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Article

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Article

The Impact of COVID-19 on Stock Market Returns in Vietnam

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Abstract: This paper studies the impacts of COVID-19 on the performance of the Vietnamese Stock Market—a rapidly growing emerging market in a country that has to date successfully controlled the disease outbreak. The study uses a random-effect model (REM) on panel data of stock returns of 733 listed companies on both HOSE (the Ho Chi Minh Stock Exchange) and HNX (the Hanoi Stock Exchange) from 2 January 2020 to 13 December 2020. The study shows that the number of daily COVID-19 confirmed cases in Vietnam has a negative impact on stock returns of listed companies in the market. The impacts were more severe for the pre-lockdown and second-wave period, compared to impact for the lockdown period. The impacts also differed across sectors, with the financial sector being the most affected. With significant government control and influence over the bank-dominated financial system, the financial sector was expected to absorb some of the negative shocks hitting the real sector. Such expectations were reflected in the stock market movement during the pandemic.

Keywords: COVID-19; Vietnam; stock market; pre-lockdown; lockdown; second-wave; stock return; stock performance



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1. Introduction

Vietnam is currently one of the most dynamic emerging countries in the world with a rapidly growing economy and stock market (The World Bank 2020). The stock market of Vietnam is made up of two principal stock exchanges: the Ho Chi Minh Stock Exchange (HOSE) listing companies with charter capital above VND 120 billion; and the Hanoi Stock Exchange (HNX), listing companies with above VND 30 billion (State Securities Commission of Vietnam 2012). The number of listed companies increased from 5 in 2000 to 743 in 2019. The stock market of Vietnam has turned from a frontier market into an emerging market. Market capitalization increased by almost three times during the 2014–2019 period, from USD 52.43 billion to USD 149.82 billion (The World Bank 2020).

The coronavirus disease (COVID-19), which commenced at the end of 2019, has had a very serious impact on many fields of social and economic life of all countries across the world in unprecedented ways. On 11 March 2020, the WHO (World Health Organization) declared it a pandemic, and up to 28 December 2020, there were 222 countries affected with over 79 million confirmed cases and nearly 2 million deaths (WHO 2020). COVID-19 has caused substantial negative effects on the performance of stock markets around the world (Zhang et al. 2020; Alfaro et al. 2020; Al-Awadhi et al. 2020; He et al. 2020; Ahmar and Val 2020; Baker et al. 2020; Ding et al. 2020). The Vietnamese stock market is no exception, and the VN-index declined dramatically in the first three months of the year (Giang and Yap 2020) from 31 December 2019 to 30 March 2020. Market capitalization declined 37.4 billion USD in absolute value, or 28% in relative value in this period. Directive No. 16/CT-TTg implemented a nationwide lockdown, spanning the period 1 April 2020 to 15 April 2020, to curb community transmission of the virus. As a result, the Government successfully controlled COVID-19 infection rates and the stock market began showing

signs of recovery, becoming one of the four best-performing stock markets in the world (Nguyen 2020).

This paper investigates the response of stock market returns during the COVID-19 outbreak in Vietnam. First, our results show that the number of confirmed COVID-19 cases is negatively correlated with stock returns. Our contributions add to the growing body of literature on the interplay of pandemics and financial markets, including research on the SARs pandemic (Nippani and Washer 2004; Chen et al. 2007; Chen et al. 2009), the Ebola virus (Del Giudice and Paltrinieri 2017; Ichev and Marinc 2018) and recently, the COVID-19 pandemic (Onali 2020; Takyi and Bentum-Ennin 2020; Al-Awadhi et al. 2020; Alfaro et al. 2020; etc.). Our study is one of the few that test the effect of COVID-19 on stock returns, using emerging market datasets. To the best of our knowledge, it is the only one that uses a Vietnamese stock market dataset. Our results show that the negative correlation between disease cases and stock returns exists across markets, regardless of the degree of financial development. Second, our results show a heterogeneous response of stock returns to COVID-19 across sectors, with the financial sector being the most affected. This finding is in line with Demirguc-Kunt et al. (2020), which compares the responses of banks' versus non-bank firms' stock returns, using data from 53 countries. They find that bank stocks underperformed non-bank stocks during the COVID-19 outbreak. We show that those results still hold, even when one classifies non-bank firms into smaller sector-specific sub-groups. Our results highlight the importance of financial sectors developing sound financial policy so as to best absorb negative shocks hitting the real sector during pandemics.

2. Literature Review

The stock market often reacts to major events in the environment (Lorraine et al. 2004; Ramiah et al. 2013), as well as sports events (Edmans et al. 2007; Gopane and Mmotla 2019), natural disasters (Teitler-Regev and Tavor 2019) and changes in politics and current affairs (Burggraf et al. 2020; Hillier and Loncan 2019). It also responds to infectious pandemic diseases such as SARS and Ebola Virus.

Epidemics can cause economic losses, trigger anxiety and create pessimism among investors about future incomes, leading to volatility in stock markets (He et al. 2020; Liu et al. 2020; Jiang et al. 2017). Investors act more optimistically when the stock market is in an upwards trend and there is less potential risk. If the stock market is in a downward trend, investors tend to wait until the market begins to recover to invest (Burns et al. 2012; Liu et al. 2020). During these periods many investors turn to "safe-haven assets" to mitigate risk during these volatile economic times (He et al. 2020). As a result, stock prices often fall and market performance worsens.

