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The Impact of the Coronavirus Pandemic on Financial Markets Returns - A Study of a Sample of Middle Eastern and North African Countries Using the GJR GARCH Model

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Abstract:

This study aims to examine the impact of the Corona virus pandemic on the financial markets returns of the Middle East and North Africa countries for the UAE (**DFMGI)**, Bahrain (**BAX)**, Jordan (**AMGNRLX**), Egypt (**EGX30)**, and Tunisia (**TUNINDEX)** from the period January 29, 2020 to June 16, 2022 using the GJR GARCH model. The results of the GJR-GARCH models show that the Corona virus has a significant positive impact on stock market volatility in three out of five of the studied countries (i.e. Bahrain, Tunisia, Jordan), but its impact is small in the UAE and especially Egypt.

Keywords: financial market, corona virus ; GJR GARCH Model.

1.Intrduction

Since the coronavirus emerged in Wuhan, China, the pandemic has spread across various countries, although governments have tried to curb the virus, including travel restrictions and quarantine policies. Accordingly, the World Health Organization (WHO) declared the outbreak of coronavirus (Covid-19) to be a pandemic on 11 March 2020 (Carter et al. 2021 ; Kamaludin et al. 2021). When writing this paper, the pandemic affects 225 countries and territories (Worldometer, 2022). More than 450 million Covid-19 confirmed cases have been confirmed, with over 6 million deaths worldwide (WHO, 2022). The Covid-19 pandemic has been generally considered an event for the 2020 stock market crash worldwide (from February to April 2020). The pandemic appears to cause various financial issues such as declined stock returns (Al-Awadhi et al., 2020); increased stock volatilities (Baig et al., 2021; Zaremba et al., 2020); liquidity crunch (Baig et al., 2021; De Vito and Gómez, 2020; Kamaludin et al., 2021); high level of debt (Zhang et al., 2020); and high cases of bankruptcy (Akhtaruzzaman et al., 2021). Furthermore, recent empirical studies indicate significant increases in the transmission of risk, volatility and fear shock among financial markets worldwide and sectors within a financial market during periods of crisis, including the Covid-19 pandemic (Abuzayed et al., 2021; Bossman et al., 2022; Huynh et al., 2021; Shen et al., 2022)

The COVID-19 pandemic has severely damaged not only human lives but also the global economy and financial markets. While the short-term economic impact of COVID-19 is the limited economic activity resulting from strict quarantine policies, its long-term economic impact is mass unemployment and business failure (Zhang et al. 2020). The International Monetary Fund (2020) reported in World Economic Outlook that the global economy is projected to contract by 3 % in 2020 because of the COVID-19 pandemic. The World Bank (2020) forecast a 5.2 % contraction in global gross domestic product (GDP) in Global Economic Prospects, and the Organisation of Economic Cooperation and Development (OECD ,2020) forecast a 6% fall in global GDP with a single-hit scenario and a 7.6 % decline with a double-hit scenario due to COVID-19 in Economic Outlook. According to (Goodell, 2020), COVID-19 causes more unprecedented damage to a country's economy than other natural and human-made crises like climate change, nuclear wars, natural disasters, and local tragedies, and it has a relatively wide range of impacts on financial markets. In comparison to the global financial crisis of 2008, the COVID-19 pandemic caused more severe and abrupt damage to the global economy. While the 2008 global financial crisis started in the United States (US) and gradually spread to the rest of the world with a significant time delay, the COVID-19 pandemic instantaneously brought the global economy to a standstill by simultaneously disrupting demand and supply lines around the world because of widespread lockdowns. (Baker et al. 2020) reported that stock markets were more affected by COVID-19 than any previous infectious disease outbreak. In March 2020, the circuit breaker mechanism, which had not been used for over two decades, was activated four times in 10 days in the US stock market (World Economic Forum, 2020), global stock markets plunged,1 and oil prices hit the ground.

