Article

The Impact of the Introduction of Index Futures on the Daily Returns Anomaly in the Ho Chi Minh Stock Exchange

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Abstract: This study investigated the impact of the introduction of the VN30-Index futures contract on the daily returns anomaly for the Ho Chi Minh Stock Exchange (HOSE). Daily returns of the VN30-Index for the period 6 February 2012 through 31 December 2019 are used in this study to ascertain the new VN30-Index futures contract influence on the day-of-the-week anomaly observed in the HOSE. To test this effect, ordinary least square (OLS), generalized autoregressive conditional heteroskedasticity [GARCH (1,1)] and exponential generalized autoregressive conditional heteroskedasticity [EGARCH (1,1)] regression models were employed. The empirical results obtained from the models support the presence of the day-of-the-week effect for the HOSE during the study period. Specifically, a negative effect was observed for Monday. However, the analysis revealed that the day-of-the-week effect was only present in stock returns for the pre-index futures period, not for the post-index futures period. These findings suggest that the introduction of the VN30-Index futures contract had a significant impact on the daily returns anomaly in Vietnam's HOSE, providing evidence that the introduction of the index futures contract facilitated market efficiency.

Keywords: daily returns anomaly; introduction of index future trading; HOSE; EGARCH model

JEL Classification: G10; G40

1. Introduction

The Vietnam derivatives market was officially launched on 10 August 2017 with the initial offering of the VN30-Index futures contract. Its introduction was undoubtedly an important step in the market's growth 17 years after the opening of the Ho Chi Minh Stock Exchange (HOSE), the first stock exchange in Vietnam. At the time of the introduction of the VN30-Index, total market capitalization approached USD 130 billion. Since that time, the market has grown substantially to a market capitalization that now exceeds USD 200 billion and attracts ever-increasing attention from global investors (source: HOSE website—www.hsx.vn). On 25 November 2020, Bloomberg reported that the Korea Investment Management Co. (KIM), one of the largest asset management firms in Korea, is using the Bloomberg VN30 Futures Index for its new "KINDEX" Vietnam VN30 Futures Leverage Exchange traded fund (ETF) (Bloomberg and Korea Investment Management Launch first Vietnam VN30 Futures Leverage ETF 2020).

Bloomberg just named Vietnam Asia's hottest stock market and projects its market to see even greater inflows. Over the last year, market capitalization rose over 70% (Giang 2021). After Kuwait graduated to Morgan Stanley Capital International (MSCI) Emerging Market status, Vietnam became the largest component of the MSCI Frontier Markets index with a weighting of just over 30%, leading additional international inflows as frontier market funds rebalanced. Assuming that Vietnam can make some ownership structure and regulatory changes, they will graduate to Emerging Market status in the near future further propelling their popularity among international investors (Long 2021).

According to HOSE's 2020 annual report, at the end of the year there were 31,134 foreign individuals and 3937 foreign organizations investing in the Vietnam stock market, amounting to a 16.7 percent year-over-year increase. As the market continues to mature and attract more international attention, the VN30-Index Futures contract should see rapid growth by both domestic and international investors in the coming years and possibly lead to the introduction of additional contracts.

The daily returns anomaly has been extensively investigated in the financial literature (Jaffe and Westerfield 1985; Balaban 1995; Lian and Chen 2004; Dicle and Levendis 2014; Al-Loughani and Chappell 2001; Basher and Sadorsky 2016; Toit et al. 2018). It is argued that derivatives trading may have a significant impact on the daily returns anomaly by providing traders with a more cost-effective method to exploit this and other anomalies. However, the impact of derivatives trading on the daily returns anomaly has not been widely explored. This is especially the case for frontier and emerging markets as most empirical studies have focused the daily returns anomaly in larger, developed stock markets (Kamara 1997; Hiraki et al. 1998; Faff and McKenzie 2002).

Since the VN30-Index futures contract is so new and will play an ever-increasing role in investor portfolios as it becomes more seasoned, additional research is required to understand the relationship between the establishment of the index futures market and the stability of the underlying market (Nhung et al. 2019). There is a lack of research on the role of the VN30-Index futures as it relates to daily anomalies within the HOSE. Therefore, the purpose of this study is to investigate this relationship in light of past evidence showing a day-of-the-week effect in the HOSE prior to the introduction of the index futures contract. This phenomenon, to our knowledge, has not yet been explored in the literature.

