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Impact of COVID-19 Shocks on the Volatility of Stock Markets of Emerging Economies

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Abstract: The COVID-19 Outbreak has increased volatility in Pakistan relative to other growing countries on international stock markets. This study examines this phenomenon using the Threshold Generalized Autoregressive Conditional Heteroscedasticity (TGARCH) model. This daily time-dependent information flows into the market for PSX-listed equities are explained. This research aims to provide empirical evidence in favor of the TGARCH specification. Through COVID-19, we observed that the volatility of returns from developing countries significantly affects the Pakistani stock market, utilizing data from a selection of countries' stock markets at their respective closing times between January 1, 2015, and April 30, respectively, 2022. Descriptive statistics, Correlation, and TGARCH Model were used to find the desired outcomes. In addition, findings indicate that the Bombay Stock Exchange (BSE) and Shanghai Stock Exchange (SSE) play a pivotal role in understanding the volatility of Pakistan, a developing nation. Despite the existence of the leverage effect during COVID-19, we were unable to find any correlation between the performance of stocks on the Dhaka Stock Exchange (DSE) and volatility on the Karachi Stock Exchange (KSE). The study will provide more information to investors, brokers and market players about the volatility of the financial markets.

Keywords: Stock Market indices, Volatility, TARCH, E_GARCH, GARCH (1, 1)

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INTRODUCTION

The COVID-19 pandemic may have relatively short-term economic effects on the stock market of emerging economies. However, this shock wave's long-term impact on the financial markets might be severe. This pandemic poses a massive danger to humanity and is quickly spreading worldwide (Alnassar & Chin, 2015).

Anxieties about the economy, financial system, and market contribute to economic instability (Hartwell, 2018). Fundamental forecasts can sometimes trigger market turbulence. According to (Onan et al., 2014), both positive and negative announcements affect market volatility asymmetrically.

In addition, it has been hit hard by the widespread COVID-19 virus. In light of recent research on the COVID-19 pandemic, the business strength that existed before the pandemic may have aided stock performance throughout the crisis.

COVID-19 preventive measures may be less effective in a culture that values independence (i.e., individualism) above dependence (i.e., collectivism). Understanding the interplay between the COVID-19 pandemic and organizations' immunity is illuminating if seen through the lens of culture.

Financial intervention policies and their effects on investor trading patterns and the subsequent returns of equities markets during the COVID-19 pandemic need to be thoroughly understood. Experts in the fields of culture and economics have concluded that investors' trust and faith in data about government intervention policies might vary significantly among nations due to cultural variations (Aggarwal et al., 2012; Farooq and Amin, 2017).

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Global markets have been less volatile as the coronavirus outbreak has expanded (COVID-19). The components of the COVID-19 global fear index companies used to move in tandem with stock market volatility (reported case index, reported death index, and corona fear index) ultimately failed to do so (Salisu & Akanni 2020).

World Health Organization (WHO) designated Covid-19 a pandemic in March 2020, and financial markets worldwide have faced increasing volatility. More market volatility has been produced by the Covid-19 health catastrophe than by any previous health tragedy, including the Spanish Flu epidemic of 1918, according to (Baker et al., 2020). Fallouts of up to 30 percent were seen in the world's three largest markets: the United States, Japan, and Europe (Marobhe, 2021). The government's strict responses decreased economic activity, explaining this phenomenon (Akhtaruzzaman et al., 2021).

Consequently, stock prices tend to follow the crowd rather than reflect intrinsic value. Because of this, the investor overreaction hypothesis casts doubt on the efficacy of markets. The impact of unforeseen occurrences on stock prices should be investigated. The recent worldwide stock market meltdown and economic downturn have been attributed partly to the COVID-19 pandemic, an unexpected occurrence with far-reaching consequences (Shah et al., 2020).

Shocks to the real economy may be caused by widespread economic instability brought on by systemic events that disturb the regular operation of the financial system (Duca & Peltonen, 2013; Thanh et al., 2020). In light of recent research on the COVID-19 pandemic, business strength that existed before the pandemic may have aided stock performance throughout the crisis (Ding et al., 2020)

The pre-pandemic spread of Covid-19 has significantly affected the economy, leading to a drop in trade, tourism, logistics, and food shortages. It was impossible to disregard Covid-19's effect on the financial sector in light of recent stock market bubbles (Albulescu, 2021). The physical and financial repercussions of the pandemic are causing investors and institutions to deal with a substantial amount of uncertainty, which may be frustrating for both parties. The most recent Outbreak of COVID-19 has disrupted financial markets across the globe. Because of this, the World Health Organization (WHO) professed the COVID-19 pandemic. Since the current outbreak started in February 2020, the stock market has seen several shock waves since COVID-19 is still a mystery, and market volatility will keep increasing (Khan et al., 2021).

