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Economic Shockwaves: Examining Stock Market Behavior in Pakistan Amidst the COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic sent shockwaves through global economies, particularly affecting capital markets and stock price returns across major indices. This study examines the response of various industries listed on the Pakistan Stock Exchange (PSX) to the initial COVID-19 lockdown implemented on March 23, 2020. The research evaluates stock market reactions within a 61-day event window, with a focus on Average Abnormal Returns (AAR) and Cumulative Average Abnormal Returns (CAAR). The study encompasses nine diverse industries and employs regression analysis to compute alpha and beta coefficients. Notably, the findings reveal short-lived negative impacts across industries, followed by swift recoveries, indicative of the stock market's resilience in Pakistan. Descriptive statistics highlight sector-specific characteristics, while regression results emphasize low stock return volatility. The study underscores the role of government interventions and investor confidence in mitigating the pandemic's economic impact, providing valuable insights for investors, policymakers, and researchers. This research contributes to our understanding of stock market dynamics during crises, particularly in emerging economies.

1. Introduction

The COVID-19 pandemic, declared by the World Health Organization (WHO) in 2020, has unleashed an unprecedented global crisis, affecting every facet of human life. As of 2022, the pandemic has resulted in a staggering 6.22 million fatalities and has afflicted more than 509 million individuals worldwide (WHO, 2022). Beyond its devastating toll on public health, the virus has cast a long shadow over the global economy. According to the International Labor Organization (ILO, 2022), the pandemic's impact has reverberated across all sectors, resulting in an estimated 4.9 percent decline in economic growth and a 32 percent slump in

international trade in 2020, as reported by the World Trade Organization (WTO, 2020). The economic fallout from COVID-19 even eclipsed that of the 2007-2008 financial crisis, with the International Monetary Fund (IMF, 2020) reporting 300 million job losses, including 130 million in the first quarter alone.

Amid a litany of disasters and epidemics, COVID-19 has emerged as one of the most contagious viruses in recent memory (Frezza, Bianchi, & Pianese, 2021). The financial markets, often considered a barometer of economic stability, were not spared. In the early months of 2020, global stock markets hemorrhaged a staggering $20 trillion (Xu, 2021; Zhang, Hu, & Ji, 2020). The Dow Jones Industrial Average, for instance, experienced its most significant single-day loss in 30 years on March 20, 2020, plummeting by 2,300 points, as reported by the BBC (2020). CNBC (2020) similarly documented a nearly 3,000-point drop in the Dow Jones in a single day.

The response to COVID-19, including the lack of support programs, social distancing measures, and widespread shutdowns and lockdowns, exacted a heavy toll on global financial markets. This resulted in severe downturns across various regions (Razzaq et al., 2020; Yu et al., 2021). For instance, BBC (2020) highlighted a 9.5% drop in the S&P, a 9.4% drop in the Nasdaq, and stock market losses amounting to £160.4 billion. Consequently, on March 20, 2020, the S&P recorded a 4.97% decrease, the FTSE tumbled by 29.113%, the Hang Seng Index dipped by 15.69%, and the Dow Jones fell by 11.54%. Notably, business expansion through stock issuance, a critical source of financing, faced significant headwinds, with empirical evidence underscoring the substantial adverse effects of COVID-19 on stock markets in economies worldwide, particularly in Asian markets (Pandey & Kumari, 2021).

Numerous empirical studies have affirmed the pivotal role of stock markets in contributing to a country's economy (Boubaker, 2016) by attracting potential investors (Levine, 1998). In a similar vein, the Pakistan Stock Exchange (PSX) played a significant role in raising capital, contributing 14.87% and 13.73% to the nominal GDP in 2021 and 2020, respectively (CEIC, 2022). Unfortunately, due to population density and inadequate healthcare infrastructure, COVID-19 spread rapidly in densely populated nations like Pakistan (Johnston, 2020; Tao, Su, Yaqoob, & Hammal, 2021). Consequently, the PSX bore witness to a seismic shift brought about by the pandemic. The KSE-100 index plunged to an all-time low of 37,000 points, the KMI-30 index shed 575.80 points, and the Karachi All Share Index saw a 290-point decline (KSE, 2020). This downward spiral commenced in mid-January 2020, as the country grappled with the virus outbreak and continued unabated until March 2020. The PSX hemorrhaged value at an alarming rate, with daily losses of 1,500 points, resulting in a 50% loss in share values (Government of Pakistan, 2020-21). Market capitalization for KSE 100 plummeted from Rs. 7,851 billion to Rs. 5,621 billion (Government of Pakistan, 2021-22), with a staggering 10,749-point drop from February to March 2020 (PSX, 2020).

This study takes cognizance of the dearth of research on stock market performance in the context of emerging economies, with existing studies primarily focusing on developed markets (Choi & Jung, 2022; Yarovaya et al., 2021) or conducting analyses at the macroeconomic level rather than delving into industry-specific data (Shahzad et al., 2021). In light of these gaps, this research sets out to explore the impact of COVID-19 lockdowns on major industries in Pakistan, grounded in the framework of the Efficient Market Hypothesis (EMH). It seeks to shed light on whether the pandemic's effects vary across different industries within the Pakistani market. Specifically, this study has two primary objectives:

1. To empirically test the Efficient Market Hypothesis (EMH) concerning the top major sectors or industries in the Pakistani economy within the context of COVID-19 lockdowns.

2. To investigate and compare variations in stock performance across the top major industries of the Pakistani economy resulting from the COVID-19 lockdowns.

The foundation of this study rests on the premise that the efficient market hypothesis has not been exhaustively explored within the Pakistan stock market, and this study seeks to address this gap. Furthermore, it delves into the intricacies of the stock market behavior in Pakistan by drawing on existing literature and theories, ultimately providing insights into the implications, limitations, and potential avenues for future research in this domain.

2. Literature Review

The theoretical framework of this study rooted in efficient market theory and rational expectations intertemporal asset pricing theory (Chen, Roll, & Ross, 1986; Merton, 1973), stock prices consistently incorporate all accessible information. In this context, when a specific asset is affected by systematic economic news, there is no additional reward for undertaking diversifiable risk. Consequently, it is anticipated that a robust connection exists between the COVID-19 pandemic and the performance of stock market indices.

The utilization of event-studies methodology has emerged as a vital approach for analyzing how different events affect stock returns. In this research, we employ the event-studies methodology to explore the effects of the Covid-19 pandemic on stock returns within key sectors in Pakistan. The evolution of event-studies methodology has been marked by significant contributions from scholars over the years. Dolley (1933) made pioneering efforts in this field by examining stock splits and stock trends. Subsequently, scholars like Aktas, de Bodt, and Cousin (2007) and Corrado (2011) have further refined this methodology. Event-studies methodology has found applications in diverse domains, including finance (MacKinlay, 1997), accounting (Johannesen & Larsen, 2016), and other relevant areas (Hartman, Drake, & McGuire, 2019; Val, Klotzle, Pinto, & Barbedo, 2018).

Researchers have employed event-studies methodology to assess the impact of various events on stock prices. For instance, Park (2004) investigated the effect of international news on the stock prices of airlines across multiple countries. Savita and Ramesh (2015) conducted a study in India and established that investors can achieve abnormal returns by making informed decisions during such events. French (2018) conducted a comprehensive analysis of market returns in six developing and developed countries, spanning the period from 2007 to 2016, considering investor sentiment.

Infectious diseases have also been a subject of interest, with studies like that of Smith, Machalaba, Seifman, Feferholtz, and Karesh (2019) demonstrating the wide-ranging socioeconomic consequences of such diseases. Similarly, Kim, Kim, Lee, and Tang (2020) investigated the financial performance of the restaurant industry during the pandemic, focusing on the years 2004 to 2006. Event-studies methodology is versatile and extends beyond epidemics and disasters, being applied to investigate events such as mergers and acquisitions (Kumar Pandey & Kumari, 2020; Ali et al., 2022).

