Day of Week Effect on Financial Market: Evidence in Vietnam during Normal Period and COVID-19 Pandemic

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Abstract

The article is focused on examining the existence of the day-of-the-week (DOW) effect on the Vietnamese stock market. This study uses the daily series of closed market indexes data from 2014 to 2021 and extends to a deep-dive review of the outbreak period of the COVID-19 pandemic. Furthermore, the regression model with dummy variables and parametric and non-parametric methods are employed to identify the existence of the DOW effect on stock market returns and volatility. The empirical results obtained from the above models have demonstrated that the day-of-the-week effect impacts stock returns shown in three out of four indices, especially on Mondays and Fridays. At the same time, no statistical evidence supports the presence of any significant daily patterns for either the COVID-19 outbreak phase or in the HNX30. Particularly, the highest return occurs on Monday, and the lowest volatility usually appears on Friday in all three HOSE Indexes. This study contributed further evidence for not only the presence of the day-of-the-effect patterns on the Vietnamese stock market but also path the ways to analyze the stock returns and variance of financial assets during the COVID-19 epidemic.

Keywords: day-of-the-week effect, COVID-19, seasonal information, stock return

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1. INTRODUCTION

Components that impacted the stock prices and further stock returns have gained considerable interest from a wide range of academics and researchers since these would contribute to evaluating market efficiency. For instance, the efficient market hypothesis concerned that the financial market is assessed as being efficient as long as the security price fully reflects all information, factors related to the market from a macro perspective to micro data such as the domestic economy status, the international market fluctuations or the corporation's performance reports in the market (Fama, 1965). Therefore, in the concept of the efficient market hypothesis, the asymmetry in absorbing the information is one of the basic challenges of efficient

markets, especially the dominance of seasonal information variables (Olowe, 2009) or weather fluctuations, customs, and traditions on production, etc. influence on business performance (Kuria and Riro, 2013). More specifically, academics have widely investigated the calendar anomalies, including January effects, month, weekend, and day-of-week phenomena in stock-market returns, including the upward trend on Monday due to the long time interval between the closing price on Friday and the opening price at the beginning of the new week and a larger lag than other trading days (French, 1980), and random change of the stock prices under the anomalous effects (Hla et al., 2015). Therefore, studies of stock returns and their volatility patterns, mainly related to the Day of the Week (DOW) effect, are becoming popular and useful exercises.

Furthermore, from the empirical perspective, the day-of-the-week effect has been extensively investigated in many different markets (Rivoli, 1989), across different sectors (Findley and Monsell, 2009), in various periods of time (Garg, Bodla, and Chhabra, 2010), by country (Solnik and Bousquet, 1990) and by several predictive models (Chang et al., 1993), (Hla et al., 2015). Although the empirical research on the day-of-the-week effect is relatively common, neither investigation yielded regular patterns. For instance, the average return securities on incompatible days of the week are always with others (Gupta and Aggarwal, 2004), or Mondays have a negative effect on returns in the U.S. market (Kelly, 1930).

With the above reasons, this study contributed to not only the literature further evidence for the presence of the day-of-the-effect patterns in security returns in the Vietnamese market but also path the ways to analyze the stock-market returns and variance of financial assets during the Covid-19 epidemic period. Although the same duration and analytical methods in this area for the Vietnamese stock market have not been used in previous studies, is there a day-of-the-week effect in the Vietnamese stock market? Furthermore, to what extent the unexpected event like the Covid-19 pandemic adjusts this effect or any unusual effects on the stock market? This becomes the premise to form a research question for the article “Day of the week effect on the financial market: Evidence in Vietnam during normal period and Covid-19 pandemic” through employing the dummy variable regression model, parametric, and non-parametric methods of 4 basic indices, including VNIndex, VN100, VN30, and HNX30, to highlight variance between the two periods.

2. LITERATURE REVIEW

2.1. An overview of the day of the week effect on financial markets

The efficient market theory holds that all weekday trades should share the same average return. However, at the same time, a number of empirical studies have demonstrated the denial of the random walk hypothesis, i.e., the average return of stock prices on a single day of the week regularly differs from those of other days (Gupta & Aggarwal, 2004). To explain this difference, the researchers used a concept that reflects the market’s seasonality in which prices and values fluctuate according to the trading day of the week, also known as the day-of-the-week effect. This suggested that Mondays negatively affect returns in the US market (Kelly, 1930). Theoretically, day-to-day price anomalies are a fundamental form of market seasonality that has a certain effect on a security’s price in a periodical, cyclical

manner, repeating in phases or periods. Still, each phase only occurs over a certain period of time (Kaeppel, 2009).

Furthermore, the day-of-the-week phenomenon is observed not only in developed markets such as the US, UK, France, Japan, etc. (Mehdian and Perry 2001, Kiymaz and Berument, 2003) but also in emerging economies such as some Southeast Asian countries (Wong, Hui & Chan, 2006). However, like seasonality, the day-of-the-week effect is inconsistently influential in different markets. At the same time, empirical researchers are facing difficulties in providing a sufficient rationale for the root cause of the day-of-the-week effect. Accordingly, the intensity of the effect is also different at the variety of regulatory rules of the management mechanism (Jacobs & Levy, 1988) or with market risks and investors' behavior in entering finance transactions (Rystrom & Benson, 1989). Due to the limited resources within the scope of this article, our effort is mainly paid to examining the relationship between the day-of-the-week effect and stock index return, but the explanation for the cause of the effect.

