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Article

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Cogent Business & Management

Provided in Cooperation with:

Taylor & Francis Group

Suggested Citation: Nguyen, Ngoc Hong; Vu, Nam Thanh; Tran, Quan; Tran, Thao; Vo, Duc Hong (2022) : Market performance and volatility during the Covid-19 pandemic in Vietnam: A sector-based analysis, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 9, Iss. 1, pp. 1-12,
<https://doi.org/10.1080/23311975.2022.2119681>

This Version is available at:

<https://hdl.handle.net/10419/289239>

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To cite this article: Ngoc Hong Nguyen, Nam Thanh Vu, Quan Tran, Thao Tran & Duc Hong Vo (2022) Market performance and volatility during the Covid-19 pandemic in Vietnam: A sector-based analysis, Cogent Business & Management, 9:1, 2119681, DOI: [10.1080/23311975.2022.2119681](https://doi.org/10.1080/23311975.2022.2119681)

To link to this article: <https://doi.org/10.1080/23311975.2022.2119681>



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Published online: 04 Sep 2022.



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Received: 27 April 2022
Accepted: 28 August 2022

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BANKING & FINANCE | RESEARCH ARTICLE

Market performance and volatility during the Covid-19 pandemic in Vietnam: A sector-based analysis

Ngoc Hong Nguyen¹, Nam Thanh Vu¹, Quan Tran¹, Thao Tran¹ and Duc Hong Vo^{2*}

Abstract: The effects of the Covid-19 pandemic on firms' performance have been extensively investigated. However, the abnormal returns and volatilities across industries during different waves of the pandemic using an event study have largely been neglected in the existing literature, particularly for Vietnam. As such, this study investigates the impact of the pandemic on the performance and volatility of the entire stock market and across 13 industries during the four Covid-19 outbreaks in Vietnam, including 23 January 2020 (the first wave), 25 July 2020 (the second wave), 28 January 2021 (the third wave), and 27 April 2021 (the fourth wave). An event study is used on the sample of 404 listed firms. Our findings indicate that the announcements of the first three outbreaks adversely affect the stock market returns and volatilities, leading to the firm's financial distress. Furthermore, we find that the market has responded slowly to the fourth wave compared to the first three waves. However, the effects of this fourth wave have lasted longer. *Agriculture, Construction, Real Estate, and Manufacturing* are the most affected industries, whilst *Information and Technology and Financial and Insurance Services* are the most resilient industries across the four waves of the pandemic in Vietnam. Furthermore, results from our analysis indicate that the government's announcement of ending the lockdown of Ho Chi Minh City in October 2021 has positively affected the stock market performance in Vietnam.

Subjects: International Economics; Development Economics; Corporate Finance

Keywords: market performance; volatility; event study; COVID-19 pandemic; Vietnam's industries

1. Introduction

The current Covid-19 pandemic has caused a global dual crisis—a health crisis and a global economic crisis for all countries (Baker et al., 2020). The pandemic may have caused only a short-term crisis, mainly the curb of infections with lockdown and the government's social distancing measures. However, the lasting effect of the pandemic has already reached out to the economy, especially the stock markets around the world. Such an effect from the pandemic is likely to resemble the housing crisis back in the 2008/2009 global financial crisis. Therefore, the crisis has been considered a systematic risk that may corrupt the entire financial system.

With the ongoing surges, many global economies have seen significant downturns in their economic performance. In the US, the economy has contracted 3.5 per cent, making it the worst crisis since World War II. The jobs market has sunk to its record low, losing over 9 million jobs in

2020, and the unemployment rate stood at 6.7 per cent at the end of December 2020 (Cepal Organization, 2020). The same outcome was seen in the labour markets in Europe, which reported a loss in profit for all industries, with the hardest-hit ones such as cultural and creative industries. The forecasted recovery for all the industries is seen to take place between 2023 and 2025. However, for the Asian markets, the downturn and the recovery seem cumbersome. India has witnessed the deadly second wave of Covid infection in the early months of 2021. India's services and agriculture industries were among the most impacted by the deadly wave of the Covid-19 pandemic. The banking industry is reported to face a significant bankruptcy risk.