Stock performance is inherently subject to uncertainty, a critical factor influencing investor decision-making (Zhu, Yang, Lv, & Zhuang, 2021). Scholars with similar motivations, including Albulescu (2021), Bakas and Triantafyllou (2020), Chiah and Zhong (2020), Coskun, Lau, and Kahyaoglu (2020), Hemrit and Benlagha (2021), and Zhu et al. (2021), have conducted studies exploring the relationship between global pandemics and stock prices. Their collective findings have revealed a negative association between these variables.

Specifically concerning the Covid-19 pandemic, Rizvi, Mirza, Naqvi, and Rahat (2020) examined 5342 firms listed in 10 European countries to gauge the impact of Covid-19 on non-financial firms' value. Covid-19's profound influence on stock returns and market indices

across nations has prompted numerous studies, often framed by the Efficient Market Hypothesis (EMH) (Malkiel & Fama, 1970).

suggests that stock prices quickly reflect new information, making traditional technical and fundamental analyses less effective in producing above-average returns (Fama, 1965; Samuelson, 1965). Research has also focused on specific waves of Covid-19, with Yousfi, Ben Zaied, Ben Cheikh, Ben Lahouel, & Bouzgarrou (2021) examining the pandemic's impact on the US stock market during its initial phases.

Studies have further expanded the scope, evaluating the damages wrought by Covid-19 on stock markets in various countries, including Spanish, South Korean, Chinese, US, Japanese, French, and German markets (Q. He, Liu, Wang, & Yu, 2020). The announcement by the World Health Organization labeling Covid-19 as a worldwide pandemic led to volatility in stock prices (Singh & Shaik, 2021), while Baker et al. (2020) observed that Covid-19 had a more severe impact on US stocks compared to previous viruses such as H3N2, SARS, and Asian Flu. In contrast, Q. Wang, Bai, and Huang (2021) identified a positive relationship between stock index returns and Covid-19.

The magnitude of Covid-19's impact was such that corporate announcements could not fully offset its effects on stock performance (Pandey & Kumari, 2021). Al-Kandari, AlRoomy, and Al-Roumi (2022) investigated the stock market indices of GCC countries, concluding that the pandemic had a negative effect on these indices. Consequently, Covid-19 is recognized as a significant factor affecting stock prices (H. Liu, Manzoor, Wang, Zhang, & Manzoor, 2020).

Covid-19's effects have also reverberated through the Pakistani stock market. Tao, Su, Yaqoob, and Hammal (2021) scrutinized the KSE 100 index across multiple events, including Covid-19, revealing a negative impact on KSE 100 returns. Shahzad et al. (2021) studied the stock returns of listed banks in the KSE 100 index and observed a significant negative impact. Many scholars have delved into the impact of Covid-19 lockdowns on stock markets and their industries, with a consistent finding of negative consequences on both emerging and developed economies.

Notably, industries such as banking (Lai, 2021), cement (Dharani, Hassan, Huda, & Abedin, 2022), chemical (Jiang & Chen, 2022), food and personal care (Yang, Chang, & Wang, 2022), power generation and distribution (Sun, Wu, Zeng, & Peng, 2021), refinery, oil and gas marketing (Verma, Kumar, & Bansal, 2021), technology and telecommunications (Carlaw, 2020), and transportation (M. Alam, Wei, & Wahid, 2020; Azam et al., 2022) have experienced widespread negative reactions in their stock prices.

Therefore, in light of the extensive literature reviewed, this study proposes the following hypotheses:

Hypothesis 1: The Covid-19 Lockdown has negatively affected the Abnormal Stock Returns of major industries in Pakistan.

Hypothesis 2: The Covid-19 Lockdown has negatively affected the Cumulative Abnormal Stock Returns of major industries in Pakistan.

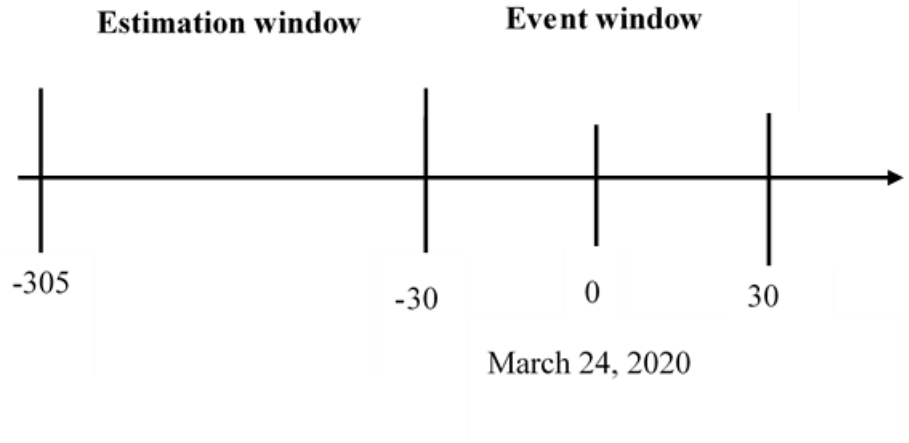
3. Methodology

3.1. Event Studies

This research utilizes the event studies methodology to investigate the impact of the Covid-19 lockdown on stock market performance within major industries in Pakistan. This approach is in line with previous research efforts (e.g., M. N. Alam, Alam, & Chavali, 2020; Albaity, Saadaoui Mallek, & Mustafa, 2022; Buigut & Masinde, 2022) that have utilized event studies to assess the extent of the Covid-19 pandemic's influence on stock markets. Following the

event studies framework proposed by MacKinlay (1997), our study adhered to the following six steps for estimating the effect of the Covid-19 pandemic on stock returns:

Event Identification: The event of interest in this study is the Covid-19 pandemic and the initial lockdown it triggered. Specifically, the first lockdown in response to Covid-19 was enforced on March 23, 2020, in Karachi, Pakistan. For estimation purposes, we considered the event day to be March 24, 2020, due to the holiday (see Table 6 for detail events during Covid 19). We established a 61-day estimation window to encompass all significant Covid-19-related events occurring in Pakistan during that period.



Units of Analysis: The scope of analysis encompasses all firms operating within the nine major industries in Pakistan.

Estimation of Normal Returns: We computed the normal returns for all firms based on data from the designated estimation window.

Estimation of Abnormal Returns: Abnormal returns were calculated as deviations from the expected normal returns.

Calculation of Cumulative Abnormal Returns (CAAR): CAAR was derived by cumulating the abnormal returns over the event window.

T-value Calculation: T-values were computed to assess the significance level of the Cumulative Abnormal Returns (CAAR) and Abnormal Returns (AAR).

3.2. Source of Data

For this study, we utilized daily stock price data from nine major industries listed on the Pakistan Stock Exchange. These industries encompass technology and communication, cement, power generation and distribution, commercial banks, refineries, food and personal care, oil and gas marketing companies, chemicals, and transportation. We collected two years' worth of data spanning from January 1, 2019, to December 31, 2020. Firms with data gaps exceeding 30 days were excluded from the analysis. In instances of other missing data, we imputed values by considering the values one day before and one day after the missing data point, following the approach proposed by Pandey and Kumari (2021).

3.3. Empirical Models Estimation

In this section, we outline the empirical models used to estimate the average abnormal return (AAR) and cumulative average abnormal return (CAAR) for our research, drawing on previous work by Khan, Elahi, Ullah, and Khattak (2020) as our foundation. The primary objective of this section is to detail the methodology and equations employed in calculating these critical financial performance measures.

