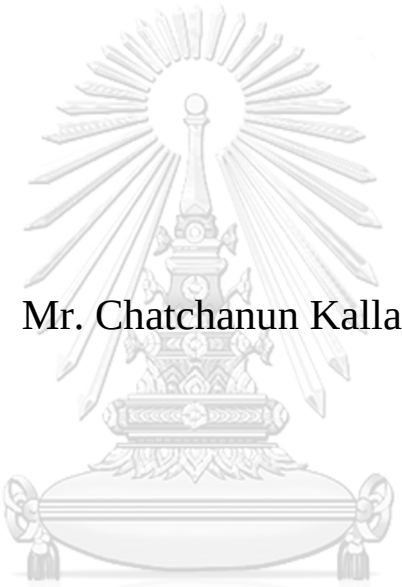
EFFECTS OF ABNORMAL TRADING VOLUME IN THE STOCK EXCHANGE OF THAILAND

Mr. Chatchanun Kallayasiri



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ปีการศึกษา 2563

Independent Study Title	EFFECTS OF ABNORMAL TRADING VOLUME IN THE STOCK EXCHANGE OF THAILAND
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Field of Study	Finance
Thesis Advisor	Tanawit Sae-Sue, Ph.D.

Accepted by the FACULTY OF COMMERCE AND ACCOUNTANCY, Chulalongkorn University in Partial Fulfillment of the Requirement for the Master of Science

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สาขาวิชา การเงิน ลายมือชื่อนิสิต

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ปีการศึกษา 2563 ลายมือชื่อ อ.ที่ปรึกษาหลัก

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This research aims to investigate the opportunity to exploit the abnormal returns follow the abnormal trading volume events for the stock listed in the Stock Exchange of Thailand (SET) from 2010 to 2019. The result suggested that investors could use abnormal trading volume as a signal to invest and obtain extra-profit by holding the stock for a certain period of time. The result also indicated that there was evidence of trading volume's information content that could be used to implement the zero-investment portfolio strategy which trades based on trading volume. The strategy suggested investors to take a long position in 10% of the most highly traded stock and in contrast, take a short position in 10% of the least traded stock in the SET index for the short time horizon to obtain 13.4 annual returns. In summary, the result of this study could reduce the market inefficiently and minimize the high-volume returns premium. Especially when a large number of traders take this opportunity, the abnormal return offered by trading volume will be diminished, and traders can no longer take the advantage of it.

Field of Study:	Finance	Student's Signature .....
Academic Year:	2020	Advisor's Signature .....

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Chatchanun Kallayasiri

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1. Introduction

1.1 Background and motivation

The trading volume and security price should be correlated in the same period of time. According to the Efficient Market Hypothesis (Fama 1970), when new information flows into the market, the security price incorporates all relevant information and adjusts to a new equilibrium. During the process, the trading volume increase due to investors heavily buying or selling. Therefore, the trading volume should not have predictive power on future security returns. However, many researchers suggested that observation of trading volume patterns can help predict future security returns. Moreover, the release of new information, price changes, and trading volume are unnecessary at the same time as the efficient market hypothesis implies.

To give more strength to the volume-returns relationship, there was empirical research-proven by Ying (1966), which presented the evidence that an increase (decrease) in trading volume on the New York Stock Exchange (NYSE) tended to be followed by a rise (fall) in the price of the S&P500 composite index. Comiskey, Walkling, & Weeks (1987) reported a significant and positive correlation between signed price change and trading volume, meaning that high trading volume more generally led to a positive price runs up, which was consistent with the result from Karpoff (1987). Rather than analyzing the volume-returns relationship, Bajo (2010) looked for the large and sudden changes in the trading volume of the Italian's stock market, which the positive abnormal returns were observed. He defined this phenomenon as the "Abnormal trading volume" events and suggested that the traders could implement successful portfolio strategies based on trading volume observation. The plausible explanation for this phenomenon is that trading volume has the information content on future returns, which could give an informative signal to the stock market.

The information content of trading volume has been confirmed by many studies such as Campbell, Grossman, & Wang (1993) and Blume, Easley, & O'Hara (1994). Then Gervais, Kaniel, & Mingelgrin (2001) verified that the highly traded stock has information content, which could generate positive abnormal returns. The

abnormal returns were postulated as a "High volume returns premium", which was consistent with the visibility hypothesis proposed by Miller (1977) and Mayshar (1983). Later, Bajo (2010) also confirmed the highly traded stock has information content. Interestingly, information content is also related to ownership characteristics and likely to be found in small companies. In Thailand's stock exchange, Dejbordin (2016) also observed the abnormal trading volume event, but the result was inconsistent with previous literature. Nevertheless, in Dejbordin's work, only the large companies, the firm listed in the SET100 index, had been tested in the hypothesis, while previous literature tested all stocks in their respective market, and the result also confirmed that small companies usually related with information content.

Following the literature mentioned above, this research is to investigate the relationship between the information content of the abnormal trading volume and the abnormal returns in Thailand's stock exchange, particularly in all the stocks from the SET index (Thailand). This research suggested that there is evidence of trading volume's information content in Thailand's stock market, and investors could follow the signal to exploit the extra-profit by holding the portfolio for a specific time.

1.2 Objectives

This research aims to investigate the opportunity to exploit the abnormal returns around abnormal trading volume events for the stock listed in the SET index (Thailand) from the period 2010-2019. To test the hypothesis, the following objectives are explored

(1) Abnormal trading volume can convey an informative signal to Thailand's stock market and generate positive abnormal returns.

(2) Propose and analyze the portfolio strategy that can exploit the abnormal returns following abnormal trading volume events

1.3 Contributions

This study provides a better understanding of the relationship between abnormal returns and abnormal trading volume events associated with the SET index member's stocks. For the contributions first, this research extends the existing literature by addressing another market (Thailand Market) and uses the most recent

data to reflect the current market condition. As we know that Thailand is listed as an emerging market (IMF 2019). More elaborately, in the emerging market, the characteristics are different from the developed country market, such as high volatility, rapid growth, higher returns than average, and a less mature capital market. These characteristics actually make emerging markets unique. Moreover, the stocks' returns in emerging markets are highly predictable, and the stock markets are less efficient than those of developed markets (Ozdemir 2011), allowing investors to exploit the situation and obtain extra-profit. Consequently, studying the Thailand stock market with totally different characteristics from developed countries can provide different results. Second, the knowledge obtained from this research could be used by various investors to improve their trading performance or use as part of their portfolio construction or trading algorithms. Lastly, it is also possible that this understanding could later be widely known and eventually minimize high-volume return premium follows the abnormal trading volume event (Gervais, Kaniel, & Mingelgrin (2001)) or reduce the market inefficiently. Especially when a large number of traders take this opportunity, the abnormal returns offered by abnormal trading volume will be diminished, and traders can no longer take the advantage of it.

2. Literature reviews

Many researchers have studied the relationship between trading volume and stock returns. First, Epps (1975) suggested that bulls consider assets to be riskier than bears, making bulls have a steeper demand function than bears. Hence, a greater volume will be associated with a positive price change than with a negative price change for the same absolute price. Comiskey, Walkling, & Weeks (1987) found a positive relationship between absolute price changes and trading volume. Karpoff (1987) confirms this positive relationship both in equity and futures markets, which also reported a positive correlation between a signed price change and trading volume, resulting in high trading volume generally leads to a positive price runs up.

With Campbell, Grossman, & Wang (1993) and Blume, Easley, & O'Hara (1994), the trading volume starts to have information content. Campbell, Grossman, & Wang (1993) develop the model in which risk-averse market makers interact with

liquidity traders. The trading volume helps distinguish between price movements associated with public information and modification on expected returns. Blume, Easley, & O'Hara (1994) also present the model in which traders can get information on security by observing past prices and trading volume. In their model, trading volume can add significant information on past price movement's quality or precision.

Some researchers found an improvement in returns predictability within the contrarian and momentum strategy portfolio based on the trading volume's information content. Conrad, Hameed, & Niden (1994) find that highly traded stocks are experiencing price reversals. A price reversal for highly traded stock in the momentum strategy portfolio was found by Lee & Swaminathan (2000). Cooper (1999) using the different filters on past returns and lagged volume changes; the portfolio based on contrarian strategy seems to outperform a buy-and-hold strategy and a positive returns autocorrelation for highly traded stock. J.Brennanab, Chordiac, & Subrahmanyam (1998) found that a portfolio composed of highly traded stock can partially explain the next day's returns of the low traded portfolio. The result shows that highly traded stock help price to reflect information more quickly.

Gervais, Kaniel, & Mingelgrin (2001) confirm the highly traded stock has information content on security returns by founding the stock experience large trading volume over a day or a week tend to experience large returns over the subsequent month. Basically, a high-volume returns premium seems to exist in stock prices. Gervais et al. (2001)argue that this evidence is consistent with the visibility hypothesis, which was proposed by Miller (1977) and Mayshar (1983). The visibility hypothesis stated that if the traders have a diverse opinion about the stock's value, the traders who are holding certain stock will be optimistic about its value. In that situation, any positive shock, an increase in trading volume, will be drawn attention to the investor. With regard to the same number of sellers, with short-sell constraints, the increase in potential buyers leads to an increase in the stock's price.

Bajo (2010) examines the informative role of large and sudden changes in trading volume, which later defines as an abnormal trading volume event. He found the abnormal returns around abnormal volume events that are not driven by price-pressure as they not reversal over the following day. He constructs a long-only portfolio based on volume signals and found the profits are statistically significant.

Interestingly, the information content is also related to ownership characteristics such as higher control shares (lower monitoring over the majority shareholders) and family-firm status (larger number of insiders and a higher probability of private information-based trades), which give a rise in abnormal trading volume. Moreover, information content is found in a small company where there is an agency problem between the majority and minority shareholders. Dejbordin (2016) also observed the abnormal trading volume event in Thailand's stock market. The result shows that abnormal trading volume cannot generate abnormal returns that persist through time and exist in some market conditions, which is inconsistent with the previous research. He used only large companies, the firm listed in the SET100 index, as a sample, while Bajo (2010) used all the stock listed in Milan's stock exchange. Usually, the information content is found in a small company.

From the literature mentioned previously, Dejbordin (2016) does not found the information content of abnormal trading volume in the stock listed in the SET100 index (Thailand). As explained by Bajo (2010) that the information content is usually found in small firms. Therefore, all stock in Thailand's stock market will be analyzed if it seems possible to observe the abnormal trading volume's information content. In other words, could investors exploit abnormal returns following abnormal trading volume events? To provide new empirical evidence, the hypothesis of this research is as follows:

H_1: There is the positive abnormal return follows an abnormal trading volume event in Thailand's stock exchange

3 Data

The daily stock dataset, comprising of 553 Thai public firms listed on the SET Index (Thailand), was obtained from Thompson Financials Datastream over the 2010 - 2019 period. The stock data was used in this research following:

- Close adjusted price (as total returns index)
- Trading volume
- SET index close price (as total returns index)

In case of missing neither daily stock data, it was assumed as a non-trading day.