THE aim of this study is to know the extent of the impact of the Covid 19 pandemic on the stocks of the stock markets of the Emirates, Jordan, Bahrain, Egypt and Tunisia by studying the fluctuations of stock returns for the indices for daily data during the period from January 2020 to June 2022.

2.Literature Review

At the beginning of 2020, the world witnessed a major outbreak of the coronavirus called COVID. It was discovered in December 2019 in the Chinese city of Wuhan, and it was classified as a pandemic by the World Health Organization on March 11, 2020, and following its spread, countries rushed to take quarantine measures that history has not witnessed such, as hundreds of millions of people were locked in their homes and all air, sea and land transportation was stopped, and many factories were disrupted, and restaurants, cafes, and everything related to gatherings of people stopped.

There are many studies that have dealt with the topic of crises in financial markets and how these markets are related to each other. Therefore, we will present special studies of the impact of the COVID-19 global health crisis as follows:

*(*Balmashri *and Doma, 2021) ;*The study aims to analyze and measure the impact of Covid 19 on global and Arab financial market indices during the period from 26/01/2020 to 25/04/2021, and to reach the goal of the study, weekly data was used for a sample consisting of the S&P500 index for the American Stock Exchange and EGX30 for the Egyptian Stock Exchange as a dependent variable and the number of confirmed cases, the number of deaths and the prevalence rate of the Covid 19 virus as an independent variable. The study adopted a descriptive and analytical approach using the ARDL model as a statistical tool and the results of the study showed a negative impact of the virus on the S&P50 index and a high degree compared to its weak negative impact on the EGX30 index.

(Ahmad & Evan, 2021) The objective of the study is to investigate the impact of the COVID-19 pandemic on the stock market in Saudi Arabia. The study relie on the data of the daily closing price index of the stock market (TASI), and the number of daily cases of COVID-19 during the period from March 15, 2020 to August 10, 2020. The study uses Vector Auto-Regressive (VAR), Impulse Response Function (IRF) and Conditional Heteroscedastic Auto-Regressive (CHAR) models. (ARCH) Correlation matrix and IRF results show that stock market returns responded negatively to growth in COVID-19 infected cases during the pandemic. ARCH model results confirmed the negative impact of the COVID-19 pandemic on stock market returns in Saudi Arabia. The results also showed that the negative market reaction was strong during the early days of the COVID-19 pandemic. The study concluded that the stock market in Saudi Arabia responded quickly to the COVID-19 pandemic. The response over time varies depending on the stage of the pandemic. However, the Saudi government's response time and the size of the stimulus package played an important role in mitigating the effects of the COVID-19 pandemic on the Saudi Arabian stock market.

*(*Abdelkader ,2021*)*This study seeks to know the extent of the impact of the Corona Covid 19 pandemic on stock market shares, by studying the volatility of stock returns of the most traded sectors on the Moroccan Stock Exchange, as this study included the sectors listed on the Moroccan Stock Exchange for daily data during the period from March 2020 to November 2020, and to achieve the goal of the study, a linear regression model was used to study the volatility of stock returns due to changes in the spread of the Covid 19 virus epidemic, from the results of the study: -The spread of the Coronavirus can affect the returns of stock market sectors in addition to the impact of the stock market index, as the study showed that there is an inverse relationship between Coronavirus changes and the returns of sector portfolios, which negatively affects the financial performance of the stock exchange.

(Kusumahadi & Permana, 2021)This study aims to examine the impact of COVID-19 on inventory return volatility in 15 countries around the world. Using daily data from January 2019 to June 2020, we find that changes in exchange rates negatively affected stock returns in most countries. We also identify structural changes across the observation period. These structural changes occur not only after the first case of COVID-19 but also earlier in the period. Based on a generalized covariance conditional regression threshold, we find evidence that the emergence of COVID-19 affected stock return volatility in all observed countries except the UK. Moreover, we find that the presence of COVID-19 in a country positively affects the return volatility. However, the magnitude of this effect is small in every country observed. This suggests the need for in-depth studies of other factors affecting stock return volatility besides that occurrence. COVID-19

(Alkayed, Yousef, & Zalmout, 2022) This study analyzes for the first time the impact of the novel coronavirus known as COVID-19 on the stock market volatility of the BRICS countries (Brazil, Russia, India, China and South Africa) using a GJR-GARCH model. We find that during the coronavirus period, Brazil, India, and South Africa exhibit extremely high volatility, with negative returns exceeding those faced by these indices during the 2008 financial crisis. Coronavirus, on the other hand.

