Educational Administration: Theory and Practice
2024, 30(4), 992-1000
ISSN: 2148-2403
https://kuey.net/

Research Article

Effects of the COVID-19 Pandemic and Russia-Ukraine Conflict on Stock Market Volatility in the GCC Countries

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Citation: Adil Arkan Mahmood et al. (2024), How Did The Covid-19 Pandemic And The Russia-Ukraine Conflict Effect The GCC Countries Stock Markets Volatility? *Educational Administration: Theory And Practice*, *30*(4), 992-1000
Doi: 10.53555/kuey.v30i4.1598

ARTICLE INFO

ABSTRACT

The primary aim of this study is to analyze the asymmetric impact of both the COVID-19 pandemic and the Russia-Ukraine conflict on the volatility of stock market returns within the Gulf Cooperation Council (GCC) region. Our focus lies in identifying potential hedging and safe haven instruments amidst the coronavirus outbreak, utilizing the stock indices of Saudi Arabia, Bahrain, Abu Dhabi, Iraq, Kuwait, Oman, and Qatar. Our analysis spans from July 12, 2011, to April 7, 2022, employing both linear and nonlinear Heteroscedastic Conditional Autoregressive (ARCH) models. We have concluded that these stock market indices do not serve as effective instruments during these crises. The implications of our findings extend to investors and policymakers, urging them to explore diversified investment portfolios and implement strategies aimed at upholding investor confidence during turbulent periods.

Keywords: Stock indices, COVID-19 pandemic, Volatility, ARCH
EL Classification: G10, C22, C58.

1. Introduction

Between health crisis and wars, in a post-Covid19 world where everything has become more dangerous and socially fragmented, where people and businesses are going into debt, where we are during climate change. How do we adapt in this constantly changing world and what are the impacts of the Ukrainian war on the markets?

The impact on the markets will have been as sudden as it is large Umar et al. (2022). These levels of variation, without being comparable to those we went through in 2008 during the “subprime” crisis or in 2020 during the Covid19 crisis, are nevertheless extreme corrections. The fall in prices following the invasion of Ukraine is justified by its negative impact on the prospects for economic growth. Three transmission channels are at work:

First, the economic sanctions imposed on Russia are also upsetting companies. In addition, the rise in the price of raw materials, whether hydrocarbons, agricultural raw materials or certain metals exported by Russia, will further increase inflation (Siingh et al. (2022)).

This inflation therefore induces a reduction in the purchasing power of consumers and in the margin rates of companies. INSEE estimates that each $10 rise in the price of a barrel results in an increase in inflation of 0.2 point and a slowdown in growth of 0.2 point, which observers qualify as stagflation. So how to invest in this anxiety-provoking context?

As brutal as this correction and its major implications may seem, many companies are positioning themselves on long-term trends to create value over time. They have also demonstrated during the Covid19 (and with the help of governments) an extraordinary ability to adapt. The recovery in 2021 has allowed them to restore room for maneuver to address current challenges (Haji (2022)). Also, Anderson et al. (2022) show that the dynamic of good surprises continues. Overall, companies are managing to "digest" the rise in costs and the outlook for activity remains solid with order books often exceeding expectations.

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If the worst is never certain, to sell long-term assets today to protect oneself against the last phase of decline would be to take the risk of the double penalty, that of suffering the fall and that of not benefiting from the recovery of the markets.
Indeed, the stocks of companies positioned on long-term growth themes have been more resilient during the Ukraine-related correction than companies whose activity is more cyclical. Should the conflict escalate, bonds with coupons indexed to inflation should continue to offer real protection, especially in the face of new sanctions on the energy front. On the "High Yield" side, volatility will remain high, but spreads had already suffered from the anticipated monetary tightening. The unpredictability of this new period of conflict makes any short-term expression difficult. In this context, central banks should be more cautious and more accommodating, particularly in the Gulf countries where risks are weighing on growth. At the same time, inflation appears less under control given its risk of increasing in the event of an acceleration of sanctions on the energy front, which would notably slow down activity and raise fears of a period of stagflation. Caution remains in order regarding the levels of the equity markets which seemed attractive before the invasion of Ukraine by Russia.
Thus, in this article we tried to study the volatility of the stock market indices of the Gulf countries to analyze the repercussion of the health crisis of COVID19 and the war between Ukraine and Russia on the performance of the stock markets of these countries.
The paper is organized as follows. Section 2 reports a synopsis of empirical studies and Section 3 reports, methodology, data, descriptive statistics, and empirical results. Section 4 concludes.