Event Window and Abnormal Return Calculation: To calculate the AAR and CAAR, we employ a 61-day event window, consistent with the methodology utilized by Khan et al. (2020). Within this context, the abnormal return (AR) is defined as the difference between the actual return (R) and the expected return (E), which is calculated using the Capital Asset

Pricing Model (CAPM) single-factor model. The initial step in this estimation process begins with the utilization of the following equation for normal return:

$$R_{i,t} = \frac{(R_{i,t1} - R_{i,t0})}{R_{i,t0}}, \quad (1)$$

where represents the normal return, $R_{i,t1}$ corresponds to the present stock return on trading day, and $R_{i,t0}$ signifies the previous stock return on the trading day. The expected return $(E(R_{i,t})$ is derived through the following equation:

$$\hat{y} = \alpha + \beta market\ retun, \quad (2)$$

where ŷ represents the expected return, α denotes the alpha value, and β signifies the beta value or slope of the equation. Further, the following equation is employed to estimate the abnormal return (*AR*):

$$AR_{i,t} = R_{i,t} - E(R_{i,t}). \quad (3)$$

Here, *AR* represents the abnormal return for the time period of firm *i,t, R* stands for the actual return, and $(E(R_{i,t})$ signifies the expected return.

Average Abnormal Return (AAR): The average abnormal return (*AAR*) for an industry with multiple firms is determined through the following equation:

$$AAR_t = \frac{1}{n}\sum_{i=1}^{n} AR_t. \quad (4)$$

In this equation, AAR_t represents the average abnormal return for a specific time period, and n is the number of firms within the industry. The *AAR* is computed by averaging the abnormal returns of all firms within the industry.

Cumulative Average Abnormal Return (CAAR): The cumulative average abnormal return (CAAR) is calculated as follows:

$$CAAR_{t1,t2} = \sum_{i=1}^{n} CAR_{t1,t2}. \quad (5)$$

Here, CAAR represents the cumulative average abnormal return for the specified time interval *[t1, t2]*. The CAAR is determined by summing the CAR (cumulative abnormal return) values for each time point within the interval.

Statistical Significance: To assess the statistical significance of the AAR and CAAR, we calculate the t-statistic as follows:

$$t_{AARt} = \frac{AAR_t}{SD}, \quad (6)$$

and

$$t_{CAARt} = \frac{CAAR_t}{SD.\sqrt{n}}. \quad (7)$$

In these equations, *SD* represents the standard deviation of stock returns and market returns during the estimation period.

The methodology outlined above provides a comprehensive framework for estimating and assessing the average abnormal return (*AAR*) and cumulative average abnormal return (*CAAR*) for our research. These measures are crucial in evaluating the impact of specific events or market conditions on the financial performance of firms within the industry.

4. Results and Discussion

The global economies have been significantly affected by the COVID-19 pandemic, particularly evident in the capital markets and fluctuations in stock prices across major international indices. This research endeavors to delve into the response of major industries listed on the Pakistan Stock Exchange (PSX) to the COVID-19 pandemic. The pivotal event for this study is the implementation of the first lockdown in Pakistan on March 23, 2020, leading to the temporary closure of the PSX. Consequently, March 24, 2020, is considered the event date for this investigation. We scrutinize stock market reactions surrounding this

date within a 30-day pre-event window and a 30-day post-event window, with an estimation window spanning 274 days, ranging from t-305 to t-31. The estimation window returns serve as the foundation for regression analysis, wherein industry return is the dependent variable, and market return is the independent variable used to derive alpha, beta, and other statistical measures. The research methodology involves determining the Abnormal Returns (AR) for each firm within an industry, averaging these to obtain the Average Abnormal Returns (AAR) for the entire industry, and summing these AARs to calculate the Cumulative Average Abnormal Returns (CAAR). The significance of AAR and CAAR, signifying negative or positive impacts, is assessed using t-tests at a 5% significance level.

Consistent with the approach outlined by He, Sun, Zhang, and Li (2020) and Khan et al. (2020), this study calculates the 61-day average AAR and CAAR, covering 30 days before the event (t-30), the event day (t0), and 30 days after the event (t30). The choice of a relatively short event window aligns with recommendations by Brown and Warner (1980) to optimize statistical performance and results. The significance of the findings is tested using the method proposed by Boehmer et al. (1991), and the regression coefficients of interest are computed using STATA event study codes by Subhan Ullah (2021).

4.1. Graphical Analysis

Figure 1 and Figure 2 provide a visual representation of the stock behavior of major industries during the 61-day event window of the COVID-19 pandemic. These figures showcase different Average Abnormal Returns (AAR) and Cumulative Average Abnormal Returns (CAAR). The most substantial decline in both AAR and CAAR is observed in the technology and communication industry, with declines of -21.14% and -62.31%, respectively, occurring one day after the event. This is followed by the transportation and food and personal care industries. Interestingly, the chemical industry exhibits a notable 7.65% increase in AAR on day 18, marking the most significant positive AAR during the 61-day event window. Remarkably, beyond the 20th day of the event, all industries show signs of recovery, with no industry experiencing significant negative AARs. The swift recovery in industry profitability contrasts with the stock markets of other countries, suggesting that the impact of COVID-19 was relatively short-lived in Pakistan.

Figure 1: AAR of 61 days Estimation Window

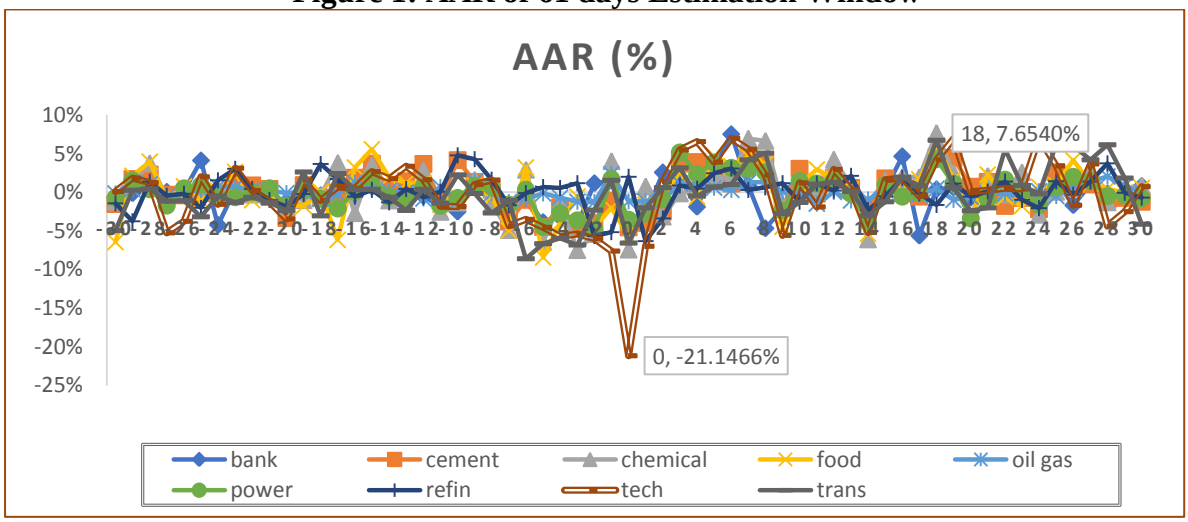
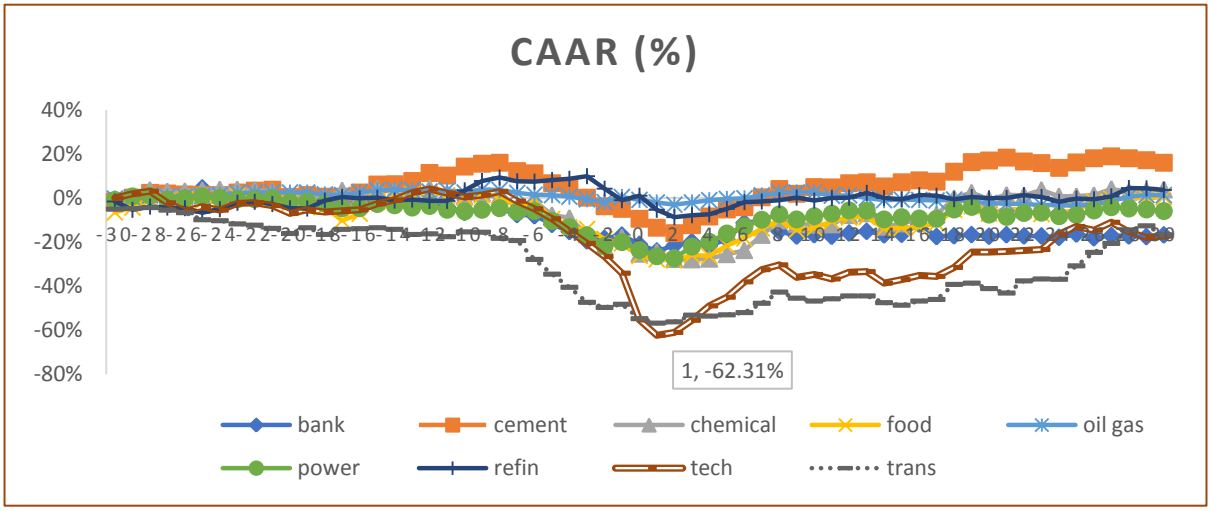