In the first eleven months of 2021, the Vietnamese industries and market were deeply affected by the Delta variant of Covid-19 and now a newly emerged Omicron variant. Ho Chi Minh City, the largest city in Vietnam, had gone through strict lockdowns for five months since May 2021. As of December 2021, some services in the city have not been fully operational yet, and thousands of new cases are still reported daily. Heavy industries such as Mining, Quarrying and Oil contracted by 6 per cent. Construction & Real Estate plummeted. Other industries such as Manufacturing, Retail Trade, Transportation and Accommodation & Food Services were among the severely hit industries when regulations imposed heavy lockdowns and social distancing on the national scale. Textiles, clothing, food and beverages with tourism are impacted industries when the government imposes Covid-19 curbs. In the third quarter of 2021, Vietnam's GDP contracted by 6.17 per cent compared to last year, in which the service industry decreased by 9.28 per cent and construction by 5.02 per cent (Reuters, 2021). The industrial zone in the South of Vietnam, including Ho Chi Minh City, Binh Duong, Ba Ria—Vung Tau and Dong Nai provinces, heavily suffered from the exponential growth of daily Covid19 cases. Deaths and the restraint of the medical system have led to lengthened lockdowns and halts in industrial production. The fourth wave of infection is the longest wave of the Covid-19 pandemic in Vietnam, making it the major cause of 2021's economic downturn. When the fourth wave of infections hit Vietnam in May 2021, strict lockdowns caused many industries to witness a shortage in demand, supply, and even the shortage of workers due to social distancing.

The stock market has responded accordingly with the emergence of four outbreaks in Vietnam. We note that different industries have responded differently to the government's responses to the pandemic. For different pandemic waves, we consider that different industries have responded differently in each wave. Therefore, a study examining the impact of Covid-19 outbreaks in Vietnam on different industries across different waves is considered essential. The fluctuations in stock markets have attracted our attention and interest for this study. Our literature review indicates that the market return and volatility at the industry level across different waves of the Covid-10 pandemic have largely been ignored in the existing literature.

Our findings are expected to contribute to a better understanding of the return and volatility of the equity market. With the data on abnormal returns of over 400 companies listed in the Ho Chi Minh City Stock Exchange (HOSE), we analyze and construct an event study to elucidate the impact of Covid 19 outbreaks across industries on the Vietnamese equity market. Our findings indicate a swift response of the Vietnamese stock market when the Vietnamese government announced Covid 19 outbreaks in the first three waves of the outbreaks. However, the fourth wave of the current pandemic in 2021 has demonstrated a slower response across industries. Concerning the adverse effects of outbreaks, a substantial impact on the return and volatility across industries on the first and last waves. However, the in-between periods of waves have exhibited a weakened negative impact of the outbreaks on the returns and volatility of the Vietnamese stock market. Agriculture, Construction, Real estate, and Manufacturing were the most affected industries, whereas Information and Technology and Financial and Insurance services were the most resilient in Vietnam. Furthermore, our analysis after the fourth lockdown was lifted indicates that the government's announcement of ending the lockdown has positively affected the returns and volatilities of the stock market in Vietnam.

Following this instruction, the remainder of the paper is organized as follows. Section 2 discusses and synthesizes relevant literature on the issue. Data and research methodology are presented and discussed in section 3. Section 4 presents and discusses empirical results focusing on the market return and volatility at the industry level across the different waves of the current pandemic. Finally, section 5 provides concluding remarks and policy implications.

2. Literature review

Since the outbreak of Coronavirus, many studies have been conducted to shed light on the impact of the pandemic on various economic and financial issues. Gu et al. (2020) investigate the reaction of Chinese enterprises to Covid-19. Wang et al. (2020) examine the impact of Covid-19 on China's insurance market. Likewise, the effects of the Covid-19 news, including new cases and the fatality on the US financial markets' volatility, are analyzed in Albulescu's (2021) study. Findings confirm that the prolongation of the Covid-19 epidemic is an important source of financial volatility. In addition, Hu et al. (2021) examine the impact of the Covid-19 pandemic on housing prices in Australia and conclude that the outbreak significantly affects the Australian housing market.

The impacts of the Covid-19 pandemic on the equity markets have also been extensively investigated. Baek et al. (2020) apply a Markov switching autoregressive model to examine volatilities in the security market in the United States. Their findings indicate that volatility is significantly affected by specific economic indicators. Additionally, it is sensitive to Covid-19 news. Liu et al. (2021) examine the relationship between the Covid-19 pandemic, crude oil market, and the US stock market, confirming that the pandemic has a significantly beneficial influence on crude oil and stock returns. Topcu and Gulal (2020) study the effects of the Covid-19 pandemic on the emerging stock markets. The results confirm that the negative effect of the Covid-19 pandemic was attenuated by mid-April, where geographical classification, response time, and the size of government stimulus packages are critical determinants. Hanif et al. (2021) investigate the effects of the Covid-19 pandemic between ten US and China equity sectors using the Copula and Conditional Value at Risk methods. Their findings indicate the asymmetric tail dependence during the pandemic, excluding the Utility industry and time-varying bidirectional asymmetric risk spillovers from the US to China and vice versa. Narayan et al. (2021) examine the impacts of the pandemic on the Australian stock market at the industry level. They find that the impacts of the pandemic vary across market industries. Industries such as Health and medical application, Information technology and Consumer staples benefited during the pandemic. Recent research by Xu (2021) analyses the reaction of the Canadian and American equity markets during the Covid-19 period. Findings confirm that mounting Covid-19 cases affect both markets, whereas the Canadian market's responses are asymmetric in new Covid-19 cases in Canada.

