Journal of Stock and Forex Trading
OPEN ACCESS Freely available online
Research Article

Effect of COVID-19 Global Stock and Share Market of Major IT Giants of World

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ABSTRACT

In the current period of time, when there is havoc across the world due to COVID-19 virus outbreak, it becomes very important to foresee the impact of this pandemic on the world economy. This has attracted us to analyze and predict the stock market prices of some international IT international companies which provide employment to thousands of people and create revenue for many countries namely Google, Microsoft, Apple and Amazon. In this study, we have implemented algorithms such as SVM and LSTM on stock market data to see if major IT companies see a rise or fall during the COVID-19 pandemic. We have also used ARIMA forecasting method to predict the stocks of above mentioned 4 companies. This paper provides a simple but original statistical analysis of the impact of the COVID-19 pandemic on stock market risk for 4 major IT companies of the world. Results revealed that while some businesses like personal computers from Microsoft, I phone handsets, sale of luxury and fashion goods at Amazon has declined during the pandemic, thus leading to fall of stocks. However, some prominent other segments like online shopping, cloud computing and streaming video from Amazon, oversees Office, Dynamics, Skype, LinkedIn Intelligent Cloud from Microsoft, Google's ad sales during the crisis and issue of cheap bonds by Apple came out to be the winning corporate strategies to fight the negative economic effect of COVID-19 and to stabilize the situation of stocks in coming months. This study may help investors and companies to sustain the tide of economic fall.

Keywords: COVID-19; Stock prices; Stock market volatility; Statistical analysis

INTRODUCTION

It is believed that the impact of COVID-19 pandemic is going to be huge on the global economic growth. Due to corona virus, the Organization for Economic Co-operation and Development (OECD) has already halved the global Gross Domestic Product (GDP) growth projection for 2020. This pandemic has also impacted the Indian economy adversely [1]. Owing to adverse effects of a pandemic, some economists have done research using statistical methods like ANN (Artificial Neural Network) algorithm for stock market prediction. Stock valuation was made with respect to some socio-economic factors. The scenario changed when the virus engulfed the world and WHO declared the COVID-19 as a pandemic, followed by various countries issuing travel bans, lockdowns, emergencies, and other restrictions. Capital market across the world suffered miserably due to this pandemic [2]. A few of the listed stocks depict the story of the chaos in the Indian Stock market, which is presently in the grip of a global pandemic. When COVID-19 was declared as a pandemic, the financial markets as well as other asset categories like commodities, crude oil and real estate got affected unexpectedly. For prediction of stock market, most researchers have focused on Artificial Neural Networks (ANN). While using ANN, the machine trains itself and by detecting various patterns it assigns the weights again in every epoch until the desired results are obtained. The spread of the COVID-19 has severely affected the financial markets all over the world. It has created an exceptional level of risk, causing investors to bear considerable losses in a very short span of time. With the

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Received: 15-Sep-2021, Manuscript No. JSFT-21-12965; **Editor assigned:** 21- Sep -2021, PreQC No. JSFT-21-12965; **Reviewed:** 05-Oct-2021, QC No. JSFT-21-12965; **Revised:** 24-Mar-2023, Manuscript No. JSFT-21-12965; **Published:** 31-Mar-2023, DOI: 10.4172/2168-9458.23.10.229

Citation: Masih J, Rajasekaran R, Saini N, Kaur D (2022) Effect of COVID-19 Global Stock and Share Market of Major IT Giants of World. J Stock Forex. 10: 229.

Corona pandemic prolonged to haunt the global equity market, and most Asian and European markets registered big losses over the economic fallout. The Indian stock market had been witnessing a roller coaster ride where Sensex ended 1,627.73 points higher at 29,915.96, while the Nifty was up 482 points at 8,745.45. All the investors big and small were keeping an eye on the global indices count on the latest cases, and the government involvement to understand their role in the current share of market volatility. Another study analyzed the potential effects, that the corona virus will have on the stock markets [3].The most popular five technology companies in the world-Apple, Facebook, Microsoft and Google and Amazon had lost collectively $623.23 billion in the market cap in the month of March after the WHO declared the Corona virus outbreak a public health emergency. Apple which had a market cap of $1.417 lost the most. Apple, which has reported its second quarter earnings, showed elastic growth for the company in spite the impact of COVID-19 pandemic on its retail business and supply chain. It was seen that Apple was facing manufacturing delays due to corona virus related lockdowns. Apple had got a strong hike in the start of 2020, after reporting solid December quarter earnings and a record high for the stock. However, due to the outbreak of COVID-19 and its spread across the world, Apple claimed that it won't be able to generate revenue guidance for the March quarter. Apple's stock had fallen nearly 19%. It is expected that Apple would be able to reach back its highest record of shares in the next 12 months.