-The results of GJR-GARCH models show that the COVID-19 variable has a significant positive effect on stock market volatility in Brazil, India, China, and South Africa but a negligible effect for Russia. Among these countries, Brazil did the

most affected by the virus, followed by South Africa, China, and India. It is clear that Russian and Chinese indices faced the greatest volatility during the 2008 crisis.

(Rusydiana & Prakoso, 2021) This study explores the impact of Covid-19 and various macroeconomic variables on Islamic stock prices in Indonesia, specifically the Jakarta Islamic Index (JII), by analyzing monthly data from 2015 to 2020. This study uses the Vector Error Correction Model (VECM) in order to investigate the short-term and long-term effects of each of the macroeconomic variables and the international stock index of the JII. The results show that the dummy variable for Covid-19 significantly affects the JII in the short term. Meanwhile, inflation, exchange rates, money supply, the US P500&S Index, China's SSE Index, and the Covid-19 dummy variable significantly affect the JII in the long run. The long-term results show that inflation, exchange rates, the US P500&S Index, and the Covid-19dummy variable are detrimental to the JII. On the other hand, money supply and China's SSE index positively affect the JII. This study confirms that Covid-19 can affect the decline of the Islamic stock index in Indonesia, at least the results of this study can be used as material to discuss and research the economic impact of the Covid-19 pandemic by providing empirical evidence that the pandemic has a restraining effect on the performance of the Islamic stock exchange in Indonesia.

3. Study data

1- Data description and sources :

This study includes a sample of daily series observations of the closing prices of financial market indices for the Middle East and North African countries of the Arab Emirates, Bahrain, Jordan, Egypt and Tunisia during the period from 26/01/2020 to 16/06/2022, where the number of observations reached 1504 from the study population represented by financial market indices (Table 03-05). The data was obtained from the official website of the exchanges published at : https://www.investing.com

Table 01. Stock price indices of the studied stock markets

Market	Emarate	Bahren	Jorden	Egypt	Tunis
Index	DFMGI	BAX	AMGNRLX	EGX30	TUNINDEX

Source : Prepared by the researchers

The daily return of the general index of the financial market has been calculated according to the following formula :

$$Rt= (\ln(P_t)-\ln (P_{t-1})) *100$$

Where :

R_t: Represents the daily return of the General Index for the current period

P_t: Represents the daily closing price of the general index for the current period

P_{T-1} : Represents the daily closing price of the general index for the previous period.

2- GJR GARCH

Developed the (Ravi ،David E ،Lawrence R ،1993) **GJR-GARCH** model that takes into account the sudden and unexpected arrival of events by introducing a new explanatory variable ;

It includes an extension of the GARCH model to address the issue of the asymmetric impact of positive and negative shocks of the same magnitude on conditional volatility. The GJR GARCH model introduces a dummy variable in the conditional volatility equation that takes a value of 1 if the shock is negative (d= 1, if $\varepsilon_t < 0$) and a value of 0 if the shock is positive or equal to zero [d = 0, if e > 0). **(Glosten, 1993)**

$$\sigma_t^2 = \beta_0 + \sum_{i=1}^{p}\beta_{1,i}\varepsilon_{t-i}^2 + \sum_{j=1}^{q}\beta_{2,j}\sigma_{t-j}^2 + \beta_3 d_{t-1}\varepsilon_t^2$$

