Pandemics and United States Pharmaceutical Stocks' Rates of Return

by

Ronald Burnette, Jr.

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Liberty University, School of Business

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Abstract

Understanding the stock market in the 21st century is very important to investors as well as company executives. All publicly traded companies get most of their financing by issuing stock on the various stock markets of the world. These stocks are then brought and sold to investors. The research in this dissertation used the event study methodology to evaluate the United States stock market rate of return for pharmaceutical stocks impacted by pandemics in 2009 and 2020. Using the stocks' historical data before and after the announcement of a pandemic by the World Health Organization, this event study will see if the pandemic affects the stocks' rate of return.

Key words: pandemic, rate of return, abnormal return, expected return, and actual return.

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Dedication

Without the constant support of friends and family, this project would not have been possible. I want to thank my mother, Shirley Burnette, and my father, Ronald F. Burnette Sr., who will never get to see this accomplishment. I also want to thank my daughter, Ashby Burnette, to whom this project is dedicated.

Love Endures All.

Acknowledgements

Rarely in life do we publicly acknowledge and thank the people who have helped to shape us as individuals. In this project, the views that are shared are also the relationships that we share with others; therefore, acknowledgements are particularly fitting. I would like to thank God for keeping His hands upon me and giving me the strength to complete my dissertation.

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Section 1: Foundation of the Study

Event studies are used to test how the stock market incorporates information about a specific event and with empirical evidence, support or disprove the basic assumptions of the event study. Event study findings could be profitable for both the company (Alrgaibat, 2015) and an investor. At the same time, the opposite holds that the market will respond unfavorably if the information is not profitable. Hence, event studies are used to determine if an event is of value to an investor in making an investment decision in the future (Thaler & Shiller, 2015).

Following in the basic steps of Wang (2016), who investigated the impact of an event as a dependent variable, it was concluded that the stock market is always efficient. This is different from research by Daniel and Hirshleifer (2015), who studied the impact of an event and statistically revealed that abnormal returns followed an event caused by investor behavior and outside forces. Compared to other researchers like Charron (2015) and Daniel and Hirshleifer (2015), whose research concluded that the stock market does not react to an event. Their research concluded no difference in the average Rate of Return (ROR) before or after an event. Wang (2016) suggested that the market's reaction to an event is just considered a normal equity reaction.

Background of the Problem

The average person is an investor in the stock market, either as a single stockholder, 401K holder, a mutual fund owner or a purchaser of goods sold by companies that offer stocks (Alrgaibat, 2015; Dalbar Associates, 2020; Wenjing, 2017). If you are involved in the purchase or selling of equity, the question arises as to how much the investor can make by buying and selling equity. By buying or selling an asset, an investor hopes to make a reasonable ROR. The money to be made is the ROR multiplied by the investment. When it comes to buying and selling

stock, information is critical to both the company and the investor. Of course, information can move a stock price in either a good or bad way resulting in sales, buys, holds, gains and losses.

How this information is interpreted is always in question and can either have a negative or positive effect on the stock price, depending on the recipient. Information usually takes the form of dividends, company takeovers, elections, laws passed at either the federal or state level, or an unplanned event such as an earthquake (Ball & Brown, 1968). The research of this event study is to see the effect of the announcement of a pandemic by the World Health Organization (WHO) on pharmaceutical sector stock prices on the NYSE. This research also looked to see if the Efficient Market Hypothesis (EMH) (Fama, 1970; Pilkington, 2017) consistently holds, resulting in investors generating statistically significant abnormal returns because of the announcement of a pandemic by the WHO. The EMH states that share prices reflect all available information, and consistent alpha generation is impossible (Fama, 1970). In its simplest form, the EMH states that the market cannot be beaten over the long haul (Charron, 2015), but no research validates that with repetitive market anomalies caused by pandemics. Also, according to Thaler and Shiller (2015), Charron (2015), and Daniel and Hirshleifer (2015), no research attempted to look at a small subsection of the market and not a market in general. Therefore, this research is unique because it looks for patterns in a specifically targeted sub-section of the stock market to see if Thaler and Shiller (2015), Charron (2015), and Daniel and Hirshleifer's (2015) findings hold that there is a flaw in the EMH.

Problem Statement

The general problem to be addressed is the failure of the EMH to hold consistently, resulting in investors being able to generate statistically significant abnormal returns. Charron (2017) asserted that the EMH does not hold and is flawed in it is very fundamental wording. This

problem was validated by Daniel and Hirshleifer (2015), Pung and Lee (2020), and Wang (2016), who also disagreed with the EMH holding true because of investor behaviors and outside forces. The problem with the EMH holding true is further explained by the research of Thaler and Shiller (2015), who, like Charron (2015) and Daniel and Hirshleifer (2015), found that the EMH does not hold true based on another idea, which is the premise of explaining rational behavior in the markets. The specific problem to be addressed is the failure of the EMH to hold consistently, resulting in investors being able to generate statistically significant positive abnormal returns in the pharmaceutical sector of the United States' stock market following the announcement of a pandemic by the World Health Organization (WHO).

Purpose Statement

The purpose of this event study research was to evaluate the potential impacts of pandemics on the financial performance of the United States stock markets, specifically, the pharmaceutical sector of the New York Stock Exchange (NYSE) after the announcement of a pandemic (Thaler & Shiller, 2015; Wang, 2016). This event study was a fixed design using quantitative methods to examine the cause and effect of the announcement of a pandemic on the stock market (Babones, 2016). This event study used a t-Test, portfolio theory, and market model to determine the abnormal return of the 26 pharmaceutical stocks compared to the Standard and Poor (S&P) 500 (Morgan et al., 2013) (Appendix B).

This event study was a fixed design using the quantitative method because it is exploratory, deductive, and has hypotheses (Babones, 2016; Creswell, 2014; Yin, 2018). The qualitative research method alone is not appropriate for this event study because it has a hypothesis. The quantitative method alone is also not appropriate for this research because the

research is comparing and interpreting data from multiple theories on one event, looking for data not presented in one set of findings from one theory (Babones, 2016; Creswell, 2014; Yin, 2018).

Nature of the Study

The nature of the study was a fixed design using quantitative methods, specifically causal-comparative ex post facto quantitative research because the objective was to test an existing theory and examine the relationship between the actual return to their expected return after the announcement of a pandemic by WHO compared to the estimation period and the S&P 500 (Creswell, 2014; Yin, 2018). The market model was used to determine the abnormal return of the healthcare sector pharmaceutical stocks to do the causal-comparative analysis.

The healthcare sector of the NYSE is made up of 196 companies as of January 2020 (NYSE, 2020). For this event study, a sample of 26 pharmaceutical companies was chosen. This sample size was also the same as the population of pharmaceutical companies that have existed since 2009, before the first pandemic in this study. This sample size was validated by a power analysis that exceeded the 95% confidence level and the 5% confidence interval requirement for a research project with a 0% error rate of proving the hypothesis. The reason for choosing the pharmaceutical sector of the market was because there was an expectation that pharmaceutical firms would exhibit abnormal positive returns on the announcement of a pandemic by the WHO since they may have been the ones to produce a treatment, cure, and/or vaccine for a pandemic (Center for Disease Control [CDC], 2020; Pung & Lee, 2020; WHO, 2020). This was because most of the market was losing funding; the pharmaceutical sector was gaining funding. This increased funding for research leads to a secondary effect of studying what the pharmaceutical sector had to do with the problem of the EMH consistently holding, resulting in investors being able to generate statistically significant positive abnormal returns (Thaler & Shiller, 2015). They

argued that the stock market is inefficient, has bubbles, and exhibits anomalies, which is the case of specific funding of a sub-section of the market during a crisis. Yet, according to Fama (1970), the whole stock market responds the same way because it takes in all information and responds accordingly (Freihat, 2019; Wenjing, 2017).

An event study is either an event-history analysis or an interrupted time series analysis (Alrgaibat, 2015; Wenjing, 2017). An event-history analysis uses time as the dependent variable and then looks for variables that explain the duration of an event or the time until an event occurs. The interrupted time series analysis compared a before and after or a cause and effect of an event to explain how and to what degree the event changed something. In this study, we looked at how the announcement of a pandemic by the WHO impacts the pharmaceutical stock price on the NYSE. Therefore, this event study was a time series analysis of the effect of the announcement of a pandemic by the WHO on pharmaceutical stock actual ROR versus the expected return of the stock compared to the movement of the entire market represented by the S&P 500.

A causal comparative study examines the relationship between the variables the researcher cannot manipulate and events that have already occurred before the research is started. Then the researcher tries to explain the cause of the difference in the variables by looking at outside factors that lead to an observed difference (Creswell, 2014; Yin, 2018). To use this methodology, the researcher identified two groups that were similar in every way except for the difference being studied. As stated earlier, this research was looking to see if the announcement of a pandemic (independent variable) makes a difference in stock price (dependent variable) using a logical argument, persuasion, and statistics (Creswell, 2014; Yin, 2018;

thefreedictionary.com, nd). The market model was used to determine the abnormal return of the pharmaceutical stocks compared to the S&P 500 to recalculate ROR.

Discussion of Method

Event studies are designed to investigate the effect of an event on a specific dependent variable using statistics. The most commonly used dependent variable in event studies is the company's stock return. In an event study, the goal is to study the changes in stock return beyond expectation or what is called an abnormal return (Beladi et al., 2016; Charron, 2017; Daniel & Hirshleifer, 2015; Thaler & Shiller, 2015). The change in stock returns occurs over a time called an event window (Beladi et al., 2016), and the researcher can infer the significance of the event on the stock ROR.

Cumulative abnormal return (CAR) is abnormal for an event study. A CAR is merely an average of the time (TP) to compare to the actual expected return of the stock and compared to the S&P 500 of the NYSE to see how the actual returns differ from the estimated return of the stock and the movement of the stock market itself. CAR is required for research because over a small-time window of hours or days, abnormal returns by themselves can lead to bias in result findings (Thaler & Shiller, 2015). Therefore, CAR is a better indicator of abnormal return since it is the average of the ROR over some time. In this study, the CAR would look at the 21 days and seven-day pre- and post-event windows for the announcement of a pandemic by the WHO on the pharmaceutical companies in the healthcare sector of the NYSE (Chen et al., 1986).

The data used in this research about stock prices will come from the historical data of the NYSE (2020). Since the stock price data is readily available for the public, there should be no ethical concerns about collecting or analyzing this readily available public data. Also, all information about stock prices have been validated by outside sources and through multiple

research criterion, legal compliance and typically audited. Reliability and validity of the online stock price data from reputable sources should not be an issue for this research project. This event study has research questions (RQs) and supporting hypotheses. Both the RQs and hypotheses are used to formulate and propose statistics for validation and for supporting the findings.

The research questions and hypotheses are based on the question of the failure of the EMH to hold consistently, resulting in investors being able to generate statistically significant positive abnormal returns in pharmaceutical stocks from the healthcare sector of the NYSE due to the announcement of a pandemic by the WHO. Leading to the idea that an investor can outperform the overall stock market through specific stock selection or specific market timing on stock purchases because of an event (Wenjing, 2017). While the hypothesis does not have to be correct, it does have to have a choice of outcomes that are either true or false. Therefore, this event study has two scientifically testable predictions about the relationship between the stock ROR and the announcement of a pandemic by the WHO. The first hypothesis looks for a direct relationship between the stocks ROR; before and after the announcement of a pandemic by the WHO. The second hypothesis looks to see if the EMH is supported by the behavior of the overall market in the volume of stock actually traded.

These hypotheses are based on the work of Fama (1970) and Pilkington (2017), who said the market is efficient and that prices are directly reflective of events and will trade at their fair market value. Daniel and Hirshleifer (2015) argued that the market is affected by outside events. This is the premise behind hypothesis one ($H1_0$), which states there is no statistically significant

difference in the aggregate pharmaceutical sector stock(s) rate of return after announcing a pandemic by the WHO.

The second hypothesis ($H2_0$) looks to support the work of Thaler and Shiller (2015) who, like Charron (2015) and Daniel and Hirshleifer (2015), looked to explain the rational market. The second hypothesis ($H2_0$) determines if a flaw exists in the EMH, which does not look at stock prices, but stock volume. When a stock is trading in larger than normal stock volume, it would be an indicator of a flaw in the market that could be exploited and used to predict the movement of a stock and hence a flaw in the EMH (Wenjing, 2017). This in itself is the basis of supply and demand, which is an underlying basis of EMH. Supply and demand say low availability and high demand with increase a stock price; whereas the opposite is true and high availability and low demand will decrease the stock price. So, increased movement of the volume of stock would indicate a potential area to exploit or an anomaly in the market (Wang, 2016). Therefore, $H2_a$ states there is no statistically significant difference in the volume of aggregate pharmaceutical stock traded after the announcement of a pandemic by the WHO.

Summary of the Nature of the Study

The market model describes the relationship of the expected ROR over a period of time for an asset(s), where the ROI is how much one plans to get back from an investment that was purchased (Alrgaibat, 2015; Freihat, 2019; Wenjing, 2017). This event study will analyze the EMH, employ the market model, and use t-Tests to statistically prove whether or not the announcement of a pandemic by the WHO does or does not affect stock price(s) in the pharmaceutical sector.

Research Questions

This event study has two research questions (RQs) which are,

RQ1. What is the difference between the pharmaceutical stocks' rate of return before and after the announcement of a pandemic by the WHO?

RQ2. What is the difference in the volume of pharmaceutical stock traded before and after the announcement of a pandemic by the WHO?

Hypotheses

There must be a hypothesis related to the research, as with any quantitative scientific research. The hypothesis uses statistics to help prove or disprove a theory. The following hypotheses are proposed for this event study to complement the previous research questions.

Hypothesis 1

$H1_0$ - There is no statistically significant difference in the pharmaceutical stocks' rate of return after the announcement of a pandemic by the WHO.

$H1_a$ - There is a statistically significant difference in the pharmaceutical stocks' rate of returns after the announcement of a pandemic by the WHO.

Hypothesis 2

$H2_0$ - There is no statistically significant difference in the volume of pharmaceutical stock traded after the announcement of a pandemic by the WHO.

$H2_a$ - There is a statistically significant difference in the volume of pharmaceutical stock traded after the announcement of a pandemic by the WHO.

Theoretical Framework

Conceptual Framework

At its simplest form, a conceptualized framework of an event study can be defined as a representation of a theory if the theory has a solid and logical rationale (Palache et al., 2017).

According to Shoemaker et al. (2003), this idea is supported by the belief that a theory can explain or predict an outcome; but a model merely describes something. This model ideology, however, does not reveal why the relationship exists between the events being studied. Shoemaker et al. (2003) also stated, though a model is not a theory, a model can be used to represent a theory (p. 112) and continues that a research model helps describe a process, but a research theory is needed if the author intends to understand how the actual research process works. The question to be addressed is if there is a failure of the EMH to hold consistently, resulting in investors being able to generate statistically significant positive abnormal returns in pharmaceutical stocks due to the announcement of a pandemic by the WHO.

Framework

While all sectors of a stock market are affected by a pandemic, some areas are hit harder than others. Historically, some sectors of the life sciences/ pharmaceutical companies do better than the normal equity stocks (EY Analytics, 2020). There is a two-fold reason for this anomaly. First, the world hopes pharmaceutical companies produce a cure, treatment, or vaccine for the pathogen (CDC, 2020; Palache et al., 2017). Secondly, governments typically invest in pharmaceutical companies for treatments for the population and the military (FDA, 2020).

According to EY Analytics (2020), the pharmaceutical sector has outperformed the market in the last three financial crises of the twentieth century. These financial crises are the savings and loan crisis of 1991, the dot.com bubble of 2001, and the financial crisis of 2008 (EY Analytics, 2020). Based on this data, this event study hypothesizes that pharmaceutical companies would have positive abnormal returns because of the announcement of a pandemic by the WHO because people are looking to pharmaceutical companies for the solution to a pandemic (Palache et al., 2017). Once a treatment or a vaccine is available, governmental

agencies are the first and sometimes largest buyers (CDC, 2020). This can be because the role and mission of the CDC are to protect America from health, safety, and security threats, in the U.S. Whether diseases start at home or abroad, are chronic or acute, curable, or preventable, human error or deliberate attack, CDC fights disease and supports communities to do the same. (CDC, 2020). This can be seen in the CDC financials, where they brought $4.1 billion on the Vaccines for Children program (CDC, 2020) or where the National Vaccine Program spent $102 million according to the Health and Human Services United States Government (2019).

EY Analytics (2020) conducted research that said pharmaceutical company stock prices showed significant wealth creation with positive news about tests and product delivery. However, losses from the same study were much larger following bad news for pharmaceutical companies. Other research by Himmelmann and Schiereck (2012) identified certain causes for the changes in stock price because of the media's increased attention. The wealth creation or destruction is reflected in the stock price and stock volume traded. Himmelmann and Schiereck (2012) also found that the smaller the pharmaceutical company, the larger the stock price increase.

Two predominant empirical models measure the ROR in an event study examining pharmaceutical companies' stock prices. They are the market model and CAPM (Alrgaibat, 2015; Freihat, 2019). These theories are typically used independently and have resulted in mixed findings. This framework follows the idea of Babones (2016), who takes on a mixed method approach for the positivist standpoint and uses it quantitatively, not the qualitative manner with which researchers normally associate positivism. Babones (2016) uses interpretivism or social constructivism from a positivist perspective. The only difference is that typically a social constructivist/ interpretivist is part of the study, not an outside observer.

Therefore, the market model is employed in this research to see if an abnormal return is generated. A market model predicts the theoretical ROR of the pharmaceutical sector stock. The final theory is a Nobel Prize winner by Markowitz (1952) called the Modern Portfolio Theory (MPT). MPT is based not on an asset but on a group of assets called a portfolio (Markowitz, 1952), which means that in a t-Test of data from a group of stocks, prices might cancel out or not reveal an abnormal return. The one factor that will not change is the total number of trades, which means that using Markowitz's (1952) MPT may show an increased volume of stock traded.

The final piece of the event study framework is the variables. This event study has independent, dependent, and intervening variables and mentions possible extraneous variables (Creswell, 2014; Yin, 2018). The announcement of a pandemic is the proposed independent variable that affects the dependent variable of the pharmaceutical stock prices of the healthcare sector of the NYSE. Other variables in research are extraneous variables (Creswell, 2014; Yin, 2018). This event study attempts to mention some extraneous variables, but these variables are just mentioned and may or may not affect the outcome. This event study has an intervening variable of the WHO. This is because the announcement of a pandemic by the WHO is the determining factor of if a disease/ pathogen/epidemic becomes a pandemic (WHO, 2020).

Summary of Conceptual Framework

Existing pharmaceutical research almost exclusively focuses on stock price clinical trial studies and company announcements made by the Food and Drug Administration. Research on stock price responses of public pharmaceutical companies listed on the NYSE or other stock exchanges is very limited. In this event study, I will try to fill this void in research by analyzing twenty-six long-term pharmaceutical companies to see if they exhibit a positive abnormal return

because of the announcement by the WHO. The choice of companies is based on these being the only NYSE companies to exist during both pandemics. Twenty-six pharmaceutical companies from the healthcare sector of the NYSE were selected as the sample and the only existing population, which exceeds the ninety-five percent confidence level and the five percent confidence interval requirement for a research project.

Because the sample is one hundred percent of the population, the hypotheses can be accepted or rejected with a margin of error of 0%. This is the first of the kind research for this topic since there have only been two pandemics since 2003 when the WHO started issuing Public Health Emergency of International Concern and only six pandemics in the last 120 years. There has been a multitude of pathogens and epidemics in the United States and the World, according to the WHO (2020). However, the WHO is the only group that can make a disease/ pathogen/ epidemic a pandemic and, therefore, an intervening variable that can affect the pharmaceutical stocks of the healthcare sector of the NYSE.

Definition of Terms

Fairly

To a degree or extent. Reasonable or moderately. Conforming to the laws and rules. Fair, just, and honestly and right. (thefreedictionary.com, nd)

Finance Ethics

The concept of right and wrong in financial/ accounting methods (Mintz & Morris, 2011).

Irrational

Not having the ability to reason, not logical, non-sensical, poor judgment, not of sound mind, incoherent, no mental clarity (thefreedictionary.com, nd)

Rate of Return (ROR) achieved (actual) in the market during the holding period (Alrgaibat, 2015; Fama, 1970; Freihat, 2019; Ragsdale, 2015; Wenjing, 2017).

Rational

Having the ability to reason, logical, good judgment, and sound mind. (thefreedictionary.com, nd)

Realized Rate of Return

Return of Investment (ROI) gained on the equity during the holding time adjusted due to inflation and other factors (Alrgaibat, 2015; Fama & MacBeth, 1973; Freihat, 2019; Ragsdale, 2015; Wenjing, 2017)

Risk-free ROR

A return that can be earned without bearing any risk. This ROI is represented by returns on treasury bills (T-bills) issued by the Federal Reserve and or Central Bank of the United States. T-bills are better than bonds because they do not fluctuate daily like bond rates (Alqisie & Alqurran, 2016).

Religion

For purposes of this event study, the word can briefly describe ANY religion unless otherwise specified. Examples are Atheism, Buddhism, Christianity, Hinduism, Islamic, Judaism, and Wicca.

Table 1

Abbreviations

Abbreviation	Meaning
AHT	After Hours Trading
AKA	Also Known As
AM	Ante Meridian
AUM	Assets Under Management
CAPM	Capital Asset Pricing Model
CBO	Congressional Budget Office
CDC	Center for Disease Control
DAX	Deutscher Aktienindex – *German stock market list of 30 stocks*
ECN	Electronic Communication Networks
EIS	Epidemic Intelligence Service
GAAP	Generally Accepted Accounting Principle
GDD	Global Disease Detection Program
GDP	Gross Domestic Product
HIPAA	Health Insurance Portability and Accountability Act
IBRD	International Bank for Reconstruction and Development
ICSID	International Centre for Settlement of Investment Disputes
IDA	International Development Association
IFC	International Finance Corporation
MIGA	Multilateral Investment Guarantee Agency
MLP	Master Limited Partnership
NASDAQ	National Association of Securities Dealers Automated Quotations Exchange
NYSE	New York Stock Exchange
PEF	Pandemic Emergency Financing Facility
PHEIC	Public Health Emergency of International Concern
PM	Post Meridiem
REIT	Real Estate Investment Trust
RET	Rational Expectations Theory
ROI	Return on Investment
ROR	Rate of Return – (has various meanings depending on application)
RRR	Required Rate of Return
SARS	Severe Acute Respiratory Syndrome
SE	Stock Exchange
SEC	Securities and Exchange Commission
S&P	Standard and Poor’s
T-bills	Treasury Bills
UNDP	United Nations Development Program
WHO	World Health Organization

Assumptions, Limitations, Delimitations

This researcher believes in the statement made by Leedy and Ormond (2010), who asserted that assumptions are so basic that without them, the research problem itself could not exist (p. 62). Because of this, assumptions should be said to be probably true; otherwise, the study cannot move forward. All data were collected via electronic records posted on the internet on websites managed by the NYSE, Bloomberg, various company/ government websites, the WHO, and the CDC. Also, all websites are reliable and accurate for the pharmaceutical stock market ROR.

Assumptions

The assumption is that all data collected and presented by the NYSE (2020), the WHO (2020), the CDC (2020), and Bloomberg (2020) is correct and accurate as of the date the data was collected. This event study and research also assume that all data collected and presented by the various company financials are correct and accurate as the data was collected. This study was limited to the collection of data readily available as public records on the collection date.

Limitations

The first limitation is reporting time and dates for this study. All dates and times may be uncoordinated due to the International Date Line. The dateline or timeline moves a clock one hour for every 15 degrees of travel longitude around the globe when one moves East to West (Lamont, 1921). There is a possibility of seconds, minutes, or hours of variance in when or where someone heard the announcement of a pandemic by the WHO. This limitation affects the reporting time of pandemic events but is impossible to control from a research perspective. This limitation is best addressed by reporting all dates and times reported in research articles.

The next limitation was that the methodology depended on the assumption of an efficient market (Fama, 1970). This assumption is not valid in many situations, as Poser (2003) pointed out. Poser (2003) pointed out the length of time required for individual investors to respond to the event(s) is random, and therefore the implication is that the markets could exhibit inefficiencies because prices do not instantly or fully reflect all available information. This is because stock prices usually increase in a series of steps as investors respond in waves. This is referred to as the Elliott Wave Principle or Elliott Wave Theory (Poser, 2003). This limitation of an efficient market is beyond the scope of this research but is a component of this event study.

Another limitation is that the researcher has no control of stock prices for the pharmaceutical sector or any stock in the stock market. In addition, the S&P 500 index was used as a proxy for the market. This index includes the most liquid and largest market companies (NYSE, 2020). Based on this information, the S&P 500 index may not represent all stocks in the market. The S&P 500 could not be the most representative index by some researchers due to the definition of terms and variables. Even if we assume away the problems of the EMH, we might have other problems if the companies under study are contaminated by other concurrent, pre-existing, or short-term ensuing events not found from a simple company inquiry during the event window time frame. Concurrent events and studied events in different stock sectors might weaken or reinforce the event, generating an abnormal return not caused by the specific event being studied (Beladi et al., 2016). This limitation is mitigated by reporting all prices accurately from the historical data of the NYSE.

Delimitations

The delimitations of this research are that it is focused on the stock ROR of pharmaceutical stock in the healthcare sector stocks of the NYSE from April 2009 to March

2020 to see if the pandemic affected the ROR of the stocks. The research is also limited to these actual research questions and hypotheses. Changing the research question and hypothesis could change the findings of this event study. At the same time, changing the equity database(s) to other stock, stock sectors, events, dates, or other equities could also change the data and findings of this research.

Significance of the Study

The EMH is a stock market investment theory that Fama created (1970) that said it is impossible to beat the market and make an investment that outperforms the overall market. The problem of the EMH consistently holds; results in investors being able to generate statistically significant abnormal returns (Beladi et al., 2016; Charron, 2017; Daniel & Hirshleifer, 2015; Thaler & Shiller, 2015), which is the underlying premise of this event study. Couple these problems of the EMH with the use of the market model and MPT (Aldaarmi et al., 2015; Bajpai & Sharma, 2015; Wenjing, 2017), which by themselves are the basis of many studies for corporate financial theory. This study may contribute to the existing body of knowledge by presenting a valid model that can be used in future theoretical event study problems in which just the traditional market model is used to see if an event has a bearing on the stock market ROR.

Reduction of Gaps

Gap is a term used to imply what the research learns (Beladi et al., 2016). This research paper serves to bridge the gap between the event study and the actual event of the announcement of a pandemic by the WHO on the NYSE pharmaceutical stocks ROR. Secondly, this research examines whether different results can be derived from the same data using the market model and MPT. Finally, if positive abnormal returns are found, this research may assist hedge fund and mutual fund portfolio managers as to where to direct some of their investments in future

pandemics. The interpretation and repercussions between these two pandemic events and the expectations of the outcomes in standards and practices are the gap in this research (Beladi et al., 2016).

Implications for Biblical Integration

The King James Version of the Bible is specific in three verses that sum up the basis of this event study. Luke 16:11 says. “And if you are untrustworthy about worldly wealth, who will trust you with the true riches of heaven?” Luke 12:34: “Where your treasure is, there your heart will be also.” Then Revelations 3:17-18: “You say, 'I am rich, with everything I want; I don't need a thing!' And you do not realize that spiritually you are wretched, miserable, poor, blind, and naked.”

Relationship to Field of Study

This event study looks at the financial aspect of the financial calculation of the United States pharmaceutical stocks of the NYSE and if the announcement of a pandemic by the WHO affected the pharmaceutical stocks ROR. Finance also relates to the market model (Aldaarmi et al., 2015; Bajpai & Sharma, 2015) because it is the most frequently used stock price expected return model. The market model builds on the actual returns of a reference market return and the correlation of the firm's stock return with the reference market return.

Summary of the Significance of the Study.

In modern finance, findings are required to be backed up by generally accepted accounting principles (GAAP) and supported by proven numbers and statistical data (Morgan et al., 2013). The readers and peer reviewers of research should easily follow logically and unbiasedly. The nature of the study is a fixed design with quantitative methods. The quality of the data from the research was as important as the interpretations of the data. Therefore, the

usefulness of the data is qualitative, using feelings and meanings to offer a holistic professional evidence-informed decision for the effect of the announcement of a pandemic by the WHO on the ROR of pharmaceutical stocks of the NYSE.

A Review of the Professional and Academic Literature

Event Study

An event study is an analysis performed on a security or a combination of securities that examines the impact of an event on the value of that security (Beladi et al., 2016; Chan et al., 1997; Charron, 2017; Daniel & Hirshleifer, 2015; Thaler & Shiller, 2015). An event study will reveal how a security is likely to react to said catalyst occurrence (the event) or contingent event. According to Binder (1998) and Fama et al. (1969), the event study does the following uses information from a specific time about a stock price and, using the event study methodology, calculates the normal return and then possibly an abnormal return.

Three time points are needed to calculate the findings of an event study. They are a period before the event (pre-event) or the (estimation period), the time of the event or (event day), and a time after the event (post-event) or (observation period) (Binder, 1998; Fama et al., 1969) these time collectively are called an event window (Ball & Brown, 1968). The researcher can infer the event's significance on the stock from these findings. However, the basic premise of event study must be true for this to be true: the market is efficient (Fama, 1970). If the market is efficient, the event's effect will be reflected immediately in the stock price of the company being studied (Fama et al., 1969). The event study methodology works to calculate the normal return of stock from the pre-event window and the new actual return of stock during and after an event. Then the actual return of the event and post-event time are deducted from the pre-event findings,

and an abnormal return is attributed to the event (Beladi et al., 2016; Chan et al., 1997; Charron, 2017; Daniel & Hirshleifer, 2015; Thaler & Shiller, 2015).

The researcher hypothesized this abnormal return, and research questions and hypotheses are proved or disproved. This can be seen in the following research, as many researchers have found problems with the EMH. For example, Thaler and Shiller (2015) and Chan et al. (1997) argued that the stock market is inefficient, has bubbles, and exhibits anomalies. These bubbles and anomalies in the stock market allow investors to make money if they specifically buy a stock based on known or hypothesized information that will affect the stock or the stock market overall.

Charron (2017) found that small-capitalization stocks outperform large-capitalization stocks. As Beladi et al. (2016) described, the January Effect is a stock market anomaly whereby a stock that performed badly in the last quarter of a year performs better in January of the next year. Chan et al. (1997) and Charron (2017) found that companies with low-price book ratios outperform the market. Charron (2017) studied reversals and found that stocks that performed well or poorly in one year typically performed the opposite in the subsequent year.

Daniel and Hirshleifer (2015) also discussed other market anomalies caused by outside forces. Other events around the world like bankruptcies, mergers, defaulting on debt, changes in management, weather, terrorist attacks, and presidential tweets have shown, on occasions, that anomalous events can result in statistically significant positive or negative abnormal the United States stock market returns (Elbe, 2008; Karolyi, & Martell, 2010; Wang, 2016). Event studies look for relationships between the selected equity prices and the chosen catalyst and how the two factors interact.

Bias

A bias is a preference or an inclination. Something that someone does affects their judgment (thefreedictionary.com, nd). With this in mind, every researcher must know that not every person can have and invest in equity with the same amount of information. Every person will read, experience, and observe different things and view the things they see and read differently (Rieger, 2012). Rieger (2012) concluded that behavioral biases lead investors to make bad estimates on the probability of the ROR from investments. Other researchers like Kahneman and Sahi et al. (2013) attempted to list a series of biases by investors. These biases included: preferring known risks over unknown risks, relying on something as a point of reference, making investment decisions based on easily available and known information, playing it safe with risk, investing differently in an asset-based on yearly income, trying to be social responsibility, invest in familiar equities, say they learn from their past decisions, are adverse to losses, often feel regret, overconfident in their ability, rely on family and friends, and follow current trends (Kahneman & Riepe, 1998; Rieger, 2012; Sahi et al., 2013).

Apart from investor bias is research bias. Research bias is not just found in conclusions from the research. It is drawn in every aspect of research. It can be found in the event study's design, data collection, and data analysis (Smith & Noble, 2014). Understanding bias allows the reader and the writer of research to review the literature and findings critically and independently to remove any potentially harmful opinions. At the same time, it keeps the research evidence based. Most bias in research is based on the fact that researchers are unwilling to publish results that show unfavorable findings. This is because researchers fear negativity towards their work or findings (García-González et al., 2019; Smith & Noble, 2014). Research work, whether good or bad, is still research. Edison was quoted by the World Bank in the 1994 Infrastructure for

Development Report as saying, I have not failed 10,000 times. I have successfully found 10,000 ways that will not work. (World Bank, 2020). This is the same mentality a researcher has to have. It is not a failure. It is more about learning what does not work so that others can know what not to try and move on and try something else.

World Bank

The World Bank is a part of the World Bank Group and is made up of the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) (Fernandes, & Sridhar, 2017; World Bank, 2020). The World Bank provides loans to poor developing countries to pursue capital projects. The World Bank is made up of five organizations. These organizations are the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), the International Finance Corporation (IFC), the Multilateral Investment Guarantee Agency (MIGA) and the International Centre for Settlement of Investment Disputes (ICSID) (Fernandes & Sridhar, 2017; World Bank, 2020). The World Bank is located in Washington, DC and has financing with all 193 countries involved in the United Nations (World Bank, 2020). The World Bank's goal is to reduce poverty, and its largest benefactors are the countries of China and India (Fernandes, & Sridhar, 2017; World Bank, 2020).

The World Bank has a unique relationship with pandemics. The World Bank, through the IBRD, has created the Pandemic Emergency Financing Facility (PEF). The PEF is a facility designed to channel emergency funding to developing countries facing the risk of a pandemic. On June 28, 2017, the Word Bank started selling a specialized $500 million bond fund to investors to raise money. Set to mature on June 28, 2020, Germany and Japan (World Bank, 2020) primarily funded these bonds. The PEF is comprised of two parts. The first part is

insurance, with premiums paid by bonds and swaps for immediate emergency funding of pandemic research. The second part is a cash window available after 2018 to contain a disease that is not eligible for funding by the insurance part (Fernandes & Sridhar, 2017; World Bank, 2020).

All of the handlings of funds and payouts are to be handled by the reinsurance companies of Swiss Re and Munich Re. The pandemic bonds are only used for the pandemics declared by WHO. The PEF covers six viruses that are most likely to cause a pandemic declared by WHO. These viruses include orthomyxoviruses (new influenza pandemic Virus A), coronaviridae (SARS, MERS, or coronaviruses), filoviridae (Ebola and Marburg) and other zoonotic diseases (Crimean Congo, Rift Valley, and Lassa fever). The declaration of a pandemic by WHO allows governments to activate preparedness plans and possibly take emergency procedures to protect the public, regulate banking and finance, including military use, and issue travel and trade restrictions (Fernandes & Sridhar, 2017; World Bank, 2020).

United States Government and Pandemics

The United States Congressional Budget Office (CBO) assessed the Macroeconomic Effects of a Pandemic Flu in 2005 and followed up in 2006 in their research (CDC, 2020). In the study, the CBO concluded there would be about a 4.25% reduction in Gross Domestic Product (GDP) reduction in a severe pandemic and about a 1% in a mild pandemic. On the supply side of a potential pandemic, there would be 2.25% percent in the severe pandemic scenario, the supply side of a potential pandemic and about 0.05% in the mild pandemic. The final side of the study was the impact on the demand side.