2.2. Related research overview

The study of calendar anomalies in general and the day of the week effect, in particular, has been the center of academics' attention since decades ago. However, there is a limited resource for experimental analysis to verify these theories. Accordingly, the day-of-the-week effect researched papers are classified based on the findings regarding confirming or negating DOW's presence. For the existence of the phenomenon of abnormal changes in prices of asset values, the day-of-the-week effect is acknowledged in many related studies such as in the stock market (Rogalski, 1984), in the exchange rate market (Ke et al. colleagues, 2007), (Yamon & Kurihara, 2004) and in the virtual currency market (Caporale & Plastun, 2019). However, when using the parametric statistical method, especially when the volatility in a certain period is much higher than at other times (financial crisis, transition of phases of the business cycle), many empirical studies negate the weekday effect on financial markets such as Apolinario et al. (2006), Sharma (2011), etc. The reason for the difference in research results may vary, from differences in the regression model used (Theodossion & Lee, 1995), (Basher & Sadorsky, 2006), (Ulussever et al., 2011) or due to differences within the country studied (Poshakwale, 1996). The difference can also be due to the research being applied in different fields (Findley & Monsell, 2009) and assessing the effects on various indicators such as stock prices, portfolios, exchange rates, etc. (Rogalski, 1984). However, in general, these studies all show a less sufficient tendency to the different days of the week effect (Alexakis & Xanthakis, 1995), featuring the concern of whether the seasonal effect exists. Therefore, the experimental study regarding the day-of-the-week effect remains unresolved. It is necessary to promote further insight and different angles of research for deriving the concept and the root causes and measuring the daily anomaly's effect on the stock market.

3. METHODOLOGY

3.1. Research data

The daily anomaly in this paper has been inspected by the three daily share price composite indexes (i.e., VNIndex, VN30, and VN100) of the Ho Chi Minh City stock market (HOSE) and one index (HNX) of the Hanoi Stock Exchange (HASTC). The data, which is extracted from Investing.com's Datastream database, has been drawn from 5th November 2014 to 26th April 2021, producing 1615 observations (working day series) for each of the four indexes, including the Vietnam Stock Index (VNIndex), the VN100 Index, the VN30 Index, and the HNX30. All of these indices comply with the FTSE Vietnam All-Share Index's standard criteria of liquidity and investability. They are operated by the Stock Exchange and the Ministry of Finance:

Table 1. Overview of four stock index in Vietnam

Factors	VNIndex	VN30	VN100	HNX30
Market and scale	Are the indexes on the Ho Chi Minh Stock Exchange Number of listing: 440 (April 2021) Market capitalization: VND 4,080,757 Billions			Are the index on the Ha Noi Stock Trading Center Number of listing: 362 Market capitalization: 356,357 Billions
Features and Method	is a market-capitalization weighted investable index series, which cover 90% of the total traded value and 80% of HOSE's market capitalization with an unlimited cap rate for large stocks and the free-float ratio of stocks	is a market-capitalization weighted index that measures the performance of 30 large market-capitalization and high liquidity stocks from VNAllshare	is a market-capitalization weighted index combining constituents from both VN30 and the next 70 in the VNMidcap	is a market-capitalization weighted index that measures the performance of 30 large market-capitalization and high liquidity on the listed stock market of HASTC with adjustment to the volume of free-transferable shares.

