Post-Pandemic Recovery of Big-Tech Stocks and Sustainability Predictions through Linear and Exponential Modeling

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Abstract

This paper examined the stock performance analysis post-pandemic recovery of the top five technology companies listed on the Nasdaq composite in the New York Stock Exchange (Apple Inc., Meta Platforms, Amazon Inc., Google Alphabet Inc., and Microsoft Inc). The analysis shows that all technology companies had a massive run in the months after the onset of the global pandemic, and stock price analysis shows great promise, while some companies lack EPS growth. Moreover, future predictions based on linear and exponential modeling of revenue and operating profit year-over-year growth were examined. There is evidence that the year-over-year growth is expected to remain positive and take a steep incline in the next 5-10 years.

Introduction

In the wake of the global pandemic that began in March of 2020 as a result of the coronavirus disease, businesses around the world took a major hit. The study is based on the financial recovery of big-tech stocks that were poorly hit at the onset of the global pandemic in March 2020. With the overall stock market crash, investors and shareholders desire to not only learn about the financial performance of their investments but also have a clear future outlook for the companies (Friedman, 2021). The five big-tech companies recovered well from the pandemic while providing positive growth for the future. As a result of the global pandemic, more and more businesses have moved to online operations, which provide an exciting opportunity for stock market analysis and future predictions of large technology companies.

Literature Review

At the onset of the pandemic, large and small businesses had to shut down either temporarily or permanently due to the specific restrictions in cities around the world (De', Pandey, Pal, 2020). Like any other businesses, large technology companies had to suffer the losses due to the major stock market crash. While almost all global stock markets were hit, the United States stock exchange which lists a number of large and small technology companies revealed tremendous losses within a few weeks into the pandemic (Hong & Yoon, 2022).

In all the pandemic chaos, the technology companies adapted to the ongoing situation rather quickly by implementing software and other technology amendments to their infrastructures to cater to the otherwise restrictive audience. More and more businesses shifted to online operations which boosted the customer base towards internet and software applications (Hong & Yoon, 2022). Within a period of a two years, many businesses not only recovered to their pre-pandemic financial levels, but also increased their market share and profitability as a result of the pandemic.

Future predictions based on financial performance of the companies is important criteria for investors who like to see a positive future outlook for the companies they invest in (Jones, Palumbo, & Brown, 2021). Financial performance is not only compared with the past performance of the company, but also with other similar companies that provide state-of-the-art technology platforms. With so much competition in the stock market, investors and shareholders are always keen to know the future outlook for companies to find their alternatives. They need to have a strong assurance about the future value of their investments as well as potential returns through the course of their investments (Jones, Palumbo, & Brown, 2021).

The stock market index where such companies are listed show positive gain or a loss based on individual companies. Nasdaq composite is an index that lists hundreds of small and large technology and other companies within the index. While Nasdaq composite trends based on the performance of all companies within it, some companies have much larger impact than others (Yahoo Finance, 2022). Companies are weighted according to their market cap, revenues, profitability, and other financial aspects. This research is intended to analyze the performance of some of the largest technology companies in terms of their financial recovery post-pandemic and sustainability predictions for the future.

In order to analyze and translate the stock data into meaningful information and predictions, the data of five big-tech companies (Apple Inc., Microsoft Corporation, Amazon Inc., Google Alphabet, and Meta Platforms) is analyzed (Yahoo Finance, 2022). The aim of the study is to analyze the financial recovery of these companies post-pandemic in comparison to their own stock prices, as well as to the overall Nasdaq composite where these companies are listed. Additionally, the present study also aims to perform predictive modeling using a discrete linear and exponential model to show future sustainability predictions of these companies (Bhusal, 2017).

Data Collection

Stock data is collected for five big-tech companies within the Nasdaq Composite (Yahoo Finance, 2022). Technology sector is one of the few sectors that saw a significant increase in demand during the pandemic.

This is because many people started to work remotely and virtual meetings and other communication became common (Goetzen, 2022). These companies publicly trade in the New York Stock Exchange within the Nasdaq Composite. While the Nasdaq composite is a composite of hundreds of [mostly] technology related companies, the selected companies for the purpose of this research are among the top ten companies on Nasdaq composite. The companies are ranked based on their market capitalization, overall worth, and financial performance.

The five companies, Apple Inc. (AAPL), Microsoft Inc. (MSFT), Amazon Inc. (AMZN), Alphabet Inc. (GOOG), and Meta Platforms (FB) are listed as some of the top companies on Nasdaq index at the United States stock exchange (Yahoo Finance, 2022). In order to show the financial recovery of each of these companies post-pandemic, two-year data is collected from the beginning of the pandemic in March 15, 2020 to March 15, 2022 (Yahoo Finance, 2022). It is important to point out that while the coronavirus was first diagnosed in November of 2019, the global disease was coined as a global pandemic in March 2020. Weekly stock price (open, close, high, low) as well as the overall traded volume for each day for all five companies is selected for the analysis. Similarly, data from the Nasdaq composite is also collected for comparison and to understand the effects of individual companies on the overall Nasdaq composite during the same period.

Methodology

The acquired stock market data was each company is first plotted based on the stock price (open, close, high, and low). A candlestick chart is plotted to visualize all the parameters with the chart. In a general candlestick chart, the vertical (rectangular) body represents the open and close prices of the stock (Mitchell, 2022). If the close price is greater than the open price for the day, the lower end of the body would represent open price and the upper end of the body would represent close price. In this instance, the candlestick is generally marked as green (gain). If the open price is greater than the close price for the day, the lower end of the body would represent the close price and the upper end of the body would represent the open price

(Mitchell, 2022). In this instance, the candlestick is generally marked as red (loss). The upper wick attached to the body represents the high for the day and the lower wick attached to the body represents low for the day.

Results and Discussion

Stock Price and Volume

Figure 1 shows two-year stock analysis of AAPL from March 2020 to March 2022. As shown in Figure 1, the general trend of the stock has been upwards from the start of the pandemic. The stock price was a lot lower because of the uncertainty during the global pandemic. These low prices attracted more people to invest into the company at the beginning of the pandemic, as shown in the volume chart in Figure 2. As shown in Figure 2, during the initial days of the pandemic up until November of 2020, the volume is very high, which means that a large number of shares were being traded in the market during that time. This caused the price of the stock to rise from around USD 60 to about USD 125 in a matter of 8 months This is a more than 100% increase in the stock price.

