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LIQUIDITY COMMONALITY:

EVIDENCE FROM THE STOCK EXCHANGE OF THAILAND

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A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science Program in Finance
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วิทยานิพนธ์ฉบับนี้แสดงผลการศึกษาเชิงประจักษ์ถึงสภาพคล่องร่วมในตลาดหลักทรัพย์แห่งประเทศไทย โดยมีการขยายช่วงเวลาของตัวอย่างและเสนอแง่มุมเพิ่มเติมเกี่ยวกับผลกระทบของการกระจุกตัวของความเป็นเจ้าของที่มีต่อสภาพคล่องร่วม ผลการศึกษาพบหลักฐานที่แสดงถึงการมีอยู่ของสภาพคล่องร่วมของหุ้นไทยกับตลาดและอุตสาหกรรม แต่สภาพคล่องร่วมดังกล่าวยังมีผลกระทบอย่างมีนัยสำคัญและการกระจายตัวน้อยเมื่อเทียบกับตลาดอื่น นอกจากนี้ผลการศึกษายังพบว่า ขนาดของบริษัทและการรวมคำนวณอยู่ในดัชนีมีผลต่อสภาพคล่องร่วม โดยพบว่าบริษัทที่มีขนาดเล็กมีแนวโน้มที่จะมีสภาพคล่องร่วมกับตลาดมากเมื่อวัดสภาพคล่องโดยใช้ช่วงราคา (spread) ในขณะที่บริษัทใหญ่มีแนวโน้มที่จะมีสภาพคล่องร่วมกับตลาดมากเมื่อวัดสภาพคล่องด้วยปริมาณ(depth) และบริษัทที่ไม่รวมคำนวณในดัชนีมีแนวโน้มที่จะมีสภาพคล่องร่วมกับตลาดมากเมื่อวัดสภาพคล่องด้วยช่วงราคา ในขณะที่บริษัทที่ถูกรวมคำนวณในดัชนีมีแนวโน้มที่จะมีสภาพคล่องร่วมกับตลาดมากเมื่อวัดสภาพคล่องด้วยปริมาณ ในอีกมุมหนึ่งการศึกษานี้ไม่พบผลกระทบของสภาพตลาด และการกระจุกตัวของความเป็นเจ้าของต่อสภาพคล่องร่วม

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This thesis provides empirical evidence on the liquidity commonality of the Stock Exchange of Thailand in an extended sample period and additional perspectives on the ownership concentration effect toward the liquidity commonality. Two main empirical results are found in this thesis. First, there is some evidence of the market- and industry-wide commonality in liquidity for Thai stocks, but it is less significant and less pervasive than that in other markets. Second, the firm size and index inclusion tend to have an impact toward the liquidity commonality. Small firms tend to have greater sensitivity to the market liquidity in terms of spread measures while larger firms tend to have greater sensitivity to the market liquidity in terms of depth measures. Besides, non-index inclusion firms tend to have greater sensitivity to the market-wide liquidity in terms of spread measures while index inclusion firms tend to have greater sensitivity to the market liquidity in terms of depth measures. On the other hand, this study does not find the impact of market condition and ownership concentration toward the liquidity commonality.

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CHAPTER I

INTRODUCTION

1.1 Background and Problem Review

Several studies have investigated the common determinants of liquidity since they corroborate on the importance of liquidity. Liquidity is the degree to which an asset or security can be bought or sold in the market without substantial change in asset's price. Liquidity also attracts trading by abating transaction costs. Moreover, liquidity plays a significant role in determining the firm's cost of capital. The higher the liquidity of the firm's stock, the lower the cost of capital (Fabre and Frino, 2004). From the characterization above, it signifies the importance of liquidity for managers, investors, and regulators in understanding the determinants of liquidity. The purpose of this study is to investigate common factors that drive liquidity in the Stock Exchange of Thailand (SET).

Earlier empirical studies mostly deal with the relationship between liquidity and stock returns (see Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), Datar, Naik, and Radcliffe (1998)). Until recently, market microstructure research has documented the widespread existence of common underlying determinants in liquidity. Recognizing the existence of commonality is a key to uncover some suggestive evidence about factors affecting changes in liquidity. Commonality in liquidity, defined by Sujoto et al. (2005), refers to the co-movement of individual stock's liquidity with the market or industry liquidity.

Academics and market practitioners have paid attention to commonality in liquidity since it can provide further insight to extreme market movements such as a market crash. Furthermore, commonality in liquidity can be considered as one of the

systematic risks that should be accounted for in asset pricing models. Thus, market practitioners can formulate better trading strategies while academics can have better explanations on market events by considering systematic liquidity risks in their analysis (Sujoto et al., 2005). Domowitz and Wang (2002) contended that investors needed to diversify their investments according to the return correlation and the degree of co-movement of the liquidity among assets within their portfolios. A better understanding on commonality in liquidity will provide valuable information for investors in managing their portfolios.

Several market microstructure researches have been published to explain the existence of common factors in liquidity such as Chordia et al. (2000), Hasbrouck and Seppi (2001), Huberman and Halka (2001), Brockman and Chung (2002), Fabre and Frino (2004), Sujoto et al. (2005), Lee et al. (2006), and Brockman and Chung (2006). Chordia et al. (2000) recognized the existence of a market-wide commonality in liquidity in the NYSE stocks in 1992, including an industry-wide commonality and its significant effect. Hasbrouck and Seppi (2001) also found strong evidences for common factors in the order flows and stock returns, with a weaker evidence for commonality in liquidity proxies. Huberman and Halka (2001) discovered the existence of a systematic liquidity component in 24 Dow Jones stocks.

Moreover, there are evidences for the existence of liquidity commonality in other markets. Brockman and Chung (2002) explained the existence of commonality in liquidity in the Stock Exchange of Hong Kong (SEHK), in which the commonality was pervasive across the size-sorted portfolios. Fabre and Frino (2004) examined commonality in liquidity for a broad sample of stocks listed on the Australian Stock Exchange (ASX), though it was less significant and less pervasive than other markets. Sujoto et al. (2005) investigated the long-run commonality in liquidity in the

Australian market and the potential non-linearities in systematic liquidity employing a simple “up” and “down” market setup. Brockman and Chung (2006) verified the effect of equity index inclusion on the commonality in liquidity in the SEHK. Lee et al. (2006) revealed the existence of common factors in both daily and intraday data in the Taiwan OTC market.

Even though several researchers have studied the determinants of liquidity in many stock exchanges, the empirical studies on liquidity in Thailand mostly deal with the correlation between liquidity and return, and the roles of liquidity as a factor in asset pricing model, such as those of Sumathanapit (2002), Suwansiri (2002) and Suwanyangyuan (2005). There is no prior research study investigating liquidity commonality in the SET.

In addition, liquidity becomes an interesting issue that regulators usually concern. Using the turnover velocity to gauge liquidity levels of several exchanges[1], the SET has a moderate-to-low liquidity level compared to other exchanges in emerging Asian markets: i.e. 46.1% for the SET compared to 206.9% for the Korea stock exchange, 134.1% for the Taiwan stock exchange, and 128.9% for the Shenzhen stock exchange. When compared to mature markets, including the NYSE, the ASX, and the SEHK, the SET has a lower liquidity level: i.e. 46.1% for the SET compared to 99.1%, 84.0%, and 50.3% for the NYSE, the ASX, and the SEHK respectively. Therefore, it will considerably benefit the SET and investors to study and analyze common factors affecting liquidity in the SET.

Furthermore, prior studies have investigated factors affecting liquidity commonality such as size, index inclusion and market condition. These factors have been found to affect the liquidity commonality. However, there is an interesting factor

[1] The liquidity for exchanges is compared using turnover velocity: from World Federation of Exchanges (See Appendix A)

that has not been investigated before: the ownership concentration. We expect the liquidity commonality will be reduced in highly concentrated ownership firms because those firms tend to have their own private, value-relevant information (Heflin and Shaw. (2000)). Therefore, their trading activities may not correlate with the whole market liquidity. Since Thailand is considered a high ownership concentration country, it is interesting to investigate whether the ownership concentration level affects commonality in liquidity in Thailand.

This thesis proposes to investigate common factors in liquidity by means of regression analysis using intraday data from the Stock Exchange of Thailand (SET). This research will explain the correlation between market liquidity and industry liquidity to individual stocks. It will also analyze the liquidity co-movement with the ownership concentration, which has not been focused by earlier studies.

1.2 Objective of the Study

1. To investigate the existence of liquidity commonality in the SET.

2. To examine the effect of size, index inclusion, and market condition on commonality in liquidity.

3. To provide a new perspective on commonality in liquidity by analyzing the association between the commonality in liquidity and the ownership concentration.

1.3 Scope of the Study

Transaction data from all companies with ordinary shares listed on the SET from January 4, 1999 through December 31, 2003, are included in this study. Transactions reported out of sequence or after the closing are not used. This study also excludes preferred stocks, depositary receipts (DR), warrants, derivative warrants,

corporate bonds, property funds, and unit trusts. Any stocks that were split during this period are also excluded.

1.4 Contributions

Empirical result from this thesis should benefit investors, stock exchange regulators, and portfolio managers. For investors, the existence of commonality in liquidity will provide an additional aspect of asset pricing involving liquidity. Based on arguments from Amihud and Mendelson (1986) and Brennan and Subrahmanyam (1996), the predictable differences in liquidity costs lead to cross-sectional differences in expected returns. If liquidity is random and covaries across stocks, then the stock sensitivity to systematic liquidity randomness could potentially play the role of a price source of risk factor. But if the commonality in liquidity does not exist, the random liquidity risk can be diversified away at the portfolio level.

For stock exchange regulators, the implication from the impact of size effect on commonality indicates that the firm size is one of the concerns in asset pricing and this may imply to differences in asset pricing between small and large firms. In addition, the empirical result from index inclusion effect should reveal the difference in liquidity risk between constitute and non-constitute groups. For the market condition aspect, this research should provide unambiguous evidence that the market up or down condition has an effect toward commonality in liquidity. Moreover, for the impact of ownership concentration toward commonality in liquidity, an implication is that the SET has to concern about the policy that supports more free float. Although greater free float leads to more trading liquidity, but greater free float also leads to more systematic risk. Therefore, there is a trade-off between liquidity and systematic risk that regulators must concern.

Finally, the empirical result of commonality in liquidity will also help portfolio managers lessen transaction costs by trading in proper timing.

1.5 Organization of the Paper

The next chapter will discuss findings regarding liquidity commonality and its factors from previous studies. Chapter III will provide an overview regarding the data, hypotheses and methodologies used in this paper. Chapter IV will discuss the results from our empirical analysis. Chapter V will provide a conclusion and directions for future research.

CHAPTER II

LITERATURE REVIEW

This chapter reviews research studies on commonality in liquidity and is divided into five sections. Sections 2.1 and 2.2 discuss the existence of commonality in liquidity in the US and Non-US markets respectively. Section 2.3 deliberates liquidity commonality in Thailand. Ownership concentration, our new perspective on factors affecting liquidity commonality, is presented in Section 2.4. The last section illustrates the summary of this chapter.

2.1 Commonality in Liquidity in the US Market

Traders have long recognized the importance of liquidity; however, they normally pay attention to the relationship between liquidity and stock returns. Several studies reveal that liquidity plays an important role in explaining the rates of return on financial assets. However, recent research studies have devoted to the common determinants of liquidity.

Chordia et al. (2000) found that commonality across stocks in the variable costs of liquidity, i.e. quoted spreads, quoted depth, and effective spreads, moves in the same direction with the market- and industry-wide liquidity by regressing the daily percentage changes in liquidity variables for individual stocks on market- and industry-wide liquidity for each of the 1169 NYSE stocks. The empirical result also documents a significant size effect, i.e. sensitivity to commonality increases in a consistently monotonic manner from lower to higher capitalization portfolios.

