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EVALUATING MARKET RESPONSES TO STOCK SPLIT ANNOUNCEMENTS: EVENT STUDY ANALYSIS OF S&P 500 COMPANIES

Bachelor's thesis

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I hereby declare that I have compiled the thesis independently
and all works, important standpoints, and data by other authors
have been properly referenced and the same paper
has not been previously presented for grading.

The document length is 8220 words from the introduction to the end of the conclusion.

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ABSTRACT

This thesis investigates the impact of stock split announcements on the stock prices of S&P 500 companies using an event study analysis. Stock splits are often seen as a signal of future growth by investors that do not alter a company's market capitalization but are perceived to potentially enhanced share liquidity and accessibility. This research uses an event study methodology focusing on short-term price movements and trading behaviors following stock split announcements. Despite the decreasing frequency of stock splits, their market reactions continue to interest academics and investors.

This study analyzes 56 companies within the S&P 500 index that announced stock splits between 2015 and 2023 using a dataset of 69 different events to examine the immediate market response. An event window of (-5,5) days around the announcement date 0 was chosen to capture the short-term market reactions.

The methodology involves calculating expected returns using the market model and determining abnormal returns (ARs) to estimate the announcement's impact. Cumulative abnormal returns (CARs) are calculated from various time windows which provides a detailed view of the announcement's short-term effect on stock prices. The study uses t-statistics and p-values to evaluate the significance of these abnormal returns which contributes to the discussion on corporate decision-making impacts on investor behavior and market efficiency.

The results indicate statistically significant positive abnormal returns immediately after the stock split announcement. These findings highlight the psychological and behavioral elements affecting investor sentiment and suggests that the stock split announcement can influence market behavior more significantly than previously assumed by market efficiency theories.

Keywords: Stock split announcement, event study analysis, S&P 500, investor sentiment, market efficiency

INTRODUCTION

Stock splits are considered as interesting and exciting events that potentially signal various radical corporate strategies and investor perceptions. Stock splits are often perceived as indicators of future growth prospects by investors since they do not change a company's market capitalization. This perception occurs because of the market frequently underreacts to the split announcement due to psychological factors and signaling effects which suggests the management's confidence in the company's positive performance (Ikenberry & Ramnath, 2002). This thesis researches the effects of stock split announcements on the stock prices of companies listed in the S&P 500 index. An event study methodology is being used which is particularly focused on identifying any short-term patterns and trends in price movements and trading behaviors following the announcements of stock splits.

Stock splits have historically been employed by companies to enhance the liquidity of their shares by making them more accessible to a larger audience of investors. The empirical evidence suggests that the market often reacts positively to stock splits although the direct financial impact of a stock split is considered as neutral. This effect is attributed to psychological factors, signaling theories and liquidity improvements (West, Azab, Ma & Bitter, 2020). Stock splits can cause "numerosity heuristic" psychological effects on investors which is defined as a cognitive bias where individuals give excessive importance to the number of shares that receive in a stock split and leaving out of account the fact that the economic value of their holdings remains the same.

Despite the declining frequency of stock split in recent decades, the market's reaction to these events remains a topic of considerable interest among academics and active investors. Positive short-term and long-term effects of stock split announcements and following the split have been discovered multiple times before (Ikenberry, Rankine & Stice, 1996). The study suggests that stock splits signal private insider information about future positive performance. Descending frequency of stock splits during the recent decades can be then seen as a negative factor of the condition of the market from the investors point of view. The dynamics of trading and stock ownership have evolved significantly in the current financial landscape. While the reasons for stock splits may

have shifted, this thesis will investigate whether the market response continue to be influenced by perceptions of company growth prospects and liquidity enhancements.

The main aim of this study is to investigate the impact of stock split announcement while identify any short-term effects, patterns and trends in the stock price movements following the announcement. The data for this study includes a comprehensive dataset of 56 different companies listed on the S&P 500 index that announced stock splits between 2015 and 2023, amounting to a total of 69 events. This data set was gathered to ensure a wide range examination across various sectors and market conditions. The study employs an event study methodology which is a widely recognized approach in empirical finance for assessing the impact of specific events on stock prices. The study investigates the immediate market response to the stock split announcements around an event window of (-5,5) days where the day 0 is the announcement day, the event day. The expected returns for each stock are calculated using the market model which considers the stock's historical relationship with the market's overall performance. Abnormal returns are then calculated as the difference between the actual returns and the expected returns, allowing to isolate the effect of the stock split announcement from other market movements.

This research contains a methodological examination of the immediate impact on the trading prices of companies listed in the S&P 500 index by exploring the dynamics of stock split announcements and their influence on market performance. Two hypotheses were developed to process the market reactions to such corporate events. Hypotheses one (H1) states that stock split announcements create significant changes in the abnormal returns of a company's stock, suggesting a notable deviation from the expected market behaviors. Hypothesis two (H2) investigates a positive shot-term price performance following the announcement indicating a positive investor sentiment and a potentially heightened investment interest around the stock split announcement event.

This methodology provides an understanding of how stock split announcements influence investor behavior and market efficiency in the short-term. The study provides empirical evidence on the validity of the hypotheses and contribute to the broader discussion on the market reactions to corporate actions by analyzing the abnormal returns (AR) and cumulative abnormal returns (CAR) around the announcement date.

Finally, the research of this study is concluded in the comprehensive discussion on the impact of stock split announcements within the S&P 500 listed companies. The results of this study refer to

how such these kinds of events typically generate positive abnormal returns. The trends and patterns following the stock split announcement are being discussed and how they indicate potential future growth and increases the investor interest. The discussion also explores the hypotheses that were developed during the research predicting positive returns in the stock market. Through the analysis of the study, the discussion examines whether stock split announcements can lead to significant abnormal returns and how these align with market efficiency and investor sentiment. Finally, the conclusion explains how the study was conducted and what did it cover by presenting the empirical results with through explanations, discussions and examinations driven by the initial hypotheses.

1. LITERATURE REVIEW

This chapter presents the empirical market reactions to stock split announcement including the theoretical background of stock splits. This is important for understanding how such corporate events influence the investor behavior and stock prices. This chapter examines the market's response supported by existing financial theories on stock splits, investor behavior and market conditions. This provides initial insight into the short-term impact of stock splits and contribute to the broader discussion on market efficiency.

1.1. The Nature and Impact of Stock Splits

In a stock split, a company divides its existing shares into multiple new shares to enhance the stock's liquidity without changing the company's value itself. In this manner, the total value of the shares remines the same compared to the pre-split amount because of the split does not add any real value. The most common types of stock split are 2-for-1 or 3-for-1, which means that after the stock split a shareholder will receive two or three shares for every share they held before the split. Stock splits are often performed to make the shares more accessible to a broader range of investors. The increased accessibility can lead to a more active trading which increases the liquidity. The psychological perception of a more affordable stock can lead to increased demand and possibly have a positive impact on the stock's market price (Laws, 2018).

