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COVID-19 ATTACK ON STOCK MARKETS: EVENT STUDY AND PANEL DATA ANALYSIS OF ORGANIZATION OF ISLAMIC COUNTRIES (OIC)

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ABSTRACT

The outbreak of COVID-19 has hampered the economies in all over the world. Due to this pandemic, many economic activities worldwide continue to be slumps. Current study examines the effect of COVID-19 contagion epidemic on stock markets of 23 OIC economies. Event study approach is employed to quantity abnormal returns (ARs). Fixed effect and random effect models are employed for the cause of abnormal return. Sixty (0 to 59) days, including the event day, are observed in the event window at the release of news related to COVID-19 in media at the international level; each window contains ten days. Pre-event window includes 120 days afore from the event day. We examine the ARs significantly negative in 4 ensuing windows in 59 days. Negative AR is significant for developed as well as developing economies. Findings reveal that the cumulative ARs from day first to day 33 remain in the range of decimal -0.203 to single digit -9.09. Still, from day 34 to day 59, it remains in the range of double digit -10.150 to -19.727, which is the consequence of increased distress in the stock market caused it requires the serious attention of the states to control this pandemic. Further, panel data analysis suggests that more time is required to return to the normal situation of stock markets from the adverse effect of COVID-19. Current investigation is significant for decision bodies for example national banks, stock market officials and state agencies to boost confidence among investors because this pandemic hampered social-economic activities all over the world, including the OIC economies.

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INTRODUCTION

The outbreak of (COVID-19) coronavirus has triggered a pandemic for which vaccines are not available (Wang et al., 2020). This (COVID-19) grab the attention of scholars to explore the reaction of stock markets to this pandemic. The COVID-19 is the acronym of Corona Virus Disease 2019. This virus caused a fever of unknown cause, and its first case was detected in Wuhan, China, and first reported to World Health Organization (WHO) on December 31, 2019. It was stated as a deadly virus on February 11, 2020 by WHO. The existing literature documented several shreds of evidence regarding the effects of major events on stock markets (Singh et al., 2020; WHO, 2020).

Many Studies look into the effects of significant occurrences on stock markets, such as the Severe Acute Respiratory Syndrome (SARS) pandemic disease outbreak (Chen et al., 2007, 2018; Loh, 2006), natural disasters (Caporale et al., 2019; Tavor and Teitler-Regev, 2019; Wang and Kutan, 2013), political events (Bash and Alsai'fi, 2019; Shanaev and Ghimire, 2019; Beauli'eu et al., 2006; Nazir et al., 2014; Ismail and Suhar'djo, 2001;), business events (Maitra and Dey, 2012; Ranju and Mallikarjunappa, 2019; Seal and Matharu, 2018) and Public News (Li,2018; Ormos and Vazsonyi, 2011). The harmful consequences of the COVID-19 epidemic on capital markets and the global economy are inexorable. The academic inquiries carried out during the early stages of this pandemic by Al-Awadhi et al. (2020), Liu et al. (2020), Ahmar and Val (2020), and Zhang et al. (2020) documented the negative impact of the outbreak of COVID-19 on stock markets.

Stock markets began to plummet when World Health Organization (WHO) declared COVID-19 as pandemic. Different studies contend to examine the behavior of stock markets at domestic and international levels due to COVID-19 outbreak. Because an event like this plays a significant role in documenting the behavior of panic activities and high volatility in stock markets. Amid growing fear and panic trading in stock markets, the Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) ceased trading on March 13 and March 23, 2020. In the same month, the US stock market showed halted trading four times within ten days (Economic Times, 2020). The current study's aim is to investigate the impact of the COVID-19 pandemic outbreak on the stock markets of Organisation of Islamic Cooperation (OIC) nations. Therefore, this study is one amongst those that work on different countries blocks like G-20 countries, Shanghai Cooperation Organization (SCO) and BRICS, etc.

The outbreak of COVID-19, announced by the WHO as a pandemic, created a dearth of studies on COVID-19's impact on stock markets. Some studies have been conducted to analyze the effect of COVID-19 on economies. A study carried out by Liu et al. (2020) by using event study methodology which investigated the coronavirus outbreak impact on the stock markets of Korea, Japan, USA, Singapore, Germany, and Italy. Through this study, it is observed that major countries' stock markets that are affected by this virus fell soon as the cases of COVID-19 increased, which indicated a bearish trend in respective markets.

Sing et al. (2020) investigated the impact of COVID-19 on the stock markets of G-20 economies which revealed that the panic in the stock market increased as the confirmed cases of COVID-19 increased. This study showed significant negative ARs (Abnormal Returns) in sub-event windows. It resulted that after the COVID-19 epidemic, stock markets began to perform badly and indicated negative returns in all around the world. Alam et al. (2020) analyzed the effect of the lockdown period on the Indian financial market, which was imposed by the emergence of the COVID-19 pandemic. This study measured the extent of the influence of COVID-19 by using the market method of event study. It is shown that during the period of lockdown, the stock market responded positively with significantly positive average abnormal returns; investors anticipated the lockdown and reacted positively, but in pre-lockdown, they became panicked, and the stock market reflected the negative average abnormal return.

A study conducted by (Herwany et al. 2021) used the event research approach in nine areas of the Indonesian Stock Exchange with a systematic selection strategy revealed the most impacted area is financials, followed by commerce, service, and investment sectors, as determined by the cumulative value of anomalous returns. Consumer goods and mining industry sectors are still optimistic, but other sectors have shown temporary negative sentiments. The OLS regression results also strengthen the relationship between the COVID-19 pandemic and negative and significant market returns. Zoungrana et al. (2021) used the event study approach based on a GARCH process and considered two event dates. It documented that the appearance of the outbreak on January 23, 2020, had only a minimal effect on the WAEMU stock market. It shows that the pandemic arrival in Africa did not cause intense disruption in the market. The Union's stock market and sectoral indices of industry, finance, and distribution have been sensitive to this pandemic since the appearance of the first case on March 2, 2020, in the WAEMU. Distribution companies are affected more adversely as compared to others. The findings of this study were consistent with previous research on the effect of pandemics/epidemics on stock market return. Previous research has shown that epidemics (Ebola, SARS, etc.) are generally associated with a negative effect on individual portfolios and even on the global economy.

A study by Ambros et al. (2021) used high-frequency data to study the impact of COVID-19 confirmed cases on 8 stock markets during the first two months of 2020. Their study found that the change in the number of COVID-19 cases leads to an increase the market volatility in the stock markets of Europe. This study suggested that a substantial segment of market volatility can be triggered by changes in the number of COVID-19 news. Alzyadat and Asfoura (2021) investigate the impact of the COVID-19 outbreak on Saudi Arabian stock market. They used the data of the closing price of daily stock market index, Tadawul All Share Index (TASI) and the number of confirmed COVID cases on a daily basis infected during the period from March 15, 2020 to August 10, 2020. They used Vector Auto-Regressive (VAR) model, the Impulse Response Function (IRF), and Autoregressive Conditional Heteroscedasticity (ARCH) models. They documented that the results of the correlation matrix and IRF indicated the stock market returns responded negatively to the growing number of COVID infected cases. The ARCH model confirmed the negative impact of COVID-19 on stock market returns. The results have also shown that the negative reaction of the stock market was strong in the early period of COVID-19.

Insaidoo et al. (2021) studied the effect of COVID-19 on the stock market of Ghana by using the EGARCH model and used the daily stock return data from January 2, 2020 to October 13, 2020. This study statistically showed an insignificant negative relationship between the stock market and the COVID-19 pandemic. Its results confirmed that the COVID-19 pandemic caused an increase in volatility by 8.23 percent in stock returns. Rabhi (2020) empirically examines the effect of a pandemic on the emerging Asian stock market vulnerability. They considered COVID-19 as a case study and used the ARDL panel data approach to empirically investigate the impact of confirmed cases of COVID-19 and death cases that triggered the fear of the event. The findings of this study suggest that both the growth in the number of COVID-19 cases and news about death cases affect the Asian stock markets negatively. Furthermore, a study conducted by Senol and Zeran (2020) examined the impact of COVID-19 outbreak on global markets between January 21, 2020, and April 7, 2020. The findings of this study indicate that the value of the firms registered on the stock market decreased, financial instruments prices dropped, and investors lost their wealth. Tahat and Ahmed (2020) conducted a study to examine the impact of COVID-19 outbreak in UK. They found a negative relationship between COVID-19 outbreak and stock market returns. They also found that during the outbreak of COVID-19 the liquidity of the stock market has been shrunk. They also observed that there is a significantly positive association between market returns and liquidity which suggests that investors either exist or hang on.