Additionally, commonality in liquidity was also found using a different methodology. Huberman and Halka (2001) investigated the commonality in liquidity

of 240 NYSE stocks by adding return, volatility and trading volume as the explanatory variables. They found that the four proxies for liquidity (spread, spread/price ratio, quantity depth, and dollar depth) varied over time and the component of systematic liquidity existed.

Furthermore, there was a great deal of evidences of the existence of liquidity commonality in different markets. For example, Hasbrouck and Seppi (2001) analyzed 30 Dow Jones stocks in 1994 using time-aggregated trade and quoted data over 15-minute intervals. They found that common factors existed in order flows and returns, as well as canonical correlation analysis documents. The study showed that there were common factors in terms of time variation for a number of liquidity proxies.

2.2 Commonality in Liquidity in Non-US Markets

Commonality in liquidity was not only found in the US market, but also in other markets. Brockman and Chung (2002) examined commonality in liquidity in the SEHK, which was the order-driven market. Their study found not only the existence of significant commonality in liquidity, but also the magnitude of commonality in liquidity, which was lower for stocks traded in the order-driven SEHK than stocks traded in the specialist-based NYSE. In addition, their research study showed that large firms in order-driven markets had relatively low exposures to commonality, especially when liquidity was measured in terms of spreads while large firms in specialist-based markets were the opposite. Moreover, their study also found that the coefficients of liquidity beta exhibited an inverted U-shape pattern for their SEHK sample data sorted by market capitalization (except when depth was used as the liquidity proxy).

Another study that investigates liquidity commonality in an order driven market is that of Fabre and Frino (2004). Their study showed commonality in liquidity for a broad sample of stocks listed on the Australian Stock Exchange (ASX), using the same methodology as Chordia et al. (2000). Unlike Chordia et al. (2000), their study found the existence of market-wide commonality in liquidity but it was less significant and less pervasive than the NYSE. Fabre and Frino (2004) were not able to find supportive evidence of the existence of industry-wide liquidity commonality. The study concludes that the variation may arise from different market structure characteristics between the NYSE and the ASX.

By extending the sample period and by using the turnover rate and bidimensional liquidity measure, Sujoto et al. (2005) discovered stronger evidences supporting the existence of liquidity commonality in ASX than Fabre and Frino's research (2004). Their research study exemplifies the evidence of systematic liquidity which is most pervasive for the largest size quintile of sample stocks and is consistent with the ASX concentrated nature toward large market capitalization stocks. In addition, the research study also explored new perspectives in commonality in liquidity by developing the concept of a long-run liquidity beta and non-linearity modeling. The focus of the research was to examine stocks' commonality in liquidity according to the market condition ("up" versus "down" phase) due to the well-known correlation between trading activities of market participants and the state of the market (bull/bear modeling of beta risk in the conventional return setting). Furthermore, their study found that the Australian stocks' commonality in liquidity was more pervasive during the "up" market.

After finding liquidity commonality in the SEHK in 2002, Brockman and Chung (2006) revealed that equity index inclusion was a significant source of

commonality using the intra-day data from the four stock indexes available on the Hong Kong's future exchange and regressing data into two sub-samples (constituent and non-constituent stocks). Their study revealed that the index inclusion effect was a general phenomenon that affected the co-variation of liquidity for all indices, i.e. the effect was not index specific. In addition, their study concluded that commonality in liquidity was unambiguously higher for index-included firms instigating by the market behavior of arbitragers and fund managers through their block purchases and sales.

Lee et al. (2006) also uncovered liquidity commonality in the Taiwan OTC stock market. Their study investigated common factors in liquidity using six liquidity measures (quoted spread, proportional quoted spread, depth, effective spread, proportional effective spread, and trading volume). Research result showed that the market- and industry-wide effects existed in the Taiwan stock market. Furthermore, small firms tended to have greater exposure to market liquidity than large firms, which was consistent with Brockman and Chung (2002).

2.3 Liquidity in Thailand

In Thailand, liquidity problem is explicitly recognized by authorities. However, research studies on liquidity in Thailand mostly deal with the correlation between liquidity and return, and the roles of liquidity as factor in asset pricing model, such as the studies of Sumethnapis (2002), Suwansiri (2002), and Suwanyangyuan (2005).

Sumethnapis (2002) investigated the relationship between stock return and liquidity using the turnover rate as the proxy for liquidity during January 1994 to December 1999. The study applied the methodologies of Amihud and Mendelson

(1986) and Fama-Macbeth (1973). The research did not find any relationship between the excess return and the turnover rate as in other researches due to differences in market and time period.

In contrast to Sumethnapis (2002), Suwansiri (2002) found relationship between stock return and liquidity. Suwansiri (2002) investigated the relationship between the stock return and liquidity using the share turnover, trading volume, and estimated bid-ask spread as the proxy for liquidity during 1994 to 2001 by employing the Roll's model (1984). Additionally, the study examined the sensitivity of liquidity to stock price movement by investigating the co-movement between liquidity and absolute stock return. Results from the research proved that absolute stock return and firm size was the important determinant of liquidity.

Further study by Suwanyangyuan (2005) examined the role of liquidity as an additional factor in asset pricing and as an indicator of the relative dominance of the irrationally overconfident investors in the market during 1994 to 2004. Suwanyangyuan (2005) used illiquidity ratio as a proxy of liquidity. The results showed that CAPM model was the best model for explaining abnormal return and the liquidity premium had a positive sign. Moreover, Suwanyangyuan (2005) also found that high-liquidity states were associated with higher momentum profits than low-liquidity states when the market experienced recent gains.

Even though several researchers have studied the correlation between liquidity and return, and the roles of liquidity, there is no prior study investigating the common determinants of liquidity in the SET. Therefore, this thesis will explain the common determinants of the liquidity by investigating the correlation between market liquidity and industry liquidity to individual stocks and will also analyze factors affecting liquidity co-movement.

2.4 Ownership Concentration

Several researchers have found the existence of commonality in liquidity with differing significant levels. Their studies also revealed that size, index inclusion, and market condition have major impacts on commonality in liquidity. However, there is a new interesting perspective that prior studies have never been focused: the evidence on association between the commonality in liquidity and the ownership concentration. This initial evidence suggests the correlation between liquidity commonality and the ownership concentration. Consequently, this correlation should be fully explored since the ownership concentration should have an impact on commonality in liquidity.

In general, composition of the firm ownership varies systematically across countries. Except in countries with excellent investment protection, few firms are widely held (La Porta et al. (1999)). Claessens et al. (2000) found that the ownership structures of many East Asian companies, including many Thai firms, are highly concentrated and most of these companies are also family-controlled firms. Firms with greater blockholders are considered highly concentrated ownership firms (Stuzl (2005)). These blockholders are believed to have access to private, value-relevant information via their roles to monitor the firms' operations (Heflin and Shaw, 2000). Therefore, this paper expects liquidity commonality to be reduced in highly concentrated ownership firms because those firms tend to have their own private, value-relevant information, and thus, their trading activities may not correlate with the whole market liquidity. Consistent with this belief, this study expects that the commonality in liquidity in the context of market-wide liquidity will be reduced in highly concentrated ownership firms.

2.5 Summary

This chapter critically discusses the existence of liquidity commonality, including its factors, in many stock exchanges. And this conviction lends itself to a very interesting research topic to determine if the commonality in liquidity in the SET exists. Furthermore, this research study would examine how the firm size, index inclusion, market condition, and ownership concentration affect commonality in liquidity in the SET.

CHAPTER III

DATA AND METHODOLOGY

3.1 Sample and Data

3.1.1 Sample

Data provided by the SET includes all companies with ordinary shares listed on the SET from January 4, 1999 to December 31, 2003, totaling 361 firms with 1,229 trading days each.

3.1.2 Data

The intraday data is obtained from the SET database. The data is compiled into 5-minute time interval. The morning session consists of 30 periods from 10:00 a.m. to 12:30 p.m. and the afternoon session consists of 24 periods from 2:30 p.m. to 4:30 p.m., totaling 54 periods per day and 1,229 trading days (January 4, 1999 through December 31, 2003). The required data includes every transaction, along with time-stamped, transaction price, trading share, the best bid (ask) price, bid size, and ask size.

3.2 Theoretical Hypothesis

Based on findings in previous studies in the US and non-US markets, including Chordia et al. (2000), Huberman and Halka (2001), Hasbrouck and Seppi (2001), Brockman and Chung (2002), Fabre and Frino (2004), Sujoto et al. (2005), Brockman and Chung (2006), and Lee et al. (2006), the theoretical hypotheses are as follows:

Hypothesis 1 The liquidity commonality of SET in market-wide context does exist.

Hypothesis 2 The liquidity commonality of SET in industry-wide context does exist.

Hypothesis 3 Firm-size has an impact on commonality in liquidity.

Hypothesis 4 Index inclusion has an impact on commonality in liquidity.

Hypothesis 5 Market condition has an impact on commonality in liquidity.

Hypothesis 6 Ownership concentration has an impact on commonality in liquidity.

3.3 Methodology

3.3.1 Data Preparation

Construction of intraday bid-ask quotes

Best bid/ask quotes during regular trading sessions with depth were constructed for each security. A new record was created when there was a change in bid/ask quote or depth. Each record comprised of the following fields: (1) time stamped, (2) trade volume (if there is transaction; positive if buyer-initiated), (3) investor type flag (4) best bid price, (5) bid depth (volume outstanding at the best bid), (6) best ask price, (7) ask depth (volume outstanding at the best ask), and (8) time duration for this quote (from the last quote or from the pre-opening time). Only orders from the main board were included while opened and matched orders were included with the exception of cancelled orders. Pre-opening and intermission periods were excluded.

With each order, there are three possible situations. First, the order is marketable, i.e. it can be matched. This will result in positive/negative trade volume and changes in bid/ask quotes and depth. Second, the order is not marketable but falls in between best bid and best ask. This will result in changes in bid/ask quotes and depth but trade volume recorded will be zero. Third, the order is not marketable and falls out of best bid and best ask. In this case, no record will be created. Then, we obtained the price and depth for each transaction throughout the sample period. Next,

transaction data were complied into five-minute time interval at best bid and best ask, and depth. A total of 54 five-minute intervals were obtained: 30 intervals from 10:00 a.m. to 12:30 p.m. morning session, and 24 intervals from 14:30 p.m. to 16:30 p.m. afternoon session.

The reasons for using intraday data instead of daily closing price data are that intraday data is appropriate to capture more micro phenomena in the trading market during the day and it also helps to avoid the end-of-the-day effect. This study calculates a price change pattern for each five-minute interval using quoted spread and proportional quoted spread (see the calculation in the liquidity measure section). Results from the study show an increase in price in the last five-minute interval of the day.[2] Consistent with this study, Sinchai (2006) provided some evidence of the end-of-the-day effect by calculating the price change pattern for each five-minute interval using raw return (raw return is $\ln(P_t/P_{t-1})$ where P_t is the last transaction price of the security at the end of the interval and price changes for each interval are then averaged across all security-days). His study found no distinct stock price change pattern during the trading session, but there is a large positive return in the last five-minute interval of the day which supports Anantavalee's study (2003). Anantavalee found no distinct return pattern for the SET index but a considerable positive return in the last fifteen-minute interval.

Liquidity Measures

After bid (ask) prices and depths data are compiled into five-minute time interval, five different liquidity measures are calculated for each of this five-minute transaction. These liquidity measures include the quoted spread, the proportional

[2] For further details of calculation, please see Appendix B.

quoted spread, the quoted spread weighted by volume weighted average price, the quoted depth, and the dollar depth. Next, they are averaged across all intervals over the trading day.