The demand side of a pandemic would depend on the industry, and those that depend on intense interpersonal contact would suffer more than those that do not require person-to-person

contact, except for the healthcare industry, which would show an increase in demand. In both the severe and mild pandemic models, it was concluded by the CBO that economic activity would rebound in the post-pandemic period to pre-pandemic levels; but this number would have to be adjusted by the overall effect of the pandemic on the population. The economy would return to normal. However, in a severe case scenario, a pandemic that causes a loss of 5% of the population would see economic activity return to normal minus 5%, meaning in a mild pandemic with no major losses of life or long-term effects (CDC, 2020; Fitzgerald et al.,2017; Hsieh et al., 2013).

Equity Markets

According to the NYSE data (January 2020), the entire world's stock exchanges have a value of over $80 trillion United States Dollars (USD). The two largest players in the global stock markets are the NYSE and NASDAQ. The NYSE and NASDAQ combined are bigger than the next seven global equity exchanges combined. These other equity exchanges are Japan, China, Euronext, London, Hong Kong, Germany, and Canada (Jeanneret, 2017; NYSE, 2020; Roseman et al., 2018) (Table 2).

Table 2

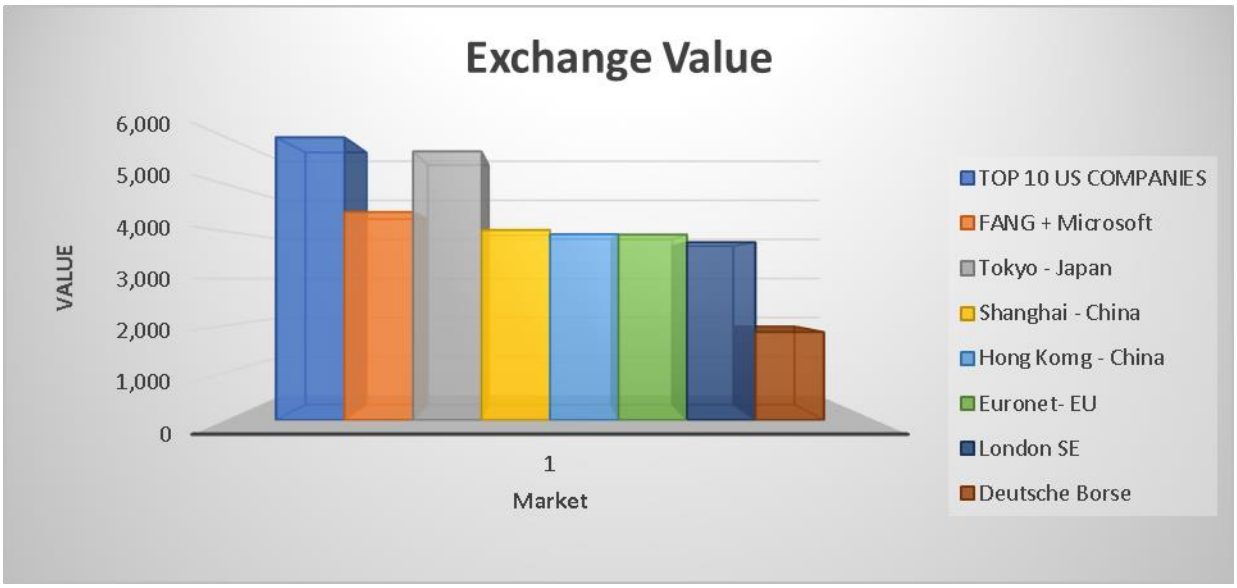
Exchange Market Values in United States Dollars 2019

EXCHANGE	
	Billion (USD)
TOP 10 US COMPANIES	5,986
FANG + Microsoft	4,406
Tokyo - Japan	5,689
Shanghai - China	4,026
Hong Kong - China	3,936
Euronet- EU	3,927
London SE	3,767
Deutsche Borse SE -Germany	1,864

The top 10 United States companies and FAANG plus Microsoft (Figure 1).

Figure 1

Exchange Values Graph



The top 10 US companies are Walmart, Exxon, Apple, Berkshire Hathaway, Amazon, United Health Group, McKesson, CVS. Health, AT&T, and AmerisourceBergen. FAANG stands for: Facebook, Amazon, Apple, Netflix, and Google plus Microsoft (NYSE, 2020) (Table 2). Most people say the stock market is too risky and that individual stock ownership is even riskier. However, owning an index fund on a major world index in the long term is proven to yield a good profit (Fama & MacBeth, 1973; Jeanneret, 2017; Roseman et al., 2018).

From 1999 to 2020, the best indexes of the NASDAQ 100 have an average ROI of over 300% percent. The Dow Jones Industrial Average followed this with a 196% ROI, the German DAX with 150% ROI, and the S&P 500 with 154% ROI. Compared to the stock market in the United Kingdom, the ROI of just 36% percent and the Nikkei 225 stock exchange ROI of 48% (NYSE, 2020) (Figure 2, Table 3).

Figure 2

Sector Percentage of the Market Graph 1-2-2020 (NYSE, 2020)

Table 3

Stock Market Sectors and Values are in Billions (NYSE, 2020)

Stock Market Sector		MARKET CAP 1-2-2020
Information Technology	18%	9.29
Financials	15%	7.72
Health Care	12%	6.12
Industrials	9%	4.5
Consumer Discretionary	11%	5.79
Consumer Stables	8%	4.1
Communication Services	10%	4.92
Energy	6%	3.28
Materials	4%	2.01
Utilities	3%	1.5
Real Estate	3%	1.38
TOTALS	100%	50.61

Stock-market history shows that the market and investors react to epidemics and pandemics. The reactions are usually based on the severity of the epidemic/ pandemic (NYSE, 2020). This is just not a Unites States NYSE problem. For example, the Avian Flu epidemic of 1997 coincided with the Asian stock market crisis. The Asian Stock market problems preceded the Russian Market collapse of 1998 (World Bank, 2020). The Dow Jones Market also has data on the effects of epidemic/ pandemics on the NYSE. According to the Sert et al. (2020), there is always an effect on the market based on epidemics and pandemics (Table 4).

Table 4

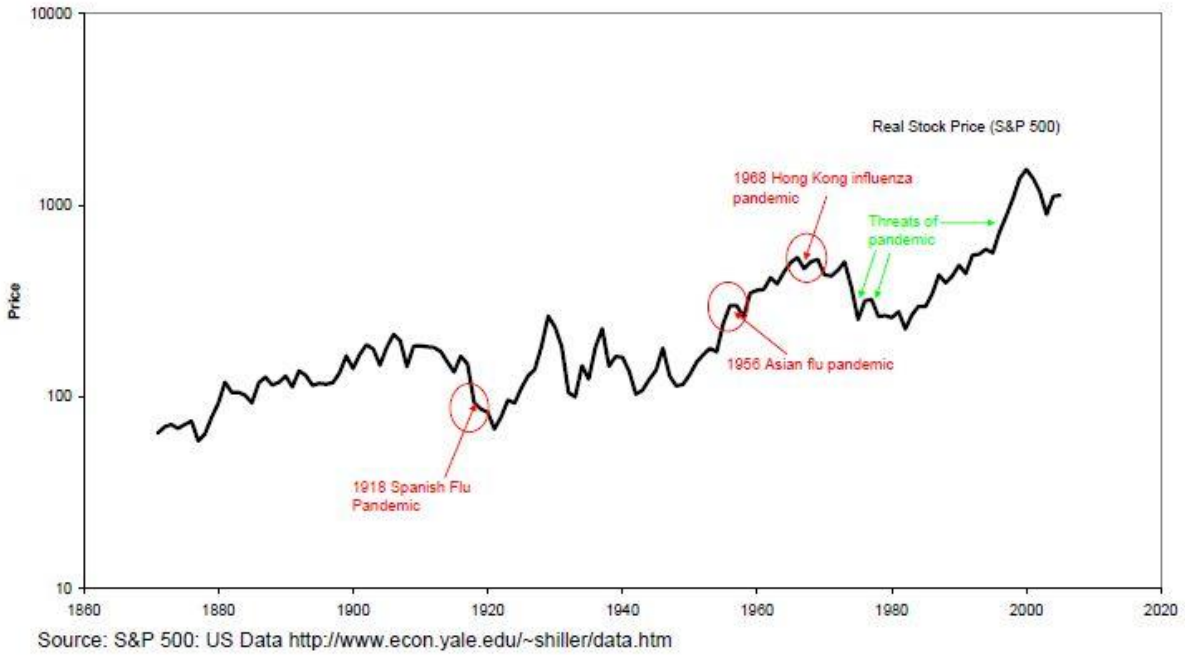
Dow Jones Market Data 2020

Epidemic	Month End	6-month % Change of S&P	12-month % Change of S&P
HIV/AIDS	June 1981	-0.20	-10.73
Pneumonic plague	September 1994	8.22	26.31
SARS	April 2003	14.59	20.76
Avian flu	June 2006	11.66	18.36
Dengue Fever	September 2006	6.36	14.29
Swine flu	April 2009	18.72	35.96
Cholera	November 2010	13.95	5.63
MERS	May 2013	10.74	17.96
Ebola	March 2014	5.34	10.44
Measles/Rubeola	December 2014	0.20	-0.73
Zika	January 2016	12.03	17.45
Measles/Rubeola	June 2019	9.82	N/A

The S&P 500 also has the following chart about epidemic/ pandemic history and the Unites States Stock Market (Figure 3).

Figure 3

Epidemic/ Pandemic History in US Stock Market



Federal Security Rules and Regulations

The United States has various rules, laws, and regulations that govern the establishment of and the buying and selling of equities. These laws are enforced by one of 52 regulatory agencies. The United States Securities and Exchange Commission (SEC) (SEC, 2020) is the largest enforcer of finance rules and laws related to equities on the NYSE. The first major finance law was the Sherman Anti-Trust act of 1890, followed by the Securities Act of 1933, the Glass Steagall Act of 1933, which was repealed in 1999, the Securities Exchange Act of 1934, the Investment Company Act and the Investment Advisors Act of 1940, Securities Investor Protection Act of 1970, and the National Securities Markets Improvement Act of 1996 which amended the Security Exchange act of 1934 section 15 (h). This was later followed by the Sarbanes-Oxley Act of 2002 and the Dodd-Frank Wall Street Reform and Consumer Protection

Act of 2010 (Dyer, 2016; Jeanneret, 2017; Roseman et al., 2018; United States Government, 2019).

All of these laws are in place to help protect the average investor (Alrgaibat, 2015; Dalbar Associates, 2020; Wenjing, 2017) in the stock market and to make sure the companies are doing what they are supposed to do, reporting all information that would have a bearing on the company and their stock price. Because of these laws, all information is made public as soon as possible (Fama (1970). This information would change stock prices accordingly. We have an efficient market (Fama, 1970), and no one can benefit from anomalies in the market.

Securities and Exchange Commission

The United States Securities and Exchange Commission (SEC) is the primary government agency that oversees the United States stock market. According to the SEC (2020), stocks are a type of security or equity that gives the shareholder ownership in a company (Dyer, 2016; Jeanneret, 2017; Roseman et al., 2018; United States Government, 2019). To buy or sell stock, a stock owner or equity buyer has to go to a stock market to buy or sell stocks. A stock market is where companies sell stocks and investors buy/ sell stock (Dyer, 2016; Jeanneret, 2017; Roseman et al., 2018; United States Government, 2019). Stock is broken down into two categories of common stock and preferred stock. These two categories can be broken down into other categories. These stock categories are growth, income, value, and blue-chip (SEC, 2020). Growth stocks have earnings that increase faster than the market average and do not pay dividends, but investors hope the stock will appreciate and be sold for more money later (SEC, 2020). Income stocks are company stocks that pay dividends. Investors buy them because of the dividends they generate (SEC, 2020). Value stocks have low price-to-earnings ratios (SEC, 2020). Finally, there are blue-chip stocks. Blue-chip stocks are a combination of value and

growth. Typically, blue-chip stocks are well-known companies that usually all pay dividends (SEC, 2020).

Companies issue stocks for several reasons. One is to pay off debt. The second is to raise money to launch a new product or expand into a new market locally or internationally. By buying stock, stock owners or investors get a capital appreciation of hoping the stock price goes up, earns dividends, and has voting rights for the board of directors or influences company decisions. Preferred stock owners do not have voting rights (Dyer, 2016; Jeanneret, 2017; Roseman et al., 2018; United States Government, 2019). Buying and selling stocks come with some inherent problems. These problems are called risk or market volatility. These uncertainties can affect the amount of return on investment (ROI) (Dyer, 2016; Jeanneret, 2017; Roseman et al., 2018; SEC, 2020).

Epidemic

An epidemic is a rapid spread of an infectious disease to a large number of people in a given area within a short time, usually two weeks or less (CDC, 2020; Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020). Epidemics are generally caused by a change in the ecology of the host population, a genetic change in the pathogen itself, or the introduction of a new pathogen to a new host population. An epidemic occurs when the host's immunity to the pathogen is reduced below the endemic equilibrium, and the transmission spreads into the host's body. An epidemic may be restricted to one area; however, it may spread to other countries or areas and cross international boundaries. Depending on the severity of the epidemic, it might be classified as a pandemic by the World Health Organization, but it must meet the criteria of a pandemic. All pandemics usually start as an epidemic (CDC, 2020; Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020).

There are two types of epidemics or pandemics. First is the common source outbreak epidemic. This is where an affected individual(s) had an exposure to a common disease-causing agent. A person can get it from a single exposure occurrence or an incubation period from multiple long-term exposures if this is the case. It is a point source outbreak (CDC, 2020). The second type of exposure is the propagated outbreak. The pathogen-causing disease is spread from person to person, usually by a single exposure. However, the one person moved around and exposed multiple people who continue to move around and affect others (CDC, 2020; Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020).

Therefore, in a propagates outbreak, each person is the reservoir of disease, and either is affected and becomes sick or has immunity and just carries the disease-causing pathogen and infects others. Each person becomes sick at their rate. However, this time from exposure to showing symptoms of the disease is called the disease incubation period (CDC, 2020; Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020). The propagated outbreak is the most common form of epidemic/ pandemic transmission since the carrier(s) do not know they are sick or infected with a pathogen. This is usually how an epidemic becomes a pandemic is because in the twenty-first century, we are an interconnected world, and travel is common with international airports and frequent travel for a job(s) or personal leisure.

Pandemic

All over the world, there are deadly infectious diseases. There are two ways to think about diseases. The first is diseases that threaten under-developed countries, either small or large scale. Then some diseases threaten more developed countries like the United States. Alternatively, other industrialized countries. Outside of the Unites States, according to WHO (2020) and the CDC (2020), there is cholera, tuberculosis, malaria, dengue fever, pneumonia,

diarrheal diseases and a litany of other epidemics and problems. These diseases account for over 34.4% of all deaths, according to the World Bank (2020), which is quite large considering the World Bank also says that war only accounts for .64% percent of all deaths.

As far as pandemics go, the Spanish Flu of 1918 killed more Americans in one year than all of the Unites States fought in the 20th century. This includes World War II, Korea, and Vietnam (World Bank, 2020). At the same time, the CDC and WHO are not prepared for a large-scale pandemic of the next unknown disease. According to the CDC (2020), there are drug-resistant strains of existing infections and new mutated strains of influenza, tuberculosis, malaria, dengue fever, and Methicillin-Resistant Staphylococcus Aerus (MRSA). The full extent of a human pandemic's economic, social, and political impacts depends critically on a number of factors. The first factor of a pandemic is the number of people who 1) become infected, 2) can transmit the disease, 3) develop symptoms, 4) cannot work for a certain time either because they are ill or because they are at home caring for the sick and finally, and 5) the number of people who eventually die (CDC, 2020; Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020).

A pandemic is an epidemic; that scale is bigger than an epidemic. A pandemic also crosses international borders, affects a large number of people, and can be contagious or infectious, usually in less than a year where it starts small, increases then decreases in cases and severity (CDC, 2020; Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020). Pandemics are not a disease that makes people sick. It is widespread globally and kills people. If this were the case, one could argue that cancer is a pandemic. Cancer is a disease that crosses borders, makes people sick, kills some people, but has been around for generations and has not decreased in volume or severity since it was first recorded. However, cancer is not

infectious or contagious (CDC, 2020; Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020). Another distinction that must be made for pandemics is that it is not seasonal. The best example of this is influenza or the flu (CDC, 2020), which occurs yearly but is not a pandemic or epidemic.

The influenza virus causes influenza or the flu (CDC, 2020; Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020). There are four types of influenza viruses. Only three affect humans: Type A, Type B, and Type C. The fourth type is Type D which is not known to affect humans (CDC, 2020; WHO, 2020). The flu is a virus spread through the air from coughs or sneezes or touching surfaces contaminated by the virus and then touching the eyes, nose, or mouth. An infected person can be infectious to others before and when they show symptoms. Usually, the flu is tested by looking at the spectrum of a person and checking for influenza ribonucleic acid (RNA) (CDC, 2020; WHO, 2020). Most flu cases are seasonal and are generally Type B influenza virus. The Spanish Flu of 1918, as with any other epidemic or pandemic flu, was a Type A influenza virus (CDC, 2020; (Karlsson et al., 2014; WHO, 2020).

World Health Organization (WHO)

The World Health Organization (WHO) was founded in 1948 and is a part of the United Nations specializing in international health. The WHO is located in Geneva, Switzerland, and has 150 offices worldwide. The WHO has members from all 194 participating states of the United Nations and provides essential functions of monitoring public health, responding to health emergencies, advocating for universal healthcare, and promoting general health and well-being (Pandemic, 2009; Pung & Lee, 2020; Villarreal, 2016; WHO, 2020).

According to the WHO, classifying pandemics as a future global shock factor is consistent with considering certain aspects of public health and infectious diseases as an

existential threat to society and human security. This is an expansion on the United Nations Development Program (UNDP) of 1994 (WHO, 2020). The UNDP was reaffirmed in the 2003 United Nations Commission on Human Security. The premise behind the UNDP conceptualizes the security of society and humans as human-centric rather than the traditional state-centric belief system. This ideology's goal is to protect society and human safety and welfare from such things as disease, hunger, unemployment, crime, social conflict (war), political repression, and environmental hazards (Pandemic, 2009; Pung & Lee, 2020; Villarreal, 2016; WHO, 2020).

WHO says there are four major things learned from studying epidemics and pandemics? There is insufficient globally shared information available in real-time about pandemic risk inventories, hazards, or threats (WHO, 2020). 2) There is a lack of forward-thinking and planning for creating and distributing medicines and vaccines. This is caused by the lack of shared information (WHO, 2020). 3) There is not an international harmonization of regulations across the globe for identifying and treating a pandemic (WHO, 2020). 4) There needs to be sustainable basic research efforts required before, during and after a pandemic (WHO, 2020).

The WHO and the CDC acknowledge and post all known pandemics and epidemics on their website. Pandemics are nothing new and have been around for as long as people kept records. Some non-recent pandemics, according to WHO (2020), are the Plague of Athens (430 BCE) caused by typhus or perhaps typhoid fever; the Antonine Plague (165-180 CE) caused by either smallpox or measles; and the Bubonic Plague caused by the bacterium yersinia pestis, (540 BCE). Then there is cholera, caused by vibrio cholerae (1816-1826 ad), Barua (1992) in Angola, Ethiopia, Somalia, Sudan, Zambia, South Africa, and Northern Vietnam.

These are not the only pandemic agents. There are also other documented pandemics causing agents, which are typhus, measles, smallpox, tuberculosis, malaria, yellow fever, viral

hemorrhagic fever, antibiotic-resistant bacteria including staphylococcus aureus, enterococcus species, Mycobacterium tuberculosis, Serratia marcescens, e. coli, pseudomonas aeruginosa, and Acinetobacter baumannii (CDC, 2020, Pandemic, 2009; Pung & Lee, 2020; Villarreal, 2016; WHO, 2020). In addition to these known pandemic-causing agents, there is the dreadful threat of engineered or synthetic bioterrorist agents on the immediate horizon, which are manufactured chemically engineered forms of the above agents according to the CDC (2020) in their bioterrorist's articles. Finally, the severe acute respiratory syndrome (SARS) virus did not meet the criteria for a pandemic but was an epidemic. The SARS virus (COV-2) of 2002-2003 (CDC, 2020) is also a corona virus that, just like the corona virus of 2020, affects the respiratory system of its hosts, causing breathing problems and death in some cases (Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020).

According to WHO, the declaration of a pandemic has profound social, political, and economic consequences worldwide and even on the agency itself. WHO (2020) defines a disease as an epidemic when there are more cases of a particular disease than normal in an area(s). A pandemic is where the disease leaves one area and affects others in other countries or globally. A pandemic can range from mild to severe, with the level of severity changing over time. These changes usually start small and increase, then shrink back down after the pandemic has run its course. According to the older WHO guidelines which are no longer used, there were six phases of a pandemic, and also what is a Post Peak Period and a Post Pandemic Period (Pandemic, 2009; Pung & Lee, 2020; Villarreal, 2016; WHO, 2020).

These six phases are:

Phase 1

No animals have been reported to cause infection in humans

Phase 2

An animal is known to have caused human infection and is therefore considered a specific potential pandemic threat.

Phase 3

An animal or human-animal has caused sporadic cases or small clusters of diseases in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks

Phase 4

Human to human transmission of an animal or human-animal virus able to sustain community-level outbreaks has been verified.

Phase 5

The same identified virus has caused sustained community-level outbreaks in two or more countries in one WHO region.

Phase 6

In addition to the criteria defined in Phase 5, the same virus has caused sustained community-level outbreaks in at least one other country in another WHO region.

Post Peak Period

The pandemic cases in most countries with adequate surveillance have dropped below peak levels; additional pandemic waves may recur during this period.

Post Pandemic Period

Levels of case activity have returned to the levels seen for seasonal cases in most countries with adequate surveillance. (WHO, 2020). Prior to declaring a pandemic, the WHO normally declares a Public Health Emergency of International Concern (PHEIC) (WHO, 2020).

A PHEIC is a formal declaration by the World Health Organization (WHO) for an exceptional incident that has been found to pose a public health danger to neighboring nations as a result of the worldwide transmission of illness and to need a coordinated international response, including the possibility of a nuclear war (WHO, 2020). When a situation arises, that is sudden, unusual, serious, or unexpected. It is proposed to cross international borders and require an immediate international response (Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020). The PHEIC was formulated in response to the SARS outbreak of 2003 under the 2005 International Health Regulations. The WHO has only used the PHEIC six times as of 2009 and until January 2020 (WHO, 2020). These six times were the 2009 swine flu pandemic, the 2014 polio declaration, the 2014 Ebola outbreak in Africa, the Zika epidemic of 2015, the 2018 Kivu Ebola epidemic, and the 2020 Coronavirus COVID-19 (Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020).

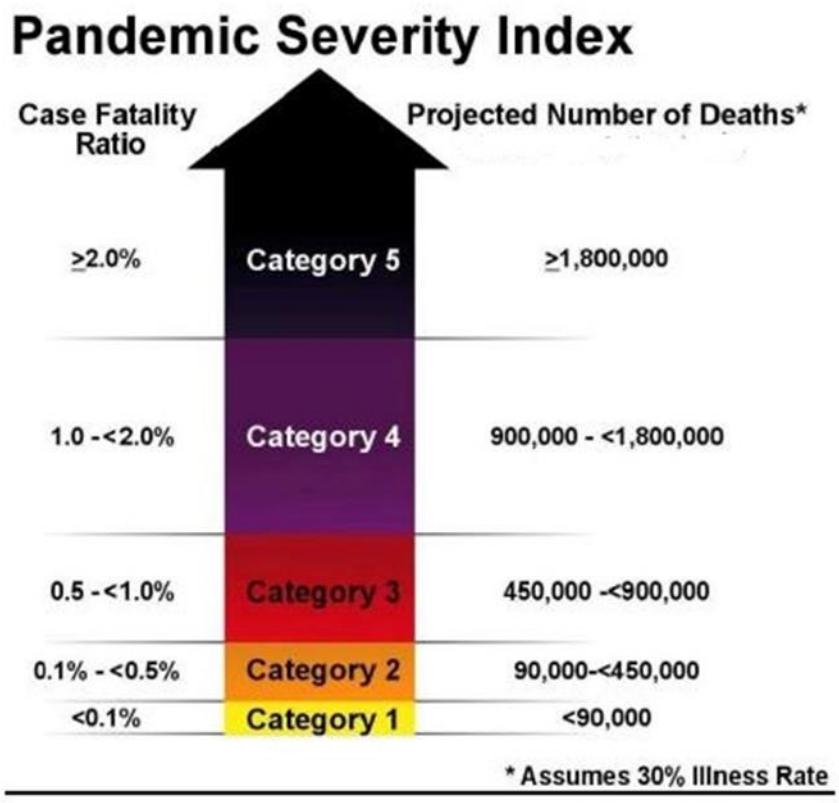
The WHO has it is own criteria for defining words related to pandemics. WHO defines risk as some measure of the probability of an event (disease-causing agent) and its consequence to animals, humans, or society. The word threat is the basis, origin, or agent of an unwanted impact by disease to a system. Lastly, vulnerability is any condition or weakness that makes an animal or human susceptible to a threat. Then to assess risk, we have four more terms. There four basic terms for assessing risk are 1) inventory, 2) hazard, 3) vulnerability and 4) loss (Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020). Inventory considers the inventory of properties, humans, physical environment, and society's critical infrastructures at risk. In the term hazard, we will consider the geographic origin of pandemics, the pathway to spread, and the spread rate of the disease. The words hazard and inventory allow consideration of the population's vulnerability to being affected combining these two terms. This then leads to the

build and natural resources affected, leading to and allowing for an estimation of loss (Crossley et al., 2012; Gilbert, 2014; Lofgren & Rapazzo, 2017; WHO, 2020). These words play into how a disease is classified in its phase and whether or not it is in a post-peak or post-pandemic period.

The Center for Disease Control (CDC) rates pandemics by the severity of deaths caused by a pathogenic agent, which scales pandemics as a Category 1 to Category 5. The CDC says that HIV/AIDS is a pandemic and the WHO does not. The WHO does acknowledge it as a pandemic in the following article *Vatican: condoms don't stop Aids* by The Guardian in October 2003 when the WHO condemned the Vatican's views about HIV/AIDS by saying: These incorrect statements about condoms and HIV are dangerous when we are facing a global pandemic which has already killed more than 20 million people, and currently affects at least 42 million.

Figure 4

Pandemic Categories (CDC, 2020)



Since the 19th century, there has only been a small list of pandemics, according to WHO (2020). The list can be seen below in WHO's list of Pandemics (WHO, 2020). This list is not the only pandemics but is a list of all pandemics by WHO in the last 120 years (Table 5).

Table 5

List of Pandemics (WHO, 2020)

Pandemic	Dates
Sixth Cholera Pandemic	1899-1923
Spanish Flu	1918-1920
Seventh Cholera Pandemic	1961-1975
HIV/AIDS Pandemic	1960-Present
Swine Flu	2009-2010
Coronavirus Covid-19	2019- 2020

Center for Disease Control (CDC)

The Center for Disease Control is the United States government agency founded in 1946 to protect United States citizens' public health and safety through controlling and preventing disease, injury, and disability (CDC, 2020; Fitzgerald et al., 2017; Hsieh et al., 2013). The CDC's main focus is to educate, train, inform and monitor infectious disease, food borne pathogens, environmental health, occupational safety and health, health promotion, injury prevention and educational activities. It is a United States federal agency with headquarters in Atlanta, Georgia, controlled by the Department of Health and Human Services.

The CDC has a specialized group of employees who work as part of the Epidemic Intelligence Service (EIS). It is a specialized hands-on group of employees investigating public health problems domestically and globally (CDC, 2020; Fitzgerald et al., 2017; Hsieh et al., 2013). The EIS, when deployed, do short-term epidemiological assistance assignments to provide technical epidemiology expertise in containing and investigating disease outbreaks. The

CDC has information on over 400 diseases and has investigated all recent epidemics and pandemics. The CDC is partners with WHO and 196 countries to help monitor, educate, prevent, and control infectious diseases through the use of the Global Disease Detection Program (GDD) (CDC, 2020; Fitzgerald et al., 2017; Hsieh et al., 2013). Information for and about the CDC and its efforts are readily available through its many reports, including State of CDC Report, CDC Programs in Brief, Morbidity and Mortality Weekly Report, Emerging Infectious Diseases, the Preventing Chronic Disease, and the Vital Statistics Report (CDC, 2020; Fitzgerald et al., 2017; Hsieh et al., 2013).

Healthcare Sector

The healthcare sector of the NYSE is normally the largest sector of the NYSE (NYSE, 2020) until the year 2018 when the economy and stock market had a record-breaking two years, which saw the development of its first trillion-dollar technology companies starting in 2019 what is referred to as FAANG plus Microsoft (NYSE, 2020). This can be seen in Figure 1

Exchange Values Graph. Because of these changes and the management of the funds of these companies, the healthcare sector in January 2020 was the third largest sector of the market at that time (NYSE, 2020). The healthcare sector of the NYSE comprises 196 companies as of January 2020 (NYSE, 2020) and includes the pharmaceutical companies used. The NYSE healthcare sector also includes companies from managed healthcare, biotech, pharmaceutical companies, and medical supplies.

A great deal of thought and planning has focused on the problem of medical care and laboratory support during a pandemic (Hanfling, 2016; Hick et al., 2007, 2020; Meltzer & McNeill, 2010). This sector would be critically impaired in the event of a severe pandemic, with the obvious demand for care. However, this surge in demand would require supplies and help

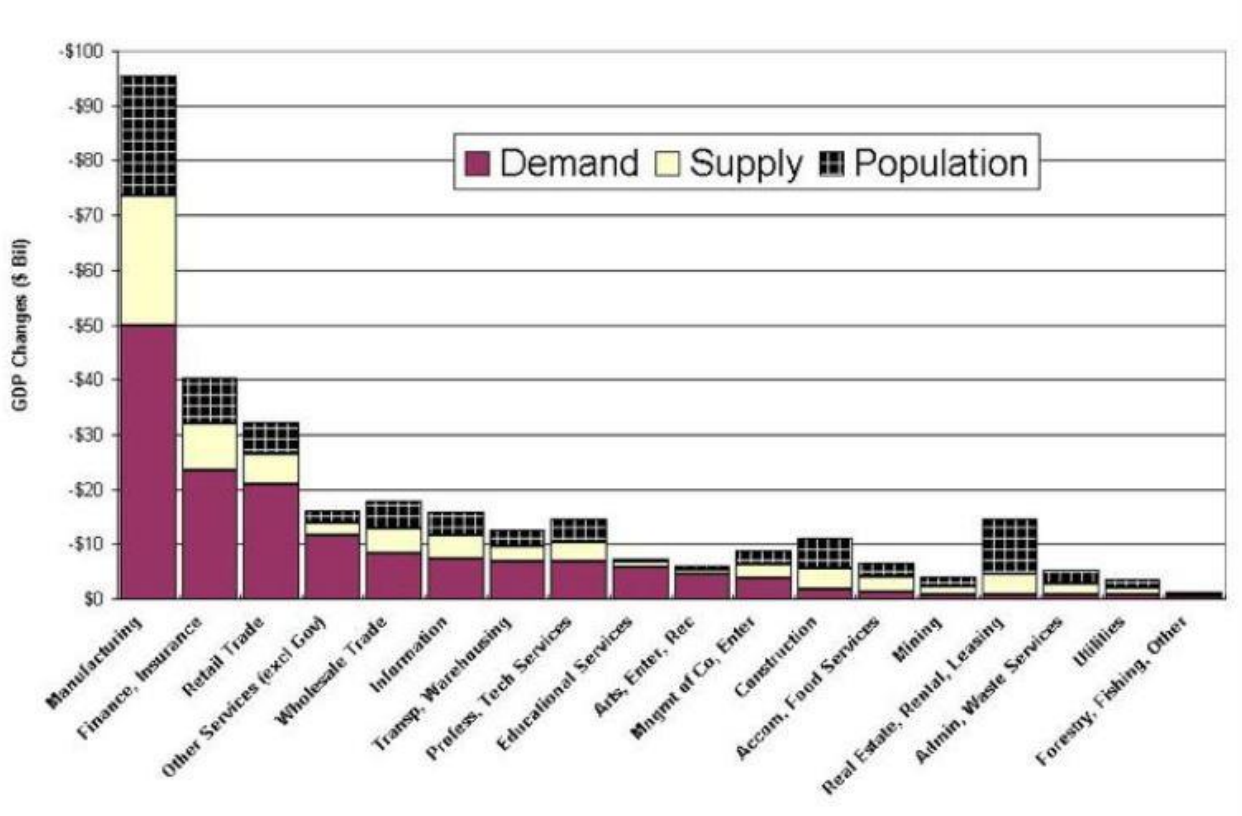
affected by the pandemic. Even if supplies and finances are there to carry out healthcare, the effects of absenteeism and uncertainty of long-term effects would probably cripple the healthcare sector (Hanfling, 2016; Hick et al., 2007, 2020; Meltzer & McNeill, 2010).

The financial impact on the healthcare sector would primarily be caused by the impact of the insurance industry, which is in the financial sector of the NYSE (NYSE, 2020). This is because of two reasons. The first is the general downturn in the economy and, secondly, more specifically, a result of increased insurance claims. These claims would hit the health insurance, life insurance, and pension insurance sectors especially hard, while the nonlife insurance sectors would not be severely impacted. Also, the market sector that writes insurance policies would be hit because insurance companies know they cannot make money, so they would not sell policies (Weisbart, 2006).

This data about the effects of a pandemic can be supported by the Department of Homeland Security, which did a study in 2007. They estimated the effects of a pandemic on the financial markets of the NYSE by sector. They found that manufacturing would suffer the largest hit losing $95 billion in output, finance and insurance would lose $40 billion, other services, including healthcare, would be $18 billion, and retail trade would lose $32 billion. This can be seen in **Error! Not a valid bookmark self-reference.** below.

Figure 5

Average GDP losses Department of Homeland Security October 15, 2007



Ironically, for all of this research, the pharmaceutical sector is the one area that a person, country, or government would look for to find a treatment, cure, or vaccine to the pandemic (CDC, 2020; FDA, 2020). The pharmaceutical sector in healthcare discovers, develops, produces, and markets drugs, medicines, and vaccines to the general population to either be self-administered or administered by a healthcare professional (NYSE, 2020) to treat or cure a medical problem. Any sick person would seek treatment by themselves or through another healthcare sector and potentially be given something (medicine, vaccine) to treat them. During a pandemic, the sick would seek treatment(s), and some pharmaceutical companies would have to

provide it in theory, meaning that when the rest of the world, businesses are potentially affected negatively by a pandemic. The pharmaceutical sector should show opposite positive results based simply on supply and demand. Sick people demand treatment, and pharmaceutical companies are the supplier of the treatment, not necessarily the administrator of the treatment (Palache et al., 2017). The administer of the treatment would be someone/ something (business) in the healthcare sector.

Spanish Flu 1918

In the last 120 years, the world has had six pandemics. The first pandemic in the twentieth century was the Flu Pandemic of 1918, called the Spanish Flu (Karlsson et al., 2014; WHO, 2020). This was preceded by the first pandemic listed by the WHO, called the Sixth Cholera Pandemic of 1899. The Spanish Flu got its name because the world was coming out of World War I, and the government regulated how newspapers could print about the flu epidemic. Spain was a neutral country during this time, and it appeared from reading the news that Spain was hit hard by the flu compared to other countries at the time and hence the name Spanish Flu that stuck to this first twentieth-century pandemic (CDC, 2020; Karlsson et al., 2014; WHO, 2020). The H1N1 influenza virus caused the Spanish Flu, the same virus type that caused the Swine Flu of 2009, just a different virus strain.