The response of the investors was really shocking, and investment in the market was badly affected. I also dug out that the economy of Pakistan and China remains stable compared to the economy of India, equity market of India remains under depression due to mismanagement. It will take more time to normalize the economies with the envelopment of advanced technology (Rasool et al., 2023).

Statement of Problem

COVID-19 has had a significant negative influence on the global economy. Due to partial or complete lockdowns implemented by several countries, economic activity has been reduced or halted, causing financial hardship for firms. The stock market's decline has also been widely reported, which is a cause for concern given that the needs are a barometer of the economy. Companies and enterprises in several industries, including agriculture, construction, education, textiles, tourism, transportation, and oil and gas, have been hit hard by the global economic slowdown caused by the epidemic. Specific industries, including health and internet services, are booming despite the epidemic. This study aims to investigate the effects of the pandemic (COVID-19) on stock markets and compare the severity of the impact across nations according to when they were first infected.

Significance of the Study

The study aims to analyze how the pandemic influenced stock prices and how the market reacted in various nations at various times. The goal is to learn whether or not the countries' stock markets and the times people become infected with the pandemic follow similar patterns. Knowledge of stock market activity is crucial for investors, governments, corporations, enterprises, and people, and this study contributes much to their ability to do. Practically, study will assist to the hedgers and market players in getting diversification and volatility during a pandemic.

Objectives

The followings are the objectives of this study.

- To investigate the COVID-19 pandemic impact on the volatility of stock markets in emerging economies.
- To identify the leverage effect during a COVID-19 pandemic in emerging economies.
- To investigate the daily time dependence regarding the influx of stock trading information in emerging stock markets.
- To suggest guidelines to portfolio managers regulators, and policymakers regarding current pandemic shocks to the emerging markets.

REVIEW OF LITERATURE

Corbet et al. (2020) analyzed the spread of the COVID-19 virus. The authors suggest that the Chinese financial markets have been at the epicenter of financial and physical contagion since the onset of the COVID-19 epidemic. The research results show many features typical of a "flight to safety" throughout the period analyzed. Bit-coin's association with the Chinese stock market has developed throughout the era of the massive financial crisis.

Ashraf et al. (2020) investigated the effect of IEIs during the COVID-19 epidemic. S&P Dow Jones said IEIs maintained their performance advantage over traditional index funds in the first quarter of 2020. The careful management of IEIs and the possible hedging advantages support this assertion. The results show that IEIs offer hedging advantages during the market downturn and that hedging benefits are associated with an extra cost, as suggested by the research.

Kumeka et al. (2021) examined how external factors, such as health crises, affected African stock markets. The authors specifically looked at how well 12 different African nations' top stock markets held up throughout the current worldwide epidemic. This research employs the recently developed panel vector autoregressive model to represent the stock market's reaction to shocks in COVID-19, commodities markets, and the currency rate. The authors also analyzed the panel Granger causality test to ensure the validity of their findings. Information was gathered from January 2, 2020, to December 31, 2020. According to the results, African stock markets are adaptable and resistant to the COVID-19 pandemic. Still, they are vulnerable to external shocks like fluctuating commodity prices and the currency exchange market. However, the effect wears off quickly, in a matter of days.

Mushafiq (2021) aimed to evaluate how COVID-19 may affect equity markets in emerging economies. This study takes a novel approach to the event study method to determine how COVID-19 has impacted emerging stock markets. These results show that COVID-19 affected most sectors traded on the Pakistan Stock Exchange negatively. The commercial banking, insurance, real estate, and textile industries were all severely impacted by COVID-19. On the other hand, the pharmaceutical, refining, food, and personal care product businesses have all responded favorably.