The case of the HOSE provides an excellent natural experiment due to the fact that it only recently released the VN30-Index futures contract as an investment alternative. This means that, in principle, the effects of index futures trading on the daily returns anomaly can be evaluated by comparing data from before the release of the index futures contract with data from after the release of that contract. This is a unique scenario in which a substantial dataset is present since the HOSE only released the index futures contract in 2017. Researchers can make use of this dataset to explore the main research question of this study: "What effect did the introduction of the VN30-Index futures contract by the HOSE have on the daily returns anomaly also known as the day-of-the-week effect?" As the proportion of trading volume by both domestic and international investors increases, this research will contribute to their understanding of the behavior of the both this derivative contract and the underlying index as well as the influence of the new contract on previous market behavior and relationships.

The hypothesis of this study is that the introduction of index futures contract on the HOSE diminished the daily returns anomaly by providing a more cost-effective means for exploiting and thus reducing the anomaly. This is a hypothesis that can be tested through the use of statistical regression models that compare data from the pre-index futures contract period against data from the post–index futures contract period. The rest of the paper is structured as follows. Section 2 reviews the empirical literature with a focus on studies related to index futures and their introduction. Section 3 provides general background information about the HOSE and the index futures contract in Vietnam. Section 4 describes the data and the research methodology employed in the study. Section 5 discusses the empirical results. Finally, Section 6 provides conclusions formulated on the basis of empirical findings.

2. Literature Review

Although the day-of-the-week effect in stock returns has been extensively documented in the financial literature over the last several decades, the impact of derivatives trading on this anomaly has not been explored extensively. Some studies concluded that the introduction of the index futures contract has had significant effects on the daily returns anomaly. Specifically, Kamara (1997) investigated the effect of the S&P 500 index futures

trading on the day-of-the-week effect for the U.S. market during the period 1962–1993. The findings from this study indicated that the daily returns anomaly was significantly reduced in the post-futures trading period. The author claimed that the decline was associated with reducing transaction costs, which were seen as obstacles to arbitraging the index. In addition, Hiraki et al. (1998) examined the impact of index futures trading on daily-return seasonality in Japan for the period 1976–1996. This study provided evidence that the introduction of index futures has a significant impact on the daily index returns anomaly. Specifically, the Tuesday effect disappeared in the post-futures trading period while the Monday effect was found. Moreover, Faff and McKenzie (2002) investigated the impact of index futures introduction on the daily returns anomaly for seven developed stock markets (Australian, German, Spanish, Japanese, Swiss, U.K. and U.S.). The findings from this study generally suggested that the introduction of futures trading weakened the daily returns seasonality.

The authors found no previous research on this particular topic examining the influence of the VN30-Index futures contract on the daily returns anomaly for the Vietnamese stock market. However, the literature does address various effects of index futures as well as the daily returns anomaly independently. Friday and Hoang (2011) examined the day-of-the-week effect on 550 stocks listed on the Vietnam Stock Exchange from the market's inception in July 2000 through July 2010. Stocks were categorized into deciles based on market capitalization. In addition, the dataset was partitioned into two sub-periods, the first being from 28 July 2000 to 1 March 2002—-when the stock exchange only traded on Monday, Wednesday and Friday—and the period afterward until 13 July 2010, when the exchange converted to daily trading. Across both sub-periods, the authors found consistently negative returns for Monday, which also had the lowest trading volume, while Wednesday showed significantly positive returns and had the highest daily volume. These results were mostly consistent across market capitalization based deciles.

In a study specific to stock market informational efficiency within the HOSE, Duong et al. (2016) examined the importance of financial news in making stock market predictions specific to the HOSE. The authors found that financial news related to stock prices was significant in predicting trends in the VN30-Index as news influences investors and stock market behavior.

In addition, Nguyen et al. (2019) investigated the effects of futures contracts on risk and returns of the VN30-Index for the period from 10 August 2017 through 31 January 2019. Using an EGARCH model, the authors found that the leverage effect existed in the market returns. In addition, the results of the study indicated that growth trends could be predicted to a degree that profitable opportunities existed for investors, further confirming that futures contracts have a significant effect on stock market dynamics. Given this case, the authors posited that for this analysis, the introduction of the VN30-Index futures contract could have significant influence on a range of outcome variables. This study was particularly relevant because it focused on the same stock exchange as in the present study.

Recently, Nhung et al. (2019) examined the daily closing prices of Vietnam's VN30-Index futures, VN30-Index, and VN-Index from August 2017 through February 2018 to understand the role of futures trading on price discovery and information transmission for the spot market. This analysis relates to the present study in that the researchers explored the significance of the VN30-Index futures for the stability of, and predictions pertaining to, the Vietnamese stock market. It is also relevant as the researchers examined the daily closing data since the introduction of VN30-Index futures trading.

