DETERMINANTS OF MARKET LIQUIDITY AND TRADING ACTIVITY: EMPIRICAL EVIDENCE FROM THE STOCK EXCHANGE OF THAILAND

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ปัจจัยที่มีผลกระทบต่อสภาพคล่องและกิจกรรมการซื้อขายของตลาด : หลักฐานเชิงประจักษ์จากตลาดหลักทรัพย์แห่งประเทศไทย

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ฐานุพงศ์ เดชสุธรรม : ปัจจัยที่มีผลกระทบต่อสภาพคล่องและกิจกรรมการซื้อขายของตลาด : หลักฐานเชิงประจักษ์จากตลาดหลักทรัพย์แห่งประเทศไทย (DETERMINANTS OF MARKET LIQUIDITY AND TRADING ACTIVITY: EMPIRICAL EVIDENCE FROM THE STOCK EXCHANGE OF THAILAND) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ธนากร ลิขิตาภิวัฒน์, 4 หน้า.

งานวิจัยฉบับนี้ศึกษาปัจจัยที่มีผลกระทบต่อสภาพคล่องและกิจกรรมการซื้อขายของตลาดหลัก ทรัพย์แห่งประเทศไทยในช่วงปี 2544-2552 พบว่าอัตราดอกเบี้ยระยะสั้นและระยะยาวมีความสัมพันธ์ในทางบวกกับบางตัวแปรของสภาพคล่องและกิจกรรมการซื้อขายของตลาด ผลตอบแทนในตลาดระยะยาวมีผลกระทบในเชิงลบกับสภาพคล่องตลาด (Depth) ในขณะที่ความแปรปรวนของตลาด (Lag volatility) มีความสัมพันธ์ในเชิงลบกับกิจกรรมการซื้อขายของตลาด นอกจากนี้ยังพบว่าสภาพคล่องและกิจกรรมการซื้อขายของตลาดยกเว้น Spread ลดลงในวันศุกร์ แต่ไม่พบวันที่ชัดเจนสำหรับเพิ่มขึ้นของสภาพคล่องและกิจกรรมการซื้อ วันที่ประกาศดัชนีราคาผู้บริโภคยังทำให้บางตัวแปรของสภาพคล่องและกิจกรรมการซื้อขายของตลาดเพิ่มขึ้น งานวิจัยฉบับนี้ยังศึกษาถึงความแตกของของประเภทผู้ลงทุนในปัจจัยที่มีผลต่อสภาพคล่องและกิจกรรมการซื้อขายของตลาด แต่ไม่พบความแตกต่างระหว่างประเภทของผู้ลงทุน

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This research explores the determinants of market liquidity and trading activity in the Stock Exchange of Thailand during the period of 2001 to 2009. Only some weak evidence is found. Short-term and long- term interest rates have a positive effect on some of market liquidity and trading activity's variables. Long-term market performance is found to be a negative predictor variable of depth, while lagged volatility has a negative relation with market trading activity's variable. This research also finds that market liquidity and trading activity fall on Friday (except spread), but there is no specific day for the opposite pattern. Depth and baht volume increase when there is a consumer price index announcement. Type of investor is studied, but no significant difference in predictor variables between retail and non-retail liquidity and trading activity's providers is found.

Department: Banking and Finance Student's Signature .....

Field of Study: Finance Advisor's Signature .....

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CHAPTER I INTRODUCTION

1.1 Background and Problem Review

Liquidity is an important factor in asset pricing. As, Amihud and Mendelson (1986) investigate returns on the New York Stock Exchange and find that spread has a significant positive effect on stock return. The return from less liquid stock is also higher than from those with more liquidity. Stocks' excess returns partly compensate for the liquidity premium, and it is not constant over time but rather varies as a function of changes in market illiquidity (Amihud 2002).

Liquidity is not only a concern for investors but is also connected to the firms' cost of capital. Jacoby et al. (2000) use a CAPM-based model to examine the relation between an investor's expected return and the level of relative spread. They find that as an expected future spread increases, investors demand compensation in the form of expected returns. So the stock price is lower. When stocks can be sold at a lower price, the cost of capital for firms is higher due to the liquidity expectation. This argument implies a direct link between liquidity and corporate cost of capital. Butler et al. (2005) also find that bank fees as a cost of raising external capital are lower for firms with more liquid stock.

Furthermore, liquidity can give a prediction of the real economy. Levine and Zervos (1998) find a significant positive correlation between stock market liquidity and both current and future rates of economic growth, even after considering economic

and political factors. Neas et al. (2011) also find that changes in liquidity in the US stock market coincide with the real economy since the Second World War.

As more implications of market liquidity are introduced, more literature explores its determinants and characteristics over time. First, Benston (1974) studies determinants of the bid-ask spread in the over-the-counter market of the New York Stock Exchange. He finds a significant relation among spread and price, volume, and unsystematic risk (volatility). Bid-ask spread is part of the stock price, and a positive relation between price and bid-ask spread exists. Volume should reduce spread (more liquidity) because as volume increases, limit orders also increase, and they provide immediacy to the exchange, so the cost of buying and selling is reduced through the bid-ask spread. Volatility, proxy for unsystematic risk, has a positive relation since unsystematic risk can be diminished by portfolio diversification.[1]

Draper and Paudyal (1997) observe seasonality in monthly returns, trading volume, number of trades, average size of order flow, and month-end spread on the London Stock Exchange. They find that there is seasonality in stock return and trading activity in January and April but not on the spread. Foster and Viswanathan (1993) examine the stock market, trading volume, and return volatility and find that, for actively traded firms, volume is low and adverse selection cost is high on Mondays.

[1]See Markowitz, H. (1952), PORTFOLIO SELECTION. The Journal of Finance, 7: 77–91.

Lakonishok and Maberly (1990) also find an increase in the number of sell transactions relative to buy transactions on Mondays.

Previous studies are mostly conducted in developed markets, especially in the United States, which may be one of the most liquid markets in the world. A survey by Chuhan (1994) shows that inadequate liquidity is a main reason institution investors keep away from the emerging market. So, liquidity is an important issue for emerging markets like Thailand.

Market conditions in the Stock Exchange of Thailand are also different from what is seen in the previous research. For most studies, the market makers are involved in the exchange providing liquidity to the market. The Stock Exchange of Thailand, however, is designed to be a pure order-driven market in which trading is mainly based on an automated order matching (AOM) system. The system automatically matches the priority buy and sell orders and confirms transactions to brokers' terminals. No market maker or dealer provides liquidity to the market. Liquidity providers are the investors participating in the market. The research should yield a particular result for Thailand.

Thailand is dominated by retail investors who share 70% of the total trade, and small retail accounts are 80% of the total accounts. Traders are classified into four groups: institutions, proprietary traders, foreign investors, and individuals. This allows for a new body of research exploring different liquidity and trading activity providers

or investor types. Each type of investor possesses different characteristics and constraints. It may also possess different characteristics of liquidity determinants.

1.2 Research Questions

1. What are the determinants of liquidity and trading activity in the Stock Exchange of Thailand?

2. Is there a difference in predicted variables between liquidity provided by retail investors and that provided by non-retail investors?

1.3 Objectives

There are two primary objectives of this study. The first objective is to find the determinants of market liquidity in the Stock Exchange of Thailand. The second objective is to test whether the different types of investors have different equations of liquidity determinants.

1.4 Research Hypothesis

In order to choose explanatory variables for market liquidity and trading activity, this study is guided by prior literatures.

First, interest rate is both a cost and a return reference to all investors. For example, margin trading, which charges investors to pay an interest, is a cost for them. A decrease in short-term interest rates should stimulate trading activity and increase

market liquidity. Chordia et al. (2001) also find that a change in the short-term rate has a negative relation with trading activity and depth but a positive relation with quoted spread.

On the other hand, an increase in long-term interest rates should cause investors to reallocate their wealth between equity and debt instruments because risk-free asset is now providing a better return. Investors should move their investment from the stock to the bond market resulting in increased trading activity and affecting the liquidity in the stock exchange.

Therefore, I hypothesize that short-term interest rate changes will be negatively related to market liquidity and trading activity while long-term interest rate changes will be positively related to market liquidity and trading activity. The first set of candidate factors consists of short-term and long-term interest rates. The short-term interest rate is a proxy by the Bank of Thailand's Treasury bill yield and long-term interest rate is proxy by ten-year government bond yields.

Second, market performance could have an effect on market liquidity and trading activity. Recent market performance could trigger a change in investor expectation along with a change in portfolio composition. According to Jegadeesh and Titman (1993), past intermediate returns continue to perform in the same direction. As a result, the investor would expect a good market to be followed by a good market and a bad market to be followed by a bad market. In a good market, trading activity

should increase and affect market liquidity. Concurrent market return is a proxy for recent market performance.

In addition, technical analysis involves a past return movement, creating a link between trading activity and market performance. Five-day average market index return is then used a proxy for past market performance.

