Commonality in Liquidity in Emerging Markets: Evidence from the Chinese Stock Market

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ABSTRACT

This study examines to what extent liquidity is determined by common underlying factors in an emerging market that has adopted an order-driven trading system. Using a proprietary set of data from China, we select a broad sample of stocks from two separate Chinese stock exchanges to measure and analyse market-wide movements in liquidity. This unique data set contains all intraday transactions of A-shares from July 2000 to June 2002 and provides rich information for the empirical estimation. Evidence found in this study confirms that commonality in liquidity is present in China and seems more significant and pervasive. Its existence is robust to the influences of the size, industry, and up and down markets effects. In parallel to a market-wide component, we find in the commonality construct an industrial component. Liquidity of large firms' stocks is found to be more likely to move with market liquidity. We also find that fund managers exhibit herding behaviour in their liquidity management. In the face of shocks to market liquidity, Chinese market participants tend to adjust both the spread and the depth. In a down market, market liquidity moves more widely and commonality in liquidity becomes more significant. As arguably the most important emerging market, evidence from China may shed critical lights on the property of commonality in liquidity of emerging markets. Findings of how liquidity co-moves can also promote a better understanding of the rapidly growing Chinese capital market which has attracted a growing interest of international investors and national regulators.

EFMA classification: 360; 620; 310; 560
Keywords: Market Microstructure; Liquidity determination; Commonality in liquidity; Emerging markets; Asset Pricing Models with Liquidity

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I. Introduction

Recent research has made considerable progress in shifting the focus from liquidity of individual stocks to liquidity of the market. Beginning with Chordia et al. (2000), identification of the common movements of liquidity across stocks, or commonality in liquidity, has led to the emergence of a burgeoning literature on this topic, which reflects the growing research consensus on the critical importance of liquidity co-movements caused by common determinants across securities.

At least three reasons can be cited for the importance of commonality in liquidity and its related research. First, given that liquidity is a determinant of asset prices, commonality in liquidity will have an impact on asset prices. However, this is largely ignored by conventional asset pricing models. Fundamental changes are therefore required for these models to incorporate this effect. Future models will not only have to explain the impact of individual liquidity on an asset's price, but must also consider common determinants of liquidity. Eventually, this research will make contact with monetary theory (how aggregate liquidity shocks are propagated across different types of asset), and will also have to be considered in the regulation of financial markets. Second, for market participants, the issue now becomes whether market liquidity is priced in the stock market, or whether a liquidity risk factor enters the stochastic discount factor. Given that individual stock liquidity is at least partly driven by common determinants, shocks to these common factors tend to generate market-wide effects. If asset returns and market liquidity are correlated, the source of common liquidity effects could constitute a non-diversifiable risk factor. In other words, systematic liquidity variation is non-diversifiable, and so is a priced risk factor. Thus, investors holding such assets will demand a systematic liquidity premium to bear the risk (Fujimoto, 2003). As such, commonality in liquidity also poses a problem to diversification strategies that rely on picking stocks that do not correlate in returns (Domowitz and Wang, 2002).

Third, commonality in liquidity is also important to central bankers and regulators. As a market risk factor that is non-diversifiable, it is naturally a policy concern. By its very nature, shocks to commonality will have market-wide effects and hence affect the functioning of the financial market as a whole. In more serious cases, shocks to liquidity commonality could even trigger a financial crisis. Fernando and Herring (2003) show that common liquidity shocks may precipitate a shift in investors' beliefs about the market, which in turn could lead to market collapse. In fact, the simultaneous decline in liquidity across several markets was a major contributory factor in the Asian and Russian crises in 1997-1998. Empirical evidence for common liquidity movements therefore will assist regulators to improve market design (Coughenour and Saad, 2004). As a result, exchange organisations, regulation, and investment management could all be improved (Chordia et al., 2003). Knowledge of what drives liquidity, and the characterisation of its effects, will prove to be critical in preventing market crashes due to sudden evaporation of liquidity (Persand, 2000). The findings of the study on commonality should also shed light on how aggregate liquidity shocks are propagated across different types of assets, and may thereby help formulate a better monetary policy.

Academically, research on commonality opens an entirely new avenue for exploring the dynamics of liquidity, through a shift of emphasis from the single-asset focus to a market-wide common determinant view. Furthermore, future asset pricing models must consider the influence not only of individual liquidity, but also of those common determinants. For practical investment, a better understanding of the dynamics of liquidity within and across markets could help investors to design improved trading strategies. Findings about the properties of common determinants will also help investors to decide on their liquidity exposures and the rewards they would require. With an improved knowledge of factors that influence liquidity, investors will increase their confidence in financial markets, and will thereby enhance the efficacy of corporate resource allocation (Chordia et al., 2003).

However, the current literature primarily concerns with most liquid markets such as that of the US; little investigation has been conducted into the emerging market cases. This ignorance is surprising because one major concern triggering the development of the commonality literature was the liquidity commonality as a contributing factor to financial crises in emerging economies during 1997 – 98. This suggests that there is a critical gap in the current literature, which this paper is attempted to fulfill.

Emerging markets represents an ideal setting for the study of liquidity issues (Bekaert, et al., 2006). In addition to cross-sectional and temporal variations in liquidity in these markets, liquid effects in emerging markets turn out to be more acute than in developed markets. This is because, in the US market for example, liquid effects can be mitigated by large number of traded securities, diversified ownership structures, and combinations of long- and short-term investors (Bekaert, et al., 2006).

Liquidity in emerging markets is also a major concern for international investment. Chuhan (1992) indicates poor liquidity was one main reason that prevented foreign institutional investors from investing in emerging markets. Lesmond (2005) points out that investments in emerging markets can yield substantial but volatile returns. The fact that spectacularly high returns can be significantly reduced by the increased illiquidity highlights the importance of addressing liquidity concerns and its determinants in emerging markets (Lesmond, 2005).

An added significance of our research is from our focus on order driven trading systems. Existent research is mostly concerned with mature markets that operate a quote driven system. However, trading systems in emerging markets can be considerably different from those of mature markets. Many emerging markets have adopted order-driven systems. Brockman and Chung (2002) is the first study that extends the literature to the order driven trading system in Hong Kong. However, there has been a lack of research on commonality in emerging order-driven systems.

Research on commonality in liquidity of emerging markets is very scant.[1] However, our research differs from these studies with a distinctive emphasis on China. As arguably the most important emerging economy, China is rapidly becoming a global influence. Research on an issue concerning emerging markets at large is unlikely to be totally convincing if it did not engage the Chinese case. In fact, the growing size and great potential of the Chinese stock market warrant a closer look at commonality in liquidity of that market. China nowadays provides perhaps the most important investment opportunity of emerging markets. If liquidity of emerging markets is a major concern for international investors, it would be the most critical for international investments in China. On the other hand, it is imperative to understand liquidity variations in China since illiquidity has proved to be a triggering mechanism of the financial crisis in emerging economies and if there is a financial crisis originating from the China market, the global impact could be huge.

In addition, despite the widespread evidence of commonality in liquidity, some research findings have challenged the notion that commonality is a widespread existence and hence a general attribute of financial assets. Hasbrouck and Seppi (2001) find that there is only weak evidence of liquidity commonality in the New York

[1] Only since completion of our early drafts have there appeared two other working papers that involve the emerging markets. In Brockman, Chung and Ignon (2006), 47 exchanges including 17 of emerging economies are investigated for the existence of liquidity commonality. Kumar and Shah (2006) examine commonality in liquidity of Indian markets.

market. Fabre and Frino (2004) believe there is no common movement of liquidity in the Australian market. Evidence from China can provide a weighty contribution to this debate.

This paper will be set out as follows. Section 2 reviews the theory and empirical work on commonality in liquidity; Section 3 describes the background to market liquidity in the Chinese stock market; Section 4 explains the data and methodology; Section 5 provides empirical evidence of commonality in liquidity in the Chinese stock market; Section 6 provides further empirical evidence, including the size effect, industry effect and effects in up and down markets； Section 7 comprises concluding marks.

II. Review of the Literature

The first published empirical study that provided evidence for the existence of commonality in liquidity was by Chordia, et al. (2000). They argued that liquidity was not just an attribute of a single asset, and proved that individual liquidity measures co-move with each other. Even after accounting for individual determinants of liquidity such as trading volume, volatility, and price, commonality remained significant and material. They found that concurrent slope coefficients are positive and statistically significant for nearly 30% to 35% of the NYSE firms. As a result, both spreads and depths are significantly affected by changes in market liquidity.

They suggested that there is an industrial component of liquidity, and found commonality to be present in this component as well.

In addition, they found evidence for the size effect of commonality, whereby market-wide changes in spreads have a greater effect on large firm spreads even though large firms have smaller average spreads, while small firms cannot be influenced by prevalent asymmetric information. At the same time, size has little effect on depth, although depth also shows commonality. Overall, commonality in liquidity has a significant size effect.

Huberman and Halka (2001) also pointed out that most of the current theories focus on the liquidity of individual securities; little can be learned from them about variations in liquidity that affect many stocks simultaneously. They argued that liquidity of individual stocks varies over time and cross-sectionally, and showed that this variation has a common component. To statistically detect the presence of such a systematic component of liquidity, they estimated the autoregressive structure of each of the four liquidity proxies: spread, spread/price ratio, quantity depth, and dollar depth, to derive a series of the residuals of autoregressive processes. The found these innovations are positively correlated for each liquidity proxy, indicating the presence of liquidity commonality.

Hasbrouck and Seppi (2001) argued that a focus on stocks in isolation has led to researchers being ignorant of the most basic facts about interactions between stocks.

