Routledge
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Economic Research-Ekonomska Istraživanja

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rero20

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To cite this article: Jiachong Hu, Xiao-Guang Yue, Deimante Teresiene & Irfan Ullah (2022) How COVID19 pandemic affect film and drama industry in China: an evidence of nonlinear empirical analysis, Economic Research-Ekonomska Istraživanja, 35:1, 2254-2272, DOI: 10.1080/1331677X.2021.1937262

To link to this article: https://doi.org/10.1080/1331677X.2021.1937262

Published online: 18 Jun 2021.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA
2022, VOL. 35, NO. 1, 2254–2272
https://doi.org/10.1080/1331677X.2021.1937262

How COVID19 pandemic affect film and drama industry in China: an evidence of nonlinear empirical analysis

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ABSTRACT

With its contiguous nature, paired with the people's fear and anxiety, the Covid-19 outbreak has become a lethal combination, which despite the lower death ratio, has led to unanticipated financial and economic repercussions that have eventually disturbed the life of every single human being around the globe. In this very context, enterprises that belong to the fields of entertainment, tourism, lodging, dining, hotels, and restaurants have been found to be at a higher risk, as such operations are harshly affected during such unanticipated situations. Hence, based on this notion, the present study has been conducted, in order to precisely identify the effect on China's film and drama industry's stock returns, due to the outburst of the COVID-19 pandemic. Therefore, based on the time-series data from China, spanning from the time period of 01-Jan-2020 to 15-Mar-2021, the quantile autoregressive distributed lag method (QARDL) method has been applied, as the preferred statistical technique for this study. The results have reported that there happens to be a negative impact of the COVID-19 pandemic, on the industry across all the considered quantiles, representing the bearish, normal, and bullish market conditions. Therefore, based on these findings, the government regulations' full compliance regarding social distancing and health assurance has been recommended.

ARTICLE HISTORY
Received 29 March 2021
Accepted 26 May 2021

KEYWORDS
China; COVID-19; drama; film; QARDL; stock market

JEL CODES
A1; F15; DO3; Z11

1. Introduction

It was the fateful day of 31st January 2020, (Beijing time) when the World Health Organization declared the outbreak of the novel coronavirus COVID-19 as a global pandemic (Liu et al., 2020). It is noteworthy that such a declaration has not been made for the first time in history, and has already happened five times earlier as well. However, the magnitude of the outbreak with its contiguous nature, combined with the fear and anxiety of the people have become a lethal combination (Mirza, Naqvi,

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et al., 2020; Mirza, Rahat, et al., 2020), which despite the lower death ratio, has led to unanticipated financial and economic repercussions. These repercussions have altered the life of every single human being in one way or the other, and hence has been termed as a global health emergency (Fu & Shen, 2020; Guan et al., 2020; Liu et al., 2020; Rizvi et al., 2020). The outbreak of the COVID-19 virus is deemed to be different from the earlier outbreak of viruses that have plagued the earth in the past (Reinhart, 2020). For instance, viruses such as the Zika and Ebola viruses erupted, and were concentrated in specific regions of the world only. However, they did have economic effects globally as well (Baker et al., 2020). In this case, on the other hand, the COVID-19 emerged from the city of Wuhan, which is located in the Hubei Province of China, and is considered to be one of the most operational transportation hubs, through which there is a perpetual mass human transit activity going on (Chakraborty & Maity, 2020; Liu et al., 2020). The timing of the origination of this virus also enlarged the magnitude of this pandemic, as there was an annual spring festival underway, for which the world's largest human migration activity is undertaken through this very hub, thus resulting in the Covid-19 virus's global transmission and outbreak.

The emergence of COVID-19 being one of the most infectious and contagious diseases in the world, coupled with panic and confusion among the people and institutions, have led to several kinds of volatilities and disruptions in the operations of several industries (Haroon & Rizvi, 2020). In such a situation, in order to break the spread of the virus, government institutions have already taken several steps and measures to control any further spread of the disease (Ashraf, 2020a). For instance, there has been an implementation of the immediate lockdown policy on a global level, by which all of the business activities have been put on a halt, and the movement of people has been minimized, and in some instances even banned. Moreover, travel restrictions have been put into place, which include both national and international traveling of people from one place to another, etc., (Ding et al., 2020). It has been observed that this implementation of lockdowns has given rise to more confusion among the people, often leading to panic buying, thus increasing the gap between the demand and supply of goods and services. In addition to this, in order to assist and compensate the people with food and other necessities, the wealthy countries' local government institutions have announced several economical packages, which have helped the local people with their food and other living essentials during the pandemic. However, the implementation of such measures has decreased the global level of economic production and has created a deficit that can also be referred to as economic distancing. This is a phenomenon where lots of people have lost their jobs, whereas there has been decrease in the income levels of millions of people on a global level (Park et al., 2020).

Following the same context, (Ashraf, 2020a) categorized the government measures, to control the outbreak, into three broad categories. The first category included the measures to ensure social distancing, including the closure of parks, schools, public transportation, encouraging work from home or minimal working staff, and the restrictions for dining in restaurants. In the second category, public awareness and containment measures, in which general awareness was given to the public, were

regularly followed by abundantly testing for COVID positive individuals, and quarantining them accordingly. The third category referred to the government institutions' financial support programs, which included cash transfers to the households and the needy families, relaxation in the loan and debt payments, and relaxing the utility expenses as well (Hepburn et al., 2020).

