STOCK MARKET VOLATILITY, TRADING VOLUME AND TRADING STYLES BY INVESTOR GROUPS: EVIDENCE FROM THE STOCK EXCHANGE OF THAILAND

BY

MR. KASIDIT PRANEECHIT

AN INDEPENDENT STUDY SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
PROGRAM IN FINANCE (INTERNATIONAL PROGRAM)
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THAMMASAT UNIVERSITY
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ENTITLED

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was approved as partial fulfillment of the requirements for the degree of Master of Science (Finance)

on 03 MAY 2016

Chairman _____
(Assistant Professor Suluck Pattarathammas, DBA.)

Member and Advisor _____
(Assistant Professor Anchada Charoenrook, Ph.D.)

Dean _____
(Professor Siriluck Rotchanakitumnuai, Ph.D.)

Independent Study Title	STOCK MARKET VOLATILITY, TRADING VOLUME AND TRADING STYLES BY INVESTOR GROUPS : EVIDENCE FROM THE STOCK EXCHANGE OF THAILAND
Author	Mr. Kasidit Praneechit
Degree	Master of Science (Finance)
Major Field/Faculty/University	Master of Science Program in Finance (International Program) Faculty of Commerce and Accountancy Thammasat University
Independent Study Advisor	Assistant Professor Anchada Charoenrook, Ph.D.
Academic Year	2015

ABSTRACT

This study determines the relation between daily stock market volatility and daily trading volume by four groups of investor in Stock Exchange of Thailand (SET). All stocks in market are divided into three portfolios based on stock-sizing for testing whether some investor group may has a different impact on each portfolio. The results suggest that trading volume by all groups have a positive effect to market volatility for all portfolios and investors who have the dominant impact over market volatility is proprietary investor. Moreover, this study not only determines relation between volume and volatility but also examines whether trading strategies as contrarian and momentum can be used to explain the positive and negative impact of trading volume on market volatility. It found that trading as contrarian and momentum do not always reduce and increase market volatility. Therefore, trading strategies can't be used to explain the different effect of trading volume on market volatility.

Keywords: Market volatility, Trading volume, Contrarian, Momentum

ACKNOWLEDGEMENTS

First and foremost, I wish to express my sincerest thanks and appreciation to my independent study advisor, Assistant Professor Anchada Charoenrook, Ph.D. for her invaluable help, good comments and suggestions as well as constant encouragement throughout the processing of this research. This independent study would not have been successfully accomplished and my graduation would not be achieved without all her support and kindness. In addition, I would like to thank all of the staff at MIF, Faculty of Commerce and Accountancy at Thammasat University, for their generosity in providing all facilities and materials for my study.

Mr. Kasidit Praneechit

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CHAPTER 1
INTRODUCTION

The effect of trading of different groups of traders on how the market functions in terms of volatility is relevant to asset market risk management and strategic trading. The study of relation between market volatility and trading volume may provide a benefit for market maker. If market makers know how their trading volume impact market volatility, they can take this opportunity for higher return. Empirical evidence from Bessembinder and Seguin (1993) shows that there existing correlation between stock return volatility and trading volume. Previous research by Wiley and Daigler (1999) also found relationship between future market volatility and trading volume classified by type of trader. These provide that trading volume of each group of investors has an effect to the market volatility differently. This may be because various investor groups may have asymmetric information and different trading strategies so trading by various groups of investor may has a different impact to the stock volatility. Recently the study of impact of trades on daily volatility (Avramov, Chordia and Goyal 2006) suggests that the trading activity as contrarian and momentum trading has different effect to daily stock volatility. Thus, the trading styles of investors have an impact on the stock volatility. Therefore, understanding the impact of investor type trading and investor style trading on stock volatility may shed light to variation in volatility of the stock market.

Stock volatility is a measurement of stock return dispersion for a given security or market index. Volatility can be calculated by using standard deviation or variance of return and be used to represent the risk of that security. According to the theory called "mixture of distribution hypothesis" (Clark 1973) which explained that stock return volatility and trading volume have a positive correlation. This means when trading volume increases due to some situation, the stock return volatility also increases along with trading volume so the study of relation between stock return volatility and volume trading will provide a benefit to investors in managing the risk of their investment with regard to change in volume trading in the market. However, there exist some empirical evidence (Li and Wang 2010) that the correlation between stock return volatility and

trading volume aren't always positive when classified trading volume for each group of investors. These studies found that trading volume by informed trader (Institutional trader) who has more information will reduce the volatility while trading volume by uninformed trader (Individual trader) who has less information will increase the volatility. To support these arguments (Avramov, Chordia and Goyal 2006) provided that the proxy of informed trading is identified as contrarian trading which help to reduce the volatility while the proxy of uninformed trading is identified as momentum trading which increase stock volatility.

Contrarian trading and Momentum trading are the major trading strategies. For contrarian trading, it is the strategy that investors will go against market trend by purchase stock when market performs poorly with expect that in the future, stock price will reverse to be increasing then they will sell stock after price increases. In contrast, for momentum strategy investors will trade stock along with market trend at that time by purchase stock when the stock price is still up-trend and sell it when stock price breaking up-trend and begin to decline.

The objective of this study is to determine the relationship between stock market volatility and trading volume of each type of investors and investors trading styles (contrarian and momentum). The dataset used from SET (Stock Exchange of Thailand) which distinguishes type of investors into four categories: 1) Institutional investors, 2) Proprietary investors (Securitized firm), 3) Foreign investors, and 4) Individual investors. In each group of investors, they may have different strategies in trading. This study focuses on two types of trading strategies which are contrarian trading and momentum trading. Earlier paper (Ng and Wu 2007) provided a different classification of trading styles of investors and provided that institutional investors used momentum trading strategies and individual investors used contrarian trading strategies but recent research (Umutlu and Shackleton 2015) argued that rather than classified the whole group of investors as contrarian or momentum they classified the group of investors from net purchases and net sales depending on lagged stock return. Therefore, this classification allowed that each group of investors can be both contrarian and momentum which be more realistic comparing to the real world.