Thus, they also support the shift of research focus away from analyzing individual stocks in isolation to an emphasis on analyzing variations between stocks. However, using principal components and canonical correlation analyses, they found no conclusive evidence of the existence of commonality. While there is strong evidence for common factors in order flows and stock returns, the evidence for commonality in liquidity proxies is not significant. Brockman and Chung (2002) held that, since Hasbrouck and Seppi's (2001) sample consisted of only thirty companies of the Dow Jones Industrial Average, this absence of evidence might be caused by a small sample with little industry overlap. Brockman and Chung (2002) constructed a similar index by selecting the four largest companies from each of seven industries. Using this sample of twenty-eight firms, they estimated their model and found strong evidence of commonality.

While Chordia et al. (2000) and other studies all use only a single year of data, Eckbo and Norli (2002) extended previous work by employing monthly data over a much longer period, from 1963 to 2000. Their results are similar to those reported by Chordia et al. (2000), although they use a different regression model.

Henker and Martens (2003) tried to detect the presence of commonality by using a spread cost decomposition model. Under their model, the traded spread can be decomposed into adverse selection costs, stock specific inventory cost, order processing costs, and a market buying and selling pressure cost component that is common to all stocks. They found that a significant proportion of the spread is explained by market buying and selling pressure, hence providing strong evidence of commonality in liquidity.

Another critical new development in current research on commonality is to extend the analysis to other markets. Martinez, Nieto, Rubio, and Tapia (2003) broadened the literature to include the Spanish case. In their study of the relationship between asset pricing and systematic liquidity risk, they confirm that commonality in liquidity also exists in the Spanish stock market. Meanwhile, Bauer (2004) extended the research to Switzerland and detected the presence of commonality there.

In another direction, Coughenour and Saad's (2004) research focused on the existence and relative importance of supply generated liquidity co-variation. Using an approach that combined favourable elements of Chordia et al. (2000) and Hasbrouck and Seppi (2001), they found that individual stock liquidity co-varies with both market liquidity and specialist portfolio liquidity, and that for the variation of each measure of spread, over 90 percent of the individual market-liquidity betas are significant and positive. These results indicate the presence of common liquidity variation, which is consistent with previous studies, although the degree of commonality is greater.

The most exciting development in this field however, has been the extension of research to the order-driven market. Brockman and Chung (2002), who were among the first to focus on commonality in liquidity in an order-driven market structure, maintained that, unlike specialist markets where there are barriers to entry and exit, order-driven systems generate liquidity demand and supply schedules that more closely approximate equilibrium under perfect competition.

They showed that, in their sample, the sum of all liquidity coefficients is highly significant, and that in order-driven markets overall, both the average relative spread coefficient and the average depth coefficient are smaller than those reported for specialist-based markets. The results show that commonality is an important trait, influencing the liquidity provision process in an order-driven market.

Bauer’s (2004) work on commonality in the order-driven market in Switzerland followed the modelling strategy developed by Hasbrouck and Seppi (2001). He adopted the principal components analysis by using data over three months on the order books of 19 stocks traded on the Swiss Stock Exchange (SWX). His evidence showed the existence of three to four common factors, and the proportion of the variation in liquidity explained by common factors was higher than in previous studies for quota driven markets.

Fabre and Frino (2004) reconfirmed the existence of commonality in order-driven markets in their study of 660 stocks on the Australian Stock Exchange (ASX) during the year 2000. They applied the same filter and regression models as Chordia et al.

(2000), but redefined the market liquidity measures by deleting the effective spread and the proportional effective spread because the possibility of price improvement had been included in electronic trading on the ASX. They also added dollar depth, which is more sensitive for the results measuring depth. Their statistics summary showed that commonality in liquidity exists on the ASX but is weaker than for the NYSE. To strengthen the regression results, they used Z-statistics, whereas Chordia et al. did not. Their results for the size effect revealed that the co-movement in individual liquidity was not as significant as in Chordia et al. (2000).

In contrast, Sujoto, Kalev and Faff (2005) found very strong evidence for commonality in liquidity in the ASX. Their two years sample of 2001 and 2002 is longer than previous research and includes bullish and bearish markets. They tested commonality in liquidity not only in conventional liquidity measures but also in new liquidity proxies (the turnover rate and bi-dimensional liquidity measure). In addition, they considered long run commonality in liquidity. Commonality in liquidity was found in up and down markets as well as in a quadratic specification.

In short, since the seminal work of Chordia et al. (2000), the nascent literature on commonality has been expanding rapidly. New research has emerged, extending the analysis to various aspects of commonality, including larger sample size, higher data frequency, cost decompositions, and introduction of demand and supply conditions. The most recent development has been the extension of investigation to commonality in order-driven markets. Most of the research has confirmed the presence of commonality in liquidity, hence the critical importance of characterising stocks with liquidity.

Despite its rapid growth, the commonality literature is mostly concerned with quota driven markets in industrial economies. Only recently have order-driven systems received attention from researchers, and almost without exception, emerging markets have been ignored. The consequent critical void in our knowledge invites research on order-driven markets in emerging economies. This propels us to study the Chinese case.

III. The Trading System and Liquidity of the Chinese Market

In response to the need for economic transition, China reopened the Shanghai Stock Exchange (SHSE) in December 1990, and established the Shenzhen Stock Exchange (SZSE) in July 1991 (Liu and Green, 2003). Since then, the Chinese stock market has experienced extraordinary growth, to become the second largest in Asia after Japan in terms of capitalisation.

The Chinese trading system has a modern infrastructure that includes an automated trading regime, a high-speed nationwide satellite communications system backed by digital data networks, a paperless depository, and an efficient clearing and settlement system (Wong, 2005). With the exception of public holidays, the exchanges are open 5 days a week, from 9:30 A.M. until 3:00 P.M., with a lunch break between 11:30 A.M. and 1:00 P.M. There is also a 30 minute pre-trading session, during which the morning opening prices are generated (Yang, Li and Liu, 2002).

The system operates two trading sessions, i.e. a periodic call auction and a continuous, discriminating auction (Xu, 2000). The first of these takes place when trading opens, while the discriminating auction occurs later in the trading day (Su, 2004). In the continuous auction session throughout the trading day, buy and sell orders are submitted and auctioned. Matching of the orders is automated through a computer system, which executes the matching transactions according to a time and price priority scheme. The Shanghai Exchange runs a time-price priority scheme that prioritises the matching first by price and then by time. The Shenzhen Exchange has a price-time order priority (Sun and Shi, 2002). Transactions are continuous and transparent. All trading goes through the computer systems in each exchange's trading hall, and terminals at the members' offices.

In contrast to the US, the Chinese market does not have market makers to stabilise stock prices by trading on their own accounts. Individual investors wishing to trade A-shares are required to act through a broker. The broker provides the investor with an account number to be quoted on all exchange settlements. Brokers are forbidden to engage in floor trading or short selling. To be legally recognised, transactions must take place through the automated order matching system and trading must be in units of at least 100 shares (Xu, 2000).

The Chinese regulation allows only market orders and limit orders, both of which remain valid for one day. The Chinese trading process begins when investors place a buy or sell limit order with the broker. Any limit order must specify the bid (ask) price and the number of shares to be purchased or sold. The broker then sends the orders to one of the exchanges' main frameworks via terminals, either on the floor or from member firms. Once arrived, these orders can be executed immediately through the computerised trading system with matching priority schemes. Currently, the Chinese system continuously publishes on the screens details of the five latest orders including their bid/ask prices and the number of shares to be traded. For SHSE, the broker sends orders to his member broker on the floor of the exchange, who then records the order in the centralised order matching system (Yang, Li and Liu, 2002). The trading process at the SZSE uses a dual clearing system whereby stocks are registered locally but are centrally cleared (Jiang, 2005).

Transaction prices are generated according to the bid/ask prices and time of order submissions. A broker in the SZSE and the SHSE has responsibility not only for the buyers but also for the sellers. According to Yang, Sun and Shi (2003), the biggest difference for brokers between the Chinese stock markets and the dealership markets is that spread does not form part of the profits in the Chinese stock markets, but does in the dealership markets. Therefore, the inventory holding costs do not determine bid-ask spread in China. Rather, two exogenous variables caused by asymmetric information, i.e. the order processing costs and the costs of adverse selection, are the determinants of the bid-ask spread.

A special factor that affects bid-ask spread in China is the existence of illiquid shares. About two-thirds of the outstanding Chinese shares are state owned shares and legal person shares, which are neither negotiable nor tradeable in the markets (Yang, Li and Liu, 2002). As a consequence, the illiquid shares often overvalue the stock price because the liquidity premium inherent in the stock prices is too high.

These illiquid shares can also enhance the level of asymmetric information among investors. Owners of illiquid shares play more important roles in corporate governance than do investors in secondary markets, because they control insider information and the market prices of their stocks, whilst the common traders receive little information. These mechanisms will enlarge the bid-ask spread and increase the adverse selection costs. As a result, market liquidity tends to decrease with the increase in the proportion of illiquid shares (Yang , Li and Liu (2002).

The intraday spreads in both the SZSE and the SHSE display an L-shaped pattern, which differs from the U-shaped pattern of market liquidity in the Hong Kong Stock

Exchange (Qu and Wu, 2002; Sun and Shi, 2002; Yang, Li and Liu, 2002). The relative spread would decrease during the trading day because the bid price and ask price have big difference, and there is more noise around the information of price when the stock markets are opened (Sun and Shi, 2002). The relative bid-ask spread is found to be influenced by risks, prices and certain times of day, such as one hour after the morning opening, ten minutes after afternoon opening, and 20 minutes before afternoon closing (Qu and Wu, 2002). The bid-ask spread on Monday is higher in both exchanges because on Mondays more information is available after the non-trading period of the weekend (Yang, Li and Liu, 2002).