Nippani and Washer (2004) studied eight Asian and Canadian stock exchanges using the Mann–Whitney test and t-test statistics. They found that stock markets in China and Vietnam were significantly negatively affected by the SARS epidemics. The stock market in Taiwan was also affected by SARS with a negative correlation between the outbreak of disease and stock returns in tourism, hotel, retail and wholesalers' sectors, while returns in the biotechnology sector demonstrated a positive correlation (Chen et al. 2007, 2009). The travel industry was hit the hardest and experienced the biggest drop in stock value (sharply falling by 29%) within a month of the SARS outbreak. The relationship between the Avian influenza A virus (H7N9) epidemic and the stock market in China was assessed by Jiang et al. (2017). They found that in the market index, stock prices in certain industries, including traditional Chinese medicine and the biomedical industries, were adversely and dramatically influenced by the number of infection cases each day. Del Giudice and Paltrinieri (2017) looked into the effect of the Ebola virus on investors' decisions in the equity mutual funds of Africa. They looked at 78 mutual funds in African countries and tracked monthly mutual fund transactions as well as results from 2006 to 2015 and discovered that Ebola had a huge impact on mutual fund flows. Retail finance pundits overreacted to the event; the more heavily Ebola featured in the press, the more investors

withdrew their investments from African mutual funds (Del Giudice and Paltrinieri 2017). In the securities market of the US, Ichev and Marinc (2018) also pointed out the influences of the Ebola pandemic on stocks. They revealed the significant effects of the Ebola-infected cases that occurred in the US and West Africa on the companies having operations located there. The stock returns of small companies were more impacted by Ebola than the larger ones. The positive relationship between this epidemic and the food and beverage, pharmaceutical, healthcare supplies as well as biotechnology sectors was also shown by Ichev and Marinc (2018). Conversely, the other sectors had a negative relationship in respect of the impact of Ebola.

Recognizing the possible economic impacts of epidemics, when COVID-19 happened, besides some publications show no significant impact of COVID-19 to the financial market (Onali 2020; Takyi and Bentum-Ennin 2020), a number of pieces of recent academic research made several attempts to investigate the influence of this pandemic on performance of stock markets in various countries with various econometric methods. According to Al-Awadhi et al. (2020), all stock returns of companies in China responded negatively with both confirmed infected cases and deaths per day. The consequences of COVID-19 on the performances of 64 countries' stock markets were examined by Ashraf (2020). The authors explored whether the number of reported infection cases had a negative association with the stock market and found it seemed to react more strongly with confirmed cases than with deaths. Alfaro et al. (2020) also showed the returns of US stock were negatively influenced by the COVID-19. Baker et al. (2020) discovered that while previous epidemics, such as the Spanish Flu, had only a minor effect on the stock market of the U.S., the COVID-19 has had a significant impact. Yilmazkuday (2021) also found out a 1% rise in daily COVID-19 cases in the United States resulted in a fall of about 0.01 percent in the S&P 500 Index after a day and after a month, this figure had fallen further to around 0.03 percent. Negative impacts on Nigeria's stock market returns were also found by Adenomon and Maijamaa (2020) through Generalized Autoregressive Conditional Heteroskedasticity (GARCH) Models. In research by Zhang et al. (2020), it was shown that this epidemic has had negative effects on the stock markets of Singapore, Japan, and Korea, as well as the ten countries having the highest confirmed infected cases in March 2020. In February, the stock market of China demonstrated the biggest standard deviations, but in March, it showed the smallest. Additionally, according to Zhang et al. (2020), during the study period, the U.S.'s stock market had the sharpest rise in the standard deviation of the nations examined. Liu et al. (2020) and He et al. (2020) in their studies analyzed the influences of COVID-19 on worldwide stock markets and observed that the epidemic had a negative effect on stock returns. There was also a spreading impact from the pandemic across Asian, European, and American nations (He et al. 2020). COVID-19's extreme effect on capital markets has caused policymakers around the world to enact prohibitions (such as short-selling bans) to mitigate the likelihood of market losses, reduce uncertainty, and protect the stability of the market (Kodres 2020).

Moreover, the impact of the COVID-19 outbreak on returns of stock varied across industries (To and Bui 2020; Czech and Wielechowski 2021). The sectors most heavily influenced on the stock market by this epidemic include petroleum and gas, machinery, transport, automobile, garment, and hospitality (Schoenfeld 2020). The financial sector (including financial institutions and banks) was heavily affected by the COVID-19, according to Goodell (2020), as it witnessed a rise in non-performing loans owing to a large number of withdrawals by depositors within a short period of time and the depletion of borrowers' income. COVID-19, however, does not have a negative impact on all industries. Alam et al. (2020) delineated the positive effect of COVID-19 on the stock returns of the Telecommunications and Technology industries in Australia after the pandemic, as a result of the soaring demand for utilities to learn and work from home (Ramelli and Wagner 2020). During the pandemic, Chinese stocks in the IT and pharmaceutical industries dramatically outperformed those of the economy more generally (Al-Awadhi et al. 2020).

There have also been some studies on the Vietnamese market in the COVID-19 period. The research of [Duc et al. \(2020\)](#) addressed how Vietnam's oil and gas industry is experiencing the third oil price crisis in 12 years due to the impacts of COVID-19 and it is proving difficult to return to a period of strong development. [Pham \(2020\)](#) pointed out that COVID-19 has caused heavy damage to the economy, putting great pressure on the production capacity and global supply chains that directly affect the logistics activities of enterprises in general. Vietnam's tourism industry has also been hit hard by the government's shutdown policy ([Pham et al. 2020](#)). However, most of the data used by these studies was obtained from the beginning of the year to May 2020, when the second wave of the epidemic had not happened yet in Da Nang, Vietnam. Furthermore, these studies only provided scenarios for industries to prepare for the future wave of disease and focused mainly on tourism, logistics, supply chain and the economy in general.

Overall, these prior studies just concentrate on the stock markets of developed or emerging markets such as China, the US, Japan, South Korea, Germany, France, Spain, and Italy. There was a lack of research on countries that have a rapidly growing emerging market or had successfully controlled the disease outbreak, and there is little research on those economies demonstrating signs of recovery in the stock market, such as Vietnam. This research was inspired by the literature review gap and the future growth of the stock market in Vietnam.