Figure 2: CAAR of 61 days estimation window



4.2. Descriptive Statistics

Table 1 presents the descriptive statistics pertaining to the estimation window (274 days from t-304 to t-31) and the event window (61 days from t-30 to t30). During the estimation window, the transportation industry, despite having the lowest minimum return, recorded the highest average return, followed closely by the banking industry. Over the 274-day estimation period, five out of nine industries exhibited negative average returns, with the refinery, technology and communication, oil and gas marketing, chemical, and power generation and distribution industries posting the highest to lowest negative values, respectively. Notably, all nine industries in the estimation window exhibited standard deviations of less than 1. However, the refinery and technology and communication industries, characterized by higher standard deviations, displayed greater stock price volatility than other sectors.

In the event window, all industries recorded negative abnormal returns over the average 61-day period, except for the cement industry, which achieved the highest average abnormal return. This outlier may be attributed to the special stimulus package announced by the Government of Pakistan targeting Small and Medium-sized Enterprises (SMEs) and the construction sector, thus buoying the cement industry during the pandemic. These findings provide valuable insights into the resilience and responsiveness of various industries within the Pakistan Stock Exchange during the early stages of the COVID-19 pandemic, shedding light on sector-specific challenges and opportunities for investors and policymakers alike.

Table 1. Descriptive Statistics of Estimation Window

	Obs.	Mean	Std. Dev.	Min	Max
Estimation Window: 274 days from t-304 to t-31					
Bank	274	0.000623	0.011922	-0.02675	0.048601
Cement	274	0.000203	0.021082	-0.04969	0.053513
Chemical	274	-0.00027	0.015049	-0.04607	0.049487
Food & personal care	274	0.000549	0.020278	-0.05067	0.056841
Oil & Gas marketing	274	-0.00054	0.017877	-0.05262	0.046338
Power generation & distribution	274	-0.00014	0.014713	-0.03363	0.052243
Refinery	274	-0.0016	0.030011	-0.05762	0.054192

Technology & communication	274	-0.00116	0.026115	-0.0551	0.0547
Transportation	274	0.0016	0.021759	-0.05975	0.070287
Event Window: 61 days from t-30 to t+30					
Bank	61	-0.0027	0.0226	-0.0565	0.0748
Cement	61	0.0026	0.0244	-0.0455	0.0455
Chemical	61	0.0007	0.0316	-0.0750	0.0765
Food and personal care	61	0.0001	0.0309	-0.0845	0.0610
Oil and Gas marketing	61	0.0002	0.0087	-0.0150	0.0232
Power generation and distribution	61	-0.0010	0.0209	-0.0480	0.0514
Refinery	61	0.0006	0.0218	-0.0635	0.0476
Technology and communication	61	-0.0028	0.0454	-0.2115	0.0702
Transportation	61	-0.0027	0.0332	-0.0861	0.0671

4.3. Regression Results

Table 2 presents the regression results for the estimation window, in which the industry average return was regressed on the market return. A market index analogous to the KSE 100 index was constructed for each industry using the same methodology employed to calculate the latter index. All beta values were found to be positive and less than one, indicating a low volatility of stock returns for each industry. Notably, the Refinery industry exhibited the most significant beta value, which was 0.9, followed closely by the oil and gas marketing industry. Remarkably, even in our empirical results, these two industries did not exhibit a significant reaction to the Covid-19 lockdowns. In contrast, the transportation industry and the technology and communication industry were the most affected industries during the initial stages of the COVID-19 outbreak, as they displayed the lowest beta values.

Table 2: Regression Results

	Alpha	Beta	SE	P>t	Prob > F	R^2	Adj R^2
Bank	0.0004	0.4587	0.0296	0.0000	0.0000	0.4684	0.4665
Cement	0.0001	0.4065	0.0306	0.0000	0.0000	0.3934	0.3912
Chemical	-0.0003	0.0097	0.0085	0.2540	0.2538	0.0048	0.0011
Food & personal care	0.0004	0.0058	0.0057	0.3050	0.3050	0.0039	0.0002
Oil & gas marketing	-0.0002	0.8289	0.0195	0.0000	0.0000	0.8693	0.8689
Power generation & distribution	0.0001	0.4519	0.0278	0.0000	0.0000	0.4922	0.4904
Refinery	-0.0009	0.9000	0.0331	0.0000	0.0000	0.7315	0.7305
Technology & communication	-0.0013	0.3882	0.0560	0.0000	0.0000	0.1503	0.1471
Transportation	0.0013	0.1364	0.0215	0.0000	0.0000	0.1283	0.1251

4.3.1. Cumulative Average Abnormal Returns: 5 Trading Days' Difference

Table 3 displays the cumulative average abnormal return (CAAR) for 13 different windows with a 5-day difference around the event to measure the cumulative effect of the event on stock performance within the event window of 61 days. The first Covid-19 lockdown was implemented on March 23, 2020, in Karachi, Pakistan, and, due to a holiday, we considered the event day as March 24, 2020, for estimation purposes. Out of the nine industries analyzed, five industries exhibited negative reactions and earned significant negative CAARs before the event occurred. For instance, the banking industry reacted negatively in the first 15 days, 20 days, 25 days, and 30 days before the event, resulting in CAARs of -20.9979%, -21.5247%, -21.3876%, and -18.9015%, respectively. These negative CAARs, observed prior to the event with a 5-trading day difference, decreased as the event date approached.

Similarly, the chemical industry displayed a similar pattern, reacting negatively 30 days before the event and consistently earning significant negative CAARs across six different 5-trading day difference windows. Specifically, this industry exhibited negative CAARs for the first 5 days, 10 days, 15 days, 20 days, 25 days, and 30 days before the event, with corresponding CAARs of -25.3336%, -28.5883%, -28.4663%, -26.1216%, -27.3672%, and -24.0559%, respectively. Following this trend, the industry's CAARs turned positive within the first 10 days and continued to increase.

The power generation and distribution industry experienced significant negative CAARs for three different 5-trading day windows, making it the industry with the shortest duration of negative CAARs. The industry began earning negative CAARs 30 days, 25 days, and 20 days before the event.

In contrast, the technology and communication industry exhibited negative CAARs for five windows with 5-trading day differences, ranking as the second most negatively affected industry after the chemical industry. Notably, all five industries initiated their negative CAARs more than 30 days before the event, except for the technology and communication industry, which began earning significant negative CAARs 25 days, 20 days, 15 days, 10 days, and 5 days before the event, resulting in CAARs of -49.4492%, -51.9418%, -50.0776%, -57.6128%, and -50.4550%, respectively.