In another recent study on the HOSE, Nguyen and Truong (2020) investigated the impact of the introduction of index future trading on spot market returns and trading volume from 6 February 2012 through 31 December 2019. Using OLS, GARCH (1,1) and EGARCH (1,1) models, the authors found that the introduction of index futures trading it had no effect. However, the introduction of index futures contracts had a positive impact on the underlying market trading volume.

Though insightful in its scope, the current literature has a specific gap regarding the effects of the introduction of the new VN30-Index futures contract on the daily returns anomaly within the HOSE. Indeed, it would seem that this is not a relationship that has previously been explored by any of the extant literature in the field. The present study is thus poised to make a valuable contribution to the literature.

3. Overview of the HOSE and Index Futures Contract in Vietnam

The Vietnam stock market comprises two stock exchanges, the HOSE and HNX (Hanoi Stock Exchange). The HOSE, formerly the Ho Chi Minh Securities Trading Centre (HOSTC), was launched on 28 July 2000 while the HNX, initially named the Hanoi Securities Trading Center, was opened on 14 July 2005. The HOSE is the largest stock exchange in Vietnam and was developed for large firms with a minimum capital investment of VND 120 billion (about USD5.19 million)[1], according to the Decree No. 58/2012/ND-CP dated 20 July 2012. During its first two years, until 1 March 2002, the HOSE was only open for trading on Monday, Wednesday and Friday. After the market transitioned to daily trading on that date, there were two order-matching sessions for the market at 9:20 a.m. and 10:00 a.m. respectively. Continuous order matching was implemented starting on 30 July 2007 to meet ongoing market growth. The HOSE-listed shares are traded in Vietnamese Dong (VND) and have a standardized par value of VND 10,000 for each. According to the MSCI (Morgan Stanley Capital International) 2020 annual market classification, the HOSE falls in the frontier markets group.

Although now a market that is experiencing rapid growth, at the first trading session, only two stocks were traded having total market capitalization of VND 444,000 million (Nguyen and Truong 2020). The growth in the number of listed companies on the Exchange was slow in the beginning. In fact, at the end of 2001, only 10 companies listed their stocks on the market. Despite this slow initial growth, over the last two decades the HOSE experienced rapid growth as a larger number of enterprises went public. By the end of 2019, a total of 378 joint-stock companies with a total market capitalization of USD 139.7 billion were listed on the exchange (see Table 1). The majority of firms listed were former state-owned enterprises (SOEs) that were restructured by equitization, a type of privatization for these Vietnamese firms (see, e.g., Truong et al. 2006). Hoang et al. (2019) explored the role of financial efficiency as related to the growth of the HOSE and concluded that the success of the market was due to the efficient use of short-term debt by the listed firms. For the period 2006 to 2012, Vo (2016) found that stock return volatility in the HOSE was stabilized by institutional investors. To understand the developments of the HOSE, some of its key indicators from 2000 through 2019 are presented in Table 1.

Table 1. Some indicators for the HOSE during the period of 2000–2019.

Year	Number of Listed Companies	Market Capitalization (Billion VND)	Total Trading Volume (Million Shares)	Total Trading Value (Billion VND)	Market Capitalization on Gross Domestic Product (%)	VN-Index (Point)
2000	5	986	3.66	90	0.2	206.83
2001	10	1570	19.72	1030	0.3	235.4
2002	20	2436	37.01	1080	0.5	183.33
2003	22	2370	53.16	3000	0.4	166.94
2004	26	4237	248.07	19,890	0.6	239.29
2005	41	7390	353.07	26,880	0.9	307.50
2006	106	147,967	1120.78	86,830	15.2	751.77
2007	138	364,425	2389.52	245,650	31.9	927.02
2008	174	169,346	3404.80	152,620	13.9	315.62
2009	200	495,094	1040.27	422,460	29.9	494.77
2010	275	591,345	1164.33	376,510	29.9	484.66
2011	301	453,784	828.16	15,915	17.9	351.55
2012	308	678,403	1398.06	216,880	24.0	413.73
2013	301	842,105	1607.81	260,990	23.5	504.63

Table 1. *Cont.*

Year	Number of Listed Companies	Market Capitalization (Billion VND)	Total Trading Volume (Million Shares)	Total Trading Value (Billion VND)	Market Capitalization on Gross Domestic Product (%)	VN-Index (Point)
2014	305	985,258	3044.76	533,050	24.7	545.63
2015	307	1,146,925	2812.55	482,050	27.3	579.03
2016	320	1,491,778	3226.77	602,030	35.0	664.87
2017	344	2,614,150	4770.31	1,041,230	57.0	984.24
2018	373	2,875,544	4923.19	1,337,560	52.0	892.54
2019	378	3,279,611	4442.42	982,020	60.0	960.99

Source: Annual reports of the HOSE. Note: Figures are year-end.

