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Examining the Influence of COVID-19 Pandemic and Government Response on the Qatar Stock Market: An ARDL Approach

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Abstract: Objective: This study examines the complex interaction of COVID-19, the government response index and stock market performance, with special attention on the Qatari stock market. **Methodology:** On a positive note, effective government measures for disease containment and economic support exhibit a positive influence on the Qatari stock market. Additionally, the enduring association between international market indices, such as the Dow Jones Industrial Average and FTSE (UK), with the local stock market underscores the global-local financial dynamics. **Key Findings:** Empirical results help to explain the Qatari stock market's sensitivity to the COVID-19 pandemic. It shows how, in fact, an increasing number of cases and deaths pose a serious negative impact on it. Notably, the heightened government responses index is linked to a probable decline in the Qatari stock market's performance, highlighting the intricate balance that the governments must strike between health measures and market stability. **Conclusions:** These reflections go beyond Qatar, to provide guidance of practical use for areas facing similar challenges. They also highlight how health; economic and financial markets are intertwined. **Recommendations:** Practical recommendations would require that policymakers must lead government health-related responses with the purpose of minimizing stock market declines while also continuing to provide some measure of economic support, as well as take note exchange rate fluctuations, and in another sense act as a pioneer in the field of risk management for fund investors.

JEL classification: C22, G15, H12

Keywords: COVID-19, government response, stock market, ARDL model, financial markets

تحليل تأثير جائحة كوفيد-19 واستجابة الحكومة على سوق الأسهم القطري: نهج ARDL

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الملخص: الهدف: تستكشف هذه الدراسة التفاعل المعقد بين جائحة كوفيد-19، ومؤشرات استجابات الحكومات، وأداء سوق الأسهم، مع التركيز بشكل خاص على سوق الأسهم القطري. **المنهج:** على الجانب الإيجابي، تُظهر التدابير الحكومية الفعالة لاحتواء المرض ودعم الاقتصاد تأثيرًا إيجابيًا على سوق الأسهم القطري. بالإضافة إلى ذلك، تؤكد العلاقة المستمرة بين المؤشرات السوقية الدولية، مثل مؤشر داو جونز الصناعي ومؤشر (المملكة المتحدة)، مع السوق الأسهم القطري على ديناميكيات الترابط بين الأسواق المالية العالمية والمحلية. **النتائج:** تسلط النتائج التجريبية الضوء على حساسية سوق الأسهم القطري تجاه جائحة كوفيد-19، حيث تكشف عن تأثير سلبي كبير مرتبط بزيادة عدد حالات الإصابة والوفيات. ومن الجدير بالذكر أن ارتفاع مؤشر استجابة الحكومة يرتبط بانخفاض محتمل في أداء سوق الأسهم القطري، مما يبرز التوازن الدقيق الذي يجب أن تحققه الحكومات بين التدابير الصحية واستقرار الأسواق المالية. **الاستنتاجات:** تمتد هذه الرؤى إلى ما هو أبعد من قطر، حيث تقدم إرشادات قيمة للمناطق التي تواجه تحديات مماثلة، مما يؤكد الطبيعة المترابطة بين الصحة والاقتصاد والأسواق المالية. **التوصيات:** تشمل التوصيات العملية ضرورة قيام صانعي السياسات بإدارة استجابات الحكومة المتعلقة بالصحة بعناية لتقليل انخفاضات سوق الأسهم، والحفاظ على تدابير الدعم الاقتصادي، ومراقبة تقلبات سعر الصرف، كما يُنصح المستثمرون بتبني استراتيجيات لإدارة المخاطر.

الكلمات المفتاحية: كوفيد-19، استجابة الحكومة، سوق الأسهم، نموذجARDL ، الأسواق المالية.

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INTRODUCTION

COVID-19 has emerged as a leading global crisis of modern times, disrupting economic systems, cultural practices, and financial systems in multiple nations worldwide (Senol & Zeren, 2020; Shuaib, 2021). Governments established quarantine protocols, along with travel restrictions and social distancing rules, to slow down the harmful effects of the spreading virus (Güner et al., 2020, Saa & Assaf, 2024). The implementation of government response intervention measures created severe disruptions to businesses and economic sectors, resulting in market vulnerability (Ahmed & Sleem, 2022). The State of Qatar has experienced significant consequences from the pandemic on its economic framework and financial markets (Salman & Ali, 2021). The financial framework of Qatar maintains the Qatar Stock Exchange (QSE) as its essential securities marketplace where publicly listed firms can trade their stocks (Almujamed & Alfraih, 2019). Despite Qatar's strong global economic position, it heavily relies on its significant oil and gas reserves, which serve as the basis for its economic development and wealth generation (Ennis, 2015). Moreover, it plays a significant role in global economics by remaining a leading force in the worldwide energy sector and functioning as a center for trade and investment; however, this situation has been challenged by the unprecedented health crisis (Ulrichsen, 2012).

The COVID-19 pandemic introduced unprecedented financial market challenges worldwide, which affected Qatar's stock market alongside other markets (Salman & Ali, 2021). The spreading virus necessitated non-drug interventions, including lockdowns, travel restrictions, and social distancing measures, because existing governmental virus prevention measures failed to halt its progression (Muley et al., 2021). The business world experienced significant disruption through these actions, which caused damage to supply systems and altered customer behaviours, leading to economic instability and decreased corporate performance (Makin & Layton, 2021).