Fama et al. (1969) have introduced the event study approach as a widely-used method to evaluate the relationship between the fluctuation of stock prices with a novel event such as the spread of Coronavirus. Thus, various papers have applied this approach to examine the impacts of the Covid-19 pandemic on the equity markets. One of the initial archetypes is the study of He et al. (2020) about the response of the Chinese market to Covid-19 at the industry level. The results confirm that Covid-19 adversely affects the traditional industries while it creates a developmental opportunity for high-tech industries. Likewise, Mazur et al. (2021) examine the behaviour of the US stock market during the March 2020 crisis. Findings confirm that natural gas, food, healthcare, and software equities all have substantial positive returns, whereas the petroleum, real estate, entertainment, and hospitality industries face adverse effects. Xiong et al. (2020) also conducted an industry-level analysis in China and concluded that firms belonging to the more vulnerable industries tend to suffer more from the outbreaks. In addition, Heyden and Heyden (2020) examine market responses to fiscal and monetary policy measures on a cross-country level. Findings suggest that the adverse effects on stock returns result from the enacted country-specific fiscal policy measures. In contrast, monetary policy measures can calm the equity markets. Finally, Maneenop and Kotcharin (2020) analyze the impacts of the Covid-19 pandemic on the global airline industry and find that significantly negative abnormal returns after three chosen periods are

observed. Similarly, Harjoto et al. (2021) also confirm that the Covid-19 pandemic has negatively shocked the global equity markets, especially in emerging economies and small enterprises. Furthermore, Chowdhury and Abedin (2020) and Alam et al. (2021) consider the effects of the Covid-19 pandemic on the performances of stock markets in the US and Australian markets which both show the negative performance resulting from the outbreak.

In conclusion, many studies have examined the impacts of the Covid-19 pandemic on the equity market worldwide. However, few studies were conducted in the context of Vietnam. Le and Gan (2020) examine the effects of the Covid-19 pandemic on the stock performance in the Vietnamese equity market. Their empirical results confirm a significant downward trend in returns in the Vietnamese equity market, especially in the financial industry. Vo and Doan (2021) examine the effects of the Covid-19 pandemic on the equity market quality in Vietnam. Their findings indicate that the policies adopted by the Vietnamese government in response to the pandemic appear to positively affect the market quality, except for the closing of borders to international travellers (no effect) and the closing of schools across the country (negative effect). Our review indicates that the effects of the current pandemic on the performance and volatility across the Vietnamese industries using the event study focusing on the four waves of the pandemic have largely been ignored in the existing literature. This research gap warrants our study to be conducted.

3. Research methodology and events' windows

3.1. The event study method

An event study approach is often employed to investigate the market's reaction to a well-defined event by observing securities prices surrounding that event (Asquith, 1983; Peterson, 1989). Since the study on stock splits by Fama et al. (1969), this technique has been widely utilized to analyze the influences of an identifiable event on the oscillation of stock returns (Boehmer et al., 1991). We use this methodology to examine the impacts of the Covid-19 pandemic on the stock market returns and volatilities across industries in Vietnam. We choose and apply such a market model to calculate the expected returns owing to its popularity and good predictive ability (Armitage, 1995; Brenner, 1979). The steps included in this market model for implementing the event study are illustrated as follows:

$$R_{i,t}^* = \alpha_i + \beta_i R_{m,t} \quad (1)$$

$$AR_{i,t} = R_{i,t} - R_{i,t}^* \quad (2)$$

$$\widehat{AR}_t = \frac{1}{N} \sum_{i=1}^N AR_{i,t} \quad (3)$$

$$\widehat{CAR}(t_1, t_2) = \sum_{t=t_1}^{t_2} \widehat{AR}_t \quad (4)$$

First, we estimate the normal or expected return of stock i on trading day t using equation (1), where the market return $R_{m,t}$ is used as the benchmark and α_i , β_i are the estimated parameters of the daily stock return i and the market return, respectively. Subsequently, the abnormal return $AR_{i,t}$ is calculated by subtracting the stock return $R_{i,t}$ from the expected return $R_{i,t}^*$, as illustrated in equation (2). Finally, the $\widehat{CAR}(t_1, t_2)$ is calculated by averaging the abnormal returns first and then accumulating them over the event window period (t_1, t_2) using equations (3) and (4). Besides, we use the t-test to determine whether the AR and CAR are significantly different from zero.

