stocks must be public and are traded directly through broker-dealers. The two types of stocks are common and preferred shares. Common shares have voting rights while preferred shares receive dividends and assets during liquidation. The reason companies issue shares is in order to raise money to expand and grow operations. A company must have an initial public offering (IPO) for the company stock to be available on the market. The performance of the stock market is tracked through indices such as the Dow Jones Industrial Average,the Nasdaq composite or the S&P 500. When there is greater supply than there is demand then prices fall. There are multiple ways to make money in the stock market. One method is by selling a stock for more money than when it was bought. Another method, although not guaranteed by all companies, is dividends, which is a payment that companies make to their shareholders. Dividends can be taken as cash or reinvested and more shares will increase the dividend payout.

Ways to buy stocks are through a broker-dealer, robo advisor or fund. Buying through a broker requires an account with an investment company, while robo advisors are an alternative that allow fractional shares to be bought, and funds a wide variety of stocks to buy in bulk. Two types of markets are Bull and Bear markets. Bull markets are when the stock prices are increasing, while bear markets are when the stock prices are decreasing.

1.2 Project Structure and Plan

This research will follow a 6 week simulation where the swing, and buy and hold strategies will be employed. The website used for the simulation will be Market Watch with a starting amount of $100,000 for each strategy. These two strategies were chosen because of their contrasting approach to trading with the swing strategy being more aggressive, while the buy and hold is considered a passive strategy. The portfolio will start June 8th and end July 27th, which is the seven week period that trades will occur. At least 5 companies will be chosen for each strategy, invest all $100,000 and track the results. For the swing trading, closely monitoring the trends of stocks in the market will be essential for capitalizing on short capital gains. For the Buy and Hold trading, it will be optimal to search for companies that will increase in value over these 7 weeks and sell all stock at the end of the simulation period. Knowing the advantages and disadvantages of different trading methods will help make better investments in the future. Since the goal of both strategies is to make profit, the benchmark used for comparison will be the S&P 500. The weekly profits of the two simulations will be compared against this benchmark, and against themselves to see which one made more profit

1.3 Economic Background During Simulation

Social lockdown and quarantine is loosening day by day. COVID-19 has had a tremendous economic influence in the world causing companies such as Amazon to see success, while many

other companies are met with failure and struggle to survive the pandemic. Recently there have been riots in cities such as Minneapolis, which could invoke action in other locations that could affect the stock market. President Trump and the United States Government have placed travel bans on visitors from places such as China and Europe. All of these may be significant factors in how the stock market changes over the next 7 weeks.

Chapter 2. Investing Strategies

There are many different ways to approach investing, and this simulation has chosen to participate in two contrasting methods. These methods are passive trading and active trading, which will take the form of Swing trading and Buy and Hold trading. This chapter explains the trading strategies in further detail.

2.1 Swing Trading

Swing trading is short-term trading to make capital gains through the use of technical analysis and fundamental analysis. Fundamental analysis assesses value based on sales, earnings and the successfulness of the business results. Technical analysis focuses on stock trends and price patterns to evaluate trading opportunities. The goal of this strategy is to anticipate which stocks are likely to move and then quickly take action to capture profit. Swing traders generally place stop loss orders which automatically sell the stock if it drops below the specified amount. A pro of swing trading is that it maximizes short term profit but it is very vulnerable to abrupt market changes. Common patterns include: moving average crossovers, cup-and-handle patterns, head and shoulders patterns, flags, and triangles. This simulation will focus on looking at the past 6 month performance of stocks in order to determine if there are any noticeable trends such as, decreasing, increasing, stable, or bouncing. The best stock choices for swing trading are stocks that are very volatile and have high percentage change, which leads to much faster profit than slow and steady stock prices. Stocks that are cheaper are preferable to more expensive stocks because they will have a greater percentage change per one dollar. Additionally, paying close attention to company news such as if a product or service is ahead or behind schedule and if it works successfully. Other news includes company earnings reports, and how the company is using that money to advance their services. In terms of analyzing stock data itself, bollinger bands and candle

graphs show valuable information for making predictions. The candle graphs show resistance to high and low prices, which allow investors to make informed decisions on if others buyers and sellers believe a stock is worth more or less than its current price.

2.2 Buy and Hold Trading

The buy and hold trading strategy is to buy stocks and hold them for a long period regardless of market performance in the hope of long-term gains. One benefit of this strategy is that investors can usually defer capital gains taxes on investments. The goal is always to buy low and sell high but this strategy is susceptible to market crashes to lose gains. The buy and hold strategy considers the Efficient Market Hypothesis, which is defined as: "All known information about investment securities, such as stocks, is already factored into the prices of those securities." This claims that passive strategies such as buy and hold are as effective as any analysis driven investments. The most important aspect for having successful investments when using a passive trading method such as buy and hold is to choose stable, successful companies. Since Buy and Hold is a long term trading strategy, stocks that have shown a steady increase in the past are optimal as opposed to volatile stocks that show overall a consistent average. One that employs such a strategy would never sell the stock if it were to fall, but instead wait for the price to bounce back with the idea that in the long-term there will be positive market performance. The advantages to this strategy is the elimination of poor timing decisions, lower income taxes due to long term capital gains, and ease of implementation since there is no need to actively trade or monitor prices.

Chapter 3. Company Selections

Making profit all comes down to choosing the right companies. In order to do this, background research is a necessity and this chapter presents some key companies that will be the center of attention during this simulation.

3.1 Apple (NASDAQ:AAPL)

Apple is the world's largest technology company by revenue and one of the world's most valuable companies. Apple is the leader in cutting edge technology and is the third-largest mobile phone manufacturer with a large variety of other products and services. Below is a graph that shows Apple past 6 month stock performance. The stock is both volatile and has an upward trend, which makes it ideal for the trading strategies employed in this simulation. Figure 3.1 gives its price chart for the past 6 months.
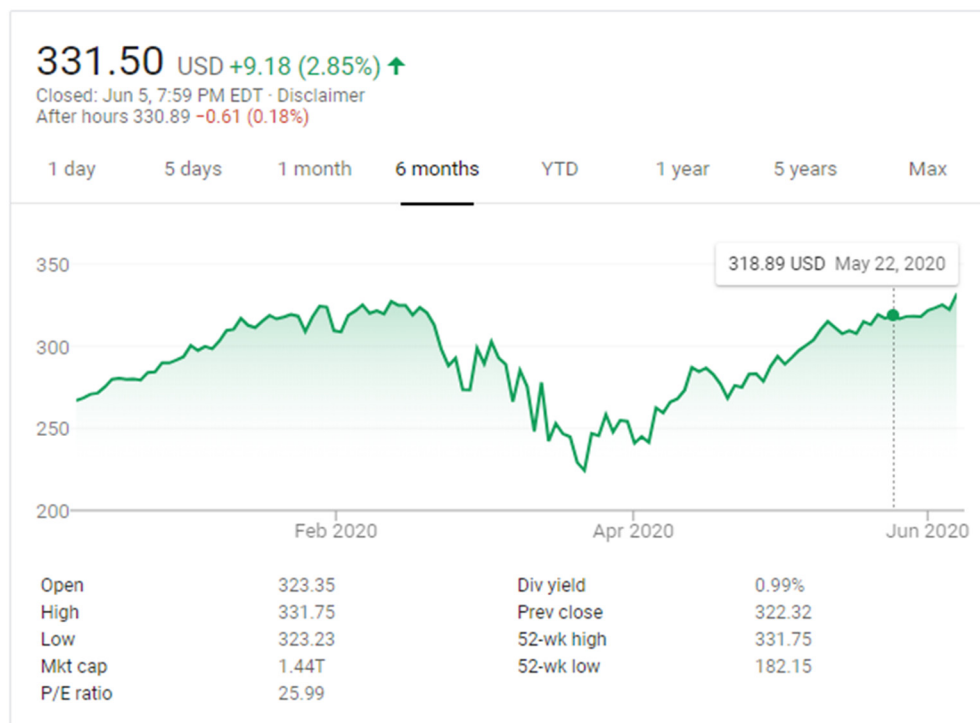
Figure 3.1 AAPL Stock Prices (past 6 months).