For the SHSE, traders in different order directions will choose different order types by clarifying the order flows as bid direction and ask direction. Traders will increase the number of limit buy orders when there are more sell order flows in the market, but decrease the number of limit sell orders. This means that when selling stocks, traders in the SHSE prefer market order; in other words, they prefer to sell stocks immediately because selling short is constrained by the trading rules of the SHSE and the traders cannot expect to profit by selling short in the future when prices fall (Ji and Yang, 2002).

China imposes a price limit on stock prices, which allows a stock to trade within plus or minus 10% of its closing price on the previous day. Research has shown that appropriate price limits cannot restrict, and may actually augment market liquidity.

However, improper price limits do to some extent restrict the market liquidity (Liu et al., 2004). On the other hand, Jiang (2005) observed that market liquidity increases as prices rise to the upper price limit (10%), then decreases. Conversely, it decreases when prices fall to the price floor (10%).

Mu, Wu and Liu (2004) confirmed that the bid-ask spread in China increases with the turnover rate but decreases with the stock price. Some researchers have found that turnover rates in China are higher than in the NYSE (Ying, 2000). However, since the level of market liquidity cannot be measured by the turnover rate alone, it does not necessarily follow that liquidity is higher in the Chinese stock markets than in the NYSE. The trading volume in the NYSE does not reflect all the trading activities in the American finance system, which also includes, for example, the NASDAQ, AMEX and OTC. Over-the-counter trade and the derivatives market have also flourished in the USA far more than in the Chinese stock markets. Furthermore, the lack of a selling short system in the SZSE and the SHSE means that the risks are higher than in the American stock markets. For these reasons, any decrease in the price of stocks can have potentially disastrous consequences for market liquidity.

IV. Data

China publishes a range of value-weighted stock indices, aggregate, and sector indices, of which the most widely cited are the SHSE Shanghai Composite Index (SHCI) and

Shanghai B Share Index; and the SZSE Shenzhen Component Index (SZCI) and Shenzhen B Share Component Index (Gao, 2002).

We use the China Stock Market and Accounting Research (CSMAR) to obtain transactions and quote data for July 2000 to June 2002 for 'A' shares traded on SHSE and SZSE. CSMAR covers all details of every transaction and related information, providing data by bid and ask record. Using a two year period as a sample will provide better evidence than that produced in previous studies, which tend to use only one year of data. The period between July 2000 and June 2002 is suitable because of the wide variations in market trends. In July 2000 and June 2001 the market was bullish, whereas in July 2001 and June 2002 the trend was for a bear market.

We applied the same method as Chordia et al. (2000) to set up the sample selection filter. A stock included in the sample should be listed on the SHSE and the SZSE constantly throughout 24 months in the sample period. To avoid possible problems with trading units, no stock should include the splitting or paying of a dividend during the sample period. To ensure sufficient observation, stocks must be traded at least once in at least ten trading days over 24 months. To focus on normal trading activity during the continuous trading session, opening trades were deleted from the study. In addition, we deleted trades and transactions with ST and PT conditions[2] to maintain

[2] Since 1996, firms that have suffered losses for two consecutive years should be under special treatment (ST). Since 1998, firms that have suffered losses for three consecutive years should be under particular treatment (PT). The shares with PT can only be traded each Friday with a price limit of 5 per cent fluctuation per day. The shares with PT will be deleted from trading on the market if their losses cannot be reversed in a year (Lee and Xue, 2002).

the stability of the stock prices. Finally, observations for June 24th, 2002 are not included, because there was a severe market shock in China on that day due to the government decision to stop the state stock reduction program.

The filtering process for A-shares on SHSE provides a sample with 34, 484, 632 transactions. Our sample comprises 259 stocks over 468 trading days; reduced by the filtering process to 113,960 stock-trading days. The average, median and minimum number of trading days per stock is 440, 463, and 59, respectively. For SZSE's A-shares, filtering provides a sample of 48,789,363 transactions. Our sample comprises 293 stocks over 468 trading days. After filtering, the sample is reduced to 130,092 stock-trading days. The average, median and minimum number of trading days per stock is 444, 458, and 146.

Following Chordia et al. (2000), we calculate three different liquidity measures for every transaction: quoted bid-ask spread, percentage quoted bid-ask spread and depth. In addition，we construct the liquidity measures recently suggested by Fabre and Frino (2004), and Sujoto, Kalev and Faff (2005). These measures include depth, a bi-dimensional liquidity measure, and the turnover rate. To smooth out intraday effects to achieve greater synchronicity, the transaction data for each daily liquidity measure is averaged across all trades for each daily stock. No effective spread and proportional effective spread are calculated, because Chinese stock exchanges have adopted an electronic trading system that allows the possibility for price improvement, leading to the identical quoted and effective bid-ask spread. The definition of each liquidity measure constructed is given in Table 1.

[Table 1 about here]

Our results show QSPR and PQSPR in China are consistently lower than their counterpart measures in the US. Both mean and median for TR are higher than those given in Sujoto et al. (2005). Both mean and median for BLM are negative, while Sujoto et al. (2005) find the opposite. The prime reason for these differences is likely to be the different trading mechanisms in the Chinese and Western stock markets.

There is marginal negative correlation, ranging from -0.0086 to -0.1803 0.1934 in the SHSE and -0.0130 to 0.3825 in the SZSE, between the depth measures and the spread measures. This is consistent with the findings of Fabre and Frino (2004) where the correlation ranges between -0.095 and 0.004, and with the findings of Sujoto et al. (2005), where the correlation ranges between -0.0159 and -0.1803.

The absolute daily variations of liquidity measures are presented in Table 2. All the measures except the turnover rate and the measure for bi-dimensional liquidity are consistently higher than the counterpart measures documented in previous studies. For example, we find that the mean of absolute daily variation for DQSPR is 5.1190 (0.8972 in SZSE), while it is 0.3302 in Sujoto et al. (2005), 0.7282 in Fabre and Frino

(2004) and 0.2396 in Chordia et al. (2000). The mean of absolute daily variation for DDEP is 8.3241 (7.3756 in SZSE), which contrasts with 0.5771 in Sujoto et al. (2005), 0.7886 in Fabre and Frino (2004), and 0.7828 in Chordia et al. (2000) .

[Table 2 about here]

Our findings show that the variation of depth is almost twice (7 times in SZSE) that of spread measures (except the variation of PQSPR), which is in agreement with Sujoto et al. (2005), but different from Chordia et al (2000). The variation of the turnover rate is substantially smaller relative to other liquidity measures, as is the bi-dimensional liquidity measure. This suggests the turnover rate and the bi-dimensional liquidity measure may capture different aspects of liquidity. Therefore, further investigations should be carried out into how these measures can affect commonality in liquidity.

V. Empirical Findings

We applied the methodology of Chordia et al. (2000), Fabre and Frino (2004) and Sujoto et al. (2005) to examine the co-variation of market liquidity. The regression equation is rendered as follows:

$$DL_{j,t} = \alpha_j + \beta_j DL_{M,t} + \varepsilon_{j,t} \qquad (1)$$

where $DL_{j,t}$ is the cross-sectional percentage change in liquidity measure L for stock j on day t and $DL_{M,t}$ is the concurrent change in a market-wide daily average of the same liquidity measure. In order to avoid the average coefficients being constrained in the wrong way, stock j is excluded from the market liquidity measure.

We will examine the contemporaneous adjustment in liquidity as well as one lead and lag of the market average liquidity variable. In order to avoid spurious dependence caused by a relationship between returns and bid-ask spread measures, it is vital to examine concurrent, lead and lag value-weighted market returns. In addition, the concurrent daily percentage change in the individual stock squared return is deployed as a proxy for controlling changes in price volatility. However, we do not report the coefficients on the market returns and squared stock returns because both are nuisance variables.

The residuals from individual regressions may not be normally distributed due to the discreteness in stock pricing. However, as argued by Chordia et al. (2000), it should be remembered that the central limit theorem can slightly reduce the asymptotically normal distribution for the estimated coefficients. As a result, the cross-sectional mean of the estimated coefficients is close to Gaussian when the residuals of the individual regressions are independent.

Table 3 and Table 4 present the results of estimating equation (1). The percentages of positive coefficients are shown in the 'Percentage+' column, while the 'Percentage+significant' column shows the percentages with a t-statistic greater than + 1.645, the 5% critical level in a one-tailed test.

[Table 3 about here]

[Table 4 about here]

Both equal-weighted and value-weighted market liquidity variables are used to estimate similar regressions. Value-weighted market liquidity variables can reveal more sensitivity to market-wide shocks in spreads and less market return sensitivity. To investigate value-weighted effect, market capitalisation at 30 June 2000 is used in our sample. Compared with Chordia et al.'s (2000) results, the contemporaneous slope coefficients from estimating equation (1) are found to be greater when the liquidity measure is value-weighted.

For the SHSE, the cross-sectional mean of liquidity beta ranges from -80 (for BLM, 7 for DPQSPR with value-weighted) to 86 (for DQSPR, and 120 for DTR with value-weighted). The proportion of stocks with positive β ranges from 77% (for BLM and 76% for BLM with value-weighted) to 99% (for DDEP and DVDEP, the same for value-weighted). Of the 259 stocks, between 2% (for BLM) and 89% (for DDEP and

DVDEP) have a significantly positive β at the 5% level, which applies to both equal- and value-weighted variables.

For the SZSE, the cross-sectional mean of liquidity beta ranges from 6 (for DTR and 54.29 for BLM with value-weighted) to 79 (for DPQSPR and 94 for DTR with value-weighted). The proportion of stocks with positive β ranges from 37% (for BLM and 38% for BLM with value-weighted) to 99% (for DDEP and DVDEP, the same for value-weighted). Of the 291 stocks, between 7% (for BLM, and the same with value-weighted) and 92% (for DQSPR, and 93% for DQSPR with value-weighted) have a significantly positive β at the 5% level.