Monika and Rupish (2021) investigated research to determine whether and how the COVID-19 pandemic influenced investors' sentiments and the stock market's subsequent performance. Investor sentiment towards the COVID-19 Outbreak is measured using an index based on Google Trends' Search Volume Index of search phrases related to COVID-19 terminology and expressions supplied by Google and Internet dictionaries. The COVID-19 fear index was used to analyze the impact of worry on investment returns. The study shows a significant negative association between fears about COVID-19 and stock performance. This study, unlike others, discovered a connection that persisted for an extended period. This bond will not loosen in the coming days. The results demonstrate that concern about COVID-19 considerably impacts the stock market. In contrast to earlier studies, this sensation lasts for quite some time until it fades.

Bora and Basistha (2021) used a generalized autoregressive conditional heteroscedasticity model to study the influence that COVID-19 has on the volatility of stock prices in India. For this research, the daily closing prices of the stock indexes, Nifty and Sensex, were utilized, and the period covered was from September 3, 2019, to July 10, 2020. According to the findings, the stock market in India went through a period of extreme volatility during the epidemic. When they compared the result obtained during the COVID period with the ones obtained during the pre-COVID era, results discovered that the return on the indices was more significant during the pre-COVID-19 time than during the COVID-19 period.

Shamsudheen et al. (2022) examined the conventional and Islamic stock market responses to the Outbreak of COVID-19 in each member country of the Gulf Cooperation Council, paying particular attention to the impact of the announcement of fiscal stimulus packages in each country and the recent drop in the price of oil on these markets. This investigation estimates stock market volatility and the correlation between COVID-19 instances and stock returns using a generalized autoregressive conditional heteroscedasticity model and continuous wavelet coherence. Empirical evidence suggests a negative response throughout the period analyzed, with the stimulus package leading to an improvement in the stock market returns of each nation and the regional stock index as a whole. Additionally, the oil price drop has not been shown to have had any negative consequences. Identical outcomes may be seen in both the traditional and Islamic financial markets.

Yilanci and Pata (2022) set out to study how the 2019 coronavirus disease (COVID-19) Outbreak affected the Brazilian and Indian stock markets, currency exchange rates, and government bond yields. The authors analyze daily data from March 17, 2020, to May 8, 2021, using the wavelet transform coherence (WTC) and continuous wavelet transform (CWT) methods. The results demonstrate that COVID-19 does not affect currency exchange rates but increases government bond yields starting in 2021. However, Markets in both countries are significantly affected by COVID-19. Stock prices and COVID-19 examples show high time-frequency consistency. Stock prices in Brazil and India are being affected by the growth of COVID-19 instances, particularly at higher frequencies.

METHODOLOGY

Data Collection

The data of variables were collected from different websites. For Pakistan KSE 100 index data were collected from the Pakistan stock exchange website. BSE 100 index for India and DSE 30 index for Bangladesh data, were collected from yahoo finance. SSE 380 index data collected from trading economics. The period was taken from January 2015 to April 2022. The study was conducted in Pakistan.

Data Analysis

Data analysis is necessary for the study. Data analysis is an applied technique to data that was collected. To do the necessary analysis, the research used Microsoft Excel and E-views statistical software for data analysis.

Descriptive Statistics

Descriptive statistics help summarize the data and enable the researcher to present data in a more meaningful way, which helps interpret data. In other words, the descriptive statistic summarizes massive data and describes the essential aspects of data that are helpful for the researcher. The technique provides the summary table, which contains mean mode, median, Skewness, range, standard deviation, sample variance, Kurtosis, and maximum and minimum values of variables that the researcher uses. Most researchers use descriptive statistics for analysis. Mean is the sum of values divided by total numbers, the model is the most repeated value, and the median is the center value of the sequence values. Range distinction between minimum and maximum values. Standard deviation is a measured amount of variation. Comparing samples from another possible use of descriptive statistics. Researchers may also use descriptive statistics to help them pinpoint aspects of their sample that may affect their results. Applying and evaluating descriptive statistics, a kind of summary statistic that quantitatively characterizes or summarizes aspects from a data set is known as descriptive statistics.

Correlation

In statistics, two variables are said to be correlated if there is a statistically significant relationship between them. Correlation is used to test the relationship between the dependent and independent variables. There is no distinction between independent and dependent variables. Correlation tells the two aspects one direction (+ positive, - negative) and the other is magnitude (how strong the relationship). The correlation value varies between +1 and -1. It means that the relationship is equal to 1 and is positive and strong, whereas -1 indicates the negative. The positive relationship between two variables indicates a move to gather or move in one direction, and the negative association shows an inverse relation. If the relation value is 0 between two variables, it means no relation. It's the norm for explaining elementary connections without explicitly asserting cause and effect.

