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TIME-VARYING WEEKDAY EFFECTS IN THE VIETNAMESE STOCK MARKET: PRE- AND DURING-COVID-19 EVIDENCE

EFEITOS VARIÁVEIS AO HORÁRIO DO DIA DA SEMANA NO MERCADO DE AÇÕES VIETNAMITA: EVIDÊNCIAS PRÉ E DURANTE A COVID-19

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Hoang Thi Du*
* Graduate School, Southern Luzon State University, Philippines
Orcid: https://orcid.org/0000-0003-1615-1279
duthi@slsu.edu.ph

Vo Van Can**
**Faculty of Accounting & Finance Nha Trang University, Khanh Hoa, Vietnam
Orcid: https://orcid.org/0009-0000-7145-1616
canvv@ntu.edu.vn

Nguyen Bich Huong Thao**
**Faculty of Accounting & Finance Nha Trang University, Khanh Hoa, Vietnam
Orcid: https://orcid.org/0009-0009-4285-4913
thaonbh@ntu.edu.vn

Nguyen Thi Lien Huong**
**Faculty of Accounting & Finance Nha Trang University, Khanh Hoa, Vietnam
Orcid: https://orcid.org/0009-0007-8808-7823
huongntl@ntu.edu.vn

Phan Thi Khanh Trang**
**Faculty of Accounting & Finance Nha Trang University, Khanh Hoa, Vietnam
Orcid: https://orcid.org/0009-0005-5156-277X
trangptk@ntu.edu.vn

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Abstract
This study investigates the weekday effects in the Vietnamese stock market by using the data across two distinct periods, before and during the COVID-19 pandemic. The data series spans from January 2018 to March 2022 with five major indices: VN-Index, Largecap, Midcap, Smallcap, and VN30. We employ both OLS and GARCH (1,1) models with weekday dummies to capture mean and volatility dynamics. Our results show that weekday effects were weak and index-specific in the pre-pandemic period; only Largecap and Smallcap indices were observed with significant anomalies. However, a consistent and statistically significant Friday effect was presented across all indices during the pandemic. It indicates reduced market efficiency and provides empirical support for the Adaptive Market Hypothesis. In addition, volatility persistence decreased during the COVID-19

Resumo
Este estudo investiga os efeitos dos dias da semana no mercado de ações vietnamita utilizando dados de dois períodos distintos: antes e durante a pandemia de COVID-19. A série de dados abrange de janeiro de 2018 a março de 2022 e inclui cinco índices principais: VN-Index, Largecap, Midcap, Smallcap e VN30. Utilizamos modelos OLS e GARCH(1,1) com variáveis dummy para os dias da semana a fim de capturar a dinâmica da média e da volatilidade. Nossos resultados mostram que os efeitos dos dias da semana foram fracos e específicos para cada índice no período pré-pandemia; apenas os índices Largecap e Smallcap apresentaram anomalias significativas. No entanto, um efeito consistente e estatisticamente significativo das sextas-feiras foi observado em todos os índices durante a pandemia. Isso indica uma redução na

crisis, which means that volatility shocks became more intense but less persistent. These findings make some contributions to the literature. First, they offer multi-index, time-varying evidence of calendar anomalies in a frontier market. Second, they highlight how exogenous shocks can temporarily distort market efficiency.

Keywords: Calendar Anomalies. COVID-19 Pandemic. Manufacturing Firms. The day-of-the-week Effect. Weekday Effects.

eficiência do mercado e fornece suporte empírico para a Hipótese do Mercado Adaptativo. Além disso, a persistência da volatilidade diminuiu durante a crise da COVID-19, o que significa que os choques de volatilidade se tornaram mais intensos, porém menos persistentes. Essas descobertas contribuem para a literatura da área. Primeiro, eles oferecem evidências multi-índice e variáveis no tempo de anomalias de calendário em um mercado de fronteira. Segundo, eles destacam como choques exógenos podem distorcer temporariamente a eficiência do mercado.

Palavras-chave: *Anomalias de Calendário. Pandemia de COVID-19. Empresas Manufatureiras. Efeito do Dia da Semana. Efeitos do Dia da Semana.*

1 INTRODUCTION

The stock market has a critical role in mobilizing capital for economic development, as it channels savings into productive investment. In emerging economies such as Vietnam, the development of a well-functioning stock market becomes more crucial. It not only supports domestic firms in accessing long-term capital but also enhances the country's integration into the global financial system. The Ho Chi Minh City Stock Exchange was established in 2000. Although relatively young, the Vietnamese stock market has experienced rapid growth in size and scope, with increasing participation from institutional investors, foreign investors, and retail traders. This expansion is an important reason for understanding how asset returns are generated and whether they follow the predictions of market efficiency. These insights into return behavior are valuable. It not only helps investors seeking to design profitable trading strategies but also policymakers and listed firms aiming to strengthen transparency, stability, and confidence in the financial system.

Ranking among numerous anomalies that have challenged the Efficient Market Hypothesis (EMH), the weekday effect or the day-of-the-week effect, is one of the most widely documented. The EMH proposed by Fama (1970) states that security prices fully reflect available information and thus follow a random walk. Under this perspective, systematic and predictable patterns in returns do not allow to exist. However, extensive evidence across international markets exhibits otherwise. It shows that average returns often differ systematically depending on the trading day. For example, French (1980) and Gibbons & Hess (1981) indicated evidence for negative returns on Mondays and positive returns on Fridays in U.S. equity markets. It suggests that calendar-based trading rules could generate abnormal profits. Subsequent studies tried to extend these findings to developed and emerging markets. The results demonstrated that the magnitude, direction, and persistence of weekday effects vary across contexts. In certain markets, these anomalies appear strong and persistent, whereas in others, they are weak or even reverse. This view raises debates about the stability of such effects and their compatibility with evolving market conditions.

