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INSIDER TRADING AND STOCK MARKET EFFICIENCY

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I hereby declare that I have compiled the thesis independently
and all works, important standpoints and data by other authors
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ABSTRACT

Insider trading has been an interest of many researchers and some papers have already been written with interesting outcomes. However, this thesis analyses the COVID-19 pandemic period to offer some additional insights. This research aim is to analyse the efficiency of insider trading in the U.S. stock market during COVID-19. The research question analyses, in what instances can stocks with active insider trading outperform the market on a risk adjusted basis.

In the given thesis quantitative research was applied and three hypotheses were formulated based on previous theoretical background and empirical literature review. All hypotheses were tested by calculating risk-adjusted mean returns of stocks with active insider trading compared to S&P 500 returns. Three risk-adjusted measures used were abnormal returns, Sharpe ratio and Treynor ratio.

The first hypothesis stated that there is no performance difference in stocks with active insider trading and market returns and the second hypothesis stated that risk adjusted mean returns of stocks with insider buying are not significantly different from that of insider selling. Both hypotheses were rejected as insider portfolio outperformed the market and purchased stocks outperformed the sold stocks. Third hypothesis tested whether the size of the company acts as a significant factor with the hypothesis that small companies have the same sensitivity to insider trading as large companies and given hypothesis was partially accepted.

Moreover, the given thesis concluded that stocks with active insider trading can outperform the market on a risk-adjusted basis and an active investor could potentially benefit from this information.

Keywords: stock market, insider trading, efficient market theory, random walk theory

INTRODUCTION

Insider trading can be categorised into illegal and legal action and oftentimes when the term insider trading is used most people think of the illegal trading as many headlines regarding this have made it to news. However, not all insider trades are illegal and today many regulations and laws have been established by the Securities and Exchange Commission (SEC) to ensure an equal and efficient stock market. On the other hand, it can be assumed that insiders have more information than the outsiders meaning that they have more reasons to believe how the company will do in the future. Due to this, the topic of insider trading has been in interest of many researchers as this might indicate that external investors can take advantage of this as well since all significant insider transactions need to be disclosed publicly to the SEC.

Based on previous research it is not clear whether and to what extent does insider trading affect market efficiency or company valuations through revealing private information as the outcomes differ in many cases. Moreover, this thesis analyses the COVID-19 pandemic period and it could be seen to offer some additional and supportive insights. The pandemic period is important to note because the markets faced significant volatility and investors had to come to terms with constant uncertainty regarding the future, implying that insiders of companies might have had valuable information about whether the company will manage to overcome the challenges or not.

Moreover, the performance of stocks with insider trading is analysed and compared to the market, leading to given research problem of whether insider trading can outperform the market on a risk-adjusted basis or is it simply a noisy signal. This research aim is to analyse the efficiency of insider trading in the U.S. stock market during COVID-19. Furthermore, it is determined if an active investor could benefit from information regarding insider trading in some instances or are the markets too efficient for any mispricing. Moreover, the research question is: in what instances can stocks with active insider trading outperform the market on a risk adjusted basis?

The formation of hypotheses is based on analysis and discussion of previous theoretical background and additional empirical literature review. This research analyses whether insider

trading falls under the strong form and random walk theory or do stocks with active insider trading outperform the market as semi-strong form suggests. Based on empirical literature review and theoretical concepts, the thesis proposes three hypotheses. The first hypothesis states that there is no performance difference in stocks with active insider trading and market returns. For this the risk-adjusted mean returns of stocks with active insider trading are compared to S&P 500 returns. The second hypothesis states that risk adjusted mean returns of stocks with insider buying are not significantly different from that of insider selling. Given hypothesis is based on the idea that insiders should buy the stock in case of good future outlooks and vice versa. The risk-adjusted returns of stocks with buy transactions are compared to stocks with sell transactions to answer this. The last hypothesis tests whether the size of the company acts as a significant factor for returns of stocks with insider trading with the hypothesis that small companies have the same sensitivity to insider trading as large companies. To answer this hypothesis, risk adjusted mean returns of small and large cap stocks with insider trading are compared.

In the given thesis S&P 500 was chosen as the benchmark index to represent the average US stock market returns. The sample of stocks with insider trading was retrieved from the first 4 months from the beginning of COVID-19. The sample stocks chosen were retrieved from the New York Stock Exchange and Nasdaq. The final dataset consists of 77 buy transactions and 77 sell transactions, a total sample size of 154. Given thesis applies quantitative method and risk-adjusted mean returns for the following 23 months were calculated by applying abnormal returns, Sharpe ratio and Treynor ratio.

Given thesis is divided into three chapters which are in turn divided into subchapters. The first subchapter under the first chapter provides a theoretical overview including theoretical background associated with insider trading and stock market. The second subchapter provides empirical literature review, and the third subchapter follows with proposed hypotheses and research questions based on the theoretical background and empirical literature review. The second chapter describes chosen methodology including data collection and research methods. The last chapter interprets the results, discusses findings and conclusions and suggests implications for further research.

1. THEORETICAL OVERVIEW

It is important to distinguish different terms associated with the stock market to understand its different aspects. Given chapter presents the main terms linked to research problem, theoretical background and previous empirical research. In the last sub-chapter, the research question and hypotheses are proposed based on information and research discussed prior to that chapter.

1.1. Stock market and insider trading

The purpose of the stock markets is to provide capital to companies and opportunity for investors to receive a share in public companies. Efficiently functioning stock markets offer the companies' ability to quickly access capital from the public without any complicated large-scale projects and this should lead to profits and (Stock Market n.d.). Stock market should offer the public equal opportunity to trade stocks but an exception to this can be seen in insiders. An insider is seen as an officer, director, 10% stockholder or anyone who possesses inside information because of their relationship with the company or insider including any employees and family members who have non-public information regarding the company and anyone who has gotten a "tip" from an insider (The U.S. Securities and Exchange Commission 2015).

1.1.1. Stock market

According to Statista Research Department (2021), the biggest stock exchanges by market capitalisation in the world are New York Stock Exchange and Nasdaq, both based in the United States. Additionally, the U.S. stock market is the most liquid stock market in the world (Mackintosh 2021). These two factors make the U.S. stock market suitable for this thesis. Regarding analysis of the stock market, according to Benjamin Graham (1934), the process of deciding which securities are sound investments is called security analysis. Its three functions are descriptive, selective and critical. Descriptive function compares companies and presents relevant facts, selective function decides based on descriptive function facts and critical function deals with monitoring policies, management and company's structure. On the other hand, market analysis

aims to forecast prices of security or the movement of the market without focusing on facts about companies. Another important concept is the intrinsic value of a security as it represents the value of given security. It is complicated to estimate intrinsic value and no exact value which is true for everyone can be provided whereas the price of stock can be determined. (Graham *et al.* 1934)

Overall, two different types of approaches to price prediction and stock market analysis can be distinguished, namely technical and fundamental. The motivation behind technical theory is that history tends to repeat itself, which is why analysing past performance of stock prices should help to determine future price patterns. Fundamental analysis focuses on the intrinsic value of stock, implying that the intrinsic value depends on the earnings potential of the security which depends on fundamental factors such as outlook for the economy and industry. An investor who applies fundamental analysis tries to evaluate whether the actual stock price is above or below its intrinsic value. (Fama 1995) Moreover, both approaches differ from each other based on the way of functioning, time window used, tools used and their objective (Petrusheva, Jordanoski 2016).

Start of insider trading regulation can be seen from one of the most significant events on the wall street stock market. The event took place in October of 1929 also known as the start of the Great Depression. The market was clearly in a boom, but the stocks had been losing value since September and by October investors started to panic which is why they started to sell their stocks and initiated forced margin calls leading to market fall (White 1990). On Black Monday, October 28, 1929, the Dow Jones index had declined by about 13 percent, next day it dropped another 12 percent and by 1932, the value of Dow had declined by 89 percent, and it did not return to its pre-event levels before 1954 (Richardson *et al.* 2013). During the period of the Great Depression companies' executives took advantage of the market turbulence and volatility. This is a clear example of how extensive the problem of insider trading is.

Evidence suggests that insiders notice when the stock of the company is mispriced and take advantage of this for their own good (Clacher *et al.* 2009). The regulation prior to the given event was minimal and after this crash the president of the United States decided to establish laws and regulations along with congress to stop those companies' insiders from taking advantage of volatile markets (The role … n.d.). In the past the insiders had the opportunity to minimise losses or make profits based on dishonest acts towards the stock or the company itself. First laws were established in 1933 which stated that investors must receive financial and other important information regarding the securities being offered for sale and to prohibit any form of fraud in sale

of securities. Following this, in 1934 SEC was created with the task to protect investors and ensure efficient markets. (The laws n.d.)

1.1.2. Laws and regulations for insider trading

Consensus agrees that speculators can take advantage of stock manipulation for profits and release of false information, but this has been made illegal (Allen, Gale 1992). Determining whether transactions with stock can be categorised into illegal or legal trading can be challenging as insiders can trade simply due to liquidity or diversification needs and not based on private information. Oftentimes the trade can also be due to some public information in combination with more thorough understanding of the firm or information (Cline, Posylnaya 2019). Newkirk and Robertson (1998) have noted in the SEC speech that legal insider trading takes place every day but usually when people hear the term "insider trading", they immediately think of illegal trading. SEC also mentioned that insider trading as a crime is extremely difficult to prove as the direct evidence on it is rare. The only certain evidence is when the inside trader confesses (Newkirk, Robertson 1998).