3.2 Nike (NYSE:NKE)

Nike is the world's largest supplier of athletic shoes and apparel and a major manufacturer of sports equipment. Nike is valued as the most valuable brand among sports businesses. Below is a graph that shows Nike's past 6 month stock performance. The stock is both volatile and has an upward trend, which makes it ideal for the trading strategies employed in this simulation. Figure 3.2 gives its price chart for the past 6 months.
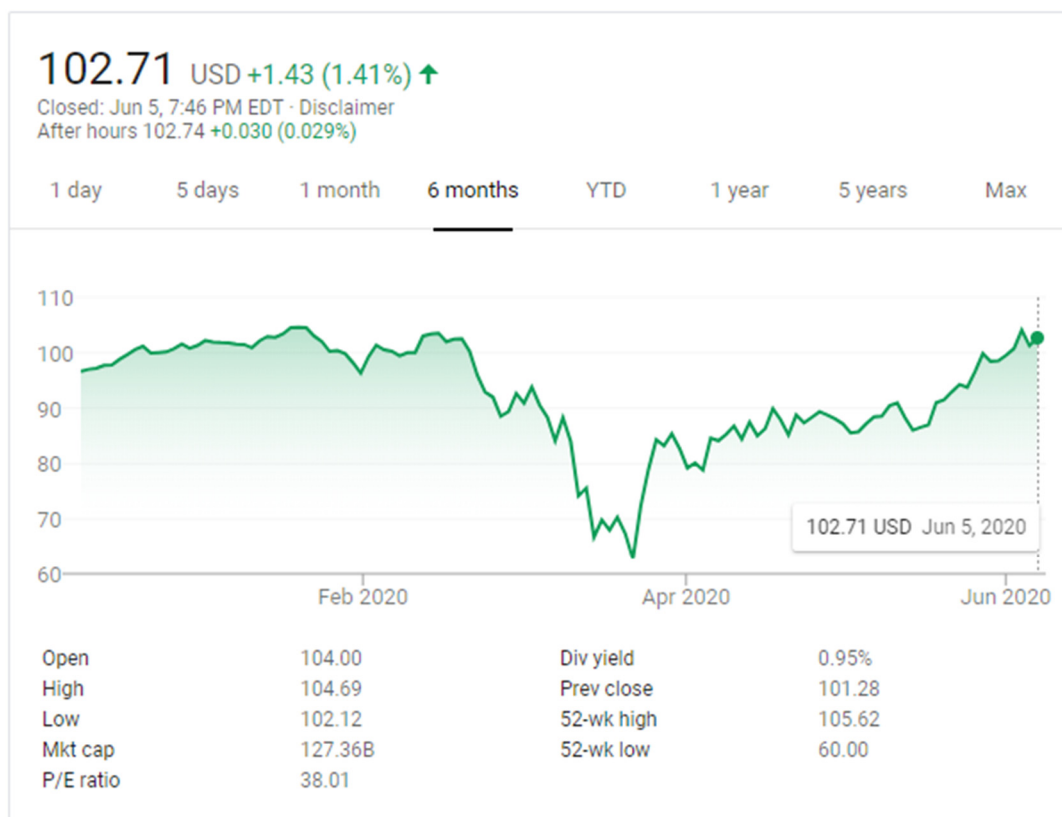
Figure 3.2 NKE Stock Prices (past 6 months)

3.3 Advanced Micro Devices (NASDAQ:AMD)

AMD develops computer processors and related technologies for business and consumer markets. The company saw a revenue of 6.73 billion in 2019. AMD products have become more common in high end computers with their recent breakthroughs in technology and performance. Below is a graph that shows AMD's past 6 month stock performance. The stock is both volatile and has an upward trend, which makes it ideal for the trading strategies employed in this simulation. Figure 3.3 gives its price chart for the past 6 months.
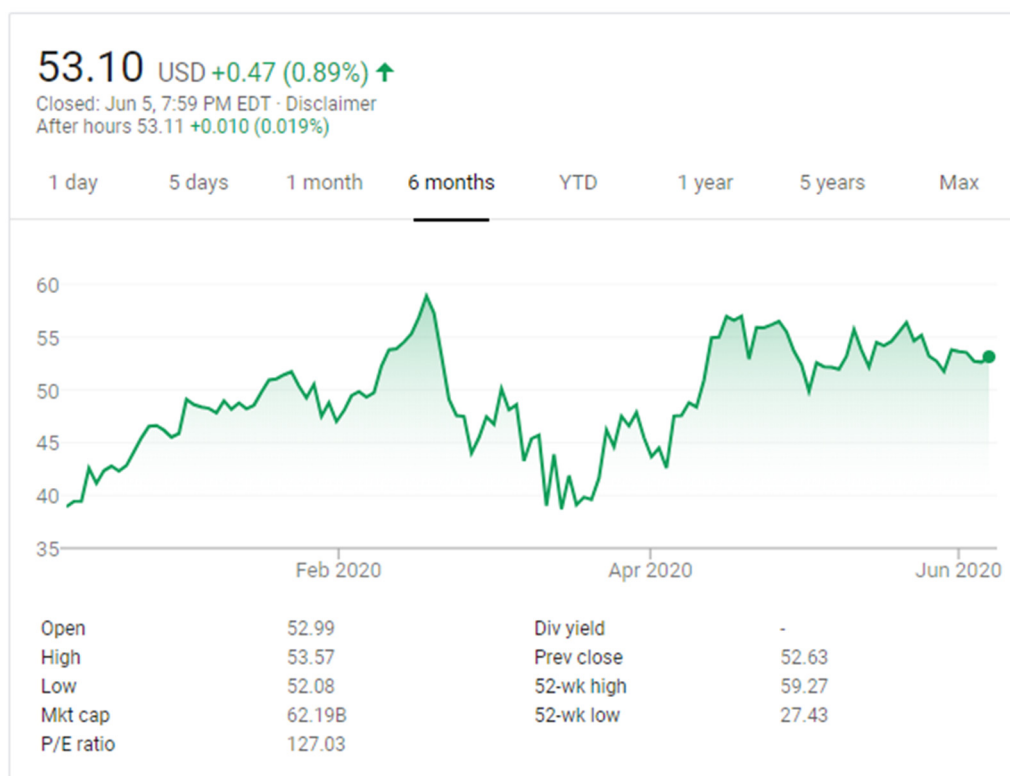
Figure 3.3 AMD Stock Prices (past 6 months)

3.4 Netflix (NASDAQ:NFLX)

Netflix is an American media-services provider and production company. The main source of revenue is its subscription-based streaming service. As of April 2020, Netflix had over 182 million paid subscriptions worldwide, including 69 million in the United States. It is available

worldwide except for select places. Below is a graph that shows Netflix's past 6 month stock performance. The stock is both volatile and has an upward trend, which makes it ideal for the trading strategies employed in this simulation. Additionally, it has received recent gains due to the lockdown and quarantine measures taken against COVID-19. Figure 3.4 gives its price chart for the past 6 months.

Figure 3.4 NFLX Stock Prices (past 6 months)

3.5 Amazon (NASDAQ:AMZN)

Amazon is the world's largest online marketplace, AI assistant provider, live-streaming platform, cloud computing platform and the largest Internet company by revenue in the world. Amazon's prime subscription service has over 100 million subscribers worldwide. Amazon produces as well as distributes technology. Below is a graph that shows Amazon's past 6 month stock performance. The stock is both volatile and has an upward trend, which makes it ideal for

the trading strategies employed in this simulation. Additionally, it has received massive gains due to the lockdown and quarantine measures taken against COVID-19. Figure 3.5 gives its price chart for the past 6 months.
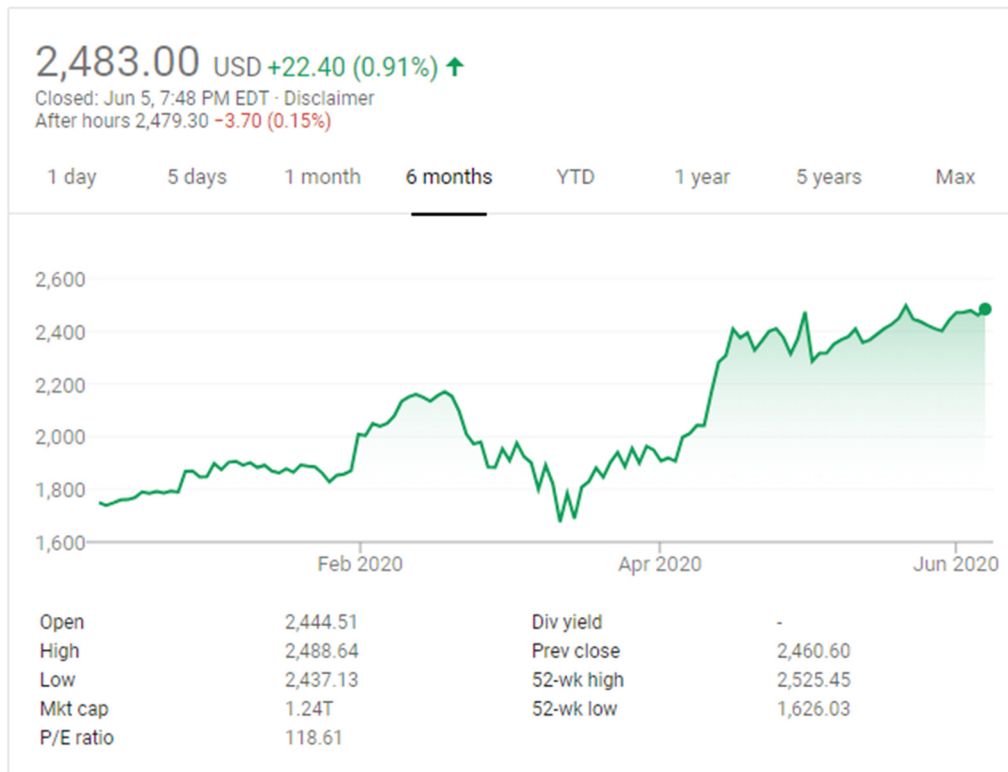
Figure 3.5 AMZN Stock Prices (past 6 months)

Chapter 4. Buy and Hold Trading Simulation

This chapter presents the data, research, and results for the Buy and Hold trading simulation.

4.1 Week 1 Report

Ten companies were selected and all $100,000 were invested into their stock. Following the buy and hold strategy, these stocks will not be sold until the end of the simulation period. Table 4.1 shows the transactions made in this week of the buy and hold simulation.

