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The asymmetric effect of oil price, news-based uncertainty, and COVID-19 pandemic on equity market

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ARTICLE INFO

Keywords:
Oil price
News-based uncertainty
COVID-19
QARDL
Equity market

ABSTRACT

Equity markets are prone to several external factors, especially in the lethal pandemic situation when the uncertainty regarding the spread of the COVID disrupts the daily financial and economic activities along with the sharp decline in the oil price causing severe devastations to people not just in terms of life and health but also in the form of finance. Therefore, to assess the presence of empirical association of the oil price, Covid-19, and news-based uncertainty with the equity market condition, the method of QARDL was applied in the current investigation. The results revealed that the relationship of OIL was found to be positive and significant across all of the quantiles of the Stock Price Index (SPI); news-based uncertainty was found to be negative and significant across all of the quantiles of SPI, whereas COVID19 has the negative and significant impact on SPI only in the bearish and stable market conditions. Based on the findings, balance government interventions are recommended, balancing the generation of economic activities and counter COVID spread.

1. Introduction

The outbreak of novel coronavirus, which brings in the health emergency, is not new as human history has already witnessed several similar incidents, including the Spanish flu, which erupted in 1918 (Gao et al., 2021; Su et al., 2021). However, it should be noted that the frequency of happening such events has increased, and the world has witnessed another three eruptions, including SARS which erupted in 2003; MERS, which erupted in 2012 and Ebola, which was erupted in 2014 (Organization, 2020). Though these eruptions were not as lethal as the current COVID-19 is, neither had they devastated the financial matters to that extent that current COVID-19 did. However, the governments and international organizations failed in handling, whereas the chaos, anarchy, and uncertainty made in this situation are not similar to earlier conditions (Atri et al., 2021; Zhang et al., 2020; Wang et al., 2021). In addition to this, the spread of this virus was not restricted to a single region as happens and was found in the earlier pandemics where the maximum coverage was within a region or continent and disturbed the financial markets (Hung, 2021; Yousaf, 2021). However, the current pandemic spread severely affects more than 215 countries across the globe (Organization, 2020).

Precisely, talking about the initiatives that have been taken to counter the spread includes the lockdown, which reported to put more than 50% of the population across the globe were forced to stay in their homes. Moreover, such lockdown was imposed for periods ranging from 1 month to 4 months (De Vito and Gomez, 2020). Because of such measures to counter the spread of COVID, the world has also experienced the counter effects that the world has borne (Nguyen et al., 2021). Such counter effects which adversely disrupted the whole economic activities include (but were not limited to) a credit crunch where there was a deficit in the demand and supply of the cash (De Vito and Gomez, 2020); a significant increase in the ratio of bankruptcies (Akhtaruzzaman et al., 2019); increase in the levels of debts (Umar et al., 2021a; Zhang et al., 2020); increased level of disruptions and volatilities in the stocks (Umar et al., 2021b, 2022; Zaremba et al., 2020) and comparatively lower level of returns in stocks (Al-Awadhi et al., 2020; Li et al., 2021; Umar et al., 2021c), thus disturbing the whole supply chain (Nguyen et al., 2021).
In situations where such uncertainties threaten the global economy, researchers have summarized such counter-effects into two streams regarding the contagion caused to the financial markets. The first stream reflects the situation where there is an imbalance in the stock market portfolios. For instance, similar to the current situation where the most affected industry was found to be airline, hotel, and all related industries that directly or indirectly belongs to the category of tourism, when these companies are severely affected, their return on the respective stocks will eventually decrease in the more extended period of time. Hence, the potential investors, being proactive decision-makers, withdraw their funds from those companies and accordingly invest in the companies, thus creating an imbalance in the stock market portfolios (Manela and Moreira, 2017; Nguyen et al., 2021). The second stream is the reflection of the financial crises, which eventually makes the investors risk-averse, thus forcing them to sell out the shares belonging to the companies higher at risk, and there could also be a withdrawal of the funds from the stock market to have a higher number in cash forms (Baele et al., 2020; Jirat et al., 2021; Zaremba et al., 2020).

