# Three Theses on Commonality in Liquidity

# Summary

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In this study, we examine several issues related with commonality in liquidity.

**1. Chapter 1**

Systematic property of liquidity has drawn the attention of empirical researchers since Chordia et al. (2000) first proposed the co-variation of liquidity with market liquidity (commonality in liquidity). Studies on commonality in liquidity are initiated from investigation on the U.S. exchanges (e.g., Chordia et al., 2000; Hasbrouck and Seppi, 2001; Huberman and Halka, 2001). There is also evidence of commonality in liquidity on non-U.S. exchanges (Brockman and Chung, 2002; Fabre and Frino, 2004; Bauer, 2004; Le and Visaltanachoti, 2009). Brockman et al. (2009) give evidence that commonality in liquidity on the individual market is a world prevailing phenomenon, studying 47 stock exchanges. At the same time, they also examine commonality in liquidity across exchanges.

Besides the existence of commonality in liquidity, the roll that commonality in liquidity plays in asset pricing is focused on by recent studies. Acharya and Pedersen (2005) theoretically prove commonality in liquidity as a risk factor and study the economic significance of commonality in liquidity for return, using the liquidity–adjusted capital asset pricing model (LCAPM), looking at the data of NYSE and AMEX from 1964 to 1999. Following Acharya and Pedersen (2005), Lee (2011) explored the LCAPM on a global level, where commonality in liquidity of five years is calculated.

There is a gap between these two fields. Empirical studies on liquidity risk need to investigate commonality in liquidity from both short term and long term, so that the properties of commonality in liquidity in both short term and long term are important. However, most of the studies on the existence of commonality in liquidity are on a short term (one or two years), leaving a black that whether commonality in liquidity exists in the long term.

Our study examines the existence and characteristics of commonality in liquidity on the Shanghai Stock Exchange of China (SHE) and Shenzhen Stock Exchange of China (SZE) over twelve-year period from 2000 to 2011. Our sample makes it possible to explore, whether three kinds of possible factors affect the existence and characteristics of commonality of liquidity. One factor is the natural volatility of liquidity in the long term, which exits in common even without event shocks. Chordia et al. (2001) suggest that daily changes in market averages of liquidity are highly volatile using an extended time sample. The high volatility of market liquidity in the long term may induce the disappearance of commonality in liquidity. The second source is event shocks in the 12 years of the sample, e.g., non-tradable share reform since 2005 and Lehman Shock in 2008. Non-tradable share reform, initiated in Chinese stock market in 2005, which makes earlier non-tradable state-owned shares tradable in stock market, changes the total volume of tradable shares in the market, which may influence the liquidity and commonality of liquidity. Meanwhile, Hameed et al. (2010) find market declines affect both liquidity level and liquidity commonality. The Shanghai Composite Index dropped from the peak 6124.04 point on Oct. 30,

2007 to the trough 1664.92 point on Oct. 31, 2008 because of Lehman shock, which may lead to extreme liquidity and commonality in liquidity during this period. The third factor is the highly exploding Chinese stock market (including both SHE and SZE). As the number of stocks in the stock markets of China grew from 949 in 2000 to 2342 in 2011, the constitution of the market also changed, which may lead to the change of the commonality in liquidity. On the concern that these factors affect the properties of commonality in liquidity, we test the commonality in liquidity in three steps, in total, by term and by year respectively. The results show strong evidence of commonality in liquidity in the long term. Additionally, we also find a term effect on commonality in liquidity, that more stocks show commonality in liquidity as term increases. Commonality in liquidity exists in each year, and stays stable in most of years. There is no evidence showing that the three factors mentioned above influence the commonality in liquidity in each year.