It is important to note that the spike in the stock price, as shown is Figure 1, corresponds to the spike in volume around the same time, as shown in Figure 2. This change is attributed to the financial recovery of the company just after the beginning of the pandemic. In the year 2021, the volume remained steady while the stock price kept increasing steadily. While there were no more spikes in the stock price, a steady and strong increase in the stock price is attributed to the financial recovery of the company. During the recovery time, the company reported to have sold a record number of smart devices including IPhones, IPads, and MacBook computers (Canon & Jolly, 2021). Additionally, the software and advertising channels of the company also resulted in record profits which resulted in the overall increased price of the stock. With travel and other restrictions in place during the pandemic, people spent more time in their private space while interacting with others virtually. This practice gave rise to the use of smart devices and related software products. During the two-year recovery period, the company saw a whopping 314% increase in the stack price, from USD 57 to USD 179.

Figure 1 Stock price trends of AAPL

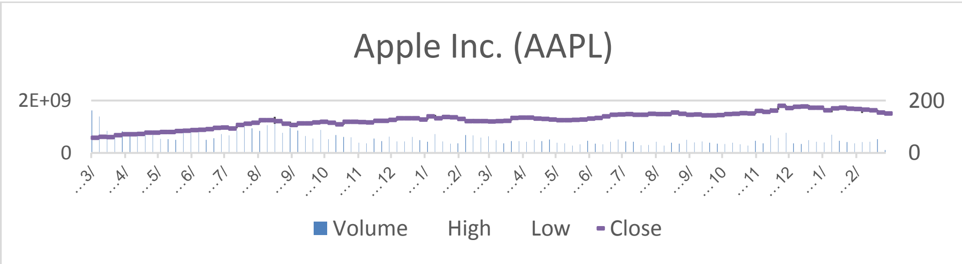

Figure 2 Volume trends of AAPL

Figure 3 shows two-year stock analysis of MSFT from March 3020 to March 2022. As seen from Figure 3, the general trend of the stock has been upwards from the l start of the pandemic. However, toward the end of the research period, the stock price went downwards. Similar to the AAPL company, MSFT is another big-tech company which relies heavily on their software products related to technology (Nellis & Rana, 2021). At the start of the pandemic, the stock price was USD 135 which triggered a lot of volume into the shares of the company. The higher volume and more trades gave rise to the price in the first few months of the pandemic, as shown in Figure 4. Financial results from the second and third quarter, ending in June and September respectively, the company reported better than expected results.

During the first half of 2021, the stock price remained pretty constant, in the range of USD 200, While the volume was still higher during that time, the stock price did not move much. In the second half of 2021, the company gained a much better financial position in terms of their sales, profits, and future outlook. This resulted in a significant increase in the stock from USD 200 to just under USD 350 that was recorded in November of 2021, This is a 175% increase in that year and a 260% increase in stock price since the start of the pandemic. The most notable thing however is the decline in the stock price at the beginning of the year 2022. This is due to a negative future outlook by the company and lack of trust from the investors (Nellis & Rana, 2021). It is important to note that following the decline in price of over 25%, the volume of shares increased tremendously with a few notable spikes in January of 2022. A lot of investors saw the decline as an opportunity to begin or strengthen their position in the company. Nonetheless, the company saw an overall increase of over 210% through the two-year period analyzed in this research.

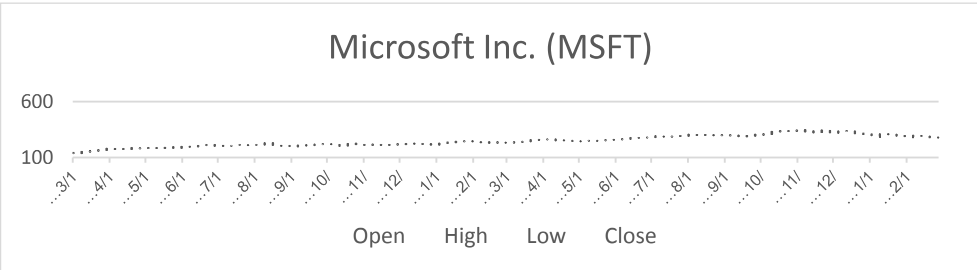

Figure 3 Stock price trends of MSFT

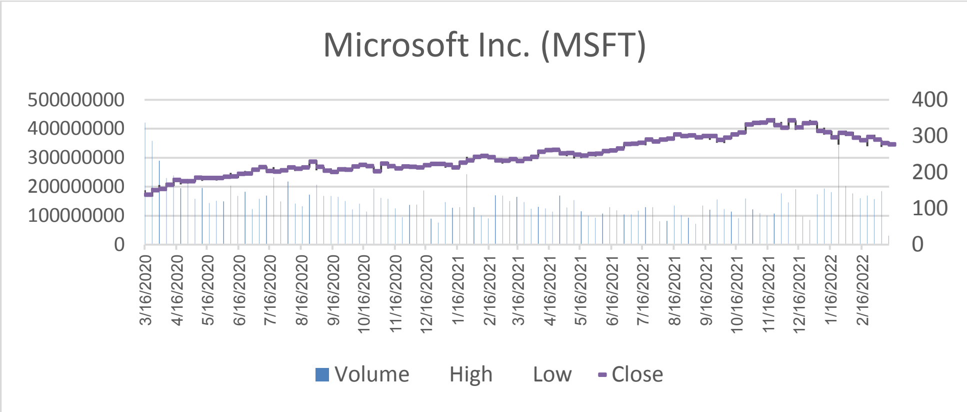

Figure 4 Volume trends of MSFT

Amazon Inc. is another big tech name when it comes to online marketplace and web services. Figure 5 shows a two-year stock analysis of AMZN from March 2020 to March 2022. As shown in Figure 5, the general trend of the stock shows a decent increase in the stock price followed by a stability throughout the analysis period of two years. At the onset of the global pandemic, Amazon stock price was just under USD 1800, But with increased volume and extraordinary financials, the company had a great run at the stock exchange to up to USD 3500 at the end of the year 2020 (Young, 2022). During the first 9 months of the pandemic, the stock price increased by almost 200%. The higher volume of the stock, as shown in Figure 6, corresponds to the doubling of the stock price.