Rahman et al. (2021) conducted a study to examine the effect of uncertainties that arose from the COVID-19 pandemic on stock market of Australia. They documented that stock market reacted negatively to the outset of this pandemic. The cross-sectional results indicated that the pandemic negatively affected the smallest, least profitable, and value portfolios. Ahmed (2020) examined the effect of COVID-19 epidemic on Pakistan's stock market. In that study, he used the confirmed COVID cases, deaths and number of recovers and daily closing price of PSX-100 index for the first half of 2020. The result of this study indicated that only the recoveries from COVID-19 are influencing the index performance, and fatalities and positive cases are insignificant to the index performance. It documented that the recoveries from this pandemic are influencing the stock market performance, and the remaining variables are insignificant to the index.

METHODOLOGY

Event Study Method

For this article, event study methodology is used for empirical work, as it is required to disclose how stock markets behave after the rash of COVID-19. The event study approach is regarded as a fit method to study the effect of an event on stock market return over an event timeframe. (Anwar et al., 2017) documented that event studies help us to forecast how indices and securities will behave in relation to the event's announcement. The call of an event can affect the stock markets negatively and positively.

Generally, the event study method is used to establish the relationship between the occurrence of events (such as stock splits, acquisitions, dividends, bonus shares, amalgamation) and the stock market performance, etc. Various researchers used the same approach to investigate the effect of non-business events, such as the eruption of the disease on stock markets (Pendell and Cho, 2013; Liu et al., 2020; Chen et al., 2007, 2018).

Past studies have shown that the event study approach is the most appropriate device for estimating ARs after any event announcements (MacKinlay, 1997; Brown and Warner, 1985). Bowman (1983) recommended that to estimate the abnormal returns through event methodology, which involves a respective event, event window, estimation window, and the selection of appropriate model. Recent studies attempted to investigate the short-run effect of COVID-19 epidemic on returns of stock markets (Liu et al., 2020; Zhang et al., 2020; Nicola et al., 2020); On December 30, 2019, information about the outbreak of COVID-19 in the southern Chinese city of Wuhan began to circulate online, causing panic among the crowd. On January 20, 2020, Zhong Nanshan (head of the national health commission (NHFC)) stated in an interview that this infectious disease could be transmitted to humans (Liu et al., 2020). Therefore, for this study, the event day is January 20, 2020, as the first news about this pandemic is highlighted in media news.

To estimate the impact of COVID-19 on stock markets, the event window for the current study is 60 days, consisting of event day and 59 days are considered after the first news about this infectious disease hit the international media. As shown in Figure I, for the estimation of expected returns, an event estimation window is used. As per the previous studies (Lalwani et al., 2019; Anwar et al., 2017), here the estimation window is from day -120 to day -1, the day before the event day when information about new virus floated in the stock market, hence consisting of 120 days of trade.

Estimation of Model

In the first part of the event window, daily returns are calculated for all selected stock markets through Equation 1.

$$R_{i,t} = \ln[p_{i,t}/p_{i,t-1}] * 100 \quad (1)$$

Where;

$R_{i,t}$ is the return of index i on day t, and ln is natural log, $p_{i,t}$ denotes the closing.

price of an index on day t and $p_{i,t-1}$ is the closing price of index i of the previous day.

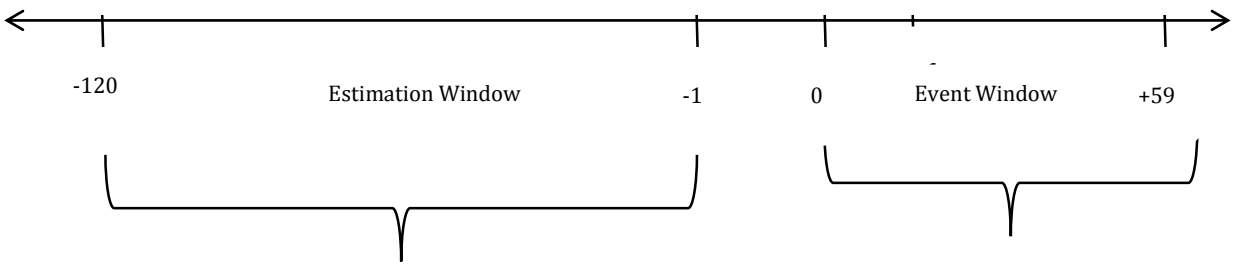

Figure 1. Event timeline.

$$\bar{R}_i = \frac{1}{N\sum_{-120}^{-1} Ri,t} \text{for duration I } = 1,2,3,\ldots..,N \quad (2)$$

Equation (2) is used to find the expected average return of index i. here $R_{i,t}$ is the daily return of index i in this whole estimation period (-120 to -1).

The abnormal return of each day is measured by using equation (3).

$$AR_{i,t} = R_{i,t} - \bar{R}_i \quad (3)$$

Cumulative abnormal return (CAR) for each index from the day, t_0 to day t_2, computed by using equation (4).

$$CAR_i(t_0, t_2) = \sum_{t=t_0}^{t_0} AR_{i,t} \quad (4)$$

Equation (5) is used to calculate the average abnormal return (AAR), here, we find out the arithmetic mean of ARs for each index at every day. N indicates the number of days.

$$AAR_t = \frac{1}{N\sum_{t=1}^{N} AR_{i,t}} \quad (5)$$

We find out the cumulative average abnormal return (CAAR) to examine the cumulative effect of this epidemic for a specific time-frame. Cumulative average abnormal return is the aggregate of each day average-abnormal-return for pre-defi ned event window (t0 – t1). CAAR for the pre-specified window is calculated using equation (6).

$$CAAR(t_0, t_1) = \sum_{t=t_0}^{t_1} AAR_t \quad (6)$$

For the calculation of standard deviation, the time series of average abnormal returns (AAR) in the estimation period by equation (7).

$$\sigma(AAR_t) = \frac{\sqrt{\sum_{-120}^{-1}\left(\overline{AR_t} - \overline{\overline{AR}}\right)^2}}{120} \quad (7)$$

Where $\overline{\overline{AR}} = 1/120 \ \sum_{-120}^{-1} \overline{AR_t}$ and $\overline{AR_t} = 1/N \sum_{i=1}^{N} AR_{i,t}$

The significance of the coefficient of AAR on event day t and of CAAR for a particular event window (t1 – t2), t-statistics are calculated as per Equations (8) and (9), respectively:

$$t\_Test_{AAR} = \frac{AAR}{\sigma(AAR_t)} \quad (8)$$

$$t\_Test_{CAAR} = \sqrt{CAAR_t(t2 - t1 + t1)/\sigma(AAR_t)} \quad (9)$$

Panel Data Regression Model

$$AR_{i,t} = \alpha + \beta_1 LnconfCases_{i,t} + \beta_2 ReturnIndex_{i,t} + \beta_3 ReturnMarket_{i,t} + \beta_4 StringIndex_{i,t} + \beta_5 StringIndex * InconfCases_{i,t} + \beta_6 DevelopingE_{i,t} + \beta_7 AbTrading_{i,t} + \varepsilon_{i,t}$$

Where;

$AR_{i,t}$ *is the abnormal return of index i at day t.*

LnconfCases is the natural log *of confirmed Covid* − 19 *cases in economy i at day t.*

ReturnIndex is the daily return of index i at day t.

ReturnMarket is the reutn of global index (Dow jones) i at day t.

StringINdex is the stirngency Index of country i at day t.

DevelopingE is the dummy variable for Developing Economy.

AbTrading is the abnormal Trading of index i on day t.

Here, we introduced "DevelopingE" as a dummy variable to present the stock markets indices of the developing economies, whether this pandemic have significant impact on AR of the developing economies or not. Then, the index of developing countries is assigned a value of 1, and 0 otherwise. The result of the fixed effect model does (see Table A in appendix) not support "DevelopingE". Therefore, we now use the random effect model for analysis.