The outstanding securities of companies and governments are traded in the stock market. A stock represents the ownership in a firm and hence, it has claims over the profits that the firm makes. Due to the volatile nature of the stock market, buying and selling of shares have high risk associated with it. This leads to the need for stock market predictions to avoid losses and maximize profits. Therefore, stock price prediction is one of the most widely studied and challenging problems which attract researchers, economists, statisticians, and data analysts. We plan to implement the stock prediction using machine learning algorithm SVM (Support Vendor Machine) and neural network techniques such as back propagation and LSTM (Long Short-Term Memory). With Stock market prediction we aim to determine the future values of several companies' stocks. A detailed comparative study will be conducted between the outcomes of these techniques to state which algorithm is most suitable for achieving higher accuracy [4].

A firm which has a great degree of business risk or financial risk along with commensurate high earnings potential is termed as speculative company. When a stock appears to be highly overpriced compared to its intrinsic value is called speculative stock. As per Patel the accuracy of the prediction done by ANN (Artificial Neural Network) algorithm is 50%. So, the stock market prediction becomes difficult as the stock market data undergoes a lot of changes, especially during pandemic situations. Recent research in the field has also implemented another machine learning method known as support vector machines in addition to or as an alternative to ANNs. Whereas ANNs are models which always try to minimize the classification error within the training data, SVMs may make some classification errors within the training data in order to minimize overall error across the test data. A major advantage of SVM is that it finds a global optimum, whereas neural networks may only find a local optimum [5]. ARIMA forecasting is another famous technique to predict the prices or stocks. As it is expected that there will be dynamic changes in the Indian economy as well as the economies of other nations, it is important to quantify and predict the stock prices as accurately as possible using machine learning algorithms given the current high volatile nature of the stock market. This may help investors and companies to sustain the tide of economic fall. In this study, we have implemented algorithms such as SVM and LSTM on stock market data to see if major IT companies see a rise or fall. Thus, the paper tries to study the economic impact of the pandemic by providing evidence that COVID-19 has affected the stock market of the country using latest technologies like ARIMA, SVM and LSTM. This adverse situation created by COVID-19 gives us a unique opportunity to understand the impact of an unexpected and dreaded disease on the various IT companies. Our paper contributes to the literature by documenting the impact of COVID-19 on the stock market of various five major IT companies. Moreover, it also provides a reference for assessing stock markets after the pandemic subsides.

MATERIALS AND METHODS

There are generally two sources that publish the stock prices of companies in India, namely, BSE (Bombay Stock Market) and NSE (National Stock Market). Here, we have focus on NSE stock prices instead of BSE. The reason behind using NSE data is that BSE stocks are more volatile in nature as compared to those of NSE stocks. Less volatile prices are preferred by analysts as it helps and enables to estimate the stock prices soon. It thus aids, to increase the accuracy of the machine learning model used. We have considered the daily data from four major IT companies, namely Apple, Google, Microsoft and Amazon from 20^{th} March 2019 to 20^{th} March 2020. Since, all these 4 IT giants are USA based companies, thus to support our results, we also considered secondary data in results and discussion about NYSE (New York Stock Exchange). There was an option of directly downloading the data from yahoo finance using pandas datareader in python. We have opted international companies such as Apple, Google, Microsoft and Amazon as they fall in the category of giant companies. Their data were merged to form a single CSV for further pre-processing, analysis and prediction using machine learning algorithms. It was noticed that there was a sudden and huge fall in stock prices of most of the companies. This change was not predictable. These changes attracted us to try and predict the stock market prices of some companies for next 30 days [6]. So, we can see the difference between the predicted and actual prices. Analysis of the mentioned companies was carried out using seaborn and matplotlib libraries in python. We implemented two algorithms, namely SVM and LSTM models on all the companies mentioned before. In the final stage, we have implemented ARIMA best fit model to predict the stock prices of major IT companies, owing to the COVID-19 pandemic scenario (Figure 1).