During the first half of 2021, the stock price was rather stable and fluctuated in the range of USD 3000 and USD 3500 followed by another increase in the price of over USD 3700 in the latter part of the year. This is an increase of another 23% from the average USD 3000 level during the first half of 2021. While the volume during this time was relatively lower than that in the first half of 2021, a consistent volume was noticed. During the pandemic, as most business moved to virtual settings, consumers shifted towards online shopping from marketplaces such as Amazon. This provided a significant boost to the company with sales, revenues and profits skyrocketing during the time (Young, 2022).

Similar to the trend observed for MSFT, the share price dropped significantly towards the beginning of 2022 with a decrease of about 30% from the all-time high. During this time, the volume of the stock increased tremendously with consistent peaks observed during the first quarter of 2022. The drop in price is attributed to fewer restrictions for in-person shopping and increased outdoor activities.

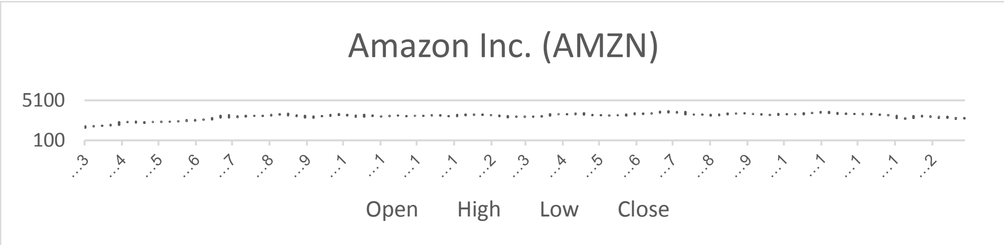

Figure 5 Stock price trends of AMZN

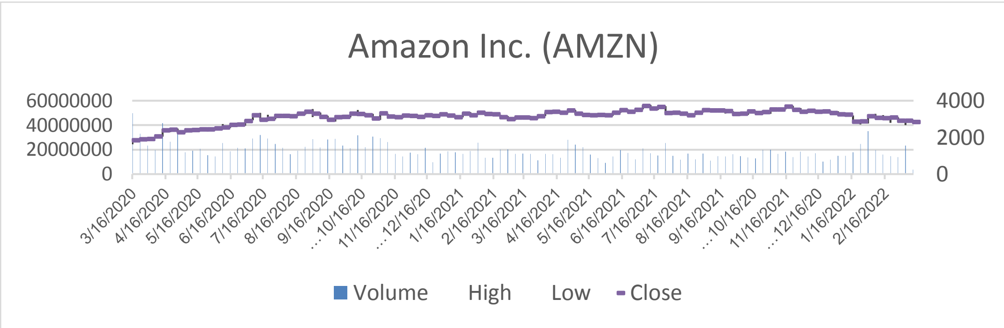

Figure 6 Volume trends of AMZN

Figure 7 shows a two-year stock analysis of GOOG from March 2020 to March 2022. The overall trends for this stock tell a similar story but with a more linear and consistent increase in the stock price over the course of almost two years. As shown in Figure 7, at the start of the pandemic, the stock price was just over USD 1000. Very early in the pandemic, the stock gained much attention from the investors with much increased trade volume, as evident from Figure 8. Unlike other stocks analyzed here GOOG had a pretty consistent increase in the stock price from March 202 all the way up to the end of 2021.

During the period of 21 months, the stock prices peaked to a whopping USD 3000 around December 2021. That is a significant increase of approximately 300% during this time. What is notable here is the linear increase in the stock price which is attributed to strong financials on quarterly basis and increased bottom line for the company (Goetzen, 2022). The company revealed significant increase in its user base throughout the pandemic with a positive future outlook. Through this time, the trade volume remained consistently higher which shows interest from the investors. Like some other stocks mentioned earlier, Google Alphabet also saw a downturn at the beginning of 2022 with the stock price slightly dropping to about USD 2600, which is a decrease of nearly 15% from its all-time high. Google Alphabet stock shows very positive trends when compared to other stocks mentioned earlier.

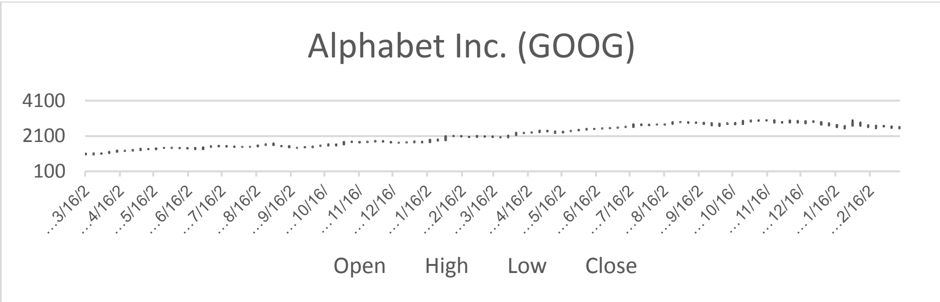

Figure 7 Stock price trends of GOOG

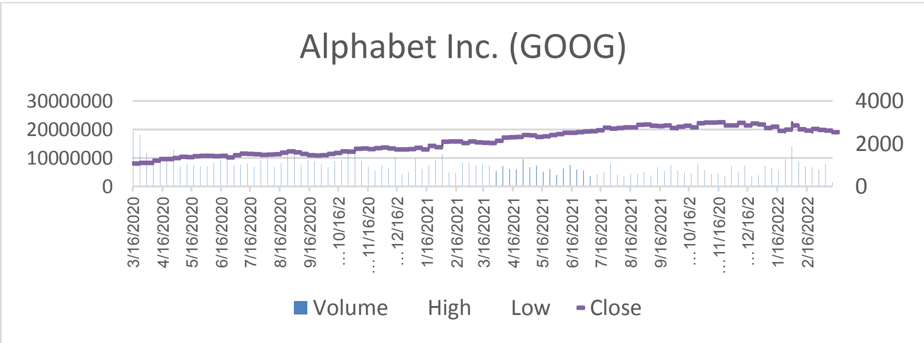

Figure 8 Stock price trends of GOOG

Meta Platforms (FB) tell a slightly different story in the overall analysis of big-tech stocks. While the stock price has slightly increased compared to that at the beginning of the pandemic, there have been a number of rifts on the way. Figure 9 shows a two-year stock analysis of FB from March 2020 to March 2022. As shown in Figure 9, the stock price grew rather linearly during the first few months of the pandemic. At the beginning of the pandemic, the stock price was around USD 140, which increased to over USD 300 in the first 5 months until August 202Q. This is a significant increase of over 215% in a short span of time. This is attributed to the increase in user-base and the revenue generated through advertisements on the social media platforms owned by Meta Platforms (Canon & Jolly, 2021).