Data

There are 57 member countries of the OIC forum, from which 23 member countries are selected on the availability of data (see Table I). Media news reported that OIC economies are also facing problems during this rival pandemic. Due to this COVID-19, all major indices, such as Dow Jones, has also plummeted and have been negatively impacted. We calculate expected returns for each country using a comparison period average-adjusted model. The data for selected OIC countries are collected from investing.com (it functions as an open-access website), which shows stocks and indices prices from all over the world. For the estimation period, we have collected the intra-day closing value of the indices for 120 days and for 60 days of the event window, respectively. Data related to the confirmed cases of coronavirus obtain from the website of ourworldindata.com. We used E-view and Microsoft-Excel spreadsheets for analysis.

Table 1. List of countries with market indices.

Country	Stock Exchange	Indices	Abbreviation	Economy Status
Jordan	Amman Stock Exchange	Amman SE General	AMGNRLX	Developing
UAE	United Arab Emirates Stock Market	DFM General	DFMGI	Developed
Indonesia	Indonesia Stock Exchange	Jakarta Stock Exchange Composite Index	JKSE	Developing
Uganda	Uganda Stock Exchange	Uganda All Share	ALSIUG	Developing
Pakistan	Pakistan Stock Exchange	Karachi 100	KSE	Developing
Bahrain	The Bahrain Bourse	Bahrain All Share	BAX	Developed
Bangladesh	Dhaka Stock Exchange	Dhaka Stock Exchange 30	DS30	Developing
Turkey	Borsa Istanbul	BIST 100	XU100	Developed
TUNISIA	Bourse Régionale des Valeurs Mobilières	Tunindex	TUNINDEX	Developing
Saudi ARABIA	Saudi Tadawul Group	MSCI Tadawul 30 Price Return	MISCI	Developed
Iraq	Iraq Stock Exchange	ISX Main 60	ISX60	Developing
Oman	Muscat Securities Market	MSM 30	MSX30	Developed
Palestine	Palestine Exchange	Al-Quds	PLE	Developing
Qatar	Qatar Stock Exchange	QE General	QSI	Developed
Kazakhstan	Kazakhstan Stock Exchange	KASE	KASE	Developing
Côte d'Ivoire	Bourse Régionale des Valeurs Mobilières	BRVM 10	BRVM 10CI	Developing
Kuwait	Boursa Kuwait	Kuwait Main Market 50	BKM50	Developed
Lebanon	Beirut Stock Exchange	BLOM Stock	BLSI	Developing
Maldives	Maldives Stock Exchange	MASIX	MASIX	Developing
Malaysia	Bursa Malaysia	FTSE Malaysia KLCI	KLSE	Developed
Egypt	Egyptian Exchange	EGX30	EGX30	Developing
Morocco	Casablanca Stock Exchange	Moroccan All Shares	MASI	Developing
Nigeria	Nigerian Stock Exchange	NSE All Share	NGSEINDEX	Developing

RESULTS AND DISCUSSION

Table 2 presents the average and standard deviation of the indices of corresponding OIC economies. Panel 1 and panel 2 present the mean and standard deviation for pre and post-event periods. Panel 1 of Table 2 presents the mean and standard deviation for before-event days 120; similarly, panel 2 presents the mean and std. Deviation for the post-event period. Before the formal announcement of COVID-19 as a pandemic, all the sampled economies from the OIC group yielded positive mean and standard deviation except the (Developing Economies; AMGNRLX, JKSE, DS30, TUNINDEX, ISX60, PLE, BRVM 10CI, BLSI, MASIX, and Developed Economies; MISCI, KLSE), presented in panel 1. But when it is announced that the outbreak of COVID-19, a pandemic and fatal virus, the mean of all indexes of selected economies are shown as negative, and their deviation from the mean is higher than the pre-event period, it directed toward the increase of volatility in stock markets. Indices of all the selected economies showed a negative response to the COVID outbreak. But the negative response was more by the United Arab Emirates, Indonesia, Pakistan, Bangladesh, Turkey, Saudi Arabia, Qatar, Egypt, Morocco, and the United States of America. The remaining stock market that's shown less negative response to this pandemic suggests that the respective states took remedial action at the initial stage of this pandemic to protect the economy. The emergence of this pandemic negatively influenced the stock markets of developing and developed economies as well.

Table 2. Mean returns of OIC countries indices.

Developing Countries				Developed Countries			
Indices (OIC countries)	No. of Trading days	Mean (%)	Standard deviation (%)	Indices(OIC countries)	No. of Trading days	Mean (%)	Standard deviation (%)
Panel 1: Mean and Standard Deviation measured from estimation period (120 days before the event day).							
AMGNRLX	120	-0.0032	0.3093	DFMGI	120	0.0021	0.8895
JKSE	120	-0.0010	0.7044	BAX	120	0.0545	0.4496
ALSIUG	120	0.0866	0.9183	XU100	120	0.1452	1.2301
KSE	120	0.2391	1.3006	MISCI	120	-0.1131	1.1378
DS30	120	-0.1726	0.9925	MSX30	120	0.0695	0.4639
TUNINDEX	120	-0.0313	0.2972	QSI	120	0.0064	0.8085
ISX60	120	-0.0119	0.4552	BKM50	120	0.0125	0.4352
PLE	120	-0.0014	0.3184	KLSE	120	-0.0307	0.5256
KASE	120	0.0403	0.5474				
BRVM 10CI	120	-0.0639	0.9919				
BLSI	120	-0.1515	2.5541				
MASIX	120	-0.0076	1.2386				
EGX30	120	0.0182	1.2278				
NGSEINDEX	120	0.0442	0.7089				
MASI	120	0.0699	0.4122				
Panel 2: Mean and Standard Deviation measured from event period (60 days, including the event day also).							
AMGNRLX	60	-0.1919	0.9070	DFMGI	60	-0.6780	2.9346
JKSE	60	-0.4838	2.6077	BAX	60	-0.3925	1.3089
ALSIUG	60	-0.5510	1.7821	XU100	60	-0.3841	2.3758
KSE	60	-0.5399	2.4286	MISCI	60	-0.3191	3.0698
DS30	60	-0.1928	2.1567	MSX30	60	-0.2328	1.0921
TUNINDEX	60	-0.1683	1.0355	QSI	60	-0.3035	2.0008
ISX60	60	-0.1859	5.9454	BKM50	60	-0.3298	1.1245
PLE	60	-0.1587	0.6254	KLSE	60	-0.2714	1.7591
KASE	60	-0.0784	1.2527				
BRVM 10CI	60	-0.1817	0.8517				
BLSI	60	-0.2531	1.7789				
MASIX	60	-0.0761	1.1914				
EGX30	60	-0.4931	2.7146				
NGSEINDEX	60	-0.5047	1.2986				
MASI	60	-0.4911	2.2485				

Abnormal Returns of OIC Indices

Abnormal returns of event day (the 1st day when the broadcast related to COIVD-19 pandemic hit the media at the international level) and the next two consecutive days are presented in Table number 3. On the announcement day/event day (day 0), the stock markets of the developing economies of Pakistan, Lebanon, Egypt, Morocco, and Indonesia show negative abnormal returns. Same as this, the stock markets of developed economies such as UAE, Oman, Qatar, Kuwait, and Malaysia reported negative AR as well. Here we also reported the AR for the second day when news about COIVD-19 was widely reported in the international media, on t1. The COVID-19 news failed to hamper the confidence of investors in Jordan, UAE, Uganda, Turkey, Tunisia, Qatar, Lebanon, Maldives and Morocco, whereas markets in Indonesia, Pakistan, Bahrain, Bangladesh, Saudi Arabia, Iraq, Oman, Palestine, Kazakhstan, Republic of COTE D'Voire, Kuwait, Malaysia, Egypt, Nigeria reported the negative abnormal returns. On t2=day 3, the AR for developed economies is negative except for Bahrain. Same as this, the ARs are negative in developing economies except; Bangladesh, Tunisia, Palestine, Maldives, Egypt, and Morocco. Here, the abnormal returns indicated the more negative COVID-19 effect on stock markets in developed economies rather than developing economies.

Table 3. ARs of t0, t1, t2 (Abnormal returns (%).

