

Modeling and Analyzing Stock Price Volatility in Stock Exchanges of Selected Islamic Countries During the COVID-19 Pandemic

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Received: 1/9/2025

Accepted: 2/27/2025

Published: 4/29/2025

Abstract:

This study analyzed stock price fluctuations in the exchanges of several Islamic countries and the impact of the COVID-19 pandemic. Covering 14 countries, it utilized daily data from 01/03/2020 to 31/12/2022, employing GARCH and EGARCH models and the EGARCH news impact curve. The findings indicated that the pandemic influenced the exchanges, resulting in asymmetric volatility and persistent shocks. New cases affected stock price fluctuations more than new deaths. The news impact curve demonstrated that negative information had a more significant effect than positive information. The EGARCH model is recommended for analyzing severe and asymmetric volatility exacerbated by the pandemic.

Keywords: COVID-19 Pandemic; Stock Price Fluctuations; GARCH And EGARCH Models; News Impact Curve.

JEL Classification Codes: G15; C22; D53.

1. INTRODUCTION

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Amidst the COVID-19 pandemic, the global community faced unprecedented conditions, and stock markets were not exempt from significant fluctuations and rapid changes. The impact of the pandemic on stocks extended beyond economic and political changes, profoundly influencing investor behavior and sentiment. The fast and widespread transmission of COVID-19 and the dissemination of negative news increased uncertainty in financial markets and heightened investor anxiety.

Amid the economic challenges imposed by the pandemic, financial markets experienced immense pressure due to price volatility, significantly affecting their performance. This raised numerous questions about understanding and predicting these fluctuations in an information-efficient stock market. Analyzing such phenomena under these extraordinary circumstances is crucial for investors and financial analysts to comprehend stock market trends and make sound decisions in a volatile environment.

This research aims to investigate how the COVID-19 pandemic has influenced stock price variations, which serve as an indicator of risk, utilizing modelling and analysis in several Islamic countries using daily data from 01/03/2020 to 31/12/2022. This study employs the Exponential GARCH (EGARCH) and GARCH models—referring to Generalized Autoregressive Conditional Heteroskedasticity models—to better understand the variations in stock values during the pandemic.

1.1. Study Problem

The central question framing the problem of this study is as follows:

What is the impact of the COVID-19 pandemic on stock price volatility in the countries under examination?

The following sub-questions arise from this issue:

- Did the COVID-19 pandemic significantly influence stock price volatility?
- Were the stock markets in the nations being analyzed affected by the pandemic like other markets?
- Which model, GARCH or EGARCH, is better equipped to model stock price volatility during the pandemic? To address these questions, this study reviews previous research and literature on GARCH and EGARCH models, followed by presenting the empirical results of these models for stock price indices in a selection of Islamic countries' exchanges.

1.2. Study Objectives

Given the difficulty of making investment decisions in the stock market, particularly during extraordinary conditions such as the COVID-19 epidemic, this study aims to model stock price volatility in several Islamic countries. Understanding the severe volatility in stock prices during the pandemic is important for helping investors make better investment decisions and reduce financial risks during crises. Additionally, the study seeks to determine which model, GARCH or EGARCH, is more effective in this context.

1.3. Study Scope

The research encompasses the complete duration of the COVID-19 pandemic, from 1 March 2020 to 31 December 2022, consisting of a total of 1,036 daily observations of stock price indices from 14 Islamic countries, obtained from the relevant exchanges' trading bulletins. The study also incorporates data pertaining to the pandemic, with a specific focus on identifying the precise counts of newly reported cases and fatalities throughout the entire study period.

1.4. Study Methodology

The study employed a descriptive approach to present information on stock price volatility and the statistical methods used in the empirical analysis. The research utilized econometric approaches to identify the optimal model for assessing the COVID-19 pandemic's impact on the selected exchanges' stock price indices. The GARCH and EGARCH models were applied using the Eviews12 software.

1.5. Literary review

Several studies have analyzed the impact of COVID-19 on stock markets worldwide, focusing on volatility spikes, investor behavior, and market efficiency.

Study by (Alan et al., 2020): "Multi-regime Forecasting Model for COVID-19 Pandemic's Effect on Global Equity Market Volatility." The research aimed to evaluate the influence of the COVID-19 outbreak on market volatility by estimating realised volatility using five-minute intraday returns for 46 specific ETFs in each country. It also estimated daily volatility for stock market indices in 88 countries worldwide using the GARCH model. The results indicated that the number of individuals with ongoing cases on a daily basis and the curve serve as important markers for both realized volatility's daily cross-section and the volatility of GJR-GARCH in international equity markets. Additionally, the more rigorous policy responses implemented by individual countries, as shown by higher levels of the OxCGRT Stringency Index, led to decreased stock market volatility; conversely, the spike in negative management sentiment gleaned from texts during the conference call caused realized volatility to climb.

Study by (Khalid et al., 2021): "Indications of the Varied Influence of the COVID-19 Pandemic on Stock Market Performance and Volatility Is Provided by a Panel Quantile Regression Model." This study aimed to investigate how the COVID-19 pandemic influenced stock market volatility and returns in developed markets. The panel quantile regression model (PQRM) was employed to account for unobserved individual and distributional heterogeneities. The results revealed that the impact of COVID-19 was not uniform on stock returns and volatility, exhibiting a more pronounced negative effect on stock returns during bear markets, while the effect was minimal in bull markets.

A Study by (Iqbal et al., 2021): "An examination of how news affected the fluctuation of Australian stock returns during the COVID-19 pandemic, focusing on asymmetry and leverage using the News Impact Curve perspective." This study aimed to examine how the COVID-19 pandemic affected the volatility of Australian market returns, placing particular emphasis on the consequences of negative and positive shocks by exploring the asymmetric nature of these shocks and the effect of leverage on volatility. The S&P ASX200 (ASX-200) index represented the Australian stock market, and the value-weighted returns of stocks listed in the ASX-200 were analyzed for the period from 27 January 2020 to 29 December 2020. The study employed the GARCH framework, with the EGARCH model developed to incorporate the impacts of leverage and asymmetry. The empirical findings demonstrated that the EGARCH model represented asymmetry more accurately. In contrast, the GARCH model was compared to assess the effect of leverage on calculating the volatility of Australian stock returns.

A study by (Saleem et al., 2021): "Examining the Relationship Between COVID-19 and the Islamic Stock Index: Investigating Market Behavior and the Persistence of Volatility." This study examined the response of Islamic stock markets and fluctuations in volatility prior to and during the COVID-19 epidemic. The event study approach utilized the market model to examine the responses of nine Islamic stock indices, and the GARCH model was used to study changes in volatility and risk persistence. The results showed that the Australian and Gulf Islamic stock indices remained stable in the short term (15 days) after the pandemic news, while Islamic stock indices in Qatar, the outbreak had a substantial short-term impact on the UAE, ASEAN, MENA, South Asia, and Bahrain. Furthermore, the Islamic stock indices experienced a substantial rise in volatility following the declaration of a worldwide health crisis by the WHO, with volatility shocks tending to persist longer after COVID-19.

A Study by (Caporale et al., 2022): "The COVID-19 pandemic's effects on how long European stock markets can last." The objective of this research is to examine the impact of the COVID-19 pandemic on the resilience of European stock markets. Utilizing fractional integration techniques, we calculated the persistence level at daily, weekly, and monthly frequencies for ten important European stock market indexes. Pre-pandemic estimates (2005-2019) were compared in order to evaluate the consequences of the pandemic with those extended to July 2021, which included the pandemic period. The estimation was performed using two different assumptions: white noise and autocorrelation. The results demonstrated that the COVID-19 pandemic had no discernible impact on the longevity of European stock market indices, despite a decrease in the persistence of their volatility.