The liquidity measures are computed by combining the intraday observations into five-minute time interval. The ask price (P_A) and bid price (P_B) used in the calculation are the best ask price and the best bid price for each five-minute interval. The ask/bid share represents the number of shares available at each best bid/ask price for each interval. The difference between the ask price (P_A) and the bid price (P_B) is called the quoted spread ($P_A - P_B$). The proportional quoted spread equals to the quoted spread divided by the mid-price between ask prices and bid prices (P_M) or equals to $(P_A - P_B)/P_M$. The quoted spread weighted by the volume weighted average price (VWAP) equals to the quoted spread divided by the daily volume weighted average price. The depth equals to the average of ask shares (Q_A) and bid shares (Q_B) or equals to $(Q_A + Q_B)/2$. The dollar depth is the average of the sum between the ask shares multiplied by its quoted price and bid shares multiplied by its quoted price or equals to $(P_A Q_A + P_B Q_B)/2$. The liquidity measures from the calculation become the liquidity measures for each five-minute interval. Then, all five-minute liquidity measures of each stock for each day are averaged to create daily time series. Each liquidity measure is averaged across all trading transactions of that stock for the day in order to smooth out intraday peculiarities. This promotes greater synchronicity and reduces our data into a more manageable level. There are 1,229 trading days during 1999 to 2003, and a total of 443,669 observations for each liquidity measure are examined.

3.3.2 The Existence of Commonality in Liquidity in the SET

For comparison, the methodology of Chordia et al. (2000) will be utilized. The various proxies for the individual stock liquidity were run in the regression against market-wide averages on stock-by-stock basis. To interpret the result, sign test technique[3] was applied.

Market-wide Liquidity Commonality

First, the market liquidity is investigated by performing the sign test for the SET. Then, the regression of the percentage change in individual stock liquidity on market liquidity is estimated using firm-by-firm time series regression.

$$\Delta Liquidity_{j,t} = \alpha_{j} + \beta_{j,1}\Delta Liquidity_{M,t} + \beta_{j,2}\Delta Liquidity_{M,t+1} + \beta_{j,3}\Delta Liquidity_{M,t-1} + \delta_{j,1} Return_{M,t} + \delta_{j,2} Return_{M,t+1} + \delta_{j,3} Return_{M,t-1} + \delta_{j,4}\Delta Volatility_{j,t} + \varepsilon_{j,t} \quad (1)$$

where;

$\Delta Liquidity_{j,t}$ is the ratio of $(Liquidity_{j,t} - Liquidity_{j,t-1})/Liquidity_{j,t-1}$;

j = number of firms, t = number of trading days. It is the percentage change (Δ) for stock j from trading day t-1 to t in liquidity measures (i.e. the quoted spread, the proportional quoted spread, and the quoted depth) and each liquidity measure is averaged across all trading transactions of that stock for the day.

$Liquidity_{M,t}$ is an equally weighted average on day t of the respective liquidity measures for all firms in the sample representing the market, excluding firm j.

[3] Sign test is a nonparametric method that uses the binomial distribution in order to test the median against a known reference value.

Return $_{M, t}$ is an equally weighted average of the daily return at day t for all firms in the market, excluding firm j. Return $_{M, t}$ = $(\sum_{i=1}^{n} \log(P_{i,t} / P_{i,t-1}))/n$, where i are firms in the sample, excluding firm j; $P_{i, t}$ and $P_{i, t-1}$ are the price of the stock i for day t and the previous day while n is the total number of firms.

Volatility $_{j, t}$ is the return volatility for firm j on trading day t and is measured as the daily squared return (Brockman and Chung, 2000).

Market liquidity is calculated from an equally-weighted average liquidity for all stocks in the sample excluding the dependent variable stock (firm j) in order to eliminate some of the cross-sectional dependence in estimated coefficients. In this equation, Chordia et al. (2000) adds ΔLiquidity $_{M, t-1}$ and ΔLiquidity $_{M, t+1}$, the lead and lag of the market's liquidity measures, in order to capture any non-contemporaneous adjustment in commonality while the market return is intended to remove spurious dependence that may represent an association between returns and spread measures. The squared stock return, assuming that the mean of average return equals to 0, is included as a proxy for volatility which they think it was a nuisance variable that possibly influences liquidity.

In order to test the existence of market-wide commonality, the hypothesis testing of equation (1) is given as follows:

H_0: Median of SUM $_M$ = 0

(The commonality in liquidity in market-wide does not exist)

H_1: Median of SUM $_M \neq 0$

(The commonality in liquidity in market-wide exists)

For further comparison with Chordia et al. (2000), SUM is defined as the sum of the concurrent, lag and lead coefficients of the market liquidity measures (from (1); $SUM_M = \beta_{j,1} + \beta_{j,2} + \beta_{j,3}$), and the p-value is from the sign test for the null hypothesis of H_0; Median of $SUM_M = 0$. The coefficients are tested significantly different from zero by using t-statistic.

Industry-wide Commonality in Liquidity

The industry effect in the SET is examined by using the following regression model:

$$\begin{aligned}\Delta Liquidity_{j,t} = {} & \alpha_j + \beta_{j,1}\Delta Liquidity_{M,t} + \beta_{j,2}\Delta Liquidity_{M,t+1} \\ & + \beta_{j,3}\Delta Liquidity_{M,t-1} + \gamma_{j,1}\Delta Liquidity_{I,t} + \gamma_{j,2}\Delta Liquidity_{I,t+1} \\ & + \gamma_{j,3}\Delta Liquidity_{I,t-1} + \delta_{j,1} Return_{M,t} + \delta_{j,2} Return_{M,t+1} \\ & + \delta_{j,3} Return_{M,t-1} + \delta_{j,4}\Delta Volatility_{j,t} + \varepsilon_{j,t} \qquad (2)\end{aligned}$$

$Liquidity_{I,t}$ is an equally weighted average on day t of the respective liquidity measure for all firms in the industry, excluding the dependent variable stock (firm j). All other variables are the same as defined in equation (1). The list of industry classification is from the SET[4]. The hypothesis testing of equation (2) is given as follows:

H_0: Median of $SUM_I = 0$

(The commonality in liquidity in industry-wide does not exist)

H_1: Median of $SUM_I \neq 0$

(The commonality in liquidity in industry-wide exists)

[4] The list of firms in Industry and Sector classification updated in July 2006 from the SET is used because it provides more unambiguous and is suitable for new economy.

To compare results with Chordia et al. (2000), SUM_M and SUM_I are defined as the sum of the concurrent, lag and lead coefficients of the respective market and industry liquidity measures (from (2); $SUM_I = \gamma_{j,1} + \gamma_{j,2} + \gamma_{j,3}$) The coefficients are tested significantly different from zero by using t-statistic.

The expected result for market-wide and industry-wide liquidity commonality anticipates the existence of liquidity commonality. The supportive reason is based on the evidence from other order-driven markets such as ASX (Fabre and Frino (2004), Sujoto et al. (2005)), SEHK (Brockman and Chung (2002), Brockman and Chung (2006)), and Taiwan OTC stock market (Lee et al. (2006)) confirming that the commonality in liquidity exists. This study expects that the SET, which is also the order-driven market, should have commonality in liquidity as well.

3.3.3 Factors that Affect Commonality in Liquidity

Size Effect

Based on an average of five-year market capitalization of each firm, all of the sample firms are divided into 5 size-based quintiles, ranked from the smallest to largest market capitalization (calculated by averaging daily market capitalization for 5 years). Then we perform firm-by-firm time series regressions analysis for market-wide as shown in equation (1). The hypothesis testing of the size effect is given as follows:

H_0: Median of SUM = 0

(Firm-size has no impact on commonality in liquidity)

H_1: Median of SUM $\neq$ 0

(Firm-size has an impact on commonality in liquidity)

In order to confirm the direction of an impact on size effect, this paper also runs additional regression for testing null hypothesis as follows:

H_0: Median of $SUM_{M, small}$ = Median of $SUM_{M, large}$

(Commonality in liquidity for large and small firms is indifferent)

H_1: Median of $SUM_{M, small} \neq$ Median of $SUM_{M, large}$

(Commonality in liquidity for large and small firms is different)

where; small in subscript represents small market capitalization,

large in subscript represents large market capitalization.

This study expects the size effect to exist, and small firms stocks will have greater spread and smaller depth coefficients than larger firms in response to market liquidity. Empirical results for other order-driven markets from previous studies lead to this belief (Brockman and Chung (2002), Sujoto et al. (2005), and Lee et al. (2006)). The reason is that small firms stock may be more sensitive to market changes due to higher information asymmetry in relation to the spread and depth liquidity measures.

Index Inclusion

The same methodology with Brockman and Chung (2006) is applied by partitioning the full sample into two sub samples; the portfolio that makes up of companies that are constituent stocks of SET50 index, and the portfolio that makes up of non-constituent stocks. In this research study, the constituent stocks refer to stocks which were always included in the SET50 from January 1999 to December 2003, resulting in only 23 qualified firms. Non-constituent stocks are randomly selected from firms that had never been included in the SET50. The firm-by-firm time series

regressions for two sub-samples are estimated as the equation (1). The hypothesis testing of index inclusion is given as follows:

H_0: Median of SUM = 0

(Index inclusion has no impact on commonality in liquidity)

H_1: Median of SUM $\neq$ 0

(Index inclusion has an impact on commonality in liquidity)

In order to ensure an impact direction on index inclusion, additional regression is performed to test null hypothesis as follows:

H_0: Median of $SUM_{M, G}$ = Median of $SUM_{M, NG}$

(Commonality in liquidity for index and non-index inclusion firms is indifferent)

H_1: Median of $SUM_{M, G} \neq$ Median of $SUM_{M, NG}$

(Commonality in liquidity for index and non-index inclusion firms is different)

where; G in subscript represents firms in the constitute list,

NG in subscript represents firms out of the constitute list

Based on the finding of Brockman and Chung (2006), expected result from this hypothesis indicates that constituent firms will have greater exposure to commonality in liquidity than non-constituent firms. An explanation for this prediction owes to the market behavior of stock index arbitragers and fund managers who increase the co-variation of liquidity through their block purchases and sales of the underlying (spot) index.

Market Condition

The methodology from Sujoto et al. (2005) is applied. First, an up (Bull) or down (Bear) market is defined by comparing an excess market return (EMR). The daily EMR is calculated by deducting the return of the saving deposit rate of Thai banks, which represents a proxy for risk free rate, from the average of daily stock return in the sample. Then the EMR is partitioned evenly among the up, down and neutral market and the equation is estimated as follows:

$$\begin{aligned}\Delta Liquidity_{j,t} = {} & \alpha_{j,n} D_n + \alpha_{j,u} D_u + \alpha_{j,d} D_d + \beta_{j,n} D_n \Delta Liquidity_{M,t} + \\ & \beta_{j,u} D_u \Delta Liquidity_{M,t} + \beta_{j,d} D_d \Delta Liquidity_{M,t} \\ & + \lambda \Delta Liquidity_{j,t-1} + \delta_{j,1} Return_{M,t} + \delta_{j,2} Return_{M,t+1} \\ & + \delta_{j,3} Return_{M,t-1} + \delta_{j,4} \Delta Volatility_{j,t} + \varepsilon_{j,t} \end{aligned} \quad (3)$$

where; D_d (D_u) [D_n] are dummy variables which take the value of 1 in down (up) [neutral] markets and 0 otherwise.

The hypothesis testing of effect of the market up/down is given as follows:

H_0: $\beta_{j,u} = \beta_{j,d}$

(Market condition has no impact on commonality in liquidity)

H_1: $\beta_{j,u} \neq \beta_{j,d}$

(Market condition has an impact on commonality in liquidity)

where; u in subscript represents the up market,

d in subscript represents the down market

As in Sujoto et al. (2005), this research also performs the Wald test (null hypothesis $\beta_{j,u} = \beta_{j,d}$), on a stock-by-stock basis in order to formally test this asymmetry hypothesis.

Based on this hypotheses, we can reasonably predict that stock liquidity co-movement will be influenced more by market liquidity during the up market (Sujoto

et al. (2005)). They conclude that investors are more prone to herd during the bull market, most likely to chase momentum profits. On the other hand, during the bear market, information sources and events will be scarce causing investors (particularly noise traders) to become more idiosyncratic (and perhaps more risk averse) in their trading behavior. Liquidity in this circumstance tends to dry up, making it more difficult to isolate patterns of systematic liquidity.