3. Model

3.1. Data Source

This research examines how the COVID-19 has impacted the stock returns per day of 733 listed Vietnamese stock market companies including 345 companies on HNX and 388 companies on HOSE. Daily stock data begins on 2 January 2020, the first day of operation of the stock market in Vietnam in 2020, and 31 December 2020 will be taken as the data end date. The updated data on the number of COVID-19 confirmed cases in Vietnam every day will be obtained from the website of the Ministry of Health of Vietnam (<https://ncov.moh.gov.vn/>). The stock prices and detailed data of listed companies are from the Hanoi Stock Exchange (<https://hnx.vn/>) and the Ho Chi Minh Stock Exchange (<https://www.hsx.vn/>). There are 184,716 observations in total. The websites were accessed on the 30 April 2021.

3.2. Research Methods

In research examining the influence of the COVID-19 outbreak on worldwide stock market returns, [Ashraf \(2020\)](#) and [Al-Awadhi et al. \(2020\)](#) explained that the spread of a pandemic lasts for a long time (several days or months) rather than being a specific event that occurs at one point in time. Therefore, the panel data regression methodology is more fitting than the classical MacKinlay event-study methodology (cross-correlation problems could exist in abnormal returns when study periods of stocks overlap, and thin trading due to stocks that do not trade every day could be a problem when applying the Fama-French three-factor model or market model). Furthermore, the panel data regression is better in identifying time series variation relationships between independent and dependent variables as well as reducing the errors such as heteroskedasticity, estimation bias and multicollinearity ([Hsiao 2014](#); [Wooldridge 2010](#); [Baltagi 2008](#)). Therefore, the quantitative method is employed.

3.3. Regression Models

Following the panel data regression approach, this research will analyze the impacts of the COVID-19 on the Vietnamese stock market's performance while controlling for firm-specific characteristics. Based on the study of [Anh and Gan \(2020\)](#), two dummy variables (D_before, the pre-lockdown period between 1 January 2020 and 31 March 2020 and D_lockdown, the lockdown period from 1 April 2020 to 15 April 2020) are generated to estimate the differences of stock returns in these two periods. In addition, based on the specific circumstance in Vietnam with different periods of COVID-19 pandemic in 2020

(Pham 2021), the authors generated one more dummy variable (D_second , the second wave of COVID-19 period in Vietnam from 6 July 2020 to 30 August 2020) to examine the impact of COVID-19 in this more serious period which saw the first cases of deaths. In the studies of Ashraf (2020), Anh and Gan (2020), and Al-Awadhi et al. (2020), the price-to-book ratio, daily market capitalization and sector specific factors (being in financial, energy, industrials, consumer goods, communications and technology, and healthcare sectors) all significantly affect stock returns. Thus, these variables will be included in the models of this study. Furthermore, the authors also wanted to know whether there were different impacts of COVID-19 between the two exchanges of Vietnam, which have different scales. Accordingly, the models study HOSE and HNX separately.

The models estimated in this study are:

- (1) Examining the impact of COVID-19 on Vietnam's stock returns in each period:

$$\text{stockreturn}_{i,t} = \alpha_1 + \alpha_2 \text{case}_{t-1} + \alpha_3 \text{marketcap}_{i,t-1} + \alpha_4 \text{pb}_{i,t-1} + \alpha_5 D_period_{i,t} + \varepsilon_{i,t}$$

$$(1a) \text{ stockreturn}_{i,t} = \alpha_1 + \alpha_2 \text{case}_{t-1} + \alpha_3 \text{marketcap}_{i,t-1} + \alpha_4 \text{pb}_{i,t-1} + \alpha_5 D_before_{i,t} + \varepsilon_{i,t}$$

$$(1b) \text{ stockreturn}_{i,t} = \alpha_6 + \alpha_7 \text{case}_{t-1} + \alpha_8 \text{marketcap}_{i,t-1} + \alpha_9 \text{pb}_{i,t-1} + \alpha_{10} D_lockdown_{i,t} + \varepsilon_{i,t}$$

$$(1c) \text{ stockreturn}_{i,t} = \alpha_{11} + \alpha_{12} \text{case}_{t-1} + \alpha_{13} \text{marketcap}_{i,t-1} + \alpha_{14} \text{pb}_{i,t-1} + \alpha_{15} D_second_{i,t} + \varepsilon_{i,t}$$

- (2) Examining the impact of COVID-19 on stock returns in different industries:

$$\text{stockreturn}_{i,t} = \beta_1 + \beta_2 \text{case}_{t-1} + \beta_3 \text{marketcap}_{i,t-1} + \beta_4 \text{pb}_{i,t-1} + \beta_5 D_industry_i + \theta_{i,t}$$

- (3) Examining the impact of COVID-19 on stock returns in different industries in each period:

$$\text{stockreturn}_{i,t} = \gamma_1 + \gamma_2 \text{case}_{t-1} + \gamma_3 \text{marketcap}_{i,t-1} + \gamma_4 \text{pb}_{i,t-1} + \gamma_5 D_industry_i D_period + \varepsilon_{i,t}$$

$$(3a) \text{ stockreturn}_{i,t} = \gamma_1 + \gamma_2 \text{case}_{t-1} + \gamma_3 \text{marketcap}_{i,t-1} + \gamma_4 \text{pb}_{i,t-1} + \gamma_5 D_industry_i D_before + \varepsilon_{i,t}$$

$$(3b) \text{ stockreturn}_{i,t} = \gamma_7 + \gamma_8 \text{case}_{t-1} + \gamma_9 \text{marketcap}_{i,t-1} + \gamma_{10} \text{pb}_{i,t-1} + \gamma_{11} D_industry_i D_lockdown + \varepsilon_{i,t}$$

$$(3c) \text{ stockreturn}_{i,t} = \gamma_{12} + \gamma_{13} \text{case}_{t-1} + \gamma_{14} \text{marketcap}_{i,t-1} + \gamma_{15} \text{pb}_{i,t-1} + \gamma_{16} D_industry_i D_second + \varepsilon_{i,t}$$

where:

$\text{stockreturn}_{i,t}$: the stock return of firm i on day t (calculated by: $\text{stockreturn}_{i,t} = \ln(P_{i,t}/P_{i,t-1})$, in which $P_{i,t}$ is the stock's closing price at day t ; $P_{i,t-1}$ is stock's closing price at day $t - 1$). It is a dependent variable, regressed on the independent variables below:

case_{t-1} : the rise in number of daily confirmed cases of COVID-19 infections in Vietnam

$\text{marketcap}_{j,t-1}$: the natural logarithm of company i 's daily market capitalization at day $t - 1$.

$\text{pb}_{j,t-1}$: company i 's lagged daily price-to-book ratio.

$D_period_{j,t}$: a vector of dummy variables that present the period. The factor includes whether the relevant day is in the period before the lockdown (i.e., D_before takes value 1 between 1 January 2020 and 1 April 2020, and 0 otherwise); in the lockdown period (i.e., $D_lockdown$ takes value 1 between 1 April 2020 and 15 April 2020, and 0 otherwise); or during the second wave of COVID-19 in Da Nang, Vietnam (i.e., D_second takes value 1 between 6 July 2020 and 30 August 2020, and 0 otherwise).

$D_industry_j$: a vector of dummy variables that represent the sector of a company. The sectors included are financial ($D_financial$), energy (D_energy), industrial ($D_industrial$), consumer goods ($D_consumergoods$), communications and technology ($D_comtech$), and healthcare ($D_healthcare$). It equals 1 if the company belongs to these respective industries; 0 otherwise.

$\varepsilon_{i,t}$ and $\theta_{j,t}$: error term

The various panel-data regression approaches (FEM/REM/Pooled OLS) are checked to see which one is best for analyzing COVID-19 impacts. The authors use Stata 14 software to assess the data.

The following steps are used to interpret the data: (1) reporting quantitative data's characteristics using descriptive statistics analysis; (2) examining the normal distribution of variables and calculating Pearson correlation coefficients; and (3) performing regression analysis. There are different panel models depending on α_1 , β_1 , and γ_1 . The Hausman test is used to determine which estimator is more suitable for the models, selecting between the fixed-effects model (FEM) and the random-effects model (REM). The null hypothesis is the REM is the suitable model (Hausman 1978). α_1 , β_1 , and γ_1 are viewed as regression parameters in the FEM whereas while using the REM, they are considered components of random disturbance. Furthermore, the Breusch-Pagan Lagrangian multiplier test is used to choose which is the appropriate model between Pooled OLS and REM. The F-test is also used to check whether FEM or Pooled OLS is more suitable.

Following the selection of the best model for the research, it is evaluated again using an autocorrelation test in panel data (Wooldridge 2010) and VIF test (Variance Inflation Factor) for multicollinearity.

3.4. Hypothesis Development

Due to the consistent empirical results throughout recent research, the authors expect that the increase in daily confirmed COVID-19 cases in Vietnam has a negative relationship with stock returns, meaning the Hypothesis is expected that the higher the number of infections, the greater fall will be seen in stock returns. Moreover, it is doubted about the different levels of significance among different periods of the COVID-19 (Eleftheriou and Patsoulis 2020; Baig et al. 2020; Pham et al. 2020), the authors also want to examine the significant, negative impacts of pre-lockdown, lockdown and the second wave period on Vietnam's stock market performance.

Different industries will also be adversely affected by COVID-19, especially the financial sector which is easily affected by economic downturns with unusual deposit withdrawals and the risk of a rise in bad loans (Goodell 2020; Ashraf 2020). However, the communications and technology and healthcare sectors are expected to be positively affected in line with the rising number of confirmed cases (Ramelli and Wagner 2020; Alam et al. 2020; Al-Awadhi et al. 2020). Therefore, the authors construct the Hypotheses (Table 1) with expected signs in relationships between the stock returns and COVID-19 confirmed cases in different industries in Vietnam

Table 1. Hypotheses with expected signs of relationships based on previous researches.

Variables	Expected Sign	Based on Studies
case	Negative (−)	Yilmazkuday (2021), Ashraf (2020), Al-Awadhi et al. (2020), Anh and Gan (2020), ...
marketcap	Negative (−)	Al-Awadhi et al. (2020)
pb	Negative (−)	Al-Awadhi et al. (2020)
D_before	Negative (−)	To and Bui (2020)
D_lockdown	Negative (−)	Eleftheriou and Patsoulis (2020), Baig et al. (2020)
D_second	Negative (−)	Pham et al. (2020)
D_financial	Negative (−)	Goodell (2020), Ashraf (2020)
D_energy	Negative (−)	Duc et al. (2020), Schoenfeld (2020), Al-Awadhi et al. (2020)
D_industrial	Negative (−)	Schoenfeld (2020)
D_consumergoods	Negative (−)	Schoenfeld (2020), Al-Awadhi et al. (2020)
D_comtech	Negative (+)	Ramelli and Wagner (2020), Alam et al. (2020)
D_healthcare	Negative (+)	Al-Awadhi et al. (2020)

3.5. Descriptive Statistics

Table 2 below demonstrates the descriptive statistics of 733 listed companies in Vietnam's stock market over the period 2 January 2020 to 31 December 2020.

Table 2. Summary of descriptive statistics (Source: Authors' calculation and compilation).

