

**Stock Market Simulation**

An Interactive Qualifying Project Report:

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By

Aneela Haider \_\_\_\_\_

Ahmad H. Khan \_\_\_\_\_

Kevin Mbogo \_\_\_\_\_

Dung Nguyen \_\_\_\_\_

Nghia Nguyen \_\_\_\_\_

Minh Pham \_\_\_\_\_

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Approved by Professor Dalin Tang, Project Advisor

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# Abstract

The main goal of this Interactive Qualifying Project was to learn more about different trading strategies in stock trading to make profit. The team, consisting of six students, researched various investment options available, the history and the current state of the stock market. Six different trading techniques were selected and used in a ten-week stock market simulation. During this period, each team member implemented a different trading strategy using an online platform called Investopedia. This simulation took place during the COVID -19 pandemic, which affected the stock market by a great extent. At the end of the simulation, an in-depth comparison and analysis was conducted. The pros and cons of each trading strategy were identified to conclude which trading strategy yielded the most profit, and if the pros of that certain trading strategy outweighed the cons. Scalping (10.36%), Day trading (8.31%), and Momentum Trading (4.37%) resulted in profits whereas Value Investing (-4.67%), Martingale Trading (-8.2%), and Penny Stock (-15.24%) trading resulted in losses over the course of the simulation. The S & P 500 index lost 23.29% for the simulation period. Upon the completion of this project, each team member gained significant stock market trading experience, which will enable them to make good investment decisions in the future.

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# Chapter 1: Introduction

## *1.1. Goals and Scope*

The main objective of this Interactive Qualifying Project is to gain in-depth knowledge about the stock market and practical experience in stock trading using a virtual stock simulation platform. The project will start off by researching the history of the stock market, terminologies used in stock trading and different trading strategies that exist in the present-day stock market. Once the team is more familiar with different trading strategies, each team member will pick one strategy and use it for simulation. The team will decide on a trading platform, and each member will start off with \$1,000,000. Since there are six members in this current project, six trading strategies will be implemented during the simulation and the results will be recorded. The simulations will continue for 10 weeks and each week data from the simulations will be recorded in detail along with graphs and charts to explain the material better. After 10 weeks, the members will come together to analyze the advantages and disadvantages of their own respective trading strategies and compare the results to see which trading strategy yielded the maximum profit.

Ultimately, this IQP should result in building a stronger foundation of knowledge regarding stocks, useful trading strategies and gain some experience when it comes to the real-world stock market of the present age. This will hopefully help shape each member of the team in making responsible decisions and becoming a competent stock investor in the future.

## ***1.2. History of Stock Markets***

### ***1.2.1 Stock Market Early Concepts during 11th - 15th Century***

In the late 1100's France had a system where foreign exchange dealers managed agricultural debts on behalf of the banks. This was the first instance of a broker because of their ability to manage debts. In the 13th century merchants of Venice were credited with trading government securities and debts. This trend continued with other cities in Italy such as Pisa, Verona, Genoa, and Florence. The first appearance of a stock market was linked to Belgium in the commercial center Antwerp. Bruges Flanders, Ghent, and Rotterdam, cities in the Netherlands, all hosted their versions of a stock market in the 1400s and 1500s.

### ***1.2.2. East India Company of 16th Century***

Later on, in the years, East India Company was recognized as the first public trade company. The reason was because of the immense risk of sailing to far corners of the planet. East Indies became a known haven of riches and trade opportunities were explorers sailed in droves. Few voyages were able to return with the profits back home. Ships were lost due to several reasons from poor navigation, piracy, to harsh storms. During such instances fortunes were lost and financiers had to come up with a way to reduce the risk. To solve this they came up with the idea to use a limited liability formula. This formula was made to split investments on each voyage whereby they would have some secured assets while some would be lost they would keep and gain others. In 1602 the Dutch East India Company became the first official trade company when it released its shares on to the Amsterdam Stock Exchange. Stocks and bonds were issued to each investor at a fixed percentage of the company's profits.

Investors would often meet in coffee shops. Early stocks were handwritten on sheets of paper and investors traded these with other investors. Coffee shops were the first real stock market

to buy and sell stocks. People started to realize it would be more efficient to hold these proceedings in an office, a marketplace where businessmen could trade stocks without interactions. However a problem that occurred was credibility, there was no regulation to distinguish the legitimate stocks with the illegitimate companies. Soon companies stopped paying dividends to investors and the government of England banned the issuing of shares until 1825. The emergence of the London Stock Exchange in 1817 made it possible to have limited exchange, however, it would not stop a superpower from being born.

### ***1.2.3. New York Stock Exchange of 18th Century***

This point in time gave way for the creation of the New York Stock exchange in 1817 marking an important moment in history. The first stock exchange in the United States was the Philadelphia Stock Exchange, however, the NYSE became the most powerful in the country due to domestic competition and the location at the center of US trade and economics in New York. The expansion of NYSE occurred beyond government bonds and bank stocks. Advanced telegraphic communication paved the way for buying and selling stocks through telegraphs, which made stock exchange very easy.

### ***1.2.4. Major Crashes in Stock Market history***

When a stock index drops severely in a matter of days of trading it is known as a stock market crash. A stock market crash is not the same as a stock market correction. When the market falls 10 percent from its 52 weeks high over days, weeks or months it is known as a stock market correction. However, the stock market crash is more sudden. Some of the major crashes in the stock market history are stated below-

### *The South Sea Bubble (1711)*

This speculation fueled fever centered around the riches of the South Sea Company. The main purpose of this company was to supply 4800 slaves per year for a span of 30 years to the Spanish plantations in Southern and Central America. The share of the company rose from 128.5 to 1000 in the first half of 1720. But in September the market started to crumble and by December stocks were down to 124.

### *The Stock Exchange Crash (1873)*

In the year 1873, the Stock Exchange Crash in Vienna was induced by uncontrolled speculation. This caused a major fall in the price of stocks and panic selling. The economic growth in Monarchy ended due to this crash. It caused the number of Vienna World Exhibition visitors to drop. Europe was affected by this crash gradually.

### *The Wall Street Crash (1929)*

One of the causes of the Great Depression in the 1930s was the collapse of the New York Stock Exchange in October 1929. The US stock market saw rapid growth in the 1920s. However, in 1929, production decreased, and unemployment rose, along with the increase in debt which contributed to the Wall Street Crash. Panic Selling began on October 21st and reached a stock trading record of 16,410,030 on NYSE in one day. To this day, this is known as the biggest crash in the history of financial markets, marking the beginning of the Great Depression that lasted for 12 years.

### *Black Monday (1987)*

Stock markets all over the world suffered a great crash which is known as Black Monday today. It started in Asia and violently made its way to the Western world. The theories for the

reasons for the crash are related to a drop in the US economy, a fall in oil prices and the rising conflict between Iran and the US.

### *The Dotcom Bubble Burst (1990)*

The commercialization of the internet which started in the 1990s gave hope to the future of online commerce. During that time, when a company had a “.com” suffix after their name, capitalists would invest in it recklessly. In spite of the market peaking, big companies put a huge sell order on their stock on March 10, 2000, which caused panic selling. The dot com companies went out of business within a couple of weeks.

### *The Asian Crash (1998)*

This crash in 1998 affected many rising economies in Asia along with some other countries like Russia and Brazil. It started in Thailand and gradually spread across Hong Kong, Indonesia, Malaysia, and South Korea.

### *The Financial Crisis (2008)*

This market crash is notorious in the history of the stock market crashes. During this time the Wall Street banks’ high-risk trading almost caused the collapse of the US economy. After the Great Depression, this is considered to be the worst economic disaster. After this disaster, the US housing bubble burst and Lehman Brothers’ collapse nearly destroyed the world’s economy.

### *The Flash Crash (2008)*

The US stock market went through a crash in May 2010, that only lasted for 36 minutes, but managed to wipe out billions off the stock prices of the big companies. It did not have a big impact on the US economy. The theory of potential reasons for this crash is ‘fat-fingered’ trading which is basically a keyboard error in technical trading and an illegal cyberattack. The reason why this crash is very impressive is that some securities lost 99% of their value.



### Chinese Market Crash (2015-2016)

This crash occurred in China's stock market on June 12, 2015, and again on July 27 and August 24, 2015. The Chinese government tried to stabilize the market but however, the drops kept repeating. As panic selling began, mainland shares lost the value of \$3 million in just three weeks.

### ***1.3. Common Terminologies***

Some of the common terminologies related to stock market trading are described below:

***Annual Report:*** An annual report is a report prepared by a company that's intended to impress shareholders. It contains tons of information about the company, from its cash flow to its management strategy. When you read an annual report, you're judging the company's solvency and financial situation.

***Arbitrage:*** Buying and selling the same security in different markets and at different price points.

***Bear Market:*** Trading talk for the stock market is in a downward trend or a period of falling stock prices.

***Beta :*** A measurement of the relationship between the price of a stock and the movement of the whole market. If stock XYZ has a beta of 1.5, that means that for every 1 point move in the market, stock XYZ moves 1.5 points and vice versa.

***Bull Market:*** When the stock market as a whole is in a prolonged period of increasing stock prices. It's the opposite of a bear market. A single stock can be bullish or bearish too, as can a sector, which I'll describe later on.

***Broker:*** A person who buys or sells an investment for you in exchange for a fee (a commission).

***Close:*** The NYSE and Nasdaq close at 4 p.m., with after-hours trading continuing until 8 p.m. The close simply refers to the time at which a stock exchange closes to trading.

**Day Trading:** The practice of buying and selling within the same trading day, before the close of the markets on that day.

**Dividend:** A portion of a company's earnings that is paid to shareholders, or people that own that company's stock, on a quarterly or annual basis. Not all companies pay dividends.

**Haircut:** A haircut is an extremely thin spread between the bid and asks prices of a given stock. It can also refer to a situation in which a stock price gets reduced by a specific percentage for margin trades or other purposes.

**Index:** A benchmark that is used as a reference marker for traders and portfolio managers. A 10 percent return may sound good, but if the market index returned 12 percent, then you didn't do very well since you could have just invested in an index fund and saved time by not trading frequently.

**Initial Public Offering (IPO):** An IPO is the first sale or offering of stock by a company to the public. It happens when a company decides to go public rather than remain solely owned by private or inside investors.

## ***1.4. Investment Options***

Often in the investment world, a person would likely only know about stocks as a common investment option due to its frequent mention in the news. Surprisingly, however, there are several more ways to invest one's capital. These include stocks, bonds, mutual funds, and real estate - each of which even has sub-options, thus expands their scope even more.

### ***1.4.1. Stocks***

The first option, stock, is a type of security that signifies proportionate ownership in the issuing corporation<sup>[1]</sup>. Corporations issue stock to raise funds for their business operations. Since buying stocks gives investors a portion of company ownership, they would generally buy stocks

from the companies which they believe will increase in value over time. This investment option has the greatest risk due to its high volatility and market fluctuation, especially in the short term. In the long term, however, stocks have historically outperformed most other investments over the long run <sup>[3]</sup>.

There are two main types of stock: common stock and preferred stock. While both offer investors a piece of ownership in a company, preferred stocks come with no voting rights. This means that preferred stockholders cannot vote on choosing the company's board of directors or deciding its policies. In addition, similar to bondholders, preferred stockholders are guaranteed a fixed dividend in perpetuity. On the other hand, common stocks' dividends can vary greatly depending on the board of directors' decision. In fact, lots of companies, including many big ones such as Google and Amazon, do not even pay out dividends to common stocks at all <sup>[4]</sup>.

#### ***1.4.2. Bonds***

The second option, bond, can be viewed as a loan made by an investor to companies or governments, with a similar purpose to stock of funding their business operations. Bonds are considered fixed-income investments and typically make regular interest payments to investors until it matures, or, in other words, expires. Upon a bond maturity, the investor is returned a full amount of their original principal. Therefore, bond investment is often called a "buy-and-forget" investment. This option is generally much safer than stocks. In the worst case, when a company goes bankrupt, bondholders get priority on payment by selling the company's assets, while stockholders most likely lose all their investment capital.

The important key to remember is that bond prices are inversely correlated with interest rates: when rates go up, bond prices fall and vice-versa <sup>[5]</sup>. There are two main reasons for this correlation. First, if the bond issuers are more credit-worthy, meaning they are more likely to pay

back their debts, their bonds will obviously be worth more, and the interest rates will get lower. Second, bonds are naturally subject to the supply and demand rules. Accordingly, if the general interest rates rise beyond the bond yield, bonds would become unattractive to investors. As the demand for bonds falls, so does its price.

There are four main types of bonds: Government bonds, corporate bonds, municipal bonds and agency bonds. A government bond is issued by a national government, aimed to support government spending. Specifically, bonds issued by the Treasury with a year or less to maturity are called “Bills”; bonds issued with 1 – 10 years to maturity are called “notes”; and bonds issued with more than 10 years to maturity are called “bonds”. The entire category of bonds issued by a government treasury is often collectively referred to as "treasuries". Municipal bonds are issued by states and local governments, usually aim to support constructions of local infrastructure and education facilities, thus are exempt from federal taxes and state taxes. Agency bonds are those issued by government-affiliated organizations. These bonds are not fully guaranteed in the same manner as the government and municipal bonds. Corporate bonds are issued by companies, and generally have a higher risk than government bonds, thus have higher interest rates paid to investors.

### ***1.4.3. Mutual fund***

The third investment option, mutual fund, is typically a mix of other investments options. Putting money in a mutual fund lets the fund managers, who are generally considered more experienced and mature investors, help invest the investors’ money into a basket of different investments. This basket includes, but not limited to, various types of stocks and bonds. In this sense, mutual funds immediately provide you a super-diversified portfolio. If the fund’s total investments return profits, you will be able to gain a portion of that profit, while the rest goes to

the fund managers. The investor typically also has to pay a monthly fee for the portfolio management tasks. The most popular mutual fund currently is the Vanguard Total Stock Market Index Fund, which provides capitalization-weighted exposure to the entire U.S. equity universe across all sizes and styles, thus diversifying your portfolio across all sectors of the U.S. economy.

#### ***1.4.4. Real estate***

The fourth investment option, real estate, allows you to set your mind outside of the traditional idea of stocks and bonds. Real estate investing involves the purchase, ownership, management, rental and/or sale of real estate for profit. Investors in this market view houses as commodities, which they can buy, then either rent it out to others to finance it over years or sell it when the price is high. Real estate is an asset form with limited liquidity relative to other investments. In addition, it is usually capital intensive and highly cash flow dependent.

There are four common ways to invest in the real estate market. First, an investor can purchase a house and rent it out to others, effectively becoming a landlord. This provides the investor with a regular income while maximizing available capital through leverage. As long as he or she can maintain the property in good condition, this is generally considered a long term financial victory. Second, an investor can join real estate investment groups, thus be relieved from the stress of property management. This idea is similar to mutual funds that invest mainly in rental properties. Third, one can use the technique of real estate development to buy and sell housing properties frequently. Specifically, an investor can purchase an undervalued property, spend some capital on upgrading and repairing it, then sell it for high profit. Apparently, real estate trading requires deeper market knowledge and some marketing skills. Last but not least, one can invest their capital in real estate investment trusts (REITs) - an option that does not involve a traditional

real estate transaction. REITs are similar to dividend-paying stocks: instead of investing in companies, one can invest in undervalued properties and trust that its value would rise in the future.

#### ***1.4.5. Benefits of having many investment options***

The fact that there are many investment options is great news. This means that different people with varied risk profiles can create a suitable portfolio, one that can offer a variety of returns, thus make their portfolio more well-rounded, diverse, and generally safer.

### ***1.5. Stocks versus other financial instruments***

So, what is a financial instrument? According to Investopedia, financial instruments are assets or packages of capital that can be traded. The assets can be cash, the right to receive or deliver cash, or ownership of an entity.

Although there are a plentiful number of financial instruments, we wanted to focus on the instruments that are widely known, which are:

- Stocks
- Bond
- Mutual Fund
- High-interest savings account

#### ***1.5.1. Stocks versus Bonds***

First, the advantages and disadvantages of stocks and bonds are compared. Stock is sold by companies to investors, the companies are selling a part of their ownership indicated by shares. On the other hand, unlike stocks which represent ownership, bonds represent debt. A bond is when the investors loan money to a corporate or government. These debts will be paid off after a period of time with a fixed interest rate. The biggest advantage, which can also be the biggest disadvantage of stocks is the value of your stocks depends on the invested company. Since you

own the shares in profits and losses, if the company is doing well, the value of your stocks can increase drastically over time, but the price of your stock could also fall, or even be worthless if the company performs poorly. Since your investment will be paid back unless the company does not have the capability to do so, bonds are the low-risk-low-reward option.

### ***1.5.2. Stocks versus Mutual Fund***

A mutual fund is an investment made by professionals that collected a great amount of funds from multiple investors. Instead of choosing companies by yourself, mutual funds allow you to invest in different companies in one transaction through a “middleman”. This is ideal for people who do not want to spend time researching the market. Another advantage of having mutual funds is because each investor owns a smaller number of shares, the risk of losing everything is lower than investing by yourself. On the other hand, there are also a few disadvantages to this investing option. Since the mutual funds are usually managed by professionals, there is an annual fee to each fund, which can be quite significant depending on the fund. Also, many funds have an investment minimum, usually of \$1,000.

If you do not want to spend a lot of time researching the market or are afraid of the risk of investing alone, then investing in a mutual fund would be a better option.

### ***1.5.3. Stocks versus high interest saving account***

A savings account is also a great financial instrument. Currently, most banks offer savings account with an annual percentage yield (APY) of 2%, which means a balance of \$5,000 would give you \$100 after a year. This is a good option for somebody who does not have time to research the stock market and invest, or who need the cash in the near future. The downside of this option is the low profit gained from saving money. If there is a long-term goal that requires a lot of money, investing in stocks would be a better option.

## ***1.6. Past research on stock simulation at WPI***

There are over 100 studies in the WPI library database. The aim of most of the research was to gain personal trading experience by simulating stock trading using different strategies. Some common strategies used by the simulations include day trading, scalping, swing trading, breakout trading, long term trading, penny stock trading. Something to note is that the penny stock trading often yielded stark results as compared to other conservative strategies. For example, in one of the IQPs, penny stock trading yielded 75.5% percent as compared to the next highest-grossing strategy, day trading, which yielded only 9.78 percent [2]. The penny stock trading strategy is a high-risk high reward strategy, and most strategies in the simulations were not alike. Overall, students got great insight regarding stock trading that they could potentially utilize in the future in their life outside of the project.



# **Chapter 2: Strategies**

## ***2.1. Chapter Overview***

The main objective of this chapter is to introduce different trading strategies used in the stock market presently, for example - day trading, scalping, momentum trading, penny stock trading, value investing and technical trading. Analysis will be conducted on each strategy to figure out what makes each of them unique and what their benefits and risks are. Each member will choose one among the six strategies and perform simulations for this project. The simulation will be conducted on a web-based software known as Investopedia.

## ***2.2. Day Trading***

Day trading is the practice of buying in and selling out in a short timeframe, typically a day. The objective is to acquire a small profit on every trade, which will accumulate into a good amount of profit over time. As technology advances, day trading becomes more viable for investors through online stockbrokers and cheap trades. However, day trading might be only suitable for decisive and risk loving. They are the ones who are disciplined enough to stick to a clear plan and avoid emotions, such as fear or greed that might cause them severe losses.

## ***2.3. Scalping***

Scalping can be considered to be a subsection of short-term investment. For this trading strategy, the trader is expecting to profit from the price changes between the time they buy and sell the stocks. This is like trend trading because both strategies tend to buy when the trend goes down and sell when the trend goes up. But the main difference between the two is while trend traders usually hold their stocks until they start to see the trend going downward and vice versa, scalpers would sell right when they start to make a profit no matter how big or small it is.

A good scalper is a trader who has more wins than losses while keeping the profits equals or bigger than the losses. However, if the trader doesn't sell the stocks in time, one large loss can wipe out all the profits that you have obtained.

This strategy makes sense since smaller moves happen more frequently than larger ones, no matter how big or small the markets or stocks are. This also means smaller gains can be obtained easier unless the market or stock prices suddenly move due to a phenomenon.

## ***2.4. Momentum Trading***

Momentum trading is more or less like a sudden reaction to market information. The main idea of momentum trading is selling the stocks that are going down in price and buying stocks with a rising trend in price. It is very different from the conventional Wall Street adage which is, "buy low, sell high."

The father of momentum trading, Richard Driehaus believed that more money can be made if he abided by the philosophy "buying high and selling higher". He was a true believer in selling the losers and letting the winners ride while he reinvested the money from the losers in other stocks that were starting to rise. Many techniques that he used has now become the basic fundamentals of momentum trading.

Momentum trading takes advantage of market volatility by buying stocks that are going up and selling them as soon as they show signs of going down. The investor then moves the money from the stocks that were sold to other stocks that are rising. An investor in momentum trading also takes advantage by leading a pack of investors in which is known as investor herding and then being the first one to take the money and run. Momentum trading requires a sophisticated approach which involves following certain risk management rules to notice volatility of the market,

overcrowding and detection of hidden traps that may reduce profit. The four important elements of momentum trading are stated below:

- Careful selection of equities
- Timing of opening and closing trades is what the risk revolves around
- Entry timing which means getting into the trade early
- Exit points require consistent monitoring

For momentum trading the best option is liquid securities. Liquid securities mean the securities of an issuer that are not an affiliate of the company and can be traded publicly on the New York Stock Exchange. There are some certain risks which the investor has to be wary of to avoid failure of the momentum trading strategy such as: jumping into a position before confirmation of momentum move, closing the position after saturation has reached, missing changing trends and keeping a position open overnight as stocks are more susceptible to change after the close of the day's trading.

Momentum trading is very time intensive and market sensitive. Even though momentum trading comes with many risk factors, it can certainly turn into large profits within a short period of time for the investors who can handle the risks involved by sticking to the strategy.

## ***2.5. Penny Stock Trading***

Penny stocks refer to small company stocks that trade less than 5 dollars per share. Some of the stocks are traded over the counter transactions. These transactions take place through electronic over the counter bulletin board or through the privately-owned Pink Sheets. There is no trading floor for over the counter transactions. In the past, penny stocks refer to stocks that traded for less than 1 dollar per share until the U.S Securities and Exchange Commission modified the definition to any stocks that are below five dollars a share. Penny stocks do carry high risk as they

have a lack of liquidity or ready buyers. Because of the low liquidity investors have difficulty finding a price that accurately reflects the market, investors could lose a sizeable amount or all their investment. Due to the fact that penny stocks offered on the marketplace are often growing companies, they carry a high amount of risk typically the higher level of risk can result in a high level of volatility.

Penny stocks are volatile as there is a lack of information available to the public. The information is much more difficult to find as compared to well-established companies referred to as blue-chip companies. The information available about penny stocks may not come from credible sources. Companies listed on the pink sheets are not required to file with the Securities and Exchange Commission making it so that the businesses do not receive the same public scrutiny as stocks represented on the NYSE, Nasdaq, and other markets. Lack of history also factors to why penny stocks have a high risk. Many of the companies are newly formed and some approaching bankruptcy. These companies will generally have poor track records or no track record making it hard to determine a stock's potential. Another risk that is associated with penny stocks is liquidity. Investors find it hard to sell the stock once acquired and will need to lower their price until it is considered attractive to another buyer. Therefore, investors should analyze the companies from which they are buying to avoid fraud, scammers with techniques like "pump and dump".

## ***2.6. Value Investing***

Value investing is an investment practice of purchasing securities whose market value is below its estimated intrinsic value. This investment practice revolves around three major ideas:

First, Benjamin Graham, the famous founding father of this technique, provides his own definition of real investment. According to him, an investment operation is one which, upon thorough analysis, promises safety of principles and a satisfactory return. Operations not meeting

these criteria are speculative <sup>[9]</sup>. Under this definition, the majority of investment strategies utilized nowadays would be considered speculative.

Second, each company has their own intrinsic value (often referred to as book value). A novice investor or security analyst usually calculates such value as a company's total assets minus its total liabilities. Though this is theoretically correct, many corporations often employ various techniques to inflate their actual intrinsic value in order to attract more investments, thus hinder many serious investment operations. Investors could only attempt to estimate the correct intrinsic value of the company by performing both quantitative and qualitative analysis.

Third, value investing endorses the inefficient market theory. An inefficient market is one in which an asset's market prices do not always accurately reflect its true value. Simply put, the market is considered irrational and unpredictable in the short run but will eventually correct itself over the long run.

By combining these three ideas together, one could understand the core idea of value investing. Investors should generally focus on protecting their principles and generating satisfactory returns. In order to achieve such a goal, they should perform a thorough analysis of that company in an attempt to understand it as well as to estimate its intrinsic value. Afterwards, they could take advantage of the inefficient market's price fluctuations and purchase securities that are below its estimated intrinsic value.

It is worth mentioning that the goal of security analysis is not to convince the investor that the market evaluation of the company is incorrect, but rather helps him/her to not be convinced that the market evaluation of the company is correct. Simply put, since an investor can make mistakes on his own analysis, he should always insist on a margin of safety when purchasing a security.

## ***2.7. Martingale trading***

Martingale Trading is much different to other trading strategies in the sense that it is free of any bias towards any particular direction a stock moves in, or what stock it is applied on. The only thing that is important for Martingale trading is that the price moves in one direction for certain amount, and due to that any stocks that get stuck in certain price ranges are risky for Martingale trading. To avoid such a situation, stocks with high volatility and strong trends are preferred.

In Martingale trading a trade is opened in a certain direction, and if the stock moves in the opposite direction of the initial trade, a second trade double the value of the first one is now opened in the opposite direction. This process is repeated until all trades opened in that stock result in overall profit, at which point the trades are closed. Due to this doubling the bet nature of Martingale trading, it can be very risky and high drawdowns can occur frequently; therefore, it is advisable to use this strategy with a significant amount of cash available only.

## **Chapter 3: Day Trading (Minh Pham)**

### ***3.1. Simulation Goal and Strategy***

For this simulation, we will be given \$1,000,000 to start. As discussed above, the profits we make each day might only account for a small percentage of the investment money. However, as traders make a small profit daily, by the end of the simulation, the amounts can add up to a considerable number. Moreover, due to the high volatility of the stocks, day trading includes a lot of risks. Within a day, a stock can deviate around 10% from its open price and the difference between the lowest and highest price can be approximately 24%. This means that traders can potentially make 24% or lose the same percentage of investment money. That being said, the stop and target of each trade should be limited to around 7-10%. If we use one-tenth of the total money to trade, the limit would be 0.7% of the total money. Ultimately, the goal of this method is to experiment and learn how to read trends so we can select the low and high of the stock price in order to obtain profits.

Day trading can turn out to be a profitable career, as long as you do it properly. However, it can be challenging for beginners who do not have a clear and well-planned strategy. This method of trading requires stocks to be chosen wisely. Day traders use a variety of intraday methods such as scalping, range trading, news-based trading, high-frequency trading (HFT), etc.

Day trading is difficult because it requires the traders to be discipline and insusceptible to emotions. Hence, one needs to have clear rules and trading methods for this strategy to be effective. There are multiple rules that the trader needs to set such as trade frequency, the time interval for waiting for the price to reach a local peak, the stop and target for each trade, etc.

In terms of trading frequency, one should only perform from one to five trades per day. This limit is set to refrain traders from losing to emotions and make irrational trades to make up for losses. They will have to use a minimum of \$20,000 and a maximum of \$50,000 per trade. Additionally, traders are not allowed to use borrowed money to trade.

As mentioned above, the stop and target of each trade will vary from 7-10% of the purchase price. This rule will not allow traders to control the risk of investment but also control their emotions.

The stock market is open from 9:30 AM and closes at 4:00 PM. That being said, most purchases should be made in the first 6 hours. If the stock price decreases or destabilizes in the last 10 minutes, traders may make an exception and purchase stocks for next-day usage. As the stock price reaches the target price in the last 30 minutes, traders can still sell their stocks. Last but not least, if a rapid increase in price occurs but followed by a small decrease, traders can be flexible and choose when to sell the stocks.

### ***3.2. Companies Selected***

Day traders make a profit by taking advantage of the high volatile characteristic of stocks. As a result, for this simulation, we will choose companies based on the volume and volatility of stocks. For example, Figure 3.2.1 below is Trillium Therapeutics Inc. stock price on January 24, 2020.





Figure 3.2.1 Trillium Therapeutics Inc (TRIL). Stock Price on Jan 24, 2020

From the figure, the difference between the lowest and highest stock price is 24%, showing that the price is highly volatile. A purchase between 10:50 AM - 12:47 PM and a sell between 1:08 PM - 3:30 PM can yield a considerable profit.

Below is the figure of the company stock on January 24, 2020.



Figure 3.2.2 Miragen Therapeutics, Inc (MGEN). Stock Price on Jan 24, 2020

Even though the price of MGEN decreases throughout the day if traders can purchase at a local minimum and sell at a local minimum, they can still make around 20% of the investment money. From these 2 examples, we can see that profits can be made from stocks with high volatility. That being said, here are the stocks that we will use for this simulation: Trillium Therapeutics (TRIL), Advaxis (ADXS), Acorda Therapeutics (ACOR), NanoViricides (NNVC), Agile Therapeutics (AGRX), Advanced Micro Devices (AMD), Bellicum Pharmaceuticals (BLCM), Co-Diagnostics (CODX), Biopharmx (BPMX), and AIM ImmunoTech (AIM).

### ***3.3. Simulation Week 1***

After the first week of simulation, the total net change is \$39,402 (without commission fee). If we take commission fee into account, we would still make a profit of \$38,922. No trades were made on the first day of the week since we want to use it to investigate all the companies' stocks. The result of the simulation for the rest of the week is shown in Table 4.1 below.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
01/27/20							1000000	
01/28/20	ARGX	Buy	3.5	29325	102637.5		897362.5	
	CEI	Buy	1.69	56497	95479.93		801882.57	
	ACOR	Buy	2.26	45871	103668.46		698214	
	ARGX	Sell	3.79	29325	111141.75	8504.25	809355.75	8504.25
	CEI	Sell	1.8	56497	101694.6	6214.67	911050.35	14718.92
	ACOR	Sell	2.11	45871	96787.81	-6880.6	1007838.16	7838.27
01/29/20	TRIL	Buy	4.3385	23049	99998.1		907840.06	
	AIM	Buy	0.93	107526	99999.18		807840.88	
	AEMD	Buy	3.15	31746	99999.9		707840.98	
	TRIL	Sell	4.4455	23049	102464.33	2466.23	810305.31	10304.5
	AIM	Sell	1.01	107526	108601.26	8602.08	918906.57	18906.58
	AEMD	Sell	3.4285	31746	108841.16	8841.26	1027747.73	27747.87
01/30/20	AEMD	Buy	3.7448	26703	99997.4		927750.33	
	ACOR	Buy	2.11	47393	99999.23		827751.11	
	NNVC	Buy	10.25	9756	99999		727752.11	
	AEMD	Sell	4.05	26703	108147.15	8149.76	835899.26	35897.63
	ACOR	Sell	2.01	47393	95259.93	-4739.3	931159.19	31158.33
	NNVC	Sell	11.08	9756	108096	8097	1039255.19	39255.33
01/31/20	AIM	Buy	1	100000	100000		939255.19	
	CEI	Buy	1.65	60606	100000		839255.19	
	AEMD	Buy	3.93	25445	100000		739255.19	
	AIM	Sell	0.95	100000	95000	-5000	834255.19	34255.33
	CEI	Sell	1.63	60606	98787.78	-1212.2	933042	33043.11
	AEMD	Sell	4.18	25445	106360	6360	1039402	39402

*Table 3.3.1. Simulation week 1 day trading*

All trades were purchased 10 minutes after the market opened in order to get a sense of how volatile the stock is. Most of the stocks would eventually deviate around 8% from the purchasing price. There were occasions when stocks were sold when the price decreased 6% from the original price because the trader decided that the stocks would not go up by looking at their charts throughout the day. By following the rules, we managed to make 8 profitable trades out of 12 trades.

### **3.4. Simulation Week 2**

The second week of day trading simulation was worse than the previous week with multiple negative trades. Out of a total of 18 sells, only 3 trades were made because the price of stock reached a local maximum peak high enough for us to sell. Hence, one of the next rules to set for

next week will be reducing the percentage deviation needed to sell/buy a stock. The data of the second week simulation is shown in Table 3.4.1 below.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							1039402	
02/03/20	ADXS	Buy	0.82	121951	100000		939402.18	
	BLCM	Buy	12.9	7752	100000		839401.38	
	CODX	Buy	3.1588	31657	99998.13		739403.25	
	ACOR	Buy	2.05	48780	100000		639403.25	
	ADXS	Sell	0.839	121951	102316	2316	741719.25	2316
	BLCM	Sell	13.95	7752	108140	8140	849859.25	10456
	CODX	Sell	3.01	31657	95287.57	-4710.56	945146.82	5745.44
	ACOR	Sell	2.015	48780	98291.7	-1708.3	1043438.52	4037.14
02/04/20	TRIL	Buy	4.121	24266	100000		943438.52	
	BPMX	Buy	0.41	243902	100000		843438.52	
	NNVC	Buy	9.62	10395	100000		743438.52	
	TRIL	Sell	4.02	24266	97549.32	-2450.6	840987.84	1586.46
	BPMX	Sell	0.41	243902	100000	0	940987.84	1586.46
	NNVC	Sell	8.85	10395	91995.75	-8004.3	1032983.59	-6417.79
02/05/20	BLCM	Buy	14.67	6816	99990		932993.59	
	TRIL	Buy	3.99	25062	99997.38		832996.21	
	AIM	Buy	1.05	95238	99999		732997.21	
	BLCM	Sell	15.9	6816	108374.4	8384.4	841371.61	1966.61
	TRIL	Sell	3.96	25062	99245.52	-751.86	940617.13	1214.75
	AIM	Sell	1.06	95238	100952.28	953.28	1041569.41	2168.03
02/06/20	TRIL	Buy	3.786	26413	100000		941569.41	
	BPMX	Buy	0.42	238095	100000		841569.41	
	ACOR	Buy	2.14	46728	99997.92		741571.49	
	NNVC	Buy	8.73	11454	99993.42		641578.07	
	TRIL	Sell	3.8	26413	100369.4	369.4	741947.47	2537.43
	BPMX	Sell	0.41	238095	97618.95	-2381.1	839566.42	156.38
	ACOR	Sell	2.085	46728	97427.88	-2570.1	936994.3	-2413.66
	NNVC	Sell	8.72	11454	99878.88	-114.54	1036873.18	-2528.2
02/07/20	ADXS	Buy	0.9015	110926	100000		936873.18	
	BLCM	Buy	11.2	8928	99993.6		836879.58	
	AEMD	Buy	2.74	36496	100000		736879.58	
	AIM	Buy	1.04	96153	100000		636879.58	
	ADXS	Sell	0.9032	110926	100188	188	737067.58	-2340.2
	BLCM	Sell	10.151	8928	90628	-9365.6	827695.58	-11705.8
	AEMD	Sell	2.6	36496	94889	-5111	922584.58	-16816.8
	AIM	Sell	0.96	96153	92306.88	-7693.1	1014891.46	-24509.9

*Table 3.4.1 Simulation week 2 day trading*

Compared to the first week, the stocks were not very volatile in the second week. Multiple trades were made simply because the trading hours were coming to an end. So even though more trades were made than week 1, there are more losses than profits. That being said, another rule that we

are going to add for the following weeks is that we will choose stocks to trade based on their volatility of the previous day and week.

In conclusion, traders will purchase the same amount of stocks with similar timing and rules. Two more rules will be added are: (1) reducing the percentage deviation to buy/sell a stock from 8% to 4%; and (2) choose stocks to trade based on their previous day/week volatility.