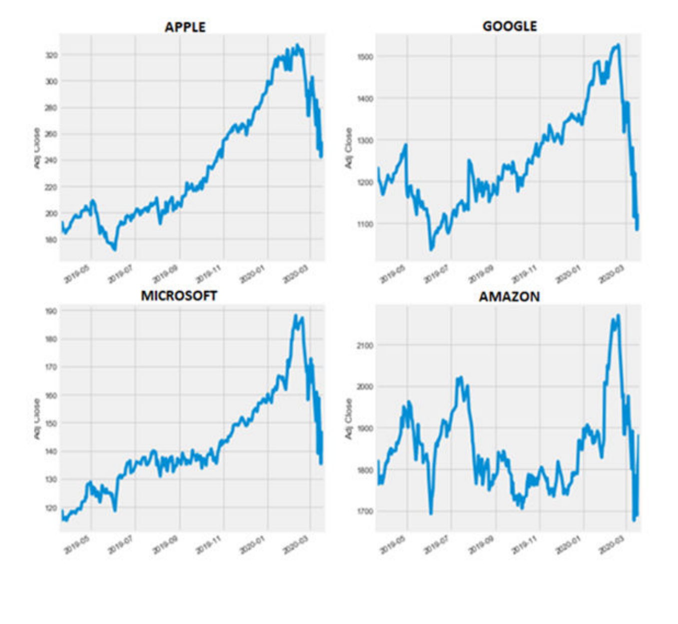

Figure 1: Historical view of the closing price. The figure illustrates the drastic drop in the stock market of the listed companies during 2020 for months February and March due to COVID-19 pandemic.

RESULTS AND DISCUSSION

As the coronavirus continued to spread across the world, the world's financial markets began to crash. The NYSE started plummeting in February and March, as more countries and companies across the world had to deal with mandated stay-at-home orders and social distancing guidelines (Figure 1). It was a similar story for Apple's stock price [7]. The price reached its lowest point of $224.37 on March 23, causing Apple to dip below the $1 trillion market capitalization. China began recovering in March, with improved apple's supply chain in the region. Elsewhere, however, apple shuttered all of its retail locations outside of China, and they remained closed throughout April and early May. As the world transitioned to remote learning and work-from-home policies, Apple's stock began recovering again. The company eventually regained its $1 trillion valuation, and throughout April, apple's share price has largely recovered to pre-coronavirus levels. On April 30, Apple reported earnings that exceeded Wall Street expectations [8]. Although revenue was still down from the pre-pandemic levels, the company's results proved to investors that it could maintain a relatively strong position during COVID-19.

Talking about Google, alphabet (parent company of Google) stock fell more than 13% in March, which marked its worst month in last five years. Investors sold Alphabet shares due to the COVID-19 pandemic. So far, the coronavirus has weakened the demand of advertising services, which is an alphabet's main revenue source. Since advertising sales contribute most of alphabet's revenue, the stock tends to be sensitive to the marketing industry's health. Microsoft stated that COVID-19 had minimal impact on revenue in its latest quarter. Its stocks continued to rise with a minor downfall even in COVID-19 economic shut down. Microsoft's fiscal third-quarter went better than expected. For the period ended March 31, the software giant reported revenue of $35 billion, up 15%. For the final weeks of the quarter, Microsoft noted a slowdown in transaction licensing, particularly in small and medium businesses, and a reduction in advertising spend in linked in due to the impact of COVID-19. Amazon.com inc. on May 2, 2020 reported it could post its first quarterly loss in five years, even as revenue surges because it is spending at least $4 billion in response to the coronavirus pandemic, including plans to test its workforce for COVID-19. Shares of Amazon, the world's largest online retailer, fell 5% in after-hours trade (Figure 2).

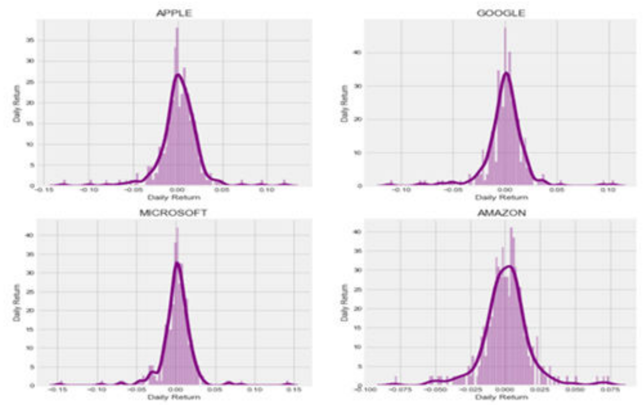

Figure 2: Daily return of the stock on average histogram. The figure reflects the spikes which are moving out of normality curve, due to COVID-19 fluctuations in stock prizes. It is visible in the graph that certain histogram (representing daily return of stock) represented higher fluctuation as compared to average histogram curve.