Stock splits are events that are common corporate actions where the company divides its existing shares enhancing its liquidity. However, stock splits used to be more common corporate actions, but the frequency of stocks splits have been decreasing over the recent decades. This is mostly due to reduced participation of individual investors and increased household income (Minnick & Raman, 2014). The direct ownership of corporate equity has decreased by 30% from the 1980s to the 2010s. Since stock splits are traditionally aimed to make the stock more affordable for all investors, it is not necessary to make the splits as frequently as before because of the rise of household income has made the purchase of a stock more feasible for everybody. At the same time, we have witnessed a shift

towards more institutional investors and a significant decline in direct equity ownership by households. This has resulted in a declining amount of stock splits during the recent decades.

Many large companies have faced a stock split during their life span due to their growth. A stock split may be precipitated by a multitude of factors and can be attributed to various reasons. However, the most prevalent reason for implementing stock splits is for a company to enhance its liquidity through the reduction of its share price. This way the stock becomes more affordable, and the trading volume may increase. Typically, the announcement of the occurring stock split is made by the board of directors while the decision to split the stock is a part of the broader corporate strategy. According to (Lamoureux & Poon, 1987), the split of a stock can be a signal from the management that the company is undervalued. It is also mentioned that the split can provide a negative signal and that the price of the stock has peaked its value.

In the past, stock splits within the S&P 500 index have created positive abnormal market reactions to forward split announcements and ex-split days (Lamoureux & Poon, 1987). Contrary to some expectations, the study finds that stock splits lead to decreased liquidity and is challenging the concept that stock splits invariably improve market conditions for the involved stock. Despite the increased trading volumes and shareholder base, (Lamoureux & Poon, 1987) highlights that the overall market does not take into consideration the reduced liquidity following splits, indicating to a complex interplay between market perceptions, investor behavior and corporate actions.

Significant positive abnormal returns have been discovered also prior the stock split announcements (Nadig, 2015), indicating investor anticipation and reaction to insider information. The ability of the stock market to adjust prices in anticipation of public announcements of stock splits supports the semi-strong form of efficient market hypothesis (EMH). This efficiency means that it would be challenging to achieve consistently higher returns that the market average by using the public information alone. The reactions on the stock split announcement varies across different sectors with most sectors showing negative returns on the announcement day. (Nadig, 2015) highlights the complexity of investor behavior and its influence on stock prices alone. Investor reactions to stock splits are not coherent and they can be influenced by various factors such as sector-specific dynamics, market conditions and overall economic environment.

According to (Liljeblom, 1989), positive price reactions occur in Stockholm Stock Exchange (StSE) after the stock split announcements are published. The period between the announcement

date and the split its-self can vary from one company to another. Generally, for most of the stock splits the process from the announcement to the execution of the split takes approximately one to two months. Once the stock split is announced the company is obliged to provide two key dates, the record date, and the effective date (ex-date). The record date is the date by which you must own the stock to receive the additional shares from the split. The effective date is the date when the stock begins trading at the new split-adjusted price.

The research by (Garcia de Andoain, 2009) concludes that the public announcements of stock splits do not immediately affect stock prices on the day they are announced. The research was conducted of three different sample groups which were divided by the style of the split that the company was going to perform. The sample groups were stocks that had a split of two for one, three for two and reverse stock split. For the reverse stock split, the stock prices "exhibited a significant negative reaction up to 30 days prior to the announcement". For the other two sample groups the stock price reaction was like the reverse split, but investors saw it as a positive sign. Similar research was conducted by (Grinblatt, Masulis & Titman, 1984). The research found significant increase in stock prices at the time of stock split and stock dividend announcements. An event study was conducted to analyze daily stock price returns around the time of the announcement compared to a benchmark period. The study found that the mean two-day return around the announcement date for the entire sample of 1762 firms was 3.41%. These returns were significantly higher than the benchmark period returns which averaged 0.10%. The study confirms that these abnormal returns were not driven by outliers because a large portion of the announcement returns were positive.

1.2. Empirical Studies on Stock Splits

(Duffy, Rabanal & Rud, 2023) conducted experimental research around the idea of stock split announcement reactions. The experiment was conducted using the platform called oTree where undergraduate students from Monash University, Australia with no prior experience attended the specific game designed for the experiment. Students were divided into two different stock split scenarios: stock splits (SS) and reverse stock splits (RS). The experiment consisted of 14 sessions, with 7 sessions for each split scenarios, involving a total of 179 participants. Each session had 10 to 14 participants and after the sessions, subjects answered three cognitive reflection test questions. The experiment aimed to examine how share prices adjusted to changes in fundamental values per

share following the split announcement. Regression analysis and event study methodology was implemented in the study to analyze the behavior of prices relative to their fundamental values. The main findings from (Duffy, Rabanal & Rud, 2023) are that stock splits and reverse stock splits do not fully adjust share prices to changes in fundamental values per share following the announcement.

The study conducted by (Gharghori, Maberly & Nguyen, 2017) examines these pertinent aspects through an analysis of 1780 stock split announcements within the years from 1998 to 2012. The study investigates option traders' perceptions of volatility and return changes resulting from stock splits using the option-implied volatility measures. The study analyzes the differences in implied volatility between the matched call and put options, the volatility spread, and the differences between out-of-the-money put and at-the-money call options implied volatilities, volatility skew, using regression analyses. The expectations of higher volatility are highlighted as there is a clear expectation among option traders of increased stock volatility following the split announcements. The study findings show that there is weak and limited evidence that an abnormal increase in the stock prices around the time of the split announcement are anticipated by the option traders. However, the study supports the conception of increased trading activity around the stock split announcement supporting the notion of informed trading around these events.

Stock splits have historically had impacts on trading behavior and market structures. Empirical studies find that stock splits are inclined to attract knowledgeable traders but also unknowledgeable traders which lead to increased trading drive towards the company which performs the stock split (Easley, O'Hara & Saar, 2001). This can be an indication of inflating the company's stock value because it might not be based on any actual growth factor. While stock splits can change the structure of trading, they can also introduce new complexities and complications not only for the knowledgeable traders but particularly for the less knowledgeable traders. From this we can make a conclusion that stock splits have complex impact that does not make the trading easier or more equitable although the main objective of stock splits is to make the stock more accessible for wider range of investors.

When studying stock splits, it is important to take into consideration also the long-term effects of the stock split. Research by (Desai & Jain 1997) discovers that stock splits usually lead to positive long-term returns for stocks. This suggests that the market might not react as strongly right after the stock split is being announced. The main long-term goal from the company's point of view when

conducting a stock split is to enhance its liquidity. This attracts more investors and broadens the spectrum of shareholders. Although it is rare that companies conduct stock splits just to grow or increase their market capitalization, they might have psychological benefits that impact the company's stock positively or negatively. This thesis will look at how these are shown in today's market conditions.