Developing Countries				Developed Countries			
Indices (OIC-Countries)	t0	t1	t2	Indices (OIC-countries)	t0	t1	t2
DS30	1.9909	-0.3172	1.0118	BAX	0.0040	0.0027	0.4244
EGX30	-1.0615	-0.9959	0.8024	BKM50	-0.0023	0.0616	-0.2267
JKSE	-0.7428	-0.1094	-0.0744	KLSE	-0.4045	-0.0669	-0.5601
ISX60	0.9101	-0.8013	-1.0653	MSX30	-0.0125	-0.4594	-0.1569
AMGNRLX	0.5951	0.0022	-0.1072	QSI	-0.2238	0.0376	-0.1347
KASE	0.2539	-1.6067	-0.1666	MISCI	0.0607	-0.4221	-0.2723
BLSI	-1.3325	0.0340	-1.0022	XU10	0.7929	0.6152	-0.8022
MASIX	0.0076	0.9308	0.0076	DFMGI	-0.4271	0.1370	-0.2118
MASI	-0.0662	0.2014	0.8233				
KSE	-1.2171	-0.5229	-0.3922				
PLE	0.0377	-0.0196	0.0682				
BRVM 10CI	0.5658	-0.5603	-0.2894				
TUNINDEX	0.5661	0.2637	0.3259				
NGSEINDEX	0.2661	-0.8817	-0.0596				
ALSUIG	0.1116	0.2058	-0.4723				

Notes: t0 = abnormal return on event day; t1=abnormal return on one day after event day; t2=abnormal return on thirds day after the event day.

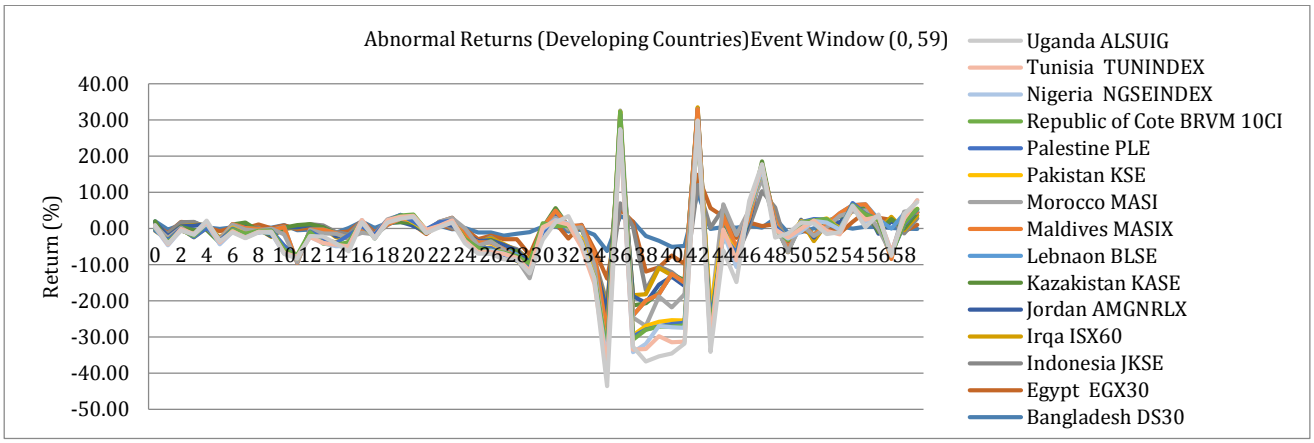

Figure 2. Developing economies indices abnormal returns.

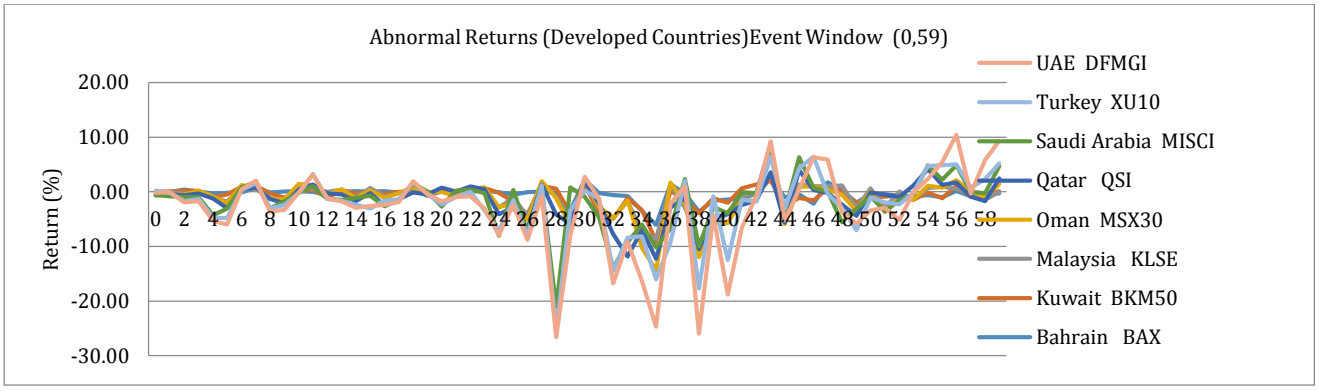

Figure 3. Developed economies Indices abnormal returns.

Figure 2 and 3, respectively, depict the abnormal returns from 0 day to 59 day of OIC developed and developing economies. All indexes show a high variation in abnormal returns in these 60 days. Figure 2 shows that when news of COVID-19-outbreak-as-pandemic broadcasted by international media, stock-markets-indices of developing economies show a higher fluctuation in abnormal returns. After the 10th day, the stock market responded more oddly manner to the emergence of this deadly virus. From day 24, high market volatility was observed in Uganda, Tunisia, the Republic of Cote D'Voire, Morocco, Iraq, and Pakistan. This volatility continued till the end of this event period. But after day 47, we observed from this line graph that the line shows fewer negative ARs. It indicates that the corresponding countries are keen to take remedial actions against this pandemic. In the case of

developed countries, abnormal returns from 0 day to 59th day are also greatly fluctuated. COVID-19 weakened the stock markets in UAE, Oman, Qatar, Turkey, and Malaysia. After the outbreak, on day 29 in the United Arab Emirates and day 39 in USA the abnormal returns of DFMGI and DJI reported the highest negative values.

Cumulative Abnormal Return (CAR) of OIC-Indices

CAR in Event Windows

Tables 4 to 9 provide a snapshot of CAR, which is derived from the aggregate of daily ARs of the OIC developing and developed economies that are affected by the novel coronavirus 2019. Table 4 shows the CARs for days 1- 10 of the OIC developing and developed economies indexes. In the first 10 days of the event period, almost all indexes (except developing economy DS30, AMGNRLX, MASIX, PLE, BRVM10CI TUNINDEX, and developed economy BAX) presented negative CARs because of the announcement made by the Chinese authority about COVID-19 as a pandemic. In the first event window (0-9), KSE responded the most negatively to the outbreak of COVID-19 among the OIC economies, which fell by -6 percent (significant at the 10 percent level). In this window (0-9), Indonesia, Kazakhstan, and Malaysia reported the negative CARs which are -5.74 percent, -3.67 percent, and -4.43 percent, respectively. These first ten days of this event represent the announcement of COVID-19 as a pandemic creating fear among the stock markets of OIC economies.

Table 4. CARs in the event window (0-9) (OIC-Countries).

Developing Countries			Developed Countries		
Indices	CAR (0-9)	t-Stat	Indices	CAR (0-9)	t-Stat
DS30	4.235	1.350	BAX	0.544	0.383
EGX30	-0.393	-0.102	BKM50	-0.948	-0.689
JKSE	-5.741**	-2.578	KLSE	-4.432**	-2.667
ISX60	-0.594	-0.412	MSX30	-0.224	-0.153
AMGNRLX	0.179	0.183	QSI	-3.394	-1.327
KASE	-3.670**	-2.120	MISCI	-4.385	-1.219
BLS	-1.577	-0.195	XU10	-3.393	-0.872
MASIX	1.064	0.272	DFMGI	-3.457	-1.229
MASI	-0.339	-0.260			
KSE	-6.016*	-1.463			
PLE	0.041	0.040			
NGSEINDEX	-3.093	-1.380			
BRVM 10CI	0.725	0.231			
TUNINDEX	2.838	3.019			
ALSUIG	-0.185	-0.064			

Notes**:** CAR = Cumulative normal return; Significance of CAR at: *p<0.10; **p<0.05; and ***p<0.01.