TARCH Model

The system of internal economic cycle theories has shed light on the numerous causes of stock market volatility. Among them, the multiplier acceleration hypothesis suggested by Samuelson has risen to prominence. Evidence suggests that the time-varying expected value of the stochastic term is a crucial feature of the turbulent stock market. Therefore, in such a market, proving return arrangements need a rational framework that can accommodate variations in stock returns. Therefore, having satisfied the assumption for selecting the appropriate model, we use the TARCH model estimates offered by Glosten and Zakoian. Compared to the ARCH and GARCH models, the TARCH model is superior. Since the square of the residuals has the same effect on both positive and negative shocks of the same magnitude, both requirements are symmetric. The TGARCH model, on the other hand, may be used to verify the existence of any significant difference between bullish and bearish stock periods. For the TARCH model to function, dummy variables are included in the variance equation. We get an estimate for the TGARCH (1) model by using the following formula:

$$r_t = \mu_0 + \mu_1 r_{t-1} + \mu_t$$
$$h_t = \gamma + \alpha\mu_{t-1}^2 + \beta\mu_{t-1\zeta t-1}^2 + \delta h_{t-1}$$

Looking above, you'll see the TARCH in its original form, shown by Equations (1) and (2). The TARCH model relies on two equations (Mean and Variance equations).

In the TARCH model, the OLS model represents the autoregressive form of stock returns, as shown by the mean equation (1). The time-varying behavior of $_t$ is reflected in the TARCH model's variance equation, which is shown in Eq. (2). Parameters of the model to be estimated appear as γ, α, β, and δ in this equation. For the news's abnormalities to be tested, the variable r, β has to be statistically significant and positive. Negative news affects the series' volatility more than positive news in any scenario. In this variance equation, ζ_t, is a dummy variable that displays 1 for u_t 0 when u_t >0 is true, so both "good news" and "bad news" have varying effects.

RESULTS AND DISCUSSION

The results were interpreted after the analysis of the data. Data was collected from different websites. The results were obtained through E-views. The descriptive statistic test, correlation, unit root test, GARCH, EGARCH, and TGARCH was used for the knowing characteristic of the data. Descriptive statistics tell the data's normality and variability. Correlation defines the relationship between variables. The unit root test determined whether the data series was stationary or non-stationary. We used the basic GARCH, EGARCH, and TGARCH models for the volatility measurement. The results were presented in the form of tables. Interpretation of data that gives understanding to the reader about the results concluded.

Descriptive Statistics

Table 1: Descriptive statistics of the full sample

	R_KSE 100	R_BSE 100	R_SSE 380	R_DSE 30
Mean	0.000265	0.00059	9.40E-05	0.000213
Median	0.000364	0.001194	0.000587	0.000224
Maximum	0.234015	0.081075	0.132279	0.096848
Minimum	-0.10208	-0.099415	-0.155401	-0.058512
Std. Dev.	0.014887	0.012177	0.020693	0.010916
Skewness	2.219072	-0.803495	-1.153849	1.02005
Kurtosis	52.88958	12.28692	13.30763	14.28162
Jarque-Bera	135363.5	4793.084	6020.282	7092.123
Probability	0.0000	0.0000	0.0000	0.0000
Sum	0.343092	0.76356	0.12169	0.276406
Sum Sq. Dev.	0.286799	0.19188	0.554083	0.154198
Observations	1295	1295	1295	1295

Note: Significant level at *0.01, significant level at**0.05 and significant level at***0.10

As mentioned above, table 1 exhibited the descriptive statistics for variables used in the study. R_KSE 100 return value of the mean is 0.000265. R_BSE 100 return value 0.00059 R_SSE mean value 9.40E-05 while R_DSE 30 return value 0.000213 are positive in the study period, which suggests the increase in volatility.

The standard deviation results are positively significant for all variables. Standard deviation values are R-KSE 00.14887; BSE_0.012177, R_SSE 0.020693, and DSE return 0.010916. The skewness results show the positive values of the R_KSE 100 and R_DSE 30 index, while R_BSE_100 and R_SSE 380 show negative values. The R_KSE 100 return value of Skewness is positive with 2.219072 and a R_DSE 30 value of 1.02005. Furthermore, R_SSE 380 value is negative -1.153849, and R_BSE 100 value is -0.803495.

