



Does COVID-19 impact on financial markets of China—evidence from during and pre-COVID-19 outbreak

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Abstract

During the outbreak of COVID-19, concern significantly influenced our financial system. This new paper's primary assessment of the COVID-19 virus affects the world's major economies and financial markets. This paper utilizes an event analysis approach and a data model to investigate the influence of COVID-19 on the financial market system from three viewpoints: (1) supply chain finance and titles, (2) processing system, and (3) the financial system of the organization. According to data analysis, the model built in this work may properly depict the influence of COVID-19 on the financial market system. The results indicated that the low age coefficient (p -value ($p < 0.05$)) and a higher blocking condition (p -value ($p > 0.05$)) impact city tourism market system with p -values of 0.002 and 0.004, respectively. Other results show the impact of the Chinese New Year vacations. Since then, the government has slowly stabilized its recovery, with many measures taken to limit the epidemic in February and a series of regulatory measures enacted to stabilize financial markets. These findings show a small but statistically significant degree of stabilization in international financial markets in response to stay-at-home government policies and social distancing measures, which is encouraging for political actors concerned about economic performance during the coronavirus 2019 pandemic response.

Keywords Finance market system · COVID-19 · Market economy · Supply chain finance · China

Introduction

The outbreak of COVID-19 started in China on December 31, 2019, and has spread to 220 nations and regions. The World Health Organization (WHO) issued a global epidemic announcement on March 11, 2020 (Chen et al. 2021b). Since the COVID-19 epidemic disturbed everybody, irrespective of nationality, ethnicity, color, or faith, it is a democratic virus. An out-of-control pandemic has drastically altered people's lives, which has bound governments to close universities, schools, workplaces, and places of devotion like churches, mosques, and temples (Yumei et al. 2021a; Huang et al. 2022; Abbas et al. 2022). In order to stop the spread of the disease, several governments have locked down large metropolises and cities by forbidding public meetings such

as weddings, funerals, sporting events, national holidays, and tourism attractions (Lei et al. 2022b; Wu and Zhu 2021). People were obliged to “remain at home” because of these constraints (Bayramova et al. 2021; Yumei et al. 2021b). An unprecedented and quickly spreading COVID-19 pandemic (Lei et al. 2022a) necessitates the development of tailored therapies (Mota et al. 2021).

Concerns regarding the COVID-19 epidemic continue to grow because of the absence of clearness in the report about the epidemic (Chen et al. 2022) and the lack of adequate drugs (Albulescu et al. 2021). As a result of this widespread anxiety about COVID-19, economic activity worldwide has decreased, especially in the manufacturing and supply chains of commodities and services (Liu et al. 2022). This pandemic also has a negative impact on the global economy, as it reduces travel and trade and worsens local food shortages (He and Ortiz 2021). Because of a combination of supply, demand, and uncertainty shocks caused by the COVID-19 outbreak (Hu et al. 2021), prominent banks and institutions in a number of nations were obliged to reduce their growth estimates by closing offices, factories, air transportation, cafeterias, and retail outlets (Mahmoud et al. 2021). The spread

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of COVID-19 has been described by Bilal et al. (2021) as a big shock to worldwide economies, leading to a dramatic slump in the stock market. Financial markets worldwide have responded negatively and behaved in ways not seen since the financial disaster of 2008 as an outcome of the global spread of COVID-19 (Pedauga et al. 2022). In Pedauga et al. (2022), the US S&P-500 index fell to its lowest point ever in a single day on March 12 and 16, 2020, while the Shanghai stock market collapsed by 8% on February 3, 2020 (Wei and Han 2021). Financial markets worldwide are experiencing volatility and unfavorable aggregate market reactions because of the ongoing pandemic of COVID-19 (Boamah et al. 2022). COVID-19 outbreak, government responses, and major central bank policies all have an impact on the long-term impact of worry on financial markets and global GDP (Yao et al. 2022). Without an immediate fix, the impact on financial markets will worsen (Liu 2020).

Global financial markets have been forced to reevaluate their strategies because of the rapid spread of the pandemic COVID-19 among lawmakers, researchers, and academics. There are four ways in which this study contributes to the existing literature. For starters, by examining the expanding influence of COVID-19 on worldwide economic markets over extended time periods, this study aimed to deliver a firsthand account of the continuing endemic. The business market's response to the COVID-19 epidemic is quite the latest and has a short time sequence (Baser 2021). Future studies could investigate using lengthier time runs to obtain more solid outcomes, as suggested by Liu et al. (2022).

Another unique feature of this investigation is that it examines the marketplaces of both developed and developing nations, grounded on the significant number of confirmed cases. Emerging market economies like India, China, and Brazil were also affected by the COVID-19 pandemic's first wave of infected individuals (Clampit et al. 2021). The COVID-19 pandemic is one of the biggest macroeconomic shocks that affects both established and developing economies, according to Zhang et al. (2021a, b, c, d). Only a single market or developing markets (Tomé et al. 2022) are considered by contemporary academics, who do not consider both developed and developing countries simultaneously. Moreover, global samples are needed for comparison analyses (Gerth et al. 2021) in this vein.

As the most recent studies have shown, the influence of the WHO's authorized declaration concerning the COVID-19 epidemic, casualties reported, new COVID-19 tests directed, the optimistic progress rate of COVID-19 infection and life expectancy index, poverty index, and development index on market returns in developed and developing countries were examined in this study. When several variables are considered, the problem of neglected variable bias is less of a concern, and stock market return fluctuations can be explained with greater precision (Mitrega and Choi 2021).

This research employs robust approaches like the event analysis approach to gauge the impact of the COVID-19 pandemic on global financial markets. Researchers have used either static panel models (Ganlin et al. 2021) or conventional event-study approaches to examine the association between the COVID-19 pandemic and market returns in recent years (Goodell and Goutte 2021). According to Rahman et al. (2022), modern penalized regressions could provide reliable estimates of financial market returns during the COVID-19 pandemic. Furthermore, long-term investigations are needed to gather data on financial markets during the pandemic of COVID-19 (Kawasaki et al. 2022).

