The Effect of COVID-19 on Investment Decisions in Saudi Stock Market*

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Abstract

In this study, the response to the COVID-19 global pandemic by the Saudi financial market is discussed. Using panel data and pooled Ordinary Least Squares (OLS), it is seen that the increase in COVID-19 verified cases has led to adverse reactions by the stock market. This can be determined through related stock market returns data from March 3rd, 2020 to December 9th, 2020, which shows that, during this period, stock market returns declined as numbers of registered cases grew. In addition, further observation reveals that stock markets took a more dynamic stance towards the rise in confirmed non-fatal cases as opposed to that of virus-related fatalities. Furthermore, it is noticed that when the degree of restriction of lockdown increases, the impact of Brent crude oil price return on Saudi stock market return decreases. Thus, the suggestion is that investors should not use Brent oil return as an indicator of Saudi stock return during a complete lockdown. Moreover, the rise of lockdown restrictions and the number of confirmed cases leads to more fluctuation in the Saudi stock market return. Overall, our findings indicate that financial markets are swiftly reacting to this destructive virus but this response differs according to different outbreak stages.

Keywords: COVID-19, Coronavirus, Oil Price, Lockdown, Stock Market Return, Panel Data

JEL Classification Code: G010, G110, G120, I150

1. Introduction

1.1. Background

Worldwide devastation has been caused by COVID-19, a highly infectious virus originating from a new form of SARS-CoV-2. This disease first hit the world in Wuhan, China in 2019 and, by the second week of November, it was acknowledged by the World Health Organization (WHO) to be a pandemic. By 17th April 2020, the number of COVID-19 confirmed cases worldwide had surpassed 2 million and around 139,000 had lost their lives (WHO, 2020). Saudi Arabia has been among numerous countries to have been seriously affected by the outbreaks of COVID-19. The current research aims to supplement published literature by further investigating the response of the Saudi stock market (Tadawul) towards disasters and crises in general. One example of similarly related literature is by Gangopadhyay et al. (2010) who studied the reaction of stock markets as well as share price activity at the time of the Katrina hurricane in 2005. In another similar study, the impact of COVID-19 on stock market returns in Indonesia majorly hit the financial sector (Herwany et al., 2021). According to the authors, the factors influencing the negative sentiment were a sudden decrease in export, production, and other economic activities.

Studying the impact of the pandemic on the Saudi stock market holds great importance particularly as it is well-known that it has had a significant impact on real economic activity. However, the magnitude of the direct effect has yet to be identified. As per the COVID-19 Dashboard of Saudi Arabia, the first case had appeared in Saudi Arabia on 2nd March 2020, an incidence shocking enough to lead to partial or absolute lockdowns (Al-Arabiya News, 2020).

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This action thus affected the local economy generally and the stock market specifically.

Another systematic factor that arose with the shifting of financial markets concurrently with COVID-19 was the fluctuation in oil price. Significantly, COVID-19 has had a confusing effect on stock market volatility in the battle over oil supply and prices between Saudi Arabia and Russia. On 6th March, Russia declined to comply with the decision taken at the OPEC summit on the previous day to cut oil supplies. In response, on 8th March, Saudi Arabia made announcements concerning price rebates of between $6 and $8 per barrel for European and Asian buyers in addition to increases in oil production (Ashraf, 2020). However, in comparison with the fluctuation in oil prices which started on 6th March 2020, the first case in Saudi Arabia was confirmed on 2nd March 2020 (Arab News, 2020).

On 20th January 2020, the Saudi stock market index was at 8470 points level, but it started to fall from that point afterward (Trading Economics, 2020). The Saudi stock market index has been on the declining trend since January 2020 (Trading Economics, 2020), however, the declining trend became much steeper from the start of March 2020 (Trading Economics, 2020), right when the first positive case was reported in the Kingdom (Arab News, 2020). As the daily confirmed cases and death cases started to rise the Saudi stock market index started to fall sharply which indicates a negative impact of Covid-19 on the stock market. Nevertheless, the declining trend persisted around mid-March 2020, and afterward, the Saudi stock market index started to rise again from 6031 points level on 16 March 2020 (Trading Economics, 2020). Around mid-March 2020 the number of daily new cases in Saudi Arabia was rising noticeably, and it had reached its peak on 19 May 2020 when the number of new cases was increasing daily to 5102 (Google News, 2020), yet still, the Saudi stock market index retained its positive performance and reached at 6994 points level on 19 May 2020. At the beginning of December 2020, the Saudi stock market index has crossed 8500 points level, while the COVID-19 cases per day were reported to be around 250.