Source : Summary based on information of the Hochiminh and Hanoi Stock Exchange

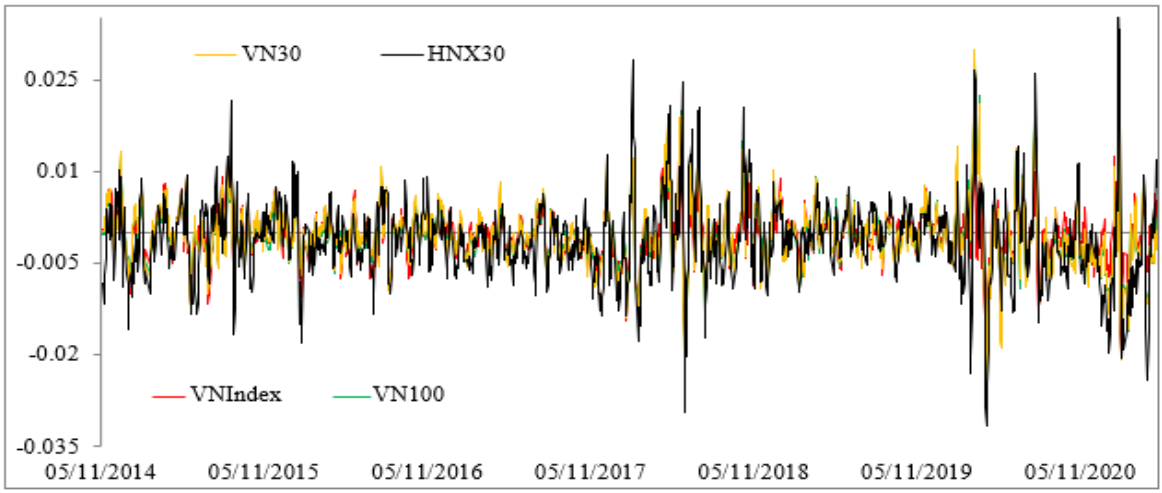

Figure 1. Trendlines of four Indexes Return for the period 2014 - 2021

Figure 1 plots the indices' evolution from 5th November 2014 to 26th April 2021. It can be seen that the profitability of the four indices generally tends to be in a similar trend, in which the HNX30 index has a much further larger fluctuation range than the other three indices. The amplitudes of these changes are variable over time, meaning they tend to be self-correlated, which is also the heuristic for the ARCH model (Gujarati, 2011).

3.2. Research Design

This paper employs multiple quantitative approaches, including regression as a dummy variable, ANOVA, non-parametric test, or generalized auto-regression for investigating the day-of-the-week effects (Basdas, 2011). Furthermore, Chien et al. (2002) suggested applying the non-parametric tests to avoid bias from dummy variables, especially for the sudden fluctuation during the research period. Therefore, a dummy regression model with the assumption of constant stock return variance is used to investigate the effects of the weekday effect on the Vietnamese stock market. The model is shown below:

$$R_t = \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 D_4 + \beta_5 D_5 + \varepsilon_t$$

Where: R_t is the average daily return of index I and is calculated by $R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$,

D1 to D5 are dummy variables and granted the value either as one if is the day being studied or equal 0 for the rest of the days, β1 to β5 are the respective daily average returns, and ε_t is the random error.

The data tend to return to the mean to ensure the time series data is stationary. Therefore, the fluctuations around the mean will be the same, or mean, variance, and covariance (at different lags) will remain constant (Gujarati, 2003). The article also employs the Augmented Dickey–Fuller test (Phillips & Perron, 1988) to test the null hypothesis of the unit root (γ = 0) at the base order and the first difference.

Furthermore, to ensure that the data are experimental and valid to the hypothesis that the dependent variable changes over time, the ARCH model determines the day-of-the-week effect on the return (Engle, 1982) during the study period and over the Covid-19 outbreak period. The ARCH model is a nonlinear model that does not assume constant variance and is motivated by a series of returns over time, also known as "volatility subgroups," that describe trends in large price changes in asset value (Xiao, 2016). In the ARCH model, "*variance autocorrelation*" is modeled using the conditional variance of error σ_t^2, which has the form (Angle, 1982): $\varepsilon_t = Z_t \sigma_t$, $Z_t \; i.i.d., E(Z_t) = 0, var\,(Z_t) = 1$ with error variance dependent on *q* delay of squared error $\sigma_t^2 = \omega + \sum_{i=1}^{q} a_i \varepsilon_{t-1}^2$.

Specifically, the study employs an Exponential GARCH (Generalized Autoregressive Conditional Heteroskedasticity) model and Student distribution TGARCH (Akaike, 1978 and Schwarz, 1978), which helps to capture possible day-of-the-week effect. The use of EGARCH and TGARCH specifications to handle possible asymmetries, nevertheless, distinguishes in this paper.

Finally, pairwise comparisons using the Kruskal-Wallis non-parametric test (Zwick & Marascuilo, 1984) for the period of the Covid-19 outbreak to eliminate the

biases of the dummy variable model since the Covid-19 pandemic is a mutating phenomenon, which might cause the crossing effects, rapid spike or decline for the data series (Liu, 2020).

4. RESULT AND DISCUSSION

4.1. Results

Table 2 reports the Mean and Standard Deviation of daily returns of four Vietnamese stock indexes, including VNIndex, VN100, VN30, and HNX30, from 5th November 2014 to 26th April 2021. All four researched indices' averaged returns have been negative. Due to the nature of the two stock exchanges, VNIndex, VN100, and VN30 of HOSE have the same model, while HNX30 of the Hanoi Stock Exchange has different trends. From the perspective of three HOSE Indexes, the daily returns peaked on Monday. However, the returns significantly dropped to a greater loss on Tuesday. From Tuesday to Thursday, the losses gradually improved before sinking to a trough on Friday. On the other hand, the HNX30 depicted losses for the whole week. The highest daily return was on Friday, while the lowest was on Wednesday.