Date	Symbol	Buy/Sell	Price	Shares	Cost	Cash
6/8/20	MSFT	Buy	188.36	53	9983.08	90016.92
6/8/20	EPAM	Buy	237.98	42	9995.16	80021.76
6/8/20	DXCM	Buy	368.62	27	9952.74	70069.02
6/8/20	FIVN	Buy	96.99	103	9989.97	60079.05
6/8/20	NET	Buy	29.17	342	9976.14	50102.91
6/8/20	AMZN	Buy	2524.06	4	10096.24	40006.67
6/8/20	NFLX	Buy	419.49	23	9648.27	30358.40
6/8/20	AMD	Buy	52.97	188	9958.36	20400.04
6/8/20	NKE	Buy	104.29	95	9907.55	10492.49
6/8/20	AAPL	Buy	333.49	31	10338.19	154.30
6/8/20	NET	Buy	29.17	5	145.85	8.45

Table 4.1 Week 1 Buy and Hold Simulation Transaction Table

4.1.1 Price Changes Week 1:

The price changes for week 1 are overall daily stable, however there were two stocks that showed greater change than the others. Nike's sales for the past quarter have dropped nearly 40%, and as a result the stock prices have decreased in value. Five9 stocks have shown a significant positive increase due to the increasing use of cloud call centers prompted by the pandemic conditions of COVID-19. Table 4.2 shows the changes in price over this week for the simulation.

Symbol	Buy Price	Shares	Last Week Ending	This Week closing	Weekly Price Change	Weekly Profit/ Loss	Total Profit/ Loss
MSFT	188.36	53	188.36	187.74	-0.62	-32.86	-32.86
EPAM	237.98	42	237.98	235.00	-2.98	-125.16	-158.02
DXCM	368.62	27	368.62	370.23	-1.61	-43.47	-201.49
FIVN	96.99	103	96.99	100.92	3.93	404.79	203.3
NET	29.17	347	29.17	28.82	-0.35	-119.7	83.6
AMZN	2524.06	4	2524.06	2545.02	20.96	83.84	167.44
NFLX	419.49	23	419.49	418.07	-1.42	-32.66	134.78
AMD	52.97	188	52.97	53.50	0.53	99.64	234.42
NKE	104.29	95	104.29	96.43	-7.86	-746.7	-512.28
AAPL	333.49	31	333.49	338.80	5.31	164.61	-347.67
						Total Assets:	99,652.33

Table 4.2 Week 1 Buy and Hold Simulation Price Change Table

4.1.2 End of Week Results

By the end of the week the S&P 500 was down 6%. The price change for the first week of the simulation is a loss of $347.67 in total. The total assets by the end of the week are $99,652.33. The greatest loss came from Nike (NKE) and the greatest gain came from Five9 (FIVN). The value of these stocks are predicted to increase overall in the long-term despite this week's 0.3% loss.

4.2 Week 2 Report

4.2.1 Price Changes Week 2:

This week's price changes have been overall positive, with every investment seeing an increase in value, which has led to a significant overall increase in total assets. The demand for cloud networking had spiked due to the stay-at-home conditions in the United States. Similar to Five9, Cloudflare (NET) has benefited off the pandemic and the stock prices reflect this positive change. Dexcom (DXCM) has reported promising progress for diabetes treatment and as a result, the stock prices have shown significant increase as well. Table 4.3 shows the changes in price over this week for the simulation.

	Buy Price	Shares	Last Week Ending	This Week closing	Weekly Price Change	Weekly Profit/ Loss	Total Profit/ Loss
MSFT	188.36	53	184.58	195.15	10.57	560.21	212.54
EPAM	237.98	42	229.95	252.32	22.37	939.54	1152.08
DXCM	368.62	27	363	409.36	46.36	1251.72	2403.8
FIVN	96.99	103	100.4	100.79	0.39	40.17	2443.97
NET	29.17	342	29	36	7	2394	4837.97
AMZN	2524.06	4	2526.6	2675.01	148.41	593.64	5431.61
NFLX	419.49	23	421.4	453.72	32.32	743.36	5827.3
AMD	52.97	188	52.58	54.23	1.65	310.2	6485.17
NKE	104.29	95	93.9	95.78	1.88	178.6	6,663.77
AAPL	333.49	31	333.25	349.72	16.47	510.57	7,174.34
						Total Assets:	107,174.34

Table 4.3 Week 2 Buy and Hold Simulation Price Change Table

4.2.2 End of Week Results

By the end of the week the S&P 500 was up 1%. The price change for the second week of the simulation is a gain of $7522.01 in total. The greatest gain came from Cloudflare (NET) and there were no losses in any investments. The second greatest gain came from Dexcom due to successful service in the medical field. The stock market numbers are seeing record highs and the buy and hold strategy shows promise for the future.

4.3 Week 3 Report

4.3.1 Price Changes Week 3:

The price changes of week 3 result in an overall loss. The greatest loss came from Dexcom, which has shown a notable earnings report, so it is predicted to bounce back. The second greatest loss comes from AMD, however many analysts have correlated the prediction that it will show a significant increase with the comping earnings report. Table 4.3 shows the changes in price over this week for the simulation.

	Buy Price	Shares	Last Week Ending	This Week closing	Weekly Price Change	Weekly Profit/ Loss	Total Profit/ Loss
MSFT	188.36	53	195.79	196.33	0.54	28.62	7,202.96
EPAM	237.98	42	252.3	244.38	-7.92	-332.64	6,870.32
DXCM	368.62	27	415.03	383.06	-31.97	-863.19	6,007.13
FIVN	96.99	103	102.14	107.72	5.58	574.74	6,581.87
NET	29.17	342	36.32	35.53	-0.79	-270.18	6,311.69
AMZN	2524.06	4	2684.5	2692.87	8.37	33.48	6,345.17
NFLX	419.49	23	455.01	443.4	-11.61	-267.03	6,078.14
AMD	52.97	188	54.67	50.1	-4.57	-859.16	5,221.98
NKE	104.29	95	96.85	93.67	-3.18	-302.1	4,919.88
AAPL	333.49	31	351.34	353.63	2.29	70.99	4,990.87
						Total Assets:	104,987.87

Table 4.4 Week 3 Buy and Hold Simulation Price Change Table

4.3.2 End of Week Results

By the end of the week the S&P 500 was down 3.49%. The price change for the third week of the simulation is a loss of $2,186.47 in total. The greatest gain came from Five9 (FIVN), but the majority of investments were largely negative. Many of these companies such as Dexcom, and AMD will release earnings reports soon and are predicted to bounce back afterwards. Overall the total assets are still positive at $104,987.87.

4.4 Week 4 Report

4.4.1 Price Changes Week 4:

The price changes of week 3 result in an overall gain. The greatest gains came from Amazon. COVID-19 is a large helping factor in the spike in Amazon's price and the Amazon prime subscription sales report showed $5.5 billion sales in first quarter earnings. In addition to almost being the world's first $2 trillion company, Amazon has other services besides shopping such as the cloud, which is a work in progress. Table 4.5 shows the changes in price over this week for the simulation.

	Buy Price	Shares	Last Week Ending	This Week closing	Weekly Price Change	Weekly Profit/ Loss	Total Profit/ Loss
MSFT	188.36	53	196.33	206.26	9.93	526.29	5517.16
EPAM	237.98	42	244.38	250.16	5.78	242.76	5759.92
DXCM	368.62	27	383.06	407.35	24.29	655.83	6415.75
FIVN	96.99	103	107.72	113.58	5.86	603.58	7019.33
NET	29.17	342	35.53	36.47	0.94	321.48	7340.81
AMZN	2524.06	4	2692.87	2890.3	197.43	789.72	8130.53
NFLX	419.49	23	443.4	476.89	33.49	770.27	8900.80
AMD	52.97	188	50.1	52.34	2.24	421.12	9321.92
NKE	104.29	95	93.67	98.43	4.76	452.2	9774.12
AAPL	333.49	31	353.63	364.11	10.48	324.88	10099
						Total Assets:	110096

Table 4.5 Week 4 Buy and Hold Simulation Price Change Table

4.4.2 End of Week Results

By the end of the week the S&P 500 was up 2.51%. The price change for the fourth week of the simulation is a gain of $5,108.13 in total. This week all changes are positive for every investment. Netflix also managed to bounce back up, and this is most likely due to COVID-19 since more time spent at home, means there will be a greater consumption of home activities and services. Regarding company news, it does not seem like much has changed, however this simulation went from 40% of investments showing slight positive changes last week, to 100% of investments showing great positive changes this week. This may support that holding onto investments rather than panic selling is an effective strategy.

4.5 Week 5 Report

4.5.1 Price Changes Week 5:

The price changes for week 5 resulted in a positive change for 90% of the investments. Amazon had an impressive week, with an over 10% increase in stock value, now putting it at the

most expensive stock on Wall Street. Additionally, the second most profitable stock came from Netflix, which has bounced back from being in the red a few weeks ago. The main reason why these two stocks prices have soared is due to COVID-19. The pandemic has had a significant impact on the stock market, therefore investing around it would be the optimal line of action. Table 4.6 shows the changes in price over this week for the simulation.

	Buy Price	Shares	Last Week Ending	This Week closing	Weekly Price Change	Weekly Profit/ Loss	Total Profit/ Loss
MSFT	188.36	53	206.26	213.67	7.41	392.73	10491.73
EPAM	237.98	42	250.16	261.14	10.98	461.16	10952.89
DXCM	368.62	27	407.35	439.64	32.29	871.83	11824.72
FIVN	96.99	103	113.58	119.06	5.48	564.44	12389.16
NET	29.17	342	36.47	40.08	3.61	1234.62	13623.78
AMZN	2524.06	4	2890.3	3200	309.7	1238.8	14862.58
NFLX	419.49	23	476.89	548.73	71.84	1652.32	16514.9
AMD	52.97	188	52.34	55.88	3.54	665.52	17180.42
NKE	104.29	95	98.43	97.99	-0.44	-41.8	17138.62
AAPL	333.49	31	364.11	383.68	19.57	606.67	17745.29
						Total Assets:	117742.29

Table 4.6 Week 5 Buy and Hold Simulation Price Change Table

4.5.2 End of Week Results

By the end of the week the S&P 500 was up 1.76%. The price changes for week 5 resulted in an overall gain of $7646.29, which is the highest weekly profit seen so far in the buy and hold simulation. Notable profit came from Amazon, Netflix, and Cloudflare stocks. Cloudflare shares have seen an increase greater than 140% from the company's $15 IPO price. This value increase is due to a strong revenue growth and successful execution of services. There has been a growing demand for 5G edge-computing services, which also provides Cloudflare more customers, and thus more profit. Amazon, and Netflix as expected have capitalized gains due to the current economic conditions imposed by the pandemic. Since the beginning of the simulation, the buy and hold strategy has seen a 17.74% increase in portfolio value from a mix of 10 companies.