When compared with previous findings, our study provides much stronger evidence of the existence of liquidity commonality in the Chinese stock market (except for DPQSPR). The magnitude and significance of β for the spread measures and the depth measures in Table 3 and Table 4 is more than twice that of comparable measures in Chordia et al. (2000), whose results are higher than Fabre and Frino (2004) and Sujoto et al. (2005). Furthermore, we also find a much higher proportion of stocks with positive and significant β: 89% (231 out of 259 stocks) in SHSE and 92% (268 out of 291 stocks), compared with the less than 3% (20 out of 660 stocks) reported by Fabre and Frino (2004), 30% (351 out of 1169 stocks) reported by Chordia et al. (2000) and more than 50% (172 out of 333) reported by Sujoto, et al. (2005).

However, our leading and lagged terms are not positive and significant. Most of the cross-sectional means of liquidity beta (β) are negative. Most results are quite small and a few results are zero. This implies the lead and lag effects of commonality are less significant and less pervasive in the Chinese stock market.

When calculating the cross-sectional t-statistic for the average β, it is assumed that the estimation errors in β are independent across regressions. The panel labelled 'SUM' presents the combined contemporaneous, lead, and lag coefficients, and shows that in most cases the t-statistic is highly significant. Nevertheless, since the average adjusted R^2 is less than two percent, the typical individual regression does not carry much explanatory power. These results suggest that there must be other significant influences, such as noise, on daily changes in individual stock liquidity construct.

Overall, the results from estimation of conventional liquidity measures provide strong evidence for the existence of systematic liquidity in Chinese stocks. However, regarding the claim in previous research that traders are more likely to revise their spreads than depth, our evidence suggests that, in response to systematic changes in liquidity, Chinese stock market participants tend to revise both their price and the quantity of shares they are willing to trade.

Using the turnover rate as an alternative liquidity proxy, as suggested by Sujoto et al. (2005), we find even stronger evidence of commonality in liquidity. However, when employing the second alternative liquidity measure, i.e. bidimensional liquidity, the cross-sectional mean of β is found to be not statistically significant and the proportion of stocks with significant and positive β is lower, at 2% in SHSE and 7% in SZSE. These results suggest an absence of co-movements in the combination of depth and spread of our sample stocks, and that the bi-dimensional liquidity measure is not a suitable variable to be employed in investigating commonality in liquidity in the Chinese stock market.

VI. Further Evidence

In order to examine the potential size effect of systematic liquidity, we partition the sample into five quintiles, based on market capitalisation at the beginning of the sample period, and re-estimate equation (1) for each quintile.

The results are reported in Table 5 and Table 6. Previous studies have performed the same test, but with varying results. Chordia et al (2000) find that, for DQSPR and DPQSPR, the cross-sectional means of "SUM" are positively related with firm size. Brockman and Chung (2002) find an inverted U-shape pattern of the cross-sectional means of β; when using the spread measure, the proportion of stocks with positively significant β increases with firm size. Fabre and Frino (2004) report the cross-sectional means and median of β but do not find any size pattern for any of the liquidity proxies. Sujoto et al.(2005) do not find supportive evidence for the size patterns cited in Chordia et al (2000) and Brockman and Chung (2002). However, their finding that the proportion of stocks with positively significant liquidity beta tends to increase with the stock size is consistent with Brockman and Chung (2002).

[Table 5 about here]

[Table 6 about here]

From the tables, it can be seen that systematic liquidity exists for most of the quintiles; that is, commonality in liquidity is not driven by only one or two quintiles. For variables of DQSPR, DDEP and VDEP, more than 90% of the stocks in each quintile have positively significant β.

On the other hand, we do not find supportive evidence for the size patterns identified by Chordia et al (2000) and Brockman and Chung (2002). However, in agreement with Sujoto et al. (2005), we find that the proportion of stocks with positively significant liquidity beta tends to increase with the stock size. The exceptions in the SHSE are DPQSPR, DTR and BLM. In the SHSE there is an inverted U-shape pattern of stocks with positively significant liquidity beta for DTR, but this is not the case for the SZSE, where the proportion of stocks with positively significant liquidity beta seems to decrease with the stock size for BLM.

In order to explain the lack of consistency between the size pattern found in our study and the findings of previous researches, a further examination is required. The results presented in Table 7 and Table 8 make it clear that in the SHSE, the liquidity of a large stock is more likely to move with liquidity of the market, thus suggesting that large stocks might be more exposed to correlated trading. This indicates that fund managers in China exhibit herding behaviour, and is consistent with Gallagher and Looi's (2002) findings that managers have a preferential bias towards large stocks in their investment portfolios.

[Table 7 about here]

[Table 8 about here]

All liquidity proxies in our model show evidence of significant commonality in liquidity. This indicates that when responding to shocks to market-wide liquidity, participants in the Chinese stock market are prone to adjust their spreads (or prices) as well as depth (or quantity).

We also compare commonality in liquidity within the industry and within the market as a whole. Using the Global Industry Classification Standard (GICS) code, we classify the firms in our sample into three categories: industrial (128 stocks for SHSE, 160 stocks for SZSE), resources (39 stocks for SHSE, 27 stocks for SZSE) and financial (84 stocks for SHSE, 79 stocks for SZSE). We then augment Equation (1) with an industry average liquidity variable. This enables us to estimate a modified version of equation (1):

$$DL_{j,t} = \alpha_j + \beta_{1,\mathrm{j}} DL_{M,t} + \beta_{2,\mathrm{j}} DL_{I,t} + \varepsilon_{j,t} , \qquad (2)$$

where $DL_{I,t}$ is the concurrent change in a cross-sectional average of the liquidity measure within the industry, excluding stock *j*.

According to both Chordia et al (2000) and Brockman and Chung (2002), the liquidity of individual stocks can be influenced by market-wide common factors as well as by industry-specific common factors. Chordia et al. (2000) find that, with the exception of DPQSPR and DDEP, the cross-sectional mean and median of β_1 is smaller than β_2. Brockman and Chung (2002) however, find that it is always greater than β_2, as is the percentage of stocks with positive and significant β_1. Sujoto et al. (2005) obtain the same results, but Fabre and Frino (2004) fail to find evidence of industry-specific commonality.

Tables 7 and 8 present the results of estimating Equation (2). Like Chordia et al (2000), we find that the proportion of stocks with significant and positive β_2 is greater relative to market-wide liquidity beta β_1. However, we do not find this pattern in the coefficients of the industry liquidity beta β_2. In the SHSE, when DTR is used as the liquidity proxy, 82.09% of stocks in our sample show significant and positive β_1, while 10.90% show significant and positive coefficients of the industry liquidity beta β_2. Using BLM as the liquidity proxy, the proportion of stocks with positive and significant β_1 and β_2 are 13.65% and 10.90%, respectively. For SZSE, when DTR is employed as a liquidity proxy, 81.59% of the stocks in our sample show significant and positive β_1, while 10.57% have significant and positive coefficients of the industry liquidity beta β_2. Using BLM as the liquidity proxy, the proportion of stocks with positive and significant β_1 and β_2 are 14.61% and 10.61%, respectively.

When examining the significance of the coefficients, we find supportive cross-sectional evidence for the existence of both market-wide and industry-specific commonality in liquidity. For the alternative liquidity proxies, DTR shows the strongest evidence of market-wide commonality. Bi-dimensional liquidity measure has the lowest and second lowest percentage of stocks with significant and positive β_1 a β_2 , respectively, in both the SHSE and the SZSE.

We further investigate whether the liquidity beta differs between up and down markets. Markets are defined as up or down according to the size of excess market returns (EMR), which is calculated by subtracting the average of daily stock returns in our sample from the returns of the 10-year Bank Accepted Bill (BAB) rate as a proxy for the risk free rate. In SHSE, an up market day is where EMR for that day is greater than –0.022995581; a down market day is where EMR is less than -0.027055032. Where EMR is between -0.027055032 and –0.022995581, we define that as a neutral market day. In SZSE, an up market day is where EMR for that day is greater than –0.022929265; a down market day is where EMR is less than -0.027070515. Where

EMR is between -0.027070515 and –0.022929265, we define that as a neutral market day. After splitting the sample evenly among up, down and neutral markets, we estimate the following equation:

, (3)

where

D_d is a dummy variable that takes the value of 1 in a down market and 0 otherwise;

D_u is a dummy variable being 1 in an up market and 0 otherwise;

D_n is a dummy variable of unity in a neutral market and 0 otherwise.

The variable $DL_{j,t-1}$ is included in the Equation because it has been shown by Sujoto et al. (2005) to improve the model's goodness of fit. The results of the estimation of Equation 3 are presented in panel A of Table 9.

[Table 9 about here]

The table show that the cross sectional average of β_u is consistently significant and positive only for DQSPR and DTR. B_d is significant and positive only for DDEP. The cross-sectional mean coefficient of β_u ranges from -17.68 (for DDEP) to 15.46 (for DTR) in the SHSE. The cross-sectional mean coefficient of β_u in the SZSE ranges from -14.92 (VDEP) to 15.81 (DTR). For DQSPR and DTR, over 10% of stocks have a positive and significant β_u. In the SHSE, B_d ranges from -35.96 (DQSPR) to 245.93 (DTR), while in the SZSE it lies between -31.43 (DQSPR) and 289.74 (DTR). Up to

18.19% of stocks for DDEP and up to 12.13 for DTR have a positive and significant B_d.

Panel B of Table 9 presents the results of the Wald test (null hypothesis: $\beta_u = B_d$), which formally tests whether commonality differs between up and down markets. The Panel shows that up to 35% (33.12% for SZSE) of our sample stocks reject the null at the 10% level, and 16.95% (15.43% for SZSE) reject the null at the 5% level. These findings provide supportive evidence that in the Chinese stock market, liquidity co-movements differ between up and down markets.