The Skewness of the positive indicates the right tail of data is longer, and the negative indicates the left tail is more prolonged. The results indicate that R_KSE 100 and R the _DSE 30 right tail of data is more extended than R_SSE 380 and R_BSE 100. Kurtosis results indicate that data is heavy-tailed or light-tailed, which relates to data distribution. If the value of Kurtosis is more significant than three, then data distribution is not normal. The data used in the study does not follow normal distribution because all values in the table are more significant than 3. Further confirmation by Jarque-Bera statistics is significant at a 1% level, and thus the null hypothesis of normality was rejected. The sum of the square deviation result shows the lower value of R_BSE 100 and R_SSE 380, which indicates the data did not vary from the mean value.

Table 2: Descriptive statistics of the Post-COVID sample

	R_KSE_100	R_BSE_100	R_SSE_380	R_DSE_30
Mean	0.000475	0.001014	0.00054	0.000985
Median	0.00033	0.002214	0.000804	0.000852
Maximum	0.234015	0.063471	0.070345	0.096848
Minimum	-0.10208	-0.099415	-0.09213	-0.05851
Std. Dev.	0.018619	0.015225	0.014968	0.01509
Skewness	4.046624	-1.427218	-0.614173	0.995249
Kurtosis	66.38765	11.54817	8.567996	11.16158
Jarque-Bera	68568.68	1363.801	545.9209	1185.047
Probability	0.000	0.000	0.000	0.000
Sum	0.191422	0.408547	0.21767	0.397052
Sum Sq. Dev.	0.139354	0.093184	0.090067	0.091535
Observations	403	403	403	403

Note: Significant level at *0.01, significant level at**0.05 and significant level at***0.10

As mentioned above, table 2 exhibited the descriptive statistics for variables used in the study. R_KSE 100 return value of the mean is 0.000475. R_BSE 100 return value 0.001014, R_SSE mean value 0.00054 while R_DSE 30 return value 0.000985 are positive in the study period, which suggests the increase in volatility.

The standard deviation results are positively significant for all variables post-COVID period. Standard deviation values are R-KSE 0.018619; BSE_0.015225, R_SSE 0.014968, and DSE return 0.01509. The skewness results show the positive values of the R_KSE 100 and R_DSE 30 index, while R_BSE_100 and R_SSE 380 show negative values. The R_KSE 100 return value of Skewness is positive with 4.046624 and a R_DSE 30 value of 0.995249. Furthermore, R_SSE 380 value is negative -0.614173, and R_BSE 100 value is -1.427218.

The Skewness of the positive indicates the right tail of data is longer, and the negative indicates the left tail is more extended. The results indicate that the R_KSE 100 and R_DSE 30 right tail of data is more extended than R_SSE 380 and R_BSE 100. Kurtosis results indicate that data is heavy-tailed or light-tailed, which relates to data distribution. If the value of Kurtosis is greater than three, then data distribution is not normal. The data used in the study does not follow normal distribution because all values in the table are more significant than 3. Further confirmation by Jarque-Bera statistics is significant at a 1% level, and thus the null hypothesis of normality was rejected. The sum of the square deviation result shows the lower value of R_DSE 30 and R_SSE 380, which indicates the data did not vary from the mean value.

As mentioned below, table 3 exhibited the descriptive statistics for variables used in the study. R_KSE 100 return value of the mean is 0.00017, and R_BSE 100 return value of 0.000398 is positive, which indicates an increase in volatility, while R_SSE mean value -0.000108 and DSE 30 return value -0.00014 are negative in the study period which suggests the decrease in volatility.