Our study also investigates the size effect in the long term, whether the level of commonality in liquidity relates to the size of firm. As Acharya and Pedersen (2005) indicate that the level of commonality in liquidity acts as a risk factor, it is essential to identify whether we can diversify the systematic liquidity risk by selecting the size of firms in the long term. Previous studies report evidence of existence of a size effect on commonality in liquidity, but show extremely different relation between size of firm and commonality in liquidity, using data of different countries. Chordia et al. (2000) find that large companies have larger commonality in liquidity measured by spread but no similar relation for depth in NYSE. Brockman and Chung (2009) present that small firms show more commonality in spread than large firms but large firms show more commonality in depths than small firms, using data of 47 stock exchanges. Brockman and Chung (2002), Fabre and Frino (2004), and Le and Visaltanachoti (2009) show different results of size effect on commonality in liquidity, using data of Stock Exchange of Hong Kong, Australian Stock Exchange and Stock Exchange of Thailand respectively. The different results may be because of the difference of the stock exchange. Another possibility is because most of these studies only use data of short-term (one or two years), and their results just show the size effect in the sample period without depicting the whole fact. The only long term study on the size effects, Kamara et al. (2008) only uses a low frequency proxy of liquidity, the measure of Amihud (2002), indicating the ability to decrease the commonality in liquidity by holding large-cap stocks. To get a robust conclusion on this issue, we explore the size effects using 8 proxies of liquidity in the long term. Our results show that size effects on commonality in liquidity depend on the proxy we use. Commonality in non-standardized spread-related proxies has no size effects. Commonality in standardized spread-related proxies shows negative size effects, while commonality in depth-related proxies displays positive size effects. Small investors can decrease the effects of the aggregate liquidity shocks by holding large-cap stocks, and large investors can decrease the effect of the aggregate liquidity shocks by holding small-cap stocks

Our study investigates the effect of industry liquidity on individual liquidity. The results show that the industry liquidity plays a significant role in the liquidity of individual stocks.

Finally, we study whether diversification across industries decrease the liquidity volatility. The results of different proxies of liquidity are different. There is no enough evidence that we can decrease the volatility of liquidity by diversification across

industries.

## 2. Chapter 2

Chordia, Roll, and Subrahmanyam (2000) first time examine the co-movement in liquidity between individual stock and market on New York Exchange. As more evidence show that commonality in liquidity is prevalent around the world (e.g., Hasbrouck and Seppi, 2001; Brockman and Chung, 2002; Brockman et al., 2009), issues related to commonality in liquidity have been drawing more attention, especially in the field of asset pricing (e.g., Pastor and Stambaugh, 2003; Acharya and Pedersen, 2005; Sadka, 2006; Korajczyk and Sadka, 2008; Watanabe and Watanabe, 2008; Lee, 2011). To give support to these studies, understanding the sources of commonality in liquidity is essential.

Previous studies give sources of commonality in liquidity from two perspectives: supply-side and demand-side. On the supply-side, Coughenour and Saad (2004) argue that specialists within a firm will share capital and information and stock liquidity will co-move with specialist portfolio liquidity. Brunnermeier and Pedersen (2009) propose that changes in funding conditions affect speculators' market liquidity provision of all stocks, and thus lead to commonality in liquidity. Hameed et al. (2010) give empirical evidence to the explanation of Brunnermeier and Pedersen (2009). They document that the commonality in liquidity increases during periods of market declines, when agents may hit their funding constraints and be forced to liquidate their positions across many assets and to reduce the supply of liquidity as liquidity providers. Karolyi et al. (2012) give evidence that funding constraint is not paramount important in equity markets around the world, even during the recent global financial crisis. They also find support for demand-side sources driven by correlated trading activity of international and institutional investors (Chordia et al., 2000; Hasbrouck and Seppi, 2001; Kamara et al., 2008; Koch et al., 2009), investor sentiment (Huberman and Halka, 2001) and incentives to trade individual securities. Besides Karolyi et al. (2012), some studies also investigate the demand-side sources of commonality in liquidity relate to the role of institutional ownership. Kamara et al. (2008) show both time series and cross-sectional relation between liquidity beta and institutional ownership, and argue that the divergence of systematic liquidity can be explained by patterns in institutional ownership. Koch et al. (2009) find that stocks with higher mutual fund ownership have higher commonality in liquidity. They do further research on the relation between characteristics of stocks' owners and commonality in liquidity, and find that stocks owned by mutual funds with higher turnover and stocks owned by mutual funds that experience liquidity shocks have higher commonality in liquidity.