VII. Conclusion

The recent burgeoning of the commonality literature highlights the growing research consensus on the overwhelming importance of liquidity co-movements caused by common determinants across securities. Existing research work has generally confirmed that at least part of the change in an individual stock's liquidity is determined by market-wide factors. Therefore, commonality in liquidity is a systemic factor that is to be priced, and securities should be characterised with liquidity, in addition to risk and returns. The research on commonality and its findings represent perhaps the most important development of finance theory in many years.

The existing literature however leaves a critical void in our knowledge, because little research has been conducted on liquidity commonality in emerging markets. This is despite the fact that one major concern triggering the development of the commonality literature was the conviction that shocks to liquidity was a contributing factor to financial crises in emerging economies during 1997 - 98. This paper fills the gap by studying the case of China.

Typical of an emerging economy, the Chinese stock market is experiencing extraordinary growth as well as increased risk and volatility. The adoption of an order-driven market structure makes the situation more complex. Research into how liquidity responds to shocks under this regime can shed light on the determination of liquidity in emerging markets, hence giving us a better understanding of the functioning of financial markets there.

Using a broad sample of stocks in two separate Chinese stock exchanges, we measure and analyse market-wide movements in liquidity in the Chinese stock market. After filtering, the sample allows us to select a total of 113,960 stock-trading days for the Shanghai Stock Exchange and 130,092 stock-trading days for the Shenzhen Stock Exchange. In testing for the co-variation of liquidity, we examine the contemporaneous adjustment in liquidity as well as one lead and lag of the market average liquidity variable. Both equal-weighted and value-weighted market liquidity variables are used in our estimation.

Evidence shows that commonality in liquidity does exist in the Chinese stock market. Moreover, this evidence is much stronger than in previous research. The magnitude of liquidity beta in many cases is more than twice that of comparable measures in previous research. We also find a much higher proportion of stocks with positive and significant liquidity beta. This implies that commonality in liquidity is likely to be more significant and more pervasive in emerging markets. Our test results also suggest that there must be other significant influences, such as noise, on daily changes in individual stocks' liquidity construct.

To further detect the existence of commonality in China, we portion the sample into five quintiles and find that commonality exists in most of the quintiles in both exchanges. We also find that the proportion of stocks with positively significant liquidity beta increases with the firm size, which is in agreement with other studies. That the liquidity of large stocks is more likely to move with market liquidity suggests that large stocks might be more exposed to correlated trading. It also shows that fund managers in China exhibit herding behaviour.

We detect the presence of significant commonality for all liquidity proxies in our models. This indicates that, when responding to shocks to systematic liquidity, Chinese market participants tend to revise both the spreads (i.e. prices) and depth (the quantity of shares they are willing to trade), rather than revising more spreads than depth as found in other research.

To test commonality within the industry and within the market as a whole, respectively, we classify our sample firms into three categories: industrial, resources and financial. Cross-sectional evidence confirms that the liquidity construct of individual stocks can be influenced by market-wide common factors as well as by industry specific common factors.

Commonality is found to be present in both up and down markets. However, there are significant differences of liquidity co-movements between the two markets. In the up market, commonality is relatively moderate and less volatile. In contrast, during the down market period the range of co-movements of liquidity is wider and the evidence of significant commonality in liquidity is stronger.

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Table 1 Liquidity Measures: Definitions and summary statistics

P indicates price. Subscripts are applied for different prices: A= ask, B= bid, M= mid-quote. Q signifies quantity of trading orders at bid or ask price. and , where I is the number of transactions on a given day and T_j the time (in seconds) between two consecutive transactions. There were 468 trading days and 113,960 stock-days in SHSE (130, 092 stock-days in SZSE) from July 2000 to June 2002. The transaction data for each liquidity measure is averaged across all trades for each daily stock.

Panel A: Definitions

Liquidity Measures	**Acronym**	**Definition**	**Units**
Quoted spread	QSPR		Yuan
Proportional Quoted spread	PQSPR		None
Depth	DEP		Shares
Dollar Depth	VDEP		Yuan
Turnover Rate	TR		None
Bi-dimensional Liquidity Measure	BLM		None

Panel B: Cross-sectional statistics for time series means

SHSE	**Mean**	**Median**	**Standard Deviation**
QSPR	0.0320	0.0210	0.1673
PQSPR	0.0104	0.0017	0.6514
DEP	434.6500	36.2670	2181.396
VDEP	6335.921	474.2194	35489.10
TR	1.2278	0.7002	1.7770
BLM	-0.1400	-1.69e-08	33.5416
SZSE	Mean	Median	Standard Deviation
QSPR	0.0313	0.0200	0.1095
PQSPR	0.0424	0.0281	3.8589
DEP	401.4336	40.0890	2088.976
VDEP	5686.052	488.4150	33515.82
TR	1.2278	0.7002	1.7770
BLM	-0.0007	-1.91e-08	0.1488

Panel C: Cross-sectional means of time-series correlations between liquidity variable pairs for an individual stock

SHSE	**QSPR**	**PQSPR**	**DEP**	**VDEP**	**TR**
PQSPR	0.0502				
DEP	0.1810	-0.0086			
VDEP	0.1934	-0.0044	0.9397		
TR	0.1669	-0.0065	0.2928	0.2803	
BLM	-0.0002	-0.0006	0.0001	-0.0005	0.0004
SZSE	QSPR	PQSPR	DEP	VDEP	TR
PQSPR	0.0087				
DEP	0.3623	-0.0130			
VDEP	0.3825	-0.0100	0.9185		
TR	0.2512	-0.0330	0.4469	0.4376	
BLM	-0.0008	-0.0006	0.0001	-0.0003	0.0004

Table 2 Absolute Daily Percentage Changes in Liquidity Variables

QSPR is the quoted spread, PQSPR is the percentage quoted spread, DEP is depth. VDEP is Dollar Depth. TR is the Turnover Rate. BLM is the Bi-dimensional Liquidity Measure. D denotes the daily percentage change in that variable for each liquidity variable. We have 259 stocks during the sample period of July 2000-June 2002.

Cross-sectional statistics for time series means (*SHSE*)	**Mean**	**Median**	**Standard Deviation**
∣ QSPR ∣	5.1190	0.2594	48.3468
∣ PQSPR ∣	13.8823	0.1864	592.1499
∣ DEP ∣	8.3590	0.3361	64.0229
∣ VDEP ∣	8.3241	0.3376	63.3598
∣ TR ∣	0.5934	0.3535	1.2081
∣ BLM ∣	0.1354	1.21e-08	32.9917
Cross-sectional statistics for time series means (*SZSE*)	**Mean**	**Median**	**Standard Deviation**
∣ QSPR ∣	0.8972	0.1765	5.9155
∣ PQSPR ∣	43.7911	0.1771	3108.138
∣ DEP ∣	7.3756	0.3269	59.8885
∣ VDEP ∣	7.3575	0.3286	59.5470
∣ TR ∣	0.5943	0.3503	1.5826
∣ BLM ∣	0.0007	2.82e-08	0.1488

Table 3 Market-wide Commonality in Liquidity (Value-weighted Market Liquidity)

Daily percentage changes in individual stocks' liquidity variables are regressed in time-series on the percentage changes of a value-weighted cross-sectional average of the liquidity variable for all stocks in the sample. QSPR is the quoted spread, PQSPR is the percentage quoted spread, DEP is depth. VDEP is Dollar Depth. TR is the Turnover Rate. BLM is the bi-dimensional Liquidity Measure. D denotes the daily percentage changes in that variable for each liquidity variable. The dependent variable stock is not included in the market average liquidity variables. We use the White (1980) heteroskedasticity consistent covariance estimator. Mean coefficients are reported, as are the percentage of positive coefficients and positive and significant coefficients. They are reported on concurrent liquidity variables as well as for the previous trading day (lag) and next trading day (lead). Additional regressors, the concurrent, lag and lead value-weighted market returns and the percentage changes in the individual firm squared returns (a proxy for changes in the return volatility), are not reported.

SHSE	**DQSPR**	**DPQSPR**	**DDEP**	**VDEP**	**DTR**	**BLM**
Concurrent	97.98	7.11	73.97	77.29	119.72	17.04
	（20.38）	(5.97)	(12.35)	(15.84)	(3.00)	(0.25)
Median	78.72	1.28	75.51	74.92	14.27	1.54E-08
Percentage+	98.46	96.53	99.23	99.23	98.07	75.68
Percentage+significant	88.07	37.45	88.84	88.84	78.38	1.93
Lag	-41.60	10.52	-40.37	-32.00	-96.21	7.12
	(-0.29)	(-1.04)	(-0.36)	(-0.25)	(-1.56)	(0.12)
Median	-34.16	-0.45	-32.29	-23.46	-92.76	5.97E-09
Percentage+	23.94	9.27	3.86	6.56	3.86	67.57
Percentage+significant	1.16	3.86	0.39	0.39	0	0.77
Lead	-15.29	4.66	-28.02	-19.05	-58.39	-40.08
	(-0.05)	(-0.34)	(-0.24)	(-0.14)	(-1.01)	(0.20)
Median	-0.65	-0.40	-25.78	-19.04	-66.71	6.287E-09
Percentage+	49.03	17.76	8.11	14.67	13.51	58.69
Percentage+significant	1.54	6.95	0.39	0.39	1.93	4.25
SUM	41.09	22.29	5.58	26.24	-34.88	-15.92
	(6.68)	(1.53)	(3.92)	(5.15)	(0.14)	(0.19)
Adj R^2 Mean	0.32	0.13	0.26	0.36	0.17	0.01
Median	0.25	0.008	0.24	0.358	0.16	-0.005
SZSE	**DQSPR**	**DPQSPR**	**DDEP**	**VDEP**	**DTR**	**BLM**
Concurrent	90.48	93.33	65.95	93.17	93.62	54.29
	（8.01）	(6.31)	(5.47)	(5.75)	(2.98)	(-0.71)
Median	87.75	3.98	16.03	36.87	68.63	-0.0006
Percentage+	94.14	92.76	98.97	98.97	98.28	37.59
Percentage+significant	93.10	11.38	47.93	63.45	82.41	6.90
Lag	-91.38	-93.16	-6.89	-71.85	-40.74	80.11
	(-0.04)	(0.31)	(-0.51)	(-0.61)	(-1.41)	(0.78)
Median	5.62	1.85	-12.54	-31.28	-44.37	0.0007
Percentage+	51.03	80.00	12.76	5.17	5.17	75.52
Percentage+significant	2.41	0.69	0	0	1.38	9.31
Lead	60.27	77.34	-11.62	-11.62	-43.27	90.79
	(0.37)	(0.29)	(0.02)	(-0.90)	(-0.32)	(0.66)
Median	11.83	1.20	-7.41	-17.26	-89.09	0.001
Percentage+	77.93	80	34.83	27.59	28.28	79.31
Percentage+significant	4.14	2.76	3.10	2.76	3.45	21.72
SUM	59.37	77.51	47.44	9.7	9.61	225.19
	(2.78)	(2.31)	(1.66)	(1.41)	(0.42)	(0.25)
Adj R^2 Mean	0.18	0.12	0.13	0.13	0.13	0.08
Median	0.14	0.005	0.04	0.04	0.12	0.02

