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Who Are Driving Commonality in Liquidity?

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Individual stocks co-vary with each other in their liquidity, which induces a systematic, undiversifiable liquidity risk for investors. Despite the pervasive evidence on the commonality in individual liquidity within stock markets, few researches have looked at the source of commonality in liquidity. This study investigates whether correlated trading behavior of institutional investors causes co-variation in their demand of liquidity, and thus co-variation in liquidity. The empirical test using Japanese stock data shows that institutional investors prefer liquid stocks over illiquid stocks, and such preference is especially strong for foreign institutional investors. We also find that stocks heavily traded by institutional investors (both domestic and foreign institutional investors) have a higher commonality in liquidity than stocks heavily traded by individual investors. The positive relation between commonality in liquidity and co-movement in trading activity in stocks suggests that institutional investors' correlated trading behavior does have some impact on the liquidity risk.

Field of Research: Market Microstructure, Institutional Investor

1. Introduction

It has been well documented that liquidity is playing an important role in the price formation process for individual securities (see, for example, Amihud and Mendelson, 1986; Brennan and Subrahmanyam, 1996, and Amihud, 2002). In recent years, a new stream of research finds that liquidity is more than just a feature of individual securities. It co-moves with each other, which constitutes an undiversifiable risk factor in almost all the security markets (Chordia, Roll and Subrahmanyam, 2000; Hasbrouck and Seppi, 2001; and Huberman and Halka, 2001; Brockman and Chung, 2002; Domowitz, Hansch, and Wang, 2005; Qin, 2008 and Brockman, Chung, and Pérignon, 2006), and such risk factor is shown to be priced, both theoretically and empirically (Acharya and Pedersen, 2005; Pastor and Stambaugh, 2003; Sadka, 2006; and Korajczyk and Sadka, 2008).

However, despite the pervasive evidence on commonality in liquidity in international security markets, one question remains unexplored is why stock co-moves in liquidity. This study tries to answer this question by investigating one source of commonality in liquidity—investors' correlated trading behavior. Chordia, Roll, and Subrahmanyam (2000) suggest that commonality in liquidity

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can be traced to common variation in trading activity. However, they did not explore on this issue. Generally speaking, cause of commonality in liquidity can be traced from three aspects: co-variation in liquidity provision, co-variation in liquidity demanding and both. The liquidity co-variation induced by either supply of or demands for liquidity should arise from transactions occurring simultaneously and on a large-scale. It is very natural to associate such market behavior with institutional investors. Many studies regarding institutional investors' trading behavior has shown that the trading behaviors of institutional investors are not independent in the stock market. As institutional investors trade in portfolios at the same time, their large-scaled buying and selling will affect many stocks simultaneously, causing a common liquidity shock to many stocks. Therefore, correlated trading from institutional investors will cause co-variation in liquidity in security markets.

The above analysis suggests that stocks that are more popular among institutional investors are more likely to co-move with market liquidity, while stocks that are widely held by individual investors are less likely to co-move with other stocks in liquidity. This study investigates this conjecture in Japanese stock market. In particularly, we look at the hypothetic link between institutional (or individual) ownership of stocks with their systematic liquidity variation. The main empirical findings are: Firstly, consistent with previous research (Gompers and Metrick, 2001), we find that institutional investors in Japanese stock market prefer investing in large and liquid stocks, while individual investors hold more of small and illiquid stocks. We also find that stocks with high institutional ownership are not as actively traded as stocks with high individual ownership. Secondly, there is significant commonality in liquidity in Japanese stock market, and the extent of commonality in liquidity increases with institutional investor ownership. Thirdly, trading volume of individual stocks (measured by turnover) also co-moves with each other in the market and the extent of co-movement in turnover also increases with institutional investors. Finally, both institutional ownership and co-variation in trading volume contribute to commonality in liquidity. Our finding is consistent with our hypothesis that institutional investors' correlated trading cause, or at least partially cause the co-variation in liquidity in Japanese stock markets.

Liquidity is a very important feature of security markets and systematic liquidity risk has been calling more and more attention from both academic researchers and practitioners. A better understanding of what causes liquidity co-movement can help investors, dealers, and market participants to constitute their portfolio more efficiently. This study also has practical implications for regulators. The knowledge of liquidity risk as well as its driving mechanisms is of critical importance for designing well-functioning markets to improve the liquidity condition of security markets.

In what follows, section 2 briefly discusses the literature review. The data and construction of liquidity and trading activity proxies will be introduced in section 3, followed by research design and methodology in section 4. Section 4 also presents empirical results. Section 5 concludes the paper.