Table 3: Descriptive statistics of the Pre-COVID sample

	R_KSE 100	R_BSE 100	R_SSE 380	R_DSE 30
Mean	0.00017	0.000398	-0.000108	-0.00014
Median	0.000382	0.000898	0.000341	-6.27E-05
Maximum	0.044944	0.081075	0.132279	0.044336
Minimum	-0.071997	-0.064894	-0.155401	-0.03659
Std. Dev.	0.012863	0.010519	0.022818	0.008363
Skewness	-0.559831	0.080773	-1.15675	0.37725
Kurtosis	6.198842	9.532555	12.32614	5.932755
Jarque-Bera	426.9049	1587.031	3431.567	340.8303
Probability	0.0000	0.0000	0.0000	0.0000
Sum	0.15167	0.355013	-0.09598	-0.12065
Sum Sq. Dev.	0.147419	0.098591	0.463899	0.062315
Observations	892	892	892	892

Note: Significant level at *0.01, significant level at**0.05 and significant level at***0.10

The standard deviation results are positively significant for all variables post-COVID period. Standard deviation values are R-KSE 0.012863, BSE_0.010519 R_SSE 0.022818, and DSE return 0.008363. The skewness results show the negative values of the R_KSE 100 and R_SSE 380, while R_DSE 30 index and R_BSE_100 show positive values. The R_KSE 100 return value of Skewness is negative with -0.559831 and the R_SSE 380 value of -1.115675. Furthermore, R_DSE 30 value is positive 0.37725, and at d R_BSE 1is 00 value 0.080773.

The Skewness of the positive indicates the right tail of data is longer, and the negative indicates the left tail is longer. The results indicate that the R_BSE 100 and R_DSE 30 right tail of data is longer than R_DSE 380 and R_KSE 100. Kurtosis results indicate that data is heavy-tailed or light-tailed, which relates to data distribution. If the value of Kurtosis is greater than 3, then data distribution is not normal. The data used in the study does not follow normal distribution because all values in the table are more significant than 3. Further confirmation by Jarque-Bera statistics is significant at a 1% level; thus, the null hypothesis of normality was rejected. The sum of the square deviation result shows the lower value of R_BSE 100 and R_DSE 30, which indicates the data did not vary from the mean value.

Correlation

The table mentioned below shows the correlation among the variables of the Stock Indices Return. Double steric (**) shows a significant level at 0.01 with the two-tailed correlation. All the variables with themselves have a 100% correlation with each other. In contrast, the relation differs with different variables. A correlation test is used to know the simple relation between variables. Correlation is a two-way link between variables, independent and dependent. Positive values show positive and negative values show negative associations. The correlation values lie between +1 and -1. There is a strong positive link when the values are near 1 and a strong negative relationship when they are close to -1. A zero value indicates no relationship between variables.

Table 4: Correlation statistics of the full sample

Probability	R_BSE 100	R_DSE 30	R_KSE 100	R_SSE 380
R_BSE_100	1			
R_DSE_30	0.126784	1		
R_KSE_100	0.212184	0.078989	1	
R_SSE_380	0.056545	0.044203	0.14091	1

Note: Significant level at *0.01, significant level at**0.05 and significant level at***0.10

In the above table of the correlation statistics of the whole sample, the relation between the same variable is fully correlated, so the value between these variables is 1. The relation between R_DSE_30 and R_BSE 100 is 0.12, which means that the correlation between these variables is positively correlated (0.12), and the value is significant at 0.01. A higher value shows the highest correlation between the variables and vice versa. The correlation value between R_KSE_100 and R_BSE 100 is the highest correlated value (0.212) in the table, which is significant at 0.01. However, the other values among different variables are less correlated than the previously discussed variables.

Table 5: Correlation statistics of the post-COVID sample

Probability	Probability	Probability	Probability	Probability
R_SSE_380	1			
R_KSE_100	0.307127	1		
R_BSE_100	0.178563	0.370839	1	
R_DSE_30	0.112567	0.167382	0.219755	1

Note: Significant level at *0.01, significant level at**0.05 and significant level at***0.10

The second table shows the correlation of the post-COVID sample. The values between the different variables show the strength of the relationship, whereas 0.01, 0.05, and 0.10 is the significance level which donates that the relation is significant either at 1%, 5%, or 10%. The above tables do not have any significant relationship because all the significance values are higher than the set standard of significance.

Table 6: Correlation statistics of the Pre-COVID sample

Probability	R_DSE_30	R_BSE_100	R_KSE_100	R_SSE_380
R_DSE_30	1			
R_BSE_100	0.016854	1		
R_KSE_100	-0.024917	0.061918	1	
R_SSE_380	0.014693	0.009201	0.083013	1

Significant level at *0.01, significant level at**0.05 and significant level at***0.10

The last table also shows the correlation statistics of the pre-COVID sample. In this table, one negative value exists between the relationship of R_KSE_100 and R_DSE_30. The value is -0.02, which shows the negative relation between the variables; however, the significance value has two dimensions, i.e., firstly, it is negative, and secondly, it is not significant because the value is higher than 70%. Further, the table contains no significant value because none of the values is smaller than the significance level of 1%, 5%, and 10%. The value between R_BSE_100 and R_DSE_30 is the lowest value, which shows that these two variables have the weakest relation with each other compared to all the best ones.