The transportation industry also exhibited negative reactions before 30 days, 25 days, 20 days, 15 days, and 10 days of the event, with CAARs of -54.7871%, -48.1770%, -41.0980%, -40.9363%, and -37.1975%, respectively. This industry, too, displayed negative CAARs across five windows with 5-trading day differences and began to improve after earning its last significant CAAR before the event.

Overall, all five industries significantly impacted by the event displayed signs of improvement after they earned their last significant negative CAARs. Importantly, no industry exhibited significant negative CAARs after the event. The technology and communication industry recorded the highest significant CAAR, which was -57.61% earned 10 days before the event, followed by the transportation industry, with a -54% CAAR within the first 30 days of the event. In contrast, the cement industry, oil and gas marketing industry, food and personal care industry, and Refinery industry did not display any significant negative CAARs.

4.3.2. Impact of Covid-19 Lockdowns on Baking Industry

The banking industry's response to the Covid-19 lockdowns was notably negative. Three days before the initial lockdown, and persisting until the fifth day of the lockdown, the industry experienced adverse effects (see Column 1, Table 4). This suggests that the Covid-19-related information had a detrimental impact on the banking industry's profitability. Over a 61-day event window, the industry exhibited significant reactions on 15 trading days, with 9 of those

reactions being negative (see Column 1, Table 5). The predominant negative response can be attributed to the escalation of the Covid-19 pandemic, which led to decreased loan demand due to various restrictions and lockdown measures. This is in line with the findings of Elnahass, Trinh, and Li (2021), who observed a global decline in the number of loans requested during lockdowns, directly affecting bank operations.

Carletti, Claessens, Fatas, and Vives (2020) also noted the adverse effects of Covid-19 on the financial sector, highlighting decreased inflows and the stress it placed on the banking industry. KPMG's (2020) report confirmed that the financial sector, particularly the banking industry, suffered a significant decline in value during the early days of the pandemic. This trend was reflected in the plummeting banking indices of Europe, North America, and Asia, further highlighting the global impact of Covid-19. In the context of the Pakistani economy, these findings align with those of Mushafiq (2021), who concluded that commercial banks in Pakistan faced substantial negative consequences due to Covid-19.

The atmosphere of insecurity and uncertainty caused by travel bans and lockdowns significantly reduced the demand for money, leading to a contraction in banking activities (Finans, 2021). However, there was a positive shift in the industry as the demand for loans increased due to low interest rates (Strømnes, 2021). A similar trend was observed in Korea, where Choi and Jung (2021) noted that the negative effects of Covid-19 diminished over time, especially with multiple waves of the virus.

4.3.3. Impact of Covid-19 Lockdowns on Cement Industry

The cement industry in Pakistan showed resilience during the Covid-19 lockdowns, as indicated by the absence of significant positive or negative Cumulative Abnormal Returns (CAAR) in Column 3 of both Tables 4 and 5 over the 61-day event window. This robust performance can be attributed to government measures, including financial support from the Government of Pakistan and the International Monetary Fund (IMF), aimed at bolstering small and construction businesses in Pakistan. These measures included a 90% tax exemption, a 10% reduction in capital gains tax, and various housing schemes. These findings align with those of Sunde (2020), who concluded that industries like cement performed better than others during Covid-19 lockdowns.

Although UNIDO (2020) reported a significant slowdown in construction activity during the first quarter of 2020 due to lockdowns, the government's proactive measures reinvigorated the cement industry. This demonstrates how government interventions can mitigate the negative effects of external crises.

4.3.4. Impact of Covid-19 Lockdowns on Chemical Industry

The chemical industry in Pakistan experienced a negative impact from the Covid-19 lockdowns. The results in Table 5, Column 3, show that the industry had significantly reduced average returns on the event day, lasting for six days after the lockdown. This industry's CAAR was negative in the last 30, 25, 20, 15, 10, and 5 days within five-day interval windows, indicating a significant negative impact compared to other industries in Pakistan (see Table 4, Column 3). This aligns with the global trend, as Covid-19 disrupted chemical industries worldwide, causing an 18% decline in stock market performance. Factors contributing to this decline included shipment delays, project postponements, and decreased demand for chemical-related goods (M. Alam, Wei, & Wahid, 2020; Li, Zhou, Chen, & Liu, 2021).

Price fluctuations in the chemical industry also played a role in the negative effects on the commodity market (Jiang & Chen, 2022). The demand for chemical commodities is less elastic than for other goods, leading to potential price increases during events like Covid-19.

4.3.5. Impact of Covid-19 Lockdowns on Power Generation and Distribution Industry

The power generation and distribution industry initially reacted negatively to the Covid-19 lockdowns, with the negative effects dissipating two days after the lockdown (see CAAR values in Column 7, Table 4). Over a 61-day event window, the industry experienced significantly more negative Average Abnormal Returns (AARs) than positive AARs on five different trading days (see Table 5, Column 7). The global measures, such as travel restrictions and lockdowns, significantly disrupted the day-to-day operations of industries, leading to reduced electricity demand. Industries, educational institutions, and commodity markets in Pakistan were closed, resulting in decreased electricity consumption (Elavarasan et al., 2020).

4.3.6. Impact of Covid-19 Lockdowns on Oil and Gas Marketing and Refinery Industries

The oil and gas marketing industry and the refinery industry in Pakistan showed minimal reactions to the Covid-19 lockdowns, with no significant AARs except on the first trading day after the lockdown in the refinery industry, where a significant negative AAR of -6.35% was recorded (see Column 8, Table 5). These industries did not exhibit significant AARs or CAARs over the 61-day event window. The reduction in demand for petroleum products due to lockdowns and reduced economic activity led to limited reactions in these sectors. Despite fluctuations in oil prices, the consumption of petroleum products remained relatively stable in Pakistan (Haris & Sambit, 2020).

4.3.7. Impact of Covid-19 Lockdowns on Technology and Communication Industry

The technology and communication industry in Pakistan experienced a significant negative reaction to the Covid-19 lockdowns on the event day. However, the industry quickly recovered, with more positive significant returns than negative ones observed after the event. The initial negative AARs in the early days of Covid-19 were attributed to lockdowns and border closures, which hindered the movement of electronic products. As activities shifted to virtual platforms, such as virtual classes, meetings, and remote work, the industry's dependence on technology increased. This transition contributed to the industry's recovery and positive performance (M. N. Alam et al., 2020; Carlaw, 2020).

The Covid-19 pandemic accelerated the digital transformation of various aspects of life, and technology played a pivotal role in adapting to the new normal. The use of technologies such as AI, 5G, and cloud computing became essential for various aspects of daily life, further driving the industry's growth (Hu, 2020; Sathish et al., 2020; George, Lakhani, & Puranam, 2020). Despite the initial shock, the technology and communication industry demonstrated resilience and adaptability during the pandemic.

4.3.8. Impact of Covid-19 Lockdowns on Transportation Industry

The transportation industry was the first to react to the initial Covid-19 lockdown in Pakistan, experiencing significant negative AARs ranging from -6% to -9% in the six days leading up to the lockdown (see Column 9, Table 5). This industry's strong reaction can be attributed to its direct dependence on travel and mobility, which were severely restricted during lockdowns. The industry continued to be significantly affected for five days before and 24 days after the lockdown (see Column 9, Table 4). The reduction in passenger numbers, a major revenue source for the industry, played a significant role in these negative effects (M. Alam et al., 2020). Lockdowns and restrictions disrupted the transportation of people and goods, leading to substantial stock return reductions (Liu, Gayle, Wilder-Smith, & Rocklöv, 2020).

The transportation industry's sensitivity to external crises was evident, as similar impacts were observed during events like 9/11 and the SARS outbreak (Flouris & Walker, 2007;

Harbison, 2003; Sparaco, 2001). The maritime component of the transportation industry also faced challenges, with substantial drops in freight rates for various cargo types (Nektarios A. Michail, 2020). These factors contributed to the industry's negative reaction during the Covid-19 lockdowns.