Table 4 Market-wide Commonality in Liquidity (Equal-weighted Market Liquidity)

Daily percentage changes in individual stock liquidity variables are regressed in time-series on the percentage changes of an equal-weighted cross-sectional average of the liquidity variable for all stocks in the sample. QSPR is the quoted spread, PQSPR is the percentage quoted spread, DEP is depth. VDEP is Dollar Depth. TR is the Turnover Rate. BLM is the bi-dimensional liquidity measure. D denotes the daily percentage changes in that variable for each liquidity variable. The dependent variable stock is not included in the market average liquidity variables. We use the White (1980) heteroskedasticity consistent covariance estimator. Mean coefficients are reported, as are the percentage of positive coefficients and positive and significant coefficients. They are reported not only on concurrent liquidity variables, but also for the previous trading day (lag) and next trading day (lead). Additional regressors, the concurrent, lag and lead equal-weighted market return and the percentage change in the individual firm squared return (a proxy for changes in return volatility), are not reported.

SHSE	**DQSPR**	**DPQSPR**	**DDEP**	**VDEP**	**DTR**	**BLM**
Concurrent	86.23	77.01	63.96	51.07	6.78	-80.30
	（16.00）	(5.94)	(12.45)	(10.30)	(2.61)	(0.25)
Median	87.95	1.32	53.73	41.84	6.50	1.10E-08
Percentage+	98.46	96.91	99.23	99.23	95.75	77.22
Percentage+significant	88.07	45.95	88.84	88.84	73.75	1.54
Lag	-1.96	9.74	-1.27	-0.77	-4.01	22.87
	(-0.33)	(-1.07)	(-0.27)	(-0.18)	(-1.37)	(0.11)
Median	-1.54	-0.48	-0.99	-0.61	-3.01	3.65E-09
Percentage+	11.20	9.65	4.25	13.51	6.95	65.64
Percentage+significant	1.54	4.25	0	0	0.39	0.39
Lead	-1.78	4.73	-1.46	-0.18	-1.98	-50.50
	(-0.20)	(-0.35)	(-0.27)	(-0.02)	(-0.68)	(0.19)
Median	-0.79	-0.41	-1.34	-0.25	-2.03	3.62E-09
Percentage+	27.03	14.29	6.56	32.82	22.01	57.92
Percentage+significant	0.39	6.95	0.39	0.39	2.32	3.47
SUM	82.49	91.48	61.23	50.12	0.79	-107.93
	(5.16)	(1.50)	(3.97)	(3.37)	(0.19)	(0.18)
Adj R^2 Mean	0.38	0.11	0.26	0.20	0.15	0.006
Median	0.39	-0.001	0.24	0.18	0.14	-0.01
SZSE	**DQSPR**	**DPQSPR**	**DDEP**	**VDEP**	**DTR**	**BLM**
Concurrent	30.61	78.45	18.00	19.88	5.66	29.31
	（7.94）	(6.31)	(5.06)	(5.72)	(2.96)	(-0.71)
Median	25.19	0.06	0.49	2.04	4.88	-9.66E-06
Percentage+	94.14	91.38	99.31	99.31	97.59	37.24
Percentage+significant	92.41	11.38	35.86	77.59	83.10	7.24
Lag	-1.68	-0.88	-2.06	-2.86	-2.54	14.21
	(-0.18)	(0.26)	(-0.47)	(-0.85)	(-1.57)	(0.77)
Median	-0.35	0.02	-0.08	-0.59	-2.55	1.06E-05
Percentage+	42.07	75.86	11.38	2.41	4.83	76.55
Percentage+significant	1.72	0.69	0	0.34	0.69	9.31
Lead	5.82	3.57	-0.67	-2.41	-1.70	24.02
	(3.06)	(0.22)	(-0.13)	(-1.85)	(-0.86)	(0.62)
Median	5.92	0.01	-0.08	-0.74	-1.51	2.19E-05
Percentage+	90.34	72.41	27.59	10.69	12.76	77.59
Percentage+significant	45.17	2.07	2.41	1.72	1.72	19.31
SUM	34.75	81.14	15.27	14.61	1.42	67.54
	(5.16)	(2.26)	(1.49)	(1.01)	(0.18)	(0.23)
Adj R^2 Mean	0.16	0.11	0.10	0.11	0.13	0.08
Median	0.12	-0.008	-0.0002	0.007	0.12	0.08

Table 5 Market-wide Commonality in Liquidity by Size Quintiles (SHSE)

Daily percentage changes in individual stock liquidity variables are regressed in time-series on the percentage changes of a value-weighted cross-sectional average of the liquidity variable for all stocks in the sample. QSPR is the quoted spread, PQSPR is the percentage quoted spread, DEP is depth. VDEP is Dollar Depth. TR is the Turnover Rate. BLM is the bi-dimensional liquidity measure. D denotes the daily percentage change in that variable for each liquidity variable. The dependent variable stock is not included in the market average liquidity variables. We use the White (1980) heteroskedasticity consistent covariance estimator.

		Smallest N=51	2 N=52	3 N=52	4 N=52	Largest N=52
DQSPR	Concurrent	30.49	89.61	68.28	114.92	165.40
		(9.56)	(26.29)	(3.52)	(18.63)	(25.14)
	Median	30.43	90.51	66.80	116.29	164.46
	Percentage+	94.12	96.15	97.01	98.08	98.58
	Percentage+significant	90.20	96.15	97.01	98.08	98.58
	Adj R^2 Mean	0.25	0.62	0.15	0.44	0.59
DPQSPR	Concurrent	1.99	112.21	114.93	14.96	5.93
		(2.35)	(1.98)	(21.71)	(0.73)	(2.49)
	Median	1.8	49.22	113.26	7.20	5.22
	Percentage+	97.78	92.31	96.15	92.31	98.08
	Percentage+significant	86.67	19.23	63.46	21.15	26.92
	Adj R^2 Mean	0.03	0.01	0.55	0.04	0.03
DDEP	Concurrent	32.88	69.69	99.26	88.23	22.56
		(18.81)	(23.48)	(15.37)	(15.89)	(20.26)
	Median	28.77	67.82	101.17	85.53	22.89
	Percentage+	96.08	98.08	98.08	98.08	98.08
	Percentage+significant	94.12	97.08	97.15	98.02	98.08
	Adj R^2 Mean	0.54	0.56	0.33	0.35	0.47
VDEP	Concurrent	22.75	69.10	101.24	22.52	22.78
		(18.33)	(23.16)	(15.39)	(15.98)	(20.16)
	Median	28.65	67.31	103.50	21.89	23.15
	Percentage+	96.08	98.08	98.08	98.08	98.08
	Percentage+significant	94.12	97.08	97.15	98.02	98.08
	Adj R^2 Mean	0.52	0.56	0.34	0.35	0.47
DTR	Concurrent	251.28	236.31	602.87	232.22	98.65
		(1.22)	(0.90)	(2.22)	(0.79)	(1.61)
	Median	138.57	156.37	590.45	187.07	88.04
	Percentage+	86.27	96.15	98.08	96.15	96.15
	Percentage+significant	41.18	51.92	69.23	65.38	59.62
	Adj R^2 Mean	0.31	0.30	0.05	0.24	0.09
BLM	Concurrent	17.56	496.50	464.05	510.57	709
		(4.54)	(1.83)	(1.29)	(0.58)	(-0.08)
	Median	15.80	271.13	153.90	34.04	-2.02E-07
	Percentage+	98.04	92.31	92.31	90.38	69.23
	Percentage+significant	86.27	69.23	76.92	76.92	66.53
	Adj R^2 Mean	0.06	-0.002	0.12	0.02	-0.006

Table 6 Market-wide Commonality in Liquidity by Size Quintiles (SZSE)

Daily percentage changes in individual stock liquidity variables are regressed in time-series on the percentage changes of a value-weighted cross-sectional average of the liquidity variable for all stocks in the sample. QSPR is the quoted spread, PQSPR is the percentage quoted spread, DEP is depth. VDEP is Dollar Depth. TR is the Turnover Rate. BLM is the bi-dimensional liquidity measure. D denotes the daily percentage change in that variable for each liquidity variable. The dependent variable stock is not included in the market average liquidity variables. We use the White (1980) heteroskedasticity consistent covariance estimator.