### 3.5. Simulation Week 3

For week 3, the new simulation rule is that we decrease the percentage change in price needed to sell the stock to be 4%. Furthermore, we choose to buy a stock when the price decreases 2% from the opening price. We hope that since the stock is volatile, if it decreases by 1-2% from the opening price, there is a high chance that it will increase by 1-2% from the opening price, which adds up to around 2-4% percentage if we can purchase at the right time. Trades in week three are shown in Table 3.5.1 below.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							1014891.46	
02/10/20	TRIL	Buy	3.76	26595	99997.2		914894.26	
	NNVC	Buy	6.82	14662	99994.84		814899.42	
	TRIL	Sell	3.68	26595	97869.6	-2127.6	912769.02	-2127.6
	NNVC	Sell	7.39	14662	108352	8357.16	1021121.02	6229.56
02/11/20	CODX	Buy	6.82	14662	99994.84		921126.18	
	AMD	Buy	53.37	1873	99961.45		821164.73	
	CODX	Sell	7.25	14662	106299.5	6304.66	927464.23	12534.2
	AMD	Sell	54.47	1873	102022.3	2060.86	1029486.54	14595.1
02/12/20	NNVC	Buy	7.85	12738	99993.3		929493.24	
	CODX	Buy	7.4	13513	99996.2		829497.04	
	NNVC	Sell	8.164	12738	103993	3999.7	933490.04	18594.8
	CODX	Sell	7.27	13513	98239.51	-1756.7	1031729.55	16838.1
02/13/20	TRIL	Buy	3.68	27173	99996.64		931732.91	
	ARGX	Buy	3.43	29154	99998.22		831734.69	
	TRIL	Sell	3.8	27173	103257	3260.36	934991.69	20098.5
	ARGX	Sell	3.9	29154	113700.6	13702.4	1048692.29	33800.9
02/14/20	TRIL	Buy	3.66	27322	99998.52		948693.77	
	NNVC	Buy	7.1	14084	99996.4		848697.37	
	TRIL	Sell	3.51	27322	95900.22	-4098.3	944597.59	29702.5
	NNVC	Sell	7.86	14084	110700.2	10703.8	1055297.83	40406.3

Table 3.5.1 Simulation week 3 day trading

The chosen target and stop percentage seemed to work well in the simulation therefore in the next few weeks, no change will be made to the target and stop. Additionally, the volatility of some of our initial chosen stocks are decreasing, we will have a different strategy of selecting stocks to trade. Based on the stocks' recent history, we will select the stocks to trade at the beginning of the week with the hope that the stocks are still volatile throughout the week.

### 3.6. Simulation Week 4

This week, trader decided to choose other stocks to trade with higher volatility outside the initial list of chosen stocks. Most of the trades were positive. The result of week 4 simulation is shown in table 3.6.1 below.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							1055297.83	
02/18/20	TWMC	Buy	3.41	29325	99998		955299.83	
	AGRX	Buy	3.9585	25262	99999		855300.83	
	ACOR	Buy	1.73	57803	99999		755301.83	
	TWMC	Sell	3.5	29325	102637.5	2639.5	857939.33	2639.5
	AGRX	Sell	4.03	25262	101805.86	1806.86	959745.19	4446.36
	ACOR	Sell	1.79	57803	103467	3468	1063212.19	7914.36
02/19/20	TWMC	Buy	3.36	29761	99996		963216.19	
	TRUE	Buy	3.695	27063	99997		863219.19	
	TWMC	Sell	3.32	29761	98806.52	-1189.48	962025.71	6724.88
	TRUE	Sell	3.77	27063	102027.51	2030.51	1064053.22	8755.39
02/20/20	TWMC	Buy	3.33	30030	99999		964054.22	
	AGRX	Buy	3.44	29069	99997		864057.22	
	ACOR	Buy	1.68	59523	99998		764059.22	
	TWMC	Sell	3.39	30030	101801.7	1802.7	865860.92	10558.09
	AGRX	Sell	3.48	29069	101160	1163	967020.92	11721.09
	ACOR	Sell	1.64	59523	97617.72	-2380.28	1064638.64	9340.81
02/21/20	TWMC	Buy	5.78	17301	99999		964639.64	
	AGRX	Buy	3.15	31746	99999		864640.64	
	TWMC	Sell	6.42	17301	111072.42	11073.42	975713.06	20414.23
	AGRX	Sell	3.07	31746	97460.22	-2538.78	1073173.28	17875.45

Table 3.6.1 Simulation week 4 day trading

Week 4 was somewhat successful. Out of ten trades, seven trades actually reach their targets. Therefore, for next week, we will continue to trade using our strategy. Stocks will be chosen based on their previous weeks' volatilities. Even though some stocks continue to rise after

we sell them, we will not increase the target percentage in order not to increase risks and still maintain consistent profits.

### **3.7. Simulation Week 5**

Even though the profit is still positive for this trading week, we made a lot less progress than simulation week 4. As we can see in table 3.7.1, we made a profit of \$1615.47, which is only around 9% of last week's. One reason for this loss might be that this week's stock market was not opened for all 5 days. Another reason is that the Corona Virus is affecting all businesses. Since our method of trading depends on selecting the right local minimum to buy and we also set a threshold of when to buy/sell to reduce as much as loss as possible. Since next week the stock market will open for all 5 days, we will continue with our trading strategy to see the overall profit and see if we need to make any changes.

<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>
							1073173.28	
02/24/20	TWMC	Buy	4.84	20661	99999		973174.28	
	AGRX	Buy	3.1	32258	99999		873175.28	
	ACOR	Buy	1.36	73529	99999		773176.28	
	TWMC	Sell	4.9824	20661	102941.36	2942.36	876117.64	2942.36
	AGRX	Sell	3.055	32258	98548.19	-1450.81	974665.83	1491.55
	ACOR	Sell	1.405	73529	103308.24	1491.55	1077974.07	4433.91
02/25/20	TWMC	Buy	4.85	20618	99997		977977.07	
	TRUE	Buy	3.31	30211	99998.41		877978.66	
	TWMC	Sell	4.7719	20618	98387	-1610	976365.66	2823.91
	TRUE	Sell	3.27	30211	98789.97	-1208.44	1075155.63	1615.47

*Table 3.7.1 Simulation week 5 day trading*

### **3.8. Simulation Week 6**

Week 6 simulation is the second week so far, besides simulation week 2, that we experienced a loss in profit. Out of 12 trades, while half of them lead to a profit, the loss still outweighs and overall reduces our total money by \$2117.1. Details of all trades are below in the Table 3.8.1.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							1075155.63	
03/02/20	ACOR	Buy	1.45	68965	99999		975156.63	
	AGRX	Buy	2.69	37174	99998.06		875158.57	
	TWMC	Buy	3.93	25445	99998.85		775159.72	
	ACOR	Sell	1.42	68965	97930.3	-2068.7	873090.02	-2068.7
	AGRX	Sell	2.63	37174	97767.62	-2230.44	970857.64	-4299.14
	TWMC	Sell	4	25445	101780	1781.15	1072637.64	-2517.99
03/03/20	ACOR	Buy	1.38	72463	99998.94		972638.7	
	TWMC	Buy	4.11	24330	99996.3		872642.4	
	AGRX	Buy	2.57	38910	99998.7		772643.7	
	ACOR	Sell	1.35	72463	97825.05	-2173.89	870468.75	-4691.88
	TWMC	Sell	4.19	24330	101942.7	1946.4	972411.45	-2745.48
	AGRX	Sell	2.518	38910	97975.38	-2023.32	1070386.83	-4768.8
03/04/20	ACOR	Buy	1.23	81300	99999		970387.83	
	TWMC	Buy	4.24	23584	99996.16		870391.67	
	ACOR	Sell	1.2	81300	97560	-2439	967951.67	-7207.8
	TWMC	Sell	4.32	23584	101882.88	1886.72	1069834.55	-5321.08
03/05/20	ACOR	Buy	1.23	81300	99999		969835.55	
	TWMC	Buy	4.24	23584	99996		869839.55	
	ACOR	Sell	1.2	81300	97560	-2439	967399.55	-7760.08
	TWMC	Sell	4.32	23584	101882.88	1886.88	1069282.43	-5873.2
03/06/20	ACOR	Buy	1.12	89285	99999.2		969283.23	
	TWMC	Buy	4.06	24630	99997.8		869285.43	
	ACOR	Sell	1.14	89285	101784.9	1785.7	994284.43	-4087.5
	TWMC	Sell	4.14	24630	101968.2	1970.4	1096252.63	-2117.1

*Table 3.8.1 Simulation week 6 day trading*

### ***3.9. Simulation Week 7***

This week's simulation was a special week, the number of people who got infected with the novel virus increased exponentially, which had a major effect on the stock market. All the trades are below in Table 3.8.2.



Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							1096252.63	
03/09/20	ACOR	Buy	1.09	91743	99999.87		996252.76	
	TWMC	Buy	3.96	25252	99997		896255.76	
	NNVC	Buy	11.7	8547	99999		796256.76	
	ACOR	Sell	1.06	91743	97247.58	-2752.29	893504.34	-2752.29
	TWMC	Sell	3.88	25252	97977.76	-2019.24	991482.1	-4771.53
	NNVC	Sell	11.93	8547	101965.71	1966.71	1093447.81	-2804.82
03/10/20	ACOR	Buy	1.09	91743	99999.87		993447.94	
	TWMC	Buy	3.94	25380	99997.2		893450.74	
	NNVC	Buy	8.82	11337	99992.34		793458.4	
	ACOR	Sell	1.04	96153	95412.72	-4587.15	888871.12	-7391.97
	TWMC	Sell	3.86	25380	97966.8	-2030.4	986837.92	-9422.3
	NNVC	Sell	8.99	11337	101919.63	1927.29	1088757.55	-7495.08
03/11/20	ACOR	Buy	1.07	96153	102883.71		985873.84	
	TWMC	Buy	3.83	26109	99997.47		885876.37	
	NNVC	Buy	7.29	13717	99996.93		785879.44	
	ACOR	Sell	0.98	96153	94229.94	-8653.77	880109.38	-16148.85
	TWMC	Sell	3.75	26109	97908.75	-2088.72	978018.13	-18237.57
	NNVC	Sell	7.43	13717	101917.31	1920.38	1079935.44	-16317.19
03/12/20	ACOR	Buy	0.95	105263	99999.85		979935.59	
	TWMC	Buy	2.86	34965	99999.9		879935.69	
	NNVC	Buy	8.5	11764	99994		779941.69	
	ACOR	Sell	0.93	105263	97894.59	-2105.26	877836.28	-18422.45
	TWMC	Sell	2.91	34965	101748.15	1748.25	979584.43	-16674.2
	NNVC	Sell	8.33	11764	97994.12	-1999.88	1077578.55	-18674.08

*Table 3.9.1 Simulation week 7 day trading*

This week simulation yielded not only a loss but it has also become the week that had the second highest loss since simulation week 1. Out of 12 trades, 8 of them were negative, leading to a reduction of \$18,674 to our total money.

### **3.10. Simulation Week 8**

This week was another week where the stock market was hit again by the novel virus outbreak. However, after 2 weeks with consecutive losses, we managed to get back on our feet and made a profit. The result of this week is below in Table 3.10.1.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							1077578.55	
03/16/20	ACOR	Buy	0.87	114942	99999.54		977579.01	
	AMD	Buy	39.08	2558	99966.64		877612.37	
	ACOR	Sell	0.887	114942	101953.55	1954.01	979565.92	1954.01
	AMD	Sell	39.86	2558	101961.88	1995.24	1081527.8	3949.25
03/17/20	ACOR	Buy	0.77	129870	99999.9		981527.9	
	AMD	Buy	40.19	2488	99992.72		881535.18	
	ACOR	Sell	0.785	129870	101947.95	1948.05	983483.13	5897.3
	AMD	Sell	39.38	2488	97977.44	-2015.28	1081460.57	3882.02
03/18/20	ACOR	Buy	0.75	133333	99999.75		981460.82	
	AMD	Buy	39.54	2529	99996.66		881464.16	
	ACOR	Sell	0.765	133333	101999.74	1999.99	983463.9	5882.01
	AMD	Sell	38.74	2529	97973.46	-2023.2	1081437.36	3858.81
03/19/20	ACOR	Buy	0.77	129870	99999.9		981437.46	
	AMD	Buy	39.54	2529	99996.66		881440.8	
	ACOR	Sell	0.785	129870	101947.95	1948.05	983388.75	5806.86
	AMD	Sell	38.74	2529	97973.46	-2023.2	1081362.21	3783.66
03/20/20	ACOR	Buy	0.87	114942	99999.54		981362.67	
	AMD	Buy	41.51	2409	99997.59		881365.08	
	ACOR	Sell	0.8874	114942	101999.53	1999.99	983364.61	5783.65
	AMD	Sell	40.67	2409	97974.03	-2023.56	1081338.64	3760.09

*Table 3.10.1 Simulation week 8 day trading*

This week, we made a total profit of \$3,760.09. Even though 4 out of 10 trades yield negative outcomes, by sticking to the selling strategy, we were able to control the loss to some extent. As a result, since we made more positive trades, a profit was made. Moreover, this week's simulation experienced lots of miss opportunities where stock price increased very fast, however we missed the short amount of time where the price kept going up, and later the price stabilized again at a high price, so we could not purchase that stock anymore.

### ***3.11. Simulation Week 9***

Simulation week 9 marked another week where we were able to make a profit. The novel coronavirus outbreak was still getting worse, causing the stock market to reduce in value again. The results of week 9 can be seen in table 3.11.1 below.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							1081338.64	
03/23/20	ACOR	Buy	0.95	105263	99999.85		981338.79	
	AGRX	Buy	1.62	61728	99999.36		881339.43	
	ACOR	Sell	0.93	105263	97894.59	-2105.26	979234.02	-2105.26
	AGRX	Sell	1.6524	61728	101999.34	1999.98	1081233.36	-105.28
03/24/20	ACOR	Buy	0.92	108695	99999.4		981233.96	
	AGRX	Buy	1.68	59523	99998.64		881235.32	
	NNVC	Buy	5.86	17064	99995.04		781240.28	
	ACOR	Sell	0.9016	108695	97999.41	-1999.99	879239.69	-2105.27
	AGRX	Sell	1.72	59523	102379.56	2380.92	981619.25	275.65
	NNVC	Sell	5.74	17064	97947.36	-2047.68	1079566.61	-1772.03
03/25/20	ACOR	Buy	0.91	109890	99999.9		979566.71	
	NNVC	Buy	5.2	19230	99996		879570.71	
	ACOR	Sell	1.02	109890	112087.8	12087.9	991658.51	10315.87
	NNVC	Sell	5.096	19230	97996.08	-1999.92	1089654.59	8315.95
03/26/20	ACOR	Buy	1.03	97087	99999.61		989654.98	
	NNVC	Buy	4.88	20491	99996.08		889658.9	
	ACOR	Sell	1	97087	97087	-2912.61	986745.9	5403.34
	NNVC	Sell	4.97	20491	101840.27	1844.19	1088586.17	7247.53
03/27/20	ACOR	Buy	1.09	91743	99999.87		988586.3	
	AGRX	Buy	1.95	51282	99999.9		888586.4	
	NNVC	Buy	6	16666	99996		788590.4	
	ACOR	Sell	1.11	91743	101834.73	1834.86	890425.13	9082.39
	AGRX	Sell	1.91	51282	97948.62	-2051.25	988373.75	7031.14
	NNVC	Sell	5.88	16666	97996.08	-1999.92	1086369.83	5031.22

*Table 3.11.1 Simulation week 9 day trading*

This week's stock market was more volatile than last week's. Since we are doing day trading, it can be a good sign. This week, we performed a total of 12 trades, 7 out of which were negative. However, on March 25, we bought ACOR stock at 0.91. The price that we were supposed to sell was around 0.928, but the stock jumped straight to 1.02. We decided to buy right away and for only that stock we made already \$12,087.9. This made up for the losses for the 7 negative trades and therefore yielded us a total profit of \$5,031.22.

### ***3.12. Simulation Week 10***

This week is the last simulation week for us. That being said, as the total amount of profit from the first simulation week so far has accumulated to a decent number, we decided to try a new trading strategy. We bought stocks and sold them in short windows (15-minute window) when the

stock price just increased in the last 5 minutes quickly after a decrease for a long time. The result for simulation week 10 is shown in table 3.12.1 below.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							1086369.83	
03/30/20	TWMC	Buy	3.38	29585	99997.3		986372.53	
	NNVC	Buy	5.7	17543	99995.1		886377.43	
	TWMC	Sell	3.42	29585	101180.7	1183.4	987558.13	1183.4
	NNVC	Sell	5.814	17543	101995	1999.9	1089553.13	3183.3
03/31/20	TWMC	Buy	3.39	29498	99998.22		989554.91	
	NNVC	Buy	6.15	16260	99999		889555.91	
	TRUE	Buy	2.41	41493	99998.13		789557.78	
	TWMC	Sell	3.32	29498	97933.36	-2064.86	887491.14	1118.44
	NNVC	Sell	6.027	16260	97999.02	-1999.98	985490.16	-881.54
	TRUE	Sell	2.38	41493	98753.34	-1244.79	1084243.5	-2126.33
04/01/20	TWMC	Buy	3.33	30030	99999.9		984243.6	
	NNVC	Buy	5.75	17391	99998.25		884245.35	
	TRUE	Buy	2.44	40983	99998.52		784246.83	
	TWMC	Sell	3.39	30030	101801.7	1801.8	886048.53	-324.53
	NNVC	Sell	5.635	17391	97998.28	-1999.97	984046.81	-2324.5
	TRUE	Sell	2.39	40983	97949.37	-2049.15	1081996.18	-4373.65
04/02/20	TWMC	Buy	3.15	31746	99999.9		981996.28	
	NNVC	Buy	5.17	19342	99998.14		881998.14	
	TWMC	Sell	3.21	31746	101904.66	1904.76	983902.8	-2468.89
	NNVC	Sell	5.27	19342	101932.34	1934.2	1085835.14	-534.69
04/03/20	TWMC	Buy	3.06	32679	99997.74		985837.4	
	NNVC	Buy	4.87	20533	99995.71		885841.69	
	TRUE	Buy	2.15	46511	99998.65		785843.04	
	TWMC	Sell	3.12	32679	101958.48	1960.74	887801.52	1426.05
	NNVC	Sell	4.96	20533	101843.68	1847.97	989645.2	3274.02
	TRUE	Sell	2.1	46511	97673.1	-2325.55	1087318.3	948.47

*Table 3.12.1 Simulation week 10 day trading*

The new strategy that we were using proved to be still working for us. In total we made 13 trades, 7 out of which were positive. The stock for TWMC was not so volatile and we made the decision to sell it not because it reached the selling target but because the stock market was about to close. That to some extent explained why even though the number of positive trades were more, the final profit was only \$948.47. The final week of simulation is the 3rd consecutive week that yielded us a profit. Given the fact that the stock market is going down due to the shutdown of many businesses, our trading strategy seemed to work fine and consistently.

### 3.13. Conclusion

The simulation started on Monday, January 27th. After 10 weeks, the simulation ended on Friday, April 3rd. The overall weekly simulation is below in table 3.12.1. Please note that the “Profit” column is accumulated from previous weeks.

<b>Week</b>	<b>Weekly Profit</b>	<b>Total Money (\$1,00,000)</b>	<b>Total Profit</b>
<b>Week 1</b>	39,402	1,039,402	39,402 (3.9402%)
<b>Week 2</b>	-24,510	1,014,891	14,891 (1.4891%)
<b>Week 3</b>	40,406	1,055,297	55,297 (5.5297%)
<b>Week 4</b>	17,875	1,073,173	73,173 (7.7173%)
<b>Week 5</b>	1,615	1,075,155	75,155 (7.5155%)
<b>Week 6</b>	-2,117	1,096,252	96,252 (9.6252%)
<b>Week 7</b>	-18,674	1,077,578	77,578 (7.7578%)
<b>Week 8</b>	3,760	1,081,338	81,338 (8.1338%)
<b>Week 9</b>	5,031	1,086,369	86,369 (8.6369%)
<b>Week 10</b>	948	1,087,318	87,318 (8.7318%)

*Table 3.13.1 Weekly overall profit over 10 weeks*

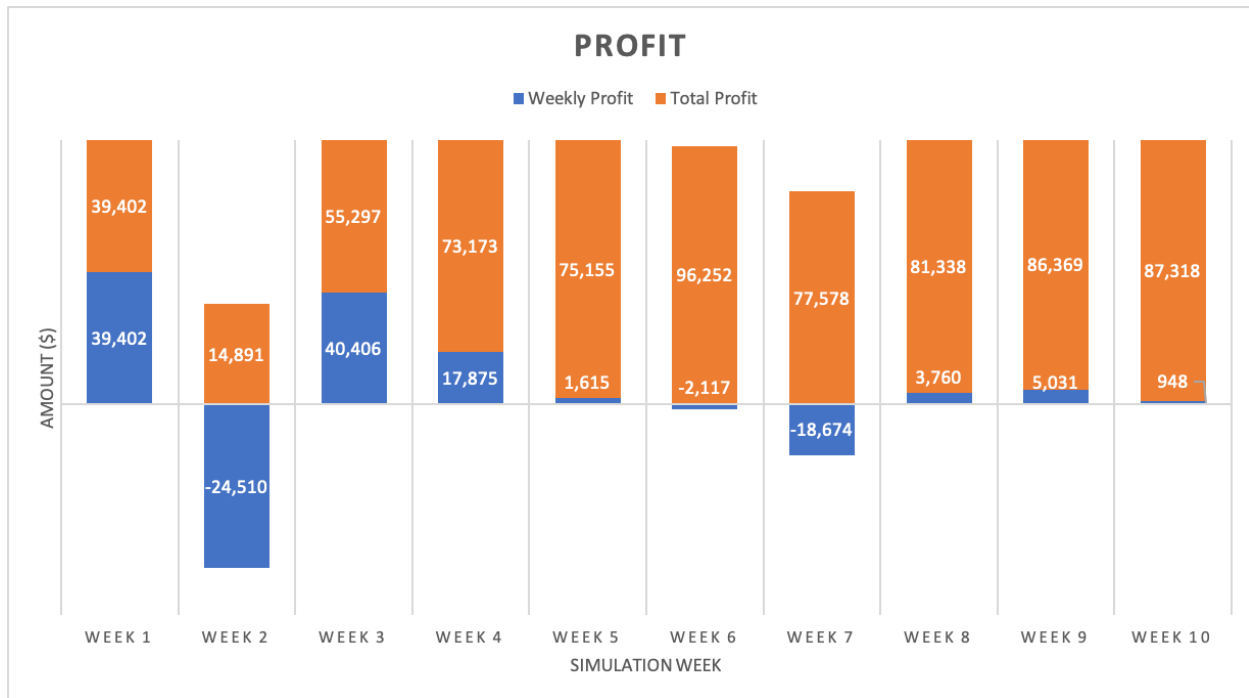
The total profit of the simulation, the total number of trades made with profit and loss are shown in Table 3.14.1 below.

<b>Starting money</b>	\$1,000,000
<b>Ending money</b>	\$1,087,318
<b>Profit</b>	\$87,318 (8.318%)
<b>Total of trades</b>	114
<b>Number of positive trades</b>	59 (51.75%)
<b>Number of negative trades</b>	55 (48.25%)

*Table 3.13.2 Overall trades data*

Overall, the simulation went well. There are a few noticeable details about day trading compared to other types of trading strategies. Day trading does not get affected greatly by news and after hour trade since we made the decision to purchase based on the local minimum of the stock price and not the opening price. Target and loss cutoffs are very important for day trading because it reduces the loss and at the same time secures profit within the trade. Stocks that possess daily high volatility are good for trading purposes. However, such stocks also contain the risks of losing money. As long as we maintain a consistent loss cutoff, the amount of losing will be

minimal. The time when the price is stabilizing after a decrement from the opening price is the good time to buy stocks. However, buying stock when it is stabilizing after an increment might be a 50-50 as it could create a local maximum. On the other hand, buying stock when it is increasing is good for short duration trading.



*Table 3.13.3 Profit/Losses*

Simulation week 2 marked the first time we made a significant loss. After this event, we reduced the percentage change in price needed to buy/sell stock from 6% to 3% and then 2%. This explained why we made the largest profit in the first simulation week, which was followed by a major loss and then a profit again in simulation week 3. From simulation week 4 on, a special event occurred, the novel virus outbreak, which led to the reduction in values of stock as well as unpredictability. However, we managed to maintain a small profit every week most of the time while keeping the loss low. This can be seen from the consistency of orange bars in Table 3.13.3.

In conclusion, the simulation went well, not only are we able to generate a profit, but it provides me with a lot of understanding of the stock market. Even though we were able to get about 8.73% in profit with this trading strategy, we should be aware of the fact that this is not real money. When it comes to real money, the decision of when to purchase or buy a stock will put a lot more pressure on us as it will determine whether the trade is negative or not. The pressure of losing thousands of dollars in a single day may be a difficult one to handle.

## Chapter 4: Scalping (Nghia Nguyen)

### *4.1. Simulation Goal and Strategy*

For this simulation, \$1,000,000 would be used to trade over a span of 8 weeks. Since scalping relies heavily on adding up smaller profits, each of the gain is not expected to be greater than 1%. Therefore, the goal of this simulation is to gain around 10% of the amount that is invested in, which is \$1,000,000. Furthermore, we hope to gain more experience with how to be a good scalper and how to maximize our profit.

Scalping is based on the fact that stock values can go either way at any given time. A good scalper can make as many small profits as possible without losing a lot of money. This is different from swing trading (momentum trading), which has the mindset of letting your profit go until you start to see the sign of the stock value decreasing. This goal can be obtained by increasing the number of wins during a day, or a week and giving up the size of the wins. By adding up the profits gained from the wins and minimizing the amount of losses, scalpers are able to make money in the long run.

The most important characteristic of a good scalper is they have to be disciplined. Because scalping works best when the market is choppy (prices swing up and down for a short period of time), scalpers need to be efficient when executing orders. If a decision is not made at the right time, a big loss can wipe out multiple small wins. Since the profit margin is very narrow, orders must be executed to perfection.

A good scalper also needs to understand the charts, especially the one-minute chart. By understanding the charts, scalpers can make the right decision at the right time. Furthermore, spotting the trend and momentum would also benefit a scalper. Similar to momentum trading,



understand the momentum would make the trades more profitable, which could be done by reading the charts and the daily news.

Another thing to keep in mind is the cost to execute orders. Because sometimes, the profits gained by scalping can be small, it would not be ideal if the profit gained from the trade is \$50 and the cost to execute order is \$20. Because we're using Investopedia simulator, the commission for each trade is \$19.99. But for real-life trading, the choice of brokers should be considered based on the amount of commission each broker wants.

Finally, companies with a set of characteristics must be chosen correctly to maximize the profit gained from scalping. A good market for scalpers is the one that has volume and liquidity. This could also be a double-edged sword. When the market becomes too liquid, slippage may happen. For example, to maximize the wins, scalpers would buy around 1000 stocks from a company. But when the value of the stocks goes down, having 1000 stocks will create more losses than having 500 stocks. So the amount of stocks to buy for each company should also be considered before each order.

To recap, there are 3 main tips for a beginner scalper:

1. Don't stick with a stock for a long amount of time.
2. Don't get greedy and accept your profit.
3. Cut losses immediately.

## 4.2. Companies Selected

Since scalping is a type of day trading, different companies will be chosen based on the market each day. There are a few characteristics that we are looking for when choosing companies to scalp every day, but the most significant attribute is volume. We want a market that is volatile enough throughout the day to create a profit out of small changes but should not be too volatile so that the change would be unpredictable. A few examples of the companies that we are looking for are:

### 1. Apple Inc. (AAPL):



Figure 4.2.1: Apple Inc. Stock price (30 minutes chart)

### 2. Microsoft Corporation (MSFT):



Figure 4.2.2: Microsoft Corporation stock price (30 minutes chart)

3. The Boeing Company (BA):



Figure 4.2.3: The Boeing Company stock price (30 minutes chart)

As we can see from the three examples, the 30 minutes charts can clearly show the volatility of the markets. By exploiting the small changes in market price in 30 minutes to an hour, scalping can help traders to add up the profits from multiple small wins.

The other characteristic that I will look into during the simulation is the market price of the stocks. Throughout the simulation, volatile stocks at different market price points will be investigated to see the pros and cons of investing based on the market price of the stocks.

Some of the companies I might invest in during the simulation are:

1. Apple Inc. (AAPL)
2. The Boeing Company (BA)
3. The Walt Disney Company (DIS)
4. General Electric Company (GE)
5. The Home Depot, Inc. (HD)
6. NIKE, Inc. (NKE)
7. Tesla, Inc (TSLA)
8. Microsoft Corporation (MSFT)
9. Amazon.com, Inc (AMZN)
10. Intel Corporation (INTC)

### ***4.3. Simulation Week 1***

Since we started our simulation during the very first week of the Corona Virus outbreak, the stock market was down for a few days, which was a perfect opportunity for us to start trading. For the first two days of trading, I tried to trade with companies that have a different stock price to see what is the correlation between the stock price and the profit gained from each trade. The stock price ranges from around \$12/stock (GE) to \$1840 (AMZN). The decision of buying and selling was made based on the 1-minute chart of each stock. If the stock price was on a downward trend, I would sell it immediately to minimize the loss, and if the stock gains a significant amount of profit, I would sell immediately so that the price would not unpredictably drop. After a few trials, I decided to stick with the stocks that have prices ranging from \$100 to around \$600, since it would be easier to predict the trend to buy and sell accordingly and maximize the profit from the small wins.

As I was researching the strategy before the simulation, everyone mentioned the fact that in order to be a successful scalper, you need to be disciplined. This is the main reason why scalping is not a popular strategy for beginners who just got into stock trading, and I got the chance to experience the difficulty of this strategy during the first week. Our main goal is to minimize the number of losses and maximize the number of wins, but as we can see in table 4.3.1, I lost 7 out of 15 trades, which make a winning percentage of 53.33%, which is not ideal for scalping. According to rangingbull.com's guide to scalping, an ideal win rate would be around 80%, which would be my goal for each week from now. I was not able to decisively make decisions in time, which was the reason why some of the losses are enormous compared to the wins ( -5548.48 with TSLA on 1/28/2020 and -4497.98 with AAPL on 1/31/2020).

Hopefully, with time and experience, I would be able to be more disciplined with my decisions and improve on my winning percentage.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
1/28/2020	MSFT	Buy	163.49	500	81764.99		918235.01	
	AMZN	Buy	1833.5	50	91694.99		826540.02	
	TSLA	Buy	571.35	500	285695.49		540844.53	
	MSFT	Sell	165.01	500	82482.51	717.52	623327.04	717.52
	AMZN	Sell	1840.35	50	91997.51	302.52	715324.55	1020.04
	DIS	Buy	137.67	1000	137689.99		577634.56	
	TSLA	Sell	560.33	500	280147.01	-5548.48	857781.57	-4528.44
	AAPL	Buy	315.75	1000	315769.99		542011.58	
	DIS	Sell	137.56	1000	137535.01	-154.98	679546.59	-4683.42
	AAPL	Sell	316.74	1000	316720.01	952.02	996266.6	-3731.4
1/29/2020	TSLA	Buy	570.45	500	285244.99		711021.61	
	MSFT	Buy	167.04	1000	167059.99		543961.62	
	AAPL	Buy	324.52	500	162279.49		381682.13	
	TSLA	Sell	572.12	500	286040.01	795.02	667722.14	-2936.38
	AAPL	Sell	323.02	500	161490.01	-789.48	829212.15	-3725.86
	MSFT	Sell	166.98	1000	166960.01	-99.98	996172.16	-3825.84
	BA	Buy	323.13	800	258523.99		737648.17	
	BA	Sell	324.05	800	259220.01	696.02	996868.18	-3129.82
1/30/2020	AAPL	Buy	332.37	800	257915.99		738952.19	
	GE	Buy	12.74	10000	127382.99		611568.2	
	AAPL	Sell	322.73	800	258164.01	248.02	869733.21	-2881.8
	MSFT	Buy	171.79	1200	206167.99		663565.22	
	AAPL	Buy	318.88	1000	318899.99		344665.23	
	MSFT	Sell	171.73	1200	206056.01	-111.98	550721.24	-2993.78
	TSLA	Buy	635.59	500	317814.99		232906.25	
	GE	Sell	12.67	10000	126680.01	-702.98	359586.26	-3696.76
		AAPL	Sell	321.37	1000	321350.01	2450.02	680936.27
	TSLA	Sell	646.66	500	323307.51	5492.52	1004243.78	4245.78
1/31/2020	AAPL	Buy	315.83	1000	315847.99		688395.79	
	AAPL	Sell	311.37	1000	311350.01	-4497.98	999745.8	-252.2

Table 4.3.1: Simulation Week 1 Scalping.

#### ***4.4. Simulation Week 2***

There was a significant improvement in my trading win rate for this week. I tried to minimize my losses by making sure that I would make profit through each trade, which also resulted in making relatively less trades compared to the first week. Even though I did not make as many trades as I did last week, I was able to spectate the stock prices at different time throughout the days, and I came to a few conclusions that I would use for the following weeks. Firstly, it would be easier for scalpers to manage one or two transactions each time. Since scalpers have to check the stock prices each minute, having more than two stocks at the same time would be almost impossible to manage, and if you miss a price point where it would be profitable to buy or sell, you will lose that trade immediately. Another point is that the stock prices are extremely unpredictable during the first 30 minutes after the market is open. Since most of the companies chosen for this simulation are volatile, not only I was not able to compare the price when the market was closed on the previous day to the price when the market was open on the next day, but also I was not able to compare the price minute-by-minute and see the trend. My solution was to start trading every day at around 10:30 to 11, when I could see the trend and predict if the price is going to go up or down for me to make transactions. Finally, by looking at the 1-minute chart for multiple stock prices, I found out that at around 3 p.m., because the market is almost closed, there were a significantly smaller amount of changes in stock prices. So I decided to change my strategy accordingly, by starting trading at around 11am and stop at around 3pm. And by looking at table 4.4.1, I think I have made the right decision.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
2/3/2020	TSLA	Buy	713.63	500	356834.99		642910.81	
	AAPL	Buy	311.58	1000	311599.99		331310.82	
	AAPL	Sell	312.36	1000	312340.01	740.02	643650.83	487.82
	TSLA	Sell	726.04	500	363000.01	6165.02	1006650.84	6652.84
2/5/2020	AAPL	Buy	320.78	500	160409.99		8476240.85	
	AAPL	Sell	321.35	500	160655.01	245.02	1006895.86	6895.86

Table 4.4.1: Simulation week 2 Scalping.

### 4.5. Simulation Week 3

Week Three saw a significant rise in profit. This was due to the fact that I was able to win trades off of the most volatile stocks in my list companies, which were Tesla, Inc. (TSLA), Apple Inc. (AAPL), and Microsoft Corporation (MSFT). The scalping technique worked well with highly volatile stocks, as we can see in Table 4.5.1, the total profit made from these three companies were around \$15000 for a week, which was remarkably impressive. I was able to predict the price of TSLA based on the trend seen from the stock price graph.



Figure 4.5.1: Stock price graph of Tesla, Inc. 2/13/2020



The upward trend was recorded for at least an hour, which was the main reason why I decided to trade Tesla, Inc. stocks and gained a profit of \$11981.62 for one trade.