A Study by (Elbach et al., 2024): "The Impact of COVID-19 News on the Financial Markets' Volatility in MENA Countries." This study sought to analyze the influence of COVID-19 news in the United States on the level of instability in the MENA region's financial markets. The GARCH model was employed for the period starting on January 1, 2019, and ending on December 31, 2020. The empirical findings demonstrated the progression of financial gains and daily volatility in the stock indices of the MENA region displayed significant volatility during the study period.

A Study by (Hamma et al., 2024): "The COVID-19 Epidemic's Effect on Using Financial Assets to Hedge Islamic and Conventional Stock Markets." This study investigated the ideal ratios of hedging for Islamic and the COVID-19 epidemic in traditional stock markets with Dynamic Conditional Correlation (DCC), Asymmetric DCC (ADCC), and Orthogonalized GARCH (GO-GARCH) models. It was assessed how well different financial assets worked as hedges. The findings showed that the Euro STOXX 50 Volatility Index and the Dow Jones Commodity Index, and a measure of the Chicago Board Options Market's volatility Exchange shown greater efficacy in both market types. Hedging ratios changed based on the asset in the portfolio, according to the hedging analysis. Moreover, the findings indicated that some assets' suitability as safe-haven instruments were diminished due to the pandemic's worldwide effects.

A Study by (Ben yaala & Henchiri, 2024): "Effects of the COVID-19 pandemic on the stock market in the Middle East and North Africa (MENA) region." This study sought to examine the influence of COVID-19-related information on stock market behavior in the MENA region by utilizing Panel Estimation findings and Panel Granger non-causality tests. The findings demonstrated that there were daily increments in the total number of cases that

have been verified and the overall number of deaths attributed to COVID-19 had a substantial and consistently adverse effect on stock returns in all observed markets.

2. Theoretical Study

In this section, we aim to briefly present some theoretical concepts related to stock price fluctuations and autoregressive conditional heteroskedasticity models.

2.1. Stock Price Fluctuations

Stock price fluctuations refer to the extent of change in a stock's price. The greater and more frequent the price movement, the higher the degree of fluctuation. Statistically, volatility refers to the statistical measure of the stock return dispersion over a specific period of time, calculated as the standard deviation. Typically, the larger the risk, the higher the volatility (Bhowmik & Wang, 2020).

To simplify, volatility reflects the degree of price movement. A stock that experiences significant price swings, reaching peaks and then dropping to lows, or moving irregularly, is considered highly volatile. Conversely, a stock with minimal volatility is characterized by a generally constant price. A stock with high volatility is naturally riskier, but at the same time, it offers higher returns commensurate with the risk of loss. Therefore, many risk-tolerant investors use various metrics to measure and analyze these fluctuations to evaluate past price changes and predict future movements, aiding in selecting appropriate investment strategies.

2.2. Autoregressive Conditional Heteroskedasticity Models

To describe and analyse stock price fluctuations, researchers have proposed several models. Engle initially introduced the Autoregressive Conditional Heteroskedasticity (ARCH) model as a means to elucidate potential associations in the conditional variance of the prediction error. The model assumes that the variance of the random error follows a moving average process. The random error or the model's residuals, often denoted by the random variable ε_t , can only be utilised in ARCH models if the residuals exhibit conditional heteroskedasticity in the errors.

ARCH Model: This is the first model proposed by Engle in 1982 that aligns with the characteristics of financial time series. It is formulated by taking the squared errors, which depend on the lags q , and is expressed as the ARCH(q) model as follows:

$$\sigma_t^2 = \alpha_0 + \sum_{i=0}^p \alpha_i \varepsilon_{t-i}^2$$

Where α_t : represents the errors and the conditional variance equation, which follows an independent and symmetric distribution with a mean of 0 and variance σ_t^2 (Elbach et al., 2024, p. 119).

GARCH Model: Despite the simplicity of the ARCH model, it requires numerous parameters to describe the fluctuations in financial asset returns. Therefore, Bollerslev (1986) proposed the generalized GARCH model, which is written as follows:

$$\sigma_t^2 = \omega + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^p \beta_j \sigma_{t-j}^2$$

Where $\omega > 0$ and $(\alpha_i; \beta_j) \geq 0$ with $\sum_{i=1}^{max(p;q)} (\alpha_i; \beta_j) < 1$

Similar to the ARCH model, the GARCH model includes two constraints: the first is to ensure that the volatilities are positive, $\omega > 0$ and $(\alpha; \beta) \geq 0$ The second constraint relates to

the necessity of ensuring the stability of the conditional variance such that $\alpha + \beta < 1$ (Aktan et al., 2010, p. 517)

EGARCH Model: Introduced by Nelson (1991), this model accounts for asymmetry in an exponential form, allowing the natural logarithm of the conditional variance to vary over time based on past errors, rather than the square of lagged errors. The model is expressed as follows:

$$\ln(\sigma_t^2) = \alpha_0 + \sum_{j=1}^q \xi_j \left| \frac{\varepsilon_{t-j}}{\sqrt{\sigma_{t-j}^2}} \right| + \sum_{j=1}^q \eta_j \frac{\varepsilon_{t-j}}{\sqrt{\sigma_{t-j}^2}} + \sum_{i=1}^p \delta_i \ln(\sigma_{t-1}^2)$$

Where η represents the asymmetry effect and measures the persistence of shocks in variance. When $\eta_j > 0$, it indicates that positive news has higher volatility than negative news, and vice versa. When $\eta_j = 0$, the model is symmetric. As for ξ , it embodies the effect of the conditional shock on the conditional variance (Francq & Zakoian, 2019, p. 77).

3. Empirical Study

In this section, the study population and sample will be presented, detailing the performance evolution of the selected stock exchanges during the specified period and examining the correlation between them. This will be followed by a descriptive study and an analysis of the stability of the time series under investigation, and finally, the application of the study models through the development of a mathematical representation of the equation that measures the variability during the COVID-19 period epidemic.

3.1. Study Data and Model

The research population consists of Islamic countries. The study sample relied on daily stock index prices from 14 Islamic countries, selected based on the availability of complete data for the time frame for the study is March 1, 2020–December 31, 2022. The data were obtained from the website (investing, 2024). Regarding the COVID-19 variable, two main variables were used: The total number of new cases and new fatalities within the specified period. The data was acquired from the website (ourworldin data, 2024). The study sample can be clarified in the following table:

Table (01): Study Sample Table

No	Country	Index	Symbol
1	Bahrain	Bahrain All Sh	BAS
2	Egypt	EGX 30	E30
3	Indonesia	IDX Comp	IDXC
4	Jordan	Am SE Ge	ASEG
5	Kuwait	Main M 50	MM50
6	Lebanon	BLOM Stock	BLOMS
7	Malaysia	FTSE M KLCI	FTSEKLCI
8	Morocco	MAI Shares	MAS
9	Oman	MSM 30	MSM30
10	Palestinian T	Al-Quds	AQ
11	Qatar	QE General	QEG
12	Saudi Arabia	Tadawul All Share	TAS

13	Tunisia	Tunindex	TDEX
14	Turkey	BIST 100	BT100

Source: Prepared by the researchers based on information about the stock exchanges in the study sample.