1.3. Hypothesis Development

The primary objective of this research is to systematically investigate the impact of stock split announcements on the trading price of the issuing companies' stocks. The research aims to identify short-term effects, patterns, and trends in the price movements after the company's stock split decision is published. This section provides two different hypotheses that are going to discuss the predictions of the outcome of this research. When conducting a research, hypotheses address different aspects of the research questions, and they are used to determine the relationship between two variables.

This research is conducted to investigate the market reactions to stock split announcement and how it effects the short-term performance of the issuing company's stock. The research methodology is based on an event study which is an empirical analysis of a certain occurrence that examines the impact of a planned event taking place on a given timeframe measuring and managing its outcome during it (Getz & Page, 2019). Stock splits have been common corporate actions for over a century, and they can be well measured by event study analyses. These split events often provide multiple different stages and timeframes from the public announcement to completion. This research is going to investigate the initial public reaction to the stock split announcement since it is often perceived as the strongest reaction in the stock market. The research question was developed as follows: What is the immediate impact of stock split announcements on the abnormal returns of the issuing company's stock? We can argue that the announcements of stock splits engender unusual responses within the investing behavior of investors. Based on the assumption the main hypothesis of this study is developed as followed:

H1: Stock split announcements create significant changes in the abnormal returns.

Given the timeframe, it is crucial to notice that the announcement might not reach all the public at the same time. The announcement is made on the given event day but not all the investor reactions are

perceived at this exact same time, hence why we need to investigate the investor reactions around the event date. This short-term reaction can be measured by comparing the long-term past to the current cumulative reaction. The significance of understanding the timing of investor behavior cannot be overstated in the context of semi-strong form of market efficiency (Sorescu, Warren & Ertekin, 2017). This strengthens the principle that the stock prices directly reflect all publicly available information underlining the importance of the study timeframe. The following research question was defined in the following way: Do stock split announcements create unusual positive short-term investor interest towards the stock? The short-term investor interest is going be portrayed with the second hypothesis as followed:

H2: There is a positive effect on the short-term price performance following a stock split announcement creating positive abnormal returns.

Hypotheses are valuable tools when conducting an empirical investigation serving as a structured predictions that articulate expected outcomes based on the prior theoretical and empirical evidence. The hypotheses are developed to investigate the immediate and short-term effects of stock split announcements on abnormal returns and price performance in this study. By proposing that stock split announcements lead to significant changes in abnormal returns (H1) and have a positive impact on short-term price performance (H2), this research sets a clear empirical path to explore the reactions of the stock market to such corporate events. Implementing an event study methodology to test these hypotheses allows for a detailed investigation of the market efficiency and the initial investor reactions to the stock split announcements. Thus, these hypotheses serve more than just the outline that we are investigating by assisting to link the greater picture and theory with data and analysis. This makes it easier for us to understand the how corporate decisions, such as stock splits, really affect the stock market and investor behavior.

2. DATA AND METHODOLOGY

The aim of this chapter is to explain the data and research methodologies used to examine the market reactions to stock split announcements across the companies listed in the S&P 500 index. In this chapter, event study methodology, data selection, statistical and analytical research methods, and research purpose are being presented. Additionally, this chapter discusses the analytical approaches used to interpret the data including the statistical methods that estimates the significance of the findings. The main purpose of this chapter is to create clear and through understanding of the data and methodological approach used in this thesis to assess the impact of stock split announcements.

2.1. Research Design

This research is designed to analyze the impact of stock split announcement across a variety of companies listed in the S&P 500 index. A research question: What is the immediate impact of stock split announcements on the abnormal returns of the issuing company's stock? Research questions are very important when conducting financial research. Research questions provide direction for the analysis of the study and helps to focus on the areas that are most important for the research. They also serve as a base for the analysis and helps to format the hypotheses that are crucial when testing the results of the analysis made in the research. Based on the research question in this study, the abnormal returns are being investigated to examine the effect on the share price.

An event study methodology was selected to examine the effects of the announcements as the study methodology examines the impact of a certain event taken place in each timeframe. The study methodology is a precise way to measure and estimate the stock's price volatility based on its historical data. Downside of event study methodology is that it does not take into consideration the other possible events taken place during the estimated timeframe (MacKinlay, 1997). In addition, it is hard to identify the linear component of the path of pre-trends and dynamic treatment effects which often causes problems since pre-trends are often considered as absent in research

development (Borusyak & Jaravel, 2018). This study is less likely to suffer from pre-trends due to the event's secrecy. Because the event of this study is a public announcement, it is unlikely to face any unpredictable dynamic treatment prior to the event day since the information about the event will only be published then. A perspective that as to be considered is the expectation and presumption prior the event.

This research analyzes a sample drawn from S&P 500-listed companies that have announced stock splits during 2015-2023. The sample consists of 56 different companies and a total of 69 stock split announcement events from those companies. Table 1. shows in total the 56 companies examined in this research.

Table 1. The companies included in the analysis.

#	RIC code	Company name	#	RIC code	Company name
1	AOS.N	A O Smith Corp	28	HSIC.OQ	Henry Schein Inc
2	AFL.N	Aflac Inc	29	HRL.N	Hormel Foods Corp
3	LNT.OQ	Alliant Energy Corp	30	IDXX.OQ	IDEXX Laboratories Inc
4	GOOG.OQ	Alphabet Inc	31	ICE.N	Intercontinental Exchange Inc
4	GOOGL.OQ	Alphabet Inc	32	ISRG.OQ	Intuitive Surgical Inc
5	AMZN.OQ	Amazon.com Inc	33	KR. N	Kroger Co
6	APH.N	Amphenol Corp	34	MPC.N	Marathon Petroleum Corp
7	AAPL.OQ	Apple Inc	35	MKC.N	McCormick & Company Inc
8	ACGL.OQ	Arch Capital Group Ltd	36	MCHP.OQ	Microchip Technology Inc
9	ANET.N	Arista Networks Inc	37	MNST.OQ	Monster Beverage Corp
10	BALL.N	Ball Corp	38	NDAQ.OQ	Nasdaq Inc
11	TECH.OQ	Bio-Techne Corp	39	NFLX.OQ	Netflix Inc
12	BRO.N	Brown & Brown Inc	40	NEE.N	Nextera Energy Inc
13	BFb.N	Brown-Forman Corp	41	NKE.N	Nike Inc
13	Bfa.N	Brown-Forman Corp	42	NVDA.OQ	NVIDIA Corp
14	CNC.N	Centene Corp	43	ODFL.OQ	Old Dominion Freight Line Inc
15	CF.N	CF Industries Holdings Inc	44	PCAR.OQ	Paccar Inc
16	CHD.N	Church & Dwight Co Inc	45	PANW.OQ	Palo Alto Networks Inc
17	CMCSA.OQ	Comcast Corp	46	PPG.N	PPG Industries Inc
18	COO.OQ	Cooper Companies Inc	47	RJF.N	Raymond James Financial Inc
19	CPRT.OQ	Copart Inc	48	ROL.N	Rollins Inc
20	CSGP.OQ	CoStar Group Inc	49	ROST.OQ	Ross Stores Inc
21	CSX.OQ	CSX Corp	50	SRE.N	Sempra
22	DXCM.OQ	Dexcom Inc	51	SHW.N	Sherwin-Williams Co
23	EW. N	Edwards Lifesciences Corp	52	SBUX.OQ	Starbucks Corp
24	FAST.OQ	Fastenal Co	53	TSLA.OQ	Tesla Inc
25	FI. N	Fiserv Inc	54	TJX.N	TJX Companies Inc
26	FTNT.OQ	Fortinet Inc	55	V.N	Visa Inc
27	GPN.N	Global Payments Inc	56	WRB.N	W R Berkley Corp

Source: Data compiled by the author from Refinitiv Eikon.

