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COVID-19 and stock market nexus: evidence from Shanghai Stock Exchange

Chuanjian Li[a], Chi-Wei Su[b], Mehmet Altuntaş[c] and Xin Li[b]

[a]School of Economics, Qufu Normal University, Rizhao, China; [b]School of Economics, Qingdao University, Qingdao, China; [c]Faculty of Economics, Administrative and Social Sciences, Department of Economics, Nisantasi University, Istanbul, Turkey

ABSTRACT

The outbreak of the contagious pandemic Covid-19 has disturbed various economic and business activities across the globe. This has resulted in the declination of cash flows and revenues, which significantly increases the probability of corporate bankruptcies and adversely affects the stock market performance. The current study investigated the Covid-19 and stock market nexus whilst considering the Shanghai Stock Exchange (SSX). Covid-19 active cases and deaths have been considered proxies for the Covid-19 from 1 April 2020 to 30 July 2020. For empirical analysis, this study utilised quantile regression and dynamic ordinary least squares (DOLS). Empirical findings of both quantile regression and DOLS illustrate that both the Covid-19 active cases and deaths significantly decline the SSX closing index. However, the quantile estimates reveal that from lower (0.25) quantile to medium (0.50) to higher (0.75) quantile, the magnitude of these variables is found declining. Moreover, the frequency domain causality test confirmed the unidirectional causal relationship between the study variables, running from Covid-19 cases and deaths to the SSX. The findings are robust, which leads to providing practical policy implications that identified the need to revise health-finance-related policies and financial education to combat such circumstances in the future.

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1. Introduction

The contagious disease named Covid-19 appeared in December 2020 in Wuhan, China. The deadliest disease has suffered economies globally by halting production, distribution and lifestyle that considerably surges economic uncertainty (Baker et al., 2020; Su, Huang, et al. 2021). The pneumonia disease novel coronavirus was declared a pandemic by WHO on 11 March 2020. China was the first country to bear the shocks of the pandemic on both the economy and people's life living. The major solution found for the contagious disease was limiting it or stopping by introducing

CONTACT Chi-Wei Su cwsu7137@gmail.com
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the complete lockdown of big cities and limiting travelling, which generally affects the industrial businesses specifically and Stock exchanges (Su, Dai, et al., 2021). The Novel coronavirus is as severe as the great depression that has stopped the companies' sales and distribution networks, even most companies have vanished, and the stock markets are poorly affected across the globe, with the biggest economic losses for the Western world, including South America, Europe and Australia, Asian economies, such as China in this case. However, The Great depression crisis was endogenous, the bad decisions of market players, stockbrokers and bankers, whilst the Covid-19 pandemic is the exogenous crisis affecting the real economy. Additionally, the daily positive cases and fatalities compelled the Chinese government to propose a series of health-effective policies, including complete pandemic lockdowns that consequently disrupt China's business cycles and economy (Gao et al., 2021; Huo & Qiu, 2020). Thus, for the general Chinese public, the complete lockdown suspended all public transportation, schools, travel and public gatherings were prohibited (Huo & Qiu, 2020). Consequently, the economic activities have been substantially affected that anticipated the current economic slowdown. Besides, the stock market, which is a crucial part of every economy, is also affected adversely.

Since the recent Covid-19 pandemic has badly influenced all stock markets, especially Dow Jones and S&P from the USA, Shanghai Stock Exchange (SSX), Nikkie and Japan stock markets. The Dow Jones has a variety of companies whose stocks fell by 20% in the index; similarly, Financial times suggests that Nikkie Index, which trades on the Tokyo stock exchange, experienced downward shocks and fell accordingly the lockdowns and smart lockdowns periods. However, the Chinese stock market faced unmatched uncertainty during the Chinese New Year 2020, where the government imposed a complete lockdown during the last trading day of 2019. After the reopening of the stock market on 3 February 2020, it was expected that the reopening of the stock market would be a positive signal for economic circumstances but seemed risky (Huang et al., 2020; Umar, Mirza, et al., 2021). However, it is reported that the first day of the reopening of the stock market witnessed a significant downfall in trading. On the one side, (Huang et al., 2020) reported the downfall of the stock market in China, whilst on the other hand, Xinhua (2020) argued that contrary to the other financial markets, financial markets in China were not affected that much and remained stable and steady during the pandemic.