Ownership Concentration

Sample firms are separated into three equal-size groups based on the percentage of each firm's free float in Year 2003, ranking from the lowest to the highest percentage of free float. The Free float[5] of the listed securities is an estimate of proportion of shares accessible for trading in the market by common investors. In principal, it is the part of shares that does not belong to strategic shareholders and is not held as treasury stock. Then, the firm-by-firm time series regression analysis for market-wide using equation (1) is executed. The hypothesis testing of effect of market up/down is given as follows:

H_0: Median of SUM = 0

(Ownership concentration has no impact on commonality in liquidity)

H_1: Median of SUM $\neq$ 0

(Ownership concentration has an impact on commonality in liquidity)

In order to ascertain the direction of an impact on ownership concentration, this research also runs additional regression analysis to test null hypothesis as follows:

[5] The definition and calculation guideline are defined by the Research Department of the Securities and Exchange Commission, Thailand (SEC) and the free float data is available on the SET Smart database. For further details of calculation, please see Appendix C.

H_0: Median of $SUM_{M,\ high}$ = Median of $SUM_{M,\ low}$

(Commonality in liquidity for high and low ownership concentration firms is indifferent)

H_1: Median of $SUM_{M,\ high} \neq$ Median of $SUM_{M,\ low}$

(Commonality in liquidity for high and low ownership concentration firms is different)

where; high in subscript represents firms with high ownership concentration (low percentage of free float)

low in subscript represents firms with low ownership concentration (high percentage of free float).

This paper expects that commonality in liquidity in the context of market-wide liquidity will be reduced in highly concentrated ownership firms because these firms tend to have their own private, value-relevant information (Heflin and Shaw. (2000)). Therefore, their trading activities may not correlate with the whole market liquidity.

CHAPTER IV

RESULTS

This chapter is separated into two main findings: 1) the existence of liquidity commonality in the Stock Exchange of Thailand (SET), and 2) factors that affect commonality in liquidity that is size, index inclusion, market condition, and ownership concentration.

The descriptive statistic for the time-series means of the five liquidity measures is shown in Panel A of Table 1. The shapes of the cross-sectional daily average spreads and depth are skewed to the right because the sample's means are larger than the medians. The mean of quoted spread in Table 1 is 1.0007 which is larger than the mean of quoted spread in other countries, for instance, 0.0258 for ASX (Sujoto et al. (2006)), 0.4680 for Taiwan's OTC stock market (Lee et al. (2006)), 0.0588 for SEHK (Brockman and Chung (2000), and 0.3162 for NYSE (Chordia et al. (2000)). However, when this measure is adjusted by its mid-price, the mean of the spread measure is comparable to other markets, i.e. the mean of proportional quoted spread for SET is 0.0376 compared with 0.0133, 0.0082, 0.0274, and 0.0160 for the ASX (Fabre and Frino (2004)), Taiwan's OTC stock market, SEHK, and NYSE, respectively.

Panels B, C, D, and E in Table 1 show the mean, median, and standard deviation for time series of each liquidity measure ranking by size, index inclusion, market condition, and ownership concentration groups. For Panel B, the spread measures seem to have no clear pattern of time-series means, while the depth measure provides a clearer pattern, i.e. larger firms have a larger depth than small firms. In Panel C, non-constitute firms have a largest spread and smallest depth than other

groups, which implies to the lower liquidity than other groups. Panel D illustrates that the spread liquidity measures are higher while the depth liquidity measures are lower during the down market, which implies a lower level of liquidity than the up and neutral market conditions. For ownership concentration groups in Panel E, the spread measures increase with a higher level of ownership concentration while the depth measures decrease with a higher level of ownership concentration. This implies a higher liquidity for firms with a lower level of ownership concentration.

The correlation coefficients for liquidity variables of the SET, ASX, Taiwan's OTC, and NYSE are presented in Panel F. Consistent with previous studies (i.e. Sujoto et al. (2006), Lee et al. (2006), and Chordia et al. (2000), etc.), all measures of spread are positively correlated with each other across time and negatively correlated with their depth: i.e. the wider the bid-ask spreads, the smaller the number of shares available at the highest bid price or the lowest ask price.

4.1 The Existence of Commonality in Liquidity

4.1.1 Market-wide Liquidity Commonality

Table 2 reports the ample evidence of the existence of commonality in liquidity. Cross-sectional averages of time-series slope coefficient are reported with p-values to examine the null hypothesis: the commonality in liquidity in the market-wide does not exist. The coefficients of lead, lag and concurrent values of the equal-weighted market return and the volatility of individual stock's return, which were additional regressors, are not reported. All the concurrent coefficients are positive and the nonparametric sign tests show that all estimated concurrent coefficients are significantly different from zero. The mean of concurrent liquidity beta ranges from 0.0750 (quoted spread) to 0.4534 (dollar depth) and the proportion of stocks with

positive concurrent beta ranges from 64% (quoted spread; 231 firms out of 361 firms) to 82% (depth; 296 firms out of 361 firms). In addition, the proportion of stocks with positive and significance level at 5% ranges from 6% (quoted spread; 23 firms out of 361 firms) to 38% (dollar depth; 136 firms out of 361 firms).These findings suggest the evidence of the existence of market-wide liquidity commonality in the SET. However, these results are still not as strong as the evidence in Chordia et al. (2000) which reports that over 30% of the liquidity measures' beta were positive and significant, except effective spread (15%) and proportional effective spread (14%). This can be concluded that the market-wide liquidity commonality for SET stocks is lower in significance and less pervasive than that of NYSE stocks.

Although the leading and lagged terms are usually positive and are often significant, they are small in magnitude. Besides, the number of individual coefficients at the 5% significance level is much below half of the sample firms. These results can be implied that the leading and lagged market liquidity has no significant impact on the individual firm's liquidity.

However, the explanatory power of the typical individual regression is not impressive. The average R^2 (adjusted R^2) is less than 5% (4%). Obviously, there are either a large component of noises and/or other influences on daily changes in individual stock liquidity constructs. However, the empirical results of the SET's market model are quite consistent with previous researches, such as Chordia et al. (2000), Fabre and Frino (2004), and Lee et al. (2006).

4.1.2 Industry-wide Liquidity Commonality

Table 3 reports the evidence of existence of industry-wide commonality in liquidity. Cross-sectional averages of time-series slope coefficient are reported with p-values to examine the null hypothesis: the commonality in liquidity in the industry-wide does not exist. Apart from the quoted spread, all of the sum coefficients are positive and the nonparametric sign tests show that all estimated sum coefficients are significantly different from zero both for market-wide and industry-wide liquidity. The mean of concurrent market [industry] liquidity beta ranges from 0.0514 [0.0156] (quoted spread) to 0.3943 [0.2248] (dollar depth). Except for the quoted spread, the liquidity measures seem to be influenced by both market and industry components, i.e. the coefficients of the industry liquidity beta for all liquidity measures are lower than those of to market-wide liquidity beta. These findings suggest that the industry-wide liquidity is another common factor for stocks' liquidity in the SET but the impact of industry liquidity is lower than that of market liquidity.

4.2 Factors that Affect Commonality in Liquidity

4.2.1 Size Effect

Table 4 demonstrates the market average coefficients across firms based on size quintiles. From Panel A, cross-sectional averages of time-series slope coefficient are reported with p-values to examine the null hypothesis: firm-size has no impact on the commonality in liquidity. In response to the market–wide liquidity, the average coefficients do not clearly demonstrate the size patterns in relation to the spread measures of liquidity. However, the slope of large firms is generally smaller than that of small firms. For the largest size-based quintile, the average coefficients of quoted spread, proportional quoted spread, and VWAP quoted spread are 0.0372, (0.0425),

and (0.0017), respectively. However, the average coefficients of quoted spread, proportional quoted spread, and VWAP quoted spread for the smallest size-based quintile are 0.2008, 0.3938, and 0.3428, respectively. These findings show that smaller firms have a greater sensitivity to commonality than larger firms.

However, the results in Table 4 are not consistent with the size effect stated by Chordia et al. (2000), where the coefficients in all quintiles are statistically significant and gradually increase with the firm size. But, our results are similar to those of Brockman and Chung (2002) and Lee et al. (2006) that large firms have relatively small β coefficients when liquidity is measured in terms of spreads. Unlike previous studies of Chordia et al. (2000), Brockman and Chung (2000), and Lee et al. (2006), there is no clear size pattern for the depth and dollar depth. However, the average coefficients of smallest quintile are smaller than those of the largest quintile (compare 0.3414 with 0.7504 for depth and 0.1394 with 0.8880 for dollar depth). These findings are cemented by the result in Panel B that the smallest firms tend to have larger spread and smaller depth coefficients than larger firms in response to the market liquidity. The encouraging reason is that small firms stocks may be more sensitive to market changes due to higher information asymmetry.

In summary, firm-size has an impact on the liquidity commonality in the SET. Smaller firms tend to have greater sensitivity to the market liquidity in terms of spread measures while larger firms tend to have greater sensitivity to the market liquidity in terms of depth measures.

4.2.2 Index Inclusion

Table 5 summarizes the market average coefficients across two groups of firms, index and non-index inclusion firms. From Panel A, cross-sectional averages of

time-series slope coefficient are reported with p-values to examine the null hypothesis: index inclusion has no impact on the commonality in liquidity. For quoted spread, it seems that there is no difference between two groups. For proportional quoted spread, and VWAP quoted spread, there is an ambiguous result between index and non-index groups because the percentages of firms with positive and statistically significant coefficient are nearly between two groups, about 0% to 17.4%. These results may not be clear because of the limited number of observations. But, depth liquidity measures show clearer results. For depth and dollar depth, there are 69.6% and 82.6% of index inclusion firms' $B_{M,G}$ coefficients which are positive and statistically significant, compared to 8.7% and 0% of non-index inclusion firms' coefficients.

From the above results, it seems that index inclusion has an impact on the liquidity commonality for depth liquidity measures. These findings are cemented by the results in Panel B that there are the differences between $B_{M,G}$ and $B_{M,NG,}$ and those differences are statically significant for depth and dollar depth. The result also shows that index inclusion firms are more susceptible to the liquidity commonality than non-index inclusion firms for depth liquidity measures. However, the results in Panel B show that there are also the differences between $B_{M,G}$ and $B_{M,NG}$ of proportional quoted spread and VWAP quoted spread, and the differences are statistically significant. Moreover, the result also shows that non-index inclusion firms are more susceptible to the liquidity commonality than index inclusion firms for proportional quoted spread and VWAP quoted spread liquidity measures. In order to increase the number of observations[6], this study also run additional regression based on the list of stock in SET50 as at December 2003 instead of list of stock continually listed in

[6] Another method to increase the number of observations is to change the list of index inclusion firms in this study every six-month to coincide with the change in the list of stocks in the SET50 during the sample period. However, we expect no difference in the result.

SET50 through sample period (the number of observations will increase from 46 firms to 100 firms). The result is provided in Panel C and D of Table 5. However, the empirical result provides similar evidence of index inclusion effect but stronger than the previous evidence.

In summary, Table 5 confirms the index inclusion hypothesis, i.e. the index inclusion firms show greater impact on the liquidity commonality in the SET for proportional quoted spread, VWAP quoted spread, depth, and dollar depth. Non-index inclusion firms tend to have greater sensitivity to the market liquidity in terms of spread measures while index inclusion firms tend to have greater sensitivity to the market liquidity in terms of depth measures.