Amongst all 4 companies, the maximum fluctuation was observed in case of Amazon, since due to lockdown the online delivery of goods was adversely affected. However, this fluctuation in the Amazon was considered temporary since Amazon own multiple ventures like cloud computing and online streaming serves which helped the company to regain the strength of its stocks. Apple, Google and Microsoft also witnessed some odd days when their stock prices fluctuated more than expected due to the impact of COVID-19 (Figure 2). Apple is the most valuable brand in the world. According to Forbes, Apple was worth $205.5 Billion in 2019. The company has a strong following across the world. This is because people consider owning Apple products to be a great luxury. Due to this, market analysts usually give apple's stock a high rating. They consider it to be a blue-chip stock. But during the COVID-19 pandemic, even blue-chip companies are suffering. The stock market is very unstable currently. When the COVID-19 pandemic started spreading in February, apple's stock was at a price of 308.66 USD as of 3 February 2020. The stock plummeted initially, falling as low as 224.37 USD as of 23 march 2020. But the company has recovered since and now stands at a price of 318.89 USD. While the demand for Apple's iPhones and Wearables, the company has consolidated with a rise in subscription to its premium services. Overall, the company is holding up well during the pandemic.

Google said on its first-quarter earnings call that search revenues were down 15% in March and April, while YouTube revenue growth decelerated to high single digits by end march. Google stock on January. 16 closed at 1,450.16, reaching a $1 trillion market cap. It hit an all time high of 1,530.74 in intraday trading on February 19. Amid the coronavirus-driven market sell-off, Google stock hit a low of 1,054.13 on March 23. Google stock has formed a cup with handle chart pattern, and trades about 10% below its proper entry point of 1,530.84 by March end. Microsoft said its gaming segment "benefited from increased engagement following stay-at-home guidelines." The company reported that its search business "was negatively impacted by reductions in advertising spend, particularly in the industries most impacted by COVID-19." The company said it returned$9.9 billion to holders in the quarter in dividends and stock repurchases, up 33% from the December quarter. The stock repurchases totalled $6 billion. The performance of Microsoft should not necessarily be a surprise. The fact is that the company has a wide assortment of mission-critical business with dominant market positions. Amazon has unsettled investors in the past with heavy spending on cloud data centres, streaming video and voice-controlled gadgets, which often paid off in the form of new businesses. Since mid-February, Amazon's shares have risen by more than 10%, while the broader stock market has sunk. With online shopping booming as millions of people stay at home and avoid traditional stores, the amazon's stock has climbed 9% in the same period, including a 2% jump on April 22 (Figure 3).

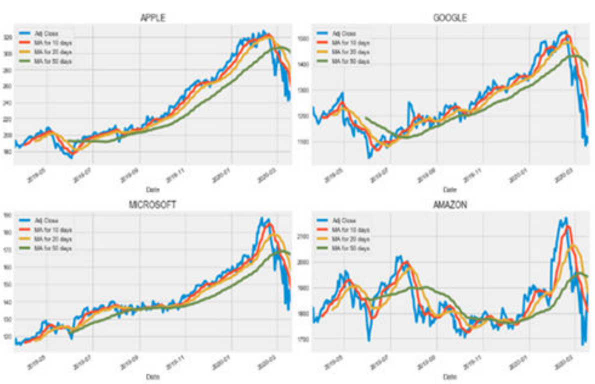

Figure 3: Plot of all the moving averages. The figure compares the moving averages of stock prices of 4 major IT giant companies. An upward trend was found in moving averages of stock prices over the period of last one year. However, the stock prices suddenly inflated during the months of February and march due to the impact of COVID-19 pandemic.

Google and Apple are now roughly flat for the year, after each falling more than 30% from the February. Google stock has dropped nearly 10% from its all time high as the coronavirus impacted the economy worldwide. Google stocks had plunged 34% from on March 23 due to COVID-19 outbreak. In the March quarter, Google bought $8.5 billion of its own stock, topping the December quarter's $6.1 billion. Amazon's strategy of landing in internet streaming service, came out as clear winner during the locked down. Microsoft, has also benefited from the video calling services (Figure 4).

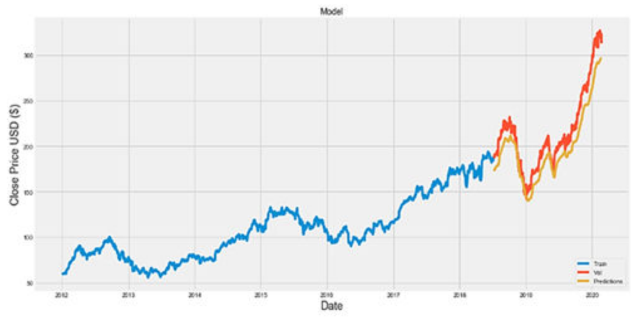

Figure 4: Stock price prediction of IT industries using ARIMA best fit model. The figure shows that there will be there will be a slight fall in the stock prices of major IT companies under consideration but stock prices will rise again by the end of the year 2020. Prices of stocks might fall upto 30%-40% as compared to last year.