2. Literature Review

The functioning of stock markets depends on volatility, which is seen as an indicator of the financial risk associated with investments (Vo et al. (2022)). Therefore, it is crucial for investors and regulators to investigate how the COVID-19 pandemic affects the volatility in stock markets. Given that financial markets are typically viewed as a complicated adaptive system (Mauboussin (2002)), their reactions to the COVID-19 pandemic have varied over time. In comparison to the reactions when the COVID-19 first surfaced in March 2020, current responses to the outbreak look to be very different. As a result, it might be argued that it is relevant and helpful to revisit the effects of the epidemic on the volatility in stock market indices more than 2 years after it first appeared. It is significant to note that after the COVID-19 pandemic rocked the globe, studies started to appear that looked at how the pandemic affected various parts of stock markets, national and global markets, and particular business activities (Aliani et al. (2022)). According to recent research, the world's financial markets have been adversely impacted by the emergence of the COVID-19 pandemic, and this pandemic's worldwide response has had historically large and unprecedented effects (Baker et al. (2020)).
In response to the COVID-19, the risk in capital markets have considerably escalated, and such markets have become very unpredictable and unstable (Zhang et al. (2020)). In the same vein, an investigation into the first quarter of 2020 was done by Siriopoulos et al. (2021). According to their study 34% of the volatility was connected to the general level of volatility on the Chinese financial market, whereas 7% of the volatility was connected to global unpredictability. The fact that the COVID-19 had a relatively minor (less than 1%) impact on European capital markets suggests that these markets responded to the two risks of transmitting shocks from the Chinese stock market and global uncertainty. In his study of the United States using OLS regression, Albulescu (2021) concluded that the revelation of new diseases was globalized, raising financial volatility in the country, and the death rate had a large and positive impact on the financial volatility. The United States had a bigger economic effect than the rest of the globe when the COVID-19 data were compared to that country.
While Onali (2020) found no correlation among COVID-19 cases and stock return in Italy and France, it did find a negative correlation between COVID-19 outbreak and market returns in the US in relation to the number of cases and deaths on US and European stock markets. Liu et al. (2020) investigated the short-term impact of COVID-19 on stock markets in 21 different nations, including Japan, Singapore, the US, and the UK.According to the findings, the Corona outbreak had a detrimental effect on the performance of the stock markets in the countries that were the subject of the investigation. Additionally, the study's findings indicated that Asia's stock markets were responding to COVID-19 more swiftly than other regions, and some of them also recovered quickly.
Regarding emerging economies, Akhtaruzzaman et al. (2021) noticed a large change in correlation between Chinese stock market returns and those of the G7 nations across both nonfinancial and financial enterprises. Investors lost their capital in the short-run because of COVID-19's unfavorable effects, which also increased risk in the stock market (Corbet et al. (2020); Zhang et al. (2020)). In their study, When Yong et al. (2021) used the GARCH family method to analyze daily stock returns from Bursa, Malaysia and the Singapore Exchange between July 2019 and August 2020 and discovered that while stock returns were generally stable before the COVID-19 epidemic, they began to decline after the outbreak in both financial markets. In the same line, Lee et al. (2020) analyzed the effects of the COVID-19 on the Malaysian financial market from December 2019 to April 2020. According to their findings, Malaysia had a greater than average number of COVID-19 cases, which seemed to have a negative impact on the KLCL index's performance. With regard to

the other financial markets in developing countries, the Indian stock market demonstrated a substantial progress in terms of monthly average yields. Not only the Indian stock market exhibit stability during the global pandemic, but so did the Pakistani stock market because both of these nations had appropriate lockdown policies in place and planned to continue operating its stock markets as routine (Rehan et al. (2022)).