4.2.3 Market Condition

In Table 6, Panel A presents the summary of the market average coefficients in the up and down market. The cross sectional average of B_u is significant and positive only for proportional quoted spread and VWAP quoted spread while the cross-sectional average of B_d is significant and positive only for depth and dollar depth. However, the cross-sectional mean of B_n is also significant and positive for all liquidity measures. Therefore, this can be implied that the liquidity commonality is indifferent for the up or down market. Besides, the result in Panel B confirms that there is no significant difference between B_d and B_n because the χ^2 is not significant. Our result seems to contradict that of Sujoto et al. 2005, who found strongly supportive evidence that the Australian stock liquidity co-movement is different during up and down markets and investors being more prone to herd during the bull markets, most likely chasing momentum profits while information sources and events will be scarce and inducing investors to become more idiosyncratic in their trading

behavior in the bear market. Conversely, the results in Table 6 lead to the conclusion that market condition has no impact on the commonality in liquidity in the SET.

4.2.4 Ownership Concentration

Table 7 demonstrates the market average coefficients across firms based on the level of ownership concentration. From Panel A, cross-sectional averages of time series slope coefficient are reported with p-values to examine the null hypothesis: ownership concentration has no impact on the commonality in liquidity. While there is an ambiguous pattern for depth measures, the slope coefficient of spread measures generally increases with the level of ownership concentration, i.e. the spreads of high ownership concentration firms have greater response to market-wide changes in spreads. For the highest ownership concentration-based groups, the average coefficients of quoted spread, proportional quoted spread, and VWAP quoted spread are 0.1436, 0.3408, and 0.3782, respectively. On the other hand, the average coefficients of quoted spread, proportional quoted spread, and VWAP quoted spread for the lowest ownership concentration group are 0.0526, 0.2139, and 0.1964, respectively. However, the result in Panel B indicates that the difference between B_{high} and B_{low} is insignificant at the 5% critical level. Therefore, these findings show that ownership concentration has no impact on the liquidity commonality.

Table 1 Descriptive statistics and correlation matrix of liquidity variables

This table presents the summary statistics and correlations of the five liquidity measures for the 361 firms listed on the SET during January 1999 to December 2003. The summary statistics reported in Panel A are cross-sectional statistics computed from individual stock time-series means. The comparative data were obtained from Sujoto et al. (2005) for ASX, Lee et al. (2006) for Taiwan OTC, Brockman and Chung (2002) for SEHK, and Chordia et al. (2000) for NYSE. The daily summary statistic mean, median, and standard deviation of SET are separated into each category (size, index inclusion, market condition, and ownership concentration level) in Panel B, C, D, and E. Panel F reports the correlation between five liquidity measures in SET, ASX (Sujoto et al. (2005)), Taiwan's OTC (Lee et al. (2006)), and NYSE (Chordia et al. (2000)).

Panel A: Daily Summary statistic for time-series means

Year	SET 1999-2003	ASX 2001-2002	Taiwan's OTC 2000	SEHK 1996-1999	NYSE 1992
Quoted Spread[7]					
Mean	1.0007	0.0258	0.4680	0.0588	0.3162
Median	0.2870	0.0215	0.4482	0.0283	0.2691
Standard deviation	2.3816	0.0154	0.1394	-	1.3570
Proportional quoted spread					
Mean	0.0376	0.0133	0.0082	0.0274	0.0160
Median	0.0173	0.0112	0.0077	0.0201	0.0115
Standard deviation	0.0572	0.0078	0.0024	-	0.0136
VWAP quoted spread					
Mean	0.0381	-	-	-	-
Median	0.0173	-	-	-	-
Standard deviation	0.0592	-	-	-	-
Depth					
Mean	70,265	37,318	-	431,463	3,776
Median	8,777	21,731	-	171,968	2,661
Standard deviation	256,784	61,711	-	-	3,790
Dollar Depth					
Mean	848,755	62,015	-	837,826	-
Median	157,977	44,686	-	167,113	-
Standard deviation	2,628,531	74,544	-	-	-

[7] The units of quoted spread are THB for SET, AUD for ASX, TWD for Taiwan's OTC, HKD for SEHK, and USD for NYSE. The unit of proportional quoted spread and VWAP quoted spread is none, while the unit of depth is a number of shares. The Dollar depth is measured in THB, AUD, TWD, HKD, and USD.

Table 1 - continued

Panel B: Daily Summary statistic for time-series means by size quintile

Size quintile	Smallest (N = 72)	2 (N = 72)	3 (N = 73)	4 (N = 72)	largest (N = 72)
Quoted Spread					
Mean	0.8912	0.9575	1.1858	1.1749	0.8098
Median	0.4093	0.3009	0.3287	0.2963	0.2546
Standard deviation	1.4486	2.1862	2.9149	2.8144	2.0567
Proportional quoted spread					
Mean	0.0772	0.0470	0.0370	0.0307	0.0148
Median	0.0446	0.0223	0.0194	0.0151	0.0098
Standard deviation	0.0845	0.0652	0.0497	0.0471	0.0189
VWAP quoted spread					
Mean	0.0786	0.0478	0.0373	0.0311	0.0149
Median	0.0456	0.0223	0.0194	0.0151	0.0098
Standard deviation	0.0877	0.0685	0.0507	0.0490	0.0193
Depth					
Mean	13,315	20,762	41,752	59,535	167,477
Median	3,978	6,271	6,163	9,664	41,731
Standard deviation	145,793	55,102	213,522	197,361	398,400
Dollar Depth					
Mean	77,808	178,068	339,517	561,688	2,374,068
Median	37,602	82,698	117,364	211,951	966,777
Standard deviation	377,857	339,186	1,012,247	1,137,385	4,612,085
Average market value (MB)	181	504	1,260	2,590	22,666

Table 1 - continued

Panel C: Daily Summary statistic for time-series means by index inclusion groups

	Constitute (N = 23)	Non-constitute (N = 23)	Other (N = 315)
Quoted Spread			
Mean	0.9153	1.8054	0.9521
Median	0.2593	0.6667	0.2870
Standard deviation	1.7421	3.3648	2.3483
Proportional quoted spread			
Mean	0.0104	0.0460	0.0402
Median	0.0090	0.0252	0.0189
Standard deviation	0.0051	0.0572	0.0595
VWAP quoted spread			
Mean	0.0104	0.0462	0.0407
Median	0.0090	0.0253	0.0189
Standard deviation	0.0050	0.0578	0.0618
Depth			
Mean	197,722	13,299	59,798
Median	54,108	3,353	8,206
Standard deviation	398,695	44,582	240,241
Dollar Depth			
Mean	3,485,264	223,112	592,190
Median	1,875,606	94,295	133,936
Standard deviation	4,436,999	1,343,884	2,219,400
Average market value (MB)	43,415	1,587	2,936

Table 1 - continued

Panel D: Daily Summary statistic for time-series means by market condition

	Market Condition		
	Down (t=410)	Neutral (t=409)	Up (t=410)
Quoted Spread			
Mean	1.0661	0.9433	0.9954
Median	0.3148	0.2731	0.2824
Standard deviation	2.4996	2.2437	2.3977
Proportional quoted spread			
Mean	0.0417	0.0340	0.0374
Median	0.0198	0.0153	0.0167
Standard deviation	0.0610	0.0529	0.0572
VWAP quoted spread			
Mean	0.0426	0.0344	0.0376
Median	0.0199	0.0153	0.0167
Standard deviation	0.0640	0.0548	0.0586
Depth			
Mean	62,485	71,546	76,341
Median	7,813	9,374	9,280
Standard deviation	246,021	261,276	262,024
Dollar Depth			
Mean	737,760	879,615	923,048
Median	139,039	167,210	169,424
Standard deviation	2,533,118	2,722,527	2,619,346

Table 1 - continued

Panel E: Daily Summary statistic for time-series means by ownership concentration level

	Ownership concentration groups		
	Highest (N=107)	2 (N=107)	Lowest (N=107)
Quoted Spread			
Mean	1.5907	0.9984	0.6486
Median	0.5870	0.3241	0.2500
Standard deviation	3.3150	2.3862	1.4177
Proportional quoted spread			
Mean	0.0519	0.0378	0.0264
Median	0.0228	0.0180	0.0131
Standard deviation	0.0726	0.0554	0.0413
VWAP quoted spread			
Mean	0.0527	0.0382	0.0267
Median	0.0229	0.0180	0.0131
Standard deviation	0.0755	0.0570	0.0434
Depth			
Mean	29,373	44,275	119,819
Median	4,007	7,023	20,657
Standard deviation	101,185	174,942	338,698
Dollar Depth			
Mean	520,835	613,782	1,295,642
Median	98,725	131,319	337,940
Standard deviation	2,609,801	2,021,261	2,648,472
Average Market Value (MB)	4,437	6,482	6,295

Table 1 - continued

Panel F: Cross-sectional statistics for time series correlations between liquidity measure pairs for an individual stock

SET

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth
Proportional quoted spread	0.4630			
VWAP quoted spread	0.4573	0.9874		
Depth	-0.0958	-0.0845	-0.0837	
Dollar Depth	-0.0707	-0.1345	-0.1324	0.6419

ASX

	Quoted spread	Proportional quoted spread	Depth
Proportional quoted spread	0.7432		
Depth	-0.1803	-0.0159	
Dollar Depth	-0.1395	-0.1469	0.9174

Taiwan's OTC

	Quoted spread	Proportional quoted spread
Proportional quoted spread	0.083	
Depth	-0.136	-0.199

NYSE

	Quoted spread	Proportional quoted spread
Proportional quoted spread	0.844	
Depth	-0.396	-0.303

Table 2 Market-wide commonality in liquidity

This table presents the existence of market-wide liquidity commonality by reporting the results from the estimation of the following equation for each stock:

$$\Delta Liquidity_{j,t} = \alpha_j + \beta_{j,1}\Delta Liquidity_{M,t} + \beta_{j,2}\Delta Liquidity_{M,t+1} + \beta_{j,3}\Delta Liquidity_{M,t-1} + \delta_{j,1} Return_{M,t} + \delta_{j,2} Return_{M,t+1} + \delta_{j,3} Return_{M,t-1} + \delta_{j,4}\Delta Volatility_{j,t} + \varepsilon_{j,t}$$

where $\Delta Liquidity_{j,t}$ is the percentage change in individual stock liquidity from trading day t-1 to day t in the stock j' s liquidity. $Liquidity_{M,t}$ is an equally weighted average on day t for all firms representing the market, excluding firm j. $Return_{M,t}$ is an equally weighted average of the daily return at day t for all firms, excluding firm j. $Volatility_{j,t}$ is the return volatility for firm j on trading day t. The means [median] of time series slope coefficients are reported. 'Sum' aggregates coefficients for concurrent, lag, and lead of market liquidity. The 'p-value' reports the p-value of the sign test for the H_1 that the median of the estimated coefficients $\neq 0$. '# + (-)' reports the number of positive (negative) slope coefficients while '# significant + (-)' reports the numbers with t-statistics greater (less) than the 5% critical level. R^2 (Adjusted R^2) is the cross-sectional mean R^2 (Adjusted R^2).