3.2. The events' windows

Vietnam has undergone four waves of the Covid-19 pandemic. Ho Chi Minh City, the largest city, has experienced a complete lockdown for more than five months since May 2021. In this study, the "event" is defined as in line with each wave of the pandemic in Vietnam. The first event date is

identified as the date when the first confirmed Covid-19 case was reported in Vietnam on 23 January 2020. The second wave started on 25 July 2020, used as our second event date. The 28 January 2021 and the 27 April 2021 are used as our third and fourth event dates, coinciding with the two waves in Vietnam. Finally, 1 October 2021 is the fifth event date as Vietnam’s most prolonged lockdown in Ho Chi Minh city ended. As such, five events are identified and used in our analysis. The window for each of our events covers five trading days. Our sample includes 404 listed firms on Ho Chi Minh Stock Exchange (HOSE) from 15 April 2019 to 15 November 2021.

4. Empirical results

This section presents empirical results from a market-wide analysis and industry-level analysis. Our empirical findings on the entire HOSE market are presented first, followed by the industry-by-industry analysis.

4.1. The performance of the Vietnamese equity market across the Covid-19 waves

Table 1 and 2 presents the effects of the pandemic on the market performance across four Covid-19 waves in Vietnam. Our empirical results show that, on each event date (0; 0) window, the overall stock value was significantly affected by the pandemic throughout the first three waves. However, the effects of the pandemic on the market performance disappeared on the event date of the Covid-19 wave 4, which is on 27 April 2021.

Vietnam was in a nationwide lockdown in the first Covid-19 wave in January 2020. However, in the second wave in July 2020, only Danang, the epidemic centre, was in a strict lockdown. Other main cities, such as Ho Chi Minh City and Ha Noi’s capital city, were open for business as usual. For the third lockdown, with Hai Duong in the North, only Hai Duong and a few small provinces were in lockdown as the epidemic entered. Ho Chi Minh City and Ha Noi capital city were open. However, for the fourth Covid-19 wave, Ho Chi Minh City and all provinces in the Delta Mekong area were in a strict lockdown, with heavy-handed regulations to completely enact social distancing. In addition, neighbouring provinces with Ho Chi Minh City, including all major provinces in Vietnam such as Binh Duong, Dong Nai and Baria—Vung Tau, were also in a strict social distancing. Flights from Ho Chi Minh City to Ha Noi’s capital city and other cities in the central region and the North of Vietnam were suspended.

Our empirical results indicate that the performance of the Vietnamese stock market is negatively affected for most of the selected windows in the analysis, including the broadest window of 30 trading days from the event date (0, +30). The same negative effects are found for the fourth Covid-19 wave in April-September 2021 period. We note that the negative effects disappear after five trading days, the event window (0, +5) for the second wave and ten trading days, the event window (0, +10) in the third Covid-19 wave. In addition, the market performance is negatively affected both before and after the event date of the fourth Covid-19 wave in Vietnam. We find that the market performance is negatively affected 30 trading days before and after 27 April 2021.

Table 1. Major Covid-19 waves in Vietnam

Announcement date	Event	Ending Date	Total cases
23/01/2020	The first confirmed Covid-19 case in Vietnam	24/07/2020	415
25/07/2020	Da Nang as the epicentre	27/1/2021	1,136
28/01/2021	Hai Duong as the epicentre	26/4/2021	1,301
27/04/2021	Fourth wave with Delta variant	Ongoing	1,200,000+
01/10/2021	End lockdown & Ease restrictions	-	-

Sources: www.suckhoedoisong.vn and www.moh.gov.vn (Ministry of Health of Vietnam, 2021).