TARCH

Table 7: TARCH model for full sample

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
C	0.000497	0.000346	1.435755	0.1511
R_KSE_100(-1)	0.074694	0.030263	2.468157	0.0136
Variance Equation				
Variable	Coefficient Std.	Error	z-Statistic	Prob.
C	1.25E-05	1.56E-06	8.043809	0.0000
RESID(-1)$\hat{2}$	-0.028665	0.005586	-5.131363	0.0000
RESID(-1)$\hat{2}$*(RESID(-1)<0)	0.185329	0.01817	10.19997	0.0000
GARCH(-1)	0.86435	0.014425	59.92125	0.0000

Significant level at *0.01, significant level at**0.05 and significant level at***0.10

Cont.....

Variable	Coefficient	Std. Error	z-Statistic	Prob.
R_BSE_100	-0.000499	0.000195	-2.560312	0.0105
R_SSE_380	-0.000483	6.70E-05	-7.207756	0.0000
R_DSE_30	-0.000322	9.28E-05	-3.468431	0.0005
		Diagnose Test		
Log-likelihood	3858.334	Akaike info criterion		-5.94951
Durbin-Watson stat	2.106552	Schwarz criterion		-5.91359
Significant level at *0.01, significant level at**0.05 and significant level at***0.10				

The modeling of TARCH is adding BSE SSE and DSE return in the variance equation. Table 7 shows the full sample results stating that the mean equation's C and R_KSE (-1) are positively significant. The past statistical value is significant because the p-value is less than the significance level. The past value significantly predicts the current series by 0.074694 values. Full-sample analysis shows that the model's ARCH and GARCH terms are substantial and insignificant in explaining stock market volatility. The findings of the variance equation reveal that the three components of BSE, SSE, and DSE largely explain KSE volatility over the whole sample. Pre-COVID-19 findings demonstrate that the BSE, SSE, and DSE stock markets, as well as the ARCH and GARCH terms, are significant in understanding the volatility of the KSE stock market. Schwarz Criterion (SIC) and Akaike info Criterion (AIC) values tell whether the model is better or best-fitted. The lowest value of all models tells the model is best fitted.

Table 8: TARCH model for post-COVID sample

Variable	Coefficient	Std. Error	z-Statistic	Prob.
		Mean Equation		
C	0.027236	0.00906	3.00602	0.0026
KSE_100(-1)	-6.10E-07	2.04E-07	-2.985005	0.0028
		Variance Equation		
C	0.000115	1.24E-05	9.324646	0.0000
RESID(-1)2̂	-0.057083	0.012951	-4.407712	0.0000
RESID(-1)2̂*(RESID(-1)<0)	0.733818	0.176389	4.160239	0.0000
GARCH(-1)	0.537704	1.90E-101	2.80E+100	0.0000
R_BSE_100	-0.005874	0.000972	-6.045211	0.0000
R_DSE_30	0.000493	0.000884	0.557609	0.5771
R_SSE_380	-0.001369	0.000707	-1.935142	0.053
		Diagnose Test		
Log-likelihood	1151.376	Akaike info criterion		-5.683463
Durbin-Watson stat	2.006766	Schwarz criterion		-5.59399
Significant level at *0.01, significant level at**0.05 and significant level at***0.10				

The modeling of TARCH is adding BSE SSE and DSE return in the variance equation. Table 8 shows the results of the Post COVID sample stating that the C and R_KSE (-1) in the mean equation are positively and negatively significant. The past statistical value is significant because the p-value is less than the significance level. The past value significantly predicts the current series by -6.10E-07 values. Estimates from the model demonstrate that the ARCH and GARCH terms are respectively substantial and insignificant in explaining stock market volatility for the post-COVID sample. The findings of the variance equation reveal that the three components of BSE, SSE, and DSE largely explain KSE volatility over the whole sample. Pre-COVID-19 findings demonstrate that the BSE, SSE, and DSE stock markets, as well as the ARCH and GARCH terms, are all relevant in explaining the volatility of the KSE stock market. Schwarz Criterion (SIC) and Akaike info Criterion (AIC) values tell whether the model is better or best-fitted. The lowest value of all models tells the model is best fitted.