The Spanish Flu is mentioned because it is a pandemic but was disqualified as there were not enough pharmaceutical companies in existence then and now on the NYSE to make it a viable candidate for study. The Spanish Flu is also mentioned as a reference to the H1N1 virus that caused the Swine flu of 2009 (CDC, 2020; Karlsson et al., 2014; WHO, 2020), used in this study. Finally, this pandemic was disqualified as a viable study candidate since the WHO did not exist until April 7, 1948 (WHO, 2020); therefore, the WHO could not announce the pandemic.

Seventh Cholera Pandemic

The Seventh Cholera Pandemic is the second pandemic of the twentieth century from 1961-to 1975 (Ramamurthy et al., 2019; WHO, 2020). It is the seventh outbreak of cholera in the world, and this outbreak was caused by the El Tor strain (name of where it was first discovered in El Tor, Egypt) of the bacterium Vibrio cholerae (CDC, 2020; Ramamurthy et al., 2019; WHO, 2020) or cholera. Cholera is an intestinal disease that is preventable with clean water and basic sanitation. This pathogenic disease was primarily around 1961 to 1975 but still exists in third-world countries today. The seventh cholera pandemic is caused by a mutated form of cholera on the genetic level and is distinguished by the fact that it produces hemolysins (CDC, 2020; Ramamurthy et al., 2019; WHO, 2020). Basic general treatment is access to clean water. The Seventh Cholera Pandemic is mentioned as a pandemic because it is only the third of six pandemics in the last 120 years but is also disqualified because it has also never had an actual declaration as a pandemic by WHO; even though this was the first pandemic to exist after the creation of the World Health Organization. The Seventh Cholera Pandemic was also disqualified because a very small population of pharmaceutical stocks existed from the 1960s until 2020.

HIV/ AIDS Pandemic 1960 to Present

The fourth pandemic of the twentieth century is the HIV/AIDS pandemic. HIV was first identified in the Democratic Republic of the Congo in 1960. It has killed more than 36 million people (CDC, 2020; Silva & Cueto, 2018; WHO, 2020). HIV peaked in 2005 and 2012 with an annual global death rate of 2.2 million people (CDC, 2020) and currently holds at about 1.6 million people per year. Human immunodeficiency syndrome (HIV) is the disease that causes acquired immune deficiency syndrome, AIDS, and is typically a sexually transmitted disease (CDC, 2020; Silva & Cueto, 2018). There are other cases where HIV/AIDS is transferred via

blood, semen, vaginal fluids, and saliva from mother to child (CDC, 2020; Silva & Cueto, 2018; WHO, 2020). HIV is a retrovirus species of Lentivirus that cause the immune system to fail, and an infected person catches other infections and cancers which can kill you. HIV/AIDS does not usually kill its host; some other disease kills the host. Normal life expectance is up to 11 years (CDC, 2020; WHO, 2020). HIV infects vital cells in the human immune system with the help of a T cell called CD4T (CDC, 2020; Silva & Cueto, 2018). When the t cell numbers decrease below a certain point, the cell is compromised, and immunity is lost. Any opportunistic infections can then infect the host. These infections and the infected host now have AIDS (CDC, 2020; Silva & Cueto, 2018).

HIV/AIDS has been classified as a pandemic since the early 1980s (CDC, 2020). HIV/AIDS is a pandemic because of the number of deaths it has caused and its sporadic effects in certain geographic populations (CDC, 2020; Silva & Cueto, 2018, WHO, 2020). Africa currently has at least a 5% population with HIV/AIDS (CDC, 2020). However, advances in managing and treating HIV/AIDS with retroviruses are manageable, and those infected can live relatively normal lives. It may one day be treatable like the human papillomavirus (HPV), or a vaccine will be found for measles, mumps, and rubella (CDC, 2020).

HIV/AIDS is the longest-running and even current pandemic (CDC, 2020; Cohen et al., 2008). Because of HIV/AIDS, the actual term to classify HIV/AIDS should be an endemic, not a pandemic. An endemic is an infectious disease that stays in a population and maintains a consistent baseline with small increases and decreases (CDC, 2020) but never goes away. The HIV/AIDS Pandemic originated in 1960 as an epidemic and changed to a pandemic on December 1, 1988, by WHO, which declared Worlds Aids Day (WHO, 2020). As mentioned earlier, the pandemic of HIV/AIDS is different from most pandemics in the fact that it is a

pandemic by CDC standards; but not by WHO standards with the official declaration of a Public Health Emergency of International Concern (PHEIC) of a pandemic (CDC, 2020; Silva & Cueto, 2018). The term PHEIC did not start till 2003 (WHO, 2020). WHO acknowledges HIV/AIDS as a pandemic in its writings and statements! This can be seen in their statement when WHO condemned the Vatican's views about HIV/AIDS by saying: These incorrect statements about condoms and HIV are dangerous when we are facing a global pandemic which has already killed more than 20 million people and currently affects at least 42 million HIV/AIDS is mentioned as a pandemic because it is only the fourth of six pandemics in the last 102 years but is also disqualified. It has never had an actual declaration as a pandemic by the WHO because the PHEIC did not exist until 2003. HIV/AIDS is also disqualified because a very small population of pharmaceutical stocks existed from the 1980s until 2020.

Influenza

There are four types of influenza viruses Type A, Type B, Type C, and Type D. Type D is not known to infect humans (CDC, 2020). Influenza or the flu is a virus spread through the air from coughs or sneezes for relatively short distances. It can also be spread by touching surfaces contaminated by the host-virus and then touching the eyes, nose, or mouth. Influenza is different from the seasonal FLU (CDC, 2020). An infected person can be a host both before and when they show symptoms. Tests are usually performed to determine the type of flu a person has, but the tests often give false-negative results (CDC, 2020).

The flu can be stopped by washing hands and wearing surgical masks. The flu can be treated, and some vaccines change yearly that treat up to three or four different strains. The season flu virus mutates rapidly, and there is no current cure. The WHO and the CDC recommend the yearly vaccine, but the vaccine does not treat or prevent influenza. Influenza is a

Type A virus, and the yearly flu is usually a Type A or Type B. Most people who have it are asymptomatic (CDC, 2020). The seasonal variety of influenza spreads worldwide in yearly outbreaks, resulting in millions of illnesses and from 250,000 to 750,000 deaths per year. The flu is typically present in the winter months, depending on a person's location of the globe and anytime they are located near the equator (CDC, 2020). Deaths occur mostly in high-risk humans, with the most killed in the young and old age groups and hosts with other health issues (CDC, 2020). The symptoms of influenza can appear as soon as one or two days after exposure are seen with present with chills and body aches, fevers of up to 103-degree Fahrenheit or 39.4444 degrees Celsius. Most people with the flu are confined to bed for days with body aches and pains as other symptoms (CDC, 2020).

Swine Flu Pandemic 2009 to 2010

The 2009 Swine Flu H1N1 was an influenza pandemic that lasted from 2009 to 2010 and was the same type of influenza virus that caused the first pandemic of the Twenty-first Century called the Spanish Flu. This was a new strain of the H1N1 flu virus which mutated and combined with another form of influenza found in pigs. This is where the term swine flu originated (CDC, 2020). The Swine Flu was the first PHEIC ever declared by WHO. This version of the flu was a combination of Type A and Type C influenza (CDC, 2020; WHO, 2020). Unlike another version of the flu known as the Spanish Flu of 1918, the Swine flu had a very high infection rate; but a low mortality rate (CDC, 2020; WHO, 2020). The swine flu was officially declared on June 11, 2009, and was declared over by WHO in August 2010 (WHO, 2020). The swine flu affected 700 million to 104 billion humans and caused up to a little over 550,000 deaths (CDC, 2020; WHO, 2020).

Swine Flu Timeline

- March 2009 - Mexico In La Gloria, Veracruz H1N1 first appears
- March 28 - first care of H1N1 in the United States
- April 14 – CDC confirmed H1N1 in the United States
- April 24 – WHO issues an outbreak notice
- April 25 - The Schertz-Cibolo-Universal City Independent School District outside San Antonio, Texas, is closed
- April 28 – WHO has cases in four regions
- April 29 – WHO now has cases in nine regions
- May 1- 331 cases of the H1N1 in the United States
- May 2 -WHO has 15 countries and 615 cases of H1N1
- May 3 – WHO has 17 countries and 787 cases
- May 5 – WHO 21 countries and 1,124

The United States has second confirmed death

- May 12 – WHO has 30 countries have officially reported 5,251 cases
- May 15 – WHO has 34 countries have officially reported 7,520 cases
- May 17 – WHO has 37 countries have officially reported 8,480 cases
- May 20 – WHO has 40 countries have officially reported 10,243 cases
- May 25 – WHO has 46 countries have officially reported 12,515 cases
- May 29 – WHO has 53 countries have officially reported 15,510
- June 1 – WHO has 62 countries have officially reported 17,410
- June 5 – WHO has 69 countries have officially reported 21,940 cases
- June 6 – FLU week 22: H1NI reported in 8 states of the United States

- June 11, 2009 – WHO declares a pandemic (WHO, 2020)
- June 12 - WHO has 74 countries with 29,669 cases
- June 24 – FLU week 24: H1N1 reported in 12 states of the United States
- July 18 - FLU week 28: H1N1 reported in 13 states of the United States
- July 23 – WHO stops tracking individual H1N1 cases

Other Events in the Swine Flu Timeline 2009

Time is not a thing that is only affected by one event. For reference purposes, other notable events that happened in the event window must be mentioned for the world that could affect the NYSE of the United States. These are not the only events, but some notable events may affect the NYSE stock prices. Those coexisting events are:

- May 17, 2009 - the video game Minecraft is released to the public
- May 20 – Mexico officially says it is in recession
- May 25 – North Korea conducts its second nuclear test and launches missiles
- June 1 – General Motors files for bankruptcy
- June 11 – Bulgaria officially says it is in recession
- June 12 – All United States televisions switched from analog to digital signals
- June 29 – Bernie Madoff is sentenced to 150 years in prison
- July 15 – Harry Potter and the Half-Blood Prince is released worldwide
- July 23, 2009 – The Bank of Canada announced the recession's end.

Coronavirus Covid-19

A coronavirus is a group of viruses that cause diseases in mammals and birds. It is typically an upper respiratory disease that is mild or potentially lethal in humans. Other symptoms are gastro-intestinal problems (WHO, 2020). There are no known vaccines or antiviral

drugs approved for the prevention or treatment of a coronavirus as of May 2020. Coronaviruses were first discovered in the 1960s, with the earliest form of the virus discovered in chickens. Later two coronaviruses were discovered in the nasal cavities of human patients who had a common cold. This human coronavirus was called 229E and human coronavirus OC43 (WHO, 2020). The most famous case of coronavirus is the SAR(s) outbreak in 2003 called SARS-CoV (WHO, 2020). A new form of coronavirus was found and reported to the WHO in December 2019 in Wuhan, China. On January 9, 2020, the coronavirus was named 2019-nCoV or (Covid-19) by WHO (2020). At the time of this event study, there is speculation of the original starting spot of the Covid-19 pandemic. All early news reports place their origins in China and WHO reporting data indicates China was the origin's spot in March 2020 (WHO, 2020). Since that date, this has been a highly contested issue, with the virus's origins being earlier than December and in different countries.

Coronavirus Pandemic 2020 Timeline

- Dec 8, 2019 – 28 people went to the hospital with an unknown pneumonia infection
- Dec 31, 2019 – WHO is alerted to the Chinese outbreak
- Jan 1, 2020 – videos start showing on Weibo about sick people in China.
- Jan 9 – WHO names the coronavirus 2019-nCoV
- Jan 11 - first death caused by the coronavirus
- Jan 14 – first case of coronavirus reported outside of China
- Jan 16 – first case reported in Japan
- Jan 17 – second death reported in China by a coronavirus. Airports start screening flyers rdered by the Center for Disease Control (CDC).

- Jan 20 – three deaths, and now the coronavirus is in three countries (South Korea, United States, and Japan).
- Jan 21 – first report of coronavirus in the United States by WHO. Death total 17.
- Jan 22 – China goes on lockdown (Includes Disney and McDonalds)
- Jan 23 – Twenty-Five (25) deceased worldwide
- Jan 24 – second case of coronavirus reported in the United States. The Senate health committee has a closed-door meeting. Four members of Congress sell millions in stock (USA Today, March 2020)
- Jan 25 – 41 reported dead
- Jan 26 - third confirmed case in the United States. Fifty-Six (56) are now deceased.
- Jan 30 – WHO declares a Corvid-19 a pandemic
- Feb 29 – United States has 2 confirmed deaths.
- March 9 – United States has 26 confirmed deaths. Italy has 463 confirmed deaths.
- March 11 – Coronavirus is officially declared a pandemic by WHO.
- March 20 – NYSE closes floor. All electronic trading starting on 3/23/20

The United States has 273 confirmed deaths

- March 21 – United States has 346 confirmed deaths
- March 22 - United States has 468 confirmed deaths.
- March 23- United States has 554 confirmed deaths
- March 24 -United States has 783 confirmed deaths. Italy has 6820 confirmed deaths.

Other Events of the Event Window

There were also coexisting events.

- January 8, 2020 – Duke and Duchess of Sussex step down as senior royals

- Jan 15 – Phase 1 of United States the China Trade war signed
- Jan 15 – Articles of impeachment were formally delivered to Senate for President Donald Trump
- Jan 20 – Martin Luther King Holiday
- Jan 21 – Formal impeachment of President Donald Trump began
- Jan 28 – Middle East Peace plan released by President Donald Trump
- Feb 5 - Donald Trump was acquitted by a 51- 49 vote in Congress
- Feb 18 – Boy Scouts of America files for bankruptcy
- Feb 27 – Dow Jones suffers biggest point fall in history
- March 16 - Congress proposes a Coronavirus bailout bill
- March 27 – Congress passes a two (2) trillion-dollar Coronavirus bailout bill.

Single Asset Pricing Model

The Single Asset Pricing Model or Single-Index Model or (SIM) is simply a correlation equation between 2 variables, which are (Ri - Rf) and (Rm - Rf). The preceding must always be true. Also, the SIM tells you a lot less than CAPM; specifically, it does not say anything about the magnitude of the expected ROI, which of course, is the purpose of financial research by finance professionals (Santos, 2017; Yip, 2005). The Sim can be expressed as:

$$R_{ei} = \alpha_i + \beta_i * (R_m) + e_i$$

Where:

R_{ei} – the return of stock i.

Alpha (α) – the constant of stock i or abnormal return

Beta (β) – measure indicating the correlation between the stock i and the index

R_m – the return of the market

$E(e_i)$ – the residual return with a zero mean or 0.

The above must be true for any two random variables in the equation. The equation says that the ROI to a random variable is the correlation (β_i) with another variable multiplied by the ROI to the other variable plus a trend (α_i) plus an unbiased error. If the error was not unbiased, simply remove the bias and add it to α_i. Factoring in all other finance theories (Markovitz's diversification, Von Neumann and Morgenstern expected utilities) leads one to CAPM, which says alpha of -i = 0. For SIM to be true, the variant covariance must be diagonal (Yip, 2005). The problem with SIM is that a stock in relation to the market directly correlates. As the market goes up, typically, a stock goes up. If the stock market goes down, a stock price typically goes down. In most cases, this holds for the market except in situations where incidents happen to a single stock, such as bad press or accidents (Santos, 2017).

History of Capital Asset Pricing Model (CAPM)

Ever since introducing the stock market in the United States in 1792, investors have tried to develop theories about explaining or predicting the historical and future equity returns. The biggest part of this endeavor is to produce an equity pricing model that best reflects the simple cost of equity of an asset (Ward & Muller, 2012). To calculate the price of an asset such as a stock or bond that trades in an equity market is one of the most important areas of finance. This valuation of assets affects all economic life of both the individual and the business world. According to economic theory, the value of an asset depends on four factors. These factors are a) the cash flow or expected future cash flow, b) the timing of the cash flow, c) the required ROI or

expected ROI from that asset now or in the future, and d) the discount used to help purchase the equity (Cochrane, 2001).

Asset classes are the grouping of investments with similar characteristics and are subject to various governmental agencies' same laws and regulations. Assets classes are generally divided into three main classes: equities (stocks), fixed income (bonds), and cash equivalent/ money market. Other items include real estate, commodities, futures, derivatives, and cryptocurrencies. Investment assets are both tangible and intangible, which people/ businesses/ investors buy and sell to generate additional income on either a short or a long-term basis (Cochrane, 2001).

Because assets can be similar in one aspect, they can be different. This difference usually has to do with cash flow and the risk associated with the equity. At the same time, there is an expected ROI for buying and selling this asset over a certain time. The CAPM is the main focus and is the most referenced theory that individuals use and investors to explain balancing.

Ethics

A distinction must be made between ethics, morals, or morality. Even the most uncivilized and uncultured person has their morality or sum of prescriptions that govern its moral conduct. Nature has provided that each man establishes a code of moral concepts and principles that apply to the details of practical life, without the necessity of the conclusions of science. Ethics is the scientific or philosophical treatment of morality. The subject matter of ethics is man's deliberate, free actions, for these alone are in our power (Ayer, 1946). The study of ethics is called axiology.

When businesses speak about ethics, they usually mean one of three things: 1) avoid breaking the criminal law in one's work-related activity; 2) avoid action that may result in civil

lawsuits against the company; and 3) avoid actions that are bad for the company image. Businesses are especially concerned with these three things since they involve losing money and company reputation. In theory, a business could address these three concerns by assigning corporate attorneys and public relations experts to escort employees on their daily activities (Hare, 1952, 1981; Trevino, 1986, 1990, 1992; Trevino & Brown, 2004; Trevino et al., 1998, 2006).

The sources of ethics are partly man's own experience and partly the principles and trust proposed by other philosophical disciplines (logic and metaphysics). Ethics takes its origin from the fact that certain general principles and concepts of the moral order are common to all people at all times (Moore, 1903). This fact has indeed been frequently disputed, but recent ethnological research has placed it beyond the possibility of doubt. All nations distinguish between what is good and bad, between good men and bad men, between virtue and vice; they have all agreed that the good is worth striving for, and that evil must be shunned, that the one deserves praise, the other, blame. Though they may not be the same thing in individual cases, good or evil, they agree to the general principle that good is to be done and evil avoided (Kant, 1971, 1985, 1985).

Financial business is immediately concerned with man's social activity since the treatment of production, distribution, and consumption of material commodities. However, this activity is not independent of ethics; industrial life must develop following the moral law and be dominated by justice equity love. Businesses are wholly wrong in trying to emancipate themselves from the ethics requirements. (MacIntyre, 1984; Noddings, 1990, 2002; Plato's Republic (as cited in Cooper, 1997).

An example was shown in business financial ethics when the Ford Motor Company in 1970 valued human life compared to the sale of cars and death or several injuries caused by such

cars. The company said it was too expensive to put $11 parts on a gas tank to make it safe. These cars caught fire and killed or injured many people. Ford did a financial comparison to compare the value of the money made and the value of payout from lawsuits. A human life was valued at $200,000. There is a clash between two opposing cultural perspectives: A corporate financial culture mindset that prioritizes profit as the highest value and an ethical perspective seen as a social norm to value human life above financial gain. It is reasonable to assume that the average person would find it unethical to take the life of another human being for financial gain. Legally, it is a punishable offense to take the life of another human being, but because of advertising and profits, white-collar crime is viewed in a different light than when an individual commits homicide. A corporation's legal obligation to prioritize the financial interests of its shareholders primarily has created very opposing cultural values in our society (Bennett, 1990).

We value human life as a social agreement that we each value our own life and therefore have a duty to respect the lives of others to preserve the right to our own. On the other hand, we have designed an economic system that incentivizes social progress with personal gain and competition, differentiating our work values. In order to sustain the corporations that provide us with stuff, we embrace the corporate value of maximizing profit and disregard personal values that contradict many decisions made in the name of profit. Kant's categorical imperative says we act only in our best interest. Based on our rights and expectations of society, we have a duty to maintain a sense of social responsibility in our personal lives as well as our work lives; even to the extent of resisting when an unethical decision is being executed, that endangers the lives of others (Kant, 1971).

Ethics is defined as the discipline dealing with good, bad, moral duty and obligation (thefreedictionary.com, nd). It can be a theory or system of moral principles or values. It is the

principles of conduct governing an individual or a group. It can also be a guiding philosophy. By definition, there is no clear explanation of what is and what is not ethical. We receive guidance first from our families, society, individual religious beliefs, and codes of conduct at organizations where we are employed. Though laws have been made to govern what is explicitly wrong, each person must choose for themselves what path to follow and how close to the edge they will remain. While what is right or wrong is not always clear, we must always remember that we are responsible for our actions and the outcome of those actions in many instances.

Traditional approaches to morality have sought to find grounds for moral claims about right and wrong. This search is because the demands of morality are sought to exist beyond man's everyday interests and selfish considerations. This relationship has been conceived in several different ways, but perhaps the most relevant is the continuing debate over moral agency within organizations, closely examining the debate on psychological and sociological perspectives (McDonald & Victor, 1988). Today's most generally accepted concept seems to be that the individual within the organization is the moral agent, but that the firm exerts significant influence on the ethical behavior within its boundaries (Sims, 1992). The issue of business morality is, and cannot avoid being, both a personal and an institutional matter for every corporate executive and for every employee who does not mean to surrender his integrity, his honor, his very soul to an organization (Silk & Vogel, 1976, p. 231).

Personal Ethics

The real goal of life is to work in God's kingdom and be right before Him. God created man for a purpose. Life is meaningless unless we fulfill that purpose (Matthew 6:19-24). Personal ethics could be defined as what a person thinks is right. However, this would vary from person to person based on factors such as culture, beliefs, personal experience(s), law(s), and

religion(s), to name a few. An example of one's ethics could be being honest, telling the truth, what to spend time on or how much time to spend on a topic, what to eat, or how much to eat. These actions become habits. The habits become character, and character becomes values and morals (Bindman, 2015; Brennan, 1971; Brennan & Magness, 2018; Luce, 2019; Shulman, 2019; Trevino, 1999).

People will sacrifice their values and morals for work or the sake of not being rude or doing their job. Imagine for a moment that you work for the government and have been sworn to secrecy for a military topic. These people do not tell what they know or all that they know because it is part of their job, yet they say they are honest. How about your coworkers who say what a great presentation or idea is so that a meeting will end, and you do not get fired for saying what you think? These two examples point out where a person's ethics and business ethics can collide and not be harmonious. The same could be the opposite if a person has no personal ethics. If a person thinks it is ok to lie, cheat, and steal in their life, then working at a company will have no problem doing the same at a job. Some examples of ethical lapses might be the Bernie Madoff Ponzi Scheme, Enron, or Martha Steward (Bindman, 2015; Brennan, 1971; Brennan & Magness, 2018; Luce, 2019; Shulman, 2019).

Problems with Ethics

Forcing ethical behavior on professionals, called applied ethics, has seen difficulties. Bayles (1987) stated that applied ethics has not lived up to its original promise for many observers as it has emerged in the last decade. Some outsiders, for example, have questioned the need for ethics, while others have questioned if having a code of ethics will do any good. A major criticism from applied fields is that much of applied ethics has been too abstract, rigid, and divorced from the concrete problems practitioners face in fields considered by applied ethics. A

strong case can be made if ethical reasoning is to influence others; ethics must be communicated to them in a form workers can understand (Bayles, 1987).

In general terms, identification of the problem is the first step in the problem-solving process, without which no further reflection or action can take place. As a determinant of moral behavior, Rest (1986, 1988), Rest and Rest et al. (1999) stated that moral cognition must occur before moral judgment can begin. A consequence of this idea is that moral action can occur without prior moral awareness of a situation (i.e., one can do something that affects others in a morally significant way without being aware beforehand of the moral implications of the action). However, doing so precludes any possibility of moral deliberation about the action. This type of scenario is precisely what most businesspeople attempt to avoid, acting without knowing the ramifications of the action. In short, perception is the setting for action (Blum, 1991). Blasi (1980) noted that almost any action could be relevant to morality if perceived as relevant by a person, whereas no action is appropriate if a person does not see it as morally important to them.

The inherent complexity of business situations makes recognizing a moral component difficult, and business decisions involving a moral component are arguably even more complex than the average (Jones & Ryan, 1997). Perhaps unethical choices in organizations are often made not because of human evil or un-ethicality but because ethical decision-making is cognitively complex and strongly affected by organization design. The inherent complexity of business situations makes recognizing a moral component difficult. Business decisions involving a moral component are arguably even more complex than the average (Jones & Ryan, 1997).

Ethics in finance relates to the concept of financial allocation of resources. Finance is intertwined with ethics because the resources of any business unit are finite. This allocation of resources is both on the macro and micro levels. The microfinance level is the individual investor

equity, and the macro-level finance is the actual CAPM of equity. This is a manifestation of ethical theory and justice, whereas efficiency, competition, and profit-making are ethical. This is what businesses do. They ration the scarce resources between all that is involved. Ethics become problematic and unethical when people are not responsible for the money. Leading others is unethical by seeing a problem and doing nothing about it (Rogers, 2003). In actuality, this is morals because morals in the actions of an induvial in an ethical situation (Rest, 1986, 1988)

Law

The philosophy of law called jurisprudence implies there is a question as to what law is and has been argued by Aristotle (1958, 1984) and Kant (1971, 1985, 1996) that there must be a reason and moral action to require such things. At the same time, there is no common meaning of law except that it reflects the use of the word law in such context of its usage. This is because the law is broken down into many categories to include but not limited to common, civil, religious, binding, criminal, legal, Sharia (Ahmad, 2009), religious, and canon. Law can be the art and science of justice (Lord Lloyd of Hampstead, 1972). The principles of law are for the betterment of society because humankind cannot always do this on their own in a moral fashion (Younger, 2017).

Law pertains to people's health and pandemics because it protects all people affected by a pandemic. Law gives the government the right to enforce quarantines during an emergency (CDC, 2020) and other general issues such as smoke-free air quality laws the ability to issue temporary detention orders for those with psychological issues. Most people are not aware of how the law affects people's health. In the United States, the Public Health Authority is the managing authority for the CDC and the Occupational Safety and Health Department of the United States government and gets their authority from the 45 CFR 164.512 (CDC, 2020).

These laws give those acting in the legal capacity to report, control, prevent, and educate about diseases, injuries and things that cause disabilities. For patients' laws are in place to protect those affected by diseases and injuries with the Health Insurance Portability and Accountability Act (HIPAA) of 1996 (CDC, 2020). This law can be overridden by 45 CFR 165.512 (b) (1) (IV) when a health care professional deems a person exposed to a communicable disease and has or can spread the disease to others. When this occurs, the individual affected must be notified that his or her information has been shared. This information sharing is not limited from doctor to local government agency, but from a doctor, all the way up to foreign governmental agencies is deemed appropriate. This is what happens when a potential pathogen is identified. The CDC has a list of known pathogenic diseases that must be reported in writing and found on their website (CDC, 2020). The CDC is the government agency that reports potential pathogens to the World Health Organization and foreign governments. Knowing when to report to others becomes an ethical and moral issue for a doctor or clinical practitioner. Because making a clinical decision for a patient also involves making an ethical decision, whether consciously or not. This is why the American Medical Association has its codes of ethics (CDC, 2020).

Morality

Morality is a system of beliefs, values, and underlying judgments about the rightness or wrongness of acts (Zimbardo, 1995). Moral sensitivity is the awareness of how our actions affect other people. It involves being aware of different possible lines of action and how each line of action could affect other parties. It involves imaginatively constructing possible scenarios and guessing cause and effect consequences in the real world (Rest et al., 1999).

Butterfield et al. (1996, 1997, 2000) and Trevino and Weaver (1996) believe that morality occurs when a person realizes that their response to a given issue could affect the

interests, welfare, or expectations of others in a manner that may conflict with one or more ethical standards or norms. Rest et al. (1999) stated that morality is aware of how our actions affect others. One significant difference between the definition and others is the notion of degree. Butterfield et al. (1996, 1997, 2000) noted that one sees' morality as an either/or state. The moral person is either aware of the moral components of a situation or is not aware (Blum, 1991). Morality is more complex than other definitions imply (Trevino & Youngblood, 1990).

Jones and Ryan (1997) pointed out that the moral person must first recognize the moral issue. A person who does not recognize the moral aspects of an issue will certainly rely on 'non-moral' criteria in deciding. Ramifications for businesses acting without moral awareness can be disastrous (Butterfield et al., 1997). Rogers (2003) stated that moral awareness is a moral obligation to fix an issue before it becomes an ethical decision.

Justice, Fairness, and Mercy

Justice and fairness are two words that are used as synonyms and are part of the definition of the other. However, they are not the same and have complex meanings for those that use them. Kant (1996) made an argument that every living person has a conscience and finds himself watched, scared, and inspired by an internal authority that watches over and guides a person; like a law, but something designed into a person, that they did not make (Kant, 1985, 1996). Rawl defined autonomy or self-ownership as the right of an individual to govern and reap the benefits of their actions, choose their life plans, and pursue their particular definitions of happiness without the interference of others (Younger, 2017). Rawl's view is similar to Kant's view in which free will and morality are the same things (Kant, 1985, 1996).

Kant's view indicates that a person can choose to be happy because they are free, which implies that a person can choose their moral definition of right and wrong by those actions; by

the sheer nature of choice because they are free. Justice is fairness, according to Rawl (Younger, 2017). Rawl had two basic ideas that came from this idea of justice is fairness. The first is that each person has a right to the basic concept of liberties as long as there is an acknowledgment of the liberties of others. Secondly, the first idea is that the gains of the best-off in society are related to the improvements and betterment of the worst-off in society. Which means that for a decision to be just, it must because the greatest benefit to the least advantaged in society, compared to the most advantaged? Otherwise, the most advantaged have put themselves above others, which is not just (Steiner, 1977; Younger, 2017).

Kant (1996) argued that for a person to act morally, rather than by accident, it must be a sense, independent of circumstance nature, and act with the objectivity of all rational laws. Hence, the practice of free wills and choice. Therefore, since we can choose, we are by definition free and can exert free will. Free means that we choose, but our choices are not independent unless we set ourselves above others. This interplay of free individuals lays the groundwork for community and that an individual is part of something bigger than oneself. This is similar to the ideas shared by Plato (as cited in Cooper, 1997) and Brown (2017). When an individual makes moral decisions; and does things that bring out the best in themselves. Then their actions are just and fair. Very similar to input versus output ratios related to work in what is referred to as distributive justice, equality, or equity theory (Adams, 1963).

Fair is defined by thefreedictionary.com (nd) as just and honest, one of twenty definitions of the word. However, being just and honest implies an ethical sense of right and wrong and disregarding one's interest. However, justice and fairness do not mean treating everyone the same, like criminals and victims. Fairness super imposes a belief that everyone is treated the same; unless someone does something that results in them being treated differently. The

difference in treatment that applies to one must be applied to all in the community resulting in fairness is the measure of justice (Gillis, 2018).

Justice means ensuring that people receive what they deserve according to thefreedictionary.com (nd) as described above; a criminal receives the appropriate punishment, for example. Mercy is also a countervailing principle that promotes being less harsh than one is entitled to (thefreedictionary.com, nd). Whereas fairness was the measure of justice, balancing the three is key for dealing with people morally from an ethical standpoint. A lack of justice is wrong, but a lack of mercy can be just as wrong. Christianity in the King James Version of the Bible mentions these three times. In Micah 6:8 (KJV), He has shown you, O man, what is good; and what does the LORD require of you but to do justly, to love mercy, and to walk humbly with your God?

In Zechariah 7:9 (KJV), Thus, says the Lord of hosts ‘Execute true justice, show mercy, and compassion everyone to his brother.’ Finally, Matthew 23:23 (KJV) states, Woe to you, scribes and Pharisees, hypocrites. For you pay tithe of mint, anise, and cumin and have neglected the weightier matters of the law: justice, mercy, and faith. These you ought to have done without leaving the others undone. Justice is a distribution of the burdens and benefits of society. These distributions should be based on needs, effort, and contributions for everyone to receive their fair and just share (Adams, 1963; Gillis, 2018).

Knowledge and Wisdom

Wisdom is defined as the accumulated philosophic or scientific learning-knowledge; the ability to discern inner qualities and relationships-insight, a good sense-judgment, the generally accepted belief challenges what has become accepted wisdom among many historians, a wise attitude, belief, or course of action, and lastly the teachings of the ancient wise men

(thefreedictionary.com, nd). Psychologists regard wisdom as distinct from the cognitive abilities measured by standardized intelligence tests. Wisdom is often considered a trait developed by experience but not taught. When applied to practical matters, the term wisdom is synonymous with prudence. Some see wisdom as a quality that even a child, otherwise immature, may possess independent of experience or complete knowledge. The status of wisdom or prudence as a virtue is recognized in cultural, philosophical, and religious sources. Some define wisdom in a utilitarian sense as foreseeing consequences and maximizing the long-term common good. (Carter, 2017; Grimm, 2015).

Knowledge is expertise and skills acquired by a person through experience or education, the theoretical or practical understanding of a subject, what is known in a particular field or is a total of facts and information, awareness, or familiarity gained by experience of a fact or situation (thefreedictionary.com, nd). Philosophical debates in general start with Plato's formulation of knowledge as justified true belief (Plato's Republic as cited in Cooper, 1997). Knowledge acquisition involves complex cognitive processes: perception, learning, communication, association, and reasoning. The term knowledge is also used to mean the confident understanding of a subject with the ability to use it for a specific purpose. (thefreedictionary.com, nd). Wisdom is the ability to understand and recognize the value. It is not knowledge. Knowledge recognizes cause and effect, which is independent of value. An example is realizing that a man will die if he has his head removed is knowledge. Deciding if the decapitation is an accident, a crime, or upholding justice is wisdom (Carter, 2017; Grimm, 2015).

Aristotle's Solution

One of the clearest and most useful ethical absolutism came from Aristotle. Aristotle realized that what people desire is what they regard as good. To say no more than this is that all

desires are good no matter how much they conflict. Consequently, there can be no standards (Aristotle, 1958). Aristotle solved this problem by delineating two types of desire: natural and acquired. Natural desires are those needs that are common to all human beings, such as food and shelter. Beyond these, people also desire health, knowledge, and a measure of prosperity. By being natural, these desires, or needs, are good for everyone. Since there can be no wrong basic needs, there can be no wrong desire for these needs (Aristotle, 1958).

However, there are other desires as well. These are not the needs of a person but the wants of a person. At the level of wants, the nature of good becomes clouded. Individuals may want something they desire as a good, but it may be bad for them. People with sound judgment should decide what is good, unlike an apparent good. This sound judgment comes with experience. Young children have little experience of what is good or bad for them, so they must be guided by parents and other adults. Mature adults, however, should be able to decide what is good for them (Aristotle, 1958). People must decide what is good for others as well as for themselves. They expect that goods for them apply equally to other people. Aristotle (1958) said it is necessary to have the three virtues of practical wisdom: temperance, courage, and justice to treat others in the same way one treats oneself.