No matter studies from the supply-side perspective or studies from the demand side perspective, they are all about the relationship between the investors' behaviors across the market and the commonality in liquidity. Their ideas could be summarized as investors' behaviors across the market increase commonality in liquidity. There is no study on how investors' behaviors on individual stocks influence commonality in liquidity. This study investigates how herding within individual stocks affects the commonality in liquidity.

The liquidity of individual stocks is influenced by the market liquidity, i.e., commonality in liquidity. Herding within individual stocks and commonality in liquidity reflects different information. Herding within individual stocks reflects the

level that investors focus on the information of individual stocks. On the other hand, commonality in liquidity reflects the level that the investors focus on the information of the whole market. Intuitively, if investors focus on the information of individual stock, they may show less concern on the market information. Therefore, we hypothesize that more herding within individual stocks leads to less commonality in liquidity.

In this study, we construct a new short-term measure of herding within individual stocks. Our results indicate that herding within individual stocks is a prevalent phenomenon.

We investigate the relationship between the liquidity of individual stocks and herding within individual stocks. Park and Sabourian (2011) suggest that once herding begins, prices respond more to individual trades so that price rises and price drops are greater. They also prove that herding lowers liquidity. Lon Ng (2010) gives evidence that traders develop their order-placement strategies, depending on the previous order settings, so that the liquidity will be influence by herding behavior. Our results give empirical support for that herding within individual stocks lowers liquidity of individual stocks. We also show that herding on the individual stock gives a more prevalent effect on depth than on spread related measure.

We also investigate whether herding within individual stocks covariate with herding of the market, i.e., herding towards the market. The phenomenon of herding towards the market is tested by empirical studies (e.g., Chang et al., 2000; Tan et al., 2008; Chiang and Zheng, 2010). However, the methodologies they use can only observe the herding towards the market indirectly. We regress the herding within individual stocks on herding of the market, and show evidence that they are positively related. We also show that most part of the variation of herding within individual stocks cannot be explained by the herding of the market.

At last, our results show higher herding on individual stock leads to lower commonality in liquidity for most measures of liquidity. The result supports our argument that when investors focus on the trades of an individual stock, they are more likely to ignore the information from the market.

## 3. Chapter 3

Previous studies give sources of commonality in liquidity from two perspectives: supply-side and demand-side. On the demand-side, Karolyi et al. (2012) argue that one demand source of commonality in liquidity is correlated trading behavior of institutional investors. Koch et al. (2009) use the level of mutual fund ownership and other three measures to proxy for the likelihood that mutual funds' trading will be correlated and find that stocks with high likelihood of mutual funds' correlated trading have high commonality in liquidity. The intuition of these studies is that mutual funds trade to the same direction simultaneously, giving liquidity shock to the stocks in their portfolio, and thus leads co-variation in liquidity as mutual funds as a whole may hold most stocks of the market.

Besides the correlated trade across mutual funds, there is another source of correlated trade across stocks, simultaneous trade within one mutual fund. Intuitively, when a certain institutional investor adjusts its total position in the stock market, it

may trade the stocks in its portfolio simultaneously. Theoretical studies predict various situations in which an investor liquidates its positions, simultaneous trade across stocks in its portfolio increases. In the models of Kyle and Xiong (2001) and Xiong (2001), noise traders trade randomly in one market, long-term investors hold the assets based on the spread between the prices and fundamentals, and arbitrageurs exploit the short-term opportunity created by noise traders. When unfavorable shocks lead arbitrageurs suffer large capital losses following market downturns, arbitrageurs need to liquidate. Garleanu and Pedersen (2007) argue that tighter risk management following market downturns reduces the maximum position an institution can take and decreases the liquidity, which in turn leads to tighter risk management as a feedback effect. Vayanos (2004) shows that the risk of withdrawal, which leads to liquidation, is related with volatility. In Brunnermeier and Pedersen (2009), for instance, a large market shock forces traders provide less market liquidity, which increases the margin, thereby worsening funding problems even further, and so on, leading to a "margin spiral". Moreover, in the cases mentioned above, the simultaneous trade is not confined to being within one investor. Simultaneous trade across stocks by multiple investors may also happen.