In view of the aforementioned discussion, it is confusing to know whether COVID-19 has negatively impacted the Saudi stock market, and if it has, then to what extent has it been impacted. Moreover, it is difficult to know which industries have been affected more by the virus and which have been affected less. Knowing that the period of COVID-19 spread coincides with the oil price war between Saudi Arabia and Russia, there is an increase in the need to study the effect of the oil price on the market.

1.2. Central Aim and Research Question

This study aims to investigate the effect of Covid-19 on Saudi stock market return. In view of this aim, the following research questions are planned to be answered in this study.

How much has the stock market been affected by Covid-19?

How have the effects of COVID-19 varied across industries?

How much has the stock market been affected by Brent crude oil prices during the period of Covid-19?

How much has the stock market been affected by the lockdown restrictions?

1.3. Delimitation

As the objective of the study is to analyze the impact of coronavirus on the market return in the Saudi Arabian context, the researcher collects the return of the whole market index which is the Tadawul All Share Index (TASI). Moreover, nine industries out of twenty-one have been selected from the market to enhance the identification of the impact. The following indices have been considered: Health Care Equipment and Service, Pharma, Biotech and Life Science, Food and Beverage, Food and Staples Retailing, Banks, Telecommunication Services, Transportation, Software and Services, and Commercial and Professional Services. However, small companies and the public sector have not been analyzed in this research as such companies are not listed in Tadawul. Not studying the effect of coronavirus on small businesses or the public sector is considered a limitation. For example, the demand for the services of some companies has been decreasing during the period of the virus outbreak.

1.4. Research Importance

In the reviewed literature, a number of studies have been found to provide empirical evidence supporting the negative effects of the Coronavirus worldwide, while others have provided contrary evidence. However, limited evidence exists regarding the effect of the virus on the Saudi stock market. Therefore, the proposed research is intended to fill this gap as it is to focus on investigating how much the stock market has thus far been affected by the virus. In this view, it is crucial to conduct this study so that the actual impact of Covid-19 on the Saudi stock market index and prices, and the extent of the impact can be identified.

2. Literature Review

The pandemic of COVID-19 has devastated countries worldwide like no other previous crises have done. Significantly, the financial world has faced unprecedented challenges and has been profoundly affected by this virus. Ozili and Arun (2020) have addressed the destructive

impact this huge catastrophe has had on the global economy and the world of business and finance. These researchers conclude that economic activity has been halted due to two occurrences. First, the need for social distancing and remote working has meant the closure of financial markets, offices, and other places of business. Secondly, the rapidly increasing spread of the virus has meant that retail and activity involving investment and trade among local and international consumers has dramatically decreased as stakeholders choose safety over uncertainty.

Fernandes (2020) suggested that, for each month the current crisis continues, there will be an average loss of 2.5 to 3% of Gross Domestic Product (GDP). If this were to prove true, the global economy could be destroyed. Additionally, Okhuese (2020) concludes that the number of those infected by COVID-19 will steadily grow until an effective vaccine is found. Moreover, it has been implied that such a widespread increase in market illiquidity and general deterioration has contributed somewhat to the rise in coronavirus cases and related deaths. The overall decline in public sentiment about the epidemic, along with the imposition of restrictive rules and lockdowns, has had a significant impact on financial market stability (Baig et al., 2020). However, heuristics behavior and prospect variable are other important factors positively affecting investment decision-making (Cao et al., 2021).

Research into Coronavirus generally comprises studies involving either global or domestic markets or methods of analysis. The presented literature studies the negative impact of the virus on the stock market both at national and international levels. The following researches particularly focus on the global and local effects on financial markets. The impact of COVID-19 on the stability of stock markets has been analyzed by (Chaudhary et al., 2020). They have examined the financial markets of the leading ten countries based on GDP. The results of their study show negative mean returns for the afore-mentioned markets during the current coronavirus from January to June 2020. Despite signs of a recent improvement in market strength, there remains some instability that may signal what is yet to come. Ashraf (2020), a financial researcher, has examined the response of stock markets to the COVID-19 pandemic. He has utilized regular data from sixty-four countries detailing confirmed cases including deaths from the virus during a three-month period. The findings have shown a negative response of stock markets in relation to the growth of Coronavirus confirmed cases.