Volatility in the market return could also affect liquidity and trading activity. Higher volatility (systematic risk) in the market should reduce trading activity as investors avoid the market. Market index absolute return is a proxy for market return volatility. Thus, I hypothesize that in an upmarket, liquidity and trading activity increase, while in a down market, liquidity and trading activity decrease. A volatile market has a negative effect on liquidity and trading activity.

Third, behavioral investment suggests that investor mood and market sentiment exist in the market. The argument also implies that trading activity could show a seasonal pattern. This issue could arise from asymmetric information problems. Stock exchanges stop their activity on weekends and holidays. During that time, anything can happen, and there is a tendency for traders to increase their trading activity on the days in which they have more or less information. Osborne (1962) predicts that individual investors have more time to digest information from the market over the weekend, so trading activity tends to occur on Mondays. I, therefore, use the

day in a week variables as indicators and hypothesize that there is seasonality in market liquidity and trading activity in the Stock Exchange of Thailand.

Fourth, a macroeconomic announcement should provide more information to the market and correct investor expectations, thereby inducing more liquidity and trading activity. Berry and Howe (1994) suggest a positive relation between public information and the trading volume. Chordia et al. (2001) find that trading activity and depth increase before the GDP and unemployment announcements. So I hypothesize that market liquidity and trading activity increase on the day of the macroeconomic announcement.

The final hypothesis addresses the second objective: whether the type of investor has an effect on liquidity and trading activity determinants. As there are different types of investors in the market, Shleifer and Summers (1990) suggest that the behavior of investors may differ depending on investor type. De Long et al. (1990) also confirm that there are noise traders or uninformed traders in the market. Thus, difference characteristics of investor may apply when they are providing liquidity and trading activity in the stock market.

Therefore, I hypothesize that investors will react differently to the determinants of market liquidity and trading activity with non-retail investors, who are more sensitive to the determinants of market liquidity and trading activity.

CHAPTER II LITERATURE REVIEW

There are many researchers studying the factors determining liquidity and trading activity in the stock market. Benston and Hagerman (1974) study determinants of the bid-ask spread in the over-the-counter market of the NYSE. They find a significant relation among spread and price, volume, and unsystematic risk (volatility).

Dealer service is also a possible determinant of liquidity in the stock market. Stoll (1978) shows that the cost of trading in the market depends on the holding cost, order cost, and information cost imposed on market dealers. Grossman (1988) adds that market liquidity is determined by the immediacy of demand, and supply and market makers adjust their positions based on their willingness to bear risk.

Chordia et al. (2001) examine the determinants of market liquidity, as well as trading activity. They conduct a study on determinants of day-to-day change in market liquidity and trading activity in the NYSE.

There are four other areas of research that relate independent variables for this study. First, Fleming and Remolona (1998) find that investors consider the correlation of return of these markets before making their speculative investment, implying that interest rate is of concern to investors when trading. This relation is confirmed by Fair (2002) who finds that a one- to five-minute change of price from large stock is associated with monetary policy. Goyenko and Ukhov (2009) also find that the Treasury bond market is a channel for monetary policy shock, which transfers to the stock

exchange. Even during a crisis, Chordia et al. (2005) still find increased liquidity when there is a monetary expansion policy.

Second, stock market performance can affect investor expectations, thus influencing asset allocation, and cause investors to change their portfolio composition. As a result, this affects market liquidity and trading activity as a whole. Jegadeesh and Titman (1993) show that past intermediate returns continue to perform in the same direction, with better-performing stocks continuing to outperform poorly performing stocks. If past market returns are on the positive side, there is more chance that a positive return will induce trading activity and market liquidity going forward.

Third, in a study of seasonality in the stock exchange, Draper and Paudyal (1997) investigate seasonality in liquidity on the London Stock Exchange with monthly data. They find a seasonal pattern in stock returns and trading activity, but not on bid-ask spread. Lakonishok and Smidt (1984) also confirm the seasonality of returns, even in small firms that do not have any action on 25% of trading days. Foster and Viswanathan (1993) examine stock markets, trading volume and return volatility. They find that, for actively traded firms, volume is low and adverse selection cost is high on Mondays.

As Osborne (1962) predicts, individual investors have more time to digest information from the market over the weekend, so trading activity tends to occur on Mondays. Harris (1986) also finds weekly and intraday patterns in common stock prices and returns. Prices and returns decrease on Mondays while increasing on other

weekdays. This issue could arise from asymmetric information problems. As noted previously, stock exchanges stop activity on weekends and holidays. During that time, anything can happen, and there is a tendency for traders to increase their trading activity on days in which they have more or less information.

Foster and Viswanathan (1990) study the implication of adverse selection with one informed trader and several liquidity traders with the assumption that informed traders have more information on Mondays. The assumption is consistent with Lakonishok and Maberly (1990) who find an increase in trading activity on Mondays, especially selling.

Fourth, in the study of investors' response to macroeconomic announcements, the arrival of public information suggests a positive relation between public information and trading volume (Berry and Howe, 1994). The information coming to the market affects investors' expectations of risk and return so price and trading behavior change. The effect of public and private information in a study by French and Roll (1986) shows that public information is more likely to occur during normal business hours. The effect of private information occurs when the informed trader trades.

The last area of literature focuses on investor behavior. Shleifer and Summers (1990) suggest that the behavior of investors may differ across investor type. De Long et al. (1990) also confirm that there are uninformed traders in the market. In the mutual fund market, James and Karceski (2006) find that the determinants of capital flow from retail and institutional investors are different between the two groups.

CHAPTER III DATA AND METHODOLOGY

3.1. Data

The previous chapter presents the importance of market liquidity and trading activity determinants along with the questions raised by this research. Now I will clarify the variables.

There are many variables used to measure market liquidity and trading activity. The Stock Exchange of Thailand provides intraday data for academic purposes and is used for this research. The data contains transaction information such as order time, order type, order volume, and price.

The data contains information from transactions made through an automatic order matching system (AOM); I am only concerned with market liquidity and trading activity in common stocks during continuous trading periods. Due to their different characteristics, I exclude the following assets from the sample: preferred shares, warrants, and unit trust.

Then, liquidity measurements are performed on a daily basis as follows:

Effective spread: the difference between the execution price and the mid-point of the prevailing bid-ask quote. This measure shows the tightness dimension of liquidity or the ability to buy and sell an asset at about the same price at the same time.

Relative spread: the effective spread divided by the midpoint of the prevailing bid-ask quote. This measure can reduce the tick size effect because it computes the spread as a percentage of the bid-ask quote.

Depth: the average volume of the best bid and ask prices. This measure displays the ability to buy or sell at a specified amount without influence on price.

Baht depth: the average of the ask depth times ask price plus bid depth times the bid price. This measure represents the depth in baht units.

The following measures represent trading activity on a daily basis:

- **Volume:** total number of shares traded per day.
- **Baht volume:** number of shares multiplied by the transaction price.
- **Number of trade:** total number of transactions in the day.

Representative variables used to test the hypotheses need to be clarified. For first hypothesis, interest rate is expected to have an influence on market liquidity and trading activity. So, daily first difference Bank of Thailand's Treasury bill yield represent short-term rate (ShortRate) and daily first difference ten-year government bond yields represent long-term rate (LongRate). Data for both variables are collected from Data Stream.

For the second hypothesis, market performance is expected to have an effect on market liquidity and trading activity. Representing market performance in regression, dummy variables of market returns capturing daily market performance are as follows. For short-term market performance, if a concurrent Stock Exchange of Thailand daily index return is positive, the value on the positive market return variables (MKT+) will be equal to 1 and 0 if otherwise. On the other hand, if a concurrent Stock Exchange of Thailand daily index return is negative, the value of the negative market performance variables (MKT-) will be equal to 1 and 0 if otherwise.

For long-term market performance, the past five trading days of the Stock Exchange of Thailand's daily index return are used. If the index return for the past five trading days is positive, the value of the positive market performance variable (MA5MKT+) will be equal to 1 and 0 if otherwise. On the other hand, if the index return for the past five trading days is negative, the value of the negative market performance variable (MA5MKT-) will be equal to 1 and 0 if otherwise.

It is not only whether market return is positive or negative that is of concern, but volatility of the return is also important as a factor related to market performance. It possibly affects market liquidity and trading activity. So, to represent market volatility (VOLAT), the average absolute return of the Stock Exchange of Thailand is used.

For the third hypothesis, I predict that market liquidity and trading activity are subject to a seasonal pattern. To test this question, I use dummy variables on the day

of the week. For a day of the week effect, the value of the day variable will be equal to 1 if that trading day is Tuesday to Friday and 0 if otherwise.

For the fourth hypothesis, I believe that macroeconomic announcements increase liquidity and market activity. Gross domestic product (GDP) and consumer price index (CPI) announcement dates represent the macroeconomic announcement effect in the regression. If the trading day is the day of a macroeconomic announcement, the value of the gross domestic product variable (GDP) or consumer price index (CPI) will be equal to 1 and 0 if otherwise. If the trading day is one or two days before a macroeconomic announcement, the value of the gross domestic product variable (GDP1-2) or consumer price index (CPI1-2) will be equal to 1 and 0 if otherwise.