The first rift came around the fall of 2020 which stopped the stock growth for a good 8 months, while keeping the average price near the USD 270-290 price mark. Between April and September 2021 the company witnessed another hike in the stock price which saw the price reach a near USD 400 peak. At the time, the company had not only showed growth and profits, but also provided a clear future outlook to its investors. The last (and ongoing) rift hit the company towards the third quarter of 2021 when the stock saw a downturn due to multiple reasons. The first reason being the restriction on advertisements on Apple products which crushed the future outlook of the advertisement revenue by FB (Perez, 2021).

Secondly, the company introduced the concept of Meta Platforms, not only through the change in its name, but also through large investments through the foreseeable future. This resulted in a sharp downturn due to lack of visibility on net profits for the company. The stock price came down tumbling to USD 180 level which is over 220% decline from its all-time highs. This is something very unusual but yet the reality for the company (Perez, 2021). As shown in Figure 10, the otherwise consistent trade volume increased tremendously with the decline in stock price, showing large interest from the investors at the discounted price.

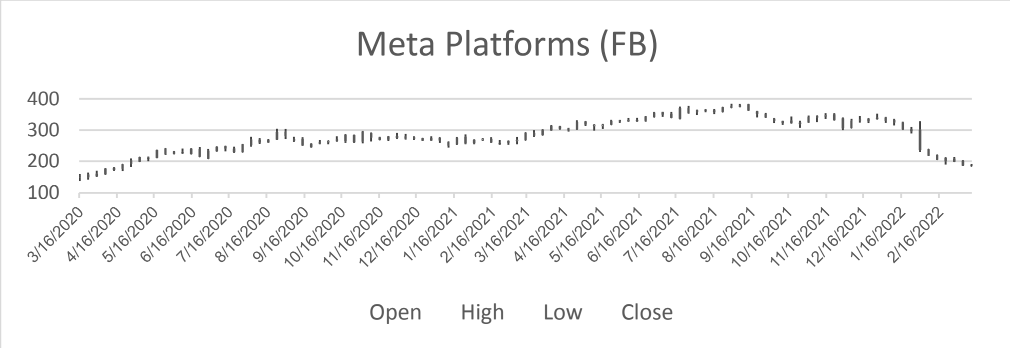

Figure 9 Stock price trends of FB

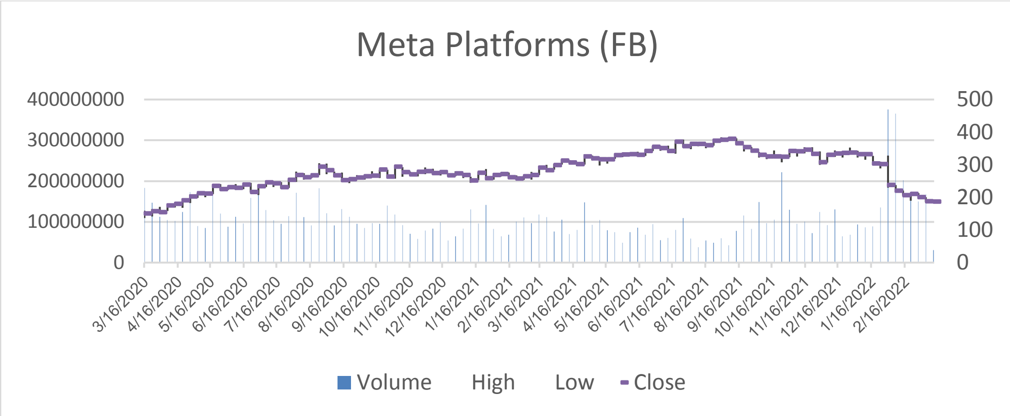

Figure 10 Volume trends of FB

Figures 11 and 12 show the trends of the overall Nasdaq composite over the course of two years. As expected, the overall Nasdaq composite tells a similar story where the index linearly increased over the course of two years. It is important to notice that there are hundreds of other companies within the Nasdaq index. The big-tech companies move the majority of the index because of their respective weightage within the index (Canon & Jolly, 2021). As shown in Figure 12, the volume of shares traded within the index remained much higher through the recovery period. With the ongoing unstable situation in the world and inflation crisis in the United States, the Nasdaq composite also shows a significant downturn at the beginning of 2022 Irrespective of the downturn, the volume remains much higher throughout the period that is analyzed in this research.