Our goal is to examine the financial markets' response to the COVID-19 pandemic in the most impacted nations and compare the outcomes of two subsamples, developed and emerging. This study focuses on the first and only investigation of global financial market returns during the COVID-19 pandemic in developed and emerging markets.

As a result, the study indicates that news reports of confirmed COVID-19 regular casualties and the increasing rate of new COVID-19 cases have negatively impacted stock market returns in recent months. Just to summarize, the world markets have been harmfully disturbed as expected by the COVID-19 epidemic. For both emerging and developed markets, however, the analysis indicated that the news declaration of new COVID-19 daily casualties had a favorable influence on the returns of emerging markets: (1) supply chain finance and titles are two research contributions in this work, (2) the organization's processing system, and (3) its financial system. Specifically, we will examine whether panic and terror had a stronger impact on Chinese financial markets than health concerns.

Here is how the rest of the document is organized: related literature is defined in the "Review of literature" section. The "Study design" section offers the empirical findings, while "Results and discussion" section summarizes the results.

Review of literature

The outbreak of COVID-19

In a study by Cucignatto et al. (2022), the backdrop of the emergence of COVID-19 and Wuhan's lockdown is thoroughly examined. As a result, there is only a quick summary here. In December 2019, the COVID-19 virus was first detected in China and gained worldwide attention in mid-January 2020. There has been a huge rise in cases of COVID-19 infection following Khokhar et al.'s (2022) confirmation of human-to-human transmission on January 20, 2020. A total lockdown of Wuhan took place on January 23, 2020. Beginning on January 24, 2020, the Lunar New Year celebrations will take place in the USA. As of 28 January

2020, COVID-19 had infected more people than SARS had afflicted. As of the end of January 2020, the virus had spread to a large number of countries. New cases in Wuhan hit their peak on February 12, 2020. On March 18, 2020, the number of new cases in Wuhan was zero for the first time. The Wuhan lockdown policy was abolished on April 8, 2020.

Shocks to the stock market

Many books and articles have been written about stock market volatility (Sharifi and Khavarian-Garmsir 2020; Benlagha and El Omari 2022; Khokhar et al. 2022). For example, stock market shocks are a major factor in volatility. Aggregate shocks (Lv et al. 2022), for example (Ahmadi et al. 2020; Siddique et al. 2021; Belitski et al. 2022), and shocks to exports (Dvorak et al. 2021; Kumari and Bhateja 2022) are among the several kinds of jolts to the economy that have been studied in the literature. Other kinds of shocks to the economy include shocks to commodity prices, labor supply, dual-earner couples, personal financial wealth, and other financial markets (Onofrei et al. 2021). Information shocks are also examined in this area of research (Vătămănescu et al. 2021). Careers in investment banking are tied to stock market volatility (Shirish et al. 2021).

The outbreak of COVID-19 and financial markets nexus

As an outcome of the COVID-19 epidemic, healthcare systems worldwide have suffered, and financial markets have been shaken (Pu et al. 2022). Border closings, company lockdowns, and self-isolation have been implemented by governments worldwide as a precautionary measure against the spread of the epidemic (Chick et al. 2020; Bermes, 2021). The three main ways the pandemic has affected the energy market are detailed as follows.

As a first step, many nations have imposed border closures due to the COVID-19 epidemic. All foreigners from specific countries have been barred from entering the USA by the government of the United States (Puaschunder and Gelter 2022). As a direct result, fewer people will choose to travel. Since there is fewer requirement for flight and other kinds of travel, the need for energy is minimized appropriately (Irfan et al. 2021a); energy transmission could potentially be slowed down by travel restrictions (Sanchez-Lorenzo et al. 2021). We should expect a dramatic increase in energy supply volatility if a political affair works as a catalyst (Ali Shah et al. 2021; Carpio et al. 2022). OPEC, for example, was unable to agree on a production quota accord because of a dispute between Saudi Arabia and Russia (Wu and Zhu 2021).

There has also been a disruption in the supply chain due to widespread business shutdown (Zhang et al. 2021a; Wu

and Zhu 2021). Supply chain disruptions and lower raw material demand due to decreased production have also reduced energy usage, hence lowering energy demand (Chaar and Bromwich 2021). Supply and demand are the primary factors that influence the price of a product in any market. Reduced energy demand and fluctuating energy supply have produced an excessive risk for the energy market, leading to an increase in energy prices (Le and Nguyen 2022).

Self-separation has also stifled population mobility. Self-separation also reduces utilization and results in employment losses for the working class (Travaglio et al. 2021). Market risks are greater for the energy industry because of its large assets and high energy use. As demand declines, revenue declines, production is hampered by a lack of skilled workers, and the rising cost of large fixed assets adds to the instability of business operations. This causes a decrease in the value of the company's stock, which increases the financial market's instability (Bollain-Parra et al. 2021).

Fears of an approaching economic crisis have grown due to the aforementioned three actions (Yuan et al. 2021). To avoid risk when dealing with uncertainty, investors tend to have negative views on the market's future outlook (Ye et al. 2022). Investors are more prone to engage in herding behavior in these circumstances, following the lead of their fellow investors. Delaying investments and broad-based selling are the results of this type of behavior (Zhang et al. 2021d). Stock price dropping is one of the effects, which increases financial market volatility and uncertainty and, as a result, risk aversion (Isabelle et al. 2022). As a result, a vicious cycle is created. Since the stock market and the energy market have a strong co-integration relationship, there is the potential for heightened volatility in both markets (Chen et al. 2021a). Surges in the energy stock market have occurred throughout the pandemic because the stock price acts as an indicator of market activity, and most price hurdles are tailed by an increase in volatility (Su and Urban 2021).

