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Assessing the impact of the COVID-19 pandemic on the performance of the Vietnam stock exchange: An empirical analysis

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ABSTRACT

The emergence of COVID-19 in Wuhan, China, in December 2019 led to a global crisis with profound implications for public health and the global economy. This study investigates the ramifications of the pandemic on the Vietnam Stock Exchange, recognizing its interconnectedness with global financial markets. Despite the considerable speculation surrounding the pandemic's influence on economic and financial systems worldwide, limited empirical research has been conducted on its specific impact on the Vietnam Stock Exchange. Employing historical data spanning from January 30, 2020, to April 27, 2022, sourced from a secondary dataset, this research empirically explores the performance of the Vietnam Stock Exchange during the COVID-19 pandemic period compared to a normal period. The findings reveal a significant decline in stock returns and heightened volatility during the pandemic, signaling adverse effects on the exchange's performance. Furthermore, the study applies Quadratic GARCH (QGARCH) and Exponential GARCH (EGARCH) models, incorporating a dummy variable, to scrutinize stock returns. The results corroborate the pandemic's negative impact on stock returns in Vietnam. This research underscores the importance of implementing strategic political and economic policies, including maintaining a stable political environment, promoting indigenous enterprises, diversifying the economy, and adopting a flexible exchange rate regime. These measures are recommended to enhance the resilience of the financial market and attract new investors to the Ho Chi Minh Stock Exchange.

1. Introduction

COVID-19 is recognized as an international public health emergency, with approximately 15% of cases presenting in severe form (WHO, 2020). Vulnerable populations, including the elderly and individuals with pre-existing medical conditions, are at a heightened risk of developing severe illness (Li et al., 2020). The onset of Coronavirus Disease 2019 (COVID-19) in December 2019, originating in Wuhan, China, has rapidly disseminated worldwide (Akanni and Gabriel, 2020). Gralinski and Menachery (2020) have documented the closure of the Wuhan seafood market due to COVID-19 outbreaks, which have tragically resulted in a substantial loss of life (Al-Qaness et al., 2020). Furthermore, the global oil price decline and economic lockdowns, notably in the United States (Ajami, 2020), have left no nation, including Vietnam, untouched by the detrimental repercussions of COVID-19 (Hung et al., 2021).

Igwe (2020) has argued that the world economy is confronting an unprecedented economic recession due to the COVID-19 outbreak. This viral shock has the potential to amplify volatility, adversely affecting a nation's economic and financial systems (Igwe, 2020). Feinstein's (2020) recent study, while focused on a hypothetical zombie outbreak similar to COVID-19, revealed that even a moderate such outbreak leading to significant casualties can result in a substantial decline in GDP and financial markets.

In Vietnam, the official identification of COVID-19 cases began in December 2019, with subsequent cases emerging thereafter. The ramifications for the Vietnamese economy and financial markets have been profound, including the lockdown of major cities in April 2020, leading to economic losses, investor withdrawals from the market, and declining oil prices in accordance with Directive No. 16/CT-TTg.

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To comprehensively assess the potential impact of the coronavirus on the Ho Chi Minh financial market and economy, it is imperative to consider not only its epidemiological characteristics but also its economic repercussions. These uncertainties have far-reaching effects, influencing businesses, households, and financial market dynamics. Businesses may defer investments due to supply chain uncertainties and concerns about the behavior of domestic and international customers. Households, fearing infection, may curtail spending on non-essential items, exacerbated by the lack of health insurance in Vietnam, which can lead to significant medical expenses. These factors collectively contribute to reduced spending and diminished economic growth.

In summary, if the consequences of COVID-19 on the economy and financial markets are not comprehensively understood and managed, this virus possesses the potential to severely disrupt the healthcare sector and economy of any nation, including Vietnam.

2. Literature review

The coronavirus pandemic, a manifestation of the coronavirus disease, has left an indelible mark on societies worldwide, characterized by widespread mortality and profound impacts on various sectors, notably the Vietnam stock market. This phenomenon has stimulated significant scholarly interest and investigation. Apergis and Apergis (2020) undertook an examination of the potential repercussions of the COVID-19 contagious disease on Chinese stock market returns and their associated volatility, employing the GARCHX model. Their findings revealed a negative correlation between daily increments in reported COVID-19 cases and deaths in China and stock returns. Notably, this effect was most pronounced when total deaths served as a proxy for the COVID-19 variable. Moreover, the research highlighted the positive influence of COVID-19 on market return volatility across both stock exchanges.