4.6 Week 6 Report

4.6.1 Price Changes Week 6:

  The price changes for week 6 resulted in a negative change for 80% of the investments. The greatest loss came from Netflix, which was the second greatest profit from last week. The reason for this 8% drop in value is due to the reported earning miss and disappointing subscriber-growth forecast. In addition to this negative change, Amazon, the greatest profit from last week, is also in the red. As expected, the $3200 price tag was a temporary overshoot and the value has come back down. Table 4.7 shows the changes in price over this week for the simulation

	Buy Price	Shares	Last Week Ending	This Week closing	Weekly Price Change	Weekly Profit/ Loss	Total Profit/ Loss
MSFT	188.36	53	213.67	202.88	-10.79	-571.87	17173.42
EPAM	237.98	42	261.14	264.69	3.55	149.1	17322.52
DXCM	368.62	27	439.64	424.43	-15.21	-410.67	16911.85
FIVN	96.99	103	119.06	112.06	-7	-721	16190.85
NET	29.17	342	40.08	37.02	-3.06	-1046.52	15144.33
AMZN	2524.06	4	3200	2961.97	-238.03	-952.12	14192.21
NFLX	419.49	23	548.73	492.99	-55.74	-1282.02	12910.19
AMD	52.97	188	55.88	55.04	-0.84	-157.92	12752.27
NKE	104.29	95	97.99	96.28	-1.71	-162.45	12589.82
AAPL	333.49	31	383.68	385.31	1.63	50.53	12640.35
						Total Assets:	112637.35

Table 4.7 Week 6 Buy and Hold Simulation Price Change Table

4.6.2 End of Week Results

By the end of the week the S&P 500 was up 1.25%. The price changes for week 5 resulted in an overall loss of $5104.94. This ends the buy and hold simulation with total assets of $112637.35, which is a 12.64% growth over 6 weeks. The average gain per week over the whole simulation was $2106.22 per week. Last week the simulation ended with 90% of investments showing positive change, however this week the simulation ended with 80% of investments showing negative change. This shows how volatile the stock market can be week to week. Although Cloudflare, Amazon, and Netflix suffered this week, they are still predicted to increase in value in the future. Cloudflare has announced plans for expansion such as a new Tokyo workplace. Amazon has also shown positive growth in subscriptions to the prime service. Similarly, Netflix is expected to report greater subscriber growth in its streaming services as well.

Chapter 5 Swing Trading Simulation

This chapter presents the data, research and results for the Swing trading simulation.

5.1 Week 1 Report

This simulation will start with $100,000 and actively make transactions in order to predict market movement and follow profit. The Bollinger Bands trading indicator: If there is a long period of low volatility then there is likely going to be an explosive move. The moving average helps to predict bouncing trends and areas of resistance or support. Timing entries with the moving averages will be key to making effective trades. The candlestick pattern consists of following the open, close, high, and low prices of each session. This data creates the body and wick of the candle, the longer the wick the stronger the price rejection. The engulfing pattern is useful for identifying market reversals. Table 5.1 shows the transactions made in this week of the swing simulation.

Date	Symbol	Buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
6/8/20	MSFT	Buy	188.36	53	9983.08		90016.92	
6/8/20	EPAM	Buy	237.98	42	9995.16		80021.76	
6/8/20	DXCM	Buy	368.62	27	9952.74		70069.02	
6/8/20	FIVN	Buy	96.99	103	9989.97		60079.05	
6/8/20	NET	Buy	29.17	342	9976.14		50102.91	
6/8/20	AMZN	Buy	2524.06	4	10096.24		40006.67	
6/8/20	NFLX	Buy	419.49	23	9648.27		30358.40	
6/8/20	AMD	Buy	52.97	188	9958.36		20400.04	
6/8/20	NKE	Buy	104.29	95	9907.55		10492.49	
6/8/20	AAPL	Buy	333.49	31	10338.19		154.30	
6/8/20	NET	Buy	29.17	5	145.85		8.45	
6/9/10	AMD	Sell	57.20	188	10753.6	795.24	11557.29	795.24
6/10/20	NET	Buy	28.79	401	11544.79		12.50	
6/12/20	MSFT	Sell	193.13	53	10235.89	252.81	10501.20	1,048.05
6/12/20	EPAM	Buy	231.70	45	10426.50		74.7	
							Total Assets:	92,311.76

Table 5.1 Week 1 Swing Simulation Transaction Table

5.1.1 Observations

6/9 AMD closes above the bollinger band at $56.39. I sell as soon as the market opens 6/10 for $57.20, predicting it will drop.

6/10 DXCM Closes around the average line, I suspect it will rise so I will hold this for a while.

6/10 Cloudflare (NET) has had strong price rejection for the past 2 days as the price descends towards the average, I suspect this will increase so I buy when the market opens at $28.79.

6/10 Amazon has the strongest upper price rejection it has had in over 2 months. Selling would not gain much however, so I decide to allow the overall increasing trend to continue.

6/11 Microsoft closed at a new high ($196.84) that exceeded the upper bollinger band. The wick of the candle is short in comparison to the body, however it is longer than the previous weeks, suggesting there may be a drop in price. I decided to sell MSFT when the market opened 6/12 for $193.13. I will wait to reinvest MSFT though it seems to be an overall upwards trend. Additionally the percentage change is so small it may not be an effective use of investments.

6/12 EPAM Systems has been on a downwards trend the past few days and is approaching the average so I am expecting a bounce back up soon. I decided to buy at $231.70.

6/12 Looking at the candle trend for FIVN, the buyers seem to be in control and price is floating around the average line, so I will hold expecting there to be a bounce up next week.

**5.1.2 End of Week Graphs (6/8-6/12):** Bollinger Bands & Average Line & Candle Patterns

AMD:

Seeing that AMD closed high on 6/9 with little resistance, I decided to sell the next day at opening price, and we now see the price dropped back down, which means this analysis of the graph held true. Figure 5.1 presents AMD's bollinger band data for this week.
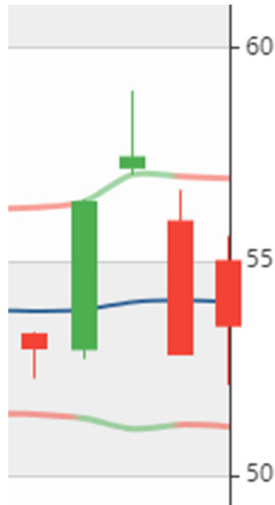
Figure 5.1 AMD Bollinger Bands Week 1

NET:

I now have the highest percentage of my total balance invested in NET. As can be seen by the bollinger graph, the price has approached the average line and from the increasing 6 month performance, I have predicted the price to swing up in the near future. Figure 5.2 presents NET's bollinger band data for this week. Figure 5.3 presents NET's stock performance for the past 6 months.
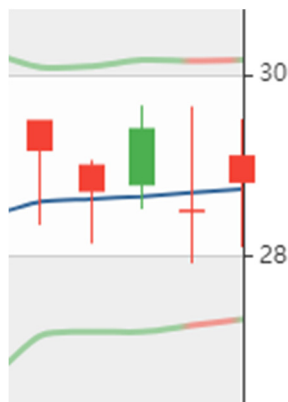
Figure 5.2 NET Bollinger Bands Week 1

Figure 5.3 NET Stock Prices (past 6 months)

MSFT:

I have employed the strategy of selling if the price ever exceeds the bollinger upper bound. In Microsoft's case I have done this, but have also decided to opt out of investing in Microsoft since the stock is very expensive and hardly volatile, and both characteristics make it difficult to swing trade on. Figure 5.4 presents MSFT's bollinger band data for this week.
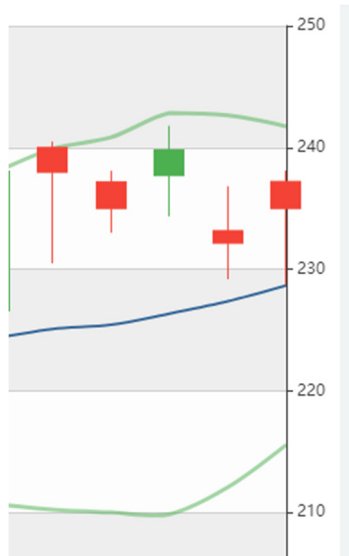

Figure 5.4 MSFT Bollinger Bands Week 1

EPAM:

EPAM is now my second most invested stock. According to the Bollinger graph, the resistance to low prices seems high and the past 6 month have seen an increasing trend. Figure 5.5

presents EPAM's bollinger band data for this week. Figure 5.6 presents EPAM's stock performance for the past 6 months.