Certain laws and regulations have been established by the SEC to ensure a fair market. SEC Rule (2015) 10b-5 states that corporate officers and directors or other insider employees are prohibited from using confidential corporate information for profits through trading the company's stock. Additionally, using a third party to perform this is prohibited as well. Even though an insider is seen as an officer, director, 10% stockholder or anyone who possesses inside information because of their relationship with the company or insider, the previously described rule 10b-5 also applies to any employees and family members who have non-public information regarding the company and anyone who has gotten a "tip" from an insider (The U.S. Securities and Exchange Commission 2015). SEC also requires that owners of 10% or more of a company's stock and all corporate insiders to fill in forms 3, 4 and 5 which can be accessed by the public. Form 4 reports insider trading or changes in ownership and must be reported to SEC two business days before actual trade. (The U.S. Securities and Exchange Commission n.d.)

It is important to determine what type of information is seen as illegal for insider trading. According to SEC Insider Trading Policy (2015), any information which could potentially affect the value of a company's stock or investment decision of the person deciding to buy or sell given stock is classified as material inside information. Information is seen as material in case an investor could potentially see it as important when deciding whether to buy or sell the stock or it is seen to

have significant effect on the overall information available before decision. Some examples include loan defaults, proposed public or private offerings of securities, a change in management, new product announcements and gain or loss of important customers or suppliers. Hence, the material information can be either positive or negative and it is non-public until it has been disclosed to the public. Information becomes public if there is evidence that it has been widely spread and the public has also had time to process it. Generally, the information is seen as public after the second business day of information released, which is usually done through press conferences or documents filled with SEC. All stock transactions such as short sales and put or call options are strictly prohibited even though they might not be done based on insider information. (The U.S. Securities and Exchange Commission 2015)

To further assure a fair market, the SEC has established rules regarding three most important things, namely no trading on material non-public information, preclearance of trades and exception of window period. The first rule regarding no trading on material non-public information states that an insider in possession of material non-public information should never trade the company's stock nor should they discuss or reveal given information. Preclearance of trades implies that all trades in a company's stock must be always disclosed by directors and officers. The window period protects the company and its insiders from even appearing to be trading on non-public information when innocent. The window opens the second trading day after the company's quarterly or annual earnings figures are disclosed to the public which means that the window is open for 20 full trading days and will close by the end of 20th trading day. All transactions must take place during this 20-day period and directors and officers must obtain a pre-clearance for trades. There is also an exception to the window period which can be requested but it cannot always be granted. The request must disclose the reason and date of the transaction and must be presented to the company's chief financial officer. (The U.S. Securities and Exchange Commission 2015)

Insider trading violation can result in a private lawsuit which can be initiated by a stockholder of the company. This is probably the best-case scenario as the second consequence is civil enforcement action which is brought against the insider by SEC, whose goal is to assign an insider with monetary penalty, a cease-and-desist order and order to omit the insider from continuing as an officer or director of any public company. The more serious insider trading case can result in criminal felony prosecution. (The U.S. Securities and Exchange Commission 2015) It is evident that the SEC has added many more definitions to the list of what is seen as insider trading and the companies have in turn applied more strict policies to their insiders and their trading. Moreover, it

can be argued that these developments of regulations and rules might have decreased the price effect of insider trading over time (Damodaran 2013).

1.1.3. Efficient market theory

According to Eugene Fama (1970), for a market to be considered efficient, its prices must always fully reflect all available information. Moreover, an efficient market is a market with many rational and profit maximising investors actively competing, trying to predict the future value of specific stocks. This competition among rational investors leads to a situation in which at any point in time the actual prices of individual securities should already reflect any information from already occurred and expected future events (Fama 1995). The price changes of stocks are due to unforeseen and unexpected events and additionally the mispricing's do not occur in a predictable pattern that could lead to consistent outperformance by investors that take advantage from it. On the other hand, the hypothesis of efficient markets does not claim that all investors and market participants are rational nor are the prices always right or supposed to be stable. (Fama 1960)

Fama (1970) reflected on the theory of market efficiency, discussing whether prices fully reflect all available information and came up with three different versions namely weak, semi-strong and strong form. The weak form implies that all data of past prices is fully reflected in today's prices and no technical analysis can help investors. Moreover, a stock price only reacts to historical information and an investor can make use of new public information or private inside information to earn abnormal returns. The semi-strong form however states that as the public information is already reflected in actual price, then investors cannot benefit from technical or fundamental analysis because prices react to new information quickly. Hence any insider trade that is made public should move the stock prices immediately. Exception to this form is the private information. Lastly, the strong form claims that both public and private information is already reflected in the actual stock price and no market participant can take advantage of it. The strong form hence also suggests that earning abnormal returns from insider trading is not possible due to strict regulations and laws. (*Ibid.*)

As it was discussed, according to the efficient market hypothesis outperformance of the market is not possible because all information is already reflected in prices. The random walk theory explains the idea of how everything in stock market prices is random and earning above normal returns is due to chance, not competence (Fama 1995). Given theory opposes models and theories which try to predict stock price behaviour, often used by investors and traders such as technical

and fundamental analysis which were described before. According to Fama (1995), the theory of efficient markets should assure investors that the actual price of security is aligned with its intrinsic value. However, it is complicated to determine the exact intrinsic value of a security, which leaves room for disagreement among market participants. Applying this idea to the efficient market theory, it can be concluded that the competition among the participants causes the actual price to fluctuate randomly near the intrinsic value. The instant adjustment of an efficient market means that price changes in individual securities will be independent. This is called the random walk market, meaning that the series of changes in stock price do not have any memory and the future path of the price of security is not more predictable than a path of any series of cumulated random numbers. (*Ibid*.) Followers of the Random Walk theory hence believe that stocks take a random and unpredictable path and the chance that stock will rise, or fall is equal. Insiders in this case should not be able to take advantage of any information that they have solely since the path of prices is random and unpredictable.

It can be argued where exactly does the stock market and insider trading fit today as the regulations and laws support the idea that no one can take advantage of the market but nevertheless insiders should have more information than the outsiders. Insider trading seems to fall well under the semi-strong form as given theory believes that only information not disclosed to the public can affect the stock price. Hence, the regulations and policies of insider trading ensure that also the insiders cannot take advantage of non-public information. The strong form and random walk theory seem slightly excessive as according to this theory all insider information is also already fully reflected in the stock prices and regulation along with laws does not leave room to earn above normal risk adjusted returns from insider trading.

Another more modern concept which could be discussed is the theory of adaptive market hypothesis, which is a combination of previously described efficient market hypothesis and behavioural finance. The combination is interesting because the efficient market theory states that it is not possible to outperform the market since prices already reflect all information while the behavioural economics states that markets are irrational and inefficient as people are driven by fear and greed instead. The hypothesis was developed by Andrew Lo (2004), who assumed that most people are rational but from time to time overreact during periods of high volatility as they are driven by their own interests which can lead to mistakes that can be seen as lessons. Based on the adaptive market hypothesis it can be assumed that some trades in the stock market might be just based on fear and can be interpreted as mistakes as not everyone in the market is rational. For

example, in case of extraordinary events and situations investors behave irrationally and cause market inefficiencies. Lo (2004) described that if a certain strategy of an investor fails then they will likely choose another strategy next time while when it succeeds, they will probably perform it again which will eventually lead to a more efficient market. (*Ibid*.)

1.1.5. COVID-19 impact

On December 31st, 2019, Wuhan Municipal Health commission in China reported a cluster of cases of pneumonia and on 5th of January 2020 World Health Organisation (WHO) published first disease outbreak news on the new virus and on January 20th in 2020 the first U.S. laboratory-confirmed case of COVID-19 in U.S. was confirmed (Centers for Disease Control and Prevention n.d.). On January 31st, 2020, WHO declared the coronavirus outbreak as a Public Health Emergency of International Concern. As the thesis analyses an abnormal period due to the outbreak of a global virus which led to a pandemic, it is important to assess the possible influence from the event on the stock market (World Health Organisation n.d.). The World Bank (2020) has also pointed out that uncertainty about the future and worldwide lockdowns led to significant fall in investor confidence meaning that investors were delaying investment decisions. The beginning of the pandemic led to plummeting equities and historically high volatility as the volatility of in United States in March 2020 outperformed the levels of Global Financial Crisis in 2008 and the Great depression in 1933 and reached similar levels to the Great Crash in 1929 and Black Monday on 1987 (Baker *et al.* 2020).

It is important to note that COVID-19 pandemic affected the information efficiency of markets significantly. The initial wave in the beginning of 2020 led to panic and lockdowns globally, including closures of businesses and the second significant wave in the beginning of 2021 had the same effect but on a smaller scale (Okorie, Lin 2021). Coming back to the theory proposed by Lo (2004), the idea of extraordinary events is applicable to the case of COVID-19 when the volatility and sell-offs illustrated the fear and greed very well which led to irrational investors and inefficient markets. Regardless of fear, uncertainty and increasing unemployment the stock market kept soaring with some important milestones that shook the market. This can be seen well from the S&P 500 performance (see Figure 1). In the start of the pandemic many people were oblivious and did not see the pandemic as a real threat to the population and economy, however when Wall Street eventually faced the reality, the market fell about 30 percent from February to March (Stewart 2021). Such fluctuations from volatility in markets offer investors including the insiders' good positions for buying and selling which is why a given period is very interesting from a research

perspective as it might offer more information. There was a record number of insider purchases after the stock market decline from late February 2020 (Anginer *et al.* 2020). The idea behind the high number of purchases might have been interpreted as a sign that those specific companies will manage to shake off the negative effects of COVID-19 or even benefit from it and insiders might have access to this information.