Table 5. CARs in the event window (10-19) (OIC-Countries).

Developing Countries			Developed Countries		
Indices	CAR(10-19)	t-Stat	Indices	CAR(10-19)	t-Stat
DS30	10.280	3.275	BAX	0.132	0.093
EGX30	-1.671.	-0.431	BKM50	-1.759	-1.279
JKSE	-6.970***	-3.130	KLSE	-3.134**	-1.886
ISX60	-4.830***	-3.349	MSX30	0.710	0.484
AMGNRLX	-0.336	-0.343	QSI	-9.966***	-3.898
KASE	-3.088*	-1.784	MISCI	-5.208*	-1.447
BLSI	-12.666*	-1.568	XU10	-4.001	-1.029
MASIX	1.013	0.258	DFMGI	-4.629*	-1.646
MASI	-2.579**	-1.979			
KSE	-11.713***	-2.848			
PLE	1.716	1.705			
BRVM 10CI	-3.454	-1.101			
TUNINDEX	3.648	3.881			
NGSEINDEX	-7.379***	-3.292			
ALSUIG	-1.715	-0.591			

Note: CAR = Cumulative normal return; Significance of CAR at: *p<0.10; **p<0.05; and ***p<0.01.

Table 5 presents the responses of stock market indices for ten trading days in developed and developing countries, 10 days after the outbreak of the news. In this window (10-19), stock markets are more negatively responding to the coronavirus news. In this event window, developing economies like Pakistan (KSE), Indonesia (JKSE), Iraq (ISX60) and Nigeria (NGSEINDEX) are presenting negative CARs -11.7 percent and -12.66 percent, -6.97 percent, -4.83 percent and -7.37 percent respectively at the significant level of 1 along this other developing countries, Morocco (MASI) representing negative return (-2.57 percent) at significance level 5 and Kazakhstan (KASE) and Lebanon (BLSI) are also showed negative CARs (at 10 percent level of significance) -3.08 and -12.66. In case of developed economies, all stock markets are indicating negative CARs, excluding the Bahrain (BAX) and Oman (MSX30) stock exchange. Qatar (QSI) shows the highest negative -9.96 percent CARs at a significance level of 1 and Malaysia (KLSE) shows -3.13 percent at a significance level 5, and Saudi Arabia (MISCI) and UAE (DFMGI) stock markets indicate negative CARs -5.2 percent and -4.6 percent at 10 level of significance. The event window (10-19) indicates that as time passes, more stock indices are responding negatively to this novel coronavirus.

Table 6 shows negative CARs for almost all stock indices during the event window (20-29). Figures 2 and 3 show that the main wave of COVID-19 started in Uganda and the UAE. During this 10-day period, indices in advanced economies began to fall sharply. Qatar (QSI), Saudi Arabia (MISCI), Turkey (XU100), and UAE (DFMGI) went down by more than -14 percent, and Kuwait (BKM50) and Malaysia (KLSE) went down by -6.10 percent and -7.50 percent at the significance level of 1. Bahrain indicated -3.9 percent cumulative abnormal returns at a 5 percent level of significance. And developing countries such as Pakistan, Indonesia, Egypt, and Nigeria significantly decreased, by -16.56 percent, -14.28 percent, -13.53 percent and -13.52 percent; along with this, Uganda and Iraq indicated negative CARs -8.09 percent, and -3.73 percent at 5 percent level of significance.

Table 6. CARs in the event window (20-29) (OIC-Countries).

Developing Countries			Developed Countries		
Indices	CAR(20-29)	t-Stat	Indices	CAR(20-29)	t-Stat
DS30	4.330	1.380	BAX	-3.923**	-2.759
EGX30	-13.537***	-3.487	BKM50	-6.106***	-4.437
JKSE	-14.283***	-6.413	KLSE	-7.500***	-4.512
ISX60	-3.734**	-2.594	MSX30	-1.892	-1.290
AMGNRLX	-0.557	-0.569	QSI	-14.780***	-5.781
KASE	-7.868***	-4.546	MISCI	-22.020***	-6.120
BLSI	-10.485	-1.299	XU10	-17.990***	-4.625
MASIX	0.249	0.064	DFMGI	-14.678***	-5.218
MASI	-3.923***	-3.010			
KSE	-16.569***	-4.029			
PLE	2.142	2.128			
BRVM 10CI	-0.468	-0.149			
TUNINDEX	4.742	5.045			
NGSEINDEX	-13.527***	-6.034			
ALSUIG	-8.098**	-2.789			

Note: CAR = Cumulative normal return; Significance of CAR at: *p<0.10; **p<0.05; and ***p<0.01.

Table 7. CARs in the event window (30-39).

Developing Countries			Developed Countries		
Indices	CAR(30-39)	t-Stat	Indices	CAR(30-39)	t-Stat
DS30	-4.025	-1.283	BAX	-17.069***	-12.007
EGX30	-39.669***	-10.217	BKM50	-20.187***	-14.668
JKSE	-24.806***	-11.137	KLSE	-20.776***	-12.500
ISX60	-6.665***	-4.630	MSX30	-11.098***	-7.565
AMGNRLX	-4.584***	-4.686	QSI	-23.147***	-9.053
KASE	-16.076***	-9.288	MISCI	-26.094***	-7.252
BLSI	-13.587*	-1.683	XU10	-29.758***	-7.650
MASIX	3.494	0.892	DFMGI	-37.815***	-13.443
MASI	-20.900***	-15.265			
KSE	-34.368***	-8.356			
PLE	-3.215***	-3.193			
BRVM 10CI	-0.028	-0.009			
TUNINDEX	-2.894***	-3.079			
NGSEINDEX	-28.221***	-12.589			
ALSUIG	-20.186***	-6.607			

Notes: CAR = Cumulative normal return; Significance of CAR at: *p<0.10; **p<0.05; and ***p<0.01.

Table 7 shows the CAR in event-window (30-39) of OIC Economies. During this event window, all selected OIC indices of developing and advanced economies report significantly negative CARs, with the exception of two countries, Bangladesh and the Maldives. Indexes for developed countries represent a CAR of over -11 percent, and most developed countries have negative CARs of over -20 percent. When UAE, Turkey, and Saudi Arabia experienced major outbreaks; thus, DFMGI, XU100, and MISCI reported cumulative abnormal returns of -37.81 percent, -29.75per-cent, and -26.09per-cent, respectively, during this event window (30-39). Cumulative abnormal returns for all developed indexes are significant at a 1 percent significance level. For developing countries, Egypt and Pakistan stocks have CARs of over -30 percent, -39.66 percent, and 34.36 percent, respectively. Nigeria, Indonesia, Uganda, Kazakhstan, Iraq, Jordan, and Palestine have -28.22 percent, -24.80 percent, -20.90 percent, -20.18 percent, -16.07 percent, -6.66 percent, -4.58 percent, -3.21 percent, and -2.89 percent respectively at significance level of 1 and at 10 percent level of significance, Lebanon experienced the negative CAR -13.58.

During this event window (40-49), major indices in both advanced and developing economies experienced an accumulation of negative volatility. Tables 8 indicate that CARs of all indices of developed economies are significant at 1 level of significance. In this event window, the indices of UAE (DFMGI) -44.74 percent, Turkey (XU100) -39.35 percent, Qatar (QSI) -26.96 percent, Kuwait (BKM50) -20.36 percent, Bahrain (BAX) -21.37per-cent and OMAN (MASX30) -19.58 percent are showing highest negative cumulative abnormal return respectively which indicates the peak level of COVID-19. Malaysia (KLSE) and Saudi Arabia (MISCI) are showing -16.77 percent and -15.76 percent lowest CAR as compared to the previous event windows, which indicates the recovery in these two markets. On the other hand, developing economies; Jordan (AMGNRLX) 0.196percent and Lebanon (BLSI) -11.89 percent, Egypt (EGX30) -38.87percent, and Kazakhstan (KASE) -8.92 percent are showing a recovery in stock market indices as their CAR in previous event window was -4.58 percent and -13.58percent, -39.66 percent and -16.07percent respectively. Other major developing economies showed that the cumulative abnormal returns are moving rapidly towards negative as the COVID cases on their peak; Pakistan (KSE) -50.93 percent, Indonesia (JKSE) -35.38 percent, Iraq (ISX60) -10.74 percent, Morocco (MASI) -28.30 percent, Tunisia (TUNINDEX) -5.48 percent, Nigeria (NGSEINDEX) -32.57 percent, Palestine (PLS) -9.43 percent and Uganda (ALSUIG) -36.99 percent. In this 5th event window, a developing economy Cote D'Ivoire (BRVM10CI), indicated a significantly negative CAR -6.58 percent which indicates the hit of the COVID-19 wave in Cote D'Ivoire (Figure 2).

