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The Impact of COVID-19 on Stock Market Performance: Evidence from the Dhaka Stock Exchange Indices

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ABSTRACT

The COVID-19 pandemic sent shockwaves through capital markets worldwide, and the Dhaka Stock Exchange (DSE) was no exception. This paper examines the impact of COVID-19 on three major indices of the DSE: the Broad Index (DSEX), the Sharia Index (DSES), and the blue-chip index (DS30). Using daily pricing data from January 2015 to December 2021 and employing the GJR-GARCH (1,1) model, the study explores how the pandemic influenced market volatility and returns in the unique context of Bangladesh's capital market. The findings reveal that (i) the COVID-19 outbreak significantly increased volatility across all three indices, (ii) DSEX experienced the highest volatility, while DS30 was the least affected, and (iii) there was a positive relationship between COVID-19 and market returns during the sample period. The heightened volatility may be attributed to pre-existing struggles in the DSE, the initial panic caused by the outbreak, and the subsequent policy responses. Conversely, immediate policy interventions—such as the introduction of floor prices and circuit breakers—appear to have contributed to positive returns. The study underscores the importance of disseminating positive news and implementing timely market-stabilizing measures to help mitigate the impact of financial shocks.

Keywords: COVID-19, DSEX, DSES, DS30, Volatility

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INTRODUCTION

COVID-19 has triggered a global crisis like no other global health crisis that, in addition to an enormous human toll, led to the deepest global recession since the Second World War (World Bank, 2020). Most stock market indices, such as those in America, Europe, and Asia, have flopped due to COVID-19. While many industrialized nations struggled to deal with the COVID-19 catastrophe, Bangladesh, a nation plagued by poverty, experienced enormous hardship (Raihan et al., 2020; Raihan et al., 2021a; Raihan et al., 2021b; Raihan et al., 2022a; Raihan et al., 2022b; Raihan et al., 2022c; Raihan et al., 2022d; Raihan et al., 2023; Raihan et al., 2024; Sayeed Al-Zaman, 2020).

As of 11 February 2023, there were 755,918,338 confirmed cases of COVID-19 worldwide, resulting in 6,856,229 fatalities (COVID-19 Situation Updates, 2023). However, COVID-19 had severe effects between the years 2020 to 2021. By 26 December 2021, 278,714,484 people were affected, and 5,393,950 people died all over the world due to COVID-19 (WHO Bangladesh COVID-19, 2021).

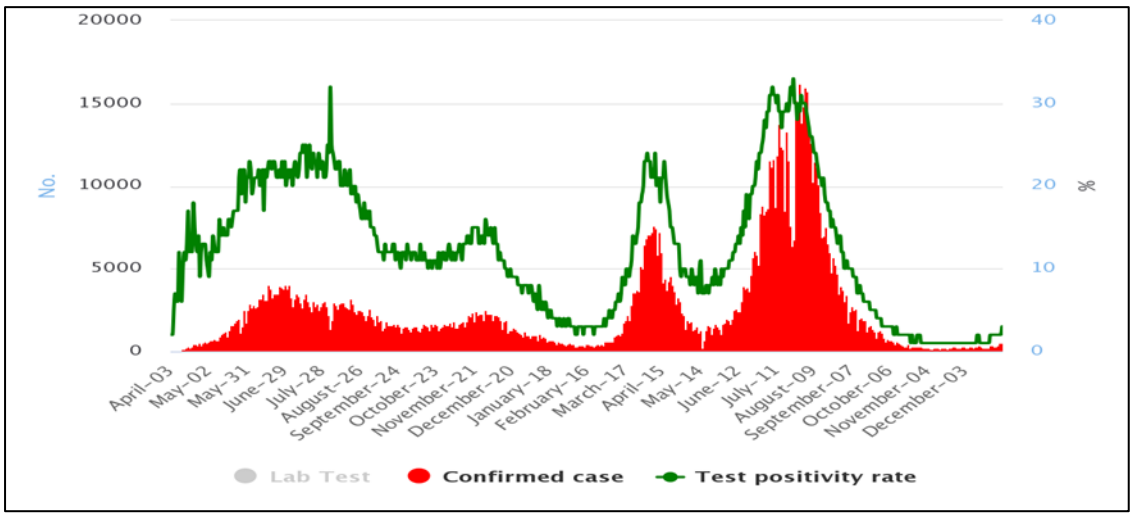

Figure 1: Number of Lab Tests vs Confirmed Cases in Bangladesh from April 2020 to December 2021

Source: http://dashboard.dghs.gov.bd/

Analyzing the effects of COVID-19 on Bangladesh's stock market is a bit of technical work due to the distinct conditions of the DSE at different times. Bangladesh's stock market has been struggling since 2010, and Bangladesh's stock market is the only stock market that has remained closed for more than 3 months (Haque & Chowdhury, 2020). On the other hand, with

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the emergence of COVID-19, the Bangladesh government took a floor pricing policy to stop the bleeding of the already wounded market, which resulted in impressive outcomes. Lower points for the indices of Bangladesh's stock market are seen for the first few months after COVID-19 attacked Bangladesh (lower than in 2019), but the points started to grow in the last half of 2020. Even in September 2021, DSEX skyrocketed to 7,052, the highest level since 2013 (DSE Index Crosses, 2021).