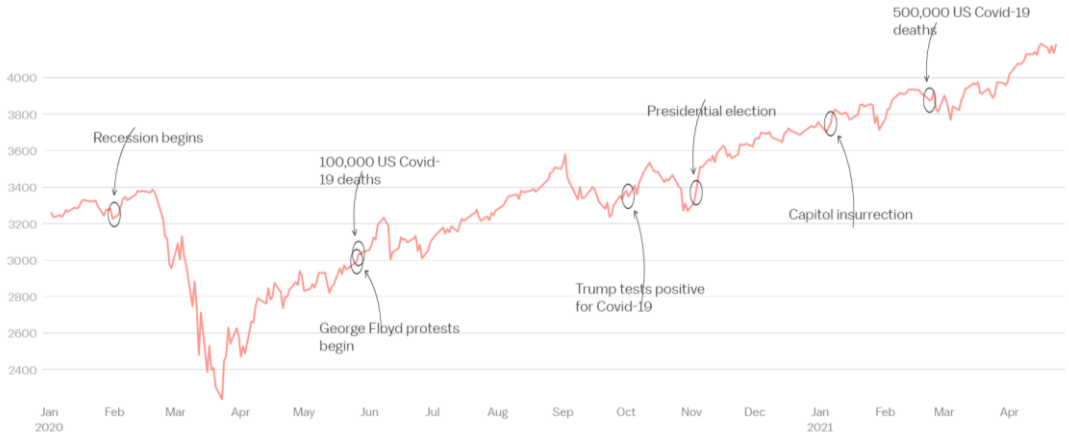

Figure 1. S&P 500 performance during pandemic
Source: Stewart (2021)

As the pandemic was taking over, the Federal Reserve started implementing policies and taking action to avoid recession, including cutting interest rates, offering forward guidance, and purchasing Treasury securities and agency mortgage-backed securities (Clarida *et al.* 2021). These actions along with many others created a boosting environment for the stock market, which led to all-time highs and significant gains of markets and stocks, including the S&P 500. Regarding market efficiency and Fed policies, according to Siegel (2021), stocks are not reacting as they have in the past because investors have become so geared to watching and anticipating the policy so that the effect of easing or tightening is already included in the market. This idea supports the efficient market hypothesis and implies that the announcements during coronavirus do not have effect on the stock prices. Similarly, it was discussed before that Damodaran (2013) pointed out that laws and regulations have decreased the price effects of insider trading. According to Siegel (2021), the reaction is solely due to the difference between investors' expectations for the announcements and reality and the same idea applies to good and bad news of the companies.

Applicable to the topic of COVID-19 and complications regarding identifying insider trading, SEC has an ongoing investigation about potential unethical insider transactions. The Congress had a

coronavirus briefing after which the Senate informed the public that the U.S. is very well prepared and there is nothing to worry about. Contrary to the information communicated to the public, the U.S. Senator Richard Burr sold most of his stocks in the beginning of the pandemic in February 2020. This was exactly a week before the global market crashed. Burr managed to call his brother-in-law who also after the call started selling his stocks (Newmyer 2021). This is not the only example of this type of investigation and during COVID-19 as many similar cases are under review. For example, Sen. Kelly Loeffler was also at the meeting with Burr and sold stocks with total value around $1,3 to $3,1 million and she even purchased stocks in two companies that could potentially benefit from the coronavirus such as teleconferencing that would benefit significantly in remote work (Kelly 2020). The complexity of these investigations illustrates how complicated it is to identify and prove whether a person has used private information. This also raises questions regarding whether regulations and laws regarding insider trading are sufficient to ensure a fair effective market and it obviously raises significant ethical questions.

1.2. Empirical literature review

There has been a vast amount of research regarding insider trading as this topic interests many researchers. Various papers have been written on different topics and some that are applicable to this paper will be discussed next. Most common topic of interest in researchers is whether insider trading conveys some information and whether it has any effect on the market. There are solid arguments on each side and the debate over this topic is ongoing. Given paper is unique because it analyses data from period with a global pandemic and this can possibly provide some additional insights. Following papers have been written on topics such as insider trading and market efficiency, some have looked at whether there are any differences between different types of transactions and sizes of the companies. Based on these topics discussed in the following papers, given research performs an analysis to provide additional conclusions and suggestions.

Damodaran noted that looking at whether insiders earn excess returns is an option to assess if above market returns can be earned with private information. Damodaran called insider trading to be a noisy signal as he claimed that about 4 in 10 stocks with insider buying turn out to be poor investments and the excess returns earned on average are not too significant (Damodaran 2013). Roddenberry and Bacon (2011) found in a performed event study that the results about insider sale announcement supported the semi-strong efficient market hypothesis as the investor was not able

to earn above normal risk adjusted returns by acting on the public announcement. However, they found that insiders themselves and investors who acted prior to the announcement did earn above normal returns (*Ibid*.). Additionally, an earlier study by Finnerty (1976) found that insiders managed to earn above average returns when they bought securities and the securities that were sold by insiders fell more than the general market. The author concluded that the insiders outperformed the market due to access to private information (*Ibid*.).

There are additional studies looking into differences between purchase and sell transactions by insiders. The idea is that as insiders have more information they should know if the company will do well in the future and hence buy the stock while in case of poor outlooks for the future the insider should sell the stock. Moreover, the returns of stocks with buy transactions should exceed the returns of stocks with sell transactions. In a study conducted by Lakonishok and Lee (2001) they found out that firms with substantial insider buying have stock returns over the next 12 months of about 22% while stocks with insider selling had returns of about 14%. Finnerity (1976) found similar results as the study concluded that insiders earn above average returns when they buy securities of their respective corporations. Access to valuable information is not necessarily always only associated with company's direct insiders and a prime example of this is how even lawmakers might take advantage of the vast amount of valuable information that they receive which can be categorised as insider information. Another study which analysed abnormal returns from the common stock investments of the U.S. Senate found that their documented portfolio, which imitated the purchases of the U.S. Senators beated the market by 85 basis points per month while the portfolio with sales beated the market only by 12 basis points per month (Ziobrowski *et al.* 2004). This suggests that stocks that are purchased and believed to do well in the future perform significantly better and stocks with poor future outlooks are not that successful. This might suggest that the lawmakers had received valuable information for evaluating which stock will do better in the future and which will do worse and chose the appropriate times to make the transactions. From a slightly different perspective a study conducted by Scott and Xu (2004) found that only large sales that accounted for a large percentage of insiders' holding managed to predict significant negative future abnormal returns while small sales were correlated with positive abnormal returns.

According to some previous research, categorising companies according to their market capitalisation can also provide some insights about whether information about insider transactions has any significant value. Lakonishok and Lee (2001) found that there is a significant relationship between insider trading and excess returns in small companies while they did not find almost any

link between larger firms and excess returns. Additionally, Damodaran (2013) argues that the information about insider trading is less useful in companies which already have large amounts of information that is easy to access such as large public companies, which supports the study by Lakonishok and Lee. In addition to the company size, the level of position in the company of the insider offers some conclusions as well. Considering how most companies are structured, insiders should not have equal access to information as the top-level members and managers should have more access and hence their trades should convey more information. A study by Bettis, Vickery and Vickery (1997) revealed that trades made by the higher-level insiders led to excess returns. This information could be beneficial for investors as they can look at selected insider trades which in this case are large scale trades by the top executives. Hence, given study suggests that the market is not efficient in the semi strong from implying inefficiency regarding all publicly available information as outsiders can earn abnormal returns by following insider trades (*Ibid*.).

Regarding the COVID-19 period some research has been already done about insider trading from a different perspective. Study by Anginer et al. (2020) found that the purchases by insiders were more common in larger firms, value firms and firms that have high leverage. They additionally found that purchases were linked to sectors as it was more common in energy, finance and consumer nondurable sectors as these sectors should manage to benefit from the pandemic or just manage well (*Ibid*.). Paper by Wronka (2021) drew the attention to emerging financial crime due to COVID-19 which pushed companies and individual people to their limits and compelled them to take part in illegal insider trading. These studies illustrate the difference between a normal period and pandemic period which is why analysing COVID-19 period might offer additional insights.

1.3. Hypothesis development

Based on previous information it cannot be clearly stated whether and to what extent does insider trading affect market efficiency or company valuations through revealing private information. Due to this reason more research should be done and adding the pandemic period as one of the factors might offer some additional and supportive insights. Moreover, the aim is to analyse the efficiency of insider trading in the U.S. stock market during COVID-19. The research question of the thesis is the following:

In what instances can stocks with active insider trading outperform the market on a risk adjusted basis?

