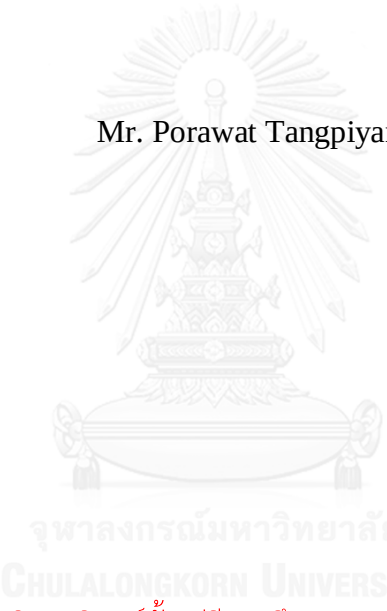
Understanding the Liquidity Commonality in the Stock Exchange of Thailand

Mr. Porawat Tangpiyanan



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ความเข้าใจสภาพคล่องร่วมในตลาดหลักทรัพย์แห่งประเทศไทย

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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ปรวัฒน์ ตั้งปิยนันท์ : ความเข้าใจสภาพคล่องร่วมในตลาดหลักทรัพย์แห่งประเทศไทย (Understanding the Liquidity Commonality in the Stock Exchange of Thailand) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: รศ. ดร. สันติ ถิรพัฒน์, 57 หน้า.

วิทยานิพนธ์ฉบับนี้ศึกษาสภาพคล่องร่วมในตลาดหลักทรัพย์แห่งประเทศไทย ตั้งแต่ปี พ.ศ. 2546 ถึงปี พ.ศ. 2556 ในแง่ของปัจจัยด้านอุปทาน (สภาพคล่องด้านเงินทุนของตัวกลางทางการเงิน) และปัจจัยด้านอุปสงค์ (การซื้อขายที่สอดคล้องกันของสมาชิกในตลาดทุน) ของสภาพคล่องในตลาด มีการค้นพบรูปแบบเฉพาะตัวที่สภาพคล่องร่วมเพิ่มสูงขึ้นในช่วงที่ตลาดเป็นขาขึ้นมากกว่าในช่วงที่ตลาดเป็นขาลง ผลการวิจัยแสดงให้เห็นว่าหลักฐานสนับสนุนของสมมติฐานด้านอุปสงค์ที่มีต่อสภาพคล่องร่วมมีความน่าเชื่อถือมากกว่า โดยกิจกรรมการซื้อขายหุ้นของแต่ละกลุ่มของนักลงทุนในตลาดนั้นมีผลต่อสภาพคล่องร่วมในหุ้นแตกต่างกัน กล่าวคือการซื้อขายของนักลงทุนรายย่อยและนักลงทุนต่างชาตินั้นส่งผลกระทบต่อสภาพคล่องร่วมโดยเฉพาะอย่างยิ่งในสภาวะที่ตลาดมีความผันผวนสูง ในขณะที่การซื้อขายของนักลงทุนสถาบันนั้นมีผลกระทบในลักษณะตรงกันข้าม และโดยเฉลี่ยแล้วหุ้นที่มีขนาดใหญ่จะมีสภาพคล่องร่วมสูง แต่หุ้นขนาดเล็กนั้นมีความเสี่ยงด้านสภาพคล่องร่วมที่เกิดจากกิจกรรมการซื้อขายที่สอดคล้องกันของนักลงทุนมากกว่า

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PORAWAT TANGPIYANAN: Understanding the Liquidity Commonality in the Stock Exchange of Thailand. ADVISOR: ASSOC. PROF. SUNTI TIRAPAT, Ph.D., 57 pp.

This thesis examines liquidity commonality in the Stock Exchange of Thailand (SET) during 2003 to 2013 in respect of supply-side (funding liquidity of financial intermediaries) and demand-side (correlated trading of market participants) determinants of liquidity. Unique asymmetric pattern is found, where the commonality greater increases during large market rising than during large market declining period. The result shows more reliable evidence of demand-side hypothesis. Investor-types' trading activities affect differently to the commonality in liquidity of each stock-size. For instance, retail and foreign investor trading are found to create greater liquidity commonality during high volatility period, while proprietary trading has the opposite effect. On average, large-cap stocks have higher commonality in liquidity, but small-cap stocks have greater commonality risk from correlated trading activity of particular investor-type.

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CHAPTER I

INTRODUCTION

1.1 Background and Problem Review

Liquidity, the ability to immediately trade significant amount of asset with minimal cost, is an important characteristic needed in a good financial market. A number of stakeholders are found to be related to liquidity. Traders, institutions and even retail investors are affected by liquidity since it determines their trading and hedging costs, and risk management model (Amihud and Mendelson (1986), Jacoby, Fowler, and Gottesman (2000), Harris and Hasbrouck (1996) and Peterson and Sirri (2002)). The regulators, or stock exchange, need to market's liquidity in order to attract more fund-flow and market stability. Normally, market with those pre-conditions will attract even more liquidity. Focusing on listed-firm's cost of capital, high liquidity stock means low cost of capital to the firm, and vice versa (Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996)). Liquidity promotes smooth-functioning and stability to the whole financial system. So, it is an essential to better understand liquidity particularly, a currently highlighted determinant, commonality in liquidity. Brockman and Chung (2002) formally defined liquidity commonality as the proposition that the firm's liquidity can be explained by industry- or market-wide factors. In the other words, it is the co-movement of liquidity across individual stock driven by industry- or market-wide factors, e.g., market liquidity.

Commonality in liquidity was first introduced by Chordia, Roll, and Subrahmanyam (2000), Hasbrouck and Seppi (2001) and Huberman and Halka (2001) and was shown to exist in the major financial market. Even though, there is not many fundamental reasons behind the existent of liquidity commonality. Several studies suggest that liquidity commonality plays a significant role in determining the stock returns (Pástor and Stambaugh (2003), Acharya and Pedersen (2005) and Korajczyk and Sadka (2008)). Commonality in liquidity is arguably arisen

from both demand-side and supply-side. It is considered as the result from supply-side when financial intermediaries change their level of liquidity supply, documented in many studies, for example, Brunnermeier and Pedersen (2009) showed how funding liquidity of intermediary affect their ability to supply liquidity to the market. Lin (2010) studied the arisen inventory risk due to market liberalization in emerging market. Hameed, Kang, and Viswanathan (2010) found liquidity commonality in downturn of NYSE after controlling for demand-side variables. However, there are some papers that support the demand-side theory which explain liquidity commonality as a result of correlated trading activity among investors. First explanation of the demand-side is proposed by Chordia, Roll, and Subrahmanyam (2002). They found that an aggregate order imbalance, which represents the liquidity demand, is negatively correlated with liquidity. Kamara, Lou, and Sadka (2008) attributed the increasing of commonality in liquidity in US market over years to growing activity of institution in the market. Koch, Ruenzi, and Starks (2009) investigated the demand-side effect focusing on mutual fund ownership and found that correlated trading of mutual fund affects the liquidity commonality. Recently, Karolyi, Lee, and Van Dijk (2012) completed the full scale study of commonality in liquidity around the world and their finding is against major supply-side theory by addressed that demand-side exhibits more powerful explanation than supply-side for most stock markets around the world.

In Thailand, Lohaset (2005) and Pukthuanthong-Le and Visaltanachoti (2009) already showed significant evidences of an existent of liquidity commonality in the stock market. Lohaset (2005) also provided additional findings on the effect of firm's size, index inclusion, market condition and ownership. Pukthuanthong-Le and Visaltanachoti (2009) also examined the size effect, moreover, they introduced the liquidity beyond best bid-ask and the liquidity supply imbalance. However, the source that drives commonality in liquidity in Thailand market is still inconclusive. Therefore, this thesis will re-examine the liquidity commonality in the Stock Exchange of Thailand with respect to the source of it, using full assessment introduced

by Karolyi et al. (2012). The data will be more precise and exclusive comparing to the data which Karolyi et al. (2012) used. Furthermore, the extended period will capture the effect of global monetary policies exploit by many major nations after the "*Hamburger crisis"* to the year of 2013. Another examination in this study will focus on each investor-type trading activity to see if it has an effect on commonality in liquidity among individual stock. This finding will be the subset of demand-side explanation.

1.2 **Statement of Problem/Research Question**

There are many empirical studies showing the existence of commonality in liquidity in stock markets. Most of these studies found that the supply-side is the main source that drive the liquidity commonality in US market. However, the result of recent studies show a concrete evidence of a persuasive impact from demand-side on commonality in liquidity in numerous markets around the world, though the exclusive empirical evidences related to the mechanism of commonality in liquidity specified to each market setting is still needed.

Up until now, there is no study showing any essential information beyond merely existent of liquidity commonality of SET. In other word, no one knows whether supply- or demand-side drives the liquidity commonality in this market. SET is quite unique in the sense of the appearance of market maker, level of financial development, market profiles, etc. The global financial environment is changed after the 2008 crisis, in which the world became flooded by supply of money through various monetary policies. Due to unique market dynamic and changes in financial environment, we need more evidence and explanation to understand the liquidity commonality of SET. Thus this thesis aims to answer the question "By using more exclusive and extended period data, what is the main cause driving commonality in liquidity in the Stock Exchange of Thailand?"

1.3 **Objective of the Study**

To fill the gap in the existing finding of commonality in liquidity in the Stock Exchange of Thailand, this thesis will re-investigate the commonality in liquidity in SET with an attempt to attribute the commonality whether it mainly comes from the demand- or the supply-side. Knowing exactly how the commonality arises would lead to the more accurate implication or better solution to deal with these commonality issues. The proxy used to capture the effect from both demand- and supply-side will be very new for Thai's commonality literatures and will be more precise and exclusive comparing to the existing global-scale commonality literature.

1.4 **Scope of the Study**

This study investigates the arisen of commonality in liquidity in Thai's market (SET) in respect of the source, weather it is driven by demand- or supply-side, during 2003 to 2013.

1.5 **Contribution**

This study will show new empirical evidence of commonality in liquidity of SET, which will extend the existing literature by addressing the original source of liquidity commonality in Thai market. This knowledge will help the policy makers to develop important and precise implication for commonality issues. For instant, if supply-side, which central bank concerns of, is the main source driving liquidity commonality in Thailand, Bank of Thailand, theoretically, will be able to help the situation of liquidity dry-up by supplying monetary aids to the market. Otherwise, in the case where demand-side matters and different type of investor affects the commonality in a different way, market regulator could either use this new insight information to conduct the policies and design more stable financial system to charge more trading cost when the commonality rise and less when it decline.

1.6 **Organization of the Study**

The remainder of this study is organized as follows. Chapter II provides the literature review and hypothesis development and Chapter III describes data and methodology.

CHAPTER II
LITERATURE REVIEW

This chapter presents the reviews of commonality in liquidity and followed by hypothesis development. Section 2.1 is the discussion of the existence of liquidity commonality, which includes supportive evidence of supply-side and demand-side in section 2.1.1 and 2.1.2 respectively. The commonality in liquidity study in Thailand is in section 2.1.3. The hypothesis development is discussed in section 2.2.

2.1 Empirical Evidence of Commonality in Liquidity

Most of market participants know the importance of liquidity. Main attention, so far, focuses on the role of liquidity in asset pricing. But the trend shifts to the new aspect of liquidity, commonality in liquidity. Chordia et al. (2000) used daily data of NYSE stocks from 1992 and five liquidity measures; quoted spreads, effective spreads, proportional quoted spread, proportional effective spreads, and quoted depth. The result reveals stock's liquidity significantly moves together with overall market and industry liquidity, even after controlling for volatility, volume and price. In addition, they also found size-effect in liquidity commonality. They officially addressed this liquidity commonality as the new dimension to study the liquidity. Hasbrouck and Seppi (2001) used a different approach on 30 Dow Jones stocks. They showed a significant evidence of the existence of common factors in order-flow and stock returns, and they found less significant evidence of liquidity commonality compared to Chordia et al. (2000) while Huberman and Halka (2001) used TAQ database of 240 stocks listed in NYSE for the year 1996 and liquidity proxies (absolute bid-ask spread, spread/price ration, quantity depth, and dollar depth). They found systematic, time-varying common determinant of liquidity. In addition, they showed that inventory risk and adverse selection based approach could not explain their result.

Outside the United States, there are several studies in order-driven type of market. Brockman and Chung (2002) documented the existence of liquidity commonality in the Stock Exchange of Hong Kong. They attributed the result to the absent of market marker to provide the liquidity in the last resort, so the investors are directly affected by the commonality in liquidity. Fabre and Frino (2004), in the opposite, found no commonality in liquidity in the Australian Stock Exchange, with the explanation of low inventory risk due to the absent of market maker.

2.1.1 Evidence Support the Supply-side Hypothesis

Supply-side explanation is appealed to many researchers especially in the first phase of this field of study, because most of attention is on the US market, which operates as the quoted-driven and concentrated with many types of liquidity providers. Comerton-Forde, Hendershott, Jones, Moulton, and Seasholes (2010) used market maker's inventory and trading revenue as a proxy for funding constrain, which affects both market-wide and stock's liquidity. When specialist's inventory becomes large or the trading profit is poor, market-level and firm-level spread go widen. They also found that high volatility stock is more sensitive to this supply-side liquidity commonality. Brunnermeier and Pedersen (2009) proposed the model to explain the liquidity spirals; in large market shock, market becomes illiquid and the margin required goes up, so market makers become reluctant to supply liquidity especially on high-margin position, making it become more illiquid which further pushes up the margin requirement and even more obstructs dealers to provide liquidity to the market. They also found that illiquidity could become contagious across asset because the change in margin affects dealers who provide liquidity to the whole market. Market liquidity is also related with volatility due to the higher required margin on high volatility asset. And the market liquidity moves with the market returns because funding liquidities do.