However, there may have some liquidity that must be concerned. As will discuss in theoretical session, liquidity also has an impact to market volatility. If market has a lot of liquidity then trading volume may has less or no relation with market volatility. So this study will controls for liquidity issue.

CHAPTER 2
REVIEW OF LITERATURE

Some previous studies (Karpoff 1986), (Bessembinder and Seguin 1993) of relation between stock return volatility and trading volume followed the theory of "Mixture of distribution hypothesis (Clark 1973)" which explained that there existed the positively comtemporaneous correlation between stock return volatility and trading volume. However, many studies separated the trading volume into each group of investors to determine whether volume trading by different group of investors has a different impact to stock market volatility. As the results, these studies found that the correlation between stock market volatility and trading volume weren't always positive. These studies such as (Wiley and Daigler 1999) determined the relationship between volatility and volume in future market by separating volume into four type of traders; 1) Floor traders, 2) Value traders, 3) Other floor traders, and 4) General public which found that the volume by general public group (Individual investors) who are classified as uninformed trader have positively influenced the stock return volatility. While the study of effect from institutional trading to stock price volatility (Li and Wang 2010) which examined the short-term relation between institutional trading to the stock market volatility shown that institutional trading had a negative impact to stock volatility, this represented that institutional trading stabilized the stock volatility. According to these previous studies, trading volume by informed traders mostly stabilize the market by reducing the stock market volatility and trading volume by uninformed traders who have less information seem to increase the stock market volatility making the market to be more fluctuation.

With the asymmetrical effect on volatility by several groups of investor, some prior studies tried to determine the cause of asymmetrical effect. Several studies related informed trading and uninformed trading to the trading activity such as contrarian trading and Momentum trading which being used as proxies to determine whether there exists the correlation between trading strategies and stock return volatility. The study (Avramov, Chordia and Goyal 2006) proved that the cause of asymmetrical effect on volatility was the trading behaviors as contrarian and herding. As a result, this study

found that informed trading (identified as contrarian trading) lead to reduction of volatility while uninformed trading (identified as herding trading) lead to increasing in volatility. Some study focused on foreign ownership and stock volatility in Vietnam (Vo 2015) by examined the relation of foreign trading and stock volatility which provided the evidence that most foreign investors in Vietnam interested in long-term investment using buy-hold strategy, this trading strategy would help the stock market to be more stable. According to the result of these studies, the asymmetrical effect of trading volume on volatility can be explained by the trading behavior as contrarian and herding

However, several previous studies examined the relation between stock volatility, volume trading by investor groups, and investor behaviors by classified each type of investors to be contrarian traders or momentum traders for the whole group. Classified specific investor groups as contrarian or momentum for whole group which means researchers made an assumption that every investor in each group have a homogenous information and the same trading strategy which might not be practical trading. To contradict this assumption (Umutlu and Shackleton 2015) examined the relation of trading styles and stock return volatility in Korea by allowed investors in each groups can be both contrarian and momentum. The concept of classifying the trading strategies was delivered from (Avramov, Chordia and Goyal 2006) which were classification of purchase and sale volume of investor groups based on lagged stock return. This research also studied the short-run relation between stock return volatility and volume trading of investor groups by applied GARCH(1,1) model to estimate the conditional volatility of stock return and test whether there existed the relation between stock return volatility with net purchase and net sale provided by investor groups. The results shown that increasing in volume traded between individual and institutional investors lead to the decreasing in the volatility while trading between individual and foreign investors increased the volatility.

The research on relation between stock market volatility and trading volume by using SET Thailand as sample was done by Phrukpaisal (2003). His study determined the relation between stock market volatility and trading volume by different group of investors and the result shown that foreign investor and individual investor have an

effect the stock market volatility. He used Granger Causality as methodology to determine the relation between trading volume and market volatility. This methodology can provided only result as whether trading volume impacts market volatility but it was difficult to interpret the coefficient. Thus, this study can't determine whether trading volume by each groups of investor either stabilize or destabilize the stock market volatility. Another study (Wang 2007) also determined the relation between trading volume by investor groups and stock market volatility in Thailand and Indonesia but this study focus on the foreign trading volume in period 1996-1999. The empirical results shown that only foreign investor had a dominant effect on market volatility over other groups of investor for Thailand.

However, these two studies calculated the stock market volatility from SET index which represents overall market volatility. But classifying investors into several groups, some group might interests in large stocks such as foreign investor and institutional investor while some group such as individual investor might interest in small stocks. If test the relation between overall market volatility and trading volume by individual investor who interest in small stocks, it might not found the relation because price change of small stocks have a small impact to the market. To prevent this problem my study will separates stocks into two portfolios, portfolio consisting large stocks and portfolio of small stocks.

The difference of my study from these two studies (Phrukpaisal 2003) and (Wang 2007) is my study determines which group of investors make the stock market volatility either increase or decrease rather than just finding which groups of investor has a dominant effect on market volatility and my study focuses on the most recent data of SET by obtaining the data from 2010 to 2015.

Moreover, my study also determines whether the cause of asymmetrical effect on volatility among investors come from the difference in trading strategies by employ the methodology from Umutlu and Shackleton (2015).

CHAPTER 3
THEORETICAL FRAMEWORK

The theory that commonly refers to the positive comtemporaneous positive relation between trading volume and volatility is called “Mixture of Distributions Hypothesis (MDH)” which provided by (Clark 1973). MDH theory implies that both security price change and trading volume are driven by some “latent variable” which reflects the new arrival information that flow in the market. After new arrival information occurred, traders would adjust their portfolio to reflect the new arrival information to the market. This situation creates trading volume to the market. But how trading volume affect security price, this question can be explained by another theory “Sequential Information Arrival Hypothesis” which provided by (Copeland and Friedman 1987) (Jenning and Cheistopher 1983). This hypothesis implies that traders willing to change their position when new information comes to the market but all traders don’t receive new information at the same time so this create lead-lag responding on new information among the traders. Therefore, when traders change their position based on new arrival information with a different timing security price can be moved by the trading volume.

