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RESEARCH ARTICLE

Impact of COVID-19 Pandemic and Vaccinations on Pakistan Stock Exchange

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Abstract: The study aims to investigate the impact of the COVID-19 outbreak and vaccinations on market returns in Pakistan. For this purpose, the study considered a sample period of January 2019 to December 22. This study 14 events of the COVID-19 outbreak and 09 events to establish the impact of Covid-19 and vaccination on capital market returns. The study reveals the strong negative impact of COVID-19 proxies such as 1st wave, 2nd wave, travel restrictions, and travel lockdown on market returns. Meanwhile, vaccination has a positive effect on Pakistan's market returns. Future research can be conducted to compare the impact of COVID-19 on different sectors of the stock market.

Keywords: COVID-19, Vaccination, Pakistan Stock Exchange, Pandemic

Introduction

As the fifth known pandemic since the 1918 flu pandemic, the human coronavirus disease 2019 (COVID-19) was initially discovered in Wuhan, China, in 2019. It quickly spread throughout the world. More than 200 million confirmed cases and almost 4.6 million fatalities have been reported by September 2021, two years following COVID-19's discovery (Alanagreh et al., 2020). On December 31, 2019, episodes of pneumonia in Wuhan, China, with no known cause, the first confirmed COVID-19 cases were reported to the World Health Organization (WHO). The cause of these infections was determined by Chinese officials to be a novel coronavirus on January 7. This virus was given the temporary name 2019-nCoV. A global public health emergency for COVID-19 was announced on January 30, 2020, a few weeks later.

At the very beginning of COVID-19, the general public and healthcare workers were completely unaware of how rapidly and dangerously this virus was going to spread and cause a huge number of lives to be affected in a negative way. On March 1, 2020, $15 million was released by the United Nations as a fund for supporting the global COVID pandemic. On March 7, 100,000 new cases of COVID-19 emerged after about a week. The CoronavirusWHO declared the Coronavirus a pandemic after a few days. COVID-19 went from being a serious issue that seemed to be limited to China to a global health emergency almost immediately.

In Pakistan, first case of Covid-19 Pandemic was discovered in the end of February 2020, however the outbreak was erupted after March 2020. However, serious precautions were taken by the Government of Pakistan. Complete lock down was implemented and travel ban was imposed in Pakistan for next one and the half year.

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In the context of prospect theory various experimental studies examined the economic and financial prospects of COVID-19 Pandemic and COVID-19 vaccinations. Such as Ngwakwe, (2020), resolute the shocking impact of coronavirus on oil, tourism industries, financial sector, firm performance, world stock indexes "SSE Composite Index Euronext 100, Dow Jones Industrial Average", while, Oanh, (2022), evaluated the relationship between the stock market and COVID-19 vaccination. Moreover, literature examined the consequences of COVID-19 pandemic and COVID-19 vaccines on the stock market. The normal results exposed that coronavirus and COVID-19 vaccines had been negatively and positively related with stock market respectively. Furthermore, Estrada et al., (2021) evaluated the impact of COVID-19 pandemic on ten major stock markets worldwide and their recovery period. Zeren & Hizarci, (2020) found that each stock markets inspected with whole death part together for the long time period. It is understood that entire cases had cointegration relationship of "Chinese stock market, South Korean stock market and Spain stock market and no relationship found with Italian stock market, French stock market and the German stock market". Another study by Ngwakwe (2021) confirmed that the arrival of vaccine has a significant and positive effect on stock price. And it is visible in the statistical result of five stock indexes. The results showed that stock indexes are also sensitive to COVID-19 vaccine information.

This paper fills the research gap by studying the impact of COVID-19 vaccinations on Pakistan stock market. There are several researches on the impact of Covid-19 on Pakistan stock market but none of them analyzed the impact of vaccinations solely. This point is much needed to be elaborated through proper research and evidences. As Pakistan stock market plays a vital role in country's economy.

Secondly, it can be seen that in all the previous research, the results of the study were unclear and ambiguous. There's no clear or accurate evidence-based result of findings showing the actual impact of the virus.

Thirdly, no previous research elaborated the impact of covid-19 vaccinations on stock market. Vaccinations did play a vital role during the whole pandemic. A huge part of vaccination program showed positive results but some of it had negative impacts as well. But a proper study showing those impacts in an accurate and consolidated form couldn't be found. These important factors were much needed to be explained well off through proper research.

Lastly, no previous research has compared the effects of the vaccination phase and the COVID-19 pandemic phase. There are a few studies on the impact of the COVID-19 pandemic phase on various areas and a few on the impact of the vaccination phase separately; however, there is no proper study comparing these two crucial phases. As a result, the primary objective of this study was to compare how the stock exchange's daily performance was affected by the pandemic, precautions, restrictions, and, most importantly, treatment, such as vaccinations.

This research basically addresses the significant impact of the COVID-19 pandemic and the COVID-19 vaccinations on Pakistan's stock exchange market. For this study, several previous studies are analyzed through facts and figures to determine the root causes and correct the effects that are widely seen. Currently, there's no significant cure for this virus. Rather, certain factors are used to manage the symptoms, and safety measures like vaccinations are there to control its spread, but complete eradication measures are still to be found.

It was discovered that over 47 million Pakistanis were able to rise out of poverty between 2001 and 2018 thanks to the expansion of off-farm economic opportunities and the increased inflow of remittances. Prior to the COVID-19 outbreak, Pakistan's stock prices were at a level that was significantly manageable, and the economy was anticipated to expand. However, the COVID-19 outbreak caused serious distress in the economic conditions of Pakistan and pushed citizens towards the poverty line.