In Vietnam, there is some research on weekday effects which has produced mixed and sometimes contradictory results. In the initial stages of market development, early studies primarily concentrated on a single index, such as the VN-Index. The studies of Hau (2010) and Pham (2013) reported evidence of significant Monday or Friday effects, while Luu et al. (2016) and Vinh & Thao (2014) showed no consistent patterns. Loc & Friday (2021) emphasized the impact of the introduction of index futures on return behavior, but their scope was limited to a specific index. In general, the literature suggests that weekday effects in Vietnam are still controversial and far from conclusive, both in terms of existence and persistence. A key limitation is that most prior studies either examine narrowly on one index or cover relatively short time phases. This fails to account for structural changes in the market. Because Vietnam has become one of the most dynamic frontier markets in Asia, it shows its rising liquidity and diversification of listed firms. It is timely to reinvestigate whether weekday effects continue to exist, and whether they are index-specific or systemic.

The COVID-19 pandemic provides a unique context to reexamine these questions. The pandemic is one of the most disruptive global events in recent years. It created unprecedented uncertainty, liquidity shocks, and behavioral shifts among investors. In many countries, the crisis caused sharp increases in volatility, changes in trading volume, and deviations from previously observed return patterns. Aleknevičienė et al. (2022) and Bolek et al. (2022) have shown that calendar anomalies may intensify, disappear, or even reverse during crisis periods when they considered certain markets. In Vietnam, a lot of evidence suggests that COVID-19 lockdowns and policy responses strongly affect investor sentiment, risk perceptions, and trading strategies. However, until now, there has been no comprehensive analysis which compares weekday effects before and during the pandemic across multiple Vietnamese indices. Therefore, fulfilling this gap is crucial. It allows us to answer questions: not only whether anomalies exist, but also how resilient or adaptive they are under extreme stress conditions.

This study aims to fill this gap by systematically investigating weekday effects across five major Vietnamese stock indices, which are the VN-Index, VN30, Largecap, Midcap, and Smallcap indices. The dataset spans from January 2018 to March 2022, and it covers both the pre-pandemic phase and the COVID-19 crisis. In order to identify anomalies, we estimate based on weekday dummy variables by using both OLS regressions and GARCH(1,1) models. While OLS provides initial evidence of mean return differences, GARCH models help capture volatility clustering and conditional heteroskedasticity. These features are common in financial time series and especially relevant during crisis periods. We compare the results across sub-periods, and then we can test whether weekday effects are time-varying and whether market efficiency evolves as the Adaptive Market Hypothesis (AMH) proposed by Lo (2004, 2005).

This study contributes to the literature in three aspects. First, it extends prior research in Vietnam by providing multi-index evidence, rather than examining a sole index such as the VN-Index. This opens a more comprehensive picture of return variations across different market segments. Second, it explicitly examines the pandemic as a structural break. It tests whether anomalies are stable or adaptive under crisis conditions, thereby contributing to the broader debate on the AMH. Third, it delivers meaningful implications. The findings advise investors to have hybrid potential short-term trading strategies, guide regulators in monitoring systemic risks, and encourage listed firms to adopt transparent communication practices during times of heightened uncertainty.

The remainder of this paper is built on the structure. Section 2 provides the relevant literature and develops research hypotheses. Section 3 shows the description of the data and methodology. Section 4 contains the empirical results and discussion. Section 5 synthesizes key findings, implications, and directions for future research.

2 LITERATURE REVIEW

2.1 Theoretical background

The Efficient Market Hypothesis (EMH) introduced by Fama (1970) is one of the most cited and impactful frameworks in modern finance. It asserts that asset prices fully and instantaneously incorporate all available information. Therefore, it is impossible for investors to systematically earn abnormal returns. Under a perfectly efficient market, price changes follow a random walk, and we cannot use historical patterns, such as calendar anomalies, to predict them. However, numerous empirical studies have repeatedly documented deviations from the EMH. Within these anomalies, the weekday effect, which is a systematic variation in stock returns depending on the trading day, has become one of the most resilient anomalies.

In an attempt to explain market anomalies with the changes of market conditions, Lo (2004, 2005) proposed the Adaptive Market Hypothesis (AMH). Unlike the static assumption of efficiency in EMH, AMH argues that efficiency is time-varying and driven by evolutionary adaptation. Market participants can adjust their strategies to adapt to competitive pressures, environmental conditions, and information change. Consequently, anomalies such as the weekday effect are not permanent; they may appear, disappear, or reverse over time. The AMH framework provides a valuable insight to interpret the fluctuation of weekday effect: why it sometimes emerges strongly in one period but vanishes in another, particularly under stress or structural changes in the market.

2.2 International evidence on the weekday effects

Research on the weekday effect first began in developed markets and gradually expanded around the world. Early evidence provided by French (1980) and Gibbons & Hess (1981) indicated negative Monday returns and positive Friday returns in the U.S. markets. Later studies also confirmed these findings in other developed economies, including the United Kingdom, Japan, and Canada. However, the magnitude of the effect has varied across time and instruments (Jaffe & Westerfield, 1985; Balaban, 1995). Some evidence showed that the weekday effect is not homogeneous. While some markets exhibit strong Monday effects, others show Tuesday or Wednesday anomalies. The reasons may be local market microstructure, trading culture, and regulatory differences.

In emerging markets, the evidence demonstrated diverse results. Research by Choudhry (2000) and Sahoo (2021) in India reports a significant Monday and Friday effect, while studies in China highlight regime-dependent anomalies explained by government interventions (Ul Ain et al., 2021). In Africa, Obalade and Muzindutsi (2019) argued that the weekday effect is present only under certain market regimes, in agreement with AMH. The study of Adaramola and Adekanmbi (2020) also exhibited that the weekday effect in Nigeria was significant in some sub-periods but absent in others. It illustrates that anomalies are not stable features.