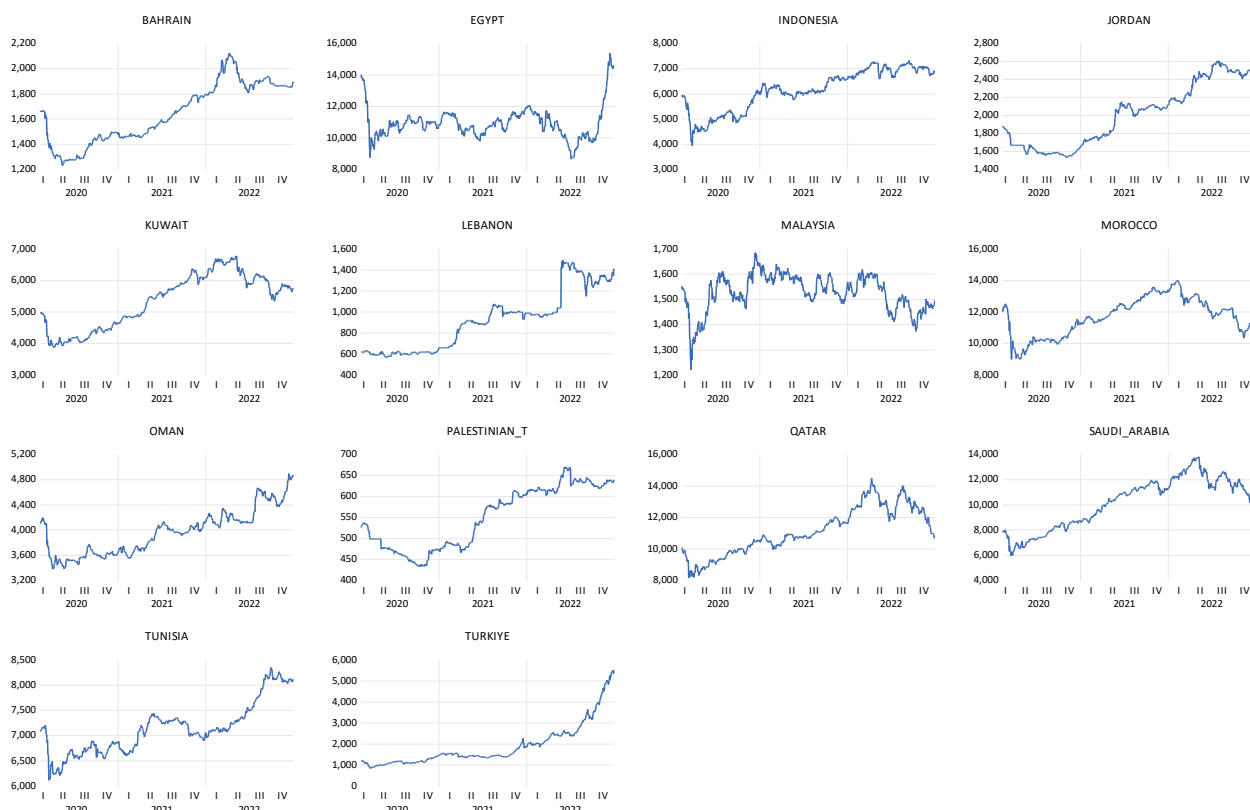
Concerning the study model, the formula representing the relationship between fluctuations in stock prices, the number of new COVID-19 cases, and the count of new deaths can be expressed for both the GARCH and EGARCH models as follows:

$$\begin{aligned} \text{STOCKPRICE} &= C(1)*\text{NEW_CASES} + C(2)*\text{NEW_DEATHS} + C(3) \\ \text{GARCH} &= C(4) + C(5)*\text{RESID}(-1)^2 + C(6)*\text{GARCH}(-1) \\ \text{LOG(GARCH)} &= C(4) + C(5)*\text{ABS(RESID}(-1)/\text{@SQRT(GARCH}(-1))) + \\ &\quad C(6)*\text{LOG(GARCH}(-1)) \end{aligned}$$

3.2. Evolution of the Performance of Stock Exchange Indices Under the COVID-19 Pandemic

To highlight the behaviour of the stock indices across all the exchanges being studied, the evolution curve of these indices for each stock exchange is shown individually, as illustrated in the following figure:

Figure (01): Evolution of the Performance of Stock Exchange Indices During the COVID-19 Pandemic



Source: Prepared by the researchers using Eviews12.

Based on the graph illustrating the evolution of stock index prices for the studied exchanges, we observe significant fluctuations in the indices during the COVID-19 pandemic across most exchanges, reflecting instability and considerable price volatility. It is also evident that most exchanges began to recover around 2022, returning to levels higher than those recorded during the COVID-19 pandemic (2020, 2021). Furthermore, the behaviour of the exchanges appears to be similar, indicating a correlation among the exchanges under study,

which will be discussed in the following section.

3.3. Simple Linear Correlation Study Between the Series of Stock Index Prices of the Studied Exchanges

The table (01) in the appendices provides an overview of the estimation results shows the correlation matrix between stock index prices in the markets under investigation, we observe that the correlation coefficient between stock index prices ranges from positive to negative, and from strong to weak. The strong positive correlations were observed between Bahrain and each of Indonesia, Jordan, Kuwait, Palestine, Qatar, and Saudi Arabia, and between Indonesia and each of Qatar and Saudi Arabia, and between Jordan and each of Lebanon, Oman, and Palestine, and between Kuwait and each of Egypt, Qatar, and Saudi Arabia, and between Qatar and Saudi Arabia.

The highest positive correlation was between the indices of the Kuwait Stock Exchange and the Saudi Stock Exchange at 96%. On the other hand, the lowest positive correlation was between the Palestine Stock Exchange and the Egypt Stock Exchange, both experiencing a 5.11% increase. The negative correlations were observed between Egypt, Jordan, Lebanon, Qatar, and Saudi Arabia, and between Malaysia and each of Bahrain, Jordan, Lebanon, Oman, Palestine, Tunisia, and Turkey.

The highest negative correlation was recorded between the Turkey Stock Exchange and the Malaysia Stock Exchange, which both experienced a significant decline of -22.9%, while the lowest negative correlation was between the Bahrain Stock Exchange and the Malaysia Stock Exchange, which both experienced a decrease of 0.69%.

These results can be interpreted by considering the nature of the economies in these countries and their dependence on changes in global stock exchanges. Additionally, this indicates that market participants are tracking price behaviour in the studied exchanges and taking advantage of arbitrage opportunities among these exchanges. Furthermore, the global crisis represented by the COVID-19 pandemic may have similarly affected a group of countries, leading to comparable fluctuations in stock markets.

3.4. Description and Analysis of the Stock Index Price Behavior of the Studied Exchanges During the COVID-19 Pandemic

This section provides descriptive statistics for the stock index prices of the subjects under study exchanges during the COVID-19 pandemic, The table (02) in the appendices provides, the average stock index prices of the surveyed stock exchanges in Egypt, Morocco, and Qatar were found to be high, with the highest recorded in the Morocco Stock Exchange at 11,702.25. The lowest values were seen in the Lebanon and Palestine stock exchanges, with the lowest being 550.1131 in the Palestine Stock Exchange. The maximum and minimum values indicate a wide range of prices across Egypt, Lebanon, Morocco, Qatar, Saudi Arabia, and Turkey stock exchanges, suggesting significant stock price variability and confirming high volatility. Conversely, in the Bahrain, Indonesia, Jordan, Kuwait, Oman, Palestine, and Tunisia stock exchanges, the maximum and minimum values indicate a narrower range of prices compared to other countries, implying less variability and more excellent stability in stock prices.

Regarding risk, represented by standard deviation, which indicates the dispersion of data values from the mean, it was high in Egypt, Morocco, Qatar, Saudi Arabia, and Turkey stock exchanges, with the highest value recorded in the Saudi Arabia Stock Exchange at 1996.913.

This indicates that the stock index prices in these countries vary widely around the mean, confirming high volatility in these stock exchanges during the COVID-19 pandemic. In contrast, Palestine reported the lowest readings, along with the Malaysia and Iraq stock exchanges, with the lowest value being 72.37725 in the Palestine Stock Exchange, indicating that the stock index prices in these countries cluster closely around the mean, thus confirming less variability and greater stability in stock prices.

The skewness coefficient was negative, indicating a leftward skew in the Indonesia, Kuwait, Malaysia, Morocco, Palestine, and Saudi Arabia stock exchanges. At the same time, it was positive, indicating a rightward skew in the other stock exchanges. This suggests the presence of extremely high values, which may point to stocks with high prices. The kurtosis coefficient was more significant than 3 in the Egypt, Malaysia, and Turkey stock exchanges, indicating a higher likelihood of extreme events, whether positive or negative and associating high kurtosis with increased investment risks. Conversely, the other stock exchanges recorded a kurtosis coefficient of less than 3, indicating a moderate level of risk.