Generally, the Covid-19 disease is severe and will be more disastrous than the Global crisis of 2007–2008. Different monetary organisations have observed that the effects will surpass the global crisis of 2007–2008. According to the John Hopkins Coronavirus research center, 72.8 million cases are confirmed globally, whilst 1.62 million people have died. Accordingly, the Shanghai Stock market hit by the pandemic dropped significantly. During the lockdown, most companies related to travel and tourism, i.e. petroleum companies, Airline companies (since international flights were banned across the world), and Transport and Air Cargo companies.

Since we are working on the Pandemic effect on the resulting influence on the stock market, it is important to know how the world is reacting to their economies and stock markets and rescue them either by bailout package or investing in the health technology companies. Researchers and scholars have focussed on the impact

of the current contagious pandemic on various economic indicators, where the stock markets are playing a major role as it determines the health of an economy. The literature has been provided that empirically investigates the impacts of Covid-19 on stock markets for different countries and regions.[1] However, the most noticeable stock market SSX, empirical investigation of which could provide innovative policy implications, remained ignored by the scholars as China stood the first to witnessed the Covid-19 pandemic. To fill this gap, the current paper contributed to the existing literature by empirically investigating the SSX, which is a part of the stable economies of the world. The reason for selecting the SSX is that China first witnessed the outbreak of such contagious diseases in the world. This research investigates how the stock prices react to the pandemic and how the Covid-19 outbreak influences it. The purpose of the research is to check whether the Stock Market Index is affected by the Covid-19 daily positive cases, fatalities and recoveries and observe which variable affects the share market negatively or positively.

The remaining part of the research is organised as follows: Section 2 consists of a literature review. Section 3 specifies the model for the research and the following methodology, whilst Section 4 includes a discussion on the empirical results and the final part (Section 5), including conclusion and policy recommendation.

2. Literature review

Covid-19 is spreading across the world, and the daily positive cases are increasing day by day with the high rate of fatalities, and its impact on the economies of the globe is also severe. There are numerous studies available on the current pandemics and the pandemics that occurred in the past, which is highly relevant to the current outbreak in the world.

For instance, literature on the impact current pandemic (Covid-19) is empirically investigated on the assets management, price reaction and funds performance, equity funds performance and human capital efficiency, corporate solvency, mutual funds, Islamic equity, non-financial European firms and credit portfolios by Mirza, Naqvi, et al. (2020), Rizvi, Yarovaya, et al. (2020), Su, Sun, et al. (2021), Umar, Su et al. (2021), and Yarovaya et al. (2021), respectively. Specifically, Rizvi, Mirza et al. (2020) assessed the performance and investment style in the Period of Covid-19 and asset management for the European Union (UN) case throughout January to May 2020 by categorising the contagion spread into three phases. The findings reveal that social entrepreneurship funds exhibit a positive return throughout these phases. However, the majority of the sub-categories have fallen negatively. Empirical estimates also witnessed the switching to relatively low risk from high-risk options in investment and size strategies. However, (Mirza, Hasnaoui, et al., 2020) reveal that most investment funds have shown stressed performance.

Consequently, the social entrepreneurship funds exhibit flexibility whilst investigating January–June 2020 for the same case study area as prior. Concerning human capital efficiency and performance of equity funds (Yarovaya, Mirza, Rizvi, & Naqvi, 2020) examined 799 open-ended equity funds for the case of five EU economies. The study ranked these five countries in the five categories of human capital efficiency to