Table 2 . Descriptive statistics results for daily market returns

	Day	**VNIndex**	**VN100**	**VN30**	**HNX30**
Average value (R_t)	Monday	0.1066	0.0576	0.0413	-0.2084
	Tuesday	-0.0781	-0.0988	-0.1207	-0.01837
	Wednesday	-0.0760	-0.1250	-0.0784	-0.2252
	Thursday	-0.0228	-0.0650	-0.0212	-0.2200
	Friday	-0.1054	-0.1277	-0.1465	-0.0745
Average value (R_t)	5 days	-0.034	-0.036	-0.030	-0.108
Standard Deviation (SD)	5 days	0.983	-0.085	-0.069	-0.152
Maximum	5 days	4.951	6.499	6.484	8.108
Minimum	5 days	-5.838	-5.016	-5.161	-6.614
Total of observations: N = 1615					

Source: Author's Calculation

To test hypothesis H0, the study compares the calculated test value with the Mackinnon (1996) critical τ value and concludes about the stationary of the observed series. Table 3 shows the results of the ADF unit root test, where the t-statistic is greater than the critical value at 1% and significant at the 1% level in all cases. Specifically, the absolute value of the calculated value is larger than the absolute value of the critical value, so hypothesis H0 is rejected. Therefore, the data series have no unit roots at both the base order and the first difference. It means that stock return is a stationary time series. The ADF test equation also explains that the constant and the trend are insignificant, a series at the base order with time-independent mean and covariance (Gujarati, 2011).

Table 3. ADF test results

	VNIndex	VN100	VN30	HNX30
At the level				
t-stat (Prob.*)	-27.365*** (0.000)	-25.317*** (0.000)	-25.332*** (0.000)	-40.201*** (0.000)
Critical value 1% level	-3.434	-3.434	-3.434	-3.434
Durbin-Watson Stat.	1.996	1.993	1.994	1.991
F-Statistic	991.84	775.15	788.35	1616.13
ρ-value	0.000	0.000	0.000	0.000
At 1st Difference				
t-stat (Prob.*)	-18.080*** (0.000)	-19.101*** (0.000)	-19.147*** (0.000)	-19.650*** (0.000)
Critical value 1% level	-3.434	-3.434	-3.434	-3.434
Durbin-Watson Stat.	2.001	2.006	2.006	1.998
F-Statistic	600.81	574.898	584.203	586.53
ρ-value	0.000	0.000	0.000	0.000

Note: *** significance level at 1%, ** significance level at 5%, * significance level at 10%
Source: Author's Calculation

Table 4 presents the estimated results of average daily return β, in which the coefficient on Monday has a positive effect on the return of the VNIndex, VN100, and VN30 at 5% significance level, 10% significance level, and 1% significance level, respectively. In contrast, the coefficient for the HXN30 index on Monday finds no statistical meaning. Similarly, the coefficient on Friday also depicts the statistical meaning for VNIndex, VN100, and VN30 at 1% and 5% significance levels. Accordingly, the HNX30 coefficient on Friday is not statistically significant. This contrasts with the trend of weekday effects in the US (Gibbons and Hess, 1981), (Gibbons – Hess, 1984), and some other developing countries (Agrawal & Tandon, 2001). Research about the day of the week's effect on US and Canada stock markets showed that stock returns are typically lower on Mondays and higher on Fridays. In contrast, daily returns in Pacific Area countries tend to be lowest on Tuesdays (Yalcin & Yucel, 2006).

On the other hand, the difference in the significance level of the test indicates that the observed results on the testing data may be randomly distinctive. Hence, the data sets' confidence levels will differ (Greenland et al., 2016). Accordingly, the effect magnitude is a measurement of the studied actual significance (Hojat et al., 2004), and VN30, for example, is the smaller population and size compared to VNIndex or VN100. Hence VN30 index data reach a high degree of accuracy or highest reliability. In contrast, the HNX30 index was negatively affected by the coefficients on Wednesday (at 5% significance level) and on Thursday at 1% significance level. The rest are not statistically significant.

Table 4. Regression results of dummy variable model - OLS estimate

	VNIndex	VN100	VN30	HNX30
Monday	0.1312	0.1035	0.1014	-0.1144
Coef. (*Prob.*)	(*0.0172*)**	(*0.0787*)*	(*0.1000*)***	(*0.1453*)
Tuesday	-0.0861	-0.0639	-0.0759	0.0020
Coef. (*Prob.)*	(*0.1137*)	(*0.2726*)	(*0.2128*)	(*0.9792*)
Wednesday	-0.0878	-0.1082	-0.0925	-0.1947
Coef. (*Prob.)*	(*0.1072*)	(*0.0636*)*	(*0.1298*)	(*0.0124*)**
Thursday	0.0284	0.0295	0.0492	-0.2482
Coef. (*Prob.*)	(*0.6002*)	(*0.6108*)	(*0.4175*)	(*0.0014*)***
Friday	-0.1509	-0.1382	-0.1306	0.0132
Coef. (*Prob.)*	(*0.0055*)***	(*0.0175*)**	(*0.0319*)**	(*0.8652*)
R^2	0.0104	0.0072	0.0065	0.0055
Durbin-Watson Stat.	2.805	1.933	1.949	1.998
Akaike Information criteria	2.799	2.935	3.025	3.512

Note: *** significance level at 1%, ** significance level at 5%, * significance level at 10%
Source: Author's Calculation

To select the most suitable symmetric and asymmetric GARCH models with the assumption of proper distribution, information criteria such as the Akaike information criteria (AIC) (Akaike,1978) and the Schwarz information criterion (SIC) (Schwarz, 1978) are used. The best-fit model is the one with the minimum information criteria and the largest log likelihood value.