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
Concurrent					
Coefficient mean	0.0750	0.1607	0.1632	0.4094	0.4534
[median]	[0.0433]	[0.1241]	[0.0963]	[0.3673]	[0.3969]
p-value	<.0001	<.0001	<.0001	<.0001	<.0001
# +(-)	231(130)	259(102)	252(109)	296(65)	294(67)
# significant +(-)	23(5)	50(5)	49(9)	133(2)	136(2)
Lead					
Coefficient mean	0.0056	0.0179	0.0180	0.0986	0.0684
[median]	[-0.0018]	[0.0243]	[0.0191]	[0.0443]	[0.0116]
p-value	1.0000	0.0154	0.0351	0.0114	0.4613
# +(-)	180(181)	204(157)	201(160)	205(156)	188(173)
# significant +(-)	11(13)	25(9)	23(12)	12(2)	12(1)
Lag					
Coefficient mean	-0.0163	0.0314	0.0258	0.0483	0.0567
[median]	[0.0117]	[0.0228]	[0.0159]	[0.0359]	[0.0686]
p-value	0.0920	0.0734	0.1405	0.0061	0.0022
# +(-)	197(164)	198(163)	196(166)	207(154)	210(151)
# significant +(-)	16(7)	20(4)	17(4)	15(2)	18(6)
Sum					
Coefficient mean	0.0642	0.2100	0.2070	0.5563	0.5785
[median]	[0.0666]	[0.1445]	[0.1299]	[0.5146]	[0.5349]
p-value	0.0002	<.0001	<.0001	<.0001	<.0001
R^2	0.0222	0.0269	0.0280	0.0428	0.0487
Adjusted R^2	0.0093	0.0142	0.0153	0.0303	0.0362

Table 3 Industry-wide commonality in liquidity

This table presents the existence of industry-wide liquidity commonality by reporting the results from the estimation of the following equation for each stock:

$$\Delta Liquidity_{j,t} = \alpha_{j} + \beta_{j,1}\Delta Liquidity_{M,t} + \beta_{j,2}\Delta Liquidity_{M,t+1} + \beta_{j,3}\Delta Liquidity_{M,t-1} + \gamma_{j,1}\Delta Liquidity_{I,t} + \gamma_{j,2}\Delta Liquidity_{I,t+1} + \gamma_{j,3}\Delta Liquidity_{I,t-1} + \delta_{j,1} Return_{M,t} + \delta_{j,2} Return_{M,t+1} + \delta_{j,3} Return_{M,t-1} + \delta_{j,4}\Delta Volatility_{j,t} + \varepsilon_{j,t}$$

$Liquidity_{I,t}$ is an equally weighted average on day t of the liquidity measure for all firms in the industry, excluding firm j. All other variables are the same as defined in equation (1). The means [median] of time series slope coefficients liquidity commonality are reported. 'Sum' aggregates coefficients for concurrent, lag, and lead of market liquidity. The 'p-value' reports the p-value of the sign test for the H_1 that the median of the estimated coefficients $\neq 0$. '# + (-)' reports the number of positive (negative) slope coefficients while '# significant + (-)' reports the numbers with t-statistics greater (less) than the 5% critical level. R^2 (Adjusted R^2) is the cross-sectional mean R^2 (Adjusted R^2).

	Quoted spread		Proportional quoted spread		VWAP quoted spread		Depth		Dollar Depth	
	Market	Industry	Market	Industry	Market	Industry	Market	Industry	Market	Industry
Concurrent										
Coefficient mean	0.0669	0.0166	0.1513	0.0230	0.1546	0.0202	0.2792	0.1287	0.3038	0.1695
[median]	[0.0390]	[0.0045]	[0.1265]	[0.0123]	[0.0948]	[0.0164]	[0.3046]	[0.0912]	[0.3176]	[0.1054]
p-value	<.0001	0.3435	<.0001	0.0005	<.0001	0.0007	<.0001	<.0001	<.0001	<.0001
Lead										
Coefficient mean	0.0067	-0.0035	0.0180	-0.0029	0.0270	-0.0144	0.0810	0.0252	0.0430	0.0274
[median]	[-0.0014]	[-0.0019]	[0.0253]	[-0.0015]	[0.0183]	[-0.0035]	[0.0336]	[0.0082]	[0.0137]	[0.0042]
p-value	0.9162	0.3435	0.0007	0.3998	0.0204	0.3435	0.0154	0.2925	0.5987	0.5277
Lag										
Coefficient mean	-0.0222	0.0025	0.0239	0.0034	0.0208	0.0038	0.0423	0.0146	0.0475	0.0279
[median]	[0.0030]	[-0.0010]	[0.0195]	[-0.0023]	[0.0141]	[0.0014]	[0.0339]	[-0.0029]	[0.0264]	[0.0157]
p-value	0.5987	0.5987	0.1405	0.3998	0.2925	0.4613	0.2065	0.8333	0.0734	0.0734
Sum										
Coefficient mean	0.0514	0.0156	0.1933	0.0236	0.2025	0.0096	0.4025	0.1686	0.3943	0.2248
[median]	[0.0494]	[0.0085]	[0.1453]	[0.0130]	[0.0981]	[0.0114]	[0.3791]	[0.1007]	[0.3646]	[0.1244]
p-value	0.0204	0.5277	<.0001	0.0154	0.0001	0.0454	<.0001	<.0001	<.0001	<.0001
R^2	0.0283		0.0331		0.0342		0.0495		0.0565	
Adjusted R^2	0.0099		0.0148		0.0159		0.0316		0.0388	

Table 4 Market-wide commonality in liquidity by size quintile

This table reports the market-wide liquidity commonality ranking by size quintile by performed the same regression analysis as mentioned in table 2 but the sample was divided into 5 size-based quintiles (based on average of daily market capitalization for 5 years) and ran the time series regression for each quintile. The means [median] of time series slope coefficients liquidity commonality are reported in Panel A. 'Sum' aggregates coefficients for concurrent, lag, and lead of market liquidity. The 'p-value' reports the p-value of the sign test for the H_1 that the median of the estimated coefficients $\neq 0$. '# + (-)' reports the number of positive (negative) slope coefficients while '# significant + (-)' reports the numbers with t-statistics greater (less) than the 5% critical level. R^2 (Adjusted R^2) is the cross-sectional mean R^2 (Adjusted R^2). Panel B reports the coefficient of the difference between median of $SUM_{M, small}$ and median of $SUM_{M, large}$.

Panel A: Summary of size-based coefficients estimated from null hypothesis that the median of the estimated coefficients = 0

Size quintile	smallest[8] (N = 72)	2 (N = 72)	3 (N = 73)	4 (N = 72)	Largest (N = 72)
Quoted spread					
Sum mean	0.2008	-0.0290	0.0775	0.0344	0.0372
[median]	[0.0686]	[0.1428]	[0.0884]	[0.0691]	[0.0189]
p-value	0.1945	0.0444	0.1006	0.0245	0.5560
R^2	0.0251	0.0235	0.0212	0.0213	0.0222
Adjusted R^2	0.0075	0.0096	0.0089	0.0095	0.0093
Proportional quoted spread					
Sum mean	0.3938	0.3605	0.2759	0.0613	-0.0425
[median]	[0.4323]	[0.2557]	[0.3349]	[0.1122]	[0.0201]
p-value	0.0013	0.0002	0.0009	0.0245	0.5560
R^2	0.0301	0.0282	0.0282	0.0252	0.0230
Adjusted R^2	0.0126	0.0143	0.0160	0.0134	0.0144
VWAP quoted spread					
Sum mean	0.3428	0.3539	0.2560	0.0834	-0.0017
[median]	[0.3332]	[0.2838]	[0.3266]	[0.1200]	[0.0125]
p-value	0.0013	<.0001	0.0095	0.0013	0.9063
R^2	0.0315	0.0291	0.0289	0.0263	0.0243
Adjusted R^2	0.0139	0.0153	0.0167	0.0145	0.0159
Depth					
Sum mean	0.3414	0.3970	0.3704	0.9247	0.7504
[median]	[0.2558]	[0.3110]	[0.4433]	[0.6276]	[0.8289]
p-value	0.0029	<.0001	<.0001	<.0001	<.0001
R^2	0.0543	0.0330	0.0361	0.0428	0.0479
Adjusted R^2	0.0372	0.0193	0.0240	0.0313	0.0396
Dollar Depth					
Sum mean	0.1394	0.7161	0.4460	0.7049	0.8880
[median]	[0.1878]	[0.3951]	[0.5288]	[0.6965]	[0.9740]
p-value	0.1249	0.0013	<.0001	<.0001	<.0001
R^2	0.0570	0.0375	0.0444	0.0476	0.0568
Adjusted R^2	0.0400	0.0239	0.0325	0.0361	0.0486

[8] The average market values of each group are 181, 504, 1,260, 2,590, and 22,666 million baht ranking from smallest to largest quintile, respectively.

Table 4 – continued

Panel B: Summary of coefficients estimated from null hypothesis: Median of $SUM_{M, small}$ = Median of $SUM_{M, large}$

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
DiffBeta ($B_{small} - B_{large}$)					
Mean	0.1635	0.4363	0.3445	-0.4090	-0.7486
Median	-0.0027	0.4991	0.4237	-0.4056	-0.7276
p-value	1.0000	0.0013	0.0013	0.0005	<.0001

Table 5 Summary of index inclusion and non-index inclusion commonality in liquidity coefficients

This table reports the market-wide liquidity commonality categorized by index inclusion group by means of the same regression analysis as mentioned in table 2 but the sample was divided into 2 groups (index and non-index inclusion) and ran the time series regression for each group. The means [median] of time series slope coefficients liquidity commonality are reported in Panel A. '$B_{M, G}$' ('$B_{M, NG}$') aggregates coefficients for concurrent, lead, and lag of market liquidity for the individual stock that were constituent (non-constituent) stocks of SET50 index throughout sample period. The 'p-value' reports the p-value of the sign test for the ($H_{1)}$ that the median of the estimated coefficients ≠ 0. '# + (-)' reports the number of positive (negative) slope coefficients while '# significant + (-)' reports the numbers with t-statistics greater (less) than the 5% critical level. R^2 (Adjusted R^2) is the cross-sectional mean R^2 (Adjusted R^2). Panel B reports the coefficient of the difference between median of $SUM_{M, G}$ and median of $SUM_{M, NG}$.

Panel A: Summary of index and non-index inclusion coefficients estimated from null hypothesis that the median of the estimated coefficients = 0 (constituent firms based on list of SET50 stock continually listed through January 1999 to December 2003).

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
$B_{M,G}$ Mean[9]	0.0354	-0.0407	-0.0478	0.8889	1.0814
[Median]	[0.0331]	[-0.0684]	[-0.0793]	[0.8555]	[1.1553]
p-value	0.4049	0.4049	0.2100	<.0001	<.0001
# +(-)	14(9)	9(14)	8(15)	23(0)	23(0)
# significant +(-)	1(2)	0(2)	0(2)	16(0)	19(0)
$B_{M,NG}$ Mean	0.3349	0.6314	0.5577	0.4125	0.2675
[Median]	[0.1891]	[0.3346]	[0.3150]	[0.2449]	[0.3181]
p-value	0.0347	0.0347	0.0347	0.0106	0.0347
# +(-)	17(6)	17(6)	17(6)	18(5)	17(6)
# significant +(-)	1(0)	4(0)	2(0)	2(0)	0(0)
R^2	0.0163	0.0212	0.0222	0.0292	0.0343
Adjusted R^2	0.0078	0.0128	0.0138	0.0208	0.0259

Panel B: Summary of coefficients estimated from null hypothesis: Median of $SUM_{M, G}$ = Median of $SUM_{M, NG}$

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
DiffBeta ($B_{M,NG}$ - $B_{M,G}$)					
Mean	0.2995	0.6722	0.6055	-0.4764	-0.8139
Median	0.1429	0.3438	0.4778	-0.6106	-0.8495
p-value	0.0931	0.0026	0.0106	0.0106	0.0005

[9] The average market values of two groups are 43,415 and 1,587 million baht for constitute and non-constitute groups, respectively.

Table 5 – continued

Panel C: Summary of index and non-index inclusion coefficients estimated from null hypothesis that the median of the estimated coefficients = 0 (constituent firms based on list of SET50 as at December 2003).

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
$B_{M,G}$ Mean[10]	-0.0327	-0.1334	-0.0816	0.8435	1.0265
[Median]	[0.0163]	[-0.0420]	[-0.0279]	[0.8792]	[1.0686]
p-value	0.6718	0.6718	0.3222	<.0001	<.0001
# +(-)	31(19)	27(23)	26(24)	50(0)	49(1)
# significant +(-)	1(1)	2(2)	1(2)	44(0)	49(0)
$B_{M,NG}$ Mean	0.2127	0.5361	0.5161	0.3880	0.3626
[Median]	[0.0770]	[0.3546]	[0.3444]	[0.3400]	[0.3713]
p-value	0.1189	0.0066	0.0066	0.0003	0.0009
# +(-)	39(11)	42(8)	43(7)	39(11)	39(11)
# significant +(-)	3(0)	11(0)	10(0)	10(0)	10(0)
R^2	0.0190	0.0232	0.0242	0.0424	0.0505
Adjusted R^2	0.0096	0.0138	0.0148	0.0332	0.0415

Panel D: Summary of coefficients estimated from null hypothesis: Median of $SUM_{M,\ G}$ = Median of $SUM_{M,\ NG}$

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
DiffBeta ($B_{M,NG}$ - $B_{M,G}$)					
Mean	0.2455	0.6697	0.5977	-0.4555	-0.6639
Median	0.1307	0.3675	0.4311	-0.5713	-0.7574
p-value	0.0153	0.0009	<.0001	0.0026	<.0001

[10] The average market values of two groups are 28,152 and 1,890 million baht for constitute and non-constitute groups, respectively.