This week I was able to understand how scalping can be less profitable for traders who do not have a big account. On 2/13/2020, I accidentally bought 600 shares of TSLA stocks, so I had to sell them immediately. I realized that as a scalper, multiple trades need to be made throughout the day, and with little profit with each trade, the commission price can add up quickly. I did not have to take into account the \$39.98 for each buy and sell transaction, but for a scalper that has a smaller account, they might have to take that into consideration for every transaction that they make.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
2/10/2020	DIS	Buy	141.12	1000	141139.99		865755.87	
	BA	Buy	344.20	1000	344219.99		521535.88	
	BA	Sell	344.11	1000	344087.01	-132.98	865622.89	6762.88
	DIS	Sell	141.52	1000	141500.01	360.02	1007122.9	7122.9
	AAPL	Buy	318.23	1000	318249.99		688872.91	
	AAPL	Sell	319.54	1000	319520.01	1270.02	1008392.92	8392.92
2/11/2020	TSLA	Buy	769.14	500	384589.99		623802.93	
	TSLA	Sell	773.49	500	386722.51	2132.52	1010525.44	10525.44
2/12/2020	MSFT	Buy	183.35	1000	183366.99		827158.45	
	AAPL	Buy	323.35	1000	323364.99		503793.46	
	AAPL	Sell	324.36	1000	324340.01	975.02	828133.47	11500.46
	MSFT	Sell	184.88	1000	184855.01	1488.02	1012988.48	12988.48
2/13/2020	TSLA	Buy	770.28	600	462187.99		550800.49	
	TSLA	Sell	770.28	600	462148.01	-39.98	1012948.5	12948.5
	TSLA	Buy	767.48	600	460510.39		552438.11	
	TSLA	Sell	787.52	600	472492.01	11981.62	1024930.12	24930.12

*Table 4.5.1: Simulation Week 3 Scalping.*

## 4.6. Simulation Week 4

Since this week starts with the Presidents' Day, we only had four days to trade, which means fewer opportunities for us to trade. But as the week went on, the stock market of multiple companies was on a downward trend. According to multiple news sources such as Yahoo Finance, this is due to the fact that the Corona Virus outbreak had reached the Western countries such as France and Italy. By looking at the stock price graph of multiple companies, we can clearly see the trend of the prices.



Figure 4.6.1: Stock prices of Apple Inc. 2/21/2020



Figure 4.6.2: Stock prices of The Boeing Company 2/21/2020



Figure 4.6.3: Stock prices of The Walt Disney Company 2/21/2020



Figure 4.6.4: Stock prices of Microsoft Corporation 2/21/2020

As we can see on the 1-minute stock prices graph of multiple companies on 2/21/2020, not only there were downward trends throughout the day, but also the stock prices did not fluctuate enough for scalpers to trade. This trend happened throughout the week, but luckily I was able to find a window where the stock prices of The Boeing Company (BA) and Apple Inc. (AAPL) were going up, which resulted in the win rate of 100% for week 4. Below is the list of transactions made throughout the week.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
2/19/2020	AAPL	Buy	323.22	1000	323237.99		701692.13	
	BA	Buy	337.08	1000	337099.99		364592.14	
	BA	Sell	338.96	1000	338935.01	1835.02	703527.15	26765.14
	AAPL	Sell	324.19	1000	324170.01	932.02	1027697.16	27697.16

Table 4.6.1: Simulation Week 4 Scalping.

## 4.7. Simulation Week 5

This week showed more progress than the previous week, as I was able to use the small changes of the stock prices to gain profit. As we can see in table 4.7.1 , we have made almost \$35000 in profit, which is 35% of the \$100000 profit that we aimed for at the beginning of the simulation. This is a good sign considering the Corona Virus outbreak is affecting all businesses. This points out that the price of the stocks does not matter for scalping, only the changes of the price throughout the day matter. Below is the list of transactions made throughout the week.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
2/26/2020	BA	Buy	308.03	1000	308047.99		719649.17	
	TSLA	Buy	791.52	600	474933.79		244715.38	
	BA	Sell	310.22	1000	310200.01	2152.02	554915.39	29849.18
	TSLA	Sell	795.20	600	477100.01	2166.22	1032015.4	32015.4
2/28/2020	AAPL	Buy	258.00	1000	258019.99		773995.41	
	TSLA	Buy	624.12	600	374491.99		399503.42	
	AAPL	Sell	268.87	1000	268850.01	10830.02	668353.43	42845.42
	TSLA	Sell	636.05	600	381607.01	7115.02	1049960.44	49960.44
	TSLA	Buy	645.69	600	387433.39		662527.05	
	AAPL	Buy	268.76	1200	322531.99		339995.06	
	AAPL	Sell	269.85	1200	323084.81	552.82	663079.87	50513.26
	TSLA	Sell	664.47	600	398662.01	11228.62	1061741.88	61741.88

*Table 4.7.1: Simulation Week 5 Scalping.*

## 4.8. Simulation Week 6

This week is another successful week for our portfolio considering how devastating the stock market is. By predicting the prices just by using news and trends, I was able to accurately predict the local maximum and minimum price value in order to trade accordingly. According to table 4.8.1, we have made about \$12000 in profit in total this week, which is out of my expectation.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
3/2/2020	AAPL	Buy	285.30	1500	427969.99		633771.89	
	MSFT	Buy	164.88	2000	329779.99		303991.9	
	AAPL	Sell	289.11	1500	433637.51	5667.52	737629.41	67409.4
	MSFT	Sell	166.36	2000	332700.01	2920.02	1070329.42	70329.42
3/6/2020	BA	Buy	259.58	1000	259599.99		810729.43	
	BA	Sell	262.80	1000	262780.01	3180.02	1073509.44	73509.44

*Table 4.8.1: Simulation Week 6 Scalping.*

#### **4.9. Simulation Week 7**

As we can see in the transaction list for this week, I did not make much progress in terms of profit. This is due to the fact that the stock market was significantly fluid, which made short term price prediction impossible to be conducted. Therefore, I did not make many transactions this week. Even though the market did not go as I expected, I was able to make a small profit throughout the week. After having two significantly successful weeks, this week was totally acceptable. Below is the list of transactions made throughout the week.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
3/13/2020	AAPL	Buy	261.17	1000	261189.99		812319.45	
	HD	Buy	194.02	1000	194039.99		618279.46	
	AAPL	Sell	260.35	1000	260330.01	-859.98	878609.47	72649.46
	HD	Sell	195.01	1000	194990.01	950.02	1073599.48	73599.48

*Table 4.9.1: Simulation Week 7 Scalping*

#### **4.10. Simulation Week 8**

At the end of week 7, the President of the United States of America declared a state of national emergency. Even though, this forced the stock prices to decrease, the stock market increased in price throughout the day. This was a great sign for scalpers to maximize their profit. As we can see in Table 4.10.1, I have made plenty of trades, focusing on big companies, which are the stable ones. Even though we got a lost trade for Berkshire Hathaway, our total profit increased significantly. Below is the list of transactions made throughout the week.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
3/17/2020	AAPL	Buy	253.96	1000	253979.99		819619.49	
	MSFT	Buy	145.30	1500	217969.99		601649.5	
	AAPL	Sell	255.86	1000	255840.01	1860.02	857489.51	75459.5
	MSFT	Sell	149.55	1500	219797.51	1827.52	1077287.02	77287.02
	BRK.B	Buy	183.34	1500	275029.99		802257.03	
	BRK.B	Sell	181.20	1500	271772.51	-3257.48	1074029.54	74029.54
3/20/2020	TSLA	Buy	463.25	800	370619.99		703409.55	
	NKE	Buy	71.98	5000	359919.99		343489.56	
	INTC	Buy	47.35	6000	284119.99		59369.57	
	TSLA	Sell	473.36	800	378668.01	8048.02	438037.58	82077.56
	INTC	Sell	47.93	6000	287560.01	3440.02	725597.59	85517.58
	NKE	Sell	73.09	5000	365405.01	5485.02	1091002.6	91002.6

*Table 4.10.1: Simulation Week 8 Scalping*

### **4.11. Simulation Week 9**

Because the status of the Corona Virus pandemic was getting worse, the stock market kept on decreasing in value. I was not able to trade a lot this week. This was because the stock market was not volatile enough to guarantee make any profit from scalping, so I decided to not trade in order to keep myself from having large losses. Below is the list of transactions made throughout the week.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
3/25/2020	AAPL	Buy	252.69	1000	252709.99		838292.61	
	AAPL	Sell	254.94	1000	254920.01	2210.02	1093212.62	93212.62

*Table 4.11.1: Simulation Week 9 Scalping.*

### **4.12. Simulation Week 10**

Even though the pandemic was still destroying the stock market, the market seemed to be much more volatile than last week. Thanks to that, I was able to capitalize on the small price changes and made some profit out of it. During the final week, I was able to gain a profit of around

\$5000, ending the simulation with the profit of \$103611.9. This was a success to me as the person who is learning to be a good trader. Below is the list of transactions made throughout the week.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
3/30/2020	TSLA	Buy	500.94	850	425818.99		667393.63	
	TSLA	Sell	508.37	850	432096.21	6277.22	1099489.84	99489.84
	TSLA	Buy	506.60	800	405299.99		694189.85	
	TSLA	Sell	509.53	800	407604.01	2304.02	1101793.86	101793.86
4/2/2020	AAPL	Buy	239.61	1000	239629.99		862163.87	
	MSFT	Buy	152.74	1500	229126.99		633036.88	
	MSFT	Sell	153.43	1500	230125.01	998.02	863161.89	102791.88
	AAPL	Sell	240.47	1000	240450.01	820.02	1103611.9	103611.9

*Table 4.12.1: Simulation Week 10 Scalping.*

### 4.13. Conclusion

The simulation started on Monday, January 27<sup>th</sup> and ended on Friday, April 3<sup>rd</sup>. Table 4.13.1 shows the amount of weekly profit, total profit and total cash obtained for each week over the course of 10 weeks.

Week	Weekly Profit	Total Profit	Total Cash
Week 1	-254.2	-254.2	999745.8
Week 2	7150.06	6895.86	1006895.86
Week 3	18034.26	24930.12	1024930.12
Week 4	2767.04	27697.16	1027697.16
Week 5	34044.72	61741.88	1061741.88
Week 6	11767.56	73509.44	1073509.44
Week 7	90.04	73599.48	1073599.48
Week 8	17403.12	91002.6	1091002.6
Week 9	2210.02	93212.62	1093212.62
Week 10	10399.28	103611.9	1103611.9

*Table 4.13.1: Weekly, total profit and cash over 10 weeks*

Figure 4.13.1 represent my weekly portfolio throughout the 10 weeks.



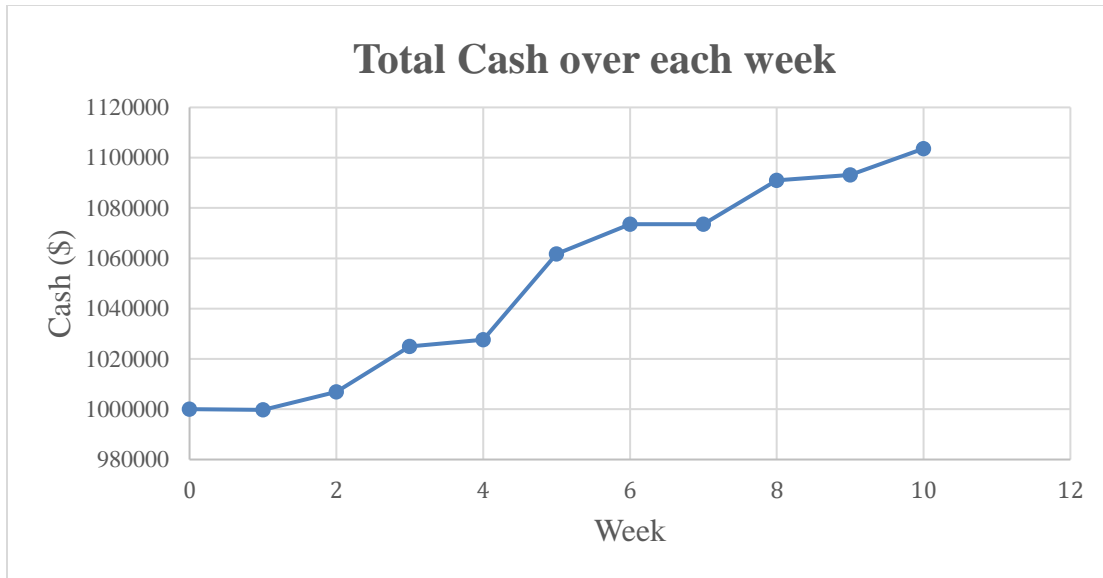


Figure 4.13.1 Weekly portfolio graph

Table 4.13.2 shows the overall data and statistics for the entire simulation.

Starting Money	\$1,000,000
Final Money	\$1,103,611.9
Profit	\$103,611.9 (10.36%)
Total amount of trades	50
Number of wins	39 (78%)
Number of losses	11 (22%)

Table 4.13.2: Overall trades data

Overall, considering how the Corona Virus, or COVID-19 is affecting the market, the simulation went significantly better than I expected. After 10 weeks of simulation, I have noticed a few key points to be a good scalper. Since scalping is a type of day trading, our performance is not affected by the news or current events. Because all the trades need to be made by the end of the trading session, the main thing we need to focus on is the stock prices' volatility. In order to scalp effectively, we need to find stocks that are volatile enough to make a profit, but not too much so that we cannot predict the trend anymore. And since we are making profit by stacking up the

small profit we make after each trade, we want to minimize the losses and maximize the wins, which I did pretty well for a first time scalper, with the win rate of 78%. Even though in the first two weeks, I had a lot of losses, but by learning from my mistakes, I was able to bounce back and increase the amount of winning trades. In conclusion, we were able to get 10.36%, which surpass our primary goal of getting 10% in profit. This is a good starting point in case I want to start investing in real life.

# Chapter 5: Momentum Trading (Aneela Haider)

## *5.1. Simulation Goal and Strategy*

For this momentum trading simulation, the investor will start with \$1,000,000. The simulation of the stock exchange will be carried out in an online virtual stock exchange platform called Investopedia and the simulation will last for 10 weeks. Momentum trading is a type of day trading along with some extra conditions. Usually in day trading stocks are bought at the beginning of the day and sold by the end of the day. Stocks are bought at a low price in hopes that the price will get higher by the end of the day and it can be sold. However for momentum trading, the stocks with an increasing price trend will be bought and once the stocks start showing the first signs of decrease in price they will be sold. The investor does not have to wait for the end of the day to do this. The goal of this strategy is to make a small profit everyday so that, by the end of the 8 week simulation, the small percentage of profit made every day could add up to a big number. In momentum trading it is recommended to not risk more than 1%. That is, if the investor invests \$10,000, they should not risk more than \$100. It is also important to have a closing limit for profits which in this case would be 2%. For each trade, the investor will use one-fourth of the total money. As a result, 2% limit would be 0.5% limit of total money. For every 3 trading days if the investor can make a minimum of one successful trade, then by the end of the 8 week simulation which is a total of 56 days, the investor can make a profit of  $56/3 \times 0.5\% = 9.33\%$ . Thus, the goal of this trading strategy is to buy stocks from the companies with a rising trend and selling the stocks as soon as they reach their high, and start dropping, hopefully making a total end profit around 9.33%.

Momentum trading strategy requires the investor to be very selective when choosing their stocks. For this trading strategy, the investor will look at a total of eight different companies and

then after analyzing the trend, they will buy the stocks that already has a rising trend but has not reached their high peak yet. The aim of this trading strategy is not to buy at the low peak, but to “Buy high and sell even higher”. Liquid securities are best when it comes to momentum trading. The securities that trade more than 5 million shares per day whenever possible should be looked for.

The key to making momentum trading successful is to choose the holding period wisely. The risk in momentum trading increases with the rise in holding period. It is very necessary to keep a keen eye for profitable exits. It is recommended to exit when the price is moving to an overextended technical state which is usually identified by a series of vertical bars on the 60 - min chart. There are other rules, the trader needs to set such as: time interval, number of trades, the stop and limit of each trade.

For frequency of trade, there should be a minimum of two trades per day and a maximum of 5 trades per day. This range was selected because it is essential for the investor to be completely aware of all their stocks and be cautious of any potential losses. Momentum trading is a very high risk trading strategy and as a result it is important to set a limit to the frequency of trades as a protocol for risk control. The investor should use a minimum of \$50,000 per trade and a maximum of \$300,000 per trade.

Another rule for risk control is setting the stop target. It is important to keep in mind that momentum trading is not the same as regular day trading. As a result, the stop target is different for each trade in case of momentum trading. The goal is to buy the stock when it is rising. If it keeps rising, it is important to let it ride until the first sign of descent is seen. As soon as the investor sees the price going down, the strategy is to sell the stock and take the money and leave before going into a loss.

Momentum trading is very time intensive. As this trading strategy takes advantage of the volatility of the stock market, momentum investors have to monitor the stock market details every day more than once. This strategy deals with stocks that will crest and go down again. As a result, investors need to jump in early and get out fast before incurring a loss. Since the stock market opens at 9:30 am, the first three hours will be used to purchase stocks. Since the stock market closes at 4 pm all stocks should be sold before that time so that they are not held overnight as that might be risky.

## ***5.2. Companies Selected***

Momentum trading is a type of day trading. This trading strategy is used to make profit by taking advantage of the volatility of the stock market. It is difficult to trade stocks of only ten companies to simulate this trading strategy as the stock market is very volatile and some stocks require weeks to go up. As a result, some of the regular companies might be switched with more active stocks for more profit in some weeks. Some of the companies that will be used almost every week is given below:

### **Intel Corporation (INTC)**

This company is engaged in designing and manufacturing various products and technologies popular in today's market. The segments of this company are Cloud Computing Group, Data Center Group, Intel Security Group etc. It provides services like computer and networking platforms.

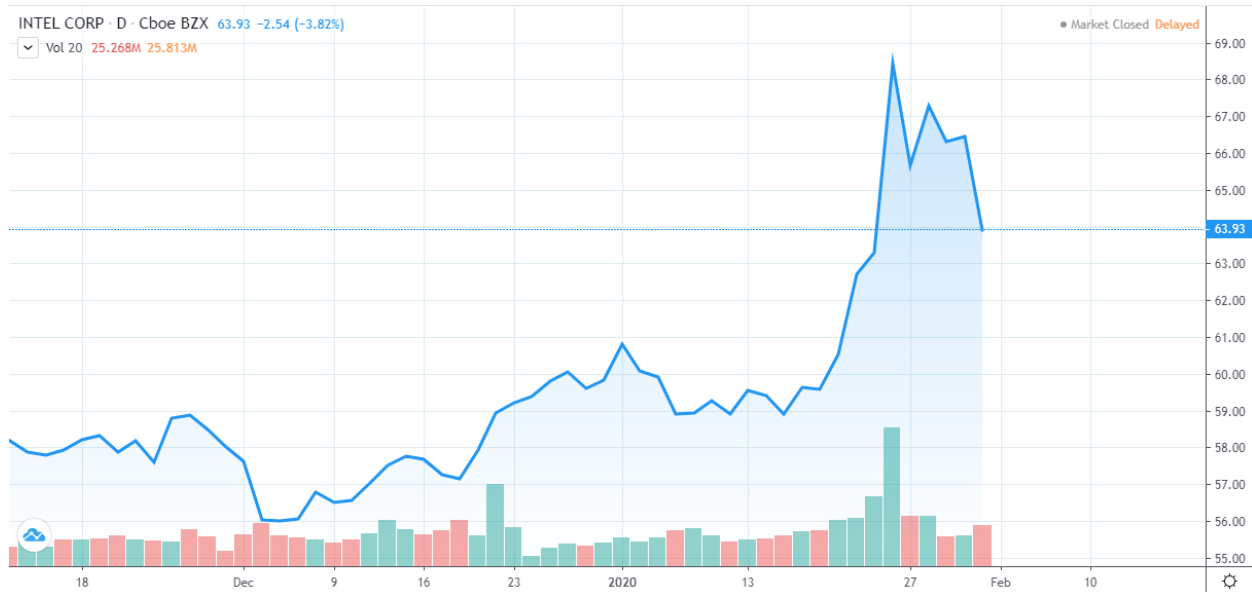


Figure 5.2.1: Stock price of Intel Corporation

### Credit Issue Nassau Velocity (TVIX)

This is a highly volatile company. It exists as an exchange traded fund. It is a highly volatile company which means the stock price fluctuates every day. It is usually low in the morning and goes up as the day advances. It is a perfect company to invest in for momentum trading.



Figure 5.2.2: Stock price of Credit Suisse Nassau Velocity

## Comcast Corporation (CMCSA)

This is a consumer service company that deals media and technology services like Cable and Satellite TV. The main reason to invest in Comcast Corporation is the fluctuation of stock price for this company. Being undervalued, the prices of the stocks change very frequently causing the company to have great potential when it comes to momentum trading.



Figure 5.2.3: Stock price of Comcast Corporation

## Advanced Micro Devices Inc (AMD)

AMD is a global company that makes semiconductors. This company deals with the manufacture of several electrical components like microprocessors as standalone devices or even incorporated into APUs, chipset, discrete graphics processing units (GPUs) etc. This company is currently at its high right now given the fact that their microprocessors are being used many recent electronic gadgets. However, the market price still changes every day making it a volatile asset. As a result, it is stock worth looking into when it comes to momentum trading.



Figure 5.2.4: Stock price of Advanced Micro Devices Inc.

### Cisco Systems Inc (CSCO)

Cisco Systems is a information technology company engaged in designing and commercializing a range of technologies across security, collaboration applications and networking. Some of its products include infrastructure platforms, security, applications etc. In the middle of this corona virus outbreak causing the recession of the global stock market, Cisco Systems still manages to remain one of the top U.S tech companies. As a result, it would be make a very reliable stock for the momentum trading.



Figure 5.2.5: Stock price of Cisco Systems Inc.



## Applied Materials Inc (AMAT)

Applied Materials is a producer manufacturing company that deals with the provision of materials engineering solutions that is used to manufacture new chips. The company is divided into several segments among which the Semiconductor Systems segment is the most popular. This segment is responsible for deposition of semiconductor equipment, implantation of ion, rapid thermal procession, wafer level packaging etc. AMAT is a very volatile stock with it stock prices rising and falling by a great extent each day. Its volatility makes it a great stock for momentum trading.



Figure 5.2.6: Stock price of Applied Materials Inc.

## Gilead Sciences Inc (GILD)

It is a biopharmaceutical company engaged in research, development and commercial manufacturing of medicine in the situation of medical need being unmet. The company mainly focuses in Human Immunodeficiency Virus, Acquired Immunodeficiency Syndrome, Oncology, inflammation and respiratory diseases by offering antiviral medication. Due present pandemic caused by the novel coronavirus, the company is trying to tackle Covid-19 with an experimental

corona virus treatment. This has sparked renewed interest for GILD, making it an excellent stock for momentum trading.



Figure 5.2.7: Stock price of Gilead Sciences Inc.

### 5.3. Simulation Week 1

The first week of trading went well. Most of the profit I made this week came from trading the stocks of the company TVIX on the first day of the week. The table above shows most of the stocks were bought in a bulk of around 3000. The companies I bought stocks from were very volatile causing the prices to hike up and down really quick. So I had to be very diligent in getting into the market as early as possible to see which stocks were rising and buy them. My strategy required me to keep track of the trends of all my stocks as much as possible as I needed to sell them as soon as they show any signs of the price going down before incurring a severe loss. However, since it was the first week, I did make an error of getting into the market pretty late in the day when the price was already high and not being able to get out in time causing me to incur a loss with some stocks.

Date	Symbol	Buy/ sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
1/27/20							\$1,000,000	
1/27/20	TVIX	buy	\$50.78	3000	\$152,340		\$847,660	
1/27/20	TVIX	sell	\$52.83	3000	\$158,490	\$6,150	\$1,006,150	\$6,160
1/27/20	ABBV	buy	\$84.42	2000	\$168,840		\$873,310	
1/27/20	ABBV	sell	\$84.47	2000	\$168,940	\$100	\$1,006,250	\$6,250
1/27/20	GILD	buy	\$63.31	1000	\$63,310		\$942,940	
1/27/20	GILD	sell	\$63.64	1000	\$63,640	\$330	\$1,006,580	\$6,580
1/28/20	AMD	buy	\$50.59	3000	\$151,770		\$854,810	
1/28/20	AMD	sell	\$50.47	3000	\$151,410	\$360	\$1,006,220	\$6,220
1/28/20	INTC	buy	\$67.56	3000	\$202,680		\$803,540	
1/28/20	INTC	sell	\$67.59	3000	\$202,770	\$90	\$1,006,310	\$6,310
1/29/20	CZR	buy	\$13.64	10000	\$136,400		\$869,910	
1/29/20	CZR	sell	\$13.77	10000	\$137,700	\$1,300	\$1,007,610	\$7,610
1/29/20	AAL	buy	\$27.03	5000	\$135,150		\$872,460	
1/29/20	AAL	sell	\$26.97	5000	\$134,850	\$300	\$1,007,310	\$7,310
1/30/20	PENN	buy	\$31.13	7000	\$217,910		\$789,400	
1/30/20	PENN	sell	\$31.16	7000	\$218,120	\$210	\$1,007,520	\$7,520
1/30/20	TVIX	buy	\$53.34	3000	\$160,020		\$847,500	
1/30/20	TVIX	sell	\$52.73	3000	\$158,190	\$1,830	\$1,005,690	\$5,690
1/30/20	ATUS	buy	\$27.12	5000	\$135,600		\$870,090	
1/30/20	ATUS	sell	\$27.41	5000	\$137,050	\$1,450	\$1,007,140	\$7,140
1/31/20	CY	buy	\$23.42	5000	\$117,100		\$890,040	
1/31/20	CY	sell	\$23.36	5000	\$116,800	\$300	\$1,006,840	\$6,840
1/31/20	VZ	buy	\$59.68	7000	\$417,760		\$589,080	
1/31/20	VZ	sell	\$59.63	7000	\$417,410	\$350	\$1,006,490	\$6,490

Table 5.3.1: Simulation Week 1 Momentum Trading

## 5.4. Simulation Week 2

This week I made a profit similar to the first week of simulation. I started off the first day of the week with stocks of the popular company Intel Corporation. It did not go so well as I made the mistake of estimating it to rise looking at the trend for the past couple of days. The bigger companies usually take a while for the price to rise. The price tends to stay the same for a couple of days and rise really slowly. But once it starts going down, it happens pretty quick. I failed to close the trade fast enough to not incur a big loss. However, the rest of the days of the week went by well without any failed trades. The highlight of this week was the GILD trade which was made on Thursday, 2/6/2020. I made a profit of \$4,130 within a span of 3 hours.

Every trade has a commission fee of \$19.99.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceed	Profit/ Loss	Total Cash	Total Profit
2/3/20							\$1,006,490	
2/3/20	INTC	buy	\$64.87	5000	\$324,370		\$682,120	
2/3/20	INTC	sell	\$64.60	5000	\$322,980	\$1,390	\$1,005,100	\$5100
2/4/20	CSCO	buy	\$47.29	5000	\$236,470		\$768,630	
2/4/20	CSCO	sell	\$47.51	5000	\$237,530	\$1,060	\$1,006,160	\$6,160
2/4/20	CMCSA	buy	\$43.51	5000	\$217,570		\$788,590	
2/4/20	CMCSA	sell	\$43.74	5000	\$218,680	\$1,110	\$1,007,270	\$7,270
2/5/20	VZ	buy	\$58.74	5000	\$293,720		\$713,550	
2/5/20	VZ	sell	\$59.05	5000	\$295,230	\$1,510	\$1,008,780	\$8,780
2/6/20	GILD	buy	\$66.18	5000	\$330,920		\$677,860	
2/6/20	GILD	sell	\$67.05	5000	\$335,230	\$4,310	\$1,013,090	\$13,090
2/7/20	MAT	buy	\$14.34	7000	\$100,400		\$912,690	
2/7/20	MAT	sell	\$14.35	7000	\$100,430	\$30	\$1,013,120	\$13,120

*Table 5.4.1: Simulation Week 2 Momentum Trading*

### **5.5. Simulation Week 3**

For week 3, a new rule I decided to stick to is performing two trades (one buy and one sell) per day. It helped me keep a better track of my stocks. I tried out this rule in week 2 that is on some days I only bought and sold from one certain company and realized it was easier to make a profit as I am consistently monitoring the trend of the stocks of that specific company.

Coming to the stocks I bought and sold this week, I was not able to make a huge profit. The stocks I estimated to have a high increase in the trend in price did not rise by that much and some of them ended up going down instead of increasing. If you take a look below at Table 5.5.1, it is seen that I incurred a loss with my trades on the dates February 10, 12 and 14. I assume the reason for this loss is because I entered the market too late on those days, which rendered my trading strategy useless. One of the important rules of momentum trading is to enter the market early and leave the market as soon as the stock shows the first sign of the price decreasing. Due to close monitoring, I was able to close the trades before incurring too large of a loss

Every trade has a commission fee of \$19.99.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceed	Profit/ Loss	Total Cash	Total Profit
2/10/20							\$1,013,120	
2/10/20	KHC	buy	\$29.79	7000	\$208,550		\$804,570	
2/10/20	KHC	sell	\$29.75	7000	\$208,230	\$320	\$1,012,800	\$12,800
2/11/20	CMCSA	buy	\$45.32	5000	\$226,620		\$786,180	
2/11/20	CMCSA	sell	\$45.90	5000	\$229,480	\$2,860	\$1,015,660	\$15,660
2/12/20	CSCO	buy	\$49.87	7000	\$349,110		\$666,550	
2/12/20	CSCO	sell	\$49.66	7000	\$347,600	\$1,510	\$1,014,150	\$14,150
2/13/20	AMD	buy	\$55.14	3000	\$165,440		\$848,710	
2/13/20	AMD	sell	\$55.18	3000	\$165,520	\$80	\$1,014,230	\$14,230
2/14/20	RDFN	buy	\$31.16	3000	\$93,500		\$920,730	
2/14/20	RDFN	sell	\$31.17	3000	\$93,490	\$10	\$1,014,220	\$14,220

*Table 5.5.1: Simulation Week 3 Momentum Trading*

## **5.6. Simulation Week 4**

For simulation week four I stuck to the rule of one buy and one sell a day for all days except Friday, February 21. The reason I decided to trade more than one type of stock is because the stocks DBX, Dropbox Inc. and BLDP, Ballard Power Systems Inc. showed potential for increase in price. And it turns out, these two stocks were the highlights of the week. I made most of the weeks' profit from these two stocks. When I bought the DBX stocks, the price for each stock was \$22.58. The trends looked promising as the price kept rising very rapidly which is what I need for momentum trading. I bought 5000 stocks and within a span of 4 hours the price rose to \$22.91 for each stock resulting in a substantial profit.



Figure 5.6.1: Stock Performance of Dropbox Inc

From Table 5.6.1, it is seen that another stock that made a profit of around \$1500 is Ballard Power Systems. When I bought the stock, the price per stock was \$13.13 and it rose to \$13.28.

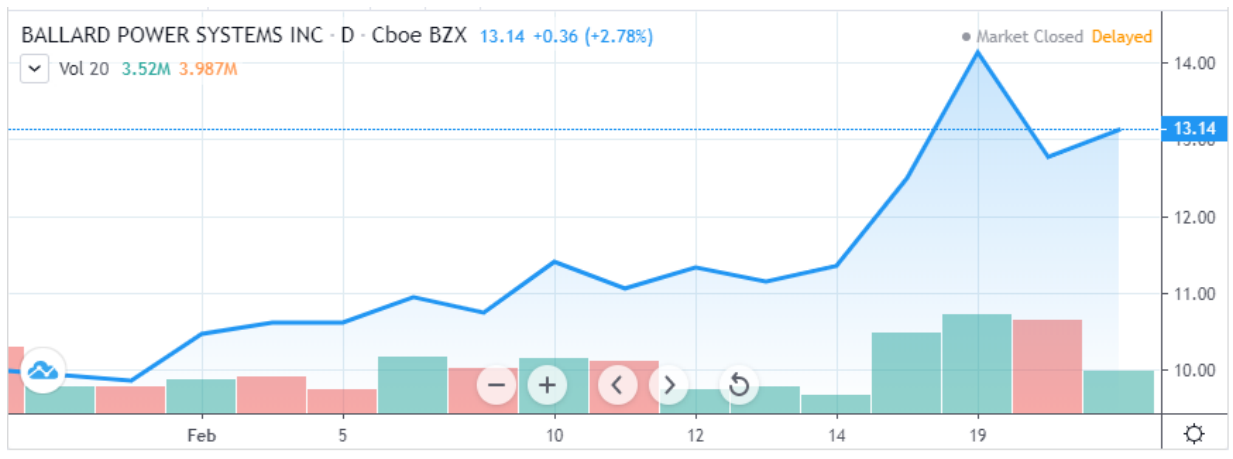


Figure 5.6.2: Stock Performance of Ballard Power Systems

Overall, this week was not the best week for momentum trading as it can be seen from Table 5.6.1 below. There were stocks from three companies that incurred a loss. Among them, the company Sirius XM Holdings Inc., (SIRI) was the worst. This trade incurred a loss of more than \$1000.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceed	Profit/ Loss	Total Cash	Total Profit
2/17/20							\$1,014,220	
2/17/20	MSFT	buy	\$186.75	1000	\$186,770		\$827,450	
2/17/20	MSFT	sell	\$186.84	1000	\$186,820	\$50	\$1,014,270	\$14,270
2/18/20	CMCSA	buy	\$46.21	3000	\$138,650		\$875,620	
2/18/20	CMCSA	sell	\$46.15	3000	\$138,430	\$220	\$1,014,050	\$14,050
2/19/20	SIRI	buy	\$7.40	10000	\$74,020		\$940,030	
2/19/20	SIRI	sell	\$7.30	10000	\$72,920	\$1,100	\$1,012,950	\$12,950
2/20/20	AAL	buy	\$28.75	7000	\$201,270		\$811,680	
2/20/20	AAL	sell	\$28.74	7000	\$201,160	\$110	\$1,012,840	\$12,840
2/21/20	DBX	buy	\$22.58	5000	\$112,920		\$899,920	
2/21/20	DBX	sell	\$22.91	5000	\$114,530	\$1,610	\$1,014,450	\$14,450
2/21/20	BLDP	buy	\$13.13	10000	\$131,320		\$883,130	
2/21/20	BLDP	sell	\$13.28	10000	\$132,780	\$1,460	\$1,015,910	\$15,910

*Table 5.6.1: Simulation Week 4 Momentum Trading*

## **5.7. Simulation Week 5**

For simulation week five, no major changes were made. The two stocks that stood out were E Trade Financial Corporation and Etsy Inc. The stock market was very volatile this week with sudden drop in prices of most of the stocks. From the Table 5.7.1 below, we can see that there were two failed trades this week : ETFC and INO. I bought these two stocks as they showed signs of increasing. But the prediction was wrong and as a result the prices started to go down. I was able to sell the INO stocks before incurring a huge loss. However, for the ETFC stocks, it was too late. The price dropped drastically by the time I sold it. And as a result, this trade made a loss of a big \$12,590. This is the biggest loss in my trades so far.



Figure 5.7.1: Stock Performance of E Trade Financial Corporation

The Etsy Inc. trade was the highlight of this week. I made a profit of \$15,640 which is the biggest profit made so far. Due to the market being highly volatile this week, the Etsy Inc stock price shot up by a big amount.

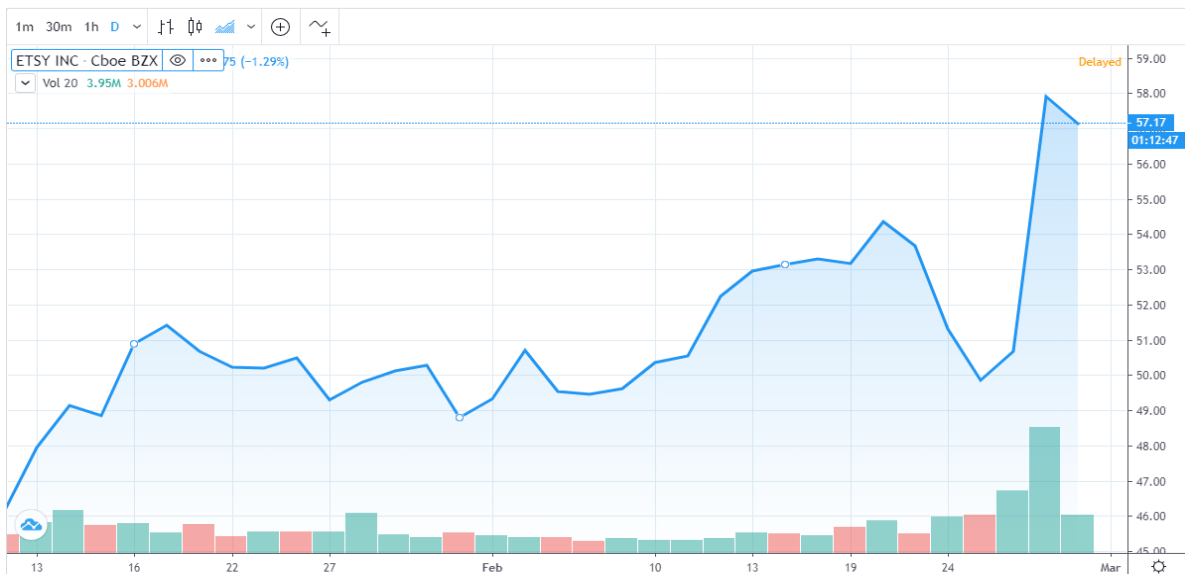


Figure 5.7.2: Stock Performance of Etsy Inc.



Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceed	Profit/ Loss	Total Cash	Total Profit
2/24/20							\$1,015,910	
2/24/20	TVIX	buy	\$57.00	5000	\$285,020		\$730,890	
2/24/20	TVIX	sell	\$57.05	5000	\$285,230	\$210	\$1,016,120	\$16,120
2/25/20	PTON	buy	\$27.61	5000	\$138,070		\$878,050	
2/25/20	PTON	sell	\$28.29	5000	\$141,430	\$3,360	\$1,019,480	\$19,480
2/25/20	ETFC	buy	\$50.64	5000	\$253,220		\$766,260	
2/25/20	ETFC	sell	\$48.13	5000	\$240,630	\$12,590	\$1,006,890	\$6,890
2/26/20	CSCO	buy	\$43.11	3000	\$129,350		\$877,540	
2/26/20	CSCO	sell	\$43.22	3000	\$129,640	\$290	\$1,007,180	\$7,180
2/26/20	INO	buy	\$4.75	7000	\$33,270		\$973,910	
2/26/20	INO	sell	\$4.55	7000	\$31,830	\$1,440	\$1,005,740	\$5,740
2/27/20	NVAX	buy	\$11.16	7000	\$78,140		\$927,600	
2/27/20	NVAX	sell	\$11.19	7000	\$78,310	\$170	\$1,005,910	\$5,910
2/28/20	ETSY	buy	\$55.94	7000	\$391,600		\$614,310	
2/28/20	ETSY	sell	\$58.18	7000	\$407,240	\$15,640	\$1,021,550	\$21,550

*Table 5.7.1: Simulation Week 5 Momentum Trading*

## 5.8. Simulation Week 6

This week's simulation went well compared to the past couple of weeks. As we can see in Table 5.8.1 that there were no failed trades this week. Every single trade yielded some type of profit. The total profit made this week was more than \$10,000. The trade that made the most profit was the company Gilead Sciences Inc (GILD). The stock performance of the company GILD is given below in Figure 5.8.1. This trade yielded a profit of \$5,120 on March 2, 2020 in a span of just 4 hours. There were three more companies that were successful trades and they are JD.com Inc (JD), Verizon Communications Inc (VZ) and Novavax Inc (NVAX). These companies also made a profit of more than \$2,000 each within a couple of hours.



Figure 5.8.1: Stock Performance of Gilead Sciences Inc.

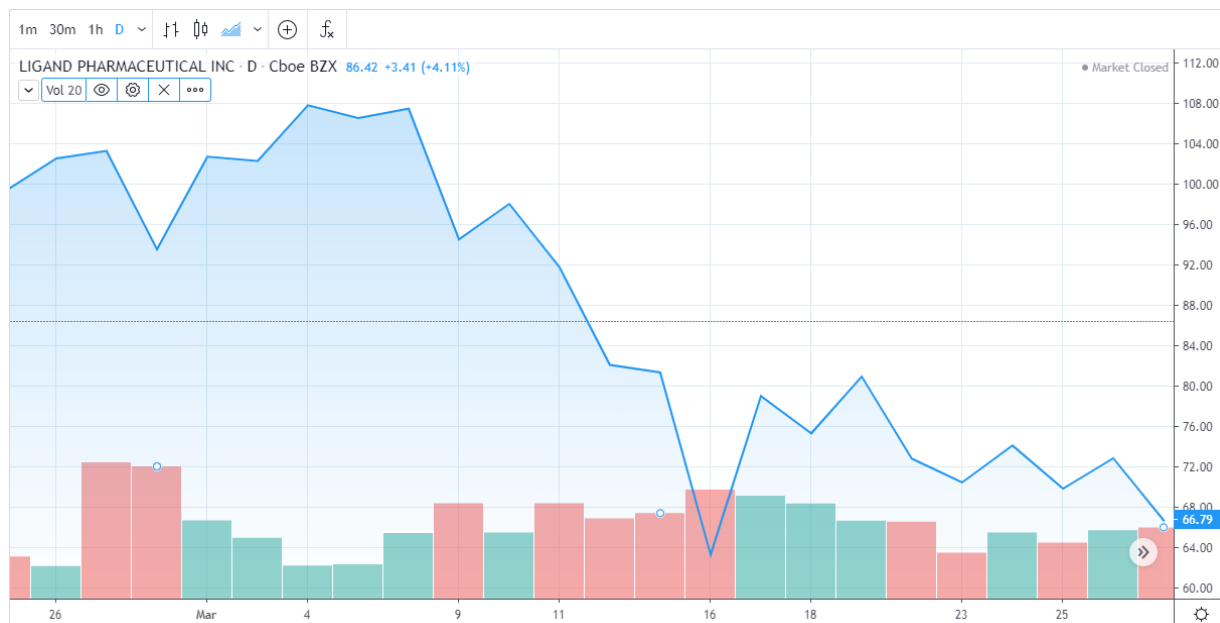
Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceed	Profit/Loss	Total Cash	Total Profit
3/2/20							\$1,021,550	
3/2/20	GILD	buy	\$72.14	3000	\$216,440		\$805,110	
3/2/20	GILD	sell	\$73.86	3000	\$221,560	\$5,120	\$1,026,670	\$26,670
3/3/20	JD	buy	\$42.74	3000	\$128,240		\$898,430	
3/3/20	JD	sell	\$43.71	3000	\$131,110	\$2,870	\$1,029,540	\$29,540
3/4/20	BLDP	buy	\$10.65	10000	\$106,520		\$923,020	
3/4/20	BLDP	sell	\$10.80	10000	\$107,980	\$1,460	\$1,031,000	\$31,000
3/5/20	VZ	buy	\$56.36	5000	\$281,820		\$749,180	
3/5/20	VZ	sell	\$56.80	5000	\$283,980	\$2,160	\$1,033,160	\$33,160
3/6/20	NVAX	buy	\$12.43	7000	\$87,030		\$946,130	
3/6/20	NVAX	sell	\$12.75	7000	\$89,230	\$2,200	\$1,035,360	\$35,360

Table 5.8.1: Simulation Week 6 Momentum Trading

## 5.9. Simulation Week 7

If we take a look at Table 5.9.1, it can be seen that overall this was a very bad week for simulation. This is the week where the stock market crashed due to the widespread pandemic COVID-19 which is caused by the novel corona virus. As a result I expected there to be a couple of failed trades. In total, there were three failed trades this week which are Vaxart Inc (VXRT), Co Diagnostics Inc (CODX) and Ligand Pharmaceuticals Inc (LGND). I made these purchases, assuming that the stocks for the pharmaceutical companies will go up as the number of COVID-

19 cases were increasing. Unfortunately that was not the case. Even the biomedical and pharmaceutical companies fell victim to panic selling that week and as a result the prices dropped by a great extent. Among the above mentioned three companies, the company that did the most damage was Ligand Pharmaceuticals Inc. I lost a total of \$44,710 within a span of one day.



*Figure 5.9.1: Stock Performance of Ligand Pharmaceuticals Inc.*

There were only two stocks this week that resulted in successful trades and they are Gilead Sciences Inc (GILD) and Cisco Systems Inc (CSCO). With GILD I made a profit of \$5,510 and with CSCO, I made \$3,440 which were nothing compared to the loss of \$44,710 caused by LGND.

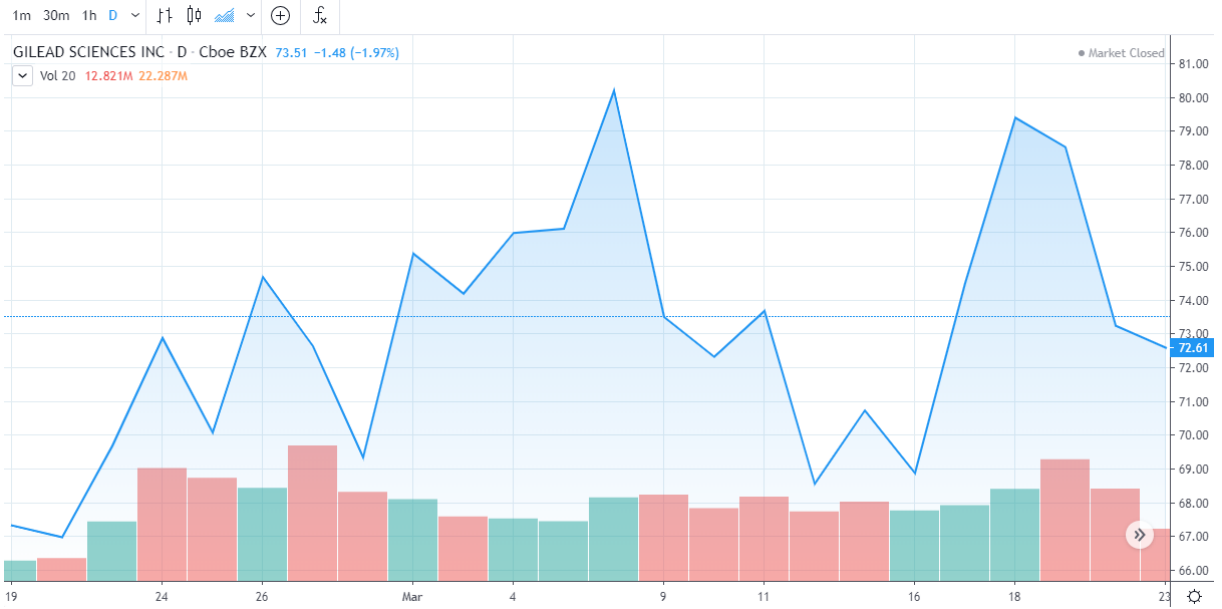


Figure 5.9.2: Stock Performance of Gilead Sciences Inc.

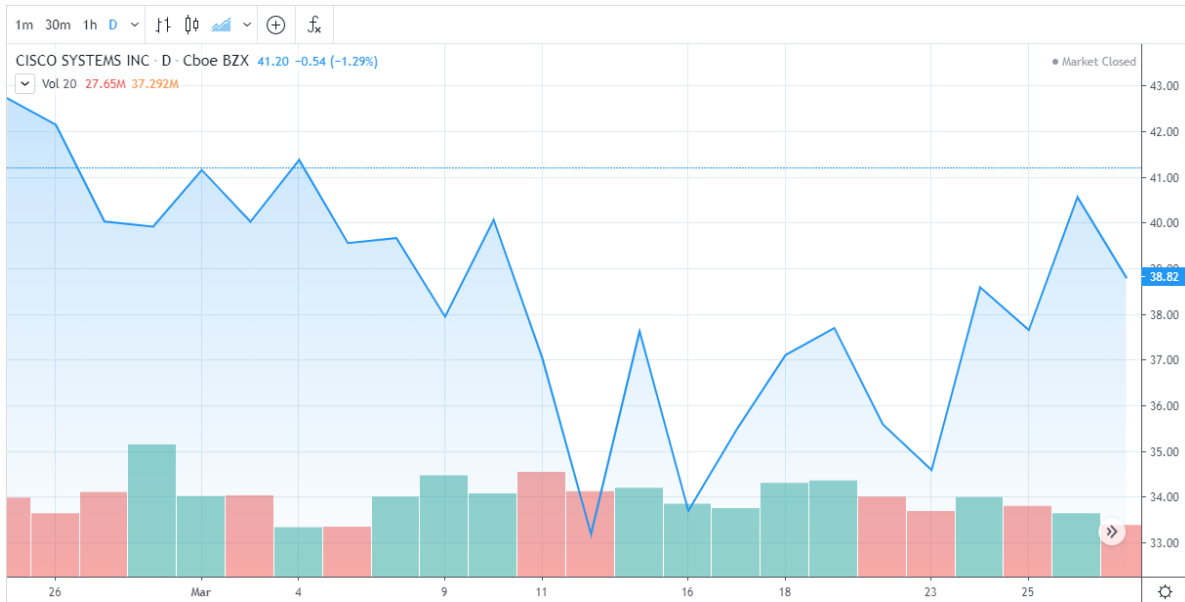


Figure 5.9.3: Stock Performance of Cisco Systems Inc.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceed	Profit/ Loss	Total Cash	Total Profit
3/9/20							\$1,035,360	
3/9/20	GILD	buy	\$75.80	3000	\$227,420		\$807,940	
3/9/20	GILD	sell	\$77.65	3000	\$232,930	\$5,510	\$1,040,870	\$40,870
3/10/20	VXRT	buy	\$2.70	7000	\$18,920		\$1,021,950	
3/10/20	VXRT	sell	\$2.56	7000	\$17,900	\$1,020	\$1,039,850	\$39,850
3/11/20	CODX	buy	\$13.46	5000	\$67,320		\$972,530	
3/11/20	CODX	sell	\$12.74	5000	\$63,680	\$3,640	\$1,036,210	\$36,210
3/12/20	LGND	buy	\$102.13	3000	\$306,410		\$729,800	
3/12/20	LGND	sell	\$87.24	3000	\$261,700	\$44,710	\$991,500	\$8,500
3/13/20	CSCO	buy	\$36.38	3000	\$109,160		\$882,340	
3/13/20	CSCO	sell	\$37.54	3000	\$112,600	\$3,440	\$994,940	\$5,060

*Table 5.9.1: Simulation Week 7 Momentum Trading*

## **5.10. Simulation Week 8**

Simulation this week went well. There were four successful trades and one failed trade. The only failed trade this week was the company Gilead Sciences Inc (GILD). We lost \$1,330 for on this trade. However, compared to last week, the companies started to slowly regain their original prices. As a result, stocks started to go back up again. The two trades that yielded the most profit this week are Roku Inc (ROKU) and Penn National Gaming Inc (PENN). ROKU yielded a profit of \$10,250 and PENN made a profit of \$9,130.

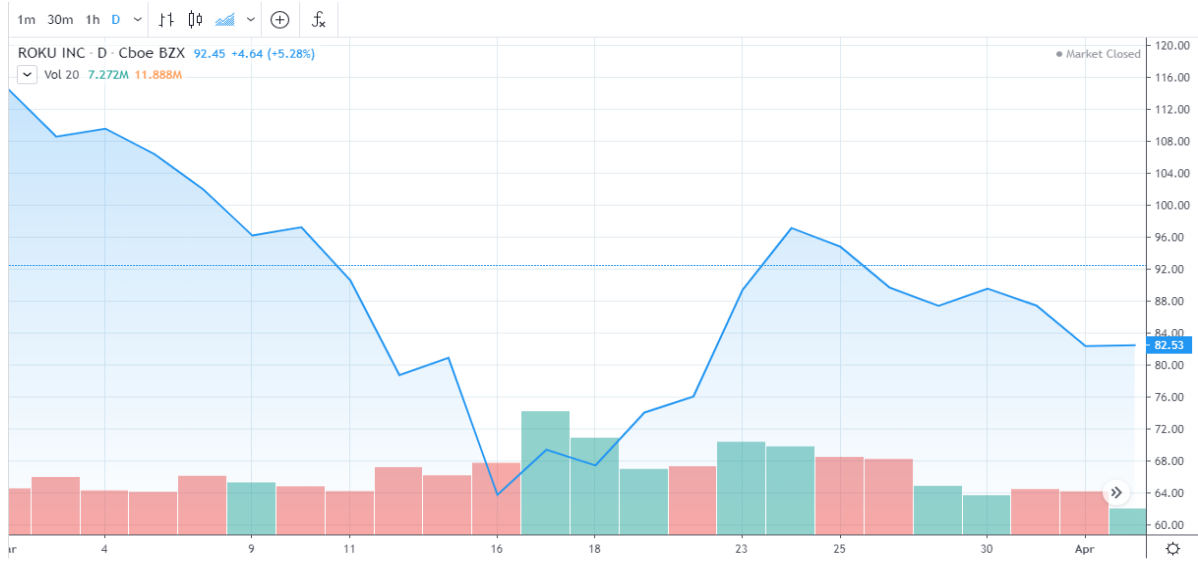


Figure 5.10.1: Stock Performance of Roku Inc.

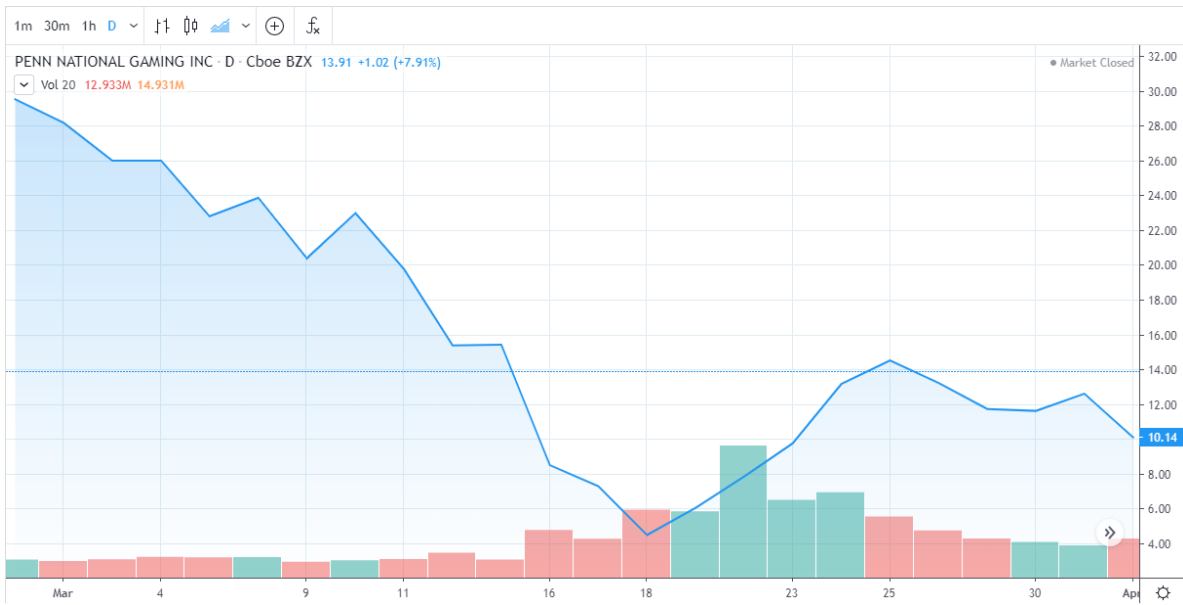


Figure 5.10.2: Stock Performance of Penn National Gaming Inc.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceed	Profit/ Loss	Total Cash	Total Profit
3/16/20							\$994,940	
3/16/20	ROKU	buy	\$69.56	3000	\$208,700		\$786,240	
3/16/20	ROKU	sell	\$72.99	3000	\$218,950	\$10,250	\$1,005,190	\$5,190
3/17/20	GILD	buy	\$81.33	3000	\$244,010		\$761,180	
3/17/20	GILD	sell	\$82.45	3000	\$247,330	\$3,320	\$1,008,510	\$8,510
3/18/20	MU	buy	\$37.85	5000	\$189,270		\$819,240	
3/18/20	MU	sell	\$38.48	5000	\$192,380	\$3,110	\$1,011,620	\$11,620
3/19/20	GILD	buy	\$81.14	3000	\$243,440		\$768,180	
3/19/20	GILD	sell	\$80.71	3000	\$242,110	\$1,330	\$1,010,390	\$10,390
3/20/20	PENN	buy	\$10.19	7000	\$71,350		\$938,940	
3/20/20	PENN	sell	\$11.50	7000	\$80,480	\$9,130	\$1,019,420	\$19,420

*Table 5.10.1: Simulation Week 8 Momentum Trading*

## **5.11. Simulation Week 9**

This week's simulation went well resulting in three successful trades out of four. The failed trade only incurred a loss of \$40. I noticed the trend of the stock AGNC Invest Corp (AGNC) going down as a result managed to get out of the market in time without incurring a big loss. The most successful trade this week was Applied Materials Inc (AMAT) which yielded a profit of \$10,510. Another successful trade this week that yielded a profit of \$5,310 was Advanced Micro Devices Inc (AMD).

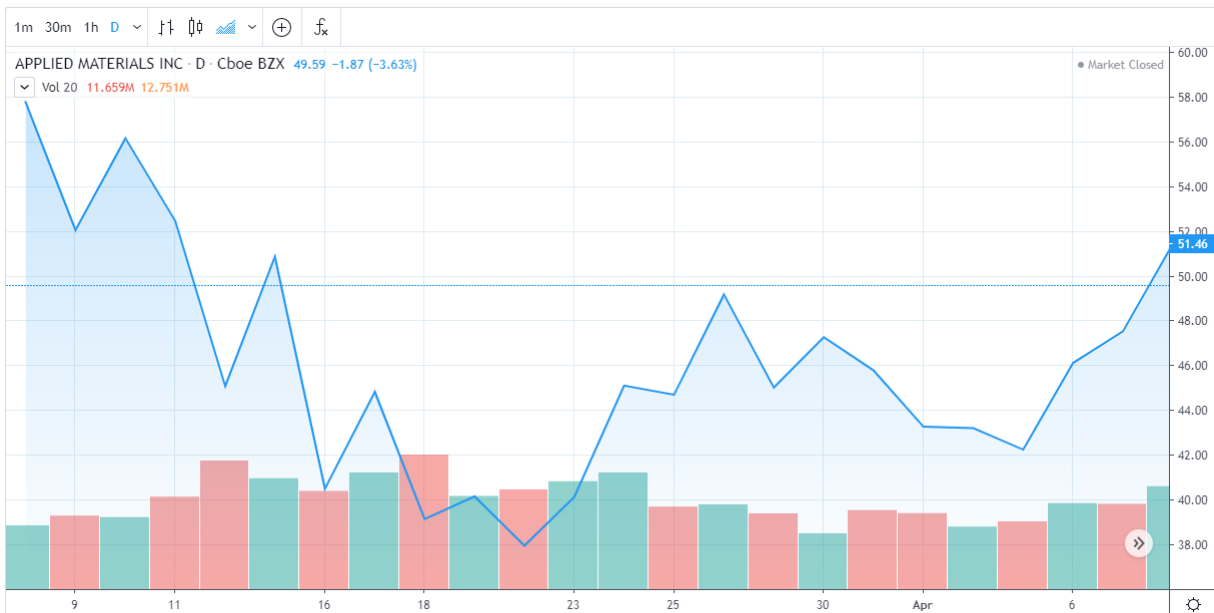


Figure 5.11.1: Stock Performance of Applied Materials Inc.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceed	Profit/Loss	Total Cash	Total Profit
3/23/20							\$1,019,420	
3/23/20	AMAT	buy	\$38.23	5000	\$191,170		\$828,250	
3/23/20	AMAT	sell	\$40.34	5000	\$201,680	\$10,510	\$1,029,930	\$29,930
3/24/20	AMD	buy	\$45.19	5000	\$225,970		\$803,960	
3/24/20	AMD	sell	\$46.26	5000	\$231,280	\$5,310	\$1,035,240	\$35,240
3/25/20	AGNC	buy	\$11.81	7000	\$82,690		\$952,550	
3/25/20	AGNC	sell	\$11.81	7000	\$82,650	\$40	\$1,035,200	\$35,200
3/26/20	JBLU	buy	\$11.99	7000	\$83,950		\$951,250	
3/26/20	JBLU	sell	\$12.12	7000	\$84,820	\$870	\$1,036,070	\$36,070

Table 5.11.1: Simulation Week 9 Momentum Trading

## 5.12. Simulation Week 10

Simulation this week did not result in drastic changes in profit or loss. Overall stock prices this week remained steady. Market was not as volatile as it was the last two weeks. Out of five trades, four of them were successful. The most successful trade this week that yielded a profit of \$4,960 was Comcast Corp (CMCSA). There were two more trades that made profits of more than \$2,000 each and they are Caesars Entertainment Corp (CZR) and Advanced Micro Devices Inc (AMD).



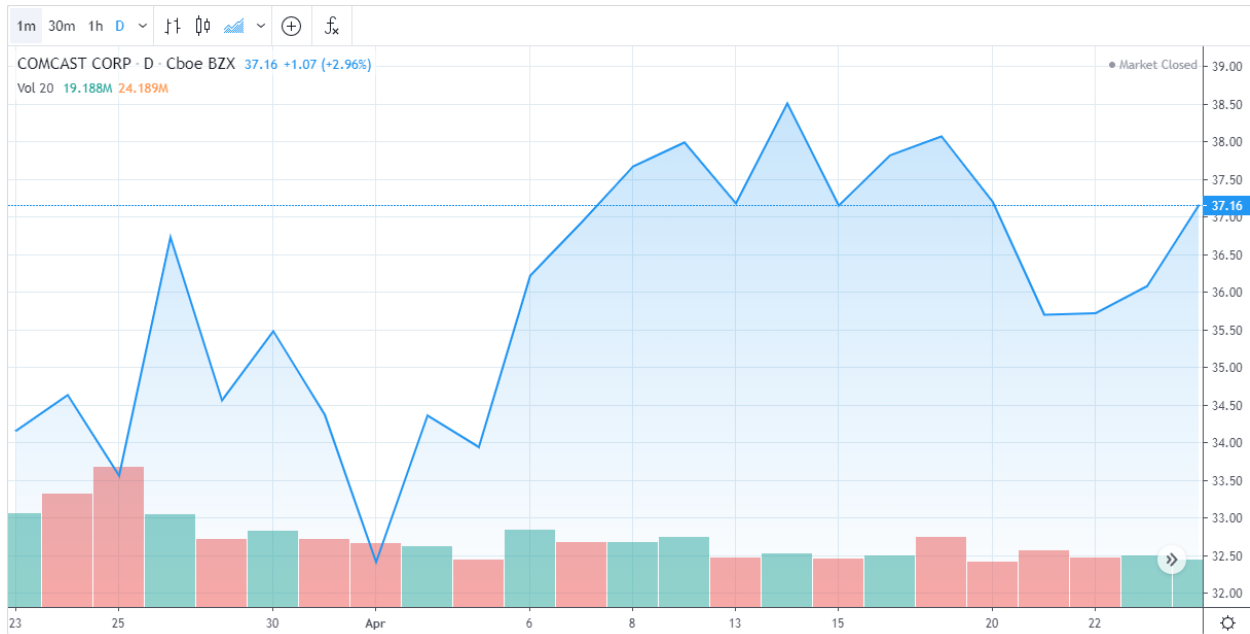


Figure 5.12.1: Stock Performance of Comcast Corp.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceed	Profit/Loss	Total Cash	Total Profit
3/30/20							\$1,036,070	
3/30/20	CZR	buy	\$6.50	7000	\$45,520		\$990,550	
3/30/20	CZR	sell	\$6.84	7000	\$47,860	\$2,340	\$1,038,410	\$38,410
3/31/20	SIRI	buy	\$4.83	10000	\$48,320		\$990,090	
3/31/20	SIRI	sell	\$5.01	10000	\$50,080	\$1,760	\$1,040,170	\$40,170
4/1/20	NVAX	buy	\$14.18	7000	\$99,280		\$940,890	
4/1/20	NVAX	sell	\$13.62	7000	\$95,320	\$3,960	\$1,036,210	\$36,210
4/2/20	CMCSA	buy	\$33.06	5000	\$165,320		\$870,890	
4/2/20	CMCSA	sell	\$34.06	5000	\$170,280	\$4,960	\$1,041,170	\$41,170
4/3/20	AMD	buy	\$44.61	5000	\$223,070		\$818,100	
4/2/20	AMD	sell	\$45.13	5000	\$225,630	\$2,560	\$1,043,730	\$43,730

Table 5.12.1: Simulation Week 10 Momentum Trading

### 5.13. Conclusion

To test the momentum trading strategy a 10 week simulation was conducted with a starting investment of \$1,000,000. The simulation started on Monday, January 27, 2020 and ended on Friday, April 3, 2020. The Table 5.13.1 contains the data which included profit/loss each week along with the record of total money at the end of each week and also total profit which is an accumulated each week. The record of losses are highlighted in red.

<b>Week</b>	<b>Weekly Profit</b>	<b>Total Money (\$1,00,000)</b>	<b>Total Profit</b>
<b>Week 1</b>	\$6,490	\$1,006,490	\$6,490 (0.649%)
<b>Week 2</b>	\$6,631	\$1,013,120	\$13,120 (1.31%)
<b>Week 3</b>	\$1,100	\$1,014,220	\$14,220 (1.42%)
<b>Week 4</b>	\$1,690	\$1,015,910	\$15,910 (1.59%)
<b>Week 5</b>	\$5,640	\$1,021,550	\$21,550 (2.16%)
<b>Week 6</b>	\$13,810	\$1,035,360	\$35,360 (3.54%)
<b>Week 7</b>	-\$40,420	\$994,940	-\$5,060 (-0.506%)
<b>Week 8</b>	\$24,480	\$1,019,420	\$19,420 (1.94%)
<b>Week 9</b>	\$16,650	\$1,036,070	\$36,070 (3.61%)
<b>Week 10</b>	\$7,660	\$1,043,730	\$43,730 (4.37%)

*Table 5.13.1: Weekly Overall Profit Over 10 Weeks*

The figure shown below, Figure 5.13.1 and Figure 5.13.2 gives us a better representation of the portfolio of momentum trading conducted during this 10 week simulation in the form of a line graph with markers for each data point. The x and y axis represent the week number and the total amount of money by the end of each week respectively. From the first glance it can be seen that the trading went well for most of the weeks except for week 7. For all the other weeks the total money at the end of the week was higher compared to the total money at the end of its previous week. Momentum trading makes use of the volatility of the stock market. Due to the onset of the present day pandemic COVID-19, the stock market took a huge hit during week 7 (3/9/2020 – 3/13/2020). The pandemic caused hundreds of small companies to close down, even the big companies shut down several of their stores. This instilled a fear in investors which in return induced the beginning of panic selling. I failed to predict this downward trend in the prices of stocks I invested in that week and as a result lost a huge portion of my money.

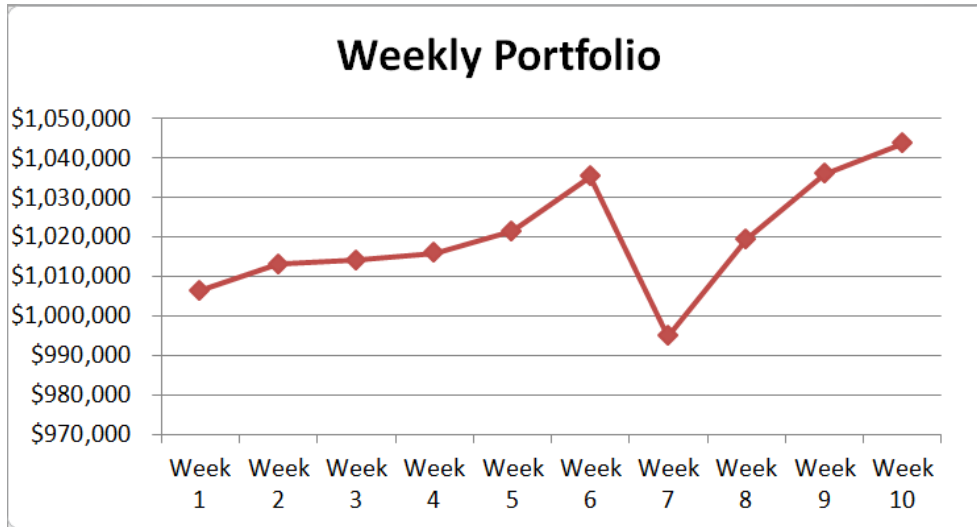


Figure 5.13.1: Line Graph of Weekly Portfolio

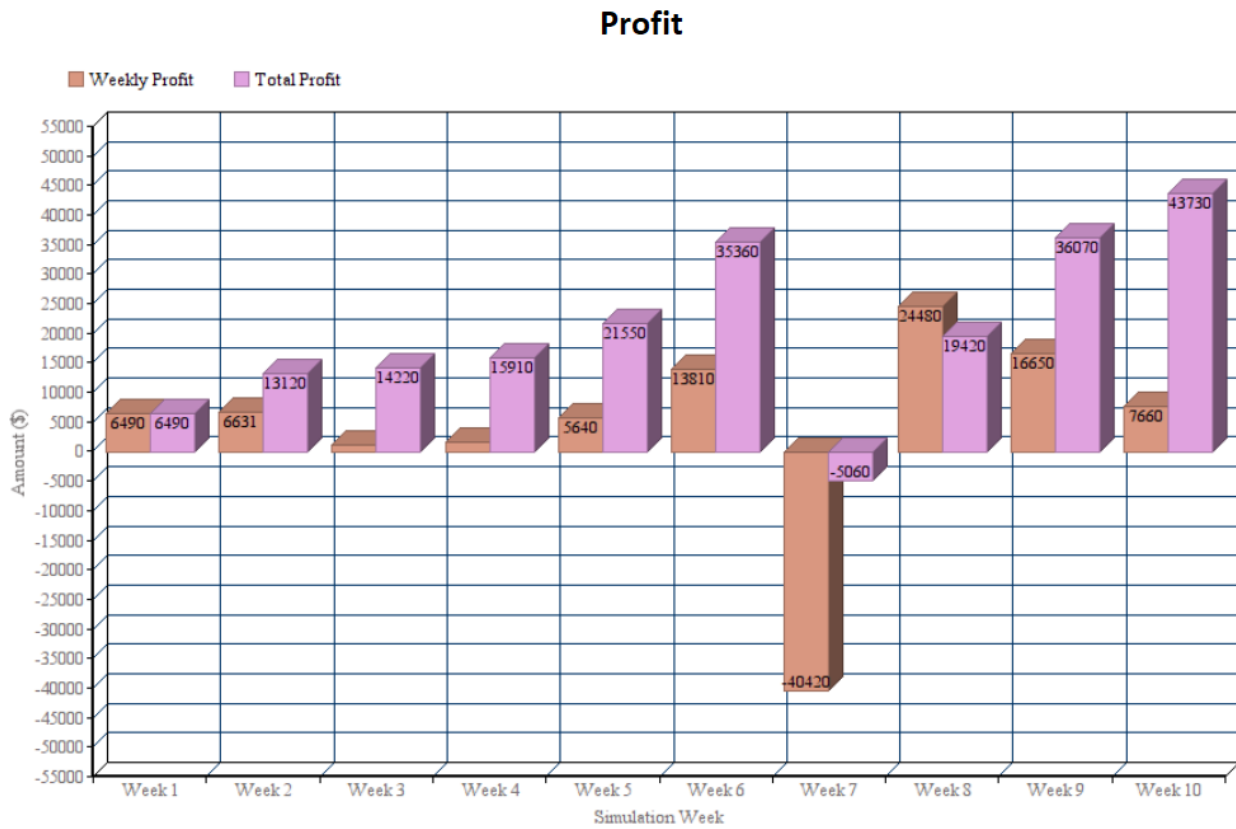


Figure 5.13.2: Bar Graph of Profit (Weekly and Total)

Table 5.13.2 gives an overall summary of the simulation conducted over the time period of 10 weeks. This table gives us an idea of the total number of trades and among them how many

were successful. It can be seen that 66.7% of the overall trades were successful, leaving the remaining 33.3% to be failed trades.

<b>Starting money</b>	\$1,000,000
<b>Ending money</b>	\$1,043,730
<b>Profit</b>	\$43,730 (4.37%)
<b>Total trades</b>	60
<b>Number of positive trades</b>	40 (66.7%)
<b>Number of negative trades</b>	20 (33.3%)

*Table 5.13.2: Data of Overall Simulation*

The amount of profit made through momentum trading in this 10 week simulation was \$43,730 which is about 4.37% of the starting money. Making a profit of 4.37% is not bad for a beginner. However, I do feel like I could have made twice that profit if the stock market had not taken a hit that big during week 7. Losing so much money over a course of that short time period was unexpected. But, it was a learning curve for me. Because when it comes to trading in real life, I needed to realize that unexpected things can happen anytime in the stock market. When we buy stocks, we make predictions regarding the trend to the best of our abilities. However, at the end of the day, these are just predictions, not guarantees.