A recent study by Topcu and Gulal (2020) has investigated how COVID-19 impacted developing stock markets from March 10th to April 30th, 2020. When referring to region, Asian emerging markets have experienced the greatest impact of the outbreak in contrast to equivalent European markets who have suffered the lowest. Accordingly, it can be seen that speed of worldwide governmental response to counteract the economic effects of the pandemic has also proven instrumental.

As stated by Baker et al. (2020), the COVID-19 pandemic, has caused more destruction to the stock markets than any other earlier virus including the infamous Spanish Flu. They profess that previous pandemics had only slightly affected U.S. stock markets. In contrast, current limitations on commercial activity as well as social distancing in a society relying on a service-oriented economy have led to devastating effects on the U.S. financial markets as opposed to previous pandemics. However, information has been the leading source for investors to make investment decisions (Zainuri et al., 2021). The good/bad news guides the investors in making their buying and selling decisions.

The research of Griffith et al. (2020) showed how the impact of the current Coronavirus differs across industries. In their study, they record their findings using data on the share prices of companies listed on the London Stock Exchange as well as corresponding government support received by said firms and their employees. Al-Awadhi et al. (2020) investigated the possibility of infectious diseases affecting the stability of stock markets. Panel data analysis is used to test the effects of the current virus on the Chinese stock market. The researchers conclude that the confirmed cases and deaths of this virus have significantly impacted the stock markets in companies nationwide.

Chia et al. (2020) mentioned that the Movement Control Order (MCO) is significant in that, as, in this time of COVID-19, it not only restricts the movement of people, but it also decreases the financial profits of companies, thus negatively impacting the stock markets. These researchers have analyzed the relationship between the Malaysian stock market and related variables of the current pandemic. They concluded that the MCO has positively impacted the returns on all indices while financial risks from overseas have affected the same returns negatively. In their study, Topcu and Gulal (2020) presented stock market indices as functions of exchange rates, oil price rises, and COVID-19 cases. They also concluded that there has been a significantly negative impact of the pandemic, oil prices as well as the financial exchange rate on the financial growth of stock markets.

Albulescu (2020) stated that the reaction of oil prices to the current Coronavirus showed no variation until March 9th, 2020. However, Saudi Arabia subsequently flooded the market with oil 49 days after the World Health Organization (WHO) released the first COVID-19 monitoring report. This resulted in oil prices dropping internationally by over 20% in one day. Albulescu (2020) has further investigated the impact that the number of coronavirus cases has had on crude oil price and the overall

effect it has had on economic stability in the U.S. financial markets. However, in the long term, Autoregressive-Distributed Lag (ARDL) estimation shows that new coronavirus cases have a minimal negative impact on crude oil prices. Despite this, through amplification of the financial market volatility. COVID-19 has affected crude oil prices indirectly (2020). According to Kalyanaraman and Tuwajri (2014), the pricing process of the Saudi stock market can be explained through macroeconomic factors including consumer price index, industrial output, funds supply, rate of exchange, and oil price.

It can be seen that studies analyzing the negative effects of the Coronavirus on stock markets have used OLS (ordinary least square), GARCH (Generalized Autoregressive Conditional Heteroskedasticity), or panel regression for investigation purposes. Studies such as those by Chia et al. (2020), Ozili and Arun (2020), and Topcu and Gulal (2020) utilized the OLS method. However, other research such as those by Ashraf (2020), Al-Awadhi et al. (2020), and Ahmed (2020) have opted for panel regression. The GARCH method, on the other hand, has been employed in the studies of Chaudhary et al. (2020), Chowdhury et al. (2020), and Czech et al. (2020). The GARCH method is instrumental in estimating volatility in financial markets; however, for the current research objective, panel regression or OLS is considered more appropriate and therefore preferable.

Overall, it appears that no study up till now has attempted to examine the effect that the four variables have had on the stock market, these variables being the numbers of COVID-19 active confirmed cases and death, lockdown and oil prices.