After the spread of the Corona pandemic, a health crisis that spread in most countries of the world, which affected especially the developed countries, and the accompanying unprecedented governmental measures, by imposing a quarantine, restricting the movement of people and goods, and disrupting many industrial provinces in China, the global financial markets witnessed major shocks. In order to know the impact of the global health crisis on the financial markets under study, the start and end period of COVID-19 was taken in the following countries :

DFMGI	January 29, 202 to September 22, 2021
BAX	February 23, 2020 to February 20, 2022
AMGNRLX	March 02, 2020 to February 28, 2022
EGX30	February 16, 2020 to June 16, 2022
TUNINDEX	March 02, 2020 to May 25, 2021

Source : Prepared by the researchers

Table 02. Descriptive statistics

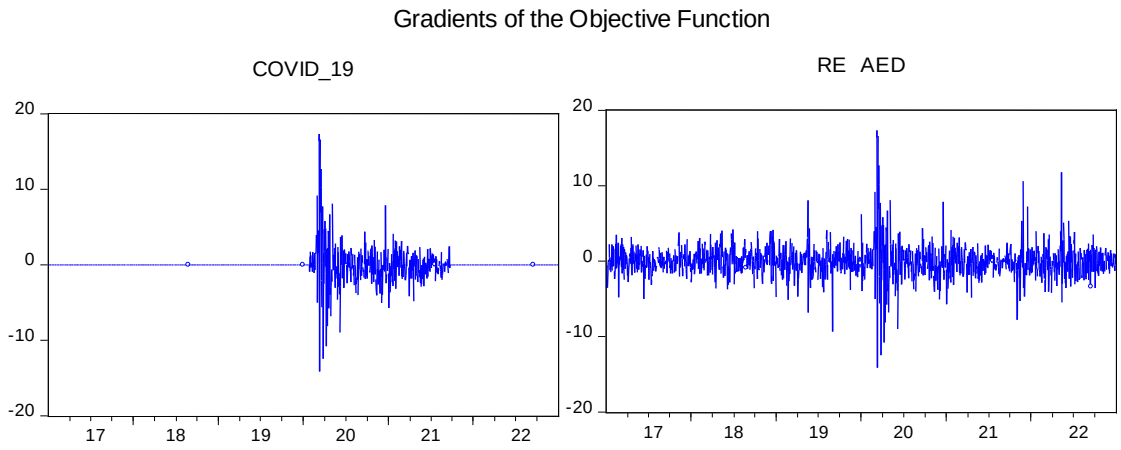
Kurtosis	kewness	Maximum	Minimum	Median	Mean	
2.011906	1.005935	1.00000	0.000000	0.446831	0.275333	**DFMGI**
1.504597	0.710350	1.00000	0.00000	0.471324	0.33265	**BAX**
1.623646	0.789713	1.00000	0.000000	0.465219	0.316369	**AMGNRLX**
1.208241	0.456335	1.00000	0.00000	0.487639	0.388775	**EGX30**
3.170458	1.473248	1.00000	0.00000	0.402704	0.203457	**TUNINDEX**