While Hameed et al. (2010) focused exclusively on the decline market. Using intermediary balance sheet and the market value of the investment banking sector as funding

constrains proxies, they found that large negative market returns decreases stock's liquidity especially when there is the tighten in funding. This relation is still robust after controlling for demand-side variable. The volatility effect is also found and consistent with the aforementioned studies. They documented the spill-over effect; illiquidity can be spread across all securities, as the support evident for supply-side effect.

2.1.2 Evidence Support the Demand-side Hypothesis

High demand of either buy or sell will drive the commonality. Chordia et al. (2000) revealed that liquidity commonality may be arisen from large and simultaneous trades. They suggested some situation when there is net out-flow of cash from closed-end mutual funds, they needed to close the position to meet the redemption, which considered as the increasing in demand of liquidity. Chordia et al. (2002) introduced new measurement of demand in liquidity, aggregate order imbalance. It is the different between buy order and sell order, either excess buy or sell causes negative effect on liquidity.

Given that foreign and local institution always trade large and highly-correlated among each other, institution would be the main contributor of commonality in liquidity. Kamara et al. (2008) investigated the development of liquidity commonality in US market from 1963 to 2005. They found that an increase in liquidity commonality is associated with the trading pattern of institutional and the index-based or basket trading strategy, especially liquidity commonality on large firms. This is because institutions and the basket trading are focusing on the large capitalization stock. They also found that the institution ownership could explain the increase of large firm's liquidity beta. Koch et al. (2009) focused on correlated trading activity of mutual fund, because net-flow of each fund was highly correlated, so mutual fund trading activity would be the main source of commonality in liquidity. They hypothesized that stock with high level of mutual fund ownership should be more sensitive to commonality in liquidity, comparing to other stocks. The results showed that commonality in liquidity of high mutual fund ownership stocks are about twice when comparing to low mutual fund ownership stock.

Furthermore, they also found highly owned by mutual fund stocks with high turnover rate have higher commonality. Lastly, the relation between commonality and fund ownership is stronger when mutual funds face with liquidity shock.

While Karolyi et al. (2012) equally focus on both demand- and supply-side explanation, they investigated liquidity commonality in many markets around the world. Their results revealed that the commonality is higher in the market with this following condition; high volatility characteristic, or the time when volatility goes up (large market decline), great present of foreign investor, or the highly correlated trade activity. Obviously, these results supported the demand-side explanation of commonality in liquidity.

2.1.3 Evidence of Commonality in Liquidity in the Stock Exchange of Thailand

Lohaset (2005) found liquidity commonality in Thai market. He also addressed the size-effect, index inclusion, condition of market and ownership effect on the commonality. Pukthuanthong-Le and Visaltanachoti (2009) focused on the Stock Exchange of Thailand. They used better and precise limited order book data from 1996 to 2003, and they documented the strong evidence of the existent of market- and industry-wide liquidity commonality with various types of liquidity proxy. They did not find any effect from liquidity supply order imbalance. They also documented the size-effect and some market condition effect on the commonality.

2.2 Hypothesis Development

2.2.1 Hypothesis Related to Supply- and Demand-side

Supply-side

Brunnermeier and Pedersen (2009) proposed that the intermediaries reduces the level of liquidity supply because they face with liquidity spiral caused by funding constrain, especially when market is high volatile. There are also other models; Bernardo and Welch (2004) and Morris and Shin (2004) proposed "*liquidity black holes*" which states that when

traders reach their loss limit, one liquidation will cause price drop further and trigger another's reinforcing liquidation, Garleanu and Pedersen (2007) proposed tightening risk management by institution due to the high volatility causing even lower market liquidity. But there is another explanation about commonality in liquidity and volatility relationship, the flight to quality, Vayanos (2004) documented that investors demand more on high liquidity asset, during high volatility period. Various models and explanations on supply-side of commonality in liquidity have something in common, by stating that when it is a large declining market and high level of volatility, the demand in liquidation of specialists increase and also their ability to supply liquidity decreases (Karolyi et al. (2012)). Up to this point volatility seem to be the factor that related to both supply- and demand-side explanation, so I will keep volatility as only control variable.

Hameed et al. (2010) used intermediary's balance sheet and investment banking's market value as the proxies for funding constrain. And they found that the liquidity of individual stock in the declining market will drop even more if there is the funding constrain. In pure order-driven market like Thailand, the Stock Exchange of Thailand has no market marker to provide the liquidity. Each of market participants is free-entry to provide liquidity as the limit-order type when the spread induces them to do, and they are also free to exit from acting as the liquidity provider, because there is no obligation for them to do so (Brockman and Chung (2002)). So I cannot straightforwardly use the same proxies, as Hameed et al. (2010) did, to investigate the supply-side effect in Thailand. This study can only use common supply-side proxies mention in Karolyi et al. (2012); short-term local interest rate, global prime broker returns, and local bank returns.

Demand-side

First demand-side explanation related to the correlated trading activity of institution was investigated by Kamara et al. (2008). They found that the increasing of liquidity commonality in large US stock from 1981 to 2005 could be attributed to the increasing in

institution participation in the market. Then Koch et al. (2009) found the stocks with high mutual fund ownership especially the high turnover fund or the fund that facing with liquidity constrain exhibit larger commonality in liquidity. The reason is that institutions usually trade large and continuing order, which causing the increase in commonality in liquidity (Chordia et al., 2000). Sias and Starks (1997) found that institution's trading induces autocorrelation in stock returns, by using strategic trading, private signals and herding. Some studies have shown that the strategy used by institution is persistent; buy winner, sell loser in short run, and do the opposite in the long run. (Campbell, Ramadorai, & Schwartz, 2009) Therefore, using of persistent trading strategies, private information and herding by institution can cause large-scale and simultaneous trading, which increases the commonality in liquidity. Furthermore, mutual funds' net-flow is highly correlated across the fund, causing them to buy or sell in the same period of time. But the effect of positive net-flow should differ from of negative net-flow, because mutual fund can hold cash to invest in the future, but they must immediately liquidate the position to meet the redemption when it is the negative net-flow. For this study, I use institution relative order imbalance and net-flow of institution as the proxies for correlated trading activity of institution.

Another group of investor with the same rationale as of institutional, the foreign investor, could be the main source of commonality in liquidity. Ferreira and Matos (2008) reported that about 75% of non-U.S. firm held by U.S. investor were held through institution. So they may exhibit the same co-variation of trading by the same explanation. Even though, foreign investor may be considered similar to the institution investor, there are still other factors related to the foreign trading decision (e.g. currency exchange rate, capital inflow). So this study uses foreign relative order imbalance, exchange rate and capital inflow as the proxies for correlated trading activity of foreign investors.

The last group of investor is individual investor. The studies about individual or retail investors are likely ignored, comparing to literature focusing on big player like institution

investors. The fact is more than half of trading volume in the Stock Exchange of Thailand is of retail investor. So their correlated trading behavior could be the source of commonality in liquidity of the market. Barber, Odean, and Zhu (2009) found that individual investor avoided changing their trading side; if they buy one stock, they will buy that stock again. Another finding of Barber and Odean (2005) was overconfident of individual investor during the uptrend market, which they will buy more and more. This might be the explanation of how individual drive commonality during the upward period of stock market. In addition, Anginer (2010) found the flight to liquidity among household investors; they demanded more on liquid asset during the time of low market liquidity. Again, this might be the explanation of how individual drive commonality in the downturn market. For this study, I propose individual investor's relative order imbalance as the proxies for correlated trading activity of individual investor. This study focuses on small-size stocks, which is absent of institution and foreign investor influence, so that I can identify whether individual can drive the commonality.

To investigate which source can explain the liquidity commonality, how big player trading activity affect the liquidity commonality, and whether small player can contribute any effect on the commonality in liquidity of the Stock Exchange of Thailand, so this study proposes;

Hypothesis 1: Demand-side factors are the main drivers of liquidity commonality in the Stock Exchange of Thailand.

Hypothesis 2: Both local institution and foreign trading activities drive commonality in liquidity.

Hypothesis 3: Individual trading activities drive commonality in liquidity of small-sized stocks.

CHAPTER III

DATA AND METHODOLOGY

3.1 Data and Sample

The data covers firms in the Stock Exchange of Thailand (SET) from 2003-2014. Stock prices, stock returns, stock traded volumes, stock market capitalization, SET index returns, SET traded volumes, SET market capitalization and risk-free rates are obtained from DataStream. Cash-flows of mutual fund in Thailand are obtained from Morningstar. Local short-term interest rates and exchanges rates are obtained from Bank of Thailand (BOT). Treasury bill rates are from the Thai Bond Market Association (ThaiBMA). Firms' fundamental data are collected from SETSMART. Firms' traded volumes specified to each investor-type are generated from Market Microstructure data provided by SET.

Main liquidity measurement used in this study is Amihud liquidity. Follow Hameed et al. (2010) and Pukthuanthong-Le and Visaltanachoti (2009), Amihud liquidity will be adjusted for some events and seasonality effects, which will be described in detail in the next session.

3.2 Methodology

3.2.1 Data Preparation

Amihud

Amihud liquidity is the price impact or illiquidity measure, and can be calculated by the ratio of absolute value of daily return of the stock *i* on day *t* and the dollar volume traded of that stock on the same day.

$$Aillq_{i,t} = \frac{|r_{i,t}|}{dvol_{i,t}}$$

Where:

- $Aillq_{i,t}$ is the Amihud illiquidity proxy of stock *i* on day *t*.
- $r_{i,t}$ is the return of stock *i* on day *t*.

- $dvol_{i,t}$ is the dollar volume of stock *i* on day *t*.

Follow Karolyi et al. (2012), I adjusted this measurement by adding the constant to the Amihud measure and take logs, to minimize the outlier' impact, and multiply by -1 to make it become liquidity instead of illiquidity measure. Local currency volume (baht) is used instead of dollar volume.

$$AmLiq_{i,t} = -\log(1 + \frac{|r_{i,t}|}{LVol_{i,t}})$$

Where:

- $AmLiq_{i,t}$ is the Amuhid liquidity proxy of stock *i* on day *t*.
- $r_{i,t}$ is return of stock *i* on day *t*.
- $LVol_{i,t}$ is local currency volume of stock *i* traded on day *t*.

Adjustment

Amihud measure has to be adjusted for changing in minimum tick, time trend and calendar effect by following both Hameed et al. (2010) and Pukthuanthong-Le and Visaltanachoti (2009).

$$AmLiq_{i,t} = \sum_{d=1}^{4} \delta_d Day_d + f_1 Holiday + f_2 Ntick1 + f_3 Ntick2 + AdAmLiq_{i,t}$$

Where:

- $AmLiq_{i,t}$ is Amihud liquidity proxy of stock *i* on day *t*.
- Day_d is the dummy representing the day in the week from Monday to Thursday.
- *Holiday* is the dummy of the trading day around holiday, which is not the weekend.
- *Ntick1* is the dummy representing the 1st tick-size changing implementation, which is equal to 1 if the data is after November 5 of 2001and before March 30 of 2009 and 0 for otherwise.

- *Ntick2* is the dummy representing the 2nd tick-size changing implementation, which is equal to 1 if the data is after March 30 of 2009 and 0 for otherwise.
- $AdAmLiq_{i,t}$, which is the sum of intercept and residual of this regression, is the adjusted liquidity measurement.

Turnover

Turnover of each firm is used to control dynamic in market condition, generally calculated by dividing total trade volume by shares outstanding for the firm. But this study will use the logarithm-form as followed;

$$Turn_{i,t} = \log(1 + \frac{VO_{i,t}}{NSO_{i,y}})$$

Where:

- $Turn_{i,t}$ is turnover of stock *i* on day *t*.
- $VO_{i,t}$ *is* total trade volume of stock *i* on day *t*.
- $NSO_{i,y}$ is number of share outstanding of stock *i* on the beginning of year *y*.

This turnover variable is not only used as control variable, but its commonality is also used to represent some aspect of liquidity demand (Karolyi et al., 2012), which will be used as the general demand-side proxy.

3.2.2 Commonality Measurement

The R^2 approach inspired by Roll (1988) and Morck, Yeung, and Yu (2000), will be used to measure the commonality in liquidity of each securities. Those classic literatures introduced R^2 approach to represent the co-movement between firm's value and the market return. So R^2 approach should be applicable for indicating the co-movement between individual firm's liquidity and market's liquidity. Following Chordia et al. (2000) and Hameed et al. (2010), we use single factor market model to generate the liquidity commonality proxy, R^2.

Then we regress adjusted firm's Amihud liquidity proxies ($AdAmLiq_{i,t}$) with market average liquidity proxies ($AdAmLiq_{m,t}$).

$$AdAmLiq_{i,t} = \alpha_i + \beta_1 AdAmLiq_{m,t} + \varepsilon_{i,t}$$

Where:

- $AdAmLiq_{i,t}$ is Amihud liquidity proxy of stock *i* on day *t*.
- $AdAmLiq_{m,t}$ is Amihud liquidity proxy of market (*m*) on day *t*.

Employ this regression to each stock, yield $R^2_{i,t}$. And the strength of liquidity commonality is represented by the equally average of $R^2_{i,t}$.and get R^2_t. Because R^2_tvalues is between zero and one, follow Hameed et al. (2010), I create new liquidity commonality proxy by the logistic transformation of R^2_t, $LIQCOM_t = \ln[R^2_t/(1 - R^2_t)]$. Employ these same steps to the turnover variable and yield turnover commonality, $TURNCOM_t$.

3.2.3 Control Variables

Market return, volatility, liquidity, turnover and time trend will be used to control for market condition, because these market condition variables can affect the commonality via both demand and supply channel. So in this study, I have to include all these proven variables before further investigate the others focused explanatory variables.

Model (1) includes only control variables to regress with the logistic transform of liquidity commonality, $LIQCOM_t$.

$$LIQCOM_t = \alpha_i + \gamma_1 R_{m,t} + \gamma_2 STD_{m,t} + \gamma_3 AmLiq_{m,t} + \gamma_4 Turn_{m,t} + \gamma_5 t + \varepsilon_{i,t}$$

Where:

- $LIQCOM_t$ is equally averaged of liquidity commonality of each stock on day *t*.
- $R_{m,t}$ is the market return on day *t*.