Stock markets, which are considered the marketplace of opinionated, sophisticated, and sane investors, have also responded differently in terms of the returns to the government measures taken all over the world (Su et al., 2020a, 2020b; Umar, Mirza, et al., 2021; Umar, Su et al., 2021; Yarovaya et al., 2020). For instance, social distancing measures could potentially have a negative impact on the return, as there have been no or minimal economic and finance generation activities. On the other hand, government assistance and income packages could lead to positive returns, and also improve the investors' confidence in the market (Su, Huang, et al., 2021; Su, Sun, et al., 2021; Umar, Rizvi, et al., 2021). Thus, the direct impact of these measures could be negative, but since they are temporary in nature, and eventually normality will prevail, in which normal operations will ideally be performed. Therefore, in indirect terms, these measures help the investors to maintain the hope that the situation will eventually become go back to how it was before.

Unlike any other industry, the entertainment industry has reportedly been found to be more vulnerable, and at a higher risk factor during this pandemic (Gu et al., 2020; Hu et al., 2019). This is due to a multitude of reasons, which include the closure of cinema houses, which are the entering doors of the revenue collection of the released films, stoppage of the production of films, which are expected to be on the floor and the sets, and even the release of the films that are ready to be displayed, as the operations are suspended because of the government initiatives of social distancing. Even though people, while staying at home, had a high watch time due to the added exposure to more media and entertainment content during the period of lockdown (Haroon & Rizvi, 2020), such increased watch time only resulted in the financial generation of activities which are already being performed. Hence, by putting the newer projects on a halt, there has been an increase in the level of unemployment, leading to adverse effects in terms of the circulation of money. Moreover, negative effects have also been experienced in terms of the economic activity generation, and eventually have negative repercussions in the investor sentiments, and the stock markets and returns of the film and drama industry (FDI) (Hu et al., 2009). In short, for obvious reasons, the investment in FDI becomes a futile exercise.

As discussed earlier, despite the closure of cinemas and other physical entertainment activities, there has been shift in the online entertainment platforms globally, through which people have access to the content for their entertainment through the easy access to the internet. However, the majority of the people still prefer the conventional cinema experience and like to visit the cinemas in a physical setting. The transition towards online forums and platforms has led to a novel change, which has not just improved the level of convenience among the end-users, but has also significantly reduced the costs associated with the distribution and dissemination, screening, and the ultimate consumption of the content and product (García Leiva & Albornoz, 2020; Nieborg & Poell, 2018). Nevertheless, online platforms have come as saviour to

the FDI during the Covid- 19 pandemic. However, this still cannot justify the total untapped, or rather interrupted potential of this industry.

In specific terms, China is a country of more than 1.3 billion people, and has one of the largest film and drama industry markets. According to (Statista, 2021), China is reported to have produced 1037 films, only in the year 2019. Moreover, the Chinese cinema industry has more than 50 chains that are operated by different dealing parties, in which only "Guangdong Dadi Digital Cinemas" are reported to have more than 1120 cinema screens. The total number of cinema screen exceeds a figure of 75,000, while the total number of cinema houses is also about 11300. In addition to this, most importantly, the country happens to have the largest market, based on the revenue collection through box office, which exceeded a total amount of USD 3 Billion in 2020 alone. Hence as per the objectives defined, the magnitude of the nature of the relationship that exists between FDI and COVID19 needs to be explored further, especially in the context of China, which has one of the largest FDI industries in the world. Moreover, this also needs to be undertaken because the largest consumer base has been a marketplace of the international industries to come, and release their products in China.

In addition to the geographical contribution, this study also offers a methodological contribution to the literature, by applying the "Quantile autoregressive distributed lag method" (QARDL) method. According to (Cho et al., 2015), this technique helps to understand the relationship between the variables across the different level of quantities of the dependent variable. This exercise provides a more sophisticated analysis which assists in making and implementing the economic and financial policies with respect to the studied variables (Razzaq et al., 2021; Umar et al., 2020). Precisely though, with the help of this technique, there has been a division of dependent variable(s) in the quantiles, which helps in an in-depth explanation of the relationship's overall behaviour, leading to more insightful implications upon the nature of the variables that are being studied. On the other hand, COVID 19 and its effects have been assessed on the scale of various economic indicators, including the oil prices (Apergis & Apergis, 2020; Gil-Alana & Monge, 2020; Su et al., 2020a, 2020b), media coverage (Haroon & Rizvi, 2020), financial markets (Ali et al., 2020) and the other macro-economic implications on the deficit of demand and supply (Guerrieri et al., 2020).

In the remainder of the study, the literature review has been discussed in section 2 of the study, after which the methodology is discussed in chapter 3. This is followed by the statistical estimations, while the probable recommendations are provided based on the findings, in chapter 5.

2. Review of related literature

The eruption of COVID 19 as a global pandemic has left an impact on every individual, and its financial repercussions are a strenuous task to be estimated. Since the world itself is going through this pandemic, and there is confusion regarding the immunization and vaccination for its further spread and control, such confusion is a source of an increased panic among the people. This state of being affects a common persons' expenditure patterns as well (Haroon & Rizvi, 2020). A sane representation

of the investment or expenditure pattern can be assessed from the stock market patterns, as this market comprises of the rational and sophisticated people who reasonably anticipate any future trends, and earn profits accordingly (Ashraf, 2020b; Mirza et al., 2020; Tao et al., 2021; Umar, Ji, et al., 2021).