Table 8. CARs in the event window (40-49)(OIC-Countrie).

Developing Countries			Developed Countries		
Indices	CAR(40-49)	t-Stat	Indices	CAR(40-49)	t-Stat
DS30	-1.261	-0.402	BAX	-21.372***	-15.033
EGX30	-38.874***	-10.013	BKM50	-20.362***	-14.795
JKSE	-35.385***	-15.887	KLSE	-16.770***	-10.089
ISX60	-10.743***	-7.463	MSX30	-19.584***	-13.350
AMGNRLX	0.196	0.200	QSI	-26.962***	-10.546
KASE	-8.922***	-5.155	MISCI	-15.762***	-4.381
BLSI	-11.891*	-1.473	XU10	-39.357***	-10.118
MASIX	4.305	1.100	DFMGI	-44.741***	-15.905
MASI	-28.300***	-21.721			
KSE	-50.938***	-12.385			
PLE	-9.433***	-9.370			
BRVM 10CI	-6.583**	-2.099			
TUNINDEX	-5.487***	-5.837			
NGSEINDEX	-32.576***	-14.531			
ALSUIG	-36.990***	-12.737			

Note: CAR = Cumulative normal return; Significance of CAR at: *p<0.10; **p<0.05; and ***p<0.01.

In this last event window (50-59), Table 9; shows the recovery in stock markets of developed and developing economies as well. Let's compare this event window with the previous event window. It indicates that stock markets around the world are moving from negative cumulative abnormal returns to positive cumulative abnormal returns. Still, the rate of movement toward positive CAR is very slow. Almost all developing and developed economies are showing negative CARs. Indices are highly significant in Bahrain(BAX) -26.81 per cent, Kuwait(BKM50) -20.54 percent, Morocco(MASI)-33.65 percent, Palestine(PLE) -9.44 percent, Cote D'Ivoire(BRVM10CI) -7.06 percent, Tunisia(TUNIINDEX) 8.22 percent, Nigeria(NGSEINDEX) -32.93 percent and Uganda(ALSUIG) -38.26 percent are showing the increasing trend in CARs on the negative side it means that still COVID-19 cases are increasing in respective countries. But indices in Egypt (EGX)-30.67 percent, Indonesia (JKSE) -28.96 percent, Iraq (ISX60) -10.44 percent, Kazakhstan (KASE) -7.12 percent, Lebanon (BLSI) -6.10 percent, Pakistan (KSE) -46.73 percent, Malaysia (KLSE) -14.44 percent, Oman (MSX30) -18.13 percent, Qatar (QSI) -18.59 percent, Saudi Arabia (MISCI) -12.36 percent, Turkey (XU10) -31.76 percent and UAE (DFMGI) -40.81 percent are showing the less volatility in this event window which indicate that authorities decided to take action to curb this deadly pandemic in all over the world.

A complete snapshot of cumulative abnormal returns of developed economies and developing economies are shown in Figures 4 and 5 from day-0 to day-59. Cumulative abnormal returns of indices in all developed countries started declining from the first day. They continued to decline in this whole period, but the tip of each line in Figure 5 of the developed country indicates the upward trend in CARs at the end, but still, it's moving negatively, approximately it will take 2 to 3 more windows to touch the positive point.

Table 9. CARs in the event window (50-59)(OIC-Countries).

Developing Countries			Developed Countries		
Indices	CAR(50-59)	t-Stat	Indices	CAR(50-59)	t-Stat
DS30	-1.212	-0.386	BAX	-26.819***	-18.865
EGX30	-30.676***	-7.900	BKM50	-20.542***	-14.925
JKSE	-28.960***	-13.006	KLSE	-14.441***	-8.689
ISX60	-10.442***	-7.253	MSX30	-18.139***	-12.365
AMGNRLX	0.926	0.946	QSI	-18.590***	-7.271
KASE	-7.126***	-4.117	MISCI	-12.360***	-3.435
BLSE	-6.100	-0.756	XU10	-31.761***	-8.165
MASIX	-4.107	-1.049	DFMGI	-40.811***	-14.508
MASI	-33.658***	-25.822			
KSE	-46.739***	-11.364			
PLE	-9.440***	-9.377			
BRVM 10CI	-7.068**	-2.253			
TUNINDEX	-8.221***	-8.746			
NGSEINDEX	-32.934***	-14.691			
ALSUIG	-38.260***	-13.175			

Note: CAR = Cumulative normal return; Significance of CAR at: *p<0.10; **p<0.05; and ***p<0.01.

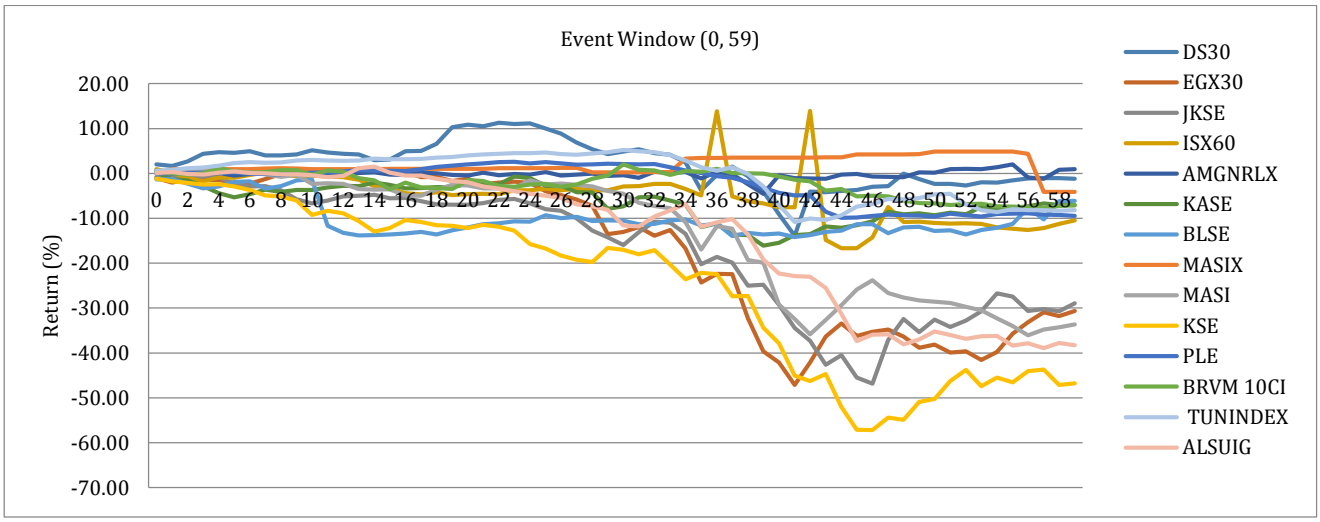

Figure 4. CARs of indexes in developing countries during event period (0 - 59).