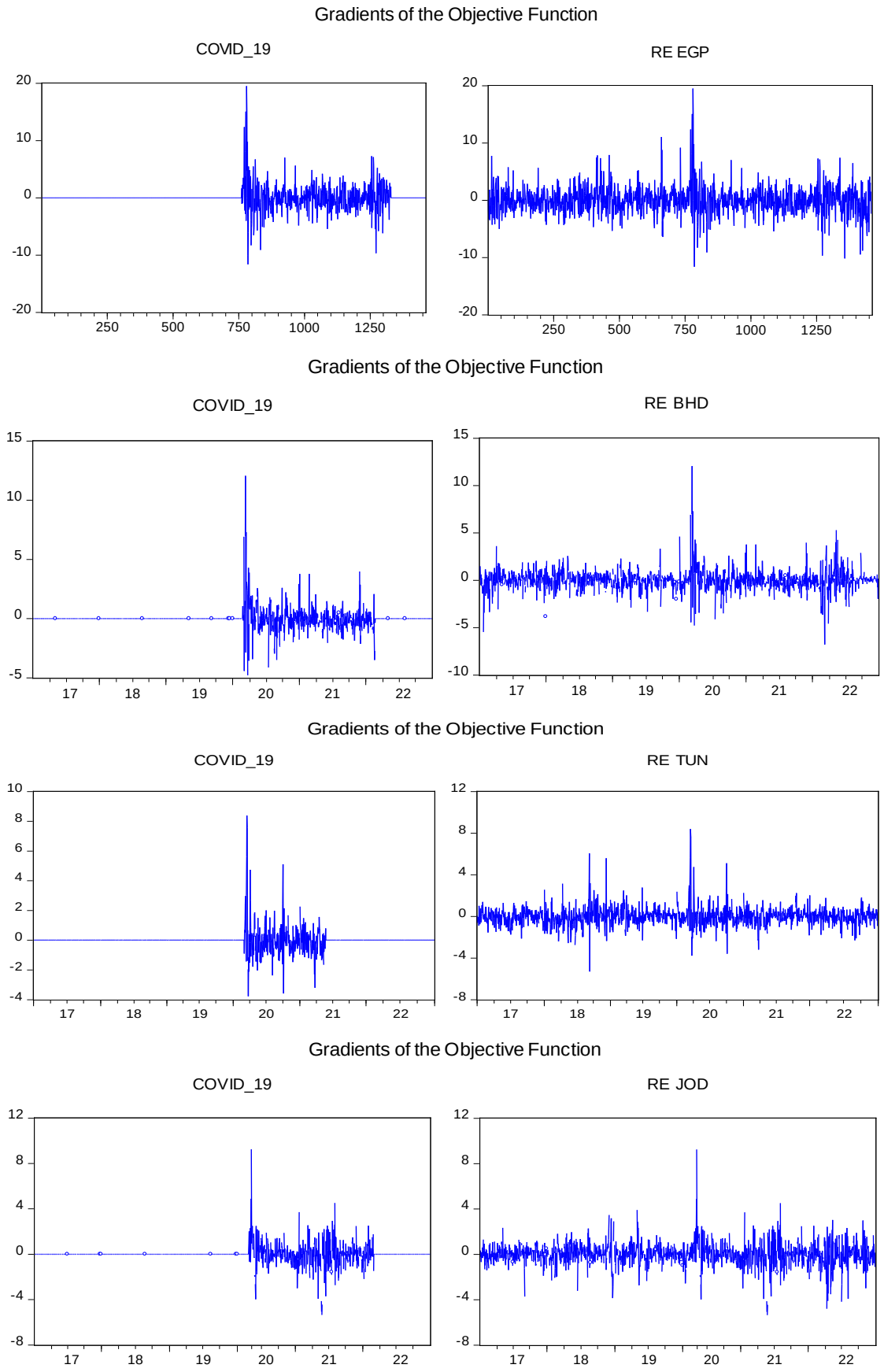
Source : Prepared by the researchers based on the output of Eviews10

Analysis:

Table02. Information about the descriptive statistics in the crisis period. During this period, average stock market returns were positive for all financial markets studied. Another noteworthy statistic in this table is that the volatility values in the crisis period are lower than in the pre-crisis period. In addition, the average daily stock market returns in the crisis period are higher than in the pre-crisis period. The standard deviation of stock market returns in the crisis period is lower than in the pre-crisis period. There is a normal distribution in all stock market returns, which can be considered as common characteristics of financial variables.

Figure 01 : Illustrating the impact of the coronavirus pandemic on the returns of the studied financial markets.





Source : Prepared by the researchers based on the output of Eviews10.

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Time series plots of the return series during the COVID pandemic. The figure shows a time plot of all of the return series over the period from 29 January 2020 to 16 June 2022.