Based on the above analysis and cross-country comparisons, it suggests that weekday anomalies tend to be more pronounced in less mature markets where there is the presence of information asymmetry, behavioral biases, and institutional weaknesses. Conversely, in developed markets with some attitudes: high liquidity and strong regulation, these anomalies often weaken or disappear over time. This pattern reveals the need to consider the level of market development when examining anomalies like the weekday effect.

2.3 Evidence during the crises and the COVID-19 pandemic

In the past, some research has investigated how anomalies behave during crisis periods. The evidence from the global financial crisis (2007-2009) indicates that weekday and other calendar effects can either emerge or disappear under stress. Aleknevičienė et al. (2022) found that there were some effects, such as Friday, July, and turn-of-the-month effects under normal conditions in the Baltic markets; however, they largely disappeared during the financial crisis. This may imply that investor behavior and predictable return patterns can be altered and reshaped by crisis periods.

The COVID-19 pandemic provided a new natural context. It disrupted global financial markets through heightened uncertainty, extreme volatility, and shifts in investor sentiment. Bolek et al. (2022) provided evidence for a pronounced weekday effect across OMX markets during COVID-19, when abnormal returns concentrated on specific days. Similarly, Sahoo (2021) reported the findings that mention significant anomalies in the Indian stock market during the pandemic, contrasting with weaker patterns in the pre-pandemic period. These findings support AMH when they suggest that shocks like COVID-19 can temporarily reduce market efficiency and create exploitable return patterns.

From a behavioral finance perspective, crises can intensify investors' psychological biases. They often exhibit greater risk aversion, herd behavior, and short-termism when facing high uncertainty. For example, Chen and Singal (2003) explained that the existence of the Friday effect is due to closing positions of investors before weekends to avoid news risk. During COVID-19, such behavior could have intensified. Because investors sought to minimize exposure to sudden pandemic-related announcements. This behavioral channel enriches the AMH by illustrating how external shocks can alter market efficiency through shifts in investor psychology.

2.4 Evidence from Vietnam

In Vietnam, the evidence of the weekday effect is mixed. Hau (2010) and Loc (2006) found anomalies in earlier stages of market development, reporting significant Monday and Friday effects in the VN-Index. Luu et al. (2016) confirmed some seasonality but did not find robust weekday patterns, while Pham (2013) and Vinh & Thao (2014) suggested weak or inconsistent anomalies. Loc & Friday (2021) emphasized the role of derivatives in affecting daily returns, but their analysis was limited in scope. Overall, studies in the Vietnamese stock market show some limitations:

The concentration is narrow: Most studies utilize only the VN-Index and overlook other important indices such as VN30, Largecap, Midcap, and Smallcap. This limitation may make it difficult to assess whether anomalies are systemic or index-specific.

Lack of crisis perspective: There is a limitation in the existing Vietnamese studies which do not systematically compare anomalies before and during a major crisis such as COVID-19. This represents a crucial omission when anomalies are regime-dependent.

When addressing these gaps, the present study makes some contributions. First, it examines weekday effects across five indices, including VN-Index, VN30, Largecap, Midcap, and Smallcap, to provide a more comprehensive view of the Vietnamese market. Second, it covers both pre-COVID-19 and COVID-19 periods; it thus tests whether anomalies are time-varying and in agreement with the AMH. By filling these gaps, the study makes contributions both to international literature on calendar anomalies and to the policy debate on market efficiency in Vietnam. In addition, it also contributes by interacting with human psychology to produce time-varying anomalies. Based on these arguments, the null hypotheses are applied for each day of the week in both sub-periods as follows:

Before the COVID-19 pandemic

H1: Stock returns do not show the presence of the Monday effect.

H2: Stock returns do not show the presence of the Tuesday effect.

H3: Stock returns do not show the presence of the Wednesday effect.

H4: Stock returns do not show the presence of the Thursday effect.

H5: Stock returns do not show the presence of the Friday effect.

During the COVID-19 pandemic

H6: Stock returns do not show the presence of the Monday effect.

H7: Stock returns do not show the presence of the Tuesday effect.

H8: Stock returns do not show the presence of the Wednesday effect.

H9: Stock returns do not show the presence of the Thursday effect.

H10: Stock returns do not show the presence of the Friday effect.

3 METHODOLOGY

3.1 Research design and approach

This study intends the purpose to examine whether weekday effects exist in the Vietnamese stock market and whether such anomalies are time-varying across different market conditions, particularly before and during the COVID-19 pandemic. In order to achieve these research objectives, we employ a quantitative econometric approach, combining both ordinary least squares (OLS) regressions and generalized autoregressive conditional heteroskedasticity (GARCH) models. When applying these approaches, it allows us to capture not only mean return differences across days of the week but also the volatility dynamics that characterize financial time series.

Calendar anomaly studies often face some challenges, such as distinguishing genuine return patterns from statistical noise and controlling for volatility clustering to avoid biased inference. If we only examine a baseline examination of weekday dummies, OLS regressions are useful, but they assume homoskedastic errors. In contrast, GARCH models can control model time-varying variance. Therefore, it provides more reliable inference when volatility is persistent and clustered, especially, these features are relevant during crisis periods. The application of both approaches strengthens the robustness of the results.

3.2 Materials and data

The dataset contains daily closing prices of five major Vietnamese stock indices:

VN-Index refers to the market-capitalization-weighted index of all stocks listed on the Ho Chi Minh City Stock Exchange (HOSE).

VN30 is an index of the 30 largest and most liquid stocks.

Largecap Index represents the index of large capitalization firms.

Midcap Index refers to an index of medium-sized firms.