2. Literature review

Though commonality in liquidity has been well documented in many security markets, few studies have looked at why stocks co-move in liquidity. Coughenour and Saad (2004) find the co-variation in liquidity among securities handled by the same specialist firm, suggesting that shared capital and information among specialists within the firm cause co-movement in their provision of liquidity. While this explanation applies to quote-driven markets such as New York Stock Exchange, it does not apply to order-driven markets like most emerging markets. Qin (2008) suggests that high co-variation in volatility and inventory risk could cause high co-variation in liquidity provision, which is consistent with the empirical findings that commonality is more significant in emerging markets than in developed markets. Similar evidence can be found in Karolyi, Lee, and Dijk (2009) who document that “the extent of commonality in a country is inversely related to measures of its economic and institutional development”.

Commonality in liquidity can be traced to co-variation in liquidity provision, co-variation in liquidity demanding or both. Coughenour and Saad (2004) suggest that co-variation in liquidity provision could be caused by systematic variation in the costs of supplying liquidity. Brunnermeier and Pedersen (2006) propose a theoretical model in which when financial intermediaries hit their capital constraints and have to reduce their positions, their correlated reduction in liquidity provision affects many securities simultaneously, causing an increase in commonality in liquidity. Empirical evidence supporting the prediction of this model can be found in Hameed, Kang and Viswanathan (2010) who document that liquidity decreases while commonality in liquidity increases during market declines in U.S. stock market. Co-variation in liquidity demanding could arise as “variation in a common factor stimulates systematic variation in the desire to transact” (Coughenour and Saad, 2004). Kamara, Low and Sadka (2007) find that commonality in liquidity increased for large stocks and decreased for small stocks over the period 1963-2005. They attribute this finding to correlated liquidity demanding generated by institutional investors’ prevalent basket trading in large stocks.

Institutional investors usually trade on large scale. Their trading, therefore, will often have large impact on market. Many studies have been carried out regarding institutional investors’ trading behavior. One interesting finding about institutional investors is that their trading behavior is not independent in the stock market. First, institutions act as informed traders, and their transactions always reflect market-wide information (Barclay and Warner, 1993). Different institutional investors in the stock market might use the same information, similar analysis tools, models and methods, and employ similar trading strategies. As a result, they might react in the same way to market-wide information. For example, many institutional investors are inclined to engage in positive feedback trading (Sias and Starks, 1997). Therefore, many institution investors tend to increase their holdings in bullish markets but decrease their holdings in bearish markets. Second, herding has been found among many institutional investors (Nofsinger and Sias, 1999). Some institutional investors follow other informed institutional investors in trading, because of the pressure of performance-

evaluation by sponsors (Lakonishok, Shleifer and Vishny, 1992) or due to the need to meet the requirements of clients (Scharfstein and Stein, 1990).

Correlated trading from institutional investors has been used to explain autocorrelation in daily returns (Sias and Starks, 1997), market volatility of returns and volumes (Gabaix, Gopikrishnan, Plerou and Stanley, 2006). But one issue missed from literature is that it will also cause co-variation in liquidity in security markets. As institutional investors trade in portfolios at the same time, their large-scaled correlated buying and selling will affect many stocks simultaneously, causing a common liquidity shock to many stocks. This study fills the gap by looking at the link between institutional investors' trading and commonality in liquidity. Our findings should shed light on literature in market microstructure and in institutional trading behavior as well as its impact on financial markets.

3. Data and liquidity proxy

Liquidity, defined as the ability to buy or sell an asset quickly and in large volume without substantially affecting the asset's price, is not directly observable or measurable. We follow the recent literature to construct a proxy to measure liquidity using daily data. The reasons why we use daily data are: Firstly, high-frequency transaction data are usually not available for stocks outside U.S. stock markets, or they are available for a relatively short period of time. Using daily data, instead, makes it possible for us to construct liquidity measure for all our sample stocks for a sufficiently long period of time, which increases the power of our tests. Secondly, empirical studies show that neither liquidity measures constructed from high-frequency data nor liquidity proxies estimated with daily data is a perfect measure of liquidity. But most of these measures are highly positively correlated (Lesmond, 2005; Goyenko, Holden and Trzcinka, 2008). Following Amihud (2002), for each individual stock on each day, we construct the illiquidity measure (ILLIQ) defined as the ratio of the daily absolute return to the trading value. This illiquidity measure mainly captures the response of price to order flow and closely follows the Kyle (1985) price impact definition of liquidity. And it is the most significant transaction cost for institutional investors with large trade.