3. Research Framework

The aim of this current research is to analyze the four independent variables and their impact on stock prices in Saudi Arabia as presented in the model below.

$$R_{i,t} = \beta_0 + \beta_1 COVC_{i,t-1} + \beta_2 GF_{i,t-1} + \beta_3 GBP_{i,t-1} + \beta_4 LDL_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

According to the above research model $R_{i,t}$ is the return of the indices i at day t, $COVC_{i,t-1}$ indicates the daily growth in total ongoing confirmed cases, $GF_{i,t-1}$ indicates the daily growth in fatality cases, $GBP_{i,t-1}$ is the daily growth in Brent crude oil price, $LDL_{i,t-1}$ is a dummy variable which indicates the daily level of lockdown restricted by the government in response to Covid 19 outbreak. $LDL_{i,t-1}$ takes values between 0 and 2 according to the level of lockdown. A value of 0 implies no lockdown and a value of 2 implies complete lockdown.

In addition, the following hypotheses will be statistically analyzed in this study.

H1: *The daily growth in ongoing verified cases caused by COVID-19 has negatively impacted stock returns significantly across all industries.*

H2: *The daily increase in total fatal cases caused by COVID-19 has negatively impacted stock returns significantly across all industries.*

H3: *Under the conditions of the current CORONA VIRUS, Brent oil price has positively impacted stock returns significantly across all industries.*

H4: *Under the conditions of the current CORONA VIRUS, the lockdown level has negatively impacted stock returns significantly across all industries.*

4. Research Methodology

4.1. Research Designs and Methods

The purpose of this section is to explain the research designs and methods employed to collect data. The research is designed to analyze the relationship between coronavirus active cases, deaths, oil prices, and lockdown with the return of the Saudi stock market. The causal research study design that is going to be employed in this study aligns with the objective of the study. Using data related to the corona virus, oil prices, and market return, a quantitative approach is to be applied to find the relationship. Therefore, the intended research will be conducted based on secondary data which is based on historic share prices of listed firms on the Saudi Stock Market and active cases of Coronavirus.

The data of daily confirmed cases started from one then increased to reach the peak for several days then started decreasing which indicates that the coronavirus situation does not follow regular study methodologies. According to Baltagi (2008), panel data regression can be employed and it is aligned with the objective of the study. Moreover, the pooled Ordinary Least Squares (OLS) regression method with robust standard errors has been used to visualize the effect of the pandemic on Saudi stock investment between 3rd March and 9th December 2020.

4.2. Data Sample

Various resources have been used for collecting data. The daily ongoing verified cases and fatalities are collected from the ministry of health website (Ministry of Health, 2020). The daily closing prices of the Saudi Stock market and the Brent oil crude are collected from the Bloomberg application. Moreover, the level of lockdown is determined according to Saudi government decisions and announcements. Al-Arabiya News (2020) has been used to collect related information specifying the level of lockdown as mentioned that the complete lockdown was during the period 23rd March and 28th April then between 21st May and 31st May.

Data of industries included in the Tadawul index was collected over the period from March 3, 2020, to December 9, 2020. The industries were selected using the non-probability sampling technique. Judgmental sampling was used because selected industries were chosen according to their returns during the COVID-19 period of time. Consequently, nine industries were selected to analyze how these indices have been affected by the virus. The research investigates the following sectors: Health Care Equipment and service, Pharma, Biotech and Life Science, Food and Beverage, Food and Staples Retailing, Banks, Telecommunication Services, Transportation, Software and Services, and Commercial and Professional Services. Moreover, all cases related to the virus whether active cases or deaths have been considered in the research.

4.3. Variables Description and Measurement

According to the model, the growth of ongoing verified cases (GOVC) which have resulted from the corona virus is going to be an independent variable. The variable is measured by calculating the percentage change of ongoing confirmed cases using the below formula.

$$GOVC_t = \frac{OVC_t - OVC_{t-1}}{OVC_{t-1}} \qquad (2)$$

Knowing that $GOVC_t$ is the growth of ongoing verified cases at day t, whereas OVC_t and OVC_{t-1} stand for the daily active confirmed cases at day t and $t-1$, respectively.

Moreover, the growth of fatalities (GF) is going to be presented as an independent variable in the model. This variable is measured by applying the same growth formula as applied for COVC

$$GF_t = \frac{GF_t - GF_{t-1}}{GF_{t-1}} \qquad (3)$$

Where that GF_t is the growth of death cases at day t, whereas GF_t and GF_{t-1} stand for the daily death cases at day t and $t-1$, respectively.