The most used stock split types are 2-for-1 or 3-for-1. This means that towards every stock that the shareholder holds prior the stock split, the shareholder gets two or three stocks after the split has taken place. For example, if the company is going to perform a stock split that has a type of 2-for-1, every shareholder is going to double the amount of stocks they hold. This decreases the share price proportionately but does not change the total value of the shares held by shareholder. Reverse stock splits are opposite from the forward split. Multiple different forward stock split types are assessed in this research. The most used stock split type from the evaluated events is the 2-for-1 stock split totaling to 30 different occurrences and the second most observed stock split type is 3-for-1 with 11 different occurrences. The range of stock split types expands all the way to 20-for-1 split performed by Alphabet Inc effective on 15th of July in 2022. Additionally, other more unusual split types were discovered. 3-for-2 split had seven different occurrences and on the 28th of February in 2018 Brown-Forman Corporation performed a stock split of 5-for-4. In this research, all types of stock splits are treated equally, assuming they do not present any statistical difference.

The design of this research is aimed to evaluate the impact of stock split announcements on abnormal returns within the S&P 500. Effectively implemented event study methodology is introduced to capture immediate market reactions around the stock split announcement event. Despite the inherent methodological constraints, such as the potential oversight of simultaneous events and the complexity of pre-trends, the research design of this study addresses some of these challenges by leveraging the precise timing and nature of these events. The dataset of 56 different companies and 69 stock split events from 2015 to 2023 aims to minimize the margin of error by spreading the time interval of events so that momentary trends do not gain much influence. This research reinforces the importance of careful planning in financial studies and offers insight that extends over the immediate scope of stock splits. It provides information for the future research to use better methods and more data for a clearer picture of how stock markets and splits behave.

2.2. Collecting the Data

The investigation of stock split announcement effects on abnormal returns requires multiple different ways of data collecting and analyzing. The stock split announcement dates are being

gathered from Refinitiv Eikon data base from the wanted timeline filtering in the S&P 500 companies. In this study the primary data variable of interest is the daily adjusted closing price, as it is critical for analyzing the effect of stock split announcements on stock prices. The primary data source of the research is Nasdaq from which all the daily adjusted closing prices has been collected for the analysis of the daily returns. The daily adjusted closing prices are being downloaded to Microsoft Excel which is utilized as the primary platform for the analysis in this research.

In table 1, Alphabet Inc. and Brown-Forman Corp. are highlighted in red since they are duplicated companies with two different stock types. Table 2 from appendix shows the date that the stock split announcement has taken place, the company announcing, the split type, and the date that the split will be effective. Copart Inc. and Rollins Inc. both conducted three different stock split announcements during the analysis period. Monster Beverage Corp, Tesla Inc, W R Berkley Corp, Intuitive Surgical Inc, Edwards Lifesciences Corp, Centene Corp and Brown-Forman Corp (BF. B) conducted two different stock split announcements during the time and other examined companies announced once.

Even though the data and information for this research is being gathered from different reliable financial sources such as Nasdaq and Refinitiv Eikon, it is possible that the accuracy and reliability of the information data might vary and are not entirely accurate. The data is very concentrated to a specific index which limits the focus of the analysis to specific sector and failing to consider the other factors that might be present in other indices or sectors. This could limit the applicability of the findings to other market conditions. Additionally, any other events prior, during or after the stock split announcement might affect the result of the analysis. The concentration of the data within a single index can lead to statistical limitations which can affect the statistical credibility of the conclusion drawn. Finally, there is a risk that the findings might be interpreted as general for the entire market when they are actually specific only to the companies evaluated in this research from the given financial period.

2.3. Methodology

S&P 500 is an index that lists the 500 largest companies in the United States serving as a great indicator for the US economy and stock market. Investors across the world are using S&P 500 index because of its comprehensive coverage of the market and economy. It provides high

liquidity, meaning their stocks are traded in high volumes and it provides long historical data for different analyses. Since the S&P 500 is perhaps the most known index in the world, it serves as a well-structured and stable index to examine the effects of stock splits.

Event window of (-5,5) was determined around the stock split announcement date where the announcement day is the day 0. The estimation window to examine and calculate the expected and abnormal returns is 200 days prior the stock split announcement day. The expected return of S&P 500 was calculated using the market model. Further, the abnormal returns of each stock were calculated as the difference between real returns and the expected returns. The t-test was used to examine whether the abnormal returns were statistically significant. To examine the variation in the abnormal returns, standard deviation was then calculated.

The market model (MM) approach is being used in this research to predict the stock's return based on its relationship with the market return. When calculating expected returns, different models such as market model (MM), marked-adjusted model (MAAM), and mean-adjusted model (MEAM) generally yield similar outcomes in assessing the impact of corporate events like stock splits (Marisetty & Babu, 2020). However, the market-adjusted model tends to slightly inflate the abnormal returns compared to other models because it does not rely on a stocks or market's historical returns.

The expected returns are based on expectance of risk levels, market performance or historical averages while abnormal returns differ from these expectations. Capital asset pricing model (CAPM) contains the intercept (**α**) and the beta (**β**), and they are being used to determine the expected return of the stock (Armitage, 1995). The beta is a measurement of how much the expected return is expected to respond to market movements. Further, the alpha (**α**) represents the intercept of the regression equation that is independent from the market's movement. The expected return (ER) is calculated as follows:

$$ER_{i,t} = \alpha_i + \beta_i \times R_{m,t} \quad (1)$$

Abnormal returns (ARs) refer to profits or losses that differs from the expected market return or the return predicted by an asset pricing model. These abnormal returns can result from specific events such as stock split announcements creating significant positive or negative shifts in stock prices over what general market movements would suggest. Abnormal returns are considered as

positive when the actual return exceeds the expected return and as negative when the actual returns does not reach the expected return level. Abnormal returns are commonly used measurements in financial analysis to determine and understand how event related information is reflected in stock prices. Abnormal return calculations involve subtracting the actual return from the expected return over a specific period as follows:

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

Cumulative abnormal return (CAR) is used to measure the impact of the stock split announcement over a specific period surrounding the event and it is calculated by adding the abnormal returns together. The CAR allows us to investigate the impact of the announcement from different perspectives, visualizing the short-term market response (Kolari & Pynnönen, 2010). Cumulative abnormal returns allow us to investigate the total impact of the event and gives us insight to the influence of the different return windows around the event date. The different cumulative abnormal return windows used in this research are (0,1), (-1,1), (0,5), and (-5,5). The CAR window of (0,1) takes into consideration the event day (0) and the day (1) after it, focusing narrowly on the immediate market reaction to the announcement. Along with the immediate market reaction, the window of (-1,1) takes into consideration any anticipation on the market. Longer windows like (0,5) and (-5,5) help to understand both the anticipation before the event and the aftermath. However, since the stock split announcement is an initial publicly made announcement, the stock prices are less likely to witness any abnormal movements based on anticipation prior the event.