Despite the fact that the COVID-19 issue is a worldwide one, the Gulf countries' specific economic dependence on oil poses a concern in addition, particularly in light of the current drop in oil prices. Corbet et al. (2020) notice that the decline in demand brought on by the COVID-19 pandemic was associated with the decline in oil prices. Financial and non-financial industries have also seen a significant increase in their sensitivity to the oil price as a result of the Covid-19 pandemic (Akhtaruzzaman et al. (2021)) because the economic activities suffered from a labor shortage and decreased production of products and services due to concerns about virus spreading (The Economist (2020)). In particular, events such as COVID-19 can trigger disruptions in investor attitude that are detrimental and have a significant impact on their investment choices and, as a result, stock market values. The impact of investor emotions on financial markets is more obvious in nations with minimal institutional involvement or nations that are traditionally more susceptible to herd-like actions and overreaction (Liu et al. (2020)). In this vein, Bahrini and Filfilan (2020) conducted a study on how identified cases and COVID-19 deaths affected daily returns of the leading stock market indexes in the Gulf Cooperation Council (GCC) between April 2020 and June 2020. According to their findings, the total number of deaths during COVID-19 had a considerable negative impact on GCC stock markets, whereas the number of cases during COVID-19 had a negligible impact. Additionally, the returns of the key GCC stock market indexes decreased as the number of confirmed deaths rose. Moreover, El-Basuony (2020) highlighted the COVID-19's effects on the Arab stock markets in Egypt and Saudi Arabia between April and May 2020. The study found a substantial negative link between the confirmed pandemic cases and death cases. The study concluded that during this period of time, the COVID-19 epidemic significantly affected the financial markets in Egypt and Saudi Arabia. Further, using weekly data covering the period from January to September 2020, Alsedrah and Gherbi (2021) focused at the effect of market type for investors on the overall value of market trade in Saudi Arabia during the COVID-19 pandemic. In their study, they applied autoregressive distributed lag (ARDL) method and time-series analysis techniques to show that stock holding and net traded values both had a short-term detrimental impact on the expansion of trading activities. Trading activities throughout the three-month lockout period demonstrated a negative growth effect, particularly in Saudi Arabia. The evolution of market operation was significantly influenced favorably over the long term by the net traded value.

3. Empirical validation

In order to empirically validate the volatility of the stock market indices of the Gulf countries, we analyzed the stock exchanges of Saudi Arabia, Bahrain, Abu-Dhabi, Iraq, Kuwait, Oman, and Qatar using a daily study period, from12 July 2011 to 07 April 2022, with 2.803 observations for each index. **Figure 1** depicts the evolution of each index during our investigation period.