4. Methodology

From the statement of problems mentioned above and the aims of this research are: (1) To verify whether the abnormal trading volume event could generate positive abnormal returns. (2) To analyze the portfolio strategy based on observed trading volume. The methods to verify the hypothesis are described as follows.

4.1 The measurement of abnormal trading volume events

To detect the abnormality of trading volume, a measurement tool is required. Some literature B.Ajinkya & C.Jain (1989); M.Cready & RamachandranRamanan (1991); Campbell & Wasley (1996) often proposed the turnover ratio for detect abnormal trading volume, which is computed by dividing trading volume by the number of outstanding shares. However, the turnover ratio might not be proper for measuring stock experiencing days with no trading activity or the evidence of the trading volume serial correlation.

Following the method of Jarrell & Poulsen (1989); Bajo (2010), this research use normalized trading volume to detect the abnormality by converting the natural logarithm for daily trading volume into z-score (V) and compare with its 66 (3 months) most recent non-zero-trading day including the current day (the zero-trading days are skipped to avoid miscalculation from illiquid stock). If the zero-trading day is included, then it might be affecting the V value to be lower than its actual. The abnormal trading volume event occurs for stock i at day t when

$$V_{i,t} > c$$

Where

$$V_{i,t} = \frac{logtv_{i,t} - \mu_{i,t}}{\sigma_{i,t}}$$

$$\mu_{i,t} = \frac{1}{66}\sum_{t=1}^{66} logtv_{i,t}$$

$$\sigma_{i,t} = \sqrt{\frac{1}{65}\sum_{t=1}^{66}\left(logtv_{i,t} - \mu_{i,t}\right)^2}$$

$tv_{i,t}$ = (trading volume of stock *i* on the day *t*) + 1

c = the threshold parameter

Table 1 represents the universe of the observations. Since *V* is re-estimated on daily basis for each firms, so the total observation consist of roughly 1 millon observations with 3,736 zero trading days. The distribution of *V* is approximately normal, as it is slightly skewed to the right (skewness greater than zero) and has a fatter tails (kurtosis greater than three). To define which observations were considered as abnormal, the threshold level (*c*) was needed. Under the assumption that *V* distribution is a theoretical normal distribution, *c* equal 2.326 would represent the 1% of extreme values on the right tail regardless of the value from actual distribution is equal 2.643. However, this research use *c* at 2.326 level, resulting in 19,255 events satisfied this cut-off.

As a matter of fact, when the abnormal trading volume events have occurred ($V > c$), it tends to last for some consecutive days. This phenomenon may arise from the serial correlation on trading volume series. To mitigate the problem and have a unique observations, the overlapping cases, recurring events within 22 proceeding days, must be removed.

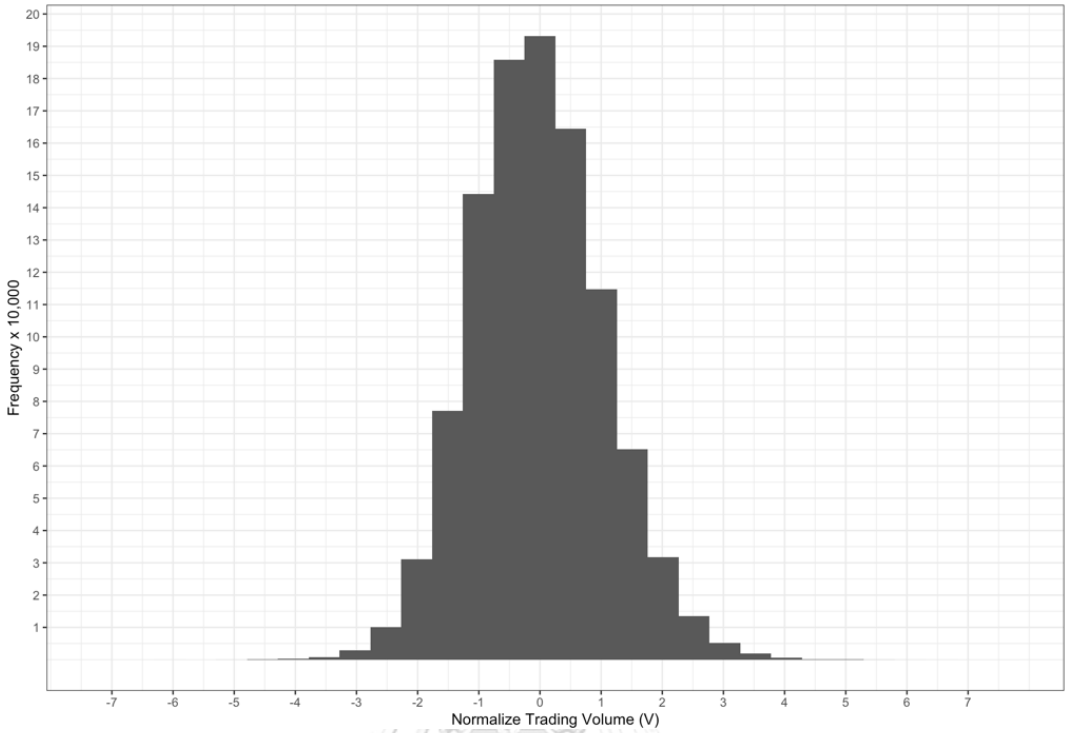
Additionally, this research excluded the observations caused by the stock split event because numerous studies have documented the effect of stock split events usually accompanied by an unusual change in trading volume and positive stock returns. The two traditional explanations are information signaling and liquidity

improvement. J.Brennan & E.Copeland (1988); McNichols & Dravid (1990); Brennan & Hughes (1991) support the signaling hypothesis that stock splits are associated with positive announcements abnormal return because managers use stock split to reveal positive private information about their firm's good financial standing. In contrast, Baker & Gallagher (1980); Baker & Powell (1993) stated that stock split restores the price back to suitable trading range level, and then attracts more investors to own the stock, thus improving the liquidity of these stocks. Then the price and trading volume are increasing, respectively.

By eliminating the stock split event from the sample, the firms' stock split event data were collected from the SET Index (Thailand) members between the 2010 - 2019 period. The collected data have to satisfy the following criteria: (1) The stock split event data is available on either Thompson Financials Datastream or SETSMART. (2) No concurrent of the firm-specific events during the stock split event date. (3) No missing daily stock data on the event date. The total number of stock split events is 134 events after the selection criteria, as shown in *Table I*. Second, excluding the abnormal trading volume event that occurred 66 days after the stock split event, [t, t+65] window period. The reason for using this range is that the stock split event could increase the liquidity and causes the stock to be highly traded after the event, as stated from the literature. It might raise a probability that stock split events generate abnormal trading volume and interfere with the observations when converted trading volume into V value. Therefore, the abnormal trading volume after stock split events were treated as the outlier.

After the observations were filtered out with overlapping cases, and stock split events, the sample were reduced to 9,708 events consistent of 549 firms with an average 17.5 events per firm as shown in *Table 2*. According to this table, the abnormal trading volume events were spread out almost the whole market, 549 out of 553 firms. Therefore, the abnormal trading volume events could be considered as market-wide effects, not the firm-specific event.

Table 1: *The descriptive statistic for normalized trading volume (V).*



Percentiles	**0.1**	**1**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**95**	**99**
NAV (V)	-3.321	-2.391	-1.697	-1.348	-0.933	-0.625	-0.344	-0.074	0.2	0.495	0.847	1.347	1.778	2.643

Observations	1,046,999	**Mean**	-0.033
Days of zero trading	3,736	**Median**	-0.074
Events (*V* > 2.326)	9,708	**Standard Deviation**	1.069
		Skewness	0.215
		Kurtosis	3.287

Table 2: *The number of abnormal trading volume events for each security is here reported (V > 2.326).*