The cumulative abnormal returns (CAR) are being calculated using the market-adjusted method where the t1 is the starting point of the event window and the t2 is the ending point. Abnormal returns from the same event window are being summed together, using the following formula to calculate the CAR:

$$CAR_{(t1,t2)} = \sum_{t2}^{t1} AR_{i,t} \quad (3)$$

For example, for the event window (0,1) the following formula is being used:

$$CAR(0,1) = \sum_{t=t0}^{t1} AR_{i,t} \quad (4)$$

In event studies, t-statistics are important measures to determine whether the event has a statistically significant effect on the variable of interest which is the return of the announcing company's stock in this study. In this study, t-statistics help to test the hypotheses about the cumulative abnormal returns around the event date. A higher t-statistic signifies a more significant deviation of the abnormal returns from the ones anticipated by chance and indicating a greater level of statistical significance. When calculating the t-statistics, the cumulative abnormal returns (CAR) is being divided by the standard deviation of the abnormal return (stdevAR) multiplied by the square root of the number of days in the event window (n):

$$t_{CAR_i} = \frac{CAR_i}{\sqrt{n} \times stdevAR_i} \tag{5}$$

The statistical significance of the results is assessed using the two-tail t-test which determines if there is effect regardless of the direction of the effect. P-values are calculated based on the corresponding t-statistics. P-values tell us how likely it is to see results if the null hypothesis were correct. The smaller the p-value is the stronger the evidence is against the null hypothesis. In this study, the null hypothesis is that stock split announcements do not affect stock prices.

This research offers a comprehensive view of how much corporate events, such as stock splits, influence investor sentiment and market behavior by using the market model for calculating expected returns and employing both traditional and adjusted models for analyzing abnormal returns. The research aims to find out the short-term market reaction to stock splits through the calculation of cumulative abnormal returns (CAR) across different event windows. Utilization of t-statistics strengthens the analysis for a statistically significant assessment of the results. These approaches use the analysis of the past data with statistical methods to investigate how stock split announcements impact stock prices providing important future information for investors, analysts, and scholars who want to understand how the stock market reacts to corporate events and news.

3. EMPIRICAL RESULTS

This chapter is going to go over the empirical results of the research defined in the previous chapter. Among with the research results, data analysis and discussion of the results are presented. The analysis incorporates 200 days' worth of historical data prior the stock split announcement date, cumulative abnormal return (CAR) calculations around the event day and a statistical analysis of the data. The discussion section examines the results, focusing on the identification and analysis of abnormal and statistically significant findings.

3.1. Empirical Study

Abnormal returns (AR) were calculated from each company during the estimation window of 200 day prior and 10 days after the event. The event window of (-5,5) was determined to calculate the cumulative abnormal returns (CAR) around the stock split announcement day, the event day, to analyze the cumulative difference between the actual and expected return.

Table 3. Event day average abnormal return (AAR) descriptive statistics.

Date	AAR	Std.Dev	Min	Max	t-statistics	p-value
2	0.01%	0.01529	-4.94%	3.72%	0.03012	0.97606
1	0.98%	0.03066	-3.26%	18.12%	2.66396	0.00961
0	1.08%	0.02879	-6.62%	11.64%	3.11073	0.00271
-1	0.17%	0.01389	-3.18%	5.34%	1.03205	0.30565
-2	-0.02%	0.01219	-3.50%	4.95%	-0.14832	0.88252

Source: Author's calculations

With two dates before (-1 and -2) and after (1 and 2) surrounding the event day 0, table 3 presents the average abnormal returns (AARs) for all the companies analyzed in this research on the day of the stock split announcement. The average abnormal return on the event day 0 signals that the examined companies in generally have experienced a return that was 1.08% higher than what would have been expected under normal market conditions. This demonstrates a positive market response which provides insights into investor sentiment consistent with prior research expectations (Chenyu, Frank Weikai, Jiaren & Deren, 2019). With other dates this effect is less noticeable. The standard deviation shows the spread to which individual returns vary from the average abnormal return. The standard deviation on the event day is approximately 2.5 times the

average abnormal return which suggests a relatively high level of volatility in the returns. The minimum and maximum shows us the range of abnormal returns indicating significant losses and significant gains during the event day. On the event day, t-statistics 3.11073 is greater than 2, which is a common rule of thumb for significance with large sample groups, indicating that the AAR is statistically significant. The low p-value under the common threshold of 0.05 suggests that there is a very small probability that the AAR is due to incidental chance. From the graph we can tell that there is a lot of variation in the daily results hence why we need to analyze them cumulatively.