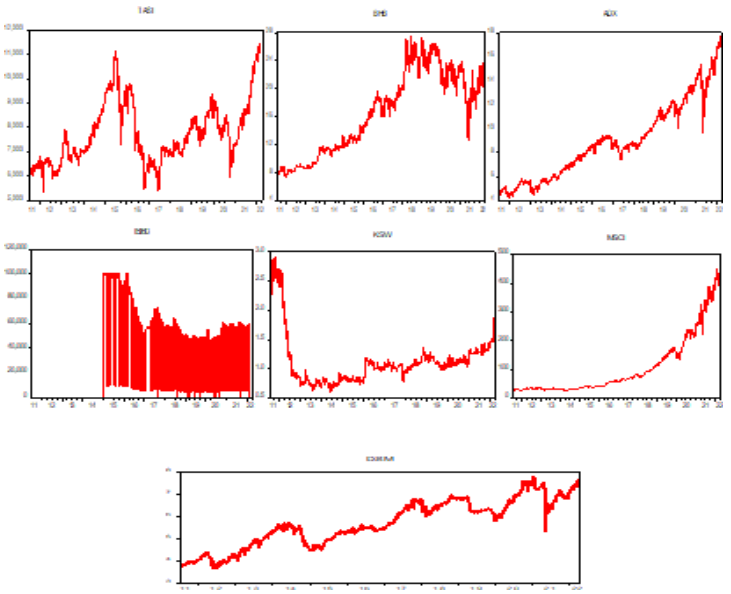

Figure 1. Evolution of TASI, BHB, ADX, ISX60, KSW, MSCI and DSM

According to **Figure 1**, the plots illustrate that all the stock indices analyzed are non-stationary because each financial asset has a seasonal influence. In addition, volatility is graphically validated for the Iraq Stock Index (ISX60). To analyze the quality of precision, linear fit, symmetry, flattening, and normality of each stock index, we will use position, dispersion, and shape indicators. These indicators for analyzed financial assets are presented in the **Table 1**.

Table 1. Descriptive statistics

	LTASI	LBHB	LDSM	LISI60	LKSW	LMSCI	LADX
Mean	8,9369	2,7434	1,7267	7,6451	0,0628	4,2899	2,1301
Median	8,9128	2,8572	1,7339	10,7827	0,0556	4,1128	2,1561
Maximum	9,3609	3,315	2,0562	11,5129	1,0695	6,1077	2,8774
Minimum	8,5798	1,9939	1,2931	0,289	-0,4921	3,1592	1,4464
Std. Dev	0,1573	0,391	0,1933	**4,3207**	0,3051	0,847	0,3645
Skewness	0,5068	**-0,3647**	**-0,4607**	**-0,6629**	1,1858	0,5524	**-0,0132**
Kurtosis	2,7282	1,72	2,1728	1,6458	4,8043	1,9974	1,9913
Jarque-Bera	124,1474	244,7125	172,8788	404,923	1001,196	250,9287	114,7906
Probability	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000

The results showed that non-linearity is a dominant characteristic for these different financial assets because Jarque-Bera statistics are strictly greater than the critical value of the Chi-Square law with two degrees of freedom. Furthermore, because Kurtosis statistics are three different, non-flattening is an essential element for these different stock indexes. Our result reveals that the linear adjustment to the mean is very good for all of these financial assets, with the exception of the poor linear adjustment for the Iraqi stock market index (ISX60). Since their Skewness statistics are strictly negative, the information asymmetry is shifted to the left for the Bahrain stock market index (BHB), the Abu-Dhabi stock market financial asset (ADX), the Iraq stock market index (ISX60), and the Qatar stock market financial asset (DMS). On the other hand, the information asymmetry is shifted to the right for the other financial asset indicators because their Skewness statistics are strictly positive.

In order to identify the various dependence links between stock market indices, the Variance-Covariance Matrix was used. As revealed in **Table 2,** the variances plotted in the diagonal and have minimal values, except the variance of the stock market index of Iraq (ISI60).

Table 2. Variance-Covariance Matrix

	LTASI	LBHB	LDSM	LISI60	LKSW	LMSCI	LADX
LTASI	**0,0247**	0,0216	0,012	0,1706	-0,0042	0,0617	0,0318
LBHB	0,0216	**0,1528**	0,0677	1,28	-0,0003	0,2616	0,1255
LDSM	0,012	0,0677	**0,0373**	0,5075	-0,0035	0,136	0,0624
LISI60	0,1706	1,28	0,5075	**18,6618**	0,1668	2,2298	1,1072
LKSW	-0,0042	-0,0003	-0,0035	0,1668	**0,093**	0,066	0,0098
LMSCI	0,0617	0,2616	0,136	2,2298	0,066	**0,7172**	0,2908
LADX	0,0318	0,1255	0,0624	1,1072	0,0098	0,2908	**0,1328**