In summary, the Covid-19 pandemic had varying impacts on different industries in Pakistan. The banking industry initially faced significant negative effects due to decreased loan demand, but it later recovered as government measures, including low interest rates, supported increased loan demand. The cement industry remained resilient thanks to government initiatives that bolstered construction businesses. The chemical industry experienced substantial negative impacts due to shipment delays and decreased demand for chemical products. The power generation and distribution industry faced challenges as lockdowns disrupted electricity consumption patterns. The oil and gas marketing and refinery industries showed minimal reactions due to stable petroleum product consumption. The technology and communication industry, while initially negatively impacted, quickly rebounded as virtual activities became the norm. Lastly, the transportation industry suffered the most due to its direct dependence on travel, experiencing significant negative effects.

Despite the initial setbacks, all industries showed signs of recovery, indicating resilience in the face of adversity. Government interventions and proactive measures played a crucial role in mitigating the negative impacts of the pandemic. Overall, the Pakistani economy demonstrated a V-shaped recovery, with swift rebounding in various sectors (Pakistan Economic Survey, 2021). The quick recovery observed in Pakistan's stock market aligns with the Prospect Theory, suggesting that investors tend to hold onto their investments during market downturns, anticipating a rebound. The government's effective policies, including relief packages and low-interest rates, bolstered investor confidence (Riaz, Ahmed, Parkash, & Ahmad, 2020). Pakistan's success in managing the pandemic, as recognized by WHO and global rankings, further contributed to its economic resilience (Bloomberg, 2022).

In summary, the study investigated the impact of the COVID-19 pandemic on sectors listed on the Pakistan Stock Exchange (PSX) during a 61-day period centered around the initial lockdown in March 2020. Using regression analysis and event study methodology, the research assessed Average Abnormal Returns (AAR) and Cumulative Average Abnormal Returns (CAAR) for nine industries. Notable findings include a significant decline in the technology and communication sector, followed by a general recovery in all industries after the 20th day of the event. Descriptive statistics revealed low stock return volatility during a 274-day estimation window, with the transportation and technology sectors facing the most substantial impact. The study delved into specific industry dynamics, such as the banking sector's initial decline and recovery, the resilient cement industry supported by the government, sustained negative effects on the chemical industry, and the rapid rebound of the technology sector. The transportation sector emerged as the most adversely affected due to its reliance on travel. Despite initial setbacks, all industries show signs of recovery, emphasizing the crucial role of government interventions in mitigating the economic repercussions of the pandemic on Pakistan's stock market. The study concluded that the Pakistani economy demonstrated resilience and a V-shaped recovery, attributed to effective government policies.

5. Conclusion and Recommendations

5.1. Conclusion

In conclusion, this study sought to investigate the reaction of Pakistan's stock market to the Covid-19 lockdown, with a focus on different industries. The results of our analysis reveal several important insights into the behavior of the stock market during this unprecedented global crisis.

Our findings indicate that, with the exception of the oil and gas marketing and refinery industries, all other industries in Pakistan's stock market reacted negatively on the day of the Covid-19 lockdown. However, it is noteworthy that these negative reactions were short-lived, with a rapid recovery observed across most sectors shortly after the event. This trend is consistent with previous research conducted by Khan et al. (2020) and M. N. Alam et al. (2020), which suggests that the impact of Covid-19 on stock markets tends to be temporary, especially in the context of developing economies.

Interestingly, the study also highlights that while the lockdown had an immediate impact on stock market returns, there were indications of investor concerns and panic prior to the event. This suggests that the stock market is sensitive to information and news related to Covid-19, even before official lockdown measures were imposed.

Furthermore, our analysis indicates that Pakistan's stock market demonstrated informational efficiency in terms of the Abnormal Average Returns (AAR) and Cumulative Average Abnormal Returns (CAAR) for the industries affected by the Covid-19 lockdown. However, it exhibited a relatively less responsive behavior compared to some other markets. This may be attributed to the timely actions and strategic interventions by the government of Pakistan, which helped mitigate the long-term impact of the crisis on the stock market.

5.2. Recommendations

Based on the findings of this study, several recommendations can be made for investors, policymakers, and researchers:

i. Investment Considerations: Investors should consider Pakistan's stock market as a relatively safe place to invest during times of crisis, such as epidemics. The market's ability to rebound quickly after a negative event suggests that it can offer opportunities for profitable investments, even in challenging circumstances.

ii. Portfolio Diversification: Investors should take into account the distinct behavior of different industries within Pakistan's stock market. This information can aid in making informed decisions regarding portfolio diversification, helping investors identify the most promising industries for investment.

iii. Stock Selection: This study provides valuable insights into whether to invest in small or large stocks during crises. Investors can use this information to tailor their investment strategies to their risk preferences and financial goals.

iv. Policy Implications: Policymakers in developing economies can draw lessons from the experience of Pakistan in managing the economic impact of Covid-19. Implementing timely and effective preventive measures and strategies can help mitigate the damage to economic activities during crises.

v. Further Research: Future research endeavors may explore additional factors that influence the resilience and responsiveness of stock markets during crises. Additionally, comparative studies across different countries and regions can offer valuable insights into the global dynamics of stock market behavior during pandemics and similar events.

6. Limitations and Future Research

The study examines the impact of the COVID-19 pandemic on Pakistan's stock market using the event study methodology. However, it acknowledges several limitations. Firstly, the methodology assumes market efficiency, which may not hold during unprecedented events like a global pandemic. Secondly, the chosen 61-day event window might not capture the entire market response period adequately. The study focuses on stock market reactions without delving into underlying factors affecting different industries. To address these issues, future research is suggested to explore alternative methodologies, extend the event window,

and conduct a more in-depth qualitative analysis of industry challenges and opportunities during the pandemic.

Recommendations for future research include refining the event study approach, employing a more extended event window, and incorporating a comprehensive set of variables for a nuanced understanding. Qualitative methods such as interviews and case studies could complement quantitative findings, revealing contextual factors influencing industry responses. Comparative analyses with other countries or regions could enhance generalizability, providing a more comprehensive global perspective on the pandemic's impact on stock markets. Additionally, exploring external factors like government interventions and public health measures in shaping market resilience and recovery is proposed. While the study offers valuable insights, addressing these limitations and implementing suggested improvements can contribute to a more robust understanding of the intricate relationship between pandemics and stock market behavior.

In conclusion, this study contributes to our understanding of how Pakistan's stock market responded to the Covid-19 lockdown and offers practical recommendations for both investors and policymakers. While the market exhibited short-term negative reactions, its rapid recovery and relative stability underscore its potential as a resilient investment destination, even in the face of unprecedented challenges.

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Table 3: CAAR (%) with 5 days difference

Windows	**Bank**	**Cement**	**Chemical**	**Food and Personal care**	**Oil and Gas Marketing**	**Power Generation and Distribution**	**Refinery**	**Technology and Communication**	**Transportation**
(-30,30)	-16.71	16.04	4.04	0.52	1.40	-5.91	-17.23	3.74	-16.70
(-30,0)	**-21.00***	-9.44	**-25.33***	-26.27	-0.75	**-23.57****	**-55.32***	1.02	**-54.79****
(-25,0)	**-21.52***	-11.11	**-28.59***	-25.62	-1.34	**-23.45***	**-49.45***	5.57	**-48.18****
(-20,0)	**-21.39***	-13.30	**-28.47***	-25.72	-3.41	**-23.49***	**-51.94***	3.67	**-41.10***
(-15,0)	**-18.90***	-11.92	**-26.12***	-19.23	-3.42	**-19.02***	-50.08	1.04	**-40.94***
(-10,0)	-17.08	-19.68	**-27.37***	-27.46	-4.38	**-18.21****	-57.61	2.29	**-37.20***
(-5,0)	-13.00	-20.66	**-24.06***	-25.25	-2.30	**-17.63***	-50.45	-6.52	-26.88
(0,0)	-4.17	-4.55	-7.44	-5.70	-1.21	-3.57	-21.15	1.97	-6.60
(0,5)	-1.82	-0.35	-7.66	-1.05	-0.77	3.99	-10.84	-3.98	-4.77
(0,10)	0.21	9.91	5.76	7.02	2.17	11.79	-0.58	-0.11	1.40
(0,15)	0.41	12.04	6.33	7.16	-1.12	11.28	-2.79	0.44	-0.53
(0,20)	-0.49	22.00	17.27	13.54	-2.77	12.55	9.68	0.94	7.09
(0,25)	0.52	21.16	18.78	14.93	-4.06	12.40	21.26	0.74	17.45
(0,30)	0.12	20.93	21.94	21.08	0.94	14.08	16.95	4.69	31.49