Table 2. Overall market performance across four waves of the Covid-19 pandemic

Event Window	Wave 1		Wave 2		Wave 3		Wave 4	
	CAAR	t value	CAAR	t value	CAAR	t value	CAAR	t value
(-30,0)	-0.0234	-1.6431	-0.0153	-0.6386	0.0498**	2.3800	-0.0469*	-1.9223
(-25,0)	-0.0292**	-2.2372	-0.0138	-0.6272	0.0316*	1.6499	-0.0553**	-2.5238
(-20,0)	-0.0227*	-1.9376	-0.0205	-1.03656	0.0251	1.4540	-0.0456**	-2.2694
(-15,0)	-0.0159	-1.5533	-0.0084	-0.48543	0.0153	1.0151	-0.0421**	-2.4024
(-10,0)	-0.0108	-1.2737	-0.0026*	-0.18127	-0.0003	-0.0246	-0.0532***	-3.6595
(-5,0)	0.0041	0.6505	-0.0088	-0.83774	-0.0108	-1.1734	-0.0307***	-2.8602
(0,0)	0.0072***	2.8173	-0.0097**	-2.26062	-0.0131***	-3.4723	-0.0058	-1.3295
(0,+5)	-0.0357***	-5.699	-0.0239**	-2.2667	-0.0352***	-3.8175	-0.0163	-1.5213
(0,+10)	-0.0164*	-1.927	-0.0071	-0.49747	-0.0266**	-2.1346	-0.0251*	-1.7276
(0,+15)	-0.0137	-1.3387	0.0019	0.1115	-0.0187	-1.2420	-0.0547***	-3.118
(0,+20)	-0.0324***	-2.7623	0.0177	0.89567	0.0044	0.2572	-0.0597***	-2.9736
(0,+25)	-0.0235*	-1.8043	0.033	1.50162	0.0276	1.4402	-0.0644***	-2.9369
(0,+30)	-0.0628***	-4.4091	0.0258	1.07577	0.0373*	1.7809	-0.0540**	-2.2129

Notes: CAAR denotes the cumulative average abnormal return. The ***, **, * denotes the statistically significant estimates at 1 per cent, 5 per cent and 10 per cent levels. The window covers the period from the event date until different dates considered in our analysis. For example, (0,+5) for the Covid-19 wave 1 covers five trading days from the event date of wave 1, 23 January 2020, until five trading days from 23 January 2020.

4.2. Market performance across 13 Vietnamese industries

When the first wave of Coronavirus hit Vietnam, the market seems to respond slowly. On day 0, the “event” day, the abnormal returns from most sectors indicate no effects on returns (Table 3). However, for other windows, we find that abnormal returns across sectors have significantly reduced except for the Professional, Scientific, and Technical Services (PST services). All industries immediately responded when the second wave of the Covid-19 pandemic hit the Vietnamese market. As presented in Table 3, on the day when the first Covid-19 case was announced from the wave, five industries suffered a free fall in stock prices, especially Accommodation and Food Services, with a drop of 4.03 per cent per day. We also note that Information and Technology sector appears to perform well in other event windows. When the third way of infection swept through Vietnam, the number of confirmed cases proliferated. However, the market seemed to have a positive perception. Only Utilities; Construction and Real Estate; Manufacturing; Transportation and Warehousing; and Information & Technology industries were negatively affected, leading to a significant decrease in the stock prices of the companies within the industries. However, during the following days, the industries witnessed steep increases. Among the Cumulative Abnormal Returns (CAR), Accommodation and Food Services, Arts Entertainment, and Recreation saw significant increases of 29.1% and 35.6%, respectively. When the fourth wave of the outbreak commenced, all the industries were adversely affected by the pandemic. On day zero of the fourth window and even after thirty days, the returns were reported to witness a decrease in abnormal returns. However, only Information & Technology; Financial & Insurance withstand the effect of social lockdown.

In summary, throughout the four waves of the Covid-19 pandemic, Construction & Real Estate; and Manufacturing were the most affected industries, whereas Information & Technology and Financial & Insurance were the most resilient sectors. In the first and the last waves of the Covid-19 pandemic, the impacts of the current pandemic appear to be more significant despite the slow response. However, the effect of the pandemic was notably lessened during the second and the third waves.

5. Market performance after the end of the lockdown of Ho Chi Minh City in October 2021

The market’s responses to the announcement that Vietnam would lift the lockdown of Ho Chi Minh City on 1 October 2021 are very different from previous Covid-19 waves. As presented in Table 4, within the window of 15 days from the event day, the announcement had no significant effect on

Table 3. Market performance of the Vietnamese industries during the four Covid-19 waves across various event windows