The growth of Brent crude oil price (GBP) is also considered as an independent variable which is measured by the same growth formula using the daily prices of Brent crude oil.

$$GBP_t = \frac{GBP_t - GBP_{t-1}}{GBP_{t-1}} \qquad (4)$$

Knowing that GBP_t is the growth of Brent crude oil price at day t, GBP_t, and GBP_{t-1} stand for the daily Brent crude oil price at day t and $t-1$, respectively.

Furthermore, the lockdown level (LDL) is defined as "The imposition of stringent restrictions on travel, social interaction, and access to public spaces". The lockdown is considered as a dummy variable in the model that takes values of zero, one, and two. Value of zero indicates a period of no lockdown, the value of one specifies partial lockdown, and the value of two designates complete lockdown.

The dependent variable is the stock market returns and the industry return that will be calculated using the following formula.

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} \qquad (5)$$

The formula indicates that the return (R) is calculated by subtracting the previous period's stock prices (P_{t-1}) from the current period's stock prices (P_t) and dividing it by P_{t-1}

5. Empirical Results

Data of industries included in the Tadawul index was collected over the period from March 3, 2020, to December 9, 2020. The industries were selected using the non-probability sampling technique. Judgmental sampling was used because selected industries were chosen according to their returns during the COVID-19 period of time. Consequently, nine industries were selected to analyze how these indices have been affected by the virus. The research investigates the following sectors: Health Care Equipment and service, Pharma, Biotech and Life Science, Food and Beverage, Food and Staples Retailing, Banks, Telecommunication Services, Transportation, Software and Services, and Commercial and Professional Services. Moreover, all cases related to the virus whether active cases or deaths have been considered in the research.

In this section, the researcher presents the results of the empirical analysis. In the first part, descriptive statistics has been used to present the data. In the second part, the pooled Ordinary Least Squares (OLS) regression method with robust standard errors has been employed to visualize the effect of the pandemic on Saudi stock investment between 3rd March and 9th December 2020. Additionally, IBM SPSS v22 has been used with RLM macro v 1.01 to find the result.

Figure 1 shows the daily returns for the Saudi stock market included in the current analysis. The graph reveals that when the number of verified ongoing daily cases increased, it led to negative investment returns during the pandemic in the first period between 3rd March and 25th March. The market was then seen to gradually recover after that. We note from the graph that the returns of the Saudi market are seen to be more volatile in periods of full and partial lockdown. Moreover, as can be seen, at the end of the period of analysis, the decrease in daily active cases and verified fatalities resulted in a rise in market returns.

5.1. Descriptive Statistics and Correlation Analysis

The summary statistics of the data used in our analysis are demonstrated in Table 1. During the aforementioned
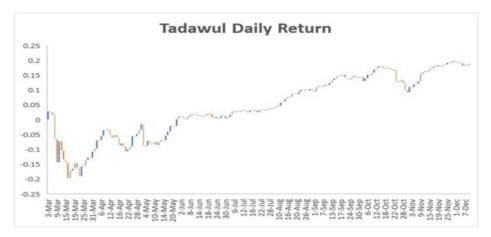
Figure 1: Daily Returns for Stocks in Saudi Arabia During the COVID-19 Period

Table 1: Summary Statistics

	TR	GOVC	GF	GBP	LDL
Mean	0.01	0.061	0.0564	0.0008	0.895
S.D.	0.016	0.234	0.368	0.049	0.858
Max	0.07	1.61	3	0.21	2.00
Min	−0.08	−0.21	−1	−0.24	0.00
Skewness	−1.78	4.5	4.405	−0.636	0.203
Kurtosis	11.114	22.919	28.878	7.944	−1.616

Note: TR: the Tadawul daily return; GOVC: The daily growth in ongoing verified cases; GF: The overall daily growth in COVID-19 related fatalities; GBP: growth in Brent Crude oil prices; LDL: Level of lockdown.

Table 2: Summary Statistics

	TR	GOVC	GF	GBP	LDL
TR	1				
GOVC	−0.259**	1			
GF	0.081	0.053	1		
GBP	0.462**	−0.169*	0.046	1	
LDL	0.089	0.091	0.194**	0.106	1

Note: TR: The Tadawul daily return; GOVC: The daily growth in ongoing verified cases; GF: The overall daily growth in COVID-19 related fatalities; GBP: growth in Brent Crude oil prices; LDL: Level of lockdown.

time, the maximum daily Tadawul return is shown to be 7% and the minimum −8%. The daily growth in ongoing verified cases is 1.61 and the highest growth in the number of COVID-19 casualties is 3.