China being the origin country of the Covid-19outbreak has also suffered significantly due to this pandemic. As the otherwise strong markets have experienced a rapid decline in the first quarter of 2020, we observed that countries such as the United States have also reported a decline of 1.22%. Moreover, in the same stride, Japan showed a decline of 0.85%, the United Kingdom showed a decline of 1.98%, Germany experienced a decline of 2.22%, and France also plummeted by 5.83%, respectively. Hence, with the world economies also suffering, China has not been any different. In fact, the service industry of China has faced the most devastation, which is reported to have experienced a staggering decline of 16%. Moreover, in addition to this, the manufacturing sector has also reported a decline of 10.7%. In this regard, the precise shortfall among the industries of China has been investigated by (Gu et al., 2020), in which the data of 34,040 companies was considered for analytical purposes, and on which the "difference-in-differences estimation model" has been employed. The findings have revealed that it is the manufacturing sector that has been largely affected by the novel COVID-19 spread, whereas the small and medium-sized enterprises have been reported to have experienced more than 30% decline as compared to the large scale manufacturers. Additionally, privately-owned enterprises have been reported to have suffered more, when comparing them with the companies owned by the government or by foreign entities.

Researchers have reportedly shown a considerable amount of interest in this timely topic, and have thus presented their findings based on different methodologies, applied in different geographical contexts (Rizvi et al., 2020b). For instance, (Liu et al., 2020) studied the impact of the Covid-19 infestation, on a short-term basis, on China's financial markets. They also studied the abnormal returns with the help of an event study, based on the first 10 days of the eruption of the virus. The findings reported the favourable investment sentiments and patterns that were observed towards pharmaceutical and information technology-based companies. These two types of companies were progressing because of the rise in the medical requirements, and also the increased usage of the internet due to lockdown and social distancing restrictions. According to the researchers, the most adversely affected industries were lodging, tourism, and transportation industries that showed a continuously declining trend.

In another study by (Haroon & Rizvi, 2020), by employing the exponential Garch model, in order to estimate the market's volatilities and the OLS regression, the relationship between media coverage and its effects on investors' sentiments of the stock market across the globes was assessed. The results reported a negligible to an adequate level of effect on the stock prices, primarily due to the spread of the COVID-19 virus. However, the highly impacted industries have been reported to have the highest impact due to the media coverage of this pandemic. On the other hand, a global study was conducted by (Ashraf, 2020a), which investigated the role of the government interventions in alleviating the COVID-19, and its further impact on

the stock market returns. For this purpose, the daily data were gathered for the first quarter of 2020, from 77 countries, on which the pooled panel OLS regression was applied. The results reported that the government initiatives regarding the lockdowns and social distancing negatively impacted the stock market returns. In contrast, government initiatives which pertained to health support, financial assistance, testing and quarantining, and communication of information for the awareness of the general public, were observed to be favourable for the stock market returns, as such news leas to an increase in the confidence of the investors regarding the operationalization of the stock markets, and its continuity in the near future.

In addition to this, considering the coverage of the pandemic on a global level, (Albulescu, 2021) also studied the volatility experienced in the US stock markets, and reported some rather interesting findings. According to the researchers, although the reporting of the newer cases in the international or US markets amplifies the volatilities in the stock markets, the fatality rate reported globally has had a stronger impact on the financial volatility, as compared to those reported in the US. Nevertheless, the fatality rate reported in general has been found to have a strong and adverse effect on the financial market returns. On the other hand, findings of (Zhang et al., 2020) reported that undoubtedly, COVID-19 has severely affected the stock markets and returns. However, the severity of the effect is highly dependent on the nature and spread of Covid-19 in the regional settings. Hence, the uncertainty in the markets has led to a higher level of unpredictability and volatility.

It is noteworthy that even though the outbreak of Covid-19 is a relatively new phenomenon, there is a history attached to it, in which the available literature has documented evidence in which market volatilities are reported in response to the different kinds of natural or human-made uncertainties and risks. The connections and similarities of the Covid-19 virus are from the SARS family, and there are a plethora of references available in the literature which have recorded and analysed response of the markets in the situation of the spread of the epidemic of SARS. For instance, (Nippani* & Washer, 2004) analysed the effect of SARS on the different stock markets, including Hong Kong, China, Canada, Thailand, Philippines, Singapore, and Vietnam, and concluded that there was an absence of all the Vietnamese markets from China. Before this, a study by (Zhang et al., 2003) in the context of China, analysed different industries and their stocks response to the SARS. It was reported that there was a negligible counter-response of the SARS for the majority of the industries, whereas the industries that assist tourism, including hotels, etc., do tend to have a longer-lasting impact. On the other hand, in the case of the Ebola virus, geographical closeness was found to have adverse effects on the United States' stock prices (Marinč, 2016). In contrast, (Del Giudice & Paltrinieri, 2017) by studying the 78 funds in the African region with the time series data, from the time period of 2006 to 2015, adverse effects of the Ebola virus on the financial returns and performance of the enterprises were reported.