Event window	Wave	AGP	MOG	UTL	CRE	MNF	WST	RTT	TAW	IAT	FAI	PST	AER	AFS
(-30,0)	1	-0.0042	0.0763	-0.0446**	-0.0745***	0.0044	-0.0681*	-0.0244	0.0099	-0.0267	0.0157	0.0080	0.0528	-0.1544**
	2	-0.2415***	-0.1011	-0.0002	-0.0162	-0.0141	-0.0521	0.0194	0.0353	-0.0022	0.0067	-0.0138	0.0770	-0.1544**
	3	0.0057	0.164***	-0.0154	0.107***	0.0125	0.0966**	0.11**	0.0167	0.1059*	0.0109	-0.04170	0.5145***	-0.0669
	4	-0.0048	-0.0506	-0.0607**	-0.0717**	-0.0458*	0.0238	0.0148	-0.0614*	-0.0587	-0.0203	-0.0964	-0.46***	0.1645*
(-20,0)	1	-0.0436	0.0439	-0.0455**	-0.0688***	0.0024	-0.0416	-0.0285	-0.0008	-0.0114	0.0221	-0.0130	0.0666	-0.152**
	2	-0.1826**	-0.0567	-0.0072	-0.0301	-0.0112	-0.0375	-0.0059	0.0084	-0.0363	0.0013	-0.0443	-0.0017	-0.152**
	3	-0.0127	0.1211**	-0.0064	0.0472*	0.0181	0.0531	0.0535	0.009	0.0483	-0.0397*	-0.06800	0.4981***	-0.0547
	4	0.0142	-0.0397	-0.0461**	-0.0679**	-0.0487**	0.0022	-0.0037	-0.0591**	-0.0994**	0.0032	-0.1231**	-0.1155	0.0032
(-10,0)	1	-0.0382	0.0067	-0.0369***	-0.0448***	0.0060	-0.0171	-0.0100	0.0130	-0.0250	0.0229	0.0303	0.0442	-0.0271
	2	-0.1036*	-0.0165	0.0041	-0.0019	0.0014	-0.0087	-0.0047	-0.0025	-0.0071	0.0103	0.00010	0.0858	-0.0271
	3	-0.0206	0.0634*	-0.0133	0.0176	-0.0102	0.0299	0.0743***	-0.0308*	-0.0388	-0.06***	-0.06450	0.3782***	-0.0361
	4	-0.0831	-0.0783**	-0.04**	-0.0725***	-0.0546***	-0.02970	0.0088	-0.0494**	-0.0869**	-0.0125	-0.0835**	-0.237***	-0.0426
(0,0)	1	0.0294***	0.0069	-0.0008	0.0048	0.0081***	0.011*	0.0091	0.0054	0.0051	0.0103**	0.0208*	0.0001	0.0149
	2	-0.0335**	0.0005	-0.0026	-0.0121**	-0.0069	-0.0151*	-0.0079	-0.0153**	-0.0139	-0.0054	-0.01550	-0.0313	0.0149
	3	0.0024	-0.0018	-0.025***	-0.0159***	-0.0147***	-0.0055	0.018**	-0.02***	-0.024**	-0.0063	-0.0161	0.0194	-0.0180
	4	-0.0120	-0.0006	-0.0008	-0.0077	-0.0056	-0.0084	-0.0073	-0.0028	-0.0109	-0.0033	-0.0155	-0.0204	-0.0270
(0, +10)	1	-0.0577	-0.0085	0.0148	-0.0236*	-0.021**	-0.0054	-0.0268	-0.0372*	-0.0557*	0.0036	0.0767**	-0.0232	0.0038
	2	-0.0146	0.0243	0.0177	0.0439**	0.0454***	0.0417	0.0090	0.0304	0.1008***	0.0206	-0.01750	-0.0886	0.0038
	3	-0.1534***	-0.0009	-0.01920	-0.0396**	-0.0287**	-0.0048	-0.0098	-0.05***	0.0289	-0.0120	-0.02000	0.3569***	-0.0320
	4	-0.0689	-0.0345	-0.0161	-0.046**	-0.0208	0.0044	-0.0244	-0.0291	-0.0013	0.0123	-0.0721*	-0.1068	-0.0798
(0, +20)	1	-0.0867*	-0.0354	-0.0142	-0.0389**	-0.0305**	-0.0183	-0.0284	-0.0721***	-0.0773*	-0.0118	0.126**	0.0263	-0.1293**
	2	-0.0421	0.0080	0.0008	-0.0035	0.0210	-0.0007	-0.0111	0.0027	0.0039	-0.0107	-0.01710	-0.1173	-0.1293**
	3	-0.0942	0.0496	-0.0095	-0.0291	0.0121	0.0441	-0.0188	-0.0160	0.0397	0.0138	-0.0341	0.719***	0.1952**
	4	-0.1479**	-0.128***	-0.0498**	-0.0936***	-0.0489**	-0.0490	-0.0645*	-0.0559*	-0.0175	0.0156	-0.1323**	-0.249**	-0.0500

(Continued)

Table 3. (Continued)