In conclusion, the simulation went well. It did not only return a profit, but it also helped me understand the stock market better. Regarding the momentum trading strategy, I do feel like it is a very high maintenance strategy which is not for everyone. It requires constant monitoring of the stock market and requires the trader to be one of the first ones to notice market transitions as well as making quick decisions regarding a buy or sell. Being a type of day trading, momentum trading is very vulnerable to impactful events, which in our case was the COVID-19 pandemic. Overall, I do not believe momentum trading is suitable for a beginner like me as it is very time intensive and comes with high risk.

# Chapter 6: Martingale Strategy (Ahmad Khan)

## *6.1. Simulation Goal and Strategy*

As in this strategy we are trying to minimize our exposure to risk and maximize our time that we can survive in the market, this strategy will not be expected to yield huge results. This will be a test of if we can use this strategy to earn small sums of money slowly but surely over long terms. An annual target of 10-20% would be considered really good so for this 10-week simulation any profit above 3% will be considered really good.

For my strategy I will be using the TradingView website to scan for stocks daily. I will begin the day by sorting stocks with the most gain/loss in the day and will pick stocks with minimum change in price of approximately 30% in that day, doing so will help me pick volatile stocks. However, once in the market and if the trade is not going in a successful direction, I will use martingale strategy to try and make it into a profitable trade. The way this will work is that once the trade has gone in the negative direction for a certain number of pips, the trade size will be doubled and opened in the opposite direction of the original trade. This will be repeated until the security in question moves in the right direction for enough number of pips for the trade to be profitable. As this strategy involves doubling the size of the bet (trade), it is risky, and the trader will use smaller trade sizes to begin with so that the position can survive for a longer time.

I will use an example to explain the strategy. Let us say a stock called ABC is \$100 for 1 share on Monday. I see that that it has increased in price by 30% on Monday morning and I buy 1 share for \$100 expecting the price to increase. However, the next day the stock price decreases by \$10 meaning I am at a loss of \$10, so I will buy shares worth twice my initial trade in the opposite direction of my initial trade. This would amount to selling \$200 worth of ABC stock (2.22 shares)

on Tuesday. On Wednesday the stock price goes down another \$20, meaning that my buy trade is now at a loss of \$30 and my sell trade is at a profit of \$44.44 (2.22 shares x \$20 price change), which would result a net profit of \$14.44 and I could then close the trades.

We will start with \$1,000,000 in the bank and will be simulating for a period of ten weeks. With martingale, the biggest risk is the security's price gets stuck in a certain range. When that happens, the size keeps getting doubled very quickly and the risk increases manifolds in a very short amount of time. There are some things to keep in mind, for example not to trade in times of low volume such as holidays as ranging is more likely to occur.

To enter the market, buy trades will be favored as the most consistent trends in the stock market have been bull trends unlike the forex market which has a fair share of both. The good thing about this strategy is that it is free of bias of any direction, it favors all directions the same, and as long as the market moves in any direction the trade will be successful.

## ***6.2. Companies Selected***

The trader will be looking to select companies that trend aggressively as getting stuck in a range is very bad for martingale strategy. Companies that are usually bad for other investors, such as highly volatile companies, are good for this strategy as it means they will break out of the range more often.

The trader looks at the top moving stocks of the day using the Tradingview website and selects the most volatile stocks, which mostly end up being stocks with more than 30 % movement in the day. Then the trader opens a trade in those stocks and uses Martingale strategy until an exit point is reached.

### ***6.3. Simulation Week 1***

In Week One stocks were selected based on the daily volatility and were filtered through the Investopedia volatility filter. Stocks with 10% and more movement in their prices were preferred and trades were opened in the direction of the volatility.

Table 6.3.1 gives the transactions of closed trades from Week One. We ended with a loss of \$671.36, but that is not the main takeaway from the week. There are two main takeaways. The first one is that the strategy is generally working but due to opening too small trade sizes, the commission is taking up a significant part of the profit. \$199.90 was the commission paid out of the 671.36 total loss which is a huge part; therefore, the lesson is to increase trade sizes. Initially, trades were opened with around \$2000 total cash value for each symbol to decrease risk and now that will have to increase.

The second learned is that the strategy is generally working but precautions must be taken. For example, the symbol LEE was the cause of the biggest loss of \$759.98 and that happened as Investopedia did not allow for shorting the symbol LEE as its stock price is under the limit at which Investopedia allows to short stocks; therefore, from now on trades should only be opened with stocks with prices that can be shorted as well so martingale strategy can be applied. The loss from LEE was unnecessary and should not be included in the measure of the accuracy of the strategy.

Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
1/27/2020							1000000	
1/27/2020	AMZN	Buy	1852.59	1	1852.59		998147.41	
1/27/2020	DNLI	Buy	28.99	30	889.54		997257.87	
1/28/2020	XLRN	Buy	79.99	25	2019.74		995238.13	
1/29/2020	DNLI	Sell	25.95	100	2575.01		992663.12	
1/29/2020	LEE	Buy	2.62	1500	3949.99		988713.13	
1/29/2020	LEE	Sell	2.14	1500	3190.01	-759.98	991903.14	0*
1/31/2020	DNLI	Sell	23.48	30	684.41	-205.13	992587.55	-205.13
1/31/2020	DNLI	Buy	23.61	100	2380.99	194.02	994968.54	-11.11
1/31/2020	XLRN	Sell	86.84	25	2151.01	131.27	997119.55	120.16
1/31/2020	AMZN	Sell	2040.94	1	2020.95	168.36	999140.5	288.52

*Table 6.3.1 Simulation Week 1 Martingale*

\*: Special Circumstance explained in Section 6.3.

## **6.4. Simulation Week 2**

Week Two transactions are shown in table 6.4.1 and show a total profit of about 9000 USD this week. This week was an exceptional week, with most trades ending with profits without having to open more trades using Martingale strategy. I expect this to be not a normal occurrence and moving forward I expect trades to take longer before they can be closed successfully. There was almost no drawdown this week; however, I expect this not to be a normal case and instead to have a lot of drawdown moving forward.



Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
1/27/2020							999140.5	288.52
1/27/2020	NNVC	Buy	14.85	80	1208.15		997932.35	288.52
1/28/2020	NNVC	Sell	11	200	2180.01		995752.34	288.52
1/31/2020	NNVC	Buy	16.8	450	7580.31		988172.03	288.52
1/31/2020	WWE	Sell	49.01	100	4881.01		983291.02	288.52
2/3/2020	NNVC	Sell	11.71	1500	17545.01		965746.01	288.52
2/3/2020	INSM	Buy	29.07	300	8740.99		957005.02	288.52
2/4/2020	NNVC	Sell	8.71	530	4596.31	-4192.15	961601.33	-3903.63
2/4/2020	NNVC	Buy	8.71	1700	14826.99	4898.03	976428.32	994.4
2/4/2020	INSM	Sell	31.81	300	9521.51	780.52	985949.83	1774.92
2/4/2020	MYO	Sell	29.92	250	7458.84		978490.99	1774.92
2/4/2020	MYO	Buy	22.52	250	5649.54	1809.3	984140.53	3584.22
2/5/2020	MYO	Sell	28.8	260	7468.01		976672.52	3584.22
2/5/2020	LMPX	Sell	25.25	250	6292.24		970380.28	3584.22
2/5/2020	MYO	Buy	22.83	260	5955.79	1512.22	976336.07	5096.44
2/6/2020	WWE	Buy	42.24	100	4243.98	637.03	980580.05	5733.47
2/6/2020	SGBX	Sell	2.99	3000	8950.01		971630.04	5733.47
2/6/2020	BLCM	Sell	10.56	1000	10540.01		961090.03	5733.47
2/6/2020	SGBX	Buy	2.73	3000	8209.99	740.02	969300.02	6473.49
2/6/2020	FNKO	Sell	9.26	1000	9236.11		960063.91	6473.49
2/7/2020	ZGNX	Sell	35.4	200	7060.01		953003.9	6473.49
2/7/2020	LMPX	Buy	21.27	250	5337.14	955.1	958341.04	7428.59
2/7/2020	BLCM	Buy	9.73	1000	9749.99	790.02	968091.03	8218.61
2/7/2020	ZGNX	Buy	32.59	200	6536.99	523.02	974628.02	8741.63
2/7/2020	FNKO	Buy	8.67	1000	8689.99	546.12	983318.01	9287.75

*Table 6.4.1 Simulation Week 2 Martingale*

### **6.5. Simulation Week 3**

Week Three transactions are shown in Table 6.5.1 and represent an approximate profit of 3000 USD. However, something to notice is that currently a lot of open trades are causing a big drawdown and will most likely take a long time before they can be closed down. This is leading the trader to be cautious and decrease the amount and size of future trades, so there is more cash

available to mitigate the effects of larger trades being opened to counter the losing trades currently open as per Martingale Strategy.

Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
2/5/2020							983318.01	9287.75
2/5/2020	LMPX	Sell	\$25.25	250	6292.24		977025.77	9287.75
2/6/2020	UIS	Buy	\$16.30	500	8167.49		968858.28	9287.75
2/7/2020	STSA	Buy	\$27.91	300	8393.35		960464.93	9287.75
2/8/2020	LMPX	Buy	\$21.27	250	5337.14	955.1	965802.07	10242.85
2/9/2020	STSA	Sell	\$30.55	300	9145.01	751.66	974947.08	10994.51
2/10/2020	LMPX	Sell	\$15.99	300	4777.01		970170.07	10994.51
2/11/2020	NRBO	Buy	\$19.12	300	5754.49		964415.58	10994.51
2/12/2020	NRBO	Sell	\$20.41	300	6103.01	-348.52	970518.59	10645.99
2/13/2020	UIS	Sell	\$18.04	500	9000.01	832.52	979518.6	11478.51
2/14/2020	LMPX	Buy	\$13.11	300	3951.49	825.52	983470.09	12304.03

*Table 6.5.1 Simulation Week 3 Martingale*

## **6.6. Simulation Week 4**

Week Four transactions are reflected in the Table 6.6.1 and represent a net profit of \$2970. There are two takeaways from this week. The first is that I had been getting lucky for the first few weeks and was able to close trades in short amounts of time; now, I have realized that some trades may take a very long time (more than a few weeks) and I should think about adjusting strategy accordingly. The second takeaway is that I might be trading too frequently and this will mean I will not have enough cash available later to open bigger trades to counter negative running trades, and so I should maybe adjust my trading frequency or decrease the starting trade size.

Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							983470.09	12304
1/27/2020	SEDG	Sell	97.15	10	951.46		939765.93	12304
2/4/2020	SEDG	Buy	107.37	30	3241.09		940717.39	12304
2/11/2020	S	Buy	8.32	800	6671.99		943958.48	12304
2/11/2020	LOGC	Sell	7	800	5580.09		950630.47	12304
2/12/2020	BBBY	Sell	11.28	600	6745.01		956210.56	12304
2/13/2020	LOGC	Buy	8.08	1900	15371.99		962955.57	12304
2/14/2020	CARG	Buy	25.61	200	5142.53		978327.56	12304
2/18/2020	BBBY	Buy	12.04	1250	15063.74		924702.19	12304
2/18/2020	S	Sell	9.2	800	7336.01	664.02	932038.2	12968.1
2/18/2020	BLPH	Sell	10.8	500	5380.01		926658.19	12968.1
2/19/2020	SEDG	Sell	120.88	30	3606.41	365.32	930264.6	13333.4
2/19/2020	SEDG	Buy	120.88	10	1228.79	-277.33	931493.39	13056
2/19/2020	BLPH	Buy	8.94	500	4489.99	890.02	935983.38	13946.1
2/19/2020	LOGC	Sell	9.75	1900	18505.01	3133.02	954488.39	17079.1
2/19/2020	LOGC	Buy	9.76	800	7827.99	-2247.9	962316.38	14831.2
2/20/2020	BBBY	Buy	12.84	600	7721.17	-976.16	970037.55	13855
2/20/2020	BBBY	Sell	12.84	1250	16024.14	960.4	986061.69	14815.4
2/20/2020	CARG	Sell	28.11	200	5602.01	459.48	991663.7	15274.9

*Table 6.6.1 Simulation Week 4 Martingale*

## **6.7. Simulation Week 5**

Week Five transactions are reflected in Table 6.7.1 and represent a net profit of \$2154. The highest volume open trades this week were Buy trades and due to the influx of Coronavirus the portfolio took a toll and drawdown further increased from last week. For the next few weeks, the focus will be to try and closely monitor the huge volume traders currently open, rather than adding new trades. During the first week, I started out with approximately \$3000 initial trades for each new symbol and then increased to \$8000 initial trades the following weeks. Now I have realized all those were too big, and I should be starting out with \$1000 or less per trade to be successful in the long term.

Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							991663.7	15274.9
2/12/2020	WLL	Sell	2.64	2500	6580.01		985083.69	15274.9
2/13/2020	WLL	Buy	3.07	5000	15369.99		969713.7	15274.9
2/14/2020	WLL	Sell	2.8	11000	30780.01		938933.69	15274.9
2/14/2020	BTAI	Sell	36.52	100	3631.98		935301.71	15274.9
2/19/2020	MYO	Buy	8.15	500	4094.99		931206.72	15274.9
2/19/2020	GRPN	Sell	1.74	3000	5200.01		926006.71	15274.9
2/20/2020	MYO	Sell	7	1300	9079.88		916926.83	15274.9
2/20/2020	TVTY	Sell	12.93	400	5152.01		911774.82	15274.9
2/20/2020	AVEO	Buy	5.12	809	4162.07		907612.75	15274.9
2/24/2020	GRPN	Buy	1.58	3000	4759.99	440.02	912372.74	15714.92
2/24/2020	MYO	Buy	6.17	1300	8043.59	1036.29	920416.33	16751.21
2/24/2020	MYO	Sell	6.17	500	3066.01	-1028.98	923482.34	15722.23
2/24/2020	BTAI	Buy	32.01	100	3221.12	410.86	926703.46	16133.09
2/24/2020	WLL	Buy	2.58	13500	34782.49	2577.53	961485.95	18710.62
2/24/2020	WLL	Sell	2.58	5000	12855.01	-2514.98	974340.96	16195.64
2/28/2020	TVTY	Buy	12.06	400	4843.99	308.02	979184.95	16503.66
2/28/2020	TELL	Sell	2.73	1000	2705.01		976479.94	16503.66
2/28/2020	TELL	Buy	1.76	1000	1778.89	926.12	978258.83	17429.78

*Table 6.7.1 Simulation Week 5 Martingale*

## **6.8. Simulation Week 6**

Week Six transactions are reflected in Table 6.8.1 and represent a net profit of \$149.91. The coronavirus uncertainty from the previous week continued this week, and so I chose to open small trades (approximately \$1000 each) and closed them at small profits. I did not want to get stuck with any trades and have my cash stuck in case I needed to open bigger trades due to the Covid-19 situation; therefore, I closed trades with low profits.

Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							978258.83	17429.78
3/2/2020	ENLV	Sell	7.12	140	976.81		977282.02	17429.78
3/3/2020	TT	Buy	105.24	10	1072.34		976209.68	17429.78
3/3/2020	IR	Sell	32.13	35	1104.56		975105.12	17429.78
3/4/2020	ENLV	Buy	6.63	140	948.19	28.62	976053.31	17458.4
3/5/2020	TT	Sell	113.71	10	1117.06	44.72	977170.37	17503.12
3/5/2020	IR	Buy	28.8	35	1027.99	76.57	978198.36	17579.69

*Table 6.8.1 Simulation Week 6 Martingale*

## **6.9. Simulation Week 7**

Week Seven transactions are reflected in Table 6.9.1 and represent a net profit of \$149.91. Even though the profit from this week is not significant, it has an important example of the martingale strategy working.

I bought \$4162 worth of AVEO stock on 2/20 and when I saw the stock was moving in the opposite direction, I opened a counter trade where I shorted \$8840 worth of AVEO stock. On 3/9 the profit (\$1240) from the short trade finally was more than the loss (-\$1115) of the long trade, and I closed the trade with an overall profit of approximately \$125.

Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							978198.36	17579.69
2/20/2020	AVEO	Buy	\$5.12	809	\$4,162.07		974036.29	17579.69
2/25/2020	CSOD	Sell	\$39.24	90	\$3,511.61		970524.68	17579.69
2/28/2020	AVEO	Sell	\$4.43	2000	\$8,840.61		961684.07	17579.69
3/4/2020	WANT	Buy	\$29.23	40	\$1,189.19		960494.88	17579.69
3/6/2020	WANT	Sell	\$25.66	100	\$2,546.01		957948.87	17579.69
3/6/2020	AOBC	Sell	\$6.92	150	\$1,018.04		956930.83	17579.69
3/9/2020	AOBC	Buy	\$6.18	150	\$946.24	\$71.80	957877.07	17651.49
3/9/2020	WANT	Buy	\$22.33	100	\$2,252.60	\$293.41	960129.67	17944.9
3/9/2020	WANT	Sell	\$22.25	40	\$870.01	-\$319.18	960999.68	17625.72
3/9/2020	AVEO	Sell	\$3.79	809	\$3,046.12	-\$1,115.95	964045.8	16509.77
3/9/2020	AVEO	Buy	\$3.79	2000	\$7,599.99	\$1,240.62	971645.79	17750.39
3/9/2020	CSOD	Buy	\$34.47	90	\$3,122.29	\$389.32	974768.08	18139.71

*Table 6.9.1 Simulation Week 7 Martingale*

## **6.10. Simulation Week 8**

Week Eight transactions are reflected in Table 6.10.1 and represent a net profit of \$9227. There are two very important callouts for this week, the first being the TSLA trade and the second, the MNK trade. The TSLA trade was one of my longest running trades and one with a lot of capital as well.

I bought \$8920 worth of TSLA on 2/4 when TSLA stock had gotten a massive gain, but when I saw TSLA stock was going down I shorted \$19315 worth of TSLA stock. A few days later, I saw TSLA stock was going back up and so I bought \$46068 worth of TSLA stock on 2/19. About twenty days later, I noticed that the TSLA stock was going down, so I shorted \$82205 worth of TSLA stock on 3/9. On 3/17 the profit of the short trade (\$35421) overcame the loss of the long trade (-\$29226), and I closed all TSLA trades with an overall profit of \$6195.

I shorted \$3030 worth of MNK stock on 2/25 but saw the market moving in the opposite direction so bought \$10359 worth of MNK stock on 2/25. When I saw the market changing direction again, I shorted \$12540 worth of MNK stock on 3/5. On 3/19 I closed all trades with overall profit of \$1510 when the profit from the short trades (\$9450) overcame the loss of the long trades (-\$7939).

Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							974768.08	18139.7
2/4/2020	TSLA	Buy	\$918.90	9	\$8,290.09		966477.99	18139.7
2/5/2020	TSLA	Sell	\$773.41	25	\$19,315.26		947162.73	18139.7
2/19/2020	TSLA	Buy	\$920.98	50	\$46,068.99		901093.74	18139.7
2/24/2020	MNK	Sell	\$3.05	1000	\$3,030.01		898063.73	18139.7
2/25/2020	MNK	Buy	\$5.17	2000	\$10,359.99		887703.74	18139.7
3/4/2020	SG	Sell	\$7.28	100	\$708.19		886995.55	18139.7
3/5/2020	MNK	Sell	\$3.14	4000	\$12,540.01		874455.54	18139.7
3/9/2020	TSLA	Sell	\$632.50	130	\$82,205.01		792250.53	18139.7
3/13/2020	IRCP	Sell	\$8.51	100	\$831.01		791419.52	18139.7
3/16/2020	SG	Buy	\$6.20	100	\$639.99	68.2	792059.51	18207.9
3/17/2020	TSLA	Buy	\$426.31	155	\$66,098.66	35421.61	858158.17	53629.5
3/17/2020	TSLA	Sell	\$426.31	59	\$25,132.54	-29226.54	883290.71	24403
3/18/2020	BMRA	Buy	\$9.22	100	\$942.19		882348.52	24403
3/18/2020	DBVT	Buy	\$2.85	800	\$2,295.99		880052.53	24403
3/19/2020	BMRA	Sell	\$18.40	100	\$1,820.01	877.82	881872.54	25280.8
3/19/2020	IRCP	Buy	\$7.11	100	\$730.99	100.02	882603.53	25380.8
3/19/2020	DBVT	Sell	\$3.49	800	\$2,772.01	476.02	885375.54	25856.8
3/19/2020	MNK	Sell	\$1.22	2000	\$2,420.01	-7939.98	887795.55	17916.9
3/19/2020	MNK	Buy	\$1.22	5000	\$6,119.99	9450.03	893915.54	27366.9

*Table 6.10.1 Simulation Week 8 Martingale*

## **6.11. Simulation Week 9**

Week Nine transactions are reflected in Table 6.11.1. Due to the markets being choppy, I did not open any significant trades and I was also not able to close any trades in profit, so Week Nine resulted in no change in total profit.

Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							893915.54	27366.89
3/25/2020	HIBS	Sell	33.51	33	1085.84		892829.7	27366.89
3/25/2020	ASTC	Buy	5.23	200	1065.51		891764.19	27366.89
3/23/2020	CASY	Sell	114.75	10	1127.51		890636.68	27366.89
3/23/2020	NLOK	Sell	16.45	3500	57537.5		833099.17	27366.89

*Table 6.11.1 Simulation Week 9 Martingale*

## **6.12. Simulation Week 10**

Week Ten transactions are reflected in Table 6.12.1 and represent a net profit of \$5398. There were no martingale trades that got closed in this week; however, an important callout is of the trade size increase in this week which is apparent when looking at the trades of stocks LK (shorted \$6435), SGMS (shorted \$7075 worth of stock), and CAR (shorted \$11260) worth of stock. The markets were generally in a downfall due to COVID-19 and it being the last week of trading, I got greedy and increased my trade size from \$1000 to \$5000 and above.



Date	Symbol	Buy / Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							890636.7	27366.89
							890636.7	27366.89
3/10/2020	CY	Buy	\$22.37	45	\$1,026.64		889610	27366.89
3/17/2020	QDEL	Buy	\$89.57	11	\$1,005.26		888604.8	27366.89
3/17/2020	DUST	Sell	\$4.70	200	\$919.81		887685	27366.89
3/31/2020	DUST	Buy	\$2.85	200	\$589.99	\$329.82	888275	27696.71
3/31/2020	QDEL	Sell	\$95.04	11	\$1,025.45	\$20.19	889300.4	27716.9
4/2/2020	GMLP	Sell	\$1.67	1000	\$1,650.11		887650.3	27716.9
4/2/2020	LK	Sell	\$6.37	1000	\$6,345.01		881305.3	27716.9
4/2/2020	SGMS	Sell	\$7.10	1000	\$7,075.01		874230.3	27716.9
4/2/2020	CAR	Sell	\$11.28	1000	\$11,260.01		862970.3	27716.9
4/2/2020	TNK	Sell	\$17.87	100	\$1,767.01		861203.3	27716.9
4/3/2020	CY	Sell	\$23.24	45	\$1,025.59	-\$1.05	862228.9	27715.85
4/3/2020	TNK	Buy	\$17.27	100	\$1,746.99	\$20.02	863975.8	27735.87
4/3/2020	GMLP	Buy	\$1.55	1000	\$1,574.69	\$75.42	865550.5	27811.29
4/3/2020	SONN	Sell	\$6.00	1000	\$5,979.91		859570.6	27811.29
4/3/2020	LADR	Sell	\$3.71	1000	\$3,690.01		855880.6	27811.29
4/3/2020	LK	Buy	\$5.64	1000	\$5,659.89	\$685.12	861540.5	28496.41
4/3/2020	LADR	Buy	\$3.15	1000	\$3,168.59	\$521.42	864709.1	29017.83
4/3/2020	SONN	Buy	\$5.01	1000	\$5,027.69	\$952.22	869736.8	29970.05
4/3/2020	CAR	Buy	\$9.91	1000	\$9,929.99	\$1,330.02	879666.8	31300.07
4/3/2020	SGMS	Buy	\$5.59	1000	\$5,609.99	\$1,465.02	885276.8	32765.09

Table 6.12.1 Week 10

### 6.13. Conclusion

The simulation started on Monday, January 27th. After 10 weeks, the simulation ended on Friday, April 3rd. The overall weekly simulation is below in table 6.13.1 and the net loss is represented in table 6.13.2. I was able to gain a profit of \$32,765 in 10 weeks but that is not net profit as it does not represent the loss in cash due to trades that were still open at the end of 10 weeks. If we subtract the total loss in cash (\$114723.24) from the Total Profit (\$32765.09) we get our net loss (-\$81958.15). What this means is that even though we were able to generate \$32,765 profit using the trades we had closed, there was still a drawdown of \$81,958 caused by the open

trades on our total cash. If we assume that the open trades at the end of 10 weeks would have closed with no profit or loss, then our performance of total profit 3.28% at the end of 10 weeks hits the initial goal set at the start of the simulation. However, accounting for the drawdown of the open trades our net result is a loss of 8.20%.

Week	Weekly Profit	Total Money (\$1,000,000)	Total Profit	Total Profit Percentage
Week 1	288.52	999140.5	288.52	0.03%
Week 2	8999.23	983318.01	9287.75	0.93%
Week 3	3016.28	983470.09	12304.03	1.23%
Week 4	2970.87	991663.7	15274.9	1.53%
Week 5	2154.88	978258.83	17429.78	1.74%
Week 6	149.91	978198.36	17579.69	1.76%
Week 7	560.02	974768.08	18139.71	1.81%
Week 8	9227.18	893915.54	27366.89	2.74%
Week 9	0	833099.17	27366.89	2.74%
Week 10	5398.2	885276.76	32765.09	3.28%

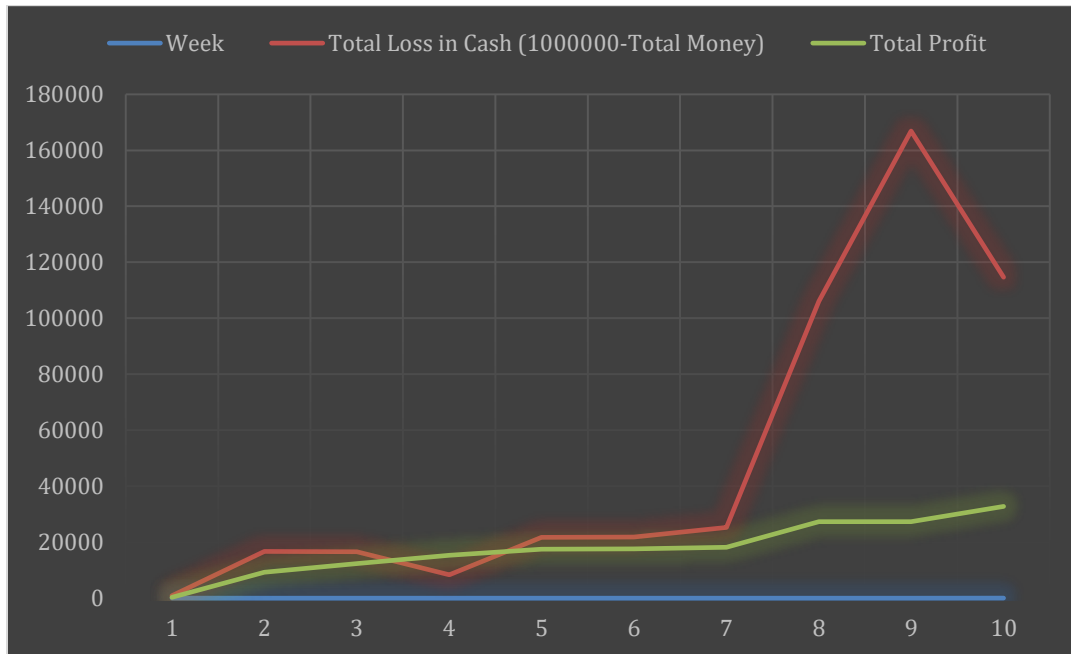
*Table 6.13.1 Weekly overall profit over 10 weeks*

Week	Total Loss in Cash (1000000-Total Money)	Weekly Profit	Total Profit	Net Profit / Loss (Total Profit - Loss in Cash)
Week 1	859.5	288.52	288.52	-570.98 (-0.00057%)
Week 2	16681.99	8999.23	9287.75	-7394.24 (-0.0074%)
Week 3	16529.91	3016.28	12304.03	-4225.88 (-0.0042%)
Week 4	8336.3	2970.87	15274.9	6938.6 (0.0069%)
Week 5	21741.17	2154.88	17429.78	-4311.39 (-0.0043%)
Week 6	21801.64	149.91	17579.69	-4221.95 (-0.0042%)
Week 7	25231.92	560.02	18139.71	-7092.21 (-0.0071%)
Week 8	106084.46	9227.18	27366.89	-78717.57 (-7.9%)
Week 9	166900.83	0	27366.89	-139533.94 (-14%)
Week 10	114723.24	5398.2	32765.09	-81958.15 (-8.2%)

*Table 6.13.2 Net profit over 10 weeks*

Figure 6.13.1 shows my performance over the 10 weeks and shows that only Week 4 was a successful week as the total profit exceeded the total loss in cash by open trades. This figure helps show a stark difference between martingale trading strategy and other trading strategies, which is that in martingale trades are only closed when the trade is profitable and hence trades can be open over long periods of time. The 3.28% total profit shows the success of the

martingale strategy but as we were unable to close all trades during the simulation, we resulted in an overall net loss 8.20%.



*Figure 6.13.1 Performance over 10 weeks*

In conclusion, I have learned martingale can be very useful but it has some drawbacks such as trades can take a long time to close and when multiple trades are opened using martingale trade size can quickly increase and cash available can be a major concern. Due to needing a lot of cash and the possibility of reaching a 100% drawdown if trades keep adding up, martingale is a high-risk strategy. Hence, I have concluded that in order to use martingale we should have a lot of cash available and have low targets for profit such as 10% profit per year. As martingale is a high-risk strategy but with low targets for profit, it is not an ideal strategy and I would not choose it for investing my life's savings.

# Chapter 7: Value Investing - Dung (Kevin) Nguyen

## 7.1. Simulation Goal and Strategy

Benjamin Graham, the founder of value investing, taught us that investors should always seek an adequate return. But what exactly is an adequate return?

It is well-known that any novice investor can achieve a return that roughly matches that of the overall market over time by simply buying an index fund or ETF. Therefore, the goal of any active investment strategy - including, but not limited to, value investing - is to perform better than that. Otherwise, if a strategy utilized cannot consistently outperform the market, one would be better off buying the index fund and spending the extra time to increase their productivity to generate more investment capital. In practice, for a value investor, seeking an adequate return might also mean keeping your money in the index fund until you are able to find exceptional companies that fit the value investment criteria.

Since our total simulation duration is only 8 weeks, we would have to make two considerations:

First, instead of using the market's annual return as a benchmark, we would convert this amount into the monthly return. Monthly returns can be useful to investors in assessing short-term performance and determining the characteristics of the portfolio that you have put together. The formula we would use for this would be:

$$\text{Annual Return} = ((1 + \text{Monthly Return})^{12}) - 1 \quad [7]$$

Given that the average annual return of the market over the last 10 years as 7%, taken into account inflation <sup>[8]</sup>, we would be able to calculate the monthly return of the market as follows:

$$7\% = ((1 + \text{Monthly Return})^{12}) - 1 \quad [7]$$

$$107\% = (1 + \text{Monthly Return})^{12}$$

$$1.00565 = 1 + \text{Monthly Return}$$

$$\text{Monthly Return} = 0.00565 = 0.565\%$$

Given that the monthly return is 0.565% and the duration of the simulation is approximately two months (8 weeks), we should expect that our strategy will achieve the return of:

$$\text{Two-month return} = ((1 + \text{Monthly Return})^2) - 1 \quad [7]$$

$$\text{Two-month return} = ((1 + 0.00565)^2) - 1$$

$$\text{Two-month return} = 0.0113 = 1.13\%$$

With a starting capital of \$1,000,000, we expect that our portfolio value at the end of the simulation will reach or exceed the amount of \$1,011,332.

Second, since value investing is considered a long-term strategy - one that takes full advantage of the inefficient market theory, it is worth keeping in mind that the return we achieve at the end of our 8-week simulation might not yet show the full potential of this strategy. Regardless, this simulation will be an interesting example to show how value investing performs in the short term.

Now, let us discuss our strategy.

*“If you don’t feel comfortable owning a stock for 10 years, you shouldn’t own it for 10 minutes.” - Warren Buffet*

When one invests, he or she should generally follow the wisdom of the legendary investor Warren Buffet: “Rule No.1: Never lose money. Rule No.2: Don’t forget rule No.1”. As intelligent investors, we should look for companies that are strong, both in the financial aspect as well as their future prospect. Accordingly, a sound investment needs to be justified by both quantitative and

qualitative means. For this project, we would focus more on the quantitative side of our investments, due to the fact that qualitative analysis can be complicated and subjective.

Let us discuss the quantitative side. The quantitative analysis is fewer in numbers, easier to obtain, and can often tell a good story about the qualitative aspect of the company. In fact, simply just by performing simple quantitative analysis, we could potentially filter out many companies that are financially weak, leaving us with only decent to great companies that deserve to take a closer look. The quantitative aspect of an investment means a thorough analysis of the company's important financial statements. These include, but not limited to, the income statement, the balance sheet, and the cash flow statement. There is a lot of useful information that we can extract from these aforementioned statements, such as the company's capitalization, earnings and dividends, assets and liabilities, etc.

To begin with, we could use the Standard & Poor (S&P)'s rating system, specifically the S&P Earnings and Dividend Rating, to first immediately filter out obviously weak companies. An S&P "Earnings and Dividend Quality Rank" is a letter grade assigned to a company based on a variety of factors, chief among them is the consistency of earnings and dividend growth over the prior 10 years. It should come as no surprise that those companies with a higher consistency of increasing earnings and dividends tended to experience lower price volatility over time relative to the broader market <sup>[10]</sup>, which is essentially what we desire. The S&P rating system ranges from D to A+. Accordingly, for the sake of our investing rules, we would stick to *stocks with ratings of B+ or better*, just to be on the safe side. In case we cannot acquire the ratings, however, we can select *companies that are at least mid-cap*, since they are generally more financially conservative than small-cap companies.

Second, we can further filter out extremely high-growth companies by using the company's price-to-earnings ratio (commonly referred to as "P/E ratio"), the ratio of earnings per share to the company's current stock price. Simply put, a stock selling at 5 times earnings usually offers investors more earning power per share than one selling at 15 times earnings. What ratio would be good here? A general answer to this question would be to invest in **companies with P/E ratios of 9.0 or less**. This will help investors filter out many high growth companies that often proves too risky for value investing principles. Despite this advice, the benchmark of P/E ratio can vary among companies in different industry sectors. A more decent approach would be to **compare a company's P/E ratio to its industry sector's average P/E ratio**. Anything **lower than the average** might actually deserve a closer look.

In addition to the P/E ratio, there is another related ratio that can help us see if a company with earnings growth is selling below its intrinsic value: the price-to-earnings-growth ratio (commonly known as "PEG ratio"), which is the company's P/E ratio divided by its earnings rate. A company with a PEG ratio of 1 is more or less properly valued. However, if you can find a company with **a PEG ratio below 1**, it could be selling at a discount. Such ratio basically means that the price per earnings of a stock is growing not as much as the actual earnings itself, which definitely seems to be a great investment opportunity.

Fourth, Benjamin Graham advised buying companies with the **total debt to current asset ratios of less than 1.10**, as well as the **current ratio greater than 1.50**. In value investing, it is vital to invest in conservative companies, those with a low debt load - but not too low because it would just show that the company is not taking every financial advantage offered to grow their company.