compare risk-adjusted-performance throughout these categories. The findings reveal that the higher-ranked equity funds surpassed their human capital efficiency counterparts during the covid-19 outbreak. Similar results have been discovered by Mirza, Hasnaoui, et al. (2020) for the case of Latin American countries' mutual funds; 95% of their investment in the Covid-19 infected region has been ranked according to their human capital efficiency 2019 base year. In the same line for EU economies, Mirza, Hasnaoui, et al. (2020) argued that Covid-19 had disturbed most businesses in the said group of economies, which declines the revenue and cash flows, consequently leading to the bankruptcy of these corporate sectors. The study introduces multiple stress scenarios on the non-financial listed firms and asserted that Covid-19 progressively increases the default probability of the corporate forms. Besides these shreds of evidence on the impact of a recent pandemic on the financial performance of the corporate firms, Rizvi, Mirza et al., (2020) investigated 5342 listed non-financial firms in 10 EU members over the period 2010–2019 and found significant losses in valuation throughout all the sectors because of the deterioration in sales and surge in equity cost.

In contrast, Yarovaya, Mirza, Rizvi, and Naqvi (2020) investigated Islamic equity funds, particularly emphasising the volatility timing, investment style and risk-adjusted-performance compared to their conventional counterparts Covid-19 period. The empirical estimates asserted that the Islamic equity funds are more flexible to the shock of Covid-19 as it surpasses their non-Islamic counterparts in the pandemic's peak months. Thus, the study argued that the Islamic equity funds are more useful for investors to hedge such pandemic risks. In another study, Yarovaya, Mirza, Rizvi, and Naqvi (2020) investigated 10 EU most affected Covid-19 economies by examining 255 credit institutes' quarterly data. Empirical findings reveal significant declination in the quality of assets across the profile of the countries, size of institutions and type of exposure. Also, the default probability of these institutes has been substantially increased whilst the capital adequacy has been considerably reduced.

Nuhu et al. (2020) observed the Covid-19 impact on China and the USA's stock markets. They used a simple regression model using the SSX time series data as a sample data for China, whilst Dow Jones was a sample indicator for the USA. The author used the time series data of 25 days, i.e. from 1 March to 25 March. The author shows a significant positive relationship between Covid-19 confirmed cases and the SSX and Dow Jones in the USA. The author also observed a strong impact of the pandemic on the stock markets of these two big economies. Additionally, Alfaro et al. (2020) investigate the unexpected changes occurring in the Covid-19 trajectories, predicting the expected returns of the equity and aggregated returns. The author collected the data of 4070 listed firms listed from bloom berg and yahoo finance. They applied real-time analysis of the firm-level stocks and aggregated returns. They found that the projected estimates of the Covid-19 trajectories are doubled, and the expected returns will either decrease or increase (vice versa). The findings also indicate that the pandemic's losses will increase when there is an intensity of leverage and capital. They also suggested that businesses will suffer losses that are more conducive to disease transmission.

Corbet et al. (2020) examined the contagion effect of Covid-19 in China. They suggested that the Chinese financial markets, especially the SSX and Shenzhen stock

exchange, served both the physical and financial stock markets. They further observed that several characteristics expected during the pandemic 'flight to safety' were present during the period analysed. They further suggested that during the severe financial crisis in China, the relationship between Chinese financial markets and bitcoins was evolved. Hence, a new product of bitcoin made its place in the Chinese financial markets. Ding et al. (2021) evaluate the relationship between corporate characteristics and financial shares reaction due to the daily cases of Covid-19. They examined the data of 6000 firms of 56 countries over the first quarter of 2020. They used the autoregression model based on the Covid-19 and financial variables of interest. They observed that the Covid-19 pandemic impact was lower on the company's stock prices, whose pre-finances, CSR is strong enough whilst less exposure in global supply chains and customer locations where the contagion disease was not much.

Amore et al. (2021) examined the fact of family ownership in the corporation during the pandemic. They used the Data of the Italian firms where the family ownership holdings were high in 2020. They tested how the inclusion of families and ownership affects the financial performance of the companies. They observed that the family ownership and inclusion of family members on the company's boards accomplished better during the pandemic. To check the transformation of financial products, S&P and Dow jones realised that in the first quarter of 2020, the Islamic equity indices outperformed their conventional equities. The period includes the novel coronavirus outbreak across the world. Ashraf et al. (2020) examined the Islamic equity indices' benefits for hedging purposes in US and European markets. They also examined whether sharia screening and evaluation impact the relative performance of Islamic equity performance. They found out that the Islamic equity indices, when screened under sharia, are useful for hedging purposes in severe market downfalls. However, the higher performance expectations can come with a price that is a high systematic risk.