All the data used in this study are obtained from the Pacific-Basin Capital Markets (PACAP) Databases. Our sample period runs from January 1995 to December 2004 when the data on ownerships are available. During this period of time, there are totally 2657 stocks in the database. We restrict our sample stocks to ordinary common shares of non-financial companies, and stocks with sufficient trading observations (no less than one year), which leaves us 2301 stocks in the final sample, and 9.795 million firm-day observations. We use both daily and annual data in this study. The daily data includes closing prices, number of shares traded, value of shares traded (in Japanese Yen), number of shares outstanding and daily return without cash dividend. We use the daily data to construct illiquidity measure (ILLIQ) and trading activity measure turnover (TNV), which is defined as ratio of daily trading volume to number of shares

outstanding. We also calculate the market value of common shares (MV, in million) as closing price multiplied by trading volume in million. To facilitate our analysis, we used the logarithm of MV to capture the size of the company (SIZE). One special feature of Japanese data in PACAP is that the ownership structure of each company is revealed in the annual report. Specifically, the database provides for each individual company shares owned by central and local governments, by financial institutions, by securities companies, by other business corporations, by foreigners, by individuals and others, and the total shares owned for all listed companies on the Tokyo stock exchange. We calculate the percentage of ownership for each owner type by dividing the number of shares owned by each owner type by total number of shares on the stock exchange. Such information is updated annually.

Table 1 presents the descriptive statistics for the variables we use in this study and for the ownership structure. From the lower panel of the table we can see that different types of owners vary a lot in their ownership of stocks. Individual investors (INDI) on average own 1/3 of the stocks in Japanese stock market, financial institutions (FIN) and other business corporations (BIZ) own about 30% of stocks respectively. Foreign investors (FRN), security companies (SEC) and governments (GOV) hold only a very small portion of the stocks in the whole market, though they may be the major shareholders for some individual companies.

Table 1 Descriptive Statistics

RET is the daily return for individual stocks without cash dividend. TNV is turnover ratio, defined as daily trading volume to number of shares outstanding. ILLIQ is Amihud (2002) illiquidity ratio, calculated as the ratio of the daily absolute return to the trading value. SIZE is the log of market value of securities (in million) for sample firms. The lower panel of the table reports the ownership structures of individual companies.

	Mean	**STD**	**Min**	**Q1**	**Median**	**Q3**	**Max**
RET	0.0004	0.0227	-0.0678	-0.0122	0.0000	0.0109	0.0894
TNV	1.5893	2.6467	0.0007	0.2995	0.7252	1.6727	23.7662
ILLIQ	1.9229	4.0021	0.0000	0.0737	0.3611	1.6536	29.6300
SIZE	3.5665	1.5738	-4.0233	2.4638	3.4764	4.5817	10.7929
GOV	0.15%	2.30%	0.00%	0.00%	0.00%	0.00%	100.00%
FIN	30.10%	15.81%	0.00%	17.53%	29.21%	41.88%	89.60%
SEC	1.53%	2.22%	0.00%	0.30%	0.76%	1.82%	47.43%
BIZ	30.24%	18.80%	0.00%	14.70%	26.18%	43.84%	100.00%
FRN	4.96%	8.31%	0.00%	0.30%	1.64%	6.22%	97.25%
INDI	33.03%	16.27%	0.00%	20.67%	30.51%	42.53%	100.00%

In the rest of the paper, we define institutional ownership in three ways: “INST1” is the broad institutional ownership, which is defined as the sum of GOV, FIN, SEC, BIZ and FRN. “INST2” is defined as domestic institutional ownerhship, which is calculated as INST1–FRN. INST3 is defined as domestic non-government institutional ownership, calculated as INST2–GOV.

Table 2 reports the Pearson correlation coefficients matrix for our liquidity, trading and company size measures. As we can see that consistent with

people's intuition, stocks of large companies are more liquid and more actively traded than stocks of small companies. And actively trades stocks are more liquid than non-active stocks.

Table 2 Pearson Correlation Coefficients

	ILLIQ	**TNV**	**SIZE**
ILLIQ	1	-0.19671	-0.67501
P-value	<.0001	<.0001	<.0001
TNV	-0.19671	1	0.03958
P-value	<.0001	<.0001	<.0001
SIZE	-0.67501	0.03958	1
P-value	<.0001	<.0001	<.0001

4. Commonality in liquidity and ownership structure

4.1 Institutional ownership and firm characteristics

Previous studies find that institutional investors prefer large, liquid companies (for example, Gompers and Metrick, 2001). Table 3 reports the Pearson correlation coefficients between firm or stock characteristics and each type of ownership in Japanese stock market. As we can see that over all, institutional ownerships (measured as INST1, INST2, and INST3) are significantly negatively correlated with illiquidity, and positively correlated with company size. While individual ownership is positively associated with illiquidity, and negatively associated with company size. The evidence suggests that consistent with in Japanese stock market, institutional investors also have a higher holding of the large and liquid stocks, while individual investors trade more of illiquid and small stocks. We also find that turnover decreases with institutional ownership but increases with individual ownership—suggesting that stocks held by institutional investors are not as actively traded as stocks held by individual investors. One possible explanation could be that institutional investors on average have a longer holding period compared with individual investors, especially speculative noise traders.