This research analyses whether insider trading falls under the strong form and random walk theory or do stocks with active insider trading outperform the market as semi-strong form suggests. Firstly, portfolio of stocks with insider trading is analysed to assess if given portfolio outperforms the market. To answer this, risk-adjusted mean returns of stocks with active insider trading are compared to S&P 500 returns on corresponding dates. Furthermore, the hypothesis is as follows:

H1: There is no performance difference in stocks with active insider trading and market returns

The idea of excess returns due to private information is tested with second hypothesis implying that insiders should have reasons to believe that the company will do well in the future. This implies that insiders should buy the stock in case of good future outlooks, while in case of poor outlooks the insider should sell the stock. Moreover, the risk-adjusted returns of stocks with buy transactions are compared to stocks with sell transactions and analysed whether returns of buy transactions exceed the returns of sell transactions. Hypothesis that explores this idea is:

H2: Risk adjusted mean returns of stocks with insider buying are not significantly different from that of insider selling

The last hypothesis tests whether the size of the company acts as a significant factor for returns of stocks with insider trading. This idea was analysed by Lakonishok and Lee (2001) who found a significant relationship between insider trading and excess returns in small companies while there was almost no link between larger firms and excess returns. The same concept was also discussed by Damodaran, who claimed that the information about insider trading is less useful in companies which already have large amounts of information that is easy to access. For this, the risk adjusted mean returns of small and large cap stocks with insider trading are compared. Hypothesis to analyse given concept is as follows:

H3: Small companies have the same sensitivity to insider trading as large companies

Based on given research question and hypotheses the thesis aims to find out if an active investor could benefit from information regarding insider trading in some instances or are the markets too efficient for any mispricing.

2. DATA AND METHODOLOGY

Given research is conducted applying quantitative analysis as the thesis compares the risk-adjusted returns of stocks over a certain period. The aim of the given research is to analyse the efficiency of insider trading in the U.S. stock market during COVID-19 and to find out if an active investor could benefit from information regarding insider trading in some instances or are the markets too efficient for any mispricing.

2.1. Data collection

Quantitative method deals with collecting and analysing data which can be represented numerically. More specifically, quantitative research uses numbers to access information, hence the data accessed can be measured and quantified. Additionally, the aim is to give objective answers and problems can be answered by using statistical analysis on which results can be well concluded. (Goertzen, 2017) Since the aim of the thesis is to analyse the efficiency of insider trading in the U.S. stock market during COVID-19 through comparing the risk-adjusted returns of stocks over a certain period then quantitative method is suitable. However, the limitation is that quantitative method does not answer why people feel or think certain things, which might be also an important factor during uncertain times.

The SEC requires that companies report their annual earnings no later than 90 days from the end of its fiscal year which is why in the given thesis a 4-month period starting in 2020 January was chosen to ensure that chosen transactions do not fall under the blackout period, which represents the period before the publication of annual reports during which insiders are prohibited from trading (Form 10-K n.d.). As it was mentioned in the theoretical part, SEC requires owners of 10% or more of a company's stock and all corporate insiders to file form 4, which reports insider trading or changes in ownership, and it must be reported two business days before actual trade (Insider trade n.d.). This provides the public access to given information but unfortunately it is in separate files for each transaction meaning that one would have to work through a large set of files to find

suitable transactions. However, many online resources offer overview of the transactions in one database and this option was also used in the given thesis and data was retrieved from Gurufocus and every trade which was left after data cleaning was checked by looking up SEC Form 4 fillings.

The sample of stocks with insider trading was retrieved from January 1st, 2020, to April 31st, 2020, to avoid a blackout period. The sample stocks chosen were retrieved from the New York Stock Exchange and Nasdaq. Additionally, criteria of 100 million to 100 billion market capitalisation were added to exclude any possible outliers that could affect the results. Sell and buy transactions were retrieved separately to get an equal amount of data about both transaction types. The data was sorted descending starting from the highest cost per transaction and a total of 400 sell and buy transactions were retrieved including 200 buy transactions and 200 sell transactions. This data was later cleaned so that there were no duplicates and the same stocks with lower cost per transaction were removed in order to have one transaction per each stock. After this cleaning the dataset consisted of 77 buy transactions and 111 sell transactions. The sell transactions were reduced to get equal amount of buy and sell transactions leading to 77 sell and 77 buy transactions, a total sample size of 154. The descriptive statistics of final raw data collected can be seen from Table 1. Additional descriptive statistics of mean returns can be seen in Appendix 1. To analyse the stocks with insider trading from different perspectives in addition to transaction type, companies were also categorised according to their size into groups of small (market cap less than 2 billion), mid (market cap between 2 and 10 billion) and large capitalisation (market cap more than 10 billion) (Seth 2022).

Table 1. Descriptive statistics of raw monthly mean returns over 23 months

	Portfolio	Buy	Sell
Mean	0.82	0.96	0.69
Standard deviation	1.55	1.57	1.51
Variance	2.39	2.48	2.29
Count	154	77	77

Source: Author's calculations

In the given thesis S&P 500 (SPY) was chosen as the benchmark index to represent the US stock market returns. The S&P 500 index is appropriate because it includes the 500 leading publicly traded companies in the U.S. and it is considered to be one of the best benchmarks for the equities market due to its depth and diversity (Kenton 2022). Damodaran (1999) has pointed out that in the case of short-term analysis the government security rate can be used as risk free rate. Treasury

bills are closest to investment possible to being risk-free because the U.S. government has never defaulted on its debt obligations, the government will always repay bondholders at par when they mature and there is virtually no interest rate risk since they are paid at their part value over short maturities without regular interest rate payments (Why Are T-Bills … 2021). Hence, for calculations of risk-free rate the U.S. 3-month treasury bill rate was retrieved from Federal Reserve Bank of St. Louis online dataset (Board of Governors n.d.). Monthly stock prices were retrieved using excel Stock History function which provided the adjusted closing price of each stock on the first day of a month for the following 23 months. Even though the overall industry continues to focus on total returns and dividends, this is insufficient for calculation of portfolio returns as it ignores the risk (Modigliani, Modigliani 1997). Additionally, Modigliani and Modigliani (1997) pointed out that it is important to adjust returns to risk as it makes stocks with different risks and returns comparable. Hence, solely calculating mean market returns would not provide any significant results, which is why in given thesis risk-adjusted returns are analysed by applying three metrics namely abnormal returns, Sharpe ratio and Treynor ratio.

2.2. Research methods

In this research abnormal returns are calculated and compared as a first approach to calculating risk-adjusted returns. Additional measure to account for risk is to calculate the Sharpe ratio. It is one of the most common measures of risk-adjusted returns and it provides the measure of "reward per unit of total risk" (Sharpe 1998 referenced in Modigliani, Modigliani 1997). Additionally, Treynor ratio is a widely used metric because it only considers the systematic risk as beta, which is a market risk that cannot be diversified away and it represents the "reward to volatility", offering additional value to this analysis (Treynor 1965 referenced in Pilotte, Sterbenz 2006). For hypothesis testing, calculated returns were tested with Excel Data Analysis t-Test: two-sample with unequal variances as all compared returns were independent from each other. According to the strong-form theory and random walk theory the abnormal returns, Sharpe ratio and Treynor ratio should all be statistically insignificant.

2.2.1. Returns

Closing prices recorded at the first day of each month were taken as a point of analysis for the following 23 months. Returns were calculated for all stocks and S&P 500 after which average mean returns were calculated as well. Arithmetic mean was chosen because geometric mean

considers only positive returns. Another option to calculate returns is to compute logarithmic returns however there should not be any significant difference and the most important thing is to apply same type of return throughout one study which is why simple arithmetic returns were calculated (Panna 2017). Simple returns are also more easily interpreted by most people. Firstly, monthly returns from price changes were calculated using Formula 1 after which average mean returns were calculated using the arithmetic mean and for further risk-adjusted calculations standard deviation was calculated as well.

$$r = \frac{P_{t+1} - P_t}{P_t} = \frac{P_{t+1}}{P_t} - 1 \quad (1)$$

where r is the monthly return, P_t represents initial stock closing price at the date of insider transaction and P_{t+1} represents stock closing price on the first day of the following month (Ross *et al.* 2013).

2.2.2. Risk-adjusted returns

Given thesis analyses performance of stocks with insider trading by adjusting the returns to risk to provide more reliable conclusions. First approach to calculating risk-adjusted returns is abnormal returns. The idea of higher than market returns oppose the strong-form efficient market hypothesis and random walk theory. Abnormal returns or excess returns are usually calculated by the difference in actual return of stock and expected return of stock or the competitive return (Jacobsen 1988). For example, in case the value of stock falls following an announcement of a new issue then the fall is seen as abnormal return (Ross *et al.* 2013). As the thesis compares the stocks with active insider trading to the S&P 500 returns then using the simplified version of difference between actual returns and market returns is applicable. Abnormal returns were calculated using Formula 2.

$$AR_{i,t} = R_{i,t} - R_{m,t} \quad (2)$$

where $AR_{i,t}$ is the abnormal return in period t, $R_{i,t}$ is the actual return of stock in period t and $R_{m,t}$ is the market return in period t (Ross *et al.* 2013).