In spite of their very different production methods, the fossil fuel and renewable energy sectors share the same business atmosphere and are consequently interdependent. An event in one market can quickly spread across borders and create a systemic co-movement after danger has been identified (Siddiqui et al. 2021; Irfan et al. 2021b).

Studies have focused mostly on the correlation between energy commodities, notably oil products, and their volatility spillovers (Khan et al. 2021; Woon Leong and Bee Lian 2022). Alternatively, the research examines how the global energy stock market moves in tandem (Eton et al. 2022). Studies on the COVID-19 epidemic and China's energy stock market spikes are few and far between. Based on this, this report aims to answer the following questions: What impact will the COVID-19 pandemic have on the

financial markets? Is fiscal and monetary policy relevant to the COVID-19 pandemic's financial market disruptions? As a result of the COVID-19 epidemic, what fiscal and monetary policies should be enacted in the future?

Study design

Theoretical framework

The event analysis approach begins by identifying the events that might lead to a performance overshoot. The discrepancy between actual performance in the event window and expected performance without the event is referred to as extreme performance and abnormal performance. It may be expressed in the following way (Hallerberg et al. 2009),

$$[AR_t | X_t] (AR_t = R_t - E) \quad (1)$$

Additional income, actual revenue, and projected return over time are represented by (AR_t, R_t) and $E [R_t | X_t]$ correspondingly (T and X_t). The predicted rate of return is intended using the specified model, and the model parameters are determined using the data for the estimated time. This straightforward treatment, however, might occasionally result in difficulties. When a savage event, such as a corporate (R) event, is on the horizon, we refer to it as such. Serious events, such as rising interest rates at the Federal Reserve and changes in accounting standards, frequently occur simultaneously as the market's development. The Chinese stock market is so volatile that it defies the fixed income concept in stocks. As a result, we utilized the market model in this study since the lessons obtained from this model are not persuasive. At the same time, asset returns must be independent and dispersed equitably.

The projected return of the I value at time t is

$$(R_{it} = ai + iR_{mt} + I) \quad (2)$$

(R_{mt}) stands for market performance, and I is a random shock phrase among them. The following equation is one that I agrees with:

$$E(ei), VAR(ei) = \sigma^i \quad (3)$$

If you pick $L1$ as the expected period length, all of the estimated periods have the following advantages:

$$R_i = X^i \theta_i + \varepsilon_i \quad (4)$$

R is the matrix in row $L1$ that represents the input of values during the estimate period (X^i is $L1 * 2$), and $L1 * 2$ is the matrix.

The matrix's first column includes only one value, whereas the second column solely contains market returns.

$$\theta_i = [a_i, \beta_i] \quad (5)$$

The formula above represents the parameter table. To obtain unbiased and consistent parameter estimations, use the least squares approach.

$$\theta_i = (X_i' X_i)^{-1} X_i' R_i \quad (6)$$

$$\hat{\sigma}_{\varepsilon_i}^2 = \frac{1}{L1 - 2} \hat{\varepsilon}_i' \hat{\varepsilon}_i \quad (7)$$

$$\begin{aligned} \hat{\varepsilon}_i &= R_i - X_i \hat{\theta}_i \\ Var(\hat{\theta}_i) &= (X_i' X_i)^{-1} \hat{\sigma}_{\varepsilon_i}^2 \end{aligned} \quad (8)$$

The following is a list of the extra revenue earned during this time period.

$$AR_i = R_i^* + \bar{a}_i - \hat{\beta}_i R_m^* = R_i^* - X_i^* \hat{\theta}_i \quad (9)$$

The $L2 * 2$ vector of the equation $AR_i = R_i^* + \bar{a}_i$ reflects the actual input of the I value in the event window. (The X_i^* matrix is an $L2 * 2$ matrix.) The matrix's second column is made up of units, and the matrix's second column is made up of market returns. The excess performance vector (abnormal performance) fits the following requirements if there is no change in aviation inventory during the event window (AR_i in N)

$$\begin{aligned} AR_i &\sim N(0, V_i) \\ V_i &= I\sigma_\varepsilon^2 + X_i^* (X_i^* X_i)^{-1} X_i^* \hat{\sigma}_{\varepsilon_i}^2 \end{aligned} \quad (10)$$

To check if the assumptions are true, enter the CAR of the cumulative excess returns. Define $(CAR_i = (1, 2))$ as the cumulative excess return in the event window, and vector ($L2 * 1$) of title I from (11, 12, and 13)

$$\begin{aligned} J1 &= \frac{CAR(\tau_1, \tau_2)}{\hat{\sigma}(\tau_1, \tau_2)} \sim N(0, 1) \\ \hat{\sigma}^2(\tau_1, \tau_2) &= \frac{1}{N^2} \sum_{i=1}^N \delta_i^2(\tau_1, \tau_2) \\ J2 &= \left(\frac{N(L1-4)}{L1-2} \right)^{1/2} SCAR(\tau_1, \tau_2) \\ SCAR(\tau_1, \tau_2) &= \frac{1}{N} \sum_{i=1}^N SCAR_i(\tau_1, \tau_2) \end{aligned} \quad (11)$$

In financial market research, event research methodologies are commonly used to explore the influence of unanticipated events (mergers, acquisitions, earnings releases, refinancing operations, and so on) on share prices (or corporate securities). It is divided into six stages: interpretation, analysis, and conclusion. To put it another way, specify the event you wish to look into. The event study includes the estimation window, the event window, and the post-event window. Use the characters (L) for the event time, $=0$ for the event label, and $(= T1 + 1a = T2)$ for the event window.

The length of the event window is represented by the symbol ($L1 = T2T1$), the interval represents the estimated window length ($= T0 + 1a = T1$), and the estimated window length is represented by the symbol ($L2 = T1T0$).