Value

In the early twentieth century, Alfred North Whitehead did research on values. His ideas were in sharp contrast to the existing dualistic and materialistic worldviews. He proposed that some individuals are void of any value but affirmed that every individual is valuable in and for itself. For Whitehead, no matter how fleeting or trivial, every living thing is unique and subject to experience. Every individual is a unique achievement of value. So, value and existence are coexistence. If a value is limited exclusively to the subject, then there is no warrant for affirming

the value of others. However, since living, things know that others exist, and each has its intrinsic value; then there has to be respect for the value of others (Whitehead, 1920, 1925, 1927, 1929a, 1929b, 1933, 1938, 1948, 1951a, 1951b, 1978, 1996).

Value is no longer something one finds in the world; it places on the world. To exist; is prima fascia, to being internally related to others. In this relation and fulfillment of needs, each subject starts to place value on itself against the values of all other living and non-living subjects (Whitehead, 1920, 1925, 1927, 1929a, 1929b, 1933, 1938, 1948, 1951a, 1951b, 1978, 1996). Things gain value based on work; based on the un-pleasantness, difficulty, stability, and responsibility generated by the work.

Value is the word Whitehead (1925) uses for the intrinsic reality of an event. Value is an element that permeates through and thinks for a poetic view of nature. We have only to transfer to the very textures of realization in itself that value which we recognize so readily in terms of human life (Whitehead, 1925). Are not five sparrows sold for two farthings, and not one of them is forgotten before God? Nevertheless, even the very hairs of your head are all numbered. Fear not, therefore: ye are of more value than many sparrows. Also, I say unto you, whosoever shall confess me before men. He shall the Son of man also confess before the angels of God. (Luke 12: 6-8. KJV).

Value is where every subject has to decide whether its intrinsic value is worth more than the intrinsic value of the other subject whose value that one subject takes from another in fulfillment of its own needs. This interaction is the basis for humans to lay the groundwork of ethics and morality where the extrinsic value would be something that brings one joy or happiness like a family (Whitehead, 1920, 1925, 1927, 1929a, 1929b, 1933, 1938, 1948, 1951a, 1951b, 1978, 1996).

Efficiency

Fama (1970) developed what is known as the efficient market hypothesis (EMH). To understand this, one has actually to understand efficiency at its core. Efficiency is defined as a way to avoid waste, energy, money, and time by doing something (thefreedictionary.com, nd). In Fama et al.'s (1969) EMH, he explained an ideology of testable efficiency based on an equilibrium model. His idea is that the market takes in all information, and the price reflects that information. This is equilibrium. Equilibrium is when two opposing forces are balanced, supply and demand are matched, and a stable price (thefreedictionary.com. nd). If the price is not stable and balanced, an abnormal return would be generated.

Efficiency is comprised of two different models. These models are technical efficiency and fundamental efficiency. Both of these models look at a relationship between information and price. Fama (1970) uses technical efficiency to say that information is instantly reflected in the price. Therefore, an investor cannot use the information to predict stock prices. The idea of fundamental efficiency lies in the idea that the price of an equity is in its intrinsic value (what an investor thinks) equity is worth (Thaler & Shiller, 2015). In both examples, a study is conducted to study the relationship between the price of equity and information. In technical efficiency, a researcher looks at information as the study's starting point and sees a relationship between the information and the equity price. In the fundamental efficiency relationship, the price is the starting point, and we look to see if the information explains how the equity price reacts (Thaler & Shiller, 2015).

This event study is a fundamental efficiency analysis since we know stock prices and want to see if we have explained the equity price. This leads to a technical efficiency question for

an investor: Can I profit from information? The opposite question can be proposed for fundamental efficiency: Do equity prices deviate from the intrinsic value?

We have to ask ourselves: Where do we stand concerning the company with these two questions? Are we an investor in a company, or are we a part of the company? Fama et al.'s (1969) EMH is based on technical efficiency for investors to make money from an investment. Whereas the company is concerned with fundamental efficiency and does the purchasers of an equity value it worth more or less than what the company owners say it is worth. This leads us to other efficiency studies: weak-form, semi-strong, and strong-form efficiency (Baker & Bloom, 2013; Peón et al., 2019). Weak-form efficiency asserts that prices of the equity instantly reflect all information. Future equity price movements cannot be predicted using past prices. Semi-strong efficiency asserts that equity prices fully reflect all publicly available information. Only investors with additional non-public (inside) information could have an advantage in purchasing equity (Baker & Bloom, 2013; Peón et al., 2019). The downside is that the equity price will adjust accordingly when this information is made public, bringing a strong-form efficiency. Finally, the strong-form efficiency asserts that equity prices fully reflect all public and private information available. This model of efficiency implies that no one can have an advantage in the market and that there is no data that would provide any additional value to the investors and generate an abnormal return (Baker & Bloom, 2013; Peón et al., 2019).

According to Thaler and Shiller (2015), the idea of technical efficiency implies that an investor should not try to guess what the market will or will not do. However, the best thing an investor can do is build a portfolio (Markowitz, 1952) that represents their goal and attempt to replicate the market overall as best as possible. At the same time, Thaler and Shiller (2015) have a different opinion on fundamental efficiency. This implies that any intervention by the public

(an event study) or laws and regulations by the government to weigh, measure or predict the price of an equity is harmful to the market. The idea of the price generated by the market is the best price for the equity. Thaler and Shiller (2015) also discussed critiques of efficiency. If critics say fundamental efficiency does not hold, then advocates of technical efficiency did hold. Or vice versa. However, according to Thaler and Shiller (2015), the only logical explanation is that for these advocates, technical efficiency implies fundamental efficiency or vice versa (Thaler & Shiller, 2015).

Assets Under Management

Assets Under Management (AUM) is a legal term from the Securities and Exchange Commission (SEC) (SEC, 2020). Any time a company has 30 million in AUM, it must register with the SEC. An equity management company takes in equities (cash, deposits, stocks, bonds, mutual funds) and makes decisions for investors for their various equities. These management companies usually charge a fee and trade equities for their benefactors in a hopeful way to make more money than the investor can make on their own (SEC, 2020). According to Fama (2013), 80% percent of all mutual funds are in wealth management accounts. World Bank (2020) estimates that over 15 to 19 trillion dollars in United States assets are managed worldwide from 2013 to 2018. Equities are managed, and management implications can forecast that future stock returns. In contrast, Fama's whole idea of efficiency says the market and equity prices cannot be forecasted or controlled (Fama, 1970).

AUM matters are two-fold. One uses the information or financial dissertation to predict equity movement. Secondly, the AUM implies using ethics and finance models/ theories to apply efficiency to the market. Most equity managers follow Markowitz's (1952) idea of a diversified portfolio and lower the risk of loss for the investors. At the same time, the idea of managing

equity says the market is controllable and contradicts the EMH (Fama, 2013). The average investor, whether small or large (Alrgaibat, 2015; Brigham & Houston, 2009; Fama & MacBeth, 1973; Frase & Ormiston, 2004; Freihat, 2019; Mossin, 1966; Ragsdale, 2015; Ramadan, 2014; Sharifzadeh, 2006; Wenjing, 2017) are always looking for a better ROR on investments. Managed accounts have the mass appeal of the more a company has (Assets Under Management), the more they can generate a better return. Otherwise, there would be no need for someone else to let people manage their money, hold their equities, and buy and sell their stocks for them.

This is where ethics/ morality comes into this event study. If, as Poser (2003) said that the market moves in waves and investors respond to other investors, a large managed account would swing equity prices or the market as a whole. Therefore, a managed asset fund, if mismanaged, could create it is own anomaly in the market that could be exploited just like so many other researchers have shown with other anomalies (Baker, & Bloom, 2013; Elbe, 2008; Fama et al., 1969; Karolyi & Martell, 2010; Luo, 2012). Most managed accounts have set ROR from the companies that offer them. Usually, the risk is a determining factor when calculating said risk and ROR (SEC, 2020). The whole idea of a managed account and Markowitz's (1952) idea of a portfolio that can predict ROR contradicts the idea of Fama (1970) and the idea that the investor can control and predict the ROR of a stock. Because if one can control the ROR, they are predicting/ controlling what the market does, which contradicts the EMH.

Another factor with AUM is fees which range from 0 dollars up to as much as 25% percent (Mauck & Salzsieder, 2015). With AUM, funds mimic a known index like the S&P 500 or generate a specific ROR. However, according to EMH, all funds should pay out the same yield. So, a rational investor should find a fund with the cheapest fee and invest in that fund.

Mauck and Salzsieder (2015) found that investors would invest in equities with the highest fees because of investor bias in the diversification of equities, even though those investments had the same ROR as cheaper or historically more successful funds. Mauck and Salzsieder (2015) argued that this was a clear violation of EMH and the ability to have a rational investor. They also hypothesized that companies that allowed investors to invest with higher fees and lower ROR acted unethically with AUM. At the same time, companies are acting immorally because they do what helps the companies that sell equities to generate funds for a company and pay themselves fees generated by deceiving the average investor into buying and selling to generate funds that help them (investment manages) and their investment companies' profits.

Rational Investor

DALBAR, Inc., which started in 1976, is the financial community's leading independent expert for evaluating, auditing, and rating business practices, customer performance, product quality and service (Dalbar Associates, 2020). DALBAR gives unbiased evaluations of investment companies, financial advisors, insurance companies, broker/dealers, retirement plan providers and financial professionals. DALBAR has done studies of what are rational and emotional investors. DALBAR questions if people invest based on personal values, memories, or what they hear in the news? DALBAR says you are an emotional investor in a 2016 study (Dalbar Associates, 2020).

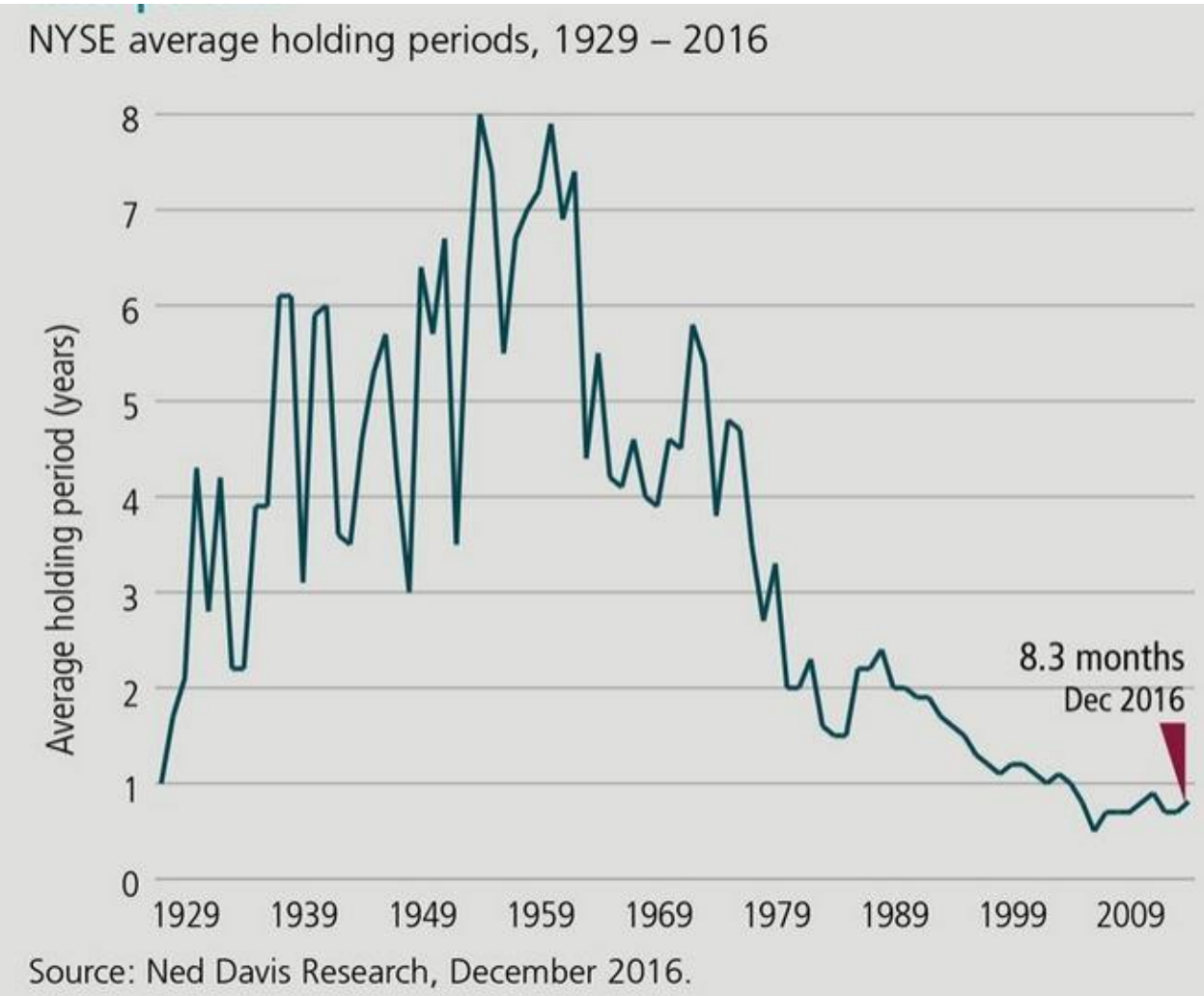
A rational investor or rational behavior is defined as a reason or logic (thefreedictionary.com, nd). In finance, rational is making a logical decision with the optimum benefit level (Sharpe, 1964). This cognitive bias can be seen in the gambler's fallacy. Suppose you flip a coin; it lands on tails six times. You assume that head is coming up, so you are inclined to say tails are coming up. When in reality, it is still a 50/50 chance. The new coin toss

is a new independent event. The new coin flip is not dependent on the prior coin flips like most people emotionally feel. This is Fama's (1970) whole idea with the EMH. You cannot determine what the market will do based on prior information because the market will take in all information and react accordingly. This is different from anything else in the market. However, this idea supports Poser's (2003) idea that investors buy stocks in waves and are emotional investors because investors see what others are doing and follow other investors' leads regardless of whether they are rational. Neither of these assumptions about investors' rationality can be considered normal. It is a starting point for looking at the relationship between information and equity price; because it is all about the market efficiency and how the market reacts to investors purchasing stock.

According to the NYSE (2020) and the World Bank (2020), the time limit on investors holding an investment is diminishing, which contradicts stock market investment advice (Sharpe, 1964). This is usually to buy and hold. The average holding period for stocks in 1960 was eight years and four months. In the 1970s, it was five years and three months. The 1980s were two years and nine months. The 1990s were two years and two months, and the 2000s saw one year and two months, according to the NYSE Historical Market Reports (2020). Ned Davis Research (2020) has the following graph to support these findings located as Figure 6.

Figure 6

Stock Holding Periods 1929 to 2016 (Ned Davis Research, 2016)



Since 2000 there have been conflicting reports because of electronic trading. Most trades are short-term (less than a year). The time limit for holding an investment can be as low as 22 seconds and longer (Harris, 2011; NYSE, 2020) World Bank, 2020). According to Harris (2011), these short-term investments are considered long-term investments by the actual investors. The World Bank from 2015 reported the average stock is traded four times a year from 2008 to 2014- and 1.5-times a year after 2015. The Ned Davis Research group said 8.3 months was the average

holding time in 2016 (Rowles, 2020). A potential reason for the changes in time for trading to increase is because of the 1993 law called the Commercial Transaction Law Number 18, which according to the Credit Swiss and World Bank cite the growth of E-trading and the fact that financial companies' bonuses of executives for meeting measurable performance goals can be tax-deductible (World Bank, 2020). Other things proposed in the same report are that large financial companies only make money buying or selling investments. Therefore, a financial company that buys and holds assets cannot make short-term quarterly financial goals for the companies without buying and selling AUM (World Bank, 2020).

For the average investor, this is defined by rational decisions when investing in equity (Dalbar Associates, 2020). A trade-off between the plan's choices or what you feel or think. This is demonstrated in efficiency. Efficiency means you get the maximum benefit of resources (Fama, 1970; thefreedictionary.com, nd). Equality means that benefits are shared equally among society (thefreedictionary.com, nd). In finance, efficiency is the size of the economic pie, where equality divides the pie into equal slices. This is seen in laws and how government policies are designed. The rich are asked to pay more taxes for those who make less and do not pay taxes. Unemployment is given to those who could work who are not working then. Hence, unemployment helps people work less and as a country. We are not efficient because we produce less. When cutting the finances into more equal slices, the smaller the pie gets is not fair and or just for all.

This trade-off of finance is seen in investing, where investors choose when to buy and sell. The question becomes what the investor thinks will achieve their financial goal. This investor opinion is the trade-off between what they give up and what do they think the outcome of their actions will be. An example is that stock prices start to drop. Do you hold or sell and get

out of the stock? History teaches that stock prices will increase over time. This is demonstrated in Figure 3 which shows that the market eventually goes up no matter what happens. The question is can you wait for it to recover? The early twenties investor theoretically can wait for the market to recover. However, a 75-year-old might not have years to wait. No matter what they decide, their individual choices can be rationale as long as it fits into the investor's financial plan(s) (Sharpe, 1964). Only humans can say a financial plan is irrational or emotional because it does not fit into their (another person/ investor) financial plan(s).

This whole idea plays into the Rational Expectations Theory (RET) (Muth, 1961). The RET is the dominant assumption model used in finance as a cornerstone of the EMH. RET implies the following:

- Individuals use their knowledge to rationalize when making a decision
- The average person has expectations
- Rational expectations are just a guess of tomorrow
- The average person is right most of the time
- People learn from their mistakes
- Equity (company) values are important (price, production, and employment)
- Investors behave in ways that give them enjoyment in life
- Investors seek to maximize profits
- These expectations about the future influence current decisions
- Investors create expectations based on all available information
- These market predictions are very close to the market value (Muth, 1961)

In RET (Muth, 1961), the investors' expectations and, therefore, the outcomes of investor actions influence each other. Hence, there is continual feedback from prior investments and

current behavior. This behavior of RET either supports or disproves EMH (Fama et al., 1969) or adds credence to the Elliott Wave Principle or Elliott Wave Theory discussed by Poser (2003) by saying that people react accordingly to the new information. These ideas of waves and time are supported by Swedroe (2013), Agrawal et al. (2010), and Smales (2013), who tested and reported the effects of information on event windows and found that from the time information is released, it takes 40 seconds for the NYSE to respond to information compared to 75 to 90 seconds for the London Stock Exchange to respond to the same event.

Momentum

To coincide with Elliott Wave Theory (Poser, 2003) is the idea of momentum. Momentum is a phenomenon that behavioral finance has uncovered in the presence of bias in investing (Daniel et al., 1998). Momentum comes from investors acquiring information and reacting to it (buying or selling equity). Then the market reacts, and therefore the investor reacts again (buying or selling equity) with a financial goal. The equity takes on its energy, and the movement of the equity, either up or down, has its momentum repeating this process repeatedly. Daniel et al. (1998) concluded that depending on the strength of the bias and how many biases an investor had determined how long and how much equity could move. Their research was seminal when it was written and explained the over and under reactions of the market.

Pharmaceutical Companies

The companies were chosen from the idea of looking at twenty-six pharmaceutical companies in the healthcare sector of the NYSE because they potentially should react differently than the surrounding market since investors would be looking for them (pharmaceutical companies) to produce a treatment, vaccine, or cure to the pandemic (Palache et al., 2017). However, choosing the actual companies because of the word pandemic was a problem. Many

articles and research material described epidemics as pandemics in their writings. These epidemics are described as pandemics because of WHO's public health declarations but not WHO's PHEIC (2020). The list of epidemics in the twentieth century after the foundation of WHO in 1948 is: Polio 1949 and 1952, Asian Flu of 1957, Hong Kong Flu of 1968, smallpox and London flu of 1972, smallpox of 1974, the plagues of 1984 and 1994, meningitis of 1996, Nipah Virus of 1998, Dengue fever of 2000, Cholera of 2001, SARS of 2002, the plague of 2003, Cholera, Dengue Fever, Ebola, Yellow Fever, and Leishmaniasis od 2004, Dengue fever of 2005, Cholera, Plague, Malaria, Dengue Fever, and Rift Valley fever of 2006, Dengue fever, Cholera, Plague, Hepatitis B, Mumps, Bubonic plague, and hand foot and mouth diseases of 2008, 2009, and 2011, MERS of 2012, the 2014 polio declaration, the 2014 Ebola outbreak in Africa, the Zika epidemic of 2015, the 2018 Kivu Ebola epidemic, and 2017, 2018, 2019 encephalitis, measles, Dengue fever, Nipah Virus, and Yellow fever (WHO, 2020).

There have only been six pandemics in the last 120 years. They are the Sixth Cholera Pandemic of 1899-1923, Spanish Flu of 1918-1920, Seventh Cholera Pandemic of 1961-1975, the HIV/AIDS Pandemic of 1960-Present, the Swine Flu of 2009-2010, and the Coronavirus Covid-19 of 2019- 2020 (WHO, 2020). However, HIV/ AIDS disqualified itself from the research because it never announced a pandemic. This was because the idea of an announcement of a pandemic did not exist until 2003 in response to the SARS epidemic of 2003. In 2003 the WHO started declaring Public Health Emergency of International Concern (PHEIC) (WHO, 2020). Any epidemic or pandemic prior to 2003 had to be eliminated because of the term pandemic; or because of the PHEIC by WHO, which could not have existed prior to 2003.

Pharmaceutical companies are a sub-category of the healthcare sector of the stock market. Healthcare companies are the world's largest and fastest-growing part of most economies

and usually consume as much as 10% of most developed nations' gross domestic product (GDP) (World Bank, 2020). The healthcare sector provides goods and services to treat curative, preventive, rehabilitative, and palliative care patients. Healthcare is typically divided into several areas based on the United Nations International Standard Industrial Classification system. Most healthcare is defined as hospital activities, medical and dental practice activities, and other human health activities. The Global Industry Classification Standard and the Industry Classification Benchmark further distinguish the industry into two main groups: healthcare equipment and services, pharmaceuticals, biotechnology, and related life sciences (United Nations, 2020).

Pharmaceutical companies research, develop, and market medicines made primarily from artificial sources (Palache et al., 2017). Pharmaceutical companies take years to research, manufacture, produce products and get the Food and Drug Administration's approval (FDA, 2020; Palache et al., 2017). This is slightly different from biotechnology (biotech) companies that manufacture and make living organisms' products. Both pharmaceutical and biotech companies have the same overall goal and similarities with making medicines. Pharmaceutical companies are usually more stable than biotech companies because they hold exclusive rights to products and have other forms of income from their large size and mergers with other companies. Most pharmaceutical companies have a biotech division or product line, whereas the opposite is not true for biotech companies to have a pharmaceutical division (Palache et al., 2017).

Pharmaceutical companies are considered defensive stocks (Krzeczewski, 2017). Defensive stocks tend to do well during economic downtowns in the stock market than cyclical stocks that tend to do well due to upswings in the overall economy. Defensive stocks should not

be confused with defense stocks, which manufacture such as weapons, ammunition, and fighter jets (Krzeczewski, 2017). A cyclical stock can be classified according to its reaction to business cycles. Cyclical companies tend to make products or provide services in lower demand during economic downturns and higher demand during upswings. The automobile, steel, and real estate investment industries are examples of cyclical businesses.

Defensive stocks are the opposite of cyclical stocks because they do well during poor economic conditions. Defensive stocks are companies whose products and services enjoy steady demand. Examples of defensive stocks are food, medicines, and utilities stocks since people typically do not cut back on their food, medicines, or electricity consumption during a downturn in the economy (Krzeczewski, 2017). Even though defensive stocks tend to do well during economic downturns, their performance during upswings in the economy is poor and tends to be lackluster compared to cyclical stocks because they do not show great(er) demand as the economy gets better.

To possibly identify a defensive stock, one can look at the stock's beta. Beta measures the stock-price change compared to the overall stock market change (Chen & Chi, 2018). Defensive stocks typically have a beta of less than 1. A beta of 1 means the stock price moves at the same rate as the overall market, whereas a beta of less than 1 would mean that the stock would move less than the market (Chen & Chi, 2018). Defensive stocks benefit from long-term gains with lower risk than other stocks. Another way to identify a defensive stock is to look at its strong cash flows. These companies usually have stable operations and pay dividends, which can lessen a stock's price decrease during a market decline.

Stock Prices

The stock prices used were the adjusted close price on the NYSE for each company. The adjusted close is information acquired from a company's historical data. Other data in the historical data from the NYSE is the date, opening price, the high price of the day, the low price of the day, the closing price, the adjusted closing price, and finally, the volume of that stock traded during the day (NYSE, 2020). The opening and high and low price of the day was removed from the data gathered from the NYSE historical data, which left three pieces of information. Volume is removed as it is another part of the research.

The remaining information besides the date is the close and adjusted closing price of the stock. The difference between the close and adjusted close is that the closing price is simply the cash value of that specific stock at the end of a stock trading business day. The adjusted closing price reflects the stock's closing price concerning other stock attributes like dividends, stock splits, and new stock offerings (Heun et al., 2002; NYSE, 2020). The adjusted closing price is a more accurate reflection of the stock's true value for a long-term investor. The adjusted closing price time and effort are removed, which is one of the limitations of event studies. One drawback to adjusted close is that an investor cannot buy stock at the adjusted close the next day. Stock is typically priced following the prior day's closing price (NYSE, 2020) plus an adjustment for after-hours trading.

The final consideration in stock prices is the electronic communication networks (ECNs) and after-hours trading (AHT). AHT is information because the widely used ECNs move stock prices from the close or adjusted close price to the opening market price (NYSE, 2020). Daily trading on the NYSE is from 9 AM to 4 PM Eastern Standard Time (NYSE, 2020). Companies have things happening after these hours that affect the stock price, called after-hours trading. An

example here is a company that incurs a financial scandal. If the stock was trading at $100 at close, it might only be worth three $3 at the morning open price because nobody will pay for a scandal-ridden company. This happened with Lehman Brothers in 2008, which started the largest world recession since World War II (Dullien et al., 2010; McKibbin & Stoeckel, 2009).

Dividends

One of the topics mentioned in the stock price section is dividends. Dividends are a distribution of part of the company profits to investors/shareholders of company stock (thefreedictionary.com, nd). Dividends are part of the reason for holding stock for long-term investors (Chen & Chi, 2018). Besides hoping for an increase in stock prices, companies typically pay out a portion of the profits quarterly to investors as a token reward. According to the NYSE (2020) and Chen and Chi (2018), larger, more established companies with predictable profits and losses are the best dividend-paying companies. According to the NYSE (2020), the following industries are the best dividend payers: basic materials, oil and gas, banks and financial, healthcare & pharmaceuticals, master limited partnerships (MLP), real estate investment trusts (REIT) and utilities. Dividends are usually paid out quarterly unless a special dividend is issued (Chen & Chi, 2018; NYSE, 2020).

There are rules for dividends to be paid to investors. According to the NYSE (2020), dividends follow chronological order. First is the announcement date of the dividend. This is the date that dividends are announced by company management and approved by shareholders. Second is the ex-dividend date when eligibility expires for a dividend. Next is the record date, which the company uses to which shareholders are eligible to receive a dividend. Then finally is the payment date. This is when the company distributes the money, and investors get credit for the funds in their accounts or books, depending on how or what dividend is paid (Chen & Chi,

2018; NYSE, 2020). Dividends are usually paid as cash, and long-term investors use these funds as part of the ROR calculation of their investment. Based on the adjusted close of the NYSE historical data, dividends are pre-calculated into the adjusted close of stock prices (NYSE, 2020).

Mean vs. Median and Skewness

The term average or mean expresses that something is statistically normal (thefreedictionary.com, nd). A value would be expected, middle, usual, or common in research. In mathematics, the average is the sum of all values divided by the number of values added. The mean is almost considered synonymous with average. However, a statistician will disagree because mean is only a form of describing an average (Morgan et al., 2013). Median is different from average as the median is the central point of a set of numbers (Morgan et al., 2013). In statistics, the median is the number that occurs in the middle of a set of numbers. Median is considered the most suitable way to describe the central tendency of a particular sample (Morgan et al., 2013)

The term average encompasses several ways to measure what value best characterizes a particular sample. The terms and measurements that are used will depend on the situation. It will be based on how you want to describe a certain set of data or samples. This is where skewness becomes a factor in interpreting data. Skewness is where the mean and median of a data set are not the same or have a variance (Morgan et al., 2013). A skewness to the right or the left of abnormal distribution is where the median and the mean are different. An example for mean, median and skewness is the following collection of 10 numbers in numeric order: [1, 1, 1, 2, 2, 3, 5, 8, 12, 17]. The mean of the numbers is 5.2. Which is the total of the numbers 52 divided by 10 or {1+1+1+2+2+3+5+8+12+17 = 52 or 52/10 = 5.2].

The median of the group of numbers is 2.5. This is calculated by finding the middle of the number two and the number three set of numbers. This group has two middle numbers: five numbers from the left and five numbers from the right. The number 2 plus 3 divided by 2 is 2.5 or (2+3 = 5 and 5/2 = 2.5). The group of numbers now has 5 numbers greater than 2.5 and 5 numbers less than 2.5. In this example, the mean (5.2) is greater than the median (2.5). This is common for a skewed distribution to the right; the distribution can be skewed to the left when the mean is less than the median. The mean of numbers is sensitive to outliers in number sets in statistics. The median is not sensitive to outliers (Morgan et al., 2013). An outlier is a number that is an extreme number that exists outside of a pattern or expectation (thefreedictionary.com, nd).

In finance, the word average is thrown around in relation to the average investor (Dalbar Associates, 2020), different from the concept of an average in numbers. This is seen in Fama's whole idea that an average investor cannot beat the market (Fama, 1970). However, at the same time, most accounts are managed and get a set rate of return, which is as good as or better than the market (Alrgaibat, 2015; Brigham & Houston, 2009; Fama & MacBeth, 1973; Frase & Ormiston, 2004; Freihat, 2019; Mossin, 1966; Ragsdale, 2015; Ramadan, 2014; Sharifzadeh, 2006; Wenjing, 2017). Fama even acknowledges this with 80% of all mutual funds are in wealth management accounts (Fama, 2013). In the same context, the average ballplayer does not play in the NBA, or the average tennis player does not win a tennis match at Wimbledon. This does not mean the average person cannot invest, nor should they not work on their jump shot or backhand.

The average investor is not a finance major, nor are they investing hours daily into investing. The average investor is someone invested in the stock market and has the goal of a decent ROR on their investment (Dalbar Associates, 2020). At the same time, the NYSE (2020)

stated that the average stock market return was 10% which is quite different from Appendix C: NYSE Composite Index Annual ROR, which ranges from -40.9% to 31.3% in 1995. The market return is not always average. Since 2000 the market has beaten the average for a total of nine times based on Appendix C: NYSE Composite Index Annual ROR (NYSE, 2020), which is not even a 50% rate (9 returns/19 years data Appendix C = .4737). The average is not the best number to show the relationship between the two numbers. The terms mean median and mode are required to help one understand the relationship between two numbers (Morgan et al., 2013).

At the same time, average is not a good word for all investors. Dalbar Associates (2020) implies some basic concepts about the average investor. These ideas are:

1. The average investor uses readily available stock information.
2. The average investor gets information from ads, commercials, magazines, friends, bosses, random persons, and radio/television stock advice.
3. The average investor does not want to pay a lot for the advice.
4. The average investor has lost money in the market
5. The average investor does not make the S&P 500 return on their investment
6. The average investor is a BUY and HOLD for long term of more than a year on an investment.
7. The average investor is afraid to sell when a stock price increases because of missing more gains.
8. The average investor is afraid to sell when the stock price is down because it means acknowledging losing investment money.
9. The average investor has not researched many stocks and does not plan when to sell or what price. No clue how much they will make, but it will be a lot.

10. The average investor has a 401K or another financial plan.
11. The average investor is concerned about social security and their future finances.
12. The average investor makes up the largest group of investors in the market. (Dalbar Associates, 2020).

This can be seen in Dalbar's 20-year study ending on 12/31/2015, which showed the S&P 500 Index averaged 9.85% a year, and the average investor had a market return of 5.19% (Dalbar Associates, 2020).

Significant and Practical Statistics

Formal research pushes the idea that research should be statistically significant in its findings. Whatever the researcher is studying did not happen by chance and is repeatable in another scientific study using statistical, mathematical equations (Fisher, 1925; Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015). According to scientists and researchers, these experimental findings must be at a rate of less than .05 or $p < .05$ in the statistical equation as the alpha (Fisher, 1925; Morgan et al., 2013; Peng, 2015). Medical research pushes the idea of 0.01 or $p < .01$as the alpha (Peng, 2015; Trafimow & Marks, 2015). This ideology has made researchers and scientists only believe that statistically significant findings should be published, and all other research is faulty if their findings are not statistically significant (Peng, 2015; Trafimow & Marks, 2015).

There is another type of statistics, according to some statisticians. That is the belief in 'practical' significance compared to 'statistical' significance in findings (Peng, 2015; Trafimow & Marks, 2015). Practical statistics are used to describe the magnitude of the 'effect' and whether research findings will make a difference in the real world with research findings (Peng, 2015). An example is a test score. The outcome of a test is studied using cost and test results as

variables, looking for changes from a new study technique on the final test score results. Test results from the test scores study show a statistically significant difference in the research study findings. However, upon closer inspection, the actual difference, even though statistically significant, is a three-point score difference in actual test score results. The cost of the new program is $20,000. A good researcher should know that three points on a test are not worth $20,000 in the real world, even though it is statistically significant in research results. The opposite is true where a new math formula is added to the study guide at the cost of zero ($0) dollars, and the test score goes up three points on final test scores, but the result findings on the test study scores are now not statistically significant. The findings are practically significant, yet the results are not statistically significant based on research criteria.

This is where the reader and researcher have to look at research data findings from a statistically and a practical significant point of view (Peng, 2015; Trafimow & Marks, 2015). A three-point test increase with zero cost is very practical for the average person (Alrgaibat, 2015), even though it is not statistically significant to a researcher (Fisher, 1925). This idea of practical vs. statistical findings is supported by the work of Peng (2015) and Trafimow and Marks (2015), which shows the error in null hypothesis significance testing because of the use of statistics and p-values P (T<=t) two-tail in result findings. In reality, no statistical test can tell whether the effect of a study is large enough to be important in a field of study in real-world applications for everyday purposes (Peng, 2015; Trafimow & Marks, 2015).

All statistical research does is show whether study findings are statistically significant in a research context. All statistical data is truly up to interpretation. What has been forgotten is that statistical significance is a continuous spectrum of mathematical data and not a yes or no answer that is finite in the research results (Peng, 2015; Trafimow & Marks, 2015). Researchers ask a

question based on their faulty understanding of the word significance, which is the concept of the findings of this research be statistically significant in output from the research project? The researcher should be asking a more sensible and reasonable question: How significant is the finding (data) for a real-world application(s)? Because of this faulty understanding and logic in interpreting the word significant by the scientist, researcher, or statistician, the true meaning of the word significance is missed. Significance has a more technical and colloquial meaning which is: impactful, important, and relevant (thefreedictionary.com, nd) which is where true research should be founded; not in the ideology of an arbitrary number (.05 for alpha or p>.05) based on research history or research criterion for saying something does not happen by chance (Fisher, 1925).

Summary of the Literature Review

This literature review has covered many topics and terms to define, explain, and interlink various non-sequential points of view, research, and data. The culmination of the data will become clear in the qualitative explanation of the findings of this research project, specifically in the data analysis section in part two. As mentioned in the problem and purpose statement, this research combines many pieces of a problem secondary to the actual research data collection methodology. As with any other research, a researcher and consumer know there are always new topics to be answered and new problems or results present when data is collected.