In given thesis, returns of stocks with insider trading are compared with market returns to determine in what instances do stocks outperform the market which is why applying Sharpe ratio

for risk-adjusted mean returns is applicable. Sharpe ratio was developed by Stanford University finance professor William F. Sharpe in 1966 and it is a commonly used measure for risk-adjusted returns as it compares the return to total risk of investment (Sharpe 1998). It converts total returns to excess returns by subtracting the risk-free rate and then divides the result by a common measure of dispersion such as standard deviation (Modigliani, Modigliani 1997). Sharpe ratio was calculated using Formula 3.

$$Sharpe\ ratio = \frac{R_p - R_f}{\sigma_p} \quad (3)$$

where R_p is the return of portfolio or individual stock, R_f is the risk-free rate and σ_p is the standard deviation of excess return (Sharpe 1998).

Treynor ratio, which was developed by Jack Treynor in 1965, measures what is the reward of an investment compared to its risk, more specifically the market risk known as beta (Treynor 1965 referenced in Pilotte, Sterbenz 2006). Meaning that it compares the return to market risk as it evaluates investment performance by comparing the expected excess return to the expected systematic risk of the asset (Treynor 1965 referenced in Hodges *et al.* 2003). Treynor ratio was calculated using Formula 4. Regression analysis was performed to calculate beta, which can be seen in Appendix 2.

$$T_i = \frac{R_p - R_f}{\beta_p} \quad (4)$$

where T_i is the Treynor ratio for asset i, R_p is the return of portfolio, R_f is the risk-free rate and β_p is the beta of the portfolio (Treynor 1965 referenced in Hodges *et al.* 2003).

$$\beta_i = \frac{Cov(R_i, R_m)}{\sigma_m^2}$$

where β_i is the beta of asset i, σ_m^2 is the variance of market returns, R_i is the return on asset and R_m is the return on the market.

3. ANALYSIS AND DISCUSSION

Given chapter focuses on the results of analysis and examines the significance of each outcome based on proposed hypotheses to answer in what instances can stocks with active insider trading outperform the market on a risk adjusted basis as it was stated in research question. Each hypothesis will be analysed with quantitative methods and results will be discussed more in depth in the second chapter after which in the third chapter states implications for further research.

3.1. Interpretation of results

To reach more significant results, the analysis was done with three different types of measures to adjust returns for risk, which were abnormal returns, Sharpe ratio and Treynor ratio. The abnormal return shows the excess return from an investment that exceeds the market return, Sharpe ratio compares the return from investment to the total risk of investment and Treynor ratio compares the return to the market risk also known as the systematic risk. Systematic risk beta was calculated by performing regression analysis and the value of beta calculated was 1,24. This means that based on monthly returns stocks with insider trading were more volatile than S&P 500 which was chosen as the benchmark index. To reach any conclusions, hypotheses that ought to be true according to theories are tested and in case original hypotheses are rejected, then alternative or the opposite is accepted.

The first part of this chapter analyses the overall portfolio performance and compares it to the market return to answer the first hypothesis. The first hypothesis stated that there is no performance difference in stocks with active insider trading and market returns. Hence risk- adjusted average returns of 154 stocks with active insider trading are compared to the S&P 500 returns over the following consecutive 23 months.

From Figure 2 calculated average abnormal returns yielded positive returns over the 23-month period. The first 11 months the portfolio showed a clear increasing trend but started to decline

rapidly after that month and by the last month the portfolio abnormal returns had fallen to almost the same level as they were in the first month. However, according to abnormal returns, the portfolio of stocks with active insider trading outperformed the market as the returns are positive.

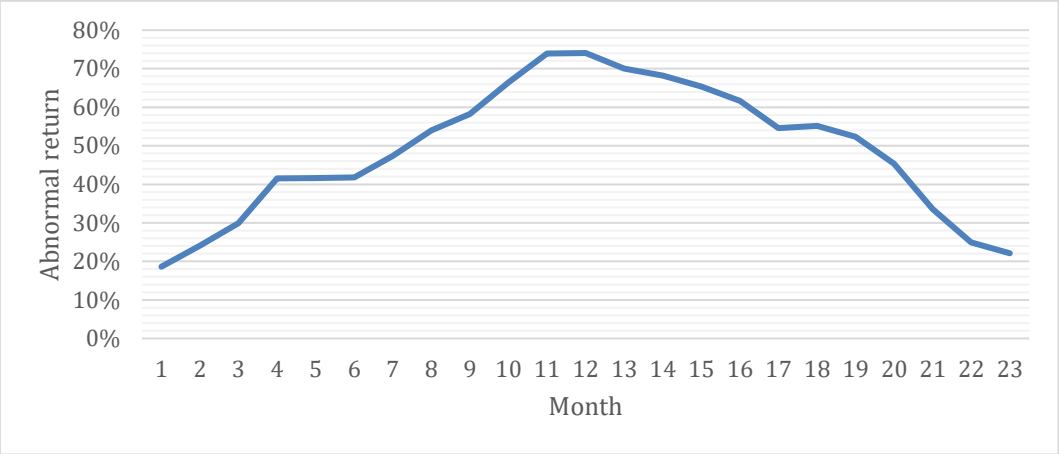

Figure 2. Abnormal returns of portfolio over 23 months
Source: Author's calculations

Similar pattern can be seen in risk adjusted returns of Sharpe ratio for the first months from Figure 3. The average returns of the portfolio were significantly higher than the market returns and the ratio showed a strong increasing trend for the first 13 months after which it started to decline. However, the average returns calculated with Sharpe ratio did not fall below the market return before the 19th month from which the returns yielded slightly lower returns than the market.

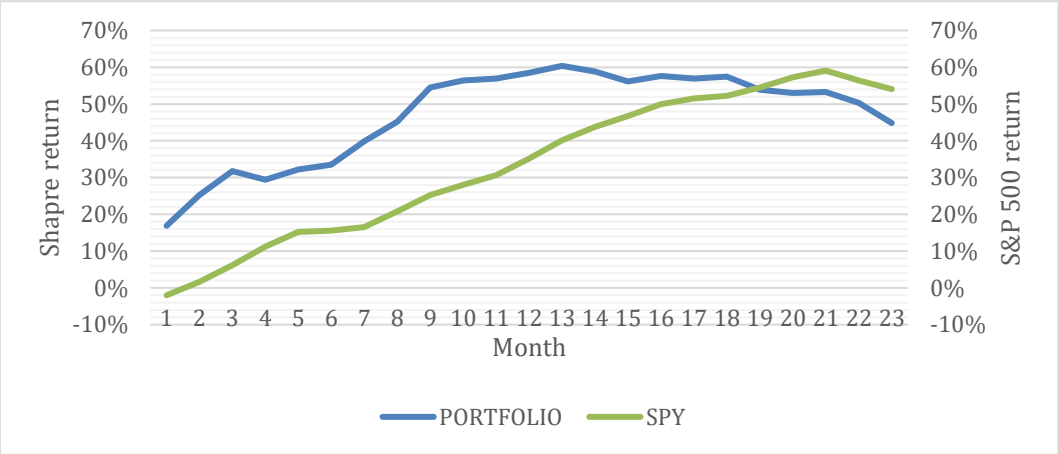

Figure 3. Sharpe ratio return of portfolio and S&P 500 over 23 months
Source: Author's calculations

From Figure 4 the Treynor ratio showed even higher returns and during the whole period of 23 months the average returns did not fall below the market return. The average returns calculated with Treynor ratio showed an increasing trend for the first 13 months after which it started declining similarly to previous measures.

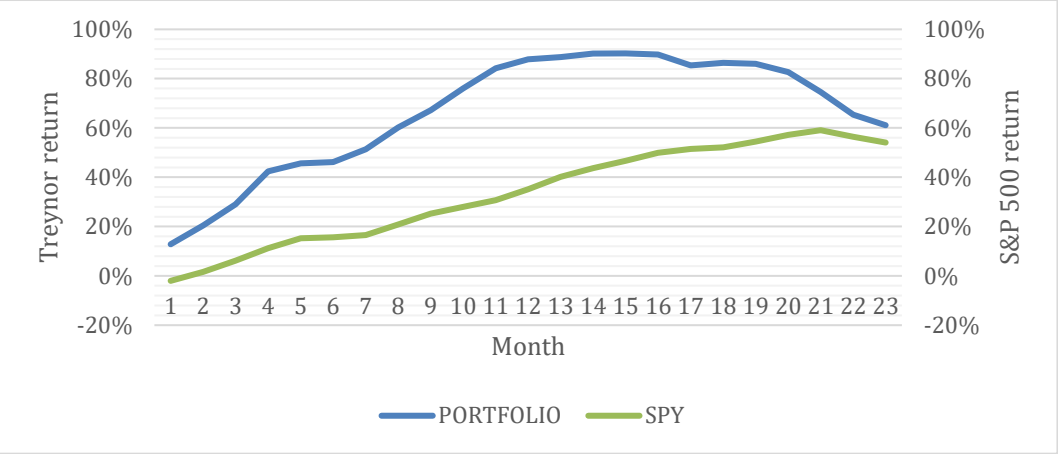

Figure 4. Treynor ratio return of portfolio and S&P 500 over 23 months
Source: Author's calculations

From Table 2 it is evident that the mean monthly return of the portfolio of stocks with insider trading was higher than the market return based on all three measures. However, previous literature has noted that T-tests might not be the best for Sharpe ratio, and it should be considered as a limitation (Lo 2002). For abnormal returns it was analysed if the returns are significantly different from zero. The mean market return was 33% while abnormal returns yielded on average 49%, Sharpe ratio yielded 47% and Treynor ratio 66% mean returns over the 23-month period. Treynor ratio yielded the highest return but also the highest meanwhile the variance in Sharpe ratio and abnormal returns was equal. P-value is significant in all three measures as it is less than 5%. Hence, according to these three measures, the portfolio outperformed the market.