In a similar vein, Malini (2020) delved into the impact of the COVID-19 pandemic on six select global stock markets, including the USA, Indonesia, India, South Korea, Saudi Arabia, and Singapore. The outcomes underscored the significant association between the pandemic and stock market behavior, particularly concerning volatility and abnormal returns, driven by investor reactions to the prevailing shock.

Furthermore, Ozili and Arun (2020) investigated the global economic ramifications of COVID-19 and revealed its substantial adverse impact on the Vietnam stock market. The virus-induced imperative of social distancing precipitated the closure of financial markets, corporate offices, businesses, and events. The rapid and exponential spread of the virus engendered safety concerns among investors, consumers, and trade partners, adversely affecting consumption and investment dynamics.

In parallel with these developments, the global COVID-19 pandemic cast a profound shadow over the Vietnam stock market, reminiscent of the events during the 2008 global financial crisis, resulting in a precipitous decline of the Vietnam market index (VN-index). Stock prices across the Vietnam securities market plummeted during the initial three months of 2020. Notably, on March 30, 2020, the VN-Index plummeted by 28% compared to December 31, 2019, resulting in a staggering loss of USD 37.4 billion, equivalent to over 15% of the 2019 GDP, in Vietnam's stock market capitalization. Subsequently, from April 1 to April 15, 2020, Vietnam initiated a nationwide lockdown in an effort to mitigate community transmission of the virus, during which time the Vietnam stock market continued to operate.

Nhuong et al. (2020) have posited that the Vietnam stock markets, consistent with common characteristics of emerging markets, do not exhibit informational efficiency, even in their weak form. This inherent inefficiency in the stock markets raises concerns about the profound impact that the COVID-19 pandemic may exert on the Vietnamese stock market.

Furthermore, the International Monetary Fund (IMF) has issued a report indicating a projected global growth decline of 0.5% in the year 2020, attributing this downturn to the far-reaching effects of the COVID-19 pandemic. These effects manifest as increased rigidity in both demand and supply, coupled with a significant reduction in commodity trade and international tourism arrivals. Projections indicate that the global economy may enter into a state of recession during the first half of the year due to significant challenges in processing raw materials and responding to heightened demands for goods and services.

Several studies have paid attention to the impact of the COVID-19 lockdown on stock market performance. Baig et al. (2021) and Ghosh (2022) when assessing the effects of COVID-19 and its lockdown on the US stock market, revealed that the lockdown contributed to a decline in the market's stability and liquidity. Eleftheriou and Patsoulis (2020) measured the effects of the COVID-19 lockdown and social isolation on the stock market indexes of 45 nations. The authors find a negative relationship between the lockdown and the performance of international stock markets. However, Eleftheriou and Patsoulis (2020) did not clarify the impact of the lockdown on each specific country. In general, the prior studies analyzed the effects of the COVID-19 pandemic and its lockdown on stock markets worldwide. However, few study as the research of Hung et al. (2021), estimated the influence of COVID-19 during pre-lockdown and lockdown in Vietnam but they used the panel data and OLS regression models therefore the goal of this paper is to examine the impact of the COVID-19 pandemic on the Ho Chi Minh Stock markets using Quadratic GARCH (QGARCH) and Exponential GARCH models.

3. Data and descriptive statistics

The dataset pertaining to daily stock performance commences on January 30, 2020, marking the inaugural trading day of the Vietnam stock market subsequent to the Lunar New Year break. This date is particularly significant as it coincided with the revelation of Vietnam's first confirmed COVID-19 case, representing the commencement of pandemic-related impacts on market dynamics. The dataset concludes on April 27, 2022, thereby encapsulating an extensive timeframe of stock market activity. The stock price data, fundamental to this study, is meticulously sourced from the Ho Chi Minh stock exchange, ensuring the reliability and accuracy of the financial information under investigation. Concurrently, the daily tally of confirmed COVID-19 cases within Vietnam is procured from the official website of the Vietnam Ministry of Health, accessible at https://ncov.vncdc.gov.vn/. This reputable source serves as the primary reference for updated COVID-19 statistics, affirming the data's integrity and relevance to the study's objectives.