The literature has continuously been evolving to explore the COVID and the other diversified market and economic forces and indicators. For instance, it has been studied concerning the financial markets (Ali et al., 2020); oil prices (Apergis and Apergis, 2020; Gil-Alana and Monge, 2020); coverage of the media (Haroon and Rizvi, 2020), and entertainment industry (Hu et al., 2021) are few to be mentioned. Moreover, the literature has reported the adverse effects in the different periods of the eruption of COVID-19 across the different stock markets based in different geographical locations. For instance, in the context of the Asian market, which has shown an immediate downfall as the pandemic erupts (Liu et al., 2020), the data from the Chinese market has shown a structural break in the earlier stage (Gunay, 2020). The research of Ru et al. (2020) urged the stock markets that were severely affected by the outbreak of SARS were reported to decline immediately and abruptly. In contrast, the markets of the U.S. and Germany experienced the downfall only when the eruption reached South Korea, Iran, and Italy (Gormsen and Koijen, 2020). Hence the current study add the evidence on the impact of Covid on developed equity market of USA. Moreover, the outbreak started and eventually spread across the world. The findings of the research that have been reported in the said area include a study by McKibbin and Fernando (2021) in which the researchers noted that countries that have a high density of population and have an absence of quality healthcare infrastructure whereas based on the findings, Ma et al. (2020) concluded that severity of the economic growth could be counted by the strong fiscal policies of the government institutions. In contrast, as per the findings, developing countries can face more problems than developed countries. While evaluating the impact of the uncertainty on the stock markets, Baker et al. (2020) explored the relationship in the U.S. market where uncertainty was measured based on the daily news headlines, which are considered an essential source of information and are sufficient to build the national narrative and concluded that the uncertainty spread through news headlines had reported unmatched uncertainty to the stock markets. Similar results were also reported by Barro et al. (2020), who also highlighted and exposed the level of instability and volatility of the world that fails to counter the outbreak of COVID.

The other example of the literature includes an investigation of the stock markets of the U.S. and China by Nguyen et al. (2021). The authors justify selecting U.S. and China markets as the U.S. represents the world’s largest economy and market where the liquidity level is also comparatively higher than any other market. In contrast, the reason for selecting the market of China includes the market from where the whole outbreak started and eventually spread across the world. The findings confirm that both markets were severely affected by the pandemic, especially the U.S. market, as the contagious effect was estimated to be comparatively lower in the U.S. market than in China’s results. On the other hand, Harjoto et al. (2021) reported that the developing economies are primarily affected while comparing it with the markets of the developed countries. Moreover, at the micro-level, the small and medium-sized entities are more volatile than the large-scale entities.

In addition to this, the relationship between the oil prices and stock markets are reportedly explored by a plethora of researchers who further reported their level of disagreement in terms of findings and also reported the nature of relationships as asymmetric (Balciar et al., 2019; Basher et al., 2018; Chang, 2020; Demirer et al., 2019). One of the reasons that cause the nature of the relationship as non-linear is the difference in the investment behavior of the potential investors who invest in different horizons. In terms of applying the statistical techniques, the “non-linear ARDL” was applied by Badeeb and Lean (2018). They have reported the nature of the relationship between oil prices with Islamic stock indices as negligible weak. In contrast, Hashmi et al. (2021), by applying the QARDL technique, which is an innovation and

2. Literature review

COVID19 and its eruption across the countries have happened simultaneously as the researchers studied this topic (Harjoto et al., 2021). The current literature has successfully captured the diversified aspects that COVID has touched since its eruption. There is no doubt that COVID has affected every individual and disturbed most economic activities (Sharif et al., 2020). The examples of the research that have been reported in the said area include a study by McKibbin and Fernando (2021) in which the researchers noted that countries that have a high density of population and have an absence of quality healthcare infrastructure whereas based on the findings, Ma et al. (2020) concluded that severity of the economic growth could be counted by the strong fiscal policies of the government institutions. In contrast, as per the findings, developing countries can face more problems than developed countries. While evaluating the impact of the uncertainty on the stock markets, Baker et al. (2020) explored the relationship in the U.S. market where uncertainty was measured based on the daily news headlines, which are considered an essential source of information and are sufficient to build the national narrative and concluded that the uncertainty spread through news headlines had reported unmatched uncertainty to the stock markets. Similar results were also reported by Barro et al. (2020), who also highlighted and exposed the level of instability and volatility of the world that fails to counter the outbreak of COVID.