To overcome the impact of natural disasters, certain precautionary measures must be taken. Preparedness for emergency situations can reduce the worse impacts of natural disasters like COVID. For the stock exchange to keep working properly during any natural disaster in the country, effective planning is for sure needed to stay firm and reduce the percentage of losses. So, this study tries to interpret how restrictions like lockdowns and vaccinations can help to overcome the impact of any pandemic on stock market performance.

The pandemic's impact on Pakistan's stock market was much more severe at the beginning of the COVID-19 pandemic phase. The stock index started to decrease on the days of this pandemic event and kept on decreasing. The stock market started to decline on March 19; it went to its lowest value in the past 5 years. The main reason behind this sudden fall is the pandemic situation, which urged foreign investors to withdraw their foreign portfolio investments. Investors had no idea at the start how to overcome the losses they were bearing and what exactly the correct measures they should take. With the passage of time, as vaccinations and certain other measures were taken to decrease the symptoms of COVID-19, the stock market again started to become stable, and it was in a much better position than the starting crucial phase.

This study applied event study methodology to find out the impact of Covid-19 Pandemic and Vaccinations on Pakistan Stock Exchange. The findings concluded that Covid-19 Pandemic and Vaccinations has a significant impact on Pakistan Stock Exchange. The findings are aligned with efficient market hypothesis that stocks show the impact of all y available information.

Reminder of the paper is arranged in a way that section 2 discusses the previous literature, section 3 highlights the research methodology implemented, section 4 includes detailed analysis and discussion, and section 5 provides the implications, limitations, and future research recommendations with a brief conclusion of the paper.

Literature Review

COVID-19 is an infectious disease spread by a virus in 2019, and the disease was spread worldwide. The first case of Coronavirus was diagnosed in Wuhan, China, in December 2019. Within a few days, it quickly spread to China. The first case of COVID-19 in Pakistan was reported on February 26 2020. The Government of Pakistan imposed a complete lockdown in the whole country at the end of March. This complete lockdown was followed by several partial lockdowns over the next 2 years. This pandemic had a huge impact on the worldwide economy.

Firstly, about theories that relate to and support our study, we integrated the black swan and EMH theories to determine the relationship between variables. The final goal is to evaluate the impact of the COVID-19 pandemic and COVID-19 vaccination on PSX. First is the black swan theory, which relates to this study. The black swan is considered an unpredictable event, but it occurs surprisingly and shockingly with severe consequences. It may have a negative or positive impact on other dependent aspects. So, according to this phenomenon, COVID-19 can be considered a black swan event that has a significant impact on the stock market. The impact of the COVID-19 pandemic on the stock market illustrates the unpredictability of black swan events and highlights the importance of risk management strategies for investors. Many investors were caught off guard by the sudden and severe declines in the stock market, highlighting the requirement for a diversified portfolio and a long-lasting investment plan. It is supported by the argument of the black swan theory that sudden and unpredictable events can have a strong impact on stock market returns. Taleb (2005) developed the Black Swan theory and its request to economics. In his books, Talib traces his application of the Black Swan theory to early Australia, when it was unusual and unbelievable for early Australians to see a black swan other than the well-known white swans, which they were familiar with. But when a scientist exposed a blackbird (Taleb, 2007). Talib used the then-novel black swan discovery to describe sudden, unexpected events that have an effect on the stock market and commercial operations, also harmfully or

pleasantly. Given that the spread of the Coronavirus in China decimated the whole population, this theory consequently fits this research.

The other theory is the efficient market hypothesis theory, proposed by Louis Bachelier in 1900, which is the most important theory in this study. A market is supposed to be efficient through the information set if the price completely discloses that set of information, i.e., yet the price will not be affected by disclosing the set of information to whole market members. The EMH theory declares that financial markets are efficient (Guerrien & Gun, 2011). On the other hand, the definition entirely is a hard condition recommended that any real market could never be effective; this showed that the EMH theory is surely wrong. If we look at the impact of COVID-19 in the same way, there was a lot of panic created in the financial market, and therefore, there was a lot of impact on the stock market in the initial phases. Now, we will analyze this in our results. Whether the market we had was efficient or not, whether it had recovered quickly from Covid-19 or not. The results of the study showed that the probability of stock prices eventually increased in some of the major telecom, finance, and retail industries. Hence, the results concluded that the COVID-19 disaster has brought an immense increase in the inefficiency of stock markets.

Many studies have been done over the time period to assess the effect of COVID-19 pandemic on different areas of life. However, the best way to evaluate the influence of COVID-19 on economic, corporate and financial sectors is stock markets. Shen et al. (2020) studied COVID 19 impact on firm performance. They found that COVID-19 had more adverse impact on firms with small investment scale or sales revenue.

There are a number of studies exploring the impact of the COVID-19 pandemic and COVID-19 vaccinations on the stock market. Several empirical studies have revealed the impact of COVID-19 on stock market prices. Zeren & Hizarci (2020) determined the potential impact of the Covid-19 pandemic on the stock markets. The findings of their study showed that each stock market inspected the whole death part together for a long time period. It is realized that entire cases had a cointegration relationship with the "Chinese stock market SSE, South Korean stock market KOSPI and Spain stock market IBEX35 and no relationship found with Italian stock market FTSE MIB, French stock market CAC40 and the German stock market DAX30". Furthermore, Liu et al. (2020) estimated the recent impact of Coronavirus on stock market indices in the countries that influenced it, which are Korea, Japan, Singapore, Germany, Italy, the UK, the USA, etc. The observation of this research explained that COVID-19 occurrence had a notable harmful impact on stock market returns across affected countries. These researches have shown that the COVID-19 epidemic had a negative and significant impact on stock market returns in many countries, beginning to improve instability and uncertainty among traders.