- $STD_{m,t}$ is the standard deviation of market return on day *t*.
- $AmLiq_{m,t}$ is the proxy for market liquidity on day *t*.
- $Turn_{m,t}$ is the turnover of market on day *t*.
- t is the proxy for time trend.

To investigate the recent finding of Hameed et al. (2010), model (2) includes the adjusted market return variables to represent the separated effect of each large rising/declining and small market return.

$$LIQCOM_t = \alpha_i + \delta_1 R_{Down,Large} + \delta_2 R_{Up,Large} + \delta_3 R_{Small} + \gamma_1 t + \varepsilon_{i,t}$$

Where:

- $LIQCOM_t$ is equally averaged of liquidity commonality of each stock on day *t*.
- t is the proxy for time trend.
- $R_{Down,Large}$ is equal to 1 when $R_{m,t}$ is negative and more than one standard deviation below mean market return.
- $R_{Up,Large}$ is equal to 1 when $R_{m,t}$ is positive and more than one standard deviation above mean market return.
- R_{Small} is equal to 1 when absolute of $R_{m,t}$ is less than one standard deviation of mean market return.

3.2.4 Supply-side Factors and Commonality in Liquidity

Model (3) – (6) include one-at-a-time direct proxy of supply-side, together with all control variables.

$$LIQCOM_t = \alpha_i + \sum_{j=1} \beta_j X_t + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{i,t}$$

Where:

- $LIQCOM_t$ is equally averaged of liquidity commonality of each stock on day *t*.
- $\sum_{k=1}^{5} \gamma_k Z_{m,t}$ is the set of market condition control variables at time *t*.
- For model (3), $\sum_{j=1} \beta_j X_t$ is the proxy of local short-term interest rate at time *t*.
- For model (4), $\sum_{j=1} \beta_j X_t$ is the US. Commercial spread at time *t*.
- For model (5), $\sum_{j=1} \beta_j X_t$ is the return of local bank at time *t*.
- For model (6), $\sum_{j=1} \beta_j X_t$ is the return of global prime broker at time *t*.

3.2.5 Demand-side Factors and Commonality in Liquidity

Model (7) – (14) include one-at-a-time direct proxies of demand-side, together with all control variables.

$$LIQCOM_t = \alpha_i + \sum_{j=1} \beta_j X_t + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{i,t}$$

Where:

- $LIQCOM_t$ is equally averaged of liquidity commonality of each stock on day *t*.
- $\sum_{j=1}^{5} \gamma_j Z_{m,t}$ is the set of market condition control variables at time *t*.
- For model (7), $\sum_{j=1} \beta_j X_t$ is the turnover commonality at time *t*.
- For model (8), $\sum_{j=1} \beta_j X_t$ is the individual relative order imbalance at time *t*.
- For model (9), $\sum_{j=1} \beta_j X_t$ is the foreign relative order imbalance at time *t*.
- For model (10), $\sum_{j=1} \beta_j X_t$ is the institution relative order imbalance at time *t*.
- For model (11), $\sum_{j=1} \beta_j X_t$ is the proprietary relative order imbalance at time *t*.
- For model (12), $\sum_{j=1} \beta_j X_t$ is the total relative order imbalance at time *t*.
- For model (13), $\sum_{j=1} \beta_j X_t$ is the net-flow of institution at time *t*.
- For model (14), $\sum_{j=1} \beta_j X_t$ is the currency exchange rate at time *t*.

3.2.6 Size-effect and Commonality in Liquidity

I follow Karolyi et al. (2012) by using the same model (1-14) to investigate the commonality in liquidity of each size sorted portfolios. There will be 2 more portfolios based on the stocks' market capitalization at the end of previous year. The liquidity commonality proxy of each portfolio is equally averaged across the stocks in the portfolio. The result of this session will be present along with the normal study for comparison.

3.2.7 Large Rising/Declining and Depreciation Interaction Studies

I applied the idea of Hameed et al. (2010) by adding the dummy of large rising/declining and currency depreciation into the particular models. This attempt is to test whether the direct proxies of supply- and demand-side are emphasized during the specific event.

3.2.8 Robustness Test

To test whether the result is robust, this part will employ the "liquidity-beta", used by Hameed et al. (2010) and Pukthuanthong-Le and Visaltanachoti (2009) instead of using R^2-approach, which I follow Karolyi et al. (2012). After applying the same data preparation as usual, regress daily liquidity of stock on daily liquidity of market. The key of this approach is to use slope coefficient (or beta) of market liquidity as the alternative commonality in liquidity measurement.

So we use the model (R.1) to test the existent of liquidity commonality. It is the regression of adjusted Amihud liquidity of stock on adjusted Amihud liquidity of market and the set of control variables.

$$AdAmLiq_{i,t} = \alpha_i + \beta_{liq} AdAmLiq_{m,t} + controls + \varepsilon_{i,t}$$

Where:

- $AdAmLiq_{i,t}$ is Amihud liquidity proxy of stock *i* on day *t*.
- $AdAmLiq_{m,t}$ is Amihud liquidity proxy of market on day *t*.

- $controls$ includes the current and 4-week lag market return, the current and 1-week lag market volatility, the current and 1-week lag market turnover, 4 weekly lag individual liquidity , 4 weekly lag individual return, and the current and 1-week lag of individual volatility.

To test the asymmetry between up and down market condition affecting the commonality, I add dummy variables to represent up/down market and its interaction with market liquidity.

$$AdAmLiq_{i,t} = \alpha_i + \beta_{liq} AdAmLiq_{m,t} + \sum_{j=1}^{2} \lambda_j (AdAmLiq_{m,t} \cdot D_{Up,Large/Down,Large,t}) + controls + \varepsilon_{i,t}$$

Where:

- $AdAmLiq_{i,t}$ is Amihud liquidity proxy of stock *i* on day *t*.
- $AdAmLiq_{m,t}$ is Amihud liquidity proxy of market (*m*) on day *t*.
- $\sum_{j=1}^{2} \lambda_j (AdAmLiq_{m,t} \cdot D_{Up,Large/Down,Large,t})$ is the interaction term to represent the joint effect of large change in market return on liquidity commonality.

To test whether which direct demand- or supply-side proxies do affect the commonality, I add interaction term of market liquidity and one-at-a-time dummy for key variables and it's 1-week lag to the model (R.1)

$$AdAmLiq_{i,t} = \alpha_i + \beta_{liq} AdAmLiq_{m,t} + \gamma_{liq} AdAmLiq_{m,t-1} + \sum_{j=1} \lambda_j (AdAmLiq_{m,t} \cdot X_{m,t}) + \sum_{k=1} \rho_k (AdAmLiq_{m,t-1} \cdot X_{m,t}) + controls + \varepsilon_{i,t}$$

Where:

- $AdAmLiq_{i,t}$ is Amihud liquidity proxy of stock *i* on day *t*.
- $AdAmLiq_{m,t}$ is Amihud liquidity proxy of market on day *t*.

- $\sum_{j=1} \lambda_j (AdAmLiq_{m,t} \cdot X_{m,t})$ is the interaction term to represent the joint effect of each proxy on liquidity commonality.
- $\sum_{k=1} \rho_k (AdAmLiq_{m,t-1} \cdot X_{m,t})$ is the interaction term to represent the joint effect of each 1-week lag of proxy on liquidity commonality.

CHAPTER IV

RESULT AND DISCUSSTION

In this section, I will start with summary statistic discussion, base model and asymmetric pattern study, then follow by the results of two set of studies regarding demand- and supply-side of liquidity commonality.

4.1 Summary Statistics

Table 1 presents summary statistics of the annual average and standard deviation of the commonality in liquidity based on Amihud liquidity (R^2_{liq}). This table also presents the number of unique stock and number of stock-day observation of each year. The mean and standard deviation of liquidity commonality are expressed in percentage per day. The commonality for size-sorted portfolio; small and large portfolio, are presented in the last two column. From the table, commonality in liquidity declines over the years (from 33.2% in 2003 to 15.8% in 2013) in all three portfolios, consistent with the result of Karolyi et al. (2012) on global liquidity commonality. The large-size firm exhibits larger commonality in liquidity, conforms to the previous studies of Chorida et al. (2000), Fabre and Frino (2004) and Pukthuanthong-Le and Visaltanachoti (2009).

Table 1

Summary statistics: Liquidity Commonality

This table presents the summary statistics of the annual average and standard deviation of the commonality of Amihud liquidity (R^2_{liq}) for the sample period January 2003 to December 2013. The first two columns present the number of unique stocks and stock-day observations in the sample. The next six columns report annual average and standard deviation of liquidity commonality in each portfolio; all stocks portfolio, small-size stocks portfolio and large-size stocks portfolio respectively. For small- and large-firms portfolio, stocks are sorted into two equally portfolio based on market capitalization at the beginning of each year. The screening criteria for sample selection and this commonality calculation are described in Chapter 3. And in order to reduce outlier effect, liquidity commonality is winsorized at 1% and 99% of the sample distribution.

Year	Unique stocks	Stock-day obs.	All-portfolio R^2_{liq}		Small-portfolio R^2_{liq}		Large-portfolio R^2_{liq}	
			mean (%)	st.dev. (%)	mean (%)	st.dev. (%)	mean (%)	st.dev. (%)
2003	271	48,758	33.2123	8.2858	29.2841	7.7449	36.4671	9.0738
2004	308	58,123	30.7781	8.8995	28.4045	8.3475	32.9852	9.8471
2005	332	65,918	26.9266	8.4666	24.4878	8.0696	29.0409	9.2488

2006	358	71,964	22.8112	6.9757	18.4887	6.0409	27.3339	8.1061
2007	355	74,254	23.8070	6.6152	18.8482	6.1308	27.9220	7.5466
2008	352	72,286	21.6238	7.4087	17.2400	7.2603	25.7668	7.9506
2009	351	69,475	20.9186	7.9329	17.2584	8.2778	24.1884	8.0205
2010	346	71,688	16.3074	4.6189	12.3317	4.1951	20.1983	5.7856
2011	344	73,523	18.6454	4.8851	13.6312	4.6341	23.1303	5.5618
2012	341	72,916	18.9555	4.5240	15.0365	4.7263	22.6222	5.1265
2013	340	74,042	15.8431	4.2272	12.8814	4.1134	18.6760	5.2912
Total	360	869,620	22.7608	8.7492	19.1083	8.7095	26.4157	9.1989

4.2 Analysis of Liquidity Commonality and Capital Market Conditions

Table 2 presents the estimation results of ordinary least square (OLS) models to relate daily (Penal A), weekly (Penal B) and monthly (Penal C) R^2_{liq} to capital market condition variables. The figures shown in this table are OLS coefficient estimates, model R^2, the number of observations in the OLS, and the economic impact of the factors of interest in each specification for each model. The economic magnitude is measured by the effect of an increase of the standard deviation in variable of interest, and expressed as the fraction of standard deviation of R^2_{liq}.[1]

Time trend is included in all specification. The result shows that time trend has a significantly negative coefficient in all models, around -0.006 to -0.009. Consistent with Table 1, this negative coefficient means commonality in liquidity in the Stock Exchange of Thailand declines over the years.

Vayanos (2004) and Karolyi et al. (2012) suggest that an increasing of uncertainty (market volatility) makes investor to demand more liquidity, which subsequently raises the commonality in liquidity. Unlike those suggestion, Model (1) shows that market volatility have

[1] following Karolyi et al (2012), the impact of a one-standard-deviation (σ) increase in the factor of interest relatives to its mean on R^2_{liq} can be computed by this expression: $\Delta R^2_{liq} = \frac{e^{\alpha+\beta x(\mu+\sigma)+\gamma x\lambda}}{1+e^{\alpha+\beta x(\mu+\sigma)+\gamma x\lambda}} - \frac{e^{\alpha+\beta x\mu+\gamma x\lambda}}{1+e^{\alpha+\beta x\mu+\gamma x\lambda}}$, where α, β, and γ are the intercept, the estimated coefficient of factor of interest, and the vector of coefficient of other variables in the OLS model, respectively; μ, λ and σ is the mean of factor of interest, vector of mean of other variables in the OLS model, and the one-standard-deviation of factor of interest, respectively. Then I subtract the economic magnitude effect ΔR^2_{liq} with the standard deviation of R^2_{liq}, so these numbers are expressed as the fraction of one standard deviation of the commonality liquidity.

no significant effect on the co-movement of liquidity. An increasing of market activity (market turnover) increases liquidity commonality, though this effect is not significant. Model (1) also shows that market liquidity is negatively related to R^2_{liq}.

Model (2) is an investigation of the asymmetric pattern from volatility effect proposed by Hameed et al. (2010), where liquidity commonality increases with greater magnitude in a large market decline.[2] The results exhibit this pattern only in daily dataset, where R^2_{liq} increase dramatically during large market decline. This result alone can be interpreted as a supportive evidence of supply-side explanation of liquidity commonality. However the behavior or investor, especially institution investor, may explain this effect during the large declining period. There are also strong evidences showing that R^2_{liq} significantly increases during large raising market in all portfolios of monthly dataset and in small portfolio of weekly dataset. It possibly be the case where demand-side explanations do affect the liquidity commonality in the Stock Exchange of Thailand.

[2] According to models of Brunnermeier and Pedersen (2009) and Morris and Shin (2004), this asymmetric pattern arises from both binding funding constraints and loss of collateral values, which make any liquidity providers become struggled to supply liquidity to the market.

Table 2

Liquidity Commonality and Capital Market Conditions

This table shows result of time-series regression of commonality in liquidity ($LIQCOM_t$), computed as the logistic transformation of commonality in liquidity (of each all, small, and large portfolio) over 2003:01:01 – 2013:12:31 on capital market condition variables:

$$LIQCOM_t = \alpha + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{m,t}$$

(m = market ; t = 2003 : 01 : 01 ,…, 2013 : 12 : 31),

where $Z_{m,t}$ denotes the time-series control variables; market return, volatility, liquidity, turnover and the time trend, to account for any variations in capital market conditions. Daily, weekly, and monthly time series regression results are shown in Panel A, B, and C, respectively. Variable definitions are in Table A1. Intercepts are suppressed to conserve space. Significance at the 1%, 5%, and 10% level is indicated by [a], [b], and [c], respectively. The economic effects in the last row indicate the effect of one-standard-deviation (σ) increase in the factor of interest, expressed as a fraction of one α of R^2_{liq}.