Smallcap Index is an index of smaller listed firms.

The data was collected from the Vietstock company and covers the period from January 2018 to March 2022. It results in approximately 1,050 daily observations per index. We chose this period for some reasons. It helps ensure to combination of a relatively stable pre-pandemic phase (January 2018 - December 2019) and incorporation of the COVID-19 pandemic (January 2020 - March 2022). A significant structural break may be observed during the pandemic. Dividing the dataset into two sub-periods: pre-COVID-19 outbreaks and during the COVID-19 crisis, allows us to directly compare and assess time-varying anomalies.

3.3 Measurement and variable construction

To obtain the research objectives, we examine the presence of weekday effects in stock returns with weekday dummy variables included in the mean equation of the GARCH model. This approach facilitates controlling for volatility clustering and conditional heteroskedasticity. These features, which commonly happen in financial time series and could make standard estimates of OLS biased (Bollerslev, 1986).

Let ret_t denote the continuously compounded daily return on day t, according to (Brooks, 2019), it is calculated as:

$$\mathrm{ret_t} = \ln\left(\frac{\mathrm{pr_t}}{\mathrm{pr_{t-1}}}\right) = \ln(\mathrm{pr_t}) - \ln(\mathrm{pr_{t-1}}) \quad (1)$$

where $\mathrm{pr_t}$, and $\mathrm{pr_{t-1}}$ are parameters, representing the closing prices on days t and t-1, respectively.

The key independent variables, which are weekday dummies, are constructed: Mo_{tk} , Tu_{tk} , We_{tk} , Thu_{tk} . Each dummy variable takes the value 1 if day t falls on Monday, Tuesday, Wednesday, or Thursday, and 0 otherwise. To avoid spurious traps, the dummy variable, Friday, is omitted in the model.

When a coefficient on any weekday dummy is significant, it implies that returns on that day differ systematically from Friday, mentioning a weekday effect.

3.4 Econometric models

Equation (2) is constructed for the OLS model.

$$ret_{tk} = a_{0k} + a_{1k}Mo_{tk} + a_{2k}Tu_{tk} + a_{3k}We_{tk} + a_{4k}Thu_{tk} + u_{tk} \quad (2)$$

The symbol, k (k = 1,2,3,4,5), represents in turn 5 multiple indices, including VN-index, VN30, Largecap, Midcap and Smallcap.

If α_i(i = 1,2,3,4) is significantly different from zero, it means that returns on that day differ from Friday.

However, OLS assume the results with homoskedastic and serially uncorrelated residuals. These features are often violated in financial time series. Preliminary tests, ARCH-LM, are suggested to detect heteroskedasticity, then motivates the use of GARCH models.

Equation (3) is formulated to present the mean equation of the GARCH(1,1) model.

$$ret_{tk} = a_{0k} + a_{1k}Mo_{tk} + a_{2k}Tu_{tk} + a_{3k}We_{tk} + a_{4k}Thu_{tk} + u_{tk} \quad (3)$$

The error term $\mathrm{u_{tk}}$ is also modelled when using GARCH(1,1) process:

$$u_{tk} \sim T\left(0, \sigma_{tk}^2\right) \tag{4}$$

In this study, to account for fat tails in return series, we suggest applying the Student's t distribution.

Equation (5) describes the conditional variance equation of the GARCH(1,1) model.

$$\sigma_{tk}^2 = \alpha_{0k} + \sum_{i=1}^{p} \alpha_{ik} u_{tk-i}^2 + \sum_{j=1}^{q} \beta_{jk} \sigma_{tk-j}^2 + \varepsilon_{tk} \tag{5}$$

where σ_{tk}^2 is the conditional variance of returns with $\alpha_0 > 0$, $\alpha_i \geq 0$ and $\beta_j \geq 0$. This specification allows for capturing volatility persistence through parameters α_i (ARCH effect) and β_j(GARCH effect).

3.5 Diagnostic tests

In order to assure robust estimation results, several diagnostic tests are conducted before estimating the models:

Stationarity tests: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are applied to confirm that return series are stationary at level, I(0). This step helps avoid spurious regressions.

Normality tests: Jarque-Bera statistics are typically exposed to reject normality, consistent with heavy tails in financial returns. This step helps justify the use of Student's t distribution in GARCH.

Serial correlation: Ljung-Box Q-statistics are exhibited to check for autocorrelation in residuals.

ARCH effect tests: the ARCH-LM test for remaining ARCH effects is used to assess whether the GARCH model is valid to choose.

Model adequacy: After estimation, residual diagnostics are performed to ensure that no autocorrelation or remaining ARCH effects persist, confirming model validity.

3.6 Hypotheses testing

Aiming to obtain the objectives of the study, the weekday effect is assessed through the statistical significance of the estimated coefficients, α_1,α_2, α_3, and α_4 relative to Friday in the mean equation. For each trading day, we test the null hypotheses: H_0: $\alpha_i = 0$ vs. H_1: $\alpha_i \neq 0$ (i=1,2,3,4, denotes Monday, Tuesday, Wednesday and Thursday, respectively).

When a coefficient is significant, it means that average returns on that trading day are not similar to Friday returns, implying a weekday effect. In addition, to consider whether weekday effects are time-varying, we separately employ the above model for two sub-periods, the pre-COVID-19 period and the COVID-19 period. We then compare the results based on the significance and magnitude of coefficients across periods.

4 EMPIRICAL RESULTS

4.1 Descriptive statistics

Table 1 reports the basic descriptive statistics of daily returns for the five indices, including VN-Index, Largecap, Midcap, Smallcap and VN30 in both the pre-COVID-19 and COVID-19 sub-periods. In the period without COVID-19 impact, average daily returns were close to zero or slightly negative for most indices. For instance, the mean of the VN-Index exhibited a negative value of -8.47e-06, and the mean of the Midcap index showed -0.0003. These average values reveal weak average performance in normal times. It supports the notion that frontier markets may not deliver strong risk-adjusted returns in the case of absence of external shocks.