Figure 5.5 EPAM Bollinger Bands Week 1

Figure 5.6 EPAM Stock Prices (past 6 months)

5.1.3 End of Week Comparison Results:

By the end of the week the S&P 500 was down 6%. The Buy and Hold simulation was down 0.3%. My total portfolio value in the swing trading simulation ended at $92,311.76. This

means a 7.66% loss for swing trading, which is to be expected because I invested in the downwards trend for now, expecting there to be an even greater upwards trend soon.

5.2 Week 2 Report

Date	Symbol	Buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
6/19	DXCM	Sell	405.15	27	10948.5	995.76	10948.5	2,043.81
6/19	EPAM	Sell	246.03	87	21404.61	982.95	32353.11	3,026.76
6/19	Net	Buy	36.18	894	32344.92		8.19	
							Total Assets:	110,389.39

Table 5.2 Week 2 Swing Simulation Transaction Table

5.2.1 Observations

6/15 Apple's stock has shown a steading increasing trend for months and I believe it has no reason to decrease so I have decided to hold this stock until a more noticeable stabilization or period of less volatility occurs.

6/17 Today Netflix closes above the upper bollinger band the upper and lower wicks are both equal, thus it is possible for the price and average to both increase. Netflix has also reported increasing customers during this time and has seen success economically. I decide to hold for now and sell as soon as it shows any decline.

6/15 Amazon has been on a rapid increase, as expected from the current societal conditions in the world due to the pandemic. Amazon is such an essential part of consumers interacting with the market that the stock is predicted to increase in value even further, so I will hold for now.

6/19 Looking at the 6 months performance of DexCom and EPAM, it becomes clear that the stock has reached the peak of it's fluctuation, and I predict it will fall soon. Based on the past trends for both of these stocks bouncing down, I decided to sell both midday at the end of this week.

6/19 Five9 closes at it's average and did not show any sudden increase during the week that would have made a good swing sale.

6/19 Selling Nike now would be a loss, and according to the past 6 months, the price seems to have stabilized. This week has not shown any opportunities to sell Nike for profit. The overall economy has seen success in the recent few weeks so I will hold out for this stock as well.

6/19 Cloudflare has reported to have more increasing customers using their service, in addition to innovation that has allowed the service to operate more efficiently. The bollinger brands have in fact shown a resistance to lower prices. I believe this stock could skyrocket in the near future so I will invest even further.

**5.2.2: End of Week Graphs (6/15-6/19):** Bollinger Bands & Average Line & Candle Patterns
AAPL:
Since the lower wick of the candles are longer than the upper wick, the price has shown resistance to decrease.Figure 5.7 presents AAPL's bollinger band data for this week.
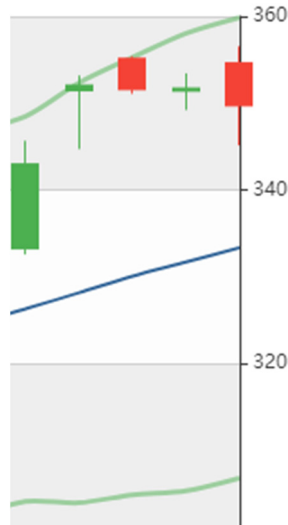
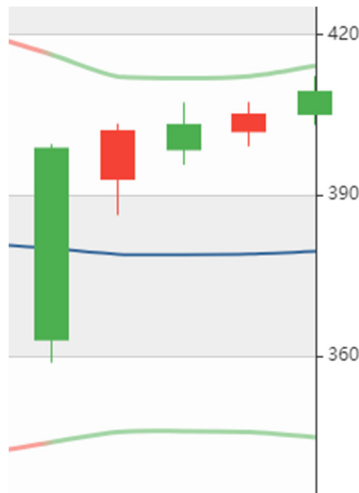*Figure 5.7 AAPL Bollinger Bands Week 2*

AMZN:

The cost of the amazon stock is what limits its volatility so I am most likely not going to see any further transactions with this stock until the end of the simulation. Figure 5.8 presents AMZN's bollinger band data for this week.
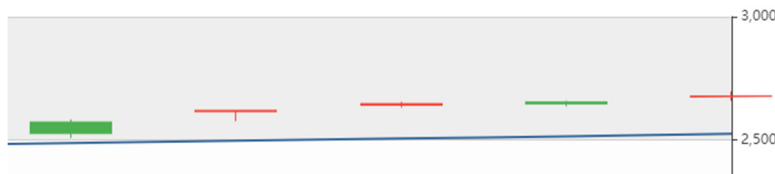
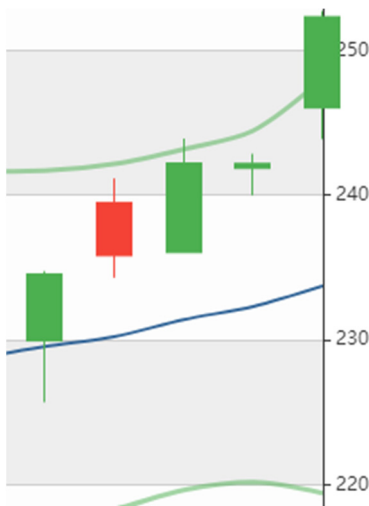
Figure 5.8 AMZN Bollinger Bands Week 2

DXCM:

Although increasing, it is nowhere near the rate of Cloudflare so I have sold for profit and reinvested. Figure 5.9 presents DXCM's bollinger band data for this week.

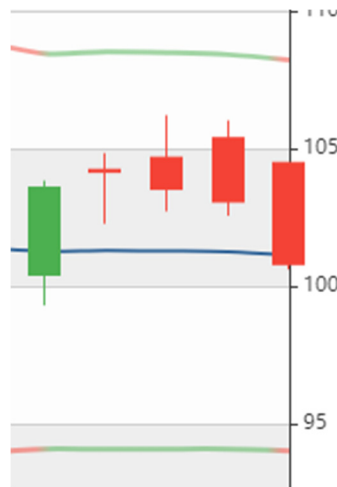*Figure 5.9 DXCM Bollinger Bands Week 2*

EPAM:

I had invested extra in EPAM last week, suspecting there to be an increase in price. Not only was there an increase but by the last day of the week, prices had reached the upper bollinger line prediction. I had already decided if this were to happen then I would sell. Figure 5.10 presents EPAM's bollinger band data for this week.
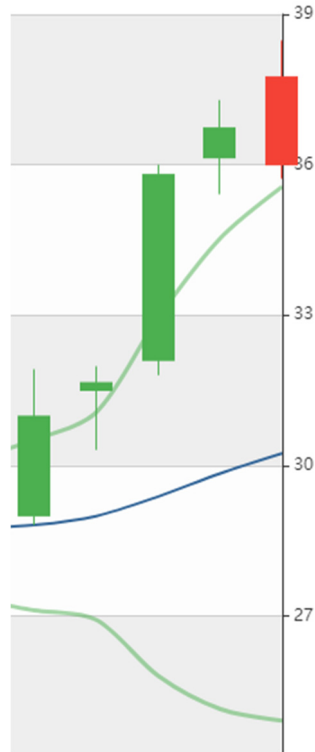

Figure 5.10 EPAM Bollinger Bands Week 2

FIVN:

This graph shows the stock hovering near the average with resistance to the higher band. If a trend of low volatility continues then I will have to take action in order to prevent great loss, or capitalize on great gain. Figure 5.11 presents FIVN's bollinger band data for this week.
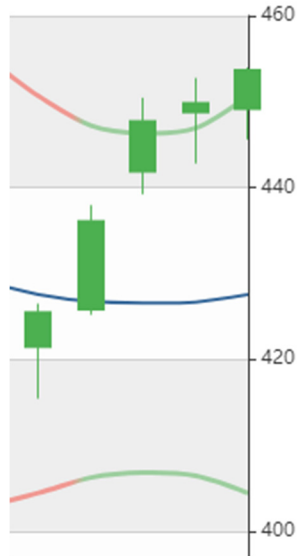

Figure 5.11 FIVN Bollinger Bands Week 2

NET:

Ending the week on red does not bode well for the following week, however I believe in the necessity of this service and its effectiveness is proven through the Cloudflare's company reports. Figure 5.12 presents NET's bollinger band data for this week.

Figure 5.12 NET Bollinger Bands Week 2

NFLX:

Netflix has seen similar growth to amazon, and I have decided to hold onto both. The above graph shows promise for next week as the final day 6/19 closed with resistance to lower prices as indicated by the size of the lower wick. Figure 5.13 presents NFLX's bollinger band data for this week.

Figure 5.13 NFLX Bollinger Bands Week 2

NKE:

Nike's stock is my worst performing stock, as it has not only fallen below the average, but has not shown any signs of recovery for months. It is highly likely that I sell NKE next week if the trend continues. Figure 5.14 presents NKE's bollinger band data for this week.

Figure 5.14 NKE Bollinger Bands Week 2

5.2.3 End of Week Comparison Results:

By the end of the week the S&P 500 was up 1%. The Buy and Hold simulation was up 7.5%. My total portfolio value in the swing trading simulation ended at $110,389.39. This means a 10.39% gain for swing trading. Most of my money is invested into Cloudflare, which has also given me the greatest returns. I predict it is possible that the stock price of NET will double following the current trends.