Table 6 Commonality in liquidity: Conditioning on up and down markets

This table reports the market-wide liquidity commonality categorized by market conditions by the means of Sujoto et al. (2005) specification as following equation:

$$\Delta Liquidity_{j,t} = \alpha_{j,n} D_n + \alpha_{j,u} D_u + \alpha_{j,d} D_d + \beta_{j,n} D_n \Delta Liquidity_{M,t} + \beta_{j,u} D_u \Delta Liquidity_{M,t} + \beta_{j,d} D_d \Delta Liquidity_{M,t} + \lambda \Delta Liquidity_{j,t-1} + \varepsilon_{j,t}$$

where $\Delta Liquidity_{j,t}$ is the percentage change in individual stock liquidity from trading day t-1 to day t in the stock j' s liquidity. $Liquidity_{M,t}$ is an equally weighted average on day t for all firms in the sample representing the market, excluding firm j. D_d (D_u) [D_n] is a dummy variable which takes the value of 1 in down (up) [neutral] markets and 0 otherwise. Panel A reports the means [median] of time series slope coefficients liquidity commonality for up-market and down-market. The 'p-value' reports the p-value of the sign test for the H_1 that the median of the estimated coefficients $\neq 0$. '# + (-)' reports the number of positive (negative) slope coefficients while '# significant + (-)' reports the numbers with t-statistics greater (less) than the 5% critical level. Panel B reports the results of conducting the Wald test with null hypothesis H_0: $B_u = B_d$. χ^2 denote the cross-sectional averages of chi-square statistic. '%_*' ('%_**') reports the percentage of stocks which significantly reject the null hypothesis at the 5% (10%) level.

Panel A: Summary of Up-market and Down-market Commonality in Liquidity Coefficients

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
B_u Mean	0.0144	0.0822	0.1132	0.0834	0.0303
[Median]	[0.0259]	[0.0499]	[0.0563]	[0.0327]	[-0.0293]
p-value	0.1142	0.0269	0.0061	0.7522	0.4613
# +(-)	196(165)	202(159)	207(154)	183(178)	173(188)
# significant +(-)	7(8)	13(5)	17(6)	15(7)	12(15)
B_d Mean	0.0149	0.1223	0.1321	-0.0257	-0.1072
[Median]	[-0.0035]	[0.0146]	[0.0102]	[-0.0862]	[-0.0975]
p-value	0.7522	0.5277	0.3435	0.0084	0.0032
# +(-)	177(184)	187(174)	190(171)	155(206)	152(209)
# significant +(-)	23(15)	18(9)	19(8)	11(14)	9(16)
B_n Mean	0.0608	0.0541	0.0438	0.3474	0.3754
[Median]	[0.0227]	[0.0249]	[0.0215]	[0.3824]	[0.4173]
p-value	0.0002	0.0454	0.0454	<.0001	<.0001
# +(-)	216(145)	200(161)	200(161)	273(88)	275(86)
# significant +(-)	15(5)	12(7)	8(9)	100(5)	99(1)
R^2	0.0347	0.0397	0.0410	0.0554	0.0612
Adjusted R^2	0.0128	0.0179	0.0192	0.0340	0.0400

Panel B: Wald Test Results

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
χ^2	1.3069	1.4558	1.5581	1.2138	1.2464
%_*	9.1413	10.5263	10.5263	7.7562	8.0332
%_**	15.2355	15.5125	16.3435	13.2964	13.0194

Table 7 Market-wide commonality in liquidity by ownership concentration

This table reports the market-wide liquidity commonality categorized by ownership concentration levels by performing the same estimation as mentioned in table 2 but the sample was divided into 3 groups ranking by the level of ownership concentration and ran the time series regression for each group. The means [median] of time series slope coefficients liquidity commonality are reported in Panel A. 'Sum' aggregates coefficients for concurrent, lag, and lead of market liquidity. The 'p-value' reports the p-value of the sign test for the H_1 that the median of the estimated coefficients $\neq 0$. '# + (-)' reports the number of positive (negative) slope coefficients while '# significant + (-)' reports the numbers with t-statistics greater (less) than the 5% critical level. R^2 (Adjusted R^2) is the cross-sectional mean R^2 (Adjusted R^2). Panel B reports the coefficient of the difference between median of $SUM_{M, low}$ and median of $SUM_{M, high.}$

Panel A: Summary of high, medium and low level of ownership concentration coefficients estimated from null hypothesis that the median of the estimated coefficients = 0

	Ownership concentration groups		
	Lower[11] (N = 107)	2 (N = 107)	Highest (N = 107)
Quoted spread			
Sum mean [median]	0.0526[0.0730]	0.0595[0.0617]	0.1436[0.1027]
p-value	0.0009	0.2459	0.0199
R^2	0.0219	0.0190	0.0240
Adjusted R^2	0.0122	0.0090	0.0086
Proportional quoted spread			
Sum mean [median]	0.2139[0.1269]	0.2378[0.2034]	0.3408[0.3019]
p-value	<.0001	<.0001	0.0018
R^2	0.0279	0.0223	0.0278
Adjusted R^2	0.0183	0.0122	0.0124
VWAP quoted spread			
Sum mean [median]	0.1964[0.1246]	0.2342[0.1138]	0.3782[0.3158]
p-value	<.0001	0.0009	<.0001
R^2	0.0292	0.0233	0.0290
Adjusted R^2	0.0196	0.0132	0.0136
Depth			
Sum mean [median]	0.6479[0.7335]	0.4152[0.4100]	0.4534[0.3666]
p-value	<.0001	<.0001	<.0001
R^2	0.0538	0.0362	0.0274
Adjusted R^2	0.0445	0.0263	0.0121
Dollar Depth			
Sum mean [median]	0.6070[0.8101]	0.7040[0.4265]	0.4490[0.3338]
p-value	<.0001	<.0001	<.0001
R^2	0.0629	0.0419	0.0287
Adjusted R^2	0.0537	0.0321	0.0133

[11] The average market values of three groups are 4,437, 6,482, and 6,295 million baht ranking from lowest to highest level of ownership concentration groups, respectively.

Table 7 – continued

Panel B: Summary of coefficients estimated from null hypothesis: Median of $SUM_{M, low}$ = Median of $SUM_{M, high}$

	Quoted spread	Proportional quoted spread	VWAP quoted spread	Depth	Dollar Depth
DiffBeta ($B_{high} - B_{low}$)					
Mean	0.0910	0.1268	0.1818	-0.1944	-0.1579
Median	0.1014	0.1065	0.1837	-0.1728	-0.2268
p-value	0.0527	0.1756	0.1215	0.1215	0.1215

CHAPTER V

CONCLUSION AND AREAS FOR FUTURE RESEARCH

5.1 Conclusion

The purpose of this research is to investigate the co-movement of Thai stock liquidity with the market and industry liquidity, so called 'commonality in liquidity'. Although recent researches have established a widespread existence of commonality in liquidity, the liquidity commonality in Thailand has not been empirically documented. This study also examines the liquidity commonality in an extended sample period, and establishes additional perspective on commonality in liquidity. Recognizing the liquidity commonality can provide additional aspect in asset pricing related to liquidity. In addition, other factors, including size, index-inclusion, market condition, and ownership concentration, must also be considered in asset pricing.

In this research study, the investigation was conducted by employing a regression analysis of common factors for five liquidity measures using daily data which was averaged from the intraday data over the sample period from January 4, 1999 to December 31, 2003. The analysis reveals that the market- and industry- wide effects exist in the SET. All five liquidity measures co-move with the market liquidity. Furthermore, average coefficients are positive and are statistically significant difference from zero. However, the coefficients are lower in significance level and are less pervasive when compared to those of other markets, namely the NYSE, SEHK, ASX, and Taiwan's OTC stock market. Results from this study also reveal the industry-wide liquidity as additional common factor for stock's liquidity but the impact of industry liquidity is lower than that of market liquidity.

In addition, this research also finds that small firms tend to have greater sensitivity to the market liquidity in terms of spread measures, while larger firms tend to have greater sensitivity to the market liquidity in terms of depth measures. Moreover, non-index inclusion firms tend to have greater sensitivity to the market-wide liquidity in terms of spread measures, while index inclusion firms tend to have greater sensitivity to the market liquidity in terms of depth measures. In contrast, market condition and ownership concentration seem to have no impact on liquidity commonality.

The existence of liquidity commonality and its factors are in line with the hypotheses, except for the market condition and the ownership concentration aspects. The implication for the existence of liquidity commonality is that liquidity commonality should be one of the risk factors accounted for in asset pricing model. And for the effect of size and index inclusion, it may lead to the differences in liquidity risk in asset pricing between small and large firms, and constitute and non-constitute groups. Moreover, market condition and ownership concentration imply that liquidity risk is the same during the market up or down situation, and there is indifference between high or low ownership concentrations. Therefore, the two factors can be disregarded as a price source of risk factors.

5.2 Areas for Future Research

Like all other researches, this thesis also has a limitation. This thesis is subjected to the time constraint and the availability of the intraday data. When more updated data are publicly available, revisiting these hypotheses could reveal some new information, or it could confirm some of these research findings.

Another interesting issue from this thesis is that although commonality in liquidity does exist in the SET, the adjusted R^2 is not very large. This could be caused by some elements of noises or some unknown factors. Further investigation may reveal additional factors that could better explain the liquidity commonality.

Moreover, future research can be carried out by improving the empirical model to further analyze the liquidity commonality and the implication of liquidity commonality to other areas, such as asset pricing, risk valuation and behavioral finance.

In addition, Thailand is an order-driven market, which is one of several different types of markets. Applying the theoretical framework and methodology adopted in this thesis into other markets with different structural characteristic will provide evidence that will supplement the analysis conducted in this thesis.