Variables	All Market		HOSE		HNX	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
stockreturn	0.00516	0.20169	0.00062	0.01445	0.00279	0.01556
case	4.01370	5.11828	4.01370	5.11831	4.01370	5.11833
marketcap	12.81257	1.88740	13.81125	1.77416	11.69723	1.44316
pb	1.07470	1.65498	1.20202	1.05719	0.93245	1.98685
D_before	0.24863	0.43281	0.24863	0.43281	0.24863	0.43281
D_lockdown	0.04098	0.19852	0.04098	0.19852	0.04098	0.19852
D_second	0.15300	0.36048	0.15300	0.36048	0.15300	0.36048
D_financial	0.14482	0.35192	0.18614	0.38922	0.09867	0.29821
D_energy	0.03974	0.19536	0.02856	0.16659	0.05224	0.22250
D_industrial	0.35215	0.47764	0.30371	0.45986	0.40627	0.49113
D_consumer	0.24230	0.42847	0.25186	0.43408	0.23162	0.42186
D_comtech	0.03837	0.19210	0.01558	0.12385	0.06384	0.24447
D_healthcare	0.02985	0.17018	0.03370	0.18046	0.02555	0.15779

Variables	All Market		HOSE		HNX	
	Min	Max	Min	Max	Min	Max
stockreturn	−0.06655	0.05401	−0.06478	0.04861	−0.06655	0.05401
case	0	81	0	81	0	81
marketcap	7.928014	19.77904	8.976439	19.77904	7.928014	17.27959
pb	0.7879	2.3751	0.7879	1.3545	0.7879	2.3751

The average daily confirmed cases of COVID-19 infections per day in Vietnam is 4 cases with the highest number at 81 cases per day. Listed companies on the HOSE have an average price-to-book value of 1.20 and on HNX this figure is 0.93. During the research period, the average stock return of all listed companies in the market is positive. The ranging of stock returns of listed companies on HOSE is from −6.478% to 4.861%, while the ranging of returns of stocks on HNX exchange is from −6.655% to 5.401%.

Based on the results of Table 3, the Pearson correlation coefficients between the independent variables in the regression models are lower than 0.5 (50%), thus, the moderate correlation between variables may be expected to eliminate the multicollinearity issues in regression analysis.

Table 3. Correlation matrix for models' explanatory variables (Source: Authors' calculation and compilation).

Variables	Stockreturn	Case	Marketcap	pb	D_before	D_lockdown	D_second
stockreturn	1.0000						
case	−0.0198	1.0000					
marketcap	−0.0083	−0.0152	1.0000				
Pb	−0.0176	−0.0230	0.0823	1.0000			
D_before	−0.1132	0.0861	0.0198	0.0278	1.0000		
D_lockdown	0.0738	0.1307	−0.0146	−0.0263	−0.1041	1.0000	
D_second	−0.0091	0.0983	−0.0155	−0.0069	−0.2390	0.0243	1.0000

Variables $stockreturn_{i,t}$, $case_t$, $marketcap_{i,t}$, $pb_{i,t}$ are checked for unit root. The Levin-Lin-Chu test is performed on panel data for each variable: $stockreturn_{i,t}$, $marketcap_{i,t}$ and $pb_{i,t}$. The Augmented-Dickey-Fuller test is performed on variable $case_t$. Results are reported in Table 4. The null-hypothesis that each of these variables contains a unit-root are strongly rejected.

Table 4. The impact of COVID-19 on the Vietnamese stock market during pre-lockdown, lockdown and second wave periods.

Variable	Adjusted t	p-Value
stockreturn	-2.6×10^2	0.0000
case (ADF)	−4.026	0.0013
marketcap	-2.6×10^2	0.0000
pb	−79.4896	0.0000

3.6. Regression Model and the Errors

The authors conducted some tests to determine if FEM (Fixed Effects Model), REM (Random Effects Model), or Pooled OLS was more suitable for the models mentioned above. These three models were run via Stata 14 software. With model (1a), (1b), (1c), the Pooled OLS gave a *p*-value of marketcap and pb higher than 0.05; with model (2), it gave a *p*-value of D_finance, D_industrial and D_comtech higher than 0.05; with model (3a), (3b), (3c) the Pooled OLS showed four out of six independent variables had a *p*-value higher than 0.05. As a result, the Pooled OLS is not suitable for these research models. Furthermore, after running FEM and REM for all the research models, the authors conducted the Hausman test using each of them. All results show that Prob > Chi-square is greater than 0.05. This means the null hypothesis cannot be rejected. In short, the random effects model (REM) is the most appropriate model for the research models.

After choosing REM, the authors implemented the VIF test to inspect the multicollinearity among independent variables. The VIF value of variables is less than 5, meaning there was no multicollinearity. The Breusch-Pagan Lagrangian multiplier test for heteroskedasticity is also used to check REM. The null hypothesis (H_0) for this test is homoscedasticity. All research models gave the result Prob > χ^2 higher than 0.05, so the null hypothesis cannot be rejected. This means there is no occurrence of heteroskedasticity in these random-effect models. With the results of the Wooldridge test for autocorrelation, there is also no autocorrelation error in all models with a Prob > F above 0.05.

3.7. Regression and Analysis

The following tables are regression results of models mentioned in Section 3.3.

4. Discussion

4.1. The Impact of COVID-19 on the Vietnamese Stock Market during Pre-Lockdown, Lockdown and Second-Wave Periods

Table 5 above shows the results of model (1a), (1b), (1c) via the REM. As can be seen, the number of daily COVID-19 confirmed infection cases in Vietnam is substantially negatively correlated with the HOSE stock returns as well as the HNX stock returns at various significance levels in the three models. This finding supports the conclusion of other researches, such as (Ashraf 2020; Liu et al. 2020; He et al. 2020; Adenomon and Maijamaa 2020; Zhang et al. 2020; Alfaro et al. 2020; etc.) that the COVID-19 has harmed stock market returns significantly.