Symbol	Events	Symbol	Events	Symbol	Events	Symbol	Events	Symbol	Events	Symbol	Events
7UP	26	CPH	23	IVL	18	PAF	24	SMK	28	TSI	15
A	26	CPI	22	J	6	PAP	24	SMPC	10	TSR	9
AAV	15	CPL	19	JAS	20	PATO	26	SMT	21	TSTE	15
ABPIF	7	CPN	19	JASIF	9	PB	22	SNC	24	TSTH	31
ACC	24	CPNCG	4	JCK	27	PCSGH	12	SNP	22	TTA	26
ADVANC	19	CPNREIT	2	JCT	30	PDI	26	SOLAR	33	TTCL	20
AEC	17	CPT	4	JMART	29	PDJ	26	SORKON	24	TTI	13
AEONTS	16	CPTGF	5	JMT	12	PE	24	SPACK	21	TTLPF	15
AFC	20	CRANE	12	JTS	25	PERM	23	SPALI	17	TTW	14
AH	24	CSC	26	JUTHA	22	PF	19	SPC	28	TU	22
AHC	20	CSP	18	JWD	6	PG	20	SPCG	17	TU-PF	17
AI	15	CSR	13	KAMART	21	PK	8	SPF	10	TVI	18
AIMIRT	3	CSS	19	KBANK	18	PL	20	SPG	24	TVO	19
AIT	23	CTW	25	KBS	18	PLANB	10	SPI	25	TWP	21
AJ	19	CWT	24	KCE	21	PLAT	10	SPORT	19	TWPC	6
AJA	8	Com7	8	KDH	23	PLE	24	SPRC	5	TWZ	25
AKR	28	DCC	17	KGI	24	PM	23	SQ	5	TYCN	23
ALLA	5	DCON	27	KKC	24	PMTA	10	SRICHA	17	UMI	22
ALT	4	DDD	3	KKP	21	POPF	4	SRIPANWA	1	UNIQ	20
ALUCON	30	DELTA	19	KPNPF	10	POST	14	SSC	33	UOBKH	12
AMANAH	22	DEMCO	21	KSL	23	PPF	1	SSF	16	UP	22
AMARIN	22	DIF	9	KTB	19	PPP	13	SSPF	8	UPF	32
AMATA	21	DREIT	2	KTC	17	PPPM	20	SSSC	19	UPOIC	17
AMATAV	7	DRT	21	KTIS	7	PRAKIT	22	SST	25	URBNPF	9
AMC	22	DTAC	24	KWC	9	PREB	21	STA	24	UT	20
ANAN	16	DTC	21	KWG	23	PRECHA	28	STANLY	20	UTP	18
AOT	25	DTCI	10	KYE	26	PRG	19	STARK	22	UV	26
AP	17	EA	6	L&E	14	PRIN	24	STEC	20	UVAN	18
APCO	3	EASON	22	LALIN	19	PRINC	27	STPI	20	VARO	13
APCS	19	EASTW	13	LANNA	16	PRM	6	SUC	12	VGI	16
APEX	1	ECL	23	LEE	19	PSH	19	SUPER	19	VIBHA	26
APURE	28	EE	26	LH	19	PSL	20	SUSCO	25	VIH	22
AQUA	22	EGATIF	4	LHFG	20	PT	22	SUTHA	8	VNG	19
AS	18	EGCO	20	LHK	24	PTG	13	SVH	28	VNT	23
ASAP	4	EKH	8	LHPF	3	PTL	26	SVI	21	VPO	13
ASEFA	8	EMC	18	LHSC	2	PTT	19	SVOA	29	W-R	25
ASIA	17	EP	27	LOXLEY	23	PTTEP	24	SYMC	22	WACOAL	22
ASIAN	25	EPG	9	LPH	5	PTTGC	16	SYNEX	23	WAVE	16
ASIMAR	22	ERW	12	LPN	13	PYLON	9	SYNTEC	21	WG	23
ASK	24	ERWPF	7	LRH	24	Q-CON	17	TAE	17	WHA	13
ASP	27	ESSO	23	LST	21	QH	19	TASCO	20	WHABT	1
AYUD	21	ESTAR	24	LUXF	5	QHHR	5	TBSP	14	WHART	2
B	21	EVER	23	M	11	QHOP	12	TC	17	WHAUP	4
B52	4	F&D	19	M-CHAI	28	QHPF	9	TCAP	23	WICE	8
BA	7	FANCY	21	M-II	12	RAM	14	TCC	27	WIIK	28
BAFS	23	FE	11	M-PAT	5	RATCH	23	TCCC	21	WIN	31
BANPU	24	FMT	23	MACO	15	RCI	24	TCJ	19	WORK	22
BAT-3K	27	FN	6	MAJOR	18	RCL	17	TCMC	23	WPH	2
BAY	23	FNS	23	MAKRO	19	RICHY	15	TCOAT	19	ZMICO	26
BBL	22	FORTH	22	MALEE	9	RJH	4	TEAM	26		
BCH	25	FPT	20	MANRIN	20	RML	23	TFG	7		
BCP	23	FSS	16	MATCH	14	ROBINS	22	TFI	28		
BCPG	3	FTE	5	MATI	21	ROCK	13	TFMAMA	6		
BCT	20	FTREIT	4	MAX	28	ROH	15	TGPRO	17		
BDMS	26	FUTUREPF	5	MBK	15	ROJNA	25	TH	20		
BEAUTY	19	GBX	17	MBKET	21	RPC	34	THAI	24		
BEC	25	GC	19	MC	14	RPH	4	THANI	21		
BEM	9	GEL	18	MCOT	21	RS	24	THCOM	19		
BFIT	19	GENCO	29	MCS	27	RSP	6	THE	22		
BGRIM	5	GFPT	22	MDX	24	S	23	THG	4		
BH	29	GGC	4	MEGA	7	S & J	13	THIP	29		
BIG	8	GIFT	5	METCO	28	S11	15	THRE	17		
BJC	23	GJS	18	MFC	23	SABINA	34	THREL	15		
BJCHI	11	GL	24	MFEC	24	SAM	33	TIF1	8		
BKI	20	GLAND	15	MIDA	24	SAMART	19	TIP	20		
BKKCP	15	GLOBAL	21	MILL	16	SAMCO	25	TIPCO	27		
BLA	23	GLOCON	18	MINT	22	SAMTEL	15	TISCO	16		
BLAND	20	GOLD	18	MJD	20	SAPPE	12	TIW	28		
BPP	4	GOLDPF	5	MJLF	10	SAT	19	TK	25		
BR	10	GPI	5	MK	21	SAUCE	25	TKN	10		
BRR	6	GPSC	8	ML	23	SAWAD	11	TKS	24		
BRRGIF	2	GRAMMY	19	MNIT	12	SAWANG	12	TKT	19		
BSBM	22	GRAND	24	MNRF	11	SBPF	10	TLGF	7		
BTNC	10	GREEN	21	MODERN	20	SC	22	TLHPF	6		
BTS	23	GULF	3	MONO	10	SCB	23	TMB	23		
BTSGIF	6	GUNKUL	18	MPIC	13	SCC	25	TMD	26		
BWG	14	GYT	22	MSC	23	SCCC	23	TMT	22		
CBG	15	HANA	13	MTC	9	SCG	17	TNITY	18		
CCET	24	HFT	25	MTI	27	SCI	10	TNL	20		
CCP	24	HMPRO	25	NC	17	SCN	6	TNPC	16		
CEN	23	HPF	11	NCH	27	SCP	28	TNR	3		
CENTEL	21	HTC	24	NEP	18	SDC	28	TOA	4		
CFRESH	23	HTECH	6	NEW	12	SE-ED	17	TOG	15		
CGD	14	HUMAN	2	NEX	25	SEAFCO	23	TOP	19		
CGH	8	ICBCT	1	NKI	15	SENA	22	TOPP	12		
CHARAN	20	ICC	25	NNCL	28	SF	23	TPA	27		
CHG	13	ICHI	15	NOBLE	26	SFP	15	TPBI	4		
CHOTI	36	IFS	22	NOK	17	SGP	20	TPCORP	12		
CI	19	IHL	18	NSI	22	SHANG	29	TPIPL	22		
CIMBT	25	III	2	NTV	22	SIAM	22	TPIPP	5		
CITY	29	ILINK	12	NUSA	19	SINGER	21	TPOLY	23		
CK	21	IMPACT	2	NVD	3	SIRI	26	TPP	24		
CKP	20	INET	21	NWR	27	SIRIP	11	TPRIME	1		
CM	23	INGRS	5	NYT	9	SIS	26	TR	23		
CMR	25	INOX	22	OCC	18	SITHAI	22	TRC	16		
CNS	16	INTUCH	29	OGC	20	SKE	3	TRITN	23		
CNT	24	IRC	15	OHTL	15	SKN	4	TRU	22		
COL	10	IRPC	18	OISHI	28	SKR	13	TRUBB	27		
CPALL	22	IT	26	ORI	10	SLP	10	TRUE	21		
CPF	18	ITD	24	PACE	11	SMIT	18	TSC	27		

4.2 Abnormal returns model

In order to verify whether abnormal trading volume has information content, and it is able to generate the positive abnormal returns, both *market-adjusted* and *market and risk-adjusted* models were tested using a standard event study from Brown & Warner (1985); Park (2004). The *market-adjusted* is the expected return of reference market return, SET index, at day *t*. The *market and risk-adjusted* is the expected return based on a single factor model. The α_i and β_i parameters were estimated using Ordinary Least Square (OLS) regression of daily stock returns on 150 days window [t-155, t-6] before an event (*estimation period*), as shown in *Figure 1*. This method controls the relation between stock returns and market returns in other respect, considers the systematic risk associated with a selected stock. The abnormal returns are estimated for 28 days windows period [t-5, t+22] around the event (*test period*) and calculated by minus the return of stock *i* at day *t* with the previous two models' expected return. The abnormal trading volume event is analyzed through the 22-day cumulative average abnormal returns (*CAAR*), and the average abnormal returns (*AAR*) are calculated by average the end-of-day abnormal returns (*AR*) of firms that experience the abnormal trading volume event. The diagram demonstrates the calculation is shown in *Figure 2*. The equations are presented in the following:

Abnormal returns

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

Market-adjusted return

$$E(R_{i,t}) = R_{SET,t}$$

Market and risk-adjusted returns

$$E(R_{i,t}) = \alpha_i - \beta_i R_{SET,t}$$

Average abnormal returns at day t

$$AAR_t = \sum_{i=1}^{N} \frac{AR_{i,t}}{N}$$

Cumulative abnormal returns of event i

$$CAR_i[T_0, T_1] = \sum_{i=T_0}^{T_1} AR_{i,t}$$

Cumulative of average abnormal returns

$$CAAR[T_0, T_1] = \sum_{i=T_0}^{T_1} AAR_t$$

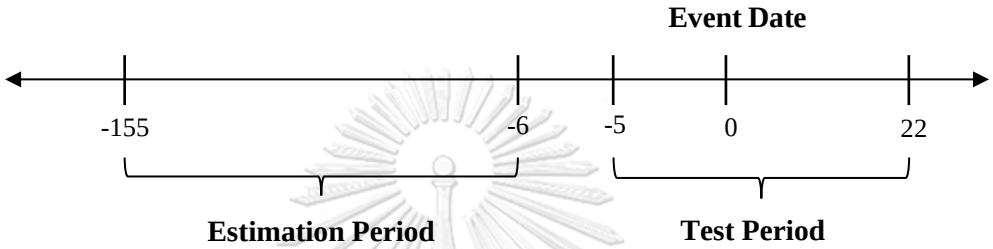


Figure 1: Event study timeline relative to the event date

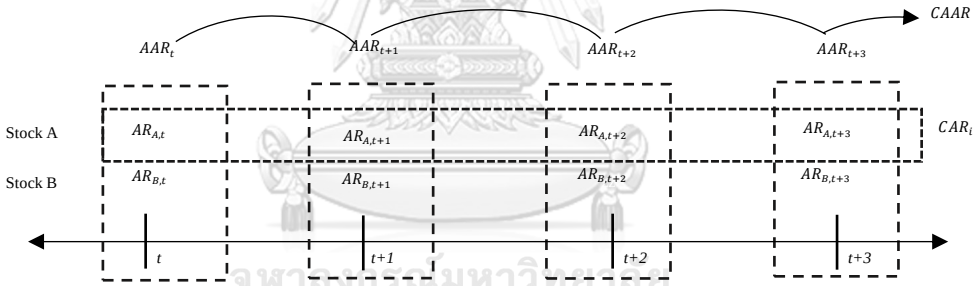


Figure 2: The calculation diagram of AR, AAR, CAR, and CAAR

The assumption of the returns data is normally distributed, the parametric *t*-test was used for statistical analysis to determine the significant difference from zero of abnormal returns. All statistical tests were performed using the R programing language. The result was indicated as a statistically significant difference at a 95% confidence level.

Statistical parametric t-test on abnormal returns

$$H_0: AAR = 0, H_a: AAR \neq 0$$

$$t_{AAR,t} = \sqrt{N}\frac{AAR_t}{S_{AAR,t}} \text{ and } S^2_{AAR,t} = \frac{\sum_{i=1}^{N}\left(AR_{i,t}-AAR_t\right)^2}{N-1}$$

$$H_0: CAAR = 0, H_a: CAAR \neq 0$$

$$t_{CAAR,t} = \sqrt{N}\frac{CAAR_t}{S_{CAAR,t}} \text{ and } S^2_{CAAR,t} = \frac{\sum_{i=1}^{N}\left(CAR_{i,t}-CAAR_t\right)^2}{N-1}$$

4.3 Portfolio strategy based on the abnormal trading volume events

If information content on abnormal trading volume can be taken as a reliable signal for the future's returns, then the portfolio strategy based on trading volume observation could exploit extra-return. The zero-investment portfolio was used in this study, based on literature from Gervais, Kaniel, & Mingelgrin (2001), with the difference in the trading interval to verify the persistence of returns.