Based on the literature above, it is evident that health emergencies, encountered either due to natural disasters, man-made disasters, and/or any pandemic, severely affect human consumption and expenditure patterns, whether on an individual or an enterprise level. Similarly, such effects are found to be quite evident when considering

the stock returns. However, the nature of the effect depends on the enterprises' businesses' nature as well. For instance, if an enterprise belongs to the pharmaceutical, or information communication and media technology sector, the effect would be positive, as there will be an influx of increased operation activity by such firms, in order to alleviate and mitigate the damage caused. On the other hand, in such a situation, enterprises belonging to the sector of tourism, lodging, dining, hotels, and restaurants are found to be at a higher risk, as such operations are harshly affected during these times. However, such situations do not lead to obvious and apparent findings, particularity when it comes to the FDI. In the recent times, this industry's operation has spread over to both the physical and virtual platforms, and hence such operations could also prove to be favourable for the FDI. However, this is probably not the case at all times, as the individuals working in the industry have to gather and make the product by ensuring their physical presence, which can eventually be made available to the online platforms. Hence, based on this notion, the present study has been conducted in order to precisely identify this industry's effect, due to the eruption and spread of the Covid-19 virus.

3. Methodology

3.1. Quantile autoregressive distributed lag (QARDL)

In order to assess the cointegration among the studied variables, which in the present study are primarily the COVID-19 virus, and the stock prices of film and drama industry (FDI). These are paired along with two other control variables, which include the energy prices (OIL) and exchange rates (ER), which happen to be strong determinants and have a strong influence in the functioning of any economic and/or financial phenomena. Since the present study's geographical context is China, thus, in order to assess all of the grids through the quantiles, the QARDL method has been applied, as (Cho et al., 2015) discussed. This model ascertains the equilibrium among the quantiles in the long run, among the studied variables. In addition to this, integration across the time-varying factors has also been assessed by employing the Wald Test, which permits the steadiness of the coefficients that are integrated across the various quantiles grids.

In empirical terms, while comparing with the conventional linear approaches, the QARDL is found to have an edge over them on three fronts. Firstly, this approach allows the assessment of the asymmetry, based on the considered location. This absorbs the dependencies of the criterion variable, which in the present study is FDI, within the distribution based on the conditional probability. The second edge of the technique includes simultaneously ascertaining the connection between the long run, and its respective dynamics in the short run period, in the studied variables. These are based on the quantiles of the FDI that revolved around the conditional probability distribution. The third factor includes the failure to ascertain the cointegration among a few of the time series, which is not the present study's case, while applying the conventional linear-based ARDL approaches and tests, including Johansen. Such countering effects are eventually misunderstood, and then interpreted as the coefficients computed from the quantiles vary across the short time period that is considered.

However, the variables tend to respond similarly in a longer period of time (Hu et al., 2009). In addition to this, the QARDL approach also allows the coefficient of cointegration across the quantiles, due to the ability to absorb the shocks.

Moreover, the QARDL approach is also superior to the nonlinear approaches, for instance, the "Nonlinear Autoregressive Distributed Lag (NARDL)," which tends to explain the nonlinearity independently, because of the failure to define the threshold, as it is derived from the data and is not fixed to a value of zero (Shin et al., 2014). Hence, based on these three objectives, the QARDL approach has been found to have the most related application, which also has the capability to ascertain both nonlinear and asymmetric linkages. The mathematical formulation of the linear ARDL approach is thus shown as under:

$$FDI_t = \mu + \sum_{i=1}^{p} \varphi_i FDI_{t-i} + \sum_{i=0}^{q} \gamma_i COVID19_{t-i} + \sum_{i=0}^{r} \omega_i OIL_{t-i} + \sum_{i=0}^{s} \theta_i ER_{t-i} + \varepsilon_t \ \ equation\ (1)$$

Referring to equation 1, the error term is denoted by ε_t, which describes FDI_t – $E[FDI_t/\sigma_{t-1}]$. Whereas, σ_{t-1} is the representation of the lowest σ- area of $\{FDI_t, COVID19_t, OIL_t, ER_t, FDI_{t-1}, COVID19_{t-1}, OIL_{t-1}, ER_{t-1}\}$, and the letters *p, q, r,* and *s* represent a lag order of the criterion of Schwarz information (SIC). In equation 1, the FDI denotes the film and drama industry, while COVID −19 denotes the pandemic, OIL represents the energy prices, and the factor of ER denotes China's exchange rates.

In this regard, Cho et al. (2015) proposed an extension that forms the quantile predictions. Therefore the extended form of equation 1, the QARDL approach in mathematical form, is shown as under:

$$Q_{FDI_t} = \mu(\tau) + \sum_{i=1}^{p} \varphi_i(\tau)\ FDI_{t-i} + \sum_{i=0}^{q} \gamma_i(\tau) COVID19_{t-i} + \sum_{i=0}^{r} \omega_i(\tau) OIL_{t-i} + \sum_{i=0}^{s} \theta_i(\tau)\ ER_{t-i} + \ \varepsilon_t(\tau)\ \ equation\ (2)$$