		Smallest N=58	2 N=58	3 N=58	4 N=58	Largest N=59
DQSPR	Concurrent	49.42	162.32	68.46	125.43	111.09
		(12.41)	(13.35)	(11.72)	(60.67)	(22.93)
	Median	46.34	172.02	66.03	128.92	109.08
	Percentage+	94.83	98.28	98.21	98.28	98.31
	Percentage+significant	91.38	98.08	98.11	96.55	98.31
	Adj R^2 Mean	0.45	0.37	0.39	0.88	0.57
DPQSPR	Concurrent	55.22	136.24	579.89	646.74	718.28
		(0.08)	(9.16)	(0.46)	(22.82)	(6.45)
	Median	-0.010	148.56	3.20	1.26	1.22
	Percentage+	91.38	84.48	86.21	93.10	91.53
	Percentage+significant	8.62	10.34	8.62	32.76	18.64
	Adj R^2 Mean	0.03	0.30	-0.003	0.03	0.12
DDEP	Concurrent	52.27	80.36	94.93	148.73	128.77
		(18.29)	(12.06)	(42.60)	(21.31)	(17.16)
	Median	47.68	904.46	158.08	156.05	131.85
	Percentage+	98.28	98.28	96.55	98.28	98.31
	Percentage+significant	94.83	98.08	96.55	98.08	98.31
	Adj R^2 Mean	0.43	0.33	0.80	0.51	0.42
VDEP	Concurrent	52.42	770.10	147.92	146.69	129.16
		(18.62)	(11.92)	(41.79)	(21.23)	(17.11)
	Median	48.09	866.24	156.54	153.75	132.46
	Percentage+	96.55	98.28	96.55	98.28	98.31
	Percentage+significant	94.83	98.08	96.55	98.08	98.31
	Adj R^2 Mean	0.44	0.32	0.79	0.51	0.42
DTR	Concurrent	496.84	163.17	85.81	89.74	29.05
		(1.51)	(12.77)	(2.45)	(3.77)	(1.58)
	Median	357.18	185.05	78.86	91.19	12.62
	Percentage+	96.55	94.83	98.28	91.38	98.31
	Percentage+significant	51.72	70.69	62.07	51.72	55.93
	Adj R^2 Mean	0.08	0.50	0.08	0.17	0.15
BLM	Concurrent	483.96	-67.05	11.28	13.02	13.14
		(2.29)	(0.44)	(-5.33)	(0.08)	(-0.22)
	Median	529.91	0.004	-0.02	0.11	-0.004
	Percentage+	84.48	51.72	41.38	58.62	25.42
	Percentage+significant	51.72	10.34	6.90	5.17	5.08
	Adj R^2 Mean	0.13	0.02	0.10	0.01	0.22

Table 7 Market versus Industry Commonality in Liquidity (SHSE)

The regression equation for each stock is:

$$DL_{j,t} = \alpha_j + \beta_{1,j} DL_{M,t} + \beta_{2,j} DL_{I,t} + \varepsilon_{j,t}$$

Daily percentage changes in individual stock liquidity variables are regressed in time-series on the percentage changes of a value-weighted cross-sectional average of the liquidity variable for all stocks in the sample. QSPR is the quoted spread, PQSPR is the percentage quoted spread, DEP is depth. VDEP is Dollar Depth. TR is the Turnover Rate. BLM is the bi-dimensional liquidity measure. D denotes the daily percentage change in that variable for each liquidity variable. The dependent variable stock is not included in the market average liquidity variables. We use the White (1980) heteroskedasticity consistent covariance estimator. Mean coefficients are reported as are the percentage of positive coefficients and positive and significant coefficients. They are reported not only on concurrent liquidity variables, but also for the previous trading day (lag) and next trading day (lead). Additional regressors, the concurrent, lag and lead value-weighted market return and the percentage change in the individual firm squared return (a proxy for changes in return volatility), are not reported. $DL_{I,t}$ is the concurrent change in a cross-sectional average of the liquidity measure within the industry, excluding stock j.

	DQSPR		**DPQSPR**		**DDEP**		**VDEP**		**DTR**		**BLM**	
	Market	Industry	Market	Industry	Market	Industry	Market	Industry	Market	Industry	Market	Industry
Concurrent	49.05	127.91	41.92	263.26	20.40	748.62	36.85	67.62	15.56	24.96	9.54E-06	0.01
	(3.19)	(18.31)	(4.01)	(6.20)	(3.41)	(11.71)	(4.22)	(8.58)	(2.39)	(0.65)	(0.50)	(0.16)
Median	35.44	127.13	31.16	237.45	12.12	548.04	18.58	447.61	16.51	351.88	3.06E-06	5.92645E-05
Percentage +	73.80	92.86	92.21	60.58	80.55	98.48	86.09	86.09	91.54	70.24	75.13	75.13
Percentage +significant	61.90	90.48	80.09	53.10	60.55	90.12	70.34	86.02	82.09	10.90	13.65	10.90
Lag	27.18	-185.8	98.10	64.15	-5.07	33.43	-13.07	71.11	-94.57	220.12	-2.40E-06	-2.60E-05
	(0.13)	(-0.14)	(1.78)	(-0.1)	(-0.10)	(0.01)	(-0.15)	(0.07)	(-1.76)	(0.62)	(0.21)	(0.009)
Median	8.84	-99.07	150.35	-1547.26	-7.77	17.56	-13.26	42.56	-104.18	157.12	3.16E-07	7.21E-06
Percentage +	57.14	33.33	80.09	20.28	30.38	64.90	20.28	73.50	11.91	93.14	50.32	50.60
Percentage +significant	8.62	1.05	50.69	20.28	5.02	8.33	1.88	1.32	0.50	10.28	0.11	0.26
Lead	71.74	36.04	311.56	-268.77	-5.11	83.16	-11.29	116.33	-82.43	-0.38	9.69E-06	-6.52898E-05
	(0.35)	(0.14)	(2.65)	(-2.55)	(-0.10)	(0.12)	(-0.14)	(0.17)	(-1.35)	(0.006)	(0.71)	(0.01)
Median	30.67	128.90	248.61	-985.21	-3.39	26.21	-8.96	37.57	-79.94	26.04	4.03E-06	4.07954E-05
Percentage +	73.81	59.52	60.14	42.14	42.14	80.09	40.03	80	7.05	65.66	72.59	65.66
Percentage +significant	4.76	2.38	50.08	40.05	2.32	0.96	2.20	1.94	0.04	10.28	27.20	1.52
SUM	147.97	-21.88	451.58	58.64	10.22	865.21	12.49	255.06	-161.44	244.7	1.68E-05	0.00022
	(1.22)	(6.10)	(2.81)	(1.18)	(1.07)	(3.94)	(1.31)	(2.94)	(-0.24)	(0.42)	(0.47)	(0.06)
Median	34.10	156.82	304.10	-14.60	0.46	99.11	-2.81	132.31	-72.86	137.50	1.70E-06	2.31403E-05
Adj R^2 Mean	0.70		0.70		0.41		0.42		0.18		0.04	
Median	0.75		0.98		0.46		0.49		0.15		0.03	

Table 8 Market versus Industry Commonality in Liquidity (SZSE)

The regression equation for each stock is:

$$DL_{j,t} = \alpha_j + \beta_{1,j}DL_{M,t} + \beta_{2,j}DL_{I,t} + \varepsilon_{j,t}$$

Daily percentage changes in individual stock liquidity variables are regressed in time-series on the percentage changes of a value-weighted cross-sectional average of the liquidity variable for all stocks in the sample. QSPR is the quoted spread, PQSPR is the percentage quoted spread, DEP is depth. VDEP is Dollar Depth. TR is the Turnover Rate. BLM is the bi-dimensional liquidity measure. D denotes the daily percentage change in that variable for each liquidity variable. The dependent variable stock is not included in the market average liquidity variables. We use the White (1980) heteroskedasticity consistent covariance estimator. Mean coefficients are reported as are the percentage of positive coefficients and positive and significant coefficients. They are reported not only on concurrent liquidity variables, but also for the previous trading day (lag) and next trading day (lead). Additional regressors, the concurrent, lag and lead value-weighted market return and the percentage change in the individual firm squared return (a proxy for changes in return volatility), are not reported. $DL_{I,t}$ is the concurrent change in a cross-sectional average of the liquidity measure within the industry, excluding stock j.