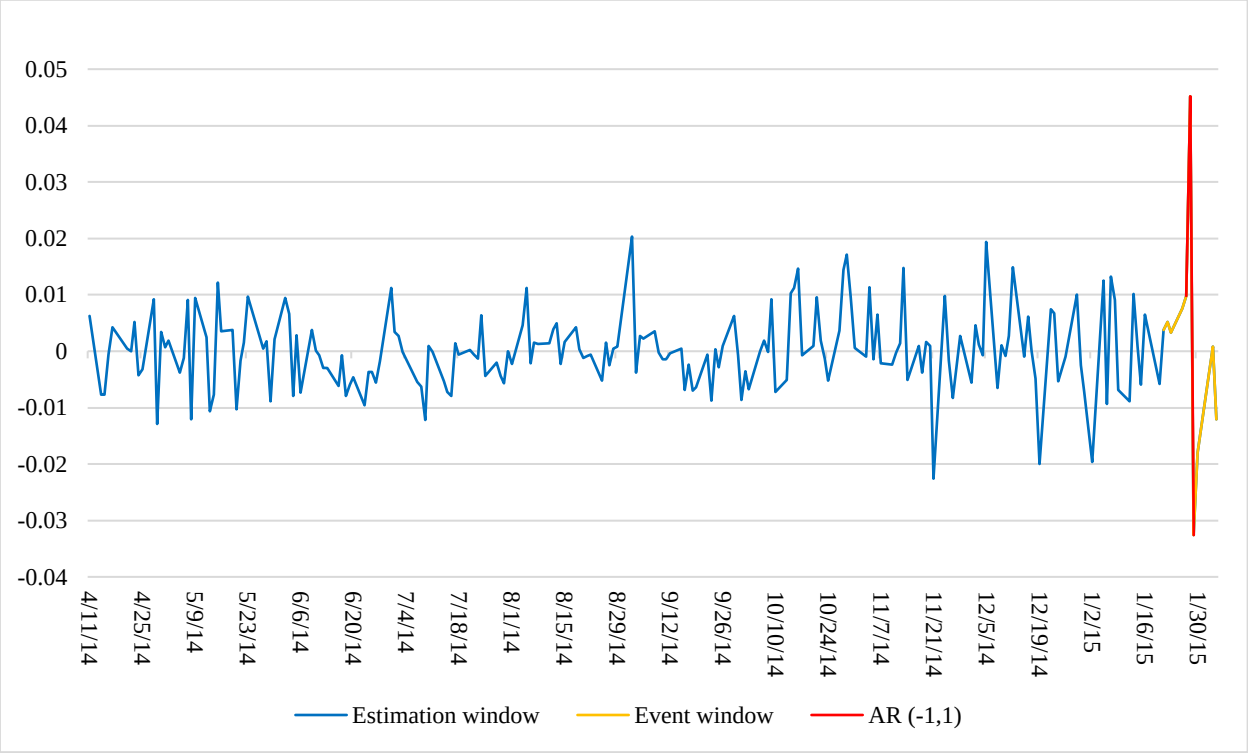

Figure 1. Abnormal returns of Rollins Inc.

Source: Author's calculations

Figure 1 visualizes the movement of abnormal returns, showing the estimation window of 200 days prior the stock split announcement, the event window, and the abnormal returns (AR) from the window of (-1,1) days around the announcement date. In the figure, the calculated abnormal returns of Rollins Incorporation are shown from the stock split announcement taken place on the 28th of January in 2015.

To have more detailed understanding of investor sentiment and market expectations, it is essential to examine the cumulative average abnormal returns (CAAR) around the event. This analysis will provide us with better insights into the market's reactions. Four different cumulative abnormal return (CAR) windows were examined, CAR (0,1), (-1,1), (0,5), and (-5,5) to illustrate the

reactions from different times around the event day (0). The cumulative average abnormal return (CAAR) was then calculated by averaging the values from each event's CAR windows and the descriptive statistics were computed based on these averages.

Arista Networks Inc announced its 4-for-1 stock split on the 1st of November in 2021 which generated the largest cumulative abnormal returns during each examined CAR windows except for the CAR (0,5) where Tesla Inc's announcement from 12th of August in 2020 was the highest at 25.01%. Similar result pattern appeared when investigating the lowest results in the cumulative abnormal returns of each event individually. Alliant Energy Corporation's 2-for-1 stock split announced on the 20th of April in 2016 performed the worst with results of CAR (0,1) being -6.62% and CAR (-1,1) being -6.82%. On the other hand, Tesla Inc's most recent stock split announcement from 5th of August in 2022 performed the worst with the CAR (0,5) being -9.62%. These result from Tesla Inc signals us the impact and importance of the timing and context of the stock splits.

Table 4. Cumulative abnormal returns and descriptive statistics from different time windows.

Variables	CAAR	Std. Dev	Min	Max	t-statistics	p-value
CAR (0,1)	2.06%	0.04149	-6.26%	17.62%	4.12741	0.00010
CAR (-1,1)	2.23%	0.04206	-6.82%	18.03%	4.41226	0.00004
CAR (0,5)	2.29%	0.05617	-9.62%	25.01%	3.38707	0.00117
CAR (-5,5)	1.89%	0.06364	-20.35%	25.81%	2.47172	0.01592

Source: Author's calculations

The table 4 shows us the average of each cumulative abnormal return window and the descriptive statistics of the period. For example, when averaging the cumulative abnormal return (CAR) form each event over the period including the event day and the day after it, denoted as (0,1), we get the result that the cumulative average abnormal return (CAAR) is 2.06%. From each different CAR windows, the averages are positive meaning that the events had a generally positive impact on the return over what would usually be expected. The standard deviations demonstrate us how spread out the returns are, lower number indicates more consistency. We can tell that the standard deviation increases when the event window increases which is expected since a longer event period likely includes more variation in the returns. This is also being visualized by the minimum and maximum cumulative abnormal returns within the observed sample.

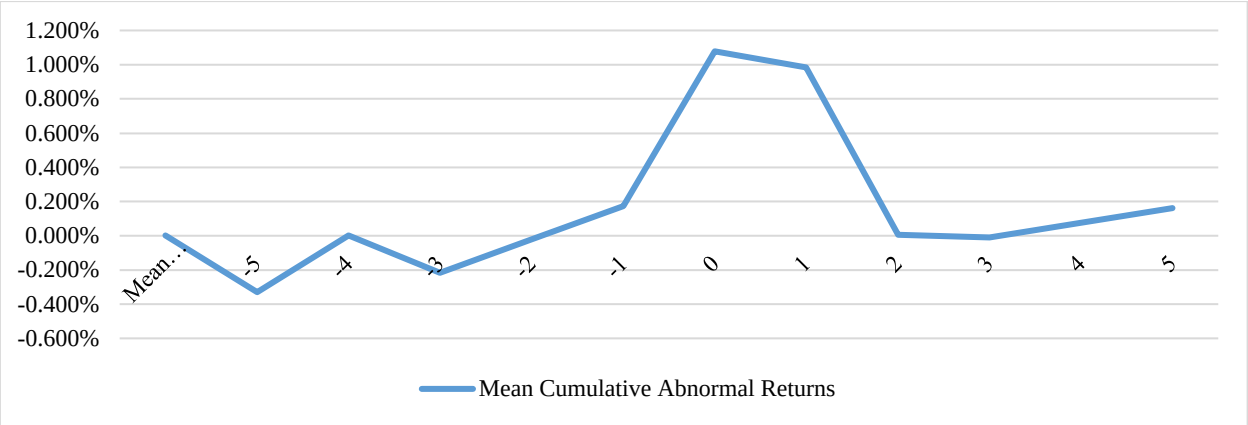

Figure 2. Mean cumulative abnormal returns.

Source: Author's calculations

Figure 2 presents the daily mean cumulative abnormal returns of the analyzed events from the event window of (-5,5). From the figure we can tell that the highest abnormal returns are observed during the stock split announcement day 0 and that the market responses immediately to the announcement. Because of the relatively large sample size of events in this study, it is not reasonable to analyze each event separately but to use the averages form each different even windows. As previously stated, the t-statistic measures how many standard errors the observed CAAR is away from zero which would indicate no effect. All the t-statistics are above 2 which indicates a statistically significant result, for example the t-statistic of CAAR (0,1) is 4.12741 which is quite high. This indicates us that the observed abnormal return is not a result of random fluctuations but rather a significant effect of the stock split announcement.