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new estimation technique, has explored the relationship between oil prices and stock markets and reported the absence of cointegration for a more extended period of time. In contrast, the study reported having a nonlinear relationship in a shorter period. Nevertheless, the researchers’ findings reported that for both long term periods of time and shorter periods of time, asymmetrical relationships between the oil prices and stock markets belong to most of the countries studied. In addition, a comparison was also drawn by the researcher in which QARDL and its respective findings are compared with the non-linear QARDL, which reports similar results for both of the techniques.

Moreover, the study conducted by Sharif et al. (2020) explored the nexus between COVID, stock market, oil prices, and uncertainty with the help of wavelet methodology. The findings of the study have reported interesting results. Through the help of this technique, the results between the studied variables are un-parallel and cannot be compared with any similar circumstances. Risks were highly influenced by COVID, whereas the impact of volatility was comparatively low. Most important, due to the difference in the behavior of the pandemic in a shorter period and a more extended period of time, it was assumed to be similar to the economic crises. However, the world has witnessed this pandemic being broader, more dangerous, and more lethal than any of the earlier pandemics.

Overall, the current literature analyzing the relationship between oil price, news uncertainty, and disastrous pandemic with the eminent equity market reflected the deficiency of clarity on the topic. Moreover, the association between the orthodox oil and stock variables are reportedly explored by a plethora of researchers that later reported the different results (Balcilar et al., 2019; Basher et al., 2018; Chang, 2020; Demirer et al., 2019), stressing on the need of analyzing the relationship among the variables over time. Also, these studies have recommended applying the nonlinear empirical method, given the presence of asymmetry in the financial market. Hence, based on these assertions, the current study has examined the role of oil, news uncertainty, and pandemic on the equity market.

3. Methodology and data

3.1. Quantile Autoregressive Distributed Lag (QARDL)

In the pursuit of addressing the problem highlighted in the study and to evaluate the level of cointegration within the constructs that have been used in the present study, which are pandemic of COVID 19, which is represented by COVID19; oil prices which are represented by OIL; stock price index which is SPI and economic policy certainty which EPU represents. The daily data on the said variables have been taken, spanning from January 2020 to June 20, 2021. The data on the stock returns and oil price have been taken from Bloomberg, and the proxy for Covid is retrieved from Worldometer. At the same time, the measure of news-based uncertainty is obtained from the online web source of Economic Policy Uncertainty. The brief of the problem discussed is that the equity market is prone to several external factors, whereas in the current situation, the oil prices, which have been declining to their minimum level during the pandemic, uncertainty regarding the spread of the COVID which disrupt the daily financial and economic activities and the COVID itself which emerge as the pandemic which has caused one of the most severe devastations to suffer by the human life not just in terms of life and health but also in the form of finance. In short, for assessing the level of cointegration in all of the variables mentioned above, QARDL was applied by following the guidelines of Cho et al., 2015. This technique helps in the equilibrium ascertainment for the variables on their respective quantiles, generating the relationships for longer and shorter periods. Moreover, the Wald Test applied, which helps assess the causal effects and variation over time and allows the evaluation of stability across the beta coefficients incorporated among the grids of different quantiles.