This section also has given credence to the problem and the background of the problem. It describes many factors into the nature of the study about the EMH and the general problem to be addressed the possible failure of the Efficient Market Hypothesis (EMH) to consistently hold, resulting in investors being able to generate statistically significant abnormal returns. Charron (2017) asserted that the EMH does not hold true and is flawed in its very fundamental wording.

Daniel and Hirshleifer (2015) validated this problem and disagreed with the EMH holding true because of investor behaviors and outside forces. The research further explains the problem with the EMH holding true by Thaler and Shiller (2015); who, like Charron (2015) and Daniel and Hirshleifer (2015), found that the EMH does not hold true based on another idea; which is the premise of explaining rational behavior in the markets. The specific problem questions are if the EMH consistently holds, resulting in investors being able to generate statistically significant positive abnormal returns in the pharmaceutical sector of the United States NYSE stock market following an announcement of a pandemic by WHO.

Section 2: The Project

Purpose Statement

The purpose of this event study research was to evaluate the potential impacts of pandemics on the financial performance of the United States stock markets, specifically, the pharmaceutical sector of the NYSE after the announcement of a pandemic (Thaler & Shiller, 2015; Wang, 2016). This event study was a fixed design using quantitative methods to examine the cause and effect of the announcement of a pandemic on the stock market (Babones, 2016). This event study used a t-Test and portfolio theory to determine the abnormal return of the 26 pharmaceutical stocks compared to the S&P 500 (Morgan et al., 2013) (Appendix B: Used Pharmaceutical Company List broken down by NYSE and NASDAQ categories).

This event study was a fixed design using the quantitative method because it was exploratory, deductive, and had hypotheses (Babones, 2016; Creswell, 2014; Yin, 2018). The qualitative research method alone was not appropriate because it had a hypothesis. The quantitative method alone was also inappropriate because the research compared and interpreted data from multiple theories on one event, looking for data not presented in one set of findings (Babones, 2016; Creswell, 2014; Yin, 2018).

Role of the Researcher

According to Denzin and Lincoln (2003), research is considered an instrument of data collection. The data went thru the human instrument (AKA: the researcher) rather than thru questionnaires, machines, or piles of inventories. The research and the consumers of said research need to know a little about the researcher (Greenbank, 2003). I, Ronald (Ron) Burnette, am an employee of the State of Virginia and a Fortune 500 company. I hold no bias, nor gain any benefit from the data, the compilation of data, or the outcome of this dissertation except to say I

wrote a finance-related dissertation which will help me acquire my Doctorate in Business Administration (DBA). I have presented all information based solely on the data's face value, hopefully without imposing any judgments,' bias, or influence on said findings. This event was exempt from the Liberty University Institutional Review Board (IRB) as it has no primary instrument for data collection but is a collection and interpretation of second-hand data (Liberty University Institutional Review Board Policies, 2019). I did, however, present this event study from an interpretive quantitative method. This framework follows the idea of Babones (2016), who used a mixed method approach for the positivist standpoint and used it quantitatively, not the qualitative manner with which researchers normally associate positivism.

I present this data from an etic perspective as a researcher. Etic means from an outside perspective compared to an emic or inside perspective (thefreedictionary.com, nd). I have attempted to answer questions relevant to the market and portfolio theories and their effect on the equity market related to pharmaceutical stock ROR. The research itself is important as the outcome of the research. The fact that the data did or did not support the underlying problem(s) or hypotheses is inconsequential. This research gives actual researched proof to any investor, whether average or professional, which theory is an appropriate guide for looking at pharmaceutical stock ROR and adding additional proof to the theory that the market is or is not efficient.

Participants

The participants in this research project are all of the 2,800 plus publicly traded companies of the NYSE, of which 296 are healthcare sector stocks listed as of March 2020 (NYSE, 2020). However, this event study focused only on 26 of the 47 pharmaceutical companies from that list. This is because the 26 companies are the only companies that have

existed for 11 years. Other participants were the sources of information about said companies or other terms and factors used in the literature review for their contribution to this project.

These 26 pharmaceutical companies were not random. The participants in this study were chosen for one reason. This reason was that the pharmaceutical sector of the stock market would behave differently than the rest of the stock market, as demonstrated in Figure 3: Sources: http://www.pandemicflu.gov. - An official U.S. Government Web site managed by the U.S. Department of Health & Human Services. (1): S&P 500: US Data http://www.econ.yale.edu/~shiller/data.htm. (2): UK Equity Market: Global Investment Returns Yearbook 2005. Dimson et al. (2020) and Elgeti (2020) showed the pharmaceutical sector performing better than the rest of the market because of its defensive investment nature. However, the speculation to this research shown in the hypothesis is that the pharmaceutical sector would behave differently due to the announcement of a pandemic by WHO.

Research Method and Design

The research method and design were primarily built around analyzing data from public databases related to the NYSE equity markets. The purpose of this research was to paint a picture of how the different finance theories have a bearing on how stock prices are viewed. This data was then statistically analyzed, and the finding was presented in the results section. This results in statistical information that will or will not support the null hypothesis and answers the corresponding research questions.

Discussion of Method and Design

Event studies are designed to investigate the effect of an event on a specific dependent variable using statistics. The most commonly used dependent variable in an event study was the company's stock return. In an event study, the goal of it was to study the changes in stock return

beyond expectation or what is called an ‘abnormal return(s)’ (Beladi et al., 2016; Charron, 2017; Daniel & Hirshleifer, 2015; Thaler & Shiller, 2015). The change in stock returns occurs over a time called an ‘event window’ (Beladi et al., 2016), and the researcher can infer the significance of the event on the stock ROR.

Cumulative abnormal return (CAR) is abnormal for an event study. A CAR is merely an average of the time (TP) to compare to the actual expected return (EP) of the stock and compared to the S&P 500 of the NYSE to see how the actual returns differ from the EP of the stock and the movement of the stock market itself. CAR is required for research because over a small-time window of hours or days, abnormal returns by themselves can lead to bias in result findings (Thaler & Shiller, 2015). Therefore, CAR was a better indicator of abnormal return since it is the average of the ROR over some time. In this study, the CAR would look at the 21 days and 7-days pre- and post-event windows and the day of the actual event (T0) for the announcement of a pandemic by the WHO on the pharmaceutical companies in the healthcare sector of the NYSE (Chen et al., 1986).

The data used in this research about stock prices came from the historical data of the NYSE (2020). Since the stock price data is readily available for the public, there should be no ethical concerns about collecting or analyzing this readily available public data. Also, all information about stock prices had been validated by outside sources, and through multiple research criteria, legal compliance and typically audited before publishing by outside sources; so, reliability and validity of the online stock price data from reputable sources was not an issue either for this research project. This event study has research questions (RQs) and supporting

hypotheses. Both the RQs and hypotheses were used to formulate and propose statistics for validation and for supporting the findings.

The RQs and hypotheses were based on the underlying question of the proposed failure of the EMH to consistently hold, resulting in investors being able to generate statistically significant positive abnormal returns in pharmaceutical stocks from the healthcare sector of the NYSE due to the announcement of a pandemic by the WHO. Leading to the idea that an investor can outperform the overall stock market through specific stock selection or specific market timing on stock purchases because of an event (Wenjing, 2017). While the hypothesis did not have to be correct, it chose either true or false outcomes. Therefore, this had two scientifically testable predictions about the relationship between the stock ROR and the announcement of a pandemic by the WHO. The first hypothesis looked for a direct relationship between stocks ROR; before and after the announcement of a pandemic by the WHO. The second hypothesis looked to see if the EMH was supported by the behavior of the overall market in the volume of stock actually traded during the same periods.

These hypotheses were based on the work of Fama (1970) and Pilkington (2017), who said the market is efficient and that prices are directly reflective of events and will trade at their fair market value. Daniel and Hirshleifer (2015) argued that the market is affected by outside events. This was the premise behind hypothesis one ($H1_0$), which stated there is no statistically significant difference in the aggregate pharmaceutical sector stock(s) rate of return after announcing a pandemic by the WHO.

The second hypothesis ($H2_0$) looked to support the work of Thaler and Shiller (2015) who, like Charron (2015) and Daniel and Hirshleifer (2015), looked to explain the rational market. The second hypothesis ($H2_0$) determined if a flaw existed in the EMH, which did not

look at stock prices, but stock volume. When a stock is trading in larger than normal stock volume, it would be an indicator of a flaw in the market that could be exploited and used to predict the movement of a stock and hence a flaw in the EMH (Wenjing, 2017). This in itself is the basis of supply and demand, which is an underlying basis of EMH. Supply and demand say low availability and high demand with increase a stock price; whereas the opposite is true and high availability and low demand will decrease the stock price. So, increased movement of the volume of stock would indicate a potential area to exploit or an anomaly in the market (Wang, 2016). Therefore, ($H2_a$) stated there is not a statistically significant difference in the volume of aggregate pharmaceutical stock traded after the announcement of a pandemic by the WHO.

Summary of Research Method and Design

Although one could argue that there is great leniency in how data is interpreted, that could not, in reality, be the case. However, one can have an unbiased opinion of what that data reveals. A quantitative research project is very strict on interpreting and presenting it compared to a qualitative research project. For this to take place, three main things have to co-exist. They are the internal, external, and individual perspectives. The internal factors were the various data from the various financial reports on the NYSE (2020) and company websites. Externally, the data was reviewed and plugged into various formulas that complied with GAAP and statistical formula rules. Lastly, the researcher had to ensure no bias when interpreting the statistical model's findings. The data must be presented fairly and clearly.

Then a conclusion was drawn from this data that either supported or disproved the basic assumptions of the research problem and answered the research question(s) and hypotheses of if a positive abnormal return is found in the pharmaceutical companies of the NYSE when WHO makes the announcement of a pandemic with a PHEIC. Even though as a researcher, I take an

interpretive quantitative method perspective following the ideology of Babones (2016) and view the data with no absolutes and open for interpretation. I presented all data collected and the findings; however, the results came out. My presentation was inconsequential whether these findings supported the research questions or hypothesis. As a researcher, I know that even though my RQs or hypotheses are supported or not. All data and findings were used in the real world from a practical vs. statistical significance use (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015).

Population and Sampling

Since no new instrument was created, all data were collected from public data as secondary data. As mentioned in the literature review, all data was noted as reliable and valid due to the laws and regulations imposed upon publicly traded companies in the Unites States. However, all data on its own did not provide the information sought after in this event study. Therefore, various pieces of data were pulled from various sources and compiled to make useful data and data tables for the calculation of this research. The notes of where and when this data was collected can be seen in the reference section, with citations to those references located by each data set.

Discussion of Population

Population in statistics is a large group with at least one common element (Morgan et al., 2013; Peng, 2015). In finance, a population is the stock market of whatever country studied. However, with a population of this size, there was too much data to be analyzed by one person or a small group of people. Therefore, researchers dissect the overall population to study in a research project. This small group from within the population is called a sample (Morgan et al., 2013; Peng, 2015). A sample is a finite subset group of the overall population chosen by some

process. There was a finite population and a finite sample of the population which were the same at a count of 26. This was unique as the sample represented 100% of the population.

The NYSE has over 2,800 plus publicly traded companies, out of which 296 are healthcare sector stocks listed as of March 2020 (NYSE, 2020). Forty-seven of those healthcare sector stocks are pharmaceutical companies. These 47 can be seen in Appendix A: Alphabetized Pharmaceutical Company List NYSE (2020). This list was narrowed down because 21 of those companies did not exist in 2009. They now exist in 2020 (47-21=26) according to the NYSE (2020) historical data in March of 2020. The 26 pharmaceutical companies used in this research can be seen in Appendix B: Used Pharmaceutical Companies and have existed on the NYSE from the year 2009 to the year 2020. This was based on April 13, 2009 (Swine Flu Event Beginning Timeline) and March 2, 2020 (Covid-19 Event Ending Timeline).

The NYSE is stratified into 11 main sectors and further broken down by the parameters of the companies within the sectors. Stratification breaks the larger group into subgroups for classification purposes (thefreedictionary.com, nd). Pharmaceutical companies are one subgroup of the overall healthcare sector. In theory, according to Fama (1970), the stock market is efficient, and no one group, or sector will perform differently than any other group. This event study challenged that efficiency notion and proposed that the pharmaceutical sector of the NYSE would perform differently and generate a positive abnormal return compared to the overall market represented by the S&P 500.

Discussion of Sampling

The population and sample are the same with 26 finite pharmaceutical companies that have existed for the last 11 years from the healthcare sector of the NYSE based on data from the NYSE historical data March 2020. Typically, the sample is smaller than the population. This is

done for time and cost issues where the sample represents the population in research. However, the sample size equaled the population; therefore, the results of the data had no variance, and the population was reflected 100% accurately in the findings of the results. This factor alone removed any uncertainty for the data and any guess about the reliability of the data for the 26 pharmaceutical companies that existed for the years 2009 to 2020 as of March 2020.

The entire list of pharmaceutical stocks was found in the NYSE historical data to choose the companies (see Appendix A). Then, this list was narrowed down by the dates: April 13, 2009 (Swine Flu Event Beginning Timeline) and March 2, 2020 (Covid-19 Event Ending Timeline). The 26 pharmaceutical companies used in Appendix B: Used Pharmaceutical Companies List as mentioned in the population above. Next, the 26 companies were searched on the internet and newspaper articles on the internet for potential extraneous variables (Creswell, 2007, 2014; Yin, 2013, 2018). In this case, the extraneous variable was any positive or negative newsworthy event affecting the companies during April 13, 2009, to July 13, 2009 (Swine Flu Event Timeline) and November 27, 2019, and March 2, 2020 (Covid-19 Event Timeline). No negative or positive news events were found, such as lawsuits, crimes, mergers & acquisitions, environmental pollutions, board of director changes, or scandals in a simple Internet search of company names. This was not to be mistaken with the companies having lawsuits, crimes, mergers and acquisitions, environmental pollutions, board of director changes, or scandals in the company's history. Each company had no findable negative or positive newsworthy event during the aforementioned timeline that could be considered an extraneous variable that impacted the stock price during the event windows (Heun et al., 2002).

This event study was rare because the total proposed population was small. Therefore, this event study tested the entire population, which meant that the sample size and population

were the same. Because the sample size was 100% of the population, the sample met or exceeded the 95% percent confidence level and the 5% percent confidence interval required for a research project (Morgan et al., 2013). Most research requires that the researcher find the sample size concerning the population; so that the data can be valid and representative of the entire population. This did not require a sample size calculation since the data represents 100% of the pharmaceutical company's population. Not to be confused with the entire population of pharmaceutical companies on April 13, 2009, to July 13, 2009 (Swine Flu Event Timeline) and November 27, 2019, and March 2, 2020 (Covid-19 Event Timeline).

Understanding the confidence level in research is the probability that the value of research falls within a specific range (Morgan et al., 2013). Because there was a population of 26 companies and a sample size of 26 companies, the confidence level exceeded the expectation that 95% percent of the population was represented in the research because it was at 100%. The confidence interval is the degree of uncertainty associated with a research sample (Morgan et al., 2013). The required confidence interval in research studies is 5%. One hundred percent of the pharmaceutical companies (AKA: confidence level) in existence from April 13, 2009, to July 13, 2009 (Swine Flu Event Timeline) and November 27, 2019, and March 2, 2020 (Covid-19 Event Timeline) from the NYSE list of pharmaceutical companies (NYSE, 2020) is represented in this study with a degree of error less than 5% (AKA: confidence interval) from our representative sample (Morgan et al., 2013).

Summary of Population and Sampling.

The sample of stocks chosen is 26 pharmaceutical companies from the NYSE (2020). This population is a small group of all stocks on the NYSE and with the sample size being the same as the total population with a greater than 95% percent confidence level and the 5% percent

confidence interval requirement for a research project. A sampling method is a procedure for selecting sample elements from an entire population of equities. In this study, these pharmaceutical equities were chosen because of the hypothesized idea that pharmaceutical companies would increase in value because they would be the ones to produce a treatment, cure, or vaccine for a pandemic; which means they would act differently than other companies from the stock market; including other companies in the healthcare sector. At the same time, this relationship between the pharmaceutical companies' ROR and the volume was also hypothesized either to support or disprove the EMH as proposed by Fama (1970).

Data Collection

Data collection is the procedure for collecting, measuring, and analyzing data using validated research techniques. The most important step of data collection is to make sure the data is information-rich, and that the data is reliable, allowing the data to be used for statistical analysis. Because of this process, a data-driven decision was made for quantitative research. The primary data collection was through online stock price history from the NYSE historical database (2020) and Bloomberg (2020), where all data has a 90% or better rating in accuracy as stated on the websites' disclaimers. This data is called secondary data collection, as it was collected from a primary source. This data is readily available with the internet and computers accessing the internet to connect to those above-listed websites. Along with journals, government records, and periodicals, this data gave an up-to-date picture of the needed information.

Instruments

There was no new instrument created for this quantitative research project. All information gathered was from prior existing public records related to stock prices from the

historical data of the NYSE (2020) Bloomberg (2020) and compiled in Microsoft Excel as secondary data. This data can be viewed in the appendices, findings, and conclusion section.

Data Collection Techniques

The data collection techniques used were based on the research questions' ideas and what data was needed for the research questions. Various public records were read and compiled in Microsoft Excel as secondary data. Then the researcher translated all of the data to support or disprove the research questions and hypotheses. They result in the ability of the researcher and a reader of the research to conclude if the market model or MPT was a valid indicator of an efficient market. Also, the researcher and the reader would conclude if pharmaceutical stocks generated a statistically significant positive abnormal return.

All data for this project was done using Microsoft Excel. The reason was this research project is about the average investor (Alrgaibat, 2015; Brigham & Houston, 2009; Dalbar Associates, 2020; Fama & MacBeth, 1973; Frase & Ormiston, 2004; Freihat, 2019; Mossin, 1966; Ragsdale, 2015; Ramadan, 2014; Sharifzadeh, 2006; and Wenjing, 2017). This research needed to be up to date, so the data analysis software must be up to date. According to Muenchen (2019), Statistical Package for the Social Sciences (SPSS) and Statistical Analysis System (SAS) statistics software use is declining, and other statistical software’s use is increasing in scientific research, including dissertations. According to Microsoft (2020), Microsoft Excel is the most popular spreadsheet and statistics software and is readily available and easy to use. It is also a major tool used in the finance industry. The average person has access to Excel where the average person might not have access to other statistics software without utilizing two or more computer programs to do statistical calculations (Muenchen, 2019); therefore, making Microsoft Excel a great tool to utilize and to analyze data from an average investor standpoint with no

additional cost to the analyst (Alrgaibat, 2015; Brigham & Houston, 2009; Dalbar Associates, 2020; Fama & MacBeth, 1973; Frase & Ormiston, 2004; Freihat, 2019; Mossin, 1966; Ragsdale, 2015; Ramadan, 2014; Sharifzadeh, 2006; and Wenjing, 2017).

There was also another advantage to using Excel. Data had to be collected, stored, and transposed before transferring to another program to run statistical formulas. Excel did all of the above and more without using a secondary program like SPSS or SAS (Muenchen, 2019). By using Excel, there was also a reduction of handling information and less likely that an error occurred in data processing because it stayed in only one computer program and was handled less by the researcher. Excel also made it easier to share data and findings from a research perspective around the globe because of its popularity and availability.

Some research (Fairhurst, 2015; Melard, 2014) supported this idea that Excel is a reliable statistical tool, but it also points to limitations with Excel in research. Excel Data Analysis is an add-on tool for Excel with a conflicting finding compared to other statistical packages like SAS or SPSS programs because Excel is based more on mathematical formulations. SAS and SPSS are used to process statistical operations and problematic statistical analysis theories based on computer programming. Excel also has limited use when going above 65,536 rows of data in statistical calculations lacks non-parametric tests, post-tests, and some ANOVA's. Plus, it can take too long to redo the calculations with a non-programmed approach by using Excel compared to SAS or SPSS.

Excel is spreadsheet software that is open to everyone and relatively inexpensive (Fairhurst, 2015; Melard, 2014; Microsoft, 2020), whereas SAS and SPSS are statistical analysis software programs that are very expensive and have fewer users. Excel has more likelihood of copying and pasting errors with its manual processing than the programming aspect of SPSS and

SAS software. There is no comparison between Excel, SPSS, SAS, and other statistical software (Fairhurst, 2015; Melard, 2014). However, the purpose of quantitative research, statistical findings, and data integrity was to ensure that the research reader and the research methods and tools were appropriate for the research. This is a finance dissertation with a limited scope and testing requirements based on the average investor and the average investor's computer ability, skills, lack of computer programming skills, and costs. Excel meets or exceeds the limitations requirement and was a reasonable choice for analyzing data for most academic and professional research in finance (Fairhurst, 2015; Melard, 2014). This event studies hypothesis, research questions, and the number of variables (stocks) being studied, using Microsoft Excel as the most reliable and appropriate statistical analysis software.

Data Organization Techniques

Data organization is the method of sorting data so that it is useful. The organizational data techniques employed were to sort data from categorization and logical viewpoint and then show the relevant statistics and tables that were pulled and calculated from outside sources and labeled for use. Table and figure data structure are described above or below each table or figure and then explained.

Since all tables and figures came from audited NYSE records, all records were tested and considered reliable and valid. This was also stated on the NYSE (2020) and Bloomberg (2020) websites as all data had a 90% or better rating in accuracy. If any discrepancy was known, this was described in the explanation of the table or figure. Then following the contextual framework of Creswell (2007, 2014) and Yin (2013, 2018), a series of relationships were explored between the collected data and reported without bias. Excel was used as an all-inclusive data management tool since it can do a viable copying and data storage format and operates as statistical analysis

software. Also, Excel is used because it leads credence to the idea that this method of cross analyzing the same data with multiple methods should be easy and readily available to anyone (average person/ investor) with a standard personal computer and the Microsoft Office Suite without having to buy or rent another type of statistical software like SPSS.

The data collection process began by going to the NYSE historical data and looking up the 26 pharmaceutical companies by name and then looking up the S&P 500 historical data from the actual ticker symbol, which was ^GSPC (NYSE, 2020). This data was verified by comparing it to Bloomberg's (2020) data. Once the company had been found, the actual dates needed for the research were entered into the search parameters of the historical data. The two events were the Swine Flu of 2009, which dates April 13, 2009, to July 13, 2009, and the Covid-19 pandemic of 2020 for November 27, 2019, to March 2, 2020. These dates are based on the date of the pandemic announcement by WHO, which is June 11, 2009, and January 30, 2020, respectively. These dates provided a total of 64 days of the timeline as shown in the Swine Flu timeline of 2009 and Coronavirus Pandemic 2020 (Covid-19) from the methodology.

Once the historical data and the dates for the events were obtained, all data was copied to have two sets of the same data. With the second data set, the researcher had to remove some non-essential data from the pasted data that had no bearing or use. By having and working with a copied set of data, any changes would be evident, and there was also an unedited original set of data if questions arise by outside sources for review later if needed. There was a focus on the following data from the historical data: date (Date), open price (Open), daily high price (High), daily low price (Low), daily closing price (Close), Adjusted Closing price (Adj. Close), and stock volume traded (Volume). The researcher removed the Open, High, and Low-price data for all the companies because it had no bearing in this research. This left 64 pieces of daily data

from the stock(s) historical data plus the heading for each of the 26 pharmaceutical companies and the S&P 500 historical data for both pandemics. The 64 pieces coincided with the 42 days pre-event, day of the event (T0) and 21 days post-event (42+1+21 = 64).

The next step was to get each timeline section's CAR (Cumulative Abnormal Return). The median of each cumulative section of the volume and price worksheets were calculated to get the CAR. To calculate the CAR, each grouping of 26 stocks had headers placed above them with dates and numbers. The dates were the dates prior to, during and after the announcement of a pandemic by the WHO. The announcement date was labeled T0. Then the other 63 days are broken down by seven days before and after the announcement labeled T-1 and T1, respectively. Then the 14 days before and after the seven days are labeled T-2 and T2, respectively. Finally, the 21 days prior to the testing period is labeled (EP) for the Estimation Period. For simple viewing, the following color pattern breaks down these periods. For quick reference, the number of days in each section was posted above each heading above in Table 6 Color code for Excel Data with a total of 64 days (21+14+7+1+7+14=64 days).

Table 6

Color Code for Excel Data

21 Days	14 Days	7 Days	1 Day	7 Days	14 Days
EP	T-2	T-1	T0	T1	T2

The next step was to calculate the median value (CAR) of the stock prices and or stock volume for each of the 26 companies for both pandemics. The math formula of =MEDIAN (??:??) is used to calculate the median value. The ??:?? represented the potential cell(s) reference for the cell range in Excel used in the math formula. An example is the range of B2:B23; reflected in the Excel formula as =MEDIAN (B2:B23). This process was repeated five times for

each company's data set. A median value was not compiled on the T0 date since it was just one day with one value. The CAR data was now six columns of data for the 26 companies. These can be viewed in their entirety in Appendix E to Appendix H.

The final step was to run the t-Test on the data. A t-Test is used to determine whether two variables were significantly different using statistical formulas (Morgan et al., 2013). The data in this research was being used for hypothesis testing, which was the basis of inferential statistics, which was used to ascertain the authenticity of a claim against a given variable. According to statisticians, a one-tail t-test is used for hypothesis testing (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015), but the data has to be the test's specific direction must be known. If we do not know the direction (tail) of our t-Test or load the variables backward in statistical formulas, the researcher will get the wrong answer. A two-tail *t*-test has its benefits, and the researcher does not know a direction (tail) or does not make a difference in the results. Whereas a two-sided *t*-Test is used to find out if a sample means it is more than and less than the population mean (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015); and the result of the tail of the test is directional concerning the way the variables are loaded in the statistical software or how the statistics are calculated.

Excel does not have a one-tail *t*-Test built into the data analytics section as a single function. The only way to run the one-tail *t*-Test is to run the two-tail t-Test (Microsoft, 2020). The two-tail test results are double the value of a one-tail test and reflect both sides of the testing results with a slight difference as noted in the p-value and were recommended when the hypothesis said no change in findings. Alternatively, the direction of the tail of the test does not have to be known. A tailed test (left or right) is based on the alternate hypothesis of greater than

findings are a right-tailed test, and less than findings are a left-tailed test. This can be seen below in

Figure 8

Two-Tail Bell Curve or (Gaussain Distribution), which shows a two-tailed test with 95% of the data laying in the center and 5% of the data at the two ends split between two sides equally.

Figure 7

One-Tail and Two-Tail Bell Curve

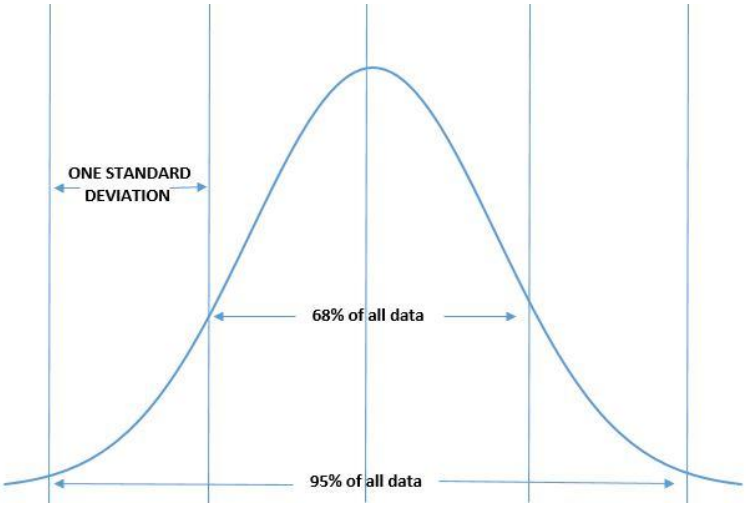


Figure 9

One-Tail Test below shows just the one-tail of the test but notice the p-value at the top of the curve at 95%, with the 5% reflected below on the left in red. Hence, a left-tailed test is pictured in

Figure 9

One-Tail Test because the tail points to the left of the center.

Figure 8

Two-Tail Bell Curve

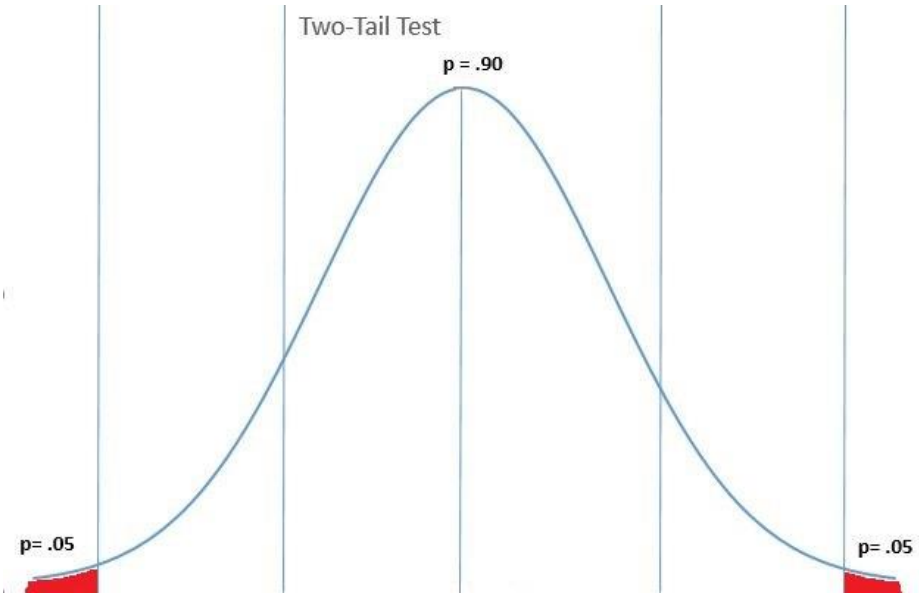
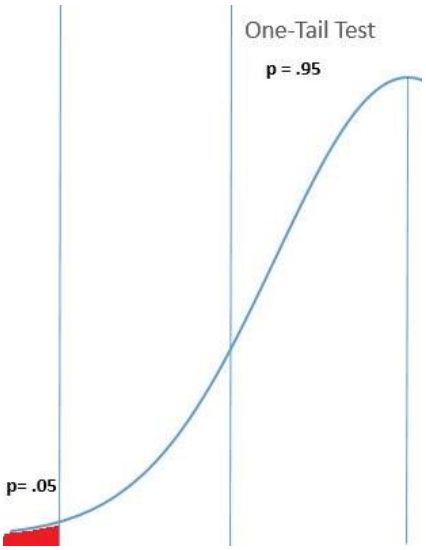


Figure 9 could be inverted with the same numbers but would be called a right-tailed test because the tail would point to the right of the center. This is slightly different from the two-tailed test pictured in Figure 8: Two-Tail test because it shows both tails simultaneously.

Figure 9

One-Tail Test



However, Figure 8 is slightly different because it has a p-value of 90% at the peak and 5% equally on each side of the bell curve (Gaussain Distribution) reflected in the red color area. This is because it is not known the direction of the tail. It has to maintain a .05% p-value or confidence interval for each direction. This is the case since the statistical outcome to the stock price, or volume could be either a right-tail or a left-tail result because there could have been a statistically significant gain or a statistically significant loss in stock prices and stock volume.

This t-Test is repeated for each of the testing periods of the stock price and the stock volume for both pandemics yielding five sets of statistical findings per part of the event study. These five data sets are based on the Estimation Period (EP) versus the five T-2, T-1, T0, T1 and T2 testing periods. The t-Test results show the mean for each of the data sets for each variable, the variance for each variable, the number of observations in each variable, the pooled variance

value, the hypothesized mean difference, the degrees of freedom (abbreviated as df), the t-value (or t-Stat), and the probability values for the one-tail test, two-tail test and the t Critical one-tail and the t Critical two-tail calculations.

The t Critical two-tail test findings will always be bigger than the t Critical one-tail results because our data is skewed because of the change in p-value from the one-tailed or the two-tailed test. Data from the two-tail test is used; as stated earlier, our statistical significance could be from either a gain or loss reflected in either stock price or volume. The tail of the test is usually referred to as a directional test or directional hypothesis (Morgan et al., 2013) and is revealed in the two-tailed findings to be discussed in the interpretation of data section later.

The tail of the test is used in statistics to determine the region of distribution or if data is more or less than a specific value. In statistics, if the data (tail or t-Stat) lies in the opposite region of the test results, it will accept the alternate hypothesis, not the null hypothesis. This depends on which side the variables are in the t-Test pop-up window. Since the hypothesis testing with a potential for statistical significance in either direction, it is unknown which side the data (variable) should be on. However, to run a two-tail test, the statistical software (Excel) output will answer the question about the direction of the tail or if the data is statistically significant. However, the two-tail test and the direction of the tail are two different statistical tests and reveal two different sets of information to the reader of the test results (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015).

To interpret the findings; look at the output data by comparing the two-tail p-value P (T<=t) two-tail against our significance level or (alpha/ confidence level of 0.05), which we typed (or defaulted) into the Excel calculation before the findings are shown.

Figure 10

t-Test: Two-Sample Assuming Unequal Variances
EP vs. T2

	14.0352381	*15.06714*
Mean	16.2315429	17.88117
Variance	211.018734	218.1455
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.3981479	
P(T<=t) one-tail	0.34614331	
t Critical one-tail	1.6772242	
P(T<=t) two-tail	0.69228661	
t Critical two-tail	2.01063476	

The p-value P (T<=t) two-tail is also called the significant or Sig in statistics. value (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015). If the p-value P (T<=t) two-tail is larger than the alpha, the rule is to not reject the null hypothesis and that there is no statistically significant difference in the findings. If the confidence level (alpha) is bigger than the p-value P (T<=t) two-tail, there is a statistically significant difference in the findings, then Reject the Null Hypothesis and Accept the Alternate Hypothesis should be used.

By running a two-tail t-test Assuming Unequal Variances, the other revealed data could clash with the findings. In Excel, if the t-Stat output is positive, the reported p-value P (T<=t) two-tail is a right-tailed result, or the t-Stat is more positive. The opposite is also true. If the t-Stat is negative, the p-value P (T<=t) two-tail is a left-tailed output, or the t-Stat is more negative. So, it is possible to have the results of a two-tailed test P(T<=t) two-tail if the tail is left

tailed (negative numbers) to reject the Null Hypothesis, where the findings of the two-tailed test (Positive Number) will not reject the Null Hypothesis by using the t-Stat result findings. There could be conflicting information from the results of the two-tailed test that must be considered in lieu of looking at the one-tailed test or two-tailed test findings since they are both present in the statistical findings.

To understand the relationship between the t-Stat and the p-value P (T<=t) two-tail, a researcher must return to the concept of hypothesis testing (one-tailed t-Test) and look at the t critical finding for the one-tailed test and the two-tail test in relation to the 95% confidence interval and 5% confidence level. The p-value P (T<=t) two-tail or P (T<=t) one-tail is the real number that represents the 5% value in the statistical formula for the t-Test findings. The question is, where does the t-Stat number lay concerning that p-value P (T<=t) one-tail or p-value P (T<=t) two-tail result? Does the t-Stat lie in the center with 95% of the data making it not statistically significant, or does it fall outside of the 5%, making it statistically significant? The last factor is to remember that the t Critical number by default is a right-hand test number, an absolute number, or always positive when shown in results. If it is a left-hand test, t Critical number is negative. Hence, if the t-Critical number is a negative and the t-Stat is positive, they do not lie in the same region and are conflicting because you are running a left-tailed test with right-tailed results or vice versa. When interpreting the results, the researcher must hypothesize that they are running the right-tailed test and then the left-tailed test by itself. Does the t-Stat number support or disprove the findings of a tailed test (either right or left)?