The fifth factor we would consider in this simulation is the price to book value ratio (P/BV), the market price per share divided by the book value per share. Find **companies with the price to**

*book value ratio less than 1.20* to filter out overpriced companies. At this point, one would be tempted to state that using the price to book value ratio should be enough for determining if a company is worth investing in, because its very definition helps investors pick companies that are undervalued. This idea is theoretically correct, yet in practice it is rarely the case. Companies have many ways to adjust their financial statements to make the case that their company seems to be a bit undervalued, in order to attract more investors <sup>[11]</sup>. Therefore, this ratio should merely be regarded as an additional puzzle piece to complete our analysis.

The qualitative aspect of an investment looks at the core behavior of the company. These include management, customer preferences, competitive landscape, and technological change. This is much harder to analyze than its fellow quantitative aspect, since it requires a good business knowledge of the company to draw a sound conclusion.

After a thorough analysis of a company, an investor would have to determine the proper market price of a stock that he or she is willing to pay. At first glance, it would seem that buying any securities that are undervalued (as a result of the analysis) would surely bring investors profits. However, this is often not true. Note that even the most thorough analysis performed by the best security analyst could not avoid the risk of being wrong, since the result is just an estimation after all. Therefore, an investor should insist on a subjectively acceptable margin of safety when purchasing a stock. Keep in mind that the idea of a margin of safety is one of the key principles of value investing. It helps insulate your portfolio from shocks that hit the broader industry or the market as a whole. At the same time, it also represents the potential upside of an investment. That is, if one has bought a stock at a reasonable discount, he or she can expect that the price of the stock has more potential to rise towards its intrinsic value over time.



## ***7.2. Companies Selected***

Since we will only apply our value investing strategy on a basic level, we would look at every company's last year's annual report, and find companies whose financial conditions satisfy four key criteria (identified in the Intelligent Investor book):

- a) PEG ratio is less than 1.
- b) Total debt to current asset ratio is less than 1.10.
- c) Price to book value ratio less than 1.20.
- d) Current ratio (current assets divided by current liabilities) is greater than 1.50.

Afterwards, we would filter out companies that are small-cap. This leaves us with companies that are medium and large caps, which are considered more financially conservative, thus reducing the risk of our investments.

These are the companies that seem to be undervalued based on their last year's annual report (released on September 2019):

1. Essential Properties Realty Trust, Inc. (EPRT)
2. Zoom Video Communications, Inc. (ZM)
3. QUALCOMM Incorporated (QCOM)
4. Cisco Systems Inc. (CSCO)
5. KLA-Tencor Corporation (KLAC)
6. Open Text Corporation (OTEX)
7. Energizer Holdings Inc. (ENR)
8. Uber Technologies, Inc. (UBER)
9. Apergy Corporation (APY)
10. Parker-Hannifin Corporation (PH)

11. Rockwell Automation Inc. (ROK)
12. Applied Industrial Technologies Inc. (AIT)
13. nVent Electric plc (NVT)
14. Visa Inc. (V)
15. FactSet Research Systems Inc. (FDS)
16. AssetMark Financial Holdings, Inc. (AMK)
17. AXA Equitable Holdings, Inc. (EQH)
18. Jefferies Financial Group Inc. (JEF)
19. ResMed Inc. (RMD)
20. Catalent Inc. (CTLT)
21. Myriad Genetics Inc. (MYGN)
22. Bio-Techne Corp (TECH)
23. Elanco Animal Health Incorporated (ELAN)

Every day, we would check to see if the current P/E ratio of these companies are below their sector's average P/E ratio. If that is the case, we believe that such companies are truly undervalued, thus investing our money in their stock.

Below is the list of average P/E ratio based on sector:

1. Real Estate: 39.26
2. Communication Services: 26.74
3. Technology: 33.05
4. Energy: 17.4
5. Industrials: 25.06
6. Financial Services: 13.25

## 7. Healthcare: 50.52

At the end of each week, we would summarize our results by two tables. One table (optional) will demonstrate our up-to-date portfolio state, and the other one will show the detailed records of all our transactions.

### 7.3. Simulation Week 1

At the beginning of the week, we decided to purchase the Vanguard Index Fund (one that matches the S&P 500), due to a steep drop in its market price. Following that transaction, we identified Cisco Systems Inc. (*CSCO*) and Jefferies Financial Group (*JEF*) as undervalued, since their P/E ratio during the week was 1.25 times less than the average P/E ratio in their according sector. In addition, we also purchased Uber Technologies Inc (*UBER*), since its stock has reached its low point (\$10 less than its IPO) and has slowly recovered, presenting us with a potentially good investment.

After the first week simulation, the total net change is negative \$2,342.25 (with commission fee). Below is our current portfolio:

<b>SYMBOL</b>	<b>QTY</b>	<b>PURCHASE PRICE</b>	<b>CURRENT PRICE</b>	<b>TOTAL VALUE</b>	<b>TOTAL GAIN/LOSS</b>
VOO	150	\$298.70	\$295.69	\$44,353.50	-\$451.50 (-1.01%)
UBER	750	\$36.45	\$36.29	\$27,217.50	-\$120.75 (-0.44%)
CSCO	2250	\$46.74	\$45.97	\$103,432.50	-\$1,732.50 (-1.65%)
JEF	1250	\$21.67	\$21.64	\$27,050.00	-\$37.50 (-0.14%)
			<b>TOTAL</b>	\$202,053.50	-\$2,342.25 (-1.15%)

*Table 7.3.1. Simulation Week 1 Ending Portfolio*

The detailed data for our first week simulation is shown below:

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
1/27/20							1000000	
1/28/20	VOO	Buy	298.7	150	44824.99		955175.01	
	UBER	Buy	36.45	750	27358.24		927816.77	
1/29/20	CSCO	Buy	47.67	750	35772.49		892044.28	
1/30/20	CSCO	Buy	46.6	750	34969.99		857074.29	
1/31/20	JEF	Buy	21.67	1250	27107.49		829966.8	
	CSCO	Buy	45.95	750	34482.49		795484.31	

Table 7.3.2. Simulation Week 1 Value Investing

Although we lost \$2,342.25 at the end of this first week, we actually achieved our goal of beating the market consistently, as shown by the figure below:

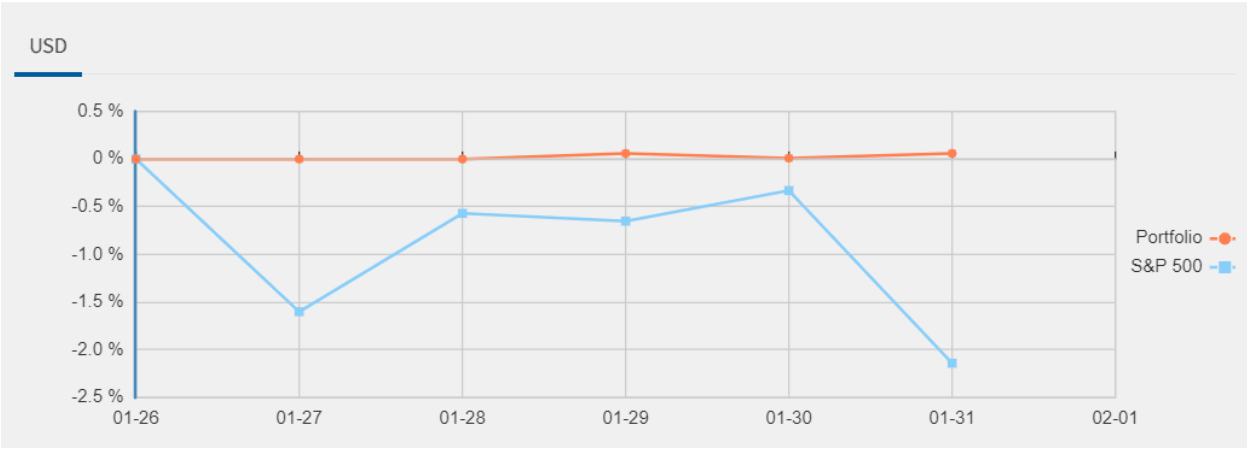


Figure 7.3.1. Value Investing portfolio performance versus the S&P 500

## 7.4. Simulation Week 2

Our second week performance is worse than our criteria, since we actually underperform the market (S&P 500) by quite a large margin. Despite that, however, we took advantage of the dropping in price of our undervalued stocks and purchased a lot more of them at a bargain price. The detailed data for our second is shown in the table below:

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/ Loss	Total Cash	Total Profit
							795484.31	
02/04/20	MYGN	Buy	28.5	1500	42769.99		752714.32	
02/05/20	UBER	Buy	37.53	500	18783.34		733930.98	
	KLAC	Buy	170.69	200	34157.99		699772.99	
02/07/20	KLAC	Buy	165.63	500	82834.99		616938	

Table 7.4.1 Simulation Week 2 Value Investing

We decided to purchase a large amount of Uber Technologies Inc (*UBER*) stocks and KLA Corp (*KLAC*) stocks due to their sudden drop in prices, making them quite a bargain. Below is their performance over the past week:

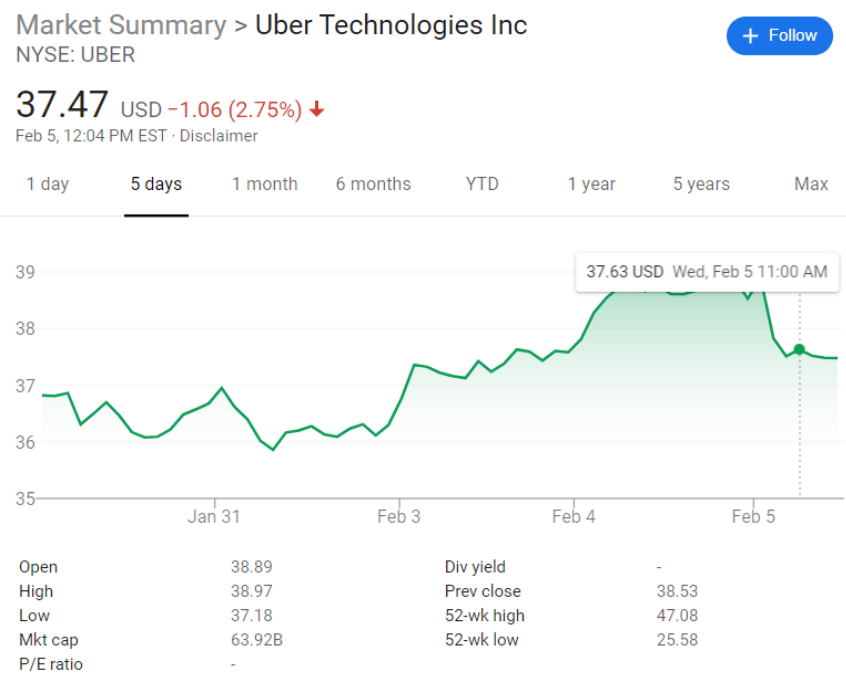


Figure 7.4.1. UBER Stock Performance over last 5 days on Feb 5

Market Summary > KLA Corp  
NASDAQ: KLAC

+ Follow

165.10 USD -6.64 (3.87%) ↓

Closed: Feb 7, 7:16 PM EST · Disclaimer  
After hours 164.74 -0.36 (0.22%)



Figure 7.4.2. KLAC Stock Performance over last 5 days on Feb 5

We have also identified several more undervalued stocks as well, but since their prices have risen so much over the week, we decided not to purchase them. Two examples of these are nVent Electric PLC (NVT) and Applied Industrial Technologies (AIT). Below is their performance over the past week:

Market Summary > nVent Electric PLC  
NYSE: NVT

+ Follow

26.94 USD +1.71 (6.78%) ↑

Feb 5, 12:07 PM EST · Disclaimer



Figure 7.4.3. NVT Stock Performance over last 5 days on Feb 5

Market Summary > Applied Industrial Technologies  
NYSE: AIT

+ Follow

68.18 USD +0.97 (1.44%) ↑  
Feb 5, 12:06 PM EST · Disclaimer



Figure 7.4.4. AIT Stock Performance over last 5 days on Feb 5

### 7.5. Simulation Week 3

Over this week, we identified 6 seemingly undervalued companies based on their P/E ratio. These include: QUALCOMM Inc (*QCOM*), Cisco Systems Inc (*CSCO*), KLA Corp (*KLAC*), Parker-Hannifin Corp (*PH*), Applied Industrial Technologies (*AIT*), and Jefferies Financial Group Inc (*JEF*). Specifically, each of these companies have much lower P/E ratio than their sector's average:

1. QCOM: 25.19 compared to 33.05.
2. CSCO: 19.65 compared to 33.05.
3. KLAC: 24.90 compared to 33.05.
4. PH: 20.21 compared to 25.06.
5. AIT: 20.22 compared to 25.06.
6. JEF: 7.76 compared to 13.25.

Ideally, we would like to buy low to achieve a good margin of safety. This week, only Cisco (CSCO) and Jefferies Financial Group Inc (JEF) presented us with such an opportunity. Below is their performance over the past week (the price mark represents the time which we purchased these securities):



Figure 7.5.1. CSCO Stock Performance over last 5 days on Feb 14



Market Summary > Jefferies Financial Group Inc  
NYSE: JEF

+ Follow

23.47 USD +0.11 (0.47%) ↑

Closed: Feb 14, 4:21 PM EST · Disclaimer  
After hours 23.40 -0.070 (0.30%)



Figure 7.5.2. JEF Stock Performance over last 5 days on Feb 14

In addition, realizing that UBER stock has grown quickly over the past few weeks, reaching its IPO's market value, we decided to sell it and accept the current profit of \$5,707 on an initial \$46,000 investment. Below is UBER's performance over the past week:

Market Summary > Uber Technologies Inc  
NYSE: UBER

+ Follow

39.66 USD -0.43 (1.07%) ↓

Closed: Feb 14, 7:59 PM EST · Disclaimer  
After hours 39.68 +0.020 (0.050%)



Figure 7.5.3. UBER Stock Performance over last 5 days on Feb 14

The other companies have P/E ratios of either close to the average of their sector, or even higher (which means that they are seemingly overvalued). Below are the overvalued companies' final P/E ratio over the week compared to industry average:

1. EPRT: 48.90 compared to 39.26
2. ZM: 2560.29 compared to 26.74 (extremely overvalued)
3. ENR: 349.22 compared to 33.05 (extremely overvalued)
4. APY: 26.09 compared to 17.4
5. PH: 19.82 compared to 25.06
6. V: 37.54 compared to 13.25
7. FDS: 30.95 compared to 13.25
8. AMK: 219.02 compared to 13.25 (extremely overvalued)
9. CTLT: 70.55 compared to 50.52
10. TECH: 85.75 compared to 50.52
11. ELAN: 124.96 compared to 50.52

The detailed data for our third week simulation is shown below:

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							616938	
02/10/20	JEF	Buy	22.85	1250	28576.24		588361.76	
02/12/20	UBER	Sell	41.5	1250	51848.76	5707	640210.52	5707
02/13/20	CSCO	Buy	46.94	1750	82165.52		558045	

*Table 7.5.1. Simulation Week 3 Value Investing*

## **7.6. Simulation Week 4**

Over this week, we have identified three seemingly undervalued companies based on their P/E ratio. These include Cisco Systems Inc. (*CSCO*), KLA Corp (*KLAC*), Jefferies Financial

Group Inc (*JEF*). Specifically, each of these companies have much lower P/E ratio than their sector's average:

1. CSCO: 18.02 compared to 33.05.
2. KLAC: 23.53 compared to 33.05.
3. JEF: 7.85 compared to 13.25.

However, only Cisco Systems Inc. (*CSCO*) and KLA Corp (*KLAC*) presented us with a buying opportunity, providing that their stocks dropped significantly recently. Below are their performance over the past week (the price mark represents the time which we purchased these securities):



*Figure 7.6.1. CSCO Stock Performance over last 5 days on Feb 21*

Market Summary > KLA Corp  
NASDAQ: KLAC

+ Follow

161.12 USD -6.18 (3.69%) ↓

Closed: Feb 21, 4:57 PM EST · Disclaimer  
After hours 161.12 0.00 (0.00%)



Figure 7.6.2. KLAC Stock Performance over last 5 days on Feb 21

Although JEF is also noted as a seemingly undervalued company, its stock has again risen so high, thus dissuading us from purchasing it. Below is JEF's stock performance over this week:

Market Summary > Jefferies Financial Group Inc  
NYSE: JEF

+ Follow

23.56 USD -0.16 (0.67%) ↓

Closed: Feb 21, 4:02 PM EST · Disclaimer  
After hours 23.56 0.00 (0.00%)



Figure 7.6.3. JEF Stock Performance over last 5 days on Feb 21

The other companies have P/E ratios of either close to the average of their sector, or even higher (which means that they are seemingly overvalued). Below are the overvalued companies' final P/E ratio over the week compared to industry average:

1. EPRT: 45.41 compared to 39.26
2. ZM: 2856.29 compared to 26.74 (extremely overvalued)
3. OTEX: 38.72 compared to 33.05
4. ENR: 337.82 compared to 33.05 (extremely overvalued)
5. APY: 24.39 compared to 17.4
6. PH: 20.19 compared to 25.06
7. V: 38.05 compared to 13.25
8. FDS: 32.12 compared to 13.25
9. AMK: 223.22 compared to 13.25 (extremely overvalued)
10. RMD: 55.59 compared to 50.52
11. CTLT: 70.25 compared to 50.52
12. TECH: 86.78 compared to 50.52
13. ELAN: 169.53 compared to 50.52

The detailed data for our fourth week simulation is shown below:

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							558045	
02/18/20	CSCO	Buy	46.46	2000	92929.99		465115.01	
02/19/20	CSCO	Buy	46.08	500	23059.99		442055.02	
02/20/20	KLAC	Buy	167.84	250	41979.99		400075.03	
02/21/20	KLAC	Buy	162.91	150	24456.49		375618.54	
	CSCO	Buy	46.53	500	23282.49		352336.05	

*Table 7.6.1. Simulation Week 4 Value Investing*

Below is our current portfolio:

SYMBOL	QTY	PURCHASE PRICE	CURRENT PRICE	TOTAL VALUE	TOTAL GAIN/LOSS
VOO	150	\$298.70	\$306.49	\$45,973.50	\$1,168.50 (2.61%)
CSCO	7000	\$46.65	\$46.30	\$324,065.00	-2,458.03 (-0.75%)
JEF	2500	\$22.26	\$23.56	\$58,900.00	\$3,256.25 (5.85%)
MYGN	1500	\$28.50	\$19.65	\$29,475.00	\$13,275.00 (-31.05%)
KLAC	1100	\$166.68	\$161.12	\$177,232.00	-\$6,117.50 (-3.34%)
			<b>TOTAL</b>	\$635,645.50	-\$17,425.78 (-2.67%)

Table 7.6.2. Simulation Week 4 Ending Portfolio

## 7.7. Simulation Week 5

Over this week, we have identified seven seemingly undervalued companies based on their P/E ratio. These include QUALCOMM Inc. (QCOM), Cisco Systems Inc. (CSCO), KLA Corp (KLAC), Parker-Hannifin Corp (PH), Applied Industrial Technologies (AIT), nVent Electric PLC (NVT), Jefferies Financial Group Inc (JEF). Specifically, each of these companies have much lower P/E ratio than their sector's average:

1. QCOM: 21.47 compared to 33.05.
2. CSCO: 15.96 compared to 33.05.
3. KLAC: 20.74 compared to 33.05.
4. PH: 18.01 compared to 25.06.
5. AIT: 18.26 compared to 25.06.
6. NVT: 19.41 compared to 25.06.
7. JEF: 7.85 compared to 13.25.

The stock market has performed extremely poorly this week as investors as investor concerns mount about the coronavirus's impact on business activity. Theoretically, this should put lots of companies at an on-sale stock price. However, since the stock market has been on a bull run for so long, we still have to eliminate companies whose stock has risen too much since their

last annual report. In addition, we do not want to put too much money into one basket, so we will not purchase any more securities that we have already bought for a large amount, such as CSCO and KLAC. Accordingly, only QUALCOMM Inc. (QCOM), CnVent Electric PLC (NVT), and Jefferies Financial Group Inc (JEF) presented us with a buying opportunity. Below is their performance over the past week (the price mark represents the time which we purchased these securities):



Figure 7.7.1. QCOM Stock Performance over last 5 days on Feb 29

Market Summary > nVent Electric PLC  
NYSE: NVT

+ Follow

**24.01** USD **-0.56 (2.28%)** ↓  
Closed: Feb 28, 4:20 PM EST · Disclaimer  
After hours 23.87 **-0.14 (0.60%)**

1 day   **5 days**   1 month   6 months   YTD   1 year   5 years   Max



Figure 7.7.2. NVT Stock Performance over last 5 days on Feb 29

Market Summary > Jefferies Financial Group Inc  
NYSE: JEF

+ Follow

**19.71** USD **-0.25 (1.25%)** ↓  
Closed: Feb 28, 4:20 PM EST · Disclaimer  
After hours 19.71 0.00 (0.00%)

1 day   **5 days**   1 month   6 months   YTD   1 year   5 years   Max



Figure 7.7.3. JEF Stock Performance over last 5 days on Feb 29



The other companies have P/E ratios of either close to the average of their sector, or even higher (which means that they are seemingly overvalued). Below are the overvalued companies' final P/E ratio over the week compared to industry average:

1. EPRT: 39.94 compared to 39.26
2. ZM: 3252.43 compared to 26.74 (extremely overvalued)
3. OTEX: 34.84 compared to 33.05
4. ENR: 299.21 compared to 33.05 (extremely overvalued)
5. APY: 28.19 compared to 17.4
6. ROK: 24.18 compared to 25.06
7. V: 33.38 compared to 13.25
8. FDS: 30.45 compared to 13.25
9. AMK: 194.37 compared to 13.25 (extremely overvalued)
10. RMD: 52.67 compared to 50.52
11. CTLT: 63.79 compared to 50.52
12. TECH: 82.21 compared to 50.52
13. ELAN: 158.33 compared to 50.52

The detailed data for our fifth week simulation is shown below:

Date	Symbol	Buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							352336.05	
02/24/20	JEF	Buy	22.86	1750	40024.99		312311.06	
02/26/20	QCOM	Buy	80.24	500	40139.99		272171.07	
02/27/20	JEF	Buy	20.28	500	10159.99		262011.08	
02/27/20	NVT	Buy	25	1000	25014.99		236996.09	

*Table 7.7.1. Simulation Week 5 Value Investing*

SYMBOL	QTY	PURCHASE PRICE	CURRENT PRICE	TOTAL VALUE	TOTAL GAIN/LOSS
VOO	150	\$298.70	\$271.74	\$40,761.00	-\$4,044.00 (-9.03%)
CSCO	7000	\$46.65	\$39.93	\$279,510.00	-\$47,013.03 (-14.40%)
JEF	4750	\$22.26	\$19.71	\$93,622.50	-\$12,166.25 (-11.50%)
MYGN	1500	\$28.50	\$17.62	\$26,430.00	-\$16,320.00 (-38.18%)
KLAC	1100	\$166.68	\$153.71	\$169,081.00	-\$14,268.50 (-7.78%)
QCOM	500	\$80.24	\$78.30	\$39,150.00	-\$970.00 (-2.42%)
NVT	1000	\$25.00	\$24.01	\$24,010.00	-\$985.00 (-3.94%)
			<b>TOTAL</b>	\$672,564.50	-\$95,766.78 (-12.46%)

*Table 7.7.2. Simulation Week 5 Ending Portfolio*

## **7.8. Simulation Week 6**

Over this week, we have identified seven seemingly undervalued companies based on their P/E ratio, which actually turned out to be the same as last week. These include QUALCOMM Inc. (QCOM), Cisco Systems Inc. (CSCO), KLA Corp (KLAC), Parker-Hannifin Corp (PH), Applied Industrial Technologies (AIT), nVent Electric PLC (NVT), Jefferies Financial Group Inc (JEF). Below is an update on each of these companies, which had much lower P/E ratio than their sector's average over the past week:

1. QCOM: 22.46 compared to 33.05 (increased compared to week 5)
2. CSCO: 15.70 compared to 33.05 (decreased compared to week 5)
3. KLAC: 21.72 compared to 33.05 (increased compared to week 5)
4. PH: 17.94 compared to 25.06 (decreased compared to week 5)
5. AIT: 16.99 compared to 25.06 (decreased compared to week 5)
6. NVT: 18.95 compared to 25.06 (decreased compared to week 5)
7. JEF: 6.59 compared to 13.25 (decreased compared to week 5)

Similar to last week, the stock market has performed extremely poorly this week as the effects of coronavirus had eventually hit the United States. This theoretically would put a lot of

companies' stock on-sale. We would have to be careful, however, since the effects of the coronavirus on the economy seems potentially disastrous (proven in the case of China). In addition, this disease would not go away anytime soon. Since we do not have much cash left, we would start to make use of two strategies until the end of the simulation, or until the end of this disease (whichever comes earlier). First, we would invest small amounts of money into the stock market, using the dollar cost averaging approach. Simply put, for each investment, we would put the same amount of money in, over a certain period. For example, we can first invest \$5000 in company A when its stock is \$50 - thus buying 100 of A; later on, we can invest \$5000 in company A when its stock is \$40 - thus buying 125 of A. Second, we would stop building stronger positions on companies whom we have invested more than \$50,000. As for this week, we decided to buy AIT, NVT, and TECH to further diversify our portfolio.

The other companies have P/E ratios of either close to the average of their sector, or even higher (which means that they are seemingly overvalued). Below are the overvalued companies' final P/E ratio over the week compared to industry average:

1. EPRT: 41.98 compared to 39.26
2. ZM: 3329.43 compared to 26.74 (extremely overvalued)
3. OTEX: 34.98 compared to 33.05
4. ENR: 307.76 compared to 33.05 (extremely overvalued)
5. APY: 27.42 compared to 17.4
6. ROK: 23.72 compared to 25.06
7. V: 34.14 compared to 13.25
8. FDS: 29.92 compared to 13.25
9. AMK: 184.76 compared to 13.25 (extremely overvalued)

10. RMD: 52.87 compared to 50.52
11. CTLT: 62.72 compared to 50.52
12. TECH: 38.96 compared to 50.52
13. ELAN: 150.89 compared to 50.52

The detailed data for our sixth week simulation is shown below:

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							236996.09	
03/02/20	AIT	Buy	58.33	500	29184.99		207811.1	
03/03/20	TECH	Buy	193.85	100	19404.99		188406.11	
	NVT	Buy	24.37	400	9767.99		178638.12	
03/04/20	AIT	Buy	57.98	150	8716.99		169921.13	

*Table 7.8.1. Simulation Week 6 Value Investing*

## **7.9. Simulation Week 7**

Over this week, we have identified nine seemingly undervalued companies based on their P/E ratio, which indicated that the market has suffered a strong hit from the coronavirus situation. These include QUALCOMM Inc. (QCOM), Cisco Systems Inc. (CSCO), KLA Corp (KLAC), Parker-Hannifin Corp (PH), Applied Industrial Technologies (AIT), nVent Electric PLC (NVT), Jefferies Financial Group Inc (JEF), Bio-Techne Corp (TECH), and Apergy Corp (APY). Below is the P/E ratio on each of these companies, which had much lower P/E ratio than their sector's average over the past week:

1. QCOM: 19.50 compared to 33.05
2. CSCO: 13.39 compared to 33.05
3. KLAC: 18.50 compared to 33.05
4. PH: 12.79 compared to 25.06
5. AIT: 12.48 compared to 25.06

6. NVT: 13.53 compared to 25.06
7. JEF: 5.09 compared to 13.25
8. TECH: 33.37 compared to 50.52
9. APY: 8.72 compared to 17.4

Again, the stock market has performed extremely poorly this week as the number of coronavirus cases in the United States has risen up to 1000. This incident has caused many states authorities to close schools and ask workers to work from home if at all possible. Going ahead, this will harm the economy disastrously if productions were to go to a halt. This had made the market drop sharply, at least until some positive information or incident happened. In the meantime, we would stick to our planned strategy of holding our strong positions and wait out the storm, rather than keep building on them. At the same time, we would switch our buying power on other companies to diversify our portfolio and take advantage of stocks being on sale. Accordingly, we decided not to purchase more securities from QCOM, CSCO, KLAC, and JEF because we already have strong positions on those stocks. Instead, we purchased TECH, APY and AIT, since those stocks have dropped most sharply.

The other companies have P/E ratios of either close to the average of their sector, or even higher (which means that they are seemingly overvalued). Below are the overvalued companies' final P/E ratio over the week compared to industry average:

1. ZM: 1193.33 compared to 26.74 (decreased sharply, but still extremely overvalued)
2. ENR: 259.54 compared to 33.05 (extremely overvalued)
3. V: 30.43 compared to 13.25
4. FDS: 25.66 compared to 13.25
5. AMK: 138.39 compared to 13.25 (extremely overvalued)

6. ELAN: 119.94 compared to 50.52

The detailed data for our seventh week simulation is shown below:

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							169921.13	
03/10/20	TECH	Buy	186.28	50	9333.99		160587.14	
	APY	Buy	8.11	1000	8129.99		152457.15	
03/11/20	AIT	Buy	48.27	250	12086.24		140370.91	
03/13/20	APY	Buy	5.98	4000	23939.99		116430.92	

*Table 7.9.1. Simulation Week 7 Value Investing*

## **7.10. Simulation Week 8**

Over this week, we have identified eleven seemingly undervalued companies based on their P/E ratio, which reflected the disastrous effects that coronavirus had on the U.S. economy. These include Essential Properties Realty Trust Inc. (EPRT), QUALCOMM Inc. (QCOM), Cisco Systems Inc. (CSCO), KLA Corp (KLAC), Apergy Corp (APY), Parker-Hannifin Corp (PH), Rockwell Automation Inc. (ROK), Applied Industrial Technologies (AIT), nVent Electric PLC (NVT), Jefferies Financial Group Inc (JEF), and Bio-Techne Corp (TECH). Below is the P/E ratio on each of these companies, which had much lower P/E ratio than their sector's average over the past week:

1. EPRT: 18.68 compared to 39.62
2. QCOM: 18.15 compared to 33.05
3. CSCO: 14.02 compared to 33.05
4. KLAC: 17.60 compared to 33.05
5. APY: 5.79 compared to 17.4
6. PH: 10.26 compared to 25.06
7. ROK: 16.71 compared to 25.05

- 8. AIT: 10.47 compared to 25.06
- 9. NVT: 11.35 compared to 25.06
- 10. JEF: 4.38 compared to 13.25
- 11. TECH: 34.25 compared to 50.52

We did not purchase CSCO, KLAC, and JEF stocks because we already accumulated a strong position on those stocks. For this week, we decided to purchase EPRT, NVT, APY, QCOM, ROK, and AIT stocks. We made these decisions because their value has dropped below that when their last annual report was released - around September 2019 (at which point we determined that these companies were undervalued based on their financial ratios). Below are their performance over the past week:

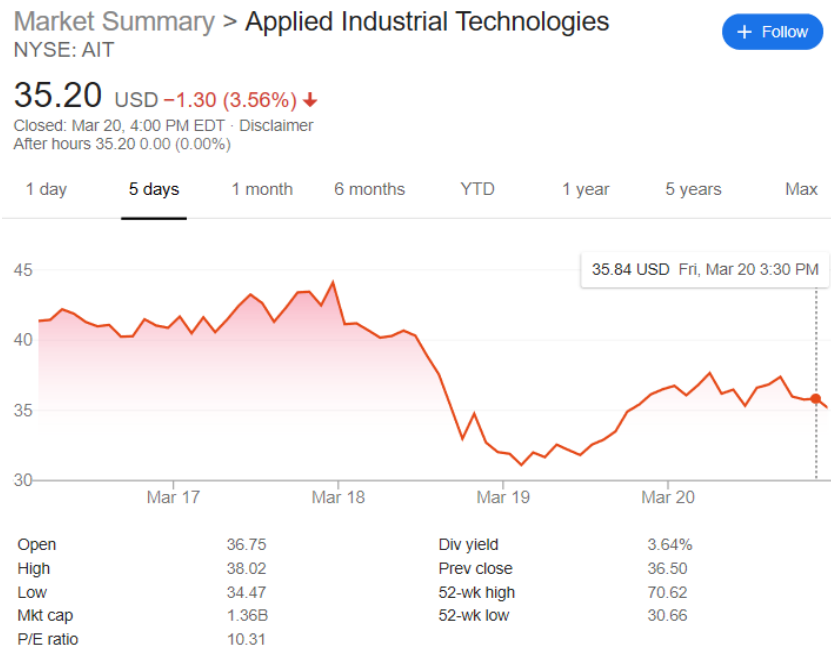


Figure 7.10.1. AIT Stock Performance over last 5 days on Mar 20

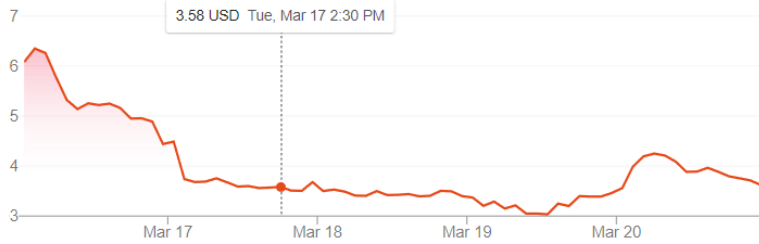
Market Summary > Apergy Corp  
NYSE: APY

+ Follow

3.62 USD +0.17 (4.93%) ↑

Closed: Mar 20, 4:18 PM EDT · Disclaimer  
After hours 3.62 0.00 (0.00%)

1 day 5 days 1 month 6 months YTD 1 year 5 years Max



Open	3.56	Div yield	-
High	4.32	Prev close	3.45
Low	3.37	52-wk high	43.37
Mkt cap	280.52M	52-wk low	2.96
P/E ratio	5.39		

Figure 7.10.2. APY Stock Performance over last 5 days on Mar 20

Market Summary > Essential Properties Realty Trust Inc  
NYSE: EPRT

+ Follow

12.69 USD +2.11 (19.94%) ↑

Closed: Mar 20, 4:02 PM EDT · Disclaimer  
After hours 12.69 0.00 (0.00%)

1 day 5 days 1 month 6 months YTD 1 year 5 years Max



Open	10.58	Div yield	7.25%
High	13.68	Prev close	10.58
Low	10.31	52-wk high	29.34
Mkt cap	1.17B	52-wk low	6.08
P/E ratio	20.11		

Figure 7.10.3. EPRT Stock Performance over last 5 days on Mar 20



Market Summary > nVent Electric PLC  
NYSE: NVT

+ Follow

14.27 USD -0.36 (2.46%) ↓

Closed: Mar 20, 4:21 PM EDT · Disclaimer  
After hours 14.27 0.00 (0.00%)

1 day 5 days 1 month 6 months YTD 1 year 5 years Max



Open	14.62	Div yield	4.91%
High	15.68	Prev close	14.63
Low	14.21	52-wk high	28.75
Mkt cap	2.42B	52-wk low	10.54
P/E ratio	11.09		

Figure 7.10.4. NVT Stock Performance over last 5 days on Mar 20

Market Summary > QUALCOMM, Inc.  
NASDAQ: QCOM

+ Follow

60.91 USD -4.09 (6.29%) ↓

Closed: Mar 20, 7:48 PM EDT · Disclaimer  
After hours 60.80 -0.11 (0.18%)

1 day 5 days 1 month 6 months YTD 1 year 5 years Max



Open	65.03	Div yield	4.07%
High	67.98	Prev close	65.00
Low	60.79	52-wk high	96.17
Mkt cap	69.62B	52-wk low	55.78
P/E ratio	17.37		

Figure 7.10.5. QCOM Stock Performance over last 5 days on Mar 20

Market Summary > Rockwell Automation  
NYSE: ROK

+ Follow

126.79 USD -8.28 (6.13%) ↓

Closed: Mar 20, 5:05 PM EDT · Disclaimer  
After hours 126.79 0.00 (0.00%)