Table 2. Portfolio of stocks with insider trading and the market monthly returns over 23 months

	Portfolio			S&P 500
	Abnormal returns	Sharpe ratio	Treynor ratio	
Mean	0.49	0.47	0.66	0.33
Variance	0.03	0.02	0.06	0.04
P-value	<0.00	<0.00	<0.00	–

Source: Author's calculations

The second hypothesis stated that risk adjusted mean returns of stocks with insider buying are not significantly different from that of insider selling. To analyse this the stocks are divided into two groups and risk-adjusted mean returns of stocks that were purchased will be compared to returns of stocks that were sold.

From Figure 5 which illustrates the abnormal returns it is evident that stocks which were purchased by insiders performed significantly better than stocks which were sold. Both portfolios of stocks with sell and buy transactions had an increasing trend for the first 11 months after which it slowly shifted to decreasing trend. Portfolio of stocks which were purchased by insiders ended the period below the return that it yielded in the beginning. Portfolio of stocks which were sold by insiders started the period with negative abnormal returns but managed to earn positive returns from month 2 until. Hence, it can be concluded that both portfolios outperformed the market and purchased stocks yielded higher returns than stocks which were sold.

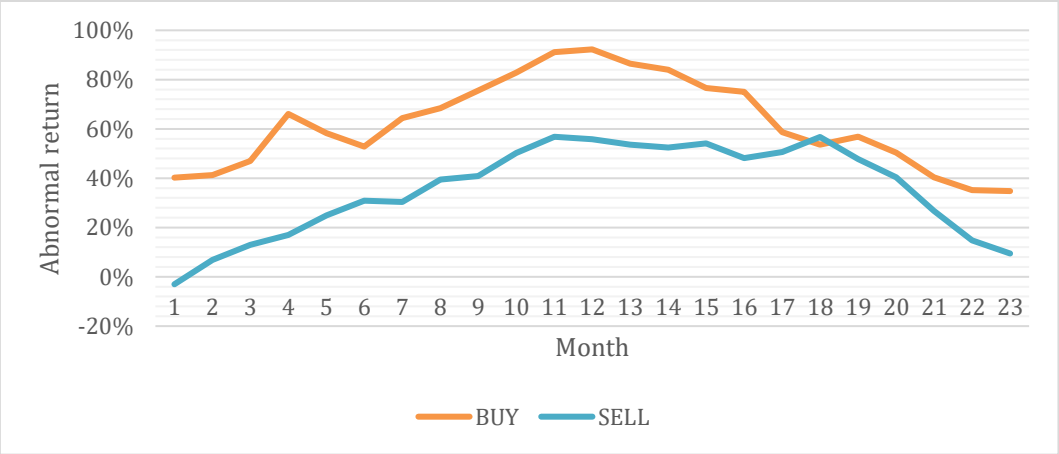

Figure 5. Abnormal returns of stocks with buy and sell insider transactions over 23 months
Source: Author's calculations

According to Sharpe ratio in Figure 6 the portfolio of stocks which were purchased by insiders also yielded higher returns than portfolio of stocks which were sold by insiders. Portfolios of stocks which were sold by insiders had initially negative returns but started earning positive returns in month 2. Both groups' returns had an increasing trend initially and yielded higher than market returns until month 19 after which purchased stocks returns fell below the market and portfolio of sold stocks was almost identical to the market.

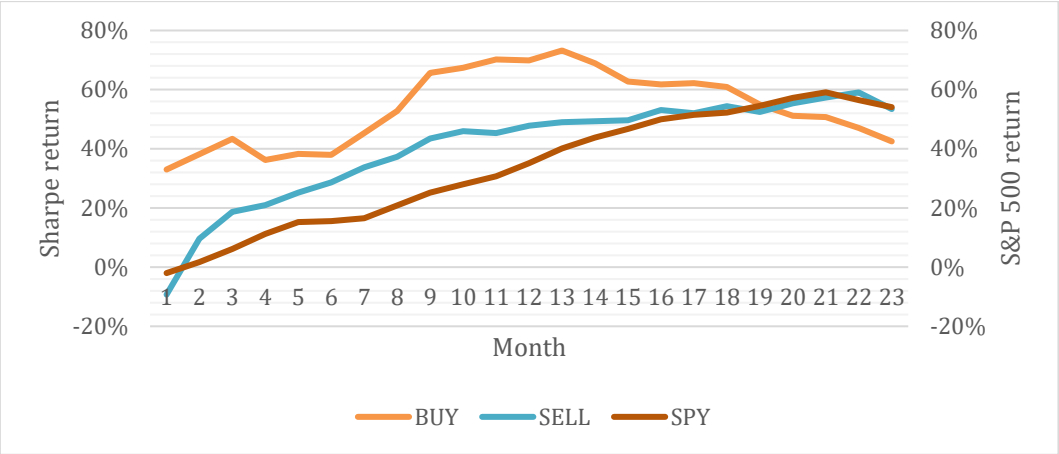

Figure 6. Sharpe ratio return of stocks with buy and sell insider transactions and S&P 500 over 23 months
Source: Author's calculations

According to Treynor ratio in Figure 7, purchased stocks performed better throughout the period. However, portfolio of stocks which were sold by insiders yielded above market returns for most of the period except for first and last month. Both groups had an increasing trend for the first 11 months after which purchased stocks portfolio started to slowly decrease.

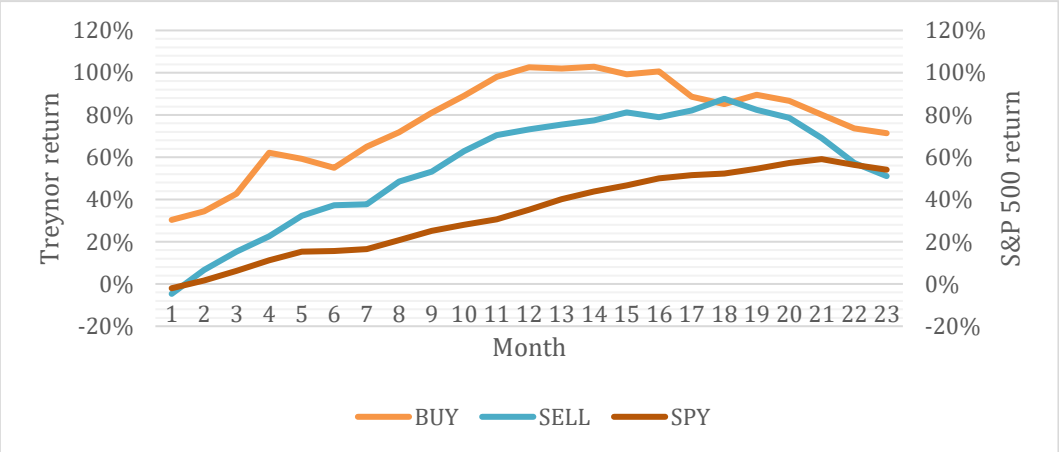

Figure 7. Treynor ratio return of stocks with buy and sell insider transactions and S&P 500 over 23 months
Source: Author's calculations

Furthermore, from Table 3 it is evident that in all three instances portfolios of stocks which were purchased by insiders yielded higher returns than portfolios of stocks which were sold by insiders. Additionally, both groups in both Sharpe and Treynor ratio yielded on average above market returns as the market return was 33% and Sharpe ratio yielded 54% return for buy group and 41%

return for sell group while Treynor ratio yielded 77% for buy group and 55% for sell group. The abnormal returns yielded 63% returns for the buy group and only 35% for the sell group. The p-value of all groups is significant which suggests that the hypothesis should be rejected meaning that risk adjusted mean returns of stocks with insider buying are higher than insider selling.

Table 3. Stocks with insider buying and selling monthly returns over 23 months

	Abnormal returns		Sharpe ratio		Treynor ratio		S&P 500
	Buy	Sell	Buy	Sell	Buy	Sell	
Mean	0.63	0.35	0.54	0.41	0.77	0.55	0.33
Variance	0.03	0.03	0.02	0.03	0.05	0.07	0.04
P-value	<0.00	–	0.01	–	0.01	–	–

Source: Author's calculations

To answer the last hypothesis the sample was divided into groups according to the company's size. The third hypothesis stated that small companies have the same sensitivity to insider trading as large companies. Moreover, risk adjusted average returns of stocks with small, mid and large capitalisation were compared based on three different approaches.

The abnormal returns in Figure 8 illustrate a lot of fluctuation. At first the small cap stocks provided the highest returns. After the 9-month period the highest returns were among mid cap stocks and from 16th month the highest return was among large cap stocks. However it seems that the small cap stocks group was more volatile than others.