The duration of a week, half month, month, quarter, and half year (5, 10, 22, 66, and 132 days) was used as the trading interval's length to describe the time sequence in this research. The stock screening was done in the *reference period* and added to the portfolio *information period*. The portfolio was held in a *holding period* until the end of the period, and then it will be rebalanced. The time sequence is illustrated in *Figure 3*.

At each formation period, the normalized trading volume (*V*) was processed by following steps; (1) average $V_{i,t}$ value of each stock in *reference period* ($\overline{V_{i,k}}$); (2) rank $\overline{V_{i,k}}$ value by descending; (3) separate $\overline{V_{i,k}}$ value into three groups by 10% of bottom rank (Low-Volume), 80% of middle rank (Medium-Volume), and 10% of top rank (High-Volume) as shown in *Figure 4*. Hence, taking a long (short) position for a total of one dollar in the High (Low)-Volume group, which stock in the group is given equally weighted. This research denotes each day returns of the long (short) position in the *holding period* by $R^H_{k,t}$ (returns of the High-Volume group) and $R^L_{k,t}$ (returns of the Low-Volume group). The cumulative returns were taken at the end of the *holding period* (CR^H_k , CR^L_k) in each trading interval, and the net returns are calculated by combining a long and a short position (NR_k). In addition, the

performance of the portfolio was measured by average net returns for all *trading intervals* ($\overline{NR}$), and the result was indicated with a statistically significant difference at a 95% confidence level. The equations are presented as follows:

Average normalized trading volume of stock i at trading interval k

$$\overline{V_{i,k}}[T_0, T_1] = \frac{1}{T_1}\sum_{t=T_0}^{T_1} V_{i,t}$$

Cumulative returns at trading interval k

$$CR_k^{H(L)}[T_0, T_1] = \sum_{t=T_0}^{T_1} R_{k,t}^{H(L)}$$

Net returns of portfolio at trading interval k

$$NR_k = CR_k^H + CR_k^L$$

Average net returns of portfolio

$$\overline{NR}[T_0, T_1] = \frac{1}{T_1}\sum_{k=T_0}^{T_1} NR_k$$

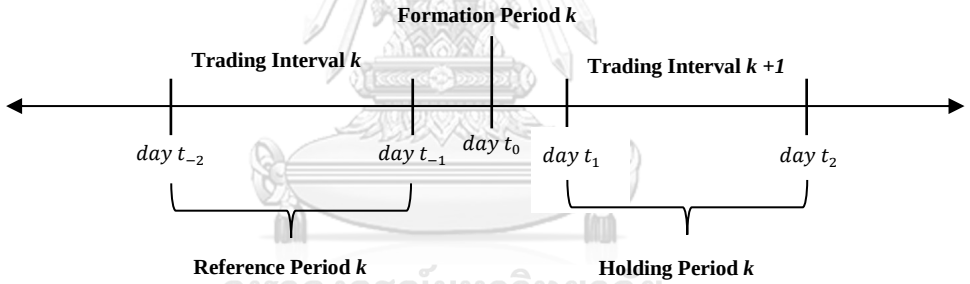


Figure 3: The time sequence for the portfolio strategy

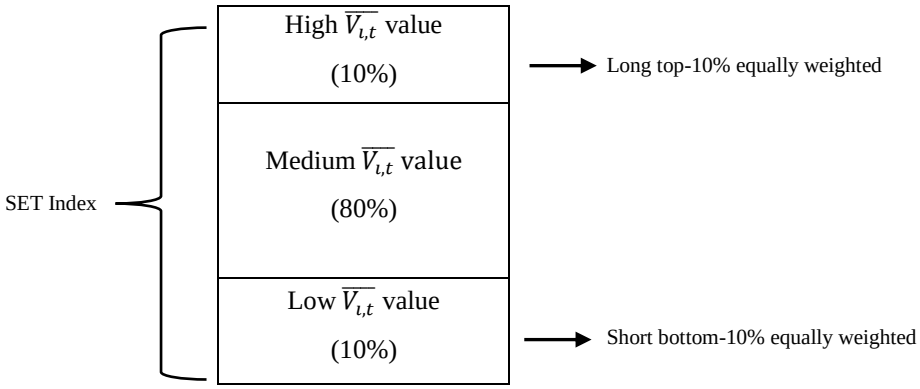


Figure 4: The diagram ranking groups of the average normalized trading volume (V)

5. Empirical results

In this chapter, the results are offered and discussed in two distinct groups as follows. Section 5.1 presents the abnormal returns that follow abnormal trading volume events, and section 5.2 analyzes the portfolio performance of trading strategies based on trading volume.

5.1 The abnormal returns around the abnormal trading volume events on the Thailand stock market

This section investigates the abnormal returns following an abnormal trading volume event (hypothesis 1). The abnormal returns were calculated as average abnormal returns (*AAR*) at the end-of-day of the event date, and cumulative average abnormal returns (*CAAR*) were examined in three different window periods to represent the pre-event and post-event returns. Although, the APPENDIX contains the complete list of *AAR* for the 28-days around the events. The threshold level (*c*) was inspected in three different cut-off levels: 1.645, 2.326, and 2.576 corresponding to the 5, 1, and 0.5 percentiles of the theoretical normal distribution as shown in *Figure 5*. The statistical significance was indicated using a parametric test (*t*-test).

As shown in *Table 3*, firms earn positive and significant abnormal returns on the event date (*AAR*[0]*)* with respect to both methodologies (*market-adjusted* and *market and risk-adjusted*). Especially, when the higher the cut-off level tends to show the higher *AAR*[0]. The *AAR* on the event date ranges from 2.08% ($V > 1.645$) to 4.26% ($V > 2.576$) for the *market-adjusted* and 2.06% ($V > 1.645$) to 4.28% ($V > 2.576$) for the *market and risk-adjusted*. With regard to the post-event window, the *CAAR*[1,10] and *CAAR*[1,22] are positive and significant on both methodologies at any threshold level. However, there is no evidence to supports that the events exhibit a positive and significant *CAAR*[1,5]. The shape of the *CAAR* graph from both methodologies is identical in the sense that they both show negative abnormal returns on day one and slowly accumulate up until reaching the maximum value at the end of 22-days (roughly 1-month or 4-weeks), as illustrated in *Figures 6* and *7*. For the pre-event analysis, *CAAR*[-1,-5] is significantly positive for both methodologies indicating that abnormal return and abnormal trading volume occur before the event and gradually increase until the measurement tool can detect. These type of anomalies

are caused by the selected extreme level of threshold cut-off. *Table 4* further presents the issue by showing the result of decreased cut-off level to 0.842, corresponding to the 20 percentiles of the normal distribution. The pre-event *CAAR*[-1,-5] dramatically drops approximately ten times from 1.00% to 0.17%, which means that a lower threshold could be detected this phenomenon at the beginning of the event. However, the post-event returns are only significant for *market-adjusted* methodology and lower than the returns from the extreme cut-off level. As a matter of fact, this research focused on the profit follows the abnormal trading volume signal. Therefore, the high cut-off level was still a better choice to form a return generating portfolio.

The evidence support that the abnormal trading volume events are followed by positive abnormal returns for the stocks listed in the SET index (Thailand) from the period 2010 - 2019, which consistent with hypothesis 1. In other word, there is a signal that allows investors to follow and obtained extra-profit from holding the stock for a certain period of time (at least 10-days). The evidence which supports this phenomenon similar to previous literature by Gervais, Kaniel, & Mingelgrin (2001); Bajo (2010), but the result contradicts with Dejbordin (2016). A possible explanation could be the lack of small stocks used in his research. *Table 5* shows the number of the top one-hundred firms most events-occurred in each market and sector, firms in non-SET100 are most likely to have the events than the firms in SET100, which is equal to 67% of the total number of firms (all firms' event-occurred are presented in APPENDIX). The agency problem between management and shareholders among small stocks might be the key that causes the abnormal returns to follow the abnormal trading volume event.

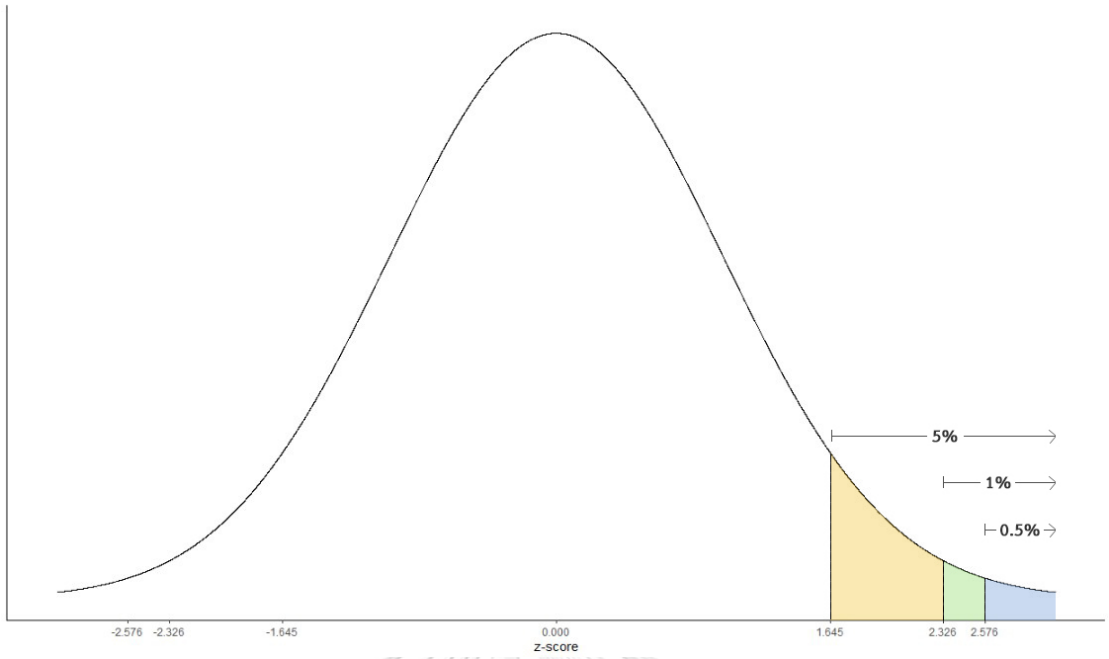


Figure 5: the threshold level (c) of the right tail of the distribution with a different cut-off level

***Table 3**: The average abnormal returns at the end of event date and cumulative average abnormal returns in different windows.*

Panel A: c = 1.645

Day	**Market Adjusted**		**Market and Risk Adjusted**	
	AAR	***t*-Test**	***AAR***	***t*-Test**
0	2.08%	40.65*	2.06%	40.25*
Window	***CAAR***	***t*-Test**	***CAAR***	***t*-Test**
[-5, -1]	0.47%	12.81*	0.46%	12.69*
[1, 5]	0.09%	1.93	0.04%	0.83
[1, 10]	0.27%	4.59*	0.13%	2.22*
[1, 22]	0.59%	6.89*	0.17%	2.04*