In contrast, during the COVID-19 pandemic, average returns presented positive values across all research indices. The mean of Midcap is the highest value of 0.0020. This reversal indicates that the higher uncertainty during the crisis created trading opportunities and potentially attracted speculative capital. In addition, standard deviations increased markedly during COVID-19, which confirms heightened volatility. For example, the volatility of the VN-Index grew from 0.0109 in pre-pandemic to 0.0137 during the pandemic. The extremes also became more pronounced in the case of VN30. It experienced a maximum return of 0.0766 and a minimum of -0.0696 during the period of the pandemic. Together, the results of these descriptive statistics highlight that the presence of the pandemic intensified both risks and potential returns. It is consistent with global evidence of market fluctuation in the period from 2020-2021.

Jarque-Bera statistics were significant at the 1% level for all return series. These results reject the null hypothesis of daily return normality. Based on this result, Student-t specifications are advised to use in GARCH models to account for fat-tailed return distributions.

Table 1

Basic Descriptive Statistics for Stock Returns

Statistics	VN-Index	Largecap	Midcap	Smallcap	VN30
Pre-COVID-19 Pandemic					
Mean	-8.47e-06	0.0001	-0.0003	-0.0002	-0.0002
Median	0.0006	0.0006	0.0003	1.63e-05	0.0005
Max	0.0370	0.0374	0.0469	0.0362	0.0374
Min	-0.0523	-0.0545	-0.0633	-0.0547	-0.0521
Standard deviation	0.0109	0.0113	0.0129	0.0110	0.0114
Skewness	-0.7525	-0.7249	-0.8830	-0.6971	-0.6371
Kurtosis	6.2123	6.2291	6.6716	6.3687	5.9353
Jarque-Bera	268.4591*	267.2868*	354.1134*	283.5604*	218.4409*
Probability	0.0000	0.0000	0.000	0.0000	0.0000
Observations	512	512	512	512	512
During COVID-19 Pandemic					
Mean	0.00081	0.0007	0.0020	0.0013	0.0010
Median	0.00213	0.0018	0.0044	0.0036	0.0018
Max	0.04860	0.0540	0.0636	0.0498	0.0766
Min	-0.06908	-0.0743	-0.0805	-0.0763	-0.0696
Standard deviation	0.013686	0.0143	0.0182	0.0187	0.0158
Skewness	-1.27404	-1.2824	-0.9588	-0.8390	-0.7852
Kurtosis	7.96423	8.7947	5.5402	5.0176	8.1482
Jarque-Bera	705.7557*	910.2159*	229.6094*	156.0883*	656.6586*
Probability	0.00000	0.0000	0.0000	0.0000	0.0000
Observations	544	544	544	544	544

*Notes: *, **, and *** denote p< 1%, p<5%, and p< 10%, respectively.*
Source: author's analysis

4.2 Stationarity and ARCH effect tests

Regarding stationarity, the results are demonstrated in Table 2. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were performed on all return series under three specifications: constant, trend and constant, and none. Test statistics were significant at the 1% level for all indices. These results confirm that all return series are stationary at level, I(0). This helps avoid spurious regression, and we can use the regression of GARCH models without differencing.

In terms of the ARCH Effect, Table 3 shows that the ARCH-LM tests strongly reject the null hypothesis of no ARCH effects for all indices in both sub-periods, with χ^2 statistics significant at 1%. Ljung-Box Q-statistics also indicated autocorrelation in squared returns at several lags, such as lag 1 and lag 6. Together, the results of ARCH-LM tests and Ljung-Box Q confirm the presence of conditional heteroskedasticity and volatility clustering. It supports the application of GARCH(1,1) models to capture time-varying variance.

Table 2

Unit Root Test

	VN-Index	Largecap	Midcap	Smallcap	VN30
Pre-COVID-19 Pandemic					
ADF Test					
Constant	**-14.238*** (0.000)	**-14.316*** (0.000)	**-14.075*** (0.000)	**-20.664*** (0.000)	**-22.633*** (0.000)
Trend and constant	**-14.226*** (0.000)	**-14.303*** (0.000)	**-14.076*** (0.000)	**-20.661*** (0.000)	**-22.614*** (0.000)
None	**-14.252*** (0.000)	**-14.330*** (0.000)	**-14.069*** (0.000)	**-20.680*** (0.000)	**-22.648*** (0.000)
PP Test					
Constant	**-22.683*** (0.000)	**-23.098*** (0.000)	**-23.051*** (0.000)	**-20.628*** (0.000)	**-22.704*** (0.000)
Trend and constant	**-22.664*** (0.000)	**-23.077*** (0.000)	**-23.039*** (0.000)	**-20.622*** (0.000)	**-22.686*** (0.000)
None	**-22.703*** (0.000)	**-23.116*** (0.000)	**-23.025*** (0.000)	**-20.644*** (0.000)	**-22.719*** (0.000)
During the COVID-19 Pandemic					
ADF Test					
Constant	**-21.837*** (0.000)	**-21.610*** (0.000)	**-20.802*** (0.000)	**-19.515*** (0.000)	**-22.54*** (0.000)
Trend and constant	**-21.832*** (0.000)	**-21.604*** (0.000)	**-20.840*** (0.000)	**-19.614*** (0.000)	**-22.734*** (0.000)
None	**-21.777*** (0.000)	**-21.558*** (0.000)	**-20.455*** (0.000)	**-18.981*** (0.000)	**-22.659*** (0.000)
PP Test					
Constant	**-21.904*** (0.000)	**-21.638*** (0.000)	**-20.932*** (0.000)	**-20.056*** (0.000)	**-22.777*** (0.000)
Trend and constant	**-21.897*** (0.000)	**-21.630*** (0.000)	**-20.926*** (0.000)	**-20.040*** (0.000)	**-22.757*** (0.000)
None	**-21.861*** (0.000)	**-21.621*** (0.000)	**-20.770*** (0.000)	**-20.029*** (0.000)	**-22.712*** (0.000)