Like every other economy, Pakistan's economy also suffered due to COVID-19. The findings of two key studies were directed by Ghouse et al. (2022) and Azam et al. (2020). These studies explore the significant impact of epidemic on the banking industry as well as the wider consequences on the poverty line, education system, and measures applied by government reduce the harmful impacts. These investigations emphasize the requirement for proceeded with research and viable strategy intercessions to address the difficulties presented by the pandemic and relieve its drawn out results on Pakistan's economy. Further examinations must investigate extra areas and variables impacted by the pandemic to give a far-reaching comprehension of the circumstance and guide policymakers in forming powerful techniques for monetary recuperation and flexibility.

The restrictions of Covid-19 like travel bans and business closures have more affected stock markets. Chowdhury et al., (2022) studied that stock market considered a negative trend due to COVID-19 related restrictions like closure of borders, travel ban. Narayan et al., (2021) examined the effects of government responses, such as travel restrictions, lockdowns, and economic stimulus plans, on stock market performance during the COVID-19 outbreak. The findings of this study demonstrate the positive impact of measures such as lockdowns and economic stimulus plans on stock markets. Overall, both studies contribute valuable insights

into the relationship between government responses to the COVID-19 outbreak and stock market performance.

After the Coronavirus pandemic, a worldwide emergency of unexpected extents, finally the medical researchers came up with some crucial development in vaccinations of COVID-19. Haque & Pant, (2020) examined the efforts of Coronavirus vaccine development, challenges, and success in their study. The SARS–CoV–2 and the new (CoV) affect world health very badly. To tackle this virus, many preventive efforts have been taken, and vaccine development is on the lead. The findings of this study showed that although we have found out that the vaccine is the most effective way to tackle this virus, it will remain a threat to everybody as it is still circulating around the world.

The connection between Coronavirus vaccination, the stock market, and economic dynamics emerges as an essential research area, and financial exchange elements arise as an essential exploration region. COVID-19 had a new impact on all kinds of businesses in both developed and developing nations. With COVID-19's arrival, many stock markets experienced negative outcomes; however, some stock markets were adaptable and maintained growth, such as the Chinese stock market. The results confirmed that the news about the vaccine's arrival has a significant and beneficial effect on stock prices. Oanh, (2022) examined the connection between the stock market and COVID-19 vaccination using the PVAR model. According to the findings of the drive reaction capability examination, vaccinations have a positive effect on the stock market in developed nations, whereas this effect is negative in developing nations. The variance breakdown's findings also point out that the COVID-19 vaccine has a greater impact on stock market return in developing countries than in developed ones. This finding supports the strategy's suggestion that in order to boost the stock market, non-industrial nations should implement mass vaccination programs. Even though vaccination rates are high in developed nations, legislators must increase public awareness and trust in the sufficiency and effectiveness of Coronavirus antibodies.

(Ngwakwe, 2021) uses the efficient market hypothesis (EMH) to investigate how information about the COVID-19 vaccine affects the performance of five global stock market indexes' stock prices. the goal of this paper is to figure out the ratio of stock price increases during the vaccine's arrival. The five market indices experienced a significant increase in stock prices as a result of the introduction of COVID-19 vaccines, as evidenced by the information from the analysis in the preceding result sections. Consequently, the findings indicate that information regarding the COVID-19 vaccine affects stock indexes. And according to Hartono & Study, (2021), a number of nations have implemented measures to lower the rate of Covid-19 transmission. From closing businesses to engaging in other commercial activities and requesting that the general public maintain social distance on their own. The restrictions on business activities were more stringent, covered a wider area, and lasted longer than the policies. Concerns rise as a result, and economic uncertainty grows as a result. The global economy suffers greatly as a result of the spillover effect, which also has a negative impact on investor confidence in the stock market. Additionally, the waning stockholder confidence casts doubt on the future prospects of listed companies on the stock exchange, raising the possibility of stock price declines. Vaccine development is anticipated to become a "game-changer" for restoring economic and social conditions in the event of an epidemic. The stock market's performance, particularly that of medical company stocks, also improved as a result of this investor perspective.

In previous research, the researchers analyzed the many-sided consequences of COVID-19 vaccination on the worldwide economy and stock markets. While vaccination operations hold the capacity for profitable recovery and stock market flexibility, the detailed elements shift across countries and highlight the requirement for variation plans. These results add to a more profound comprehension of the mind-boggling connection between well-being emergencies, vaccination events, economic strength, and financial backer trust in an interconnected world.

Current empirical studies revealed the impact of the COVID-19 pandemic and vaccinations on the worldwide economy and the stock market. However, the literature reveals the broad impact of the COVID-19 pandemic on stock markets, supported by the randomness and uncertainty related to Black Swan events. The epidemic's impact on worldwide markets, economies, business performance, and administration responses resulted in unparalleled stock market variations. These researches add to a variation understanding of the difficult relationship among well-being crises, financial methods, government involvements, and stock market dynamics in a connected world. Previous studies conduct research on multiple countries' stock markets. In this context, this study will investigate the impact of the COVID-19 pandemic and COVID-19 vaccination on the Pakistan Stock Exchange. This research will fill the gap by studying the impact of COVID-19 vaccinations on the Pakistan stock market. There are several studies on the impact of COVID-19 on the Pakistan stock market, but none of them have analyzed the impact of vaccinations solely. This point was pretty much needed to be elaborated through proper research and evidence. Pakistan's stock market plays a vital role in the country's economy.