Calculate the usual rate of return using the information in the quotation window. A reasonable estimated window length ($L2$) should generally have at least 120 data points. Because the event window is used to assess if an occurrence influences the stock price, the duration of the event window is uncertain and is mostly chosen by each study goal. Following the definition of the event, a random examination of the event must be determined—the cost of an exchange transaction. Factors impacting data availability, such as data availability for businesses listed on the Shanghai or Shenzhen stock exchanges, are factored into the standard. Furthermore, industry-specific rules must be taken into account. It is also crucial to take into account the likelihood of sample mistakes. It is critical to monitor normal and abnormal returns in the event window to assess the impact of an event on stock prices. The terms “normal performance” and “bad performance” relate to the difference between actual and expected performance in the event window, while “normal performance” refers to expected performance in the absence of events. The real income symbol (Rit), the normal income symbol (Eit), and the abnormal income symbol (Ait) are all used to represent different types of income (it). The following conclusions may be made from the preceding definition of anomalous income (Gnezdova et al. 2022): ($it = Rit - Eit$) (22). There are several approaches to determining average stock returns, but they may be grouped into two groups: statistics and economics. Econometric model approaches generate normal returns using statistical assumptions about asset returns, but they overlook the effect of economic theory on normal returns. The calculation of normal returns in economics is not just dependent on statistical assumptions but also on economic assumptions about investor behavior. However, statistically valid assumptions must be established when utilizing an economic model. As a result, the fundamental benefit of the economic model is that it may be used to restrict normal returns using constraints other than economic constraints accurately.

Econometric model and data

(Rit) is the symbol for the stock's true performance at time t , and (Rmt) is the symbol for the market. Panel-based experiments reflect advancement by leveraging additional knowledge that arises from incorporating the cross-sectional dimension. This situation can also be broken, for example, because of standard oil price shocks. Inapplicably assuming cross-sectional independence will distort the panel find (Banerjee et al. 2004; Urbain and Westerlund 2006).

Therefore, our analysis controls for cross-section dependencies by taking into account a standard factor structure.

$$\begin{aligned} Y_{i,t} &= \varepsilon_{1t}F1_t + E_{1i,t} \\ &\text{and} \\ X_{i,t} &= \varepsilon_{2t}F2_t + E_{2i,t} \end{aligned} \quad (12)$$

where the cross-sectional part of $I = 1, \dots, N$, where the cross-sectional part of $I = 1$ and $t = 1, \dots, T$ refers to the time frame. F shows the popular factors. The popular and idiosyncratically built components can be integrated by order one, $I(1)$, or stationary, $I(0)$, which implies that the sequence test strategies suggested by Gengenbach et al. (2006) are used as a separate test for unit roots and co-integration relations. Co-integration means that the normal and the particular parts of the error term are stationary. We do investigate occurrences using a multivariate approach. The advantages of this beautiful location are quite restricted. Indeed, variables other than market forces can only partially explain this phenomenon, making it unable to lower the variance of anomalous returns much. Subsidization is a method of reducing the cost of a product. Low national energy prices have resulted from energy and increased energy intake. As a result, examining the association between economic growth and energy consumption on a global scale is essential. The demand side is the best place to start when looking at this industry. Considering oil costs and the economy, the multivariate co-integration of manufacturing and energy consumption approach is the best technique. Removing the income components related to changes in market returns, lowering the anomalous income shift, and simplifying the validation of event detection, the market model enhances the work of the constant average income model. The advantages of employing a market model are determined by the difference in ($R2$) values achieved after a market model regression. ($R2$) The higher the value, the more data there is to reliably anticipate normal returns in the event window, and the lower the outlier variance. From this perspective, the market approach appears to be more advantageous.

$$\sum k \Delta p_t \frac{1}{4} a^3 x \sum i = k i \frac{1}{4} l \beta_{3i} \Delta \gamma i p \sum i z i \frac{1}{4} R M T_T 1 \varepsilon \mu 3_i \Delta Z_t 4 i p \quad (13)$$

$$\Delta Z_t \frac{1}{4} a^4 p \sum i = k i \frac{1}{4} l \beta_{3i} \Delta Z_t i p \sum i k i \frac{1}{4} l 4_i \Delta y_t i p \quad (14)$$

$$\sum k i p_t 1 \mu^{4i} \Delta x x t_i \sum i k i \frac{1}{4} l \beta_{3i} \Delta \gamma i p \sum i z i \frac{1}{4} R M T_T 1 \varepsilon \mu 3_i \Delta Z_t \varphi 5 i p \quad (15)$$

Factorial models help explain the content of an individual's purchasing and selling behavior since people value various aspects when they purchase and sell stocks. As a result, by minimizing the variance of the anomalous content of

income, a factorial model may better describe the behavior of normal variations in income. In addition to factorial models, multifactorial models are increasingly used to estimate genetic factors. International experts, for example, debate the efficacy of multifactor index models based on industry rankings. The difference between real returns and investment portfolios of firms of comparable size, which is the size of the companies divided by the current market value of the securities in question, is another variable in the factorial model. The disparity is substantially less if the firms in the sample share common features, such as focusing on the same industry or market capitalization group. The employment of a multifactorial model should be explored at this time.

Data

We use the (1) supply chain finance, (2) processing system, and (3) the financial markets system, which includes the financial markets of China. Because COVID-19 had a significant influence on financial markets and the supply chain finance, the Chinese yuan exchange rate and processing system are considered. Our research covered the pre-COVID-19 period (January 1, 2007, to December 31, 2019) and the COVID-19 period (January 1, 2020, to December 31, 2020). We may get a reasonable estimate of variable properties from the descriptive statistics (Table 1). The SD (standard deviation) of the financial markets system is much higher than those of other markets, as shown in Table 1. There is a right skew in the daily volatility series of the seven financial markets. No variable is white noise, regularly distributed, or non-stationary, according to the LB, JB, and ADF test findings.