The rise in COVID-19 cases and mortality numbers, along with the Government Response Index, has created strong interest in analysing their effects on QSE business performance. Figure 1 illustrates the relationship between new COVID-19 cases and deaths and the Qatari equity index values. A noticeable negative trend appears in the first quarter of 2020 and the first quarter of 2021. The market experienced its first downturn because investors felt shock and uncertainty when the pandemic began to spread during early 2020, thus causing confidence levels and market stability to decline. Investors showed heightened sensitivity towards both the changing pandemic conditions and government reactions during the initial period of 2021. The figure illustrates how government actions impact Qatar's stock market index, as shown in Figure 2. The chart reveals periodic market movements with both downward and upward trends, which indicate that continuous governmental intervention affects stock market results. The periodic fluctuations of these market reactions demonstrate that government interventions create simultaneous negative and positive effects on stock market performance.

Although numerous studies have examined the impact of the pandemic on global financial markets (Zonon et al., 2025; Kartobi et al., 2025; Said & Elbannan, 2025), a clear gap remains in the literature concerning the Gulf region—particularly regarding how COVID-19 cases, deaths, and government responses have influenced stock markets in resource-rich countries like Qatar. Despite global focus, empirical research on resource-dependent emerging markets like Qatar is limited. There is also a lack of studies that jointly analyze pandemic indicators (cases and deaths) and policy indices (e.g., the Government Response Index, Economic Support Index, and Containment Health Index). This study contributes by providing insights that support policymakers, investors, and regulators in managing future crises. It also advances understanding of theories through Qatar's stock market pandemic response.

Our main questions are: How much did the COVID-19 Pandemic and government response impact the Qatar Stock Market between January 1, 2020, and December 31, 2021? In order to conduct a thorough examination of the impact of the COVID-19 Pandemic and Government Response on the stock market in Qatar, we have formulated additional sub-questions:

1. Does the number of new cases have a negative impact on the Qatar Stock Market Index?
2. Does the number of new deaths have a negative impact on the Qatar Stock Market Index?
3. Does the government response index (GRI) influence the Qatar Stock Market Index negatively or positively?
4. Does the Economic Support Index (ESI) have a positive impact on the Qatar Stock Market Index?
5. Does the Containment Health Index (CHI) have a positive impact on the Qatar Stock Market Index?

This study is organized as follows: Section 2 reviews the relevant literature on COVID-19, government responses in times of crisis, and their effects on stock markets. The procedures for data collection, analysis, and empirical modelling are described in Section 3. The empirical findings and their analysis are presented in Section 4. Section 5 examines the consequences of the findings.

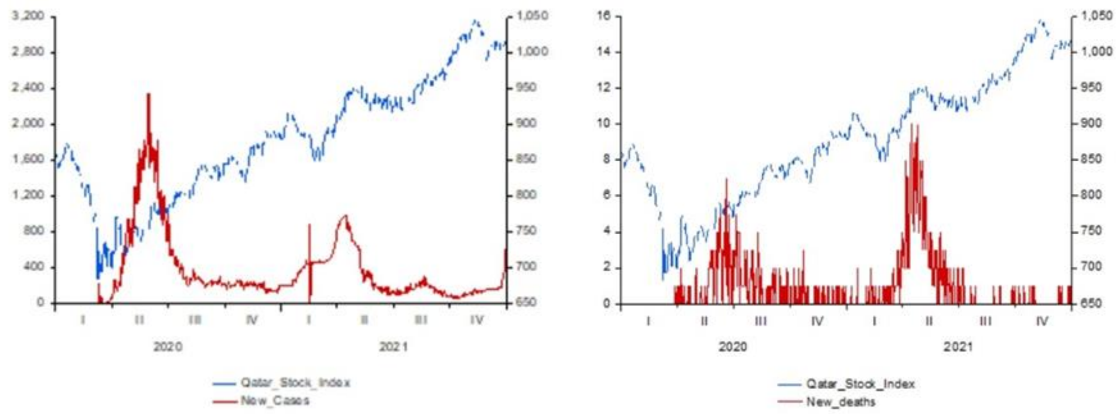

Figure (1): New cases and deaths with stock markets index in Qatar.