Note: * 5% and ** 1%

Table 4: CAAR (%) with 61 days' Window

Days	Bank	Cement	Chemical	Food and Personal Care	Oil and Gas Marketing	Power Generation and Distribution	Refinery	Technology and Communication	Transportation
-30	-0.64	-1.52	-1.22	-6.48	-0.16	-0.76	-1.46	0.09	-4.96
-29	-0.80	0.17	0.03	-4.36	0.22	0.76	-5.26	1.92	-4.73
-28	0.41	2.43	3.78	-0.42	1.24	1.13	-3.90	3.15	-4.30
-27	0.43	2.09	3.12	-1.41	0.65	-0.61	-4.35	-2.11	-5.48
-26	0.53	1.68	3.25	-0.65	0.59	-0.12	-4.55	-5.87	-6.61
-25	4.61	1.53	3.67	-1.72	0.86	0.78	-6.60	-3.89	-9.79
-24	0.35	1.44	4.01	-1.57	1.57	0.11	-5.08	-5.47	-10.31
-23	0.70	2.56	4.08	1.05	2.24	-0.53	-2.06	-2.37	-11.65
-22	0.72	3.44	3.77	0.00	2.47	-0.56	-1.63	-2.15	-12.34
-21	0.39	3.87	3.13	-0.55	2.66	-0.07	-2.65	-3.38	-13.69
-20	-1.05	0.50	1.21	-2.31	2.53	-1.84	-4.53	-6.88	-16.06
-19	-1.56	1.41	0.18	-4.11	2.59	-1.63	-4.79	-5.33	-13.46
-18	-1.98	0.69	-0.28	-4.07	1.71	-2.51	-1.13	-6.40	-16.55
-17	-1.60	0.63	3.51	-10.25	1.45	-4.63	0.57	-5.74	-14.17
-16	-2.10	2.48	0.79	-7.04	2.67	-4.54	-0.02	-5.25	-13.85
-15	-1.42	6.17	4.30	-1.48	3.63	-2.65	0.28	-2.62	-13.49
-14	-1.59	6.31	3.22	0.41	3.80	-3.28	-1.03	-0.87	-14.17
-13	-1.50	7.72	1.76	1.61	3.77	-4.29	-0.63	2.50	-16.53
-12	-2.01	11.36	4.59	2.82	2.96	-3.59	-1.29	4.11	-16.16
-11	-3.92	10.25	2.03	1.19	3.63	-5.35	-1.27	2.29	-17.59
-10	-6.47	14.38	0.68	0.50	2.50	-6.10	3.49	0.43	-15.36
-9	-5.05	15.70	2.28	1.34	3.90	-5.33	7.74	1.44	-15.52
-8	-4.51	16.02	0.74	0.77	3.72	-4.64	9.36	3.01	-18.22
-7	-7.46	12.22	-4.17	-4.21	2.43	-6.26	7.68	-1.34	-19.30
-6	-8.00	11.23	-1.28	-1.02	1.55	-5.93	7.54	-4.87	-27.90
-5	-11.90	6.71	-7.68	-9.47	1.38	-10.47	8.22	-9.42	**-34.57***
-4	-15.15	4.77	-8.99	-13.41	0.67	-13.23	8.74	-15.13	**-40.54***

-3	**-19.42***	0.25	-16.49	-13.99	-0.58	-16.89	9.90	-20.54	**-47.37****
-2	**-18.29***	-3.75	-21.91	-18.55	-1.86	-21.69	4.21	-26.56	**-49.70****
-1	-16.83	-4.89	-17.90	-20.57	0.46	-20.00	-0.95	-34.18	**-48.19****
0	**-21.00***	-9.44	**-25.33***	-26.27	-0.75	**-23.57***	1.02	**-55.32****	**-54.79****
1	**-24.03****	-13.42	**-24.59***	-27.90	-1.95	**-26.34***	-5.33	**-62.31****	**-56.84****
2	**-21.49***	-15.93	**-27.76***	-28.31	-3.03	**-27.25***	-8.72	**-60.94****	**-56.25****
3	**-19.78***	-12.27	**-27.92***	-25.75	-1.92	-22.11	-7.83	**-55.46****	**-53.12****
4	**-21.70***	-8.39	**-27.62***	-26.32	-0.88	-19.81	-7.37	**-48.92***	**-53.62****
5	**-18.66***	-5.24	**-25.55***	-21.62	-0.32	-16.01	-4.94	**-45.01***	**-52.96****
6	-11.18	-4.14	**-23.71***	-18.25	-0.04	-12.86	-1.86	-38.07	**-51.95****
7	-10.34	0.41	-16.79	-13.68	1.22	-9.87	-1.59	-32.54	**-47.75****
8	-15.04	4.11	-10.15	-10.04	2.51	-7.29	-0.97	-30.33	**-42.71***
9	-17.24	2.02	-11.72	-14.53	2.53	-9.64	0.20	-35.94	**-45.47****
10	-16.62	5.03	-12.13	-13.55	2.63	-8.20	-1.07	-34.75	**-46.79****
11	-17.29	4.83	-11.98	-10.59	1.12	-7.11	0.07	-36.66	**-45.78****
12	-15.85	6.71	-7.76	-8.87	1.16	-5.62	0.26	-33.72	**-44.49****
13	-15.08	7.22	-6.93	-8.53	0.08	-5.82	2.36	-33.38	**-44.41****
14	-16.69	5.37	-13.04	-13.93	-0.88	-9.63	0.02	-38.59	**-47.46****
15	-16.42	7.15	-11.56	-13.41	-0.66	-8.71	-0.52	-36.96	**-48.72****
16	-11.80	8.03	-9.58	-13.12	-0.86	-9.29	1.33	-35.14	**-46.77****
17	-17.45	7.43	-7.63	-11.48	-1.14	-9.37	1.15	-35.62	**-45.96****
18	-17.11	11.98	0.03	-5.38	-0.68	-5.11	-0.53	-31.44	**-39.25***
19	-16.57	16.41	2.51	-3.68	-1.69	-4.04	0.57	-24.54	**-38.68***
20	-17.32	17.11	-0.63	-7.03	-2.31	-7.44	-0.01	-24.50	**-41.10***
21	-16.62	18.44	1.47	-4.77	-2.56	-8.45	0.06	-24.26	**-43.12***
22	-17.17	16.66	1.20	-5.45	-2.72	-6.83	1.42	-23.78	**-37.59***
23	-17.18	15.91	3.77	-7.24	-3.18	-6.58	0.44	-23.35	**-36.73***
24	-17.81	13.71	0.84	-6.52	-3.08	-8.25	-1.62	-16.33	**-36.92***
25	-16.31	16.27	0.88	-5.63	-3.60	-7.60	-0.22	-12.92	-30.74
26	-18.02	18.04	1.38	-1.49	-2.77	-5.60	-0.56	-14.63	-24.72
27	-17.00	19.02	4.18	-0.38	-1.41	-4.15	0.81	-11.00	-20.53