For gross domestic product (GDP) announcements, data is collected from the Office of National Economics and Social Development Board website. Consumer price index (CPI) announcements are obtained from the National Statistic Office of Thailand.

3.2 Descriptive statistic

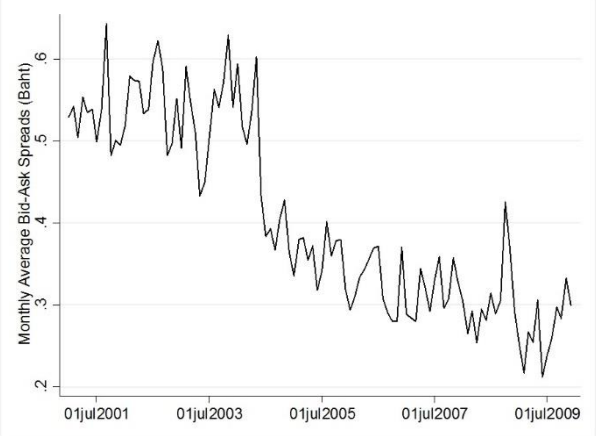
Before methodology and further analysis, I will present descriptive statistics of the data used in this research. The data ranges from 2001 to 2009. Only common stocks are included in the data.

The first market data to observe is a spread. Spread is the difference between the bid price and offer price. Lower spread means a lower cost to trade and more

liquidity. So, market spread reflects the overall market liquidity in terms of cost to participate in the market. Market spread is expected to reduce over time, as the market should be more efficient. Figure 1 shows the daily market effective spread of the Stock Exchange of Thailand and presents a declining trend.

There are two possible reasons for this result. First, there is a reduction in the tick size rule near the end of 2001. However, if that is the reason, we should find a significant drop at the exact time of the tick size change. The second possibility is that the stock's price is split to acquire more liquidity and induce a lower effective bid-ask spread in the exchange.

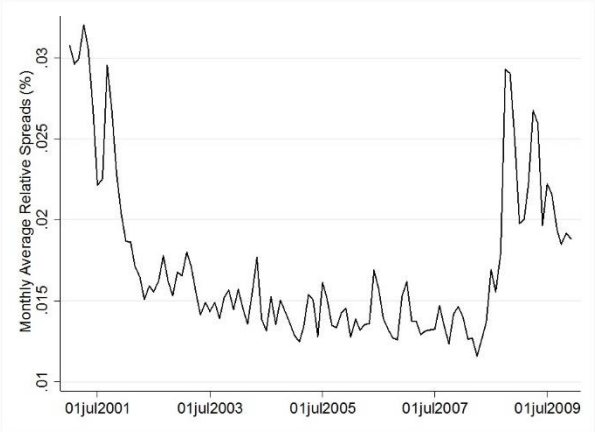
Figure 1: Average Effective Bid-Ask Spreads



There are problems using effective spread to represent market spread in Thailand. Stocks with a higher price range have a higher tick size due to their tick size rules. The higher the price of the stock, the higher the tick size assigned to the stock price. Difference in tick size for each stock causes the price to impact the effective spread measure.

As a result, another liquidity measure is included in this research. Relative spread provides a better representation of market spread. Relative spread measure is a division of the effective spread by mid-point price. The outcome is a percentage of the spread for each stock. As a result, relative spread can be compared to each stock and is a better representation of the average market spread. Figure 2 shows the monthly average relative spread of the market and also displays change over time.

Figure 2: Relative Bid-Ask Market Spread

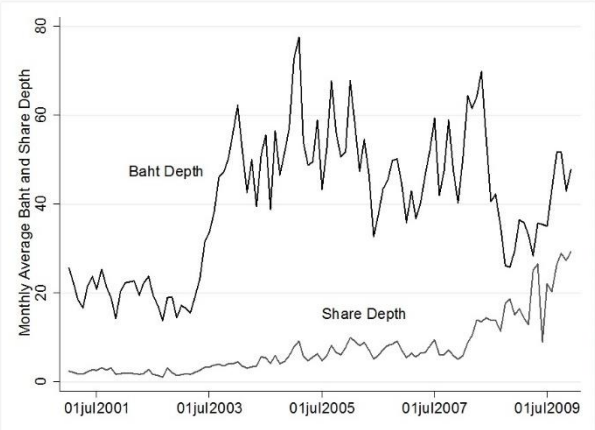


The tick size reduction in 2001 is a possible cause of the drop in the relative spread. At that time, the Stock Exchange of Thailand reduces the tick size in each stock price range, and this reduces the overall market spread. There is also a significant increase in market relative spread around 2008. The US financial crisis also began in 2008. Consistent with Yeyati et al. (2008) who find that during crisis time in an emerging market, trading activity and trading cost (spread) increase.

The second market data to observe is depth. Depth represents liquidity in terms of share and baht depth of the market. When traders provide a limit order to the market, this is considered to be depth. So, share depth and baht depth can represent how deep an investor will go in terms of share and value.

Figure 3 represents the monthly average baht and share depth. We see that the market depth increases over time, with the exception that baht depth decreases around 2008. This significant drop is consistent with the financial crisis in the United States. This event reduces baht depth overall but does not affect depth in terms of share.

Figure 3: Monthly Average Baht and Share Depth



The average share depth also increases over time. The liquidity in terms of shares in the market is roughly the same as before the crisis but reduced in terms of value.

The final set of market data is market trading activity. Figure 4 shows average trading activity, which is trading volume and baht volume. The figure shows that both share volume and baht volume are quite volatile, and both have a significant increase in 2003 and continue to be volatile over time.

Figure 4: Monthly Average Trading and Baht Volume

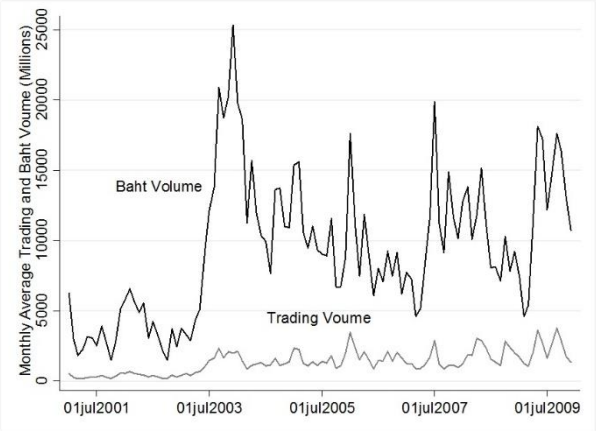
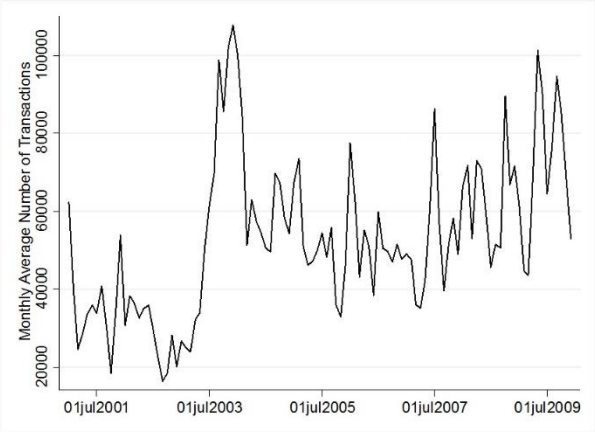


Figure 5 shows the daily number of trades or number of transactions. The number of transactions increases over time. There was a significant increase in 2003, remaining at this higher level of trading over time. It shows an improvement in the number of trades in the Stock Exchange of Thailand.

Figure 5: Average Number of Transactions



Next, I present descriptive statistics. Table 1 shows descriptive statistics of market liquidity and trading activity, including the mean, standard deviation, median, maximum, and minimum of each dependent variable.

Table 1: Descriptive Statistic for Market Liquidity and Trading Activity

These are descriptive statistics for time series market-wide liquidity and trading activity from 2001 to 2009 in the Stock Exchange of Thailand. Effective spread is different between the execution price and the mid-point. Relative spread is an effective spread divided by the mid-point. Depth is volume of best bid and best ask. Baht depth is ask depth times ask price plus bid depth times bid price. Volume is number of shares traded per day. Baht volume is the volume multiplied by the transaction price. Number of trade is a total transaction per day. The data is calculated by first averaging all transaction for each stock on a given day and then averaging all individual stock on a daily basis.