Here, the quantile has been denoted as, $\varepsilon_t(\tau) = FDI_t - Q_{FDIt}\ (\tau/\upsilon_{t-1})$ and $0 > \tau < 1$ (Kim & White, 2003). Moreover, since in equation 2, there is an anticipation of the likelihood of serial and continuous correlations, thus, the equation has been restructured as follows:

$$Q_{\Delta FDIt} = \mu + \rho FDI_{t-1} + \partial_{COVID19} COVID19_{t-1} + \partial_{OIL} OIL_{t-1} + \partial_{ER} ER_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta\ FDI_{t-1} + \sum_{i=0}^{q-1} \gamma_i \Delta\ COVID_{t-1} + \sum_{i=0}^{r-1} \omega_i \Delta OIL_{t-1} + \sum_{i=0}^{s-1} \theta_i \Delta\ ER_{t-1} + \varepsilon_t(\tau)\ \ equation\ (3)$$

On the other hand, the error correction of the dynamic quantile model is shown as under:

$$Q_{\Delta FDI\,t} = \mu(\tau) + \rho(\tau)(FDI_{t-1} - \beta_{COVID19}(\tau)COVID19_{t-1} - \beta_{OIL}(\tau)OIL_{t-1} - \beta_{ER}(\tau)ER_{t-1}) + \sum_{i=1}^{p-1}\varphi_i(\tau)\Delta\, FDI_{t-1} + \sum_{i=0}^{q-1}\gamma_i(\tau)\Delta COVID19_{t-1} + \sum_{i=0}^{r-1}\omega_i(\tau)\Delta OIL_{t-1} + \sum_{i=0}^{s-1}\theta_i(\tau)\Delta\, ER_{t-1} + \varepsilon_t(\tau)\ \ equation\ (4)$$

By applying the delta method, the overall effect of the earlier FDI on the present FDI in the short run is assessed by $\varphi_i = \sum_{i=1}^{p-1}\varphi_j$. Whereas, the accumulated influence in the short-run period of time of all the studied variables, which are COVID19, OIL, and ER, is estimated by $\gamma_i = \sum_{i=0}^{q-1}\gamma_J$, $\omega_i = \sum_{i=0}^{r-1}\omega_J$, and $\theta_i = \sum_{i=0}^{s-1}\theta_J$, respectively. The estimations of the parameters of all the independent variables taken into consideration in the long run are therefore estimated as:

$$\beta_{COVID19*} = -\frac{\beta_{COVID19}}{\rho},\ \beta_{OIL*} = -\frac{\beta_{OIL}}{\rho}\ \beta_{ER*} = -\frac{\beta_{ER}}{\rho}$$

Where the parameter of ECM, which is represented by, should be statistically significant and negative. In addition to this, the Wald test has been executed for assessing the asymmetric effects in both the long and the short run, for all the studied variables, and is investigated by the null hypothesis at parameterρ_* , as mentioned below:

$$H_0:\ \rho_*(0.05) = \rho_*(0.1) = \ \ldots\ldots\ = \rho_*(0.95)$$

Whereas, the alternate hypothesis is represented as:

$$H_A:\ \exists\ i \neq j/\rho(i) \neq \rho(j)$$

4. Estimations and results

Before estimating the quantiles, and the application of the QARDL, certain pre-requisites tests need to be applied, in order to ascertain the data's quality and behaviour. Hence, the descriptive statistics of the variables were estimated, which are shown in Table 1.

In the present study, China's time series data was taken into consideration from the time period spanning from 01-Jan-2020 to 15-Mar-2021. Here, the daily frequency for one independent variable, COVID19, and two control variables: OIL and

Table 1. Results of descriptive statistics.

Variables	Mean	Min.	Max.	Std. Dev.	JB Stats
FDI	1.157	0.751	2.582	0.016	15.041***
COVID19	3.103	2.201	4.951	1.101	24.544***
OIL	2.654	1.456	3.161	0.158	18.016***
ER	0.987	0.789	1.001	1.015	33.548***

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Source: Author Estimation.

Table 2. Results of Traditional and Structural Break Unit root test.

Variables	ADF (Level)	ADF (Δ)	ZA (Level)	Break Year	ZA (Δ)	Break Year
FDI	0.254	−6.174***	−1.461	13\05\2020	−8.330***	22\02\2021
COVID19	−0.425	−3.388***	−1.221	22\12\2020	−9.413***	09\03\2021
OIL	−1.025	−4.992***	−0.228	08\10\2020	−11.046***	26\07\2020
ER	−1.114	−5.556***	−0.854	23\04\2020	−7.551***	18\10\2020

Note: The values in the table specify statistical values of the ADF and ZA tests. The asterisk***, **, and * represent the significance level at 1%, 5%, and 10%, respectively. Source: Author Estimation.

ER, and one dependent variable, which is the FDI was taken into account. In addition to this, the data for COVID-19 cases was taken from *Worldometer,* while the data for the other variables was extracted from the *DataStream* database. In addition to this, since the variables were in different units and measures, so in order to ensure the smooth application of QARDL, the log of the variables was taken into account, so that all of them became homogenous in terms of the units that enabled the technique to move around the quantiles in a smooth manner. In precise terms, the FDI was reportedly found to have a mean of 1.157, with a minimum value of 0.751 and a maximum value of 2.582, with a deviation of 0.016. Moreover, the variable of COVID-19 was reportedly found to have a mean of 3.103, with a minimum value of 2.201, and a maximum value of 4.951, with a deviation of 1.101. On the other hand, OIL was reportedly found to have a mean of 2.654, having a minimum value of 1.456, and a maximum value of 3.161, with a deviation of 0.158. Finally, the ER was reportedly found to have the mean of 0.987, having a minimum value of 0.789, and maximum value of 1.001, with the deviation of 1.015. In addition to this, the normality of the variables was also assessed by applying the Jarque-Bera test. In this test, the rejection of the null hypothesis confirmed the presence of normality, and hence provided the approval for the further application of QARDL (Batool et al., 2019; Shahbaz et al., 2018; Sharif et al., 2019).