According to our findings, the quality of precision is very good for these various stock market assets due to the fact that their associated risks are minimal. Due to its high variation, Iraq's stock market index (ISI60) is extremely risky. Political instability of this country has a negative effect on the stock market and financial market prosperity, particularly in light of the current crisis and turbulence. There is a significant dependence between these different financial assets although these countries belong to the same zone, that is to say Gulf countries because there is no integration between them with conflict between these countries. We also identify these dependency relationships within the total correlation matrix, which presented below**.**

Table 3. Total Correlation Matrix

	LTASI	LBHB	LDSM	LISI60	LKSW	LMSCI	LADX
LTASI	1	0,3507	0,3935	0,2511	-0,0874	0,4631	0,5554
LBHB	0,3507	1	**0,8957**	**0,758**	-0,0028	**0,7903**	**0,8805**
LDSM	0,3935	**0,8957**	1	0,6079	-0,0601	**0,8311**	**0,8862**
LISI60	0,2511	**0,758**	0,6079	1	0,1266	0,6095	**0,7032**
LKSW	-0,0874	-0,0028	-0,0601	0,1266	1	0,2555	0,0879
LMSCI	0,4631	**0,7903**	**0,8311**	0,6095	0,2555	1	**0,9422**
LADX	0,5554	**0,8805**	**0,8862**	0,7032	0,0879	**0,9422**	1

Table 3 reveals a strong positive correlation between the stock market index of Bahrain (BHB) and the financial assets of the Emirates (ADX), Iraq (ISX60), Oman (MSCI), and Qatar (DMS). On the other hand, the negative correlation between this index and the Kuwait index (KSW) is insignificant, and the dependency between this index and Saudi Arabia's financial assets (TASI) is weak. In addition, there is a strong positive dependence between the Abu Dhabi Stock Exchange index (ADX) and the financial assets of Oman (MSCI) and Qatar (DMS), with a weak dependence between this index and other financial assets.In addition, there is a strong dependence between the Iraqi stock market (ISX60) and the Qatar financial market (DMS),

especially after the conflict of interest between the latter country and Saudi Arabia. The Kuwait stock market index (KSW)is weakly correlated with other financial assets and especially with Iraq because the war between these two countries has so far eliminated the imprint of the movement of transactions between them. Classical time series analysis demands that the utilized data be stationary. We analyze stationarity in level and in first difference for these various financial assets, using the Dickey-Fuller (1979-1981) and Philips-Perron (1987) tests. **Table 4** depicts the results of the Dickey-Fuller (1979-1981) test. The results for Philips-Perron (1988) test are reported in **Table 5.**

Table 4. Dickey-Fuller (1979-1981) test

	Lags	Model	Level		First Différence		Integration Order
			T-Statistics	Critical values	T-Statistics	Critical values	I(d)
LTASI	1	M1	1.0738	-1.9409	-47.0238	-1.9409	I(1)
LBHB	3	M3	-2.7637	-3.4114	-32.9776	-3.4114	I(1)
LDSM	1	M3	-3.2748	-3.4114	-53.7308	-3.4114	I(1)
LISI6o	6	M1	-1.1155	-1.9409	-27.2534	-1.9409	I(1)
LKSW	4	M3	-2.6026	-3.4114	-30.8268	-3.4114	I(1)
LMSCI	3	M3	-2.2070	-3.4114	-31.3939	-3.4114	I(1)
LADX	3	M2	-0.2352	-2.8624	-29.7477	-2.8624	I(1)

We use Dickey–Fuller (1979) unit root tests, to check the stationarity of the Saudi Arabia stock market index (TASI) and the Abu Dhabi stock market index (ADX), since they each have a term of first-order auto-correlated error, i.e. it follows a first-order autoregressive process (AR(1)). The Saudi stock index was modeled by a random walk with no constant and no linear trend, whereas the Emirate index was modeled by a random walk with a constant and a linear trend. In terms of level, the T-Statistics of these two indices are strictly higher than the values tabulated by Mackinnon (1992) and in first difference; these have Student's calculated values lower than Mackinnon's critical values. Hence, these two stock market indices are stationary after a single difference, i.e. they integrated of order one (I(1)).We apply a unit root test of the Dickey-Fuller-Augmented (1981) to the other stock market indices because their errors follow an autoregressive process greater than one and we verify that these other indices are stationary after a single difference because their T-Statistics are strictly lower than the tabulated values of Mackinnon (1992) in first difference and they are also integrated of order one (I(1)).