To examine the market returns and volatility conditions for the three DSE indices, Dhaka Stock Exchange Broad Index (DSEX), the Dhaka Stock Exchange Sharia Index (DSES), and the Dhaka Stock Exchange 30 Index, or blue-chip index (DS30), we will use a sample period of 2015 to 2021. We shall divide the sample period into three the pre-COVID period (January 2015 to February 2020), the initial COVID period (March 2020 to June 2020) and the later COVID period (July 2020 to December 2021).

Figure 2: Daily Points of the Three Indices (2015 - 2021)
Source: Stock Now

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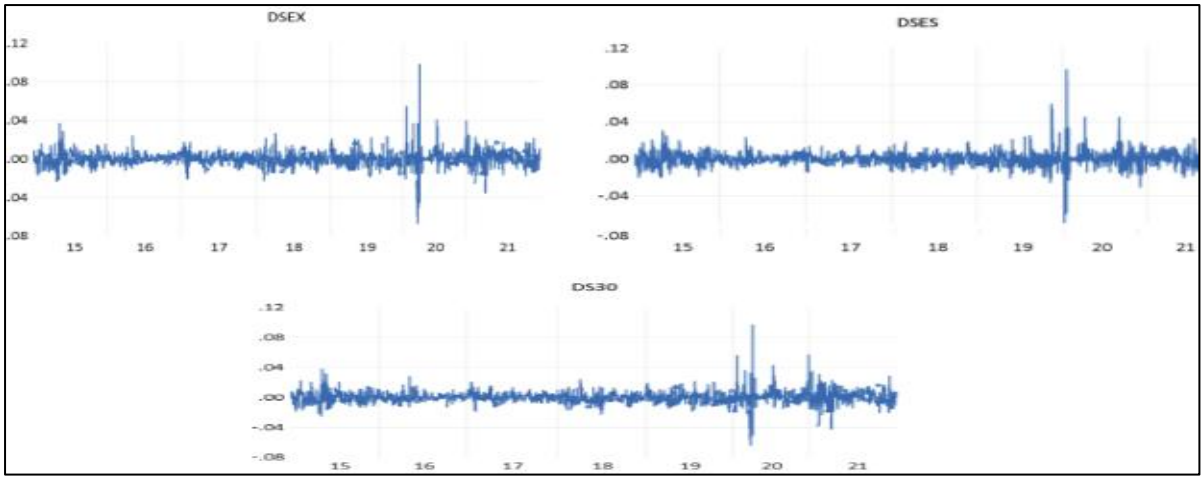

Figure 3: Daily Change in DS30, DSES, and DSEX Percentages (Full Sample Period: January 2015 - December 2021)

Source: Stock Now

Bangladesh's economy began to exhibit cracks before COVID-19 in the form of a financial crisis. Improper banking practices existed even though our nation's GDP has grown annually for the past 10 years (an astounding 8.2 per cent in 2019). Also, we are aware that the stock market suffers if the banking sector is poor. The Dhaka Stock Exchange has had an extremely difficult time resuming a sustained bull run after the stock market meltdown of 2010. Between May 2, 2016, and January 3, 2018, the DSEX increased in value from 4171 to 6318 points. However, the DSEX dropped once more from 6318 points on January 3, 2018, to 4768 points on February 17, 2020, as a result of bad financial regulation in listed companies, placement shares, strategies that promote going to invest in undervalued mutual fund schemes, challenging listing methodologies for ethical dealers, high savings rates provided by Sanchaya Patra/FDRs (which discourage relatively risky stock market investment), a lack of an active bond market, and strict Bangladesh Bank capital mark regulations (Rahman, 2020).

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Figure 4: Daily Points of the Three Indices (January 2015 - February 2020)

Source: Stock Now

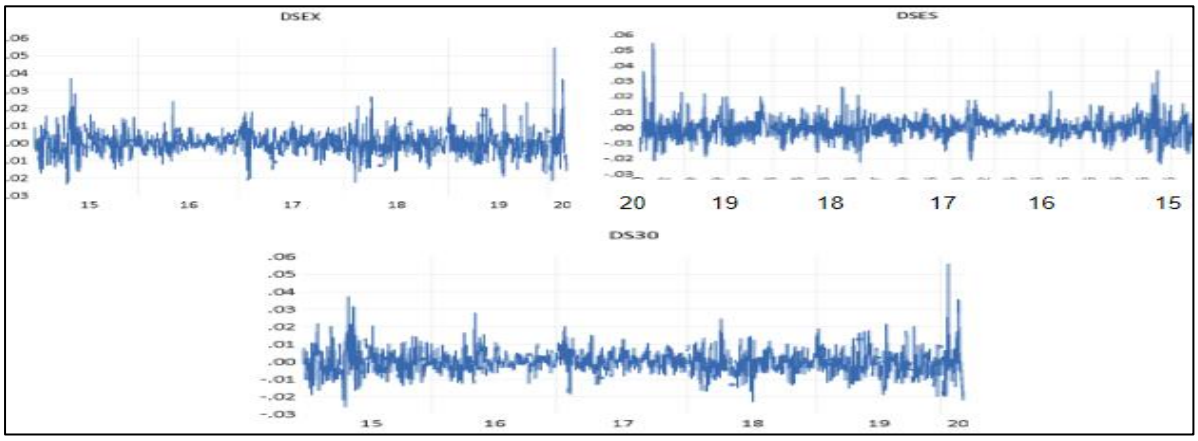

Figure 5: Daily Change in DS30, DSES, and DSEX Percentages (January 2015 - February 2020)