	DQSPR		**DPQSPR**		**DDEP**		**VDEP**		**DTR**		**BLM**	
	Market	Industry	Market	Industry	Market	Industry	Market	Industry	Market	Industry	Market	Industry
Concurrent	58.64	139.24	56.28	276.42	32.72	780.65	50.33	77.15	36.56	53.71	0.00045	2.01
	(4.72)	(20.14)	(6.63)	(7.61)	(6.94)	(12.62)	(5.73)	(11.83)	(2.51)	(0.76)	(0.62)	(1.06)
Median	37.03	126.29	42.01	268.65	16.87	604.76	22.09	657.35	35.18	270.05	2.81E-02	0.91
Percentage +	78.83	94.37	92.42	61.32	82.21	98.16	88.06	87.98	93.77	72.78	78.85	70.93
Percentage +significant	61.28	91.45	82.02	56.09	67.92	90.90	70.82	80.74	81.59	10.57	14.61	10.61
Lag	22.23	-121.9	98.89	64.74	-4.97	58.75	-9.83	104.79	-83.74	409.81	-2.50E-05	-1.32E-03
	(0.35)	(-0.14)	(1.84)	(1.82)	(-0.60)	(1.31)	(-0.03)	(0.23)	(-1.59)	(0.85)	(0.92)	(0.29)
Median	8.28	-27.43	155.32	-147.39	-8.08	20.05	-13.26	54.75	-5.19	368.78	0.02	0.12
Percentage +	57.52	34.26	80.54	22.40	33.26	68.37	20.27	75.59	15.52	90.49	56.50	58.51
Percentage +significant	2.21	2.74	50.31	20.21	7.13	10.10	0.98	2.24	0.17	12.18	0.19	0.23
Lead	85.83	36.04	581.28	-171.75	-4.77	102.34	0.48	139.25	-20.05	2.81	3.91E-06	2.064E-05
	(0.67)	(0.14)	(4.54)	(0.35)	(-0.16)	(1.31)	(0.25)	(0.81)	(-1.08)	(1.23)	(1.29)	(0.33)
Median	52.96	128.90	252.35	-345.62	-3.39	44.18	0.39	62.57	-5.62	4.02	0.006	5.124E-05
Percentage +	73.83	59.65	61.47	40.42	40.41	80.41	43.30	82.16	5.28	67.14	70.42	61.32
Percentage +significant	4.96	3.02	50.19	40.17	1.17	0.17	4.07	3.96	1.04	13.91	20.09	1.02
SUM	166.7	53.38	736.45(3.0	169.41	22.98	941.74	40.98	321.19	-67.23	466.33	0.000429	0.000201
	(2.31)	(8.20)	6)	(3.74)	(2.88)	(3.32)	(1.62)	(2.62)	(0.83)	(1.19)	(0.47)	(0.06)
Median	45.20	167.49	775	-9.80	5.08	71.41	0.25	455.61	-20.55	106.22	2.64E-03	1.574E-05
Adj R^2 Mean	0.82		0.88		0.72		0.51		0.20		0.01	
Median	0.85		0.85		0.49		0.56		0.13		0.003	

Table 9 Asymmetric Commonality in Liquidity: Conditioning on Up and Down Markets

The regression equation for each stock is:

Panel A (Panel C) reports mean coefficients. The percentage of positive coefficients and positive and significant coefficients are reported in Panel A (Panel C) as well. Additional regressors, the concurrent, lag and lead value-weighted market return and the percentage change in the individual firm squared return (a proxy for changes in return volatility) are not reported. DW statistic is the cross sectional average of the Durbin Watson test statistics. Panel B (Panel D) reports the results when using the Wald test. The null hypothesis is: H_0: $\beta_u = B_d$. χ^2 is the cross-sectional average of Chi-square statistics. The results that significantly reject the null hypothesis at the 5% level are reported in %_*. The results that significantly reject the null hypothesis at the 10% level are reported in %_**.

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

	DQSPR	DPQSPR	DDEP	VDEP	DTR	BLM
β_u	1.98	-0.74	-17.68	-16.70	15.46	-0.002
	(1.03)	(0.03)	(-0.64)	(0.63)	(0.72)	(-0.58)
Percentage+	40.85	30.93	15.48	10.40	20.26	6.28
Percentage+significant	16.11	2.61	1.31	1.21	12.13	0.04
B_d	-35.96	-0.22	14.50	5.98	245.93	-0.0004
	(-0.29)	(0.07)	(0.79)	(0.12)	(0.60)	(-0.92)
Percentage+	23.7	60.27	51.59	53.52	73.49	5.5
Percentage+significant	1.1	1.52	20.24	1.17	10.18	0.19
Adj R^2 Mean	0.177	0.161	0.148	0.134	0.394	0.215
DW	2.02	2.01	1.96	1.96	1.93	1.95

Panel B: Wald Test Results (SHSE)

	DQSPR	DPQSPR	DDEP	VDEP	DTR	BLM
χ^2	12.58	12.09	16.43	15.02	58.54	1.38
percentage_*	3.02	1.89	16.95	13.32	1.93	0.35
percentage_**	10	12.32	35	26.18	2.55	1.04

Panel C: Summary of Up-market and Down-market Commonality in Liquidity Coefficients (SZSE)

	DQSPR	DPQSPR	DDEP	VDEP	DTR	BLM
β_u	2.46	-0.89	-9.93	-14.92	15.81	-0.0013
	(1.72)	(0.42)	(-0.60)	(0.79)	(0.85)	(-0.93)
Percentage+	50.52	54.96	15.51	18.42	22.38	7.42
Percentage+significant	18.17	1.18	1.23	1.18	15.10	0.017
B_d	-31.43	-0.14	15.73	6.69	289.74	-0.0002
	(-0.27)	(0.12)	(0.93)	(0.23)	(1.77)	(-0.81)
Percentage+	26.49	66.50	60.47	62.35	80.39	6.41
Percentage+significant	1.18	2.19	18.19	1.09	12.13	0.109
Adj R^2 Mean	0.191	0.187	0.148	0.179	0.54	0.10
DW	2.21	2.13	1.98	1.94	1.96	1.92

Panel D: Wald Test Results (SZSE)

	DQSPR	DPQSPR	DDEP	VDEP	DTR	BLM
χ^2	11.09	14.28	18.77	19.16	69.05	1.02
percentage_*	5	1.21	10.13	15.43	2.43	0.75
percentage_**	14.01	10.17	47	33.12	3	0.94

Executive Summary

Xinwei Zheng and Zhichao Zhang, Commonality in Liquidity in Emerging Markets: Evidence from the Chinese stock market

Liquidity is usually regarded as a property of an individual stock, and so is believed to be determined primarily by the trading volume, volatility, and price of the individual stock in question. Recent research has shifted this individualistic focus to liquidity of the market and confirmed that at least part of the change in an individual stock's liquidity is determined by market-wide factors. Thus, common variations in liquidity of stocks simultaneously, or commonality in liquidity, is a systemic factor and securities should be characterised with liquidity, in addition to risk and returns. Commonality in liquidity takes on a growing interest among researchers, fund managers, investors as well as regulators because of its vital importance. Given that liquidity is a determinant of asset prices, fundamental changes are required for conventional asset pricing to incorporate this effect. For fund managers and investors, the issue now becomes how to price market liquidity in the stock market. Since individual stock liquidity is at least partly driven by common determinants, the common liquidity effects could constitute a non-diversifiable risk factor. Thus, investors holding such assets will demand a premium to bear this risk. This tends to affect investor's investment decision and necessitates changes in their diversification strategies that rely on picking stocks that do not correlate in returns. As a market risk factor that is non-diversifiable, commonality in liquidity is also a policy concern. Shocks to commonality will have market-wide effects and hence affect the functioning of the financial market as a whole. In more serious cases, such shocks could even trigger a financial crisis.

While the current literature largely focuses on mature markets that are the most liquid, we test for the existence of commonality in liquidity of emerging markets where liquidity is a major issue for international investors and illiquidity of these markets had triggered financial crises. Using data from China, examine the extent liquidity is determined by common underlying factors in an emerging market that has adopted an order-driven trading system. A unique set of intra-day transaction data for A-shares in two Chinese exchanges from July 2000 to June 2002 are deployed. From this rich data set, we select a broad sample of stocks from two separate Chinese stock exchanges to measure and analyse market-wide movements in liquidity.

After filtering, the sample allows us to select a total of 113,960 stock-trading days for the Shanghai Stock Exchange and 130,092 stock-trading days for the Shenzhen Stock Exchange. In testing for the co-variation of liquidity, we examine the contemporaneous adjustment in liquidity as well as one lead and lag of the market average liquidity variable. Both equal-weighted and value-weighted market liquidity variables are used in our estimation. Our results show that commonality in liquidity does exist in the Chinese stock market. Moreover, this evidence is much stronger than that from previous research on mature markets. The magnitude of liquidity beta in many cases is more than twice that of comparable measures in previous research. We also find a much higher proportion of stocks with positive and significant liquidity beta. This implies that commonality in liquidity is likely to be more significant and more pervasive in China and likely in other emerging markets. Our test results also suggest that there must be other significant influences, such as noise, on daily changes in individual stocks' liquidity construct.

To further explore the existence of commonality in liquidity in China, we portion the sample into five quintiles and find that commonality exists in most of the quintiles in both stock exchanges. We also find that the proportion of stocks with positively significant liquidity beta increases with the firm size, which is in agreement with other studies. That the liquidity of large stocks is more likely to move with market liquidity suggests that large stocks might be more exposed to correlated trading. It also shows that fund managers in China exhibit herding behaviour. We detect the presence of significant commonality for all liquidity proxies in our models. This indicates that, when responding to shocks to systematic liquidity, Chinese market participants tend to revise both the spreads (i.e. prices) and depth (the quantity of shares they are willing to trade), rather than revising more spreads than depth as found in other research. To test commonality within the industry and within the market as a whole, respectively, we classify our sample firms into three categories: industrial, resources and financial. Cross-sectional evidence confirms that the liquidity construct of individual stocks can be influenced by market-wide common factors as well as by industry specific common factors. Commonality is also found to be present in both up and down markets. However, there are significant differences of liquidity co-movements between the two markets. In the up market, commonality is relatively moderate and less volatile. In contrast, during the down market period the range of co-movements of liquidity is wider and the evidence of significant commonality in liquidity is stronger. Findings of the existence of commonality in liquidity and its effects on asset pricing represent one of the most important research developments in finance in recent year.

Our test outcome confirms the widespread existence of commonality in liquidity, showing that it is not only a mature market phenomenon but also a critical attribute of emerging markets. Furthermore, our results uncover that in the emerging world there could exist more significant and stronger effects of commonality in liquidity, thereby calls for the particular attention to this issue in emerging markets. As arguably the most important emerging market, evidence from China sheds further lights on the functioning of the Chinese capital market. Findings of how liquidity co-moves in China at the market and industrial level and in different market states are particularly helpful for international investors who are to tap this huge market and for regulators who concern about possible shocks to liquidity of China that may have global repercussions.