Panel B: c = 2.326

Day	**Market Adjusted**		**Market and Risk Adjusted**	
	AAR	***t*-Test**	***AAR***	***t*-Test**
0	3.60%	35.61*	3.61%	35.75*
Window	***CAAR***	***t*-Test**	***CAAR***	***t*-Test**
[-5, -1]	0.94%	15.79*	1.01%	17.53*
[1, 5]	0.03%	0.42	0.06%	0.75
[1, 10]	0.29%	2.97*	0.23%	2.43*
[1, 22]	0.67%	4.92*	0.33%	2.53*

Panel C: $c = 2.576$

Day	**Market Adjusted**		**Market and Risk Adjusted**	
	AAR	***t*-Test**	***AAR***	***t*-Test**
0	4.26%	31.06*	4.28%	31.20*
Window	***CAAR***	***t*-Test**	***CAAR***	***t*-Test**
[-5, -1]	1.12%	15.20*	1.23%	17.12*
[1, 5]	0.06%	0.63	0.09%	0.96
[1, 10]	0.34%	2.87*	0.28%	2.40*
[1, 22]	0.68%	4.09*	0.32%	2.06*

Note:

*The statistical significance is calculated by parametric test (t-test). * indicate the mean and median of AAR and CAAR s significantly different from zero at 5% significant level.*

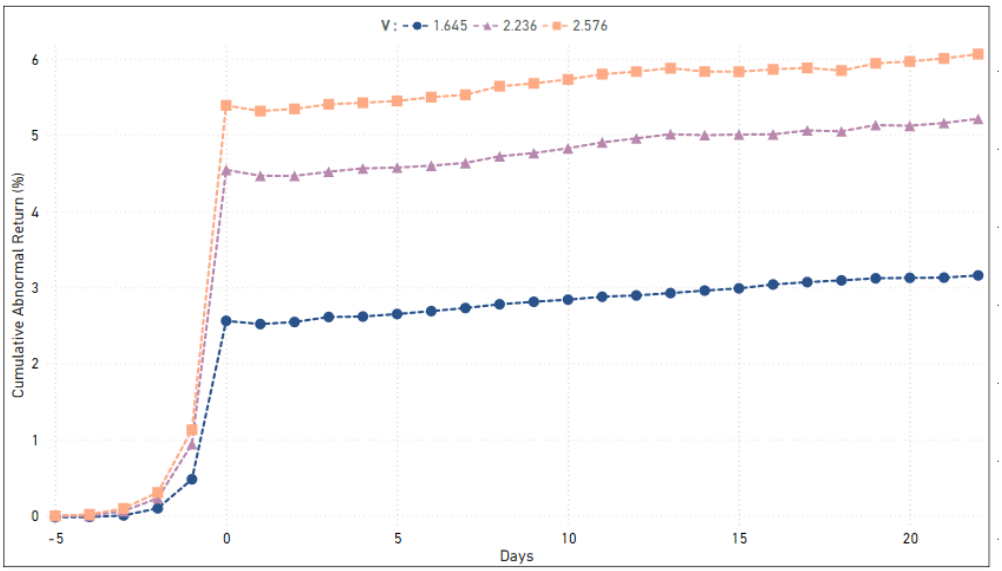


Figure 6: The end-of-day market-adjusted CAAR relative to event day for different threshold cut-off

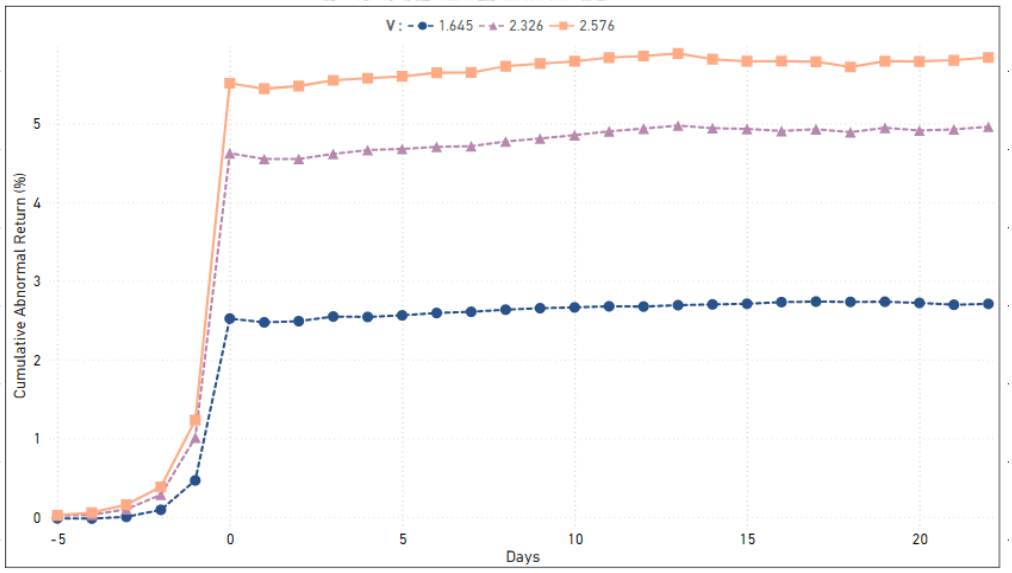


Figure 7: The end-of-day market and risk-adjusted CAAR relative to event day for different threshold cut-off

***Table 4**: The average abnormal returns and cumulative average abnormal returns at the end-of-day for 28 days around the event*

Day	***V* > 0.842 (34,925 Observations)**			
	Market Adjusted		**Market and Risk Adjusted**	
	AAR	***t*-Test**	***AAR***	***t*-Test**
-5	0.01%	0.45	-0.01%	-1.04
-4	0.00%	0.09	-0.01%	-0.90
-3	0.01%	1.03	0.00%	-0.17
-2	0.01%	0.62	-0.01%	-1.02
-1	0.14%	10.29*	0.11%	8.29*
0	0.92%	39.81*	0.88%	38.11*
1	0.01%	0.39	-0.01%	-0.92
2	0.05%	3.46*	0.03%	2.06*
3	0.02%	1.20	0.00%	-0.19
4	0.03%	2.28*	0.01%	0.70
5	0.04%	2.64*	0.01%	0.77
6	0.02%	1.53	0.00%	-0.27
7	0.01%	0.80	-0.02%	-1.38
8	0.03%	2.39*	0.00%	0.06
9	0.03%	2.19*	0.01%	0.77
10	0.01%	0.99	-0.01%	-0.85
11	0.02%	1.72	-0.01%	-0.61
12	0.01%	0.95	-0.02%	-1.42
13	0.01%	0.82	-0.01%	-0.83
14	0.01%	0.53	-0.02%	-1.15
15	0.02%	1.46	-0.01%	-0.52
16	0.05%	1.95	0.02%	0.83
17	0.01%	0.96	-0.01%	-0.95
18	0.04%	2.64*	0.01%	0.79
19	0.02%	1.33	-0.01%	-0.49
20	0.01%	0.74	-0.02%	-1.19
21	0.01%	0.93	-0.01%	-1.11
22	0.02%	1.22	-0.01%	-0.80
Window	***CAAR***	***t*-Test**	***CAAR***	***t*-Test**
[-5,-1]	0.17%	6.11*	0.07%	2.67*
[1,5]	0.15%	4.73*	0.03%	1.08
[1,10]	0.26%	6.18*	0.01%	0.20
[1,22]	0.48%	7.42*	-0.10%	-1.34

Note:

*The statistical significance is calculated by parametric test (t-test). * indicate the mean and median of AAR and CAAR s significantly different from zero at 5% significant level.*

Table 5: *The number of events and securities of top one-hundred firms most event-occurred in each market and sector*

Sector	Number of events	Number of securities		
		SET 100	Non-SET100	Total
Agro & Food Industry	335	1	11	12
Consumer Products	165	2	4	6
Financials	183	2	5	7
Industrials	513	4	15	19
Property & Construction	457	8	9	17
Resources	252	2	7	9
Services	527	10	10	20
Technology	159	4	6	10
	2,591	**33**	**67**	**100**

5.2 The performance of portfolio strategy based on trading volume

Previously it clearly emerges that trading volume can be taken as a reliable signal for future returns, even though they usually last for a month after the event. As a matter of fact, no matter whether new information is released, cumulative abnormal return after the event is also significant. Therefore, the trading volume can represent a signal for a portfolio strategy that can make a profit. The strategy is called zero investment portfolio by long any stock that has high trading volume (top ten percentage of average trading volume), and short low trading volume (bottom ten percentage of average trading volume) from the reference period, then held the portfolio without any rebalancing until the end of the holding period and evaluated the performance. The trading interval consists of 5, 10, 22, 66, and 132 days to examine the performance at different time horizons.

The average net returns ($\overline{NR}$) of the whole portfolio, the combined position of long high-volume portfolio and short low-volume portfolio, as shown in *Table 6*. The results are significantly positive at the time horizon of 5 and 10 days with both *market-adjusted* and *market and risk-adjusted* methodologies. There is a weak evidence to support the trading volume signal for the time horizon of 22 days because the net returns are significantly positive only with *market-adjusted*

methodology. The $\overline{NR}$ is range from 0.20 and 0.53 percentage per dollar over 5 and 10 days respectively in *market-adjusted* methodology. If switching to the annual returns, these are equal to 10.12 and 13.41 percent per dollar. For the *market and risk-adjusted* methodology, the $\overline{NR}$ is range from 0.16 and 0.29 percentage per dollar equal to 8.10 and 7.34 percentage per dollar annual returns. These significant $\overline{NR}$ indicate that trading volume by itself could generate the abnormal return in the subsequent period, which is consistent with hypothesis 1. For the longer time horizon, $\overline{NR}$ are not significant and start to shows the unaccountable sign.

From the evidence suggest that the profit seems to start declining, and the significance is also diminished. Therefore, investors could get the benefit of trading volume from a zero-investment strategy by holding the portfolio not exceeding two weeks, which is consistent with the study from Gervais, Kaniel, & Mingelgrin (2001). The explanation for this phenomenon is stock that experiences high trading volume contains information content about the future's return.