	Effective Spread (Baht)	Relative Spread (Baht)	Depth (Millions Share)	Baht depth (Millions Baht)	Volume (Millions Share)	Baht volume (Millions Baht)	Number of trade per day	Number of Stock per day
Mean	0.4061	0.0171	7.4179	40.100	1,320	9,230	53,064	336
Std. [a]	0.1482	0.0053	6.5620	16.500	973	5,740	24,450	51
Median	0.3837	0.0154	5.6272	41.100	1,130	8,240	49,218	348
Minimum	0.1137	0.0058	0.4954	8.6898	43.5	414	7,372	198
Maximum	0.9747	0.0390	33.900	91.300	5,910	29,800	145,941	427

[a] **Standard deviation**

Table 2 provides a pair-wise correlation of market liquidity and trading activity. Trading activity and depth are positively correlated with each other but negatively correlated with the spread. As expected, when trading activity and depth increase, the spread that represents trading cost should be low. On the other hand, when market activity is low, the cost of trading should be high.

Table 2: Correlations of Market Liquidity and Trading Activity

These are pair-wise correlations among the daily variables described in Table 1 and include effective spread, relative spread, depth, baht depth, volume, baht volume and number of trades per day. Effective spread is different between the execution price and the mid-point. Relative spread is an effective spread divided by the mid-point. Depth is the volume of best bid and best ask. Baht depth is ask depth times ask price plus bid depth times bid price. Volume is number of shares traded per day. Baht volume is the volume multiplied by the transaction price. Number of trades is total transactions per day. The result suggested that trading activity and depth are positively correlated with each other but negatively correlated with the spread.

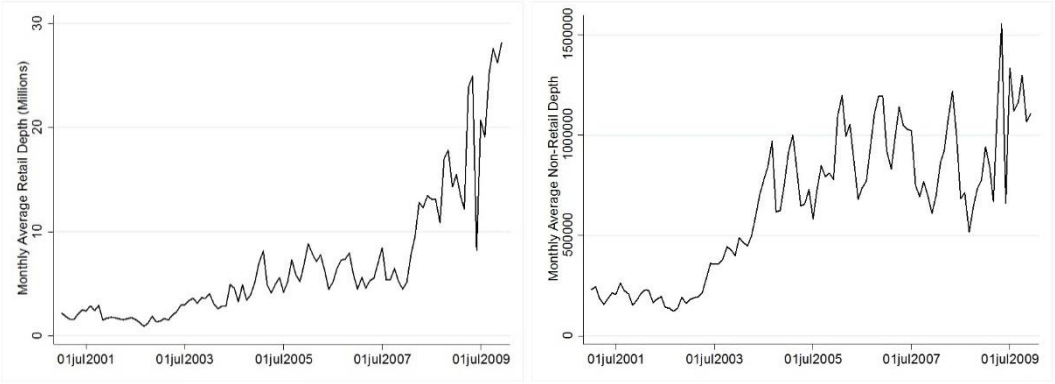
	Effective Spread	Relative Spread	Depth	Baht depth	Volume	Baht volume	Number of trade per day
Effective Spread	1.0000						
Relative Spread	0.3059	1.0000					
Depth	-0.5178	0.1034	1.0000				
Baht depth	-0.4451	-0.5616	0.3402	1.0000			
Volume	-0.3761	-0.1595	0.6153	0.5966	1.0000		
Baht volume	-0.1672	-0.2675	0.3488	0.6560	0.7389	1.0000	
Number of Trade	-0.1960	-0.0647	0.4583	0.5313	0.8101	0.9008	1.0000

Investor type embedded in the transactional data of every order sent to the Stock Exchange of Thailand is used further to explore the type of liquidity and trading activity provider in the market.

Thailand is dominated by retail investors who share 70% of the total trade, 80% of which are small retail accounts (less than 1 million baht).[2] As, Shleifer and Summers (1990) suggest, behavior of investors may differ depending on investor type. Institution investor may be more sophisticated in decision-making. Investors are then divided into two groups: retail investors and non-retail investors.

Retail and non-retail investors increasingly provide share depth to the market, but non-retail investors provide more consistent depth to the market. This may imply a difference in either trading behavior or strategy. Non-retail investors also provide a more consistent baht depth to the market than retail investors who provide a more volatile depth. In Figure 6, the non-retail investor graph shows a strong trend while it is hard to see any trend in the baht depth of retail investors (Figure 7).

Figure 6: Retail and Non-retail Share Depth

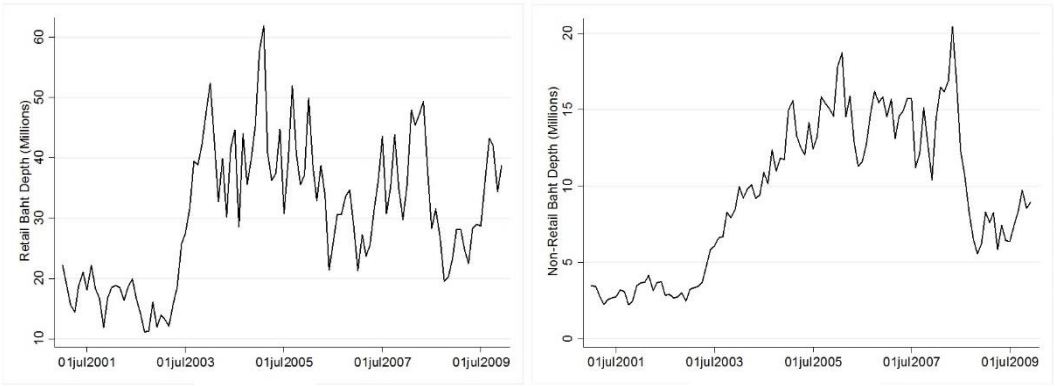


Retail

Non – retail

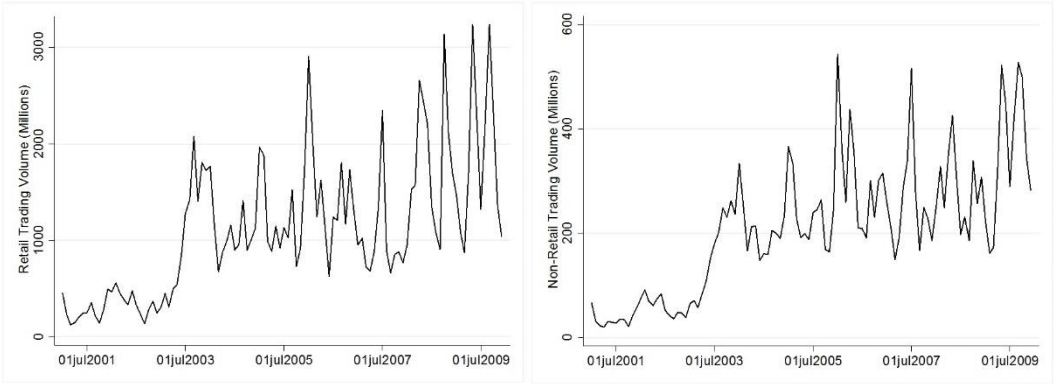
[2]Pavabutr, P. and S. Prangwattananon (2009). "Tick size change on the Stock Exchange of Thailand." Review of Quantitative Finance and Accounting 32(4): 351-71.

Figure 7: Retail and Non-retail Baht Depth



Retail Non – retail

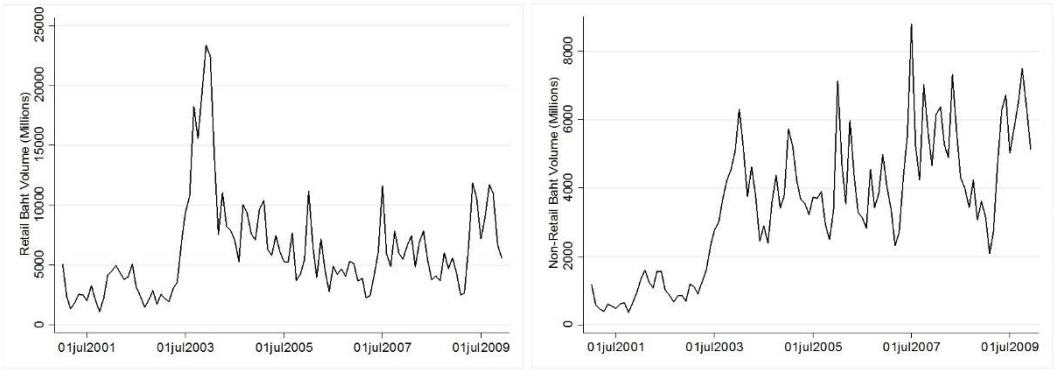
Figure 8: Retail and Non-retail Trading Volume



Retail Non – retail

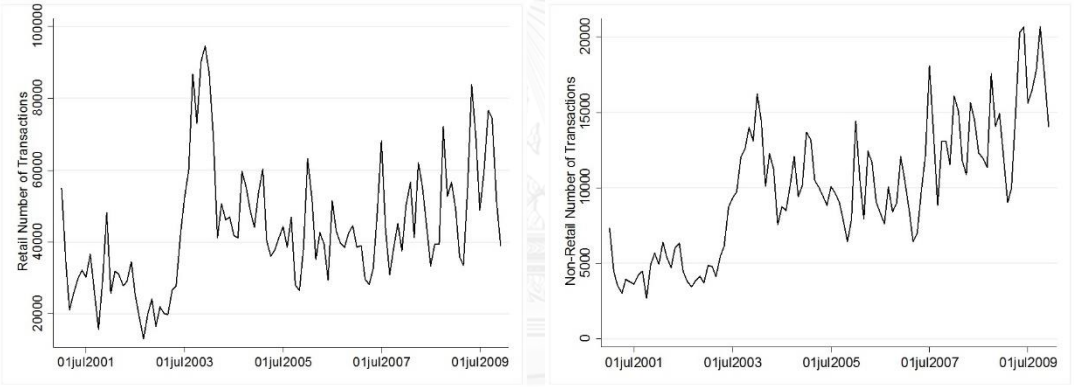
Figures 8 and 9 show that for retail and non-retail investors, both share and baht volume increase, but retail investors experience less volatility than non-retail investors. However, both retail and non-retail liquidity and trading activity are positively correlated, as shown in Table 4.