QARDL is also considered superior to traditional linear-based estimation techniques for three prominent reasons. These include allowing to ascertain the behavior of the asymmetry based on its placement while capturing the level of the reliance of the dependent variable while grounding it, on and within, the assumptions of conditional probability’s distribution; estimations of the behavior of the predictors on the quantiles of the criterion variable(s) in both longer and shorter period of time concurrently; and the successful estimation of the cointegration which some of the conventional techniques that claim to estimate based on the methodology of ARDL fails to do in the situation of the time-series data, especially. Such failure leads to the misunderstanding where the causal effects are treated as the quantiles coefficients due to their variation in the shorter period; however, the behavior of the variables is similar in the more extended period (Xiao, 2009). In addition to this, QARDL can capture the possible shockwaves while estimating the cointegration and its respective coefficients. On the other hand, QARDL also has the edge over typical non-linear techniques, for instance, “Nonlinear Autoregressive Distributed Lag (NARDL),” which are only capable of capturing the nonlinear based relationships by moving along as per the response of the behavior of the studied variables respectively thus not establishing a legitimate threshold since not fixed to a certain level and compute independently (Shin et al., 2014). Therefore, based on the aforementioned benefits discussed related to the selection of the QARDL while comparing with the other methodologies, it is accordingly selected to ascertain the asymmetric and nonlinear connections. The mathematical representation of the conventional ARDL methodology is mentioned as follows:

$$SPI_t = \mu + \sum_{i=1}^{p} \phi_i SPI_{t-i} + \sum_{i=0}^{q} \gamma_{i} COVID19_{t-i} + \sum_{i=0}^{p} \theta_i EPU_{t-i} + \epsilon_i$$

equation (1)

With reference to equation (1), $\epsilon_i$ is the representation of the error term, which is the description of $SPI_t - \{SPI_t/\sigma_{t-1}\}$; $\sigma_{t-1}$ is the representation of minimum $\sigma$- area of $\{SPI, COVID19, OIL_t, EPU, SPI_{t-1}, COVID19_{t-1}, OIL_{t-1}, EPU_{t-1}\}$ whereas the alphabets $p$, $q$, $r$, and $s$ denote the lag order of the benchmark of Schwarz information (SIC). The acronym is defined against all variables already discussed earlier.

On the other hand, for estimating the quantiles, an expansion was proposed by (Cho et al., 2015) on the ground of ARDL. Thus, the mathematical representation of the QARDL is mentioned below:

$$Q_{SPI_t} = \mu(t) + \sum_{i=1}^{p} \phi_i(t)SPI_{t-i} + \sum_{i=0}^{q(t)} \gamma_{i(t)}COVID19_{t-i} + \sum_{i=0}^{p(t)} \theta_i(t) EPU_{t-i} + \Delta_t$$

equation (2)

It should be noted that $\epsilon_i(t) = FDL_t - Q_{FDL}(t/\bar{b}_{t-1})$ along with $0 > \tau < 1$ is the representation of the quantiles. Furthermore, by looking at equation (2), it can be foreseen that there is a great level of probability of continuous and serial correlations. Hence equation (2) has been rewritten as follows:

$$Q_{SPI_t} = \mu + \rho SPI_{t-1} + \delta COVID19_{t-1} + \delta_{OIL} OIL_{t-1} + \delta_{EPU} EPU_{t-1} + \sum_{i=1}^{p} \phi_i \Delta SPI_{t-i} + \sum_{i=0}^{q(t)} \gamma_{i(t)} \Delta COVID19_{t-i} + \sum_{i=0}^{p(t)} \theta_i \Delta EPU_{t-i} + \sum_{i=1}^{p} \phi_i \delta OIL_{t-i} + \Delta_t$$

equation (3)

The computation of the correction of the term in the context of the dynamic quantile model is mentioned as follows:

- $\Delta_t$
Due to applying the delta method, the total impact of the previous SPI on the later SPI in a shorter period of time is estimated through 
\[ Q_{S_{01}} = \mu (t) + \rho (t) |\text{SPI}_{t-1} - \beta_{\text{COVID19}}(t) |\text{COVID19}\_t - \beta_{\text{OIL}}(t) |\text{OIL}_{t-1} \]
\[ - \beta_{\text{EPU}}(t) |\text{EPU}_{t-1} + \sum_{i=1}^{r} \phi_i(t) \Delta |\text{SPI}\_t + \sum_{i=1}^{r} \gamma_i(t) \Delta |\text{COVID19}\_t \]
\[ + \sum_{i=1}^{s} \omega_i(t) \Delta |\text{OIL}\_t + \sum_{i=1}^{s} \theta_i(t) \Delta |\text{EPU}\_t + \Delta(t) \]
equation (4)