Estrada et al. (2021) investigated the impact of the Covid-19 financially and economically. The paper analyses and formulates the spatiotemporal patterns of the Covid-19 on its occurrence, its relevance to the financial activity in the markets, and its further implications. They introduced the new geometric approach to capture all symmetrical and asymmetrical strategic graphical movements. Additionally, they introduced the new geometrical approach of Stagpression to find out the unexplored ways and areas where the economies of the world and the financial markets are going into, and also the model investigates the top 10 stock markets on the Stagpression model, which also analyse the capital markets behaviour in the current pandemic.

3. Materials and methods

3.1. Data Sources and model development

This study aims to investigate the hardly studied issue of the recent Covid-19 pandemic and the stock market for the case of China employing data from the SSX. However, for identifying Covid-19 impact on the stock market, we used daily data of the Covid-19 active cases and deaths and that of the SSX closing daily as utilised for 56 countries by Ding et al. (2021). Specifically, the daily data covers the time period

Table 1. Variables specification.

Variable	Specification	Period	Source
SSX closing	Shanghai Stock Exchange	1 April 2020 to 30 July 2020	Shanghai Stock Exchange
Cases	COVID-19 Active Cases	1 April 2020 to 30 July 2020	https://www.ecdc.europa.eu/en
Death	COVID-19 Deaths	1 April 2020 to 30 July 2020	https://www.ecdc.europa.eu/en

from 1 April 2020 to 30 July 2020. The variables, along with their specifications and sources, are provided in Table 1.

The infectious disease Covid-19, as earlier mentioned, the increase in cases and death from the Covid-19 compels the central government of China to impose a complete lockdown of China. The complete lockdown is thought of as a prominent and efficient health policy measure for the general public. However, this lockdown restricted transport, public gathering, travelling across the country and outside, and other business activities, which significantly disturbed the business cycle of China (Huo & Qiu, 2020). The upsurge in the Covid-19 affectees, directly and indirectly, suspended most of the economic activities, including the Shanghai stock market and a reopening after about 2 months of closing, the trading of shares significantly fall (Huang et al., 2020). Thus, both directly and indirectly, the Covid-19 could be considered a substantial factor in determining SSX conditions.

However, Most of the studies such as Ding et al. (2021), Mirza, Hasnaoui, et al. (2020), Mirza, Naqvi, et al. (2020), Rizvi, Mirza et al. (2020), Rizvi, Yarovaya, et al. (2020), Yarovaya et al. (2021), and Yarovaya, Mirza, Rizvi, and Naqvi (2020) have empirically found the negative influence of Covid-19 in different corporate, financial and non-financial institutes, and switching of the investors from risky to non-risky or low risky shares. This reveals that the overall impact of Covid-19 on all the businesses and corporate firms' equity. Hence, based on the previous findings, this study assumes the negative impact of Covid-19 on the SSX, generally presented as: $\theta_1 = \frac{\partial SSX_t}{\partial Covid-19_t} < 0$. Thus, following the study of Ding et al. (2021) and earlier discussion, the general model constructed is given below as:

Model-1

$$SSX\ \ closing_t = f(Cases_t, Deaths_t)$$

Hence, the regression model obtained from the pre-mentioned general model is provided below as:

$$SSX\ \ closing_t = \beta_0 + \beta_1 Cases_t + \beta_2 Deaths_t + \varepsilon \tag{1}$$

where the dependent variable is the China Stock Exchange closing value of the stocks for companies by large market capitalisation denoted by ($SSX\ \ closing_t$), the Covid-19 cases are denoted by $Cases_t$ and Covid-19 deaths are represented by $Deaths_t$, whereas the 't' in the subscript denoted the time of each variable daily in this case.