Table 3 Pearson Correlation Coefficients

	INST1	**INST2**	**INST3**	**GOV**	**FIN**	**SEC**	**BIZ**	**FRN**	**INDI**
ILLIQ	-0.2544	-0.1236	-0.1203	-0.0193	-0.4052	-0.1515	0.2613	-0.2504	0.2509
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
TNV	-0.0528	-0.0780	-0.0750	-0.0181	0.0136	0.3142	-0.1132	0.0458	0.0536
	<.0001	<.0001	<.0001	0.0002	0.0049	<.0001	<.0001	<.0001	<.0001
SIZE	0.4666	0.2638	0.2505	0.0852	0.5721	0.0218	-0.2753	0.3900	-0.4640
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

We also conduct a more refined test, by dividing all the stocks into different groups based on their ownership structure. Then within each group of stocks we calculate their mean and median illiquidity, turnover and company size. We also conduct an F-test to investigate whether stocks with high institutional ownership do differ from stocks with low institutional ownership in firm characteristics. The results are presented in Table 4.

Table 4 Firm characteristics across different levels of ownerships

All stocks are divided into different groups based on their ownership structure. Then within each group of stocks we calculate their mean and median illiquidity (Panel A), turnover (Panel B) and company size (Panel C). We also conduct an F-test to investigate whether stocks with high institutional ownership do differ from stocks with low institutional ownership in firm characteristics.

Panel A: ILLIQ across different levels of ownership

	Low Ownership		**Medium**		**High Ownership**		**HIGH-LOW**	
	mean	median	mean	median	mean	median	mean	*p-value*
INST1	4.2175	2.4875	2.9385	1.2062	1.8186	0.4323	-2.3989	*<.0001*
INST2	3.6174	1.8219	2.8293	1.0133	2.4928	0.8731	-1.1246	*<.0001*
INST3	3.5954	1.7933	2.8547	1.0280	2.4883	0.8757	-1.1071	*<.0001*
GOV	3.2560	1.5262	0.0970	0.0197	2.1875	0.4716	-1.0685	*<.0001*
FIN	5.0973	3.5733	2.8438	1.3130	1.1421	0.2567	-3.9552	*<.0001*
SEC	4.2044	2.4324	2.8245	1.1526	2.0170	0.6666	-2.1874	*<.0001*
BIZ	1.8324	0.4209	2.8559	1.1322	4.2869	2.5556	2.4545	*<.0001*
FRN	5.5795	4.1511	2.3877	1.1193	1.0853	0.2496	-4.4942	*<.0001*
INDI	1.8501	0.4389	2.9571	1.2116	4.2277	2.4932	2.3776	*<.0001*

Panel B: TNV across different levels of ownerships

	Low Ownership		**Medium**		**High Ownership**		**HIGH-LOW**	
	mean	median	mean	median	mean	median	mean	*p-value*
INST1	2.0557	0.9947	1.8563	1.1034	1.8381	1.1645	-0.2176	*<.0001*
INST2	2.1427	1.1191	1.8650	1.1739	1.7450	0.9847	-0.3977	*<.0001*
INST3	2.1285	1.1039	1.8692	1.1808	1.7543	0.9913	-0.3742	*<.0001*
GOV	2.0442	1.1253	2.6782	1.6788	1.5312	1.0121	-0.5130	*<.0001*
FIN	1.8482	0.8235	1.8468	1.0480	2.0524	1.3841	0.2042	*<.0001*
SEC	1.0830	0.5700	1.5238	1.0458	3.0884	2.0812	2.0054	*<.0001*
BIZ	2.3564	1.4653	1.9442	1.0988	1.4510	0.7631	-0.9054	*<.0001*
FRN	1.4911	0.6321	2.0500	1.1040	2.1976	1.4737	0.7064	*<.0001*
INDI	1.8364	1.1592	1.8610	1.1005	2.0625	0.9973	0.2262	*<.0001*