The official price index of the HOSE is the composite VN-Index, a capitalization-weighted price index standardized at 100 points on its inception date, 28 July 2000. The calculation of the VN-Index ignores the free-floating number of shares leading to potential distortions in its value. To address the limitations of the VN-Index, the VN30-Index was introduced on 6 February 2012. This index is a capitalization-weighted index consisting of the 30 largest and most liquid stocks traded on the HOSE. It took another five years after the introduction of the VN30-Index for the introduction of a futures contract on the index.

In addition to the increase in the number of listed companies on the HOSE, the VN30-Index futures contract officially started trading on 10 August 2017. The introduction of the VN30-Index futures contract as the first tradable stock index futures for the Vietnam stock market is an important development as it reflects the progress of Vietnam's stock market to join other more developed markets. The importance of Vietnam's stock market as a high-level financial market is that the VN30-Index futures is intended to distinguish the Vietnamese market as one with increased tools to manage risk, greater diversity in investment products, and increased liquidity and scale (Nhung et al. 2019). The VN30-Index futures contract was the first derivative contract traded in Vietnam and was established to help the Vietnamese stock market grow more stable as a means of reducing risk. This in turn increased the attractiveness of the Vietnamese stock market to investors (Nhung et al. 2019). Undoubtedly, international investors will be more attracted to the market as well with this additional risk mitigation tool.

Based on maturity months, four different VN30-Index future contracts are concurrently traded. Specifically, the maturity months of the contracts are the current month, the next month and the last month of the following two quarters. Like other markets, before trading, investors are asked to put a certain amount of cash in their account, known as the initial margin requirement. The current initial margin rate set by the Securities Depository Center is 10 percent. Key metrics and definitions for the VN30-Index futures contract are provided in Table 2.

Table 2. VN30-Index futures contract specifications.

Characteristics	Descriptions
Contract codes	VN30FYYMM
Underlying asset	VN30-Index
Contract size	VND 100.000×VN30-Index
Trading methods	Order-matching and put-through
Trading unit	1 contract
Order limits	500 contracts/order
Initial margin rate	10%
Reference price	The settlement price at the end of the previous trading day
Price limits	+/−7%
Delivery months	Current month, the next month and the last two months of the next two quarters
Expiration date for the contract	The 3rd Thursday of the delivery month.

Two years after its inception in August 2017, the Vietnam derivatives market had achieved impressive results in both trading volume and the number of investors. As the market entered 2020, daily trading volume averaged 88,186 contracts while open interest stood at 5,567,121 contracts. Foreign investor trading volume has steadily increased, but remains at about 1% of total volume.

Along with the growth of market trading volume, trading account numbers for derivatives has continuously risen from 2017 to 2020. Table 3 provides key statistics for the growth in the derivatives market during the first three calendar years of operation.

Table 3. VN30-Index futures contract trading metrics (2017–2019).

Indicators	2017	2018	2019
Open interest (contracts)	451,274	3,321,236	5,567,121
Average daily trading volume (contracts)	10,954	79,335	88,186
The number of futures accounts	17,374	57,677	92,202

Source: Truong et al. (2021).

4. Data and Methodology

To test for the day-of-the-week and the impact of the introduction of VN30-Index futures contract on the daily returns anomaly in the HOSE, the daily VN30-Index series is collected for the period from 6 February 2012 (the date theVN30-Index was officially launched) to 31 December 2019 directly from the HOSE website (www.hsx.vn, accessed on 30 July 2020)). Then, to obtain continuously compounded daily returns, the natural log transformation shown below is performed.

$$R_t = Log(P_t) - Log(P_{t-1}) \tag{1}$$

where, R_t is market returns on trading day t; P_t is the VN30 Index on trading day t; P_{t-1} is VN30 Index on trading day $t-1$.

Table 4 provides statistics describing the daily returns over the observed sample period. The average daily return is positive at 0.000149 with a standard deviation of 0.004574. Moreover, it is the highest on Friday (0.000644) and the lowest on Thursday (-0.000279). In addition, the mean is negative for both Monday and Tuesday at -0.000117 and -0.000081, respectively. The standard deviation of the market returns is the highest on Monday and lowest on Friday.

Table 4. Summary statistics of daily returns for the entire sample.