3.2. Descriptive statistics, unit root and cointegration

Before moving to estimate the prior model, we first estimated the descriptive statistics of the data. The descriptive statistics consist of the mean, median, range and the

normality value by the Jarque and Bera (1987) combined skewness and kurtosis test proposed by Jarque and Bera (1987), holding the null hypothesis 'the observations and the residuals are normally distributed'. The general equation for Jarque and Bera (1987) is given as:

$$JB = \frac{N}{6}\left(S^2 + \frac{1}{4}(K-3)^2\right)$$

For stationary check, we adopted the Augmented Dickey-Fuller (ADF) techniques proposed by Dickey and Fuller (1979), with the null hypothesis of 'the presence of a unit root in the data'. If this satisfies stationarity, we can move further to analyse the long-run relationship amongst the study variables. To identify the long-run association amongst the study variables, we utilised Bayer and Hanck (2013) cointegration techniques proposed by Bayer and Hanck (2013).

3.3. Quantile regression and causality test

We used the quantile regression model at three quantiles to identify the impact of explanatory variables on the SSX closing. Quantile reveals the impact of a particular part of the data set rather than the whole. Covid-19 is a recent global pandemic, and its impact is hardly identified because of its spreading nature. Therefore, we introduced three quantiles to check the impact of concerned Covid-19 variables on the SSX, particularly in 0.25, 0.50 and 0.75 quantiles. However, for the confirmation and total impact of the explanatory variables, we also employed robust regression. The cause of utilising a robust regression is to handle traditional parametric and non-parametric methods, such as the contamination of outlier in the data.

After estimating the quantile and robust regressions, it is essential to investigate the causal relationship amongst the studied variables. For this purpose, we used the frequency domain causality across the three periods, i.e. long-term, medium-term and short-term. The frequency domain causality holds a similar definition to the Granger causality in the time domain[2] (Tiwari et al., 2015).

4. Results and discussion

Before moving to the study's major findings, we estimated the descriptive statistics of the data provided in Table 2. The Covid-19 cases daily report at an average of 41.0909, with approximately 11 deaths on average. At the same time, the SSX closing reports a 2982.06 value on a daily average. The median values are reported as lower than that of mean values for all the three variables accounted for 19 active cases, zero deaths and 2907.0 SSX closing. During the earlier stage of COVID-19, the cases and death reports were reported as zero each. However, after, the values for cases and deaths reported as the highest of 352 and 1290, respectively. The number of deaths exceeds the number of active cases due to the unavailability of proper medication that could be used to cure the affectees. Also, the deviation from the mean value of each variable is shown as the standard deviation. The standard deviation (SD) for active cases is 55.37953, for deaths, the SD is 116.74900, and for SSX, the SD remains

Table 2. Descriptive statistics.

	Cases	Deaths	SSX closing
Mean	41.0909	11.15702	2982.06
Median	19.0000	0.00	2907.00
Maximum	352.000	1290.0000	3450.59
Minimum	0.000000	0.000000	2734.52
Std. Dev.	55.37953	116.74900	197.84
Skewness	2.654467	10.86114	1.10
Kurtosis	9.277409	120.96961	2.86
Jarque-Bera	576.0362	76156.92	16.129896
Probability	0.000000	0.000000	0.000314

Table 3. Unit root testing and cointegration test.

	Trend and Intercept	
Variables	I(0)	I(1)
SSX closing	−2.1019	−9.3785***
Deaths	−2.2150	−10.2943***
Cases	−2.2367	−12.160***
Bayer-Hanck Cointegration		
Tests	Statistics	Critical values at 5%
Engle-Granger-Johansen (EG-J)	14.2367**	10.895
Engle-Granger – Johansen-Banerjee-Boswijk (EG-J-Ba-Bo)	24.1270**	21.106

Note. *** and ** for 1% and 5% significance level.

197.84. The values of standard deviation reveal that the data contain fluctuations. Besides, the skewness and Kurtosis values have also been provided, which shows the non-normality of the data. The combined skewness-kurtosis Jarque-Bera normality test values are also presented in the same table for each variable. These values indicate the all the three variables, i.e. active cases, deaths, and the SSX index on the daily base reject the normality's null hypothesis and reveal that the data for these variables are generally not distributed as the p values are less than the general '.05' as a benchmark, which leads to rejecting the null hypothesis of data being normally distributed where skewness and excess kurtosis are being zero.