The p-values indicate the probability of seeing the results as extreme than those observed in this study if the null hypothesis were true. In other words, the smaller the p-value is, the stronger the evidence against the null hypothesis is. In this study, the null hypothesis is that there is no effect of the stock split announcement on the stock prices. All the p-values in the table 4 are very low indicating that the results are not due to a random chance but rather the effects of the stock split announcement. CAAR (-1,1) has the lowest p-value of 0.00004 which is defined as very strong evidence against the null hypothesis (H0) and CAAR (-5,5) has the highest p-value of 0.01592 which is defined as strong evidence against the H0. The other variables, CAAR (0,1) and CAAR (0,5) are both defined as very strong against the H0.

When taking a closer look at the different event windows, we can tell that the CAR (0,1) and CAR (-1,1) have the highest t-statistics and the lowest p-values. This tells us that the stock split announcement has a very significant positive effect on the abnormal returns immediately

surrounding the event date creating strong market reactions. CAR (0,5) and CAR (-5,5) have slightly lower t-statistics and higher p-values which tells us that while the market still reacts significantly to the stock split announcement, the immediate impact is more pronounced. This can indicate that the market efficiently adopts the information about the stock split announcement, but the effect continues with more reduced intensity.

3.2. Discussion

The findings of this research indicates that stock split announcements among companies listed in the S&P 500 generally lead to positive abnormal returns. This suggests that the market perceives stock split announcements as favorable events that can be an indication of potential future growth and therefore increases investor interest (Arbel & Swanson, 1993). The positive average abnormal return (AAR) of 1.08% on the announcement day and the significant cumulative abnormal returns (CARs) across various event windows supports the hypothesis that stock split announcements are interpreted by investors as a signal of future company performance and optimism about the company's value proposition.

Both hypotheses H1 and H2 have been precisely tested and greatly supported by the empirical results of the research. The validation of H1 is obvious from the consistently positive abnormal returns immediately following the stock split announcements. H2 is confirmed by the positive cumulative abnormal returns (CARs) especially in the narrower event windows such as CAR (0,1) and CAR (-1,1). This suggests that not only do stock splits affect stock prices but also reflect positive investor sentiment in the short-term (Waggle & Agrrawal, 2015). These results are indications of semi-strong market efficiency where stock prices adjust rapidly to corporate events and new public information.

The empirical support for both hypotheses highlight the importance of understanding the investor behavior and market reactions in response to stock split announcements. It also suggests that while stock splits do not change the fundamental value of the company, they do affect investor perceptions and market dynamics in ways that can be beneficial for both the company and its shareholders in the short-term. This highlights the timing of these events since they can influence significantly the immediate financial market response. These findings show the strategic

importance of timing stock splits to maximize their positive impact on market behavior and investor sentiment.

The findings of this study support the discussion around market efficiency and the behavioral finance theories. More particularly, in the context of how public information, such as stock splits, are processed by the market. The results can help investors and financial analysts to understand the different kinds of market behaviors following corporate events, guiding investment strategies to capitalize on short-term market movements. This study also brings out how stock splits can indicate new positive market opportunities that can be beneficial for the investors trying to optimize their trading. It can help to predict the market trends more accurately by understanding these effects and it offers a strategic advantage.

The strengths of this study are its supportive methodology, broad data set and the use of reliable statistical techniques. The research provides reliable insight into the patterns of the market reactions to stock splits by employing the event study methodology and analyzing a relatively large sample over a significant period. In this manner. The study is able to minimize the influence of outliers or any abnormal events outside the stock split announcement. However, the focus on only S&P 500 companies might limit the generatability of the findings to smaller or less visible companies that might experience different investor behavior and market reactions. The methodological approach on historical price data might not take into account all market conditions, macroeconomic changes, sector-specific changes, and other events during the estimation period that could also influence the stock price behavior. The inherent assumptions of the market model and event study methodology can oversimplify the complex dynamics that drive the stock prices. These ignored factors can potentially have influence on the abnormal returns that are not captured in this study.

Future researchers could expand on this study by including broader range of companies from different financial sectors and different markets to validate the findings across different economic contexts and market environments. This research examines the effect of the stock split announcement from a reasonably short period around the announcement. Exploring the long-term effects of the stock split on stock performance could offer deeper knowledge into the long-lasting impact on the company’s value, creating added knowledge and value not only for investors but for the companies as well.

CONCLUSION

This study examined the immediate impacts of stock split announcements on the stock prices of companies within the S&P 500. Expected returns (ER) were calculated using the capital asset pricing model (CAPM) that includes the intercept ($\boldsymbol{\alpha}$) and the beta ($\boldsymbol{\beta}$) that were calculated from the investigated index. An event study methodology was used to analyze the abnormal returns (ARs) surrounding these announcements from different time windows to calculate the cumulative abnormal returns (CARs). After the calculations from the individual events, cumulative average abnormal returns (CAARs) were assessed to have the overall insight from all the events together. From here we could calculate the statistical significances of the results. The empirical data included 56 different companies, resulting to total of 69 stock split announcement events from 2015 to 2023. Two hypotheses were developed in this research aimed to analyze the dynamics of market efficiency and investor behavior.

Research questions for this study was conducted as follows to guide the strategic direction of the research and analysis: What is the immediate impact of stock split announcements on the abnormal returns of the issuing company's stock? Do stock split announcements create unusual positive short-term investor interest towards the stock? Based on the research questions, two hypotheses were developed to explore the answers to these questions, provide more detailed direction for the research and to have a foundation for the statistical testing:

> H1: Stock split announcements create significant changes in the abnormal returns.
> H2: There is a positive effect on the short-term price performance following a stock split announcement creating positive abnormal returns.

Hypothesis one (H1) could not be rejected through the empirical findings which demonstrated a noticeable deviation in the returns around the announcement date. These results were statistically significant and confirmed that the market does react visibly to stock split announcements, aligning with the theoretical proposition that such corporate events are viewed favorable by investors. The statistical

evidence was confirmed through the significance of the calculated p-values that all fell under the commonly used level of statistical significance of 0.05.

Hypothesis two (H2) also could not be rejected by the data which showed positive cumulative abnormal returns (CAR) in the short-term window around the announcement date. This highlights the positive investor sentiment towards the stock's future post the stock split announcement. This is likely due to perceived enhancements in liquidity and accessibility of the shares.

This study extends the current academic literature by providing new insight into the short-term market reactions following stock splits and offers practical implications for corporate managers and investors. The study provides more detailed information to the companies listed in the S&P 500 and how they react to stock split announcements today. Understanding the timing and market anticipation around the stock split announcements can guide strategic decisions within the company. Recognizing the patterns in market behavior to stock splits can create more precise and broader investment strategies.

The findings from this research clarifies the complex impact of stock splits and confirms that they are not only administrative financial decisions but essential events that can shape the track of stock prices through investor sentiment. Future studies can expand to this research by investigating the long-term effects of stock split announcement or compare the market reactions across different sectors or indexes. It is also recommendable to investigate whether the different types of stock splits have any impact on the market reactions that are witnessed after the announcement. This research can also serve as a base structure for another study on reverse stock splits and by comparing the two, we can investigate what they have in common and how they differ from each other.