Source: Stock Now

All the cracks that persisted before, later added with COVID-19, made the situation worse. On March 15, 2020, our primary bourse's key index dropped below 4000 points for the first time in the previous five years. Week 1 (March 15 to March 19) brought the stock market an immediate shock when COVID-19 struck Bangladesh for the first time, and a panic run rocked the stability of the capital market. On March 19, 2020, the trading hours were shortened by one hour, beginning at 10:30 am and lasting until 1:30 pm. Week 02 started following the first chaotic week and only lasted four days (March 22 to March 25) (Hamim, 2020). On March 26, 2020, the Dhaka Stock Exchange (DSE) was closed. Because of the contagion, the market was closed for 66 days in FY 2019–20 (Haque & Chowdhury, 2020).

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Figure 6: Daily points of the three indices (March 2020 - June 2020)
Source: Stock Now

Following a nearly four-month break, both stock exchanges of Bangladesh resumed regular business hours on July 8, 2020, from 10:30 am to 2:30 pm. The emergency circuit breaker was put in place for all listed equities on March 19, 2020, by the Bangladesh Securities and Exchange Commission (BSEC). All stocks listed under the new emergency circuit breaker rule had to retain a price that did not drop below the five-day average closing price, and a stock's opening adjusted price had to represent the circuit breaker's floor price for the day (Haque & Chowdhury, 2020). Towards the end of 2020, the DSE Broad Index rose by 21.31% to 5402.07 points from 4452.93 points in 2019. As of December 2020, the DSE's market capitalization has increased by 32% as compared to the same time in 2019 (Ahamed, n.d.). In fact, on September 5, 2021, the Dhaka Stock Exchange reached a record high as its index surpassed 7,000 points (DSE Index Crosses, 2021).

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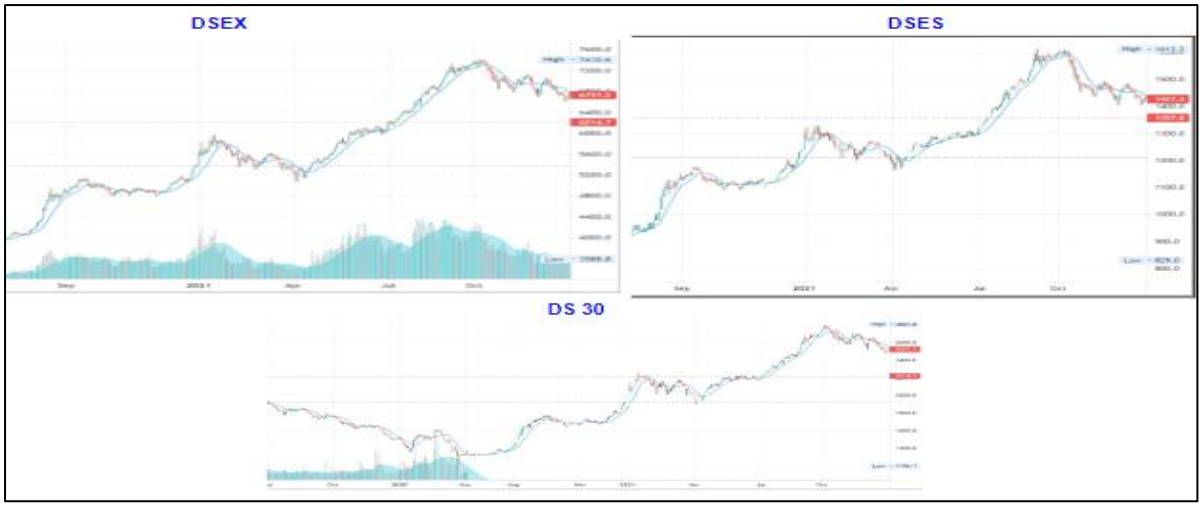