Event window	Wave	AGP	MOG	UTL	CRE	MNF	WST	RTT	TAW	IAT	FAI	PST	AER	AFS
(0, +30)	1	-0.1239**	-0.0367	-0.0358	-0.0673***	-0.0623***	-0.0222	-0.0639	-0.1116***	-0.161***	-0.0555**	0.1255**	-0.0740	-0.2092***
	2	-0.0950	-0.0602	-0.0126	-0.0318	-0.0114	-0.0427	-0.0298	-0.0173	0.0049	-0.0115	-0.03010	-0.0293	-0.209***
	3	-0.0788	0.1008*	0.0136	0.0110	0.044*	0.1093***	-0.0064	0.0037	0.1349**	0.0304	0.0772	0.3565***	0.2912***
	4	-0.1350	-0.1176**	-0.0457*	-0.0988***	-0.0404	-0.0487	-0.0874**	-0.0438	-0.0081	0.0456	-0.1269*	-0.2507*	-0.0342

Notes: CAAR denotes the cumulative average abnormal return. The ***, **, * denotes the statistically significant estimates at 1 per cent, 5 per cent and 10 per cent levels. The window covers the period from the event date to 30 days before and after the event date with 5-day intervals. For example, (0, +5) for the Covid-19 wave 1 covers five trading days from the event date of wave 1, 23 January 2020, until five trading days from 23 January 2020.

AGP for Agricultural production; MOG for Mining, Quarrying, and Oil and Gas Extraction; UTL for Utilities; CRE for Construction & Real Estate; MNF for Manufacturing; WST for Wholesale Trade; RTT for Retail trade; TAW for Transportation and Warehousing; IAT for Information and technology; FAI for Financial and Insurance; PST for Professional, Scientific, and Technical Services; AER for Arts Entertainment, and Recreation; and AFS for Accommodation and Food Services.

Table 4. Comprehensive market results for the “Lockdown end.”

Event Window	CAAR	t value
(-30,0)	0.0579**	2.000
(-25,0)	0.0577*	2.1720
(-20,0)	0.0249	1.0404
(-15,0)	0.0181	0.8670
(-10,0)	-0.0019	-0.1101
(-5,0)	-0.0177	-1.3895
(0,0)	0.0015	0.2886
(0, +5)	0.0690	0.5410
(0, +10)	0.0122	0.7030
(0, +15)	0.0310	1.4848
(0, +20)	0.0480**	2.0094
(0, +25)	0.05845**	2.1981
(0, +30)	0.0856***	2.9484

CAAR denotes the cumulative average abnormal return. (***) $p < .01$, (**) $p < .05$, (*) $p < .1$).

the market performance. However, in the subsequent windows, the announcement of ending a lockdown of the city positively affects the market performance.

Table 5 presents the abnormal returns across sectors in Vietnam after the announcement was made. Other Vietnamese sectors fail to demonstrate abnormal returns except for the PST services. However, for the (0; +30) window, significantly positive abnormal returns are observed from Agriculture, Utilities, Construction & Real estate, Manufacturing, wholesale, and retail.

6. Conclusions and policy implications

Vietnam has experienced four major outbreaks of Covid-19 cases since the pandemic emerged in December 2019 in China. The pandemic has adverse effects on the economy. Since 2020, various empirical analyses have been conducted to examine the effects of the pandemic on the stock market, the economy and other issues. However, the effects of the pandemic on the volatility across industries in Vietnam appear to have largely been neglected. As such, this study examines the effects of the pandemic on the Vietnamese sectors’ market volatility using the event study from 23 January 2020 to 1 October 2021.

Our analysis uses various “events” dates that coincide with the announcement date for various Covid-19 waves in Vietnam. These four events include 23 January 2020, 25 July 2020, 28 January 2021, and 27 April 2021. In addition, we have also used the 1 October 2021, which marks the end of the 4-month complete lockdown in Ho Chi Minh City—a commercial and trade centre in Vietnam, as an event date. In addition, our event study analysis has also used various event windows from 30 days before and after the event date with an interval of every five days between the windows. Finally, the cumulative abnormal returns for each industry are calculated to examine the effects of the announcements concerning different Covid-19 waves on the sectoral market volatility for different observation windows.

Empirical findings from our analysis indicate significant effects of the Covid-19 announcements on market volatility across various Ho Chi Minh Stock Exchange sectors. We note that the market’s volatilities have been significant in the first three Covid-19 waves leading to firms’ financial distress. In contrast, the market responds slower to the fourth wave of the outbreak. In addition, the adverse effects of the pandemic on various industries are more significant in the first and the last waves. However, these effects are less severe in the second and the third waves compared to other waves. Our results confirm that *Construction*, *Real estate*, and *Manufacturing* are the most