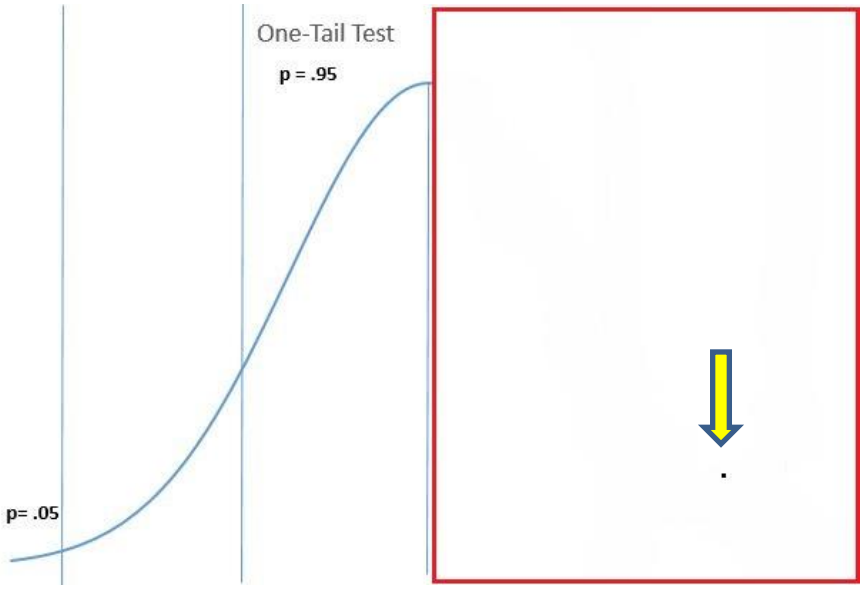
For the example to explain the above statement in findings from the t-Test results are being interpreted, and certain things like the tail direction of our tests based on our tests on t-Stat positive or negative numbers are also known. Therefore, first, we look at the t-Stat and see

whether it is positive or negative. In Figure 10, the number is negative, so it is a left tail test result. The 5% value would be t Critical 2.01 for a right two-tailed test or -2.01 for a left two-tailed test. Alternatively, the t Critical two-tail of 1.678 for the right one-tailed t-Test or -1.678 rounded for a left one-tailed t-Test. Then there was a comparison of the t-Stat to the number(s) in the prior statement(s) individually. Is the t-Stat more or less than the t Critical value? Since -.398 tells us this is a left-tailed test. We use the negative value of the t-Critical, which is -1.678 or -2.01. Both the t-Stat and the t Critical are negative, so the findings of the tail of the test are still not statistically significant, and one cannot reject the null hypothesis whether it is a two-tailed t-Test or a one-tailed t-Test where the opposite could be true if the t-Stat were positive.

This interpretation of the findings is not running just one t-Test and calling a tail direction. There are multiple t-Test results in the findings. What happens if the t-Stat is now positive compared to negative in the above example (Example: .398)? For example, 4 out of 5 t-Tests have a negative t-Stat, and the fifth t-Test has a positive t-Stat. The researcher knows they are running a left-tailed test based on the number of t-Test's findings, so why is a positive number in the t-Stat? The findings based on a one-tailed left t-Test (negative t-Stat findings overall) have results that appear in the non-existing right-tailed t-test area for a hypothesized single directional tailed test (shown below by a red box). Test results conflict with other t-Test test results, and based on this, the null hypothesis has to be rejected, and the alternate hypothesis accepted (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015). Further research is required to explain test findings. This can be seen below in where the dot represents the positive .398 in the red box opposite the left tailed test area.

Figure 11

Left-Tailed t with Positive t



Summary of Data Collection

A successful data compilation and data compilation usage are more than just putting random pieces of information together. There is so much data available that the human mind cannot process it in reality. The data collection and analysis processes require summarizing various information into a coherent flow. All of the original data was audited, tested, verified, validated, and considered reliable with over 90% percent accuracy per the disclaimers on the data on the primary website(s) for data collection. The data holds the same standard since it was not changed in any form; just copied and pasted in Excel for analysis. Then the finding from this event study, if presented logically, should hold the same standards since no information was changed from the source and the presentation of said data in this research. A researcher needs to

be careful if the researcher decides to use the one-tail test or the two-tail test and if the direction of the tail is known. Using the two-tail test is a more conservative way to analyze data and will pick up a larger difference in the variables; but can miss the smaller significant less than the difference on the other side of the findings from the one-tailed test, which is half the results of the two-tailed test findings because of the change in the p-value as noted in

Figure 9

One-Tail Test.

Data Analysis

The data analysis was based on Creswell's (2007, 2014) and Yin's (2013, 2018) research and was quantitative and used secondary sources and a qualitative approach to put them all together using the most logical flow and interpretations (Babones, 2016). The findings are compiled, categorized, and presented logically using a causal relationship. This was accomplished by bringing order, structure and meaning from various information in a qualitative manner for quantitative data in an interpretive method (Babones, 2016). The data collected included stock prices, ROR, and outstanding company share volume traded. After compiling the

equity data for these assumptions, data was analyzed, and the t-Test results were interpreted based on the probability value (p) using statistics p-value P (T<=t) two-tail and the t-Stat results.

Variables Used in the Study

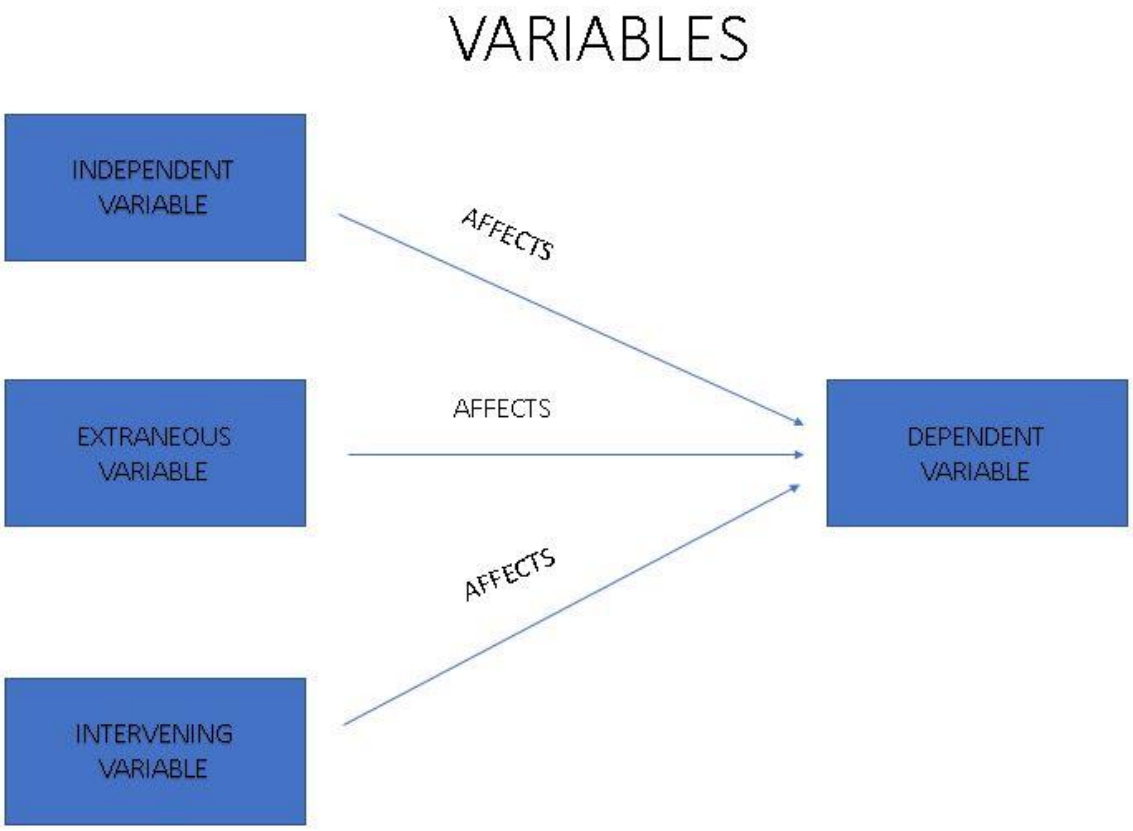
This event study had an independent, dependent, extraneous, and intervening variable(s) (Creswell, 2007, 2014; Yin, 2013, 2018). An independent variable is a variable that affects the dependent variable and is not affected by a dependent variable (Creswell, 2007, 2014; Yin., 2013, 2018). An independent variable is a reason for a change in the dependent variable. The announcement of a pandemic was the proposed independent variable that affected the dependent variable of the pharmaceutical stock prices of the healthcare sector of the NYSE. Other variables in the research were extraneous variables (Creswell, 2007, 2014; Yin, 2013, 2018). In every research project, some variables can affect both the independent and dependent variables.

This event study attempted to mention some extraneous variables, but these variables were not studied and may or may not have affected the outcome. Extraneous variables are only mentioned because the researcher knew other factors could cause the stock market to react a certain way. However, this event study did not look at those factors but was mentioned as other events during the timeline. There was no possible way to know if the extraneous variable listed affected pharmaceutical stock(s), the healthcare sector, or any other sector of the NYSE. However, the events took place during the time window and could have affected the event study.

The last element was an intervening variable. An intervening variable is different from the dependent variable, the independent variable, and the extraneous variable. An intervening variable is needed to help the independent variable affect the dependent variable (Creswell, 2007, 2014; Yin, 2013, 2018). This event study has an intervening variable of the World Health Organization (WHO). This was because the announcement of a pandemic by the WHO was the

determining factor of if a disease/ pathogen/epidemic became a pandemic and potentially did or did not affect the stock price or stock trading volume. The relationship of the variables to each other can be seen below in Figure 12.

Figure 12 *Variable Relationship*



Summary of Data Analysis

Data analysis is a process of transforming and modeling various pieces of information in a useful manner to discover information not presented in the original data hopefully. This is the same basic principle with painting. Not until each brushstroke and color is applied (explained) can one see what the artist wants to show you. Various pieces of financial information were collected and painted a picture. If the pharmaceutical sector of the stock market does not generate a significant abnormal return, then investors have one more piece of information of what not to do and where not to invest during a pandemic for statistically significant results financially.

Reliability and Validity

Except in the application of statistics, the terms' reliability and validity are interchangeable, except they have different meanings. Reliability is the consistency, and validity is whatever was used to measure something; measured what it was supposed to measure (Creswell, 2007, 2014; Yin, 2013, 2018). These terms are not synonymous. An example is a thermometer. Due to outside testing, one knows the thermometer is one degree off. Every time the boiling water is measured, it gives the same temperature; therefore, it is reliable. However, it is not valid; because it is unknown if it is a degree off and, therefore, gives the wrong temperature (Creswell, 2007, 2014).

Reliability

The reliability of this event study was based on four principles. They were understandability, relevance, comparability, and reliability. The understandability was based on the information being presented clearly, with supporting information supplied so that there was no clarification of meanings needed. The information was relevant because it met the needs of the research project and the college writing requirements without omission or misstatement of facts. This might be used either as proof of support for or against the idea that a pandemic affected the United States stock market ROR of the pharmaceutical sector (Creswell, 2007, 2014). This research is comparable to the actual documents used for research, and all relevant data is shown. Finally, there is reliability because the document is free of bias, has no errors, and is not misleading. The facts presented are faithfully represented as true, state the underlying substance of events, and prudently present all estimates, claims and disclosures. This makes reliability a consistent measurement.

The data reliability should be well established as it is publicly published information. The data was audited with strict government oversight that states it has a 90% chance of accuracy and a standard value of 1.6 error rate for the entire data population per the original posting websites disclaimers. All data was also categorized according to the GAAP standards for accounting. The non-sampling error was also addressed as information was always collected and available during calculations. Notes were made on all statistical data when there was a lag or change in information. This event study had made every attempt to report all such known lags an adjustment if they had a bearing or effect when the data was recorded and used.

Validity.

The validity hinges on factors influencing the findings of a study beyond the researcher's control (Creswell, 2007). Van Manen (2014) stated that a study must suspend personal bias. Miles et al. (2013) put forth that validity is a contested term among qualitative researchers and offers another term instead, academic rigor. To address these issues of validity:

- The researcher’s role and relationship to the study have been addressed.
- The research questions and the design of the study were aligned.
- There was meaningful parallelism between the data presented and the research questions and hypotheses.
- Quality checks had been made for errors and deceit.
- Peer and colleague reviews had taken place.
- Data presented was linked to prior research work.
- Any areas of uncertainty were identified.
- When possible, math and finding had been duplicated.
- Positive as well as negative information had been presented.

Summary of Reliability and Validity

Heeding the words of Creswell (2007, 2014) and Yin (2013, 2018), issues of validity and reliability were addressed by having work checked by others to review the accuracy of data, the analysis, interpretations of data, and the conclusion drawn. The reliability and validity of the data are as important as the research outcome. This section of the research project should have made a case for the reliability and validity of the data and the findings from the research.

Section 3: Application to Professional Practice and Implications for Change

Over the last century, the finance industry has given the world countless scandals and stories about financial professionals who have deceived investors, employees, and governmental agencies. In many cases, greed is the underlying factor (NYSE, 2020). However, most inappropriate behavior lies in unethical practices and a lack of education about the basic principles of finance. This event study expanded upon the efficient market hypothesis and helped clarify how to handle chaotic times in the market during a pandemic. It also expanded on knowing where to invest one's money to get a good rate of return. By knowing the basics of finance and encouraging higher ethical standards, financiers can take a leading role in the fair and transparent behavior of the equities market.

Overview of the Study

This event study looked to combine popular fiancé theories into a comprehensive study that dissected the behavior of the pharmaceutical sector of the NYSE. It was also done to determine if the same information in different ways resulted in an abnormal return generated by the stock market's pharmaceutical sector during a pandemic. Using the market theory and MPT, the researcher looked to see if stock market ROR generated a positive abnormal return in the pharmaceutical sector of the NYSE during the last two pandemics. By doing this research, another anomaly in the stock market or prove Fama's (1970) theory that the whole market is efficient or not would be found. Either way, the bigger picture of finance has provided another part in the financial knowledge of how or where someone should invest their funds during a pandemic.

Presentation of the Findings

The following part shows the research findings concerning the data, literature review, and proposed research questions. Each finding is presented and how the data was interpreted from the research design method. Also, the data is presented how it was described in the data collection section as described above and referenced with each interpretation.

Introduction to Findings

The researcher was looking to examine the effect of the announcement of a pandemic on 26 stocks from the pharmaceutical sector of the NYSE and to see if the pandemics generated a positive abnormal return in the pharmaceutical sector stocks; resulting in the EMH failing again in data from the last two pandemics to affect the NYSE. It must be pointed out is that every pandemic studied coincided with other major events in the United States. Every pandemic was in the year of a United States presidential election. Coincidentally, there have also been epidemics that align with elections, even though not pandemics. These epidemics/ pandemics are the SARS epidemic of 2004, the Avian Flu of 2008, MERCER of 2012, ZIKA of 2016 and now the Corona Pandemic (COVID-19) of 2020 (WHO, 2020).

Other research has shown the effects of presidential events on stock prices (Daniel & Hirshleifer, 2015; Elbe, 2008; Karolyi & Martell, 2010; Wang, 2016). However, because of the dates of the pandemics, there is no actual proof of an election having any effect on this event study, except to say that the pandemics took place in or during the years of the United States presidential elections. As noted in the literature review, President Donald Trump was impeached and acquitted during the start of the Covid-19 outbreak of 2020. At the point of the writings, there is no research to say if this did or did not affect the NYSE. Another factor that must be kept in mind is that eight of the 26 pharmaceutical companies are included in the S&P 500 list. As of

March 2020, they were Abbott Laboratories, Allergan plc, Bristol-Myers Squibb Company, Eli Lilly and Company, Johnson and Johnson, Merck and Company, Inc., Perrigo Company, and Pfizer, Inc. The S&P 500 is a stock market index that measures the stock performance of 505 of the largest companies listed on stock exchanges in the United States (NYSE, 2020). Out of these 505 companies, 61 are healthcare-related companies per their description in the S&P and NYSE (NYSE, 2020). In some ways, comparing the pharmaceutical stock to the S&P 500 is appropriate because some of the pharmaceutical companies in this study are in the S&P 500 data.

Research Questions and Hypotheses

Research Question 1

RQ1. What is the difference between the pharmaceutical stocks' rate of return before and after the announcement of a pandemic by the WHO?

Research Question 2

RQ2. What is the difference in the volume of pharmaceutical stock traded before and after the announcement of a pandemic by the WHO?

Hypotheses 1.

$H1_0$ – There is no statistically significant difference in the pharmaceutical stocks' rate of return after the announcement of a pandemic by the WHO.

$H1_a$ - There is a statistically significant difference in the pharmaceutical stocks' rate of returns after the announcement of a pandemic by the WHO.

Hypotheses 2.

$H2_0$ – There is no statistically significant difference in the volume of pharmaceutical stock traded after the announcement of a pandemic by the WHO.

$H2_a$ - There is a statistically significant difference in the volume of pharmaceutical stock traded after the announcement of a pandemic by the WHO.

Results and Findings

Findings for Research Question 1

Research Question 1 asked if there was a difference between the pharmaceutical stocks' rate of return (ROR) before and after announcing a pandemic by the World Health Organization (WHO). This question is answered by hypothesis 1, which says there is no statistically significant difference in the pharmaceutical stocks' rate of return after announcing a pandemic by the WHO. The ideas behind these hypotheses and research questions were based on Fama (1970) and Pilkington (2017), who stated that the market is efficient, prices are directly reflective of events and will trade at their fair market value. Daniel and Hirshleifer (2015) argued that the market is affected by outside events. This is the premise behind hypothesis one ($H1_0$), which states there is no statistically significant difference in the aggregate pharmaceutical sector stock(s) rate of return after announcing a pandemic by the WHO. The complete cumulative table for the findings below can be seen in Appendix E Swine Flu of 2009 Price CAR Table and Appendix F: Covid-19 of 2020 Price CAR Table.

The two-tailed t-Test for the stock rate of return is shown in the following five figures for the Swine Flu of 2009 and five figures for the Covid-19 of 2020 findings.

SWINE FLU of 2009

Figure 13

t-Test Two-Sample Assuming Unequal Variances EP vs. T-2

	13.95	*14.37*
Mean	15.974	16.3338
Variance	204.0678	195.4415
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.090005	
P(T<=t) one-tail	0.464329	
t Critical one-tail	1.677224	
P(T<=t) two-tail	0.928658	
t Critical two-tail	2.010635	

Figure 14

t-Test Two-Sample Assuming Unequal Variances EP vs. T-1

	13.95	*14.46*
Mean	15.974	16.628
Variance	204.067833	188.9193
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.1649524	
P(T<=t) one-tail	0.4348371	
t Critical one-tail	1.6772242	
P(T<=t) two-tail	0.86967419	
t Critical two-tail	2.01063476	

Figure 15

t-Test Two-Sample Assuming Unequal Variances EP vs. T0

	13.95	*14.4*
Mean	15.974	16.8264
Variance	204.0678	188.3741
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.215142	
P(T<=t) one-tail	0.415284	
t Critical one-tail	1.677224	
P(T<=t) two-tail	0.830568	
t Critical two-tail	2.010635	

Figure 16

t-Test Two-Sample Assuming Unequal Variances EP vs. T1

	13.95	*14.84*
Mean	15.974	16.5664
Variance	204.067833	176.04133
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.1519256	
P(T<=t) one-tail	0.43994121	
t Critical one-tail	1.6772242	
P(T<=t) two-tail	0.87988242	
t Critical two-tail	2.01063476	

Figure 17

t-Test Two-Sample Assuming Unequal Variances EP vs. T2

	13.95	*15.105*
Mean	15.974	18.179
Variance	204.0678	238.7895
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.523898	
P(T<=t) one-tail	0.30138	
t Critical one-tail	1.677224	
P(T<=t) two-tail	0.60276	
t Critical two-tail	2.010635	

The complete cumulative table for the findings below can be seen in Appendix: F COVID-19 of 2020 Price CAR Table.

COVID 19 of 2020

Figure 18

t-Test Two-Sample Assuming Unequal Variances EP vs. T-2

	85.61	*86.02*
Mean	50.7572	51.6368
Variance	2273.63	2421.122
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.06419	
P(T<=t) one-tail	0.474544	
t Critical one-tail	1.677224	
P(T<=t) two-tail	0.949088	
t Critical two-tail	2.010635	

Figure 19

t-Test Two-Sample Assuming Unequal Variances EP vs. T-1

	85.61	*89.73*
Mean	50.7572	52.68
Variance	2273.63	2428.6039
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.1402	
P(T<=t) one-tail	0.444544	
t Critical one-tail	1.677224	
P(T<=t) two-tail	0.889088	
t Critical two-tail	2.010635	

Figure 20

t-*Test*: Two-Sample Assuming Unequal Variances

EP vs. T0

	85.61	*89.16*
Mean	50.7572	52.4776
Variance	2273.63	2441.57
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.12527	
P(T<=t) one-tail	0.450416	
t Critical one-tail	1.677224	
P(T<=t) two-tail	0.900832	
t Critical two-tail	2.010635	

Figure 21

t-Test Two-Sample Assuming Unequal Variances EP vs. T1

	85.61	*88.23*
Mean	50.7572	53.2252
Variance	2273.63	2513.4473
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.17835	
P(T<=t) one-tail	0.429598	
t Critical one-tail	1.677224	
P(T<=t) two-tail	0.859197	
t Critical two-tail	2.010635	

Figure 22

t-Test Two-Sample Assuming Unequal Variances EP vs. T2

	85.61	*87.955*
Mean	50.7572	52.6754
Variance	2273.63	2533.702
Observations	25	25
Hypothesized Mean Difference	0	
df	48	
t Stat	-0.13833	
P(T<=t) one-tail	0.44528	
t Critical one-tail	1.677224	
P(T<=t) two-tail	0.890559	
t Critical two-tail	2.010635	

The output data needs to be compared by the two-tail p-value P (T<=t) two-tail against our significance level or (alpha/ confidence level of 0.05). If the p-value P (T<=t) two-tail is larger than the alpha, to not reject the null hypothesis and that there is no statistically significant difference in the research findings are correct o interpret the findings above for stock ROR. In all ten of the figures (Figure 12 thru Figure 22), all of the p-values P (T<=t) two-tail are larger than

the alpha. For the Swine Flu, the p-value P (T<=t) two-tail ranges from .92 to .60, respectively. In the Covid-19 figures, they range from .94 to .89, respectively. Since the findings are not statistically significant, a conclusion can be made that the answer to research question 1 is Not a Statistically Significant Difference between the pharmaceutical stocks' rate of return before and after the announcement of a pandemic by the WHO.

If the t-Stat output is positive, the reported p-value P (T<=t) two-tail is a right-tailed result or positive. In contrast, the opposite is also true. If the t-Stat is negative, the p-value P (T<=t) two-tail is a left-tailed output. This is a completely different set of findings from the statistical analysis because the t-Stat and the p-value P (T<=t) two-tail are different statistical tests than a t-Test and measure different things. All of the results of the t-Stat are negative. This is a left-tailed test. According to statistics (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015), the researcher should not reject the null hypothesis based on the negative t-Stat finding in a left-tailed test. Therefore, this data set supports the prior statements to not reject the null hypothesis and notes that the findings are not statistically significant.

Table 7 is a left tail test because of the negative t-Stat numbers. Table 7 has one strange anomaly (noted by ****), which can be seen in the highlighted cells adjacent to the ****. This is the change in numbers in EP vs. T2 from Table 7

Swine Flu t-Stat and Two-Tail Test Price Data of -.5239 for t-Stat and .60276 for the two-tailed test though not statistically significant. All other numbers in the t-Stat range from -.09001 to -.21514. However, EP vs. T2 jumped to -.5239, which is over twice the other numbers, with the highest being -0.21514. The two-tailed test changed to .60276, with the other numbers being in the range of 0.830568 to 0.928658, which is a .26 minimum drop in the findings result (though not statistically significant).

Table 7

Swine Flu t-Stat and Two-Tail Test Price Data

SWINE FLU of 2009 PRICE					
EP vs. T-2	t Stat	-0.09001	P(T<=t) two-tail	0.928658	
EP vs. T-1	t Stat	-0.16495	P(T<=t) two-tail	0.869674	
EP vs. T0	t Stat	-0.21514	P(T<=t) two-tail	0.830568	
EP vs. T1	t Stat	-0.15193	P(T<=t) two-tail	0.879882	
Ep vs. T2	t Stat	-0.52390	P(T<=t) two-tail	0.602760	****

A similar finding is found in in EP vs. T-2 t-Stat is -.06419, which deviates from the other t-Stats, which range from -.12527 EP vs. T0 to -.17835 in EP vs. T1.

Table 8

Covid-19 t-Stat and Two-Tail Test Price Data

COVID 19 of 2020 PRICE					
EP vs. T-2	t Stat	-0.06419	P(T<=t) two-tail	0.949088	****
EP vs. T-1	t Stat	-0.14020	P(T<=t) two-tail	0.889088	
EP vs. T0	t Stat	-0.12527	P(T<=t) two-tail	0.900832	
EP vs. T1	t Stat	-0.17835	P(T<=t) two-tail	0.859197	
Ep vs. T2	t Stat	-0.13833	P(T<=t) two-tail	0.890559	

As mentioned earlier, the results for RQ1 were based on the findings from the two-tailed t-Test and the one-tailed t-Test, which is used for hypothesis testing (Morgan et al., 2013). Only run a two-tailed test can be run to get the one-tailed results. Since there are two data sets, the two sets must be presented and discussed in the findings.

The findings in Table 9: Swine Flu of 2009 Price One-Tail vs. Two-Tail Comparison and Table 10: Covid-19 of 2020 Price One-Tail vs. Two-tail Comparison show that the results are still the same one-tail test is half of the two-tailed test findings. A conclusion can be drawn that the findings are not statistically significant, and the answer to RQ 1 is still that there is not a statistically significant difference between the pharmaceutical stocks' rate of return before and after the announcement of a pandemic by the WHO. However, all findings are positive, and there are two abnormalities in the test results, though not statistically significant towards this research.

Table 9

Swine Flu of 2009 Price One-Tail Vs. Two-Tail Comparison

Swine Flu of 2009 Price One-Tail vs. Two-Tail			
P(T<=t) one-tail	0.464329	P(T<=t) two-tail	0.928658
P(T<=t) one-tail	0.434837	P(T<=t) two-tail	0.869674
P(T<=t) one-tail	0.415284	P(T<=t) two-tail	0.830568
P(T<=t) one-tail	0.439941	P(T<=t) two-tail	0.879882
P(T<=t) one-tail	0.301380	P(T<=t) two-tail	0.602760

Table 10

Covid-19 of 2020 Price One-Tail vs. Two-tail Comparison

Covid-19 of 2020 Price One-Tail vs. Two-Tail			
P(T<=t) one-tail	0.474544	P(T<=t) two-tail	0.949088
P(T<=t) one-tail	0.444544	P(T<=t) two-tail	0.889088
P(T<=t) one-tail	0.450416	P(T<=t) two-tail	0.900832
P(T<=t) one-tail	0.429598	P(T<=t) two-tail	0.859197
P(T<=t) one-tail	0.445280	P(T<=t) two-tail	0.890559

Findings for Research Question 2

Research Question 2 asked, what is the difference in the volume of pharmaceutical stock traded before and after the announcement of a pandemic by the WHO? This question is answered by hypothesis 2, which says there is a statistically significant difference in the volume of pharmaceutical stock traded after the announcement of a pandemic by the WHO. The second hypothesis ($H2_0$) supports the work of Thaler and Shiller (2015) who, like Charron (2015) and Daniel and Hirshleifer (2015), explained the rational market. The second hypothesis ($H2_0$) determined if a flaw existed in the EMH, which did not look at stock prices, but stock volume. When a stock is trading in larger than normal stock volume, it would be an indicator of a flaw in the market that could be exploited and used to predict the movement of a stock and hence a flaw in the EMH (Wenjing, 2017). This in itself is the basis of supply and demand, which is an underlying basis of EMH. Supply and demand say low availability and high demand with increase a stock price; whereas the opposite is true and high availability and low demand will decrease the stock price. Increased movement of the volume of stock would indicate a potential area to exploit or an anomaly in the market (Wang, 2016). The complete cumulative table for the findings below can be seen in Appendix G: Swine Flu of 2009 Volume CAR Table and Appendix H: Covid-19 of 2020 Volume CAR Table.

The results of the two-tailed t-Test for stock volume are shown in the following five figures for the Swine Flu of 2009 and five figures for the Covid-19 of 2020 findings:

SWINE FLU of 2009

Figure 23

t-Test Two-Sample Assuming Unequal Variances EP vs. T-2

	-2168300	*26900*
Mean	4844448.077	9331309.615
Variance	5.95443E+14	2.23769E+15
Observations	26	26
Hypothesized Mean Difference	0	
df	37	
t Stat	-0.429829091	
P(T<=t) one-tail	0.334906498	
t Critical one-tail	1.68709362	
P(T<=t) two-tail	0.669812997	
t Critical two-tail	2.026192463	

Figure 24

t-Test Two-Sample Assuming Unequal Variances EP vs. T-1

	-2168300	*-1872000*
Mean	4844448.077	-2881226.923
Variance	5.95443E+14	2.16464E+14
Observations	26	26
Hypothesized Mean Difference	0	
df	41	
t Stat	1.382516069	
P(T<=t) one-tail	0.08714908	
t Critical one-tail	1.682878002	
P(T<=t) two-tail	0.17429816	
t Critical two-tail	2.01954097	

Figure 25

t-Test Two-Sample Assuming Unequal Variances EP vs. T0

	-2168300	*-1673500*
Mean	4844448.077	5914400
Variance	5.95443E+14	5.76877E+14
Observations	26	26
Hypothesized Mean Difference	0	
df	50	
t Stat	-0.15934113	
P(T<=t) one-tail	0.437021019	
t Critical one-tail	1.675905025	
P(T<=t) two-tail	0.874042037	
t Critical two-tail	2.008559112	

Figure 26

t-Test Two-Sample Assuming Unequal Variances EP vs. T1

	-2168300	*-1239900*
Mean	4844448.077	6507023.077
Variance	5.95443E+14	1.10963E+15
Observations	26	26
Hypothesized Mean Difference	0	
df	46	
t Stat	-0.205303297	
P(T<=t) one-tail	0.419120499	
t Critical one-tail	1.678660414	
P(T<=t) two-tail	0.838240997	
t Critical two-tail	2.012895599	

Figure 27

t-Test Two-Sample Assuming Unequal Variances EP vs. T2

	-2168300	*-114500*
Mean	4844448.077	3184423.077
Variance	5.95443E+14	3.09926E+14
Observations	26	26
Hypothesized Mean Difference	0	
df	45	
t Stat	0.281312167	
P(T<=t) one-tail	0.389880258	
t Critical one-tail	1.679427393	
P(T<=t) two-tail	0.779760516	
t Critical two-tail	2.014103389	

The complete cumulative table for the findings below can be seen in Appendix: H COVID-19 of 2020 Volume CAR Table.

COVID-19 of 2020

Figure 28

t-Test Two-Sample Assuming Unequal Variances EP vs. T-2

	47050	*646800*
Mean	-1746444.231	4280317.308
Variance	8.42662E+13	4.42522E+14
Observations	26	26
Hypothesized Mean Difference	0	
df	34	
t Stat	-1.338914123	
P(T<=t) one-tail	0.094741145	
t Critical one-tail	1.690924255	
P(T<=t) two-tail	0.189482291	
t Critical two-tail	2.032244509	

Figure 29

t-Test Two-Sample Assuming Unequal Variances EP vs. T-1

	47050	*263500*
Mean	-1746444.231	2121742.308
Variance	8.42662E+13	1.29201E+14
Observations	26	26
Hypothesized Mean Difference	0	
df	48	
t Stat	-1.34998272	
P(T<=t) one-tail	0.091676739	
t Critical one-tail	1.677224196	
P(T<=t) two-tail	0.183353478	
t Critical two-tail	2.010634758	

Figure 30

t-Test Two-Sample Assuming Unequal Variances EP vs. T0

	47050	*1333800*
Mean	-1746444.231	8982176.923
Variance	8.42662E+13	1.6011E+15
Observations	26	26
Hypothesized Mean Difference	0	
df	28	
t Stat	-1.332550387	
P(T<=t) one-tail	0.09671148	
t Critical one-tail	1.701130934	
P(T<=t) two-tail	0.19342296	
t Critical two-tail	2.048407142	

Figure 31

t-Test Two-Sample Assuming Unequal Variances EP vs. T1

	47050	*-252900*
Mean	-1746444.231	-5448569.231
Variance	8.42662E+13	7.29463E+14
Observations	26	26
Hypothesized Mean Difference	0	
df	31	
t Stat	0.661755908	
P(T<=t) one-tail	0.256508526	
t Critical one-tail	1.695518783	
P(T<=t) two-tail	0.513017052	
t Critical two-tail	2.039513446	

Figure 32

t-Test Two-Sample Assuming Unequal Variances EP vs. T2

	47050	*465400*
Mean	-1746444.231	9451363.462
Variance	8.42662E+13	2.17377E+15
Observations	26	26
Hypothesized Mean Difference	0	
df	27	
t Stat	-1.201583288	
P(T<=t) one-tail	0.119979537	
t Critical one-tail	1.703288446	
P(T<=t) two-tail	0.239959073	
t Critical two-tail	2.051830516	

Before interpretation of the findings of stock volume, there is one noticeable difference in Figures 23 thru 32 above. This difference is the number of observations in these figures compared to the numbers in stock price. There are 26 observations in the stock volume which is one more than the number of observations in stock price at 25 observations in Figures 13 thru 22.

In the stock volume data, a new number was added; the overall volume of stock traded on the S&P 500 compared to the number of stock trades in the pharmaceutical sector of the NYSE.

To interpret these findings for stock volume, the output data in the figures compare the two-tail p-value P (T<=t) two-tail against the significance level or (alpha/ confidence level of 0.05). If the p-value P (T<=t) two-tail is larger than the alpha. The results mean not reject the null hypothesis and that there is no statistically significant difference. In all 10 of the figures (Figure 23 thru Figure 32), all of the p-values P (T<=t) two-tail are larger than the alpha of .05. For the Swine Flu, the p-value P (T<=t) two-tail ranges from .66 to .87. In the Covid-19 figures, it ranges from .18 to .51. Since the findings are not statistically significant, a conclusion can be drawn that the answer to research question 2 is not a statistically significant difference between the pharmaceutical stocks' volume before and after the announcement of a pandemic by the WHO.

With these findings of stock volume, there is another anomaly in the data. In the Swine Flu results, the EP vs. T-1 (Figure 24

t-Test Two-Sample Assuming Unequal Variances EP vs. *T-1*) made a drop (though not statistically significant) to .17 from .6698 in Figure 23

t-Test Two-Sample Assuming Unequal Variances EP vs. T-2 in the p-value P (T<=t) two-tail. At the same time, the t-Stat goes positive from a negative and back to a negative in Figure 24

t-Test Two-Sample Assuming Unequal Variances EP vs. *T-1*. Swine flu also has t-Stat values that change concerning other t-Stat results, but the p-value P (T<=t) two-tail does not change in relation to other p-values P (T<=t) two-tail by a strong degree in EP vs. T2 data in Figure 32

t-Test Two-Sample Assuming Unequal Variances EP vs. T2. In the Covid-19 findings, an opposite spike occurred in the EP vs. T1 findings (though not statistically significant) where the data went to a .51 (Figure 31

t-Test Two-Sample Assuming Unequal Variances EP vs. *T1*) from .19 in EP vs. T0 (Figure 30

t-Test Two-Sample Assuming Unequal Variances EP ***vs. T0***) and returned to .23 in EP vs. T2 (Figure 32

t-Test Two-Sample Assuming Unequal Variances EP vs. T2) results. This is best seen in Table 11

Swine Flu of 2009 t-Stat and Two-Tail Volume Test **Data** and Table 12

Covid-19 of 2020 t-Stat vs. Two-Tail Volume Test Data below.