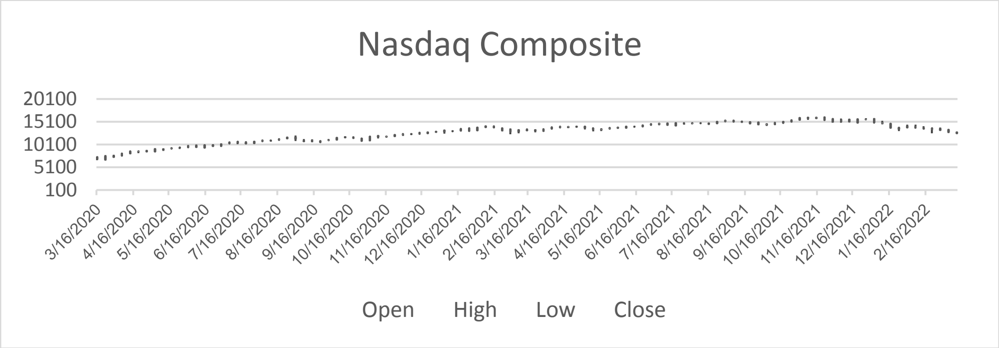

Figure 11 Stock price trends of NASDAQ

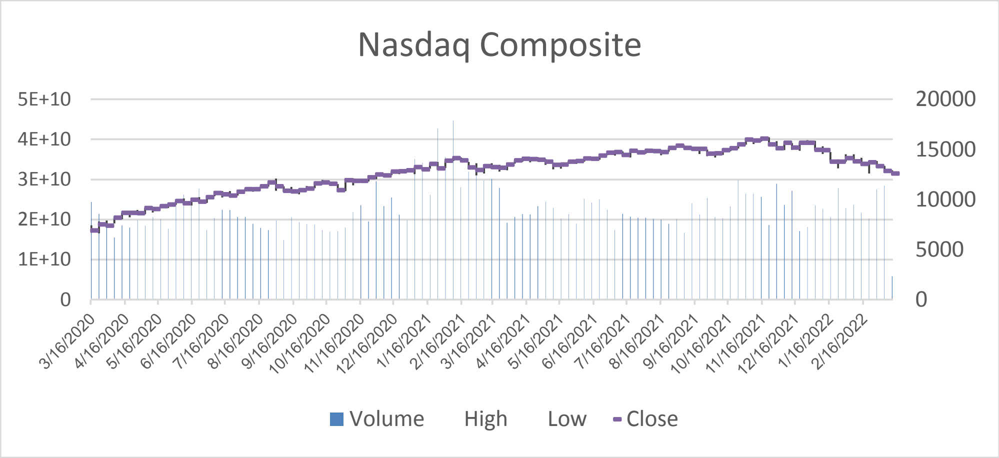

Figure 12 Volume trends of NASDAQ

Figure 13 shows a normalized comparison of all five stocks along with that of the Nasdaq composite. It can be clearly seen that the normalized trends match pretty closely with that of the overall Nasdaq composite. This is because these companies are weighted very heavily on the Nasdaq index and hence are more responsible for the overall gain (or loss) in the Nasdaq index. Moreover, around December of 2021, all companies, including the Nasdaq composite overall within the same range of values. It is also noteworthy that while all companies saw a slight decline at the beginning of 2022, FB showed a rather steep decline due to the reasons mentioned earlier.

This steep trend is evident from the normalized plot with a noticeable effect on the Nasdaq composite during that decline.

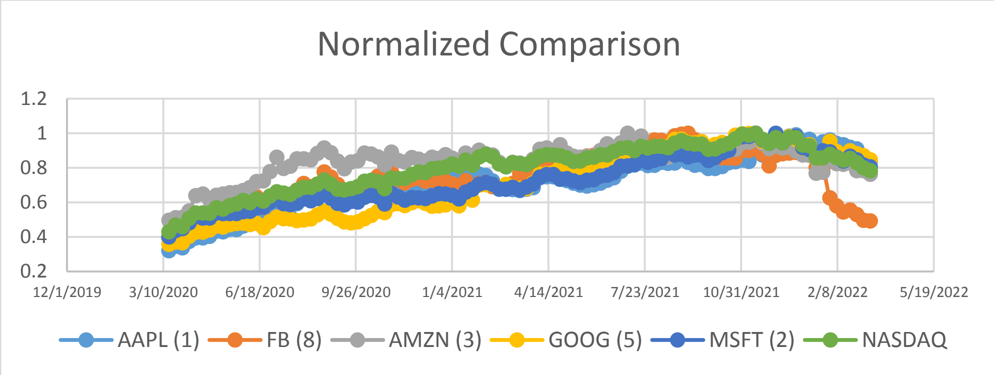

Figure 13 Normalized price comparison of all stocks and Nasdaq Composite

Financial Aspects

Table 1 shows the financial aspect of Apple Inc. (AAPL) which includes revenue, gross profit, and EPS, including other financial aspects (QuickFS, 2022). The data is shown for two consecutive years for 2020 and 2021. The data for two years is compared in terms of % increase for each one of the aspects. As shown in Table 1, the revenue growth is 505% year-over-year which is very significant right out of the pandemic. It is important to notice that the significant increase is related to the increase in technology use and demand during the lockdown period across the world. Similarly, the EPS growth is above 500% too showing the net earnings in relation to individual share of the company (QuickFS, 2022). Some of the other aspects including the Return on Assets (ROA), Return on Equity (ROA), and Return on Investment (ROI), have also gone up in 2021 up to twice as much as in the year 2020. This is a significant increase in the growth of the company showing great potential in the technology sector in the future years.

Table 1 Financial data of AAPL stock showing various performance parameters for 2020 and 2021 including the percentage difference between the two years

Financial Aspect	AAPL		
	2020	2021	% Increase
Revenue	274515	365817	33%
Revenue Growth %	5.5	33.3	505%
Gross Profit	104956	152836	46%
Gross Margin %	38.2	41.8	9%
Earnings per share (EPS)	$ 3.28	$ 5.61	71%
EPS Growth %	10.4	71	583%
Return on Assests (ROA) %	17.3	28.1	62%
Return on Equity (ROE) %	73.7	147.4	100%
Return on Investment (ROI) %	30.5	51.8	70%

Future predictive modeling of the Apple Inc. stock (AAPL) is shown in Figure 14. Figure 14 shows the total revenue and operating profit of the company for the last ten years; from 2012 to 2021 (QuickFS, 2022). The data is selected to compare the overall growth of the company in terms of revenue and profits in an effort to perform trend monitoring for the future. As shown in Figure 14, the revenue increases linearly over the course of years up until the year 2020. There is a steep curve between 2020 and 2021 indicating a sudden surge in the revenue increase during that year. This is due to the pandemic recovery as well as the increased demand of technology and technology products as a result of the technological shift.

Looking at the operating profit, the linear line is very subtle from 2012 up until 2020 but a noticeable shift upwards is shown between 2020 and 2021 indicating the increase in the demand. For each one of the curves, the linear lines are plotted to predict the future of the stock. Based on the past history, it can be inferred that the stock price is expected to go higher in the next 5-10 years (Canon & Jolly, 2021). Not only that, the linearity of the stock is expected to be much steeper compared to the previous year because of the overall usage of technology in everyday lives of people.