Table 6: *The net return of zero-investment portfolio strategy with different trading interval lengths.*

Portfolio	**Trading Interval (Days)**	**Grouping Cut-Off**	**Raw Returns**		**Market-Adjusted**		**Market and Risk-Adjusted**	
			Returns	***t*-Test**	**Returns**	***t-test***	**Returns**	***t-test***
Long High-Volume Portfolio ($\overline{CR^H}$)	5	10%	0.36%	2.99*	0.12%	1.56	-0.08%	-1.04
Short Low-Volume Portfolio ($\overline{CR^L}$)	5	10%	0.14%	1.31	-0.09%	-1.47	-0.24%	-3.93*
Whole Portfolio ($\overline{NR}$)			0.22%	3.02*	0.20%	2.84*	0.16%	2.18*
Long High-Volume Portfolio ($\overline{CR^H}$)	10	10%	0.87%	3.68*	0.39%	2.64*	-0.12%	-0.80
Short Low-Volume Portfolio ($\overline{CR^L}$)	10	10%	0.31%	1.35	-0.14%	-1.22	-0.41%	-3.45*
Whole Portfolio ($\overline{NR}$)			0.56%	3.88*	0.53%	3.68*	0.29%	2.11*
Long High-Volume Portfolio ($\overline{CR^H}$)	22	10%	1.92%	3.89*	0.82%	2.46*	-0.54%	-1.67
Short Low-Volume Portfolio ($\overline{CR^L}$)	22	10%	0.70%	1.42	-0.38%	-1.45	-0.91%	-3.02*

Whole Portfolio ($\overline{NR}$)			1.23%	4.42*	1.21%	4.32*	0.38%	1.40
Long High-Volume Portfolio ($\overline{CR^H}$)	66	10%	4.57%	2.55*	1.78%	1.77	-4.27%	-3.52*
Short Low-Volume Portfolio ($\overline{CR^L}$)	66	10%	2.45%	1.61	-0.46%	-0.65	0.24%	0.31
Whole Portfolio ($\overline{NR}$)			2.12%	2.32*	2.24%	2.56*	-4.51%	-4.35*
Long High-Volume Portfolio ($\overline{CR^H}$)	132	10%	7.26%	2.39*	2.21%	1.53	-11.13%	-4.73*
Short Low-Volume Portfolio ($\overline{CR^L}$)	132	10%	3.93%	1.06	-1.47%	-0.58	3.54%	1.66
Whole Portfolio ($\overline{NR}$)			3.33%	1.44	3.68%	1.60	-14.67%	-4.90*

Note:

*The statistical significance is calculated by parametric test (T-Test). * indicate the mean of $\overline{NR}$ is significantly different from zero at 5% significant level.*

6. Conclusion

This research investigates the information content in abnormal trading volume event could be taken as the reliable informative signal for the future's security returns in the SET index (Thailand), as well as the portfolio strategy based on trading volume was proposed.

The hypothesis was consistent with the result, this research found the abnormal returns following the abnormal trading volume that allowed investors to follow the signal and obtained the profit from holding the stocks for a certain period (at least ten days). This evidence also indicated that the trading volume-abnormal return effect was persistent and can be implemented to obtain profitable portfolio strategy.

Finally, a zero-investment portfolio strategy has been proposed to exploit the extra-return based on trading volume. This strategy suggested that investors could long the high-volume stock and short low-volume stock for the short-term holding period (not exceeding two weeks) to obtain 13.4% annual return.

APPENDIX

Table I: *Summarization of stock split events per*

Year	Number of stock split (events)
2010	8
2011	14
2012	10
2013	23
2014	12
2015	29
2016	9
2017	13
2018	15
2019	1
Total	**134**

Table II: *The board approval date, announcement date, and effective date of the stock split events.*

Symbol	Board Date	Announcement Date	Effective Date	Symbol	Board Date	Announcement Date	Effective Date
ACC	16/02/2015	17/02/2015	08/04/2015	NYT	01/03/2017	02/03/2017	19/05/2017
AEC	20/12/2013	23/12/2013	17/02/2014	PB	23/02/2011	23/02/2011	20/05/2011
AHC	02/03/2012	05/03/2012	08/05/2012	PF	25/02/2011	28/02/2011	23/05/2011
AI	24/03/2015	25/03/2015	06/05/2015	POLAR	31/10/2014	04/11/2014	15/01/2015
AJA	19/09/2014	22/09/2014	04/11/2014	POMPUI	26/03/2004	29/03/2004	16/10/2017
AOT	29/11/2016	30/11/2016	09/02/2017	PR	23/02/2011	24/02/2011	23/05/2011
APCO	23/02/2018	27/02/2018	27/04/2018	PRG	03/03/2014	04/03/2014	19/05/2014
APCO	12/02/2015	16/02/2015	03/04/2015	PTT	20/02/2018	21/02/2018	24/04/2018
AQ	21/12/2012	24/12/2012	07/03/2013	PYLON	26/02/2018	27/02/2018	17/05/2018
AQ	29/02/2012	02/03/2012	25/04/2012	RAM	12/03/2019	12/03/2019	17/06/2019
AQUA	26/04/2011	27/04/2011	10/05/2011	RICH	31/01/2011	31/01/2011	17/03/2011
ASIA	06/03/2018	07/03/2018	11/05/2018	S	16/03/2011	17/03/2011	18/05/2011
B	06/07/2017	07/07/2017	29/08/2017	SABINA	22/06/2012	25/06/2012	01/08/2012
B52	11/05/2017	12/05/2017	26/07/2017	SAFARI	14/09/2015	15/09/2015	27/10/2015
B52	08/07/2014	09/07/2014	22/08/2014	SAUCE	04/03/2011	07/03/2011	04/05/2011
B52	13/11/2013	14/11/2013	20/12/2013	SC	22/02/2013	25/02/2013	30/04/2013
BANPU	31/07/2013	01/08/2013	26/09/2013	SC	28/02/2011	28/02/2011	28/04/2011
BDMS	12/03/2014	13/03/2014	29/04/2014	SCP	13/05/2013	14/05/2013	26/07/2013
BEAUTY	25/02/2015	26/02/2015	14/05/2015	SEAFCO	10/08/2017	11/08/2017	27/10/2017
BIG	13/11/2014	14/11/2014	13/01/2015	SGP	22/02/2018	23/02/2018	17/05/2018
BJCHI	25/02/2015	26/02/2015	07/05/2015	SIRI	15/08/2011	16/08/2011	10/10/2011
BLISS	25/02/2016	26/02/2016	24/05/2016	SITHAI	25/02/2014	26/02/2014	15/05/2014
BTS	13/06/2012	14/06/2012	10/08/2012	SKR	21/02/2018	23/02/2018	30/04/2018
BWG	23/03/2015	24/03/2015	12/05/2015	SMK	25/02/2016	26/02/2016	24/05/2016
CCP	27/02/2015	02/03/2015	08/04/2015	SMPC	12/02/2015	13/02/2015	08/04/2015
CEN	09/11/2009	09/11/2009	11/01/2010	SMT	16/03/2016	17/03/2016	17/05/2016
CHG	23/02/2015	24/02/2015	11/05/2015	SNP	26/02/2014	27/02/2014	19/05/2014
CI	12/07/2013	12/07/2013	28/08/2013	SPG	18/02/2013	19/02/2013	02/05/2013
CKP	21/01/2015	22/01/2015	20/04/2015	SSSC	24/02/2017	27/02/2017	29/05/2017
CMR	24/02/2016	25/02/2016	08/06/2016	STA	16/05/2010	17/05/2010	06/07/2010
CNS	22/03/2013	25/03/2013	10/05/2013	STPI	10/06/2013	11/06/2013	02/08/2013
COL	23/02/2018	26/02/2018	11/04/2018	SUPER	08/01/2015	09/01/2015	03/03/2015
CPL	13/11/2017	14/11/2017	06/02/2018	TASCO	19/02/2015	20/02/2015	22/04/2015
CPN	04/03/2013	04/03/2013	07/05/2013	TBSP	22/02/2017	23/02/2017	27/04/2017
CWT	29/04/2011	03/05/2011	16/05/2012	TC	26/02/2010	26/02/2010	24/05/2010
DCC	28/10/2014	29/10/2014	07/01/2015	TCMC	25/03/2013	26/03/2013	09/05/2013
DCON	13/11/2014	14/11/2014	19/01/2015	TF	21/02/2011	22/02/2011	20/05/2011
DTC	25/02/2016	26/02/2016	23/05/2016	TGPRO	14/11/2017	15/11/2017	15/01/2018
ESET50	09/01/2015	13/01/2015	15/01/2015	TH	29/06/2012	02/07/2012	06/09/2012
GEL	07/03/2013	08/03/2013	03/04/2013	THE	24/06/2016	27/06/2016	18/04/2017
GEL	25/01/2011	26/01/2011	12/04/2011	THE	24/02/2012	27/02/2012	11/05/2012
GFPT	17/02/2010	17/02/2010	17/05/2010	THIP	11/05/2017	12/05/2017	21/07/2017
GJS	20/03/2015	23/03/2015	26/05/2015	TKS	13/08/2009	13/08/2009	24/05/2010
GL	12/03/2013	13/03/2013	15/05/2013	TMD	18/03/2013	19/03/2013	13/05/2013
GLAND	11/03/2011	14/03/2011	09/05/2011	TNPC	20/03/2015	23/03/2015	06/05/2015
GLOCON	25/05/2012	28/05/2012	06/07/2012	TPA	26/03/2013	27/03/2013	17/05/2013
GSTEEL	20/03/2015	23/03/2015	26/05/2015	TPIPL	25/07/2014	28/07/2014	21/10/2014
GUNKUL	03/03/2016	04/03/2016	03/05/2016	TRC	17/03/2015	18/03/2015	11/05/2015
JMT	06/07/2018	09/07/2018	20/08/2018	TRC	14/03/2013	15/03/2013	02/05/2013
KCE	13/03/2018	14/03/2018	21/05/2018	TRUBB	14/05/2010	14/05/2010	28/06/2010
KSL	23/01/2015	26/01/2015	10/03/2015	TSI	18/03/2015	19/03/2015	15/05/2015
KTC	14/05/2018	15/05/2018	13/07/2018	TSTE	23/07/2015	24/07/2015	08/10/2015
KTECH	27/02/2017	28/02/2017	28/03/2018	TU	13/11/2014	14/11/2014	05/01/2015
L&E	19/02/2014	20/02/2014	30/04/2014	TWFP	17/06/2013	18/06/2013	03/09/2013
MACO	01/08/2014	04/08/2014	03/10/2014	TWP	24/02/2016	25/02/2016	16/05/2016
MAKRO	07/08/2013	08/08/2013	10/10/2013	U	30/08/2018	31/08/2018	05/11/2018
MALEE	23/02/2017	24/02/2017	16/05/2017	UAC	14/09/2012	17/09/2012	29/10/2012
MALEE	15/02/2013	18/02/2013	18/04/2013	U-P	30/08/2018	31/08/2018	05/11/2018
MBK	27/02/2014	28/02/2014	28/04/2014	UTP	04/06/2013	05/06/2013	09/08/2013
MIDA	05/03/2014	06/03/2014	18/04/2014	UVAN	01/03/2013	04/03/2013	16/05/2013
MILL	20/01/2010	21/01/2010	10/03/2010	VGI	30/07/2013	31/07/2013	27/09/2013
ML	25/03/2010	26/03/2010	25/05/2010	VIBHA	24/02/2015	25/02/2015	22/05/2015
MODERN	28/02/2011	01/03/2011	13/05/2011	WAVE	26/02/2015	02/03/2015	26/05/2015
NFC	12/05/2017	15/05/2017	05/07/2017	WHA	26/02/2015	02/03/2015	06/05/2015
NFC	02/03/2016	03/03/2016	15/06/2016	WHAUP	30/05/2017	31/05/2017	13/07/2017
NMG	13/05/2011	18/05/2011	27/06/2011	WORLD	13/11/2015	16/11/2015	01/02/2016
NTV	24/02/2012	27/02/2012	17/05/2012	WORLD	21/08/2013	22/08/2013	10/10/2013