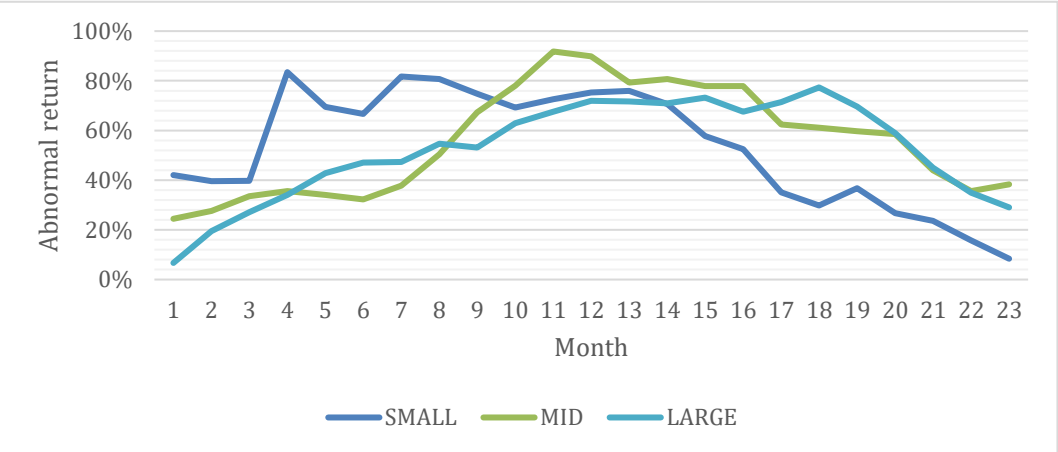

Figure 8. Abnormal returns of small, mid and large cap stocks with insider transactions over 23 months
Source: Author's calculations

Looking at Figure 9 which illustrates the Sharpe ratio the results are slightly clearer as the returns fluctuate less. Small and mid-capitalisation stocks performed similarly with large cap providing slightly lower returns. However, large capitalisation stocks had clearly the highest increase as the group started with almost no returns and after 21 months yielded higher returns than other groups.

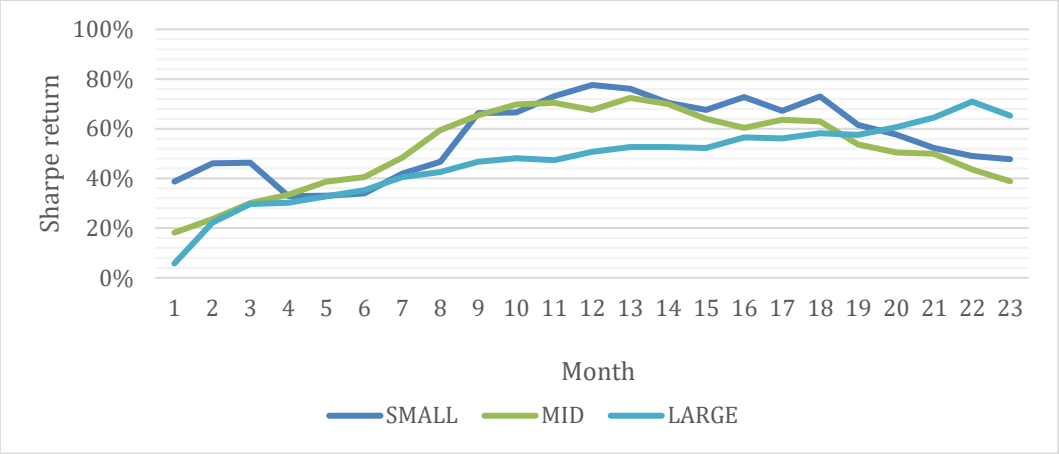

Figure 9. Sharpe ratio return of small, mid and large cap stocks with insider transactions over 23 months
Source: Author's calculations

Accoring to Treynor ratio in Figure 10 mid and large cap stocks had a similar trend. Small cap stocks started the period with highest returns but also by the last month the returns were the lowest. The large cap stocks had the longest increasing trend of 18 months while the returns of mid cap stocks started to decrease from month 11 and small cap stocks started to decrease from month 13.

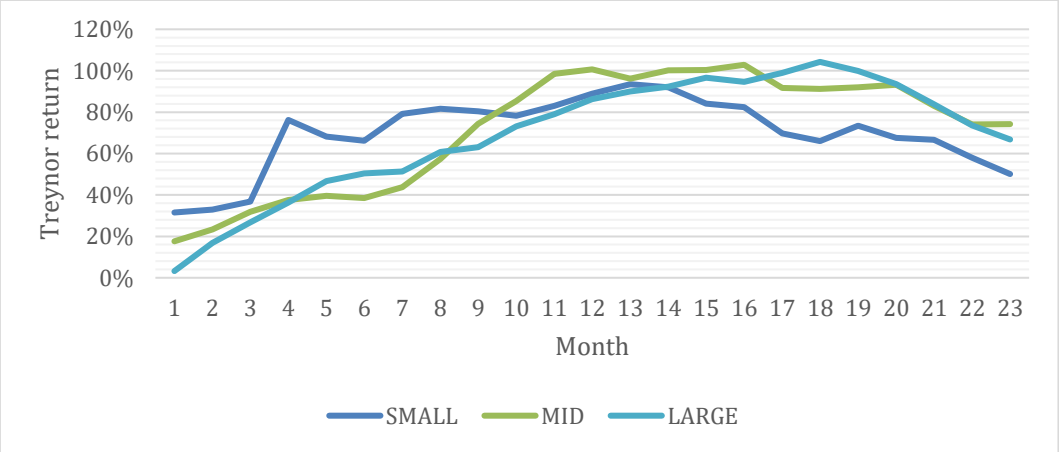

Figure 10. Treynor ratio return of small, mid and large cap stocks with insider transactions over 23 months
Source: Author's calculations

Previous graphs did not provide any clear results and more in-depth analysis is needed to answer the hypothesis. The mean market return was 33% over the 23 months and from Table 4, which displays small versus large cap companies mean returns, both groups yielded higher than market mean returns in both Sharpe and Treynor ratio. Furthermore, according to abnormal returns the mean returns of two groups did not differ significantly. Additionally, Treynor ratio shows that the mean returns between the two groups did not differ either. The difference in mean returns was slightly more notable in Sharpe ratio in which the mean return of small cap stocks was higher. Moreover, the p-value of abnormal returns and Treynor ratio is insignificant and implies that the original hypothesis should be accepted, hence small cap stocks are equally sensitive to insider trading as large cap stocks. Meanwhile Sharpe ratio p-value is significant and suggests that the original hypothesis should be rejected meaning that small cap stocks are more sensitive to insider trading. Overall, no solid conclusions can be made and hypothesis three can be accepted partially.

Table 4. Small and large capitalisation stocks with insider activity monthly returns over 23 months

	Abnormal returns		Sharpe ratio		Treynor ratio		S&P 500
	Small	Large	Small	Large	Small	Large	
Mean	0.53	0.52	0.56	0.47	0.70	0.69	0.33
Variance	0.05	0.04	0.02	0.02	0.03	0.08	0.04
P-value	0.87	–	0.04	–	0.91	–	–

Source: Author's calculations

Mid capitalisation stocks were not analysed further as the hypothesis was an assumption about small and large capitalisation stocks based on previous empirical literature. Based on three previous graphs the mid capitalisation stocks seemed to fluctuate between the two groups and provided relatively similar returns.

3.2. Findings and conclusions

In this analysis the semi-strong and strong form of market efficiency in addition to the random walk theory were analysed. Markets are often viewed as semi-strong form because the public information is allegedly already reflected in the actual price as prices react to new information quickly apart from private information. Markets are additionally seen as strong form which states that investors cannot outperform the market both public and private information is reflected in the market prices. Given form is also supported by the random walk theory which claims that price

movements are random and future prices hence cannot be predicted, implying that insider trading does not offer any additional value to investors.

The semi-strong form states that market prices reflect all public information in addition to historical information and only private information can be used to earn abnormal returns. The first hypothesis stated that there is no performance difference in stocks with active insider trading and market returns. Based on research results, the semi-strong form holds as both Sharpe and Treynor ratios of mean returns of stocks with insider trading yielded higher than market returns. Both measures were significant according to the p-value meaning that the original hypothesis was rejected, and it can be concluded that stocks with active insider trading had performance difference and outperformed the market. Additionally, the abnormal returns were positive and significant, suggesting that there were excess returns earned. Hence, according to this analysis the strong form of market efficiency does not hold as it claims that market prices reflect all available information including private information which means that investors are not able to earn excess returns with historical prices nor private information. As the risk-adjusted mean returns of stocks with active insider trading were higher than the market returns, the random walk theory is also rejected as according to the results the insiders managed to earn higher returns due to private information. Moreover, based on given analysis it can be concluded that stocks with active insider trading can outperform the market returns.

Additionally, based on previous research, comparisons within groups were made between different types of insider transactions as the research suggested that the transaction type plays a significant role as well. Moreover, in previous research it was claimed that stocks with insider buying yielded significantly higher returns than stocks with insider selling. Higher returns of purchase transactions should furthermore disclose whether insiders have taken advantage of the private information and what type of efficient market theory holds. The hypothesis stated that the risk adjusted mean returns of stocks with insider buying are not significantly different from that of insider selling. Analysis on this hypothesis rejected the original hypothesis proposed in all three instances as the abnormal returns, Treynor ratio and Sharpe ratio all showed that portfolio of stocks which were purchased by insiders yielded higher returns than portfolio of stocks which were sold. The p-value was also significant in all three instances. Hence, this suggests that the strong form market hypothesis and random walk theory do not hold and rather the semi-strong market form holds instead as insiders with private information managed to outperform the market.