However, there are some case that relation between trading volume and stock volatility may not exist because of the level of liquidity. For example, if the market has unlimited liquidity trading volume can’t move stock price because investors on buy side can’t dominate sell side on the other hand sell side also can’t dominate buy side. This make stock price not moving. Another case is that If there is no noise trader in the market, when the new information arrive, traders immediately reflect the new arrival information and move the price immediately no matter how much volume trading is. From these two hypothesis, there may no relation between trading volume and volatility. Thus, to control this effect this study adds liquidity as a controlled variable in the model.

CHAPTER 4
DATA

The data set for this study is all stocks price obtained from Stock Exchange of Thailand (SET) since January 2009 until December 2015. All stocks are classified into three portfolios based on size of market capitalization. Daily return of each portfolios is computed by using daily value-weighted method and portfolio return is used to estimates the conditional volatility. Another set of data is daily equity volume in term of number of shares trading by 1) Institutional investor, 2) Proprietary investor, 3) Foreign investor, and 4) Individual investor.

According to average net trading volume data from table 1, the investors who have a large portion in daily trading are foreign investor and individual investor with 75.07 million shares and 73.63 million shares of average trading volume. Respectively, investors who have lower portion on trading are proprietary investor and institutional investor with 4.24 million shares and 5.68 million shares of average trading volume.

Table 2 presents the correlation of net trading volume among four groups of investor. From the correlation matrix trading volume by individual investor has a highest correlation with foreign investor and has a negative correlation with other groups. Thus, individual investor seem to be the only one group who always act on the opposite way with other investor while among other groups don’t seem to have a strong correlation with each other.

Table 4.1 Descriptive statistics

This table represents some basic statistics of SET stocks. *Market return* is calculated from daily SET index return. *Volume* is the total daily trading volume in million shares. *Value* is the total daily trading value in million Bath which calculated from daily volume multiplied by daily stock close price. *Market cap* is the daily market capitalization in term of million Bath. *Net Trade* is calculated from daily buy volume minus daily sell volume by each investor group. If buy volume is greater than sell volume, *Net Trade* will be positive. If sell volume is greater than buy volume, *Net Trade* will be negative

	Mean	Standard deviation	Median	Min	Max
Market return	0.0725%	1.1681%	0.0977%	-5.6462%	5.9201%
Volume (Million shares)	7,160.33	5,680.18	5,399.22	905.66	52,941.47
Value (Million Bath)	33,789.52	14,448.33	32,200.09	2,339.79	102,662.94
Market Cap. (Million Bath)	9,839,513.79	3,309,005.79	9,813,039.72	3,275,784.36	15,037,328.95
					Net volume trading (Million shares)
Net Trade (Institution)	5.68	121.19	0.27	-738.61	787.49
Net Trade (Proprietary)	-4.24	80.63	-2.20	-916.99	581.01
Net Trade (Foreign)	-75.07	328.66	-32.28	-4,905.79	3,124.76
Net Trade (Individual)	73.63	359.07	38.54	-3,074.67	5,043.37

Table 4.2 Correlation among net trading volume by investor groups

This table represents the correlation among *Net Trade* by each group of investors

	Individual	Proprietary	Foreign	Institution
Individual	1	-0.3459	-0.9043	-0.2615
Proprietary	-0.3459	1	0.0836	0.1523
Foreign	-0.9043	0.0836	1	-0.1167
Institution	-0.2615	0.1523	-0.1167	1

The variables used in the models below are as follows. B_{Kt} is the buy volume by investor groups K, S_{Kt} is the sale volume by investor groups K. Variable K presents four groups of investor, 1) Institutional investor, 2) Proprietary investor, 3) Foreign investor, and 4) Individual investor. Buy and sale volume can be used to calculated amount of net buys (NB_{Kt}) and net sales (NS_{Kt})

When $B_{Kt} > S_{Kt}$: $NB_{Kt} = B_{Kt} - S_{Kt} \quad and \quad NS_{Kt} = 0.$ (1)

When $B_{Kt} < S_{Kt}$: $NS_{Kt} = S_{Kt} - B_{Kt} \quad and \quad NB_{Kt} = 0.$ (2)

CHAPTER 5
METHODOLOGY

In financial market, the financial time series data such as stock prices which prices always fluctuate over time then financial time series often exhibit the phenomenon called "Volatility Clustering". Volatility clustering is a period in with large changing in price (High volatility) and is followed by periods in which there is relative calm. Thus, the conditional variance for given past:

$$Var(R_t|\ R_{t-1}, R_{t-2}, \dots). \quad (3)$$

Given R_t : Return of securities at period t,

$R_t = \ln P_t - \ln P_{t-1}$.

Since the asymmetric information in financial market this leads to the different opinion among investors which lead to the fluctuation of security prices. So conditional variance isn't constant and R_t is conditional heteroskedastic then conditional security return volatility on day t is defined as:

$$\sigma_t = \sqrt{Var(R_t|\ R_{t-1}, R_{t-2}, \dots)}. \quad (4)$$

With volatility clustering and time-varying volatility, the appropriated model to estimate the conditional volatility is the Generalized Autoregressive Conditional Heteroskedastic (GARCH) model (Bollerslev 1986).

Residual is estimated from this following conditional mean equation which is provided by Schwert (1990), Jones, Kauland and Lipson (1994):

$$R_t = \alpha + \sum_{n=1}^{m} \hat{\beta}_j R_{t-n} + \hat{\varepsilon}_t. \quad (5)$$

Given R_t : Stock return on day t.