The Dickey-Fuller tests (1979-1981) consist of testingthe non-stationarity of the variables without trend break with the presence of the autocorrelation problem, but do not consider the heteroscedasticity problem. To solve this, we use the Philips-Perron test (1988) to verify non-stationarity in level and in first difference for stock market indices in the presence of autocorrelation problems and/or heteroscedasticity without trend break.

Table 5. Philips-Perron (1988) test

	Lags	Model	Level		First Difference		Integration Order
			T-Statistics	Critical Values	T-Statistics	Critical Values	I(d)
LTASI	1	M1	1.0738	-1.9409	-47.0238	-1.9409	I(1)
LBHB	3	M3	-2.9016	-3.4114	-64.3670	-3.4114	I(1)
LDSM	1	M3	-3.2748	-3.4114	-53.7308	-3.4114	I(1)
LISI6o	6	M1	-1.4410	-1.9409	-104.3147	-1.9409	I(1)
LKSW	4	M3	-2.5485	-3.4114	-75.8683	-3.4114	I(1)
LMSCI	3	M3	-2.2414	-3.4114	-60.9120	-3.4114	I(1)
LADX	3	M2	-0.221740	-2.8624	-56.82728	-2.862373	I(1)

The Philips-Perron test (1988) also proves that the different stock market indices are non-stationary in level, but they are stable in first difference, i.e. they integrated of order one (I(1)). We will check the volatility of these different stock market indices in first difference using the curves presented in **Figure 2.**

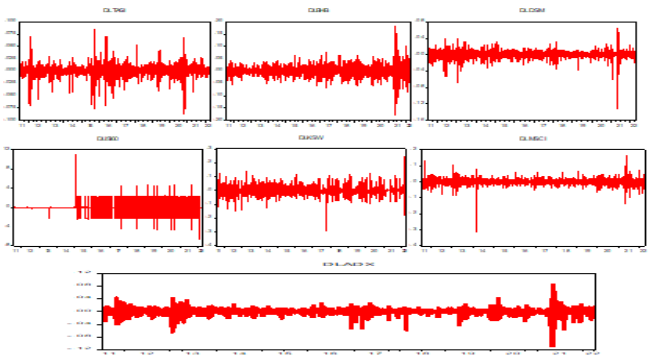

Figure 2. The volatility of different stock market indices in first difference.

According to these graphs, the volatility is an essential character of the various stock market indices in first difference because the variances are heterogeneous for them. The problem concentrated only for the stock market index of Iraq (ISX60) because the vulnerability provided only at the last study period since the lack of data from this country on the one hand with the low stock market transaction on the other hand. We were model these different indices in first difference by Autoregressive-Moving Averages (ARMA (p; q)) models.

Table 6 present our findings.

Table 6. ARMA Modeling (p;q)

	Constant	AR(1)	AR(2)	MA(1)	MA(2)	White
dLTASI	0,0002	-0,6247	0,0376	0,7518	-	2802
dLBHB	0,0004	-0,3638	-	0,1745	-	2802
dLDSM	0,0002	-0,4567	-	0,4351	-	2802
dLISI60	-0,0004	-0,4658	-	-	-	2658
dLKSW	-0,0001	-0,3453	-0,090	-	-	2802
dLMSCI	0,0009	-0,4059	-	0,2683	-	2802
dLADX	0,0005	-0,5238	-	0,4359	-	2802

Using ARMA process (2;1), we check the stock market index in first difference of Saudi Arabia (TASI). According to our findings this index has a problem of heteroscedasticity since their White Statistic is statistically significant. Also, using a second-order autoregressive process (AR (2)) for the financial asset of Kuwait (KSW), we identify the presence of the residual heteroscedasticity problem for this index. The first-difference stock market indices of Oman (MSCI) and Qatar (DMS) each modeled by an ARMA (1; 1) exhibit the heteroscedasticity problem detected by the significance of their White statistics. An AR (1) specifies each the other stock indices in first difference.