A correlation matrix of the data is shown in Table 2. Daily returns from Tadawul are negatively associated with the daily growth of COVID-19 confirmed active cases.

However, Brent Crude oil price is positively correlated with Tadawul daily returns and negatively associated with the daily growth in ongoing verified cases.

In this part of the study, (OLS) with robust standard error has been utilized to study the impact of independent variables, that is, the daily rise of ongoing verified cases caused by COVID-19, the daily growth in total cases of fatalities caused by COVID-19, Brent crude oil price and level of lockdown. The dependent variable, however, is stock returns across all industries (Tadawul daily return). The approach of OLS regression fits a regression plane into

a "cloud" of data that is expected to have a linear pattern. Although not every point in the data cloud is reached by the regression plane, the partial relationships between each slope (each regression coefficient "b") and the result variable are modeled. Regression coefficients in OLS are therefore calculated by minimizing the sum of the squares of the discrepancies between the values in the regression plane and the values in the data observed. The study may not follow classical event analysis methodologies since the highest point of the event lasts for many days after the start date. Baltagi (2008) suggested that regression of panel data lessens prejudice and multicollinearity of estimation, examines specific heterogeneity, and acknowledges the time differing association between dependent and independent variables. Therefore, panel regression was used to analyze the relationship between the total share index as a dependent variable and GOVC, GF, GBP, and level of LDL as independent variables.

5.2. Hypothesis Test

H1: the daily growth in ongoing verified cases caused by COVID-19 has negatively impacted stock returns significantly across all industries.

Table 3 displays the results of panel A data tests in which all the stocks were measured, including the share prices and stock returns of the listed companies at the Saudi stock during the COVID-19 outbreak are recorded in Table 3. The findings show that Saudi stock returns across all industries are significantly and negatively connected to the daily rise in current cases caused by the COVID-19. In addition, the impact size of GOVC on daily return is 6.7%.

H2: the daily increase in total fatal cases caused by COVID-19 has negatively impacted stock returns significantly across all industries.

Table 3 displays the results of panel B data tests in which all the stocks were measured, including the share prices and stock returns of the listed companies at the Saudi stock market during the outbreak of COVID-19. Model (1) shows an insignificant and positive relationship between Saudi stock return and GF. Furthermore, the measurement of the effect of GF is 7% on daily return.

H3: Under the conditions of the current COVID-19, Brent oil price has positively impacted stock returns significantly across all industries.

Table 3 (panel A) shows the relationship between the independent variables GOVC, GBP, and Saudi stock return. In Model (2), GBP is shown to be significantly and positively related to Saudi stock return, while GOVC is significantly and negatively related to Saudi stock return with an effect of 24.7% on the Saudi stock return.

Table 4 (Panel B) demonstrates the relationship between the independent variables GF, GBP, and Saudi stock return. In Model (2), GBP is shown to be significantly and positively related to Saudi stock return, while GF is insignificantly and positively related to Saudi stock return, with an effect of 21.7% on the Saudi stock return.

H4: Under the conditions of the current COVID-19, the lockdown level has negatively impacted stock returns significantly across all industries.

Panel A displays the results of the effect of lockdown level on the relationship between GOVC and GBP. The variable lockdown level was coded as 0 for no lockdown at all, 1 for partial lockdown, and 2 for full lockdowns. Model (3) shows LDL = 0, which shows the relationship between Saudi stock return and GOVC is significant and negative. In contrast, the relationship is significant and positive between Saudi stock return and GBP. Moreover, model (4) shows that when the level of lockdown increases to 1 the relationship between GOVC and Saudi stock return turns to be insignificant and negative, and the relationship between Saudi stock return and GBP becomes weaker but still significant and positive. Furthermore, in Model (5), as