Secondly, it can be seen that in all the previous research, the results of the study were unclear and ambiguous. There's no clear or accurate evidence-based result of findings showing the actual impact of the virus. Thirdly, nobody has compared the effects of the vaccination phase to the COVID-19 pandemic phase. There are a few studies on the impact of the COVID-19 pandemic phase on various areas and a few on the impact of the vaccination phase separately; however, there was no proper study comparing these two crucial phases.

Research Methodology

Data Description

This research examines the effect of COVID-19 events on stock market returns. For this motive, three data sets were utilized. First panel data is associated to day-to-day KSE 100 indices from January 2019 to December 2022. Although, the main focus will be on the timeline between March, 2020 to October 2021 where almost all major COVID-19 events took place. The daily indices were collected from Scstrade.com.

The second data set includes the dates of major COVID-19 events took place during the pandemic. These events include introduction of first case in Pakistan, implementation of lockdown, highest cases of COVID-19, highest casualties in 2020 and 2021, outbreak wave of COVID-19 and respective partial lockdowns.

The third dataset includes the introduction of COVID vaccinations in Pakistan, their names, dates of approval for their emergency uses, duration of vaccination programs and its phases. The vaccinations used in Pakistan for covid-19 were Sinopharm, Sputnik V, AstraZeneca, CanSino, Moderna, and Pfizer-BioNTech.

Operationalization

COVID-19 events were divided into two major categories COVID-19 pandemic phase and COVID-19 vaccination phase. The events of COVID-19 include arrival and outbreak of virus in Pakistan, its outbreak, restrictions implemented by government, arrival of vaccinations, and approval of vaccinations and phases of vaccinations. The independent variables are COVID-19 and its vaccination while the dependent variable is Pakistan stock exchange.

COVID-19 Pandemic

Covid virus 2019 is characterized as a disease brought about by a novel Covid called serious, intense respiratory condition Covid 2 (SARS-CoV-2; previously called 2019-nCoV), which was first distinguished in the midst of a flare-up of respiratory disorder cases in Wuhan City, Hubei Territory, China. The WHO first answered this question on December 31, 2019. On January 30, 2020, the WHO announced the Coronavirus

incident as a worldwide well-being crisis. On March 11, 2020, the WHO announced that Coronavirus is a worldwide pandemic.

COVID-19 Vaccination

Coronavirus vaccinations play a crucial part in calamity recuperation by forestalling the spread of the infection, safeguarding weak populaces, and diminishing the weight on medical services frameworks. By limiting the gamble of Coronavirus transmission, vaccination empowers networks to re-establish predictability, return organizations, and resuscitate monetary exercises all the more securely. They additionally add to the versatility of medical care frameworks by forestalling extreme cases that require hospitalization, permitting clinical assets to be coordinated towards other basic necessities during the recuperation interaction. By and large, Coronavirus vaccinations are instrumental in shielding general well-being, supporting monetary recuperation, and working with the reclamation of networks impacted by fiascos.

Stock Market Returns

Stock market returns are pivotal functional variables that affect the presentation and productivity of interests in public corporations. It addresses the rate change in the worth of a stock or a record over a particular period, mirroring the increases or misfortunes made by financial backers. Stock market returns give significant bits of knowledge into the general well-being and course of the market, affecting venture choices and portfolio the board systems. They are affected by different variables, including monetary circumstances, organization profit, international occasions, and financial backer feelings. Positive returns show development and expected benefits, while negative returns mean misfortunes. Financial backers intently screen securities exchanges to get back to survey market unpredictability and survey risk and assess speculation valuable open doors, making it a basic measurement in monetary examination and direction.

Econometric Model

The study investigates the connection between COVID-19 events and market returns of Pakistan stock exchange in static panel data frame work. This study used panel regression estimation due to its several advantages. In panel estimation huge number of explanations offer additional degree of freedom. Panel data avoids a problem of co-liner between explanatory variables.

The day-to-day logarithmic index returns (Rit) are going to be calculated by using Equation (1), where (i) and (t) represent the country and day, therefore.

$$R_{it} = Ln\left(\frac{I_{(i,t)}}{I_{i(t-1)}}\right)$$

Iit is the index's value at the end of period t, Ii(t-1) is the index's value at the end of period $t - 1$, and *Rit* is the return on the index for period t in equation 1. We regress the index return on the variables of interest after it has been calculated.

$$R_i = \beta_0 + \beta_i \times covid_i + \varepsilon_{it}$$

$$R_i = \beta_0 + \beta_i \times vac_i + \varepsilon_{it}$$

In this equation it represents the index of a country i at time t. Moreover, for studying the effect of dependent variable we gather the timing of different covid-19 events from appearance of first case to highest cases and highest recoveries in Pakistan in a day. And in second equation, impact of COVID-19 vaccinations was studied where the phases of vaccinations program were used as an event.

Event Study Methodology

In calculation to regression examination, this study also implements event study methodology to examine a lot of time in event of covid-19 takes to influence the stock market. For event methodology abnormal returns of stocks are calculated. Extra returns are calculated by subtracting abnormal returns from raw returns.

$R_{itj}=\alpha_{ij}+\beta_{ij}(R_{Dtj})+\varepsilon_{itj}$

We chose the estimate period to cover the interval of (-120) trading days, comparative to the even days 0. Even had occurred on the nonworking day, then the instant working day subsequent the event is selected. The beta coefficient from the CAMP equation is then used to estimate abnormal returns using following equation.