Residual term is estimated from equation (5) by using Ordinary Least Square method (OLS). Then, GARCH(p,q) is applied to capture heteroscedasticity or time varying volatility and used to estimate the conditional volatility which can be written as:

$$\sigma_t^2 = \gamma + \sum_{j=1}^{p} \delta_j \sigma_{t-j}^2 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2. \quad (6)$$

The important thing in applying GARCH(p,q) to estimate the conditional volatility is to find the appropriated number of lagged terms. Given *p*as a lagged terms of the squared error term and *q* as a lagged terms of conditional variance. Thus, Model selection criteria such as 1) Akaike information criteria(AIC), 2)R square, 3) Adjusted R squareis, 4) Schwarz information criteria (SIC) are delivered to find the appropriated number of lagged terms (p,q) then GARCH(p,q) can be applied to estimate the conditional volatility.

5.1 Liquidity factor

There are some studies that provide how to measure stock liquidity such as (Amihud 2002). Amihud (2002) explain that stock liquidity can be measured through "Illiquidity (ILLIQ)". Illiquidity reflects the impact of order flow on stock price which can be defined as the absolute return of stocks over trading volume (VOL) in term of value so Illiquidity can be called "Price impact"

$$ILLIQ_{it} = \frac{|R_{it}|}{VOL_{it}} . \quad (7)$$

Given $\mathrm{ILLIQ_{it}}$: Illiquidity of stock i at time t,

$\mathrm{VOL_{it}}$: Trading volume of stock i at time t in term of value,

$\mathrm{R_{t-1}}$: Return of stock i at time t.

According to Amihud (2002), investors willing to determine the current illiquidity based on information from last year so stock excess return has a relation with illiquidity from previous year which means stock return volatility should also relates with illiquidity from previous year. Thus, illiquidity factor, as controlled variable, should be illiquidity with one year lag ($\mathrm{ILLIQ_{t-1y}}$).

5.2 Stock-return volatility and trading volume by investor groups

The model to test the relation between stock-return volatility and net trading by investor groups is proposed by Umutlu and Shackleton (2015). This model contains the

conditional volatility as dependent variables and the volume of net purchase, net sale by investors groups, and total volume as independent variables. Some study (Avramov, Chordia and Goyal 2006) argued that there exists the correlation between volatility and lagged return then lagged return is included in this model as a control variable. Lagged values of volatility are also included in this model to avoid autocorrelation in residual terms.

$$\sigma_{P,t} = \beta_0 + \sum_{j=1}^{3} \beta_j \sigma_{P,t-j} + \beta_V V_{P,t} + \beta_{illiq} ILLIQ_{P,t-1y} + \beta_R R_{P,t-1} + \beta_K^{NS} NS_{Kt} + \beta_K^{NB} NB_{Kt} + \varepsilon_t. \quad (8)$$

Given $\sigma_{P,t}$: Conditional stock return volatility of portfolio P on day t ,

$V_{P,t}$: Trading volume of portfolio P,

$ILLIQ_{P,t-1y}$: Illiquidity factor with 1 year lag,

$R_{P,t-1}$: Daily lagged stock return of portfolio P,

NS_{Kt} : Net sale volume by investor group K on day t,

NB_{Kt} : Net buy volume by investor group K on day t.

To obtain the relation between stock volatility and trading volume by investor groups this model will be estimate using OLS estimator. The conditional volatility comes from the estimation of GARCH model for stock price of each portfolio.

5.3 Stock-return volatility and trading style of investor groups

Some researchers argued that there exists the impact of trading style to stock return volatility. Avramov, Chordia and Goyal (2006) shows the results that momentum trading increase the volatility while contrarian trading decrease the volatility. However, most researches defined specific groups of investors to be contrarian traders or momentum traders as the whole group which means these researchers assumed that every trader in each group has the same trading behavior which may not be practical so Umutlu and Shackleton (2015) contradicted this assumption by allow investors in each group can be both contrarian and momentum.

$$\sigma_{P,t} = \beta_0 + \sum_{j=1}^{3} \beta_j \sigma_{P,t-j} + \beta_V V_{P,t} + \beta_{illiq} ILLIQ_{P,t-1y} + \beta_R R_{P,t-1} + (\beta_K^{NS} NS_{Kt} + \beta_K^{D*NS} D_t * NS_{Kt}) + (\beta_K^{NB} NB_{Kt} + \beta_K^{D*NB} D_t * NB_{Kt}) + \varepsilon_t. \quad (9)$$

Avramov, Chordia and Goyal (2006) explained that contrarian investors will buy when price goes down and sell it when price rises. In contrast, momentum investors will follow the market trend with expectation that market trend will continues so they will buy when price begin to rise and sell it when price begins to be downtrend. From this research Umutlu and Shackleton (2015) generated the way to classify each net sale and net buy activities as contrarian or momentum by using lagged return over the period from day t-5 to t-1 as a proxy. Thus, dummy variable (D_t) is defined to indicates the lagged return of portfolio P for the past five days. D_t is equal to 1 when lagged return is positive and equal to 0 when lagged return is negative.

$$\text{Contrarian} \begin{cases} \text{Buy after price decline (Lagged return :Negative)} \\ \text{Sell after price increase (Lagged return :Positive)} \end{cases}.$$

$$\text{Momentum} \begin{cases} \text{Buy after price increase (Lagged return :Positive)} \\ \text{Sell after price decline (Lagged return :Negative)} \end{cases}.$$

The classification can be defined by using dummy variable D_t:

$D_t = 0$ represent negative lagged return on that day

$D_t = 1$ represent positive lagged return on that day

Then, the effect of contrarian and momentum trading on volatility can be expressed as following:

When $D_t = 0$

$$\frac{\partial \sigma}{\partial NS} = \beta_K^{NS} \quad and \quad \frac{\partial \sigma}{\partial NB} = \beta_K^{NB} \quad (10)$$

When $D_t = 1$

$$\frac{\partial \sigma}{\partial NS} = \beta_K^{NS} + \beta_K^{D*NS} \quad and \quad \frac{\partial \sigma}{\partial NB} = \beta_K^{NB} + \beta_K^{D*NB} \quad (11)$$

When D = 0, Net Sale (NS_{Kt}) is defined as momentum sell (MS_K) and the impact of MS_K on volatility is equal to β_K^{NS} while Net Buy (NB_{Kt}) is defined as contrarian buy (CB_K) and the impact of CB_K on volatility is equal to β_K^{NB}.