Table 11

Swine Flu of 2009 t-Stat and Two-Tail Volume Test Data

SWINE FLU of 2009 VOLUME					
EP vs. T-2	t Stat	-0.42983	P(T<=t) two-tail	0.669813	
EP vs. T-1	t Stat	1.382516	P(T<=t) two-tail	0.174298	****
EP vs. T0	t Stat	-0.15934	P(T<=t) two-tail	0.874042	
EP vs. T1	t Stat	-0.20530	P(T<=t) two-tail	0.838241	
Ep vs. T2	t Stat	0.281312	P(T<=t) two-tail	0.779761	****

Table 12

Covid-19 of 2020 t-Stat vs. Two-Tail Volume Test Data

COVID 19 of 2020 VOLUME					
EP vs. T-2	t Stat	-1.33891	P(T<=t) two-tail	0.189482	
EP vs. T-1	t Stat	-1.34998	P(T<=t) two-tail	0.183353	
EP vs. T0	t Stat	-1.33255	P(T<=t) two-tail	0.193423	
EP vs. T1	t Stat	0.661756	P(T<=t) two-tail	0.513017	****

Ep vs. T2	t Stat	-1.20158	P(T<=t) two-tail	0.239959	

As mentioned in the data organization techniques above, if the t-Stat output is positive, the reported p-value P (T<=t) two-tail is a right-tailed result, or positive. If the t-Stat is negative, the p-value P (T<=t) two-tail is a left-tailed output or negative. From the findings of the t-Stat test in the figures and table above, there are a completely different set of findings in the statistical analysis of the data. All of the results of the t-Stat were negative except where the anomaly was pointed out for EP vs. T-1 in the Swine Flu of 1.382516, EP vs. T2 in the Swine Flu data of .281312, and EP vs. T1 in the Covid-19 data of .661756, where all of the t-Stats became positive. According to statistics (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015), the null should be rejected based on this set of data with positive numbers t-Stat. This is because this data is based on a left-tailed t-Test, and positive numbers are now seen in the findings of the t-Stat. As mentioned in the literature review, it is possible to have the results of a two-tailed t-Test get contradicted by the findings in the t-Stat test findings concerning a one-tailed t-Test. The rule for a t-Stat test in statistics are: if it is left tailed test, the researcher is to reject the null hypothesis, where the findings of the p-value P (T<=t) two-tail test assuming unequal variances will not reject the null hypotheses based off of the same set of data (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015).

As mentioned in the findings from Research Question 1, a comparison of the data from Table 7

Swine Flu t-Stat and Two-Tail Test Price Data, A similar finding is found in in EP vs. T-2 t-Stat is -.06419, which deviates from the other t-Stats, which range from -.12527 EP vs. T0 to -.17835 in EP vs. T1.

Table 8

Covid-19 t-Stat and Two-Tail Test **Price Data**, Table 9

Swine Flu of 2009 Price One-Tail Vs. Two-Tail **Comparison**, and Table 10

Covid-19 of 2020 Price One-Tail vs. Two-tail **Comparison** the data does not always show the same anomaly. This can be seen with a price vs. volume comparison for the same pandemic data, which can be seen below in

Table 13

Swine Flu Price and Volume **Comparison** and

Table 14

Covid-19 Price and Volume **Comparison** with the differences noted by a yellow coloring in the cell and the asterisks ****. As seen in

Table 13

Swine Flu Price and Volume **Comparison** for the Swine Flu volume has an anomaly that is not reflected in the price for EP vs. T-1 price. The opposite is half true for an anomaly in Swine Flu price that is not reflected in Swine Flu volume for EP vs. T2 in volume compared to price in

Table 13

Swine Flu Price and **Volume Comparison**. This is a half-true statement because it is reflected in the T2 t-Stat but not the T2 two-tail test results.

Table 13

Swine Flu Price and Volume Comparison

SWINE FLU of 2009 PRICE					
EP vs. T-2	t Stat	-0.09001	P(T<=t) two-tail	0.928658	
EP vs. T-1	t Stat	-0.16495	P(T<=t) two-tail	0.869674	
EP vs. T0	t Stat	-0.21514	P(T<=t) two-tail	0.830568	

EP vs. T1	t Stat	-0.15193	P(T<=t) two-tail	0.879882	
Ep vs. T2	t Stat	-0.5239	P(T<=t) two-tail	0.60276	****

SWINE FLU of 2009 VOLUME					
EP vs. T-2	t Stat	-0.42983	P(T<=t) two-tail	0.669813	
EP vs. T-1	t Stat	1.382516	P(T<=t) two-tail	0.174298	****
EP vs. T0	t Stat	-0.15934	P(T<=t) two-tail	0.874042	
EP vs. T1	t Stat	-0.2053	P(T<=t) two-tail	0.838241	
Ep vs. T2	t Stat	0.281312	P(T<=t) two-tail	0.779761	****

Table 14

Covid-19 Price and Volume Comparison

COVID 19 of 2020 VOLUME					
EP vs. T-2	t Stat	-1.33891	P(T<=t) two-tail	0.189482	
EP vs. T-1	t Stat	-1.34998	P(T<=t) two-tail	0.183353	
EP vs. T0	t Stat	-1.33255	P(T<=t) two-tail	0.193423	
EP vs. T1	t Stat	0.661756	P(T<=t) two-tail	0.513017	****
Ep vs. T2	t Stat	-1.20158	P(T<=t) two-tail	0.239959	

COVID 19 of 2020 PRICE					
EP vs. T-2	t Stat	-0.06419	P(T<=t) two-tail	0.949088	****
EP vs. T-1	t Stat	-0.14020	P(T<=t) two-tail	0.889088	
EP vs. T0	t Stat	-0.12527	P(T<=t) two-tail	0.900832	
EP vs. T1	t Stat	-0.17835	P(T<=t) two-tail	0.859197	
Ep vs. T2	t Stat	-0.13833	P(T<=t) two-tail	0.890559	

Then in the Covid-19 data from

Table 14

Covid-19 Price and Volume **Comparison**, there is one strange outlier of EP vs. T1 in the Covid-19 volume that is not reflected at all in the Covid-19 price. According to the supply and demand principle, there should be a correlation between volume and price (Wenjing, 2017) and the numbers in Covid-19 price should have changed and been different than the other t-stats and p-values P (T<=t) two-tail of the data for volume findings in our test findings as shown in the results.

As mentioned in RQ1, is there a difference in using the one-tailed t-Test results compared to the two-tailed t-Test results for the finding for RQ2? The answer would still be no. The answer to research question 2 is that there is still not a statistically significant difference between the pharmaceutical stocks' volume before and after the announcement of a pandemic by the WHO, as demonstrated below in the one-tail vs. two-tail comparison in Table 15

Swine Flu of 2009 Volume One-Tail vs. Two-Tail **Comparison** and Table 16

Covid-19 of 2020 Volume One-Tail vs. Two-Tail Comparison. However, all findings are still positive and with some data coming close to being statistically significant in the one-tail test results at a .087 in Swine Flu volume and .095 in Covid-19 volume.

Table 15

Swine Flu of 2009 Volume One-Tail vs. Two-Tail Comparison

Swine Flu of 2009 Volume One-Tail vs. Two-Tail			
P(T<=t) one-tail	0.334906	P(T<=t) two-tail	0.669813
P(T<=t) one-tail	0.087149	P(T<=t) two-tail	0.174298
P(T<=t) one-tail	0.437021	P(T<=t) two-tail	0.874042
P(T<=t) one-tail	0.419120	P(T<=t) two-tail	0.838241
P(T<=t) one-tail	0.389880	P(T<=t) two-tail	0.779761

Table 16

Covid-19 of 2020 Volume One-Tail vs. Two-Tail Comparison

Covid-19 of 2020 Volume One-Tail vs. Two-Tail			
P(T<=t) one-tail	0.094741	P(T<=t) two-tail	0.189482
P(T<=t) one-tail	0.091677	P(T<=t) two-tail	0.183353
P(T<=t) one-tail	0.096711	P(T<=t) two-tail	0.193423
P(T<=t) one-tail	0.256509	P(T<=t) two-tail	0.513017
P(T<=t) one-tail	0.119980	P(T<=t) two-tail	0.239959

Findings for Research Question 2 Part 2

All data and how it is presented must address the question, “Did adding a new variable for stock volume change the outcome of the data?” The answer to this question would be yes. This is most notably seen in the variance data of stock volume compared to stock price for both pandemics noted by the word variance in the test findings. Large variances in data findings indicate the findings are very far from the mean number of the data set, noted by the word mean in each figure. In Figure 23 to Figure 32, the mean number is very large, ranging from -1,746,444.231 to 9,451,363.462. Therefore, the data for stock volume was computed again in Excel without the S&P 500 data to see if it changed the outcome of the statistics. The complete cumulative table for the findings below can be seen in Appendix: G Swine Flu of 2009 Volume CAR Table, except the data from the S&P 500 is removed from these calculations where a red

coloring notes the S&P data on the table. The following figures show the results of the t-Test without the S&P data below.

Swine Flu of 2009

Figure 33

t-Test Two-Sample Assuming Unequal Variances EP vs. T-2. No S&P 500 Data

	-2168300	*26900*
Mean	59426	54562
Variance	1.40868E+11	1.89515E+11
Observations	25	25
Hypothesized Mean Difference	0	
df	47	
t Stat	0.042311102	
P(T<=t) one-tail	0.483214968	
t Critical one-tail	1.677926722	
P(T<=t) two-tail	0.966429936	
t Critical two-tail	2.011740514	

Figure 34

t-Test Two-Sample Assuming Unequal Variances EP vs. T-1. No S&P 500 Data

	-2168300	*-1872000*
Mean	59426	2724
Variance	1.40868E+11	2.26142E+11
Observations	25	25
Hypothesized Mean Difference	0	
df	46	
t Stat	0.467981873	
P(T<=t) one-tail	0.321003674	
t Critical one-tail	1.678660414	
P(T<=t) two-tail	0.642007348	
t Critical two-tail	2.012895599	

Figure 35

t-Test Two-Sample Assuming Unequal Variances EP vs. T0. No S&P 500 Data

	-2168300	*-1673500*
Mean	59426	1294176
Variance	1.40868E+11	2.27802E+13
Observations	25	25
Hypothesized Mean Difference	0	
df	24	
t Stat	-1.2895307	
P(T<=t) one-tail	0.104751474	
t Critical one-tail	1.71088208	
P(T<=t) two-tail	0.209502947	
t Critical two-tail	2.063898562	

Figure 36

t-Test Two-Sample Assuming Unequal Variances EP vs. T1. No S&P 500 Data

	-2168300	*-1239900*
Mean	59426	-23096
Variance	1.40868E+11	9.6934E+11
Observations	25	25
Hypothesized Mean Difference	0	
df	31	
t Stat	0.391595233	
P(T<=t) one-tail	0.349018135	
t Critical one-tail	1.695518783	
P(T<=t) two-tail	0.69803627	
t Critical two-tail	2.039513446	

Figure 37

t-Test Two-Sample Assuming Unequal Variances EP vs. T2. No S&P 500 Data

	-2168300	*-114500*
Mean	59426	-261800
Variance	1.40868E+11	1.18597E+12
Observations	25	25
Hypothesized Mean Difference	0	
df	30	
t Stat	1.394346971	
P(T<=t) one-tail	0.086727063	
t Critical one-tail	1.697260887	
P(T<=t) two-tail	0.173454126	
t Critical two-tail	2.042272456	

The complete cumulative table for the findings below can be seen in Appendix: H COVID-19 of 2020 Volume CAR Table, except for the data from the S&P 500 is removed from these calculations.

Covid-19 of 2020

Figure 38

t-Test Two-Sample Assuming Unequal Variances EP vs. T-2. No S&P 500 Data

	47050	*646800*
Mean	52698	155530
Variance	1.10929E+11	1.6792E+11
Observations	25	25
Hypothesized Mean Difference	0	
df	46	
t Stat	-0.973675171	
P(T<=t) one-tail	0.167655209	
t Critical one-tail	1.678660414	
P(T<=t) two-tail	0.335310419	
t Critical two-tail	2.012895599	

Figure 39

t-Test Two-Sample Assuming Unequal Variances EP vs. T-1 No S&P 500 Data

	47050	*263500*
Mean	52698	-104588
Variance	1.10929E+11	3.4485E+11
Observations	25	25
Hypothesized Mean Difference	0	
df	38	
t Stat	1.164885093	
P(T<=t) one-tail	0.125663172	
t Critical one-tail	1.68595446	
P(T<=t) two-tail	0.251326344	
t Critical two-tail	2.024394164	

Figure 40

t-Test Two-Sample Assuming Unequal Variances EP vs. T0. No S&P 500 Data

	47050	*1333800*
Mean	52698	1231464
Variance	1.10929E+11	4.08189E+13
Observations	25	25
Hypothesized Mean Difference	0	
df	24	
t Stat	-0.921250395	
P(T<=t) one-tail	0.183044067	
t Critical one-tail	1.71088208	
P(T<=t) two-tail	0.366088134	
t Critical two-tail	2.063898562	

Figure 41

t-Test Two-Sample Assuming Unequal Variances EP vs. T1. No S&P 500 Data

	47050	*-252900*
Mean	52698	-157712
Variance	1.10929E+11	1.70881E+12
Observations	25	25
Hypothesized Mean Difference	0	
df	27	
t Stat	0.779887776	
P(T<=t) one-tail	0.221120136	
t Critical one-tail	1.703288446	
P(T<=t) two-tail	0.442240271	
t Critical two-tail	2.051830516	

Figure 42

t-Test Two-Sample Assuming Unequal Variances EP vs. T2. No S&P 500 Data

	47050	*465400*
Mean	52698	308818
Variance	1.10929E+11	5.56286E+11
Observations	25	25
Hypothesized Mean Difference	0	
df	33	
t Stat	-1.56776446	
P(T<=t) one-tail	0.063238177	
t Critical one-tail	1.692360309	
P(T<=t) two-tail	0.126476354	
t Critical two-tail	2.034515297	

Before interpretation of the findings of stock volume again, the number of observations in each t-Test is decreased by one to 25 for Figure 33 to Figure 42 from 26 in Figure 23 to Figure 32. All data from the S&P 500 stock volume has been removed from these findings. Also, the mean number has decreased, as well as the df results and the findings variance score in each figure from Figure 33 to Figure 42. Following the same rules as before, the findings for stock

volume were examined at the output data in the figures by comparing the two-tail p-value P (T<=t) two-tail against our significance level or (alpha/ confidence level of 0.05). If the p-value P (T<=t) two-tail is larger than the alpha, then one should not reject the null hypothesis and that there is no statistically significant difference in the research findings. In all 10 of the figures (Figure 33 thru Figure 42), all of the p-values P (T<=t) two-tail are larger than the alpha of .05. For the Swine Flu, the p-value P (T<=t) two-tail ranges from .17 to .966). The Covid-19 figures range from .12 to .44. Since it is known that the findings are not statistically significant, a conclusion can be made that the answer to research question 2 is that there is still not a statistically significant difference between the pharmaceutical stocks' volume before and after the announcement of a pandemic by the WHO.

With these findings of stock volume, there is another of anomalies. In the Swine Flu results, the EP vs. T0 (

Figure 35

t-Test Two-Sample Assuming Unequal Variances EP vs. T0. *No S&P 500 Data*) made a strange drop (though not statistically significant) of .46798 to -1.2895 for the t-Stat. Then this number returns to .3915 in EP vs. T1 for the t-Stat (Figure 36

t-Test Two-Sample Assuming Unequal Variances EP vs. T1. No S&P 500 Data). In EP vs. T-2 and EP vs. T2, the numbers now range from .0423 to 1.39. They are all positive, except for EP vs. T0 for t-Stat results. Swine Flu in the two-tail test results also dropped to .2095 and .17345 in EP vs. T0 and EP vs. T2, respectively. In the Covid-19 findings, an opposite positive spike occurred in the EP vs. T-1 findings (though not statistically significant) where the data went from a -.9736 (Figure 38

t-Test Two-Sample Assuming Unequal Variances EP vs. T-2. No S&P 500 Data) to 1.16488. Then it changed back to -.9212 in EP vs. T0 (Figure 40

t-Test Two-Sample Assuming Unequal Variances EP vs. T0. No S&P 500 *Data*). This time the data also made another spike in EP vs. T1 (Figure 41

t-Test Two-Sample Assuming Unequal Variances EP vs. T1. No S&P 500 Data) to .77989 and returned to -1.5677 in EP vs. T2 (Figure 42

t-Test Two-Sample Assuming Unequal Variances EP vs. T2. No S&P 500 Data). The two-tail test results in EP vs. T2 dropped to 0.1265. As seen in Table 17

SWINE FLU of 2009 Volume No S&P 500 **Data** and

Table 18

COVID-19 of 2020 Volume No S&P 500 **Data** with the irregularities noted by a yellow color and an asterisk **** mark at the end of each row. If the t-Stat output is positive, the reported p-value P (T<=t) two-tail is a right-tailed result, or positive. If the t-Stat is negative, the p-value P (T<=t) two-tail is a left-tailed output or negative. From the findings of the t-Stat test in

Table 13

Swine Flu Price and Volume **Comparison** and

Table 14

Covid-19 Price and Volume **Comparison** plus Figures 33 to 42 above, there are a completely different set of findings in the statistical analysis of the data in Table 17

SWINE FLU of 2009 Volume No S&P 500 **Data** and

Table 18

COVID-19 of 2020 Volume No S&P 500 **Data**.

Table 17

SWINE FLU of 2009 Volume No S&P 500 Data

SWINE FLU of 2009 VOLUME No S&P 500					
EP vs. T-2	t Stat	0.0423111	P(T<=t) two-tail	0.96642994	****
EP vs. T-1	t Stat	0.467981783	P(T<=t) two-tail	0.642007348	
EP vs. T0	t Stat	-1.2895307	P(T<=t) two-tail	0.20950295	****
EP vs. T1	t Stat	0.391595233	P(T<=t) two-tail	0.69803627	
Ep vs. T2	t Stat	1.39434697	P(T<=t) two-tail	0.17345413	****

Table 18

COVID-19 of 2020 Volume No S&P 500 Data

COVID 19 of 2020 VOLUME NO S&P 500					
EP vs. T-2	t Stat	-0.97367517	P(T<=t) two-tail	0.335310419	
EP vs. T-1	t Stat	1.16488509	P(T<=t) two-tail	0.25132634	****
EP vs. T0	t Stat	-0.9212504	P(T<=t) two-tail	0.36688134	
EP vs. T1	t Stat	0.77988778	P(T<=t) two-tail	0.44224027	****
Ep vs. T2	t Stat	-1.56776446	P(T<=t) two-tail	0.12647635	****

All of the results of the t-Stat are almost opposite the findings of the first stock volume that included S&P 500 data except where the anomaly was pointed out in Table 11 Swine Flu of 2009 t-Stat and Two-Tail Volume Test Data and Table 12 Covid-19 of 2020 t-Stat vs. Two-Tail Volume Test Data. The data for the Swine Flu shows outliers in EP vs. T-2, EP vs. T0, and EP vs. T2 (though not statistically significant). The same basic idea holds for the Covid-2019 volume (

Table 18

COVID-19 of 2020 Volume No S&P 500 **Data**), except it shows EP vs. T-1, EP vs. T1 and Ep vs. T2 anomalies. This is best seen in a side-by-side comparison of the two sets of data in

Table 19

Swine Flu of 2009 Volume with and without the S&P 500 **Data** and Table 20

Covid-19 of 2020 Volume with and without the S&P 500 **Data** below with the irregularities noted by a yellow color and an asterisk **** mark at the end of each row.

Table 19

Swine Flu of 2009 Volume with and without the S&P 500 Data

SWINE FLU of 2009 VOLUME NO S&P 500					
EP vs. T-2	t Stat	0.042311102	P(T<=t) two-tail	0.96642936	****
EP vs. T-1	t Stat	0.467981873	P(T<=t) two-tail	0.642007348	
EP vs. T0	t Stat	-1.2895307	P(T<=t) two-tail	0.209502947	****
EP vs. T1	t Stat	0.391595233	P(T<=t) two-tail	0.69803627	
Ep vs. T2	t Stat	1.39434697	P(T<=t) two-tail	0.173454126	****

SWINE FLU of 2009 VOLUME					
EP vs. T-2	t Stat	-0.42983	P(T<=t) two-tail	0.669813	
EP vs. T-1	t Stat	1.382516	P(T<=t) two-tail	0.174298	****
EP vs. T0	t Stat	-0.15934	P(T<=t) two-tail	0.874042	
EP vs. T1	t Stat	-0.2053	P(T<=t) two-tail	0.838241	
Ep vs. T2	t Stat	0.281312	P(T<=t) two-tail	0.779761	****

Table 20

Covid-19 of 2020 Volume with and without the S&P 500 Data

COVID 19 of 2020 VOLUME NO S&P 500					
EP vs. T-2	t Stat	-0.973675171	P(T<=t) two-tail	0.335310419	
EP vs. T-1	t Stat	1.164885093	P(T<=t) two-tail	0.251326344	****
EP vs. T0	t Stat	-0.921250395	P(T<=t) two-tail	0.36688134	
EP vs. T1	t Stat	0.77988776	P(T<=t) two-tail	0.44224027	****
Ep vs. T2	t Stat	-1.56776446	P(T<=t) two-tail	0.12647635	****

COVID 19 of 2020 VOLUME					
EP vs. T-2	t Stat	-1.33891	P(T<=t) two-tail	0.189482	
EP vs. T-1	t Stat	-1.34998	P(T<=t) two-tail	0.183353	
EP vs. T0	t Stat	-1.33255	P(T<=t) two-tail	0.193423	
EP vs. T1	t Stat	0.661756	P(T<=t) two-tail	0.513017	****
Ep vs. T2	t Stat	-1.20158	P(T<=t) two-tail	0.239959	

According to statistics (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015), the researcher should reject the null hypotheses based on this set of data with positive numbers t-Stat for a left tailed test. It was again possible to have the results of a two-tailed test contradictory to the findings in the t-Stat test compared to the direction of the left-tailed test. The rule for a t-Stat test in statistics are: if it is left tailed test, the researcher is to reject the null hypothesis, where the findings of the p-value P (T<=t) two-tail test assuming unequal variances will not reject the null hypotheses based off of the same set of data (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015). However, this time, the conclusion is based on positive numbers that are now negative and negative numbers that are now positive because of removing the S&P 500 data from our data before running the t-Test.

From this data in

Table 19

Swine Flu of 2009 Volume with and without the S&P 500 **Data** and Table 20

Covid-19 of 2020 Volume with and without the S&P 500 **Data**, a conclusion can be made conclude that there is an anomaly in EP vs. T2 in the Swine Flu data and EP vs. T1 with and with the S&P 500 data in the Covid-19 data. A deviation occurring in the stock volume traded is not reflected in stock price compatible with the overall S&P 500 data. Another conclusion is that the other inconsistencies in the data for stock volume in

Table 19

Swine Flu of 2009 Volume with and without the S&P 500 **Data** and Table 20

Covid-19 of 2020 Volume with and without the S&P 500 **Data** is probably caused by the data from the S&P 500 which would require further research beyond the scope of this event study. The inference by removing the S&P 500 data is that the overall market is dropping, and the pharmaceutical stock is increasing by looking at the results of the t-Test and reflects in the corresponding t-Stat data because the t-Stat got bigger (positive) or became a smaller negative number (Ex.-.42983 EP vs. T-2 Swine Flu to 0.0423111 Ep vs. T-2 Swine Flu without the S&P 500 data).

The final point to make with this stock volume and price data is tied to another point made in the literature review. Krzeczewski (2017) reported that pharmaceutical companies are considered defensive stocks. Defensive stocks (food, medicines, and utilities) tend to do well during economic downtowns in the stock market than cyclical stocks that tend to do well due to upswings in the overall economy. People typically do not cut back on their food, medicines, or electricity consumption during a downturn in the economy (Krzeczewski, 2017). As mentioned with each interpretation of data, if the t-Stat output is positive, it is a right-tailed result. If the t-Stat is negative, it is a left-tailed output or negative (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015). From the data in

Table 19

Swine Flu of 2009 Volume with and without the S&P 500 **Data**) and Table 20

Covid-19 of 2020 Volume with and without the S&P 500 **Data**), a researcher must point out that the findings without the S&P 500 data have either positive or more positive results compared to the data with the S&P 500 data. For instance, in EP vs. T0 the t-Stat went from -1.33255 to -.921250395 (Table 20

Covid-19 of 2020 Volume with and without the S&P 500 **Data**), an increase of 1.240429605. These statistical (though not statistically significant) results back up Krzeczewski's (2017) and Palache et al.'s (2017) findings because pharmaceutical stock prices and volume are either positive or more positive without the S&P 500 data. The stock price movement and the stock volume movement are positive except where the incongruity/ outliers are mentioned in the prior findings.

This gives credence to the idea that both the stock volume and the stock price moved in a positive direction (though not statistically significant) during the testing periods, proving that the pharmaceutical stocks were doing well or better than the surrounding overall market data as reflected by the S&P 500 data in the research which is shown and removed from the data in Figure 23 to Figure 42. Just like RQ1 and RQ2 Part 1, the researcher must address the issue of the one-tailed t-Test vs. the two-tailed t-Test findings as seen below in Table 21
Swine Flu of 2009 Volume One-Tail vs. Two-Tail Comparison Part II) and Table 22
Covid-19 of 2020 Volume One-Tail vs. Two-Tail Comparison Part II). There is no statistical difference in the results of the two tests that change my t-Test results findings. A conclusion can be made that the answer to research question 2 is that there is still not a statistically significant

difference between the pharmaceutical stocks' volume before and after the announcement of a pandemic by the WHO even after removing the data from the S&P 500 data from my calculation. However, all t-Test findings are positive.

Table 21

Swine Flu of 2009 Volume One-Tail vs. Two-Tail Comparison Part II

Swine Flu of 2009 Volume One-Tail vs. Two-Tail			
P(T<=t) one-tail	0.483215	P(T<=t) two-tail	0.96643
P(T<=t) one-tail	0.321004	P(T<=t) two-tail	0.642007
P(T<=t) one-tail	0.104751	P(T<=t) two-tail	0.209503
P(T<=t) one-tail	0.349018	P(T<=t) two-tail	0.698036
P(T<=t) one-tail	0.086727	P(T<=t) two-tail	0.173454

Table 22

Covid-19 of 2020 Volume One-Tail vs. Two-Tail Comparison Part II

Covid-19 of 2020 Volume One-Tail vs. Two-Tail			
P(T<=t) one-tail	0.167655	P(T<=t) two-tail	0.33531
P(T<=t) one-tail	0.125663	P(T<=t) two-tail	0.251326
P(T<=t) one-tail	0.183044	P(T<=t) two-tail	0.366088
P(T<=t) one-tail	0.22112	P(T<=t) two-tail	0.44224
P(T<=t) one-tail	0.063238	P(T<=t) two-tail	0.126476

Return on Investment

The return on investment (ROI) needs some clarification concerning the research findings because this is a fixed design event study using a causal-comparative ex post facto quantitative method. It is exploratory and deductive (Babones, 2016; Creswell, 2014; Yin, 2018). The qualitative research method alone is not appropriate because it has a hypothesis. The quantitative method alone is also not appropriate for this research because the research is comparing and interpreting data from multiple theories on one event, looking for data not presented in one set of findings from one theory (Babones, 2016; Creswell, 2014; Yin, 2018).

The ROR can be expected from an asset(s) investment, where the ROI is how much one plans to get back from an investment purchased (Alrgaibat, 2015; Freihat, 2019; Wenjing, 2017). This event study has analyzed the pharmaceutical sector of the NYSE for two specific periods (Swine Flu of 2009 [April 13, 2009, to July 13, 2009] and the Covid-19 of 2020 with the dates of [November 27, 2019, to March 2, 2020]. The findings for both research questions based on the hypotheses were not statistically significant. However, the question of did the pharmaceutical sector provided any data about its ROR of the pharmaceutical stock has been addressed. The answer is yes. According to Dalbar Associates (2020), the average investor can expect a 5.19% return on their investment yearly from their 20-year study. Compared to their NYSE return of 9.85% from the same 20-year study (Dalbar Associates, 2020). This is slightly different from the NYSE's actual return of -40.9% to 31.3%, as shown in Appendix C: NYSE Composite Index Annual ROR and the NYSE statement of the average return being 10% (NYSE, 2020).

The findings were not statistically significant, but the data showed that some stocks made gains while others had losses during both pandemics, with the entire segment average at the bottom. This can be seen in Figure 43

Average Percentage of Return of Swine Flu 2009 and Figure 44

Average Percentage of Return of Covid-19 of *2020*.

Figure 43

Average Percentage of Return of Swine Flu 2009

	COMPANY NAME	T-2	T-1	T0	T1	T2
1	Abbott Laboratories	3.01%	3.66%	3.23%	6.38%	8.28%
2	Synthetic Biologics, Inc	5.00%	2.50%	25.00%	5.00%	-2.50%
3	iBio, Inc.	0.00%	0.00%	5.00%	-10.00%	3.75%
4	Johnson & Johnson	5.90%	7.59%	7.99%	6.92%	9.17%
5	Bausch Health Companies Inc.	13.01%	7.86%	16.31%	11.84%	21.12%
6	Novartis AG	7.25%	6.72%	8.01%	12.23%	8.96%
7	Lannett Co Inc	6.05%	-0.18%	5.79%	7.02%	19.74%
8	Takeda Pharmaceutical Company Limited	0.00%	0.00%	0.00%	0.00%	0.00%
9	Oragenics Inc.	-30.77%	-7.69%	-23.08%	-15.38%	111.54%
10	Perrigo Company	5.98%	4.07%	3.60%	4.37%	7.76%
11	Allergan plc.	0.59%	1.07%	-0.64%	0.79%	11.38%
12	Emergent Biosolutions, Inc.	8.47%	27.12%	32.86%	34.84%	30.27%
13	Merck & Company, Inc.	6.20%	7.53%	8.01%	3.86%	11.39%
14	GlaxoSmithKline PLC	8.19%	9.36%	14.78%	19.18%	16.35%
15	Eli Lilly and Company	5.54%	4.73%	4.73%	1.85%	2.34%
16	Dr. Reddy's Laboratories Ltd	18.43%	29.61%	39.58%	37.16%	51.71%
17	NovaBay Pharmaceuticals, Inc.	-3.16%	-8.70%	-7.91%	-14.23%	-14.62%
18	Pfizer, Inc.	11.81%	8.09%	8.98%	9.87%	9.65%
19	China Pharma Holdings, Inc.	-12.06%	-16.47%	-12.94%	-14.12%	-13.82%
20	Teva Pharmaceutical Industries Limited	1.91%	8.11%	10.28%	8.11%	10.81%
21	Bristol-Myers Squibb Company	1.13%	-0.36%	0.00%	-0.44%	0.55%
22	Astrazeneca PLC	15.82%	15.96%	18.43%	24.07%	25.24%
23	Prestige Consumer Healthcare Inc.	10.57%	12.26%	14.21%	4.97%	5.51%
24	Taro Pharmaceutical Industries Ltd.	0.13%	0.13%	-2.04%	-1.02%	-4.08%
25	Palatin Technologies, Inc.	56.67%	106.67%	126.67%	100.00%	66.67%
26	Novartis AG	8.96%	10.41%	11.09%	11.09%	14.25%
	AVERAGE PERCENT RETURN	**5.95%**	**9.23%**	**12.23%**	**9.78%**	**15.82%**

Figure 44

Average Percentage of Return of Covid-19 of 2020

	COMPANY NAME	T-2	T-1	T0	T1	T2
1	Abbott Laboratories	0.48%	4.81%	4.15%	3.06%	2.74%
2	Synthetic Biologics, Inc	21.43%	28.57%	23.81%	30.95%	17.86%
3	iBio, Inc.	6.25%	16.67%	20.83%	50.00%	39.58%
4	Johnson & Johnson	2.98%	5.25%	6.39%	7.45%	5.18%
5	Bausch Health Companies Inc.	-1.28%	-0.48%	-3.34%	-3.89%	-9.87%
6	Novartis AG	1.73%	2.32%	3.10%	3.00%	3.75%
7	Lannett Co Inc	-5.77%	-0.67%	-6.55%	-4.00%	-0.11%
8	Takeda Pharmaceutical Company Limited	-1.97%	-2.12%	-3.21%	-1.43%	-7.80%
9	Oragenics Inc.	-11.11%	-16.67%	-18.52%	-11.11%	3.70%
10	Perrigo Company	-4.83%	11.18%	8.18%	10.41%	10.67%
11	Allergan plc.	1.80%	0.52%	-0.35%	2.04%	5.69%
12	Emergent Biosolutions, Inc.	1.79%	3.91%	2.19%	13.59%	16.49%
13	Merck & Company, Inc.	2.24%	-1.93%	-2.77%	-3.68%	-7.84%
14	GlaxoSmithKline PLC	1.70%	2.33%	1.80%	-2.35%	-5.95%
15	Eli Lilly and Company	10.93%	15.14%	17.39%	19.74%	16.56%
16	Dr. Reddy's Laboratories Ltd	0.96%	4.93%	8.80%	8.82%	9.91%
17	NovaBay Pharmaceuticals, Inc.	6.78%	5.08%	3.39%	-1.69%	-3.39%
18	Pfizer, Inc.	1.60%	4.19%	-2.83%	-0.89%	-6.20%
19	China Pharma Holdings, Inc.	1.22%	20.85%	25.68%	29.66%	25.65%
20	Teva Pharmaceutical Industries Limited	-5.97%	2.51%	3.11%	21.49%	26.86%
21	Bristol-Myers Squibb Company	3.47%	3.84%	2.25%	5.09%	4.79%
22	Astrazeneca PLC	3.29%	2.44%	1.26%	1.89%	-0.18%
23	Prestige Consumer Healthcare Inc.	3.51%	6.75%	6.51%	6.44%	8.41%
24	Taro Pharmaceutical Industries Ltd.	-7.76%	-10.68%	-13.21%	-17.25%	-21.98%
25	Palatin Technologies, Inc.	-6.25%	-11.25%	-16.25%	-18.75%	-26.88%
26	Novartis AG	1.85%	7.04%	6.66%	10.84%	10.24%
	AVERAGE PERCENT RETURN	**1.12%**	**4.02%**	**3.02%**	**6.13%**	**4.53%**

Figure 43

Average Percentage of Return of Swine Flu 2009) and Figure 44

Average Percentage of Return of Covid-19 of *2020*) are the returns of each stock compared against the EP, which is not shown since it would reflect a 0% gain. From the data above, the average return for T1 is better than the average investor's return of 5.19%, according to Dalbar's 20-year study (Dalbar Associates, 2020) at 9.78% for the Swine Flu of 2009 and 6.13% for Covid-19 of 2020 respectively as shown and bold at the bottom of the figures. The other periods showed mixed above or below the average threshold set by Dalbar Associates' (2020) 20-year study of 5.19%, depending on which event one looks.