*Notes: 1. *, **, and *** denote p< 1%, p<5%, and p< 10%, respectively, based on the critical values of MacKinnon (1991)*
2. Numbers in parentheses are p-*values.*
Source: Author's analysis

Table 3

Results of ARCH-LM tests and Ljung-Box Q

Statistics	VN-Index	Largecap	Midcap	Smallcap	VN30
	Pre-COVID-19 Pandemic				
ARCH(1)	**30.159*** (0.000)	**20.919*** (0.000)	**46.738*** (0.000)	**39.020*** (0.000)	**23.993*** (0.000)
Q(1)	0.032 (0.859)	0.110 (0.740)	0.063 (0.801)	**7.653*** (0.006)	0.028 (0.868)
$Q^2(1)$	**30.387*** (0.000)	**21.074*** (0.000)	**47.082*** (0.000)	**39.311*** (0.000)	**24.172*** (0.000)
Q(6)	**12.349**** (0.055)	**10.656***** (0.100)	**20.735*** (0.002)	**15.783**** (0.015)	**12.433***** (0.053)
$Q^2(6)$	**104.21*** (0.000)	**77.882*** (0.000)	**119.59*** (0.000)	**105.57*** (0.000)	**99.606*** (0.000)
	During the COVID-19 Pandemic				
ARCH(1)	**21.417*** (0.000)	**21.467*** (0.000)	**25.006*** (0.000)	**26.761*** (0.000)	**48.896*** (0.000)
Q(1)	2.624 (0.105)	1.957 (0.162)	**7.653*** (0.006)	**9.925*** (0.002)	0.956 (0.328)
$Q^2(1)$	**21.530*** (0.000)	**21.605*** (0.000)	**24.976*** (0.000)	**26.958*** (0.000)	**49.083*** (0.000)
Q(6)	**11.778***** (0.067)	**11.010***** (0.074)	**11.225***** (0.082)	**19.153*** (0.004)	**13.506***** (0.061)
$Q^2(6)$	**80.010*** (0.000)	**79.046*** (0.000)	**61.499*** (0.000)	**72.279*** (0.000)	**61.613*** (0.000)

*Notes: 1. *, **, and *** denote p< 1%, p<5%, and p< 10%, respectively.*
2. Numbers in parentheses are p-*values.*
Source: author's analysis

4.3 Results of the OLS models

Table 4 demonstrates the OLS regression results for weekday effects. The evidence of weekday anomalies was mixed in the pre-COVID-19 period. VN-Index showed a negative effect on Thursday (-0.0032). Largecap returns were significantly lower on Tuesday (-0.0029) and Thursday (-0.003) but higher on Friday (0.002). Midcap and Smallcap had negative Monday effects; the values of the coefficient are -0.0031 and -0.0035, respectively. VN30 is similar to the VN-Index with a significant negative Thursday effect (-0.004). During the pandemic, the day-of-the-week effect was more pronounced. VN-Index showed significant positive returns from Monday through Thursday (0.0038, 0.0044, 0.0049 and 0.0035, respectively), but negative Friday returns (-0.0025). Largecap, Midcap, and VN30 all displayed negative effects on Monday effects (-0.0035, -0.0047 and -0.004, respectively). Smallcap exhibited no statistically significant effects on all trading days. However, OLS results are faced with the heteroskedasticity phenomenon as suggested by ARCH-LM tests. Therefore, GARCH models are used for robust inference.

Table 4

OLS Results

Variables	VN-Index	Largecap	Midcap	Smallcap	VN30
Pre-COVID-19 Pandemic					
Constant	0.0016 (1.534)	**0.002***** (1.886)	0.0014 (1.1768)	0.0015 (1.497)	0.0017 (1.553)
Mo	-0.0014 (-0.955)	-0.0018 (-1.1338)	**-0.0031***** (-1.756)	**-0.0035**** (-2.322)	-0.0015 (-0.992)
Tu	-0.0022 (-1.464)	**-0.0029***** (-1.874)	-0.0023 (-1.332)	-0.0021 (-1.412)	-0.0025 (-1.630)
We	-0.0012 (-0.824)	-0.0019 (-1.228)	-0.0008 (-0.461)	-0.0010 (-0.689)	-0.0013 (-0.826)
Thu	**-0.0032**** (-2.176)	**-0.003**** (-2.034)	-0.0027 (-1.570)	-0.002 (-1.456)	**-0.004**** (-2.547)
During the COVID-19 Pandemic					
Constant	**-0.0025***** (-1.943)	0.0011 (0.829)	0.002 (1.402)	0.0017 (0.9511)	0.0018 (1.234)
Mo	**0.0038**** (2.062)	**-0.0035***** (-1.813)	**-0.0047***** (-1.922)	-0.003 (-1.405)	**-0.004***** (-1.949)
Tu	**0.0044**** (2.402)	0.0005 (0.301)	3.91E-05 (0.0159)	-0.0011 (-0.448)	0.0003 (0.1606)
We	**0.0049*** (2.656)	0.0011 (0.586)	0.002 (0.863)	0.0009 (0.3916)	-0.0007 (-0.3614)
Thu	0**.0035**** (1.941)	-0.0005 (-0.269)	0.0004 (0.196)	0.0017 (0.6769)	0.0002 0.923)

*Notes: 1. *, **, and *** denote p< 1%, p<5%, and p< 10%, respectively.*
2. Numbers in parentheses are t*-statistics*
Source: author's analysis

4.4 Results of the GARCH models

The post-estimation diagnostic tests show that Ljung–Box Q-statistics for standardized residuals and squared residuals and ARCH-LM statistics were insignificant. It indicates no remaining serial correlation and no residual ARCH effects after fitting GARCH(1,1) models.