$AR_{itj}=R_{itj}-\hat{R}_{itj}$

Cumulative abnormal return (CAR) was calculated for separate event windows. To analyze the event persuaded variance and to estimate our test statistic. We use the standardized abnormal return method suggested by Boehmer et al.

The event study method uses statistics to examine how a particular event, like a merger, acquisition, or significant policy change, affects the price of a company's stock or other financial assets. Firstly, it identified the event to pinpoint the occasion being investigated, such as the announcement of a merger or a rise in interest rates. Secondly, it chooses a sample of businesses that, in terms of size, sector, and other important variables, are comparable to the company under study. Further, it collects information to analyze the effects of the event; this study approach uses historical data. Before and after the event, information is gathered on the stock prices or other financial assets of the sample companies.

Table 1

Shows Events of Pandemic Phase of COVID-19

Event Window for COVID-19 Pandemic Phase
First case of COVID-19 was allegedly reported in Pakistan on 26 February 2020.
Borders were closed and travel restrictions were imposed by Government on 13 March, 2020.
Complete country-wide lock down was imposed on 24 March, 2020.
Huge Increase in COVID-19 was observed on April 10, 2020.
Lockdown was extended due to higher number of cases on April 28, 2020.
First COVID-19 lockdown was lifted by the Government on May 19, 2020.
Highest Causalities from COVID-19 in 2020 were observed on June 20, 2020.
Partial Lockdown was again implemented on June 5, 2020.
2nd wave of COVID-19 erupted on October 28, 2020.
3rd wave of COVID-19 erupted on March 15, 2021
3rd wave of COVID-19 was peaked on March 29, 2021.
Highest casualties from COVID-19 in 2021 were observed on April 25, 2021.
Partial lockdown was again imposed due to third wave of COVID-19 on May 8,2021.
An increase in the recoveries of COVID infected patients was started on June 25, 2021

Additionally, event study calculates abnormal returns by subtracting the sample companies' actual returns from the returns that would be expected based on market patterns. This makes it easier to separate the effects of the event from other potential influences on the stock prices. At the end after examines the findings irregular returns, it is possible to tell whether the incident had an impact on the stock prices or other financial assets of the company under investigation.

The discrepancy between the actual returns on the stock or other financial assets of a company and the predicted returns based on market trends is known as the abnormal return. An anomalous return is used in the context of an event study to separate the impact of the event from other potential influences on stock prices. The event study method examines the prices of stocks and other financial instruments to determine anomalous return.

Table 2

Shows Events of Vaccination Phase of COVID-19.

Event Window for COVID-19 Vaccination Phase
First phase of COVID-19 Vaccination Program started in Pakistan on February 1, 2021.
Second phase of COVID-19 Vaccination Program started in Pakistan on February 12, 2021.
Third phase of COVID-19 Vaccination Program started in Pakistan on March 10, 2021

Table 3

Shows COVID-19 Vaccination Approval in Pakistan

Approvals of COVID-19 Vaccinations for emergency use in Pakistan
Sinopharm: Approved for emergency use in Pakistan on February 1, 2021.
Sputnik V: Approved for emergency use in Pakistan on March 19, 2021.
AstraZeneca (Covishield): Approved for emergency use in Pakistan on February 15, 2021.
CanSino: Approved for emergency use in Pakistan on May 8, 2021.
Moderna: Approved for emergency use in Pakistan on July 14, 2021.
Pfizer-BioNTech: Approved for emergency use in Pakistan on August 14, 2021.

Results and Discussion

Descriptive Statistics

The descriptive statistics for various types of events of the COVID-19 pandemic in Pakistan are reported in Tables 4, 5, and 6. The total number of events taken for the study is 23. In this Covid-19 pandemic, 1,580,631 positive cases were reported in Pakistan, of which 30,656 led to death while 1,245,155 recovered. The fatality rate due to COVID-19 in Pakistan is only 1.94%. Since the arrival of COVID-19 vaccinations, 165,560,136 persons have been vaccinated. It has been proved through various reports that due to timely precautionary measures, COVID-19 couldn't have a disastrous impact like some other countries. Moreover, COVID-19 events are segregated into two categories based on the COVID-19 Pandemic phase and the COVID-19 vaccination phase. 14 events are related to the COVID-19 pandemic, while others are associated with the vaccination phase. In the first dataset, we tried to incorporate the impact of restrictions imposed by the government to combat the Coronavirus on the stock market. In the second dataset, the impact of vaccinations is studied on the stock market. However, the third dataset is also associated with the vaccination phase, and it includes the approval of different COVID-19 Vaccinations for emergency use in Pakistan.

Table 4

Pandemic Phase

Event	Date	No. of positive case	No. Of deaths
1ST Wave of COVID-19	February 26,2020	2	0
Partial Restrictions	March 13,2020	21	0
First lock down	March 24,2020	887	6
Huge Increase in cases	April 10,2020	4489	63

Event	Date	No. of positive case	No. Of deaths
Extension in lockdown	April 28,2020	13915	292
End of First lockdown	May 19,2020	42125	903
Highest Causalities in 2020	June 20, 2020	165062	3229
Partial Lockdown	June 5, 2020	89249	1838
2nd wave of COVID-19	October 28,2020	330200	6759
3rd wave of COVID-19	15 March, 2021.	514338	10863
Peak of 3rd wave.	29 March, 2021.	541031	11560
Highest casualties in 2021	April 25, 2021	795627	17117
Partial lockdown	May 8, 2021	854240	18797