The ECM and its respective parameter, denoted by \( \rho \), also need to be significant statistically, whereby nature should be negative. On the other hand, the application of the Wald Test is made for evaluating the asymmetric characteristics in both shorter periods and a more extended period of time, on the current study’s focused factors, whereas the depiction of the null hypothesis is done by \( \rho \), as discussed as follows:

\[ H_0 : \rho (0.05) = \rho (0.1) = \ldots \ldots = \rho (0.95) \]

whereas the alternative hypothesis of the above-mentioned hypothesis states as:

\[ H_1 : \exists i \neq j |\rho (i) \neq \rho (j) |\]

### 4. Estimations and results

Before applying QARDL, specific tests need to be done on a priori basis to evaluate the level of reliability and robustness that a dataset must possess. The descriptive statistics were applied to the dataset to check the variables’ initial behavior. The current study employs three predictors: OIL, EPU, and COVID19, whereas one criterion variable is SPI. OIL’s minimum and maximum values are 0.0015 and 0.0388, with a mean of 0.0287 and a standard deviation of 0.1589. Another predictor, EPU, has found the characteristics having minimum and maximum values, which are 0.0011 and 0.0144, with a mean of 0.0058 and a standard deviation of 0.2281. In contrast, the third predictor, which is COVID19, has found the characteristics having minimum and maximum values, which is to be 0.0008 and 0.0227 with a mean of 0.0019 and a standard deviation of 0.0118. In addition to this, the minimum and maximum value of SPI, the criterion variable, is 0.0005 and 0.0027, with a mean of 0.0015 and a standard deviation of 1.014. It should also be noted that all of the variables have been found to have the least values of standard deviation, which represents the level of variation, and conclude that they all are internally consistent and reliable.

On the other hand, the Jarque-Bera test is also applied to evaluate whether the studied variables possess the quality of normality. The null hypothesis of this test states that if there is a rejection of the null hypothesis, it confirms the existence of normalcy in the variables, whereas the acceptance represents absence, respectively. The results of the tests revealed all of the values as significant at a 1% level of significance, which confirms the normality of all of the variables (Razzaq et al., 2021; Shahbaz et al., 2016; Sharif et al., 2019). The summary of the results is depicted in Table 1.

After exploring the descriptive statistics, the level of integration and its respective order are evaluated among the studied variables in the following stage, which is pivotal to be tested before applying QARDL (Zivot and Andrews, 2002a). Therefore for the evaluation, “AugmentedDickey-Fuller (ADF)” is a unit root test together with the (Zivot and Andrews, 2002b) (Z.A.) as applied in the other related researches (Godil et al., 2020; Razzaq et al., 2021). The Z.A. test is considered an edge over the other typical unit root tests as they can capture the structural breaks. The summary of the results depicted in Table 2 endorses the existence of all of the studied variables, whereby there was also the confirmation of the presence of structural breaks as per the results of the Z.A. test, thus justifying the employment of QARDL, which typically is the better alternative for the datasets having characteristics of showing dynamic trends, non-linearity and most importantly the structural breaks (Aziz et al., 2020a, 2020b).

In the later stage, there was an employment of QARDL among all the predictors capable of evaluating the effects on the generated quantities of the criterion variable, which in the present study is SPI. As discussed earlier, the error term denoted by \( \rho \), which accordingly corrects, needs to be significant and negative across all of the quantiles. Referring to Table 3, these values are reported to be found as they were expected for all quantities except the last two quantities. In addition to this, the long-run relationship of OIL was found to be positive and significant across all the quantiles of the SPI, indicating that whenever there is an increase in the oil prices, irrespective of the market conditions, it will also increase a stock price index level. These results are consistent with Benlagha and El Omari (2022) study, which reported the positive relationship of oil with the five large-scale worldwide equity markets.

Furthermore, considering the relationship between EPU and SPI, it was found that EPU was found to be negative and significant across all of the quantiles of SPI. These results also seem logical as the uncertainty itself is a negative thing. Whenever there is a level of uncertainty, especially in the economic policies, it will adversely affect the stock market. Hence irrespective of the market conditions, uncertainties at all possible levels and kinds are not suitable for the stock markets; thus, such uncertainties need to be eliminated. These findings are in line with the recent work of Chang (2020), which revealed similar results in the USA equity market with economic policy uncertainty. Also, the outcomes are comparable with the worthy studies of Bhattrai et al. (2020), and Chang (2020).