The results presented in Table 5 are the normal GARCH model (1,1), EGARCH model (1,1), and TGARCH model (1,1). It supports the conclusion that the Normal distribution is suitable for the VNIndex while the Student distribution TGARCH (1,1) model is suitable for all three data series, including VN100, VN30, and HNX30.

Table 5. Model Selection

Model	Distribution	VNIndex			VN100			VN30			HNX30		
		Log likelihood	AIC	SIC	Log likelihood	AIC	SIC	Log likelihood	AIC	SIC	Log likelihood	AIC	SIC
GARCH (1,1)	Normal	-2089.707	2.598	2.624	-2138.486	2.658	2.685	-2233.826	2.776	2.803	-2632.752	3.270	3.297
GARCH (1,1)	STD	-2033.969	2.529	2.560	-2066.041	2.570	2.600	-2175.736	2.706	2.736	-2589.021	3.217	3.247
GARCH (1,1)	GED	-2048.226	2.548	2.578	-2074.741	2.580	2.611	-2184.114	2.716	2.746	-2592.369	3.222	3.252
GARCH (1,1)	SSTD	-2039.152	2.535	2.562	-2076.683	2.582	2.608	-2183.223	2.714	2.740	-2593.472	3.222	3.248
GARCH (1,1)	SGED	-2050.675	2.549	2.576	-2084.883	2.592	2.618	-2189.630	2.722	2.748	-2595.993	3.225	3.251
EGARCH (1,1)	Normal	-2077.750	2.584	2.614	-2143.244	2.664	2.691	-2239.234	2.783	2.810	-2633.392	3.271	3.298
EGARCH (1,1)	STD	-2027.611	2.523	2.557	-2068.780	2.573	2.603	-2179.664	2.710	2.740	-2589.585	3.218	3.248
EGARCH (1,1)	GED	-2041.117	2.540	2.573	-2076.809	2.583	2.613	-2187.295	2.720	2.750	-2592.901	3.222	3.252

EGARCH (1,1)	SSTD	-2031.506	2.527	2.557	-2079.993	2.586	2.612	-2187.735	2.719	2.746	-2594.069	3.222	3.249
EGARCH (1,1)	SGED	-2042.692	2.541	2.571	-2087.779	2.595	2.622	-2193.504	2.726	2.753	-2596.531	3.225	3.252
TGARCH (1,1)	Normal	-2082.261	2.590	2.620	-2134.174	2.654	2.684	-2229.147	2.772	2.802	-2628.906	3.267	3.297
TGARCH (1,1)	STD	-2028.529	2.524	2.558	-2062.360	2.566	2.600	-2171.305	2.701	2.735	-2586.557	3.216	3.249
TGARCH (1,1)	GED	-2043.090	2.543	2.576	-2071.949	2.578	2.612	-2180.614	2.713	2.746	-2590.187	3.220	3.253
TGARCH (1,1)	SSTD	-2032.898	2.529	2.559	-2072.632	2.578	2.608	-2178.319	2.709	2.739	-2590.689	3.219	3.249
TGARCH (1,1)	SGED	-2045.044	2.544	2.574	-2081.577	2.589	2.619	-2185.722	2.718	2.748	-2593.410	3.223	3.253

Source: Author's Calculation

The results of the ARCH model estimation are summarized in Table 6. The sum of the ARCH coefficients and the GARCH coefficients manipulate the existence of volatility shocks so that their sum up should be less than 1 (i.e. $\alpha + \beta < 1$) to ensure the fact that the εt series are stationary and the variance is positive (Abdullah et al., 2017). Table 6 shows that the sum of the ARCH and GARCH coefficients in each index exceeds 1. Hence the residuals of the regressions are not fixed, and the volatility tends to persist. This means the existence of volatility shocks in the Vietnamese stock market, and the volatile effect might indefinitely last. Explosive shocks are generally unprofitable for long-term investments because of their prolonged volatility, which validates the previous findings of Bala and Asemota (2013), Fasanya and Adekoya (2017), and Kuhe (2018). Regarding the VNIndex, the cumulative return on Monday was statistically significant at 5%, and the opposite trend on Wednesday and Friday at 10% significance, similar to VN100 at 1%, 5%, and 10%, respectively. While HNX30 showed a significant decline in profitability on Wednesdays and Thursdays at 5% and 10%, respectively.