A. Daily Timeframe

Model Portfolio	(1)			(2)		
	All	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions						
Market return	-0.320	-0.323	-0.305			
Market volatility	-1.225	-0.539	-1.679			
Market liquidity	-0.103[a]	-0.0867[b]	-0.110[a]			
Market turnover	5.007	5.741	5.736[c]			
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Large/small up/down market return						
$R_{mkt}^{UpLarge}$				0.718	0.742	0.869
$R_{mkt}^{DownLarge}$				-2.068[c]	-1.884	-2.212[c]
R_{mkt}^{Small}				0.583	0.463	0.68
#Obs.	2469	2469	2469	2477	2477	2477
Adjust R^2	0.304	0.397	0.223	0.303	0.394	0.222
Factor of Interest	Market volatility			Down, Large		
Economic effect (xα(R^2_{liq}))	-0.05 xα	0.02 xα	-0.07 xα	NA	NA	NA

B. Weekly Timeframe

Model Portfolio	(1)			(2)		
	All	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions						
Market return	0.001	0.053	-0.116			
Market volatility	-1.316	-1.114	-2.459			
Market liquidity	-0.123	-0.103	-0.151[c]			
Market turnover	1.833	2.437	4.121			
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Large/small up/down market return						
$R_{mkt}^{UpLarge}$				1.294	1.866[c]	0.985
$R_{mkt}^{DownLarge}$				-0.735	-0.74	-0.735
R_{mkt}^{Small}				-1.353	-1.742	-1.299
#Obs.	550	550	550	550	550	550
Adjust R^2	0.482	0.561	0.428	0.486	0.563	0.429
Factor of Interest	Market volatility			Down, Large		
Economic effect (xα(R^2_{liq}))	-0.05 xα	-0.05 xα	-0.11 xα	NA	NA	NA

Table 2 (continued)

Model Portfolio	C. Monthly Timeframe					
	(1)			(2)		
	All	Small	Large	All	Small	Large
Capital Market Conditions						
Market return	0.420	0.531	0.312			
Market volatility	1.204	2.174	-0.564			
Market liquidity	-0.216	-0.169	-0.261			
Market turnover	4.523	3.668	7.323			
Time trend	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Large/small up/down market return						
$R_{mkt}^{UpLarge}$				1.295[b]	1.476[c]	1.347[b]
$R_{mkt}^{DownLarge}$				-0.659	-0.643	-0.665
R_{mkt}^{Small}				0.734	1.015	0.354
#Obs.	131	131	131	131	131	131
Adjust R^2	0.631	0.705	0.6	0.641	0.703	0.61
Factor of Interest	Market volatility			Down, Large		
Economic effect (xα(R_{liq}^2))	0.05xα	0.07 xα	-0.03 xα	NA	NA	NA

4.3 Analysis of Liquidity Commonality and Supply-side

Table 3 presents the estimation results of ordinary least square (OLS) models in daily (Penal A), weekly (Penal B) and monthly (Penal C) R_{liq}^2 to relate to direct proxy of supply-side factors. For each model, the table presents OLS coefficient estimates, model R^2, the number of observations in the OLS, and the economic impact of the factors of interest for each specification. The economic magnitude is measured by the effect of an increase in the standard deviation of variable of interest, and expressed as a fraction of standard deviation of R_{liq}^2.

Model (3) to (6) in Table 3 include direct proxy of supply-side factors to the base model in order to investigate how funding constraint affects R_{liq}^2. The result shows that liquidity commonality is not significantly related to commercial spread. A local short-term interest rate has a negative relation to R_{liq}^2 and global prime broker returns has a significant positive relation to R_{liq}^2, which oppose to the prediction of supply-side hypothesis. The return of local financial and bank have a significant negative relation to R_{liq}^2 only in monthly dataset. The economic impact of this effect is significant at -0.84 x α(R_{liq}^2).

Following Hameed et al. (2010), I run additional tests to investigate whether the funding constrains emphasize during large-declining market, by including interaction terms of a large market decline with those supply-side factors[3]. Consistent with Karolyi et al. (2012), the result shows that even in large market decline, funding constraint has no significant relationship to liquidity commonality. Although the direction of the coefficient is the same as what funding constraint hypothesis predict, it still is not significant and conclusive. Overall, the evidence of funding liquidity supporting the supply-side hypothesis of liquidity commonality is very weak.

4.4 Analysis of Liquidity Commonality and Demand-side

Table 4 presents the estimation results of ordinary least square (OLS) models to relate daily (Penal A), weekly (Penal B) and monthly (Penal C) R^2_{liq} to direct proxy of demand-side factors. For each model, the table presents OLS coefficient estimates, model R^2, the number of observations in the OLS, and the economic impact of the factors of interest in each specification. The economic magnitude is measured by the effect of an increase of the standard deviation in variable of interest, and expressed as the fraction of standard deviation of R^2_{liq}

Model (7) to (14) in Table 4 include direct proxy of demand-side factors to the base model to capture how demand-side of liquidity affects R^2_{liq}. The coefficient of commonality in turnover (R^2_{Turn}) is significant at 1% level for all portfolio in every dataset. The economic magnitude of R^2_{Turn} effect is considerable. A one-standard-deviation increase of turnover commonality is associated with an increase of 0.57 x $\alpha(R^2_{liq})$. This study also found that the trading-activity proxy has an influence to small-size portfolio the most.

Cash-flow of fund and order imbalance of retail customer, foreign and mutual fund are not conclusively related to R^2_{liq}. While proprietary's order imbalance appears to have

3 See also in Table A3

significantly negative relation with R^2_{liq} in all portfolio of every dataset. The economic impact is also substantial. A one-standard-deviation increase of proprietary order imbalance is associated with a decrease of -0.43 x $\alpha(R^2_{liq})$. There is also the evidence that currency depreciations increase R^2_{liq}. The coefficient of currency exchange rate is significantly positive in daily and weekly dataset. One-standard-deviation increase in exchange rate returns is accompanied by a change in R^2_{liq} of 0.16 times of $\alpha(R^2_{liq})$.

Using the same previous concept of Hameed et al. (2010), I also run the additional tests to study how each investor-type trading activities affect R^2_{liq} in currency depreciation in both large-raising and large-declining market. I include interaction-term between investor-type order imbalance and dummies of currency depreciation, large-raising market, and large-declining market, respectively, to the base model.[4]

The result shows that selling activity of foreign investor in days that Thai Baht depreciation associates with an increasing of liquidity commonality. These sell-forces during currency-depreciation effects are significant at 5% level in daily dataset. This finding reveals that the sell-attempt of foreign during local-currency depreciation can increase the liquidity commonality.

There are also the evidences of buy activity of retail customer and foreign investor during the large rally week increase liquidity commonality. Especially for small-firm portfolio, buy-forces of retail customer significantly increase liquidity commonality. These buy-forces during large-raising market are significant at 10% level in weekly dataset. In addition, this study found that selling force of both retail customer and foreign investor significantly increase liquidity commonality of large-firm portfolio in weekly dataset. And selling force of mutual fund significantly increase liquidity commonality in monthly dataset. These sell-force during

4 See also in Table A4, Table A5, and Table A6

large-declining market are significant at 10% level in weekly and monthly dataset. These findings explain how those asymmetric pattern exhibited by demand-side.

In sum, these analyses reveal a number of key determinants and unique aspects of liquidity commonality in the Stock Exchange of Thailand. I found very little evidence to support the supply-side hypothesis or the funding constrain effect of the commonality in liquidity. The asymmetric pattern on the down-side of market return is found. However, the direct proxies of funding constrain show no relation with the liquidity commonality, even in bear market. Interestingly, liquidity commonality in this market exhibits difference asymmetric pattern, where it greater increases in bull market. I found stronger evidences of demand-side hypothesis that link the commonality in liquidity to the level of correlated trading activity. Also the results suggest that each investor-type trading affects differently to the liquidity commonality; proprietary always reduce the commonality, while retail and foreign create greater commonality in many event. Even though, on average, large-cap stocks have higher commonality in liquidity, small-cap stocks have greater commonality risk from correlated trading activity of particular investor-type.

4.5 Robustness Test

R^2-approach used in the main investigation cooperates with data that generated from aggregate all individual stocks' variables within the timeframe, which may "average out" some effect from any supply-side or demand-side factors. Therefore, this robustness test follows the approach of Hameed et al. (2010) and Pukthuanthong-Le and Visaltanachoti (2009) to investigate the commonality in liquidity of individual stocks based on "liquidity-bate" at weekly timeframe. I use the same steps in preparing the data as stated in chapter 3. Then, I estimate regressions of weekly adjusted Amihud liquidity of individual stock on weekly adjusted Amihud liquidity of the market. The slope or beta of the market liquidity is the alternative measurement of liquidity commonality. I also include the following control

variables: the current and 4 weekly lag market return, the current and 1-week lag market volatility, the current and 1-week lag market turnover, 4 weekly lag individual liquidity, 4 weekly lag individual return, and the current and 1-week lag individual volatility. I add the interaction term of market liquidity and the current and one-week lag dummy of each supply- and demand-side factor in each model.

Table A8 in Appendix session show the estimate coefficient of liquidity beta and interaction beta of these robustness tests. Model (1) show the significant existent of liquidity commonality in this market at weekly frequency (average liquidity beta of 0.0802). From Model (2), I still found the unique asymmetric pattern, where liquidity commonality greater increase during large market rising (an average liquidity beta increase of 0.4414) compare to the increase during large market decline (an average liquidity beta increase of 0.3668).

Model (3) to (6) are the model that include interaction term of supply-side factor in each model. Interestingly, I found the increasing of short-term interest rate and decreasing of local financial and banking firm returns increase the commonality in liquidity, which consistent with the prediction of funding constrain hypotheses. But the opposite direction from the hypotheses are also found. The increasing of commercial spread and the decreasing of global prime brokers significantly decrease the commonality in liquidity. From this only finding, the supply-side hypothesis of commonality in liquidity in the Stock Exchange of Thailand seems to be subjected more to the local funding liquidity factors than the global factors.

Model (7) to (14) are the model that include interaction term of demand-side factor in each model. Consistently, I still found significant evidences to support demand-side hypothesis. Lag increase of turnover commonality significantly increases liquidity commonality. The difference level of effect each invertor-type related to commonality in liquidity are also found. Lag increase of retail customer order imbalance, both lag and current week increase of mutual fund order imbalance increase the commonality. But the positive relation of foreign order imbalance and negative relation of proprietary order imbalance to the liquidity commonality

disappear. Interestingly, cash outflow from mutual fund turnout to have strong relation to the commonality in liquidity (an average increase of liquidity beta of 0.0342 and 0.0508 during and after the cash outflow, respectively). Consistent with the main finding, the commonality in liquidity increase by 0.0288 and 0.0083 on average during and after the local currency depreciation. In sum, these findings from difference methodology suggest the similar key results to the main study.

Table 3

Liquidity Commonality and Direct Proxies of Supply-side

This table shows result of time-series regression of commonality in liquidity ($LIQCOM_t$), computed as the logistic transformation of commonality in liquidity (of each all, small, and large portfolio) over 2003:01:01 – 2013:12:31 on various supply-side variables:

$$LIQCOM_t = \alpha + \sum_{j=1} \beta_j X_t + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{m,t}$$

(m = market ; t = 2003 : 01 : 01 ,…, 2013 : 12 : 31),

where X_t denotes the time-series supply-side factors, $Z_{m,t}$ denotes the time-series control variables; market return, volatility, liquidity, turnover and the time trend, to account for any variations in capital market conditions. Daily, weekly, and monthly time series regression results are shown in Panel A, B, and C, respectively. Variable definitions are in Table A1. Intercepts are suppressed to conserve space. Significance at the 1%, 5%, and 10% level is indicated by [a], [b], and [c], respectively. The economic effects in the last row indicate the effect of one standard deviation (α) increase in a factor of interest, expressed as a fraction of one α of R^2_{liq}.