The returns were calculated using the formula below.

$$R_t = lnP_t - lnP_{t-1} \quad (1)$$

where, P_t is return at time t; ln is the natural logarithm; P_t is the current daily stock price at time t, and P_{t-1} is the previous daily stock price at time t-1. After the time lag is accounted for, then total observation becomes 562.

Fig. 1 provides a comprehensive overview of the descriptive statistics pertaining to both price and log returns across the entire dataset. The observed mean returns, which exhibit a negative value, underscore a prevailing trend of stock value depreciation, implying financial losses within the stock market. Moreover, the distribution of returns manifests a noteworthy skewness and leptokurtosis, characterized by a pronounced peakedness and fat-tailed nature, indicative of extreme observations within the dataset. In a parallel analysis, the returns are disaggregated into two distinct periods: the non-COVID-19 and COVID-19 periods, as visually depicted in Fig. 2. During the COVID-19 period, there is a conspicuous escalation in return volatility when compared to the preceding non-COVID-19 period. This heightened volatility during the pandemic period underscores the profound influence of the COVID-19 crisis on stock market dynamics. Concluding the analysis, it is evident that the returns, when examined across the entire sample as well as within the non-COVID-19 and COVID-19 periods, reveal the presence of ARCH (Autoregressive Conditional Heteroskedasticity) effects, indicative of time-varying volatility and conditional dependencies within the dataset.

Tables 1 and 2 present the outcomes of unit root tests, specifically employing the Augmented Dickey-Fuller (ADF), Dickey-Fuller Generalized Least Squares (DF-GLS), and Phillips-Peron (PP) statistical approaches. These tests are conducted on both price and log returns, encompassing the entire dataset, as well as log returns segregated into non-COVID-19 and COVID-19 periods. The findings of these tests reveal that the price series is non-stationary, meaning it lacks a stable, constant statistical structure over time. Conversely, the log returns series demonstrates stationarity, indicating that this financial metric maintains a consistent statistical profile throughout the observation periods, for both the complete dataset and its constituent sub-samples. This observed distinction arises from the nature of the price series, denoted as Pt, which reflects the percentage increase in a stock's value relative to its preceding value. In an economic context, such returns exhibit considerable fluctuation, but within a well-functioning economy, these fluctuations tend to center around a small positive value. Consequently, the cumulative stock price for a given company tends to exhibit an approximately exponential growth trajectory over time.