Figure 9: Retail and Non-retail Baht Volume



Retail Non – retail

Figure 10: Retail and Non-retail Number of Transaction



Retail Non – retail

In summary, non-retail investors seem to be more consistent in providing liquidity and trading activity while retail investors are more unpredictable in their behavior. However, the correlations between all liquidity and trading activities are positively correlated for both retail and non-retail investors.

Table 3: Descriptive Statistics for each investor type

These are descriptive statistics for time series market-wide liquidity and trading activity from 2001 to 2009 of Stock Exchange of Thailand. Depth is volume of best bid and best ask. Baht depth is ask depth time ask price plus bid depth time bid price. Volume is number of shares traded per day. Baht volume is volume multiplied by transaction price. Number of trades is total transactions per day. The data is calculated by first averaging all transaction for each stock on a given day and then averaging all individual stocks on daily basis for each type of investor participated in the market including retail investors and non-retail investors for each variables.

	Retail Depth (Millions Share)	Non-retail Depth (Share)	Retail Baht Depth (Millions Baht)	Non-retail Baht depth (Millions Baht)	Retail Volume (Millions Share)	Non-Retail Volume (Millions Share)	Retail Baht Volume (Millions Baht)	Non-retail Baht volume (Millions Baht)	Retail Number of Trade	Non-retail Number of Trade
Mean	6.7664	649,761	30.6	9.4676	1,120	204	6,170	3,400	43,392	9,859
Std.[a]	6.3063	365,437	12.3	5.1100	858	140	4,810	2,280	20,679	5,265
Median	4.8483	673,291	30.0	9.4251	925	190	4,890	3,110	39,543	9,016
Maximum	32.600	1,957,057	70.6	28.00	5,910	789	40,600	13,000	138,886	33,839
Minimum	0.3884	85,357	7.0941	1.4973	34.9	7.0543	245	148	5,991	1,172

[a] **Standard deviation**

Table 4: Correlations of Market Liquidity and Trading Activity

These are pair-wise correlation among daily variables described in Table 3 including retail depth, non-retail depth, retail baht depth, non-retail baht depth, retail volume, non-retail volume, retail baht volume, non-retail baht volume, retail number of trade and non-retail number of trade from period of 2001 to 2009. Depth is volume of best bid and best ask. Baht depth is ask depth time ask price plus bid depth time bid price. Volume is number of share traded per day. Baht volume is volume multiplied by transaction price. Number of trade is total transaction per day. The result suggested that retail and non-retail variable are positively correlated.

	Retail Depth	Non-retail Depth	Retail Baht Depth	Non-retail Baht Depth	Retail Volume	Non-Retail Volume	Retail Baht Volume	Non-retail Baht Volume	Retail Number of Trade	Non-retail Number of Trade
Retail Depth	1.0000									
Non-retail Depth	0.6878	1.0000								
Retail ฿Depth	0.2990	0.5979	1.0000							
Non-retail ฿Depth	0.2260	0.7519	0.7299	1.0000						
Retail Volume	0.5807	0.6181	0.5615	0.4539	1.0000					
Non-Retail Volume	0.5817	0.7383	0.5986	0.5912	0.8197	1.0000				
Retail ฿Volume	0.1485	0.2143	0.6199	0.2285	0.6058	0.5634	1.0000			
Non-retail ฿Volume	0.4798	0.6506	0.6471	0.6342	0.6592	0.8789	0.6104	1.0000		
Retail Transaction	0.3505	0.3664	0.5669	0.2625	0.7724	0.6803	0.8824	0.6459	1.0000	
Non-retail transaction	0.5755	0.5784	0.5076	0.4203	0.6863	0.8578	0.6173	0.9111	0.7298	1.0000

Descriptive statistics for the explanatory variables are displayed below. They contain the market absolute return and interest rate from Table 5. The market absolute return is computed as VOLAT, as described in an earlier section.

Table 5: Descriptive statistics for Interest Rate and Market Return

These are descriptive statistics for time series market return and interest rate (ShortRate is Bank of Thailand's Treasury bill yield, and LongRate is ten year government bond yields) from 2001 to 2009 on a daily basis. The market information is obtained from the data stream while interest rate is obtained from ThaiBMA (The Thai Bond Market Association)

	Market Absolute Return (%)	ShortRate (%)	LongRate (%)
Mean	0.9430	2.3849	4.6743
Std. [a]	0.9627	1.1745	0.8513
Median	0.6941	2.0034	4.8006
Maximum	16.0269	4.9200	6.8380
Minimum	0.0013	0.7771	2.3460

[a] **Standard deviation**

Table 6 summarizes the number of days applied to the dummy variables for example, CPI index announcement day, GDP announcement day, day of the week, months, a day which has a negative or positive market performance. More details of how to justify the variables are described in chapter 3.1.

Table 6: Summary for dummy variables

These are descriptive statistics for number of days that fall into the criteria of each variable described in the data section, chapter 3. The variables including dummy variable for day of consumer price index (CPI) announcement, one and two day before consumer price index announcement CPI(1-2), day of gross domestic product (GDP) announcement, one and two day before gross domestic product announcement GDP(1-2), day of the week, months, and short-term market performance, which is a concurrent market return. When the return is positive (MKT+) and when market return is negative (MKT-), long term market performance, which is a dummy variable of five-day average index return. When the return is positive (MA5MKT+) and when market return is negative (MA5MKT-)

Variables	Number of day	Variables	Number of days
CPI	108	May	174
CPI(1-2)	214	June	189
GDP	36	July	185
GDP(1-2)	72	August	189
Monday	416	September	186
Tuesday	442`	October	192
Wednesday	449	November	192
Thursday	447	MKT+	1038
January	189	MKT-	1160
February	174	MA5MKT+	1122
March	196	MA5MKT-	1066
April	162		

3.3. Methodology

There are two sections in methodology. The first section is the test for the determinants of market liquidity and trading activity. The second is the test for the difference between two investor type equations of liquidity determinants.

Before regression to test each hypothesis, several statistical tests are performed for reliability of the regression results. First, the Dickey-Fuller Test tests for a unit root problem for all variables in the regression. Stationary data is a requirement for making statistical inferences, and unit root is one problem that may be involved in a time series model resulting in non-stationary variables.

Table 7 shows the approximate p-value for the unit root test. The null hypothesis for this test is that there is a unit root problem. If the variable has no unit root problem p-value, the null hypothesis is rejected. The results show the null hypothesis cannot be rejected in ShortRate or LongRate because the p-value is more than 0.01. Unit root problems are found in ShortRate and LongRate. Results from the unit root test show that all dependent variables are stationary except interest rate independent variables. In order to fix this potentially problematic issue, a first-different method is applied to these two factors.

Table 7: Unit Root Test

These are results of unit root tests in each variable used in regression including relative spread, depth, baht depth, share volume, baht volume, number of trade, Bank of Thailand's Treasury bill yield (ShortRate), and ten year government bond yield (LongRate). Relative spread is an effective spread divided by the mid-point. Depth is volume of best bid and best ask. Baht depth is ask depth times ask price plus bid depth times bid price. Volume is number of shares traded per day. Baht volume is the volume multiplied by the transaction price. Number of trade is a total transaction per day.

	Test Statistic	MacKinnon approximate p-value
Relative spread	-11.508	0.0000
Depth	-3.278	0.0159
Baht Depth	-6.714	0.0000
Share Volume	-12.719	0.0000
Baht Volume	-12.925	0.0000
Number of trade	-13.658	0.0000
ShortRate	-0.150	0.9693
LongRate	-1.373	0.5951

Second, I test for the autocorrelation problem. Autocorrelation is a repeating pattern through time of observed variables. In the regression analysis, autocorrelation is a problem. The autocorrelation itself is unobservable but will produce an

autocorrelation to the error term, which breaks the rule of the unbiased ordinary least squares assumption. The Durbin-Watson test is used to detect the autocorrelation problem. The statistical package will be used to compute the Durbin-Watson statistic. The critical values are determined as shown in Figure 11.