A. Daily Time-frame

Model Portfolio	(3)			(4)			(5)			(6)		
	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	-0.345	-0.363	-0.319	-0.935	-0.864	-1.031	-0.322	0.307	-0.855	-0.27	-0.296	-0.23
Market volatility	-1.632	-1.171	-1.906	-2.561	-1.509	-3.213[c]	-1.225	-0.543	-1.675	-1.524	-0.88	-1.95
Market liquidity	-0.0925[b]	-0.0701[c]	-0.104[a]	-0.0806[c]	-0.0783	-0.0752[c]	-0.103[a]	-0.0869[b]	-0.109[a]	-0.109[a]	-0.0950[b]	-0.114[a]
Market turnover	-1.126	-3.772	2.307	0.0821	-2.415	2.956	5.007	5.795	5.689[c]	4.354	5.251	4.977
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.008[a]	-0.009[a]	-0.007[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Supply-side factors												
Short-term Interest rate	-0.0303[a]	-0.0470[a]	-0.0170[b]									
Commercial spread				0.052	-0.0016	0.0982[b]						
Fin/Bank returns							0.00192	-0.578	0.505			
Prime broker returns										-0.643	-0.322	-0.946
#Obs.	2469	2469	2469	1545	1545	1545	2469	2469	2469	2423	2423	2423
Adjust R^2	0.308	0.402	0.222	0.365	0.455	0.298	0.304	0.397	0.222	0.305	0.338	0.243
Factor of Interest	Short-term interest rate			Commercial spread			Fin/Bank returns			Prime broker returns		
Economic effect (xα(R^2_{liq}))	-0.22 xα	-0.27 xα	-0.15 xα	0.1 xα	0 xα	0.22 xα	0 xα	-0.04 xα	0.05 xα	-0.04 xα	-0.02 xα	-0.07 xα

Table 3 (continued)

B. Weekly Time-frame

Model Portfolio	(3)			(4)			(5)			(6)		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	-0.0623	-0.0533	-0.154	-0.345	-0.366	-0.454	1.378	1.398	1.304	0.0331	0.0829	-0.0714
Market volatility	-1.647	-1.664	-2.657	-2.252	-1.556	-3.849	-1.514	-1.307	-2.663	-1.238	-0.963	-2.416
Market liquidity	-0.0877	-0.0439	-0.13	-0.0837	-0.0805	-0.0918	-0.124	-0.104	-0.152[c]	-0.126	-0.107	-0.153[c]
Market turnover	-6.076	-10.75	-0.628	-2.761	-4.81	1.649	1.917	2.519	4.208	2.154	2.923	4.415
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.008[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Supply-side factors												
Short-term Interest rate	-0.0323[a]	-0.0538[a]	-0.0194									
Commercial spread				0.0275	-0.0326	0.0825						
Fin/Bank returns							-1.241	-1.212	-1.28			
Prime broker returns										0.206	0.421	0.093
#Obs.	550	550	550	480	480	480	550	550	550	549	549	549
Adjust R^2	0.488	0.483	0.416	0.515	0.498	0.453	0.483	0.471	0.415	0.482	0.471	0.415
Factor of Interest	Short-term interest rate			Commercial spread			Fin/Bank returns			Prime broker returns		
Economic effect ($x\alpha(R^2_{liq})$)	-0.29 xα	-0.35 xα	-0.21 xα	0.06 xα	-0.05 xα	0.22 xα	-0.29 xα	-0.21 xα	-0.36 xα	0.03 xα	0.05 xα	0.02 xα

C. Monthly Time-frame

Model Portfolio	(3)			(4)			(5)			(6)		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	0.335	0.373	0.278	0.458	0.524	0.391	1.959[b]	2.457[b]	1.823[b]	0.448	0.572	0.333
Market volatility	1.474	2.672	-0.458	1.255	2.895	-1.129	-0.0151	0.647	-1.762	2.96	4.782	0.745
Market liquidity	-0.148	-0.0424	-0.235	-0.218	-0.201	-0.236	-0.156	-0.093	-0.202	-0.227	-0.184	-0.269
Market turnover	-2.995	-10.24	4.377	3.502	1.46	7.369	3.99	3.001	6.799	5.624	5.304	8.144
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]
Supply-side factors												
Short-term Interest rate	-0.0266	-0.0492[b]	-0.0104									
Commercial spread				0.00533	-0.0611	0.0665						
Fin/Bank returns							-1.451[b]	-1.817[b]	-1.426[b]			
Prime broker returns										1.141[b]	1.695[b]	0.85
#Obs.	131	131	131	127	127	127	131	131	131	131	131	131
Adjust R^2	0.634	0.610	0.574	0.628	0.596	0.577	0.640	0.610	0.589	0.641	0.616	0.582
Factor of Interest	Short-term interest rate			Commercial spread			Fin/Bank returns			Prime broker returns		
Economic effect ($x\alpha(R^2_{liq})$)	-0.27 xα	-0.36 xα	-0.13 xα	-0.48 xα	-0.56 xα	-0.33 xα	-0.84 xα	-0.75 xα	-1.01 xα	0.35 xα	0.38 xα	0.32 xα

Table 4

Liquidity Commonality and Direct Proxies of Demand-side

This table shows result of time-series regression of commonality in liquidity ($LIQCOM_t$), computed as the logistic transformation of commonality in liquidity (of each all, small, and large portfolio) over 2003:01:01 – 2013:12:31 on various demand-side variables:

$$LIQCOM_t = \alpha + \sum_{j=1} \beta_j X_t + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{m,t}$$

(m = market ; t = 2003 : 01 : 01 ,…, 2013 : 12 : 31),

where X_t denotes the time-series demand-side factors, $Z_{m,t}$ denotes the time-series control variables; market return, volatility, liquidity, turnover and the time trend, to account for any variations in capital market conditions. Daily, weekly, and monthly time series regression results are shown in Panel A, B, and C, respectively. Variable definitions are in Table A1. Intercepts are suppressed to conserve space. Significance at the 1%, 5%, and 10% level is indicated by [a], [b], and [c], respectively. The economic effects in the last row indicate the effect of one standard deviation (α) increase in a factor of interest, expressed as a fraction of one α of R^2_{liq}.

A. Daily Time-frame

Model Portfolio	(7)			(8)			(9)			(10)		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	-0.432	-0.335	-0.494	-0.484	-0.444	-0.504	-0.88	-0.989	-0.813	-0.303	-0.707	-0.0343
Market volatility	-1.885	-1.258	-2.283	-1.169	-0.498	-1.611	-1.109	-0.401	-1.573	-1.228	-0.474	-1.724
Market liquidity	-0.100[a]	-0.0832[b]	-0.107[a]	-0.103[a]	-0.0863[b]	-0.109[a]	-0.109[a]	-0.0936[b]	-0.115[a]	-0.103[a]	-0.0866[b]	-0.110[a]
Market turnover	3.904	4.325	4.84	4.891	5.655	5.595	5.064	5.809	5.788[c]	5.006	5.756	5.726[c]
Time trend	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Demand-side factors												
R^2_{Turn}	0.377[a]	0.491[a]	0.310[a]									
Cust OIB				0.000016	0.000012	0.000019						
Fore OIB							0.00032[c]	0.00038[b]	0.00029[c]			
Mutu OIB										-0.00002	0.00035	-0.00025
#Obs.	2376	2376	2376	2469	2469	2469	2469	2469	2469	2469	2469	2469
Adjust R^2	0.316	0.404	0.235	0.304	0.397	0.222	0.305	0.397	0.223	0.304	0.397	0.224
Factor of Interest		TURNCOM			Customer OIB			Foreign OIB			Mutual fund OIB	
Economic effect (xα(R^2_{liq}))	0.20 xα	0.20 xα	0.19 xα	0.03 xα	0.02 xα	0.04 xα	0.11 xα	0.1 xα	0.12 xα	0	0.07 xα	-0.08 xα

Table 4 (continued)

A. Daily Time-frame (continued)

Model Portfolio	(11)			(12)			(13)			(14)		
	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	0.245	0.321	0.157	-0.541	-0.586	-0.52	-0.305	-0.292	-0.305	-0.343	-0.355	-0.322
Market volatility	-1.351	-0.683	-1.782	-1.155	-0.456	-1.61	-1.219	-0.53	-1.675	-1.353	-0.716	-1.776
Market liquidity	-0.108[a]	-0.0921[b]	-0.114[a]	-0.103[a]	-0.0863[b]	-0.109[a]	-0.103[a]	-0.0864[b]	-0.109[a]	-0.103[a]	-0.0868[b]	-0.110[a]
Market turnover	5.722[c]	6.555[c]	6.320[c]	4.881	5.592	5.614	4.776	5.311	5.688[c]	5.133	5.914	5.831[c]
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Demand-side factors (continued)												
Prop OIB	-0.00133[b]	-0.00151[b]	-0.00109[c]									
Total OIB				0.00002	0.00002	0.00002						
Fund Cash-flow							0.00000	0.00000	0.00000			
Exchange rate										4.054[c]	5.560[b]	3.058
#Obs.	2469	2469	2469	2469	2469	2469	2467	2467	2467	2469	2469	2469
Adjust R^2	0.305	0.397	0.222	0.304	0.397	0.222	0.304	0.397	0.222	0.305	0.398	0.223
Factor of Interest		Proprietary OIB			Total OIB			Fund Cash-flow			Exchange rate	
Economic effect ($x\alpha(R^2_{liq})$)	-0.12 xα	-0.11 xα	-0.12 xα	0.04 xα	0.03 xα	0.04 xα	0.03 xα	0.04 xα	0.01 xα	0.09 xα	0.10 xα	0.08 xα

B. Weekly Time-frame

Model Portfolio	(7)			(8)			(9)			(10)		
	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	-0.0584	-0.0229	-0.169	-0.169	-0.214	-0.218	-0.203	-0.182	-0.305	-0.0462	-0.0496	-0.13
Market volatility	-2.059	-2.055	-3.118	-0.809	-0.318	-2.155	-1.186	-0.964	-2.338	-1.151	-0.758	-2.412
Market liquidity	-0.115	-0.0928	-0.144[c]	-0.115	-0.0907	-0.147[c]	-0.13	-0.111	-0.157[c]	-0.122	-0.1	-0.151[c]
Market turnover	0.363	0.576	2.816	0.853	0.899	3.535	2.3	2.975	4.556	1.666	2.078	4.074
Time trend	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Demand-side factors												
R^2_{Turn}	0.610[a]	0.772[a]	0.542[a]									
Cust OIB				0.00002	0.00003[c]	0.00001						
Fore OIB							0.00007	0.00008	0.00006			
Mutu OIB										0.00009	0.00019[c]	0.00003
#Obs.	550	550	550	550	550	550	550	550	550	550	550	550
Adjust R^2	0.49	0.565	0.43	0.483	0.562	0.427	0.482	0.56	0.427	0.482	0.561	0.427
Factor of Interest		TURNCOM			Customer OIB			Foreign OIB			Mutual fund OIB	
Economic effect ($x\alpha(R^2_{liq})$)	0.32 xα	0.30 xα	0.34 xα	0.14 xα	0.16 xα	0.10 xα	0.10 xα	0.09 xα	0.11 xα	0.09 xα	0.15 xα	0.03 xα

Table 4 (continued)

B. Weekly Time-frame (continued)												
Model Portfolio	**(11)**			**(12)**			**(13)**			**(14)**		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	0.23	0.333	0.0613	-0.231	-0.325	-0.254	-0.00658	0.0294	-0.117	0.102	0.173	-0.0202
Market volatility	-1.333	-1.134	-2.472	-0.777	-0.236	-2.139	-1.263	-0.955	-2.455	-1.644	-1.506	-2.772
Market liquidity	-0.135	-0.117	-0.160[c]	-0.117	-0.0932	-0.148[c]	-0.122	-0.0986	-0.151[c]	-0.128	-0.109	-0.156[c]
Market turnover	3.987	5.074	5.789	0.976	1.042	3.613	1.565	1.644	4.101	1.975	2.607	4.257
Time trend	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Demand-side factors (continued)												
Prop OIB	-0.00085[a]	-0.00105[a]	-0.00066[b]									
Total OIB				0.00002	0.00003[c]	0.00001						
Fund Cash-flow							0.00000	0.00000	0.00000			
Exchange rate										3.075[c]	3.685[c]	2.941[c]
#Obs.	550	550	550	550	550	550	550	550	550	550	550	550
Adjust R^2	0.488	0.561	0.428	0.483	0.562	0.427	0.481	0.56	0.427	0.484	0.562	0.429
Factor of Interest		Proprietary OIB			Total OIB			Fund Cash-flow			Exchange rate	
Economic effect (xα(R^2_{liq}))	-0.24 xα	-0.22 xα	-0.23 xα	0.15 xα	0.18 xα	0.10 xα	0.03 xα	0.07 xα	0 xα	0.16 xα	0.15 xα	0.19 xα

C. Monthly Time-frame												
Model Portfolio	**(7)**			**(8)**			**(9)**			**(10)**		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	0.281	0.355	0.186	0.351	0.406	0.27	0.398	0.491	0.33	0.411	0.504	0.311
Market volatility	-0.999	-0.619	-2.559	2.021	3.642	-0.0712	1.161	2.096	-0.529	1.399	2.7	-0.55
Market liquidity	-0.204	-0.154	-0.251	-0.194	-0.128	-0.248	-0.22	-0.175	-0.258	-0.216	-0.169	-0.261
Market turnover	1.514	-0.147	4.597	3.223	1.329	6.539	4.823	4.2	7.087	4.32	3.119	7.309
Time trend	-0.00613[a]	-0.00740[a]	-0.00501[a]	-0.00726[a]	-0.00899[a]	-0.00595[a]	-0.00695[a]	-0.00844[a]	-0.00580[a]	-0.00706[a]	-0.00870[a]	-0.00578[a]
Demand-side factors												
R^2_{Turn}	1.205[a]	1.527[a]	1.091[a]									
Cust OIB				0.00001	0.00001	0.00000						
Fore OIB							0.00000	0.00001	-0.00000			
Mutu OIB										0.00002	0.00005	0.00000
#Obs.	131	131	131	131	131	131	131	131	131	131	131	131
Adjust R^2	0.652	0.716	0.607	0.630	0.704	0.598	0.628	0.703	0.599	0.628	0.703	0.598
Factor of Interest		TURNCOM			Customer OIB			Foreign OIB			Mutual fund OIB	
Economic effect (xα(R^2_{liq}))	0.57 xα	0.53 xα	0.63 xα	0.16 xα	0.21 xα	0.12 xα	0.03 xα	0.03 xα	-0.02 xα	0.08 xα	0.15 xα	0.01 xα

Table 4 (continued)

C. Monthly Time-frame (continued)												
Model Portfolio	**(11)**			**(12)**			**(13)**			**(14)**		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	0.636[c]	0.801[c]	0.472	0.338	0.368	0.271	0.427	0.553	0.308	0.548	0.71	0.425
Market volatility	0.823	1.697	-0.846	1.887	3.515	-0.229	1.327	2.603	-0.65	1.203	2.172	-0.565
Market liquidity	-0.256	-0.218	-0.291[c]	-0.201	-0.139	-0.254	-0.213	-0.158	-0.263	-0.228	-0.186	-0.272[c]
Market turnover	7.463	7.342	9.502	3.667	1.985	6.903	4.14	2.325	7.594	3.637	2.425	6.537
Time trend	-0.00660[a]	-0.00801[a]	-0.00550[a]	-0.00720[a]	-0.00893[a]	-0.00589[a]	-0.00701[a]	-0.00859[a]	-0.00576[a]	-0.00698[a]	-0.00848[a]	-0.00578[a]
Demand-side factors (continued)												
Prop OIB	-0.00034[a]	-0.00042[a]	-0.00025[b]									
Total OIB				0.00000	0.00001	0.00000						
Fund Cash-flow							0.00000	0.00000	0.00000			
Exchange rate										1.607	2.254	1.427
#Obs.	131	131	131	131	131	131	131	131	131	131	131	131
Adjust R^2	0.648	0.711	0.600	0.629	0.704	0.597	0.628	0.703	0.598	0.633	0.710	0.599
Factor of Interest	Proprietary OIB			Total OIB			Fund Cash-flow			Exchange rate		
Economic effect (xα(R^2_{liq}))	-0.43 xα	-0.38 xα	-0.39 xα	0.14 xα	0.2 xα	0.08 xα	0.03 xα	0.08 xα	-0.03 xα	0.21 xα	0.21 xα	0.23 xα

CHAPTER V

CONCLUSIONS

This study aims to re-examine the commonality in liquidity in the Stock Exchange of Thailand with respect to its origin. I apply the most recent assessment of Karolyi et al. (2012), to investigate whether the liquidity commonality in Thailand arises from supply-side force related to funding constrain or demand-side force related to correlated trading activity. From the result, I am able to confirm that my direct factors of funding constrain have no significant relation to the commonality. Even during bear market, the weak effect of funding constrain is not emphasized enough to made the legitimate relation. These findings oppose to the prediction of the supply-side hypothesis, correlated trading activities or demand-side are found to have stronger influence to the commonality in liquidity in this market. These findings challenge the previous literature focusing on how funding constrain affects liquidity commonality (most notably, Brunnermeier and Pedersen (2009) and Hameed et al. (2010)). My results indicate that correlated trading activity is the key determinant of the liquidity commonality in the market, which have no obligated intermediary like the Stock Exchange of Thailand.