5.3 Week 3 Report

Date	Symbol	Buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
6/23	NKE	Sell	101.62	95	9,653.9	-253.65	9,662.09	2,773.11
6/23	FIVN	Sell	109.03	103	11,230.09	1,322.54	20,892.18	4,095.65
6/24	NFLX	Sell	468.54	23	10,776.42	1,128.15	31,668.6	5,223.8
6/25	AQMS	Buy	1.15	10,156	11679.4		19,989.2	
6/25	CALX	Buy	13.36	748	9993.28		9,995.92	
6/25	APPS	Buy	11.18	894	9994.92		1.00	
							Total Assets:	111,822.6

Table 5.3 Week 3 Swing Simulation Transaction Table

5.3.1 Observations

6/23 Nike opens above the moving average, and since the stock has not been on an upwards trend, this is, although not optimal, a decent chance to sell and reinvest elsewhere.

6/23 Five9 approaches the upper bollinger band estimate, which may be the peak of its positive bounce from the average, so it is sold.

6/24 Netflix closed on 6/23 with extremely high resistance to higher prices, as indicated by the bollinger graph of the previous day. In order to maximize profits, Netflix was sold at opening price on 6/24.

6/25 Digital Turbine (APPS) and Calix (CALX) showed high earnings growth; Aqua Metals (AQMS) reports to have successful experiments of new valuable products ahead of schedule and could soar in price. All of these stocks are volatile and low in price which means they are optimal for swing trading.

6/26 Cloudflare closes the week relatively stable, with equal resistance to both higher and lower prices. As stated in the previous week, this stock is predicted to have another spike in price, so it is optimal to continue to hold. Amazon will also be held due to its long term increasing trend. Apple is also following the steady increasing trend, as I suspect the current societal conditions are beneficial for the company.

**5.3.2: End of Week Graphs (6/22-6/26):** Bollinger Bands & Average Line & Candle Patterns
NKE:

Nike has not seen an upwards trend in the past 6 months, and has shown no signs of any increasing spike in price. Selling this week resulted in a net loss, however, it is more effective to drop this stock and reinvest in a more positive trend. Figure 5.15 presents Nike's stock performance for the past 6 months.

*Figure 5.15 NKE Stock Prices (past 6 months)*

FIVN:

Five9 has shown positive performance throughout the past 3 weeks, however although the price is on an upwards trend, the percentage change is so minimal that the investment is not as effective as Cloudflare. The earnings are green, however Five9 have not shown any signs in regards to earnings reports, and company performance, that would allow the price to increase by a factor greater than or equal to 1.5. Figure 5.16 presents FIVN's bollinger band data for this week.
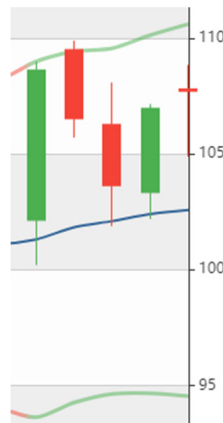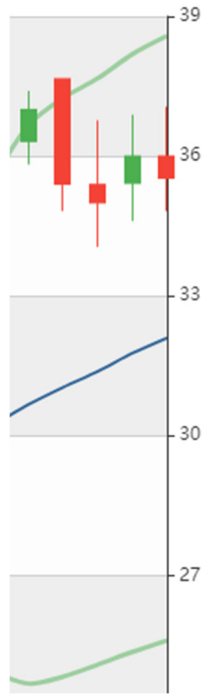

Figure 5.16 FIVN Bollinger Bands Week 3

NFLX

Netflix, similar to Five9 has shown positive performance, however that overall percentage change is not enough to make more than at most $3,000 on a swing trade. For maximum gains, it is best to avoid high priced stocks that have low increment factor week to week. Netflix was thus sold after resistance to higher prices was seen on 6/23. Figure 5.17 presents NFLX's bollinger band data for this week.
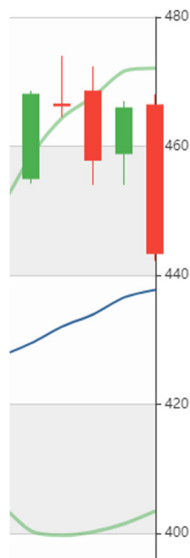
Figure 5.17 NFLX Bollinger Bands Week 3

NET

Cloudflare has had the greatest percentage change out of all the stocks that have participated in the swing simulation. As illustrated by the bollinger graph, there has been equal opposition to both high and low prices, which means a stabilization. Following stabilization however are usually drastic price changes. As stated in the previous week, the company report leads to the prediction that this stock will continue to rise. Figure 5.18 presents NET's bollinger band data for this week.

Figure 5.18 NET Bollinger Bands Week 3

AMZN & AAPL

Amazon and Apple are on a steady, unwavering increasing price trend, however they are both very expensive stocks to invest in. The biggest factor why Amazon and Apple is seeing this increase is due to the increasing usage of the service due to the current pandemic. Although the percentage change will not bring great earnings, it would be unwise to let go of guaranteed profit. Figure 5.19 presents Amazon's stock performance for the past 6 months. Figure 5.20 presents Apple's stock performance for the past 6 months.

Figure 5.19 AMZN Stock Prices (past 6 months)

Figure 5.20 AAPL Stock Prices (past 6 months)

5.3.3 End of Week Comparison Results:

By the end of the week the S&P 500 was down 3.49%. My total assets value in the swing trading simulation ended at $111,822.6. This means a 1.3% gain for swing trading this week. Last week saw a large profit of over 10% overall gain, however this week was spent reconsidering what would be the optimal investments for maximum profit. The result of this research was investments in three new companies: Digital Turbine, Calix, and Aqua Metals. The similarities between these companies that make them optimal swing trading choices are: 1. The prices of their stock is

relatively cheap, 2. The stock prices have seen an upwards trend and are volatile with a factor greater than 1.5, 3. The earnings reports of all three companies have shown promise and the performance of the services/products have seen success.

5.4 Week 4 Report

Date	Symbol	Buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
7/1	AQMS	Sell	1.39	10,156	14116.84	2437.44	14117.84	7661.24
7/2	DCAR	Buy	3.11	4539	14116.29		1.55	
							Total Assets:	119751.70

Table 5.4 Week 4 Swing Simulation Transaction Table

5.4.1 Observations

6/29 Cloudflare could be sold for approximately $5000 profit today, however upon closer examination of the past price trends, NET seems to be following a bouncing pattern with the upper bollinger band as the floor, and the moving average as the ceiling. This suggests that today's low (which also demonstrated great resistance to a bearish trend) is the apex of the bounce.

6/30 Digital Turbine has shown a 96.79% increase over the past month, and today it has once again grown past the upper bollinger band. With this considered, it would be optimal to let this sit since it is very volatile and may lead to great profit in the future.

6/30 Aqua Metals closed with a 27.27% price increase since the end of the previous week. Selling the next day at opening price would amount to great profit, and would be the optimal move for the swing trading strategy.

7/2 DropCar has been on the watch list and a good buy candidate according to analysts such as stockinvest.us, but has shown a recent bottleneck in price, which according to bollinger band analysis means there will likely be a great price swing soon. This entire week the price has been steadily increasing, therefore it is logical to predict an up swing.

7/2 Cloudflare after reaching a new high last week and dipping back down, has shown an upwards trend this entire week, in addition to resistance to lower prices, signifying this stock is likely to increase again.

7/2 Apple and Amazon stock continue to hold a bullish trend by the end of this week. Apple sees a 2.96% value increase since the previous week, while Amazon sees a 7.33% price increase. Both of these stocks are very strong and have proven to be good investments.

5.4.2: End of Week Graphs (6/29-7/2): Bollinger Bands & Average Line & Candle Patterns AQMS

Although the overall trend for the Aqua Metals stock has been an increase in value, the trend is both unsteady and does not show any signs of ever reaching the $2.00 mark. One dollar was the previous average before the entire market tanked in April 2020, and it is logical to assume this average will return, which is why this stock was sold off during week four. Figure 5.21 presents Aqua Metal's stock performance for the past 6 months.

Figure 5.21 AQMS Stock Prices (past 6 months)

DCAR

This stock was recommended by analysts at stockinvest.us because of its recent spike in price, as illustrated by the second red bollinger band, in addition to DropCar merging with AYRO, which is predicted to help the stock price follow the momentum of the market. Taking a look at the past 5 weeks emphasizes this bottleneck pattern, which is a potential signal that the price may ride the bullish market again and increase as the analysts have predicted. Figure 5.22 presents DCAR's bollinger band data for the past 5 weeks.

Figure 5.22 DCAR Bollinger Bands (past 5 weeks)

NET

This week, Cloudflare still holds the majority of the swing simulation's investments. As illustrated by the bollinger band graph for the past month, the price has been following a bouncing pattern. We can see that whenever the bounce reaches its lower apex, there is significant resistance to lower prices shown. This can be seen by the length of the lower wick increasing as the price gets closer to the moving average. Figure 5.23 presents NET's bollinger band data for this past month.

Figure 5.23 NET Bollinger Bands (past month)

5.4.3 End of Week Comparison Results:

By the end of the week the S&P 500 was up 2.51%. The total assets value in the swing trading simulation ended at $119,751.70. This means a 7.09% gain for swing trading this week. This week only two transactions were made. One stock was sold, while another was bought. Since all of the stocks currently part of the investment pool are predicted to continue increasing, the only

reason to sell would be to re-invest in an even more volatile stock. This is why only a single swap

in investments was made this week. Seeing the Netflix, has bounced back makes selling it previous

seem like a mistake. Considering the still lingering presence that COVID-19 has on the economy,

it makes sense that the home service would be able to increase in value again.

5.5 Week 5 Report

Date	Symbol	Buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
7/6	DCAR	Sell	8.00	4539	36312	22195.71	22197.26	29856.95
7/9	NET	Sell	40.00	1637	65480	21444.44	87677.26	51301.39
							Total Assets:	135,073.42

Table 5.5 Week 5 Swing Simulation Transaction Table

5.5.1 Observations

7/6 The DropCar stock selling price has been set at $8.00 since the price was predicted to double from $4.00, and today the stock went past the $8.00 but was still sold at the specified selling price.