Table 5. Further analysis at the industry level when the “Lockdown” ends

Event window	AGP	MOG	UTL	CRE	MNF	WST	RTT	TAW	IAT	FAI	PST	AER	AFS
(-30,0)	-0.0042 (-0.07)	0.0763 (1.28)	-0.0446** (-1.98)	-0.0745*** (-3.47)	0.0044 (0.26)	-0.0681* (-1.92)	-0.0244 (-0.6)	0.0099 (0.3)	-0.0267 (-0.52)	0.0157 (0.63)	0.0080 (0.12)	0.0528 (0.35)	-0.1544** (-1.97)
(-20,0)	-0.0436 (-0.88)	0.0439 (0.9)	-0.0455** (-2.46)	-0.0688*** (-3.89)	0.0024 (0.17)	-0.0416 (-1.43)	-0.0285 (-0.86)	-0.0008 (-0.03)	-0.0114 (-0.27)	0.0221 (1.09)	-0.0130 (-0.25)	0.0666 (0.54)	-0.152** (-2.35)
(-10,0)	-0.0382 (-1.07)	0.0067 (0.19)	-0.0369*** (-2.75)	-0.0448*** (-3.5)	0.0060 (0.6)	-0.0171 (-0.81)	-0.0100 (-0.41)	0.0130 (0.67)	-0.0250 (-0.81)	0.0229 (1.56)	0.0303 (0.8)	0.0442 (0.5)	-0.0271 (-0.58)
(0,0)	0.0294*** (2.72)	0.0069 (0.64)	-0.0008 (-0.19)	0.0048 (1.24)	0.0081*** (2.7)	0.011* (1.73)	0.0091 (1.24)	0.0054 (0.91)	0.0051 (0.54)	0.0103** (2.32)	0.0208* (1.82)	0.0001 (0)	0.0149 (1.06)
(0, +10)	-0.0577 (-1.61)	-0.0085 (-0.24)	0.0148 (1.1)	-0.0236* (-1.84)	-0.021** (-2.11)	-0.0054 (-0.25)	-0.0268 (-1.11)	-0.0372* (-1.91)	-0.0557* (-1.81)	0.0036 (0.24)	0.0767** (2.02)	-0.0232 (-0.26)	0.0038 (0.08)
(0, +20)	-0.0867* (-1.75)	-0.0354 (-0.72)	-0.0142 (-0.77)	-0.0389** (-2.2)	-0.0305** (-2.22)	-0.0183 (-0.63)	-0.0284 (-0.85)	-0.0721*** (-2.67)	-0.0773* (-1.82)	-0.0118 (-0.58)	0.126** (2.41)	0.0263 (0.21)	-0.1293** (-2)
(0, +30)	-0.1239** (-2.06)	-0.0367 (-0.62)	-0.0358 (-1.59)	-0.0673*** (-3.13)	-0.0623*** (-3.74)	-0.0222 (-0.63)	-0.0639 (-1.58)	-0.1116*** (-3.41)	-0.161*** (-3.11)	-0.0555** (-2.25)	0.1255** (1.97)	-0.0740 (-0.49)	-0.2092*** (-2.66)

Note: **AGP** for Agricultural production; **MOG** for Mining, Quarrying, and Oil and Gas Extraction; **UTL** for Utilities; **CRE** for Construction & Real Estate; **MNF** for Manufacturing; **WST** for Wholesale Trade; **RTT** for Retail trade; **TAW** for Transportation and Warehousing; **IAT** for Information and technology; **FAI** for Financial and Insurance; **PST** for Professional, Scientific, and Technical Services; **AER** for Arts Entertainment, and Recreation; and **AFS** for Accommodation and Food Services.

affected industries during the four waves of the Covid-19 pandemic. In contrast, *Information and Technology, Financials and Insurance services* are the most resilient industries in Vietnam during the pandemic.

Our analysis after the lockdown was lifted in October 2021, the last event date in our analysis for Ho Chi Minh City indicates that it takes time for the equity market to recover from the negative impacts of the pandemic. Nevertheless, the announcement of ending the 4-month lockdown for the largest city has positively affected the stock market.

Findings from our paper provide insights and implications for finance managers, investors, creditors and policymakers. The stock market's performance can provide a clear signal to the economy concerning the overall economic conditions of the national economy. Policymakers can take action and implement appropriate measures that support the economy and attenuate the adverse impacts of the pandemic on affected industries. Construction, Real Estates and Manufacturing industries are the most severely hit during the pandemic. Policymakers need to stipulate and implement policies to support these industries. Support for these affected industries is also required for the economy to grow.

Funding

This research is funded by the joint-research fund from the University of Economics Ho Chi Minh City and Western Sydney University.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Citation information

Cite this article as: Market performance and volatility during the Covid-19 pandemic in Vietnam: A sector-based analysis, Ngoc Hong Nguyen, Nam Thanh Vu, Quan Tran, Thao Tran & Duc Hong Vo, *Cogent Business & Management* (2022), 9: 2119681.

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