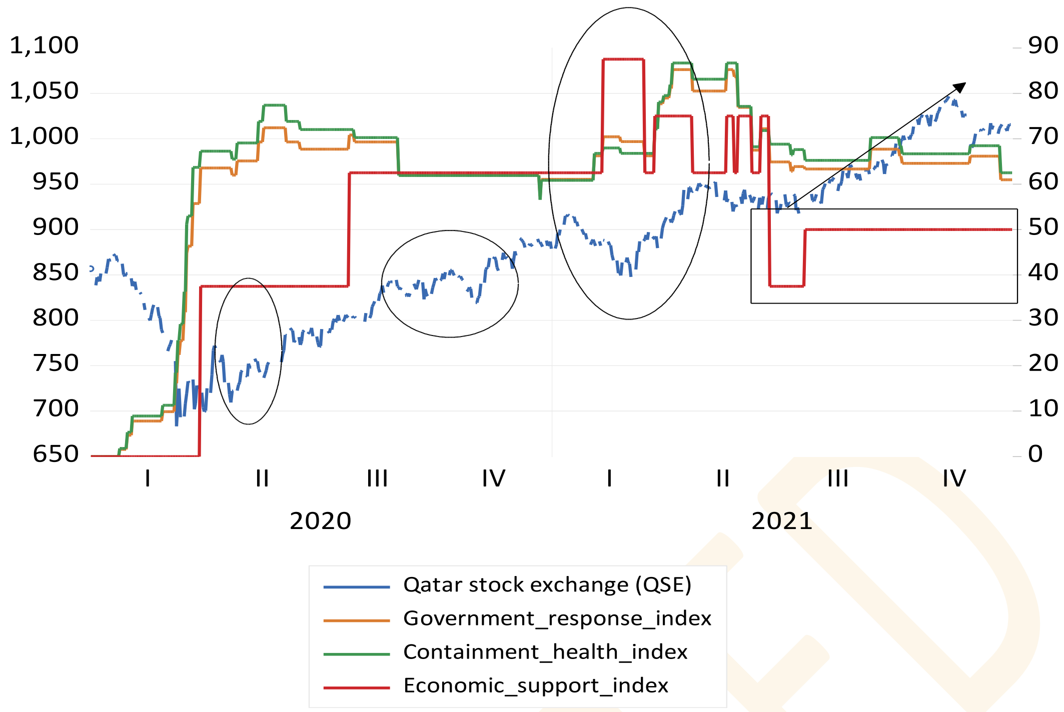

Figure (2): Presents a visual illustration of the Government response index with the stock market that were explored in the study.

LITERATURE REVIEW

Theoretical Framework

This study examines the Qatar Stock Exchange (QSE) performance in the context of COVID-19 considering the mutual relationship of markets and the government actions. It is rooted in the Efficient Market Hypothesis (EMH) of Fama (1970) that objects that all information is reflected in the asset prices are efficiently captured by markets. EMH is supported by the sharp drops in stock prices in the first quarter in 2020 (as shown in Figure 1), which signals prompt picking up of pandemic news and interventions. It is also presented as a Black Swan event, something extremely rare and unpredictable (Taleb, 2007). This opinion gets the support of Hasan and Sarker (2021), where the authors refer to the unexpected and dislocating impact of the pandemic on financial systems worldwide. To take further analysis, the research relies on institutional theory (North, 1990, 1991; Englehart & Moughamian, 1971) to evaluate the role of formal institutions in the development of market response through credibility and effect of the policy represented by health agencies, regulators and central banks. Figure 2 demonstrates the differences in the institutional responses shown by the change of the market behavior in Qatar. Besides, the hypothesis of stock market returns supply of Diermeier et al. (1984) used to explain the effect of changes in stock and the mood of investors which given the government stringency measures affected the stock returns and market liquidity (see Figure 1:2). Finally, Arbitrage Pricing Theory (APT) substantiates that the cases of COVID-19, Government Response Index (GRI), and exchange rates fluctuation act as systematic risk factors influencing Qatar's stock market performance (Jabarin et al., 2019).

Empirical Literature

One growing area of literature has emerged to look at how the COVID-19 pandemic has affected the global stock market. It has seen financial sentiment and stability disturbed with virus spreads uncertain consequences of other kinds that Al-Awadhi (2020) conducted one of the early empirical studies on the pandemic's economic consequences by using panel data from Chinese companies. Increasing cases and deaths from COVID-19 have adversely affected the returns of stocks in China, particularly in the consumer and health sectors. Similarly, Öztürk et al. (2020) measuring the effect via domestic COVID-19 cases using high-frequency data using a fixed-effect panel model, the study discovered that the Turkish industries were heavily affected by the cases of COVID-19 in those industries, and essential sectors withstood shocks well, and non-essential industries such as manufacturing and banking saw a fall. Liu et al. (2020) Using 21 international stock indexes, the study established a precipitous fall of the market, especially in Asia, and a substantial negative association between COVID-19 progression and abnormal returns. Moreover, Pandey and Kumari (2021) employed an event study that covered 49 developed and emerging economies' stock indices and revealed that globally the markets were seriously affected, with the Asian/emerging markets having a higher sensitivity to the shocks because of the weaker institutions and their lacking financial strengths.

Zhang et al. (2020) shown that the systemic risk of COVID-19 is historically unprecedented leading to investor losses, market volatility, mispricing of risks, unsuccessful hedges, and a capital run-out of risk-sensitive assets.

A great deal of research was conducted on how COVID-19 pandemic and related government measures such as (E.g., lockdowns, fiscal stimulus and mobility restrictions could be seen to have made an appreciable impact on stock market behavior. Shrimali and Shrimali (2021) employed an event study, the study revealed that lockdown announcements in India resulted in sharp declines in the Nifty Bank Index, indicating that investors respond quickly to measures and the lockdown that have led to steep losses in banking stocks in the short-run. Bakry et al. (2022) identify the different impacts of the pandemic and governmental intervention on the volatility of stock markets in the emerging and developed markets. It used asymmetric GARCH models and established volatility to be a COVID 19-severity and government intervention dynamics, more so in the emerging economies. In a related study, Bouri et al. (2021) Examining the daily data of 14 New Zealand sector indices, the analysis outlined that the lockdowns' positive market sentiment increased and that the tech, healthcare and real estate sectors had a subdued reaction. Liew (2021) used an event study approach to evaluate the short-term effect of the Wuhan lockdown on the Shanghai Stock Exchange Composite Index, looking at unusual returns in ten different economic sectors. This accords with the logic of a reaction by short-term markets to abrupt policy shocks, especially when uncertainty is the predominant theme in investors' minds. In further study, Onyele and Nwadike (2020) looked at the markets in New York, Shanghai, Toronto, and Mumbai discovered considerably low returns even prior to panic lockdowns. But as lockdown measures were loosened, markets recovered, implying that investors considered the pandemic's effects on the economy only short-term due to vaccine inoculation and transparent guidelines.