Figure 7: Daily Points of the Three Indices from July 2020 to December 2021

Source: Stock Now

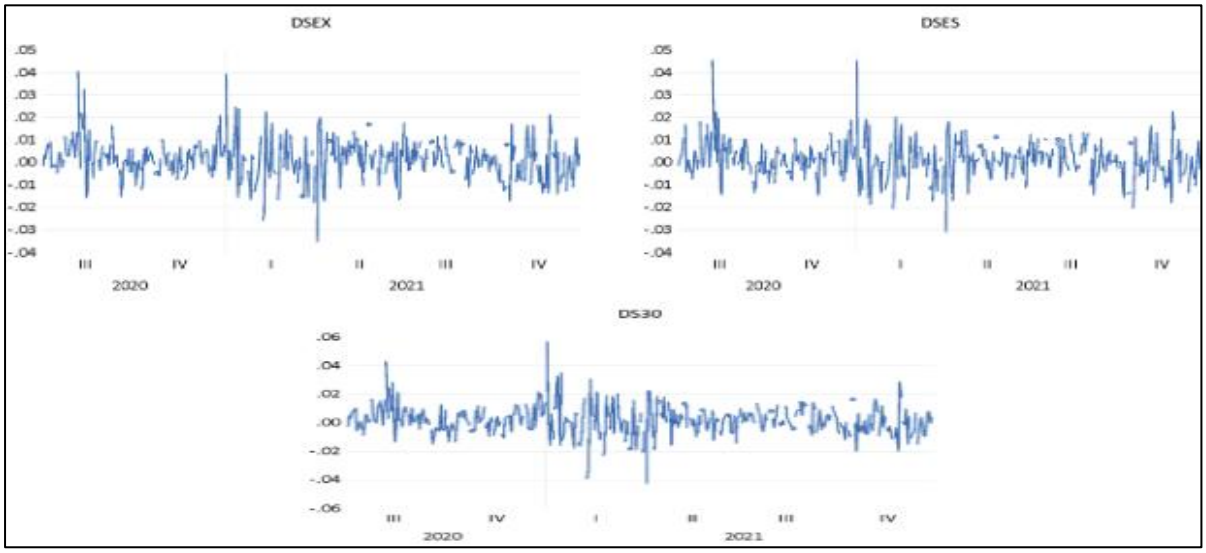

Figure 8: Daily Change in DS30, DSES, and DSEX Percentages for the later COVID period (July 2020- December 2021)

Source: Stock Now

This paper aims to investigate the impact of the COVID-19 pandemic on the Dhaka Stock Exchange (DSE) by focusing on three key indices: the Dhaka Stock Exchange Broad Index (DSEX), the Dhaka Stock Exchange Sharia Index (DSES), and the blue-chip index (DS30). Specifically, the study considers the unique characteristics and institutional context of Bangladesh's stock market during the pandemic period. It also seeks to compare the varying effects of COVID-19 across the three indices, thereby providing a more nuanced understanding

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of market behaviour. Additionally, the paper analyzes return and volatility patterns throughout the pandemic, offering insights that may help investors, policymakers, and market participants prepare for similar market disruptions in the future.

REVIEW OF LITERATURE

Various stock market literature concerns the influence of the COVID-19 pandemic on the stock markets of the world. Most of these studies imply that the stock market and the coronavirus epidemic are associated in some way. The empirical literature review concerning the effect of COVID-19 on the stock market is summarized in Table 1.

Table 1: *Summary of the Impact of COVID-19 on the Stock Market*

Authors (Year)	Countries	Study Period	Methodology	Main Finding
Hamim (2020)	Bangladesh	2019-2020	Descriptive studies	COVID-19 affects the DSE & its market participants substantially.
Golder et al. (2022)	Bangladesh	2014-2021	GJR-GARCH (1,1) model	The COVID-19 infection has a substantial positive impact on return & volatility conditions, leading to increased market volatility in all indices.
Hossain et al. (2021)	Bangladesh	2020-2021	OLS, Descriptive studies	The study indicates a significant negative impact of the COVID-19 pandemic on the stock market indexes of DSE, with specific variables like daily new confirmed cases, bank rate, inflation rate, and interest rates influencing the DSE indices negatively.
Adnan et al. (2020)	Bangladesh	2020	Event study approach, AAR, CAARs	The announcement of the first COVID-19 detection in Bangladesh has a significant negative effect on stock market returns across all firms and industries, with both financial and non-financial industries
Ahmed (2021)	Bangladesh	1997-2020	ARIMA	Observe the presence of market efficiency anomalies.
Aktar et al. (2020)	Bangladesh	2020	Baseline model estimation & Regression analysis	Stock market returns react negatively to the growth of confirmed COVID-19 cases, with a stronger reaction observed in the early days of confirmed cases.

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Authors (Year)	Countries	Study Period	Methodology	Main Finding
Qamruzzaman et al. (2021)	Bangladesh	2020	ARDL model	COVID-19 harms the stock market behaviour in both the short-term and long-term.
Bora and Basistha (2021)	India	2019-2020	GJR GARCH) model	The return on the stock market indices was higher in the pre-COVID-19 period than during the COVID-19 period.
Ozkan (2020)	Turkey	2019-2020	GARCH model	The impact of COVID-19 on the Turkish stock market volatility disappeared after March 2020.
				The realized volatilities of sector indices returned to normal post-March 2020, indicating the dissipation of COVID-19's effect.
Adenomon et al. (2022)	Nigeria	2015-2020	EGARCH, QGARCH	The study found a negative impact of COVID-19 on the Nigerian Stock Exchange, leading to a loss in stock returns and high volatility during the COVID-19 period.
Fakhfekh et al. (2021)	Tunisia	2016-2020	EGARCH, FIEGARCH, TGARCH	Volatility became more persistent in all series after the COVID-19 outbreak. Different sector return volatilities showed varying levels of asymmetric effects during the COVID-19 period.
Xu (2022)	Canada	2020	REGARCH, VAR	Finds a significant increase in market volatility due to COVID-19, a potential stabilization effect from positive government announcements, and the improved accuracy of risk predictions with the proposed model.
Priyono and Kartiko (2021)	Indonesia	2020-2021	ECM, GLS	The daily number of reported COVID-19 cases negatively impacts the Indonesian Sharia Stock Market Index (ISSI) during the pandemic.
Elsayed and Elrhim (2020)	Egypt	2020	Multiple regression analysis	The stock market sectors are more sensitive to cumulative mortality indicators than daily deaths from the coronavirus. Different sectors exhibit varying levels of sensitivity.
Baker et al. (2020)	United States	1918-2020	Descriptive studies	Observe the dominant role of COVID-19 news in stock market moves and the emphasis on