	Observations	Minimum	Mean	Maximum	Standard deviation
Monday	385	-0.022637	-0.000117	0.018076	0.005675
Tuesday	394	-0.021248	-0.000081	0.013586	0.004485
Wednesday	398	-0.016506	0.000571	0.016523	0.004080
Thursday	401	-0.025079	-0.000279	0.013347	0.004497
Friday	395	-0.015598	0.000644	0.012232	0.003900
All groups	1973	-0.025079	0.000149	0.018076	0.004574

Tests for the day-of-the-week anomaly in the HOSE were first performed using an OLS (ordinary least square) regression. It is possible that auto-correlated error terms may occur in the OLS model that give misleading inferences (Kiymaz and Berument 2003). To address this possibility, one lag order of the market return variable is included in the model. In addition, to control for the occurrence of the January effect, the anomaly most widely

documented in the Vietnam market, a January dummy variable is added. Specifically, the model used for this study takes the form:

$$R_t = \alpha + \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \beta_J D_{Jt} + \sum_{i=1}^{n} \alpha_i R_{t-i} + \varepsilon_t \tag{2}$$

where, R_t is the return of the market index at trading day t; D_{1t}, D_{2t}, D_{3t}, D_{4t} are the dummy variables for Monday, Tuesday, Thursday, and Friday at time t respectively (i.e., $D_{1t} = 1$ if observation t falls on Monday and 0 otherwise); D_{Jt} is the dummy variable for January that equals 1 if the t observation falls on January or 0 for the remainder; n is lag orders of the market returns and determined by using the AIC (Akaike information criterion) and ε_t is the error term assumed to be independent and identically distributed (iid).

The assumption of homoscedasticity (a constant variance of the errors over time) for a financial time series is often violated. Brooks (2019) pointed out that if the assumption is not satisfied, then incorrect standard errors may occur when using an OLS, thus making an inference from the results misleading. Engle (1982) proposed a class of ARCH (Auto-regressive Conditional Heteroscedasticity) models where the variance of errors varies through time as a function of past errors. Later, Bollerslev (1986) generalized the ARCH process as GARCH to allow conditional variance to depend on prior lags. This study employs the standard form of GARCH. Specifically, GARCH (1,1) takes the form:

$$R_t = \alpha + \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \beta_J D_{Jt} + \sum_{i=1}^{n} \alpha_i R_{t-i} + \varepsilon_t \quad \varepsilon_t \approx N(0, h_t)$$
$$h_t = \omega + \delta h_{t-1} + \gamma \varepsilon_{t-1}^2 \tag{3}$$

It is argued that the standard GARCH model does not account for the asymmetry that often occurs in financial time series. This led Nelson (1991) to propose the Exponential Generalized Auto-regressive conditional Heteroskedasticity (EGARCH) model that captures the leverage effects in a time series. The EGARCH (1,1) model is employed as robustness checks for the occurrence of day-of-the-week anomaly in the HOSE. In addition, to test for the presence of day-of-the-week effect on volatility of market returns, dummy variables for each day of the week are included in the conditional variance equation. Specifically, the EGARCH (1,1) has the following form:

$$R_t = \alpha + \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \beta_J D_{Jt} + \sum_{i=1}^{n} \alpha_i R_{t-i} + \varepsilon_t$$
$$\ln(\sigma_t^2 = \omega + \delta \ln(\sigma_{t-1}^2) + \gamma \frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \varphi \left[\frac{|\varepsilon_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] + v_1 D_{1t} + v_2 D_{2t} + \tag{4}$$
$$v_3 D_{3t} + v_4 D_{4t}$$

We have support for the day-of-the-week anomaly in the HOSE if significant coefficients ($\beta_1, \beta_2, \beta_3, \beta_4$) are observed for the models.

As presented in Section 3, the VN30-Index futures contracts have traded in Vietnam since 10 August 2017. Therefore, to measure the impact of index future trading on the day-of-the-week effect, dummy variables for the index future introduction are added in the model, which is given as follow:

$$R_t = \alpha + \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \beta_J D_{Jt} + \sum_{i=1}^{n} \alpha_i R_{t-i} + \beta_{1f} D_{1t}^f +$$
$$\beta_{2f} D_{2t}^f + \beta_{3f} D_{3t}^f + \beta_{4f} D_{4t}^f + \varepsilon_t$$
$$\ln(\sigma_t^2 = \omega + \delta \ln(\sigma_{t-1}^2) + \gamma \frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \varphi \left[\frac{|\varepsilon_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] + v_1 D_{1t} + v_2 D_{2t} + \tag{5}$$
$$v_3 D_{3t} + v_4 D_{4t}$$

where,

$D_{1t}^f, D_{2t}^f, D_{3t}^f, D_{4t}^f$ are the dummy variables for the index future introduction on Monday, Tuesday, Thursday and Friday respectively (i.e., D_{1t}^f equal 1 if observation t falls on Monday for post-index futures introduction period and 0 otherwise).