This study further investigates inside the demand-side explanation, that trading activity or behavior of each investor-type has difference level of influence to the commonality. In very bullish market, the overconfidence of retail customer and the persistent trading of foreign make their trade become highly correlated, result in a strong increase of the commonality in liquidity. This mechanism creates the unique asymmetric pattern where the commonality greater increases during bull market. Also, sell force of foreign during Thai Baht depreciation and small-cap stock sell-off from mutual fund during large downturn increases the commonality in liquidity. Interestingly, trading activity of proprietary help reduce the level of liquidity commonality.

The Stock Exchange of Thailand, in this case, faces with the risk of liquidity commonality during large rally market from correlated buying attempt of market participants or the demand-side source of the commonality. This knowledge helps highlighting another risk in stock selection. Even though large capitalization stocks have higher level of liquidity commonality, but small capitalization stocks have larger amount of liquidity commonality risk during that high-volatility time. This event could also be an opportunity for speculators. It is known that high liquidity commonality often related to low liquidity. At the peak of commonality risk or the bottom of liquidity, is the opportunity to "*sell liquidity*" on the highly affected stocks in that situation. Also, drawing some implementation from this finding, if the policy maker increase the incentive or even set an obligation for proprietary or intermediary to provide liquidity during that period might help reduce the risk of liquidity commonality. Consequentially, supply-side risk would be created from this implication. So the further empirical research is needed to find the ideal balance between those two sources of commonality in liquidity to maintain the liquidity stability in the market.

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APPENDIX

Table A1
Definitions of variables.

Variable	Description	Source
Market conditions		
Market return	SET Index return (in % per day/week/month).	Datastream/Own computations
Market volatility	Standard deviation (in %) of the daily market return of a country within a week, two weeks, and a month for daily, weekly and monthly dataset. Daily market returns are computed as the value-weighted average of the returns of all individual stocks on a given day, week and month.	Datastream/Own computations
Market liquidity	Daily/weekly/monthly Amihud liquidity measures are computed by the absolute market return divided by Baht trading volume (multiplied by -1,000,000 to rescale and yield the liquidity measure)	Datastream/Own computations
Market turnover	Equally average of the turnover (in % per day/week/month) of all individual stocks in a given day, week and month.	Datastream/Own computations
Supply-side factors		
Local short-term interest rate	6-month interest rate swap(% per annum)	Datastream
U.S. Commercial spread	Difference between the percentage 90-day AA nonfinancial commercial paper interest rate and the three-month T-Bill rate	Federal Reserve
Financial/Bank returns	Equally weighted average of percentage local financial sector index return and bank sector index return.	Datastream/Own computations
Prime broker returns	Equally weighted average percentage stock returns of 20 major publicly traded global brokers, directly or by mean of a bank holding company. The list of prime brokers is obtained from the annual survey by PrimeBrokerageGuide.com, a web site of the Prime Brokerage Association, and includes Goldman Sachs, Morgan Stanley, J.P. Morgan, Credit Suisse, Deutsche Bank, UBS, Bank of America, Citigroup, Barclays, BNP Paribas, Fidelity Investments, Jefferies, Well Fargo, BNP Mellon, HSBC, Interactive Brokers, BTIG, Societe Generale, Charles Schwab, ConvergEx, Nomura, Cantor Fitzgerald, Scotiabank, and RBC. The returns are measured in the excess of the U.S. market returns to control for general market movement.	Datastream/Own computations

Table A1 (continued)

Demand-side factors		
R^2_{Turn},Turnover Commonality	Equally weighted average of R^2_{Turn}, after screen out the effect from supply-side, across the individual stocks in the sample. I adjust this variable by taking the residual of the time-series regression of R^2_{Turn} on supply-side factors (short-term interest rate, commercial spread, local financial and bank return and global prime broker returns. In the regression, I use the logistic transformation of this variable	Own computations
Investor-type Order Imbalance	The sum of individual stock's relative order imbalance, specified by each investor-type on a giving day/week/month. And divided by 1,000 to rescale.	SetSmart / Market Microstructure data / Own computations
Fund cash-flow	Fund-level net cash flow from open-end mutual funds. And divided by 1,000 to rescale.	MorningStar
Exchange rate	Daily/weekly/monthly % return in the value of Bath currency relative to SDR (or special drawing right), a basket of major currencies used as a unit of account by the IMF. A positive exchange rate return indicates a depreciation of the currency relative to the SDR.	IMF's International Financial Statistics
Market conditions		
Market return	SET Index return (in % per day/week/month).	Datastream/Own computations

Table A2
Summary statistics of variables.

Variable	n	Mean	Median	Min	Max	St.dev.
Market condition						
Market return	2478	0.0004	0.0007	-0.0371	0.0343	0.0123
Market volatility	2478	0.0109	0.0094	0.0025	0.0370	0.0061
Market liquidity	2470	-0.2305	-0.1550	-3.9800	-0.0027	0.2686
Market turnover	2474	0.0043	0.0036	0.0008	0.0172	0.0028
Supply-side factors						
Short-term interest rate	2989	2.9197	2.7400	1.2500	5.6650	1.2320
Commercial spread	1551	0.2221	0.1100	0.0100	1.4200	0.3005
Financial/Bank returns	2478	0.0002	0.0003	-0.0523	0.0526	0.0151
Prime broker returns	2432	-0.0004	-0.0003	-0.0342	0.0353	0.0101
Demand-side factors						
R^2_{Turn}	2384	0.1691	0.1598	0.0372	0.5308	0.0853
Retail customer OIB	2478	94.5604	42.7362	-862.1971	1480.7030	324.5851
Foreign OIB	2478	-7.2191	-4.0670	-206.3059	145.2529	57.7688
Mutual fund OIB	2478	2.2015	-1.2250	-129.3225	182.3069	44.3054
Proprietary OIB	2478	2.5695	0.0196	-43.0919	70.3906	15.2621
Total OIB	2478	92.2082	40.5952	-1026.9520	1595.3430	370.1047
Fund cash-flow	2476	410.9974	-28.1314	-20265.4900	33480.9800	6277.4640
Exchange rate	2478	-0.00003	0.00003	-0.0105	0.0100	0.0037

Table A3

Correlations of liquidity commonality with other variables.

	R^2_{liq}	Mkt Return	Mkt Volatility	Mkt Liquidity	Mkt Turnover	Short-term Int rate	Commercial Spread	Fin./Bank Returns	Prime Broker returns	R^2_{turn}	Cust OIB	Foreign OIB	Mutual OIB	Prop OIB	Total OIB	Fund Cash-flow	Exchange rate
R^2_{liq}	1.000																
Market Return	-0.029	1.000															
Market Volatility	0.047	0.007	1.000														
Market Liquidity	-0.179	0.125	-0.308	1.000													
Market Turnover	0.111	0.137	0.044	0.289	1.000												
Short-term Int. rate	-0.025	-0.056	0.069	-0.275	-0.447	1.000											
Commercial Spread	0.044	-0.075	0.254	-0.267	-0.262	0.507	1.000										
Fin./Bank returns	-0.037	0.891	-0.008	0.113	0.139	-0.053	-0.073	1.000									
Prime broker returns	0.005	0.181	-0.016	0.002	0.027	0.016	-0.048	0.164	1.000								
R^2_{turn}	0.320	0.000	0.123	-0.390	-0.087	0.098	0.105	-0.011	0.033	1.000							
Individual OIB	-0.180	0.335	-0.091	0.135	0.041	-0.077	-0.064	0.282	0.049	-0.140	1.000						
Foreign OIB	0.076	0.301	-0.026	0.001	0.042	0.075	-0.087	0.262	0.079	0.092	0.076	1.000					
Mutual fund OIB	-0.096	0.246	-0.037	0.055	-0.006	-0.036	-0.042	0.216	0.067	-0.060	0.392	0.028	1.000				
Proprietary OIB	-0.098	0.290	-0.023	0.062	0.086	-0.133	-0.037	0.230	0.035	-0.059	0.375	0.050	0.138	1.000			
Total OIB	-0.166	0.385	-0.089	0.129	0.047	-0.067	-0.075	0.325	0.064	-0.117	0.972	0.236	0.488	0.407	1.000		
Fund cash-flow	-0.083	-0.041	-0.025	0.052	0.065	-0.023	-0.012	-0.028	0.014	-0.081	0.078	-0.026	0.099	-0.035	0.077	1.000	
Exchange rate	0.014	-0.049	0.036	-0.074	-0.043	-0.004	0.036	-0.071	-0.019	0.010	-0.034	-0.071	-0.012	0.039	-0.040	0.053	1.000

Table A4

Supply-side Factors in Large-declining Market.

This table shows result of time-series regression of commonality in liquidity ($LIQCOM_t$), computed as the logistic transformation of commonality in liquidity (of each all, small, and large portfolio) over 2003:01:01 – 2013:12:31 on various supply-side and their interaction variables:

$$LIQCOM_t = \alpha + \sum_{i=1} \beta_i X_t + \sum_{i=1} D_{Down,Large} \beta_i X_t + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{m,t}$$

(m = market ; t = 2003 : 01 : 01 ,…, 2013 : 12 : 31),

where X_t denotes the time-series supply-side factors, $D_{Down,Large}$ is the dummy of large declining market (which equal to 1 if market return is below 1 S.D. of mean market return), $Z_{m,t}$ denotes the time-series control variables; market return, volatility, liquidity, turnover and the time trend, to account for any variations in capital market conditions. Daily, weekly, and monthly time series regression results are shown in Panel A, B, and C, respectively. Variable definitions are in Table A1. Intercepts are suppressed to conserve space. Significance at the 1%, 5%, and 10% level is indicated by [a], [b], and [c], respectively.

A. Daily Time-frame

Model	(15)			(16)			(17)			(18)		
Portfolio	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	-1.161	-1.690[c]	-0.797	-0.867	-0.9	-0.886	-0.451	0.121	-0.883	-0.312	-0.36	-0.254
Market volatility	-1.365	-0.736	-1.749	-2.557	-1.511	-3.204[c]	-1.144	-0.426	-1.657	-1.532	-0.892	-1.955
Market liquidity	-0.118[a]	-0.111[b]	-0.118[a]	-0.0773	-0.08	-0.0683	-0.109[b]	-0.0948[c]	-0.111[b]	-0.113[a]	-0.101[b]	-0.116[c]
Market turnover	-0.0738	-2.059	2.925	-0.0279	-2.356	2.722	5.253	6.15	5.743	4.413	5.338	5.01
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.008[a]	-0.009[a]	-0.007[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Supply-side in Declining Market												
Short-term Interest rate	-0.0276[a]	-0.0426[a]	-0.0154[c]									
Short-term Interest rate x $D_{Down,Large}$	-0.0177	-0.0288[b]	-0.0104									
Commercial spread				0.0487	0.00015	0.0913[b]						
Commercial spread x $D_{Down,Large}$				0.0137	-0.00734	0.0290						
Fin/Bank returns							-0.0489	-0.651	0.493			
Fin/Bank returns x $D_{Down,Large}$							0.422	0.608	0.0922			
Prime broker returns										-0.785	-0.534	-1.024
Prime broker returns x $D_{Down,Large}$										0.846	1.271	0.471
#Obs.	2469	2469	2469	1545	1545	1545	2469	2469	2469	2423	2423	2423
Adjust R^2	0.308	0.345	0.242	0.364	0.381	0.308	0.304	0.337	0.24	0.305	0.337	0.242

Table A4 (continued)