Table 3: Panel A: The Daily Growth in Ongoing Verified Cases Caused by COVID-19

	(1)	(2)	(3)	(4)	(5)
β_0	0.002 (0.0009)	0.0016 (0.0009)	0.0025 (0.0014)	0.0016 (0.0011)	0.00035 (0.0010)
COVC	−0.0176** (0.0101)	−0.013** (0.0082)			
GBP		0.140** (0.0369)			
GOVC–LDL0			−0.010** (0.0084)		
GBP–LDL0			0.321** (0.0367)		
GOVC–LDL1				−0.003 (0.0081)	
GBP–LDL1				0.104** (0.0369)	
GOVC–LDL2					−0.013 (0.0085)
GBP–LDL2					0.0623 (0.0366)
Partial Eta square	6.7%	24.7%	57.5%	14.9%	8.6%

Note: The dependent variable is Tadawul daily return; GOVC: The daily growth in ongoing verified cases; GBP: growth in Brent Crude oil prices; LDL: Level of lockdown; β_0 is the intercept. The robust standard errors are in parentheses; *$p < 0.05$; **$p < 0.01$.

Table 4: Panel B: The Daily Growth in Total Cases of Fatalities Caused by COVID-19

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
β_0	0.001 (0.0012)	0.001 (0.0011)	0.0007 (0.0014)	0.0015 (0.0013)	0.00015 (0.0011)
GF	0.003 (0.0022)	0.003 (0.0027)			
GBP		0.149** (0.0393)			
GF–LDL0			−0.003 (0.0028)		
GBP–LDL0			0.345** (0.0391)		
GF–LDL1				0.0004 (0.0028)	
GBP–LDL1				0.106** (0.0394)	
GF–LDL2					0.0035 (0.0028)
GBP–LDL2					0.0651* (0.0393)
Partial Eta square	7%	21.7%	55.5%	14.3%	8.8%

Note: The dependent variable is Tadawul daily return; GF: The overall daily growth in COVID-19 related fatalities; GBP: growth in Brent Crude oil prices; LDL: Level of lockdown; β_0 is the intercept. The robust standard errors are in parentheses; *$p < 0.05$; **$p < 0.01$.

LDL = full lockdown, the variables GOVC and GBP become weaker with an insignificant relationship related to Saudi stock return.

From previous results, it is obvious that whenever the level of lockdown increases, the GBP has a weaker to insignificant effect on Saudi stock return. Furthermore, whenever the level of lockdown rises, the more there is an insignificant negative relationship between GOVC and Saudi stock return. Therefore, the impact of LDL reduces the GBP and GOVC effects from 57.5% to 8.6% on Saudi stock return.

Panel B displays the results of the effect of lockdown level on the relationship between GF and GBP. The variable lockdown level was coded as 0 for no lockdown at all, 1 for partial lockdown, and 2 for full lockdowns. Model (3) shows LDL = 0, which shows the relationship between Saudi stock return and GF is insignificant and negative., In contrast, the relationship between Saudi stock return and GBP is significant and positive. Moreover, model (4) shows that when the level of lockdown = 1, the relationship between GF and Saudi stock return turns to be insignificant and positive, and the relationship between Saudi stock return and GBP becomes weaker but still significant and positive. Furthermore, in Model (5), as LDL = full lockdown, the variables GF and GBP become weaker in their relationship to Saudi stock return.

From previous results, it is obvious that whenever the level of lockdown increases, the GBP has a weaker to insignificant effect on Saudi stock return. Furthermore,

whenever levels of lockdowns rise, the more insignificant the negative relation between GF and Saudi stock return. Therefore, the impact of LDL reduces the GBP and GF effects from 55.5% to 8.8% on Saudi stock return.

5.3. Further Analysis for All Industrial Sectors During COVID-19

Table 5 presents the coefficients of the results of the panel regressions for companies included in the daily Tadawul return index for the period from 3rd March 2020 to 9th December 2020, taking relevant sectors into account. $R_{(i,t)}$, which is the return of indices (i) at day (t), is the dependent variable. Health Care Equipment & Service daily return, Pharma, Biotech & Life Science daily return, Food and Beverage daily return, Food & Staples Retailing daily return, Banks daily return, Telecommunication daily return, Transportation daily return, Software & Services daily return and Commercial & Professional Service daily return, are sector dummy variables that take the value 1 if it is a listed stock in its respective sector, or else zero. Health Care Equipment & Service daily return, Food and Beverage daily return, Food & Staples Retailing daily return, Telecommunication daily return, Transportation daily return, and Commercial & Professional Services daily return have had high contributions significantly positive to Saudi stock return with high effect ranging from 79.2% to 63.5%.