Results

In this study, we analyzed the impact of 1st, 2nd, and 3rd waves of Coronavirus on the market returns of the Pakistan stock exchange. In Table 7, it is indicated that the first case of COVID-19 began on February 26, 2020. For the 1st wave, the CAR values are negative and statistically significant for indicating a negative impact on market returns. It showed that there was a major impact of the COVID-19 outbreak on the stock market. The second major wave of Coronavirus erupted on October 28, 2020. In the 2nd wave, the CAR values are negative and statistically significant for all event windows except CAR (0, 5), suggesting a significant negative impact on market returns during this period. The third major wave of COVID-19 outbreak started in mid-March 2020. For the 3rd wave, the CAR values show mixed results. CAR (0, 1) and CAR (0, 3) are positive but not statistically significant. CAR (0, 2) is negative and statistically insignificant, indicating a negative impact on market returns during that period. However, CAR (0, 4) is positive and not statistically significant, suggesting no significant impact. The event windows in the table range from 2 to 6 days, which indicates a short-term impact analysis. This indicates that investors reacted negatively to the uncertainty and potential economic disruptions caused by the waves of COVID-19.

Table 5

Vaccination Phase

Event	Date	No. of vaccinated people	Event
First phase of vaccination	February 1, 2021	501252	First phase of vaccination
Second phase of vaccination	February 12, 2021	518164	Second phase of vaccination
Third phase of vaccination	March 10, 2021	565216	Third phase of vaccination

Table 6

Vacc. Approval

Approval of vaccines	Date	No. of recoveries
Sinopharm	February 1, 2021	501252
Sputnik V	March 19, 2021	578314
AstraZeneca (Covishield)	February 15, 2021	525997
CanSino	May 8, 2021	752712

Moderna	July 14, 2021	915343
Pfizer-BioNTech	August 14, 2021	983754

Table 8 reports the impact of COVID-19 restrictions implemented by the government on stock market returns. The Government of Pakistan implemented a series of restrictions ranging from partial lockdowns to full lockdowns to prevent the further spreading of the virus. We calculated the abnormal returns for the event window (0, 5) for each lockdown during the COVID-19 disease in Pakistan. The results showed that the CARs for travel restrictions across borders are statistically significant. For the first complete lockdown, the CAR values are negative and statistically significant for all the event windows except (0, 5). However, the return is negative on (0, 5). One of the major reasons for this impact is a restriction on travel and transport between country borders. In comparison to the Covid-19 outbreak, the lockdown was a very disastrous event for investors, and a long-lived impact can be observed. As the virus spread across the whole country, the lockdown had to be extended. On this extension of lockdown, the CAR values show mixed results and have a positive statistically significant impact on days 3 to 5.

The CAR values during partial lockdown in 2020 showed positive insignificant impact on stock market returns. While on the other hand the CAR values in partial lockdown 2021 showed positive insignificant results for all event windows except CAR (0, 1). It can be seen that during the initial phase of covid-19 restrictions, a significant impact on stock market returns is observed.

Bouri et al., (2022)) inspected the effect of three strategies (lockdown, an improvement bundle, and a movement boycott) embraced by the New Zealand government to adapt to the COVID flare-up on 14 industry value returns. The findings showed that only lockdown had a positive impact on cumulative stock returns, suggesting its ability to raise investors' confidence in the total stock market. However, the previous findings showed mixed evidence. Researchers interpreted the positive impact of lockdown on stock returns, signifying its ability to increase stockholders' confidence in the complete stock market, while a few other researchers had a significant impact of lockdown on the stock market. We analyze that the ending of these restrictions brought a positive impact on stock market earnings.

Furthermore, in the Table, we study the impact of the highest daily cases reported highest causalities, and highest recoveries that occurred in a day on stock market returns. The result interpreted that all these three variables have an insignificant impact on stock market returns. On the event window of the highest cases reported and highest causalities, negative returns are observed, but there is no significant impact on the stock market. While the event window of the highest recoveries shows both positive and negative returns till (0, 5). In an exploration of past studies, these outcomes are disconnected from research (Ahmed, 2020). As their discoveries said that just COVID recoveries expected to be a predictor for presentation of the monetary market however positive cases and fatalities have a non-critical relationship with the exhibition of the market. Anyway, the results of one more study by Jummah Ahmed Alzyadat and Evan Asfoura show that the market returns rejoined unfortunately to the development in Coronavirus cases during the pandemic, likewise the discoveries examined that the negative market response was solid during the underlying long periods of Coronavirus pandemic.

Table 7

Impact of Covid-19 Outbreak Waves

Event Window	No. of Days	1st wave	Second wave	Third wave
CAR (0, 1)	2	-0.0242***	-0.040082***	0.014163
CAR (0, 2)	3	-0.029**	-0.061381***	-0.002441

CAR (0, 3)	4	0.002851	-0.028643***	0.001016
CAR (0, 4)	5	-0.00169	-0.028643***	0.011726
CAR (0, 5)	6	-0.01129	-0.017479	0.014238

Table 8

Impact of Covid-19 Restrictions

Event Window	No. of Days	Travel restrictions	1st LD	Extended LD	End of 1st LD	Partial LD 2020	Partial LD 2021
CAR (0, 1)	2	-0.067297***	-0.1180***	0.02743	0.005634	0.021135	0.015916*
CAR (0, 2)	3	-0.100532***	-0.1161***	0.056579***	0.003725	0.024106	0.008479
CAR (0, 3)	4	-0.171409***	-0.0852***	0.051665*	0.000473	0.033007	0.005214
CAR (0, 4)	5	-0.18188***	-0.0879***	0.054726*	0.008377	0.033007	0.01177
CAR (0, 5)	6	-0.165211***	-0.0452	0.047732	0.011977	0.022813	0.01177