The previous research also suggested that the size of market capitalisation can disclose some information regarding above market returns. This theory was analysed by Lakonishok and Lee (2001) who found that there was a significant relationship between insider trading and excess returns in small companies while they did not find almost any link between larger firms and excess returns. Additionally, Damodaran discussed that the information about insider trading is less useful in companies which already have large amounts of information that is easy to access such as large public companies. To analyse this, the third hypothesis stated that small companies have the same sensitivity to insider trading as large companies. Opposing the previous research by other authors, given research found that there was no significant difference between the two groups according to abnormal returns and Treynor ratio as both provided an insignificant p-value and accepted the original hypotheses as the mean returns in both groups were almost identical. On the other hand, Sharpe ratio showed that the small cap stocks yielded higher returns than large caps with significant p-value and hence rejected the original hypothesis. Hence, no certain conclusion cannot be drawn accepting the hypothesis partially as there seems to be some association between the company's capitalisation and excess returns.

To answer the research question of in what instances can stocks with active insider trading outperform the market on a risk adjusted basis, it can be concluded that overall, a portfolio of stocks with active insider trading can outperform the market on a risk-adjusted basis. Additionally, it can be claimed that insiders with private information manage to outperform the market as the portfolio of stocks which were purchased by insiders yielded higher returns than the portfolio of stocks which were sold by insiders. This indicated that insiders may have access to private information which could help insiders reason whether the company will do better or worse in the future. However, no clear conclusions can be drawn from the association between the size of the company and excess returns. The semi-strong form of market efficiency seems to hold while the strong form and random walk theory do not hold. Lo's (2004) theory about adaptive market hypothesis pointed out that in case of extraordinary events, which can be seen as COVID-19, the markets are not efficient as investors behave irrationally which could explain above market returns due to market inefficiency. The idea of whether insiders have more information than outsiders is even more applicable during uncertain periods such as COVID-19 as it is difficult for an investor to estimate whether a certain company will manage to overcome the negative impact from global lockdown and an external investor might find some indication about it based on insiders' actions.

It can be argued that an investing strategy could potentially be developed based on insider transactions, but one should consider the higher risk that is associated with it. Looking at most results it was also evident that the risk-adjusted mean returns of stocks with insider trading eventually fell below the market return even if they showed significant returns for a while. This illustrates the return and risk trade-off investors often face and a more risk-averse investor should therefore choose to instead invest into a less volatile instrument such as S&P 500 which showed a stable increasing trend throughout the period.

3.3. Implications for further research

Chosen research period was during a time when investors experienced significant uncertainty and markets demonstrated soaring volatility due to COVID-19. After 19-months a significant sell-off happened in the markets due to investors' fear and individual stocks seemed to be more affected than the overall market. Considering that most of previous research had already been done during normal periods this research should hence provide some new insights due to abnormal period.

A proposal for future research is to compare a normal period to COVID-19 period as this could potentially offer interesting insights. This research was limited to only the U.S. stock market, however other stock markets could be analysed as well. Additionally, a larger sample size could be selected to reach more reliable conclusions and a longer period could be viewed. In addition to small sample size as a limitation, the chosen period was rather short as the COVID-19 start is relatively recent during writing this thesis. Additionally, given study focused on quantitative method but qualitative method could potentially be applied as well to analyse investor reasoning during this abnormal period. As this research got conflicting results about company's sizes and excess returns, more research should be done as there seems to be some association between certain groups and excess returns. It can also be suggested that analysis could be done in different sectors to gain additional insights.

Moreover, the effect of various factors could be analysed in a regression analysis and different models could be applied as well. Since every trade is not informative and is rather of a routine trade such as buying when stock fell just because of the overall market sentiment while the investing thesis of the insider remains the same, it could be useful to try to sort out the routine trades and focus solely on informative trades to get more profound results.

CONCLUSIONS

Given research analysed under which market theory insider trading falls. The research question analysed in what instances can stocks with active insider trading outperform the market on a risk adjusted basis. Based on a given research question and hypotheses the thesis aimed to find out if an active investor could benefit from information regarding insider trading in some instances or are the markets too efficient for any mispricing. Moreover, the aim of the given research was to analyse the efficiency of insider trading in the U.S. stock market during COVID-19.

The first hypothesis stated that there is no performance difference in stocks with active insider trading and market returns. Based on analysis, both Sharpe and Treynor ratios of mean returns of stocks with insider trading yielded higher than market returns and additionally, the abnormal returns were positive and suggest that there were excess returns due to private information. The thesis found that the strong form of market efficiency does not hold as the risk-adjusted mean returns of stocks with active insider trading were higher than the market returns. The random walk theory was also rejected as according to the results the insiders managed to earn higher returns due to private information. Moreover, the semi-strong form of market efficiency seems to hold. Furthermore, based on given analysis it can be concluded that there is a performance difference from market returns and stocks with active insider trading can outperform the market returns.

The second hypothesis stated that the risk adjusted mean returns of stocks with insider buying are not significantly different from that of insider selling. Analysis on this hypothesis rejected the original hypothesis proposed in all three instances as the abnormal returns, Treynor ratio and Sharpe ratio all showed that portfolio of stocks which were purchased by insiders yielded higher returns than portfolio of stocks which were sold. Higher returns of purchase transactions furthermore suggest that insiders have taken advantage of the private information. Hence, this suggests that the strong form market hypothesis and random walk theory do not hold and rather the semi-strong market form should be in place instead as insiders with private information managed to outperform the market.

The previous research also suggested that the size of market capitalisation can disclose some information regarding above market returns. To analyse this, the third hypothesis stated that small companies have the same sensitivity to insider trading as large companies. However, given thesis did not find any significant difference between the two groups according to abnormal returns and Treynor ratio as both provided an insignificant p-value and accepted the original hypotheses as the mean returns in both groups were almost identical. On the other hand, Sharpe ratio showed that small cap stocks yielded higher returns than large cap stocks with significant p-value and hence rejected the original hypothesis. Moreover, no certain standpoint can be taken and the hypothesis was accepted partially as there seems to be some association between the company's capitalisation and excess returns.

To answer the research question of in what instances can stocks with active insider trading outperform the market on a risk adjusted basis, it can be concluded that overall, stocks with active insider trading can outperform the market on a risk-adjusted basis. The semi-strong form of market efficiency seems to hold. Given thesis also found similarly to previous empirical literature that insiders with private information manage to outperform the market as the portfolio of stocks which were purchased by insiders yielded higher returns than the portfolio of stocks which were sold by insiders. It can hence be concluded that insiders have access to private information which could help them reason whether the company will do better or worse in the future. Previous studies also found some linkage between the company's size and excess returns but in this thesis no clear conclusions can be drawn from the association between the size of the company and above market returns. It can be concluded to some extent that an investing strategy could potentially be developed based on insider transactions, but one should consider the higher risk that is associated with it. Looking at most results it was also evident that the risk-adjusted mean returns of stocks with insider trading eventually fell below the market return even if they showed significant returns for a while.

Considering that most of previous research had already been done during normal periods, this research should hence provide some new insights into the topic of insider trading and market efficiency. Chosen research period was during a time when investors experienced significant uncertainty and markets demonstrated soaring volatility due to COVID-19 and it can be reasoned that insiders had more information regarding how the company will do in the future. However, it is important to note that due to this extraordinary event, investors might have behaved irrationally as the adaptive market hypothesis states. Limitations of this thesis can be seen in small sample size

and short period chosen as it was rather short since the COVID-19 start was relatively recent during writing this thesis. Hence, in future research a larger sample size and longer time window could be selected to reach more reliable conclusions. The linkage between company's size and excess return could potentially be analysed further as well as this thesis did not reach any profound conclusions. This research was also limited to only the U.S. stock market and other stock markets could be analysed as well. Lastly, since every trade is not informative, it could be useful to try to sort out the noisy irrational trades and focus solely on informative trades to get more profound results. Moreover, the effect of various other factors could be analysed in a regression analysis and various models could be applied as well.

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APPENDICES

Appendix 1. Descriptive statistics

	Mean return over 23 months			
	Portfolio	Buy	Sell	S&P 500
Mean	0.82	0.96	0.69	0.29
Standard Error	0.12	0.18	0.17	0.00
Median	0.40	0.53	0.30	0.28
Mode	0.66	-	-	-
Standard Deviation	1.55	1.57	1.51	0.03
Sample Variance	2.39	2.48	2.29	0.00
Kurtosis	12.56	8.73	18.79	0.67
Skewness	3.26	2.69	4.02	-0.61
Range	10.49	8.88	10.38	0.13
Minimum	-1.00	-1.00	-0.88	0.21
Maximum	9.50	7.88	9.50	0.33
Sum	126.88	73.72	53.17	44.30
Count	154	77	77	154

Source: Author's calculations

Appendix 2. Regression analysis

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,826115767
R Square	0,68246726
Adjusted R Square	0,667346654
Standard Error	0,17147186
Observations	23

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1,327083725	1,327084	45,13491	1,19946E-06
Residual	21	0,617454574	0,029403		
Total	22	1,944538298			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,407112288	0,071458628	5,697175	1,18E-05	0,258505935	0,555718641	0,258505935	0,555718641
SPY	1,241821656	0,184842965	6,718252	1,2E-06	0,857419667	1,626223645	0,857419667	1,626223645

Source: Author’s calculations

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