Table 5. The impact of COVID-19 on the Vietnamese stock market during pre-lockdown, lockdown and second wave periods.

Variable	Model (1a)		Model (1b)		Model (1b)	
Stockreturn	HOSE	HNX	HOSE	HNX	HOSE	HNX
case	−0.0000403 *** (−2.23)	−0.0000253 * (−1.17)	−0.0001196 *** (−1.72)	−0.0001759 ** (−1.04)	−0.0000983 *** (−2.19)	−0.0000278 *** (−1.14)
marketcap	−0.0001381 * (−3.49)	−0.0000156 ** (−4.03)	−0.0001106 ** (−5.20)	−0.0000438 * (−5.03)	−0.0003399 ** (−3.58)	−0.0000538 * (−5.02)
pb	−0.0005685 ** (−1.27)	−0.001547 ** (−0.61)	−0.0005819 ** (−1.51)	−0.001625 ** (−0.59)	−0.0000175 * (−1.21)	−0.0000997 * (−0.58)
D_before	−0.0082395 ** (−13.12)	−0.0048372 *** (−6.18)				
D_lockdown			0.0094938 ** (10.28)	0.0050518 ** (5.07)		
D_second					−0.0000436 * (−1.54)	−0.0000385 * (−0.55)
_cons	0.0056103 *** (2.92)	0.0026933 * (2.47)	0.0041935 *** (2.54)	0.0001275 * (1.95)	0.0037993 *** (2.35)	0.0002385 *** (2.16)

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (Source: Authors' calculation and compilation).

For both HOSE and HNX, the dummy vector D_before is negative and significant at 1% and 0.1%, respectively, showing that the COVID-19 pre-lockdown period had a negative impact on all of the listed companies' stock returns in the Vietnam market.

The D_second dummy variable is also negative and significant at 5% in respect of both exchanges. The reasons behind this result are investor concerns about the risk that the second COVID-19 wave would make production and business activities of enterprises difficult for a long time, but especially so during this period. It was in this phase that Vietnam recorded the deaths caused by this epidemic. However, in this declining phase, there were positive signals that investors could expect a recovery of the market. Firstly, investors were reassured by the experience and determination of the authorities in respect of epidemic control. It was difficult for investors to predict the scale and extent of the spread or to predict when the epidemic would end, but from the success of the first anti-epidemic wave and the drastic zoning measures put in place by the authorities over the past time, it was deemed likely that the spread of this second epidemic would soon be controlled. Secondly, the bottom of the VN-Index and HNX-Index in March created the reference point for this decline and triggered active cash flow to buy in and catch the bottom earlier. Thirdly, between these two epidemic outbreaks, the savings interest rate level at banks had decreased by around 1% per year, a sign that cash flow was shifting to more profitable investment channels. Securities were the preferred choice when two other popular investment channels—gold and real estate—became less attractive, as gold prices have risen and real estate has poor liquidity (Lam 2020).

Noteworthy is the dummy variable D_lockdown with a positive and significant value at 1% on both HOSE and HNX, implying that the COVID-19 lockdown had a positive impact on the listed companies' stock performance in the market. This finding contradicts the results of Eleftheriou and Patsoulis (2020) that the lockdown of COVID-19 had a negative effect on international stock markets as well as the conclusion of Baig et al. (2020) about the detrimental impact of the lockdown period on the U.S. stock market. Vietnam's stock market performance in April 2020 was quite positive, with both VN-Index and HNX-Index gaining compared to March 2020. Specifically, at the end of the session on 29 April 2020, the VN-Index reached 769.11 points, up 16.08%; the HNX-Index reached 106.84 points, which represented an increase of 15.32% compared to the session ending on March 31 (Lam 2020). The faith and trust of investors in the efforts of the Vietnamese government to fight the outbreak of the virus were the underlying reasons for the stock

market's outstanding success during the lockdown (Giang and Yap 2020). Furthermore, investors returned to the Vietnam stock exchange due to the attraction of fair prices for investors' favorable stocks at the time.

In terms of company characteristics, the price-to-book ratio (pb) of both HOSE and HNX during the COVID-19 pandemic is significantly and negatively linked to stock returns at 1%. This finding suggests that the HOSE and HNX listed companies with weak financial performance as well as overvalued stock values appeared to have lower stock returns in the pandemic period.

4.2. The Relationship between Stock Returns and Various Industries on the Vietnamese Stock Market during Pre-Lockdown, Lockdown, and the Second-Wave Period

Table 6 above presents the results of models (2), (3a), (3b), (3c) via the random-effects panel-data regression models.

The findings of model (2) show that during the COVID-19 pandemic in Vietnam, various market sectors (financial, energy, industrial, consumer goods, communications and technology, and healthcare) had different connections with stock returns. COVID-19 had the most impact on the financial sector on both the HOSE and HNX, followed by the consumer goods sector and the industrial sector. The communications and technology sector was the sector least influenced by COVID-19 in both HOSE and HNX. In Vietnam, telecommunications are expanding, and during the pandemic, the internet became the primary means of linking people for work, education, and other purposes. Unlike previous research, the energy industry is shown to be even less affected by COVID-19 than the healthcare and consumer goods sector. The key reason for this phenomenon is investors' long-term expectations for the energy market regarding the recovery of oil prices, as companies around the world return to a regular production cycle and the government's effectiveness in controlling price changes, particularly when the Vietnamese government performs exceptionally well in disease control. Meanwhile, despite a spike in the healthcare sector (the dramatic rise in the use of masks, dry hand sanitizer, antiseptic liquid, and so on) and the consumer goods sector (panic buying) to hoard since the outbreak, these are thought to be short-term effects of the pandemic. These non-consumption excess stockpile activities will likely significantly decrease revenue of the businesses in the relevant sectors in the following months. As a consequence, the phenomenon is not really advantageous to them.