Panel C: SIZE across different levels of ownerships

	Low Ownership		**Medium**		**High Ownership**		**HIGH-LOW**	
	mean	median	mean	median	mean	median	mean	*p-value*
INST1	2.6300	2.5539	3.4267	3.3233	4.3275	4.3063	1.6975	<*.0001*
INST2	2.9594	2.8032	3.5677	3.4299	3.8774	3.8405	0.9180	<*.0001*
INST3	2.9859	2.8155	3.5527	3.4171	3.8671	3.8351	0.8811	<*.0001*
GOV	3.1992	3.1224	6.4562	6.4464	4.2308	4.1667	1.0316	<*.0001*
FIN	2.4757	2.4025	3.3298	3.2659	4.5333	4.4371	2.0576	<*.0001*
SEC	3.2501	3.0348	3.5814	3.4592	3.5526	3.5360	0.3026	<*.0001*
BIZ	4.0081	3.9531	3.4211	3.3772	2.9642	2.9032	-1.0438	<*.0001*
FRN	2.3472	2.2919	3.5248	3.4154	4.4858	4.4308	2.1386	<*.0001*
INDI	4.3127	4.2955	3.4173	3.3156	2.6235	2.5477	-1.6892	<*.0001*

From Table 4 we can see that the conclusions are quite robust. Stocks with high institutional (individual) ownership have significantly lower (higher) illiquidity, lower (higher) turnover and larger (smaller) company size. The p-values indicate that all the F-test results are significant at 99% confidence level.

4.2 Commonality in liquidity and correlated trading in Japanese stock market

When investigating the intra-market commonality in liquidity in Japanese stock market, we follow Chordia et al. (2000)'s methodology: For each individual stock in each sample year, we use a market model to regress the percentage change in the liquidity proxy for the individual stock on the concurrent percentage change in the market wide liquidity proxy (equal weighted average of all individual stock liquidity, excluding the stock in the dependent variable), which is specified as:

$$\mathrm{DILLIQ}_{j,t} = \alpha_j + \beta_j \mathrm{DILLIQ}_{mkt,t} + \varepsilon_{j,t} \qquad (1)$$

where $ILLIQ_{j,t}$ denotes my illiquidity measures; $DILLIQ_{j,t}$ and $DILLIQ_{mkt,t}$ are the percentage change in liquidity for each individual security j on day t and for the market. Taking into account the time variation feature of the loading factor β_j, we run this regression for each individual security in each sample year. The upper panel of Table 5 presents the percentage of β_js that are positive, the percentage of β_js that are significantly positive at the 95% and 90% level for a one-sided test of whether the coefficient is smaller or equal to zero, and the equally-weighted averages of the R_j^2 across all regressions.

Table 5 Commonality in liquidity and co-movement in trading activity

For each individual stock in each sample year, we use a market model to regress the percentage change in the liquidity proxy for the individual stock on the concurrent percentage change in the market wide liquidity proxy. Panel A presents the percentage of β_js that are positive, the percentage of β_js that are significantly positive at the 95% and 90% level for a one-sided test of whether the coefficient is smaller or equal to zero, and the equally-weighted averages of the R_j^2 across all regressions. Panel B reports the results for a similar test on the co-movement of trading volume, where trading volume is measured as TNV.

	RSQ	POSI	POSI95	POSI99	POSI90
A: Commonality in liquidity					
Mean	3.21%	75.12%	29.60%	17.14%	38.43%
Std.dev	0.094	0.432	0.456	0.377	0.486
B: Co-movement in trading volume					
Mean	4.76%	90.96%	62.41%	48.55%	69.48%
Std.dev	0.070	0.287	0.484	0.500	0.460

From upper panel of Table 5 we can see that, the empirical results show that stocks also co-move with each other in liquidity in Japanese stock market, indicated by both average R^2 and percentage of positive βs.

As we are trying to use correlated trading to explain commonality in liquidity. We also test whether the trading volume of individual stocks also co-move with each other. We employ the same procedure on turnover and regress the percentage change in the daily turnover ratio for the individual stock on the concurrent percentage change in the market wide turnover (equal weighted average of all individual stock turnover, excluding the stock in the dependent variable):

$$\mathrm{DTNV}_{j,t} = \alpha_j + \beta_j \mathrm{DTNV}_{mkt,t} + \varepsilon_{j,t} \qquad (2)$$

where as above, $TNV_{j,t}$ denotes the trading activity measure; $DTNV_{j,t}$ and $DTNV_{mkt,t}$ are the percentage change in trading volume for each individual security j on day t and for the market. The regressions are also ran for each individual security in each sample year. We present the results in the lower panel of Table 5. The results show a significant co-variation in turnover among stocks in Japanese stock market.