The impact of the COVID-19 pandemic on stock markets in the six Gulf Cooperation Council (GCC) countries has been examined in several studies. Al-Maadid (2022) study how news on covid-19 influences the market of shares in Gulf Cooperation Council (GCC) countries. This research applies machine learning to look at how news about COVID-19 affects the accuracy of its initializer algorithm for stock returns in these markets. Reports indicate that the coronavirus has caused market fluctuations in the United Arab Emirates (UAE), Qatar, Saudi Arabia, and Oman but has had no impact on stocks in Bahrain.

In addition, Al-Kandari et al. (2022) examine the impact of the COVID-19 pandemic on the GCC stock market indices. Adopting the Event Study Methodology, it was demonstrated that the market indices in GCC countries were negatively affected by the COVID-19 pandemic. According to Salman and Ali (2024) examines the impacts of COVID-19 on the stock markets of countries in the Gulf Cooperation Council (GCC) from September 2019 to July 2020. Both the T-test and the Mann-Whitney test indicate that the presence of COVID-19 led to early setbacks in the GCC markets. The research found that the stock markets in GCC countries experience less disruption than those in the global market. Moreover, Syed (2022) used TVP-VAR connectedness technique and DCC-GARCH models to examine risk contagion in GCC markets during the period running between January 2019 and August 2021. The interaction among the markets proved to be high with equity markets having a significant effect on the bond and Sukuk market, more at the time of the first wave of COVID-19 which brought about greater financial sector spillovers. Kisswani (2023) examines the effect of the COVID-19 cases on the Kuwaiti stock market and utilizes the ARDL and NARDL models in the period of March 2020 through August 2021. Results indicate long-run cointegration that increase returns in the long-term. The impacts of cases in the short run, though, are negative on returns, and asymmetric responses were recorded by the NARDL model.

The study fills one of the important research gaps in the literature since it assesses the impacts of the simultaneous occurrence of the COVID-19 pandemic and government policies on the stock market in Qatar. This is as opposed to the previous literature, which has evaluated these factors independently, since this study adopts the ARDL model to study long-term and short-term effects. The paper provides useful information on how the market will behave during crises in the future. and policies used in oil-based economies to handle the public health shocks.

Thus, based on the literature review, this study expanded on the following hypotheses:

H1: The COVID-19 pandemic indicators and government responses significantly influence the performance of the Qatar stock market.

Based on the main hypothesis there are sub-hypotheses**:**

H1a: There is a significant negative relationship between the number of new cases and the overall performance of the Qatar stock market.

H1b: There is a significant negative relationship between the number of new deaths and the overall performance of the Qatar stock market.

H1c: There is a significant negative relationship between the government responses and the overall performance of the Qatar stock market.

H1d: There is a significant positive relationship between the economic support index and the overall performance of the Qatar stock market.

H1e: There is a significant positive relationship between the containment health index and the overall performance of the Qatar stock market.

METHODOLOGY

Model specifications

The study employs a basic model to assess the impact of COVID-19, along with Government response Indices, on stock market performance, drawing on existing research findings Al-Alawnh et al., (2024); Habibullah et al., (2022); Habibullah et al., (2021); Obiakor et al., (2022); Dreger & Gros, (2021); Safuan et al., (2022).

The model can be specified as follows,

$$sm_t = \psi_0 + \psi_1 new\ cases_t + \psi_2 new\ deaths_t + \psi_3 GRI_t + \upsilon_4 Z_t + \varepsilon_t \quad (1)$$

where sm_t represent the Qatari stock index; $new\ cases_t$ and $new\ deaths_t$ are new COVID-19 cases and death in Qatar, respectively; while GRI_t is Government response index, and Z_{it} is control variables such as Dow Jones Industrial USA (DJI), FTSE All share Index UK (FTSE) and exchange rate (EXRATE) that could affect the Qatar stock market.

Method of estimation

To examine the dynamic interactions between COVID-19, government response measures, and stock market performance, this study employs the Autoregressive Distributed Lag (ARDL) model as the econometric technique. The ARDL methodology, introduced by Pesaran et al. (2001), is particularly well-suited for analyzing both short-run and long-run relationships among variables, especially when the underlying time series is a mixture of stationary at level [I (0)]. First difference [I (1)] is a condition commonly encountered in financial and macroeconomic data.

By applying this sequential approach to analyzing short-run adjustments and then testing for long-run cointegration. This study aims to deliver a comprehensive understanding of how the COVID-19 crisis and corresponding government responses influenced financial market dynamics in Qatar.

The standard ARDL model is specified as follows,

$$sm_t = \chi_0 + \sum_{i=1}^{n} \chi_{1i}\, sm_{t-i} + \sum_{i=0}^{n} \chi_{2i}\ new\ cases_{t-i} + \sum_{i=0}^{n} \chi_{3i}\ new\ deaths_{t-i} + \sum_{i=0}^{n} \chi_{4i}\ GRI_{t-i} + \sum_{i=0}^{n} \chi_{5i}\ Z_{t-i} + \omega_t \quad (2)$$

The long-run model specified as per Equation (1) can be derived from the short-run ARDL model as per Equation (2) above.

$$sm_t = \psi_0 + \psi_1 new\ cases_t + \psi_2 new\ deaths_t + \psi_3 GRI_t + \upsilon_4 Z_t + \varepsilon_t$$

when $\psi_0 = \frac{\chi_0}{1-\sum \chi_{1_i}}$, $\psi_1 = \frac{\sum \chi_{2_i}}{1-\sum \chi_{1_i}}$, $\psi_2 = \frac{\sum \chi_{3_i}}{1-\sum \chi_{1_i}}$, , $\psi_3 = \frac{\sum \chi_{4_i}}{1-\sum \chi_{1_i}}$ and $\upsilon_4 = \frac{\sum \chi_{5_i}}{1-\sum \chi_{1_i}}$.