In contrast, when D = 1, Net Sale (NS_{Kt}) is defined as contrarian sell (CS_K) and the impact of CS_K on volatility is equal to $\beta_K^{NS} + \beta_K^{D*NS}$while Net Buy ($NB_{Kt}$) is defined as momentum buy (MB_K) and the impact of MB_K on volatility is equal to $\beta_K^{NB} + \beta_K^{D*NB}$.

CHAPTER 6
EMPIRICAL RESULTS

The data is obtained from SET since 2009 – 2015 and separated into three portfolios: 1) Portfolio consisting all stocks, 2) Portfolio consisting large stocks (SET100), and 3) Portfolio consisting small stocks (All stocks in the market excluding stock in SET100). Conditional volatility of each portfolio is estimated with GARCH model by state two equations (5) and (6). For equation (5), the number of appropriated lag term of daily return must be evaluated. According to the model selection criteria, the appropriated number of lag return for all portfolios is lag 1 so equation (5) will become as follow:

$$R_t = \alpha + \hat{\beta}_j R_{t-1} + \hat{\varepsilon}_t. \qquad (12)$$

For variance equation (6), the appropriated lag number of variance and squared error term (p,q) can also be determined using model selection criteria. With AIC and BIC criteria, the appropriated GARCH model in estimating conditional volatility is GARCH(3,3) for all portfolios.

$$\sigma_t^2 = \gamma + \sum_{j=1}^{3} \delta_j \sigma_{t-j}^2 + \sum_{i=1}^{3} \alpha_i \varepsilon_{t-i}^2. \qquad (13)$$

Conditional volatility of each portfolio is estimated with equation (12) and (13) by using GARCH model. Volatility of each portfolio will be tested by regression method with equation (8) and (9). The results are shown in table below:

6.1 Result of stock-return volatility and trading volume by investor groups

Table 6.1 The regression model for determining relation between daily stock return volatility and net trading volume by investor groups.

$$\sigma_{P,t} = \beta_0 + \sum_{j=1}^{3} \beta_j \sigma_{P,t-j} + \beta_V V_{P,t} + \beta_R R_{P,t-1} + \beta_{illiq} ILLIQ_{P,t-1y} + \beta_K^{NS} NS_{Kt} + \beta_K^{NB} NB_{Kt} + \varepsilon_t.$$

Where $\sigma_{P,t}$ is the conditional volatility on day t from portfolio P and is estimated from GARCH model. P represents three portfolios which consisting of full sample of stocks

(All), large size stocks(Large) and small size stocks(Small). $\sigma_{P,t-j}$ is the lagged term of conditional volatility with number of lagged term j. $V_{P,t}$is the total trading volume(in billion shares) on day t and $R_{P,t-1}$ is the daily lagged stock return of each portfolios. $ILLIQ_{P,t-1y}$ is the liquidity factor of each portfolios. $NS_{Kt}(NB_{Kt})$ represents daily net sale volume(net purchase volume) in billion shares from investor group K(Institutional investor, Proprietary investor, Foreign investor, and Individual investor).

Panel A : Institutional investor						
Portfolio	β_0	β_V	β_R	β_{illiq}	β_{INST}^{NB}	β_{INST}^{NS}
All	0.00149*	-0.00001	-0.02713*	0.00779	-0.00007	**0.00204***
	(7.44)	(-1.33)	(-6.27)	(0.98)	(-0.11)	(2.70)
Large	0.00117*	0.00005	-0.01870*	0.00780	-0.00053	0.00143
	(5.88)	(1.32)	(-4.88)	(1.31)	(-0.81)	(1.92)
Small	0.00109*	3.21e-6	-0.07481*	0.00029	**0.00116***	0.00061
	(9.76)	(0.45)	(-15.68)	(0.36)	(2.44)	(1.11)

Panel B : Proprietary investor						
Portfolio	β_0	β_V	β_R	β_{illiq}	β_{PROP}^{NB}	β_{PROP}^{NS}
All	0.0016*	-0.00002*	-0.02694*	0.00794	0.00049	**0.00289***
	(8.07)	(-2.02)	(-6.20)	(1.00)	(0.44)	(2.97)
Large	0.00118*	0.00004	-0.01917*	0.00809	0.00039	0.00125
	(5.96)	(1.20)	(-4.98)	(1.35)	(0.36)	(1.36)
Small	0.00116*	4.20e-6	-0.07375*	0.00035	-0.00006	0.00116
	(10.58)	(0.58)	(-15.44)	(0.42)	(-0.07)	(1.62)

Panel C : Foreign investor						
Portfolio	β_0	β_V	β_R	β_{illiq}	β_F^{NB}	β_F^{NS}
All	0.00157*	-0.00001	-0.02849*	0.00660	0.00026	0.00014
	(7.87)	(-1.52)	(-6.59)	(0.83)	(0.64)	(0.75)
Large	0.00117*	0.00006	-0.01988*	0.00740	0.00029	0.00006
	(5.84)	(1.36)	(-5.20)	(1.25)	(0.74)	(0.33)
Small	0.00116*	8.64e-6	-0.07500*	0.00029	-0.00009	-0.00012
	(10.54)	(1.17)	(-15.84)	(0.36)	(-0.33)	(-0.93)

Panel D : Individual investor						
Portfolio	β_0	β_V	β_R	β_{illiq}	β_{INDV}^{NB}	β_{INDV}^{NS}
All	0.00158*	-0.00001	-0.02767*	0.00706	**0.00036***	0.00018
	(7.92)	(-1.85)	(-6.36)	(0.89)	(2.04)	(0.51)
Large	0.00116*	0.00004	-0.01933*	0.00796	0.00023	0.00019
	(5.84)	(1.17)	(-5.02)	(1.34)	(1.37)	(0.59)
Small	0.00115*	7.24e-6	-0.07525*	0.00029	-0.00007	0.00008
	(10.47)	(0.97)	(-15.80)	(0.36)	(-0.58)	(0.31)

Note : * Significant at 95% confidence, **Bold** letters indicate emphasized variables.