If an institutional investor is highly diversified, for instance, in an extreme situation, it holds all the stocks in the market, its simultaneous trade increases the liquidity demand of the market at the same time, which leads to commonality in liquidity. In contrast, if the institutional investor is not highly diversified, its simultaneous trade only affects the liquidity of stocks in its portfolio. In the case of simultaneous trade across stocks by multiple investors, if investors' portfolios are more diversified, they will face high systemic liquidity risk.

We hypothesize that commonality in liquidity of stocks held by highly diversified institutional investors should be high.

We construct two measures, the number of stocks in investors' portfolio and Herfindahl Index of investors' portfolio, as the proxies for diversification of institutional shareholders' portfolios. We use eight measures to proxy for the commonality in liquidity including both high frequency measures and a daily measure, while most other studies only use one proxy. The variety of proxies makes sure that our result is robust.

In this study, we examine our hypothesis by investigating annual shareholder data and high-frequency intraday trading data of all A-share stocks in the Shanghai Stock Exchange of China and Shenzhen Stock Exchange of China from 2003 to 2011.

The stock market of China is the second biggest stock market in the world. It has several characteristics making it suitable for our study. In Brockman et al. (2009) which examines the level of commonality in liquidity of 47 stock exchanges, the Shanghai Stock Exchange of China and the Shenzhen Stock Exchange of China show almost highest level of commonality in liquidity in the 47 stock exchanges with over 80% stocks exposing to commonality in liquidity. It is essential to understand these high levels of commonality in liquidity, while previous studies of sources of commonality in liquidity most focus on the stock market of U.S.. Second, the stock market of China is order-driven market, which makes our analysis focusing on the demand side source excluding the influence of supply-side source, e.g., the effect of common market makers that stock liquidity will co-move with the liquidity of other stocks held by the same specialist shown by Coughenour and Saad (2004).

We find evidence that high diversification of shareholders' portfolios increase the level of commonality in liquidity for most measures of liquidity. This result supports that simultaneous trade of institutional investors is a source of commonality in liquidity.

Our result also implies that institutional investor can decrease systematic liquidity risk by investing stocks, which are held by low diversified investors. Another implication of our result is that, if an investor makes highly diversified investment, the level of diversification of the stocks in its portfolio is likely be high, and hence the investor may face more systematic liquidity risk. These two implications accord with Wagner (2011), which proves that investors subjected to liquidation risk, an extreme case of shock on market liquidity, should choose heterogeneous portfolios and rationally forgo diversification benefits.

Our explanation for commonality in liquidity is also related to the argument that the index trading induces commonality in liquidity. Gorton and Pennacchi (1993) predict equity basket trading (e.g., ETF) increases the commonality in liquidity of the stocks in the basket, but decreases commonality in liquidity of stocks out of the basket. Brockman and Chung (2006) show that the group of constitute stocks of equity indices has a greater exposure to commonality in liquidity than the group that does not belong to any index. In fact, this is a special case in our argument, where constitute stocks of equity indices are inclined to be held by more highly diversified institutional investors, e.g., ETFs, than individual traded stocks. In the case of Chinese stock market, there is an index called CSI 300 index, which is constituted with 300 stocks selected from both shanghai exchange and Shenzhen exchange, made by China Securities Index Co., Ltd. Many passive investors, e.g., CSI 300 index ETF, invest all the constitute stocks of CSI 300 index tracking the CSI 300 index, so that these investors are highly diversified. Constitute stocks of CSI 300 index are held by these highly diversified passive investors. Thus, it is more likely constitute stocks of index are held by more diversified investors that other stocks.

This study is also related with studies on the portfolio choices. Wagner (2011) proves that investors subjected to liquidation risk, an extreme case of shock on market liquidity, should choose heterogeneous portfolios, and rationally forgo diversification benefits.