The regression results of model (3a) show that stock returns in Vietnam's various sectors were negatively affected during the pre-lockdown period of the COVID-19 pandemic. This pandemic caused the financial sector to be hardest hit on the HOSE, while energy was the most impacted sector on HNX before the government's nationwide lockdown period. As can be seen in the model (3b), the nationwide lockdown had a positive impact on stock performance of all the selected sectors in the research. This finding confirmed that investors' increased confidence in the Vietnamese government's efforts to combat the pandemic during the lockdown resulted in favorable results for all stock market sectors. During the period of lockdown, the financial sector gained the most benefit of all sectors on the HOSE, while on the HNX, it was communications and technology. The results in the model (3c) show that the stock returns of selected sectors were negative during the period of the second wave of COVID-19 in Da Nang, Vietnam. On both HOSE and HNX, the healthcare sector was the most affected by the pandemic. In this period, Vietnam recognized that the first deaths due to the COVID-19 had made investors more concerned about the dangers of this disease, and that healthcare companies have faced fierce competition from international firms as well suffering from a lack of investment in expansion or R&D. Models (2), (3a), (3b), and (3c) show that the effect of the number of daily confirmed cases of COVID-19 infections in Vietnam (case), market capitalization (marketcap), and price-to-book ratio (pb) on Vietnam stock returns are consistent with the results from models (1a), (1b), and (1c) (1c). As a result, stock returns in Vietnam were most affected on days when the number of reported cases was highest, confirming COVID-19's significant effect on the Vietnamese stock market. Moreover, during the COVID-19 pandemic outbreak, the

stock performance of listed companies' in Vietnam with high price-to-book value was also adversely affected.

Table 6. The relationships between stock returns and various industries during pre-lockdown, lockdown, and second-wave periods.

Variable	Model (2)		Model (3a)		Model (3b)		Model (3c)	
Stockreturn	HOSE	HNX	HOSE	HNX	HOSE	HNX	HOSE	HNX
case	−0.0000379 * (0.0000166)	−0.0001385 * (0.0000411)	−0.0000119 * (0.0000303)	−0.0001047 ** (0.0000461)	−0.0001051 *** (0.0000321)	−0.0001685 *** (0.0000491)	−0.0000218 * (0.0000129)	−0.0000573 * (0.0000131)
marketcap	−0.0000924 * (0.0001356)	−0.0001227 *** (0.000213)	−0.0000215 * (0.0001219)	0.0000723 * (0.0001952)	−0.0001562 * (0.0001211)	−0.0001382 * (0.0001936)	−0.0000276 * (0.0001635)	−0.0003906 * (0.0000449)
pb	−0.0006897 ** (0.0001966)	−0.0015781 *** (0.0003837)	−0.0005611 *** (0.0002025)	−0.0015071 *** (0.0003791)	−0.0005995 *** (0.0002022)	−0.0015744 *** (0.0059413)	−0.0000441 ** (0.0000197)	−0.0000161 ** (0.0000166)
D_financial	−0.0014528 *** (0.0006637)	−0.0011193 *** (0.0009985)						
D_energy	−0.0003551 * (0.0011608)	−0.0004810 * (0.0011662)						
D_industrial	−0.0011885 ** (0.0005992)	−0.0021806 * (0.0007274)						
D_consumer	−0.0010701 ** (0.0006059)	0.0014512 ** (0.0007808)						
D_comtech	−0.0002884 * (0.0018259)	−0.0006828 * (0.001670)						
D_healthcare	−0.0006793 * (0.0018123)	−0.0001177 ** (0.0009166)						
D_financial * D_before			−0.0090291 *** (0.0006337)	−0.0038723 *** (0.0010628)				
D_energy * D_before			−0.0075167 *** (0.0014646)	−0.0063046 *** (0.0013819)				
D_industrial * D_before			−0.0073957 *** (0.0005182)	−0.0039460 *** (0.0006321)				
D_consumer * D_before			−0.0080691 *** (0.0005274)	−0.0040870 *** (0.0007346)				
D_comtech * D_before			−0.0072334 *** (0.0010527)	−0.0030722 *** (0.0021583)				
D_healthcare * D_before			−0.0013590 *** (0.0008954)	−0.003864 *** (0.0005947)				
D_financial * D_lockdown					0.0108298 *** (0.0011867)	0.0100719 *** (0.0019977)		
D_energy * D_lockdown					0.0103555 *** (0.0029353)	0.0040310 *** (0.0027151)		
D_industrial * D_lockdown					0.0076121 *** (0.0009238)	0.0040851 *** (0.0011133)		
D_consumer * D_lockdown					0.0104943 *** (0.0009582)	0.0047084 *** (0.0013248)		
D_comtech * D_lockdown					0.0088725 *** (0.0020735)	0.0113481 *** (0.0042826)		
D_healthcare * D_lockdown					0.0072947 *** (0.0055715)	0.0063134 *** (0.0059414)		
D_financial * D_secondwave							−0.0005643 * (0.0004348)	−0.0000616 * (0.0000145)
D_energy * D_secondwave							−0.0000776 * (0.0010801)	−0.0005643 * (0.0004348)
D_industrial * D_secondwave							−0.000608 * (0.0005828)	−0.0000776 * (0.0010801)
D_consumer * D_secondwave							−0.0009376 * (0.0025807)	−0.000608 * (0.0003511)
D_comtech * D_secondwave							−0.0009132 * (0.001212)	−0.0006051 * (0.0055079)
D_healthcare * D_secondwave							−0.0011001 ** (0.0003899)	−0.0022756 ** (0.0002571)
_cons	0.0019830 * (0.0016483)	0.0015187 * (0.0022724)	0.0033236 ** (0.0015681)	0.0010859 * (0.00216)	0.0009859 * (0.0015377)	0.0013028 * (0.0020986)	0.0044319 * (0.0005836)	0.0044502 * (0.0005791)

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$ (Source: Authors' calculation and compilation).