Furthermore, considering the relationship between COVID19 and SPI, it was found that COVID19 has a negative and significant impact in the lower quantiles of SPI, whereas, in the higher quantiles, the relationship though remains negative but becomes insignificant. This is

**Table 1**

| Table 1 | Results of descriptive statistics. |
|--------|----------------------------------|
| Variables | Mean | Min. | Max. | Std. Dev. | J-B Stats |
| SPI | 0.0015 | 0.0005 | 0.0027 | 1.014 | 55.052*** |
| OIL | 0.0287 | 0.0015 | 0.0388 | 0.1589 | 81.023*** |
| EPU | 0.0058 | 0.0011 | 0.0144 | 0.2281 | 43.021*** |
| COVID19 | 0.0019 | 0.0008 | 0.0227 | 0.0118 | 39.022*** |

Source: Author’s estimation. For details, see Afshan and Yaqoob (2022).

**Table 2**

| Table 2 | Results of Unit root test. |
|--------|--------------------------|
| Variables | ADF (Level) | ADF (Δ) | ZA (Level) | Break Year | ZA (Δ) | Break Year |
| SPI | −1.103 | −3.021*** | −1.321 | 05/05 | −7.011*** | 04/01 |
| OIL | −0.352 | −5.040*** | −0.654 | 29/09 | −9.013*** | 01/06 |
| EPU | −1.120 | −3.025*** | −1.456 | 17/11 | −8.015*** | 02/05 |
| COVID19 | −0.241 | −4.013*** | −0.987 | 22/03 | −6.021*** | 19/10 |

Source: Author’s estimation.
because COVID19 emerged as a devastating phenomenon that has negatively affected every single individual; hence it is evident that in a situation where there is bearish market behavior, the investors are prone to risks and trying their best to respond safely to this situation of the stock market where there is bearish market behavior, the outbreak of pandemic has the devastating effect. In contrast, the market conditions that reflect the bullish phenomena, because of the typical aggressive response from the investors is the actual relationships tend to have emerged in the later stage to ascertain the level of asymmetries on all of the focused variables. At the same time, the forward causal relationship and causalities are already discussed in the results of Table 3.

In the shorter period, the maximum results nature was similar to the longer time except for oil prices, which are significant and negative in smaller quantities and become insignificant in higher quantities. This relationship is also apparent as the change in the oil prices negatively impacts a shorter period. In contrast, as long as the market operates, it will accordingly change. The other changes in the relationships because of the time period are of significance, as usually, it takes some time for the market to respond to anything in a short period; hence when the market gets matured concerning the operation of the timing and penetration of the phenomena, the actual relationships tend to have emerged which is usually depicted in the more extended time. Nevertheless, the summary of the results in both longer and shorter period are illustrated in Table 3.

After applying the QARDL, the application of the Wald test was made in the later stage to ascertain the level of asymmetries on all of the focused variables. Even though there is an absence of any particular asymptotic distribution in this test, this test can figure out the level of volatilities not just with the coefficients but also with the intercept. In addition to this, this test can also identify any change (if it occurs) in all types of structural breaks that are identifiable or not (Godil et al., 2020). The results confirm the presence of symmetries in both longer and shorter periods across all of the focused variables of the present study. The summary of the results in both longer and shorter periods of Wald’s Test is depicted in Table 4.

Lastly, there is an application of the Granger Causality Test, which is intended to apply to evaluate the causal effects on the quantiles of the criterion variable. The test findings revealed the presence of bi-directional relationships among all the variables, which means that from every predictor to criterion and from criterion to predictor. It means that oil prices tend to affect the stock market as the change in oil prices increases and decreases the operating cost, eventually affecting the stock prices. Its reversal impact is also seen when stock markets show causality towards oil prices. This could be because of the fact that the data of the stock market is the aggregate data which is comprised of kinds of markets. Same are the reasons for the other reversal causalities, as well as they are based on the aggregate data of all sorts of companies listed in that particular stock market. At the same time, the forward causal relationship and causalities are already discussed in the results of the QARDL. The summary of the Granger Causality Test results is depicted in Table 5.