4.3 Commonality in liquidity and institutional ownership

In order to find out the relation between commonality in liquidity and ownership structure, each year, we rank all stocks based on their different types of ownership and classify each stock into one of three portfolios: stocks with low, medium and high ownership in INST1, INST2, and INST3 etc.. Then within each ownership portfolio, we calculate average R^2 and percentage of positive βs that we obtained from the liquidity market model regression we run in previous section. We present the results in Table 6. We also conduct F-test to check whether stocks with high ownership differ from stocks with low ownership.

From table 6 we can see that stocks with high institutional (individual) ownership have significantly higher (lower) commonality in liquidity than stocks with low institutional (individual) ownership. The results suggest that stocks that institutional investors are most interested in are more likely to co-vary with each other in liquidity than stocks that most individual investors are interested in. Or, stocks with high institutional ownership have higher systematic liquidity risk than stocks with low institutional ownership. As rational investors, especially more sophisticated than individual investors, institutional investors should try to avoid undiversifiable risks. Therefore, the more possible rational explanation for the link between high institutional ownership and high liquidity risk is that institutional investors' trading behavior increases the liquidity risk of the stocks.

4.4 Correlated trading from institutional investors

As stated in the first section, one possible source of commonality in liquidity could be the correlated trading from institutional investors. Therefore, we then look at the relation between institutional ownership and correlated trading volume in stocks. We employ the similar method as in section 3.3 and present the results in Table 7.

Table 7 shows that stocks with high institutional (individual) ownership have significantly higher (lower) correlated trading volume than stocks with low institutional (individual) ownership. This is consistent with our conjecture in Section 1. Due to the same information, analysis tools or models used by institutional investors, or due to their herding behavior, institutional investors' trading tend to be correlated, causing the trading volumes of the stocks that they are trading to be highly correlated as well. But for individual investors, who behave more like random noise traders, their trading is less likely to cause the stocks' volume to be correlated with each other.

4.5 Are institutional investors driving commonality in liquidity by their correlated trading?

We finally arrive at our main research question of whether institutional investors are driving commonality in liquidity in Japanese stock market by their correlated trading behavior. In order to answer this question, we run the following panel regression across all the stock-year observations.

$$\mathrm{COMO}^{*}_{i,t} = \alpha + \beta_i \mathrm{OWNERSHIP}^{*}_{i,t} + \gamma_i \mathrm{COTRADE}_{i,t} + \varepsilon_{i,t} \qquad (3)$$

where $COMO^{*}_{i,t}$ is the R^2 from the market liquidity regression for individual security *i* in year *t* , measuring commonality in liquidity for security *i* in year *t* ; And $COTRADE_{i,t}$ is the R^2 from regression of the market turnover model for the same security in the same year, measuring the correlated trading volume for security *i* in year *t.* Since R^2 is bounded within the intervals [0,1], we apply

logistic transformation to $COMO^*_{i,t}$ as:

$$COMO^*_{i,t} = \log\left(\frac{R^2_{j,t}}{1-R^2_{j,t}}\right) \quad (4)$$

Table 8 shows the regression results. We can see that in general, higher institutional ownership is associated with higher commonality, while higher individual ownership is associated with lower commonality in liquidity. When we add the correlated trading measure *COTRADE* into the models, the sign and significance of the ownership variables do not change. And consistent with our hypothesis, the correlated trading also significantly increases commonality in liquidity. All regression coefficients on *COTRADE* are statistically significant at 99% confidence level across model 10 to model 18. Therefore, there seem to be a very strong positive link between correlated trading and co-variation in liquidity. Though we did not conduct a specific causality test, we think it is more obvious and plausible that correlated trading will induce correlated liquidity shocks among many stocks. We find it hard to explain the relationship in the other way round. However, any alternative explanation is always welcome.

Table 6 Ownership structure and commonality in liquidity

Each year, we rank all stocks based on their different types of ownership and classify each stock into one of three portfolios: stocks with low, medium and high ownership in INST1, INST2, and INST3 etc.. Then within each ownership portfolio, we calculate average R^2 and percentage of positive βs that we obtained from the liquidity market model regressions. This table reports the results. We also conduct F-test to check whether stocks with high ownership differ from stocks with low ownership in commonality in liquidity.