The modeling of TARCH is adding BSE SSE and DSE return in the variance equation. Table 9 shows the results of the Pre-COVID sample stating that the C and R_KSE (-1) in the mean equation are positively significant and insignificant. The past statistical value is significant because the p-value is less than the significance level. The past value significantly predicts the current series by 0.111362 values. Results from the examination of the pre-COVID sample indicate that the ARCH and GARCH terms in the model are, respectively, significantly and inconsequential in explaining stock market volatility. The findings of the variance equation reveal that the three components of BSE, SSE, and DSE largely explain KSE volatility over the whole sample. The table below displays data obtained earlier on COVID-19, indicating that the ARCH and GARCH terms are likely significant and unimportant, respectively. Stock market volatility before the COVID-19 shock may be partially explained by the BSE, SSE, and DSE markets. Schwarz Criterion (SIC) and Akaike info Criterion (AIC) values tell whether the model is the better or best-fitted. The lowest value of all models tells the model is best fitted.

Table 9: TARCH model for Pre-COVID sample

Variable	Coefficient	Std. Error	z-Statistic	Prob.
		Mean Equation		
C	0.000344	0.000419	0.821939	0.4111
R_KSE_100(-1)	0.111362	0.037416	2.976338	0.0029
		Variance Equation		
C	1.12E-05	1.74E-06	6.442077	0.0000
RESID(-1)^2	-0.00083	0.013321	-0.06236	0.9503
RESID(-1)^2*(RESID(-1)<0)	0.125237	0.023281	5.379479	0.0000
GARCH(-1)	0.869796	0.017911	48.56182	0.0000
R_BSE_100	-0.00077	0.00025	-3.055775	0.0022
R_SSE_380	-0.00037	6.51E-05	-5.660022	0.0000
R_DSE_30	-0.00042	0.000239	-1.733867	0.0829
		Diagnose Test		
Log-likelihood	2668.11	Akaike info criterion		-5.96882
Durbin-Watson stat	2.120094	Schwarz criterion		-5.92041

Significant level at *0.01, significant level at**0.05 and significant level at***0.10

CONCLUSION

This research analyses the stock market fluctuations in Pakistan and other developing economies from 2015 to 2022 due to the global spread of the COVID-19 pandemic. Full, before, and during the COVID-19 sample further split the time for a sample. Results from the entire sample, post-sample, and pre-sample indicate that only the DSE has a negligible impact on the volatility of the Pakistan Stock Exchange's returns, supporting the findings of the study's GARCH model, which was used to estimate the effect of emerging market stock returns volatility on Pakistan's stock market. However, the effect of the BSE on the volatility of KSE stock returns is negligible after COVID-19. For equities traded on the KSE market, the research lends empirical support to the TGARCH specification, which attempts to account for the time-dependent nature of the news flow that reaches the market daily. The results of the whole, post, and pre-samples of the TARCH model show that only the DSE is ineffective on the volatility of Pakistani stock market returns.

At the same time, Full and pre-COVID samples show no substantial BSE. In model E-GARCH, results of the complete sample, post-sample, and pre-sample, only DSE has an insignificant effect on the volatility of the PSX returns. However, the influence of the BSE on the volatility of KSE stock returns is negligible after COVID-19. But there is a continuation of favorable leverage impact according to the leverage effect; good news or a positive shock impacts the conditional variance less than alarming. What better news (the lack of a COVID-19 pandemic) produces less fluctuation or volatility than bad news (the pandemic itself) is what this statistic shows (COVID-19 pandemic news). The analysis shows that because of the pandemic, there has been an increase in volatility in indexes in a few different nations.

LIMITATION OF THE STUDY

The stock market is also affected by other macroeconomic variables such as inflation, GDP, interest rate, and unemployment rate; however, only the effect of covid-19 is addressed in this analysis. The time frame of 7 years is too short of drawing any broad conclusions about the association between the stock market and the effects of covid-19.

FUTURE RESEARCH DIRECTION

Insights gained from this study provide fresh avenues for further study. Researchers may use more years of data and consideration variables like inflation and interest rates in the future.

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