All results are shown in Table 6.1 which presents the results from regression model of equation (8). Panel A of Table 6.1 includes the net sales and net buys from institutional investors as independent variables. The results from Panel A show that there is no significant effect of NB_{INST} and NS_{INST} on volatility for the portfolio consisting large size stocks. On the other hand, the significant effect of NS_{INST} is found on the portfolio consisting all stocks in the market with estimated coefficient (β_{INST}^{NS}) equals to 0.00204 (with t-stat = 2.70) and the significant effect of $NB_{INST}$is found in portfolio consisting small stocks with estimated coefficient (β_{INST}^{NB}) equals to 0.00116 (with t-stat = 2.44).

Panel B also present the results of same model by changing NB and NS variables to be net buy and net sales of proprietary investors. The results suggest that only NS_{PROP} has a significant effect on volatility of portfolio consisting all stocks with estimated coefficient (β_{PROP}^{NB}) equals to 0.00289 (with t-stat = 2.97).

The results of net buys and net sales by foreign investors on market volatility are presented in Panel C. The results from Panel C suggest that there is no significant effect of NB_F and NS_F in any portfolios. For individual investors, the results in Panel D show the significant effect fromNB_{INDV} on portfolio consisting all stocks with (β_{INDV}^{NB}) equal to 0.00036 (with t-stat = 2.04).

From the result of Table 6.1, trading volume by proprietary investors has the most impact to the market daily volatility due to the highest estimated coefficient of NS_{PROP} in market portfolio. Institutional investors have a dominant impact on small

stocks portfolio while no one has an impact over large portfolio. The results also indicate that no matter the trading volume is net buys or net sales, the impact of net trading volume to market daily volatility always be positive regardless of whether a trade is from which groups of investor which means all net trading volume by investor groups will increase the market daily volatility for all portfolios.

6.2 Result of stock-return volatility and trading style of investor groups

Table 6.2 The regression model for determining relation between daily stock return volatility and trading strategies by investor groups.

$$\sigma_{Pt} = \beta_0 + \sum_{j=1}^{3} \beta_j \sigma_{P,t-j} + \beta_V V_{P,t} + \beta_R R_{P,t-1} + \beta_{illiq} ILLIQ_{P,t-1y} + \left(\beta_K^{NS} NS_{Kt} + \beta_K^{D_t \cdot NS} D_t \cdot NS_{Kt}\right) + \left(\beta_K^{NB} NB_{Kt} + \beta_K^{D_t \cdot NB} D_t \cdot NB_{Kt}\right) + \varepsilon_t.$$

Where $\sigma_{P,t}$ is the conditional volatility on day t from portfolio P and is estimated from GARCH model. P represents three portfolios which consisting of full sample of stocks(All), large size stocks(Large) and small size stocks(Small). $\sigma_{P,t-j}$ is the lagged term of conditional volatility with number of lagged term j. $V_{P,t}$is the total trading volume(in billion shares) on day t and $R_{P,t-1}$ is the daily lagged stock return of each portfolios. $ILLIQ_{P,t-1y}$is the liquidity factor of each portfolios. $NS_{Kt}(NB_{Kt})$ represent daily net sale volume (net purchase volume) in billion shares from investor group K(Institutional investor, Proprietary investor, Foreign investor, and Individual investor). $D_t$is dummy variable that value equals to one when portfolio return from day t-5 to day t-1 is positive and zero otherwise. $CB_K(CS_K)$ are contrarian buys and sales which defined from $NB_{Kt}(NS_{Kt})$ when D_t equals to 0 and 1. $MB_K(MS_K)$ are momentum buys and sales which defined from $NB_{Kt}(NS_{Kt})$ when D_t equals to 1 and 0.

Panel A : Institutional investor

					CB_{INST}	MB_{INST}	MS_{INST}	CS_{INST}
Portfolio	β_0	β_V	β_R	β_{illiq}	β_{INST}^{NB}	$\beta_{INST}^{NB} + \beta_{INST}^{D*NB}$	β_{INST}^{NS}	$\beta_{INST}^{NS} + \beta_{INST}^{D*NS}$
All	0.00155*	-0.00001	-0.02318*	0.00827	0.00196	**-0.00289***	**0.00375***	**-0.00005***
	(7.68)	(-1.37)	(-5.21)	(1.05)	(1.75)	(-2.35)	(4.00)	(2.90)
Large	0.00116*	0.00007	-0.01571*	0.00801	0.00124	**-0.00013***	**0.00286***	**-0.00038***
	(5.85)	(1.60)	(-4.00)	(1.35)	(1.14)	(-2.15)	(3.12)	(-2.57)
Small	0.00121*	1.49e-6	-0.06764*	0.00032	**0.00543***	**-0.00020***	**0.00176***	**-0.00043***
	(10.75)	(0.21)	(-13.74)	(0.39)	(6.23)	(-5.89)	(2.56)	(-2.29)

Panel B : Proprietary investor

					CB_{PROP}	MB_{PROP}	MS_{PROP}	CS_{PROP}
Portfolio	β_0	β_V	β_R	β_{illiq}	β_{PROP}^{NB}	$\beta_{PROP}^{NB} + \beta_{PROP}^{D*NB}$	β_{PROP}^{NS}	$\beta_{PROP}^{NS} + \beta_{PROP}^{D*NS}$
All	0.00162*	-0.00002	-0.02593*	0.00823	0.00006	0.00038	**0.00365***	0.00025
	(8.17)	(-2.02)	(-5.85)	(1.04)	(0.03)	(0.13)	(3.43)	(-1.78)
Large	0.00119*	0.00005	-0.01823*	0.00829	0.00089	0.00007	0.00193	-0.00012
	(5.97)	(1.31)	(-4.67)	(1.39)	(0.39)	(0.34)	(1.93)	(-1.68)
Small	0.00123*	2.74e-6	-0.06942*	0.00037	0.00239	-0.00094	**0.00259***	**-0.00014***
	(11.07)	(0.38)	(-14.11)	(0.44)	(1.50)	(-1.91)	(3.08)	(-3.03)