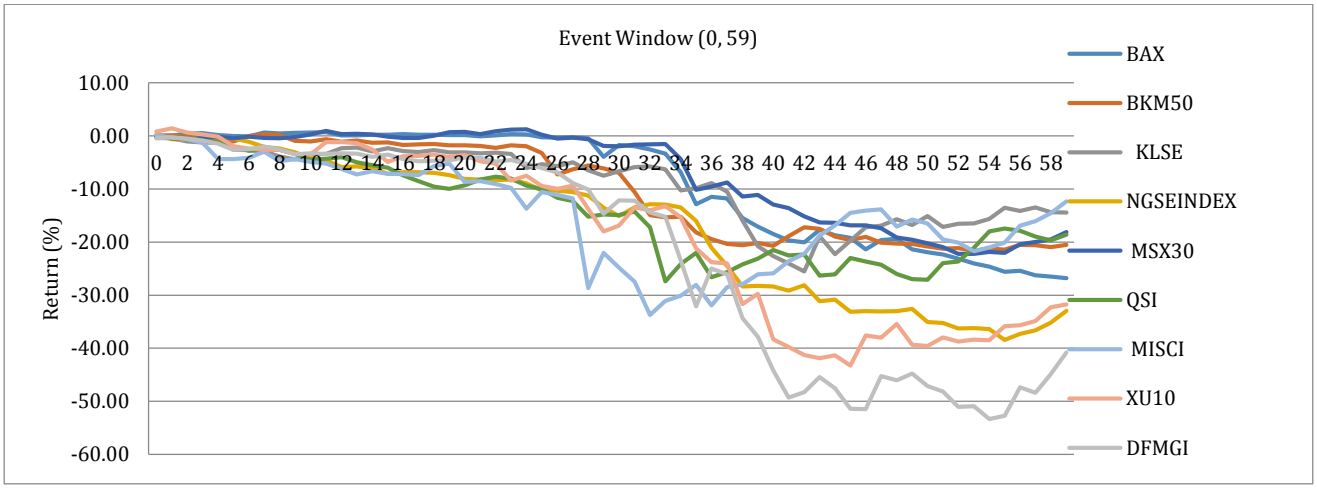

Figure 5. CARs of indexes in developed countries during Event period (0 - 59)

Table 10. Average abnormal returns and cumulative average abnormal returns of OIC-Countries-indices.

EW	AAR_t(%)	t_{AAR}-Stat	$CAAR_t$(%)	t_{CAAR}-Stat	Skewness	Kurtosis
0	0.0037	0.0252	0.0037	0.0252	0.4261	1.3831
1	-0.1820*	-1.6489	-0.2030	-1.1080	0.0204	0.2992
2	-0.1118	-1.0566	-0.3149*	-1.4097	0.6519	1.3667
3	-0.1669	-1.3778	-0.4773*	-1.5059	0.9705	3.3895
4	-0.2014	-1.1225	-0.6711*	-1.6659	0.3098	1.6197
5	-0.3721***	-2.5942	-1.0463**	-2.4102	0.4889	1.2077
6	-0.0292	-0.3244	-1.0564**	-2.3824	0.7324	1.1648
7	-0.0115	-0.0811	-1.0614**	-2.4981	0.4090	0.0799
8	-0.2872**	-2.0586	-1.3480***	-2.7725	0.2269	-0.4813
9	-0.1573	-1.1166	-1.5052***	-2.8044	0.1533	-0.4461
10	-0.2377	-1.1895	-1.7504***	-2.7763	-0.2035	0.8262
11	-0.1501	-0.3232	-1.9122***	-2.6119	-0.8691	1.3463
12	-0.1261	-1.0011	-2.0431***	-2.6296	-1.2240	2.2908
13	-0.2109*	-1.3912	-2.2502***	-2.6714	-1.1880	1.7655
14	-0.2723**	-1.8180	-2.5271***	-2.8788	-1.2571	1.7482
15	-0.3761**	-2.4282	-2.9140***	-3.3957	-0.9822	0.9938
16	0.0064	0.0348	-2.8953***	-3.3591	-0.5771	0.5083
17	-0.2105**	-2.3581	-3.0917***	-3.5211	-0.4253	0.1260
18	0.1423	1.0297	-2.9548***	-3.1556	-0.4343	0.5860
19	0.0706	0.3763	-2.8850***	-2.8617	0.2557	1.4337
20	0.0733	0.3892	-2.7978***	-2.6682	0.2811	1.2055
21	-0.1164	-1.0313	-2.8926***	-2.8770	0.5107	1.3031
22	-0.0586	-0.5792	-2.9591***	-2.8607	0.6548	1.6056
23	-0.2138	-0.9373	-3.1545***	-2.9089	0.5324	0.9124
24	-0.6364**	-2.3273	-3.7841***	-3.0696	0.1868	0.5033
25	-0.4097**	-1.7709	-4.1838***	-3.4845	0.2361	0.4380
26	-0.8498***	-3.5683	-5.0471***	-3.9482	0.0526	0.0875
27	-0.4469**	-2.5054	-5.4726***	-4.2095	-0.1536	-0.2275
28	-1.2599*	-1.6546	-6.7198***	-4.1388	-0.8560	1.1119
39	-0.9808**	-1.8334	-7.6994***	-5.0270	-0.0200	-1.0138
30	0.1646	0.4751	-7.5116***	-4.6350	-0.1615	-0.6745
31	-0.1366	-0.3821	-7.6300***	-4.6945	-0.3122	0.0814
32	-0.6026*	-1.5610	-8.1924***	-4.5026	-0.7696	1.3157
33	-0.8826*	-1.5489	-9.0904***	-4.6327	-0.6646	-0.1132
34	-1.0571*	-1.8526	-10.1523***	-5.2123	-0.3144	-0.7280
35	-3.1011***	-4.6146	-13.2656***	-6.4663	0.0490	-0.9574
36	0.6110	0.5735	-12.6085***	-5.0054	0.1552	-0.5555
37	-0.9507	-1.0059	-13.5754***	-6.2001	0.1615	-1.4125
38	-3.1963***	-4.0612	-16.7624***	-6.5184	-0.0135	-1.1076
39	-1.5427***	-3.3716	-18.1050***	-7.0703	-0.0063	-0.9926
40	-2.4994***	-4.1543	-20.4135***	-7.0836	-0.0960	-0.9716
41	-1.5652***	-3.1014	-21.9606***	-7.0837	-0.2471	-0.8358
42	1.0130	0.9567	-20.9041***	-5.9536	0.0507	-0.7839
43	-1.1679	-0.8654	-22.0260***	-7.0477	-0.2701	-1.0218
44	-0.0258	-0.0379	-22.0015***	-7.1171	-0.2625	-0.7169
45	-0.5025	-0.9290	-22.4919***	-6.6316	-0.4629	-0.6142
46	0.8370**	2.1708	-21.6481***	-6.5021	-0.5743	-0.3313
47	0.8084	1.3015	-20.8110***	-6.5982	-0.3668	-0.6860
48	-0.1345	-0.3385	-20.9137***	-6.6925	-0.3528	-0.4763
49	-0.3775	-1.1510	-21.2550***	-6.8133	-0.1748	-0.9605
50	-0.2658	-0.8749	-21.5290***	-6.8358	-0.1558	-0.9776
51	0.0250	0.0778	-21.5107***	-6.9285	-0.0609	-1.0350
52	-0.3551*	-1.5076	-21.9058***	-7.0320	-0.0728	-0.9530
53	0.2617	0.6403	-21.6870***	-6.9272	-0.1585	-0.8012
54	0.3409	1.2041	-21.3864***	-6.8434	-0.2408	-0.6438
55	0.3752	1.1646	-21.0678***	-6.7000	-0.2540	-0.6722
56	0.6418*	1.7021	-20.5102***	-6.8646	-0.1798	-1.0403
57	-0.3894	-0.9498	-20.8607***	-7.3119	-0.3302	-1.0242
58	0.5064*	1.5741	-20.3041***	-7.0946	-0.3058	-1.0079
59	0.6094	2.5399	-19.7272***	-7.1056	-0.2904	-1.0474

Source: The authors; Note: EW = Event Window; AAR = average abnormal return; CAAR = Cumulative average abnormal return; AAR and CAAR are significant at: *p < 0.10; **p < 0.05; and ***p < 0.01.

The Average abnormal return (AAR) and cumulative average abnormal return (CAAR) of all indices from day-0 to day-59 are shown in Table 10. As Table 10 shows, on 1st day, average abnormal returns are 10 percent level of significance, indicating the negative impact of the announcement about the COVID-19 as pandemic on stock markets. As this pandemic started to increase in all over the world, the average abnormal return from day-1 to day-42 began to decline, which led to an increase the economic anxiety amongst investors. On day-39-to-day-42, Average Abnormal Returns were more negative, at a 1 percent significance

level. AAR from day-6 to day-42 is significant at different significance levels, and on most days, average abnormal returns were negative.