The results of the unit root test and cointegration are presented in Table 3. First, we employed the (Dickey & Fuller, 1979) ADF test on the level data, which shows insignificant results, leading to the conclusion for acceptance of the null hypothesis that the unit root is present in the data. Secondly, we employed the same (Dickey & Fuller, 1979) ADF test for stationarity on the data at the first difference. The results for all the three variables show significant results at $p < .01$, hence rejecting the null hypothesis of the presence of a unit root in the data at the first difference. Therefore, we accept that the data of all the three variables, i.e. SSX closing, deaths, and Covid-19 active cases, are stationary at the first level and satisfying the criteria for further estimations.

The results of the Bayer-Hanck cointegration test proposed by Bayer and Hanck (2013) are presented in the same Table 3. The under-discussion test proposed the null hypothesis, as there is no cointegration amongst variables. However, the estimation of the test reveals that both the Engle-Granger-Johansen (EG-J) and Engle-Granger – Johansen-Banerjee-Boswijk (EG-J-Ba-Bo) statistics are significant at 5%, as $p < .05$, which is satisfying the condition for rejecting the null hypothesis. Hence, it is

Table 4. Quantile regression analysis.

Variables	Coefficients	Std. Error	*t*-Statistic
Quantile (0.25)			
Cases	−0.034***	0.0018	−18.88
Deaths	−0.048***	0.0125	−3.84
Constant	1.850***	0.2184	8.47
Quantile (0.50)			
Cases	−0.0334***	0.0023	−14.52
Deaths	−0.0507***	0.01095	−4.63
Constant	1.302***	0.3162	4.117
Quantile (0.75)			
Cases	−0.0554***	0.00451	−12.28
Deaths	−0.088**	0.0234	−3.76
Constant	1.762***	0.4174	4.22

Note. ***, ** and * is for 1%, 5% and 10% significance level.

concluded that there is a long-run cointegrating relationship amongst the study variables.

Based on priorly presented unit root testing and cointegration estimation, we can run the quantile regression over the time series data to analyse the real impact of Covid-19 cases and deaths over the SSX closing index. The estimated results are presented in Table 4. The estimated coefficient values of the Covid-19 cases and deaths illustrate that the coefficient values are decreasing whilst moving from the lower quantile (0.25) to medium quantile (0.50) and then to higher quantile (0.75) in this case. Specifically, in the first quantile (0.25), a unit increase in the COVID-19 cases significantly decrease the SSX closing index by 0.034 units. Similarly, a unit increases if the deaths cause a significant declination of the SSX closing index by 0.048 units. Both the variables are noted as significant at 1% level, as $p < .05$.

In the second quantile (0.50), a similar negative influence is noted. If the COVID-19 cases increase by one unit, it significantly reduces the SSX closing index by 0.0334 units. In the same way, if the deaths increase by one unit, the SSX closing index significantly falls by 0.0507 units. The results are highly statistically significant at $p < .01$. Here, it is noted that the impact of both the variables is negative but lower in magnitude as compared to the first quantile (0.25). The third quantile also reports the negative and significant impacts of Covid-19 cases and deaths over the SSX closing at $p < .01$ and $p < .05$, respectively. An increase of one unit in each variable, i.e. Covid-19 cases and deaths, cause a significant reduction of 0.0554 and 0.088 units, respectively. The empirical estimates report that the influence is negative as the other two quantiles but lesser in magnitude than the earlier (0.25 and 0.50) quantiles. Hence, it is concluded that both the Covid-19 cases and deaths are hazardous to the SSX closing index. Our empirical results are consistent with Nuhu et al. (2020) study that COVID-19 negatively influences the stock market.