We will process the volatility of different stock market indices in first difference from linear and non-linear ARCH models in order to study information asymmetry, symmetry volatility due to good and bad news and asymmetric volatility.

Table 7. ARCH (q) Modeling

	Constant	ARCH(1)	ARCH(2)	ARCH(3)
dLTASI	$7{,}74\times10^{-5}$	0,1499	0,0499	-
dLBHB	0,0003	0,1333	0,0444	0,0442
dLDSM	$5{,}69\times10^{-5}$	0,1474	0,1287	0,0321
dLISI60	$1{,}24\times10^{-6}$	0,7812	0,5471	-
dLKSW	0,0006	0,1548	0,05124	-
dLMSCI	0,0003	0,1715	-	-
dLADX	$7{,}75\times10^{-5}$	0,1714	-	-

According to **Table 7,** information asymmetry is detected within an ARCH(3) model for the first difference of the Bahrain stock market index (BHB) and the Abu Dhabi stock market (ADX) index in first difference since their squared residuals shifted "***d***" of order three are statistically significant although, their constants or their average effects of the estimated omitted variables are very negligible.In addition, the indices of Oman (MSCI) and Qatar (DMS) each in first difference have asymmetry information and they modeled from an ARCH (1). As well as, an ARCH (2) specifies the remainders of the stock indices. Finally, we study the linear volatility with this asymmetry of information by GARCH models (p; q) for these stock market indices. **Table 8** present our findings.

Table 8. GARCH (p ; q) Modeling

	Constant	ARCH(1)	GARCH(1)
dLTASI	$7{,}60\times10^{-5}$	0,1333	0,5333
dLBHB	$3{,}47\times10^{-5}$	0,1497	0,5997
dLDSM	$3{,}30\times10^{-5}$	0,1499	0,5999
dLISI60	0.0174	0.1243	0.4312
dLKSW	0,000196	0,1497	0,5997
dLMSCI	$3{,}53\times10^{-5}$	0,1498	0,5998
dLADX	$2{,}53\times10^{-5}$	0,1333	0,5333

According to our findings, the volatility is not persistent for each index because the sum of the coefficients in modulus is strictly less than unity. We will study the asymmetric volatility of these different stock market indices in first difference from the exponential GARCH model (EGARCH) and **Table 9** presents the findings.

Table 9. EGARCH Modeling

	Constant	ARCH(1)	GARCH(2)	EGARCH
dLTASI	-0,6731	0,2294	-0,1502	0,9467
dLBHB	-0,4324	0,2357	-0,0222	0,9684
dLDSM	-0,6998	0,2532	-0,0967	0,9480
dLISI60	0,0175	0,1217	-0,1547	0,7815
dLKSW	-3,7998	0,2810	0,0111	0,5027
dLMSCI	-0,6427	0,2034	-0,1185	0,9391

dLADX	-0,6624	0,2419	-0,1022	0,9495

We can see from the study of the exponential asymmetric volatility that there is no advantage effect for the first difference of the stock market indices of the Gulf countries. On the other hand, the asymmetry volatility assisted for these indices and the symmetric volatility of these mainly explained by the bad news entering the financial markets of these countries. We will now deal with the presence of asymmetric volatility with a change in the smooth regime for these stock indices above within a TGARCH model. **Table 10** presents the findings.