Table 6. ARCH estimation results from 11/2014 to 4/2021

	VNIndex	**VN100**	**VN30**	**HNX30**
Monday	0.1023	0.0746	0.0716	-0.256
Coef. (*Prob.*)	(*0.0107*)**	(*0.0617*)*	(*0.1002*)	(*0.6429*)
Tuesday	-0.0457	-0.0173	-0.0282	0.0020
Coef. (*Prob.)*	(*0.2453*)	(*0.6890*)	(*0.5504*)	(*0.4412*)
Wednesday	-0.0914	-0.0933	-0.0840	-0.1432
Coef. (*Prob.)*	(*0.0544*)*	(*0.0481*)**	(*0.0937*)*	(*0.0371*)**
Thursday	0.0019	-0.0060	0.0069	-0.2094
Coef. (*Prob.*)	(*0.9662*)	(*0.8874*)	(*0.8785*)	(*0.0006*)***
Friday	-0.0823	-0.1209	-0.0995	-0.0520
Coef. (*Prob.)*	(*0.0728*)*	(*0.0072*)***	(*0.0427*)**	(*0.3943*)
Variance Equation				
C	0.0284	0.0221	0.0262	0.0747
	(*0.000*)***	(*0.000*)***	(*0.000*)***	(*0.000*)***
RESID(-1)^2	0.1148	0.1049	0.0969	0.1454
	(*0.000*)***	(*0.000*)***	(*0.000*)***	(*0.000*)***
GARCH(-1)	0.8607	0.8801	0.8842	0.8217
	(*0.000*)***	(*0.000*)***	(*0.000*)***	(*0.000*)***

R^2	0.0087	0.0064	0.0055	0.0037
Durbin-Watson Stat.	2.186	1.934	1.950	1.998
Akaike Information criteria	2.598	2.658	2.776	3.512

Note: *** significance level at 1%, ** significance level at 5%, * significance level at 10%
Source: Author's Calculation

Part Variance Equation of Table 6 demonstrates the results of the residual test of variance for ARCH effects. The test rejected the null hypothesis and confirmed that there is no ARCH effect in the residuals of returns, meaning that errors change over time and can only be modeled using ARCH family models (Kuhe, 2018).

However, implementing ARCH model for data during the Covid-19 period (1/2020 - 4/2021) shows that the weekday effect is less likely to appear, except for the negative impact on the HNX30 index of the Thursday coefficient at 5% significance level.

On the other hand, Chien et al. (2002) argue that the test statistic of a dummy regression model tends to increase and that the estimator tools are similar at the greatest likelihood (meaning that the variance of the population T must be equal to the variance of T each 'p' observation, which represent a tested date with an assigned value as 1 and observations' q' representing other dates with a value of 0). Therefore, the article employs a pairwise comparison to investigate the difference between the five identifiers of the day of the week.

Table 7. Estimation results of ARCH from 2/2020 to 4/2021

	VNIndex	**VN100**	**VN30**	**HNX30**
Monday	0.1387	-0.0698	-0.0853	-0.2266
Coef. (*Prob.*)	(*0.2490*)	(*0.6380*)	(*0.5695*)	(*0.2114*)
Tuesday	0.0172	-0.1496	-0.1429	-0.0178
Coef. (*Prob.)*	(*0.8956*)	(*0.4339*)	(*0.4832*)	(*0.9090*)
Wednesday	-0.1949	-0.1832	-0.1821	-0.1987
Coef. (*Prob.)*	(*0.2407*)	(*0.3946*)	(*0.4106*)	(*0.3492*)
Thursday	-0.1352	-0.1695	-0.1836	-0.4444
Coef. (*Prob.*)	(*0.3438*)	(*0.2955*)	(*0.2628*)	(*0.0174*)**
Friday	-0.1144	-0.2824	-0.2886	-0.2444
Coef. (*Prob.)*	(*0.5126*)	(*0.1314*)	(*0.1542*)	(*0.1660*)
Variance Equation				
C	0.1880	0.2680	0.3145	0.1453
	(*0.0053*)***	(*0.0012*)***	(*0.0015*)***	(*0.000*)***
RESID(-1)^2	0.1398	0.1490	0.1435	0.1919
	(*0.0008*)***	(*0.000*)***	(*0.0002*)***	(*0.000*)***
GARCH(-1)	0.7417	0.7374	0.7251	0.7914
	(*0.000*)***	(*0.000*)***	(*0.000*)***	(*0.000*)***
R2	0.014	0.005	0.0038	0.0081
Durbin-Watson Stat.	2.232	1.840	1.852	1.835

Akaike Information criteria	3.180	3.555	3.613	3.881

Note: *** significance level at 1%, ** significance level at 5%, * significance level at 10%
Source: Author's Calculation