Results and discussion

The epidemic in the market financial system

For this pandemic, we used daily infection, suspicion, ICU, mortality, and recovery rates from the People's Republic of China's National Health Commission Footnote 16. In the 14 days preceding the development of symptoms, those with a cough, fever, or dyspnea were judged to have a suspected infection if they were in touch with someone infected with COVID-19 or had returned from a high-risk area.

In order to determine how COVID-19 shocks distress the Chinese stock market, we need to know how volatile certain variables are. Stock market price movements are employed as the primary indicator of volatility in this study, which is the primary focus of this research. According to theory, a company's stock price can fluctuate due to changes in its intrinsic value and outside influences. Since the stock price of a publicly traded company is based on its financial success, market fluctuations should also be found on that performance. Thus, listed firms' economic performance is predicted to significantly influence stock market volatility as a major aspect of the stock market. The stock market's steady growth is based on the performance of listed companies, which has been proven in more mature markets—the risk and volatility of the entire market increase if the overall functioning of listed corporations diminishes.

So, as you might expect, an upsurge in the business' earnings per share means an upsurge in its stock's intrinsic value as well; conversely, an increase in the company's earnings per share means an increase in the intrinsic value of the stock as well. We use total revenue, operational costs, and operating profit as proxies for a company's market value, operating capacity, effectiveness, and other factors because of the financial independence and complementarity of each statistic. The East Money database was used to obtain the annual financial reports. In the 17th paragraph of the

Table 1 Descriptive statistics

	Shanghai	Beijing	Nanjing	Xian	Financial markets	Chinese yuan	Supply chain finance
Mean	9.40E-05	1.03E-04	8.58E-05	1.93E-04	9.71E-05	4.50E-05	8.45E-04
SD	2.66E-04	2.30E-04	2.25E-04	3.41E-04	2.68E-04	1.24E-04	1.28E-02
Minimum	8.36E-07	1.46E-06	1.25E-06	3.16E-06	2.63E-06	3.00E-09	6.00E-09
Maximum	5.95E-03	3.76E-03	6.14E-03	4.78E-03	1.03E-02	4.62E-03	6.89E-01
Skew	10.2	8.68	12.41	5.81	21.86	22.27	51.88
Kurtosis	147.32	102.36	234.67	49.39	734.14	700.33	2772.7
LB test	8877.90***	7477.60***	3047.50***	6073.70***	2943.80***	1378.60***	150.54***
JB test	2.8E+06***	3.2E+05***	6.9E+06***	6.7E+07***	1.3E+06***	6.1E+07***	9.6E+08***
ADF test	− 8.21***	− 8.77***	− 8.34***	− 8.39***	− 8.77***	− 9.05***	− 12.58***

***, **, and * denote the rejection of the null hypothesis at the 1%, 5%, and 10% significance levels, respectively

footnote, because of the study's practical value and the data's veracity, we utilize the year prior to the outbreak of COVID-19, which ended on December 31, in the financial report.

In addition, we consider the volume of purchases, the price-to-book ratio, the total market capitalization, and the variations and percentage fluctuations in daily returns. We can infer a lot about changes in market sentiment from variations in trade volume; therefore, we utilize that to reflect the attitude of the market. A company's value is determined by its overall market capitalization, which includes all of its outstanding shares. A company's total market capitalization is an essential measure of its size since it influences a variety of factors that matter to investors. P/B measures the market's estimation of an organization's equity in relation to the book value of that entity's equity. The market value of a company's shares is a forward-looking indicator of its expected future cash flows. You should first determine some general criteria or a range of P/B ratios in order to better understand a company's potential for growth by taking into account numerous other elements and valuation measurements. On the SHSE and SZSE, China's two largest stock exchanges, we aggregate stock shares that have been traded on these exchanges. East Money provided the information as well.

The epidemic on market supply and demand

In light of the paper's title, we wonder if the COVID-19 epidemic is causing market panic. This question has been answered emphatically, according to our findings. There should be negative and significant coefficients in Tables 2 and 3 for the pandemic variables, such as daily rates of illness or supposed infection, casualties, and ICU patients. As a result, when these four variables are more frequently reported, the stock market becomes more agitated, resulting in lower daily returns for stock prices. A positive and significant coefficient is expected for the variable for recovery. In spite of the contradiction between the empirical findings and the theoretical framework, we are still working to enhance the models.

To investigate the influence of confinement (LD) and age group (Age) on the frequency of individual visits or participation in city site activities, ANOVA is utilized, as shown in Tables 1 and 2. A low age coefficient (p -value ($p < 0.05$)) and a higher blocking condition ($p > 0.05$) can be utilized as adequate criteria to predict the influence of age on all access frequencies. Space has an impact on city tours. With p -values of 0.002 and 0.004, respectively, the effects of age and blocking on vibrant health and yoga (H&Y) were demonstrated, as shown in Table 2 and Fig. 1. The impact of confinement on other activities like relaxing, walking, running, and seeing friends, on the other hand, is yet unknown ($p > 0.05$). He shifted his weight. The aging effect might

Table 2 Frequency of trips to urban regions by persons

Source	DF	SS	MS	<i>F</i>	<i>p</i>
Once a day					
LD	1	4.08	4.083	0.10	0.762
Age	2	986.17	493.083	11.86	0.004
Error	8	332.67	41.583		
Total	11	1322.92			
Twice a day					
LD	1	3.000	3.000	0.41	0.540
Age	2	90.500	45.250	6.19	0.024
Error	8	58.500	7.313		
Total	11	152.000			
Visit a day after					
LD	1	0.333	0.333	0.06	0.816
Age	2	487.167	243.583	42.21	0.000
Error	8	46.167	5.771		
Total	11	533.667			
Visit a week					
LD	1	8.33	8.33	1.82	0.214
Age	2	6604.67	3302.33	720.51	0.000
Error	8	36.67	4.58		
Total	11	6649.67			
Never					
LD	1	0.083	0.083	0.01	0.936
Age	2	457.167	228.583	18.72	0.001
Error	8	97.667	12.208		
Total	11	554.917			

Source: Author calculation

obscure or confound the blocking effect. A mild negative blocking impact comes from a non-quantifiable interaction between these two elements (p -value). As a result, centralized ANOVA should be utilized to examine each case of blocking and determine the influence of blocking on people's behavior.