Table 9

Impact of Casualties and Recoveries

Event Window	No. of Days	Outbreak	highest casualties 2020	highest Causalities 2021	Highest recoveries
CAR (0, 1)	2	-0.024947	0.021308	0.011124	-0.011363
CAR (0, 2)	3	-0.018531	0.022341	0.004999	-0.007511
CAR (0, 3)	4	-0.017588	0.014307	-0.000311	0.001066
CAR (0, 4)	5	-0.014478	0.022664	-0.014742	-0.002097
CAR (0, 5)	6	0.032682	0.031339	-0.019907	-0.00827

In Table 10, during the first phase of vaccination, we can see negative values from CAR (0, 2) to CAR (0, 5), and those results are statistically significant, showing negative impacts of vaccination throughout. During the second phase of vaccination, all values from CAR (0, 1) to CAR (0, 5) are positive and indicate that there is no significant impact of these vaccinations on the stock market during this phase. In the 3rd phase, the resulting values are in the same order as that of the first phase. All the values from CAR (0, 2) to CAR (0, 5) are negative except CAR (0, 1). The negative values indicate that vaccination had a significant and negative impact on the stock exchange. In the event window, CAR (0, 1) is positive, and it had no impact at all. The vaccination program helped restrict the COVID-19 outbreak and brought out a positive impact on the stock market. However, during the 2nd phase of COVID-19 vaccination, another wave of coronavirus erupted, which caused a significant impact on stock market returns.

Table 11 indicates the impact of vaccine approval for emergency use in Pakistan. During the phase of Sputnik V's approval, the extracted values from CAR (0, 1) to CAR (0, 3) are positive, and those of CAR (0, 4) and CAR (0, 5) are negative. Here, the positive values from the first 3 event windows show the positive impacts of vaccinations as COVID cases started to decrease and the number of casualties and positive cases were less than before. The negative results show the sudden increase in COVID cases and hence indicate the negative impact of Sputnik V.

The results after approval of AstraZeneca vaccination are all negative from CAR (0, 2) to CAR (0, 5) except CAR (0, 1). This implies that this vaccination had a very low positive impact on COVID. Its results are statistically significant and show a negative impact after CAR (0, 2) till the end, and it shows a high increase

again in COVID cases. At this time, this vaccination could not bring any positive results. The results after Moderna's approval are all positive from CAR (0, 1) to CAR (0, 5), showing a positive impact of this vaccination on COVID-19 cases. These positive values indicate that there was no significant negative impact on COVID after this vaccination.

Table 10

Impact of Vaccination Program

Event Window	Days	Pakistan Received First Vaccination Dose	Vaccination Phase 1	Vaccination Phase 2	Vaccination Phase 3
CAR (0, 1)	2	0.012252	0.004656	0.001657	0.002092
CAR (0, 2)	3	0.010431	-0.000427	0.023485*	-0.002339
CAR (0, 3)	4	0.005275	-0.002589	0.02523	-0.011085
CAR (0, 4)	5	0.003039	-0.004395	0.038096	-0.002339
CAR (0, 5)	6	0.001158	-0.018252	0.021715	-0.00236

Table 11

Vaccines Approval for Emergency use in Pakistan

Event Window	Days	Sputnik V	AstraZeneca	Moderna
CAR (0, 1)	2	0.012984	0.005882	0.007863
CAR (0, 2)	3	0.016355	-0.008855	0.009012
CAR (0, 3)	4	0.011256	-0.00829	0.00767
CAR (0, 4)	5	-0.013592	-0.016894	0.005483
CAR (0, 5)	6	-0.012876	-0.021688	0.006118

According to the above results, it is concluded that the stock market is semi-strong. The semi-strong efficiency changes prices from equilibrium as a result of publicly available information. This shows how stock prices can be increased and decreased with the impact of any publicly available information or any unexpected event. To test the semi-solid form of effective market speculation, one can check whether a stock's cost holes up or down when beforehand confidential news is delivered. In this study, the impact of covid-19 events was analyzed on PSX. The discoveries reasoned that, consequently, this data isn't accurately evaluated into the offers until it is made accessible. By then, the stock might bounce or downturn, contingent upon the idea of the news, as financial backers and dealers consolidate this new data.

Conclusion

The major objective of this research study is to observe the impact of the coronavirus-19 Pandemic and Vaccination phases on the Pakistan Stock Market. Through this study, we tried to find out the strength of stock market towards an unpredictable event that bought a huge economic crisis to the world. We also tried to analyze how positive events such as vaccinations can bring change after a disastrous event like the COVID-19 outbreak. The previous literature studies exposed that COVID pandemic and vaccines are positively related with stock market. Previously researchers lacked a few contents in their researches which we tried to cover through proper study. The basic concept of this study is to compare how both the pandemic phase and the vaccination phase impacted the performance of Pakistan stock exchange market either positively or negatively. For data analysis, three major data sets are used including daily KSE 100 indices, major COVID event dates and various COVID 19 vaccinations dates. The analysis is done through panel regression due to its exceptional advantages in field of research and event study methodology is used to estimate that how long it took the stock market to be affected by COVID-19 event.

Coming towards the results, the first two waves of COVID-19 show significantly negatively results indicating a short-term negative impact on stock market. And till the third wave people got used to the pandemic and results are less significant. The results for impact of covid-19 restrictions showed that only lockdown restriction had a positive impact on stock returns. Thus, it is concluded that eradication of travel restrictions etc. brought positive changes in stock market returns. The results for impact of casualties and recoveries show that there isn't any significant impact of these factors on overall market returns. The results of vaccination program are positive in relevance to the stock market returns in the first phase whereas the second phase of vaccinations brought slightly negative changes in stock market. Lastly, after the approval of three main vaccines the first one shows mixed results both positive and negative, the second vaccine AstraZeneca's results are all negative throughout and Moderna finally showed positive results during the whole phase. Overall, these results concluds that the stock market was semi strong during the pandemic.