Table 8. Pairwise comparison – Krusal-Wallis test results from 11/2014 – 4/2021

	VNIndex				VN100				VN30				HNX30			
	Mean	Average rank	*H* value	Prob.	Mean	Average rank	*H* value	Prob.	Mean	Average rank	*H* value	Prob.	Mean	Average rank	*H* value	Prob.
Monday	0.20	881.61	9.718	0.002	0.20	864.57	5.717	0.017	0.20	860.02	4.827	0.028	0.20	808.44	0.000	0.998
Other days	0.0000	790.59			0.0000	794.76			0.0000	795.88			0.0000	808.51		
Tuesday	0.20	786.82	0.875	0.350	0.20	798.96	0.170	0.681	0.20	789.13	0.698	0.403	0.20	836.19	1.427	0.232
Other days	0.0000	813.94			0.0000	810.89			0.0000	813.36			0.0000	801.56		
Wednesday	0.20	783.23	1.184	0.277	0.20	781.80	1.322	0.250	0.20	789.48	0.671	0.413	0.20	781.70	1.332	0.249
Other days	0.0000	814.81			0.0000	815.17			0.0000	813.25			0.0000	815.19		
Thursday	0.20	825.99	0.574	0.449	0.20	822.40	0.362	0.547	0.20	829.24	0.806	0.369	0.20	769.21	2.894	0.089
Other days	0.0000	804.08			0.0000	804.99			0.0000	803.26			0.0000	818.43		
Friday	0.20	766.14	3.352	0.067	0.20	775.75	2.004	0.157	0.20	775.50	2.034	0.154	0.20	846.99	2.768	0.096
Other days	0.0000	819.16			0.0000	816.75			0.000	816.81			0.0000	798.81		

Source: Author's Calculation

Tables 8 and 9 present the results of the Kruskal-Wallis pairwise test. During the research period from November 2014 to April 2021, the Monday effect occurred in all three indices in HOSE market, including VNIndex, VN100, and VN30, interpreting that HOSE market is affected by certain specific day-of-the-week effects. The shared trend of those indices in HOSE index market is due to the fact that they are all extracted and calculated from the same population and accounted for over 50% of the capitalization of the market. Measurement error is the cause of the day-of-the-week effect, mainly because this phenomenon appears stronger for a higher capitalization market. Based on public information, the influence of the day-of-the-week effect on VNIndex, VN100, VN30, and HNX30 might be due to the differences in the adjusted calculation period (VN30 is on the 2nd day of the 4th week in January or July of the year, while HNX30 is the last trading day of March and the last trading day of September). This result also ignores the application of Chien et al. (2002) that not all dummy variables promote the same trend.

Table 9. Pairwise comparison – Krusal-Wallis test results from 2/2020 – 4/2021

	VNIndex				VN100				VN30				HNX30			
	Mean	Average rank	*H* value	Prob.	Mean	Average rank	*H* value	Prob.	Mean	Average rank	*H* value	Prob.	Mean	Average rank	*H* value	Prob.
Monday	0.20	180.69	2.625	0.105	0.20	169.61	0.297	0.586	0.20	171.22	0.492	0.483	0.20	157.42	0.408	0.523
Other days	0.0000	159.70			0.0000	162.55			0.0000	162.14			0.0000	165.70		
Tuesday	0.20	173.35	0.809	0.369	0.20	160.64	0.105	0.746	0.20	159.76	0.167	0.683	0.20	180.18	2.423	0.12
Other days	0.0000	161.64			0.0000	164.85			0.0000	165.07			0.0000	159.91		
Wednesday	0.20	157.94	0.327	0.567	0.20	165.34	0.016	0.899	0.20	165.34	0.016	0.899	0.20	166.17	0.042	0.838
Other days	0.0000	165.48			0.0000	163.67			0.0000	163.67			0.0000	163.47		
Thursday	0.20	156.62	0.495	0.482	0.20	161.63	0.051	0.821	0.20	162.20	0.029	0.864	0.20	152.18	1.267	0.260
Other days	0.0000	165.83			0.0000	164.59			0.0000	164.45			0.0000	166.93		
Friday	0.20	150.66	1.615	0.204	0.20	162.68	0.016	0.900	0.20	161.34	0.064	0.800	0.20	164.03	0.000	0.998
Other days	0.0000	167.31			0.0000	164.33			0.000	164.66			0.0000	163.99		

Source: Author's Calculation

Corresponding to the ARCH estimation model, the Krusal Wallis test appears non-statistically significant for either the full survey data period or the Covid-19 outbreak timeline from February 2020 to April 2021, meaning the day-of-the-week effect does not exist during the Covid-19 period. The reason for this might be due to the relatively short survey period, and along with that, the pandemic event does not have an impact on the stock market operation when the daily transactions could be handled online without being affected by social distancing measures during the pandemic. However, this is insufficient evidence or rationale to explain the situation satisfactorily. Therefore, further studies are required to contribute the literature, empirical groundwork, and rationale for the differences.

4.2. Discussion

Based on the studies of Wong (2001), Lin and Lim (2001), Hui (2005), Yalcin and Yucel (2006), Anwar and Mulyadi (2009), Djalil et al. (2018), in normal period, most stock markets in Asia have weekday effects, especially in the Pacific Rim region (China, Indonesia, Malaysia, South Korea, and Thailand). This effect demonstrates that the stock returns of these countries tend to have significantly negative average returns on Mondays. In contrast, Friday returns are positively higher than on other weekdays, as in the US, UK, and Canada (Choudhry, 2000). It means there may be a link between US Seasonal Monday and the Asia-Pacific DOW effect because they tend to be the same but out of phase by one day due to different time zones (Lin and Lim, 2001). However, the empirical results above show that Vietnam's stock market tends to go against the trend with neighboring countries. Based on the reaction of VNIndex, VN100, and VN30, the return on Mondays is more positive than on other days and usually declines on Fridays. The cause of this difference may be the use of different stock indexes. The cause of this difference may be due to the use of different

stock indices. Each index has different extracted databases and calculation methods, leading to different results reflecting market volatility information.