Table 3 summarizes and shows the findings of the centralized ANOVA. The separation in higher susceptible groups demonstrates a substantial variation since the COVID-19 was initiated in nine of the twelve urban areas. Previous literature has mostly referred to mobility as asset that wealthier residents may be better equipped or socially situated to escape their neighborhood and enjoy amenities and social mixing in more advantaged areas, whereas more disadvantaged residents may be more bounded to the neighborhood (Ślusarczyk et al. 2022). Social network study has indicated that close relatives are likely to live close to one another, with minority groups such as Black and Mexican Americans more likely to live with their kin than White people (Irfan et al. 2021b). For example, poorer populations may demonstrate more spatial homophily (Ameli et al. 2022) and hence weaker social networks that would encourage or

Table 3 Econometric analysis of human activity in metropolitan areas

Source	DF	SS	MS	<i>F</i>	<i>p</i>
Health and yoga					
LD	1	56.33	56.333	16.59	0.004
Age	2	96.17	48.083	14.16	0.002
Error	8	27.17	3.396		
Total	11	179.67			
Relaxing					
LD	1	0.750	0.750	0.03	0.862
Age	2	645.167	322.583	13.80	0.003
Error	8	187.000	23.375		
Total	11	832.917			
Walking and jogging					
LD	1	5.33	5.33	1.70	0.229
Age	2	6571.50	3285.75	1044.48	<0.001
Error	8	25.17	3.15		
Total	11	6602.00			
Meeting with friends					
LD	1	30.08	30.08	1.62	0.239
Age	2	1196.17	598.08	32.18	0.000
Error	8	148.67	18.58		
Total	11	1374.92			
Others					
LD	1	12.00	12.000	3.49	0.099
Age	2	193.50	96.750	28.15	0.000
Error	8	27.50	3.437		
Total	11	233.00			

compel migration across the city to other sites during the epidemic. However, on the other side, poor groups may be obliged to travel through space for work and consequently be exposed to risks of infection during the pandemic (Jia et al. 2021). These groups are more susceptible to COVID-19 as

they are more likely to work in key service sectors and lack the privilege to work remotely (Pham et al. 2021).

Table 4 shows that confinement positively influences health and yoga practice in urban contexts (i.e., a mix of open and green areas) ($p = 0.028$). All other pursuits, on the other hand, have barriers. It falls within a 95% confidence interval. The difference is not significant (p -value > 0.05). This is due to the complicated impacts of different factors of weakening (social circumstances, etc.), closeness to urban areas, etc., and also plays a significant part.

A multimodal impact of an epidemic on the supply chain (see Fig. 2) distinguishes it from other risk factors such as natural catastrophes. The present COVID-19 pandemic is laden with dangers such as “supply disruption” and “demand decrease,” both of which have undetermined durations.

Key participants perform a “credit function” in supply chain financing by providing “credit complementarity” to upstream and downstream counterparties. By boosting the engagement of major enterprises in finance, supply chain finance also promotes finance across the supply chain.

The epidemic of stock securities

To explain our findings, we believe that the spread of COVID-19 across nations may be linked to their market structure, the behavior of market actors, and the degree of market integration. Liquidity risk can have varying degrees of importance depending on a country’s geographic location, economic situation, and political climate (Khlystova et al. 2022). We assert this because the diffusion of information about COVID-19 may make it easier for the stock market to price bad news about future economic performance. As a result, a broad repositioning of portfolios is possible. Investors may also be inclined to rebalance their portfolios in favor of more stable investments. All of this could lead to

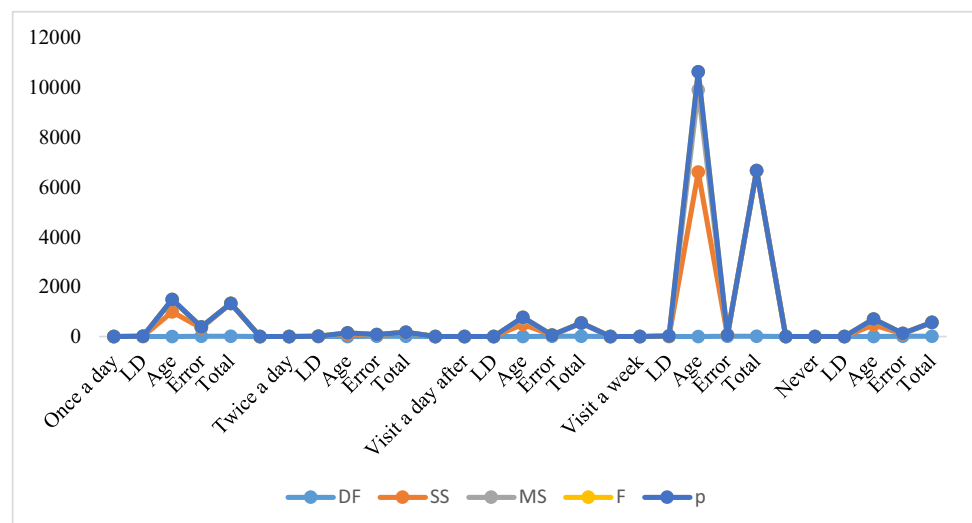
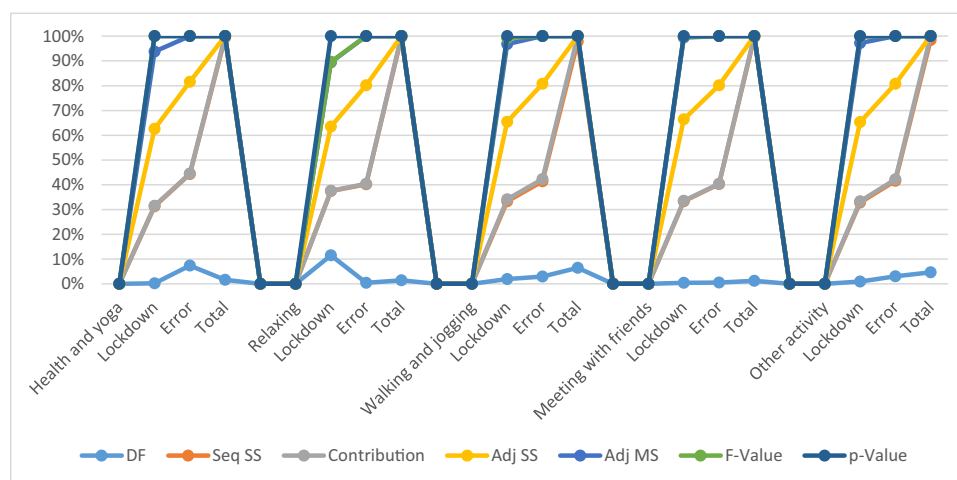
Fig. 1 Centralized analysis of variance (ANOVA)