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Authors (Year)	Countries	Study Period	Methodology	Main Finding
				business closures and social distancing as key factors.
Yong et al. (2021)	Malaysia, Singapore	2020	EGARCH	Stock market returns in Malaysia and Singapore showed decreased persistence during the COVID-19 pandemic.
Szczygielski et al. (2021)	Asia, Europe, Africa, Latin America, North America, Arabian Markets	2019-2020	IGARCH	The study emphasizes the diverse impact of COVID-19 across regions, with negative effects on returns and volatility triggered by global uncertainty, except for Arab markets.
Yousef (2020)	G7 countries	2019-2020	GJR-GARCH	COVID-19 had a significant positive impact on the stock market volatility of G7 indices.
Samitas et al. (2022)	51 stock market	2020	A-DCC	The daily number of COVID-19 cases shows a significant negative relationship with various stock indices, indicating a potential financial contagion risk associated with the pandemic and lockdown measures.

The empirical outcomes on the nexus between the stock market and COVID-19 have been invariably mixed. Some studies (Adenomon et al., 2022; Adnan et al., 2020; Aktar et al., 2020; Baker R et al., 2020; Bora & Basistha, 2021; Hossain et al., 2021; Priyono & Kartiko, 2021; Qamruzzaman et al., 2021; Samitas et al., 2022; Szczygielski et al., 2021) find the negative impact of COVID-19 on the stock market, while Ahmed (2021) and Golder et al. (2022) show positive stock market returns during COVID-19. A study from Ahmed (2021) states that the DSEX increased by 21.31% to 5402.07 points at the year's end of 2020 from 4452.93 points in 2019. DS30, climbed by 36.41% to 2078.95 points in 2020. Turkey's stock market suffers for a shorter period due to COVID-19, as per the analysis of Ozkan (2020).

In the case of volatility conditions, few studies (Golder et al., 2022; Szczygielski et al., 2021; Xu, 2022; Yong et al., 2021; Yousef, 2020) give evidence that COVID-19 causes increased volatility, whereas few studies (Ahmed, 2021; Fakhfekh et al., 2021) show persistent volatility during the COVID period. Again, various studies (Adnan et al., 2020; Elsayed & Elrhim, 2020;

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Fakhfekh et al., 2021; Özkan, 2020) have examined the sector-wise impact of COVID-19 on the stock market.

DATA AND METHODOLOGY

Research Design

Secondary data have been used for our current study. For the first objective, we have used descriptive analysis, graphs, patterns, and historical information. For the second and third objectives, we have used the GJR-GARCH model. The current paper incorporates a sample period of 7 years from January 2015 to December 2021.

Data Collection and Data Analysis

For the study, data are collected from investing.com, DSE, Stock Now, OECD, DGHS dashboard, IEDCR, WHO, and various newspapers like The Business Standard, The Daily Ittefaq, etc.

We have analyzed data for three separate indices –the DSEX, the DSES, and the DS30 over several periods: the pre-COVID era from March 2020 to June 2020, and data from July 2020 to December 2021 are analyzed under the later COVID era. The COVID-19 timeframe is certified after the 8th of March, and a dummy is added to the model based on this date, as the IEDCR identified the first COVID-19 patient on March 8, 2020; the trading day before March 8th is designated as the pre-COVID period.

Model Specification

The issue of volatility clusters is well-represented by the GARCH model, which Bollerslev introduced in 1986 as an expansion of the ARCH model. The GJR-GARCH model, which looks at the asymmetry reaction of conditional instability to news, is used in this analysis to overcome the drawbacks of the traditional GARCH model, which enforces symmetric instability feedback to both favourable and unfavourable innovations (Glosten et al., 1993; Zakoian, 1994).

Steps for the GJR-GARCH Model

The daily pricing data of the three indices of DSE are collected. Then, employing the natural log difference method, the returns of all market indexes will be calculated (Chaudhary et al., 2020; Duttilo et al., 2021).

$$R_{n,t} = ln \frac{P_{n,t}}{P_{n,t-1}} \quad (1)$$

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Where, $R_{n,t}$ is the daily return on index n at period t,

$P_{n,t}$ is the daily final value of index n at period t,

$P_{n,t-1}$ is the daily final value of index n at period t-1.

The other subsequent phases of this investigation move forward: In the first phase, to determine whether a data set is stationary, unit root testing is used. In this instance, the stationarity of the data is checked using the Augmented Dickey-Fuller (Dickey & Fuller, 1981) and Phillips-Perron (Phillips & Perron, 1988) unit root checks. The Autoregressive Conditional Heteroscedasticity-Lagrange Multiplier test (ARCH-LM) (Engle, 1982) is used to assess time-series data for heteroscedasticity and establish if an ARCH/GARCH outcome exists in the interest of discovering volatility in phase 2. The GARCH family technique is used in the third phase to forecast the volatility of the Dhaka Stock Exchange indices.