Table 5 summarizes the GARCH(1,1) estimation results. In the pre-COVID-19 pandemic, a significant weekday effect was detected only for Largecap and Smallcap. For Largecap, a positive and significant constant (0.0014) indicates higher returns on Friday. For Smallcap, it shows negative Monday (-0.0012), Tuesday (-0.001), and Thursday (-0.0008) effects, but a positive and significant constant (0.0010). It implies Friday premiums. There are no significant weekday effects for VN-Index, Midcap, and VN30. During the COVID-19 outbreaks, all indices demonstrated positive and significant constants. It confirms a market-wide Friday effect. For instance, the value of the VN-Index constant is 0.0021, and the coefficient of the Midcap constant is 0.0041; they are all significant at the 5% level. Coefficients for Monday, Tuesday, Wednesday, and Thursday were statistically insignificant. It suggests that weekday effects during the pandemic concentrated primarily on Fridays.

Regarding conditional variance equations, it indicated strong volatility clustering, with ARCH (α) and GARCH (β) parameters highly significant. The persistence (α+β) was greater than 0.88 for most indices (close to one) before the COVID-19 pandemic. It indicates high volatility persistence in this period. However, during the COVID-19 period, α increased while β declined substantially (α+β ranging from 0.70 to 0.85). It suggests that volatility shocks became less persistent but more pronounced in the short run.

Table 5

The Results of GARCH (1,1) Models

Variables	VN-Index	Largecap	Midcap	Smallcap	VN30
Pre-COVID-19 Pandemic					
Mean equation					
Constant	0.001 (0.152)	**0.0014***** (0.085)	0.0009 (0.376)	**0.0010*** (0.002)	0.0013 (0.1179)
Mo	-0.0007 (0.485)	-0.0010 (0.365)	-0.0018 (0.177)	**-0.0012*** (0.004)	-0.0014 (0.212)
Tu	-0.0009 (0.411)	-0.0015 (0.188)	-0.0013 (0.333)	**-0.0014*** (0.009)	-0.0015 (0.206)
We	-0.0008 (0.494)	-0.0011 (0.345)	-0.0008 (0.728)	-0.0003 (0.449)	-0.0009 (0.434)
Thu	-0.0005 (0.638)	-0.0004 (0.702)	-8.93E-05 (0.947)	**-0.0008***** (0.070)	-0.0010 (0.373)
	Conditional Variance Equation				
C	**2.05e-06***** (0.091)	**2.27E-06***** (0.095)	**2.57E-06***** (0.104)	**6.89E-06*** (0.004)	1.70E-06 (0.133)
u_{t-1}^2	**0.102*** (0.003)	**0.093*** (0.004)	**0.075*** (0.004)	**0.305**** (0.014)	**0.081*** (0.007)
σ_{t-1}^2	**0.883*** (0.000)	**0.889*** (0.000)	**0.906*** (0.000)	**0.444*** (0.000)	**0.9054*** (0.000)
	During the COVID-19 Pandemic				
Constant	**0.0021**** (0.0177)	**0.0015***** (0.095)	**0.0041*** (0.0025)	**0.0034*** (0.009)	**0.0024**** (0.018)
Mo	0.0006 (0.594)	0.0008 (0.480)	-0.0016 (0.359)	-0.0007 (0.679)	0.0002 (0.900)
Tu	-0.0003 (0.794)	-2.96E-05 (0.982)	-0.0004 (0.846)	-0.0014 (0.447)	-0.0002 (0.873)
We	6.09E-06	0.0004	8.94E-05	0.0008	-0.0007

	(0.996)	(0.782)	(0.963)	(0.668)	(0.647)
Thu	0.0004 (0.724)	0.0004 (0.769)	0.0007 (0.699)	0.0012 (0.512)	-0.0001 (0.921)
	Conditional Variance Equation				
C	**3.29E-05*** (0.009)	**3.17E-05*** (0.008)	**5.09E-05**** (0.014)	**6.07E-05*** (0.003)	**7.77E-05*** (0.004)
u_{t-1}^2	**0.295**** (0.011)	**0.271*** (0.007)	**0.266*** (0.004)	**0.427*** (0.001)	**0.392**** (0.013)
σ_{t-1}^2	**0.601*** (0.000)	**0.614*** (0.000)	**0.625*** (0.000)	**0.489*** (0.000)	**0.428*** (0.000)

*Notes: *, **, and *** denote p< 1%, p<5%, and p< 10%, respectively.*
2. Numbers in parentheses are t*-statistics*
Source: author's analysis

5 DISCUSSION

The empirical results of this study reveal that weekday effects in Vietnam's stock market are time varying. They were weak and index-specific before the COVID-19 pandemic, but became systematic, presented a consistent Friday effect across all indices during the pandemic. This pattern is directly in agreement with the Adaptive Market Hypothesis (AMH) proposed by Lo (2004, 2005). According to the AMH, market efficiency is not a static condition but evolves, and investors need to adapt to the changes in the environment. In normal times, there are limited and fragmented anomalies in the Vietnamese market, leading to relatively efficient. However, during the pandemic, a strong Friday effect emerged, causing efficiency to temporarily decline. These findings demonstrate that external shocks such as the COVID-19 crisis can reshape market dynamics and create short-term predictability.