Table III: *The 28-days average abnormal returns (AAR) around the abnormal trading volume events.*

Panel A. c = 1.645

Day	***V*** **> 1.645 (20,611 Observations)**			
	Market Adjusted		**Market and Risk Adjusted**	
	AAR	***t*-Test**	***AAR***	***t*-Test**
-5	-0.02%	-1.14	-0.02%	-1.05
-4	0.00%	0.18	0.00%	-0.12
-3	0.02%	1.22	0.02%	1.36
-2	0.09%	5.64*	0.09%	5.49*
-1	0.38%	18.86*	0.37%	18.76*
0	2.08%	40.65*	2.06%	40.25*
1	-0.04%	-1.79	-0.05%	-2.03*
2	0.03%	1.29	0.01%	0.73
3	0.07%	3.25*	0.06%	2.93*
4	0.01%	0.31	-0.01%	-0.27
5	0.03%	1.70	0.02%	1.04
6	0.04%	1.91	0.03%	1.52
7	0.04%	2.07*	0.01%	0.74
8	0.05%	2.53*	0.03%	1.41
9	0.03%	1.67	0.02%	0.95
10	0.03%	1.48	0.01%	0.53
11	0.04%	2.00*	0.01%	0.74
12	0.02%	0.94	0.00%	-0.17
13	0.03%	1.71	0.02%	0.98
14	0.03%	1.67	0.01%	0.51
15	0.03%	1.62	0.01%	0.46
16	0.05%	2.72*	0.02%	1.13
17	0.03%	1.70	0.01%	0.42
18	0.02%	1.30	0.00%	-0.20
19	0.03%	1.43	0.00%	0.11
20	0.01%	0.34	-0.02%	-0.84
21	0.00%	0.18	-0.02%	-1.37
22	0.03%	1.62	0.01%	0.62

* indicate that coefficient is significantly different from zero at 5% level

Table III: *(continue)*

Panel B. c = 2.326

Day	***V* > 2.326 (9,708 Observations)**			
	Market Adjusted		**Market and Risk Adjusted**	
	AAR	***t*-Test**	***AAR***	***t*-Test**
-5	0.00%	0.05	0.02%	0.78
-4	0.00%	-0.14	0.01%	0.53
-3	0.06%	2.58*	0.07%	2.95*
-2	0.17%	6.43*	0.18%	7.24*
-1	0.71%	20.9*	0.73%	21.6*
0	3.60%	35.61*	3.61%	35.75*
1	-0.08%	-1.89	-0.07%	-1.8
2	0.00%	-0.05	0.00%	0.00
3	0.05%	1.68	0.06%	1.98*
4	0.04%	1.35	0.05%	1.53
5	0.01%	0.34	0.01%	0.48
6	0.03%	0.88	0.03%	0.90
7	0.03%	1.12	0.01%	0.25
8	0.09%	2.79*	0.06%	1.91
9	0.04%	1.34	0.04%	1.21
10	0.06%	2.18*	0.04%	1.49
11	0.08%	2.52*	0.05%	1.58
12	0.05%	1.87	0.04%	1.23
13	0.05%	1.95	0.04%	1.34
14	-0.01%	-0.44	-0.03%	-1.10
15	0.01%	0.32	-0.01%	-0.34
16	0.00%	0.08	-0.03%	-0.99
17	0.05%	1.88	0.02%	0.80
18	-0.01%	-0.41	-0.04%	-1.39
19	0.08%	2.73*	0.06%	1.91
20	-0.01%	-0.32	-0.03%	-1.30
21	0.04%	1.35	0.01%	0.52
22	0.05%	1.94	0.03%	1.18

* indicate that coefficient is significantly different from zero at 5% level

Table III: *(continue)*

Panel C. c = 2.576

Day	$V > 2.576$ (6,853 Observations)			
	Market Adjusted		Market and Risk Adjusted	
	AAR	*t*-Test	*AAR*	*t*-Test
-5	0.00%	-0.04	0.02%	0.82
-4	0.02%	0.71	0.03%	1.30
-3	0.08%	2.50*	0.10%	3.20*
-2	0.21%	6.39*	0.23%	7.11*
-1	0.82%	18.50*	0.85%	19.27*
0	4.26%	31.06*	4.28%	31.20*
1	-0.07%	-1.39	-0.07%	-1.31
2	0.03%	0.63	0.03%	0.77
3	0.06%	1.49	0.07%	1.81
4	0.02%	0.48	0.03%	0.67
5	0.02%	0.61	0.02%	0.60
6	0.05%	1.34	0.05%	1.22
7	0.03%	0.77	0.00%	0.06
8	0.11%	2.87*	0.08%	2.06*
9	0.04%	0.92	0.03%	0.81
10	0.05%	1.51	0.03%	0.85
11	0.07%	1.84	0.05%	1.25
12	0.03%	0.97	0.02%	0.56
13	0.05%	1.35	0.03%	0.97
14	-0.04%	-1.23	-0.07%	-2.07*
15	0.00%	-0.05	-0.03%	-0.79
16	0.03%	0.97	0.00%	0.09
17	0.02%	0.59	-0.01%	-0.28
18	-0.04%	-1.08	-0.07%	-1.97*
19	0.09%	2.53*	0.07%	1.98*
20	0.03%	0.79	0.00%	-0.09
21	0.04%	1.15	0.01%	0.45
22	0.06%	1.75	0.03%	1.03

* indicate that coefficient is significantly different from zero at 5% level

Table IV: *The abnormal returns' descriptive statistic. For a window of 28-days around the abnormal trading volume events (V > 2.326).*

Panel A. Market-adjusted methodology

Day	Mean	Median	Max	Min	StdDev	1st Quartile	3rd Quartile
-5	0.00%	-0.09%	100.82%	-35.65%	2.4%	-0.92%	0.73%
-4	0.00%	-0.1%	30.63%	-50.48%	2.15%	-0.92%	0.76%
-3	0.06%	-0.06%	100.12%	-31.83%	2.47%	-0.91%	0.82%
-2	0.17%	-0.04%	50.18%	-33.68%	2.55%	-0.86%	0.93%
-1	0.71%	0.24%	51.05%	-34.76%	3.36%	-0.71%	1.59%
0	3.60%	2.78%	655.08%	-49.6%	9.96%	-0.35%	6.43%
1	-0.08%	-0.28%	31.21%	-33.39%	4.01%	-1.71%	1.07%
2	0.00%	-0.16%	49.72%	-29.3%	3.31%	-1.35%	0.97%
3	0.05%	-0.15%	31.94%	-29.66%	3.2%	-1.22%	0.97%
4	0.04%	-0.12%	100.29%	-32.68%	3.22%	-1.19%	0.95%
5	0.01%	-0.14%	49.99%	-33.73%	3%	-1.16%	0.95%
6	0.03%	-0.12%	31.06%	-49.9%	2.91%	-1.12%	0.9%
7	0.03%	-0.13%	99.75%	-33.67%	3.08%	-1.12%	0.9%
8	0.09%	-0.11%	52.5%	-49.61%	3.09%	-1.08%	0.94%
9	0.04%	-0.12%	98.85%	-27%	3.07%	-1.12%	0.88%
10	0.06%	-0.09%	29.9%	-50.06%	2.84%	-1.05%	0.9%
11	0.08%	-0.11%	99.54%	-18.9%	3.01%	-1.04%	0.85%
12	0.05%	-0.11%	50.02%	-49.9%	2.8%	-1.04%	0.85%
13	0.05%	-0.13%	49.96%	-32.98%	2.77%	-1.04%	0.85%
14	-0.01%	-0.14%	100.65%	-28.71%	3%	-1.08%	0.81%
15	0.01%	-0.12%	31.81%	-33.08%	2.61%	-1.05%	0.84%
16	0.00%	-0.11%	30.27%	-31.13%	2.61%	-1.04%	0.84%
17	0.05%	-0.12%	49.88%	-30.94%	2.67%	-1.02%	0.84%
18	-0.01%	-0.12%	33.48%	-50.2%	2.66%	-1.02%	0.83%
19	0.08%	-0.08%	100.33%	-29.84%	2.91%	-1%	0.85%
20	-0.01%	-0.12%	49.82%	-35.65%	2.58%	-1.03%	0.83%
21	0.04%	-0.12%	32.89%	-30.16%	2.62%	-1.02%	0.83%
22	0.05%	-0.11%	30.35%	-32.77%	2.77%	-1.04%	0.87%
Window	**Mean**	**Median**	**Max**	**Min**	**StdDev**	**1st Quartile**	**3rd Quartile**
[-5, -1]	0.94%	0.37%	149.52%	-75.89%	5.84%	-1.58%	2.79%
[1, 5]	0.03%	-0.49%	101.42%	-66.17%	7.25%	-3.10%	2.38%
[1, 10]	0.29%	-0.60%	150.45%	-95.92%	9.44%	-4.12%	3.38%
[1, 22]	0.67%	-0.80%	352.55%	-95.89%	13.41%	-5.82%	5.05%