The GJR-GARCH model can explore the leverage effect as well (Duttilo et al., 2021). The conditional mean and conditional volatility equations of the GJR-GARCH model are therefore updated in this study to assess conditional volatility, and one extraneous dummy variable is introduced to the model to indicate the effects of the COVID-19 infection. We enter 0 for the pre-COVID period & 1 for the COVID period.

The model GJR-GARCH (1,1) is as follows, with an external dummy variable: The equation of the conditional mean:

$$R_{n,t} = \rho + \theta_1 R_{n,t-1} + \omega_1 COVID-19_t + \epsilon_{n,t} \quad (2)$$

The conditional volatility equation is as follows:

$$\sigma_{n,t} = \Phi + \varphi_1 \sigma_{n,t-1} + \upsilon_1 \epsilon_{t-1}^2 + \lambda_1 I_{t-1} \epsilon_{t-1}^2 + \Omega_1 COVID-19_t \quad (3)$$

Here, $I_{t-1} = \begin{cases} 1 \; if \; \epsilon_{t-1} < 0 \; Bad \; news \\ 0 \; if \; \epsilon_{t-1} \geq 0 \; Good \; news \end{cases}$

Here, in the conditional mean equation, $R_{n,t,}$ and $\epsilon_{n,t}$ denote the return and residual of the stock index n at period t, respectively. ρ stands for the constant. $R_{n,t-1,}$ and $COVID-19_t$ is the one-

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period lag of return of stock index n at period t−1, and the dummy variable for the COVID-19 outbreak at time t. Moreover, θ_1 and ω_1 are the respective coefficients of $R_{n,t-1}$and $COVID-19_t$.

Again, in the conditional volatility equation, $\sigma_{n,t}$ signifies the conditional standard deviation of stock index n at period t, Φ is the constant. $\upsilon_1, \varphi_1, \lambda_1, and\ \Omega_1$ are coefficients of ARCH, GARCH, leverage, and a dummy variable for the COVID-19 pandemic. $\upsilon_1, and\ \varphi_1\ are$ non-negative parameters which indicate the ARCH and GARCH effects, respectively, and both must be significant. Nonetheless, a greater portion of volatility is indicated if the sum of $(\upsilon_1 + \varphi_1)$ is near to 1 (Chaudhary et al., 2020; Rastogi, 2014).

Undesirable breakthroughs have worse consequences than positive shocks, according to the asymmetric or leverage component, λ_1, and λ_1 must be more than zero to reflect the impact of leverage.

The conditional volatility equation is affected by both the positive news ($\epsilon_{t-1} \geq 0$) and the negative news ($\epsilon_{t-1} < 0$). Although the unfavourable occurrence results from $\upsilon_1 + \lambda_1$, the favourable incidence affects φ_1. The presence of a positive λ_1 indicates that negative shocks increase fluctuation more than positive ones, and a zero value of λ_1 indicates a symmetrical effect of a shock. Moreover, $\upsilon_1 + \lambda_1 \geq 0$ in the GJR GARCH model.

If the conditional mean equation includes a positive and statistically significant coefficient for COVID-19, it indicates that COVID-19 and an increase in market yield are related. Again, in the conditional volatility equation, if COVID-19's coefficient is positive and statistically significant, it may be possible to link it to an increase in market volatility. To validate the findings, some diagnostic tests are incorporated.

RESULT ANALYSIS AND DISCUSSION

Descriptive Analysis

Table 2: *Descriptive Analysis of the Three Indices*

Periods	Details	DSEX	DSES	DS30
(A) Full sample period	Mean	0.000188	0.000113	0.000191
	Median	0.000330	0.000229	0.0000933

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(January 2015-December 2021)	Maximum	0.097984	0.096598	0.096848
	Minimum	-0.067371	-0.072423	-0.063946
	Std. Dev.	0.008391	0.008253	0.008907
	Skewness	0.780390	0.732496	0.798505
	Kurtosis	20.04675	22.43593	17.14455
	Jarque-Bera	20279.95	26229.04	14022.91
	Probability	0.000000	0.000000	0.000000
	Observations	1661	1661	1661
(B)Pre COVID-19 period (January 2015-February 2020)	Mean	-0.0000782	-0.0000758	-0.000168
	Median	0.0000734	0.0000776	-0.000206
	Maximum	0.054454	0.054453	0.55760
	Minimum	-0.023588	-0.023588	-0.025883
	Std. Dev.	0.007062	0.007065	0.007206
	Skewness	0.663955	0.665484	0.713203
	Kurtosis	7.500258	7.510937	7.538018
	Jarque-Bera	1149.401	1154.029	1181.383
	Probability	0.000000	0.000000	0.000000
	Observations	1253	1253	1253
(C). Initial COVID-19 period (March 2020-June 2020)	Mean	-0.002446	-0.002589	-0.002318
	Median	-0.000141	0.000000	0.0000227
	Maximum	0.097984	0.096598	0.096848
	Minimum	-0.067371	-0.072423	-0.063946
	Std. Dev.	0.024370	0.025145	0.024123
	Skewness	0.954530	0.692738	0.947801
	Kurtosis	9.688809	8.871058	9.557854
	Jarque-Bera	82.65715	62.16432	79.60622
	Probability	0.000000	0.000000	0.000000
	Observations	41	41	41
(D)Later COVID-19 period	Mean	0.001445	0.001204	0.001745
	Median	0.001850	0.001180	0.001888
	Maximum	0.040481	0.045625	0.056900
	Minimum	-0.035054	-0.030711	-0.042319