For example, in Indonesia, with the LQ45 index, the studies demonstrate a day-of-week effect similar to that of the US (Yalcil & Yucel, 2006; Djalil et al., 2018), but with JKSE, there is only a negative trend on Mondays, with no sign of the influence of weekday effect on Friday (Anwar & Mulyadi, 2009). This is similar to the difference between the three indexes on HOSE and HNX30 in this article's research result. In reality, according to the Code of Building and Management of the HOSE-Index, version 3.0 of HOSE, updated in November 2020, the indexes (including VN-Index, VN30-Index, and VN100) will be calculated by the free-float adjusted capitalization method. Similar to VN30 of HOSE, HNX30 also includes 30 stocks that meet the following criteria: liquidity, market capitalization, the concentration of industry groups on the Hanoi Stock Exchange, and their rate-free float is allowed up to 5%. The free float ratio shows the number of shares that are truly freely transferable without any constraints or disclosure. It means that the issue of VNIndex's information disclosure will be more closely related to the market than VN30, VN100, and HNX30's. The free float rate is updated by VNIndex in market capitalization daily, so it is also affected by the highest DOW effect.

On the other hand, by convention, VNIndex has an initial base value of 100 points. From the base date is also the first trading day, 28/07/2000 (Friday). Therefore, VNIndex is calculated and updated right in the trading time. During the trading session, any changes in price and issued shares will change the index's value, and at the same time, it will be compared to the previous trading session by relative value. Meanwhile, VN100 was put into effect on the base date of 24/01/2014 (Friday) with the base price equal to the VNINDEX value of 560.19. Therefore, Monday is the time when the adjusted difference between VNIndex and VN100 is calculated in a period compared to the base value on Friday. This also explains the research results when with VNIndex, the positive cumulative return on Monday is significant at 5% and negative on Wednesday and Friday at the significance level of 10 %, the same for the VN100 index. Moreover, in 24/01/2014, Vietnam's second-largest bank by assets - the Bank for Investment and Development of Vietnam, better known as BIDV - was officially listed on the Ho Chi Minh Stock Exchange, showing the stock market in late 2013 and early 2014 showing signs Very positive. Particularly in January 2014, VN-Index increased by more than 8% and reached the highest level in 4 years, while in 2013 it increased by nearly 20%. On the contrary, by the end of 2011, Vietnam's stock market index was down 27%, compared to 22% of MSCI Frontier Markets and the down 18% of MSCI Asia outside Japan (Reuters, 2012). This makes HNX30, which was announced to apply on Tuesday, 3/1/2012, have a negative trend in the following days. Although also listed in 2012, VN30 was announced to apply on Monday, February 6, 2012, inheriting a positive sign of the economy when inflation dropped to 16.4% in January and attracted USD 32.3 million in net inflows from investment funds (EPFR Global, 2012).

In the Covid19 pandemic period, the weekday effect is almost absent, except for the negative impact on the HNX30 index on Thursday (at 5% significance level). The main cause of the invalidation of the weekday effect at this stage is the widespread negative effect of the epidemic on the stock market. Based on the research of Truong (2020), Dao & Gan (2020), Dao et al. (2021), and Nguyen et al. (2021), the growth of the number of COVID-19 cases negatively impacted stock

returns, especially during the lockdown period. The sector that the Vietnamese stock market has been hardest hit during the COVID-19 pandemic is the financial sector, which is considered a vulnerable sector during the economic downturn with the possibility of increasing bad debt and abnormal deposit withdrawals (Godell, 2020).

5. CONCLUSION

The paper investigates the existence of the day-of-the-week effect phenomenon on profitability and volatility of four key indices of the Vietnamese stock market by employing three equations. The findings present that under the reviewed period from November 2014 to April 2021, there were various daily anomalies that have affected the public equity market. Specifically, the highest return is observed on Monday, while the lowest return is observed on Friday for the three over four indexes, including VNIndex, VN30, and VN100 of the HOSE market. However, HNX30 shared the opposite trend of the other three and is confirmed to be impacted on Wednesday and Thursday instead. Although the three GARCH specifications provide more efficient estimates of parameters such as AIC and SIC, the selection of the information criteria is divided into two sets, in which GARCH (1,1) is suitable for the VNIndex while the Student distribution TGARCH (1,1) is for VN100, VN30, and HNX30. Finally, the Krusal-Wallis test found no correlation between any two single working days within a week for the stock return at any indexes. Extensively, during the Covid-19 outbreak period, both parametric and non-parametric methods, the researched findings have no statistical significance for the existence of the day-of-the-week effect phenomenon on the Vietnamese stock market. With the limitation of this paper, the rationale for the findings mentioned above and the result is insufficient and unsatisfactory. It also opens the chance for further deep-dive study to support the existence or absence of the day-of-the-week effect on the Vietnamese stock market.

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