Likewise, Table 10 shows that the cumulative average abnormal return (CAAR) ranged between -0.20 percent-to-19.72 percent from day-2-to-day-60. In the entire window (0, 59), we observed that the cumulative average abnormal return decreased from the very beginning to the end of the event window. It indicates that when COVID-19 increased, it caused increased panic in investors, which is shown in the stock markets through their trading behavior. From day-3-to-day-59, daily cumulative average abnormal returns are significant at different significant levels.

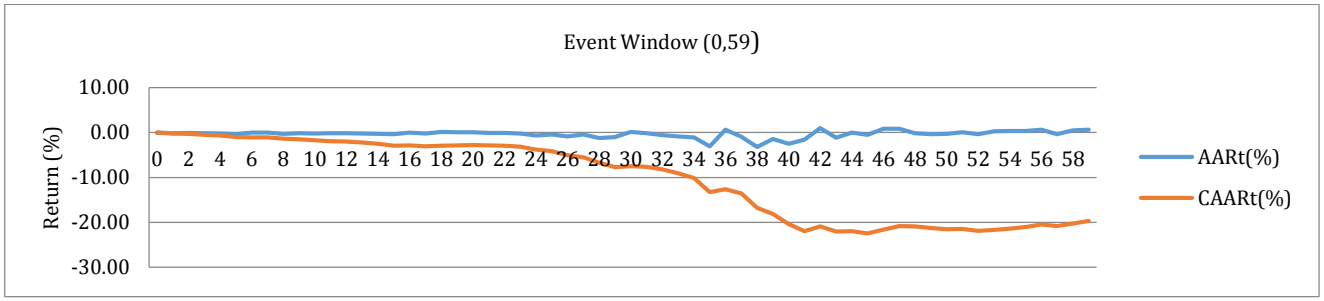

Figure 6. AAR and CAAR for day-0-to-day 59.

Panel Regression Results

As Table 11 indicates, the mean of Abnormal Return (AR) Return of the Index and Market Return are all negative after the outbreak of COVID-19. From now on, for the robustness of the above analysis, we apply panel regression analysis. Here we examine whether the index's abnormal returns declined when COVID-19 was announced as a fatal disease in the country. Hence, abnormal return of respective indices are considered as dependent variable. Explanatory variables of abnormal return (AR) are: confirmed COVID-19 cases, the daily return of stock market index (ReturnIndex), the corresponding return of Dow Jones Industrial as a global stock market index (ReturnMarket), and stringency index (StringIndex), abnormal-trading-volume (AbTrading) and dummy variable (DevelopingE) for developing countries. StIndex*Cases (Stringency Index and COVID confirmed cases) is the moderating interaction term.

It is hard to explain the behavior of stock market with respect to return and volatility with the fundamentals due to asymmetric information and noise trading. The heavy participation of noise traders in a market can cause asset prices to deviate significantly from their fundamentals (De Long et al., 1989, 1990). A study by Chordia et al. (2001) found that the announcement of macroeconomic events has a significant impact on market volatility and trading volume. There is a significant relationship between trading volume and abnormal returns around announcements of firm-specific events (Eli and Richardson, 2000; Field and Hanka, 2001). Trading volume represents the size of market activity. Therefore, to the extent of the literature, our panel regression model here includes abnormal trading volumes along with the number of confirmed COVID-19 cases because large trading volumes along with the stock-market-decline indicate a market sell-off. Regarding the variables such as information efficiency and income level to distinguish the two categories of economy, here a dummy variable of developing economies is introduced to represent the difference between developing countries and developed countries. The study by Kizys et al. (2020) express the government response to the extensive spread of the COVID-19 virus measured by means of the Oxford COVID-19 Government Response Tracker, which is based on nine indicators such as workplace closures, school closure, and travel bans have affected the behavior of investors in stock markets globally. In this respect, a corresponding measurement was adopted, known as the “stringency index” into consideration as the side effects resulting from COVID-19 pandemic. In addition, index returns and market controls for individual index performance and the Dow as a global index are included here.

The coefficient of the constant term is significant and negative, which shows that abnormal return would be negative if we did not include other variables. According to our expectation, the coefficient term of coronavirus confirmed cases is significant and negative, which represents the effect of confirmed cases on abnormal return of stock markets. A prior discussion of sub-event windows (Table 4 to 9) shows that during the whole period of the event (day-0-to-day 59), stock market indices are moving downward. It means the recovery of the stock return to normal is in trouble. It means it will take more to recover. The coefficient of the stock return is significant and positive, which indicates the recovery of returns, but it did not observe any co-movement amongst stock markets due to the insignificant coefficient term of the global market index Dow Jones with the ARs.

Table 11. Descriptive statistics.

Variable	AR	lnconfCases	ReturnIndex	ReturnMarket	StringIndex	AbTrading	DevelopingE	StIndex*Cases
Mean	-0.333	5.199	-0.325	-0.369	60.163	82.142	0.608	373.044
Median	-0.093	5.513	-0.087	-0.115	75.930	3.590	1.000	408.630
Maximum	21.480	11.829	21.468	10.764	100.000	862.000	1.000	941.683
Minimum	-28.771	0.000	-28.783	-13.842	0.000	0.000	0.000	0.000
Std. Dev.	2.220	2.563	2.216	4.141	34.390	134.789	0.488	277.078
Observation	1379	1379	1379	1379	1379	1379	1379	0.023

Table 12. Performance of abnormal return (Random effect model).

Variables	Coefficient	P-value
Constant	-0.0425	0.0125
lnconfCases	-1.62E-17	0.0056
ReturnIndex	1.0011	0.0000
ReturnMarket	8.26E-05	0.8824
StringIndex	4.40E-18	0.0914
StringIndex*lnconfCases	-3.81E-19	0.093
DevelpoingE	1.46E-02	0.0000
AbTrading	0.00E+00	1.0000
R-square	0.0450	
Observations	1379	

Since the greater value of the stringency index represents the strict policy imposed by the state to control the spread of this pandemic. It is believed that government is more concerned with controlling the viral spread of coronavirus cases to boost and enhance investors' confidence. Here the coefficient of the stringency index is significant and positively associated with ARs, revealing the stronger mechanism by the government of OIC countries to control the reported cases of COVID-19. The stringency index results align with the findings of Tzouvanes and Donadelli (2021), which suggested that stronger stringent regulation could mitigate investors herding behavior which further stabilizes the international stock market. The coefficient of the moderating term (StringIndex*lnconfCases= stringency index and confirmed COVID-19 cases) is significant and negative, which suggests that state agencies should implement other preventive measures such as hand hygiene, Personal protective equipment, respiratory hygiene, cough etiquette, disinfection and cleaning of devices, and environmental surfaces. The developing economies dummy variable (developingE) has a positive coefficient, indicating that the developing economies index is improving. But the recovery is passive (Figure IV CARs for developing economies and V CARs for developed economies). And the coefficient of abnormal trade volume is insignificant; it indicates that we did not observe any bounding between trading volume and ARs.

CONCLUSIONS

The financial effect of the Coronavirus disease 2019 can be seen in stock market turmoil. Regarding this, we analyzed the COVID-19 epidemic impact on the stock markets of OIC countries. This study shows that stock markets in all markets underperformed and posted negative returns following the COVID-19 epidemic, as shown in Table 10. Through this event study, we discover, the indices of the stock markets are indicating negative behavior as the COVID-19 outbreak announcement hit the worldwide media. The results of the panel regression are in support of negative CARs of the indices. Overall, results point out that the incoming uncertainty due to this pandemic outbreak causes panic trading in the stock market across the globe. This study is beneficial for decision makers such as investors, stock market officials, state banks, and state agencies to boost the confidence among investors in OIC economies. It is advised that traders should use long-term investing techniques in times of bad market circumstances. It is a call for researchers to investigate the market volatility considering the other economic variable.

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Appendix

Table A. Performance of Abnormal Return (Fixed effect).

Variables	Coefficient	P-value
Constant	-0.008722	0.0000
lnconfCases	-5.05E-16	0.0000
ReturnIndex	1.000	0.0000
ReturnMarket	-6.88E-18	0.2477
StringIndex	-8.33E-17	0.0000
StringIndex*lnconfCases	1.23E-17	0.0000
AbTrading	8.52E-19	0.0535
R-square	0.006	
Observations	1379	