Our results, demonstrating heterogeneous effects of COVID-19 across real sectors, are expected and in line with previous findings. Pharmaceutical and telecommuni-

cation sectors are the least affected and in some cases, gained during the pandemic (Ichev and Marinc 2018; Al-Awadhi et al. 2020; Ramelli and Wagner 2020). Pharmaceutical firms increased sales and profits by selling vaccines and medical supplies. The pandemic also increased demand for equipment and software needed to work from home. Consumer-good and tourism sectors, on the other hand, usually suffered due to travel bans and precautionary saving motives of consumers (Ercolani et al. 2021).

The strong negative effect of COVID-19 cases on financial sector stock returns is unexpected at first. One might expect banks to suffer some losses due to rising non-performing loans made to the real sector. However, one would not expect the banking sector to do worse than the consumer goods sector or the industrial sector, both of which are directly affected by COVID-19. Our results, however, show that financial sector stock returns in Vietnam suffered the most from COVID-19. This is likely because Vietnam's financial system is heavily bank-based. Counter-cyclical lending practices of banks, compelled by the government by either direct or indirect intervention, force the banking sector to absorb negative shocks hitting the real sector (Demirguc-Kunt et al. 2020). This is reflected in banking and financial sector stock returns during the pandemic. As predicted by the market, in April, 2021 Circulars 03/2021/TT-NHNN was issued by the State Bank of Vietnam requesting credit institutions to restructure loans and reduce/exempt interest charged to borrowers. Ashraf (2020) and Goodell (2020) argue that financial systems are unstable during economic crises or pandemics due to the possibility of large deposit withdrawals and excessive bad loans occurring in a short period of time. One more possible reason to explain this finding is the stimulus packages and incentives of the Vietnamese government aimed at non-financial industries, such as agriculture, food processing, textile production, manufacturing, aviation, automotive, and tourism. COVID-19 harmed non-financial market stocks less than financial firm stocks as a result of market anticipation of central bank credit policy, government stimulus packages and the vulnerability of the financial sector during crisis and pandemics.

5. Conclusions

This paper studies the impact of the COVID-19 on Vietnam's stock market performance during pre-lockdown, lockdown, and second-wave periods, looking at 733 companies listed on both HOSE and HNX from 2 January 2020 to 31 December 2020. Via a random-effect model (REM) of panel data regression, the research showed that the rise in the number of daily COVID-19 confirmed infections cases in Vietnam has a negative effect on stock returns of listed companies in the market. During the pre-lockdown and second-wave periods of COVID-19, stock returns were negatively affected by the pandemic. Contrary to the negative impact on stock returns in the COVID-19 pre-lockdown and second-wave periods in Vietnam, as well as the negative impact of lockdowns that occurred for other countries' stock markets (such as seen in research of Eleftheriou and Patsoulis 2020; Baig et al. 2020), the COVID-19 lockdown period in Vietnam had a positive impact on stock performance in Vietnam. The underlying reasons for this result were investor belief in the preventative measures taken by the Vietnamese government as well as undervalued stock prices which attracted capital inflow. These measures had the effect of resurrecting the performance of Vietnamese stock markets in the period of COVID-19 lockdown.

During the pre-lockdown, lockdown, and second-wave periods of COVID-19 in Vietnam, different market industries were impacted differently by the pandemic. The financial sector, which during economic downturns was described as a vulnerable sector with the risk of an uptick in unusual withdrawals of deposits and bad loans, was the hardest impacted sector during the COVID-19 pandemic on Vietnam's stock markets. In the second-wave period of the pandemic, the healthcare sector was the most impacted despite their services being in high demand. The reason behind this result could be that they have faced fierce competition from international firms as well as suffering from a lack in terms of investment in expansion or R&D.

This research poses some recommendations for governments and investors based on findings from the Vietnam stock exchange.

Firstly, the undeniable negative impacts of the COVID-19 as well as the daily rise in the number of reported infections cases on stock returns has suggested that proactive and timely responses and containment measures would be needed for nations as well as governments to shield stock markets from serious degradation in future pandemics or epidemics. From the start, the Vietnamese government has taken decisive steps to contain the spread of COVID-19 proactively, including issuing national guidance to all citizens about the pandemic's severity, explicit emergency response guidelines, medical measures, school blockades, travel bans, social distancing, and nationwide lockdown, as well as providing financial assistance and other measures to protect the stock market. These steps taken by the Vietnamese government have raised confidence and trust among investors, leading to a positive relationship between the lockdown period and stock returns at that time. Market performance would deteriorate if investors continued to be concerned and fearful of the future. As a result, the measures to deal with the pandemic should be followed consistently and strictly in order to sustain the positive outcomes in preventing and countering the impact of the pandemic, as well as to improve customer and investor trust and enhance economic growth.

Additionally, this research's empirical results show that the impacts of COVID-19 vary depending on the industry. Financial companies' stocks are one of the most severely impacted during an unexpected event such as a pandemic, due to: (i) the high risk of increasing abnormal large-scale withdrawals and bad debts, which could spark business crises or even bankruptcy; (ii) market expectation of counter-cyclical lending practices implemented by the government and the central bank; and (iii) stimulus packages often prioritizing non-financial sectors. Further research on how characteristics of banks (state-owned vs. private-owned, leverage ratio, capital adequacy, asset size, etc.) affect their stock returns during pandemics would be an interesting question that one can investigate in future research.

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