The residuals from the long-term model enable us to determine cointegration in the short-run Error Correction Model (ECM).

$$\Delta sm_t = \gamma_0 + \sum_{i=1}^{m} \kappa_{1i}\, \Delta sm_{t-i} + \sum_{i=0}^{n} \kappa_{2i}\, \Delta\, new\ cases_{t-i} + \sum_{i=0}^{n} \kappa_{3i}\, \Delta\, new\ deaths_{t-i} + \sum_{i=0}^{n} \kappa_{4i}\, \Delta\, GRI_{t-i} + \sum_{i=0}^{n} \kappa_{5i}\, \Delta\, Z_{t-i} + \lambda\, ECT_{t-1} + \eta_t \quad (4)$$

The term ECT_{t-1} is the residual (from the long-run model) lagged one period. That is to say, it describes the gap or disequilibrium between the observed data and the long-run steady state captured by Equations (1) with a one-period lag.

$$ECT_{t-1} = \varepsilon_{t-1} = sm_{t-1} - [\psi_0 + \psi_1 newcases_{t-1} + \psi_2 newdeaths_{t-1} + \psi_3 GRI_{t-1} + \upsilon_4 Z_{t-1}] \quad (5)$$

The parameter lambda (λ) plays a critical role in the error-correction term ECT_{t-1} of a model. This term describes how variables respond when they fall from their long-run equilibrium. In the context of this study, if the λ parameter is significant, the adjustment process is meaningful, and we can infer that the variables tend to return to equilibrium in the long-term. In this case, the value of the lambda variable would always lie in the entire interval from 0 to -2 (Samargandi et al., 2015).

The research employs a conditional error-correction model (ECM) to reveal the permanent relationships between the analysis variables. This research details the description of the conditional error-correction (ECM) model as follows:

$$\Delta\, sm_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i \Delta\, sm_{t-i} + \sum_{i=0}^{n} \alpha_{2i}\, \Delta\, new\ cases_{t-i} + \sum_{i=0}^{n} \alpha_{3i}\, \Delta\, new\ deaths_{t-i} + \sum_{i=0}^{n} \Theta_{4i}\, \Delta\, GRI_{t-i} + \sum_{i=0}^{n} \Theta_{5i}\, \Delta\, Z_{t-i} + \beta_1\, sm_{t-1} + \beta_2\, new\ cases_{t-1} + \beta_3\, new\ deaths_{t-1} + \beta_4\, GRI_{t-1} + \beta_5\, Z_{t-1} + \mu_t \quad (6)$$

which is H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ in opposed to the alternative hypothesis H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$. Furthermore, the study employed the Bound t-test, a cointegration test proposed by Banerjee et al. (1998). This test builds upon earlier contributions by Banerjee et al. (1986) and Kremers et al. (1992). The test is centered around the t-statistic associated with the coefficient of the lagged dependent variable within the conditional error correction term ECT_{t-1}.

Data collection

For this study, data was collected from various secondary sources. Daily stock market performance data, specifically focusing on the Qatar Stock Exchange, were obtained from eikon.refinitiv.com to ensure consistency and reliability. Information on government response indicators, including the Government Response Index (GRI), Containment Health Index (CHI), and Economic Support Index (ESI), was sourced from the Oxford COVID-19 Government Response Tracker (OxCGRT). In addition, key control variables such as the Dow Jones Industrial Average (DJI) and the FTSE 100 Index (UK) were also retrieved from Yahoo Finance, along with exchange rate (EXRATE) data from eikon.refinitiv.com. The study covers the period from January 1, 2020, to December 31, 2021, capturing the critical phases of the COVID-19 pandemic and its associated economic impacts.

In this research, we employ the equation $\log y_t = \log\left[y_t + \sqrt{(y_t^2 + 1)}\right]$ to transform the variables into logarithmic form, as suggested by Busse and Hefeker (2007). By employing this method, we maintain the sign of y. The values of y pass from a linear scale at small absolute values to a logarithmic scale at large values" refers to the behavior of a particular transformation, such as the log-modulus transformation, used to handle data with a wide range of magnitudes, including zero values (Busse & Hefeker, 2007). Additionally, this transformation maintains a consistent order of values and replicates the traditional logarithmic transformation for positive numbers. However, it behaves linearly near zero, allowing it to transform zero values. As a result, no data points are lost when using this transformation (Burbidge et al., 1988; Busse & Hefeker, 2007; Akhtaruzzaman et al., 2018).

Table 1 represents a summary of the variables considered in the study. Market performance is reflected in the closing price of the Qatar Stock Index that is the dependent variable. COVID-19 new cases and deaths and the Government Response Index (GRI), Containment and Health Index, and Economic Support Index are determined as independent variables (Hale et al., 2021; Djalante et al., 2020; Demir & Danisman, 2021). The Dow Jones Industrial Average (DJI), FTSE, and the exchange rate act as control variables that capture the global market volatility and currency volatility (Al-Alawneh et al., 2024; Andika & Djamaluddin, 2020).