B. Weekly Time-frame												
Model	**(15)**			**(16)**			**(17)**			**(18)**		
Portfolio	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	-0.00824	-0.0126	-0.0642	0.0580	0.244	-0.134	1.492	1.626	1.342	0.0803	0.145	-0.0202
Market volatility	-1.696	-1.702	-2.739	-1.986	-1.152	-3.638	-1.678	-1.638	-2.717	-1.198	-0.91	-2.373
Market liquidity	-0.0858	-0.0425	-0.127	-0.0401	-0.0145	-0.0572	-0.12	-0.0956	-0.151[c]	-0.104	-0.0791	-0.13
Market turnover	-6.241	-10.87	-0.903	-4.800	-7.898	0.0316	1.557	1.793	4.089	1.689	2.311	3.912
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.008[a]	-0.009[a]	-0.007[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Supply-side in Declining Market												
Short-term Interest rate	-0.0327[a]	-0.0542[a]	-0.0201									
Short-term Interest rate x $D_{Down,Large}$	0.00208	0.00157	0.00347									
Commercial spread				-0.0243	-0.111	0.0414						
Commercial spread x $D_{Down,Large}$				0.143	0.217[c]	0.113						
Fin/Bank returns							-1.210	-1.149	-1.270			
Fin/Bank returns x $D_{Down,Large}$							-0.298	-0.600	-0.099			
Prime broker returns										0.553	0.875	0.465
Prime broker returns x $D_{Down,Large}$										-1.793	-2.349	-1.939
#Obs.	550	550	550	480	480	480	550	550	550	549	549	549
Adjust R^2	0.487	0.482	0.415	0.516	0.501	0.454	0.482	0.470	0.414	0.483	0.472	0.415

Table A4 (continued)

C. Monthly Time-frame												
Model	**(15)**			**(16)**			**(17)**			**(18)**		
Portfolio	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	0.48	0.515	0.395	0.553	0.674	0.475	2.091[b]	2.622[b]	1.927[b]	0.533	0.669	0.408
Market volatility	1.505	2.702	-0.433	1.544	3.35	-0.875	-0.00445	0.660	-1.753	3.607	5.514	1.316
Market liquidity	-0.141	-0.035	-0.229	-0.195	-0.165	-0.215	-0.112	-0.038	-0.167	-0.205	-0.159	-0.25
Market turnover	-4.36	-11.58	3.276	2.242	-0.52	6.264	0.314	-1.588	3.909	3.591	3.001	6.347
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]
Supply-side in Declining Market												
Short-term Interest rate	-0.0290	-0.0516[b]	-0.0124									
Short-term Interest rate x $D_{Down,Large}$	0.0122	0.0119	0.00981									
Commercial spread				-0.0108	-0.0865	0.0523						
Commercial spread x $D_{Down,Large}$				0.0680	0.1070	0.0596						
Fin/Bank returns							-1.131	-1.417	-1.174[c]			
Fin/Bank returns x $D_{Down,Large}$							-0.872	-1.089	-0.686			
Prime broker returns										1.329[b]	1.908[a]	1.016[c]
Prime broker returns x $D_{Down,Large}$										-3.128	-3.542	-2.763
#Obs.	131	131	131	127	127	127	131	131	131	131	131	131
Adjust R^2	0.632	0.607	0.571	0.625	0.594	0.574	0.644	0.613	0.59	0.644	0.618	0.585

Table A5

Demand-side Factors in Currency Depreciation.

This table shows result of time-series regression of commonality in liquidity ($LIQCOM_t$), computed as the logistic transformation of commonality in liquidity (of each all, small, and large portfolio) over 2003:01:01 – 2013:12:31 on sell-activity of investor-type and their interaction variables:

$$LIQCOM_t = \alpha + \sum_{j=1} \beta_j X_t + \sum_{j=1} D_{FXDep} \beta_j X_t + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{m,t}$$

(m = market ; t = 2003 : 01 : 01 ,…, 2013 : 12 : 31),

where X_t denotes the sell-activity of investor-type, D_{FXDep} is the dummy of currency depreciation(which equal to 1 if return of currency return relative to the SDR is positive), $Z_{m,t}$ denotes the time-series control variables; market return, volatility, liquidity, turnover and the time trend, to account for any variations in capital market conditions. Daily, weekly, and monthly time series regression results are shown in Panel A, B, and C, respectively. Variable definitions are in Table A1. Intercepts are suppressed to conserve space. Significance at the 1%, 5%, and 10% level is indicated by [a], [b], and [c], respectively.

A. Daily Time-frame

Model Portfolio	(19)			(20)			(21)			(22)		
	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	-0.239	0.0928	-0.441	-0.758	-0.651	-0.806	-0.387	-0.551	-0.249	-0.476	-0.799	-0.24
Market volatility	-1.262	-0.67	-1.661	-1.358	-0.751	-1.767	-1.291	-0.611	-1.744	-1.203	-0.454	-1.702
Market liquidity	-0.103[a]	-0.0848[b]	-0.110[a]	-0.112[a]	-0.0949[b]	-0.119[a]	-0.104[a]	-0.0884[b]	-0.110[a]	-0.104[a]	-0.0889[b]	-0.109[a]
Market turnover	4.89	5.113	5.951[c]	5.616[c]	6.185[c]	6.439[c]	5.298	6.396[c]	5.758[c]	5.202	6.339[c]	5.651[c]
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Demand-side in FX Depreciation												
Customer Sell	-0.00000	-0.00010	0.00007									
Customer Sell x D_{FXDep}	-0.00003	-0.00001	-0.00006									
Foreign Sell				0.00093[a]	0.00099[a]	0.00089[a]						
Foreign Sell x D_{FXDep}				-0.00094[b]	-0.00128[a]	-0.00076[b]						
Mutual Fund Sell							0.00060	0.00101[c]	0.00030			
Mutual Fund Sell x D_{FXDep}							-0.00077	-0.00098	-0.00065			
Proprietary Sell										0.00119	0.00296[c]	0.00002
Proprietary Sell x D_{FXDep}										-0.00050	0.00003	-0.00101
#Obs.	2469	2469	2469	2469	2469	2469	2469	2469	2469	2469	2469	2469
Adjust R^2	0.304	0.337	0.24	0.306	0.34	0.243	0.304	0.338	0.24	0.304	0.338	0.24

Table A5 (continued)

B. Weekly Time-frame

Model Portfolio	(19)			(20)			(21)			(22)		
	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	0.065	0.172	-0.118	-0.0955	0.0195	-0.248	0.00348	0.0152	-0.0759	0.00434	0.00751	-0.0842
Market volatility	-1.427	-1.326	-2.451	-1.394	-1.253	-2.5	-1.338	-1.088	-2.527	-1.51	-1.311	-2.63
Market liquidity	-0.126	-0.108	-0.152[c]	-0.134	-0.114	-0.162[c]	-0.124	-0.101	-0.154[c]	-0.124	-0.105	-0.151[c]
Market turnover	1.752	2.269	4.138	2.41	2.8	4.812	2.27	3.064	4.429	1.828	2.54	4.052
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Demand-side in FX Depreciation												
Customer Sell	0.00004	-0.00003	0.00008									
Customer Sell x D_{FXDep}	-0.00008	-0.00003	-0.00010									
Foreign Sell				0.00021	0.00022	0.00019						
Foreign Sell x D_{FXDep}				-0.00021	-0.00027	-0.00017						
Mutual Fund Sell							0.00043	0.00048	0.00043			
Mutual Fund Sell x D_{FXDep}							-0.00033	-0.00028	-0.00042			
Proprietary Sell										0.00160	0.00208	0.00115
Proprietary Sell x D_{FXDep}										-0.00281	-0.00242	-0.00276
#Obs.	550	550	550	550	550	550	550	550	550	550	550	550
Adjust R^2	0.481	0.47	0.413	0.483	0.472	0.415	0.483	0.471	0.415	0.483	0.47	0.416

C. Monthly Time-frame

Model Portfolio	(19)			(20)			(21)			(22)		
	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	0.555	0.699	0.424	0.313	0.415	0.223	0.52	0.643	0.407	0.433	0.531	0.323
Market volatility	0.854	1.668	-0.67	-0.0584	0.774	-1.727	1.698	2.687	-0.0565	1.121	1.93	-0.504
Market liquidity	-0.253	-0.215	-0.293[c]	-0.279	-0.238	-0.319[c]	-0.237	-0.194	-0.279[c]	-0.217	-0.169	-0.262
Market turnover	4.515	3.604	7.462	7.472	6.906	9.931	4.027	3.274	6.699	4.242	3.472	7.188
Time trend	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]
Demand-side in FX Depreciation												
Customer Sell	-0.00017	-0.00020	-0.00019									
Customer Sell x D_{FXDep}	0.00012	0.00013	0.00016									
Foreign Sell				0.00008	0.00008	0.00007						
Foreign Sell x D_{FXDep}				-0.00007	-0.00008	-0.00006						
Mutual Fund Sell							0.00027[c]	0.00034	0.00023			
Mutual Fund Sell x D_{FXDep}							-0.00030	-0.00033	-0.00028			
Proprietary Sell										0.00018	0.00049	-0.00011
Proprietary Sell x D_{FXDep}										-0.00031	-0.00051	0.00002
#Obs.	131	131	131	131	131	131	131	131	131	131	131	131
Adjust R^2	0.628	0.596	0.573	0.631	0.598	0.576	0.634	0.602	0.579	0.625	0.593	0.570

Table A6

Demand-side Factors in Large-rising Market.

This table shows result of time-series regression of commonality in liquidity ($LIQCOM_t$), computed as the logistic transformation of commonality in liquidity (of each all, small, and large portfolio) over 2003:01:01 – 2013:12:31 on buy-activity of investor-type and their interaction variables:

$$LIQCOM_t = \alpha + \sum_{j=1} \beta_j X_t + \sum_{j=1} D_{Up,Large}\beta_j X_t + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{m,t}$$

(m = market ; t = 2003 : 01 : 01 ,…, 2013 : 12 : 31),

where X_t denotes the buy-activity of investor-type, $D_{Up,Large}$ is the dummy of large rising market (which equal to 1 if market return is above 1 S.D. of mean market return), $Z_{m,t}$ denotes the time-series control variables; market return, volatility, liquidity, turnover and the time trend, to account for any variations in capital market conditions. Daily, weekly, and monthly time series regression results are shown in Panel A, B, and C, respectively. Variable definitions are in Table A1. Intercepts are suppressed to conserve space. Significance at the 1%, 5%, and 10% level is indicated by [a], [b], and [c], respectively.

A. Daily Time-frame

Model Portfolio	(23)			(24)			(25)			(26)		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	-0.5	-0.657	-0.433	-0.87	-1.105	-0.778	0.101	-0.188	0.273	0.151	0.393	-0.0467
Market volatility	-1.145	-0.445	-1.641	-1.309	-0.484	-1.873	-0.827	-0.0488	-1.352	-1.493	-0.894	-1.872
Market liquidity	-0.102[a]	-0.0835[c]	-0.108[a]	-0.0970[b]	-0.0830[c]	-0.101[a]	-0.110[a]	-0.0933[b]	-0.117[a]	-0.108[a]	-0.0955[b]	-0.112[a]
Market turnover	4.591	5.038	5.464	4.021	4.34	4.886	5.208	5.354	6.288[c]	6.715[b]	8.199[b]	6.795[b]
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]
Demand-side in Raising Market												
Customer Buy	0.00003	0.00005	0.00002									
Customer Buy x $D_{Up,Large}$	-0.00000	0.00001	0.00000									
Foreign Buy				0.00025	0.00069[c]	-0.00002						
Foreign Buy x $D_{Up,Large}$				0.00060	0.00046	0.00079						
Mutual Fund Buy							0.00009	0.00065[c]	-0.00025			
Mutual Fund Buy x $D_{Up,Large}$							-0.00098	-0.00102	-0.00092			
Proprietary Buy										-0.00282[a]	-0.00392[a]	-0.00187[b]
Proprietary Buy x $D_{Up,Large}$										0.00117	0.00137	0.00100
#Obs.	2469	2469	2469	2469	2469	2469	2469	2469	2469	2469	2469	2469
Adjust R^2	0.304	0.337	0.24	0.304	0.339	0.241	0.304	0.338	0.242	0.307	0.342	0.242

Table A6 (continued)

B. Weekly Time-frame

Model Portfolio	(23)			(24)			(25)			(26)		
	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	-0.658	-0.886	-0.66	-0.401	-0.493	-0.458	0.0524	0.0319	0.00242	0.0431	0.106	-0.1
Market volatility	-2.197	-2.16	-3.489	-2.04	-1.828	-3.22	-0.955	-0.654	-2.065	-1.67	-1.619	-2.715
Market liquidity	-0.108	-0.0807	-0.141[c]	-0.114	-0.0949	-0.140[c]	-0.123	-0.104	-0.150[c]	-0.136	-0.121	-0.159[c]
Market turnover	-0.0533	-0.492	2.925	0.931	1.329	3.291	1.468	1.448	4.106	4.545	6.235	5.92
Time trend	-0.008[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]
Demand-side in Raising Market												
Customer Buy	0.00002	0.00004[c]	0.00001									
Customer Buy x $D_{Up,Large}$	0.00011[c]	0.00014[b]	0.00010[c]									
Foreign Buy				-0.00006	0.00002	-0.00011						
Foreign Buy x $D_{Up,Large}$				0.00049[c]	0.00055[c]	0.00048[c]						
Mutual Fund Buy							0.00008	0.00024	-0.00001			
Mutual Fund Buy x $D_{Up,Large}$							-0.00024	-0.00010	-0.00042			
Proprietary Buy										-0.0013[a]	-0.0019[a]	-0.00090[b]
Proprietary Buy x $D_{Up,Large}$										0.00104	0.00149	0.00077
#Obs.	550	550	550	550	550	550	550	550	550	550	550	550
Adjust R^2	0.486	0.478	0.416	0.484	0.474	0.416	0.481	0.471	0.413	0.489	0.481	0.417

C. Monthly Time-frame

Model Portfolio	(23)			(24)			(25)			(26)		
	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large
Capital Market Conditions												
Market return	0.322	0.356	0.233	0.543	0.639	0.453	0.403	0.505	0.289	0.602	0.768	0.43
Market volatility	2.068	3.683	-0.0514	1.198	2.164	-0.576	1.393	2.796	-0.543	0.511	1.27	-1.076
Market liquidity	-0.188	-0.119	-0.241	-0.189	-0.138	-0.22	-0.214	-0.166	-0.258	-0.258	-0.223	-0.290[c]
Market turnover	2.724	0.492	6.047	2.762	1.702	4.692	4.14	2.843	6.984	8.633	9.024	10.32
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.006[a]	-0.008[a]	-0.005[a]
Demand-side in Raising Market												
Customer Buy	0.00001	0.00001	0.00000									
Customer Buy x $D_{Up,Large}$	0.00001	0.00001	0.00001									
Foreign Buy				-0.00008	-0.00008	-0.00011						
Foreign Buy x $D_{Up,Large}$				0.00003	0.00005	0.00007						
Mutual Fund Buy							0.00001	0.00005	-0.00000			
Mutual Fund Buy x $D_{Up,Large}$							0.00027	-0.00003	0.00066			
Proprietary Buy										-0.00042[a]	-0.00055[a]	-0.00032[b]
Proprietary Buy x $D_{Up,Large}$										0.00014	0.00018	0.00017
#Obs.	131	131	131	131	131	131	131	131	131	131	131	131
Adjust R^2	0.627	0.599	0.571	0.629	0.595	0.578	0.625	0.595	0.571	0.649	0.621	0.587

Table A7

Demand-side Factors in Large-declining Market.