Figure 11: Durbin-Watson Critical Value

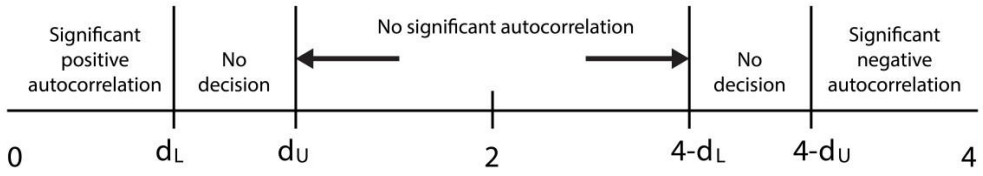


Table 8 presents the results of the Durbin-Watson statistic. The most suitable D_L is 1.91137 and D_U is 1.94159 from Durbin-Watson critical values[3]. The results indicate that there is a strong autocorrelation problem in all variables, since the Durbin-Watson statistic fall far from the critical value.

[3] Durbin-Watson critical values: http://web.stanford.edu/~clint/bench/dwcrit.htm

Table 8: Durbin-Watson Statistic

These are the results of the autocorrelation test (Dickey-Fuller Test). The tests are performed to acquire Durbin-Watson statistics for comparing Durbin-Watson critical values in figure 12. The equations include relative spread, the depth, baht depth, share volume, baht volume and number of trades as dependent variables. Effective spread is different between the execution price and the mid-point. Relative spread is an effective spread divided by the mid-point. Depth is volume of best bid and best ask. Baht depth is ask depth times ask price plus bid depth times bid price. Volume is number of shares traded per day. Baht volume is the volume multiplied by the transaction price. Number of trades is a total transaction per day.

Dickey-Fuller Test	
Equation	**Durbin-Watson Statistics**
Relative Spread	0.3582647
Share Depth	0.0415105
Baht Depth	0.0415105
Share Volume	0.3042936
Baht Volume	0.3255241
Number of Trade	0.3964338

The Cochrane–Orcutt estimation is used to adjust the error term for autocorrelation. This estimation is a procedure in econometrics, which adjusts a linear model for serial correlation in the error term. The following regression equations are then performed. Subscript 'i' refers to trading day on the Stock Exchange of Thailand. Table 9 shows results of regression analysis after modeling for the residual.

$$\begin{aligned} Liquidity_i = \ & \alpha_i + \beta_1 \Delta Tbill_i + \beta_2 \Delta Govbond_i + \beta_3 GDP(0)_i \\ & + \beta_4 GDP(1-2)_i + \beta_5 CPI(0)_i + \beta_6 CPI(1-2)_i + \beta_7 Mon_i \\ & + \beta_8 Tue_i + \beta_9 Wed_i + \beta_{10} Tues_i + \beta_{11} MKT(+)_i \\ & + \beta_{12} MKT(-)_i + \beta_{13} MA5MKT(+)_i + \beta_{14} MA5MKT(-)_i \\ & + \beta_{15} VOLAT_i + \beta_{16} VOLAT\_Lag1_i + \beta_{17} VOLAT\_Lag2_i \\ & + \beta_{18} VOLAT\_Lag3_i + \varepsilon_i \cdots\cdots\cdots\cdots\cdots\ (1) \end{aligned}$$

$$Trading\ Activity_i$$
$$= \alpha_i + \beta_1 \Delta Tbill_i + \beta_2 \Delta Govbond_i + \beta_3 GDP(0)_i$$
$$+ \beta_4 GDP(1-2)_i + \beta_5 CPI(0)_i + \beta_6 CPI(1-2)_i$$
$$+ \beta_7 Mon_i + \beta_8 Tue_i + \beta_9 Wed_i + \beta_{10} Tues_i$$
$$+ \beta_{11} MKT(+)_i + \beta_{12} MKT(-)_i + \beta_{13} MA5MKT(+)_i$$
$$+ \beta_{14} MA5MKT(-)_i + \beta_{15} VOLAT_i + \beta_{16} VOLAT\_Lag1_i$$
$$+ \beta_{17} VOLAT\_Lag2_i + \beta_{18} VOLAT\_Lag3_i$$
$$+ \varepsilon_i \dots\dots\dots\dots\dots\dots (2)$$

Table 9: Regression Result

Dependent variables are daily market liquidity and trading activity as described in Table 1. Explanatory variables are: ShortRate: daily first difference Bank of Thailand's Treasury bill yield, LongRate: daily first difference 10 year government bond yield, MKT+ (MKT-): if a concurrent Stock Exchange of Thailand daily index return is positive, the value on the positive market return variables (MKT+) will be equal to 1 and 0 if otherwise, MA5MKT+ (MA5MKT-): if index return for the past five trading days is positive, the value on the positive market performance variable (MA5MKT+) will be equal to 1 and 0 if otherwise, VOLAT: average absolute return of the Stock Exchange of Thailand is used, Day of the week: the value on the day variable will be equal to 1 if that trading day is Tuesday to Friday and 0 if otherwise, GDP (CPI): If trading day is the day of a macroeconomic announcement, the value of the gross domestic product variable (GDP) or consumer price index (CPI) will be equal to 1 and 0 if otherwise, GDP1-2 (CPI1-2): If trading day is one or two days before a macroeconomic announcement, the value of the gross domestic product variable (GDP1-2) or consumer price index (CPI1-2) will be equal to 1 and 0 if otherwise. Cochrane–Orcutt estimation is used to adjust the error term for autocorrelation. Coefficient significantly different from zero at one percent (five percent) ((ten percent)) are indicated by *** (**) ((*))

VARIABLES	*Relative Spread (Baht)*		*Share Depth (Millions Share)*		*Baht Depth (Millions Baht)*		*Share Volume (Millions Share)*		*Baht Volume (Millions Baht)*		*Number of Trade*	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
ShortRate	-0.002	-0.265	-7,050	-0.012	3.058	1.284	562.4**	1.964	2,808	1.623	13,757*	1.871
LongRate	-0.001	-0.390	727,236**	2.215	4.231***	3.132	85.148	0.523	75.563	0.077	7,573*	1.811
CPI	-0.000	-0.074	197,481**	2.418	-0.021	-0.062	42.026	1.043	701.4***	2.854	2,362**	2.277
CPI(1-2)	-0.000	-0.914	200,134**	2.456	-0.524	-1.565	-33.27	-0.831	95.916	0.395	-700	-0.681
GDP	-0.000	-0.688	5,473	0.039	0.860	1.487	16.066	0.232	420.3	0.998	2,177	1.224
GDP(1-2)	-0.000	-0.838	47,392	0.337	0.264	0.457	0.679	0.010	507.0	1.212	147	0.083
Monday	-0.000	-1.622	175,799***	3.852	1.861***	9.907	144.5***	6.380	786.4***	5.759	4,341***	7.465
Tuesday	-0.000	-0.560	415,205***	7.936	3.260***	15.141	214.4***	8.272	1,390***	8.888	7,121***	10.700
Wednesday	-0.000	-0.941	490,122***	9.397	3.419***	15.927	214.2***	8.294	1,480***	9.502	7,460***	11.251
Thursday	-0.000	-0.427	523,228***	12.180	3.427***	19.380	145.5***	6.834	885.7***	6.909	5,060***	9.257
MKT+	-0.001	-0.265	352,856	0.694	1.999	0.956	38.953	0.155	-396.8	-0.263	1,320	0.204
MKT-	-0.000	-0.241	166,674	0.328	0.517	0.247	-52.15	-0.207	-996.3	-0.661	-1,996	-0.309
MA5MKT+	-0.000	-0.240	-308,191	-0.958	-2.321*	-1.753	-128.1	-0.804	-401.8	-0.421	-1,858	-0.454
MA5MKT-	-0.000	-0.246	-330,486	-1.027	-2.455*	-1.853	-114.1	-0.716	-471.5	-0.494	-2,200	-0.538
VOLAT	0.016	1.336	10,987	0.497	-164	-0.002	-2.698	-0.249	15.245	0.219	-333	-1.136
VOLAT_LAG1	-0.005	-0.001	-11,039	-0.421	12,149	0.113	-5.147	-0.405	-139.4*	-1.726	-861***	-2.586
VOLAT_LAG2	-0.010	-0.457	25,537	0.975	-42,812	-0.397	-27.07**	-2.137	-252.1***	-3.217	-1,176***	-3.583
VOLAT_LAG3	0.011	1.335	-15,181	-0.688	37,758	0.416	-21.99**	-2.033	-110.3*	-1.683	-795***	-2.858
Constant	0.018***	10.939	7,783,699***	3.654	3.890***	10.562	1,415***	4.567	1,090***	5.876	55,284***	6.963
Observations	2,160		2,167		2,167		2,162		2,135		2,161	
R-squared	0.055		0.089		0.211		0.070		0.111		0.130	

Variables which are statistically significant for the determinants of market liquidity and trading activity will be tested for an investor type effect. Multivariate regressions, which allow two or more dependent variables with several predictive variables, are used to verify the investor type impact hypothesis. Subscript 'i' refers to trading day on the Stock Exchange of Thailand. Subscript 'g' refers to two types of liquidity providers; retail and non-retail investors.