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APPENDICES

Appendix 1.

Table 2. The stock split announcement date, split type, and effective date.

Announcement Date	Company	Split Type and Effective Date
12/7/23	Cooper Companies Inc	1:4 Stock Split effective on Feb 20, 2024
8/4/23	Copart Inc	1:2 Stock Split effective on Aug 21, 2023
8/3/23	Sempra	1:2 Stock Split effective on Aug 21, 2023
3/2/23	Monster Beverage Corp	1:2 Stock Split effective on Mar 27, 2023
12/6/22	Paccar Inc	2:3 Stock Split effective on Feb 07, 2023
11/1/22	Bio-Techne Corp	1:4 Stock Split effective on Nov 29, 2022
10/5/22	Copart Inc	1:2 Stock Split effective on Nov 03, 2022
8/23/22	Palo Alto Networks Inc	1:3 Stock Split effective on Sep 13, 2022
8/5/22	Tesla Inc	1:3 Stock Split effective on Aug 24, 2022
7/20/22	Nasdaq Inc	1:3 Stock Split effective on Aug 26, 2022
6/10/22	Fortinet Inc	1:5 Stock Split effective on Jun 22, 2022
3/28/22	Dexcom Inc	1:4 Stock Split effective on Jun 10, 2022
3/10/22	Amazon.com Inc	1:20 Stock Split effective on Jun 03, 2022
2/25/22	W R Berkley Corp	2:3 Stock Split effective on Mar 23, 2022
2/1/22	Alphabet Inc	1:20 Stock Split effective on Jul 15, 2022
2/1/22	Alphabet Inc	1:20 Stock Split effective on Jul 15, 2022
11/1/21	Arista Networks Inc	1:4 Stock Split effective on Nov 17, 2021
8/26/21	Microchip Technology Inc	1:2 Stock Split effective on Oct 12, 2021
8/25/21	Raymond James Financial Inc	2:3 Stock Split effective on Sep 21, 2021
8/5/21	Intuitive Surgical Inc	1:3 Stock Split effective on Oct 04, 2021
6/7/21	CoStar Group Inc	1:10 Stock Split effective on Jun 25, 2021
6/4/21	CSX Corp	1:3 Stock Split effective on Jun 28, 2021
5/21/21	NVIDIA Corp	1:4 Stock Split effective on Jul 19, 2021
2/3/21	Sherwin-Williams Co	1:3 Stock Split effective on Mar 31, 2021
1/27/21	Amphenol Corp	1:2 Stock Split effective on Mar 04, 2021
10/27/20	Rollins Inc	2:3 Stock Split effective on Dec 10, 2020
9/29/20	McCormick & Company Inc	1:2 Stock Split effective on Nov 30, 2020
9/14/20	Nextera Energy Inc	1:4 Stock Split effective on Oct 26, 2020
8/12/20	Tesla Inc	1:5 Stock Split effective on Aug 28, 2020
7/30/20	Apple Inc	1:4 Stock Split effective on Aug 28, 2020
5/7/20	Edwards Lifesciences Corp	1:3 Stock Split effective on May 29, 2020
2/21/20	Old Dominion Freight Line Inc	2:3 Stock Split effective on Mar 24, 2020
4/22/19	Fastenal Co	1:2 Stock Split effective on May 22, 2019
2/21/19	W R Berkley Corp	2:3 Stock Split effective on Apr 02, 2019
12/13/18	Centene Corp	1:2 Stock Split effective on Feb 06, 2019
10/23/18	Rollins Inc	2:3 Stock Split effective on Dec 10, 2018
9/18/18	TJX Companies Inc	1:2 Stock Split effective on Nov 06, 2018
5/18/18	Arch Capital Group Ltd	1:3 Stock Split effective on Jun 20, 2018
2/27/18	Brown & Brown Inc	1:2 Stock Split effective on Mar 28, 2018
2/23/18	Fiserv Inc	1:2 Stock Split effective on Mar 19, 2018
2/13/18	Aflac Inc	1:2 Stock Split effective on Mar 16, 2018
1/24/18	Brown-Forman Corp	4:5 Stock Split effective on Feb 28, 2018
8/18/17	Henry Schein Inc	1:2 Stock Split effective on Sep 14, 2017
8/14/17	Intuitive Surgical Inc	1:3 Stock Split effective on Oct 05, 2017
4/27/17	Ball Corp	1:2 Stock Split effective on May 16, 2017
3/24/17	Copart Inc	1:2 Stock Split effective on Apr 11, 2017
1/26/17	Comcast Corp	1:2 Stock Split effective on Feb 17, 2017
10/14/16	Monster Beverage Corp	1:3 Stock Split effective on Nov 09, 2016
10/12/16	Intercontinental Exchange Inc	1:5 Stock Split effective on Nov 03, 2016
9/8/16	A O Smith Corp	1:2 Stock Split effective on Oct 05, 2016
8/5/16	Church & Dwight Co Inc	1:2 Stock Split effective on Sep 01, 2016

5/26/16	Brown-Forman Corp	1:2 Stock Split effective on Aug 18, 2016
5/26/16	Brown-Forman Corp	1:2 Stock Split effective on Aug 18, 2016
4/20/16	Alliant Energy Corp	1:2 Stock Split effective on May 19, 2016
11/25/15	Hormel Foods Corp	1:2 Stock Split effective on Feb 09, 2016
11/20/15	Edwards Lifesciences Corp	1:2 Stock Split effective on Dec 11, 2015
11/20/15	Nike Inc	1:2 Stock Split effective on Dec 23, 2015
10/7/15	Global Payments Inc	1:2 Stock Split effective on Nov 02, 2015
6/25/15	Kroger Co	1:2 Stock Split effective on Jul 13, 2015
6/22/15	Netflix Inc	1:7 Stock Split effective on Jul 14, 2015
5/15/15	CF Industries Holdings Inc	1:5 Stock Split effective on Jun 17, 2015
5/5/15	IDEXX Laboratories Inc	1:2 Stock Split effective on Jun 15, 2015
4/29/15	Marathon Petroleum Corp	1:2 Stock Split effective on Jun 10, 2015
4/16/15	PPG Industries Inc	1:2 Stock Split effective on Jun 12, 2015
3/27/15	Ross Stores Inc	1:2 Stock Split effective on Jun 11, 2015
3/18/15	Starbucks Corp	1:2 Stock Split effective on Apr 08, 2015
2/3/15	Centene Corp	1:2 Stock Split effective on Feb 19, 2015
1/30/15	Visa Inc	1:4 Stock Split effective on Mar 18, 2015
1/28/15	Rollins Inc	2:3 Stock Split effective on Mar 10, 2015

Source: Data compiled by the author from Refinitiv Eikon.

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