Table IV: *(continue)*

Panel B. Market and risk-adjusted methodology

Day	Mean	Median	Max	Min	StdDev	1st Quartile	3rd Quartile
-5	0.02%	-0.05%	85.05%	-30.63%	2.31%	-0.82%	0.7%
-4	0.01%	-0.06%	29.12%	-51.4%	2.14%	-0.83%	0.74%
-3	0.07%	-0.04%	91.88%	-30.26%	2.41%	-0.81%	0.77%
-2	0.18%	0%	48.49%	-36.4%	2.51%	-0.77%	0.87%
-1	0.73%	0.23%	45.05%	-33.78%	3.32%	-0.63%	1.57%
0	3.61%	2.78%	654.74%	-61.67%	9.96%	-0.25%	6.44%
1	-0.07%	-0.19%	30.78%	-36.11%	4.01%	-1.67%	1.02%
2	0.00%	-0.13%	49.58%	-28.79%	3.3%	-1.27%	0.91%
3	0.06%	-0.09%	30.49%	-29.47%	3.19%	-1.18%	0.93%
4	0.05%	-0.08%	88.29%	-34.27%	3.17%	-1.11%	0.91%
5	0.01%	-0.09%	48.49%	-35.37%	2.99%	-1.07%	0.9%
6	0.03%	-0.09%	30.49%	-59.22%	2.92%	-1.03%	0.82%
7	0.01%	-0.09%	95.74%	-35.11%	3.06%	-1.1%	0.81%
8	0.06%	-0.09%	49.99%	-62.62%	3.1%	-1.02%	0.83%
9	0.04%	-0.08%	107.42%	-27.15%	3.07%	-1.03%	0.82%
10	0.04%	-0.08%	29.7%	-56.61%	2.84%	-1%	0.83%
11	0.05%	-0.09%	98.19%	-19.4%	2.99%	-0.97%	0.76%
12	0.04%	-0.09%	47.18%	-59.27%	2.81%	-0.98%	0.8%
13	0.04%	-0.09%	46.89%	-36.91%	2.76%	-0.99%	0.79%
14	-0.03%	-0.12%	83.28%	-27.97%	2.93%	-1.04%	0.74%
15	-0.01%	-0.09%	29.86%	-41.58%	2.61%	-1%	0.78%
16	-0.03%	-0.09%	29.73%	-36.04%	2.6%	-1.01%	0.76%
17	0.02%	-0.09%	47.5%	-29.89%	2.67%	-1%	0.77%
18	-0.04%	-0.09%	31.74%	-56.78%	2.68%	-0.98%	0.74%
19	0.06%	-0.06%	88.03%	-29.63%	2.85%	-0.96%	0.79%
20	-0.03%	-0.09%	48.34%	-39.02%	2.58%	-1%	0.76%
21	0.01%	-0.10%	32.9%	-30.02%	2.61%	-0.96%	0.75%
22	0.03%	-0.10%	30.18%	-35.75%	2.76%	-0.98%	0.79%
Window	**Mean**	**Median**	**Max**	**Min**	**StdDev**	**1st Quartile**	**3rd Quartile**
[-5, -1]	1.01%	0.49%	121.90%	-80.54%	5.67%	-1.29%	2.82%
[1, 5]	0.06%	-0.34%	95.36%	-65.61%	7.18%	-2.94%	2.26%
[1, 10]	0.23%	-0.41%	104.42%	-94.94%	9.29%	-3.92%	3.28%
[1, 22]	0.33%	-0.51%	184.30%	-86.60%	12.60%	-5.66%	4.74%

Table V: *The net return of zero-investment portfolio strategy with different trading interval lengths.*

Panel A. 20% cut-off for high and low trading volume groups

Portfolio	Trading Interval (Days)	Grouping Cut-Off	Raw Returns		Market-Adjusted		Market and Risk-Adjusted	
			Returns	*t*-Test	Returns	*t-Test*	Returns	*t-Test*
Long High-Volume Portfolio ($\overline{CR^H}$)	5	20%	0.36%	3.41*	0.12%	2.09*	-0.06%	-0.93
Short Low-Volume Portfolio ($\overline{CR^L}$)	5	20%	0.20%	1.98*	-0.03%	-0.57	-0.15%	-2.80*
Whole Portfolio ($\overline{NR}$)			0.16%	3.17*	0.15%	3.03*	0.09%	1.88
Long High-Volume Portfolio ($\overline{CR^H}$)	10	20%	0.83%	3.78*	0.35%	2.87*	-0.07%	-0.55
Short Low-Volume Portfolio ($\overline{CR^L}$)	10	20%	0.33%	1.53	-0.13%	-1.32	-0.34%	-3.20*
Whole Portfolio ($\overline{NR}$)			0.50%	4.71*	0.48%	4.57*	0.27%	2.63*
Long High-Volume Portfolio ($\overline{CR^H}$)	22	20%	1.81%	3.96*	0.70%	2.39*	-0.30%	-1.05
Short Low-Volume Portfolio ($\overline{CR^L}$)	22	20%	0.84%	1.85	-0.24%	-1.01	-0.64%	-2.46*
Whole Portfolio ($\overline{NR}$)			0.97%	4.52*	0.94%	4.38*	0.33%	1.70
Long High-Volume Portfolio ($\overline{CR^H}$)	66	20%	4.50%	2.61*	1.66%	1.93	-2.71%	-2.90*
Short Low-Volume Portfolio ($\overline{CR^L}$)	66	20%	3.16%	2.14*	0.31%	0.43	0.72%	1.01
Whole Portfolio ($\overline{NR}$)			1.33%	2.10*	1.35%	2.23*	-3.44%	-4.66*
Long High-Volume Portfolio ($\overline{CR^H}$)	132	20%	7.28%	2.51*	2.06%	1.36	-8.29%	-4.38*
Short Low-Volume Portfolio ($\overline{CR^L}$)	132	20%	5.61%	1.61	0.23%	0.11	3.32%	1.77
Whole Portfolio ($\overline{NR}$)			1.67%	1.02	1.84%	1.16	-11.61%	-5.46*

* indicate that coefficient is significantly different from zero at 5% level

Table V: *(continue)*

Panel B. 30% cut-off for high and low trading volume groups

Portfolio	Trading Interval (Days)	Grouping Cut-Off	Raw Returns		Market-Adjusted		Market and Risk-Adjusted	
			Returns	*t*-Test	Returns	*t-Test*	Returns	*t-Test*
Long High-Volume Portfolio ($\overline{CR^H}$)	5	30%	0.36%	3.49*	0.12%	2.16*	-0.04%	-0.77
Short Low-Volume Portfolio ($\overline{CR^L}$)	5	30%	0.23%	2.32*	-0.01%	-0.13	-0.12%	-2.30*
Whole Portfolio ($\overline{NR}$)			0.13%	3.14*	0.13%	3.04*	0.07%	1.78
Long High-Volume Portfolio ($\overline{CR^H}$)	10	30%	0.8%	3.90*	0.32%	2.98*	-0.06%	-0.49
Short Low-Volume Portfolio ($\overline{CR^L}$)	10	30%	0.4%	1.90	-0.06%	-0.68	-0.25%	-2.50*
Whole Portfolio ($\overline{NR}$)			0.4%	4.91*	0.38%	4.71*	0.19%	2.48*
Long High-Volume Portfolio ($\overline{CR^H}$)	22	30%	1.74%	4.01*	0.64%	2.50*	-0.22%	-0.83
Short Low-Volume Portfolio ($\overline{CR^L}$)	22	30%	0.95%	2.15*	-0.12%	-0.53	-0.5%	-2.00*
Whole Portfolio ($\overline{NR}$)			0.79%	4.90*	0.76%	4.70*	0.28%	1.73
Long High-Volume Portfolio ($\overline{CR^H}$)	66	30%	4.10%	2.46*	1.30%	1.57	-2.28%	-2.53*
Short Low-Volume Portfolio ($\overline{CR^L}$)	66	30%	3.31%	2.21*	0.48%	0.66	0.76%	1.03
Whole Portfolio ($\overline{NR}$)			0.79%	1.64	0.82%	1.79	-3.04%	-5.20*
Long High-Volume Portfolio ($\overline{CR^H}$)	132	30%	7.52%	2.54*	2.26%	1.43	-6.15%	-3.87*
Short Low-Volume Portfolio ($\overline{CR^L}$)	132	30%	5.54%	1.70	0.19%	0.10	2.36%	1.33
Whole Portfolio ($\overline{NR}$)			1.97%	1.67	2.07%	1.82	-8.51%	-5.19*

* indicate that coefficient is significantly different from zero at 5% level

REFERENCES

B.Ajinkya, B. and P. C.Jain (1989). The behavior of daily stock market trading volume, Journal of Accounting and Economics.

Bajo, E. (2010). "The Information Content of Abnormal Trading Volume." Journal of Business Finance & Accounting.

Baker, H. K. and P. L. Gallagher (1980). Management's View of Stock Splits, Financial Management.

Baker, H. K. and G. E. Powell (1993). Further Evidence on Managerial Motives for Stock Splits, Quarterly Journal of Business and Economics.

Blume, L., et al. (1994). Market Statistics and Technical Analysis: The Role of Volume, The Journal of Finance.

Brennan, M. and P. J. Hughes (1991). Stock Prices and the Supply of Information, The Journal of Finance.

Brown, S. J. and J. B. Warner (1985). Using daily stock returns: The case of event studies, Journal of Financial Economics.

Campbell, C. J. and C. E. Wasley (1996). Measuring abnormal trading volume for samples of NYSE/ASE and NASDAQ securities using parametric and nonparametric test statistics, Review of Quantitative Finance and Accounting.

Campbell, J., et al. (1993). Trading Volume and Serial Correlation in Stock Returns, The Quarterly Journal of Economics.

Comiskey, E. E., et al. (1987). "Dispersion of Expectations and Trading Volume." Journal of Business Finance & Accounting.

Conrad, J. S., et al. (1994). "Volume and Autocovariances in Short-Horizon Individual Security Returns." The Journal of Finance.

Cooper, M. (1999). "Filter Rules Based on Price and Volume in Individual Security Overreaction." The Review of Financial Studies.

Dejbordin, N. (2016). TRADING STRATEGY BASED ON INTRADAY ABNORMAL VOLUME IN THE STOCK EXCHANGE OF THAILAND, Chulalongkorn University.

Epps, T. W. (1975). "Security price changes and transaction volumes: theory and." American Economic Review.

Fama, E. F. (1970). "Efficient Capital Markets: A Review of Theory and Empirical

Work." The Journal of Finance.

Gervais, S., et al. (2001). "The High-Volume Return Premium." The Journal of Finance.

IMF (2019). World Economic Outlook October 2019. IMF.

J.Brennan, M. and T. E.Copeland (1988). Stock splits, stock prices, and transaction costs, Journal of Financial Economics.

J.Brennanab, M., et al. (1998). "Alternative factor specifications, security characteristics, and the cross-section of expected stock returns." Journal of Financial Economics.

Jarrell, G. A. and A. B. Poulsen (1989). Stock Trading before the Announcement of Tender Offers: Insider Trading or Market Anticipation?, Journal of Law, Economics, and Organization.

Karpoff, J. M. (1987). "The Relation Between Price Changes and Trading Volume: A Survey." The Journal of Financial and Quantitative Analysis.

Lee, C. M. C. and B. Swaminathan (2000). "Price Momentum and Trading Volume." The journal of Finance.

M.Cready, W. and RamachandranRamanan (1991). The power of tests employing log-transformed volume in detecting abnormal trading, Journal of Accounting and Economics.

Mayshar, J. (1983). "On divergence of opinion and imperfections in capital markets,." American Economic Review.

McNichols, M. and A. Dravid (1990). Stock Dividends, Stock Splits, and Signaling, Journal of Finance.

Miller, E. M. (1977). "Risk, Uncertainty, and Divergence of Opinion." The Journal of Finance.

Ozdemir, Z. A. (2011). "Efficient market hypothesis: evidence from a small open-economy." Applied Economics.

Park, N. K. (2004). "A guide to using event study methods in multi-country settings." Strategic Management Journal.

Ying, C. C. (1966). "Stock Market Prices and Volumes of Sales." Econometrica.

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