The Jarque-Bera test shows that the highest value, 1058.832, was recorded in the Egypt Stock Exchange, indicating that the market is exposed to unexpected and sudden fluctuations. This highlights the substantial impact of the pandemic on Egypt's financial market. In contrast, the lowest value, 36.18136, was recorded in the Qatar Stock Exchange, indicating a more stable market with less susceptibility to unexpected and sudden fluctuations.

3.5. Testing the Stability of Stock Index Price Series of the Studied Stock Exchanges

This section examines the stability of the stock index price series for the stock exchanges under study, utilizing the Phillips-Perron (PP) test and the Augmented Dickey-Fuller (ADF) test as a foundation, along with the Heteroskedasticity test (ARCH). The results are presented in the table (03) in the appendices provides, suggesting that the stock price series in the majority of the examined stock exchanges exhibit instability, as the calculated statistical value exceeded the significance levels of 1%, 5%, and 10%, except for the Oman market, which showed stability at the 1% level. However, the Phillips-Perron (PP) test revealed that the stock price series of all the studied stock exchanges were unstable. Regarding the influence of the ARCH effect on the residuals of the first-order autoregressive model for each exchange, the statistical values were significant across all exchanges, indicating the presence of the ARCH effect. This suggests strong evidence that the variance of stock prices is not constant over time, indicating that the stock exchanges are not stable but subject to cyclical fluctuations. This instability could be attributed to the COVID-19 pandemic, which increased volatility during that period, confirming that the Ordinary Least Squares (OLS) method cannot be used for estimation due to violating one of its assumptions. Therefore, it necessitates the use of GARCH models to analyse these fluctuations accurately, as these models account for time-varying variance.

3.6. Analysis of the Relationship Between COVID-19 and Stock Index Prices in the Studied Stock Exchanges Using GARCH

This study component focuses on presenting and examining the GARCH model's estimation results. The objective is to assess the effects of the COVID-19 epidemic on the volatility of stock index prices in the stock exchanges under investigation. Table (04) in the appendices provides an overview of the estimation results, where the following observations

can be made: The constant in the variance equation indicates long-term variance independent of time, representing the average stock price volatility over the studied period. We observe that it was significant, i.e., less than 5%, in most of the studied stock exchanges except for the Bahrain and Palestine exchanges, which were greater than 10%. Statistically, this suggests that its impact is insignificant at a 5% confidence level. In other words, this impact might result from random noise rather than having an accurate and stable effect on variance. Economically, the insignificance of the constant indicates that the baseline level of volatility, without the influence of other variables, is not an essential factor in determining price volatility. This implies that volatility largely depends on different factors, such as the COVID-19 pandemic. Additionally, we observe that its value was high in Egypt, Indonesia, Qatar, and Saudi Arabia, with the highest value recorded at 8067.047 in the Egypt Stock Exchange, indicating that stock price volatility there is much higher than in other exchanges, meaning that the market in the Egypt Stock Exchange is more volatile and less stable. Conversely, in the Jordan, Lebanon, Malaysia, and Oman stock exchanges, the values were low, with the lowest value recorded at 9.946054 in the Lebanon Stock Exchange, indicating that stock price volatility there is lower than in other exchanges, meaning that the market in the Lebanon Stock Exchange is less volatile.

The ARCH coefficient indicates the extent to which past stock price volatility, resulting from previous shocks, influences future price volatility. We observe that it was significant in all the stock exchanges without exception, indicating that there is an impact from previous shocks. The GARCH coefficient, which indicates the extent to which current stock price volatility, resulting from recent shocks, influences future price volatility, was significant only in the Bahrain, Indonesia, Kuwait, Lebanon, Malaysia, Morocco, Oman, Palestine, Saudi Arabia, Tunisia, and Turkey stock exchanges. This means that there is an impact from recent shocks. However, in the Egypt, Jordan, and Qatar stock exchanges, it was not significant, which, in the researchers' opinion, could be due to the presence of new events or surprises affecting stock price volatility unexpectedly, making the GARCH model inadequate in modeling these changes sufficiently. We also observe that the ARCH coefficients are larger than the GARCH coefficients, which is interpreted as previous shocks having a greater impact than recent shocks, or that the relationship between past volatility and future volatility is stronger in most stock exchanges, making the ARCH model significant. In contrast, the relationship between recent volatility and future volatility may not be as strong in other stock exchanges, making the GARCH model insignificant in those exchanges.

The constant associated with the COVID-19 pandemic indicates an additional increase in stock price volatility due to the pandemic. We observe that its value was high and statistically significant in all the studied stock exchanges, with the highest value recorded at 12157.35 in the Morocco Stock Exchange, and the lowest value at 624.4878 in the Palestine Stock Exchange. This indicates that the presence of the COVID-19 pandemic significantly influenced market volatility, reflecting the substantial and ongoing impact of the pandemic on market stability.

The number of new COVID-19 cases can be quantified using the coefficient, we attempt to test the correlation between the incidence of new instances and the level of risk, expressed as stock price volatility, in the studied stock exchanges during the specified period. The results show that the number of new cases was positive and significant, indicating a direct

relationship with price volatility in most of the studied stock exchanges, with the lowest sensitivity at 0.000649 in the Tunisia Stock Exchange and the highest at 0.366735 in the Qatar Stock Exchange. This implies that news about the quantity of new COVID-19 cases causes markets to respond cautiously. However, in the Tunisia Stock Exchange, the impact was the only one that was statistically insignificant, which statistically explains that the impact of new cases on the volatility of stock prices is not statistically significant at a 5% confidence level. This does not allow us to reject the hypothesis that new cases do not have a real impact on stock price volatility, which may indicate that the available data do not provide sufficient evidence to support a strong and stable relationship between new cases and price volatility. Economically, it can be interpreted that investors in the Tunisia Stock Exchange may have absorbed the news related to new cases, so it no longer significantly affects price volatility. On the other hand, other factors may have a more significant impact on volatility during that period, such as government measures, vaccines, or improvements in handling the pandemic. In the Morocco Stock Exchange, the impact was significant and negative, showing a negative correlation between the quantity of new cases and the level of fluctuation in stock prices. In other words, as the number of new cases increases, the variance or volatility in stock prices tends to decrease. These results can be interpreted in several ways, including the market's absorption of bad news related to increased cases, reducing its reaction. Additionally, successful government interventions, precautionary measures, or economic support taken in conjunction with increased cases and the emergence of vaccines may give investors greater confidence, reducing concerns about future economic performance, thereby reducing volatility.

Concerning the number of new deaths caused by the impact of COVID-19 on the fluctuation of stock prices, the effect was negative and significant in the Bahrain, Indonesia, Jordan, Kuwait, Lebanon, Morocco, Palestine, and Saudi Arabia stock exchanges. A strong inverse relationship exists between the number of new deaths and stock price volatility in most stock exchanges, contrary to the number of cases when a decrease in volatility is correlated with an increase in new deaths. This may mean that markets may have already absorbed the negative news or that the market reflects expectations that an increase in deaths will lead to long-term improvement by reinforcing efforts to combat and control the pandemic. In the Egypt and Qatar stock exchanges, the effect was negative but not significant, while in the Malaysia and Oman stock exchanges, the effect was positive but also not significant. However, the Tunisia and Turkey stock exchanges were the only ones where the impact of the quantity of newly reported fatalities on stock price volatility was positive and statistically significant. We observe that the sensitivity was high in both exchanges, approximately 61% in the Tunisia Stock Exchange and 99% in the Turkey Stock Exchange; there is a clear correlation between the increase in fatalities and the level of volatility. In other words, an increase in the number of deaths leads to increased volatility. This can be interpreted as investors in these exchanges expecting a deterioration in economic conditions due to the worsening pandemic, which increases the risks associated with investment, leading to panic, anxiety, and uncertainty within those markets, thereby increasing volatility.