In the following step, the integration and order have been assessed, within the variables that are also termed as essential, before applying the QARDL technique. Hence, for the sake of the assessment, the "Augmented Dickey-Fuller (ADF)" unit root tests, along with the Zivot and Andrews (2002) (ZA) were applied, which follow the rules of other similar studies (Godil et al., 2020; Razzaq et al., 2021). It is noteworthy that the ZA test is considered to be superior to other unit root tests, primarily because of the capturing of structural breaks. The results summarized in Table 2 confirm the presence of stationarity for all the variables at level Δ, except for FDI, which is observed to be significant. In addition to this, the ZA test also confirms the presence of structural breaks in the time series, which also justifies the application of the QARDL, as the QARDL is best suited for datasets that exhibit nonlinear behaviours, dynamic trends, and structural breaks (Aziz, Mihardjo, et al., 2020; Aziz, Sharif, et al., 2020).

In the following step, the QARDL is applied, in which the effects of the independent variable and control variables were assessed on the quantiles present on the FDI. The results of this have been summarized in Table 3. The results have reported that for the FDI, all of the numbers of errors correcting the term, as expected, are found to be negative and significant for all of the quantiles. In addition to this, the effect of COVID- 19 was found to be significant and negative against all of the quantiles of

Table 3. Results of Quantile Autoregressive Distributed Lag (QARDL).

Quantiles (τ)	$\alpha_*(\tau)$	$\rho_*(\tau)$	$\beta_{COVID19}(\tau)$	$\beta_{OIL}(\tau)$	$\beta_{ER}(\tau)$	$\varphi_1(\tau)$	$\omega_0(\tau)$	$\lambda_0(\tau)$	$\theta_0(\tau)$
0.05	0.009 (0.012)	−0.069*** (-3.028)	−0.251*** (-2.991)	−0.054*** (-3.101)	−0.120** (-1.991)	−0.360** (-2.978)	−0.020** (-2.148)	−0.024 (-0.053)	−0.012* (-1.751)
0.10	0.016 (0.007)	−0.160*** (-3.234)	−0.260*** (-3.000)	−0.178*** (-3.106)	−0.127* (-1.859)	−0.349** (-2.959)	−0.032** (-2.060)	−0.022 (-0.042)	−0.019* (-1.652)
0.20	0.018 (0.014)	−0.141*** (-3.126)	−0.231*** (-2.991)	−0.168*** (-3.110)	−0.115* (-1.918)	−0.358** (-2.983)	−0. 027** (-1.969)	−0.029 (-0.034)	−0.024* (-1.753)
0.30	0.013 (0.009)	−0.158** (-2.517)	−0.220*** (-3.075)	−0.145*** (-2.955)	−0.122 (-1.350)	−0.339** (-2.968)	−0.019* (-1.737)	−0.027 (-0.049)	−0.018 (-1.140)
0.40	0.019 (0.013)	−0.146** (-2.209)	−0.228*** (-3.154)	−0.156** (-2.698)	−0.130 (-1.048)	−0.351** (-2.957)	−0.039 (-0.546)	−0.020 (0.040)	−0.023 (-1.128)
0.50	0.025 (0.015)	−0.155** (-2.114)	−0.248*** (-3.235)	−0.161** (-2.402)	−0.121 (-0.861)	−0.369** (-2.987)	−0.045 (-0.100)	−0.029 (-0.038)	−0.031 (-1.139)
0.60	0.029 (0.011)	−0.062* (-1.724)	−0.250*** (-3.344)	−0.152** (-2.111)	−0.136 (-0.679)	−0.348*** (-2.991)	−0.029 (-0.228)	−0.019 (-0.054)	−0.039 (-1.147)
0.70	0.024 (0.016)	−0.048* (-1.732)	−0.216*** (-3.460)	−0.130* (-1.919)	−0.111 (-0.459)	−0.357*** (-3.000)	−0.035 (-0.235)	−0.011 (-0.068)	−0.047 (-1.166)
0.80	0.030 (0.010)	−0.059* (-1.842)	−0.298*** (-3.659)	−0.087 (-1.414)	−0.128 (-0.347)	−0.366*** (-3.009)	−0.043 (-0.242)	−0.027 (-0.047)	−0.038 (-1.153)
0.90	0.026 (0.021)	−0.061* (-1.931)	−0.319*** (-3.743)	−0.069 (-1.120)	−0.137 (-0.252)	−0.347*** (-2.999)	−0.038 (-0.229)	−0.025 (-0.036)	−0.030 (-1.173)
0.95	0.031 (0.008)	−0.076** (-2.219)	−0.324*** (-3.955)	−0.039 (-1.113)	−0.141 (-0.139)	−0.398*** (-3.001)	−0.051 (-0.250)	−0.028 (-0.051)	−0.032 (-1.161)

Note: The table reports the quantile estimation results. The t-statistics are between brackets. ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Source: Author Estimations.