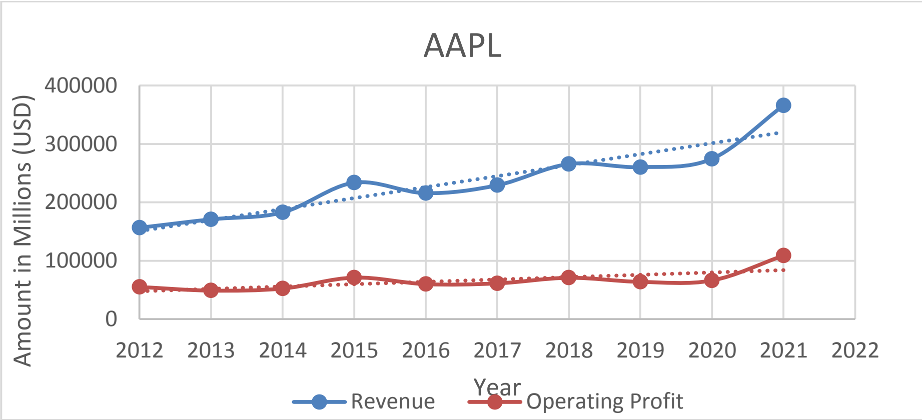

Figure 14 Revenue and operating profits including the trend lines of AAPL stock for the last ten years

Table 2 shows the financial aspect of Meta Platforms Inc. (FB) which includes revenue, gross profit, and EPS, including other financial aspects. The data is shown for two consecutive years for 2020 and 2021 (QuickFS, 2022). The data for two years is compared in terms of % increase for each one of the aspects. As shown in Table 2, the revenue growth is 72% year-over-year which is very noticeable given the overall demand and the establishment of many other social media platforms. It is important to notice that the increase is related to the increased time people spent on social media platforms during the pandemic and the revenues generated as a result of that. While the EPS has slightly increased between 2020 and 2021, the overall EPS growth is pretty negative for the company. Some of the other aspects including the Return on Assets (ROA), Return on Equity (ROA), and Return on Investment (ROI), have also gone up by 22% in 2021. The increase in the growth of the company shows potential in the technology sector in the future years (Perez, 2021).

Table 2 Financial data of FB stock showing various performance parameters for 2020 and 2021 including the percentage difference between the two years

Financial Aspect	**FB**		
	2020	**2021**	**% Increase**
Revenue	85965	117929	37%
Revenue Growth %	21.6	37.2	72%
Gross Profit	69273	95280	38%
Gross Margin %	80.6	80.8	0%
Earnings per share (EPS)	$ 10.09	$ 13.77	36%
EPS Growth %	56.9	36.5	-36%
Return on Assests (ROA) %	19.9	24.2	22%
Return on Equity (ROE) %	25.4	31.1	22%
Return on Investment (ROI) %	23.4	28.6	22%

Future predictive modeling of Facebook (FB) is shown in Figure 15. Figure 15 shows the total revenue and operating profit of the company for the last ten years; from 2012 to 2021. The data is selected to compare the overall growth of the company in terms of revenue and profits in an effort to perform trend monitoring for the future. As shown in Figure 15, the revenue increases pretty exponentially over the course of years up until the year 2021. The exponential growth follows the exponential line plotted in the curve. This shows that there is a significant revenue potential in the future for the stock. This is not only based on the post-pandemic recovery, but also over the last decade. From the operating profit curve, the profits were pretty steady up until the year 2015, after which the profits kept increasing linearly since then. The linear lines show the overall curve for the future prediction of the stock. Based on the past history, it can be inferred that the stock price is expected to go higher in the next 5-10 years (Perez, 2021). Additionally, it would be interesting to see if the revenues keep on increasing exponentially or do those settle down in the next few years.

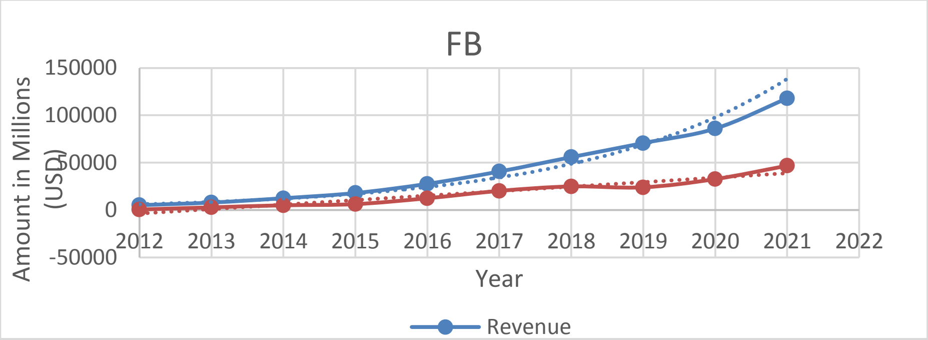

Figure 15 Revenue and operating profits including the trend lines of FB stock for the last ten years

Table 3 shows the financial aspect of Amazon Inc. (AMZN) which includes revenue, gross profit, and EPS, including other financial aspects. The data is shown for two consecutive years for 2020 and 2021 (QuickFS, 2022). The data for two years is compared in terms of % increase for each one of the aspects. As shown in Table 3, the overall year-over-year revenue growth is negative for the stock. Similarly, the EPS year-over-year growth for the stock is also negative. However, as seen previously, the stock has increased in its value and overall gross profit in the 2021 due to the sudden surge in e-commerce and online shopping (Young, 2022). Some of the other aspects including the Return on Assets (ROA), Return on Equity (ROA), and Return on Investment (ROI), have shown slight increase, indicating the positive outlook for the stock in the future.

Table 3 Financial data of AMZN stock showing various performance parameters for 2020 and 2021 including the percentage difference between the two years

Financial Aspect	**AMZN**		
	2020	**2021**	**% Increase**
Revenue	386064	469822	22%
Revenue Growth %	37.6	21.7	-42%
Gross Profit	51500	66315	29%
Gross Margin %	12.3	14.1	15%
Earnings per share (EPS)	$ 41.83	$ 64.81	55%
EPS Growth %	81.8	54.9	-33%
Return on Assests (ROA) %	7.8	9	15%
Return on Equity (ROE) %	27.4	28.8	5%
Return on Investment (ROI) %	14.1	15.4	9%

Future predictive modeling of the Amazon Inc. stock (AMZN) is shown in Figure 16. Figure 16 shows the total revenue and operating profit of the company for the last ten years; from 2012 to 2021. The data is selected to compare the overall growth of the company in terms of revenue and profits in an effort to perform trend monitoring for the future. As shown in Figure 16, the revenue increases linearly over the course of years from 2012 up until the year 2015. There is a steep exponential curve between 2015 and 2021 which shows a greater potential in terms of revenue growth for the stock. This is due to the pandemic recovery as well as the increased demand of online shopping and more consumer reliance on e-commerce. Looking at the operating profit, the company is barely growing in terms of its operating profit over the last decade. However, there is a slight increase in profits in the last few years which is evident from the plot. For each one of the curves, the linear lines are plotted to predict the future of the stock. Based on the past history, it can be inferred that the stock price (as a result of the revenues) is expected to go higher in the next 5-10 years (Young, 2022).