However, picking individual stocks based on this data could yield better results, but this is beyond the scope of this event study. For the more experienced or professional investor (Fama, 2013; Markowitz, 1952; Mauck & Salzsieder, 2015), this data could be used for stop-loss investing or short-selling stocks to get a better ROR which is beyond the scope of this event study. The pharmaceutical stock shows data reflecting positive average returns over short periods. The data shows the practically significant data using interpretivism from a positivist perspective (Babone, 2016) though not statistically significant use of this market segment data and answering the question of stock ROR during a fourteen- and seven-day period before after the announcement of a PHEIC by the WHO.

Efficient Market Hypothesis (EMH) Problem

The final topic of the interpretation of the data is the Efficient Market Hypothesis (EMH), as proposed by Fama (1970). The topic of EMH is the underlying general problem, though not a specific research question or a specific hypothesis. The first research question and hypothesis ($H1_0$) made the following statements. The ideas behind these hypotheses and research questions are based on Fama (1970) and Pilkington (2017), who said the market is efficient and that prices

are directly reflective of events trading at their fair market value. Daniel and Hirshleifer (2015) argued that the market is affected by outside events. The second hypothesis ($H2_0$) determined if a flaw existed in the EMH, not stock prices, but stock volume. When a stock is trading in larger than normal stock volume, it would be an indicator of a flaw in the market that could be exploited and used to predict the movement of a stock and hence a flaw in the EMH (Wenjing, 2017). This is the basis of supply and demand, which is an underlying basis of EMH.

In the findings of both research questions, the researcher can statistically prove some conflicting data but cannot prove statistical significance in the research findings for the research questions or the research hypotheses. Because of this conflicting data, the researcher using interpretivism from a positivist perspective (Babone, 2016) can say the EMH has not been validated, and there is a possible flaw in the EMH based on the data in this research event study where volume moved. The stock price did not correspond to the results, validating Wenjing's (2017) findings. This is not bias, a search for an interpretation that validates the research, but a statement of fact. This is also in the wording of Fama (1970), as well as Pilkington (2017), Wang (2016), and Daniel and Hirshleifer (2015). Fama's idea of EMH is that the market is efficient. This is backed up by research by Pilkington (2017), Wang (2016) and Daniel and Hirshleifer (2015). Fama did not say the market is statistically significantly efficient. Fama stated that the market is efficient. The data above shows that there is some practically significant useful data where the stock prices increased and where volume increased from each study individually based on t-Test results

Table 19

Swine Flu of 2009 Volume with and without the S&P 500 Data and Table 20

Covid-19 of 2020 Volume with and without the S&P 500 **Data**. However, supply and demand suggest that low availability and high demand will increase stock prices, but the opposite is true. High availability and low demand will decrease the stock price (Wenjing, 2017). Therefore, the anomalies in stock volume traded should have had the same effect on stock price in the same periods. This did not happen with the findings where volume moved, but the price did not move accordingly. This is because giving credence to Wenjing (2017) who reported this anomaly exists (volume does not affect price) and can be exploited by investors. Therefore, according to Wenjing (2017) and this event study, the market is non-efficient using interpretivism from a positivist perspective (Babone, 2016). This is because the volume of stock traded did not change the stock price; leading to the conclusion that the market is not efficient, indicating that Fama (1970), Wang (2016), Pilkington (2017), and Daniel and Hirshleifer (2015) are all wrong in their research and findings.

Relationship of Hypotheses to Research Questions.

A research question is simply an idea of something to be tested through formal research that has not been tested before. A hypothesis is a statement of a tentative relationship between two variables in a research study. If there is a prediction between two variables, a researcher has proposed a hypothesis. This event study proposes a relationship between the announcement of a pandemic and two things 1) proposal is the rate of return (ROR) of the pharmaceutical sector of the NYSE and 2) proposal changes in the volume of stock traded which shows a flaw not seen in the stock price ROR. The general problem was the possible failure of the EMH to consistently hold, resulting in investors being able to generate statistically significant abnormal returns in the

medical sector of the NYSE. Both the research question and hypotheses are necessary for research, where the research question proposes an idea to be tested, and the hypothesis is the testable measure of the research question.

Summary of the Findings.

No matter what question is asked or what point of view is taken on the subject, there is always a point that validates the subject and someone who has a point that counteracts those statements. This event study has provided the following information: no statistically significant findings in either research question or hypothesis in stock price ROR or stock volume movement. However, the data shows that one cannot fully accept or reject the null hypothesis in the research questions. This is because there is conflicting evidence in the findings of the data from the analysis of the t-Tests p-value P (T<=t) two-tail above and the t-Stat results. According to statistics (Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015); a researcher in order to fully reject the null hypothesis, the data does have to align, and both the p-value P (T<=t) two-tail and t-Stat data have to conform to statistical requirements.

If the data does not conform to statistical requirements, further analysis must be done to explain the differences in the statistical data. The data results conflict with statistical requirements and the specific set of parameters. The explanation of the differences is beyond the scope of this event study and is an area of further research to explain why this conflicting data exists between volume and stock price. This event study has also validated other researchers from the literature review. In the findings, the work of Wenjing (2017) was found to have been proven true as stock volume moved, but at the same time, the stock price did not move to the degree of movement in volume. Also, Krzeczewski's (2017) efficiency was proven true because

the pharmaceutical stocks moved opposite the overall S&P 500 data and moved in a positive or positive direction though all of this support and findings are not statically significant.

A final note is added to the findings. There is the potential possibility for unintentional bias. This note is based on the word efficiency. Whether interpreted as technical or fundamental (Thaler & Shiller, 2015), efficiency is the relationship between information and price. Technical efficiency says the information is instantaneously reflected in stock prices; therefore, an investor or a researcher cannot use the information to forecast stock prices. Fundamental efficiency says the price of a stock is intrinsic and reflects value through information; therefore, only information related to the stock's intrinsic value makes the price move.

There would have been a problem producing this proposal if efficiency is true. This dissertation was in November of 2019 (before December 13th, 2019) because there had to be a change in the dissertation topic. The topics of pandemics from information readily available on the internet almost four months before the WHO's announcement of the COVID-19 (Coronavirus) of 2020. This was also approved for research before the WHO announced the Covid-19 pandemic in 2019. This final note in findings is noted for the potential of a conflict of interest; in theory or practice depending on interpretation; the researcher did something which contradicts the EMH, which this research attempted to validate or disprove. The actual creation is potential proof that the EMH does not hold, and there are inefficiencies in the market from a technical and fundamental basis. This event study prior to the actual second pandemic occurred because, at the time of the event topic approval, this second event (Covid-19) had yet to occur as a pandemic. This was mentioned as a potential bias and its possible impact on this research.

Applications to Professional Practice

Professional practice is a schematic that outlines the beliefs, values, theories, and operations systems for any given industry. It can also be synonymous with a code of professional responsibility (thefreedictionary.com, nd). In the concept of this event study, the professional practice was two-fold. Professional practice is first, the responsibility to act by the SEC to enforce rules and laws about financial reporting for the benefit of the people of the United States and all investors in these companies; whether they are in the United States or somewhere else on the globe but choose to invest in the NYSE.

Secondly, the professional practice has its foundation for this quantitative study is the obligation and commitment of the chief financial officers, company presidents, accountants, financiers, and anyone responsible for reporting financial data about a company to treat its expenses and financial condition and avoid financial risk to stay in business and operate in the future. Professionalism by these decision-makers is and has a traditional tenant of being ethical and derives its beneficence from the act of helping both citizens and the companies by doing good and avoiding evil (Whitehead, 1925).

Donati (2014) said that moral responsibility is acted upon by the degree of freedom allowed. Donati made it difficult for one to see where the influence of one thing is entangled in the effect on the other. Therefore, one is culpable of ethical injustice to some degree by the complicit nature of the unknown influence. Since a man cannot serve two masters, the supervisor must choose his professional moral obligation between the economics and finances of a decision and the moral and ethical responsibilities of those under their care. Rogers (2003) argued that a moral issue must be fixed before someone says the issue is an ethical problem. For people will be

lovers of self, lovers of money, proud, arrogant, abusive, disobedient to their parents, ungrateful, unholy." (2 Timothy 3:2 KJV).

Recommendations for Action

When looking at money, one thinks of what one has, what one wants (Vining et al., 2019), what one needs (Doyal & Gough, 1991). One thinks others have that they do not (Cofsky, 1993). This brings people to a feeling of inequality and maybe disparity. Parkinson's Law says that expenses rise to meet one's income, or work grows the more time one tries to work and stops working (Parkinson, 1955).

The research results showed no statistically significant findings in the data related to this event study. However, it also showed us that a researcher could neither accept nor reject the null hypothesis. However, it also shows something else beyond the scope of the event study. It has also proven that where someone has a point of view, there is also another point of view. This event study focused on statistical significance in the data. Statistical significance implies there is no random set of chance in the data (Fisher, 1925; Morgan et al., 2013; Peng, 2015; Trafimow & Marks, 2015), but another term that must be used is practical significance to the data. Practical significance is a term that refers to the magnitude of the difference, which is also known as the effect size (Peng, 2015). Finding data is practically significant when the difference between the data sets is large enough to be meaningful in real life, where the term meaningful may be subjective and dependent on the person using it and in what context.

Some practically significant data was revealed by looking at the pharmaceutical companies that focused on vaccines only, compared to the pharmaceutical sector as a whole, which was needed for meaningful sample size and population. Even the data presented in figures 10 thru 39 above showed large gains in ROR (but not statistically significant) during short

periods not present in the EPs (Estimation Period[s]). The skewness of the data reveals some positive skewness which means the data is positive in the research results but not statistically significant in overall research findings. This leads to whether this information is practically significant, even though it is not statistically significant for the real world. Whether or not this information is relevant is dependent on the average investor (Dalbar Associates, 2020) and how or what is one's goal is during a time. This factor was not measured since it had no bearing on the findings, but it was mentioned in the data and an area of further research.

Recommendations for Further Study

Areas of further study could be the argument of the rational assumptions of the efficient market in the 21st century and defining efficiency and its relation to the average investor(s) (Dalbar Associates, 2020). Are investors rational or irrational, and is information about stocks priced readily available and free to the public? What would have been the results of the data if Cohens D an ANOVA or Gaussian Statistical Model (Morgan et al., 2013) was a statistical model of the research instead of using a t-Test for data analysis? What is the difference between the practical and statistical significance of the findings, and would those findings be relevant to the average investor (Dalbar Associates, 2020) in the 21st Century? Could further breaking down the 26 pharmaceutical companies to a smaller subset with the companies that focus on vaccines and not the topics of pharmaceutical companies have changed the findings to a statistically significant level?

Other facts to consider in finance are transaction costs from buying and selling stocks which change stock prices and, therefore, the ROI; making equities cost more than any model. Some taxes have to be paid on selling assets when money is made, which depends on the investor's income because of taxes and tax brackets. This is another hidden cost (beyond

purchase price) associated with owning an asset. Another factor is that information is not always readily available and free. Information can be interpreted differently depending on the researcher or the person hearing the information (bias). Lastly, people do not always make rational decisions. There is some luck and chance involved in buying and selling equity (Sharpe, 1964).

Can an investor or company profit from the information, either known or hypothesized, like data from an event study? From a technical efficiency perspective, the stock price changes because of an event. From a fundamental perspective and all available research, one can see that events affect stock market price in the technical efficiency sense. The more information one has from a research perspective; the more one can predict stock prices at a technical level when the normal investor reacts rationally or irrationally to the market. Ironically, this was validated by the people who issued the Nobel Prize(s) in Finance. Because Fama (2013) and Shiller (2013) have both received Nobel Prizes, one researcher says you cannot beat the market, and the other says you can beat the market, respectively. So, who is right? It depends on the Nobel Committee, the research reader depending on the information one has in front of you, and the investor's decision.

Reflections

Money is a strange and wonderful thing. It builds empires; yet can destroy them as well. It is the key to happiness; the chains bind them and take happiness away from others. It is the thing of dreams when you can have so much, but it takes away to sleep when it is about all you think about. In modern society, happiness is usually linked to money, and maybe someone would say money equals happiness. However, this is the inherent problem with money. It is a mindset that leads many down a futile path, does not suit them, or makes them miserable. The King James Version of the Bible validates this with Acts 8:20: “But Peter said unto him, thy money

perishes with thee because thou hast thought that the gift of God might be purchased with money."

The misery, of course, is not pertinent in this event study related to finance. However, it is an area of finance that could be explored. All of these statistics and data do not measure everything like individual happiness (Adams, 1963; Whitehead, 1925) from doing things like community participation, volunteer work, spending time with family, and parenting, to name a few. This leads us back to the money issue and the value (Whitehead, 1925) one places on money or the value places on one's life (Whitehead, 1920, 1925, 1927, 1929a, 1929b, 1933, 1938, 1948, 1951a, 1951b, 1978, 1996).

One does not have to be a doctor or have an MBA to understand what makes a successful equity investment. An equity investment is successful if one ends up with more money than one started with after investing. The extra money is their ROI. However, there are all sorts of ways to measure ROI. Two of the most common return formulas are ROI which shows what percentage a person gets from their original investment where ROR shows how they got their ROI, and the investment grows annually from start to finish while considering the time value of money.

It is a good idea not to draw any fixed conclusions about the effects of pandemics upon stock-market performance. Any stock market can and will react unpredictably to the unknown. Also, no event should be studied in isolation but viewed in conjunction with other market conditions. From an investment standpoint, it is hard to accept or mitigate the effects of an epidemic/ pandemic on the market. Investors should remember the benefits of long-term investing. This can be seen above because the S&P 500 over a period of time the stock market always recovers and does better the longer the stock market is observed.

The final factor to consider is probability. Probability deals with predicting the likelihood of future events, whereas statistics involves the analysis of past events (Peng, 2015). Probability is a theoretical branch of mathematics that studies the consequences of mathematical definitions, and statistics is primarily an applied branch of mathematics, which tries to make sense of observations in the real world using mathematical formulas. Just because a result of a study is not statistically significant does not imply that it is not random, just that the probability of the findings being random is greatly reduced. Finally, statistical significance in past data and the results of that data, whether statistically significant or not, may not reflect ongoing or future market conditions and variables and the practical use of said data even though it is not statically significant.

Summing up can be done by reflecting on a few verses from the Bible. The first principle is that God is the source of everything, including money. “My God shall supply all your need according to his riches in glory by Christ Jesus” (Philippians 4:19 KJV). “I lead in the way of righteousness, amid the paths of judgment: that I may cause those that love me to inherit substance; and I will fill their treasures.” (Proverbs 8:20-21) Then 2 Corinthians 9:8 says: “and God can make all grace abound toward you; that ye, always having all sufficiency in all things, may abound to every good work. Whenever we need money or possessions, prayer is the answer. Look to the Lord because He will provide it according to His will.”

However, with having everything (money), one must remember that an evil sin can occur, and that sin is greed. Generally, greed is a selfish desire for wealth. It is that point at which a person desires more than needed or what God views needed. Greed can be traced back to the Old Testament in the Bible. “He that is greedy of gain troubleth his own house; but he that hateth gifts shall live” (Proverbs 15:27). “He that loveth silver shall not be satisfied with silver, nor he

that loveth abundance with increase: this is also vanity." (Ecclesiastes 5:10). No man can serve two masters: for either he will hate the one and love the other, or else he will hold to the one and despise the other. Ye cannot serve God and mammon" (Matthew 6:24). Finally, Luke 12:15, "He said unto them, take heed, and beware of covetousness: for a man's life consists not in the abundance of the things he possesseth.". Of course, having has nothing to do with greed, but has also had to do with giving, which is a biblical principle that is mentioned in Luke 6:38, "Give, and it shall be given unto you; good measure, pressed down, and shaken together, and running over, shall men give unto your bosom. With the same measure that ye mete withal, it shall be measured to you again." "One purpose of tithing was to teach the people of Israel to put God first in their lives" (Deuteronomy 14:23).

Summary and Study Conclusions

This event study acknowledges Wilber's (1998) ideology from The Eye of Spirit. I do not believe that any human mind can 100% error. So instead of asking which approach is right and which approach is wrong, we assume each approach is true but partial and then try to figure out how to fit these partial truths together, integrate them, pick one and get rid of the others. This event study was trying to help the average investor (Dalbar Associates, 2020) and the experienced manager. This event study looked to add research to the topic of the EMH (Fama, 1970, 1976) and provide data as to how and why the market reacts the way it does. Hopefully, this research will be used by someone to benefit them and their investments during the next pandemic, which according to history, will happen again. The question is when the next pandemic will happen and the extent to which it will have a practically or statistically significant effect on the stock market.

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Appendix A: Alphabetized Pharmaceutical Company List NYSE (2020)

	COMPANY NAMES IN ALPHABETICAL ORDER	STOCK Symbol
1	Abbott Laboratories	ABT
2	AbbVie Inc.	ABBV
3	Actinium Pharmaceuticals, Inc.	ATNM
4	AgeX Therapeutics, Inc.	AGE
5	Allergan plc.	AGN
6	Amneal Pharmaceuticals, Inc.	AMRX
7	Ampio Pharmaceuticals, Inc.	AMPE
8	Arcus Biosciences, Inc.	RCUS
9	Astrazeneca PLC	AZN
10	Bausch Health Companies Inc.	BHC
11	Biohaven Pharmaceutical Holding Company Ltd.	BHVN
12	BioPharmX Corporation	BPMX
13	Bristol-Myers Squibb Company	BMY
14	Bristol-Myers Squibb Company	BMY
15	Can-Fite Biopharma Ltd	CANF
16	Catalent, Inc.	CTLT
17	China Pharma Holdings, Inc.	CPHI
18	CorMedix Inc.	CRMD
19	Dr. Reddy's Laboratories Ltd	RDY
20	Elanco Animal Health Incorporated	ELAN
21	Eli Lilly and Company	LLY
22	Emergent Biosolutions, Inc.	EBS
23	GlaxoSmithKline PLC	GSK
24	iBio, Inc.	IBIO
25	Johnson & Johnson	JNJ
26	Kadmon Holdings, Inc.	KDMN
27	Lannett Co Inc	LCI
28	Mallinckrodt plc	MNK
29	Matinas Biopharma Holdings, Inc.	MTNB
30	Merck & Company, Inc.	MRK
31	Myovant Sciences Ltd.	MYOV
32	NovaBay Pharmaceuticals, Inc.	NBY
33	Novartis AG	NVS.
34	Novo Nordisk A/S	NVO
35	Oragenics Inc.	OGEN
36	Palatin Technologies, Inc.	PTN
37	Perrigo Company	PRGO
38	Pfenex Inc.	PFNX

39	Pfizer, Inc.	PFE
40	Prestige Consumer Healthcare Inc.	PBH
41	Synthetic Biologics, Inc	SYN
42	Takeda Pharmaceutical Company Limited	TAK
43	Taro Pharmaceutical Industries Ltd.	TARO
44	Teva Pharmaceutical Industries Limited	TEVA
45	Zoetis Inc.	ZTS
46	Zomedica Pharmaceuticals Corp.	ZOM
47	Zymeworks Inc.	ZYME

Appendix B: Used Pharmaceutical Company List

	Company Name
1	Abbott Laboratories
2	Allergan plc.
3	AstraZeneca PLC
4	Bausch Health Companies Inc.
5	Bristol-Myers Squibb Company
6	China Pharma Holdings, Inc.
7	Dr. Reddy's Laboratories Ltd
8	Eli Lilly and Company
9	Emergent Biosolutions, Inc.
10	GlaxoSmithKline PLC
11	iBio, Inc.
12	Johnson & Johnson
13	Lannett Co Inc
14	Merck & Company, Inc.
15	NovaBay Pharmaceuticals, Inc.
16	Novartis AG
17	Novo Nordisk AS
18	Oragenics Inc.
19	Palatin Technologies, Inc.
20	Perrigo Company
21	Pfizer, Inc.
22	Prestige Consumer Healthcare Inc.
23	Synthetic Biologics, Inc
24	Takeda Pharmaceutical Company Limited
25	Taro Pharmaceutical Industries Ltd.
26	Teva Pharmaceutical Industries Limited

Appendix C: NYSE Composite Index Annual ROR %

NYSE Composite Index: Annual Returns							
YEAR	ROR	YEAR	ROR	YEAR	ROR	YEAR	ROR
1966	-12.40%	1980	31.10%	1994	-3.10%	2008	-40.90%
1967	22.10%	1981	-10.10%	1995	31.30%	2009	24.80%
1968	10.40%	1982	13.90%	1996	19.10%	2010	10.80%
1969	-11.20%	1983	17.50%	1997	30.30%	2011	-6.10%
1970	-4.30%	1984	1.30%	1998	16.60%	2012	12.90%
1971	12.60%	1985	26.20%	1999	9.10%	2013	23.20%
1972	15.70%	1986	14.00%	2000	1.00%	2014	4.20%
1973	-18.50%	1987	-0.30%	2001	-10.20%	2015	-6.40%
1974	-29.80%	1988	13.00%	2002	-19.80%	2016	9.00%
1975	31.00%	1989	24.80%	2003	29.30%	2017	14.50%
1976	16.60%	1990	-7.50%	2004	12.20%	2018	11.20%
1977	-9.50%	1991	27.10%	2005	7.00%	2019	28.88%
1978	5.70%	1992	4.70%	2006	17.90%	2020	4.40%
1979	10.60%	1993	7.90%	2007	6.60%		

Appendix D: Five Year Monthly BETAs of Pharmaceutical Companies March 2020

	Company Name	BETA (β) 5 Year Monthly
1	Abbott Laboratories	0.92
2	Allergan plc.	1.31
3	Astrazeneca PLC	0.22
4	Bausch Health Companies Inc.	1.22
5	Bristol-Myers Squibb Company	0.72
6	China Pharma Holdings, Inc.	0.98
7	Dr. Reddy's Laboratories Ltd	-0.23
8	Eli Lilly and Company	0.17
9	Emergent Biosolutions, Inc.	1.11
10	GlaxoSmithKline PLC	0.41
11	iBio, Inc.	-7.11
12	Johnson & Johnson	0.66
13	Lannett Co Inc	1.72
14	Merck & Company, Inc.	0.56
15	NovaBay Pharmaceuticals, Inc.	3.97
16	Novartis AG	0.46
17	Novo Nordisk AS	0.42
18	Oragenics Inc.	0.65
19	Palatin Technologies, Inc.	1.61
20	Perrigo Company	1.24
21	Pfizer, Inc.	0.60
22	Prestige Consumer Healthcare Inc.	0.78
23	Synthetic Biologics, Inc	1.79
24	Takeda Pharmaceutical Company Limited	1.05
25	Taro Pharmaceutical Industries Ltd.	0.88
26	Teva Pharmaceutical Industries Limited	1.58

Appendix E: SWINE FLU of 2009 PRICE CAR TABLE

	MEDIAN	EP	T-2	T-1	T0	T1	T2
1	Abbott Laboratories	13.95	14.37	14.46	14.40	14.84	15.11
2	Synthetic Biologics, Inc	14.00	14.70	14.35	17.50	14.70	13.65
3	iBio, Inc.	4.00	4.00	4.00	4.20	3.60	4.15
4	Johnson & Johnson	37.55	39.77	40.40	40.55	40.15	41.00
5	Bausch Health Companies Inc.	10.30	11.64	11.11	11.98	11.52	12.48
6	Novartis AG	21.59	23.16	23.04	23.32	24.23	23.53
7	Lannett Co Inc	5.70	6.05	5.69	6.03	6.10	6.83
8	Takeda Pharmaceutical Company Limited	0.00	0.00	0.00	0.00	0.00	0.00
9	Oragenics Inc.	26.00	18.00	24.00	20.00	22.00	55.00
10	Perrigo Company	23.59	25.00	24.55	24.44	24.62	25.42
11	Allergan plc.	28.02	28.19	28.32	27.84	28.24	31.21
12	Emergent Biosolutions, Inc.	10.62	11.52	13.50	14.11	14.32	13.84
13	Merck & Company, Inc.	16.60	17.63	17.85	17.93	17.24	18.49
14	GlaxoSmithKline PLC	17.52	18.96	19.16	20.11	20.88	20.39
15	Eli Lilly and Company	22.22	23.45	23.27	23.27	22.63	22.74
16	Dr. Reddy's Laboratories Ltd	9.93	11.76	12.87	13.86	13.62	15.07
17	NovaBay Pharmaceuticals, Inc.	63.25	61.25	57.75	58.25	54.25	54.00
18	Pfizer, Inc.	9.02	10.09	9.75	9.83	9.91	9.89
19	China Pharma Holdings, Inc.	1.70	1.50	1.42	1.48	1.46	1.47
20	Teva Pharmaceutical Industries Limited	35.90	36.59	38.81	39.59	38.81	39.78
21	Bristol-Myers Squibb Company	13.73	13.89	13.68	13.73	13.67	13.81
22	Astrazeneca PLC	7.27	8.42	8.43	8.61	9.02	9.11
23	Prestige Consumer Healthcare Inc.	5.63	6.23	6.32	6.43	5.91	5.94
24	Taro Pharmaceutical Industries Ltd.	7.85	7.86	7.86	7.69	7.77	7.53
25	Palatin Technologies, Inc.	1.50	2.35	3.10	3.40	3.00	2.50
26	Novartis AG	5.86	6.39	6.47	6.51	6.51	6.70

Appendix F: COVID-19 of 2020 PRICE CAR TABLE

	MEDIAN	EP	T-2	T-1	T0	T1	T2
1	Abbott Laboratories	85.61	86.02	89.73	89.16	88.23	87.955
2	Synthetic Biologics, Inc	0.42	0.51	0.54	0.52	0.55	0.495
3	iBio, Inc.	0.24	0.255	0.28	0.29	0.36	0.335
4	Johnson & Johnson	140.44	144.625	147.81	149.41	150.9	147.715
5	Bausch Health Companies Inc.	29.33	28.955	29.19	28.35	28.19	26.435
6	Novartis AG	89.78	91.33	91.86	92.56	92.47	93.145
7	Lannett Co Inc	9.01	8.49	8.95	8.42	8.65	9
8	Takeda Pharmaceutical Company Limited	20.26	19.86	19.83	19.61	19.97	18.68
9	Oragenics Inc.	0.54	0.48	0.45	0.44	0.48	0.56
10	Perrigo Company	53.3	50.725	59.26	57.66	58.85	58.985
11	Allergan plc.	187.58	190.965	188.56	186.92	191.4	198.245
12	Emergent Biosolutions, Inc.	54	54.965	56.11	55.18	61.34	62.905
13	Merck & Company, Inc.	88.23	90.21	86.53	85.79	84.98	81.315
14	GlaxoSmithKline PLC	45.55	46.325	46.61	46.37	44.48	42.84
15	Eli Lilly and Company	120.9	134.12	139.2	141.93	144.76	140.92
16	Dr. Reddy's Laboratories Ltd	40.58	40.97	42.58	44.15	44.16	44.6
17	NovaBay Pharmaceuticals, Inc.	0.59	0.63	0.62	0.61	0.58	0.57
18	Pfizer, Inc.	38.15	38.76	39.75	37.07	37.81	35.785
19	China Pharma Holdings, Inc.	41	41.5	49.55	51.53	53.16	51.515
20	Teva Pharmaceutical Industries Limited	9.96	9.365	10.21	10.27	12.1	12.635
21	Bristol-Myers Squibb Company	61.9	64.05	64.28	63.29	65.05	64.865
22	Astrazeneca PLC	47.51	49.075	48.67	48.11	48.41	47.425
23	Prestige Consumer Healthcare Inc.	38.99	40.36	41.62	41.53	41.5	42.27
24	Taro Pharmaceutical Industries Ltd.	93.59	86.325	83.59	81.23	77.45	73.015
25	Palatin Technologies, Inc.	0.8	0.75	0.71	0.67	0.65	0.585
26	Novartis AG	56.28	57.32	60.24	60.03	62.38	62.045

Appendix G: SWINE FLU of 2009 VOLUME CAR TABLE

	MEDIAN	EP	T-2	T-1	T0	T1	T2
1	Abbott Laboratories	(2,168,300.00)	26,900.00	(1,872,000.00)	(1,673,500.00)	(1,239,900.00)	(114,500.00)
2	Synthetic Biologics, Inc	(350.00)	(100.00)	100.00	(4,700.00)	-	50.00
3	iBio, Inc.	150.00	-	(400.00)	-	-	-
4	Johnson & Johnson	107,350.00	164,200.00	914,300.00	(485,500.00)	(896,100.00)	(148,150.00)
5	Bausch Health Companies Inc.	(120,850.00)	(21,950.00)	286,000.00	(1,286,100.00)	(177,200.00)	(81,900.00)
6	Novartis AG	(200.00)	(171,800.00)	116,600.00	(531,900.00)	(266,300.00)	(74,200.00)
7	Lannett Co Inc	-	(450.00)	1,500.00	17,200.00	5,000.00	(4,650.00)
8	Takeda Pharmaceutical Company Limited	-	-	-	-	-	-
9	Oragenics Inc.	-	-	-	-	-	-
10	Perrigo Company	72,100.00	3,700.00	(60,800.00)	99,200.00	(83,500.00)	23,100.00
11	Allergan plc.	(19,850.00)	121,100.00	64,700.00	141,100.00	(7,500.00)	(47,750.00)
12	Emergent Biosolutions, Inc.	(34,650.00)	(72,300.00)	(145,100.00)	(1,663,800.00)	(33,600.00)	11,550.00
13	Merck & Company, Inc.	836,250.00	966,250.00	1,177,000.00	4,227,900.00	(2,783,000.00)	(656,750.00)
14	GlaxoSmithKline PLC	(363,350.00)	(262,450.00)	(107,900.00)	958,200.00	(21,600.00)	3,650.00
15	Eli Lilly and Company	(156,050.00)	231,500.00	(13,500.00)	1,608,700.00	(190,600.00)	(265,300.00)
16	Dr. Reddy's Laboratories Ltd	(12,650.00)	42,450.00	4,400.00	(146,100.00)	(11,800.00)	64,550.00
17	NovaBay Pharmaceuticals, Inc.	-	(150.00)	-	100.00	-	-
18	Pfizer, Inc.	1,492,900.00	1,703,050.00	(1,226,800.00)	23,200,000.00	3,794,500.00	(5,433,300.00)
19	China Pharma Holdings, Inc.	(11,100.00)	(14,150.00)	(10,000.00)	37,300.00	8,500.00	(1,600.00)
20	Teva Pharmaceutical Industries Limited	16,400.00	(308,900.00)	376,400.00	1,326,000.00	(32,800.00)	139,000.00
21	Bristol-Myers Squibb Company	(534,150.00)	(660,700.00)	(1,176,800.00)	4,703,900.00	382,300.00	(202,550.00)
22	Astrazeneca PLC	254,700.00	(172,700.00)	(174,400.00)	(130,600.00)	(167,200.00)	(84,100.00)
23	Prestige Consumer Healthcare Inc.	(15,000.00)	(19,050.00)	(33,600.00)	(3,700.00)	(6,000.00)	(1,500.00)
24	Taro Pharmaceutical Industries Ltd.	100.00	(350.00)	-	(6,000.00)	-	(150.00)
25	Palatin Technologies, Inc.	2,150.00	(4,150.00)	(6,600.00)	10,700.00	1,500.00	1,250.00
26	Novartis AG	(28,250.00)	(159,000.00)	83,000.00	282,500.00	(92,000.00)	213,750.00
	S&P 500	124,470,000.00	241,250,000.00	(74,980,000.00)	121,420,000.00	169,760,000.00	89,340,000.00

Appendix H: COVID-19 of 2020 VOLUME CAR TABLE

	MEDIAN	EP	T-2	T-1	T0	T1	T2
1	Abbott Laboratories	47,050.00	646,800.00	263,500.00	1,333,800.00	(252,900.00)	465,400.00
2	Synthetic Biologics, Inc	(400.00)	(32,750.00)	(61,100.00)	90,000.00	(20,500.00)	5,900.00
3	iBio, Inc.	379,800.00	(31,600.00)	(744,600.00)	31,152,000.00	(4,434,800.00)	2,928,200.00
4	Johnson & Johnson	718,850.00	(186,500.00)	(250,500.00)	182,000.00	(500,900.00)	312,750.00
5	Bausch Health Companies Inc.	148,300.00	332,200.00	(656,400.00)	514,500.00	(588,300.00)	623,900.00
6	Novartis AG	3,250.00	(114,850.00)	714,500.00	(1,306,900.00)	(302,300.00)	120,900.00
7	Lannett Co Inc	(42,550.00)	(76,450.00)	41,400.00	(419,100.00)	106,000.00	(7,750.00)
8	Takeda Pharmaceutical Company Limited	-	-	-	-	-	-
9	Oragenics Inc.	-	-	-	-	-	-
10	Perrigo Company	(51,900.00)	(92,400.00)	(54,800.00)	100,200.00	(37,100.00)	66,600.00
11	Allergan plc.	144,350.00	(90,950.00)	425,600.00	1,365,100.00	251,900.00	54,300.00
12	Emergent Biosolutions, Inc.	21,200.00	9,250.00	(43,200.00)	(26,700.00)	44,000.00	(34,150.00)
13	Merck & Company, Inc.	622,700.00	842,650.00	(940,000.00)	2,390,500.00	(790,500.00)	(276,950.00)
14	GlaxoSmithKline PLC	(104,100.00)	(13,750.00)	(593,600.00)	(26,900.00)	(740,600.00)	24,550.00
15	Eli Lilly and Company	90,350.00	(61,200.00)	(177,300.00)	2,427,900.00	(614,600.00)	(70,800.00)
16	Dr. Reddy's Laboratories Ltd	9,900.00	(2,450.00)	(35,800.00)	(8,800.00)	(15,400.00)	1,550.00
17	NovaBay Pharmaceuticals, Inc.	(20,000.00)	(23,400.00)	(18,200.00)	(63,600.00)	-	-
18	Pfizer, Inc.	239,200.00	1,316,400.00	30,100.00	(1,754,400.00)	(1,619,900.00)	1,741,950.00
19	China Pharma Holdings, Inc.	(22,800.00)	92,250.00	129,200.00	(269,000.00)	99,200.00	83,100.00
20	Teva Pharmaceutical Industries Limited	421,850.00	1,129,750.00	1,316,700.00	(4,945,600.00)	3,829,900.00	1,857,950.00
21	Bristol-Myers Squibb Company	(1,172,350.00)	847,000.00	(1,855,600.00)	20,500.00	1,496,900.00	114,700.00
22	Astrazeneca PLC	35,200.00	43,550.00	(363,200.00)	1,929,400.00	(292,100.00)	240,000.00
23	Prestige Consumer Healthcare Inc.	(7,650.00)	(5,050.00)	10,600.00	(212,600.00)	94,600.00	(3,000.00)
24	Taro Pharmaceutical Industries Ltd.	(4,950.00)	(1,950.00)	-	(17,800.00)	-	1,150.00
25	Palatin Technologies, Inc.	(37,200.00)	3,600.00	447,400.00	(228,100.00)	102,300.00	(63,450.00)
26	Novartis AG	(53,600.00)	4,900.00	64,100.00	(106,000.00)	(10,600.00)	(950.00)
	S&P 500	(46,725,000.00)	107,400,000.00	57,780,000.00	202,750,000.00	(137,720,000.00)	238,015,000.00