This table shows result of time-series regression of commonality in liquidity ($LIQCOM_t$), computed as the logistic transformation of commonality in liquidity (of each all, small, and large portfolio) over 2003:01:01 – 2013:12:31 on sell-activity of investor-type and their interaction variables:

$$LIQCOM_t = \alpha + \sum_{j=1} \beta_j X_t + \sum_{j=1} D_{Down,Large} \beta_j X_t + \sum_{k=1}^{5} \gamma_k Z_{m,t} + \varepsilon_{m,t}$$

(m = market ; t = 2003 : 01 : 01 ,…, 2013 : 12 : 31),

where X_t denotes the sell-activity of investor-type, $D_{Down,Large}$ is the dummy of large declining market (which equal to 1 if market return is below 1 S.D. of mean market return), $Z_{m,t}$ denotes the time-series control variables; market return, volatility, liquidity, turnover and the time trend, to account for any variations in capital market conditions. Daily, weekly, and monthly time series regression results are shown in Panel A, B, and C, respectively. Variable definitions are in Table A1. Intercepts are suppressed to conserve space. Significance at the 1%, 5%, and 10% level is indicated by [a], [b], and [c], respectively.

A. Daily Time-frame

Model Portfolio	(27)			(28)			(29)			(30)		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	-0.56	-0.34	-0.69	-0.97	-0.93	-0.98	-0.50	-0.46	-0.52	-0.62	-0.89	-0.43
Market volatility	-1.09	-0.44	-1.51	-1.10	-0.40	-1.56	-1.17	-0.60	-1.54	-1.14	-0.42	-1.62
Market liquidity	-0.110[a]	-0.0953[b]	-0.116[a]	-0.117[a]	-0.101[b]	-0.123[a]	-0.106[a]	-0.0838[b]	-0.116[a]	-0.109[a]	-0.0923[b]	-0.117[a]
Market turnover	5.46	5.89	6.387[c]	5.898[c]	6.557[c]	6.668[c]	5.31	6.11	5.986[c]	5.44	6.486[c]	5.974[c]
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]
Demand-side in Declining Market												
Customer Sell	-0.00009	-0.00020[b]	-0.00002									
Customer Sell x $D_{Down,Large}$	0.00017	0.00024[c]	0.00013									
Foreign Sell				0.00033	0.00019	0.00041						
Foreign Sell x $D_{Down,Large}$				0.00029	0.00039	0.00024						
Mutual Fund Sell							0.00012	0.00060	-0.00023			
Mutual Fund Sell x $D_{Down,Large}$							0.00024	-0.00041	0.00070			
Proprietary Sell										0.00031	0.0026	-0.00129
Proprietary Sell x $D_{Down,Large}$										0.00200	0.00123	0.00265
#Obs.	2469.00	2469.00	2469.00	2469.00	2469.00	2469.00	2469.00	2469.00	2469.00	2469.00	2469.00	2469.00
Adjust R^2	0.30	0.34	0.24	0.30	0.34	0.24	0.30	0.34	0.24	0.30	0.34	0.24

Table A7 (continued)

B. Weekly Time-frame

Model Portfolio	(27)			(28)			(29)			(30)		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	0.281	0.373	0.115	0.288	0.315	0.189	0.155	0.156	0.0598	0.133	0.123	0.0201
Market volatility	-1.692	-1.576	-2.736	-1.976	-1.675	-3.179	-1.364	-1.117	-2.528	-1.33	-1.158	-2.445
Market liquidity	-0.121	-0.104	-0.146[c]	-0.116	-0.0962	-0.143[c]	-0.118	-0.096	-0.147[c]	-0.121	-0.103	-0.149[c]
Market turnover	1.109	1.691	3.437	1.886	2.388	4.219	2.022	2.838	4.187	1.501	2.245	3.788
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]
Demand-side in Declining Market												
Customer Sell	0.00005	0.00002	0.00009									
Customer Sell x $D_{Down,Large}$	-0.00019[c]	-0.00016	-0.00020[c]									
Foreign Sell				0.00014	0.00010	0.00016						
Foreign Sell x $D_{Down,Large}$				-0.00028	-0.00023	-0.00031[c]						
Mutual Fund Sell							0.00036[c]	0.00043[c]	0.00030			
Mutual Fund Sell x $D_{Down,Large}$							-0.00048	-0.00043	-0.00048			
Proprietary Sell										-0.00019	0.00056	-0.00069
Proprietary Sell x $D_{Down,Large}$										-0.00118	-0.00108	-0.00089
#Obs.	550	550	550	550	550	550	550	550	550	550	550	550
Adjust R^2	0.483	0.471	0.416	0.483	0.47	0.416	0.483	0.472	0.415	0.481	0.469	0.414

C. Monthly Time-frame

Model Portfolio	(27)			(28)			(29)			(30)		
	All	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**	**All**	**Small**	**Large**
Capital Market Conditions												
Market return	0.602	0.738	0.439	0.488	0.561	0.393	0.681[c]	0.897[c]	0.498	0.409	0.481	0.322
Market volatility	0.609	1.412	-0.97	0.655	1.592	-1.048	1.29	2.273	-0.481	1.223	2.084	-0.512
Market liquidity	-0.251	-0.211	-0.285[c]	-0.225	-0.182	-0.267	-0.15	-0.0763	-0.213	-0.215	-0.165	-0.262
Market turnover	2.988	2.158	6.219	5.816	5.293	8.333	1.319	-0.743	4.956	4.488	3.936	7.187
Time trend	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]	-0.007[a]	-0.009[a]	-0.006[a]	-0.007[a]	-0.008[a]	-0.006[a]
Demand-side in Declining Market												
Customer Sell	-0.00000	-0.00002	0.00000									
Customer Sell x $D_{Down,Large}$	-0.00013	-0.00012	-0.00009									
Foreign Sell				0.00005	0.00006	0.00005						
Foreign Sell x $D_{Down,Large}$				-0.00009	-0.00008	-0.00009						
Mutual Fund Sell							0.00006	0.00011	0.00003			
Mutual Fund Sell x $D_{Down,Large}$							-0.00147[c]	-0.00206[c]	-0.00105			
Proprietary Sell										-0.00023	-0.00024	-0.00010
Proprietary Sell x $D_{Down,Large}$										0.00026	0.00053	0.00001
#Obs.	131	131	131	131	131	131	131	131	131	131	131	131
Adjust R^2	0.631	0.598	0.573	0.630	0.597	0.575	0.634	0.606	0.575	0.625	0.594	0.570

Table A8

Robustness Test.

This table shows estimated coefficients result of weekly time-series regression of individual adjusted liquidity ($Liq_{i,t}$) over 2003:01:01 – 2013:12:31 on market adjusted liquidity ($Liq_{m,t}$) and the interaction team between market liquidity and factor of interests:

$$Liq_{i,t} = \alpha_i + \beta_{liq,i} Liq_{m,t} + \beta_{interaction,i} Liq_{m,t} D_{interestfactor,t} + \beta_{interaction,i} Liq_{m,t} D_{interestfactor,t-1} + control\ variables + \varepsilon_{i,t}$$

(m = market ; t = 2003 : 01 : 01 ,…, 2013 : 12 : 31),

where $Liq_{i,t}$ and $Liq_{m,t}$ denotes the adjusted Amihud liquidity of individual firm and market, $D_{interestfactor,t}$ is the dummy of interest factor in each model, and control variables; the current and 4 weekly lag market return, the current and 1-week lag market volatility, the current and 1-week lag market turnover, 4 weekly lag individual liquidity, 4 weekly lag individual return, and the current and 1-week lag individual volatility to account for any variations in capital market conditions and stock characteristic. Base model and asymmetric pattern study results are in Panel A. Supply-side and demand-side study results are in Panel B and C, respectively. Only focus variables are reported.

A. Base Model and Asymmetric Pattern

Model	**(1)**	**(2)**		
Estimated Coefficients of interest	$Liq_{m,t}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{DownLarge,m,t}$	$Liq_{m,t} \times D_{UpLarge,m,t}$
Mean	0.0802	0.0584	0.3668	0.4414
(t-statistics)	*(9.7)*	*(6.72)*	*(4.48)*	*(4.65)*
Median	0.0047	0.0024	0.0488	0.0477
% positive (negative)	64%	60%	62%	67%
% positive (negative) significant	26%	22%	13%	3%

B. Supply-side

Model	**(3)**			**(4)**			**(5)**			**(6)**		
Estimated Coefficients of interest	$Liq_{m,t}$	$Liq_{m,t} \times D_{IntUp,m,t}$	$Liq_{m,t} \times D_{IntUp,m,t-1}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{CCPUp,m,t}$	$Liq_{m,t} \times D_{CCPUp,m,t-}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{FINDown,m}$	$Liq_{m,t} \times D_{FINDown,m}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{BrockDown,}$	$Liq_{m,t} \times D_{BrockDown,}$
Mean	0.0598	0.0289	0.0046	0.1085	-0.0366	-0.0166	-0.0030	0.0701	0.0560	0.0924	-0.0401	-0.0340
(t-statistics)	*(6.03)*	*(3.13)*	*(0.5)*	*(9.53)*	*(-4.24)*	*(-1.89)*	*(-0.26)*	*(7.41)*	*(5.14)*	*(9.02)*	*(-4.21)*	*(-3.42)*
Median	0.0031	0.0000	0.0000	0.0054	-0.0048	0.0002	0.0003	0.0181	0.0000	0.0042	0.0001	0.0000
% positive (negative)	63%	49%	50%	66%	(65%)	(46%)	(46%)	69%	51%	63%	(47%)	(50%)
% positive (negative) significant	19%	6%	10%	17%	(10%)	(5%)	(9%)	16%	8%	16%	(6%)	(6%)

Table A8 (continued)

C. Demand-side												
Model		**(7)**			**(8)**			**(9)**			**(10)**	
Estimated Coefficients of interest	$Liq_{m,t}$	$Liq_{m,t} \times D_{TurnUp,m,t}$	$Liq_{m,t} \times D_{TurnUp,m,t-}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{CustUp,m,t}$	$Liq_{m,t} \times D_{CustUp,m,t-}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{ForeUp,m,t}$	$Liq_{m,t} \times D_{ForeUp,m,t-}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{MutuUp,m,t}$	$Liq_{m,t} \times D_{MutuUp,m,t}$
Mean	0.0352	0.0147	0.0670	0.0702	-0.0086	0.0202	0.0806	-0.0135	0.0082	0.0339	0.0317	0.0450
(t-statistics)	*(3.2)*	*(1.6)*	*(7.47)*	*(6.6)*	*(-0.93)*	*(2.25)*	*(6.1)*	*(-1.32)*	*(0.81)*	*(2.66)*	*(3.48)*	*(4.93)*
Median	0.0011	-0.0003	0.0045	0.0048	-0.0021	0.0011	0.0006	0.0006	0.0008	0.0012	0.0003	0.0006
% positive (negative)	58%	46%	63%	63%	(60%)	57%	56%	(42%)	57%	58%	55%	57%
% positive (negative) significant	16%	5%	13%	18%	(9%)	8%	14%	(4%)	9%	13%	11%	13%

C. Demand-side (continued)												
Model		**(11)**			**(12)**			**(13)**			**(14)**	
Estimated Coefficients of interest	$Liq_{m,t}$	$Liq_{m,t} \times D_{PropUp,m,t}$	$Liq_{m,t} \times D_{PropUp,m,t-}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{TotalUp,m,t}$	$Liq_{m,t} \times D_{TotalUp,m,t}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{FlowOut,m,t}$	$Liq_{m,t} \times D_{FlowOut,m,t}$	$Liq_{m,t}$	$Liq_{m,t} \times D_{FXDep,m,t}$	$Liq_{m,t} \times D_{FXDep,m,t-}$
Mean	0.0677	0.0150	0.0100	0.0827	-0.0180	-0.0008	0.0398	0.0342	0.0508	0.0607	0.0288	0.0083
(t-statistics)	*(6.03)*	*(1.71)*	*(1.16)*	*(7.64)*	*(-1.96)*	*(-0.09)*	*(3.96)*	*(3.95)*	*(5.85)*	*(6.42)*	*(3.27)*	*(0.92)*
Median	0.0054	0.0001	0.0001	0.0065	-0.0014	0.0000	0.0024	0.0000	0.0000	0.0046	0.0005	-0.0006
% positive (negative)	65%	51%	52%	64%	(55%)	(50%)	60%	50%	51%	63%	55%	45%
% positive (negative) significant	15%	10%	10%	20%	(9%)	(8%)	23%	9%	7%	22%	6%	4%

VITA

Porawat Tangpiyanan was born on January 7, 1990 in Bangkok, Thailand. At the undergraduate level, he graduated from Chulalongkorn University in Bachelor's degree in Engineering in March 2011. After completing the bachelor's degree, he then decided to continue his education in Master of Science in Finance Program at Chulalongkorn University as a full-time student in June 2013.