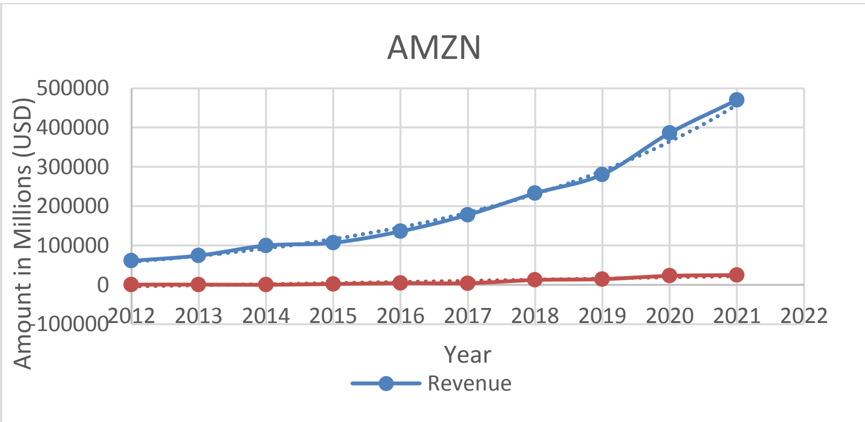

Figure 16 Revenue and operating profits including the trend lines of AMZN stock for the last ten years

Table 4 shows the financial aspect of Google Alphabet Inc. (GOOG) which includes revenue, gross profit, and EPS, including other financial aspects. The data is shown for two consecutive years for 2020 and 2021 (QuickFS, 2022). The data for two years is compared in terms of % increase for each one of the aspects. As shown in Table 4, the revenue growth is 222% year-over-year which is very significant right out of the pandemic. Similar to the Apple stock, the significant increase in revenue is related to the increase in technology use and demand during the lockdown period across the world.

The Gross Margin of the company has increased by nearly a whopping 1500% which is extraordinary given the products and services Google Alphabet offers across all of its domains. The tremendous growth in gross margins is a testimony of the market share of the company and its customer base. Along the same lines, the EPS growth is nearly 400% showing the net earnings in relation to individual share of the company. Some of the other aspects including the Return on Assets (ROA), Return on Equity (ROE), and Return on Investment (ROI), have also gone up in 2021 up to nearly 70% compared to the year 2020. This is a significant increase in the growth of the company showing great potential in the technology sector in the future years (Goetzen, 2022).

Table 4 Financial data of GOOG stock showing various performance parameters for 2020 and 2021 including the percentage difference between the two years

Financial Aspect	**GOOG**		
	2020	**2021**	**% Increase**
Revenue	182527	257637	41%
Revenue Growth %	12.8	41.2	222%
Gross Profit	97795	146698	50%
Gross Margin %	3.6	56.9	1481%
Earnings per share (EPS)	$ 58.61	$ 112.20	91%
EPS Growth %	19.2	91.4	376%
Return on Assests (ROA) %	13.5	22.4	66%
Return on Equity (ROE) %	19	32.1	69%
Return on Investment (ROI) %	17.4	28.9	66%

Future predictive modeling of the Google Alphabet Inc. stock (GOOG) is shown in Figure 17. Figure 17 shows the total revenue and operating profit of the company for the last ten years; from 2012 to 2021. The data is selected to compare the overall growth of the company in terms of revenue and profits in an effort to perform trend monitoring for the future. As shown in Figure 17, the revenue increases linearly over the course of several years from 2012 up until the year 2016. After that time, a clear exponential growth of the company is noticed from its revenues from 2016 onwards.

Moreover, there is a steep curve between 2020 and 2021 indicating a sudden surge in the revenue increase during that year. This is due to the pandemic recovery as well as the increased demand in technology products and maximum use by the consumers as a result of the pandemic (Goetzen, 2022). Looking at the operating profit, the linear line is very subtle from 2012 up until 2020 but a noticeable shift upwards is shown between 2020 and 2021 indicating the increase in the demand. For each one of the curves, the linear lines are plotted to predict the future of the stock. Based on the past history, it can be inferred that the stock price is expected to go higher in the next 5-10 years (Goetzen, 2022). Not only that, the linearity of the stock is expected to be much steeper compared to the previous year because of the overall usage of technology in everyday lives of people.

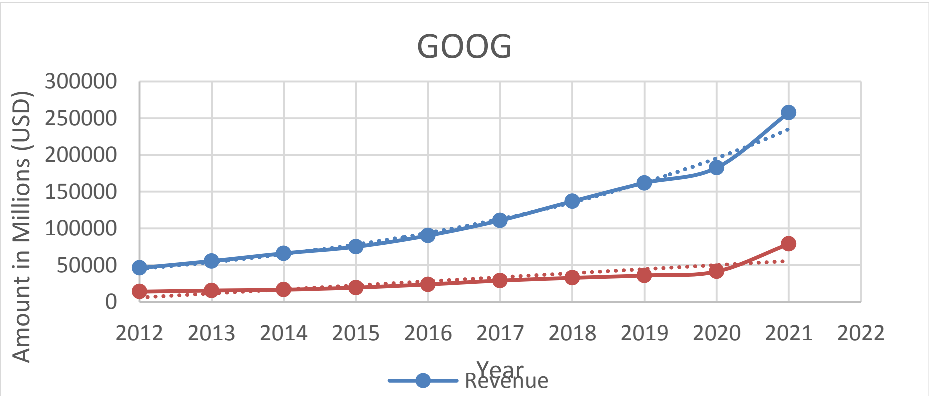

Figure 17 Revenue and operating profits including the trend lines of GOOG stock for the last ten years

Table 5 shows the financial aspect of Microsoft Inc. (MSFT) which includes revenue, gross profit, and EPS, including other financial aspects. The data is shown for two consecutive years for 2020 and 2021 (QuickFS, 2022). The data for two years is compared in terms of % increase for each one of the aspects. As shown in Table 5, the revenue growth is 29% year-over-year which is relatively on the lower side compared to some of the other companies analyzed here. However, when looking in isolation, a nearly 30% growth in revenue from 2020 to 2021 is significant right out of the pandemic.