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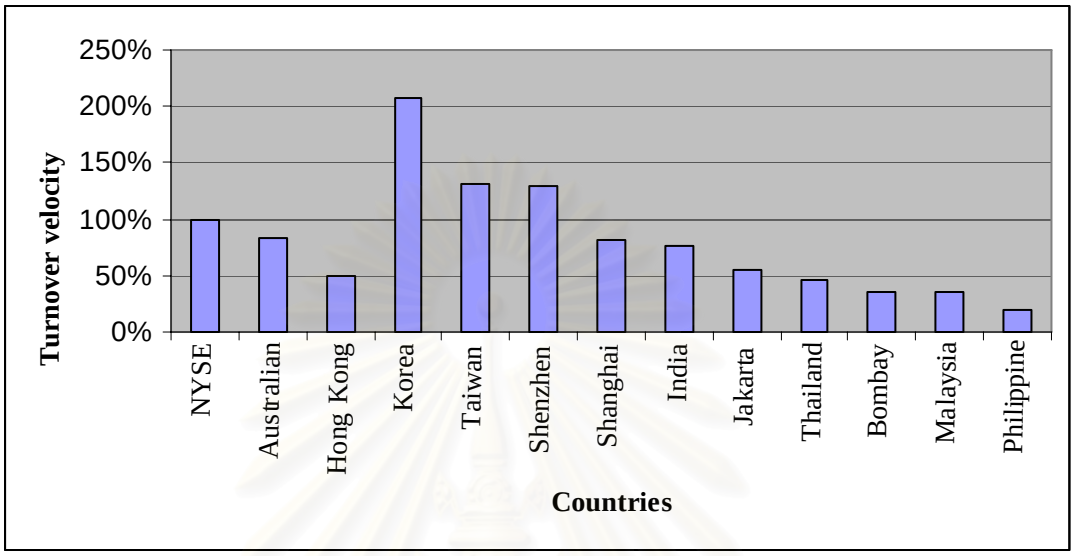
Appendices

Appendix A

Comparison of the Liquidity among Different Stock Exchanges



Name of Exchange	No. of Listed companies	Turnover velocity	Name of Exchange	No. of Listed companies	Turnover velocity
EMERGING ASIA			**OTHER MARKET**		
Korea Exchange	1,616	206.9%	NYSE	2,270	99.1%
Taiwan SE Corp.	696	131.4%	Australian SE	1,714	84.0%
Shenzhen SE	544	128.9%	Hong Kong SE	1,135	50.3%
Shanghai SE	833	82.1%			
National SE India	1,034	75.6%			
Jakarta SE	336	54.7%			
Thailand SE	**504**	**46.1%**			
Bombay SE	4,763	35.4%			
Bursa Malaysia	1,019	35.4%			
Philippine SE	237	19.7%			

Turnover velocity is the ratio between the turnover of domestic shares and their market capitalization. The value is annualized by multiplying the monthly moving average by 12, according to the following formula:

(Monthly Domestic Share Turnover÷Month-end Domestic Market Capitalization)*12

Turnover velocity is calculated in 2 steps :

- Step 1: We first calculate for each month the annualized ratio between the domestic share turnover and the domestic market capitalization, multiplied by 12 ;
- Step 2: Then, we add them together by using a moving average methodology, the percentage ratios obtained in Step 1, divided by 12.

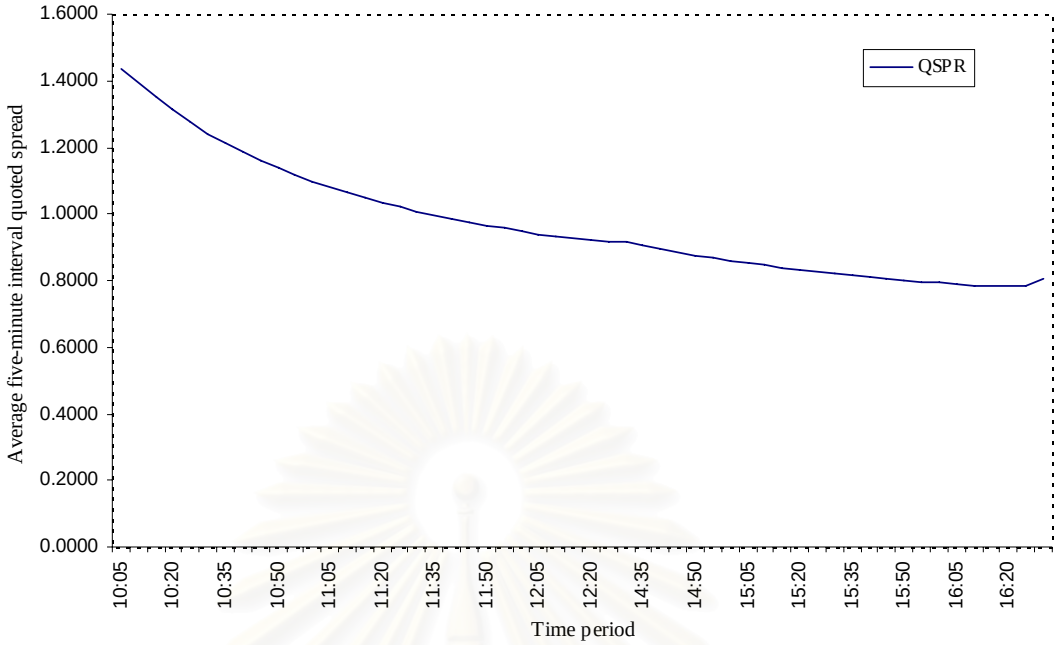
Source: http://www.world-exchanges.org/

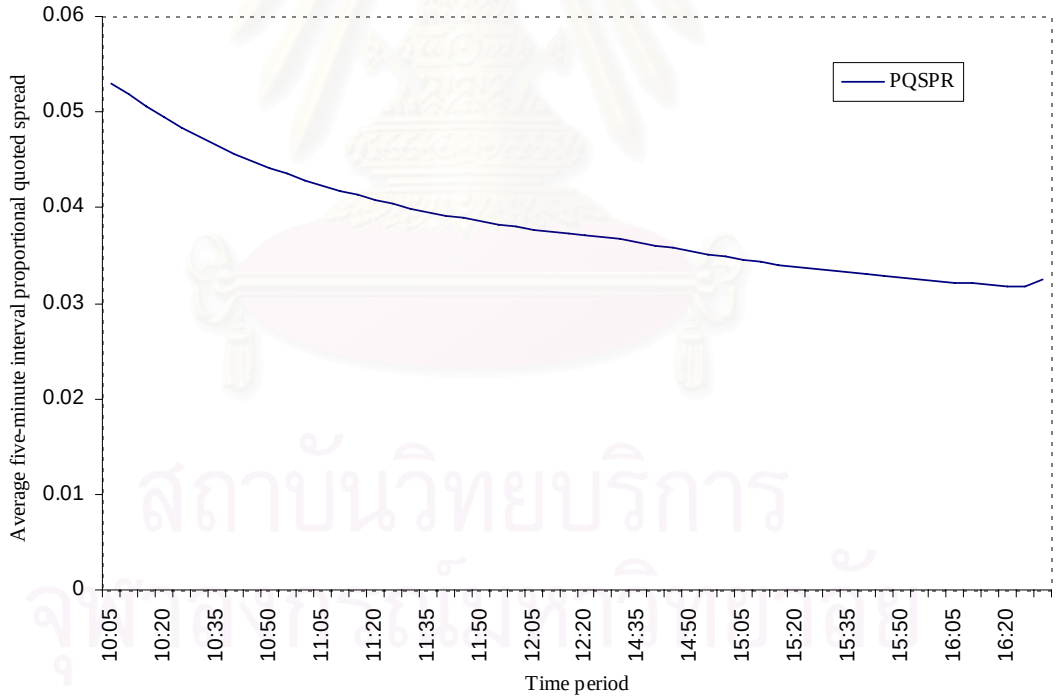
Appendix B

Intraday Quoted Spread and Proportional Quoted Spread in SET

Quoted spread and proportional quoted spread for each five-minute interval in the regular trading session is measured by $P_{A,t} - P_{B,t}$ and $(P_{A,t} - P_{B,t})/ P_{M,t}$ where P_A is ask price, P_B is bid price, P_M is mid-price between ask price and bid price, and t is time at the end of the interval. Reported values are the averages across all security-days. Only time periods in the normal trading session (without call market) are included.

Morning Session			Afternoon Session		
Period ended	QSPR	PQSPR	Period ended	QSPR	PQSPR
10:05	1.4382	0.0529	14:35	0.9072	0.0364
10:10	1.3958	0.0518	14:40	0.8952	0.0361
10:15	1.3523	0.0506	14:45	0.8852	0.0357
10:20	1.3118	0.0495	14:50	0.8757	0.0354
10:25	1.2745	0.0484	14:55	0.8679	0.0351
10:30	1.2404	0.0474	15:00	0.8598	0.0348
10:35	1.2117	0.0465	15:05	0.8523	0.0346
10:40	1.1847	0.0456	15:10	0.8452	0.0343
10:45	1.1586	0.0449	15:15	0.8387	0.0341
10:50	1.1370	0.0441	15:20	0.8339	0.0338
10:55	1.1166	0.0435	15:25	0.8286	0.0336
11:00	1.0960	0.0429	15:30	0.8227	0.0334
11:05	1.0791	0.0423	15:35	0.8173	0.0332
11:10	1.0625	0.0418	15:40	0.8112	0.0330
11:15	1.0475	0.0413	15:45	0.8060	0.0329
11:20	1.0331	0.0409	15:50	0.8011	0.0327
11:25	1.0199	0.0404	15:55	0.7971	0.0325
11:30	1.0056	0.0400	16:00	0.7922	0.0324
11:35	0.9949	0.0396	16:05	0.7885	0.0322
11:40	0.9849	0.0392	16:10	0.7847	0.0320
11:45	0.9750	0.0389	16:15	0.7819	0.0319
11:50	0.9668	0.0386	16:20	0.7819	0.0318
11:55	0.9572	0.0383	16:25	0.7833	0.0318
12:00	0.9486	0.0380	16:30	0.8072	0.0324
12:05	0.9396	0.0377			
12:10	0.9332	0.0375			
12:15	0.9264	0.0373			
12:20	0.9210	0.0370			
12:25	0.9159	0.0368			
12:30	0.9176	0.0368			


1.6000
1.4000
1.2000
1.0000
0.8000
0.6000
0.4000
0.2000
0.0000
Average five-minute interval quoted spread
QSPR
10:05
10:20
10:35
10:50
11:05
11:20
11:35
11:50
12:05
12:20
14:35
14:50
15:05
15:20
15:35
15:50
16:05
16:20
Time period


0.06
0.05
0.04
0.03
0.02
0.01
0
Average five-minute interval proportional quoted spread
PQSPR
10:05
10:20
10:35
10:50
11:05
11:20
11:35
11:50
12:05
12:20
14:35
14:50
15:05
15:20
15:35
15:50
16:05
16:20
Time period

Appendix C

Detail of calculation of free float by SEC

The free float of a listed security is the proportion of shares available for purchase in the market by investors. In principal, it is that part of shares not held by strategic shareholders and not held as treasury stock. The Research Department of the SEC defines strategic shareholders and estimates the free float under a set of guidelines, which are detailed in the section below. Listed companies of which ownership structures have changed significantly may contact the Research Department at freeflo@sec.or.th for free float adjustment.

Free Float Estimation Guidelines

1. Free float is the proportion of shares not held by strategic shareholders and not reacquired by the issuing company. Strategic shareholders are holders of shares for the purpose of company management or for business strategy. The following shareholders are considered as strategic shareholders:

1) Government, state-owned enterprises, and government agencies
2) Board members, managers or officials on the top four positions ranking down from the manager, including their related persons
3) Shareholders that hold shares in the proportion of more than 5%, with exception to the following groups of shareholders: securities companies, life-insurance companies, insurance companies, mutual funds, and contractual saving funds
4) Shareholders who have controlling power of the company
5) Shareholders whose shares are subjected to silent period

2. free float is estimated from the company's shareholder register as of the latest registered book closing date for general meeting in each year and is adjusted for subsequent changes in ownership structure as follows:

1) Newly issued shares offered through public offerings, and shares issued for warrant exercise, preferred stock / debenture conversion are classified as free float.

2) Newly issued shares offered through private placements are classified as shares held by strategic shareholders.
3) Changes in management's shareholdings as reported in Form 59-2.
4) In case of strategic shareholders selling their shares through public offerings, these shares will be counted as free float.
5) In case of treasury Stocks, if a listed company buys its shares back, free float will decrease and vice versa.

3. Sources of information used for free float estimation are from SET Smart database, the Stock Exchange of Thailand, except report of Form 59-2, which is from the Office of the Securities and Exchange Commission.

Source: http://capital.sec.or.th/webapp/freefloat/ffinfoe.htm

Biography

Miss Thitirat Lohaset was born on January 17, 1982 in Bangkok, Thailand. At the undergraduate level, she graduated from the Faculty of Commerce and Accountancy, Thammasat University in February 2003 with a Bachelor Degree in Business Administration (First Class Honors), majoring in Accounting. She then joined PricewaterhouseCoopers ABAS Ltd. during July 2003 to September 2004 as an audit assistant. She currently enrolls in the Master of Science in Finance program, Chulalongkorn University since June 2005.