	Low					MEDIUM					HIGH					HIGH-LOW				
	RSQ	**POSI**	**POSI90**	**POSI95**	**POSI99**	**RSQ**	**POSI**	**POSI90**	**POSI95**	**POSI99**	**RSQ**	**POSI**	**POSI90**	**POSI95**	**POSI99**	**RSQ**	**POSI**	**POSI90**	**POSI95**	**POSI99**
INST1	3.13%	72.99%	35.62%	27.39%	15.69%	3.26%	74.81%	37.78%	29.14%	16.58%	3.26%	77.12%	41.23%	31.88%	18.75%	0.13%	4.14%	5.61%	4.49%	3.06%
p-value																*0.243*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
INST2	3.15%	73.61%	36.07%	27.83%	16.25%	3.18%	75.06%	38.56%	29.69%	17.15%	3.33%	76.22%	39.96%	30.85%	17.63%	0.19%	2.61%	3.89%	3.02%	1.38%
p-value																*0.104*	*<.0001*	*<.0001*	*<.0001*	*0.002*
INST3	3.14%	73.47%	35.97%	27.70%	16.17%	3.18%	75.13%	38.56%	29.73%	17.18%	3.33%	76.29%	40.06%	30.94%	17.67%	0.19%	2.82%	4.09%	3.24%	1.51%
p-value																*0.105*	*<.0001*	*<.0001*	*<.0001*	*0.001*
GOV	3.22%	79.72%	45.58%	36.37%	22.65%	3.10%	73.73%	36.16%	27.50%	15.60%	3.68%	75.29%	39.03%	30.35%	17.11%	0.46%	-4.43%	-6.55%	-6.02%	-5.54%
p-value																*0.003*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
FIN	3.14%	73.73%	36.75%	28.61%	16.73%	3.25%	75.24%	38.06%	29.32%	17.00%	3.27%	75.71%	39.49%	30.10%	17.11%	0.25%	1.07%	0.05%	-0.05%	-0.97%
p-value																*0.255*	*0.000*	*<.0001*	*0.006*	*0.394*
SEC	3.11%	74.48%	37.93%	29.25%	17.20%	3.18%	74.70%	38.48%	29.64%	17.47%	3.36%	75.55%	37.99%	29.21%	16.22%	0.25%	1.07%	0.05%	-0.05%	-0.97%
p-value																*0.030*	*0.037*	*0.925*	*0.931*	*0.028*
BIZ	3.19%	74.47%	37.41%	28.57%	16.37%	3.24%	75.25%	38.60%	29.69%	17.07%	3.22%	75.03%	38.36%	29.80%	17.40%	0.03%	0.56%	0.95%	1.24%	1.03%
p-value																*0.768*	*0.281*	*0.101*	*0.023*	*0.021*
FRN	3.21%	70.89%	31.95%	24.10%	12.79%	3.24%	76.82%	41.27%	32.24%	19.12%	3.20%	77.39%	41.61%	32.14%	19.23%	-0.02%	6.50%	9.67%	8.04%	6.44%
p-value																*0.892*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
INDI	3.27%	77.04%	41.13%	31.75%	18.68%	3.25%	74.67%	37.63%	28.98%	16.48%	3.13%	72.92%	35.48%	27.23%	15.61%	-0.14%	-4.12%	-5.65%	-4.52%	-3.07%
p-value																*0.215*	*<.0001*	*<.0001*	*<.0001*	*<.0001*

Table 7 Ownership structure and correlated trading

Each year, we rank all stocks based on their different types of ownership and classify each stock into one of three portfolios: stocks with low, medium and high ownership in INST1, INST2, and INST3 etc.. Then within each ownership portfolio, we calculate average R^2 and percentage of positive βs that we obtained from the turnover market model regressions. This table reports the results. We also conduct F-test to check whether stocks with high ownership differ from stocks with low ownership in co-movement in trading activiey.