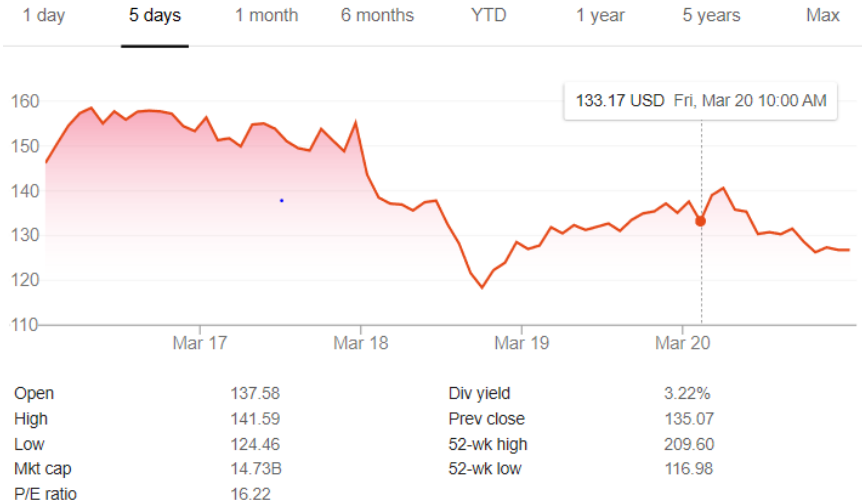


Figure 7.10.6. ROK Stock Performance over last 5 days on Mar 20

The other companies have P/E ratios of either close to the average of their sector, or even higher (which means that they are seemingly overvalued). Below are the overvalued companies' final P/E ratio over the week compared to industry average:

1. ZM: 1466 compared to 26.74 (extremely overvalued)
2. ENR: 212.96 compared to 33.05 (extremely overvalued)
3. V: 27.46 compared to 13.25
4. FDS: 24.25 compared to 13.25
5. AMK: 113.71 compared to 13.25 (extremely overvalued)
6. ELAN: 99.53 compared to 50.52

The detailed data for our eighth week simulation is shown below:

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							116430.92	
03/16/20	EPRT	Buy	11.56	1000	11574.99		104855.93	
03/17/20	EPRT	Buy	9.7	500	4869.99		99985.94	
	NVT	Buy	14.86	500	7449.99		92535.95	
	APY	Buy	3.5	2000	7019.99		85515.96	
03/20/20	QCOM	Buy	63.1	250	15793.74		69722.22	
	ROK	Buy	127.18	150	19096.99		50625.23	
	AIT	Buy	35.63	450	16053.49		34571.74	

*Table 7.10.1. Simulation Week 8 Value Investing*

SYMBOL	QTY	PURCHASE PRICE	CURRENT PRICE	TOTAL VALUE	TOTAL GAIN/LOSS
VOO	150	\$298.70	\$210.74	\$31,611.00	- \$13,194.00 (-29.45 %)
CSCO	7000	\$46.65	\$35.60	\$249,200.00	-\$77,323.03 (-23.68 %)
JEF	4750	\$22.27	\$12.34	\$58,615.00	- \$47,173.75 (-44.59 %)
MYGN	1500	\$28.50	\$12.61	\$18,915.00	- \$23,835.00 (-55.75 %)
KLAC	1100	\$166.68	\$114.02	\$125,422.00	- \$57,927.50 (-31.59 %)
QCOM	750	\$74.53	\$60.91	\$45,682.50	- \$10,211.25 (-18.27 %)
NVT	1900	\$22.20	\$14.27	\$27,113.00	- \$15,060.00 (-35.71 %)
AIT	1350	\$48.86	\$35.20	\$47,520.00	- \$18,441.75 (-27.96 %)
TECH	150	\$191.33	\$167.26	\$25,089.00	- \$3,610.00 (-12.58 %)
APY	7000	\$5.58	\$3.62	\$25,340.00	- \$13,690.00 (-35.08 %)
EPRT	1500	\$10.94	\$12.69	\$19,035.00	\$2,630.00 (16.03 %)
ROK	150	\$127.18	\$126.79	\$19,018.50	- \$58.50 (-0.31 %)
			<b>TOTAL</b>	\$692,561.00	- \$277,894.78 (-28.64 %)

*Table 7.10.2. Simulation Week 8 Ending Portfolio Value Investing*

## 7.11. Simulation Week 9

Over this week, we have identified eleven seemingly undervalued companies based on their P/E ratio. These include Essential Properties Realty Trust Inc. (EPRT), QUALCOMM Inc. (QCOM), Cisco Systems Inc. (CSCO), KLA Corp (KLAC), Apergy Corp (APY), Parker-Hannifin Corp (PH), Rockwell Automation Inc. (ROK), Applied Industrial Technologies (AIT), nVent Electric PLC (NVT), Jefferies Financial Group Inc (JEF), and Bio-Techne Corp (TECH). Below is the P/E ratio on each of these companies, which had lower P/E ratio than their sector's average over the past week:

1. EPRT: 22.52 compared to 39.62
2. QCOM: 18.97 compared to 33.05
3. CSCO: 14.06 compared to 33.05
4. KLAC: 18.57 compared to 33.05
5. APY: 5.64 compared to 17.4
6. PH: 10.81 compared to 25.06
7. ROK: 18.19 compared to 25.05
8. AIT: 11.27 compared to 25.06
9. NVT: 11.41 compared to 25.06
10. JEF: 4.29 compared to 13.25
11. TECH: 34.97 compared to 50.52

We made a harsh decision to sell JEF stocks and MYGN stocks, accepting the loss, due to their unconvincing and disappointed performance over the past three weeks. This would definitely be a lesson that we learned the hard way: an informed investor, even with supported analysis, could make a mistake; the lesson here is he or she should recognize his mistake early and cut loss after the stocks drop a significant amount. We would go further in detail on this in the post-simulation analysis.

Regardless, some positive events for the economy that happen this week opened up new investment opportunities for us. This week, the President of the United States, with the support of his fellow Republican colleagues, proposed a stimulus package of up to \$1,200 for most taxpayers, in order to keep the economy growing even in this disastrous event of the coronavirus. This has made the stocks go up significantly, thus provided us with some great opportunities. We decided to build a really strong position on EPRT and APY stocks, since their stocks have dropped

significantly below their estimated intrinsic value (varying with their P/E ratio as we analyzed). We also sold our positions on AIT, EPRT, and ROK later in the week, when their stocks had raised significantly over the week. Below is their performance over this week:



Figure 7.11.1. EPRT Stock Performance over last 5 days on Mar 27



Figure 7.11.2. APY Stock Performance over last 5 days on Mar 27

Market Summary > Applied Industrial Technologies  
NYSE: AIT

+ Follow

42.62 USD -1.28 (2.92%) ↓

Closed: Apr 3, 4:02 PM EDT · Disclaimer  
After hours 42.62 0.00 (0.00%)



Figure 7.11.3. AIT Stock Performance over last 5 days on Mar 27

Market Summary > Rockwell Automation  
NYSE: ROK

+ Follow

151.46 USD -7.83 (4.92%) ↓

Closed: Mar 27, 4:39 PM EDT · Disclaimer  
After hours 150.21 -1.25 (0.83%)

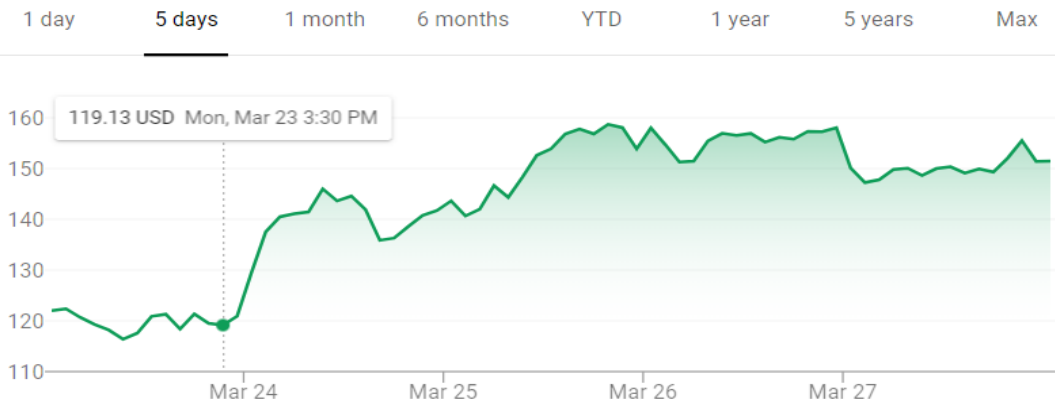


Figure 7.11.4. ROK Stock Performance over last 5 days on Mar 27

The other companies have P/E ratios of either close to the average of their sector, or even higher (which means that they are seemingly overvalued). Below are the overvalued companies' final P/E ratio over the week compared to industry average:

1. ZM: 1570.9 compared to 26.74 (extremely overvalued)
2. ENR: 202.3 compared to 33.05 (extremely overvalued)
3. V: 28.04 compared to 13.25
4. FDS: 23.27 compared to 13.25
5. AMK: 117.83 compared to 13.25 (extremely overvalued)
6. ELAN: 98.53 compared to 50.52

The detailed data for our ninth week simulation is shown below:

Date	Symbol	Buy/ Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit
							34571.74	5707
03/23/20	MYGN	Sell	12.38	1500	18589.99	-24160	53141.74	-19089
	APY	Buy	3.02	13000	39279.99		13861.75	
	EPRT	Buy	12.93	1000	12949.99		911.76	
03/24/20	JEF	Sell	13.42	4750	63764.99	-42043.75	64676.75	-61132.75
	APY	Buy	4.19	15000	62869.99		1806.76	
03/26/20	AIT	Sell	49.6	1350	66979.99	999	67871.76	-60133.75
	EPRT	Sell	15.12	2500	37819.99	8460	105671.76	-51673.75
	ROK	Sell	159.29	150	23913.49	4816.5	129565.26	-46857.25

*Table 7.11.1. Simulation Week 9 Value Investing*

## **7.12. Simulation Week 10**

Since this is the last week of simulation, we would focus primarily on selling our securities. The remaining companies whose stock we still hold on to are KLA Corp (KLAC), Apergy Corp (APY), QUALCOMM Inc. (QCOM), Cisco Systems Inc. (CSCO), nVent Electric PLC (NVT), Bio-Techne Corp (TECH), and the index-matching security - Vanguard S&P 500 ETF (VOO). Below is the P/E ratio on each of these companies (except for the ETF):

1. QCOM: 18.52 compared to 33.05
2. CSCO: 15.15 compared to 33.05
3. KLAC: 17.86 compared to 33.05

4. APY: 9.74 compared to 17.4
5. NVT: 11.56 compared to 25.06
6. TECH: 37.20 compared to 50.52

Thanks to the stimulus plan proposed by the President, the stock market has been steadily recovering over the last week, despite the negative impact the Coronavirus caused for America. This positive incident has helped us recover some losses, and at the same time make some great profit with a few companies. However, there are stocks that have dropped way too much since the beginning of the year under the impact of the Coronavirus, causing us to end the simulation with quite a steep loss of \$45,000.

Below are our portfolio's securities performance over the past week (with the mark of when we sold our holding):



Figure 7.12.1. APY Stock Performance over last 5 days on Apr 3



Market Summary > Cisco Systems, Inc.  
NASDAQ: CSCO

+ Follow

**39.06** USD **-0.74 (1.86%)** ↓  
Closed: Apr 3, 7:55 PM EDT · Disclaimer  
After hours 38.90 **-0.16 (0.41%)**

1 day   **5 days**   1 month   6 months   YTD   1 year   5 years   Max



Figure 7.12.2. CSCO Stock Performance over last 5 days on Apr 3

Market Summary > QUALCOMM, Inc.  
NASDAQ: QCOM

+ Follow

**65.23** USD **-2.79 (4.10%)** ↓  
Closed: Apr 3, 7:56 PM EDT · Disclaimer  
After hours 65.00 **-0.23 (0.35%)**

1 day   **5 days**   1 month   6 months   YTD   1 year   5 years   Max



Figure 7.12.3. QCOM Stock Performance over last 5 days on Apr 3

Market Summary > nVent Electric PLC  
NYSE: NVT

+ Follow

**15.03** USD **-0.76 (4.81%)** ↓

Closed: Apr 3, 4:02 PM EDT · Disclaimer  
After hours 15.03 0.00 (0.00%)



Figure 7.12.4. NVT Stock Performance over last 5 days on Apr 3

Market Summary > BIO-TECHNE Corp  
NASDAQ: TECH

+ Follow

**186.39** USD **-4.43 (2.32%)** ↓

Closed: Apr 3, 4:11 PM EDT · Disclaimer  
After hours 185.83 -0.56 (0.30%)



Figure 7.12.5. TECH Stock Performance over last 5 days on Apr 3

Market Summary > VANGUARD IX FUN/S&P 500 ETF SHS NE  
NYSEARCA: VOO [+ Follow](#)

**228.02** USD **-3.42 (1.48%)** ↓  
Apr 3, 8:00 PM EDT · Disclaimer

1 day   **5 days**   1 month   6 months   YTD   1 year   5 years   Max



Figure 7.12.6. VOO Stock Performance over last 5 days on Apr 3

Market Summary > KLA Corp  
NASDAQ: KLAC [+ Follow](#)

**127.94** USD **-4.50 (3.40%)** ↓  
Closed: Apr 3, 7:36 PM EDT · Disclaimer  
After hours 127.75 -0.19 (0.15%)

1 day   **5 days**   1 month   6 months   YTD   1 year   5 years   Max



Figure 7.12.7. KLAC Stock Performance over last 5 days on Apr 3

The detailed data for our tenth (last) week simulation is shown below:

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit
							129565.26	-46857.25
03/30/20	KLAC	Sell	149.52	1100	164452.01	-18876	294017.27	-65733.25
04/02/20	APY	Sell	7.04	35000	246380.01	105230	540397.28	39496.75
04/03/20	VOO	Sell	228.02	150	34183.01	-10602	574580.29	28894.75
	CSCO	Sell	39.06	7000	273400.01	-53103.03	847980.3	-24208.28
	QCOM	Sell	65.23	750	48902.51	-6971.25	896882.81	-31179.53
	NVT	Sell	15.03	1900	28537.01	-13616	925419.82	-44795.53
	TECH	Sell	186.39	150	27938.51	-740.5	953358.33	-45536.03

*Table 7.12.1. Simulation Week 10 Value Investing*

## **7.13. Simulation Analysis and Conclusion**

### **7.13.1. Overall Performance:**

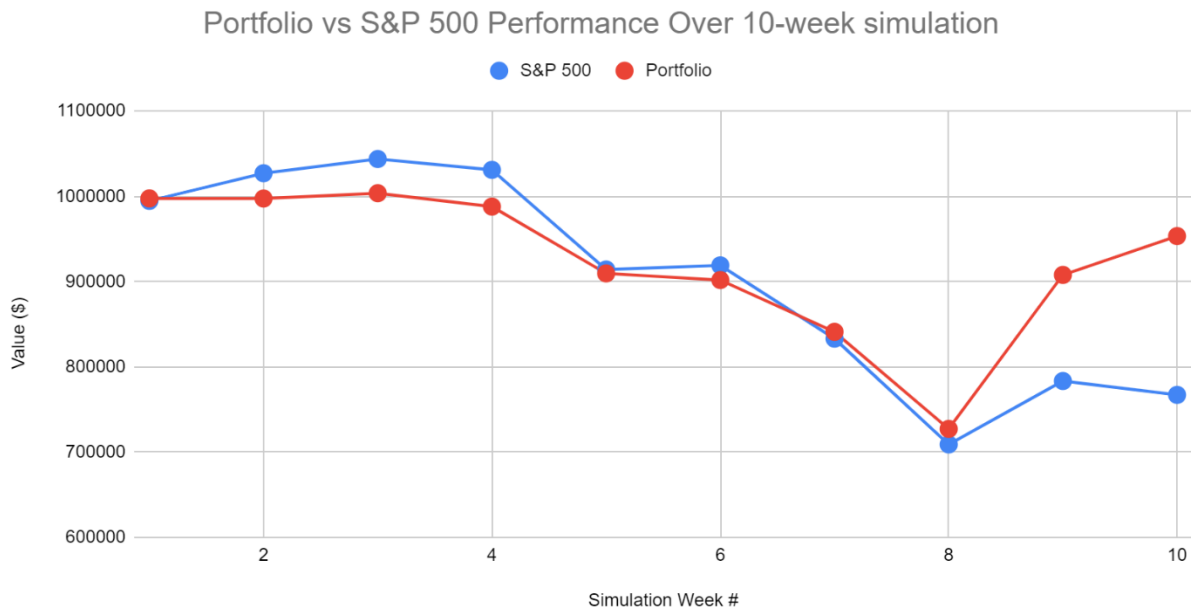
Table 7.13.1.1 below shows the summary of the simulation's weekly performance from week 1 (01/27/2020) to week 10 (03/30/2020):

Week	Total Assets	Total Cash	Total Stock Asset	Net profit
1	997537.81	795484.31	202053.5	0
2	997395	616938	380457	0
3	1003668	558045	445623	5707
4	987981.55	352336.05	635645.5	5707
5	909560.59	236996.09	672564.5	5707
6	901791.63	169921.13	731870.5	5707
7	841045.92	116430.92	724615	5707
8	727132.74	34571.74	692561	5707
9	907768.26	129565.26	778203	-46857.25
10	953358.33	953358.33	0	-45536.03

*Table 7.13.1.1. Table of weekly performance over 10 weeks*

### **7.13.2. Performance Analysis Over the 10-week period:**

During the course of this simulation, figure 7.13.2.1 below shows the performance of my portfolio compared to the S&P 500, which is our baseline benchmark:



*Figure 7.13.2.1. Performance of Value Investing Portfolio vs. the S&P 500*

Let's now evaluate our portfolio over each criterion.

For the first criteria, as figure 7.13.2.1 has shown, we successfully beat the market at the end by a landslide. Specifically, our Value Investing portfolio ended up with the total value of \$953,358.33, compared to the market value of \$767,059.28. This can serve as a good evidence that over the long run, our Value Investing portfolio would likely outperform the S&P 500.

For the second criteria, according to figure 7.13.2.1, we did not manage to beat the market consistently. Specifically, we underperformed the market from the first week to the sixth week, and then outperformed it from the seventh week to the final week of simulation. Although this seems to be a bad indicator at first glance, it provides a strong evidence to support the irrational market theory. In the short term, value stocks, which we purchased when it was undervalued, would underperform the market (based on the average sector P/E ratio). Whereas in the long term, these stocks would grow back up to their proper value, when investors start to realize these stocks' real potential.

For the third criteria, table 7.13.1.1 shows that our ending value of our Value Investing portfolio was \$953,358.33, which was lower than our expected return of \$1,011,332. The reason behind this is the global health and economic crisis regarding the Coronavirus. It has tremendously decreased many country's GDP and increased their unemployment rate, thus forcing the market to take a deep dive from its ten-year bull run.

Overall, since not all our criteria are met, it is fair to say that our Value Investing portfolio underperformed our initial expectation.

# Chapter 8: Penny stock Trading (Kevin Mbogo)

## *8.1. Simulation Goal and Strategy*

Penny Stock trading has a high risk attached to it as there is a lot of uncertainty even more other stock trading strategies because it deals with small scale companies that have a high chance of going out of business. However, along with the high risk, there is a high potential for great reward. Starting with 1,000,000 US dollars the goal of this simulation will be to earn as much money possible without losing as much of the initial investment. It will be difficult to predict how much profit I can make, as there are companies that can do great, decent, or horrible. There is a lot of ambiguity in trading penny stocks but with a clear strategy and luck, I can only hope to make a profit.

At the end of this 8-week simulation, I hope to learn and develop a lot of skills that will be useful such as timing, information gathering, pattern recognition and more. This will give me a good understanding of the dangers of the stock market help me prepare to trade with real currency.

I will use current day news, events, and trends to predict future trends and invest in companies that align with future trends. I will trade in different exchanges such as the NYSE, NASDAQ, and AMEX as it will be easier to simulate trading compared to over the counter transactions. I will plan to invest short term as this will be favorable to work in the case of major trend shifts. I will spread out my selection of companies, so I am able to test out different areas of the market and gather data on the volatility of market areas.

## 8.2. Companies Selected

### NIO, Inc.

This is a holding company, which engages in the design, manufacture, and sale of electric vehicles, driving innovations in next-generation technologies in connectivity, autonomous driving and artificial intelligence. Its products include EP9 supercar and ES8 7-seater SUV. The company provides users with home charging, and power express valet service and other power solutions including access to public charging, access to power mobile charging trucks, and battery swapping. This company has a lot of potential especially with the world moving to renewable and electricity will be a big part of the change.



Figure 8.2.1(NIO)

### Co-Diagnostics, Inc.

This is a molecular diagnostics company, which engages in the development, manufacture, and marketing of diagnostics technology. The company's products are utilized for tests that are designed using the detection and analysis of nucleic acid molecules. This company at the time had a rising trend influencing me to buy the stock.





Figure 8.2.2(CODX)

### Acorda Therapeutics, Inc.

This company works in the development of therapies that restore function and improve the lives of people with neurological disorders. Its two main products are Ampyra and Zanaflex Capsules. The Ampyra is an oral drug, which treats to improve walking in patients with multiple sclerosis and Zanaflex Capsules. This company at the time had a rising trend influencing me to buy the stock.

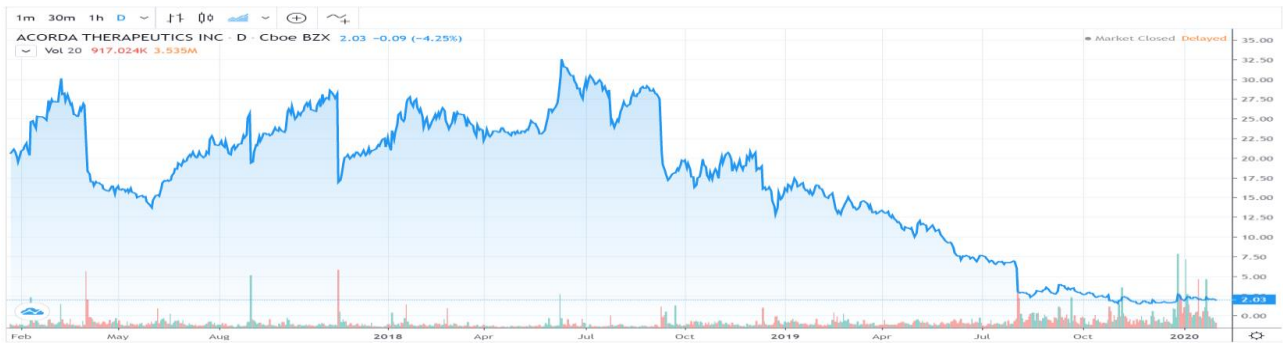


Figure 8.2.3(ACOR)

## Mirage Therapeutics, Inc.

This is a clinical stage biopharmaceutical company, which engages in the development of proprietary RNA-targeted therapeutics. That can prove a lot in the future also as seen in the graph there was a point in time they were a valued company and are currently starting to rise.



Figure 8.2.4(MGEN)

## Inovio Pharmaceuticals, Inc.

This is a late-stage biotechnology company, which engages in the discovery, development, and commercialization of DNA-based immunotherapies and vaccines. Its drug candidates include SynCon immunotherapies which helps break the immune system's tolerance of cancerous cells. The company had a decent amount of rise on 1/27/20 that prompted me to buy to make a profit.



Figure 8.2.5(INO)

**Taronis Technologies, Inc.**

This is a technology company, which engages in the production of a plasma based system for the gasification and sterilization of liquid waste. This was low price stock increasing it at the time had low risk and from the current trend is starting to increase creating a room for profit.



Figure 8.2.6(TRNX)

## IBIO, Inc

This is a biotechnology company, which engages in the development and manufacture of biotherapeutics. Its pipeline includes idiopathic pulmonary fibrosis, systemic sclerosis, and scleroderma. It operates through the iBio, Inc. and iBio CDMO business segments. The company was founded on April 15, 1993 and is headquartered in New York, NY. This is a company that has stood for a long time. This means there is something of worth this company has also looking at the week trades. It does not disappoint as it is a staple for profit if bought and sold at the right time.



Figure 8.2.7(IBIO)

## Onconova Therapeutics, Inc.

This is a clinical-stage biopharmaceutical company, which engages in the identification and development of oncology therapeutics. It focuses on discovering and developing small molecule drug candidates to treat cancer. The company was founded by Ramesh Kumar and E. Premkumar Reddy on December 22, 1998 and is headquartered in Newtown, PA. This is another company that was once on the top and has declined but as you can see there moments where the stock price has gone extremely high. This stock is a staple as I have learned when to buy hold and sell this stock to attain profit.



*Figure 8.2.8A(ONTX)*



*Figure 8.2.8B(ONTX)*

## Vaxart, Inc.

This Company operates as a clinical-stage biotechnology company, which engages in the development of oral recombinant vaccines. Its products include Influenza, Norovirus and Respiratory Syncytial Virus. The company was founded in 2004 and is headquartered in South San Francisco, CA. It is hard to see but the company has had some history as it was founded in 2004. It has withstood a lot the graph below is in a span of 5 to 6 months.



*Figure 8.2.9(VXRT)*

## GREAT PANTHER MINING LIMITED

The company engages in the mining and exploration of precious materials. Its project includes El Horcon and Santa Rosa.



Figure 8.2.10(GPL)

### ZOMEDICA PHARMACEUTICALS CORP

The company engages in the discovery, development and commercialization of pharmaceuticals for the companion pet.



Figure 8.2.11(ZOM)

## LILIS ENERGY INC

The company operates as an independent oil and gas company, which engages in the exploration, development, production, and acquisition of oil, natural gas, and liquids.



Figure 8.2.12(LLEX)

## NEW GOLD INC

The company is engaged in the operation, development and exploration of mineral properties. Its portfolio includes Rainy River, New Afton, and Cerro San Pedro.



Figure 8.2.13(NGD)

## ALEXCO RESOURCE CORP

The company conducts mining operations and mineral exploration and development in Canada. It engages in the exploration of silver, lead, zinc, and gold ores.



Figure 8.2.14(AXU)



## URANIUM ENERGY CORP

The company is engaged in mining and exploration of uranium. Its activities also include pre-extraction, extraction and processing on uranium projects.



Figure 8.2.15(UEC)

## PALATIN TECHNOLOGIES INC

The company is a biopharmaceutical company, which engages in the development of medicines based on molecules that modulate the activity of the melanocortin and natriuretic peptide receptor systems.



## GOLDEN STAR RESOURCES LTD

Golden Star Resources Ltd. engages in gold mining and exploration activities. It owns and operates the Wassa and Prestea mines situated in Ghana. It operates through the following segments: Wassa, Bogoso or Prestea, Other, and Corporate.



Figure 8.2.18(GSS)

## B2GOLD CORP

B2Gold Corp. is an exploration company. The firm engages in the acquisition and development of mineral properties. It operates through the following segments: Fekola Mine, Otjikoto Mine, Masbate Mine, Libertad Mine and Limon Mine.



Figure 8.2.19(BTG)

## KINROSS GOLD CORP

Kinross Gold Corp. is an exploration company. It engages in the production, acquisition, exploration and development of gold bearing properties in Canada, United States, the Russian Federation, Brazil, Ecuador, Chile, Ghana and Mauritania.



Figure 8.2.20(KGC)

## ENSERVCO CORP

Enservco Corp. engages in the operation of fleet services. It operates through the Production Services and Completion Services segments. The Production Services segment utilizes a fleet of hot oil trucks and acidizing units to provide maintenance services to the domestic oil and gas industry.



Figure 8.2.21(ENSV)

## CHESAPEAKE ENERGY CORP

Chesapeake Energy Corp. is an independent exploration and production company, which engages in acquisition, exploration and development of properties for the production of oil, natural gas and natural gas liquids from underground reservoirs. It focuses on projects located in Louisiana, Ohio, Oklahoma, Pennsylvania, Texas, and Wyoming.



Figure 8.2.22(CHK)

## CREDIT SUISSE HIGH YIELD BOND FUND

Credit Suisse High Yield Bond Fund is a non-diversified, closed-end management investment company. It has main objective to seeking high current income investment. It also seeks for capital appreciation.



Figure 8.2.23(DHY)

## SABRE CORP

Sabre Corp. is a technology solutions provider to the global travel and tourism industry. It provides data-driven business intelligence, mobile, distribution and software-as-a-service solutions. The company operates through the following segments: Travel Network, Airline Solutions and Hospitality Solutions



## DOCUMENT SECURITIES SYSTEMS INC

Document Security Systems, Inc. engages in the development and market of paper and plastic products designed to protect valuable information from unauthorized scanning, copying, and digital imaging. It operates through the following segments: Packaging and Printing, Plastics, Digital, and Technology Management. The Packaging and Printing segment produces custom paperboard packaging serving clients in the pharmaceutical, beverage, photo packaging, toy, specialty foods and direct marketing industries.



Figure 8.2.26(DSS)

## NEW YORK MORTGAGE TRUST INC

New York Mortgage Trust, Inc. is a real estate investment trust, which engages in the acquisition, investment, finance and management of mortgage-related and residential housing-related assets. Its objective is to deliver long-term stable distributions to its stockholders over changing economic conditions through a combination of net interest margin and capital gains from a diversified investment portfolio.





Figure 8.2.27(DSS)

## TILRAY INC

Tilray, Inc. engages in the research, cultivation, production, and distribution of medical cannabis and cannabinoids. The Company is focused on medical cannabis research, cultivation, processing and distribution of cannabis products worldwide. Its products include dried cannabis and cannabis extracts.



Figure 8.2.28(TLRY)

## WAITR HOLDINGS INC

Waitr Holdings, Inc. engages in an on-demand food ordering and delivery business. Its platform connects local restaurants to diners in underserved markets. The firm's mobile and desktop ordering platforms allow users to browse for local restaurants, customize menu items, and pay securely from mobile phones or computers.



Figure 8.2.29(WTRH)

## OPKO HEALTH INC

OPKO Health, Inc. engages in the provision of healthcare services. It operates through the following segments: Diagnostics, Pharmaceuticals, and Corporate. The Diagnostics segment include clinical laboratory operations of BioReference, as well as point-of-care operations.



Figure 8.2.30(OPK)

### AIM IMMUNOTECH INC

AIM ImmunoTech, Inc. operates as a biopharmaceutical company, which engages in the clinical development of new drug therapies based on natural immune system enhancing technologies for the treatment of viral and immune based disorders.



Figure 8.2.31(AIM)

### ***8.3. Simulation Week 1***

#### ***Getting started***

At the beginning of January 27th I started the simulation I was unsure of the stock market and although I have traded in stocks I have focused on long term investing however with penny stocks that is not the best strategy as the stock can fall so low and never come up also due to the limited information it becomes harder to predict the trend. For my first day, I began with a budget of \$20,000. I invested in 3 different stocks and as the week went on I added other stocks to my portfolio to have a total of 7. I decided to day trade penny stocks and I would look at the different stocks from a 5-year trajectory to the past week trajectory and then I would trade if I saw the stock starting to rise. I bought 1000 to 3000 shares depending on the total market cap of the company and the liquidity of the stock. Trading with penny stocks makes it hard to quick sell as few people would want to take the risk of trading with penny stocks.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/Loss	Total Cash	Total Profit
1/26/2020							1,000,000	
1/27/2020	NIO	BUY	4.12	1000	4,143.49		995,856.51	
	CODX	BUY	2.75	3000	8,275.99		987,580.52	
	ACOR	BUY	2.28	2000	4,579.99		983,000.53	
	MGEN	BUY	1.1	1000	1,119.99		981,880.54	
	INO	BUY	5.24	3000	15,732.79		966,147.75	
	NIO	SELL	4.15	1000	4,123.61	-19.88	970,271.36	-19.88
	CODX	SELL	2.56	3000	7,650.01	-625.98	977,921.37	-625.98
	MGEN	SELL	1.29	1000	1,260.01	140.02	979,181.38	50.04
	INO	SELL	5.52	3000	16,515.01	782.22	995,696.39	782.22
	ACOR	SELL	2.24	2000	4,440.01	-139.98	1,000,136.40	-139.98
1/28/2020	INO	BUY	5.05	10000	50,519.99		949,616.41	
	TRNX	BUY	1.01	5000	5,062.49		944,553.92	
	NIO	BUY	4.08	10000	40,819.99		903,733.93	
	TRNX	SELL	0.95	5000	4,731.01	331.48	908,646.94	331.48
	INO	SELL	4.53	10000	45,230.01	-5,289.9	953,694.95	-5,289.9
1/30/2020	NIO	SELL	4.02	10000	40,180.01	-639.98	993,874.96	639.98
1/31/2020	ACOR	BUY	2.09	1000	2,109.99		991,764.97	
	ADX	BUY	0.9	3000	2,723.29		989,041.68	
	CODX	BUY	2.89	3000	8,701.09		980,340.59	
								-6,125.04

*Table 8.3.1: Simulation Week 1 Penny Stock Trading*

I bought most of my companies in the first two days and along with the trends, I would buy shares on one day and sell them depending on if the stock reached its peak on that day I would constantly monitor the market to see where the stocks are in terms of price to see if I had a gain or loss. In some companies such as ACOR, ADXS, and CODX I took a chance to buy them when they are decreasing in stock price and holding it until they rise as from the past week the companies have been decreasing in value at the end of the week until the beginning of the week.

Stock	Percent Gain/Loss
NIO	-2.4% L
CODX	5.09% G
ACOR	-6.69% L
MGEN	17.27% G
INO	-13.54% L
TRNX	-13.63% L
ACOR	-6.69% L
TOTAL	-30.74% L

Table 8.3.2: Simulation Week 1 Profits and loss chart

Statement percentage gain= ((Price sold-purchase price)/purchase price)×100

The first week I took a huge loss as I was unable to quickly sell when needed and looking at the simulation there was a lag time of 5 minutes making it hard to buy and sell stocks when I needed. I can only learn from the mistakes I made this week and make it so that I can have a gain in the next week's round of simulations. I will do more research so that I can get companies that will provide me again. My current funds as of now are \$993,813.78 I hope to increase this amount back to 1,000,000 and have a gain however with penny stocks there is not a lot of rewards as I would need to buy a high amount of shares which will increase the risk.

## 8.4. Simulation Week 2

I decided to change my strategy of buying stocks this week as I did not want to incur a loss. I decided to buy most of my stocks earlier in the day and focused on stocks that were not worth a lot of money. I limited the cost per stock to \$2.00 as I noticed a trend, low company stocks tend to have a higher chance of increase due to their volatility and by trading early in the morning most of the stocks rose. This is not a definite case as most companies can fail and go bankrupt. This week was geared to proving this theory with the results shown in the table below.

Date	Symbol	Buy/Sell	Price	Shares	Net Cost/ Proceeds	Profit/ Loss	Total Cash	Total Profit/Loss
2/3/2020	VXRT	BUY	1.6	4000	6,419.9		973,920.60	
	PLUG	BUY	3.9	2000	7,809.9		966,110.61	
	CODX	SELL	3000	3.16	9,460.0	758.92	975,570.62	758.92
	VXRT	SELL	1.46	4000	5,819.6	-600.3	981,390.23	-600.8
	ADXS	SELL	0.84	3000	2,500.9	-222.3	983,891.18	-222.38
	UEC	BUY	0.85	1000	869.99		983,021.15	
	URG	SELL	0.56	1000	563.31	7.02	985,048.18	7.02
	ACOR	SELL	2.04	1000	2,020.0	-89.98	984,484.87	-89.98
2/4/2020	URG	SELL	0.56	1000	563.31	7.02	985,048.18	7.02
	FCEL	BUY	1.69	1000	1,709.9		983,338.19	
	UEC	SELL	0.9	1000	879.91	9.92	984,218.10	9.92
	PLUG	SELL	4.04	2000	8,060.0	250.02	992,278.11	250.02
	FCEL	SELL	1.69	1000	1,670.0	-39.98	993,948.12	-39.98
	ONTX	BUY	0.39	10000	3,889.9		990,058.13	
	ONTX	BUY	0.42	3000	1,273.9		988,784.14	
	TTNP	BUY	0.26	3000	803.29		987,980.85	
	IBIO	BUY	0.38	3000	1,159.9		986,820.86	
	ONTX	SELL	0.44	12000	5,209.6	45.63	992,030.47	45.63
	TTNP	SELL	0.25	3000	736.91	-66.38	992,767.38	-66.38
	IBIO	SELL	0.38	3000	1,133.8	-26.18	993,901.19	-26.18
								26.23

*Table 8.4.1: Simulation Week 2 Penny Stock Trading*

### **8.5. Simulation Week 3**

This week was very challenging dealing with penny stocks because of the volatility. In the beginning of the week I began buying cheaper stocks under the \$2.00 limit. In the past I have been using day trading, momentum trading and scalping techniques in hopes of yielding high returns. This did not work for the past week because I could not watch the market on a 24 hour basis and due to the high volatility of stocks I gained some profit expressed in the table below but I also incurred heavy losses. This prompted me to change the strategy to a buy hold and sell. In this week the penny stocks were mostly decreasing making it impossible to use previous techniques. I decided to gamble and take a risk looking at the history of the company. I determined which company was at their lowest stock price according to the history.