Analyse;

Figures 1 show the daily return series of all five indices during the COVID period from January 2020 to may 2022 The graphs in Fig. 1 highlight high levels of volatility during the pandemic in all five markets. In addition, all the indices show volatility clustering; hence, the volatility in one period appeared to affect future volatility.

Table 03. Model estimation

ARCH Effect	**Covid**		**Constant**		
LM	P – value	Coeff	P – value	Coeff	
323.0747***	0.8528	0.011503	0.8272	-0.007098	**DFMGI**
114.0610***	0.9906	-0.000361	0.0891	0.030036	**BAX**
200.0078***	0.1942	0.037746	0.8849	-0.002365	**AMGNRLX**
158.4051***	0.0723	-0.117145	0.1583	0.057322	**EGX30**
699.7627***	0.4970	-0.19738	0.0227	0.029883	**Tunisia**

Source: Prepared by the researchers based on the output of Eviews10

Table 03. Shows that the ARCH-LM test statistic is highly significant, which means that the ARCH effect is indeed present in the data under study, and this allows concluding that the current volatility of the indices is significantly affected.

3-Estimation of the GJR-GARCH model:

Glosen Jagannathan and Runkle (1993) proposed a GJR-GARCH model that takes into account the sudden and UAE unexpected arrival of events by introducing a new explanatory variable.

Table 04. Estimation of the GJR-GARCH model

	UAE		**Bahrain**		**Jordan**		**Egypt**		**TUNINDEX**	
	Coeff	**Z**	**Coeff**	**Z**	**Coeff**	**Z**	**Coeff**	**Z**	**Coef**	**Z**
Conditional mean equion										
C	-0,019	-0,753	0,007	0,534	-0,014	-1,083	0,044	1,165	0,021	2,149***
Conditional variance equation										
C	0,045	7,163***	0,034	9,233**	0,021	6,909***	0,101	5,290***	0,025	9,536***
COVID	0,057	1,233181	0,071	3,119***	0,041	1,744*	-0,049	-0,834	0,023	1,406*
Alpha	0,068	5,659***	0,192	8,158***	0,209	8,694***	0,064	3,555***	0,340	6,749***
Gamma	0,085	5,874822***	0,013	0,548***	0,029	1,156	0,081	4,865***	-0,087	-1,720*
Betta	0,841	61,87***	0,688	24,733***	0,702	28,168***	0,819	31,165***	0,584	22,453***
Llik	-1986,716		-1007,606		-884,1385		-2213,890		-689,6671	
BIC	2,638208		1,397815		1,246196		3,060576		0,946296	
AIC	2,616955		1,376247		1,224400		3,038864		0,925089	
HQC	2,624873		1,384289		1,232532		3,046964		0,932989	

Source : Prepared by the researchers based on the output of Eviews10

Analyse !

The estimation results summarized in Table 03-53 indicate that the model is statistically acceptable at the 5 percent level on all the studied stock exchanges. Next, the GJR-GARCH (1.1) technique is used to model the volatility of the return series in the study indices in order to test the impact of coronavirus on index volatility for each country, we add a dummy variable to the conditional variance equation that is equal to 1 for the COVID-19 period and 0 otherwise. The results are reported in Table 03-53.

The gamma coefficient is positive and significant for UAE, Bahrain and Egypt at 5% and Tunisia positive and significant at 1%, but insignificant for Jordan. Negative shocks usually lead to greater volatility (i.e., a drop in value) than positive events. This is because investors usually have stronger emotional reactions to bad news than to good news. It can also be seen in Table 3 that the COVID-19 dummy variable has a significant positive impact on each of the Bahrain indexes with (0.071) at 5%, Jordan with (0.041) at 10%, and Tunisia with (0.023) at 1% significance level specifically, except for UAE and Egypt.

The GARCH model reveals that the COVID-19 coefficient is the largest for Bahrain (0.071), UAE (0.057), Jordan (0.041), Tunisia (0.023) and Egypt's coefficient is negative and insignificant (0.040).