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(July 2020-December 2021)	Std. Dev.	0.008999	0.008773	0.010737
	Skewness	0.216563	0.451526	0.283846
	Kurtosis	5.295942	6.192675	6.365695
	Jarque-Bera	83.02147	167.4237	177.1798
	Probability	0.000000	0.000000	0.000000
	Observations	365	365	365

In our analysis, the mean returns (mean values) of all the indices across the whole sample period and also for the later COVID-19 period show positive results, but DSEX, DSES, and DS30 show negative mean returns for both the pre-COVID-19 era and the initial COVID-19 era. In all periods (except the pre-COVID-19 period), the mean return is the highest for the DS30 index and lowest for the DSES index. Thus, an analysis of a unique market context can be found.

DSEX has the highest maximum value of 0.097984 and the lowest minimum value of -.067371 in the initial COVID period. DSES has the highest maximum value of 0.096598 and the lowest minimum value of -0.072423 during the initial COVID period. DS30 has the highest maximum value of 0.096848 and the lowest minimum value of 0.096848 during the initial COVID period. Standard deviations in this case are minimal across all indices and periods. The initial COVID-19 stage has slightly greater standard deviations for all indicators than at other times. Here, for all indices and all periods, JB Tests are quite large and significant.

Unit Root & ARCH-LM Test

Table 3: *Augmented Dickey-Fuller, Phillips-Perron & ARCH-LM Test Outcomes (January 2015- December 2021)*

Index	Particulars	AD Test statistics	PP Test Statistics	ARCH-LM Test Statistics (Obs*R-squared)
DSEX	ADF cl/PP cl	-14.14489***	-34.71192***	120.8471***
	ADF ctl/PP ctl	-14.17117***	-34.70791***	
DSES	ADF cl/ PP cl	-15.12153***	-35.03970***	112.6533***
	ADF ctl/PP ctl	-15.13181***	-35.03723***	
DS30	ADF cl PP cl	-13.68030***	-35.14941***	136.3126***

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	ADF ctl/PP ctl	-13.71370***	-35.07799***	

Note: cl = with constant at level, ctl = with constant and trend at level, ***denotes significant effect at 1 % level.

According to estimations from both ADF and PP unit root evaluation, all of these variables (DSEX, DSES, and DS30 index) are stationary at the level in constant and constant plus trend. The LM statistical results support the GARCH model's applicability by disproving the null hypothesis that there is no ARCH effect and demonstrating that an ARCH effect is rooted in the time series models' residuals.

The GJR-GARCH (1,1) Model with COVID-19 Dummy Variable

Table 4: *Modelling GJR-GARCH (1,1) (January 2015- December 2021)*

Particulars	DSEX	DSES	DS30
Part A: Results of Conditional Mean Equations			
$\boldsymbol{\rho}$	-0.0000966 (-0.497461)	-0.000171 (-1.109267)	-0.000156 (-0.951818)
$\boldsymbol{\theta_1}$(One Period Lag of Return)	0.204249*** (7.608617)	0.184088*** (7.078220)	0.186300*** (7.209504)
$\boldsymbol{\omega_1}$(COVID-19)	0.001052** (2.064220)	0.000748* (1.636045)	0.001173** (2.514204)
Part B: Results of Conditional Volatility Equations			
$\boldsymbol{\Phi}$	0.0000025*** (4.842170)	0.00000264*** (6.155757)	0.0000025*** (5.465140)
$\boldsymbol{\nu_1}$(ARCH Effect)	0.138529*** (7.789076)	0.154233*** (7.639488)	0.150494*** (7.867321)
$\boldsymbol{\varphi_1}$(GARCH Effect)	0.723428*** (35.79470)	0.728557*** (36.80199)	0.766338*** (37.22430)
$\boldsymbol{\lambda_1}$(Leverage Effect)	0.190462*** (4.953607)	0.159727*** (6.344712)	0.108881*** (4.473348)
$\boldsymbol{\Omega_1}$ (COVID-19)	0.00000061** (2.013730)	0.00000319*** (3.508087)	0.000253** (2.228056)
Part C: Model Statistics			

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$\boldsymbol{\nu_1 + \varphi_1}$	0.861957	0.88279	0.916832
Schwarz criterion	-7.147877	-7.168924	-6.997849
Akaike information criterion	-7.159378	-7.195070	-7.023943
Hannan-Quinn Criterion	-7.149706	-7.185378	-7.014272

[Note: Records in Table 4's first bracket () indicate the Z score. Significant effects are indicated by ***, **, * at successively 1%, 5%, and 10% levels.]