To conclude, the pandemic phase caused negative returns quickly but it took a bit of time for Pakistan stock market to get back into its pre-COVID situation even after the initiation of the COVID-19 vaccination programs.

This study contributs in analyzing the sensitivity of Pakistan stock market towards any event that can cause disruptions in market returns. The findings of this study can contribute in understanding that precautionary measures and rectification of these events can overcome the disastrous impact of these events.

Keeping the relevance of this research aside, there can be some limitations such as incorporation of more events for more reliability. Also, cross country comparison can be more helpful to compare the efficiency of stock markets all over the world and suggestions can be put forward to improve it.

Keeping the relevance of this research aside, there can be some limitations such as incorporation of more events for more reliability. Also, cross country comparison can be more helpful to compare the efficiency of stock markets all over the world and suggestions can be put forward to improve it.

References

Ahmed, S. (2020). Impact of COVID-19 on performance of Pakistan stock exchange. https://www.preprints.org/manuscript/202007.0083

Alanagreh, L. A., Alzoughool, F., & Atoum, M. (2020). The human coronavirus disease COVID-19: its origin, characteristics, and insights into potential drugs and its mechanisms. *Pathogens*, *9*(5), 331. https://doi.org/10.3390/pathogens9050331

Azam, T., Mohsin, M., Naseem, S., Nilofar, M., Zia-UR-Rehman, M., Nelofer, S., ... & SongJiang, W. (2020). Economic growth vulnerability amid the COVID-19 epidemic: a systematic review of different sectors of Pakistan. *Revista Argentina de Clínica Psicológica*, *29*(4), 705. https://10.24205/03276716.2020.875

Bouri, E., Naeem, M. A., Mohd Nor, S., Mbarki, I., & Saeed, T. (2022). Government responses to COVID-19 and industry stock returns. *Economic Research-Ekonomska Istraživanja*, *35*(1), 1967-1990. https://doi.org/10.1080/1331677X.2021.1929374

Chowdhury, E. K., Khan, I. I., & Dhar, B. K. (2022). Catastrophic impact of Covid-19 on the global stock markets and economic activities. *Business and Society Review*, *127*(2), 437-460. https://doi.org/10.1111/basr.12219

Estrada, M. A. R., Koutronas, E., & Lee, M. (2021). Stagpression: the economic and financial impact of the COVID-19 pandemic. *Contemporary Economics*, *15*(Special Issue), 19. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3593144

Ghouse, G., Bhatti, M. I., & Shahid, M. H. (2022). Impact of COVID-19, political, and financial events on the performance of commercial banking sector. *Journal of Risk and Financial Management*, *15*(4), 186. https://doi.org/10.3390/jrfm15040186

Guerrien, B., & Gun, O. (2011). Efficient Market Hypothesis: What are we talking about?. *Real-world economics review*, *56*(11), 19-30. https://paecon.net/PAEReview/issue56/GuerrienGun56.pdf

Haque, A., & Pant, A. B. (2020). Efforts at COVID-19 vaccine development: challenges and successes. *Vaccines*, *8*(4), 739. https://doi.org/10.3390/vaccines8040739

Hartono, H. (2021). Covid-19 Vaccine: Global Stock Market "Game Changer". *Journal of Asian Multicultural Research for Economy and Management Study*, *2*(2), 8-17. https://doi.org/10.47616/jamrems.v2i2.102

Narayan, P. K., Phan, D. H. B., & Liu, G. (2021). COVID-19 lockdowns, stimulus packages, travel bans, and stock returns. *Finance research letters*, *38*, 101732. https://doi.org/10.1016/j.frl.2020.101732

Ngwakwe, C. C. (2020). Effect of COVID-19 pandemic on global stock market values: a differential analysis. *Acta Universitatis Danubius. Œconomica*, *16*(2), 255-269. https://www.ceeol.com/search/article-detail?id=879955

Ngwakwe, C. C. (2021). COVID-vaccination and performance in five global stock market indexes. *Acta Universitatis Danubius. Œconomica*, *17*(5), 55-65. https://www.ceeol.com/search/article-detail?id=1010531

Oanh, T. T. K. (2022). The impact of COVID-19 vaccination on stock market: is there any difference between developed and developing countries?. *Heliyon*, *8*(9), e10718. https://www.cell.com/heliyon/fulltext/S2405-8440(22)02006-0

Shen, H., Fu, M., Pan, H., Yu, Z., & Chen, Y. (2020). The impact of the COVID-19 pandemic on firm performance. *Emerging Markets Finance and Trade*, *56*(10), 2213-2230. https://www.taylorfrancis.com/chapters/edit/10.4324/9781003214687-7/impact-covid-19-pandemic-firm-performance-huayu-shen-mengyao-fu-hongyu-pan-zhongfu-yu-yongquan-chen

Taleb, N. (2005). The black swan: Why don't we learn that we don't learn. *NY: Random House*, *1145*.

Taleb, N. N. (2007). Black swans and the domains of statistics. *The American Statistician*, *61*(3), 198–200. https://doi.org/10.1198/000313007x219996

Zeren, F., & Hizarci, A. (2020). The impact of COVID-19 coronavirus on stock markets: evidence from selected countries. *Muhasebe ve Finans İncelemeleri Dergisi*, *3*(1), 78-84. https://doi.org/10.32951/mufider.706159