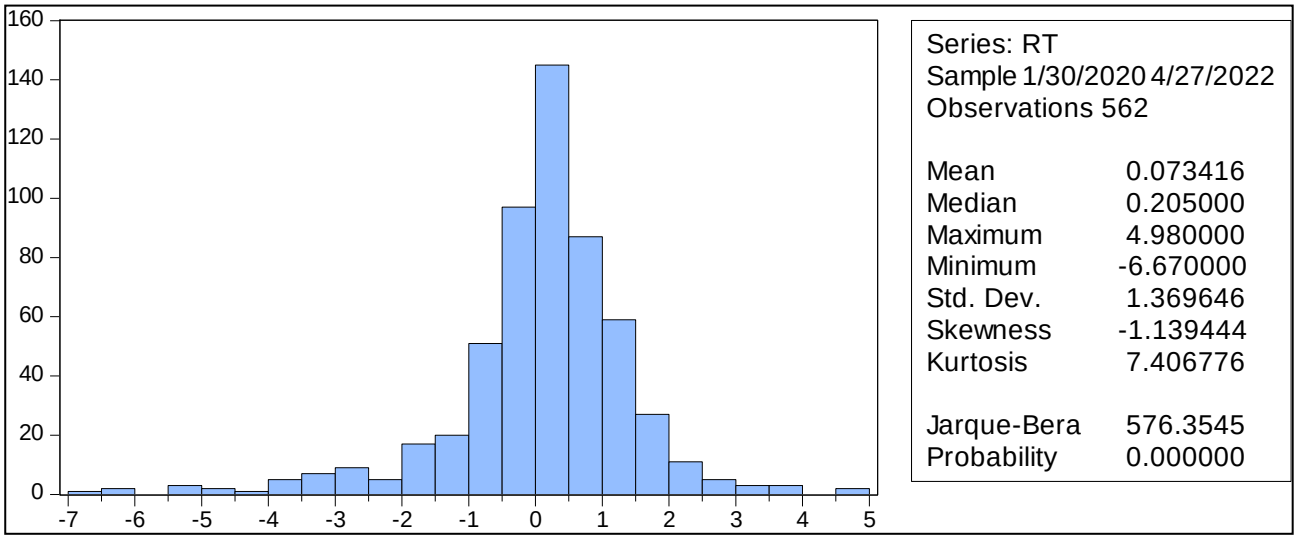

Fig. 1: Data summary

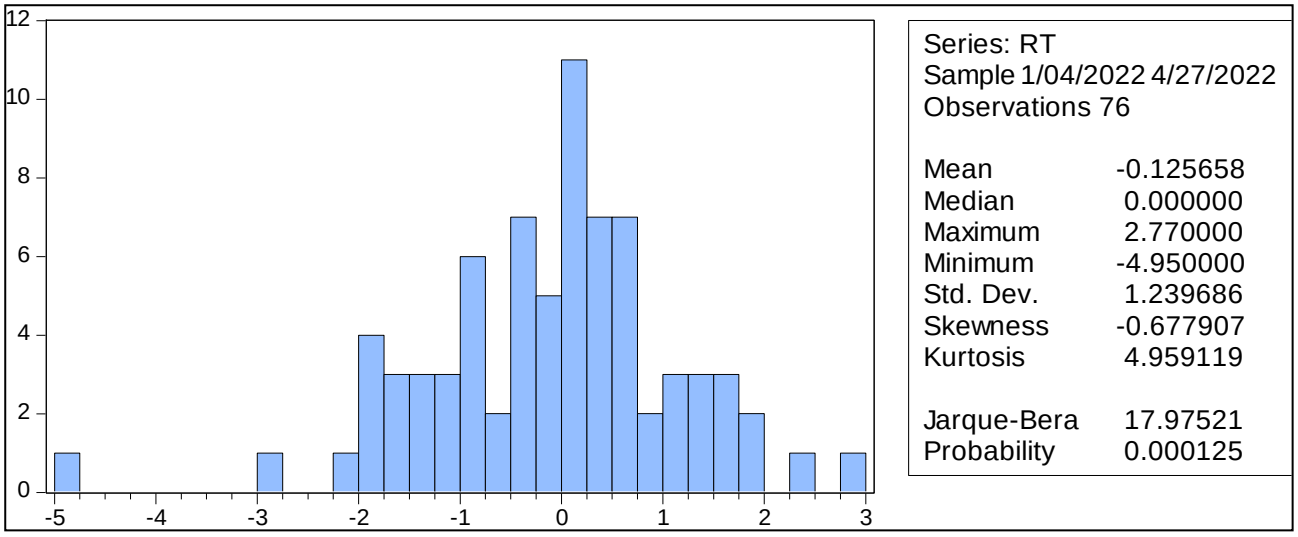

Fig. 2: Data summary for non-COVID-19 periods

Table 1: Results of classical unit root tests for the full sample

Variables	ADF	DF-GLS	PP
Changes in prices (Log-Returns) (30/01/2020-27/04/2022)			
Returns	-12.87238	-3.236530	-25.29883

Table 2: Results of classical Unit root tests for non COVID-19 and COVID-19 periods

Variables	ADF	DF-GLS	PP
Changes in prices (Sub Sample)(Non COVID-19 period)(30/01/2020-27/04/2022)			
Returns	-9.557695	-1.472849	-9.557695
Changes in prices (Sub Sample)(COVID-19 period)(30/01/2020-27/4/2022)			
Returns	-20.13491	-1.164772	-20.15119