Panel C : Foreign investor

					CB_F	MB_F	MS_F	CS_F
Portfolio	β_0	β_V	β_R	β_{illiq}	β_F^{NB}	$\beta_F^{NB} + \beta_F^{D*NB}$	β_F^{NS}	$\beta_F^{NS} + \beta_F^{D*NS}$
All	0.00157*	-0.00001	-0.02760*	0.00684	-6.7e-6	0.00030	0.00043	-0.00013
	(7.90)	(-1.44)	(-6.32)	(0.86)	(-0.01)	(0.31)	(1.71)	(-1.73)
Large	0.00116*	0.00006	-0.01913*	0.00743	-0.00019	0.00039	0.00036	-0.00024
	(5.83)	(1.50)	(-4.96)	(1.25)	(-0.23)	(0.62)	(1.54)	(-1.91)
Small	0.00117*	9.12e-6	-0.07397*	0.00029	-0.00037	-0.00006	0.00005	-0.00035
	(10.61)	(1.23)	(-15.40)	(0.35)	(-0.56)	(-0.43)	(0.28)	(-1.65)

Panel D : Individual investor								
					CB_{INDV}	MB_{INDV}	MS_{INDV}	CS_{INDV}
Portfolio	β_0	β_V	β_R	β_{illiq}	β_{INDV}^{NB}	$\beta_{INDV}^{NB} + \beta_{INDV}^{D*NB}$	β_{INDV}^{NS}	$\beta_{INDV}^{NS} + \beta_{INDV}^{D*NS}$
All	0.00158*	-0.00002	-0.02623*	0.00764	**0.00069***	**-4.1e-6***	-0.00017	2.1e-4
	(7.94)	(-1.77)	(-5.96)	(0.96)	(2.98)	(-2.25)	(-0.20)	(0.43)
Large	0.00117*	0.00005	-0.01825*	0.00826	**0.00052***	**-0.00011***	-0.00031	0.00027
	(5.85)	(1.25)	(-4.69)	(1.39)	(2.38)	(-2.09)	(-0.38)	(0.68)
Small	0.00117	6.88e-6	-0.07354	0.00031	0.00009	-0.00030	0.00057	-0.00040
	(10.62)	(0.92)	(-15.18)	(0.37)	(0.56)	(-1.68)	(0.98)	(-0.99)

Note : * Significant at 95% confidence, **Bold** letters indicate emphasized variables.

The results from equation (9) are shown in Table 6.2. For Panel A which is the result of institutional investors, there exist the significant impact from all variables on portfolios consisting small stocks. When dummy variable equal to 0, net buys volume will be classified as contrarian buy (CB_{INST}). CB_{INST} has an estimated coefficient(β_{INST}^{NB}) equal to 0.00543 for portfolio of small stocks. In contrast, net buys volume will be classified as momentum buy (MB_{INST}) when dummy variable equal to 1 so MB_{INST} is measured by $\beta_{INST}^{NB} + \beta_{INST}^{D*NB}$ that equal to -0.00289 for portfolio of all stocks, 0.00013 for portfolio of large stocks, and 0.00020 for small stocks portfolio. For net sales volume, when dummy variable equal to 0 net sales volume will be classified as momentum sale (MS_{INST}) on the other hand, net sales volume will be classified as contrarian sale (CS_{INST}) when dummy variable equal to 1. Thus, β_{INST}^{NS}presents the estimated coefficient of MS_{INST} which equal to 0.00375 for portfolio consisting all stocks, 0.00286 for portfolio consisting large stocks, and 0.00176 for portfolio of small stocks. CS_{INST} is determined by $\beta_{INST}^{NS} + \beta_{INST}^{D*NS}$which equal to -0.00005 for portfolio consisting all stocks, -0.00038 for portfolio of large stocks, and -0.00043 for portfolio consisting small stocks.

For the result of proprietary investors which is shown in Panel B, the significant results are found in portfolio consisting all stocks and portfolio of small stocks only from net sales side MS_{PROP} and CS_{PROP} which can be measured by estimated coefficients (β_{PROP}^{NS} and $\beta_{PROP}^{NS} + \beta_{PROP}^{D*NS}$). MS_{PROP} is significant on both portfolios with

estimated coefficient β_{PROP}^{NS} equal to 0.00365 for market portfolio and 0.00259 for portfolio of small stocks while significant CS_{PROP} is found only on portfolio of small stocks.

Panel C presents the result of trading by foreign investors. As shown in this table there are no significant impact on market volatility by foreign trading volume.

In Panel D, the significant results are detected from variable CB_{INDV} and MB_{INDV} in market portfolio and portfolio of contained large stocks which can be measured by estimated coefficients (β_{INDV}^{NB} and $\beta_{INDV}^{NB} + \beta_{INDV}^{D*NB}$). The estimated coefficients of CB_{INDV} are equal to 0.000069 for portfolio consisting all stocks and 0.00052 for portfolio of large stocks while coefficients of MB_{INDV} are equal to -4.1e-6 for market portfolio and -0.00011 for large stocks portfolio.

According to the hypothesis on this study, trading strategies as contrarian and momentum can explain the positive or negative impact on market volatility. Contrarian trading should reduce market volatility while momentum trading should increases market volatility. However, the results from Table 6.2 suggest that when institutional investors and proprietary investors sell stocks as momentum investors, their selling activity will increase volatility for all portfolio which follow the concept of momentum behavior but their trading as momentum buy will reduce volatility due to negative coefficient which opposes the concept of momentum trading. While net sales volume as contrarian trading from institutional investors and proprietary investors support the evidence of contrarian behavior by reducing volatility but contrarian buys by institutional investors and individual investors increase volatility.