From the perspective of the Efficient Market Hypothesis (EMH), the findings of this study provide evidence against its strong form. According to the EMH (Fama, 1970), no systematic pattern should exist because prices should fully incorporate all available information. The persistence of a Friday effect during the pandemic goes against this assumption. This protest implies that behavioral factors, information asymmetry, or structural frictions can weaken efficiency under certain conditions.

Behavioral theories offer additional insights to explain why the Friday effect emerged strongly during COVID-19. Chen & Singal (2003) argue that investors often close short-term positions near weekends to avoid exposure to unexpected news, especially during uncertain phases. Similarly, Ul Ain et al. (2021) add an argument at this point. The sentiment of investors improves toward the end of the week, which contributes to higher Friday returns. During COVID-19, the market often faced heightened risk and frequent policy announcements; these behavioral tendencies likely intensified. Investors under this condition may have rushed to adjust portfolios on Fridays, amplifying abnormal returns.

The findings are also in agreement with research in other markets that show regime-dependent anomalies. For example, Aleknevičienė et al. (2022) demonstrated that weekday effects in the Baltic markets no longer existed during the financial crisis (2007-2009). In another context, Bolek et al. (2022) confirmed pronounced anomalies in OMX markets during COVID-19. Sahoo (2021) reported similar evidence of Bolek et al. (2022). Anomalies intensified in the pandemic in India. By contrast, in more developed markets such as the U.S. or U.K., many studies indicated the weakened weekday effects over time (French, 1980; Jaffe & Westerfield, 1985). It may be reflecting stronger institutional efficiency in these markets.

This comparison makes two clear, important points. First, anomalies are not universal; they depend on context-specific factors, such as market maturity, regulatory frameworks, and investor composition. Second, emerging and frontier markets such as Vietnam are more vulnerable to anomalies when facing stress. These market belongs to limited liquidity, weaker institutions, and stronger behavioral biases. These factors may interact to reduce efficiency.

In comparison with prior Vietnamese studies (Hau, 2010; Luu et al., 2016; Pham, 2013; Vinh & Thao, 2014; Loc & Friday, 2021), these research findings illustrate several advances. While earlier research examined the anomalies based on the VN-Index alone, this work extends the analysis to component indices, including Largecap, Midcap, Smallcap, and VN30. This expansion demonstrates that anomalies can affect all segments of the market. Moreover, the time-varying nature of anomalies, which was discovered when comparing pre-COVID-19 and the COVID-19 pandemic, was largely overlooked in previous studies.

Summarily, the discussion would highlight three key points. First, the findings clarify that weekday effects in the Vietnamese stock market are not stable but evolve with market conditions, in line with the AMH. Second, the Friday effect observed during COVID-19 can be explained by behavioral finance theories, which mention particularly investor sentiment and precautionary trading behavior. Third, when situating the Vietnamese evidence within international literature, this study exhibits that anomalies are more likely to appear during crisis periods and in less mature markets.

6 CONCLUSION

Using the daily returns across two sub-periods, before and during the COVID-19 shocks, this study examined the weekday effects in five major Vietnamese stock indices (VN-Index, Largecap, Midcap, Smallcap, and VN30). GARCH(1,1) models with weekday dummies are applied in the study. We find that weekday effects were weak and index-specific in the pre-pandemic period; However, they became stronger and systematic during the pandemic, with a consistent and statistically significant Friday effect across all indices. These findings claim that the Vietnamese stock market was less efficient during the crisis, in agreement with the AMH (Lo, 2004, 2005), which mentions the evolution of market efficiency with changing environments.

This study contributes to the literature when providing multi-index, time-varying evidence of calendar anomalies in an emerging market context. It highlights how major shocks, such as COVID-19, can temporarily reduce market efficiency and create exploitable return patterns. These results also carry practical implications for investors, regulators, and listed firms in terms of portfolio strategies, market monitoring, and information disclosure.

For investors, the Friday effect was observed during the pandemic. It means that short-term trading strategies could exploit predictable return patterns. Investors could buy earlier in the week and sell before the weekend to capture abnormal returns. Nevertheless, as anomalies change over time, traders should be cautious due to their vanishing when markets regain efficiency. In addition, continuous monitoring of volatility and macroeconomic indicators is needed in order to avoid overexposure to short-term speculative risk.

For policymakers, the wide presence of the weekday effects during the COVID-19 outbreak indicates that crises can reinforce market inefficiencies and lead to herding behavior. Regulators should enhance market surveillance, ensure timely information disclosure, and implement circuit breakers or other stabilizing mechanisms under extreme volatility, such as COVID-19 shocks. These actions are meaningful, could help mitigate systemic risk and restore investor confidence more quickly.

For listed firms, public companies need to maintain transparent and frequent communication with investors during crises. Implementing initiatives such as regular earnings updates, guidance revisions, and disclosures about operational resilience. These can help stabilize expectations and reduce panic selling. Aligning with that, employing crisis management strategies, including supply chain continuity and workforce safety plans, is also crucial to protect firm value and reassure shareholders.

For market development, the persistence of anomalies urges the need to deepen Vietnam's market infrastructure. Solutions such as expanding institutional investor participation, improving liquidity, and strengthening regulatory capacity will reduce the likelihood of inefficiencies. These actions are critical when Vietnam aspires to graduate from frontier to emerging market status in global index classifications.

The analysis of this study focuses solely on the day-of-the-week effect and does not account for other calendar anomalies such as the January or turn-of-the-month effect. Future research could extend to incorporate macroeconomic variables and investor sentiment indicators. Along with that, new research can apply alternative GARCH-family models such as EGARCH, TGARCH, or FIGARCH to capture asymmetric volatility responses and long-memory effects. Based on such extensions, it would provide a more comprehensive understanding of the drivers behind time-varying market efficiency in Vietnam.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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