In addition, to test for the effect of index future trading on the day-of-the-week effect, the data is partitioned into two subsamples. The first subgroup includes the period from 6 February 2002 to 9 August 2017 (the pre-index futures period) while the other subgroup consists of observations from 10 August 2017 to 31 December 2019 (the post-index futures period). All the models as stated above were applied to each subsample. If the day-of-the-week effect were present in the pre-index futures period, but not in the post-index futures period, we concluded that the introduction of the VN30-Index futures contract influenced the daily returns anomaly for the HOSE.

5. Empirical Results

It is noted that the lag order of the market returns determined by the AIC is one for the models. The results for the OLS model over the entire period shown in Table 5 document a significant day-of-the-week effect for the HOSE. Specifically, the average returns for Monday, Tuesday and Thursday are negative and significant at the five percent level. These results indicated that the market returns on these days were significantly lower than those for Wednesday. However, the OLS model ignores time-varying volatility (ARCH effects) which is possible in the time series. The Lagrange Multiplier (LM) test proposed by Engle (1982) was conducted using one lag to test for the ARCH effect[2]. The results for the ARCH–LM test show a significant ARCH effect in the OLS model with the test statistic for the model higher than the LM-critical value at the one percent significance level. The significant ARCH effects indicated that the GARCH (1,1) and EGARCH (1,1) were more appropriate solutions for the time-varying variance.

Table 5. Empirical findings for the entire sample.

Variables	Models			
	(1)	(2)	(3)	(4)
Conditional mean equation				
α	0.000498	0.000497	0.000361	0.000362
	(2.16) **	(2.43) **	(1.99) **	(1.99) **
β_1	−0.000710	−0.000631	−0.000499	−0.000578
	(−2.18) **	(−2.41) **	(−1.66) *	(−1.71) *
β_2	−0.000648	−0.000431	−0.000274	−0.000289
	(−2.00) **	(−1.57)	(−1.07)	(−1.02)
β_3	−0.000874	−0.000522	−0.000421	−0.000237
	(−2.71) ***	(−1.89) *	(−1.58)	(−0.76)
β_4	0.000091	−0.000039	−0.000022	−0.000172
	(0.28)	(−0.14)	(−0.09)	(−0.67)
β_J	0.001000	0.000604	0.000864	0.000845
	(2.49) **	(1.82) *	(2.59) ***	(2.52) **
$\alpha_1(R_{t-1})$	0.043147	0.064753	0.057107	0.056163
	(1.91) *	(2.65) ***	(2.41) **	(2.35) **
β_{1f}				0.000257
				(1.79) *
β_{2f}				0.000077
				(0.54)
β_{3f}				−0.000518
				(−1.37)

Table 5. *Cont.*

Variables	Models			
	(1)	**(2)**	**(3)**	**(4)**
β_{4f}				0.000506
				(1.40)
Observations	1972	1972	1972	1972
ARCH-LM tests (1 lag)	55.92 ***	0.25	0.22	0.18
	Conditional variance equation			
ω		0.000067	−0.889874	−0.881772
		(5.20) ***	(−7.16) ***	(−6.94) ***
γ(ARCH effect)		0.098199	−0.050484	−0.048025
		(8.24) ***	(−4.45) ***	(−4.16) ***
δ (GARCH effect)		0.869691	0.950770	0.951889
		(60.87) ***	(111.65) ***	(108.16) ***
φ(leverage effect)			0.201339	0.202435
			(9.20) ***	(9.11) ***
v_1			0.712081	0.720959
			(7.33) ***	(7.36) ***
v_2			−0.064546	−0.062164
			(−0.55)	(−0.52)
v_3			0.305154	0.302297
			(2.55) **	(2.51) **
v_4			0.026292	0.033550
			(0.27)	(0.34)

***, **, *: significant at the 1, 5 and 10% levels respectively. *t*-values in parentheses for OLS model; *z*-values in parentheses for the GARCH models.