28	-17.20	18.04	2.86	0.02	0.61	-4.67	4.55	-15.39	-14.40
29	-17.50	17.29	3.19	-0.01	1.42	-5.12	4.46	-17.93	-12.57
30	-16.71	16.04	4.04	0.52	1.40	-5.91	3.74	-17.23	-16.70

Table 5: AAR (%) 61 Days Windows

Days	Bank	Cement	chemical	Food and personal care	Oil and Gas marketing	Power generation and distribution	Refinery	Technology and communication	Transportation
-30	-0.64	-1.52	-1.22	-6.48**	-0.16	-0.76	-1.46	0.09	-4.96*
-29	-0.16	1.70	1.25	2.12	0.38	1.52	-3.79	1.84	0.22
-28	1.21	2.26	3.75*	3.94	1.01	0.38	1.35	1.23	0.43
-27	0.01	-0.34	-0.66	-0.98	-0.59	-1.74	-0.44	-5.26*	-1.18
-26	0.10	-0.42	0.13	0.76	-0.06	0.49	-0.21	-3.76	-1.13
-25	4.08**	-0.14	0.42	-1.07	0.27	0.90	-2.05	1.99	-3.18
-24	-4.26**	-0.10	0.34	0.15	0.71	-0.67	1.52	-1.58	-0.52
-23	0.34	1.12	0.06	2.62	0.67	-0.65	3.02	3.10	-1.34
-22	0.02	0.88	-0.31	-1.05	0.23	-0.03	0.43	0.22	-0.69
-21	-0.33	0.43	-0.63	-0.55	0.19	0.49	-1.02	-1.23	-1.35
-20	-1.44	-3.36	-1.93	-1.76	-0.14	-1.77	-1.88	-3.49	-2.37
-19	-0.50	0.91	-1.03	-1.80	0.06	0.21	-0.25	1.55	2.60
-18	-0.41	-0.72	-0.46	0.05	-0.88	-0.87	3.66	-1.07	-3.09
-17	0.37	-0.06	3.79*	-6.18**	-0.27	-2.12	1.70	0.65	2.38
-16	-0.49	1.85	-2.72	3.20	1.22	0.09	-0.60	0.50	0.32
-15	0.67	3.69	3.52*	5.56**	0.96	1.89	0.30	2.63	0.36
-14	-0.17	0.14	-1.08	1.89	0.17	-0.63	-1.31	1.75	-0.68
-13	0.08	1.41	-1.46	1.20	-0.03	-1.01	0.40	3.37	-2.36
-12	-0.50	3.64	2.82	1.21	-0.81	0.71	-0.66	1.62	0.38
-11	-1.91	-1.11	-2.55	-1.63	0.67	-1.77	0.02	-1.83	-1.43
-10	-2.54*	4.13	-1.35	-0.69	-1.13	-0.75	4.76	-1.85	2.23
-9	1.41	1.32	1.60	0.84	1.40	0.78	4.25	1.00	-0.16

-8	0.53	0.32	-1.55	-0.57	-0.17	0.69	1.62	1.57	-2.70
-7	-2.94*	-3.80	-4.91**	-4.98*	-1.29	-1.62	-1.68	-4.34	-1.08
-6	-0.54	-0.99	2.89	3.19	-0.88	0.32	-0.14	-3.53	-8.61**
-5	-3.90**	-4.51*	-6.41**	-8.45**	-0.17	-4.54**	0.68	-4.55	-6.67**
-4	-3.24**	-1.94	-1.30	-3.94	-0.71	-2.76	0.53	-5.71*	-5.97**
-3	-4.27**	-4.52*	-7.50**	-0.59	-1.25	-3.67*	1.15	-5.42*	-6.83**
-2	1.13	-4.01	-5.42**	-4.56*	-1.28	-4.80**	-5.68	-6.02*	-2.33
-1	1.45	-1.13	4.01**	-2.01	2.32	1.70	-5.17	-7.62**	1.51
0	-4.16**	-4.55*	-7.44**	-5.70**	-1.21	-3.57*	1.97	-21.15**	-6.60**
1	-3.03*	-3.98	0.74	-1.63	-1.20	-2.78	-6.35*	-6.99**	-2.05
2	2.53*	-2.52	-3.16*	-0.41	-1.09	-0.91	-3.39	1.37	0.59
3	1.71	3.66	-0.16	2.56	1.11	5.14**	0.88	5.48*	3.13
4	-1.91	3.88	0.30	-0.57	1.05	2.30	0.46	6.54*	-0.49
5	3.04*	3.15	2.07	4.70*	0.56	3.80**	2.44	3.91	0.66
6	7.47**	1.10	1.84	3.37	0.27	3.14*	3.08	6.94**	1.00
7	0.83	4.55*	6.93**	4.57*	1.26	2.99*	0.27	5.53*	4.20
8	-4.70**	3.70	6.63**	3.64	1.29	2.58	0.62	2.21	5.05*
9	-2.19	-2.09	-1.57	-4.48*	0.02	-2.35	1.17	-5.61*	-2.76
10	0.61	3.01	-0.41	0.98	0.10	1.44	-1.27	1.19	-1.32
11	-0.67	-0.19	0.16	2.95	-1.50	1.10	1.13	-1.90	1.01
12	1.44	1.87	4.22**	1.72	0.04	1.48	0.19	2.93	1.29
13	0.76	0.52	0.83	0.34	-1.08	-0.20	2.10	0.34	0.07
14	-1.61	-1.85	-6.11**	-5.39**	-0.96	-3.81**	-2.34	-5.21*	-3.05
15	0.27	1.78	1.48	0.52	0.22	0.92	-0.54	1.63	-1.25
16	4.62**	0.88	1.98	0.29	-0.20	-0.58	1.84	1.82	1.94
17	-5.65**	-0.60	1.96	1.63	-0.28	-0.08	-0.17	-0.48	0.81
18	0.34	4.55*	7.65**	6.10**	0.45	4.26**	-1.68	4.19	6.71**
19	0.53	4.43*	2.48	1.70	-1.01	1.07	1.10	6.90**	0.57
20	-0.75	0.70	-3.13*	-3.35	-0.62	-3.40*	-0.59	0.04	-2.42
21	0.70	1.33	2.10	2.26	-0.25	-1.00	0.07	0.24	-2.02
22	-0.54	-1.78	-0.28	-0.67	-0.16	1.61	1.37	0.48	5.53*

23	-0.00	-0.75	2.57	-1.79	-0.46	0.25	-0.98	0.43	0.86
24	-0.63	-2.20	-2.93	0.72	0.10	-1.67	-2.07	7.02**	-0.20
25	1.49	2.56	0.04	0.89	-0.52	0.66	1.41	3.41	6.19**
26	-1.70	1.77	0.50	4.14*	0.83	1.99	-0.34	-1.71	6.01**
27	1.01	0.98	2.80	1.11	1.37	1.45	1.36	3.63	4.19
28	-0.19	-0.98	-1.32	0.40	2.01	-0.52	3.74	-4.39	6.13**
29	-0.30	-0.75	0.32	-0.04	0.81	-0.45	-0.08	-2.54	1.83
30	0.78	-1.25	0.86	0.53	-0.02	-0.79	-0.73	0.70	-4.13

Table 6: Important Dates related to COVID-19

Date	**Event**
February 26, 2020	First two Covid-19 cases confirmed in Pakistan
March 13, 2020	All international flights in Pakistan suspended
March 11-19 2020	The first outbreak of Covid-19 in Pakistan happened
March 20, 2020	First Covid-19 related death happened in Sindh Province, Pakistan
March 23, 2020	First lockdown imposed in Karachi. Both the Karachi and Pakistan Stock Markets shut down due to Covid-19
May 9, 2020	Lockdown ended in Pakistan
May 31, 2020	Nationwide lockdown in Pakistan due to Covid-19
December 8, 2020	First Covid-19 vaccine given in UK