FDI, which clearly shows the industry's negative effect, as the COVID-19 pandemic has severely challenged the normal way of life. Moreover, there were no new releases in the cinemas, as the production companies anticipated low or minimal box office collections. Whereas, there has been resistance from the production house staff members for working during the pandemic. On the contrary, in a shorter period of time, the said relationships were significant in the lower quantiles, which clearly showed the potential threats to the industry, as there has been a bearish market in the lower quantiles, and people are mostly expected to be risk-averse with respect to their financial decisions. However, in the higher quantiles, which represent the bullish markets, even though people are normally aggressive with their financial decisions in such market conditions, and strive for earning higher financial gains, the said relationship was found to be insignificant. This is thus another way which also depicts the risk aversion aptitude in the stock market of FDI.

Considering the control variables, the variable of OIL was statistically significant and negative throughout the lower quantiles and to the upper-lower quantiles. These primarily reflect the bearish and bullish market conditions as well. However, these conditions become insignificant when it reaches the upper quantiles. On the contrary, its relationship in the short run has been found to be insignificant across all the quantiles, which is obvious as the energy prices tend to leave an impact on the policy implementations for a longer period of time. On the other hand, considering the impact of ER, it was found that it happened to be significant on the lower quantiles, and insignificant on the rest of the levels, while similar results were observed in the short run as well. Lastly, while evaluating the impact of FDI with itself in the short run, it was observed to be negative, as the other relationships have been found and reported to be significant throughout the lower quantiles and the upper-lower quantiles. This also signifies the fear of the industry stakeholders concerning their financial decision making, particularly in an era where there has been a massive pandemic caused by the COVID-19 virus. In this regard, the estimated results have been displayed in Table 3.

Once the QARDL estimations had been assessed and evaluated, the asymmetries among the studied variables were evaluated by Wald's Test's help, in the following stage. However, this test does not have any specific asymptotic distribution, even though it captures the volatility across the parameters, including those of the intercept and coefficients. Another advantage of Wald's test is the identification of any changes in all kinds of structural breaks, whether known or unknown (Godil et al., 2020). Nevertheless, the results reported show that there exist symmetries among all of the studied variables in the longer and shorter period of time, except for the variables denoted as OIL and ER, which is insignificant in the short run. The results of Wald's Test estimations are shown in Table 4.

In the last stage, the Granger Causality was applied in all of the FDI quantiles, in order to test the causal relationships. The results showed that there is a bi-directional causality between the independent and dependent variables, and all of these causalities are statistically significant. In specific terms, FDI tends to cause the spread of COVID, as when this industry operates, and there will be a human interaction, there might also be a violation of the social distancing rule. This could lead to a rapid

Table 4. Results of the Wald test for the constancy of parameters.

Variables	Wald-statistics
ρ	18.951*** (0.000)
$\beta_{COVI1D9}$	8.010*** (0.000)
β_{OIL}	7.505*** (0.000)
β_{ER}	14.993*** (0.000)
φ_1	3.710*** (0.000)
ω_0	2.812** (0.041)
λ_0	1.651 (0.127)
θ_0	0.224 (0.999)

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Source: Author Estimations.

Table 5. Granger causality in quantile test results.

Quantiles	ΔFDI_t to $\Delta COVID19_t$	$\Delta COVID19_t$ to ΔFDI_t	ΔFDI_t to ΔOIL_t	ΔOIL_t to ΔFDI_t	ΔFDI_t to ΔER_t	ΔER_t to ΔFDI_t
[0.05-0.95]	0.000	0.000	0.000	0.000	0.000	0.000
0.05	0.000	0.000	0.000	0.000	0.000	0.000
0.10	0.000	0.000	0.000	0.000	0.000	0.000
0.20	0.000	0.000	0.000	0.000	0.000	0.000
0.30	0.000	0.000	0.000	0.000	0.000	0.000
0.40	0.000	0.000	0.000	0.000	0.000	0.000
0.50	0.000	0.000	0.000	0.000	0.000	0.000
0.60	0.000	0.000	0.000	0.000	0.000	0.000
0.70	0.000	0.000	0.000	0.000	0.000	0.000
0.80	0.000	0.000	0.000	0.000	0.000	0.000
0.90	0.000	0.000	0.000	0.000	0.000	0.000
0.95	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors Estimation.

spread of the virus in the duration of the COVID crisis, whereas the prevalence of COVID itself affects FDI in terms of significant financial losses. Similarly, with an increased FDI, there will also be an increase in the financial activities, which could lead to an increase in the energy demand, and eventually also play a role in determining the prices because of the forces of demand and supply. Whereas, lower oil prices broaden the budget and allow for increased FDI activities, which has also been the case between FDI and ER. The results of the Granger Causality in the Quantile Test results that have been estimated have been displayed in Table 5.