The quantile regression already showed the influence and coefficient magnitude in different quantiles. However, this is also important to identify the overall impact of Covid-19 cases and deaths over the SSX closing index by confirming the earlier estimates and provide robust results. For this purpose, we employed the dynamic ordinary least square (DOLS) as a robust regression, and the outputs are provided in Table 5. The estimated robust coefficient values indicate the negative and statistically significant impact on the SSX closing index. Specifically, a unit increase in the Covid-

Table 5. Robust regression analysis.

Dependent Variable: SSX Closing Dynamic Least Squares (DOLS)				
Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
Deaths	−0.217***	0.0323	−6.71	0.000
Cases	−0.0947***	0.0232	−4.018	0.000
C	2.623***	0.1670	15.70	0.000

Note. *** for 1% significance level.

Table 6. Frequency domain causality.

Causal link			Coefficients $\omega = 0.05$ Long-Run	Coefficients $\omega = 1.50$ Medium-Run	Coefficients $\omega = 2.50$ Short-Run
Deaths	→	SSX Closing Index	8.13***	6.12***	5.46***
Cases	→	SSX Closing Index	9.89***	6.17***	6.17***

Note. ***, ** and * is for 1%, 5% and 10% significance level.

19 deaths significantly reduces the SSX closing index by 0.217 units at $p < .01$. Also, the Covid-19 active cases increase by one unit, significantly reducing the SSX closing index by 0.0947 units at one percent level, i.e. $p < .1$. These results indicate that both the COVID-19 cases and deaths harm the SSX closing index significantly. These results showed consistency with the empirical findings of Alfaro et al. (2020), indicating that the businesses may suffer losses, which are more conducive for disease transmission.

The influence of Covid-19 cases and deaths are priorly discussed. However, it is essential to find a causal relationship between those variables for empirical estimation of economic variables. The estimated results for the long-run, medium-run and short-run are presented in Table 6 whilst employing the frequency domain causality test. The long-run estimates reveal a unidirectional and significant causal relationship at $p < .01$, running from Covid-19 active cases and deaths to the SSX closing index. Similarly, there is a unidirectional significant causal relation at $p < .01$ significance level in the medium-run, running from Covid-19 active cases and deaths to SSX closing index. Also, in the short-run, both the Covid-19 cases and deaths showed a unidirectional causal relationship running from Covid-19 to SSX closing index at 1%, 5% and 10% level of significance. Hence, there is unidirectional causal relation running from Covid-19 cases and deaths towards SSX closing index and significant in all the times, i.e. long-run, medium-run and the short-run.

4.1. Discussion

This section represents a detailed discussion on the empirical findings concerning Covid-19 and the stock market nexus. Here, the Covid-19 active cases and deaths are used as proxies that represent the overall influence of Covid-19 on the SSX index. The empirics of the unit root (Dickey & Fuller, 1979) ADF tests reveal that a unit root is present in the levelled data [I(0)], whilst the data after the first difference are found stationary. Also, the Engle-Granger-Johansen (EG-J) and Engle-Granger –

Johansen-Banerjee-Boswijk (EG-J-Ba-Bo) cointegration confirm the long-run association of the variables. This means that the variables are involved in the long-run relationship, which further leads us empirically investigate the impact of selected exogenous variables on the SSX performance. The empirical results of both quantile and DOLS confirm the negative impact of both active cases and deaths on the SSX index. The findings of this study are consistent with the empirical findings of Ding et al. (2021), Mirza, Hasnaoui, et al. (2020), Mirza, Naqvi, et al. (2020), Rizvi, Mirza et al. (2020), Rizvi, Yarovaya, et al. (2020), Yarovaya, Mirza, Rizvi, Saba, et al. (2020), Yarovaya et al., 2021). These earlier studies have mentioned that Covid-19 significantly and negatively affects the stock market, financial and non-financial institutes. However, economies with efficient human capital and investment in Islamic equity surpass the inefficient or less human capital and conventional stock or equity. As the quantile regression reveals that from the lower (0.25) quantile to medium (0.50) to higher (0.75) quantile, the impact of both the active cases and deaths are found to decrease. The decreasing impact of both of these variables is that from April to July, the active cases and death ratio is found declining. Besides, the investors are switching from risky stocks to risky low stocks (Rizvi, Yarovaya, et al., 2020; Yarovaya, Mirza, Rizvi, Saba, et al., 2020). That eventually reduces and diminishes the Covid-19 impact over the SSX closing index. Additionally, the frequency domain causality estimates report that increase in the Covid-19 cases and deaths significantly causes SSX closing index. Moreover, the results are found robust, which could provide practical policy implications for combating the negative impact of a current contagious pandemic on China's stock market.