Microsoft offers a variety of software and operating system solutions to its consumers which results in a solid revenue increase (Nellis & Rana, 2021). What is more interesting is the year-over-year increase in the EPS which is close to 200% showing the net earnings in relation to individual share of the company. Some of the other aspects including the Return on Assets (ROA), Return on Equity (ROA), and Return on Investment (ROI), have also gone up in 2021 compared to the 2020 levels. This is quite an increase in the growth of the company showing great potential in the technology sector in the future years.

Table 5 Financial data of MSFT stock showing various performance parameters for 2020 and 2021 including the percentage difference between the two years

Financial Aspect	**MSFT**		
	2020	**2021**	**% Increase**
Revenue	143015	168088	18%
Revenue Growth %	13.6	17.5	29%
Gross Profit	96937	115856	20%
Gross Margin %	67.8	68.9	2%
Earnings per share (EPS)	$ 5.76	$ 8.05	40%
EPS Growth %	13.8	39.8	188%
Return on Assests (ROA) %	15.1	19.3	28%
Return on Equity (ROE) %	40.1	47.1	17%
Return on Investment (ROI) %	23.9	30.7	28%

Future predictive modeling of the Microsoft Inc. stock (MSFT) is shown in Figure 18. Figure 18 shows the total revenue and operating profit of the company for the last ten years; from 2012 to 2021. The data is selected to compare the overall growth of the company in terms of revenue and profits in an effort to perform trend monitoring for the future. As shown in Figure 18, the revenue increases linearly from 2012 to 2015 after which the revenue drops in the year 2016. Beyond that point, the company saw a linear increase in the revenues up until the year 2021. Contrary to some steep revenue increases seen in this analysis, for example for Apple Inc. and Google Alphabet Inc., the revenue increase for Microsoft remains steady and linear when compared to that of 2020. In terms of the operating profit, the linear growth is evident from the plot. For each one of the curves, the linear lines are plotted to predict the future of the stock. Based on the past history, it can be inferred that the stock price is expected to go higher in the next 5-10 years (Nellis & Rana, 2021).

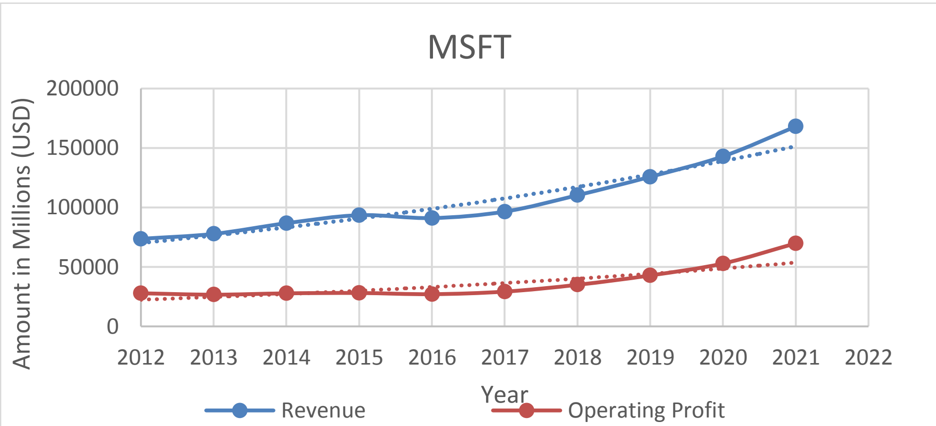

Figure 18 Revenue and operating profits including the trend lines of MSFT stock for the last ten years

Table 6 shows the mean and standard deviation of each one of the five stocks analyzed in this paper (QuickFS, 2022). Figure 19 shows the plotted mean and standard deviation in terms of error representation for each one of the stocks. As shown for the Apple stock the mean stock price is over

$127 with a standard deviation of $29. The standard deviation shows that there is more than 22% deviation of the stock price from its mean value. This shows the volatility of the stock.

Table 6 Mean, Standard Deviation, and percentage difference of all the stocks and their comparisons

	Mean	**SD**	**% Diff**
AAPL	127.3599	29.24128	23%
FB	282.1228	55.39049	20%
AMZN	3115.595	382.4284	12%
GOOG	2129.821	590.4672	28%
MSFT	248.061	50.11593	20%

For Facebook stock has a mean value of just over $282 with the standard deviation of $55. The deviation of the stock price is somewhat similar to that of Apple stock of about 20%. For Amazon stock has a mean value of nearly $3116 with the standard deviation of $382. The deviation of the stock price is fairly small compared to some other stocks of just over 12%. This shows much more stability in the stock. As seen previously from Table 3, the slight year-over-year increase in the revenue of the company is evident of its stability with less volatility. The Google Alphabet stock has a mean value of $2130 with the standard deviation of $590. The deviation of the stock price is a whopping nearly 28% which is highest among other stocks analyzed. This goes to show not only a tremendous increase in the stock price over the course of two years, but also much higher volatility and instability of the stock price. The Microsoft stock has a mean value of just over $248 with the standard deviation of $50. The deviation of the stock price is somewhat similar to that of Apple and Facebook stocks of about 20%.

Conclusions

The global pandemic that began in March 2020 as a result of coronavirus disease left world economies and businesses to drain left right and center. The stock market crashed overnight due to the uncertainties associated with the then post-pandemic time. Many businesses shut down either temporarily or permanently due to the specific restrictions around large and small cities in the world. The economic impact was evident from the stock price and uncertain future overlook of large and small companies. However, since almost all major cities followed strict lockdowns, the demand for technology increased. Large technology companies saw a major boom in their viewership and customer base.

In this research, the performance analysis of five of the top ten technology companies listed on the Nasdaq composite in the New York Stock Exchange is conducted. The companies include Apple Inc., Meta Platforms, Amazon Inc., Google Alphabet Inc., and Microsoft Inc. The stock performance of these companies in terms of post-pandemic recovery is analyzed. Moreover, future predictions based on linear and exponential modeling of revenue and operating profit year-over-year growth is analyzed. Results from the analysis show that all technology companies had a massive run in the months after the onset of the global pandemic. While some companies lack EPS growth, the stock price trends for all companies show great promise. The future predictive analysis confirms that the year-over-year growth is expected to not only remain positive but also take a steep incline in the next 5-10 years.

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