Table 4 Confounding the consequences of confinement

Source	DF	Seq SS	Contribution	Adj SS	Adj MS	F-value	p-value
Health and yoga							
Lockdown	1	169.00	94.41%	169.00	169.000	33.80	0.028
Error	2	10.00	5.59%	10.00	5.000		
Total	3	179.00	100.00%				
Relaxing							
Lockdown	1	2.250	1.11%	2.250	2.250	0.02	0.895
Error	2	200.500	98.89%	200.500	100.250		
Total	3	202.750	100.00%				
Walking and jogging							
Lockdown	1	16.00	38.10%	16.00	16.00	1.23	0.383
Error	2	26.00	61.90%	26.00	13.00		
Total	3	42.00	100.00%				
Meeting with friends							
Lockdown	1	81.00	35.22%	81.00	81.00	1.09	0.407
Error	2	149.00	64.78%	149.00	74.50		
Total	3	230.00	100.00%				
Other activity							
Lockdown	1	36.00	59.02%	36.00	36.00	2.88	0.232
Error	2	25.00	40.98%	25.00	12.50		
Total	3	61.00	100.00%				

Fig. 2 The epidemic's many effects on the supply chain

more trade, which would have an impact on the market's liquidity. Similarly, to what we had expected, the results of the impact of COVID-19 documented instances and deaths on stock liquidity were also favorable. As a result of the high number of COVID-19 cases and demises, several financial institutions were forced to close, limiting market participants' ability to trade, and thereby reducing liquidity. Irrational conduct, which is more prevalent in emerging markets, may also explain COVID-19's effect on stock market liquidity. The "ostrich effect," the "information overload" impact (De Vito and Gómez 2020), the negative influence of unpleasant experience (Caballero-Morales 2021), and the disposition effect (Zhu et al. 2020) are all examples of

this inclination to overlook bad news. All of these behavioral influences could lead to a decrease in market liquidity. According to related research (Le and Nguyen 2022), liquidity commonality changes across nations and time and the harmony in illiquidity return premium are larger in markets that are financially connected with other needs (Zhang et al. 2021b). An alternative explanation for the diversity in frequency bands between countries is that market players behave differently from one another. For short-term and long-term investors (or the retail and institutional investors) in different nations, the viability of lucrative trading methods could be different because of the impact of transaction costs. Investing in illiquid assets might yield a better net

return (after transaction costs) if the investor has a longer investment horizon (Aktar et al. 2021). The short-term investor is more concerned with short-term (higher frequency) market movements, whereas the long-term investor is more concerned with longer-term (lower frequency) market movements. Thus, each investor's risk management will be different if the degree of co-movement between COVID-19 and liquidity changes among frequency. Co-movement strength (in this case, COVID-19 outbreak and liquidity) can be assessed using wavelet analysis at many frequencies simultaneously, allowing researchers to track changes in that strength over time. Some variation in frequency bands across countries may be due to the different investor participation in each country (Table 5).

As you can see, capital markets respond fast to crises. Investor pessimism and fear have intensified due to the spread of COVID-19, with January's stock market falling owing to the panic impact of the Chinese New Year vacations. Since then, the government has slowly stabilized its recovery, with many measures taken to limit the epidemic in February and a series of regulatory measures enacted to stabilize financial markets. The typical levels of different financial obligations have nearly reverted to pre-epidemic levels in the second part of this year. The findings of this study are displayed in Fig. 3, which highlights the transaction volume and amount of the key bond kinds.

As seen in Fig. 3, the quantity decreased precipitously in January 2020. Fashion in my nation peaked in January 2020, and everyone was confined at home. Thus, while the number of transactions remains consistent compared to December 2019, the fall in the volume of transactions indicates that the present financial market is bottoming out, and the epidemic's impact is becoming more severe. After February 2020, a recovery is predicted to commence, with a large increase expected in April and May 2020. The country is currently focusing on completing repair work and manufacturing procedures. The increase in trading activity and trade volume indicates that the Korean financial market is gradually recovering from the epidemic's impacts. Following the June decrease, the curve continued to increase.