$$\%\Delta ShareDepth_{g,i} = \alpha_i + \beta_1 \Delta GovBond_i + \beta_2 CPI(0)_i + \beta_3 CPI(1-2)_i + \beta_4 Mon_i + \beta_5 Tue_i + \beta_6 Wed_i + \beta_7 Tues_i + \varepsilon_i \cdots\cdots\cdots (3)$$

$$\%\Delta BahtDepth_{g,i} = \alpha_i + \beta_1 \Delta GovBond_i + \beta_4 Mon_i + \beta_5 Tue_i + \beta_6 Wed_i + \beta_7 Tues_i + \beta_8 MA5MKT(+)_i + \beta_9 MA5MKT(-)_i + \varepsilon_i \cdots\cdots\cdots (4)$$

$$\%\Delta ShareVolume_{g,i} = \alpha_i + \beta_1 \Delta Tbill_i + \beta_4 Mon_i + \beta_5 Tue_i + \beta_6 Wed_i + \beta_7 Tues_i + Volat_{lag2} + Volat_{lag3} + \varepsilon_i \cdots\cdots\cdots (5)$$

$$\%\Delta BahtVolume_{g,i} = \alpha_i + \beta_1 CPI(0)_i + \beta_2 Mon_i + \beta_3 Tue_i + \beta_4 Wed_i + \beta_5 Tues_i + Volat_{lag1} + Volat_{lag2} + Volat_{lag3} + \varepsilon_i \cdots\cdots\cdots (6)$$

$$\%\Delta Transaction_{g,i} = \alpha_i + \beta_1 \Delta Tbill_i + \beta_2 \Delta GovBond_i + \beta_3 CPI(0)_i + \beta_4 Mon_i + \beta_5 Tue_i + \beta_6 Wed_i + \beta_7 Tues_i + Volat_{lag1} + Volat_{lag2} + Volat_{lag3} + \varepsilon_i \cdots\cdots\cdots (7)$$

CHAPTER IV RESULTS AND DISCUSSION

The results are presented below along with a discussion. In the first section, the determinants of market liquidity and trading activity results for the Stock Exchange of Thailand are described for each hypothesis.

The first hypothesis states that the short-term interest rate has a negative effect on market liquidity and trading activity because short-term interest rate represents a cost of trading in the stock exchange. Higher interest rates should make the market less attractive to the investors and reduce their trading activity. Chordia et al. (2001) also find that changes in short-term interest rates have a negative effect.

However, the results of this study find that short-term interest rates have a significant positive impact on share volume and transaction variables. Omran (2003), who finds a positive relationship between real interest rate and both market liquidity and trading activity in Egypt, argues that expected return in an emerging market through capital gain may be higher than an increasing interest rate. Investors participate in the market even when there is a higher cost for them because they expect higher return than cost.

For long-term interest rates, a positive significant relation to government bond yields is found on the depth, baht depth, and transaction variables. Long-term interest rate has a positive effect on some liquidity and trading activity of the market because

increase in a bond's yield cause an investor to move the investment to the bond market thus stimulating the stock market liquidity and trading activity.

The second hypothesis states that when a market performs badly, liquidity and trading activity are expected to decrease. On the other hand, when the market performs well, liquidity and trading activity are expected to increase. Chordia et al. (2001) also find that there is a relation between market performance and liquidity.

Significant regression results are only found in baht depth variables, which indicate a decrease in liquidity even when the long term market average return is positive. These inconsistent results may arise from existing noise trading from uninformed traders in the market, as suggested by De Long et al. (1990). There is a group of traders in the market whose buy and sell are unrelated to the larger movements of the market. Existence of the uninformed trader may be the reason for inconsistent results from other literatures.

Volatility of market return is also considered in this study, but volatility itself is not found to be a significant determinant of market liquidity and trading activity. However, lagged variables of volatility are negatively significant for all trading activity: trading volume, baht volume, and number of transactions.

When the volatility of the market return is high, investors should avoid the market as the market has higher risk. Chordia et al. (2001) also suggest the same result as they found that market volatility also has an adverse relationship with market trading activity.

For the third hypothesis, seasonality in liquidity and trading activity is found to be statistically significant for all liquidity and trading activity, except for spread. The results find that on Fridays, liquidity and trading activity decrease. The results are consistent with Chordia et al. (2001) who also find that market liquidity and trading activity decrease on Fridays.

The fourth hypothesis states that the announcement of macroeconomic data increase market liquidity and trading activity because the information corrects the market expectation. Investors trade according to new data. Consumer price index (CPI) announcement has a positive effect on share depth, baht volume, and transactions. When there is more information in the market, liquidity and trading activity increase, as predicted by Berry and Howe (1994). They suggest a positive relation between public information and trading volume. Chordia et al. (2001) also find that trading activity and depth increase before the GDP and unemployment announcement.

The last hypothesis states that there is an investor type effect. Multivariate regression is used to test the effect of predictor variables on different types of investors by comparing the population means of two groups of dependent variables with several independent variables.

Tables 10 to 14 show the results of the multivariate regressions, and they can be interpreted as normal regressions. Column 'P>|t|' displays the p-value of the independent variables. Column F-test indicates the result if the outcome can reject the null hypothesis; the reaction from different investor types is statistically significant.

Table 10: Multivariate Regression for Depth

These are results from multivariate regression, which contain two dependent variables with one set of independent variables including 10 year government bond yield (Gov Bond), consumer price index announcement day (CPI), one and two day before consumer price index announcement (CPI1-2) and day of the week. F-test can indicate significant differences between two equations of independent variables.

Depth	F-Test	Retail Depth				Non-Retail Depth			
	Prob>F	Coef.	Std.	t	P>|t|	Coef.	Std.	t	P>|t|
Gov Bond	0.9331	0.1854	0.0270	6.86	0.000	0.1880	0.0298	6.30	0.000
CPI	0.2350	0.0199	0.0138	1.44	0.150	0.0388	0.0153	2.54	0.011
CPI (1-2)	0.1200	0.0300	0.0101	2.97	0.003	0.0119	0.0111	1.07	0.286
Mon	0.0832	0.0102	0.0095	1.07	0.285	0.0239	0.0105	2.26	0.024
Tue	0.0603	0.0179	0.0093	1.91	0.056	0.0381	0.0103	3.69	0.000
Wed	0.0645	0.0204	0.0093	2.19	0.028	0.0575	0.0103	5.58	0.000
Thrs	0.1021	0.1074	0.0093	11.5	0.000	0.1385	0.0102	13.4	0.000
Constant		0.0335	0.0067	4.96	0.000	0.0618	0.0074	8.27	0.000

Results for the depth equation in Table 10 show that government bonds and day of the week are statistically significant for both investor types. Government bonds show positive significant results for both liquidity providers and a slightly higher effect for non-retail investors. The F-test results demonstrate that the difference is not significant. Day of the week shows a positive significant effect on all day variables with a lower depth on Fridays. The effect of day of the week is slightly higher for non-retail investors, but the difference is not statistically significant. The CPI predictor variable is significant only for non-retail investors.

The baht depth equation in Table 11 shows that government bonds and day of the week are statistically significant for both investor types. Government bonds show positive significance for both liquidity providers and a slightly higher effect for the retail investor but are not statistically significant. The effect of day of the week is slightly higher for non-retail investors, but the difference is not statistically significant. Long-term market average return is not significant in either model.

Table 11: Multivariate Regression for Baht Depth

These are results from multivariate regression, which contain two dependent variables with one set of independent variables including 10 year government bond yield (Gov Bond), day of the week, and long term market performance (MA5MKT). F-test can indicate significant differences between two equations of independent variables.

Baht	F-Test	Retail Baht Depth				Non-Retail Baht Depth			
Depth	Prob>F	Coef.	Std.	t	P>|t|	Coef.	Std.	t	P>|t|
Gov Bond	0.5112	0.1775	0.0213	8.31	0.000	0.1586	0.0309	5.12	0.000
Mon	0.0655	0.0049	0.0075	0.66	0.510	0.0477	0.0109	4.38	0.000
Tue	0.0841	0.0320	0.0073	4.34	0.000	0.0591	0.0107	5.51	0.000
Wed	0.0602	0.0376	0.0073	5.12	0.000	0.0913	0.0106	8.55	0.000
Thrs	0.0782	0.1266	0.0073	17.1	0.000	0.1440	0.0106	13.4	0.000
MA5MKT+	0.3631	-0.0226	0.0492	-0.46	0.646	-0.0829	0.0714	-1.16	0.246
MA5MKT-	0.3389	-0.0272	0.0492	-0.55	0.580	-0.0906	0.0714	-1.27	0.205
Constant		0.0230	0.0493	0.47	0.641	-0.0047	0.0716	-0.07	0.948

Treasury bill and the day of a week are statistically significant for trading volume equation in Table 12 for both investor types. There is a positive significant result for both liquidity providers, with a slightly higher effect for retail investors, but they are not statistically significant. Day of the week shows a positive significant effect on all day variables. The effect of day of the week is slightly higher for non-retail investors, but the difference is not statistically significant.