According to GARCH model estimates, the stock markets under study were impacted by the COVID-19 epidemic through the information released about the number of new cases and deaths. However, the increase in new cases had a more significant effect than the number

of new deaths. Moreover, when observing the sum of the ARCH and GARCH coefficients, we find that it approached or exceeded the value of one in all the studied stock exchanges except the Egypt Stock Exchange. These results indicate the instability of the GARCH model and the persistence of shocks, suggesting the need to use the EGARCH model for estimation, which will be discussed in the next section.

3.7. Analysis of the Relationship Between COVID-19 and Stock Index Prices in the Studied Stock Exchanges Using EGARCH

In this section, our objective is to present and analyse the outcomes of calculating the EGARCH model to assess the impact of the COVID-19 pandemic on stock index prices of the examined stock exchanges. The results are summarised in Table (05) of the appendices:

The results presented in Table (02) demonstrate that the EGARCH model is validated for the majority of the stock exchanges analysed, suggesting the possibility of the leverage effect and the strong impact of the flow of bad news or the asymmetry in volatility.

The constant in the variance equation was significant in most of the studied stock exchanges, i.e., less than 10%, except for the exchanges in Indonesia, Malaysia, and Saudi Arabia, where it was not significant, indicating that its statistical value was greater than 10%. Moreover, we observe that it was negative in the exchanges of Bahrain, Jordan, Kuwait, Lebanon, Morocco, Oman, Palestine, Qatar, Tunisia, and Turkey. Statistically, this effect may be attributed to random noise rather than reflecting a real and stable impact on variance. Economically, it suggests that the baseline level of volatility, without the influence of other variables, is not a significant factor in determining price volatility. This indicates that volatility is heavily dependent on other factors, such as the COVID-19 pandemic. The Egypt Stock Exchange was the only one where the constant in the variance equation was both significant and positive, which implies that stock price volatility there is considerably higher than in other exchanges, suggesting that the market in the Egypt Stock Exchange is more volatile and less stable.

The EGARCH coefficient was significant; that is, less than 10%, 5%, and 1%, and positive across all the studied stock exchanges, unlike the GARCH model, which was not significant in certain exchanges. This indicates that the model effectively accounts for the autocorrelation of previous volatilities, implying that variance in prior periods significantly influences current variance.

The leverage effect coefficient was significant and positive in all the examined stock exchanges, with the highest value recorded at 2.140324 in the Oman Stock Exchange and the lowest at 0.797371 in the Kuwait Stock Exchange. This suggests that previous shocks notably impact current volatility, meaning that negative news increases current volatility more than positive news. These findings imply that investors were more vulnerable to adverse news than positive news during the COVID-19 epidemic.

The constant associated with the COVID-19 pandemic was also significant and positive in all the studied stock exchanges. We observed a substantial increase in its value in the Egypt, Morocco, Qatar, and Saudi Arabia exchanges, with the highest value at 11946.08 in the Saudi Arabia Stock Exchange and the lowest values recorded in the Palestine and Lebanon exchanges, with the lowest being 624.295 in the Palestine Stock Exchange. This reflects the pandemic's substantial and overwhelming impact on these exchanges' volatility.

The coefficient illustrating the connection between the number of COVID-19 cases and

stock exchanges was consistently significant and positive in most of the analysed cases, with the lowest sensitivity recorded at 0.001842 in the Indonesia Stock Exchange and the highest at 0.364489 in the Qatar Stock Exchange. This suggests a direct relationship between the number of new COVID-19 cases and the volatility of these indices, indicating that as case numbers increased, volatility in these markets also rose. However, the Oman Stock Exchange was the only one where a notable and adverse number of new COVID-19 cases occurred. This indicates a reciprocal correlation between the number of new cases and the level of fluctuation in stock prices, suggesting that volatility in stock prices tended to decrease as the number of new cases rose. These results can be interpreted in various ways, including the market's absorption of negative news related to the rise in cases, thereby diminishing its reaction. Additionally, effective government interventions, precautionary measures, or economic support implemented alongside the increase in cases and the availability of vaccines may have instilled greater confidence in investors, alleviating concerns about future economic performance and consequently reducing volatility.

The coefficient for the number of COVID-19 deaths showed a positive and statistically significant relationship in the stock exchanges of Malaysia, Oman, Tunisia, and Turkey, where we observed the highest sensitivity at 1.201311 in the Turkey Stock Exchange, and the lowest value at 0.032272 in the Malaysia Stock Exchange. This demonstrates a clear correlation between the number of recent fatalities and the level of instability, indicating that an increase in mortality rates results in a rise in volatility. This can be interpreted as investors in these exchanges anticipating a deterioration in economic conditions due to the worsening pandemic, which heightens the risks associated with investment, leading to panic, anxiety, and uncertainty within those markets, thereby amplifying volatility. In contrast, in other stock exchanges, the coefficient for the number of deaths was significant and negative, suggesting a negative correlation between new COVID-19c fatalities and stock price volatility in most exchanges, contrary to the number of cases. An increase in new deaths correlates with a decrease in volatility. This may indicate that the stock exchanges have already absorbed the negative news or that the market reflects expectations that a rise in fatalities will lead to improvements over time by reinforcing efforts to combat and control the pandemic.

In summary, market volatility in the exchanges studied is significantly influenced by past fluctuations and changes associated with the COVID-19 pandemic. The EGARCH model illustrates that adverse shocks may lead to a more pronounced escalation in volatility compared to positive shocks. It also demonstrates a strong impact of new COVID-19 cases on increasing volatility. In contrast, the number of new deaths may reduce volatility, possibly due to the psychological effects on the market or the measures taken during this period. Additionally, variance follows a specific pattern based on previous data, with significant and considerable impacts from current events.

After estimating the GARCH and EGARCH models, the question arises: which is better? To compare the models, we rely on the Akaike, Schwarz, and Hannan-Quinn criteria, which indicate that the GARCH model appears to be superior based on these criteria. However, an important issue revolves around adding the ARCH and GARCH coefficients, which exceed 1 in most studied stock exchanges, suggesting that the model is unstable. In this context, it leads to challenges in long-term analysis because the conditional variance can increase over time instead of converging to a constant value. On the other hand, the EGARCH

model does not impose restrictions on the sum of the coefficients being less than 1 to ensure stability. This implies that the EGARCH model may better accommodate extreme and unexpected volatility, which could be particularly useful during the COVID-19 pandemic. In conclusion, despite the information criteria indicating that the GARCH model provides the most accurate fit, its instability poses a challenge: when the combined value of the ARCH and GARCH coefficients surpasses 1, it makes it less ideal for analysis. Therefore, the EGARCH model can be regarded as a better option as it offers more excellent stability and a superior ability to manage extreme and asymmetric volatility, which increased due to the COVID-19 pandemic.

In summary, the COVID-19 pandemic affected the analyzed stock exchanges due to the dissemination of information regarding the rise in new cases and fatalities. However, the number of new cases had a more significant impact than the number of latest deaths, as the fear of infection outweighed the fear of death. The negative implications suggests that stock exchanges are more susceptible to bad news than good news during the COVID-19 pandemic. To support these results, we will utilize the news impact curve methodology of the EGARCH model, which will be addressed in the subsequent discussion section.

3.8. Analysis of the Impact of COVID-19 on Stock Index Prices in the Studied Stock Exchanges Using the News Impact Curve of the EGARCH Model

In this section, we utilize the News Impact Curve methodology to assess the influence of the COVID-19 pandemic on the fluctuation of stock index prices in the examined stock markets, considering it the most significant negative news during the selected period. This analysis was conducted following the estimation of the EGARCH model for each exchange individually, and Figure 1 in the appendices highlights these results.