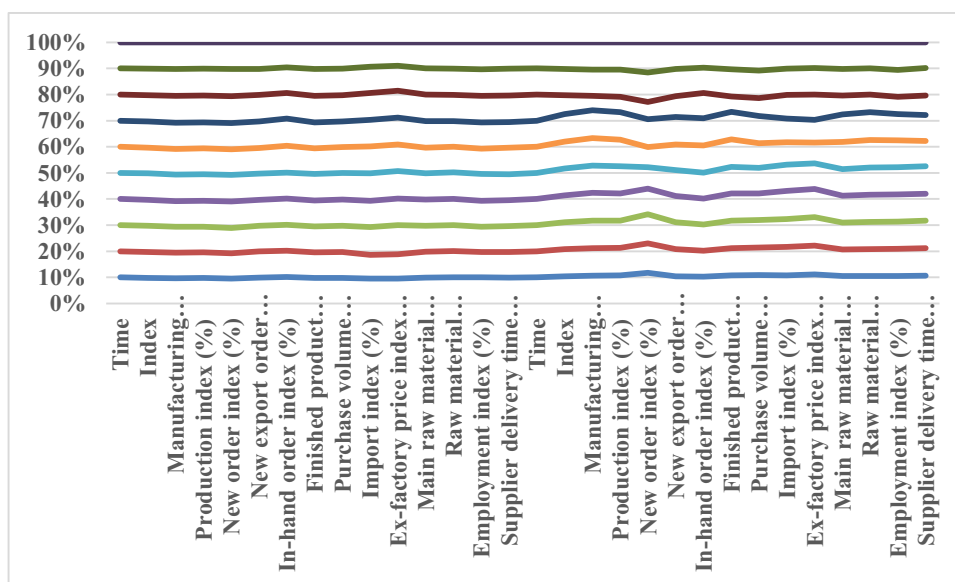
As it ascends, it descends abruptly. Investors follow the market's stabilization. The financial position has been quite steady since then. This suggests that our country's economic status has fully recovered. Currently, the pandemic is having a negligible effect.

Conclusion and policy impacts

We need more empirical research on the behavior of emerging stock markets because they are a big portion of the world's portfolio today. In the USA and other sophisticated equity markets, numerous researchers have discovered

Table 5 Major bond types weighted average transaction price (yuan)

Time	2019 Dec	2020 Jan	2020 Feb	2020 Mar	2020 Apr	2020 May	2020 June	2020 July	2020 Aug	2020 Sept
National debt	92.40	92.77	94.32	94.32	94.80	94.55	93.23	92.88	92.74	92.19
Government debt	92.23	91.86	93.70	93.70	93.97	94.39	92.82	92.85	92.06	91.01
Financial debt	104.38	109.66	120.58	112.40	123.28	114.03	112.30	112.15	123.07	120.49
Corporate debt	68.54	66.80	66.74	29.49	59.45	41.24	62.99	63.21	62.09	52.10
SME private bonds	91.10	91.18	91.57	91.57	91.45	91.64	91.26	91.04	91.03	90.82
Public issue of corporate bonds	90.76	90.68	91.53	91.53	91.69	91.76	90.98	90.39	90.44	90.08
Non-public issuance of corporate bonds	90.62	90.18	90.33	90.33	90.52	91.39	90.45	90.00	90.54	89.44
Convertible bond	103.93	109.75	113.34	113.34	110.85	107.26	107.81	118.48	122.59	116.95
Exchangeable debt	93.61	96.62	94.89	94.89	95.40	96.15	96.99	95.74	96.96	95.86
Segregated debt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corporate, asset-backed securities	88.73	90.00	88.37	88.37	87.76	87.32	86.87	86.82	87.03	84.21
Pledge repo	2.58	2.69	1.88	1.88	1.49	1.48	2.21	2.02	2.18	2.51
Offer repurchase	2.91	2.95	2.73	2.73	2.39	2.11	2.26	2.38	2.55	2.71
Repurchase agreement	4.99	5.40	4.90	4.90	4.64	4.85	4.42	4.94	4.82	4.43

Fig. 3 Monthly summary statistics bond traded

crucial truths concerning the effects of value. Emerging markets, where the COVID-19 pandemic has caused record reductions and considerable uncertainty, have seen far less research into the value consequences. In order to fill this gap, this article investigates the pandemic's impact on seven important emerging stock markets. In particular, it examines the value effect in these marketplaces before and during the epidemic.

Our findings show that the value premium exists in emerging economies and that using country-specific proxies of the value effect is critical. Value premia show significant variance, which we attribute to changes in the predictive power of the value proxies during the epidemic. We compare the value premia before and after the pandemic. There will be a strong interplay between the value premium and the pandemic, because the underlying value is unlikely to change in response to real-time market volatility. Our results show that time-varying risk is the primary stock return forecast ability source.

As a result, our findings are significant because they provide further information on how the value premium is calculated. Understanding the risk and return characteristics that apply to value investments may assist market players better comprehending the investment landscape, especially in emerging markets that are still under-researched.

Policy implications

The results of this study have three policy implications.

There are a number of things investors, governments, and other institutions need to remember when it comes to COVID-19's impact on the stock market. It is also possible to prevent COVID-19's stock market effects from lasting indefinitely if the epidemic is promptly contained

and the spread is not allowed to continue. As for technique, this study shows how estimating cause-and-effect relationships based on counterfactual predictions can effectively determine the magnitude and time evolution of shocks in an emergency. As stressed, precise assessment of causal effects must be based on exogenous factors (Ahmad et al. 2022). Measurement of the genuine impact of COVID-19 can be done using this paper's empirical process.

Author contribution Yu Liu: conceptualization; data curation; methodology; writing—original draft; data curation; visualization; supervision; editing; writing—review and editing; and software.

Data availability The data can be available on request.

Declarations

Ethical approval and consent to participate We declare that we have no human participants, human data, or human tissues.

Consent for publication N/A.

Competing interest The authors declare no competing interests.

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