4. Methodology

4.1. EGARCH model

The exponential GARCH (EGARCH) model was first proposed by Nelson (1991) to overcome some weaknesses of the GARCH model in handling financial time series. With particular interest in allowing for asymmetric effects between positive and negative asset returns, Nelson (1991) considered the weighted innovation as follows:

$$g(z_t) = \theta z_t + \gamma[|z_t| - E(|z_t|)] \quad (2)$$

where, θ and γ are real constants. Both z_t and $|z_t|-E(|z_t|$ are zero-mean and sequences with continuous distributions. Therefore, $[(\varepsilon t)]=0$. The asymmetry of (εt) can easily be seen by rewriting it as:

$$(\varepsilon t)=\begin{cases}(\theta+\gamma)\varepsilon_t - \gamma E(|\varepsilon_t|) \; if \; \varepsilon_t \geq 0, \\ (\theta-\gamma)\varepsilon_t - \gamma E(|\varepsilon_t|) \; if \; \varepsilon_t \leq 0, \end{cases} \quad (3)$$

An EGARCH (m, s) model can be written as be written as follows (Emenogu et al., 2020):

$$\alpha_t = \sigma_t \varepsilon_t$$
$$ln(\sigma_t^2) = \omega + \sum_{i=1}^{s} \alpha_i \frac{|\alpha_{t-i}|+\theta_i \alpha_{t-i}}{\sigma_{t-i}} + \sum_{j=1}^{m} \beta_i ln(\sigma_{t-i}^2) \quad (4)$$

Which specifically results in EGARCH (1, 1) being written as:

$$\alpha_t = \sigma_t \varepsilon_t$$

$$ln(\sigma_t^2) = \omega + \alpha([|\alpha_{t-1}| - E([|\alpha_{t-1}|) + \theta\alpha_{t-1} + \beta ln(\sigma_{t-1}^2) \quad (5)$$

where, $|\alpha_{t-1}| - E([|\alpha_{t-1}|)$ are considered with a mean of zero. When the EGARCH model has a Gaussian distribution of error terms, $([|\alpha_{t-1}|) = \sqrt{2/\pi}$ which gives:

$$ln(\sigma_t^2) = \omega + \alpha([|\alpha_{t-1}| - \sqrt{2/\pi}\,]) + \theta\alpha_{t-1} + \beta ln(\sigma_{t-1}^2) \quad (6)$$

4.2. Quadratic GARCH (QGARCH)

Sentana (1995) first introduced Quadratic GARCH (QGARCH) model to cope with the asymmetric effects of shocks on volatility. In addition, Quadratic-GARCH is an important time series model used mostly in econometrics and finance such as returns on stocks, and foreign exchange rate with volatility variance with time. It is used to model asymmetric effects of positive and negative shocks, it is a very important time, adequately representation of volatility and risk, and can easily be incorporated in multivariate models (Andresen and Bollerslev, 1998; Bou-Hamad and Jamali, 2020; Holý and Tomanová, 2023).

The QGARCH (1, 1) can be specified as follows:

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 + \gamma\varepsilon_{t-1}^2 \quad (7)$$

The term $\gamma\varepsilon_{t-1}^2$ often makes it possible for positive and negative shocks to have different effects on conditional volatility (Yaya and Shittu, 2010).

5. Results

In Table 3, we presented the performances of the EGARCH and QGARCH models with Generalized Error Distribution (GED), Student t distribution (STD), and Skewed Student t-distribution (SSTD) using Akaike Information Criteria (AIC) to choose the best model among the competing GARCH models.

Table 3: Results of GARCH models for full sample

Models	Distributions	AIC	SBIC	HQIC
Log returns full sample				
EGARCH(1,1)	GED	-6.5519	-6.5519	-6.5443
EGARCH(1,2)	GED	-6.5503	-6.5503	-6.5411
EGARCH(2,1)	GED	-6.5487	-6.5487	-6.5380
EGARCH(2,2)	GED	-6.5485	-6.5485	-6.5363
EGARCH(1,1)	STD	-6.5537	-6.5538	-6.5461
EGARCH(1,2)	STD	-6.5520	-6.5520	-6.5428
EGARCH(2,1)	STD	-6.5504	-6.5504	-6.5397
EGARCH(2,2)	STD	-6.5496	-6.5497	-6.5375
EGARCH(1,1)	SSTD	-6.5554	-6.5555	-6.5463
EGARCH(1,2)	SSTD	-6.5537	-6.5537	-6.5430
EGARCH(2,1)	SSTD	-6.5521	-6.5522	-6.5400
EGARCH(2,2)	SSTD	-6.5517	-6.5518	-6.5380
QGARCH(1,1)	GED	-6.5517	-6.5323	-6.5450
QGARCH(1,2)	GED	-6.5520	-6.5273	-6.5426
QGARCH(2,1)	GED	-6.5506	-6.5276	-6.5428
QGARCH(2,2)	GED	-6.5552	-6.5222	-6.5399
QGARCH(1,1)	STD	-6.5541	-6.5349	-6.5476
QGARCH(1,2)	STD	-6.5542	-6.5298	-6.5450
QGARCH(2,1)	STD	-6.5527	-6.5299	-6.5451
QGARCH(2,2)	STD	-6.5526	-6.5243	-6.5420