The curve for the stock exchanges in Egypt, Indonesia, Malaysia, Morocco, Oman, Tunisia, and Turkey indicates that large shocks, positive or negative, increase volatility. However, negative news tends to have a greater impact on volatility compared to positive news, reflecting a heightened sensitivity to adverse developments.

In contrast, the remaining stock exchanges, namely Bahrain, Jordan, Kuwait, Lebanon, Palestine, Qatar, and Saudi Arabia, exhibit a News Impact Curve that shows the market responds symmetrically to significant news, regardless of whether it is positive or negative. In this instance, any major news, irrespective of its nature, results in an equal increase in volatility, suggesting that investors in these markets process news effectively and symmetrically.

4. RESULTS AND DISCUSSION

The study yielded the following results: The findings indicated a significant and considerable influence of the COVID-19 pandemic on the unpredictability of stock prices within the examined stock exchanges. The impacts of new infections and fatalities on this volatility varied; new cases heightened volatility, whilst new deaths had the opposite effect. These findings may illustrate the complex psychological and economic repercussions of health crises on stock exchanges.

During the COVID-19 pandemic, the stock indices of the surveyed exchanges displayed notable volatility. Therefore, it can be asserted that the pandemic augmented these fluctuations and increased their severity, complicating the financial landscape and emphasizing the challenges of risk management and investment decision-making in unstable economic

conditions.

The COVID-19 pandemic precipitated significant alterations in economic conditions, fostering an environment characterized by rapid changes. Moreover, the economic and financial measures implemented by governments to mitigate the pandemic's effects substantially influenced investor behavior and the performance of the studied stock exchanges.

The EGARCH model is noted for its capacity to accommodate severe and unexpected fluctuations without imposing restrictions on the sum of the coefficients, rendering it a more stable and reliable model in stock exchanges experiencing sharp and/or unforeseen fluctuations.

5. CONCLUSION

The global financial markets have been profoundly affected by the COVID-19 outbreak, resulting in one of the most devastating disasters in recent history. This situation has led to unstable economic conditions and increased financial risks due to the ensuing panic in these markets. The aim of this study was to investigate and develop a model to assess the influence of the COVID-19 epidemic on the fluctuations in stock prices across a selection of stock exchanges in Islamic nations, considering this a critical factor for investors in determining risk levels when making investment decisions based on practical and accurate methods. The study employed GARCH and EGARCH models, which provide deep insights into the dynamics of financial volatility and the impact of the COVID-19 pandemic. It was observed that the pandemic significantly affected volatility, whether through the announcement of new cases and/or new deaths, albeit to varying degrees. The extent of recovery and overcoming the crisis also fluctuated from one stock exchange to another, and the strong correlation during the crisis indicates the presence of herd behavior.

Ultimately, the findings revealed that the COVID-19 epidemic had a substantial influence on the fluctuations of stock prices on the examined exchanges. Therefore, the study suggests:

Investors should develop risk management strategies that take into account the significant and variable fluctuations revealed by EGARCH models, especially during crises like the COVID-19 pandemic.

It is crucial for future analyses to explore the effects of economic and health crises on stock exchanges and to utilize advanced models that can better accommodate these effects. This approach would enhance the accuracy of predictions and the analysis of the long-term impacts of crises.

Researchers and analysts should continue to monitor, update, and develop models to ensure accurate predictions and the model's adaptability to the ongoing changes in stock exchanges. Moreover, there may be potential for the integration of traditional models with applications of artificial intelligence.

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7. Appendices

Table (01): Correlation Matrix Between the Series of Stock Index Prices in the Studied Exchanges

	BAHRAIN	EGYPT	INDONESIA	JORDAN	KUWAIT	LEBANON	MALAYSIA	MOROCCO	OMAN	PALESTINIAN_T	QATAR	SAUDI ARABIA	TUNISIA	TURKIYE
BAHRAIN	1	0.119684957	0.907383176	0.901410434	0.925894147	0.806160078	-0.00692373	0.702634937	0.8662406	0.9067531	0.937096951	0.905580235	0.727728646	0.692982891
EGYPT	0.119684957	1	0.130456345	- 0.006714011	0.092424195	-0.06063061	0.196794331	0.114113527	0.254844864	0.05111585	- 0.039985565	- 0.037023078	0.110864868	0.33180919
INDONESIA	0.907383176	0.130456345	1	0.860084231	0.88938135	0.820587068	0.199378335	0.728272914	0.821978482	0.8362824	0.925098265	0.906193713	0.766608617	0.70957991
JORDAN	0.901410434	- 0.006714011	0.860084231	1	0.839937373	0.941507224	-0.20633664	0.559086844	0.9201912	0.9534035	0.849233177	0.841430899	0.85696476	0.791409725
KUWAIT	0.925894147	0.092424195	0.88938135	0.839937373	1	0.764868908	0.158753625	0.870477758	0.768227361	0.8739771	0.911731848	0.967782305	0.635555279	0.52810881
LEBANON	0.806160078	- 0.060630615	0.820587068	0.941507224	0.764868908	1	-0.20969052	0.482512316	0.8510717	0.8919278	0.780645319	0.787329167	0.866044455	0.786529864
MALAYSIA	-0.00692373	0.196794331	0.199378335	-0.20633664	0.158753625	-0.20969052	1	0.378207215	-0.16890502	-0.2204526	0.152578031	0.202765569	- 0.130256206	-0.2295641
MOROCCO	0.702634937	0.114113527	0.728272914	0.559086844	0.870477758	0.482512316	0.378207215	1	0.512618897	0.646235985	0.710193418	0.818111541	0.386772177	0.170150061
OMAN	0.866240574	0.254844864	0.821978482	0.9201912	0.768227361	0.851071709	-0.16890502	0.512618897	1	0.8730542	0.778948836	0.746704227	0.896440855	0.84707541
PALESTINIAN_T	0.90675308	0.05111585	0.836282403	0.9534035	0.873977082	0.891927784	-0.22045255	0.646235985	0.8730542	1	0.824120345	0.831635477	0.746933476	0.708143128
QATAR	0.937096951	- 0.039985565	0.925098265	0.849233177	0.911731848	0.780645319	0.152578031	0.710193418	0.778948836	0.824120345	1	0.948550382	0.687915498	0.614457131
SAUDI ARABIA	0.905580235	- 0.037023078	0.906193713	0.841430899	0.967782305	0.787329167	0.202765569	0.818111541	0.746704227	0.831635477	0.948550382	1	0.676367871	0.534720785
TUNISIA	0.727728646	0.110864868	0.766608617	0.85696476	0.635555279	0.866044455	- 0.130256206	0.386772177	0.896440855	0.746933476	0.687915498	0.676367871	1	0.840940233
TURKIYE	0.692982891	0.33180919	0.70957991	0.791409725	0.52810881	0.786529864	-0.2295641	0.170150061	0.84707541	0.708143128	0.614457131	0.534720785	0.840940233	1

Source: Prepared by the researchers using Eviews12.