CHAPTER 7
CONCLUSION

This paper determines that trading volume by which investor groups has the most impact on daily stock return volatility of stock market in Thailand. This study observes the relation between trading volume by four investor groups and daily market volatility that is divided all stocks into three portfolios based on size. The results suggest that investor group who has a dominant impact on market volatility is proprietary investors. Although proprietary investors have a small portion on daily trading, their trading still have the most impact on market volatility. The reason why proprietary investors have larger impact than the other groups can be explained by behavior of proprietary investors (Phansatan et al. 2012). Their study explain that proprietary investors seek for short term investment so they will trade with higher frequency than the others and they require to trade on high liquidity stocks, in other word proprietary investors interest in trading on large sized stocks. Thus, their trading will have the most impact on short term market volatility because they trade with high frequency on large stocks. However, when testing model of relation of trading strategies and market volatility institutional investor is the one who has the most impact over market portfolio, large-sized portfolio and small-sized portfolio instead of proprietary investor. For conclusion, although it can't claim that between institutional investor and proprietary investor who has the most impact over market portfolio but institutional investor is the one who has most impact on both large-sized portfolio and small-sized portfolio. Therefore, institutional investor seem to be one who has the most impact on Thai market volatility.

Another objective of this study is to determine whether trading strategies as contrarian and momentum by investor groups can be used to explain the effect of trading volume on volatility. From previous study (Phansatan et al. 2012), they explain about the behavior of investor groups in Thailand and they found that foreign investors and proprietary investors tend to follow momentum strategy while institutional investors and individual investors seem to be contrarian. With this study, trading volume by foreign investors and proprietary investors should increase market volatility

because of momentum strategy meanwhile decreasing of market volatility should come from institutional investors and individual investors because they are contrarian. However, the results from studies show that all investor groups do not always follow only one strategy. Since trading as contrarian and momentum do not always reduce and increase market volatility as shown in results, contrarian buys increases volatility while contrarian sales reduce market volatility, this situation opposes the concept of contrarian trading which contrarian trading only reduces market volatility. Also from the result, momentum buys reduces market volatility while momentum sales increase market volatility, this also opposes the concept of momentum trading which momentum trading always increase market volatility. Therefore, it can be concluded that trading strategies as contrarian and momentum can't be used to explain the positive or negative impact of trading volume on market volatility which means the positive and negative effects of trading volume on market volatility aren't come from the trading strategies as contrarian and momentum.

REFERENCE

1. Amihud, Y. (2002). Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets*, 5, 31-56

2. Avramov, D., Chordia, T., Goyal, A., (2006). The impact of trades on daily volatility. *Review of Financial Studies,* 19, 1241-1277.

3. Bessembinder, H., Seguin, P.J., (1993). Price volatility, Trading Volume and Market depth: Evidence from future markets. *Journal of Financial and Quantitative Analysis*, 28, 21-39.

4. Bollerslev, T., (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics*, 31, 307-327.

5. Clark, P.K., (1973). A subordinated stochastic process model with finite variance for speculative prices. *Econometrica*, 41, 135-155.

6. Copeland, T.E., Friedman, D., (1987). The effect of sequential information arrival on asset prices: An experimental study. *Journal of Finance*, 42, 763-797.

7. Daigler, R.T., Wiley, M.K., (1999). The impact of trader type on the futures volatility-volume relation. *Journal of Finance,* 6, 2297-2316.

8. Jenning, R.H., Berry, C.B., (1983). Information dissemination and portfolio choice. *Journal of Finance and Quantitative Analysis*, 18, 1-19.

9. Jones, C.M., Kaul, G., Lipson, M.L., (1994). Transaction, Volume and Volatility. *The Review of Financial Studies Winter*, 7, 631-651.

10 Karpoff, J.M., (1986). A Theory of trading volume. *Journal of Finance*, 41, 1069-1087.

11. Li, W., Wang, S.S., (2010). Daily institutional trades and stock price volatility in a retail investor dominated emerging market. *Journal of Financial Markets*, 13, 448-474.

12. Ng, L., Wu, F., (2007). The trading behavior of institutions and individuals in Chinese equity markets. *Journal of Banking and Finance*, 31, 2695-2710.

13. Phansatan, S., Powell, J.G., Tanthanongsakkun, S., Treepongkaruna, S., (2012). Investor type trading behavior and trade performance: Evidence from the Thai stock market. *Pacific-Basin Finance Journal*, 20, 1-23.

14. Phrukpaisal, P., (2003). Return volatility-volume relationship in Thai market. *Master of Science Program in Finance*, Faculty of Commerce and Accountancy, Thammasat University, Bangkok, Thailand.

15. Schwert, G.W., (1990). Stock volatility and the crash of ’87. *The Review of Financial Studies*, 3, 77-102.

16. Umutlu, M., Shackleton, M.B., (2015). Stock-return volatility and daily equity trading by investor groups in Korea. *Pacific-Basin Finance Journal*, 34, 43-70.

17. Vo, X.V., (2015). Foreign ownership and stock return volatility: Evidence from Vietnam. *Journal of Multinational Financial Management*, 30, 101-109.

18. Wang, J., (2007). Foreign equity trading and emerging market volatility: Evidence from Indonesia and Thailand. *Journal of Development Economics*, 84, 798-811.

BIOGRAPHY

Name	Mr. Kasidit Praneechit
Date of Birth	December 14, 1989
Educational Attainment	2011 : Bachelor Degree of Mechanical Engineer, Second Class Honours, Prince of Songkhla University
Work Position	General Manager and Engineer
Work Experiences	2011-present: General Manager and Engineer, Tropical Land Development.Co.,Ltd Hatyai Songkhla Thailand