7/9 Cloudflare stock hit a new high of $40.00, however the stock seems to be steadily increasing at a slow pace after holding it for 4 weeks, therefore it would be optimal to see now to capitalize on these profits.

7/9 Digital Turbine (APPS) makes a compelling case for why it will increase in value. This past quarter the company saw a 30% revenue growth and is one of the fastest growing companies even in international markets. APPS has also announced a partnership with Telefonica, which has more customers than AT&T and Verizon combined. Additionally the company has made agreements with Samsung, expanded their revenue sources to outside of the core business.

7/10 Amazon closes the week at a new high of $3,200. According to the bollinger graph for today, it is likely the price could increase even further, however the common conclusion among analysts says that the value of Amazon will see a drop soon due to this sudden spike in value. Apple stock maintained a consistent growth throughout the week as well.

**5.5.2: End of Week Graphs (7/6-7/10):** Bollinger Bands & Average Line & Candle Patterns

AMZN

Amazon has not only reached a weekly high, but in fact a new all-time high price at $3,200. Analysts believe the current P/E multiple figure of about 140x is too high, and the stock will not see growth at the current rate in the near future. The effect of the corona virus is clear with Amazon's stock being up 58% since January 31st, 2020. Figure 5.24 presents Amazon's bollinger band data for this past week showing a new record high.
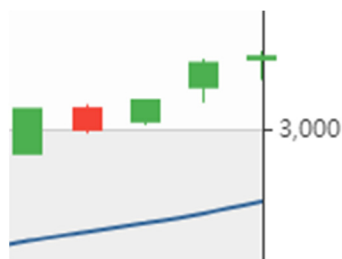
Figure 5.24 AMZN Bollinger Bands (past week)

CALX

On July 7th, Calix (CALX) dropped 8.02%, after seeing a significant spike in growth the past month. The revenue and income reports from the company for the past few years have been stagnant. This is currently the least profitable investment, therefore it would be best to sell as soon as possible. To earn a profit, the stock would need to be sold at above $14.46. This stock will be closely monitored in the following days and weeks to see if it can reach a profitable $15.00 value. Figure 5.25 presents Amazon's bollinger band data for this past week showing a new record high.
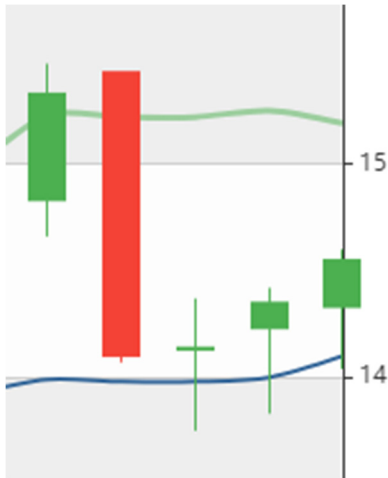
Figure 5.25 CALX Bollinger Bands (past week)

NET

Cloudflare expects revenue to grow 36.5% this year due to the pandemic. In the past four years, the company's sales have grown at a 50% compound annual growth rate. Although NET has been increasing in value over the past 5 weeks, the stock's rate of increase is not high enough to warrant 1.5 times or greater value returns. As illustrated by the bollinger graph, Cloudflare spiked on July 10th, and although the value may continue to increase with only one week left in the simulation, selling now was the most profitable decision. Figure 5.26 presents Cloudflare's bollinger band data for this past week showing a new record high.
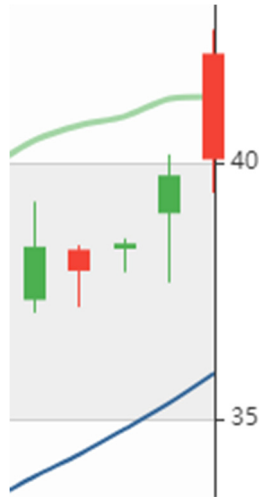
Figure 5.26 NET Bollinger Bands (past week)

5.5.3 End of Week Comparison Results:

By the end of the week the S&P 500 was up 1.76%. The total assets value in the swing trading simulation ended at $135,073.42. This means a 12.79% gain for swing trading this week. With only one week left in the simulation, the strategy for the remaining investments is to look for sudden spikes in value, and sell immediately even though the value of those stocks may increase past the temporary price spike in the future. This was done for two stocks this week: NET and DCAR. Following last week's performance of DCAR doubling price, it has doubled again this week. The Apple, Amazon, and Cloudflare stocks all benefited from the pandemic, which is why they have been held onto since the start of the swing trading simulation. As of week 5, the swing trading simulation total profit is 2.89 times greater than the buy and hold total profit.

5.6 Week 6 Report

Table 5.6 lists transactions for Week 6.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
7/13	AMZN	Sell	3251.06	4	13004.24	2908	100681.5	54209.39
7/17	AAPL	Sell	387.95	31	12026.45	1688.26	112707.95	55897.65
7/17	CALX	Sell	15.72	748	11758.56	1765.28	124466.51	57662.93
7/17	APPS	Sell	12.78	894	11425.32	1430.4	135891.83	59093.33
							Total Assets:	135891.83

Table 5.6 Week 6 Swing Simulation Transaction Table

5.6.1 Observations

7/13 Amazon was predicted to decrease in value after the record high end of last week at $3200, so it was sold at opening price on the first day of this final week, since there is not enough time left in the simulation for the price to advance much further.

7/17 Apple has no notable changes this week except closing 7/13 with the greatest percentage drop in the past 2 months from the day's high of $399.82 down to $381.91. However, as expected from the successful earnings reports, the stock continued to rise throughout the rest of the week and was sold on the final day. Similar to Apple, Digital Turbine (APPS) showed a 10% drop over the course of 7/13 and was sold the final day. Calix remained a steady price for the duration of the week and was also sold on the final day.

5.6.2: End of Week Graphs (7/13-7/17): Bollinger Bands & Average Line & Candle Patterns

AMZN

After hitting a record high last week, the price of Amazon stock was predicted to decline from the sudden positive spike. Figure 5.27 presents Amazon's bollinger band data for this past week showing that predictions held true and the price has declined. The first candle represents the last day of the past week to better show the decline since then. This is the first time Amazon has seen any decline in price since the beginning of the simulation.
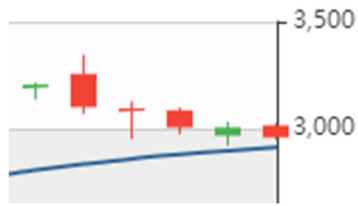
*Figure 5.27 AMZN Bollinger Bands (past 6 market days)*

APPLE

Apple has outperformed their quarterly estimates this year and are projected to do so going forward. The earnings and revenue have been strong and the stock price reflects it. As a result of this guaranteed growth in value, this stock was held for the entirety of the simulation. Figure 5.28 presents Apple's bollinger band data for this past week.
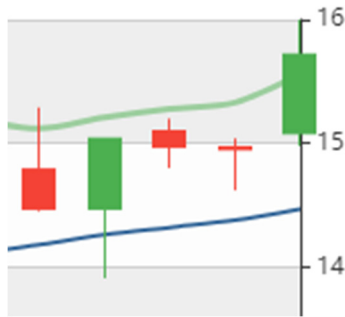

Figure 5.28 Apple Bollinger Bands (past week)

APPS

Digital Turbine shares have been up 270% since March and continues to outpace stock market gains. This tech company has reported rapid revenue and profitability growth over the past five years. It's signature software, "Ignite," has been installed on over 405 million devices. The fourth quarter revenue was up 45% with a net income of 14 million dollars. Figure 5.29 presents Digital Turbine's bollinger band data for this past week.
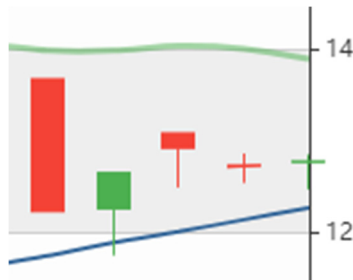
Figure 5.29 APPS Bollinger Bands (past week)

CALX

Calix describes itself as "the leading global provider of cloud and software platforms, systems and services required to deliver the unified access network and smart premises of tomorrow." Calix stock has gained 153.25% since the start of the year 2020 and the company has surpassed the earnings estimate by 66.70%. Even with massive price spikes in the past weeks, the stock still sees a continual increasing trend. Figure 5.30 presents Calix's bollinger band data for this past week.

Figure 5.30 CALX Bollinger Bands (past week)

5.6.3 End of Week Comparison Results:

By the end of the week the S&P 500 was up 1.25%. The total assets value in the swing trading simulation ended at $135,891.83. This means a 0.61% gain for swing trading since last week. Since this is the last week of the swing trading simulation, all stocks were sold. The strategy for this week was to predict and monitor the highest price point by the end of the week. Amazon was the only stock to not be sold at the end of the week, in order to take advantage of the rapid price increase from last week's performance. By the end of the 6 weeks the total profit was $35,891.83, which is a 35.89% growth in portfolio value. The majority of these gains are all from cheap stocks that were in the range $0.01-$20.00 and had large percentage change. Small stocks brought about much greater profits than the bigger stocks of Amazon and Apple even though, both Amazon and Apple saw growth throughout the entire simulation.