Table (02): Descriptive Statistics of Stock Index Prices of the Studied Stock Exchanges During the COVID-19 Pandemic

Country	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Sum	Sum Sq. Dev.	Observations
Bahrain	1641.004	1631.08	2122.51	1232.4	235.6626	0.0766	1.808237	63.52585	0	1732900	58591410	1056
Egypt	10940.62	10867.73	15378.28	8657.5	1023.454	1.444766	6.964212	1058.832	0	11553290	1.11E+09	1056
Indonesia	6140.193	6166.22	7318.02	3937.63	809.9775	-0.538554	2.223022	77.60965	0	6484043	692000000	1056
Jordan	2009.476	2067.875	2607.1	1533.35	344.2735	0.18878	1.639652	87.69633	0	2122006	1.25E+08	1056
Kuwait	5347.24	5563.29	6779.78	3879.72	854.5795	-0.190047	1.700368	80.67462	0	5646686	7.70E+08	1056
Lebanon	916.3163	917.84	1493.15	567.95	279.8624	0.447629	2.051919	74.81513	0	967630	82630755	1056
Malaysia	1526.4	1531.315	1684.58	1219.72	72.93694	-0.808744	3.672194	134.9968	0	1611879	5612386	1056
Morocco	11702.25	11796.29	13991.47	8987.89	1218.196	-0.224474	2.123617	42.66251	0	12357581	1.57E+09	1056
Oman	3963.12	3992.44	4898.86	3383.54	357.333	0.43162	2.37891	49.7614	0	4185056	1.40E+08	1056
Palestinian_T	550.1131	570.78	670.02	432.86	72.37725	-0.084808	1.44337	107.8821	0	580919.4	5526582	1056
Qatar	11128.79	10906.12	14494.35	8160.23	1477.844	0.134709	2.134138	36.18136	0	11752007	2.30E+09	1056
Saudi Arabia	10164.94	10794.51	13820.35	5959.69	1996.913	-0.286051	1.895624	68.06569	0	10734179	4210000000	1056
Tunisia	7133.05	7099.29	8351.17	6116.16	504.0459	0.558512	2.80694	56.54069	0	7532501	2.68E+08	1056
Turkey	1899.931	1460.88	5509.16	842.46	1003.329	1.753019	5.723665	867.2689	0	2006327	1.06E+09	1056

Source: Prepared by the researchers using Eviews12.

Table (03): Stability Test of the Stock Index Price Series of the Studied Stock Exchanges

Country	Dickey-Fuller test and Phillips Peron test for intercept and trend of price series							
	Price Series						ARCH	
	Augmented Dickey-Fuller test statistic			Phillips Peron test statistic				
	T-stat	prob.*	Stationarity	Adj. t-stat	prob.*	Stationarity	N*R ²	prob.*
BAHRAIN	-3.61887	0.0287	No	-3.45168	0.0453	No	1045.991	0
EGYPT	2.056468	0.569	No	2.14584	0.5189	No	1038.699	0
INDONESIA	-3.460632	0.0442	No	3.68839	0.0235	No	1029.705	0
JORDAN	-3.558183	0.034	No	-3.49015	0.0409	No	1049.384	0
KUWAIT	-1.396355	0.8618	No	1.58964	0.7968	No	1044.335	0
LEBANON	-2.677905	0.2461	No	2.78792	0.2021	No	1037.806	0
MALAYSIA	-2.522685	0.317	No	-2.7634	0.2114	No	967.5436	0
MOROCCO	-1.458197	0.8431	No	1.30774	0.8853	No	1035.334	0
OMAN	-4.089999	0.0067	Yes	3.87896	0.0132	No	1044.311	0
PALESTINIAN_T	-2.56268	0.2978	No	2.57293	0.293	No	1042.065	0
QATAR	-0.995788	0.9427	No	1.12096	0.9238	No	1033.718	0
SAUDI_ARABIA	-0.537457	0.9818	No	0.70173	0.972	No	1042.279	0
TUNISIA	-3.221328	0.0808	No	3.00143	0.1322	No	1045.691	0
TURKIYE	2.870701	1	No	2.695947	1	No	1051.627	0

Source: Prepared by the researchers using Eviews

Table (04): Results of GARCH Model Estimation for the Impact of the COVID-19 Pandemic on Stock Index Volatility in the Studied Exchanges

Country		BAHRAIN	EGYPT	INDONESIA	JORDAN	KUWAIT	LEBANON	MALAYSIA	MOROCCO	OMAN	PALESTINIAN_T	QATAR	SAUDI_ARABIA	TUNISIA	TURKIYE
Variance Equat	Coefficient	16.21633	8067.047	817.4875	84.42753	453.3879	9.946054	66.20207	536.9723	77.4203	0.363511	1205.067	4690.046	329.7656	228.3548
	z-stat	1.321359	5.09887	2.917119	2.156337	2.61626	2.348508	4.240743	2.088202	2.288551	1.340361	4.866631	2.4090504	3.481497	5.121999
		0.1864	0	0.0035	0.0311	0.0089	0.0188	0	0.0368	0.0221	0.1801	0	0.016	0.0005	0
	ARCH(1)	0.527411	0.950564	0.7705509	0.774867	0.6433955	0.527672	0.877629	0.705324	0.782385	0.44806	1.044605	0.454883	0.785475	0.834594
	z-stat	3.851174	6.287469	5.037105	3.069582	6.295512	11.71821	7.850803	6.285936	4.504162	5.733159	4.754892	5.927714	4.735018	5.382504
		0.0001	0	0	0.0021	0	0	0	0	0	0	0	0	0	0
	GARCH(1)	0.490238	0.048612	0.237863	0.21488	0.3778606	0.528731	0.128463	0.356725	0.242384	0.583562	-0.032273	0.560834	0.231039	0.198235
	z-stat	5.968071	0.8927994	3.014821	1.592255	5.696998	17.10332	1.972709	5.765701	4.660374	12.58069	-0.647162	12.8378	3.019447	3.312467
		0	0.372	0.0026	0.1113	0	0	0.0485	0	0	0	0.5175	0	0.0025	0.0009
COVID-19	Coefficient	1662.622	10796.12	6653.342	2107.959	5846.782	989.5556	1503.839	12157.35	3992.455	624.4878	10685.42	11954.71	7070.107	1074.674
	z-stat	891.2581	983.8377	1598.102	992.559	1392.873	1337.003	1697.217	2236.75	2165.852	2179.441	2408.572	774.6267	1835.48	3451.4458
		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	New cases	0.024999	0.06912	0.004517	0.004361	0.103719	0.004043	0.003422	-0.040862	0.02982	0.001873	0.366735	0.096717	0.000649	0.005133
	z-stat	63.0267	4.923361	24.1598	20.89952	35.17966	15.11444	34.19027	12.43943	7.981638	6.867889	99.50536	10.57823	0.733763	25.4318
		0	0	0	0	0	0	0	0	0	0	0	0	0.4631	0
	New deaths	-10.0306	-0.68387	-0.463087	-1.20861	-36.6905	-2.769165	0.004179	-17.20928	0.182276	-3.031653	-1.646889	-120.8823	0.613711	0.992257
	z-stat	-23.7275	-1.67648	-52.70131	-10.4968	-31.8386	-48.01543	0.393695	-52.48511	0.882798	-34.3533	-0.982192	-103.4607	9.887998	38.83336
		0	0.0936	0	0	0	0	0	0.6938	0	0.3773	0	0.326	0	0
Akaike		13.00618	15.12547	14.91962	13.28086	14.97436	12.48285	10.3795	15.9063	13.50429	10.1999	16.09082	16.16986	13.93002	13.96533
Schwarz		13.0348	15.1541	14.94824	13.30949	15.00298	12.51148	10.40813	15.93493	13.53292	10.22862	16.11944	16.19849	13.95865	13.99396
Hannan-Quinn criter		13.01704	15.13633	14.93048	13.29172	14.98522	12.49372	10.39036	15.91716	13.51515	10.21085	16.10168	16.18072	13.94088	13.9762
Log likelihood		-6731.2	-7828.99	-7722.361	-6873.48	-7750.72	-6460.118	-5370.581	-8233.463	-6989.222	-5277.596	-8329.042	-8369.987	-7209.75	-7228.04
ARCH+GARCH		1.017649	0.999176	1.012922	0.989747	1.022001	1.056403	1.006092	1.062049	1.024769	1.031568	1.012332	1.05717	1.016514	1.032829