Till February 27th, Apple's stock has been on a roller coaster ride, with shares rising as high as $278.41 within a span of a few hours before quickly plummeting as low as the $260. The coronavirus outbreak prompted many of Apple's suppliers to suspend production at their factories in China. Apple shares are virtually flat year to date, compared with a 12% drop in the S and P 500 Index. Apple reported in a regulatory filing that funds will go toward general corporate purposes, including share repurchases and dividend payments. During the six months ended March 28, apple spent $38.5 billion to repurchase its own stock. Google has a policy that prevents marketers from taking advantage of sensitive events, like epidemics or natural disasters, to promote their products or services. In January, the company blocked clients from running ads related to the coronavirus on its platforms. Now, the company will allow clients, including politicians, to run COVID-19 ads on its platforms. The shift could boost Google's ad sales during the crisis and lift Alphabet stock. Google contributes to most of the alphabet's revenue. The company also pays for Alphabet's other bets, which are still losing money.

Microsoft said that in its productivity and business processes and intelligent cloud segments, cloud usage increased in the quarter, "particularly in Microsoft 365 including teams, azure, windows virtual desktop, advanced security solutions, and power platform, as customers shifted to "work and learn from home." On Febuary 24, because of the coronavirus pandemic, the revenue forecast for the personal computing segment for the second quarter of fiscal year 2020 was not met (it was originally $10.75 billion to $11.15 billion). The main reason was the disruption to the supply chain in china. Microsoft's stock looks frothy at these levels, and it might be prudent to wait for a bigger pullback before accumulating more shares. microsoft splits its businesses into three main units: Productivity and business processes, which oversees Office, Dynamics, Skype, and LinkedIn; intelligent Cloud, which handles azure, windows server, and other data center services; and more personal computing, which manages its windows, xbox, surface, and bing units. Each of these businesses generated roughly a third of Microsoft's total revenue in the first nine months of fiscal 2020. The COVID-19 crisis primarily impacted the more personal computing segment, which struggled with slower sales of windows licenses, gaming hardware, surface devices, and search ads throughout the year. Microsoft off set the weakness of those businesses with the strength of its commercial cloud (mainly Office 365, dynamics 365, Linkedin, and azure) revenue, which rose 38% annually during the first nine months and accounted for 36% of its top line. The pandemic notably lit a fire under many of those businesses as more people worked from home. Underlying strong demand for Amazon's operations in online shopping, cloud computing and streaming video, the company went on an unprecedented hiring binge since mid March in seeking 175,000 additional workers-most of them at fulfilment centres and delivery services. Those positions have been filled, including 95,000 in April. As COVID's impact accelerates the secular shift to e-commerce (U.S. e-commerce at 12% of retail sales) and amazon is well-positioned to continue taking share. Amazon stocks outperform with a $2,700 price target, up from $2,400. In this stay-at-home, social-distancing economy, amazon is in a relatively good positioning with retail delivery, streaming and cloud services. amazon stock was up 30% in the past 12 months, while the S and P 500 index SPX, -0.53% has declined 0.2% by May 2, 2020.

CONCLUSION

On the basis of analysis, we can conclude that the stock prices of major IT companies would be adversely for some times, but after a few months the stock prices will get stable and might again start to rise. Considering prediction of stock prices as of now, we have got an accuracy of 75.95% using the SVM algorithm and ARIMA best fit forecast model. This drop in accuracy was intended, as described before due to increased volatility in the stock market due to COVID-19 outbreak. This has led to dynamic changes in the stock prices, making it very difficult to predict the future values given the current situation. This paper provides a simple but original statistical analysis of the impact of the COVID-19 pandemic on stock market risk for 4 major IT companies of the world. The financial markets have seen dramatic movement on an unprecedented scale due COVID-19 outbreak. Results revealed that while some businesses like personal computers from Microsoft, Iphone handsets, sale of luxury and fashion goods at amazon has reduced thus leading to fall of stocks. But along with the time some prominent other segments like online shopping, Cloud computing and streaming video from amazon, oversees office, dynamics, Skype, Linkedin intelligent cloud from Microsoft, Google's ads sales during the crisis and issue of cheap bonds by apple came out to be the winning corporate strategies to fight the negative economic effect of COVID-19 and to stabilize the situation of stocks in coming months.

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