The findings of the GARCH (1,1) and EGARCH (1,1) models presented in Table 5 confirmed that average Monday return was negative at the one percent significance level. However, empirical findings from these models confirmed that the mean of market returns was statistically insignificantly negative on Tuesday, Thursday and Friday. In addition, the results derived from Model (4) revealed that the index futures introduction had a positive impact on Monday returns. Specifically, the average Monday return for the post-index futures introduction period is higher than that for the pre-index futures introduction period by 0.0257%.

The results for the conditional variance equation obtained from Models (3) and (4) consistently show the positive Monday and Thursday effects on market returns volatility. The EGARCH (1,1) model results also indicate that a leverage effect on market volatility is present. Specifically, the coefficient for the leverage effect is positive (0.202435) and statistically significant at the one percent level. This result provides evidence that bad news has a lower effect on market volatility than does good news of the same size. Based on these findings, it can be concluded that the day-of-the-week effect on market returns and volatility exists in the HOSE.

Furthermore, to determine the influence of the VN30-index futures trading on the daily market returns anomaly, as discussed above, the data is partitioned into two subsamples (pre- and post-index futures periods). Then, OLS, GARCH (1,1) and EGARCH (1,1) models are also employed for each subsample. Empirical findings from these models for each subsample are presented in Tables 6 and 7.

The results presented in Table 6 derived from all three models confirm that the day-of-week-effect is present for the pre-index futures period. Specifically, a significant negative coefficient is observed for Monday across all three models at the five and ten percent threshold. In addition, the positive Monday and Friday effects on market returns volatility exist in the EGARCH (1,1) model.

However, Table 7 reveals that all estimated coefficients for daily dummy variables were not statistically significant at the 10% level, indicating that the day-of-the-week effect did not persist for the post-index futures period. The conclusion that can be drawn

from these findings is that the day-of-the-week effect was present in the stock returns of the HOSE prior to the introduction of the VN30-Index futures contract, but after the introduction the anomaly did not persist. The disappearance of the daily returns anomaly in the post-index futures sub-period was consistent with the previous empirical findings of Hiraki et al. (1998), Kamara (1997), and Faff and McKenzie (2002) and supported the hypothesis that the introduction of index futures contracts lowers the transactions costs of participants and facilitates their arbitrage opportunities to possibly more efficiently exploit this anomaly in the underlying market. In fact, it was shown that the introduction of index futures contracts had a significantly positive effect on the HOSE trading volume (Nguyen and Truong 2020).

Table 6. Empirical findings for the pre-index future subsample.

Variables	Models		
	(1)	**(2)**	**(3)**
α	0.000541	0.000473	0.000415
	(2.00) **	(1.87) *	(1.88)
β_1	−0.000928	−0.000655	−0.000637
	(−2.43) **	(−2.00) **	(−1.76) *
β_2	−0.000607	−0.000378	−0.000256
	(−1.59)	(−1.15)	(−0.79)
β_3	−0.000656	−0.000273	−0.000224
	(−1.73) *	(−0.74)	(−0.70)
β_4	−0.000087	−0.000216	−0.000195
	(−0.23)	(−0.63)	(−0.67)
β_J	0.000870	0.000721	0.000298
	(1.84) *	(1.61)	(1.35)
$\alpha_1(R_{t-1})$	0.058916	0.077194	0.067289
	(2.18) **	(2.54) **	(2.17) **
Observations	1373	1373	1373
ARCH-LM tests (1 lag)	26.934 ***	0.003	0.003
Conditional variance equation			
ω		0.000001	−1.116323
		(4.94) ***	(−6.13) ***
γ(ARCH effect)		0.125719	−0.037708
		(6.87) ***	(−2.58) ***
δ (GARCH effect)		0.808448	0.937268
		(31.63)	(68.98) ***
φ(leverage effect)			0.232305
			(8.37) ***
v_1			0.689391
			(5.24) ***
v_2			0.117259
			(0.79)
v_3			0.188719
			(1.20)
v_4			0.245218
			(1.97) *

***, **, *: significant at the 1, 5 and 10% levels respectively. *t*-values in parentheses for OLS model; *z*-values in parentheses for the GARCH models.

Table 7. Empirical findings for the post-index future subsample.