Table (1): Descriptions of variables.

No	Variable	Abbreviation	Data source	Measurements of variables	Role
1	Qatar stock Exchange	QSE	eikon.refinitiv.com	Close price, Index	Dependent
2	New cases	NC	OxCGRT.com	Daily basis, Number of people	Independent
3	New deaths	ND	OxCGRT.com	Daily basis, Number of people	Independent
4	Government response index	GRI	OxCGRT.com	Indicator 0-100, Index	Independent
5	Economic support index	ESI	OxCGRT.com	Indicator 0-100, Index	Independent
6	Containment health index	CHI	OxCGRT.com	Indicator 0-100, Index	Independent
7	Down Jones	DJI	Yahoo Finance	Close price, Index	Control
8	FTSE All share (UK)	FTSE	Yahoo Finance	Close price, Index	Control
9	Exchange rate	EXRATE	eikon.refinitiv.com	Bid price, QR per USD	Control

THE EMPIRICAL RESULTS

Descriptive Statistics

Table 2 presents the statistical properties of the selected variables, including central tendency, dispersion, and distribution characteristics. Indices such as QSE (7.4686), DJI (11.0116), and FTSE (9.1732) exhibit higher average values, while ND (0.5271) and ESI (4.2535) have lower means, possibly due to market inactivity or volatility. QSE and DJI show symmetric distributions as their mean and median values are similar, whereas ND (0.0000) and NC (6.0913) show skewed distributions. FTSE and ND have minimum values of zero, as do GRI, ESI, and CHI, reflecting extreme variations. NC (1.7742) and ESI (1.3805) exhibit higher volatility, while EX_RATE (0.0041) is more stable. Most variables show negative skewness, especially GRI (-4.1476), CHI (-4.2832), and NC (-2.1522), indicating frequent extreme losses, consistent with Ftiti et al. (2021). Positive skewness is found in ND (1.2155) and EX_RATE (1.9408). Kurtosis is high in FTSE (289.5723), GRI (22.2958), and CHI (24.1996), revealing leptokurtic behavior and frequent outliers (Bourghelle et al., 2020; Banerjee, 2021; Fakhfekh et al., 2021). QSE (2.3251) and DJI (2.8039) have near-normal kurtosis. The Jarque-Bera test confirms non-normality with high statistics and p-values of 0.0000 (Curto & Serrasqueiro, 2022; Malik et al., 2022; Youssef et al., 2021).

Table (2): Descriptive statistics.

	QSE	NC	ND	GRI	ESI	CHI	DJI	FTSE	EXRATE
Mean	7.4686	5.8258	0.5271	4.7303	4.2535	4.7627	11.0116	9.1732	2.0058
Median	7.4775	6.0913	0.0000	4.8611	4.6053	4.8948	11.0324	9.2600	2.0039
Maximum	7.6465	8.2433	2.8934	5.1383	5.1648	5.1553	11.1979	9.3513	2.0200
Minimum	7.2201	0.0000	0.0000	0.0000	0.0000	0.0000	10.5236	0.0000	2.0034
Std. Dev.	0.1000	1.7742	0.7697	0.6154	1.3805	0.5937	0.1440	0.5206	0.0041
Skewness	-0.2671	-2.1522	1.2155	-4.1476	-2.6640	-4.2832	-0.7098	-16.4105	1.9408
Kurtosis	2.3251	7.7017	3.3378	22.2958	8.4172	24.1996	2.8039	289.5723	5.7027
Jarque-Bera	10.3399	567.1720	84.0885	6157.5790	805.8713	7297.5180	28.6667	1161.0000	312.2664
Probability	0.0057	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: All variables are in logarithms.

Correlation matrix

Table 3 reveals that there exists a positive correlation between the Qatari stock market and the new cases, government response, economic support, health indices, the Dow Jones, the FTSE 100 and the exchange rate. On the contrary, new death presents a negative correlation that is a display of investor pessimism due to increased mortality. The Autoregressive Distributed Lag (ARDL) model receives validation through these relationships, as it analyzes the temporal dynamics of these variables and their causal effects.

Table (3): Correlation matrix.

	QSE	NC	ND	GRI	ESI	CHI	DJI	FTSE	EXRATE
QSE	1.0000								
NC	0.0676	1.0000							
ND	-0.0423	0.3830	1.0000						
GRI	0.2195	0.8356	0.2624	1.0000					
ESI	0.4126	0.8419	0.2247	0.8241	1.0000				
CHI	0.2004	0.8262	0.2674	0.9984	0.7969	1.0000			
DJI	0.9554	0.0810	0.0305	0.1845	0.4085	0.1636	1.0000		
FTSE	0.3050	-0.0363	0.0400	-0.0170	0.0523	-0.0242	0.3409	1.0000	
EXRATE	0.0424	0.1032	-0.0323	0.1271	0.0726	0.1352	0.1093	0.0568	1.0000

Result of unit root tests

In Table 4, the critical distinction is between variables at the level and those measured in the first differences. Variables at the level differ from those in the first difference. That difference is crucial to understanding the dynamic level of the data and its significance in the context of the study. We figure from Table 4 that NC, ND, ESI, and CHI are I(0) variables, meaning that at their levels, they are stationary. In contrast, QE, GRI, DJI, FTSE, and EXRATE are I(1) variables, implying that these variables become stationary after taking the first differences. The mixed model consisting of both I(0) and I(1) variables is appropriate for the ARDL modeling approach proposed by Pesaran et al. (2001).