5. Conclusion, policies, and recommendations

The eruption of the COVID pandemic, though not the first one in human history, is quite different because the other pandemics and their outbreaks were not as lethal as the current COVID-19 is, nor did they
devastate the financial matters to the extent that current COVID-19 did. However, the governments and international organizations failed in terms of their handling. And the chaos, anarchy, and uncertainty made in this situation are not similar to earlier conditions. To counter the spread, the measures taken include the lockdown, which was reported to put more than 50% of the population across the globe who were forced to stay in their homes. Because of such measures to counter the spread of COVID, the world has also experienced the counter effects, including a credit crunch where there was a deficit in the demand and supply of the cash; a significant increase in the ratio of bankruptcies; an increase in the levels of debts; increased level of disruptions and volatilities in the stocks and comparatively lower level of returns in stocks, thus disturbing the whole supply chain. An essential element that could affect the behavior of the stock market is the oil prices, whereas this relationship is reported to have been explored by several researchers. In contrast, oil prices are crucial, especially for oil-exporting countries, contributing significantly to their national GDP and stock markets.

Keeping in view, the problem discussed, it has been noted that the equity market is prone to several external factors, i.e., the oil prices, uncertainty regarding the spread of the COVID, and the COVID itself, which emerged as the pandemic causing one of the most severe deviations to suffer by the human life not just in terms of life and health but also in the form of finance. In the pursuit of addressing the problem highlighted and evaluating the cointegration level within the constructs, the variable of COVID 19 is represented by COVID19; oil prices denoted by OIL; stock price index symbolized by SPI and economic policy uncertainty presented by EPU. To access the level of cointegration in all of the aforementioned variables, QARDL was applied, which serves the purpose of estimations and analysis. The results revealed that the relationship of OIL was found positive and significant across all of the quantiles of the SPI, reflecting that whenever there is an increase in the oil prices, irrespective of the market conditions, it will also increase the level of a stock price index. Moreover, considering the relationship between COVID19 and SPI, it was found that COVID19 has a negative and significant impact in the lower quantiles of SPI, whereas, in the higher quantiles, the relationship though remains negative but becomes insignificant. This is because COVID19 emerged as a devastating phenomenon that has negatively affected every single individual; hence it is evident that in a situation of the stock market where there is bearish market behavior, the investors are prone to risks and trying their best to respond safely to every possible call from the market.

Based on the findings, it has been recommended that all studied factors be reported to affect the stock market. In contrast, the situation of COVID could lead to a recessionary period. Hence, there is a need for government intervention to provide a buffer and support to the market to control its abrupt behavior. With the passage of time, the world has begun to normalize; however, the experience gained from the past situation urges the financial managers and investors to seek solutions for handling equity uncertainty and the related systematic risk of the pandemic spread. Also, they should reevaluate the adopted risk management models to confront the future potential challenges of the COVID-19 pandemic. Moreover, more balanced measures are needed through which the spread of COVID can be countered.

Lastly, according to the limitations, it is recommended that the effects of specific industries should be investigated as the current study explores the overall impact of the stock market. Studying the aggregate data of the overall market could phase out the possibility of exploring the markets that are at higher risks. In addition to this, other than the U. S., there is a need to examine the other regional markets, which can help understand the markets’ response worldwide. In the end, methodologically, the present study explores the effects of predictors on the quantiles of the criterion variable. However, the econometricians have also developed the quantile-on-quantile regression, which can examine the relationships of the quantiles of the predictor with the quantile of the criterion variables. Such kind of method will help explain more in-depth insights into the data and the context respectively.

**Authors statement**

Cong Li. Conceptualization, Resources, Data curation, Visualization, Writing-review & editing.
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**Acknowledgement**

This study is supported by the Industry-University-Research Innovation Fund of Universities in China (2019ITA01001), the Humanities and Social Science Research Project of Shandong province’s colleges and universities in China (Grant No. J18RA181).