Table 10. TGARCH Modeling

	Constant	**ARCH(1)**	$\hat{\varepsilon_{t-1}}^2 \times (\hat{\varepsilon_{t-1}} < 0)$	**GARCH (1)**
dLTASI	$4{,}13\times10^{-6}$	0,0172	0,2472	0,8277
dLBHB	$6{,}02\times10^{-6}$	0,0652	0,0557	0,8922
dLDSM	$3{,}95\times10^{-6}$	0,0958	0,1268	0,7865
dLISI60	-	-	-	-
dLKSW	0,0003	0,1612	0,0287	0,3691
dLMSCI	$3{,}15\times10^{-5}$	0,0789	0,1910	0,7536
dLADX	$4{,}24\times10^{-6}$	0,0993	0,1294	0,7923

According to **Table 10,** we find a non-linear asymmetry in the volatility for the first difference of the stock market indices of the sample of Gulf countries that we have chosen in our analysis. In addition, nonlinear asymmetric volatility is persistent and increasing.

4. Conclusion

We have verified in this article the risk hedging instrument and the safe haven of the stock market indices of a sample of the Gulf countries against the pandemic and the current war in Russia and Ukraine. We have verified that these stock indices are very volatile and they cannot be used as a hedging instrument against risks as well as a safe haven against the current global crises. We focused on the stock market indices of Saudi Arabia, Bahrain, Abu-Dhabi, Iraq, Kuwait, Oman and Qatar during a study period from July 12 to April 7, 2022 on daily frequencies.We have referred to the work of Mohalhal (2015) who studied the volatility of the six stock market indices of the countries of the Gulf Cooperation Council (GCC) which are: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates.

Mohalhal (2015) found that the movement of GCC stock markets is not directly related to the movement of oil prices. On the other hand, there is a direct and non-linear relationship between oil prices and GCC stock market indices detected according to the work of Maghyereh & Al-Kandari (2007). Most of the empirical work has focused on the links between stock market indices and oil prices for the Gulf region. But, there is no investigation into the volatility of the stock market indices of the Gulf countries, especially with the COVID19 pandemic and the current war between Russia and Ukraine. For this, we collected a database from the stock exchanges of these seven Gulf countries and we empirically verified the volatility of each stock market index for these countries.

Preliminarily, we interested in the evolution of each stock market index by a graphical representation and we found that each stock market index is non-stationary over time because there is an autocorrelation problem increased by a vulnerability of the risks detected by the presence of a problem of heteroscedasticity. We validated these problems from the statistical indicators and we found that the asymmetry of information is an essential character for these stock market indices with the presence of stock market anomalies since these indices do not follow the normal law. But, the quality of accuracy is very good for these indices with a good linear fit of each stock index to its mean.

We checked the non-stationarity in level of each stock market index from the Dickey-Fuller test (1979-1981) and these indices contain unit roots but they become stationary after a single difference, i.e. they are integrated of order one. Also, we referred to the test of Philips-Perron (1988) which takes into account other than the problem of autocorrelation, the heteroscedasticity of each stock market index and we concluded that these indices are also integrated of order one. We visualized the volatility of each index graphically and modeled each stock index by the Autoregressive Integrated Moving Average (ARIMA) specification and used a simulation procedure to determine the optimal number of lags in the autoregressive and moving average parts.

We checked the presence of a problem of heteroscedasticity of each index from the test of White (1980) and we approved the asymmetry of information within a linear ARCH model. This asymmetry is explained by the COVID19 pandemic since there will be an information-transaction cost for each index and by the disruption of oil prices due to the current war between Russia and Ukraine. Also, the volatility of each stock market index is checked within a linear GARCH model because there is on the one hand bad news due to this current war and the COVID19 virus and on the other hand good news explained by the rise in oil prices over the past year. In addition, the leverage effect is absent for these stock indices because the movements of transactions are very low and the bilateral exchanges are very close between these countries.

Finally, we concluded that the stock market indices of the Gulf countries are very volatile and they cannot be used as hedging instruments against risks like gold. Also, portfolio diversification remains very limited for these countries because the majority of Arab investors prefer famous international stocks such as S&P500, CAC40, Crypto-assets, etc., to the detriment of Arab stock market indices. In addition, the current war is affecting most of the world's stock exchanges and the contagion effect has reacted on the financial markets of the Gulf countries. Finally, risk aversion affects the behavior of speculators especially after the COVID19 pandemic and the war between Ukraine and Russia because we are now in an uncertain situation.

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