Chapter 6 Comparisons and Analysis

Part one of this chapter presents the analysis of the results of the simulations at the end of the six week trading period. This analysis essentially summarizes the process and key events of the simulation. Part two of this chapter compares the deployment and effectiveness of the "Buy and Hold" trading strategy and the "Swing" trading strategy. Finally, part three presents the assessment of the project goals and the value of this project experience.

6.1 Simulation Analysis

This simulation was conducted during the economic times of a pandemic, therefore the initial companies for the "Buy and Hold" strategy were chosen with the prediction that they would increase in price under these conditions. Services that the customer can use online or at home would be ideal, which is why companies such as Amazon and Netflix made the cut. As for the "Swing" trading simulation, the amount of ways to pick apart data seemed overwhelming at first, so it was narrowed down to using performance reports such as earnings, and historical graphics such as the past six months performance of a stock's value, and most of all bollinger graphs, which were the primary way stocks were monitored.

What was learned early on was that even with a plentitude of data for each company, stock prices were still difficult to predict. An example of this is when Netflix, which showed only positive reports and would seem ideal under these economic conditions, suddenly decreased in value during the second week and the stock was eventually sold in a panicked manner. Secondly, the way stocks were monitored changed over the course of the simulation. Watching stock prices by the minute or even by the hour was part of the "Swing" strategy, however monitoring the performance day to day seemed much more optimal for seeing trends. This is how the daily bollinger graphs and candle graphs became the linchpin of decision making and value analysis. As

a result of this method, stocks would usually be sold a day after positive changes were shown. When choosing what new stocks to invest in next, company news would be the best indicating factor of which stocks to pay attention to. If according to the six month history, a stock seemed like it was on an upwards trend or was going to bounce back up then it was taken into consideration for the active trading simulation. This type of trading became easier and simpler as the simulation progressed since important information such as patterns within the graphs became more easily recognizable.

Throughout the entire process of both simulations, it was always a goal to use as much of the current assets as possible in order to maximize potential profit. In the first week of the passive trading simulation, all but eight dollars and forty five cents were invested. In week three of the active trading simulation, all but a single dollar was invested in stocks. This means over 99.99% of assets were made up of stock values during the time of this simulation, which overall maximized potential gain by making use of every tool possible.

6.2 Strategies Analysis

Despite ups and down between individual investments, both active and passive trading resulted in a positive net gain. Figure 6.1 shows the percentage change in value of total assets over the course of six weeks since the beginning of the simulation. The "Swing" trading simulation, "Buy and Hold" trading simulation, and S&P 500 are represented by the blue, red, and orange lines respectively.
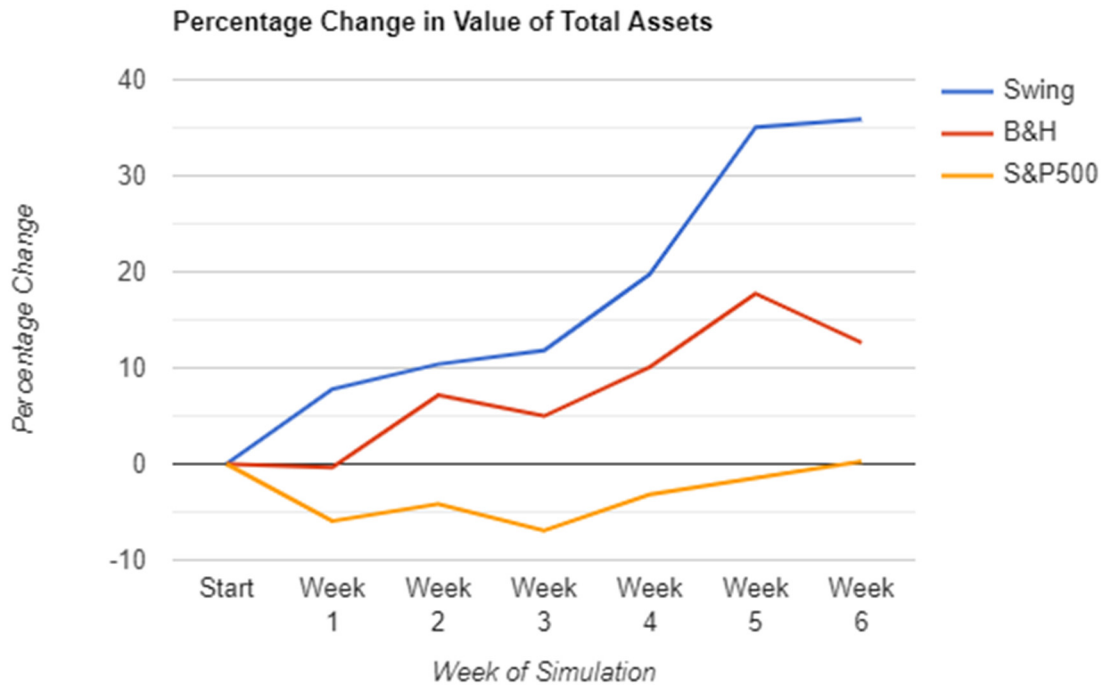
Figure 6.1 Line Graph Showing Percentage Change in Value

As presented by the figure, swing trading was the most successful and ended the six weeks at a 35.89% gain in value. The passive trading simulation ended the six weeks at a 12.63% gain in value. As for the S&P 500, which is here in order to serve as a benchmark for comparison, it stayed below its initial starting value and only managed to surpass that value in the final week of the simulation with a 0.24% gain. Every week, both simulations outperformed the S&P 500 in terms of percentage gains in value.

The passive trading strategy line graph (red line) shows both good weeks where value increased, and bad weeks where value decreased. The nature of this strategy is to ignore data because it is assumed that over time, the total value of the market will increase. Therefore despite knowing that some stocks may tank due to poor performance in company reports, and new

economic trends, the portfolio was left untouched. These signs of decrease however, were avoided in the active trading simulation. As shown by the swing strategy line graph (blue line), the declines in value were avoided. Although the blue line has a positive rate of change throughout the entire simulation, this does not mean every investment performed well. It was in fact several key investments that carried the overall change to a positive number despite other stocks performing poorly. There were some stocks such as Amazon and Apple that provided guaranteed profit due to the overwhelming successful nature of the companies, but this is not the reason swing trading was able to outperform buy and hold trading to such a degree. In addition to being able to cut loose any investments that would weight the total asset value down, swing trading was able to capitalize on shifting investments for much greater gain than simply waiting it out.

In the beginning of the simulation, it was thought that investing in the more successful and popular companies would be a good strategy. Although this strategy would net positive profit, it was later discovered that there is a better way to maximize gains. The new method that was first used in week three was to search for stocks that are extremely cheap (<$10) because those stocks would have the greatest percentage change. A stock that changes from $3 to $8 should not be looked at as merely a $5 increase, but as a 267% percentage change. Take this compared to Amazon which changed from $3,000 to $3,200. Although the $200 increase is much greater than the $5 increase, the percentage change is only 6.67%. That means if all $100,000 were invested in each of these scenarios, the first would walk away with $267,000 and the second would only end up with $106,670. This is why the swing trading strategy was able to outperform the others, since the discovery of percentage change being more important than monetary value alone.

One key takeaway is to cut loose anything that falls below a certain loss floor. For example: Nike. Nike dipped during the beginning of the simulation and was discarded early on in the swing

trading, however it did make a comeback during the fourth week of buy and hold trading. It may seem like a panic sell, however, taking control of the assets allowed a new opportunity to reinvest in even better stocks that could give greater gain in a shorter period rather than waiting weeks for Nike to climb back up. These shorter gains built upon each other and overall were able to far outshine the slow jagged climb of popular stocks. Essentially, taking back the control of money from Nike was more successful than trying to save what had already gone wrong.

6.3 Assessment of Goals

There were three main goals to this project: 1) Research and learn about the stock market 2) Monitor and interact with the stock market 3) Gain experience and knowledge by trying new things. The most valuable knowledge gained was the ability to recognize patterns and predict trends by looking at different data and graphs. Knowledge on monitoring moving averages, bollinger bands, candles graphs, swing patterns, were all gained through research. As demonstrated by the articles cited in the "References" section, the research continued throughout the duration of the simulation with daily news on each of the investments. This knowledge was then put into practice during the simulation period, which then allowed the employment of these methods to be better optimized through learning how they work best. Experience with the stock market made it easier and more comfortable to monitor, and that is why in the later weeks of the simulation, profit was reaching new highs for swing trading. The greatest value in meeting these goals is not the hypothetical profit that could have been made but the confidence to return to investing in the future with a greater arsenal of tools to work with.

Chapter 7 Conclusion

In conclusion, the swing trading strategy outperformed the buy and hold trading strategy in the environment of this simulation. There are successful billionaire investors such as Warren Buffett that use the buy and hold strategy and have seen great success. Both strategies were in fact successful, however since the simulation was only six weeks, the buy and hold strategy may not have had enough time to shine. After the simulation ended the investments for buy and hold trading were actually still increasing in value.

In regards to decision making, there are times to play it safe and times to take risks. Cloudflare is a good example of this because 10% of the total asset value was invested in Cloudflare in week one. Eventually with very positive company reports and analytical trends, the investments were redirected to Cloudflare stock, which held about 30%-40% of total asset value at some point. This was definitely a huge risk, however when it was finally sold the profit exceeded $20,000. In terms of playing it safe, there are many examples as well such as selling Microsoft, AMD, Nike and Netflix early on since they were either stagnant or did not show signs of price swings. Experience leads to knowledge, which allows for more informed decision making. With such a short amount of time to carry out the simulation, it is important to make use of every day by taking control of the assets rather than hoping it will stage a comeback on its own.

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