The outcome depicted in Table 3 underscores the superiority of the EGARCH (1, 1) model, coupled with the SSTD (Standardized Student's t-Distribution) component, as the most appropriate model for the dataset at hand. Consequently, the EGARCH (1, 1) with SSTD model was selected for modeling the entire dataset, wherein a binary dummy variable was incorporated to distinguish between the non-COVID-19 period (designated as 0) and the COVID-19 period (designated as 1).

Subsequently, Table 4 presents the results derived from the application of the EGARCH (1, 1) with the SSTD model, specifically considering the influence of the COVID-19 period. The analysis reveals a discernible adverse impact of the COVID-19 pandemic on stock returns within the context of Vietnam during the studied timeframe. To derive more robust and meaningful insights, it is imperative to juxtapose these results with those of prior research endeavors. The research of Hatmanu and Cautisanu (2021) also updates on the positive and negative impacts of COVID-19 on the Romanian stock market. The collected data covered the period between 11 March 2020 and 30 April 2021. The Autoregressive Distributed Lag (ARDL) test was used to measure the impact of COVID-19 on the emerging market. The results showed a significant negative impact of the pandemic on the BET index for Romania. However, in developed countries in Europe, there is a positive influence on the economic context. This result also is consistent with the results of Ozili and Arun (2020), Akanni and Gabriel (2020), and Hung et al. (2021).

Table 4: EGARCH (1, 1) with dummy variable

Model	ω	α_1	β_1	γ_1	COVID-19	Skew	Shape
Optimal parameters							
EGARCH(1,1)	-0.95100	-0.20743	0.90029	0.59624	-5.57650	1.00000	3.99777
	(0.000593)	(0.000130)	(0.000706)	(0.000332)	(0.002064)	(0.000895)	(0.00400)
Persistence= 0.9002867; Half-life= 6.598761							

6. Conclusion and policy implications

This research endeavors to scrutinize the ramifications of the COVID-19 pandemic on the performance of the Ho Chi Minh Stock Exchange (HOSE). This inquiry is precipitated by the prevailing speculations regarding the potentially catastrophic effects of the virus on the global economy and financial markets.

The empirical examination draws upon historical data encompassing the daily closing prices of the Ho Chi Minh Stock Exchange (HOSE) spanning from January 30, 2020, to April 27, 2022. Descriptive statistics were computed for both stock prices and log returns within this entire dataset. Notably, the mean returns are consistently negative, indicative of a prevailing trend of stock value depreciation. The distribution of returns is characterized by skewness and leptokurtosis, signifying pronounced peakedness and fat-tailed behavior within the dataset. Further analyses distinguish returns within the non-COVID-19 and COVID-19 periods, revealing substantially heightened volatility in returns during the latter.

Additionally, an examination of the entire dataset, segmented into non-COVID-19 and COVID-19 periods, unveils the presence of Autoregressive Conditional Heteroskedasticity (ARCH) effects, signifying time-varying volatility and conditional dependencies.

The research employs the EGARCH and QGARCH models, augmented with a dummy variable

accounting for the non-COVID-19 and COVID-19 periods. Amongst the competing models, the EGARCH (1, 1) model, incorporating the Standardized Student's t-Distribution (SSTD) and the COVID-19 period, emerges as the most robust.

Consequently, the analysis substantiates the adverse impact of the COVID-19 pandemic on stock returns in Vietnam during the study period. In light of these findings, the study advocates for the implementation of strategic political and economic policies aimed at fostering a stable political environment, incentivizing indigenous enterprises, diversifying the economy, and adopting a flexible exchange rate regime. These measures are essential to enhance the resilience of the financial market and attract new investors to the Ho Chi Minh Stock Exchange.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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