5. Conclusion, discussion, and recommendations

The emergence of COVID-19 as being a highly infectious and contagious disease, coupled with the panic and confusion among the people and institutions, has led to several kinds of volatilities and disruptions in the operations pertaining to several industries (Zhang et al., 2020). The magnitude of this virus and its outbreak, with its contiguous nature, has resulted in fear and anxiety of the people. This has become a rather harmful combination, which, despite the lower death ratio, has led to unanticipated financial and economic repercussions which have disturbed the life of every single human being, and hence has been termed as a health emergency on a global level.

Health emergencies, either because of natural disasters, man-made disasters, and/or any pandemic disease, severely affect the human consumption and expenditure patterns, whether they are experienced is on an individual or an enterprise level.

Therefore, several initiatives have been taken by the government regarding health support, financial assistance, testing and quarantining, and communication of information, for the awareness of the general public.

A sane representation of the investment or expenditure pattern can thus be assessed from the stock market patterns, as this market comprises of rational and sophisticated people who fairly anticipate future trends and earn profits accordingly. Therefore, in this pandemic situation, the effects of COVID-19 are quite obvious, while considering the stock returns. However, the nature of the effect largely depend on the enterprises' businesses' nature as well. For instance, if an enterprise belongs to the pharmaceutical or information communication and media technology sectors, the effect would be positive, as there will be increased operations by such firms to alleviate and mitigate the damage caused.

On the other hand, in such a situations, enterprises belonging to the sector of tourism, lodging, dining, hotels, and restaurants are found to be at a higher risk, as such operations are significantly harmful towards the industry. However though such situations do not lead to obvious findings when it comes to the FDI. In recent times, this industry's operations have spread over both physical and virtual platforms, and hence such operations can also prove to be favourable for the FDI. Although this will probably not be the case at all times, as the people working in the industry will eventually have to gather and make the actual, physical product by ensuring their physical presence, which can eventually be made available to the online platforms. Hence, based on this notion, the present study has been conducted to precisely identify this industry's effect and repercussions, due to the eruption of the COVID-19 virus.

The study is thus based on the time-series data for China, which was taken from the time period spanning from 01-Jan-2020 to 15-Mar-2021. Moreover, in this regard, the data collected has a daily frequency for one independent variable which is COVID19, two control variables which are OIL and ER, and one dependent variable which is FDI. For analysis purposes, the "Quantile autoregressive distributed lag method" (QARDL) method was applied as the preferred statistical technique in this regard. According to (Cho et al., 2015), this technique helps to understand the relationship between the variables across the dependent variable's different quantities, which provide a more sophisticated analysis and robust offerings. The results that have been reported confirm the negative impact of COVID-19 on the FDI across all the quantiles, representing the bearish, normal and bullish market conditions. This was majorly also found in the case of the control variables that have been identified.

5.1. Practical (policy) implications

The present study offers several practical implications that are limited to the FDI and the industry that share similar characteristics based on the findings. First, the government policy regarding lockdown cannot be the only solution to stop the spread of the virus, as the industries cannot be put totally at a halt or closed down during the pandemic's evasion. Other than that, awareness needs to be spread amongst the public, and people should be encouraged to adjust to the new normal, and follow the guidelines of social distancing during the operations. Due to these measures being taken,

people will also mind the social distancing rules without putting the lives of other individual in trouble. Moreover, restricting the total number of working people can also be a good solution to ensure social distancing.

Secondly, since the FDI is reportedly found to be among the highly affected industries, therefore the government needs to intervene and provide some financial assistance to the market players. Such assistance can be direct in nature, whereby direct funds are released for the support. Support can also be indirect, whereby the government can provide relief to the enterprises of the industry, in terms of the delegation of taxes, and/or even tax waivers. Thirdly, this industry needs to have a maximum amount of utilization of the digital platform, and must use it as an alternate to display and showcase their products to the viewers. By this logic, production houses can simply save the expenses of distribution and screening. This would also provide viewers with the highest level of convenience, as they will be able to access the content on their own timings and terms. Lastly, companies need to rethink the cinema houses' design and layout, if they wish to continue their projects' physical screening in times of the pandemic. Such rethinking and redesign can help the production houses to maintain social distancing protocols, even if they are willing to watch the film together as a group. Such layout change can include cubicles, or it can also be initiated in an open environment where distance can be maintained. Nevertheless, by incorporating social distancing requirements, the projects' screening can be done without further spread of the COVID-19 virus.

5.2. Directions for future research

Following the limitations of the study, there are several potential directions for future research. Firstly, the present study is based on the case of China, which has the world's third-largest FDI. Hence the markets of the other regions need to be explored as well. Secondly, a comparative study can also be carried out in which a comparison of the magnitude of the financial loss can be carried out for SARS, Ebola, and the novel COVID-19 (Feng & Li, 2021). In addition to this, similar studies should also be conducted, while also assessing other kinds of risks, such as the supply and demand risks (Ahmed et al., 2020). Thirdly, the present study employs the QARDL approach, in which the independent variables are assessed on the quantile of the dependent variables. This can further be enhanced by exploring the independent and the dependent variables' responses and behaviour, on each other's quantiles. By employing the Quantile-n-Quantile regression, this purpose can be effectively achieved, providing more valuable insights from the data available (Gao et al., 2021). Lastly, an in-depth analysis can also significantly contribute towards the literature, in which industry-wise comparisons can be drawn, and their respective magnitude can thus be studied.

Disclosure statement

No potential conflict of interest was reported by the authors.

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