Variables	Models		
	(1)	**(2)**	**(3)**
α	0.000390	0.000390	0.000362
	(0.89)	(0.38)	(1.17)
β_1	−0.000174	−0.000174	−0.000308
	(−0.28)	(−0.14)	(−0.60)
β_2	−0.000716	−0.000716	−0.000379
	(−1.17)	(−0.50)	(−0.88)
β_3	−0.001383	−0.001383	−0.000793
	(−2.26) **	(−1.09)	(−1.57)
β_4	0.000473	0.000473	0.000313
	(0.77)	(0.31)	(0.79)
β_J	0.001304	0.001304	0.000841
	(1.71) *	(0.84)	(1.34)
$\alpha_1(R_{t-1})$	0.013049	0.013049	0.027409
	(0.32)	(0.14)	(0.71)
Observations	599	599	599
ARCH-LM tests (1 lag)	29.02 ***	1.87	0.75
Conditional variance equation			
ω		0.000015	−0.537217
		(1.35)	(−2.86) ***
γ(ARCH effect)		0.150000	−0.041758
		(1.25)	(−1.96) *
δ (GARCH effect)		0.600000	0.973773
		(2.19) **	(90.33) ***
φ(leverage effect)			0.176501
			(4.67) ***
v_1			0.746252
			(3.67) ***
v_2			−0.330975
			(−1.32)
v_3			0.600650
			(2.77) ***
v_4			−0.418796
			(−2.25) **

***, **, *: significant at the 1, 5 and 10 levels respectively. *t*-values in parentheses for OLS model; *z*-values in parentheses for the GARCH models.

Regarding the day-of-the-week effect on the market volatility, the results of EGARCH (1,1) revealed that a significantly positive effect was observed for Monday and Thursday while a negative effect occurred on Friday for the post-futures period. Compared with the results for the pre-futures period presented in Table 6, the results showed that the introduction of the VN30-Index futures contract influenced the volatility of daily market returns in the HOSE. For Thursday, specifically, it was noted that the expiration dates for the index futures contracts fell on the third Thursday of each month. Thursday's volatility may result from the Index futures expiration-day effect that was seen to increase market volatility (Stoll and Whaley 1997; Chamberlain et al. 1989; Alkebäck and Hagelin 2004; Chen et al. 2011). In addition, although the positive Monday effect of return volatility was found for both periods, the introduction of futures trading is associated with a higher degree of volatility. This evidence did not coincide with the findings of Faff and McKenzie (2002), but it seemed to be appropriate to the Vietnamese derivative market, where individual speculative traders dominate. The increased volatility in the post-index period reduced the power of statistical tests to find the daily returns anomaly. In fact, for investor purposes, the increased volatility definitely makes it far more challenging to profitably trade the daily returns anomaly documented in the pre-index period. This evidence supports the conclusion that inefficiencies in the Vietnam stock market decreased during the post-index period.

Moreover, the results of EGARCH (1,1) model showed that the estimated value that captures the effects of old information on market volatility for the pre-futures period (0.937268) was lower than for the post-futures period (0.973773). This evidence indicates that the market volatility in the post-index futures introduction period was more persistent than in the pre-index period. The increase in volatility persistence could have resulted from increased information flows. Therefore, although the introduction of the index future contracts resulted in an increase in underlying market volatility, it enhanced market efficiency because the information was more quickly reflected in stock prices. In addition, the results presented in Tables 6 and 7 showed that the leverage effect on the market volatility existed in both periods. Specifically, the estimated coefficients of the leverage effect were significantly negative at the one-percent level, indicating that good news had a greater effect on the market volatility than bad news of the same size.

6. Conclusions

The purpose of this analysis was to investigate the influence of the new VN30-Index futures contract on the day-of-the-week effect for the HOSE. There is a gap in previous research on this particular research question as to whether the introduction of the index futures contract provided a more efficient venue to exploit, and daily returns anomalies present prior to its introduction. Daily returns of the VN30-Index for the period from 6 February 2012 through 31 December 2019 was employed to test the hypothesis that the introduction of VN30-Index futures contract possibly diminished the day-of-the-week anomaly observed in the HOSE. OLS, GARCH (1,1) and EGARCH (1,1) regression models are performed to examine periods before and after the introduction of the VN30-Index futures contract. The results showed that a significant day-of-the-week effect was observed during the entire study period. Specifically, a negative effect is observed for Monday. The sample was then partitioned into pre- and post-introduction of VN30-Index futures contract periods to test for the day-of-the-week effect. The results indicated a significant daily return anomaly in the pre-index futures contract period. However, the anomaly did not persist into the post-index futures period. These findings provided evidence that the introduction of VN30-Index futures contract had a significant influence on the persistence of the daily returns anomaly in the HOSE. This provided evidence that the introduction of index futures contract facilitates market efficiency by providing market participants a more cost-effective means to arbitrage away the daily returns anomaly.

Notes

[1]   Exchange rate on 31 December 2019: 1 USD = 23,110 VND (source: Vietcombank).
[2]   The authors also perform several lag orders and the basic results remain the same.

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