Three sections of the results are presented in Table 4. Section A of Table 4 presents the findings of the conditional mean equations for the three models of the three indices. Here, the previous value of returns significantly predicts the current series in all cases favorably ($\boldsymbol{\theta_1}$). Yet, compared to the other two indices, namely DSES and DS30, DSEX's historical return values have a greater influence on predicting the current return series. Moreover, COVID-19 affects all of the DSE indices, raising market returns.

The results of the conditional volatility equation are shown in (Part B), and for all the indices, the coefficients of the constant, ARCH ($\boldsymbol{\nu_1}$), GARCH ($\boldsymbol{\varphi_1}$), leverage ($\boldsymbol{\lambda_1}$), and COVID-19 are positive and statistically significant. The ARCH concept signifies the most recent information, and its statistical significance demonstrates that recent news has had an impact on the stock market's volatility. Here, the Sharia index (DSES) has the highest significant ARCH effects, with the DSEX having the lowest and the Blue-chip index (DS30) having the second-lowest. As a result, the DSES is most affected by recent events, followed by the DS30 and DSEX, respectively.

Additionally, the GARCH term has statistical significance, which suggests that market volatility is influenced by past information. A similar conclusion was drawn by Ahmed and Naher (2021). The outcome demonstrates that the shocks to conditional variance demand the largest amount of time to drop for the DSE Broad Index (DSEX), followed by the DSES, and the DS30.

If the ARCH and GARCH terms' combined coefficients are close to 1, any shock may continue to have an impact on the conditional variance predictions. As a result, the DS30, followed by

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the DSES, and DSEX, had the longest-lasting effects on conditional volatility, according to Table 4, Part C.

The results of Table 4, section B, show that the DSEX has the lowest asymmetric impact and the DS30 has the highest asymmetric impact (Leverage effect). However, compared to the other two indices that influence the leverage effect, the DSES is in the centre.

Furthermore, the results of Table 4, part B, demonstrate that COVID-19 increased market instability in all indices and that the infection has a significant positive impact on the conditional variance for all indices. The DSES, which came in second in terms of market volatility, and the DSEX were affected the least by the COVID-19 virus. The DS30, on the other hand, is the most impacted by the coronavirus.

Diagnostic Tests

Table 4 (Part C) reports some results of the diagnostic test of this GJR-GARCH model. The value of the ARCH & GARCH term is less than one, indicating a mean-reverting process. Again, the values for the Akaike Information Criterion, Schwarz Information Criterion, and Hannan-Quinn Criterion for the corresponding three indices indicate a good fit for the model.

Table 5. *ARCH-LM & Durbin-Watson Test Results*

Index	ARCH Effect (Obs*R-squared)	Durbin-Watson Test Statistics
DSEX	1.222631	2.051443
DSES	0.762279	2.036603
DS30	1.154908	2.026196

The outcome implies that the models are homoskedastic, as all three models are executed suitably in this investigation. Here, the DW test results for all three indices are around 2. So, we find no autocorrelation in the residuals of the data.

CONCLUSION AND RECOMMENDATION

This paper looks at the specific stock market contexts of Bangladesh from 2015 to 2021 and accounts for the impact the COVID-19 on market returns and volatility of the three indices (DSEX, DSES, DS30) of the DSE. After analyzing the secondary data through the GJR-GARCH model this study finds that COVID-19 has a substantial impact on market return and

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volatility of the stock market of Bangladesh (DSE). This means over the sample period, COVID-19 increases the volatility of the Dhaka Stock Exchange.

In analyzing market contexts, we have found positive mean returns for all three indices for the entire sample period, negative mean returns in the pre and initial COVID-19 period and in the later COVID-19 period, a positive mean return is revealed (See Table 2), indicating strong positive market reaction for all indices for later parts of the COVID-19 period.

The conditional volatility equations are significantly positively impacted by the COVID-19 infection, which raises market volatility across all indices, and COVID-19 also has a sizable positive impact on the conditional mean equations in all indices of the DSE. (Table 4, parts A and B) Policies such as floor pricing, lowering the interest rate of deposits, increased remittances, resumption of exports after lockdown, and the help of large-cap companies may be the reason for positive returns even in periods of high volatility due to COVID-19.

The study has found that the past value of returns significantly predicts the current series in all cases positively. Again, positive and significant coefficients of ARCH, GARCH, and Leverage effects for all indices are found, which indicates the effects of current news on volatility and asymmetry (Table 4, Parts A and B)

The investigation also acquires enough information to compare the effects of the three indices of DSE. We have found that COVID-19 increases volatility ($\boldsymbol{\Omega_1}$) most in the blue-chip index (DS30), the DSES index in the second, and volatility in the DSEX due to COVID is the least. (Table 4, Part B). Significant positive impact of COVID-19 on market return ($\boldsymbol{\omega_1}$) is highest for the DS30 index and lowest for the DSES index (Table 4, Part A).

Recent good or bad news affects the stock market substantially. So, authorities should spread some good news to dispel the effects of bad news (outbreak of COVID-19), such as ensuring loans, and circuit breakers. Due to several limitations and time constraints, the study is confined to DSE. A researcher can work with both DSE and CSE. Again, the sector-wise impact can be shown by other researchers.

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