Table (4): Unit root test results (ADF).

Variables	**With Constant**	**With Constant & Trend**
At level	**t-Statistic**	**t-Statistic**
QE	-0.1466	-2.9945
NC	-3.2702***	-3.2340***
ND	-8.3558***	-8.3524***
GRI	-1.5935	-18.5967
ESI	-3.3750***	-3.9163**
CHI	-10.9892***	-10.9017***
Down jones	-0.8940	-2.1333
FTSE_UK	-2.4161	-17.5657
EXRATE	-0.1883	-0.7339
At first difference	With Constant	With Constant & Trend
QE	-15.3388***	-15.4066***
NC	-	-
ND	-	-
GRI	-18.5588***	-18.915***
ESI	-	-
CHI	-	-
DJI	-7.3079***	-20.4686***
FTSE	-12.6057***	-12.5882***
EXRATE	-18.6187***	-18.7333***

Note: Asterisk *** and ** denotes statistically significant at the 1% and 5% levels, respectively.

Results of lag length selection method

For the Autoregressive Distributed Lag (ARDL) model, the researchers determined the correct lag length using Akaike Information Criteria (AIC). The results of this lag length selection process, which uses information criteria based on the Vector Autoregression (VAR) model, are shown in Table 5. These criteria serve to balance model intricacy by assessing distinct lag lengths in terms of their explanatory power. The detailed selection procedure helps strengthen the reliability of statistical analysis, which leads to a better understanding of research outcomes.

Table (5): VAR lag order selection criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0.0000	1716.2630	NA	0.0000	-10.3471	-10.2434	-10.3057
1.0000	4380.5400	5167.0810	0.0000	-26.0033	-24.96715*	-25.5900
2.0000	4553.9790	326.9065	0.0000	-26.5635	-24.5949	-25.7782*
3.0000	4654.2200	183.4721	0.0000	-26.6801	-23.7790	-25.5229
4.0000	4808.4970	273.9583	0.0000	-27.1242	-23.2906	-25.5950
5.0000	4940.5390	227.2728*	1.00e-23*	-27.4335*	-22.6674	-25.5324

Note: The table describes the criteria for selecting the lag order. '*' show the lag order selected by these criteria log likelihood (LogL), likelihood ratio (LR), final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-quinn information criterion (HQ) give different metric to determine optimal lag orders.

Results of Cointegration Tests

The F-Bound test presented its findings in Table 6, showing a value of 5.2357, which is significant at the 1% level. The obtained result verifies that variables maintain their relationship for an extended period. Table 6 displays a Bounds t-statistic value of -6.9595, indicating significance at the 1% level and reinforcing the evidence of this joint integration connection. The result obtained strongly confirms that a long-term connection exists between these variables. The long-run relationship between the regress and the regressors suggests that, over time, they tend to move together in the long run.

Results of ARDL model

Table 6 confirms that the ARDL model fitted very well because both the R-squared of 0.9941 and the adjusted R-squared of 0.9933 demonstrate a good explanatory power and consider the complexity of the estimated model. ARDL (1,5,4,0,5,5,5,5,4) was the most appropriate lag structure determined according to the Akaike Information Criterion (AIC). The term Given Error Correction Model (ECM) in short-run analysis has -0.1062 with a statistical significance of 1 percent, and this implies a medium rate at which the model is adjusting to long-run equilibrium after a short-run movement. Such a change is an expression of the dynamism of the Qatari stock market as it responds to changes and shocks. The long-term outcomes demonstrate that COVID-19 cases and deaths have an immense negative effect on the stock market performance further implying that the deterioration of the health situation negatively affects investor trust. The same is the case with the Government Response Index (GRI), which has a negative relationship with the performance. On the other hand, such indices as the Containment Health Index and the Economic Support Index have a positive impact, and, therefore, the well-organized system of state health and monetary tools balances the market position and increases the confidence of investors. Besides, international market reflection is also reflected with very positive impacts by references to a global index like the Dow Jones Industrial Average (DJI) and FTSE (UK). The coefficient of the exchange rate variable is negative, a fact that hints that the devaluation of the currency has a negative effect on the performance of the Qatari stock market.

Diagnostics and Stability Tests

The diagnostic tests for evaluating the augmented ARDL model are presented in Table 6 as a detailed overview. Results from the ARCH test indicate that the variation in residuals' volatility, or heteroscedasticity, is not statistically significant at a 5% threshold, given a test p-value of 0.8708. These results show that no clear patterns exist in the volatility levels of the model's residual data. The Breusch-Godfrey test confirmed the absence of serial correlation in the residuals, as indicated by the obtained p-value of 0.2423, which exceeded the 5% threshold. The model demonstrates its ability to capture temporal dependencies because of these test results. The statistical integrity of the model proves robust because it effectively addresses heteroscedasticity and serial correlation.

Table (6): Short run and Long-run relationship for GRI and stock market for Qatar.