5. Concluding remarks and policy implications

5.1. Conclusion

The contagious disease named Covid-19 has suffered economies globally by halting production, distribution and lifestyle that considerably surges economic uncertainty and consequently affects stock market performance. Since the Covid-19 emergence, stock markets across the globe faced losses of trillions of dollars. Therefore, empirical investigation of the current global pandemic on the stock market is the need of the time. This study is amongst the first studies investigating the impact of Covid-19 daily active and deaths on the stock exchange whilst specifically focussing on the SSX China. This study utilised the daily basis data from 1 April 2020 to 30 July 2020. In order to achieve the objectives of whether the Covid-19 active cases and deaths influence the SSX performance, this study adopted various econometric techniques, such as unit root testing, cointegration, quantile regression, DOLS as a robust regression, and finally, that causality test.

Empirical results of these tests reveal that the data is stationary at I(1). Also, the long-run cointegration exists amongst these variables: that is, the Covid-19 active cases, deaths and SSX are associated in the long-run. The quantile regression results are though the same in the direction of impact, i.e. negative across quantiles. However, a change has been observed in the magnitude of coefficients for both the Covid-19 active cases and deaths. Specifically, moving from the first (0.25) quantiles

to the second (0.50) and the third (0.75) quantiles, the magnitude of the coefficients is found decreasing, respectively. The robust regression DOLS also confirms the negative and significant impact of the COVID-19 cases and deaths over the SSX index. This study also utilised the frequency domain causality test, which provides evidence of causal relationships for the long-run, medium-run and short-run amongst the variables. This study evident the long-term, medium-term and short-term causal relationship amongst the variables, running from COVID-19 active cases and deaths to SSX index.

5.2. Policy implications

The empirical findings of this study recommend some practical policy implications that may help sustain the SSX index. First, as the earlier discussion reveals, the general public's good health contributes to economic activities in the region and so to the stock market. In this regard, the health-related policies should be revised that contribute to health and stimulate the stock market performance. Second, most people lose their jobs or face declination in income, due to the lockdown environment, because of which the demand side of the shares has been fallen. In this regard, an alternative approach to the government-imposed lockdown could be beneficial, such as 'self-lockdown' for the businesses to decide what best for them given its circumstances. Moreover, to circulate the money in an economy via stock markets, proper financial education is required that can make the investors and businesses deal with the unpredicted and unexpected circumstances. As it is empirically found by Yarovaya et al. (2021) and Mirza et al. (2020) human capital efficiency significantly surpasses inefficient human capital firms and stocks.

Lastly, this study is limited only to investigate the data for the available 4 months. However, this study recommends the future researchers timely investigate the impact of current pandemic active cases and deaths on the stock market performance to timely adjust the policies that might help the businesses and investors from bankruptcy. Also, this study only focussed on the SSX for empirical analysis; however, studies in the future could also extend the current study by investigating a panel of developed or developing countries or both groups.

Notes

1. See Section 2, for the previous studies.
2. It is important to note that the Granger (1969) approach to the question of whether Y causes Z is to determine how much of the current Z can be explained by past values of Z, and then to see whether adding lagged values of Y can improve the explanation. Z is said to be Granger-caused by Y if Y helps in the prediction of Z, or if the coefficients of the lagged Ys are statistically significant. It is important to note that the statement 'Y Granger causes Z' does not imply that Z is the effect or the result of Y. Granger causality measures precedence and information content but does not of itself indicate causality in the more common use of the term.

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ORCID

Chi-Wei Su http://orcid.org/0000-0001-9722-8105
Mehmet Altuntaş http://orcid.org/0000-0003-2040-3168

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