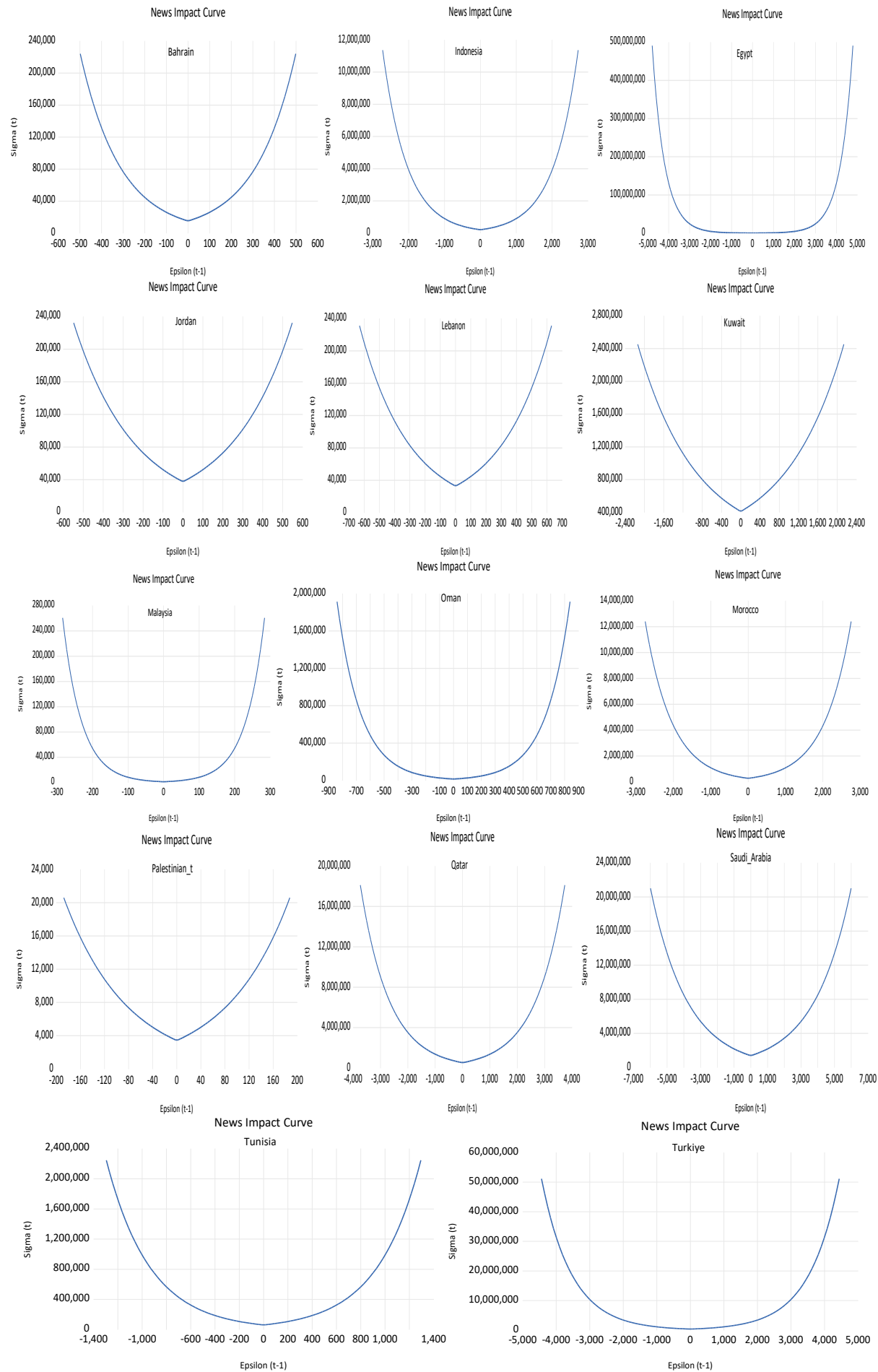
Source: Prepared by the researchers using Eviews12.

Table (05): Results of EGARCH Model Estimation for the Impact of the COVID-19 Pandemic on Stock Index Volatility in the Studied Exchanges

Country		BAHRAIN	EGYPT	INDONESIA	JORDAN	KUWAIT	LEBANON	MALAYSIA	MOROCCO	OMAN	PALESTINIAN_T	QATAR	SAUDI_ARABIA	TUNISIA	TURKIYE
Variance Equat	Coefficient	-0.60599	0.866569	-0.368282	-0.65341	-0.30147	-0.496625	-0.262072	-0.818764	-0.597827	-0.610909	-0.767178	-0.111528	-0.56631	-0.819812
	z-stat	-2.02007	3.371168	-1.486696	-2.69846	-1.68447	-6.30409	-1.231078	-2.138413	-1.992284	-5.491773	-2.180983	-0.50502	-1.921413	-4.550615
		0.0434	0.0007	0.1371	0.007	0.0921	0	0.2183	0.0325	0.0463	0	0.0292	0.6135	0.0547	0
	EGARCH	0.941551	0.805855	0.921857	0.956193	0.963865	0.969322	0.869859	0.937946	0.864149	0.972474	0.952886	0.953024	0.927902	0.956174
	z-stat	21.02889	28.1369	29.63851	27.62541	54.61372	91.58243	22.40318	23.05928	18.86561	52.75759	27.30252	54.38106	27.40468	47.73519
		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RESID/SQRT (GARCH(1))	1.237406	1.645818	1.372694	1.153959	0.797371	0.854099	1.335883	1.688455	2.140324	0.859526	1.428301	0.802495	1.432142	1.392971
	z-stat	7.445827	9.675579	8.589607	6.317002	8.16347	10.92115	9.743198	6.49098	9.427369	6.743112	5.835723	7.902065	6.824449	11.73863
		0	0	0	0	0	0	0	0	0	0	0	0	0	0
COVID-19	Coefficient	1608.949	10590.96	6654.796	2100.998	6009.501	989.5011	1503.52	11743.65	4060.003	624.295	10705.53	11946.08	7056.481	1070.388
	z-stat	1897.876	1303.439	3552.428	1384.31	1333.306	1653.258	2815.769	4407.541	7676.69	3713.945	4013.46	917.0801	2987.514	932.5465
		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	New cases	0.037789	0.0244185	0.001842	0.005104	0.089541	0.004067	0.002729	0.045866	-0.017502	0.002032	0.364489	0.095208	0.002046	0.006486
	z-stat	38.3583	17.35658	10.90332	25.88092	31.78244	16.45545	35.99221	10.72743	-24.44115	7.421797	52.12883	14.81635	4.190198	41.25533
		0	0	0	0	0	0	0	0	0	0	0	0	0	0
	New deaths	-6.59938	-1.67445	-0.5223	-1.51019	-77.8661	-2.763617	0.032272	-4.598404	0.618054	-3.003715	-3.588172	-120.7169	0.757887	1.201311
	z-stat	-28.8986	-5.52218	-64.45617	-17.9674	-34.9286	-45.87886	3.411332	-17.2758	21.89824	-33.87774	-3.313097	-117.5106	13.90188	91.31119
		0	0	0	0	0	0	0	0.0006	0	0	0	0	0	0
Akaike		13.03177	15.17473	14.9611	13.30385	15.07163	12.47885	10.4037	16.05444	13.57027	10.19693	16.111598	16.17148	13.94053	14.02858
Schwarz		13.0604	15.20335	14.98973	13.33248	15.10026	12.50747	10.43233	16.08307	13.5989	10.22556	16.14461	16.20011	13.96916	14.05721
Hannan-Quinn		13.04263	15.18559	14.97196	13.31471	15.08249	12.48971	10.41456	16.0653	13.58113	10.20778	16.12684	16.18235	13.95139	14.03944
Log-likelihood		-6744.46	-7854.51	-7743.849	-6855.39	-7801.11	-6458.042	-5383.117	-8310.201	-7023.401	-5276.012	-8342.077	-8370.829	-7215.194	-7260.806

Source: Prepared by the researchers using Eviews12.

Figure (01): News Impact Curve for the EGARCH Model



Source: Prepared by the researchers using Eviews12.