ARDL (1,5,4,0,5,5,5,5,4)				
Model selection method: Akaike info criterion (AIC)				
Panel A.	Selected Model: (1,5,4,0,5,5,5,5,4)			
R^2 and Adj. R^2	[0.9941] [0.9933]			
Panel B.	Residual Diagnostic			
LM χ (2)	[0.2423]			
ARCH (1)	[0.8708]			
Panel C.	Long-run cointegration models for GRI and stock market			
Variables	Coefficient	Std. Error	t-Statistic	Prob.
NEW CASES (NC)	-0.0220*	0.0117	-1.8803	0.0611
NEW DEATHS (ND)	-0.0178**	0.0090	-1.9776	0.0489
GOVERNMENT RESPONSE INDEX (GRI)	-0.8775***	0.3165	-2.7726	0.0059
ECONOMIC SUPPORT INDEX (ESI)	0.0446**	0.0222	2.0073	0.0457
CONTAINMENT HEALTH INDEX (CHI)	0.9663***	0.3143	3.0746	0.0023
DOW JONES INDUSTRIAL (DJI)	0.4963***	0.0801	6.1925	0.0000
FTSE ALL SHARE INDEX UK (FTSE)	0.1090***	0.0357	3.0571	0.0024
EXCHANGE RATE (EXRATE)	-0.1062***	0.0152	-6.9595	0.0000
Panel D.	Conditional ECM Bounds F-stat			
F-statistic	5.2357***			
K	8			
Panel E.	Short-run ECM regression models for GRI and stock market			
ECT	-0.0136***	0.0026	-5.2771	0.0000
R-squared	0.6411			
Adjusted R-squared	0.5998			
S.E. of regression	0.0081			
Panel F.	ECM regression Bounds t-stat			
Bounds t-statistic	-6.9595***			

Note: Statistical significance of 1%, 5% and 10% are denoted by asterisks (*, **, *). R-squared and Adjusted R-squared assess goodness of fit, whereas LM χ (2) test for serial correlation in ARDL equations The test is an ARCH test to determine the residuals' volatility or heteroscedasticity in the residuals. Table 1 provides a description of all variables. The Bounds F-test, and a related Bound T-test, which is due to Banerjee et al. (1998) is used for cointegration testing and long-run relationships of lagged dependent variables approach (Pesaran et al., 2001).

The findings of this study are very much in line with the existing studies conducted and aimed at understanding the effect of the coronavirus pandemic situation on stock markets and especially the emerging markets and the GCC region. The research supports the conclusion reached by Al-Maadid (2022), Al-Kandari et al. (2022), and Salman and Ali (2024) stating that the indicators linked to COVID-19 (particularly the confirmed cases and the death) influenced the Qatari stock market negatively, both in the short and long term. This is in line with Liu et al. (2020) and Zhang et al. (2020) who emphasized the increased sensitivity of global markets to pandemic shocks. The strength of this study is that the authors have taken into consideration the government response indices, as they were negatively affected by the Government Response Index (GRI) and positively affected by the Containment and Health Index and Economic Support Index. This dual finding builds upon the work of Bouri et al. (2021) and Bakry et al. (2022), which also documented heterogeneous impacts of policy interventions. In addition, Qatar is exposed to global financial contagion, as indicated by the positive effect caused by international indices such as the DJI and FTSE.

In addition, the study supports several other important financial theories. The Efficient Market Hypothesis (EMH) identifies a rapid reaction of markets to new information, which is proven by the fact that the Qatari stock market rapidly reacted to the news concerning the COVID-19 and the measures introduced by the government. The Black Swan Theory would support this idea because the disruptive nature of the pandemic was unpredictable and quite devastating to the market. The institutional theory is evidenced by the fact that the effect of the interventions on the state level led to positive changes in the Economic Support and Containment Indices and negative changes in the Government Response Index. Moreover, the Return and Supply Hypothesis and Arbitrage Pricing Theory (APT) are evident, rising COVID-19 cases and deaths resulted in poor stock market performance.

CONCLUSION

This paper provides a very vital information regarding how health crisis relates with government response indices and stock market behavior in Qatar using the ARDL model. The Error Correction Model (ECM) shows a considerably negative speed of adjustment in the short term which means that temporary fluctuations over the short-term range are repaired gradually. The spread of COVID-19 has the negative effect on stock performance and confirmed cases and death rates have impacts on the respective stock markets, especially in the long run, in the Qatari stock market. There is also negative influence of government measures. Nonetheless, the Containment Health Index and Economic Support Index, have a positive effect on the market performance.

Other factors, the study also underscores are that Qatar is financially dependent on the wider markets especially Dow Jones Industrial Average and the FTSE (UK) as they are interrelated in terms of their financial markets. The results are also consistent with the Efficient market Hypothesis (Fama, 1970) that suggests that data about pandemics has an immediate impact on the behaviour of the market. The COVID-19 is assigned to a Black Swan event (Taleb, 2007) as the impacts and rareness are disruptive. Relevant application of the institutional theory (North, 1990) also clarifies how the response in the public sector, which is measured by the Government Response Index (GRI), greatly influences the confidence level of investors, as well as the changes in the market. Moreover, the stock market return supply hypothesis (Diermeier et al., 1984) explains the manner in which the availability and liquidity of stocks are determined by the external market influences. In addition, Arbitrage Pricing Theory (APT) substantiates systematic risk factors influencing the performance of Qatar's stock market.

Future studies may investigate how varying stock markets in GCC countries, along with those in emerging economies, respond to global health issues and the actions taken by governments. Examining results from several markets would help us identify weaknesses found across the region. Moreover, by analyzing the various sectors, it may become clear which sectors are most easily damaged and which are most resilient, guiding how investors and policymakers manage their strategies in future crises.

Disclosure Statement

– **Ethical approval and consent to participate:** This study is based on publicly available financial data and does not have ethical concerns.

- **Availability of data and materials:** The data that supports the findings of this study are available from the corresponding author upon reasonable request.
- **Author contribution:** All authors contributed to the conception, design, data collection, analysis, and writing of the manuscript.
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