The main question posed by these results is : Why has the COVID-19 pandemic had such a strong impact on stock market volatility ? First of all, the virus-related panic has a negative impact not only on health, but also on trade and tourism, leading to local food shortages and profound repercussions on the global economy. These effects are exacerbated by the severity of the pandemic and the apparent ease with which the virus is transmitted. Moreover, as the coronavirus continues to make headlines in all news syndicates and as each country makes daily announcements of new confirmed cases and deaths, society has become saturated with information about a pandemic. This means that the stock market's impact of the situation is temporarily concentrated, leading to increased volatility. In addition, the modern global economy is interconnected. The results of the GJR-GARCH models show that the coronavirus has a significant positive impact on stock market volatility in three out of five of the studied countries (i.e. Bahrain, Tunisia, Jordan), but little impact on the UAE and especially Egypt.

Positive Shocks: The variable time of fluctuations is estimated as follows :

$\mathbf{h_t = 0.045 + 0.341h_{t-1} + 0.068u^2_{t-1}}$.	**DFMGI**
$\mathbf{h_t = 0.034 + 0.688h_{t-1} + 0.192u^2_{t-1}}$	**BAX**
$\mathbf{h_t = 0.021 + 0.702h_{t-1} + 0.209u^2_{t-1}}$	**AMGNRLX**
$\mathbf{h_t = 0.101 + 0.819h_{t-1} + 0.0641u^2_{t-1}}$	**EGX30**
$\mathbf{h_t = 0.025 + 0.584h_{t-1} + 0.340u^2_{t-1}}$.	**TUNINDEX**

Source : Prepared by the researchers based on the output of Eviews10

Negative Shocks : The variable time estimate is given for fluctuations ; the difference between good and bad news in store is gamma, which is the asymmetric term coefficient

$\boldsymbol{h_t = 0.045 + 0.341h_{t-1} + (0.068 + 0.085)\, u^2_{t-1}}$	***DFMGI***
$\boldsymbol{h_t = 0.034 + 0.688h_{t-1} + (0.192 + 0.013)u^2_{t-1}}$	***BAX***
$\boldsymbol{h_t = 0.021 + 0.702h_{t-1} + (0.209 + 0.029)u^2_{t-1}}$	***AMGNRLX***
$\boldsymbol{h_t = 0.101 + 0.819h_{t-1} + (0.0641 + 0.081)u^2_{t-1}}$	***EGX30***
$\boldsymbol{h_t = 0.025 + 0.584h_{t-1} + (0.340 + 0.087u^2_{t-1}}$	***TUNINDEX***

Source : Prepared by the researchers based on the output of Eviews10

4. CONCLUSION

This study investigates the impact of the COVID-19 pandemic on financial markets, we conducted analyses using GJR-GARCH models on daily return series data for the Middle East and North Africa countries of Bahrain, Tunisia, Jordan, Marat and Egypt during the period January 29, 2020 to May 16, 2022. The results are as follows :

- The GJR GARCH model was used to examine the impact of the coronavirus pandemic on the studied financial markets :
- The gamma coefficient is positive and significant for UAE, Bahrain and Egypt at 5% and Tunisia positive and significant at 1%, but insignificant for Jordan ; negative shocks usually lead to greater volatility (i.e. a decrease in value) than positive events.
- The COVID-19 dummy variable has a significant positive effect on each of Bahrain's indexes (0.071) at 5%, Jordan's (0.041) at 10%, and Tunisia's (0.023) at 1% significance, specifically excluding UAE and Egypt.

- The GARCH model reveals that the COVID-19 coefficient is the largest for Bahrain (0.071), UAE (0.057), Jordan (0.041), Tunisia (0.023) and Egypt's coefficient is negative and insignificant (0.040).
- The results of the GJR-GARCH models show that the coronavirus has a significant positive impact on stock market volatility in three out of five of the studied countries (i.e. Bahrain, Tunisia, Jordan), but has little impact on UAE and especially Egypt.

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