The history of the company played a lot with the decision to buy the company looking at the history of the company if the company at a point in time was valuable meaning the price per stock was above \$10.00 it showed me hope that there could be an increase especially if I bought the stock at a price of \$0.39. I thought if I can buy a lot of shares of low-priced stock that would increase in value even if it was 0.02% change it would be a good profit because the greater the shares the higher the profit. At the end of the week I did not focus on selling rather than buying which poses a high risk, but it could also lead to high reward. I am thinking that in the beginning of the next work week the stocks will begin to rise as they always do and I can make some profit.

Date	Symbol	Buy/Sell	Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit/Loss
2/10/20	VXRT	BUY	4000	1.18	4,739.99		994,472.19	
	MGEN	BUY	6000	0.85	5090.59		994,508.60	
	AUY	BUY	3000	3.82	11,479.99		994,488.61	
	XXI	BUY	3000	0.93	2,763.89		994,606.72	
2/11/20	ONTX	BUY	10000	0.73	7,299.99		994,181.43	
	XXI	SELL	3000	0.93	2,779.01	15.12	993,723.94	15.12
	AUY	SELL	3000	3.88	11,620.01	140.02	993,703.95	140.02
	ONTX	SELL	11000	0.68	7,428.11	128.12	993,834.06	128.12
	VXRT	SELL	4000	1.08	4,300.01	-439.98	993,814.07	-439.98
	MGEN	SELL	6000	0.86	5,147.21	56.62	993,794.08	56.62
	PTN	BUY	20000	0.61	12,221.99		993,774.09	
	IBIO	BUY	4000	0.34	1,369.99		993,356.10	
	UEC	BUY	4000	0.93	3,751.59		993,314.51	
	AXU	BUY	3000	1.78	5,368.39		993,282.92	
	NGD	BUY	4000	0.76	3,045.19		993,289.33	
	NGD	BUY	4000	0.76	3,020.41		993,078.54	
	IBIO	BUY	4000	0.35	1376.01		993,058.55	
								-100.10

*Table 8.5.1: Simulation Week 3 Penny Stock Trading*



## 8.6. Simulation Week 4

This week has been a profitable week. I made some smart investments and I do believe that in the future I will reap the benefits. I did not do day trade this week, I bought stocks as most penny stocks were falling in value and the few stocks that were not falling value were highly volatile. I decided to gamble on the falling stocks, but I only went for stocks that I noticed were at their lowest value stocks that could not go lower or the chance of it farther decreasing was low. I traded and invested moderately as this was a new territory and was very risky. In the beginning of the week I did not gain profit which was concerning as I noticed how most stocks would rise in value in the beginning of the week. I did not sell my stocks because I was hoping it would increase.

On Thursday 02/19/20 all my stocks increased some with a large margin of 40% and others with 5% increase from the original price I bought the stock. I had a chance to sell all my stocks but because I bought the stocks at their lowest, I decided to hold them for longer. Some stocks increased by 146% and others decreased 14% and if my guess is right the stocks will rise in value around 02/26/20 and depending on the trajectory of the stock I will decide to either hold.

Date	Symbol	Buy/Sell	Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit/Loss
2/18/20	GNPX	BUY	4000	5.12	20,499.99		993,112.96	
	GNPX	SELL	4000	4.34	17,340.01	3,159.98	990,351.77	
	ZOM	BUY	4000	0.13	521.99		990,287.38	
	GPL	BUY	6000	0.56	3,355.99		990,267.39	
2/20/20	LLEX	BUY	4000	0.37	1,486.99		990,247.40	
	ENSV	BUY	6000	0.20	1,231.99		992,588.61	15.12
	GRPN	BUY	6000	1.75	10,489.99		993,568.62	
								3,159.98

*Table 8.6.1: Simulation Week 4 Penny Stock Trading*

STOCK PORTFOLIO								<a href="#">Trade Stock</a>	<a href="#">Symbol Lookup</a>	<a href="#">How-To Guide</a>
	SYMBOL	DESCRIPTION	QTY	PURCHASE PRICE	CURRENT PRICE	TOTAL VALUE	TODAY'S CHANGE	TOTAL GAIN/LOSS		
+	Sell	PTN	PALATIN TECHNOLOGIES, INC.	20000	\$0.61	\$0.59	\$11,844.00	\$0.00(0.00 %)	-\$358.00(-2.93 %) ↓	
+	Sell	UEC	URANIUM ENERGY CORP.	4000	\$0.93	\$0.84	\$3,353.20	\$0.00(0.00 %)	-\$378.40(-10.14 %) ↓	
+	Sell	AXU	ALEXCO RESOURCE CORP.	3000	\$1.78	\$2.19	\$6,570.00	\$0.00(0.00 %)	\$1,221.60(22.84 %) ↑	
+	Sell	ZOM	ZOMEDICA PHARMACEUTICALS CORP.	4000	\$0.13	\$0.31	\$1,240.00	\$0.00(0.00 %)	\$738.00(147.01 %) ↑	
+	Sell	GPL	GREAT PANTHER SILVER LTD	6000	\$0.56	\$0.62	\$3,690.00	\$0.00(0.00 %)	\$354.00(10.61 %) ↑	
+	Sell	LLEX	LILIS ENERGY, INC.	4000	\$0.37	\$0.31	\$1,248.00	\$0.00(0.00 %)	-\$218.80(-14.92 %) ↓	
+	Sell	ENSV	ENSERVCO CORPORATION	6000	\$0.20	\$0.16	\$978.00	\$0.00(0.00 %)	-\$234.00(-19.31 %) ↓	
+	Sell	GRPN	GROUPON, INC.	6000	\$1.75	\$1.65	\$9,900.00	\$0.00(0.00 %)	-\$570.00(-5.44 %) ↓	
						<b>Total</b>	\$38,823.20	\$0.00(0.00 %)	\$554.40 (1.45 %) ↑	

*Figure 8.6.1 Stock Portfolio*

In the table 8.6.1 shown above it is clear that I did not trade as much compared to the previous weeks. The reason for this was due to the volatility of the market. There were a lot more risks than usual and because I decided to buy falling stocks, I wanted this week to be a test run before I fully immerse myself. I was mostly looking at trends of stocks and times which will make the next week more fruitful as I will make up for this week's trading.

## 8.7. Simulation Week 5

This was an unfortunate week for the stock market as there were many events that affected the stock market. Dow Jones Industrial average and Nasdaq Composite index are down 10% from their latest highs. Dow lost 3000 points last week. The losses could worsen the economy if it was to spiral into recession. Alibaba was one of the first major businesses to take a hit from this pandemic since January 13th and continued to do so, most companies in China closed for days causing a shutdown in business. In current news, having the coronavirus spread to Europe with about 200 cases, 256 new cases in Asia and 53 cases in North America makes for a volatile economy as more cases of victims of the disease increase. Containment has become a new priority to reduce the economy and diminishing businesses.

Another hand in the market returns is the United States election research states that the period leading up to the election tends to be below average for equities. The reason why is due investors being cautious and closer fisted due to uncertainty.

Date	Symbol	Buy/Sell	Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit/Loss
2/24/20	ENSV	BUY	10000	0.17	1,759.99		989,271.24	
	DSS	BUY	10000	0.2	2,018.99		989,291.23	
2/27/20	ZOM	BUY	4000	0.2	771.21		983,583.45	
	UEC	SELL	4000	0.69	2,752.01	-999.58	982,593.47	-999.58
2/28/20	GPL	SELL	6000	0.47	2,799.01	-566.98	978,486.69	-566.98
	DSS	SELL	10000	0.24	2,399.01	-380.02	980,238.50	-380.02
								-1946.58

*Table 8.7.1: Simulation Week 5 Penny Stock Trading*

The volatility of the stock market is greatly focused on penny stocks as they are not secure with some companies starting and others falling in value from previous years. I was unable to trade as day trading made it difficult because penny stocks take a while before you can buy them or sell them due to their volatility investors would not sell the shares they have or buy new shares. I decided to sell stocks that had a low chance of rising as the loss was too high and would take some time to rise.

## **8.8. Simulation Week 6**

For this week I decided to start investing aggressively. This was because there were moments in the previous weeks, I have gained profit but because I did not buy more shares, I did not get a substantial return. There is also a risk associated with buying more shares because the loss becomes substantial however I found a way I could reduce the risk.

I made it so that I buy large shares of the company if the value rises by one cent. I immediately sell it and because I am buying many shares, I can roughly make 1000 profit. However, if the stock drops in value by one cent I can roughly lose as much as 4000 dollars. This trading strategy has some risk especially when using it on penny stocks however by selecting stable stocks and practicing this method it is possible for me to make good profit.

Date	Symbol	Buy/Sell	Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit/Loss
3/2/20	ACB	BUY	6000	1.36	8,179.99		\$979,877.11	
	NOVN	BUY	6000	0.40	2,397.19		\$979,793.92	
	GRPN	SELL	6000	1.29	7,690.01	-2,799.98	\$979,903.13	-2,799.98
	PTN	SELL	20000	0.4	9,720.01	-2,501.98	\$979,883.14	-2,501.98
	NOVN	BUY	10000	0.42	4,170.99		\$979,863.15	
3/3/20	LLEX	SELL	4000	0.25	980.01	-506.78	\$979,355.06	-506.78
	TELL	BUY	100000	1.72	172,019.99		\$979,341.57	
	TELL	SELL	100000	1.68	167,480.01	-4,539.98	\$974,638.98	-4,539.98
	NOVN	SELL	16000	0.35	5,511.21	-1,056.97	\$974,618.99	-1,056.97
	ACB	SELL	6000	1.36	8,140.01	-39.98	\$974,640.80	-39.98
	ZOM	BUY	400000	0.33	130,659.99		\$974,741.81	
	ZOM	SELL	400000	0.28	113,770.01	-16,889.98	\$957,916.62	-16,889.98
	BTG	BUY	6000	4.39	26,359.99		\$957,886.63	
	BTG	SELL	6000	4.41	26,400.01	40.02	\$957,992.04	40.02
	CHK	BUY	200000	0.26	52,799.99		\$957,842.05	
	CHK	SELL	200000	0.26	51,070.01	-1,729.98	\$956,086.06	-1,729.98
	PLUG	BUY	50000	4.56	228,094.99		\$956,056.07	
	PLUG	SELL	50000	4.56	228,055.01	-39.98	\$956,036.08	-39.98
	GORO	BUY	80000	4.83	386,419.99		\$955,837.69	
	GORO	SELL	80000	4.83	394,380.01	7,960.02	\$963,858.70	7,960.02
	GSS	BUY	100000	2.82	282,019.99		\$963,991.91	
	GSS	SELL	100000	2.79	279,060.01	-2,959.98	\$961,089.12	-2,959.98
	BTG	BUY	50000	4.45	222,519.99		\$961,138.53	
	BTG	SELL	50000	4.48	223,980.01	1,460.02	\$962,718.44	1,460.02
	KGC	BUY	60000	5.68	340,819.99		\$962,698.45	
	KGC	SELL	60000	5.66	339,280.01	-1,539.98	\$961,213.76	-1,539.98
	ENSV	SELL	16000	0.18	2,819.61	1059.62	\$961,338.77	1059.62
3/4/20	CHK	BUY	200000	0.26	51,699.99		\$961,023.78	
	BTG	BUY	20000	4.37	86,519.99		\$961,003.79	
	CHK	SELL	200000	0.25	50,510.01	-1,189.98	\$959,623.80	-1,189.98
	BTG	SELL	20000	4.37	87,270.01	750.02	\$960,553.51	750.02
	IBIO	BUY	100000	2.23	223,019.99		\$960,439.82	
3/5/20	IBIO	SELL	100000	2.59	258,980.01	35,960.02	\$996,663.83	35,960.02
								11,434.17

Table 8.8.1: Simulation Week 6 Penny Stock Trading

## ***8.9. Simulation Week 7***

This week was eventful with the corona virus spreading many companies started to fall however that was mostly European and Chinese companies but with sightings of the virus in areas such as California New York. Most flights to Europe and Asia were banned by the president making businesses lose a lot especially the flight industry. It made it so that stocks began to depreciate. It was not a lot to cause alarm, it made it, so people started to become cautious. However, with this virus I decided to switch my investments to be health and pharmaceutical based as I thought there would be a need and a demand for such companies. I did have some profit from ZOM pharmaceutical however I made an error in judgement as I did not notice the company would continue to depreciate. I also held these companies' stocks at a time that I should have been quick. Throughout the week there started being rumors on the state of the country with the president declaring a state of emergency. These rumors made it so investors decided to rush in selling stocks without many people buying stocks at the intended value the stock would fall until there would be people willing to buy the orders. This partially explains why on 3/12/20 I lost a lot of money due to the sell orders being more than buy orders the value dropped and without a choice I had to wait until there would be a buy order meeting the depreciated value of the stock at the time. On 3/13/20 the president declared the state of emergency which created a ripple effect for businesses and investors in a panicked state value of stocks dropped more than it usually does at the end of the week which rippled moved on to Monday the following week (03/16/20).

Date	Symbol	Buy/Sell	Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit/Loss
3/10/20	ZOM	BUY	400000	0.25	99,179.99		999,463.86	
	ZOM	SELL	400000	0.26	102,730.01	3,550.02	999,553.85	3,550.02
	ZOM	BUY	400000	0.25	98,779.99		996,003.84	
	ZOM	SELL	400000	0.24	97,580.01	-1,199.98	998,226.27	-1,199.98
	DHY	BUY	100000	2.14	214,409.99		998,323.88	
	DHY	SELL	100000	2.12	211,990.01	-2,419.98	995,813.90	-2,419.98
	AXU	SELL	3000	1.35	4,030.01		995,793.91	
3/11/20	AIM	BUY	50000	4.05	202,379.99		985,713.92	
3/12/20	AIM	SELL	50000	3.85	192,270.01	-10,109.98	985,683.93	-10,109.98
3/13/20	OPK	BUY	80000	1.74	139,371.99		979,911.94	
	OPK	SELL	80000	1.67	133,580.01	-5,791.98	979,891.95	-5,791.98
								-15,971.90

*Table 8.9.1: Simulation Week 7 Penny Stock Trading*

## **8.10. Simulation Week 8**

This was by far the worst week seen before as a trader. The corona virus made it difficult to trade especially with the country being in a nationwide lockdown every business felt the effects of the lockdown. All businesses were shut down and any events that had more than 50 people were canceled; sports seasons were cancelled there was little to no revenue occurring only essential businesses were open which included grocery stores. News of public figures having the virus made everyone panic making this the worst week to trade by far the companies that traded were mostly internet retail, health and pharmaceutical companies however the timing was wrong making this the largest loss I have made by far. I made a substantial error in judgement on 3/19/20 At 4:04 PM I was making a profit of 3000 dollars however I did not sell at that time which was my first mistake. On 3/20/20 when I realized the stock value increased I bought it again which made sense at the time because the company was involved in internet retail I decided to risk it again however when I realized the next day and attempted to sell the stock there was no buy order that would match the market price until the value dropped to 1.68 at the time I had lost 70,441.98.

I was emotional in the amount of money I lost I decided to buy another stock hoping i can make the money back only to lose 28,219 dollars. I decided to find another way to make money that could work with the current stock market. I did some research and found out the mechanisms of shorting stocks with most stocks falling in value and few rising. I decided to bet against the rising stocks and if the stock fell, I would earn the difference. I decided to start with a small number of shares of SABR which was in technology services thinking at a time only essential businesses are operating SABR will not be able to earn as much as the quarantine period occurs.

Date	Symbol	Buy/Sell	Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit/Loss
3/16/20	ZOM	BUY	80000	0.18	14,259.99		979,891.95	
3/18/20	ZOM	SELL	80000	0.15	12,300.01	-1,959.98	977,951.96	-1,959.98
3/19/20	WTRH	BUY	80000	2.57	205,707.99		977,931.97	
	WTRH	SELL	80000	2.34	187,170.01	-18,537.98	959,423.98	-18,537.98
3/20/20	WTRH	BUY	80000	2.56	204,811.99		959,393.99	
	WTRH	SELL	80000	1.68	134,370.01	-70,441.98	888,982.01	-70,441.98
	TLRY	BUY	50000	4.61	230,689.99		888,952.01	
	NYMT	BUY	20000	2.14	42,418.99		870,762.02	
	TLRY	SELL	50000	4.05	202,470.01	-28,219.98	860,746.03	-28,219.98
	NYMT	SELL	20000	2.17	43,470.01	1,051.02	861,406.04	1,051.02
	SABR	SHORT	200	4.04	787.01		861,377.06	
								-118,108.90

*Table 8.10.1: Simulation Week 8 Penny Stock Trading*

## **8.11. Simulation Week 9**

This week was an overall success as I gained some profit trading using shorting. I was able to have greater understanding on how to short stocks when to short and cover stocks during the day due to the help of the past weeks of simulation I have made estimates on when are optimal times to sell stocks depending on the circumstance and trading method. The companies chosen were some that I believed would not survive the quarantine period because the value of the stocks would fall making it the best opportunity for short selling

Date	Symbol	Buy/Sell	Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit/Loss
3/23/20	NOVN	SHORT	10000	0.65	6,430.01		861,386.05	
3/24/20	AUY	SHORT	12000	3.02	36,220.01		863,105.07	
	AXU	SHORT	50000	1.43	71,290.01		862,581.08	
3/25/20	NOVN	COVER	10000	0.44	4,372.99	2,057.02	854,280.09	2,057.02
3/26/20	AXU	COVER	50000	1.40	70,019.99	1,270.02	861,377.06	1,270.02
	SABR	COVER	200	6.23	1,265.99	-478.98	861,331.10	-478.98
3/27/20	GSS	SHORT	50000	2.64	131,730.01		863,614.12	
								2,848.06

*Table 8.11.1: Simulation Week 9 Penny Stock Trading*

## **8.12. Simulation Week 10**

This week was neither the best nor the worst. I made a lot of mistakes that I tried to rectify however I was unable to correct. For example, my first mistake was buying stocks instead of shorting stocks and once I bought the stocks selling them to time which would depreciate the stock. The second mistake I made was I held on to stocks that were costing me a lot in the hopes of reducing the loss however this was not the case if I was too short and held the stock it would need to be for a longer period and not a week. The stocks I short during the week were two pharmaceutical companies that were falling in value AIM and ARMN, two mineral companies BTG and NGD because there is not an immediate need for product issued for this companies I deduced that the value would fall and a commercial services company DSS because there is not an immediate need for product issued for this company I deduced that the value would fall However, during some of my transactions I noticed a lag in time whereby once I sent a sell or cover order for one stock, I couldn't access the states of other stocks until the order went through. This only happened rarely in the investing platform I used.



Date	Symbol	Buy/Sell	Shares	Price	Net Cost/Proceeds	Profit/Loss	Total Cash	Total Profit/Loss
3/30/20	GSS	COVER	50000	2.66	133,730.01	-1,289.98	864,344.13	
	AUY	COVER	12000	2.95	35,419.99	800.02	863,824.14	
4/1/20	AIM	SHORT	10000	2.40	23,980.01		863,744.15	
	AMRN	BUY	8000	4.36	34,859.99		863,124.16	
	BTG	BUY	8000	3.22	25,779.99		863,104.17	
	ARMN	SELL	8000	4.29	34,300.01	-559.98	863,264.18	
	ARMN	SHORT	8000	4.29	34,300.01		862,244.19	
	BTG	SELL	8000	3.22	25,740.01	39.98	862,244.20	
	BTG	SHORT	8000	3.22	25,740.01		862,204.21	
	NGD	SHORT	10000	0.54	5,338.01		862,132.82	
	ARMN	COVER	8000	5.55	44,379.99	-10,079.98	846,663.23	
	DSS	SHORT	10000	0.21	2,080.01		846,558.24	
	DSS	COVER	10000	0.20	1,992.99	87.02	847,350.25	
	AIM	COVER	10000	0.55	27,219.99	-3,239.98	847,578.26	
	BTG	COVER	8000	3.47	27,739.99	-1999.98	847,744.27	
	NGD	COVER	10000	0.55	5,544.99	-6.98	847,724.28	
								-16,249.86

Table 8.12.1: Simulation Week 10 Penny Stock Trading

## 8.13. Conclusion

### 8.13.1 Overall performance:

The table 8.12.1 shows the summary of the simulation's weekly performance from the beginning of week 1(1/27/2020) -to the end of the Week 10 (04/03/2020).

Week	Total Stock asset	Net Profit
1	993,833.77	-6,125.04
2	993,901.19	26.23
3	994,058.55	-100.10
4	993,568.62	3,159.98
5	980,238.50	-1,946.58
6	996,663.83	11,434.17
7	979,891.95	-15,971.90
8	861,377.06	-118,108.90
9	863,614.12	2,848.06
10	847,724.28	-16,249.86

Table 8.13.1.1: The summary of actions performed in the past 10 weeks.

Initial cash amount	1,000,000
Final cash amount	847,704.29
Profit	-152,295.71
Positive selling transaction	17,468.44
Lost selling transaction	-158,501.48
Total number of trades	149
Total commission fee	3,180

Table 8.13.1.2 Performance analysis over 10-week period

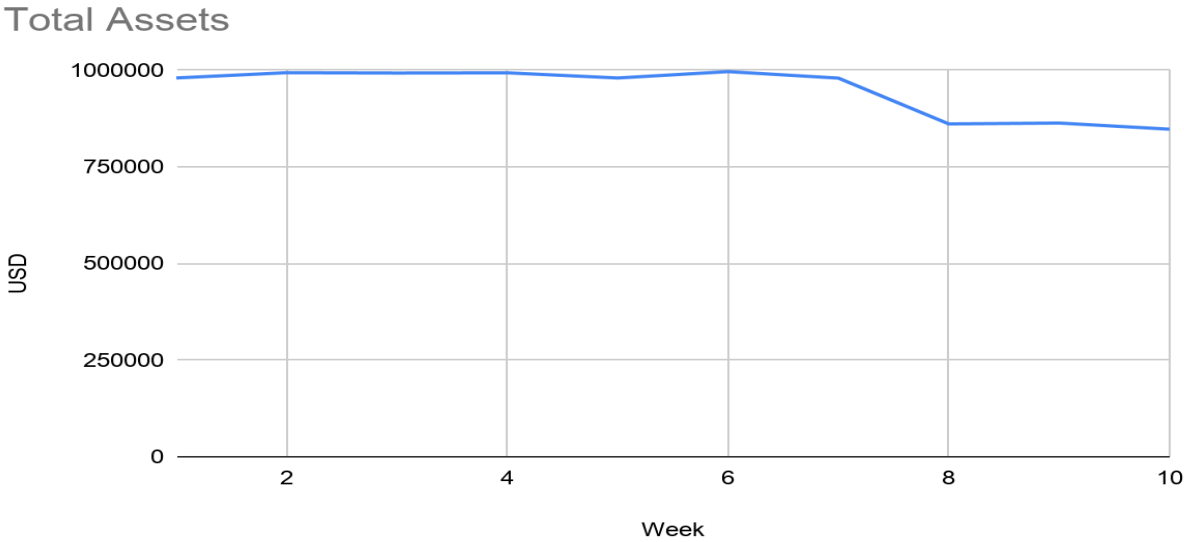


Figure 8.13.1.3 Asset loss over 10-week simulation

Observing the graph above we notice for shift trading on the 7th week this is due global events caused by COVID-19 also known as the coronavirus. During this time, the market took a big drop as companies were shutting down causing panic and increasing volatility. Due to the volatility that occurred circuit Breakers were employed four times in March alone. Circuit breakers mandate a 15-minute pause in trading on all U.S. stock exchanges if the S&P 5000 index falls more than 7% before 3:25 pm. New York time. The breakers are set to calm markets by halting trading as it grows more and more volatile. The first two levels of breaks are set to halt for 15minutes while level 3 suspends for the rest of the day.

The Dow and S&P 500 have both been dropping to the uncertainty around the coronavirus pandemic while the Chicago Board of Exchange Volatility Index has been increasing with spikes in the month of March causing circuit breakers to be initiated.

The biggest drops were found on March 16, 2020 with a 12.93 causing a circuit breaker to be employed as the drop as it passed the 7% drop. The second drop that initiated a circuit breaker was on March 12, 2020 as there was a 9.99% drop followed by the last drop that caused a circuit breaker on March 9, 2020 with a percentage loss of 7.79 percent. Due to all the drops previously stated governments all over the world are attempting to establish financial aid packages to stabilize stock markets hoping to avoid long term economic recession due to the coronavirus lockdown initiated.

Looking at the most volatile moments in March match with the eighth week of my simulation as I had my biggest loss of 118,108.90 this was due to many factors that played part such as the increased volatility the lag time between buying and selling stocks along with my inexperience with such high volatility. This was worse for penny stocks due the nature of penny stock trading. Penny stock trading is volatile because not many investors want to invest in unknown companies which are affected by buying and selling as there is a hold on the order until the corresponding order matches its counterpart.

Now as we look at the total stock performance there was a 15.24 stock loss because as I started with 1,000,000.00 in the beginning of the simulation by trading and attempting to gain a profit I ended up having a loss. The annual return predicted would be -49.64% however this number would be subject to change because the value calculated is generated if the current state of returns were extrapolated for an entire year.

### 8.13.2 Strategy Pros and Cons

After my conducting the 10-week simulation I made a list of pros and cons to this strategy and here they are as follows:

#### **Pros:**

- You do not need to start with a lot of capital to trade using this method as it is possible to start with a little and over time gain more profit which will create a feedback loop however it is not possible to get profit in a consistent basis there will be some loss however with careful consideration on stocks it is possible to gain profit.
- With this trading strategy it is possible to use many other strategies along with it such as day trading, buy and hold and shorting stocks it is versatile this makes it convenient as a trader.
- This trading does not require a lot of experience as by trying different methods of trading with lower value stocks makes the user learn more of trading and develop their own skills as a trader.
- The volatility of penny stocks is a pro due to the potential of increase in stocks. When trading stocks there is a chance for stocks to increase by 100% or more

#### **Cons:**

- However, as it can increase at such a rapid rate it can also mean it can decrease at a rapid pace causing the buyer to lose a lot of money.
- Many of the companies considered to be penny stocks could be newly formed, and some could be approaching bankruptcy. These companies will generally have poor track records or no track record at all.

- Stocks that trade infrequently do not have much liquidity. As a result, it is possible that investors will not be able to sell the stock once it is acquired. The investors might need to lower their price until it is considered attractive to another buyer.

### **Conclusion**

Penny stock trading is a versatile trading strategy and with it is possible for inexperienced traders to learn more of the intricacies that occur when trading. It has low investment commitment and can produce high yields along with high loss. Scouring for information is the most important tool to find good companies to invest in. It is also important to learn to accept loss as I made an error in judgment that cost me a lot of money during the simulation.

# Chapter 9: Conclusion

## *9.1 Strategies and Comparison*

Before we begin to compare the different strategies a small review on the different strategies will be done.

When performing day trading, the traders will perform multiple buying and selling options in range of one single trading day. This trading method is a highly debatable one. Due to the fact traders would normally trade on stocks with high volatility, there is high chance that they will lose a lot of money as well as this type of stocks contains a lot of risk. Day trading is suitable for people who are decisive, risk-loving and can stick to a clear disciplinary plan to exit the market at the right moment. Moreover, traders should be able to handle emotions such as fear or greed that may affect their trading decisions and lead to severe losses.

Scalping is a type of day trading that traders would gain profit based on the small wins that they obtained throughout the day. This strategy, like other day trading strategy, takes advantage of the volatility of the market. Therefore, to be a good scalper, you need to understand how to accurately analyze the market and be disciplined to strictly follow the plan. And since this trading is easily affected by unexpected news, it would be hard for new traders to be calm and make the right calls. In conclusion, this strategy is only recommended for traders who has already had experience with trading and can control their emotions so that their decisions would be made only based on statistical analysis.

Momentum trading is a type of day trading but instead of following the conventional approach of “buy low, sell high”, momentum investors go for “buying high and selling higher”. This trading strategy takes advantage of the volatility of the stock market and leverages investor

herding by leading the pack in and being the first one to collect the money and get out. Momentum trading is not suitable for everyone. This is a very time intensive trading strategy and it is suitable for experienced, highly decisive investors who are good at closing trades at the first sign of weakness and place funds immediately into a different trade showing strength. Momentum trading requires severe discipline and if done correctly, can lead to impressive returns.

Martingale is a strategy very different from other strategies in the sense that it does not require a lot of analysis or market knowledge, it does not matter if you are buying or selling or what stock you pick, the main thing to care about is the stock should be one that is volatile and not one that stays in the same price range a lot. For martingale trading in this simulation I looked for stocks that had moved around 30% or more in the day and then opened a trade in that stock. In martingale, if the stock moves opposite to your trade, you then open a second trade approximately double the size of the first one in the opposite direction. You keep repeating this process until you have an overall profit from all trades open in that stock. As you need to keep doubling trade size, trade sizes can increase rapidly in martingale and eat up a lot of cash, hence, it is risky strategy and not ideal for investing.

Value investing mainly involves purchasing stocks or securities whose market value seems to be lower than its intrinsic value, which can be estimated by thorough quantitative analysis. The concept is simple, yet powerful: if one knows the true value of something, buyers or investors would find a good bargain if they can purchase it when it goes on sale. According to the inefficient market theory, stocks work in a similar manner, that is, its price fluctuates a lot compared to its intrinsic value, especially in the short term. A value investor would make use of this fluctuation to purchase undervalued strong stocks, and hold it for a long period of time, which can reward them handsomely. This strategy has proven to be very successful by many legendary investors in the

market in the past and in our current time, especially Warren Buffet, arguably the best living value investor. In order to be successful using this strategy, investors must have great patience and be able to keep their head cool, even during rough times in the market, and wait for a great return of their purchased stock over the long run. As Warren Buffet said, if you are not willing to own a stock for ten years, do not even think about owning it for ten minutes.

Penny stocks deal with small company stocks that trade for \$5 or less. Some of the trades are done on large exchanges such as the New York Stock Exchange while most trades are done over the counter transactions. Because of low liquidity, Investors might have difficulty finding prices that meet the market this often creates loss for the investor. This is not the only hinderance as there is little to no information of each company with this the investor needs to be cautious and responsive to outside factors that can affect their stocks. Fluctuations of such stocks is high however this is can be seen as a benefit as with high risk there is high reward it is possible to start with a small amount of capital to grow it however, the same can be said with any amount of capital there is a possibility for a high loss. To be successful in this style of trading one must have a certain amount of the stock market and be conscious of external factors that can affect the stock.

Final return assets from the six trading strategies:

- Day trading: 8.31%
- Scalping Trading: 10.36%
- Momentum Trading: 4.37%
- Martingale Trading: -8.2%
- Value investing Trading: -4.67%
- Penny Stock Trading: -15.24%



Strategy	Profit	Pros	Cons	Suitable for
Day trading	8.31%	<ul style="list-style-type: none"> <li>- High reward</li> <li>- Fast payout</li> <li>- High payout rate</li> <li>- Less vulnerable to impactful events.</li> </ul>	<ul style="list-style-type: none"> <li>- Very high risk</li> <li>- Requires high discipline</li> </ul>	Stock investor
Scalping Trading	10.36%	<ul style="list-style-type: none"> <li>- Short trading time frame</li> <li>- No overnight risk</li> <li>- Can keep track of the prices through technical analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Trade commission fee adds up.</li> <li>- Traders need to be disciplined to make the correct decision.</li> <li>- Could be impacted by unexpected news.</li> </ul>	Intermediate to experienced investor.
Momentum Trading	4.37%	<ul style="list-style-type: none"> <li>- High reward</li> <li>- Requires short period of time</li> <li>- Leverage market's volatility</li> </ul>	<ul style="list-style-type: none"> <li>- Vulnerable to impactful events</li> <li>- Many commissions</li> <li>- Time sensitive</li> </ul>	Experienced stock investor
Martingale Trading	-8.2%	<ul style="list-style-type: none"> <li>- Strategy unaffected by market events</li> <li>- Market/trading knowledge not required</li> <li>- Can be easily automated as not many decisions required after the first trade</li> </ul>	<ul style="list-style-type: none"> <li>- Large capital required</li> <li>- Low reward for high capital investment</li> <li>- Total account wipeout has high chances</li> <li>- Trades can be open for very long</li> </ul>	<ul style="list-style-type: none"> <li>- Traders who want to invest extra cash for low returns and do not have time to keep trading.</li> <li>- Very high risk so unsuitable for investing life savings.</li> </ul>
Value investing Trading	-4.67%	<ul style="list-style-type: none"> <li>- Practically proved to generate high return</li> <li>- Do not need to check portfolio frequently, hence not need to care much about the short-term market situation.</li> <li>- Do not need to trade frequently.</li> <li>- Pay less tax on investment profits.</li> <li>- Portfolio has less risk and volatility.</li> </ul>	<ul style="list-style-type: none"> <li>- Occasionally underperform the market in the short term.</li> <li>- Requires great patience.</li> <li>- Requires researching companies before purchasing stocks.</li> <li>- Intrinsic value is difficult to estimate</li> <li>- Slow return</li> </ul>	<ul style="list-style-type: none"> <li>- Patient and emotionally stable individuals</li> <li>- Traders with decent security analysis skills.</li> <li>- Traders who do not expect high returns overnight, but over long term.</li> </ul>
Penny Stock Trading	-15.24%	<ul style="list-style-type: none"> <li>- High Reward</li> <li>- Low startup cost</li> <li>- Can comply with other trading methods</li> </ul>	<ul style="list-style-type: none"> <li>- High Risk</li> <li>- Lack of information</li> <li>- Low liquidity</li> </ul>	Experienced trader

*Table 9.1 Strategies comparison*

## ***9.2 Simulation conclusion***

We ran our IQP project over 3 terms (B, C, and D) and conduct a 10-week simulation of six different trading strategies. For the first phase of the project, we researched basic information about the stock market: its history, some common terminologies used, different investment options, a comparison between stock investments versus other financial instruments, and past research on stock simulation at WPI. Afterwards, for the second phase, each of our team members chose a specific trading strategy to practice, selected companies accordingly, and began our ten-week simulation period. Then, after the simulation phase is complete, each of us recorded our conclusion for each trading strategy, and then, together, we conducted a performance comparison between all methods, as well as identifying each method's pros and cons. This last phase served as a summary of what we have learned and practiced throughout the first two phases of the project.

This project is expected as a great opportunity for our team to gain much more knowledge and experience on the stock market and stock trading, how different types of events can positively or negatively affect the price of stocks (e.g. Coronavirus pandemic), as well as learn which strategies would be suitable for each person's circumstance. From what we have gained from this project, our expectations were met, and we will have more experience to make smart and informed trading decision when it comes to the real stock market investing in the future.

In conclusion, this project serves as a great milestone for our investing journey in the future. The experience was definitely very useful and rewarding for all our members. It has been very interesting to work on the simulation during such impactful events such as the global pandemic and the Democratic primaries. After the simulation, we are all excited by the stock market and its potential, and inspired to apply what we have learned from this project to perform real market trading in the future

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