Table 12: Multivariate Regression for Trading Volume

These are results from multivariate regression, which contain two dependent variables with one set of independent variables including Bank of Thailand Treasury bond yield (Tbill1m), day of the week, and lag of volatility (Volat_lag). F-test can indicate significant differences between two equations of independent variables.

Trading	F-Test	Retail Trading Volume				Non-Retail Trading Volume			
Volume	Prob>F	Coef.	Std.	t	P>|t|	Coef.	Std.	t	P>|t|
Tbill1m	0.3302	0.3375	0.1637	2.06	0.039	0.4801	0.1714	2.80	0.005
Mon	0.6161	0.0816	0.0287	2.84	0.005	0.0945	0.0301	3.14	0.002
Tue	0.9123	0.1633	0.0283	5.76	0.000	0.1661	0.0297	5.60	0.000
Wed	0.3580	0.2048	0.0282	7.25	0.000	0.2280	0.0296	7.70	0.000
Thrs	0.5642	0.3085	0.0282	10.92	0.000	0.2940	0.0296	9.93	0.000
Volat_lag2	0.9746	-0.0118	0.0095	-1.24	0.216	-0.0120	0.0099	-1.21	0.227
Volat_lag3	0.9352	0.0080	0.0095	0.85	0.396	0.0073	0.0099	0.74	0.459
Constant		0.2252	0.0230	9.75	0.000	0.2358	0.0241	9.75	0.000

The baht volume equation in Table 13 shows that day of the week and lag in volatility are statistically significant for both investor types. Day of the week also shows a positive significant effect on all day variables, showing that depth is lower on Fridays. The effect of day of the week is slightly higher for non-retail investors, but the difference is not statistically significant. Lag in volatility has a higher significant adverse impact for non-retail investors, but the difference is not statistically significant.

Table 13: Multivariate Regression for Baht Volume

These are results from multivariate regression, which contain two dependent variables with one set of independent variables including consumer price index announcement (CPI), day of the week, and lag of volatility (Volat_lag). F-test can indicate significant differences between two equations of independent variables.

Baht	F-Test	Retail Baht Volume				Non-Retail Baht Volume			
Volume	Prob>F	Coef.	Std.	t	P>|t|	Coef.	Std.	t	P>|t|
CPI	0.3171	0.0492	0.0468	1.05	0.294	0.0169	0.0435	0.39	0.697
Mon	0.9492	0.0892	0.0321	2.77	0.006	0.0878	0.0299	2.94	0.003
Tue	0.4594	0.1408	0.0315	4.46	0.000	0.1568	0.0293	5.35	0.000
Wed	0.6522	0.2172	0.0313	6.92	0.000	0.2075	0.0291	7.11	0.000
Thrs	0.0330	0.2501	0.0314	7.96	0.000	0.3136	0.0292	10.74	0.000
Volat_lag1	0.4248	-0.0346	0.0107	-3.22	0.001	-0.0405	0.0099	-4.06	0.000
Volat_lag2	0.1992	-0.0096	0.0107	-0.90	0.370	-0.0001	0.0100	-0.01	0.989
Volat_lag3	0.6121	0.0047	0.0107	0.44	0.661	0.0009	0.0099	0.10	0.923
Constant		0.2542	0.0266	9.52	0.000	0.2534	0.0248	10.22	0.000

Results for the transaction equation in Table 14 show that Treasury bill and the day of the week are statistically significant for both investor types. Treasury bill shows positive significant results for both liquidity providers, with a slightly higher effect for non-retail investors, but neither are significant with an F-test. Day of the week shows a positive significant effect on all day variables, showing that depth is lower on Fridays. The difference in effect for day of the week is not statistically significant. Lag in volatility is also significant in both types of liquidity providers, but there is no significant difference.

Table 14: Multivariate Regression for Number of Transactions

These are results from multivariate regression which, contain two dependent variables with one set of independent variables including Bank of Thailand Treasury bond yield (Tbill1m), 10 year government bond yield (Gov Bond), consumer price index announcement (CPI), day of the week, and lag of volatility (Volat_lag). F-test can indicate significant differences between two equations of independent variables.

Baht	F-Test	Retail Transactions				Non-Retail Transactions			
Volume	Prob>F	Coef.	Std.	t	P>|t|	Coef.	Std.	t	P>|t|
Tbill1m	0.3911	0.3314	0.1626	2.04	0.042	0.2323	0.1243	1.87	0.062
GovBond	0.2479	0.0921	0.0813	1.13	0.257	0.1589	0.0621	2.56	0.011
CPI	0.6084	0.0302	0.0378	0.80	0.425	0.0164	0.0289	0.57	0.570
Mon	0.8089	0.0652	0.0260	2.51	0.012	0.0697	0.0198	3.50	0.000
Tue	0.9617	0.1134	0.0255	4.45	0.000	0.1125	0.0195	5.77	0.000
Wed	0.9180	0.1735	0.0254	6.82	0.000	0.1716	0.0194	8.83	0.000
Thrs	0.7021	0.1821	0.0254	7.16	0.000	0.2495	0.0194	12.83	0.000
Volat_lag1	0.8009	-0.0293	0.0086	-3.38	0.001	-0.0277	0.0066	-4.18	0.000
Volat_lag2	0.1455	-0.0113	0.0087	-1.30	0.195	-0.0022	0.0066	-0.34	0.732
Volat_lag3	0.2837	0.0107	0.0086	1.24	0.215	0.0041	0.0066	0.63	0.532
Constant		0.1874	0.0215	8.69	0.000	0.1813	0.0165	10.99	0.000

CHAPTER V CONCLUSION

Liquidity, by its nature, is difficult to define; measuring market liquidity and trading activity require several variables to capture the major angles. As we discussed earlier, the results presented in this research cannot show a strong relationship between all predicted variables for both liquidity and trading activity variables.

Short-term interest rate which represent a cost of trading and expect to have a negative effect on market liquidity and trading activity. A decrease in short-term interest rate should stimulate trading from investor. However, the results find that interest rate has a positive effect on some liquidity and trading activities in stock exchange of Thailand which are unique compared to the findings of Chordia et al. (2001) and Chordia et al. (2005).

The possible reason for the result is that the expected return in the emerging market through capital gain is higher than an increasing interest rate, as Omran (2003) suggests. Investors still participate in the market, expecting a higher return than increasing cost from the market.

An increase in Long-term interest rate could induces market liquidity and trading activity due to portfolio rebalancing. Investors move from stock market to bond market when risk-free asset provide them a better return. The results find that Long-term interest rate has a positive effect on some market liquidity and trading activity in Thailand.

There is also a momentum for both the positive and negative side of the market performance, as Jegadeesh and Titman (1993) suggests. Investors would expect this pattern to occur and increase their trading activity when the market return is positive. However, the results in Thailand show that long-term market positive and negative returns are followed by decreases in depth. Existing noise trading from uninformed traders, whose buying and selling are unrelated to the larger movements of the market, may be the reason, as suggested by De Long et al. (1990).

The volatility of the market return is considered a risk. Investors should avoid the market when it has a higher risk. This evidence is supported by Benston (1974) and Chordia et al. (2001), who find a negative relationship between trading activity and volatility. In Thailand, a lag in volatility predicts a decrease in market trading activity.

Seasonality in liquidity and trading activity is found in this research. A decrease in liquidity and trading activity on Fridays is a result of lacking information, which may occur during the weekend. The results indicate a decrease in liquidity and trading activity on Fridays, except spread, which is consistent with Chordia et al. (2001).

New information should correct investors' expectations of the market, thus inducing more market liquidity and trading activity. A positive effect on the consumer price index (CPI) announcement is found in share depth, baht volume, and the number of trades. The finding is also supported Berry and Howe (1994) and Chordia et al. (2001), who arrived at similar results.

Depth and baht depth have significant determinants such as interest rate, CPI announcement, and day of the week. This finding suggests that a non-retail investor should consider liquidity determinants more than a retail investor because depth is a concern for a non-retail investor who trades on a large number of shares, which could affect the market price. Higher depth would help non-retail investors acquire stock at a lower price. Trading activity also has significant determinants, including interest rate, day of the week, CPI announcement, and lag of volatility.

The last finding shows that there is no difference in the behavior of liquidity providers on the Stock Exchange of Thailand in this research. The difference in predicted variables is not statistically significant for any liquidity or trading activity variables, even though there is literature that suggests that the behaviors of the investors are different (Shleifer and Summers 1990). However, as providers of liquidity and trading activity, they may be the same. All investors concentrate on their trading strategies rather than focusing on their roles in providing liquidity and trading activity to the market.

In conclusion, I find some weak evidence in determinants of market liquidity and trading activity, and there is no significant difference in the behavior of liquidity providers in Thailand.

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APPENDIX

VITA

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