Table 5 also shows that Pharma, Biotech & Life Science, Banks, and Software & Services have performed more

Table 5: Panel Regression with Specific Sectors Dummy Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
β_0	−0.0008 (0.0007)	0.001 (0.0014)	0.00044 (0.0008)	0.0002 (0.0011)	0.0004 (0.0003)	0.00049 (0.0006)	0.0001 (0.0005)	−0.00002 (0.0009)	0.0007 (0.0006)
GBP	0.083** (0.0277)	0.1959** (0.0310)	0.044** (0.0198)	0.121** (0.0301)	0.0117** (0.0066)	0.0647** (0.0197)	0.0659** (0.0150)	0.0954** (0.0271)	0.0716** (0.0132)
GOVC	−0.007** (0.0039)	−0.012** (0.0068)	−0.011 (0.0009)	−0.007** (0.0045)	0.0027 (0.0021)	−0.001** (0.0038)	0.002 (0.0057)	−0.0074* (0.0059)	0.00003 (0.0048)
Health Care Equipment & Svc daily return	0.5411** (0.0865)								
Pharma, Biotech & Life Science daily return		0.1947** (0.0796)							
Food and Beverage daily return			0.676** (0.0800)						
Food & Staples Retailing daily return				0.4143** (0.0822)					
Banks daily return					0.0136** (0.0006)				
Telecommunication daily return						0.7953** (0.0853)			
Transportation daily return							0.5892** (0.0552)		
Software & Services daily return								0.2825** (0.0631)	
Commercial & Professional Svc daily return									0.6775** (0.0569)
Partial Eta square	63.5%	34.4%	71.7%	54.6%	91.6%	72.8%	79.2%	48.4%	75.4%

Note: The dependent variable is Tadawul daily return; GOVC: The daily growth in ongoing verified cases; GBP: growth in Brent Crude oil prices; LDL: Level of lockdown; β0 is the intercept. The robust standard errors are in parentheses; *$p < 0.05$; **$p < 0.01$.

poorly among all industrial sectors in this study, with 34.4% for pharma Biotech & Life Science, 48.4% for Software & Services. However, it is noticed that although the bank impact on Saudi stock return is weak, it has had a very high effect of 91.6% on Saudi stock return.

6. Conclusion

In this active research, an analysis of the reaction of the stock market return towards the COVID-19 pandemic has been undertaken. Using data from Saudi stock market

returns, it has been found that the response of the financial markets to the increase in reported cases of the virus has been largely negative. Specifically, it has been observed that stock market returns drop as reported COVID-19 cases increase. The response of the stock market, particularly when related to the number of virus fatalities, has been unstable overall. The results further illustrate that stock market prices during the current pandemic correlated with early associated stock price risks as the confirmed virus cases rose but were less impacted by subsequent deaths. Furthermore, as the degree of lockdown rose, the effect of the Brent oil

prices on Saudi stock return became weaker. Moreover, the negative influence of daily active cases on the market return became more random. The Saudi stock return at the period of restricted lockdown decreased sharply with a high level of fluctuations. All in all, this study has found that there has been an increasing response to the current pandemic from financial markets with a varied reaction shown according to each stage of the outbreak.

According to the literature, the contribution of the present study can be summarized as follows: First, the study of the impact of COVID-19 on the Saudi stock market is significant as it has not been done before. Second, analysis of the effect of the virus with other independent variables (Level of lockdown and Brent crude oil price) on the Saudi Market is instrumental in providing essential data. Third, the findings are expected to reveal which industries have been affected considerably by the virus.

This research gives insight into the nature of the Saudi stock market during the period of COVID-19. Therefore, investors could predict the negative behavior of the stock return throughout any similar crises. Moreover, the research studies the effect of the COVID-19 on various industries to help investors making decisions about which industries are profitable during the period of COVID-19 and during the lockdown period. This research would also help investors who predict the return of the Saudi stock market based on crude Brent oil price and to avoid doing so when the level of lockdown becomes more restricted during any such crises.

Future research may apply comparative analysis by investigating the Saudi stock market with other emerging markets to differentiate the effect of the variation among countries. Moreover, according to the conclusion, the market behavior fluctuated unexpectedly during the restricted period of lockdown, which contributed to more confusion among investors. Further research may study the co-movement between the stock market and the COVID-19 with the oil price. Also, more independent variables can be used to study the relationship such as the exchange rate.

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