	Low					MEDIUM					HIGH					HIGH-LOW				
	RSQ	**POSI**	**POSI90**	**POSI95**	**POSI99**	**RSQ**	**POSI**	**POSI90**	**POSI95**	**POSI99**	**RSQ**	**POSI**	**POSI90**	**POSI95**	**POSI99**	**RSQ**	**POSI**	**POSI90**	**POSI95**	**POSI99**
INST1	4.34%	90.93%	68.27%	60.99%	46.79%	4.75%	90.94%	69.58%	62.79%	48.74%	5.15%	91.01%	70.55%	63.48%	50.08%	0.81%	0.09%	2.28%	2.50%	3.29%
p-value																*<.0001*	*0.799*	*<.0001*	*<.0001*	*<.0001*
INST2	4.39%	90.81%	68.36%	61.12%	47.02%	4.84%	90.81%	69.60%	62.87%	48.83%	5.00%	91.24%	70.41%	63.24%	49.72%	0.61%	0.43%	2.04%	2.12%	2.69%
p-value																*<.0001*	*0.2051*	*0.0002*	*0.0003*	*<.0001*
INST3	4.40%	90.85%	68.40%	61.11%	47.04%	4.84%	90.76%	69.58%	62.89%	48.89%	5.00%	91.26%	70.39%	63.23%	49.65%	0.60%	0.41%	1.99%	2.11%	2.61%
p-value																*<.0001*	*0.235*	*0.0003*	*0.0003*	*<.0001*
GOV	6.55%	91.22%	73.18%	66.97%	55.42%	4.13%	91.06%	68.45%	61.06%	46.17%	5.26%	90.48%	69.83%	63.22%	50.61%	-1.29%	-0.74%	-3.35%	-3.76%	-4.81%
p-value																*<.0001*	*0.1152*	*<.0001*	*<.0001*	*<.0001*
FIN	4.48%	91.17%	69.12%	62.06%	47.50%	4.81%	91.16%	69.80%	62.51%	48.90%	4.92%	90.55%	69.48%	62.66%	49.04%	0.44%	-0.62%	0.36%	0.60%	1.54%
p-value																*<.0001*	*0.0684*	*0.5156*	*0.2958*	*0.0097*
SEC	4.52%	90.23%	67.90%	60.71%	46.97%	4.95%	90.91%	69.53%	62.93%	49.18%	4.76%	91.70%	70.94%	63.60%	49.32%	0.25%	1.47%	3.03%	2.89%	2.35%
p-value																*0.0025*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
BIZ	4.68%	90.51%	69.25%	62.12%	48.14%	4.70%	90.99%	68.90%	61.85%	48.23%	4.84%	91.35%	70.27%	63.28%	49.11%	0.16%	0.84%	1.02%	1.15%	0.98%
p-value																*0.0513*	*0.014*	*0.0616*	*0.0446*	*0.1006*
FRN	3.98%	91.10%	68.20%	60.38%	45.12%	5.08%	90.89%	69.51%	62.89%	49.85%	5.21%	90.87%	70.79%	64.09%	50.73%	1.23%	-0.23%	2.58%	3.71%	5.61%
p-value																*<.0001*	*0.4929*	*<.0001*	*<.0001*	*<.0001*
INDI	5.14%	91.02%	70.56%	63.51%	50.06%	4.74%	90.92%	69.59%	62.76%	48.70%	4.33%	90.91%	68.20%	60.91%	46.64%	-0.81%	-0.11%	-2.36%	-2.60%	-3.41%
p-value																*<.0001*	*0.7563*	*<.0001*	*<.0001*	*<.0001*

Table 8 Regression analysis on commonality in liquidity and correlated trading

Table 8 shows the results for the following panel regression across all the stock-year observations. $COMO^{*}_{i,t} = \alpha + \beta_i OWNERSHIP^{*}_{i,t} + \gamma_i COTRADE_{i,t} + \varepsilon_{i,t}$ where $COMO^{*}_{i,t}$ is the R^2 from the market liquidity regression for individual security i in year t , measuring commonality in liquidity for security i in year t ; And $COTRADE_{i,t}$ is the R^2 from regression of the market turnover model for the same security in the same year, measuring the correlated trading volume for security i in year t. Since R^2 is bounded within the intervals [0,1], we apply logistic transformation to $COMO^{*}_{i,t}$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Intercept	-5.3424	-5.2258	-5.2398	-5.0918	-5.1503	-5.0631	-5.1105	-5.1220	-4.9768	-5.2849	-5.1722	-5.1893	-5.0206	-5.0905	-4.9995	-5.0387	-5.0529	-4.9054
p-value	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
INST1	0.3663									0.3815								
p-value	*<.0001*									*<.0001*								
INST2		0.2095									0.2344							
p-value		*0.007*									*0.0015*							
INST3			0.2322									0.2620						
p-value			*0.0026*									*0.0004*						
GOV				-1.1397									-1.3668					
p-value				*0.0298*									*0.0059*					
FIN					0.1833									0.2182				
p-value					*0.0151*									*0.0028*				
SEC						-1.8979									-1.4743			
p-value						*0.0003*									*0.0039*			
BIZ							0.0560									0.0508		
p-value							*0.3822*									*0.4102*		
FRN								0.5925									0.6007	
p-value								*<.0001*									*<.0001*	
INDI									-0.3640									-0.3753
p-value									*<.0001*									*<.0001*
COTRADE										0.0175	0.0181	0.0180	0.0186	0.0184	0.0187	0.0185	0.0182	0.0175
p-value										*0.0015*	*0.0011*	*0.0011*	*0.0007*	*0.0009*	*0.0007*	*0.0008*	*0.001*	*0.0015*
Adj R^2	0.06%	0.02%	0.02%	0.01%	0.01%	0.03%	0.00%	0.04%	0.06%	0.09%	0.05%	0.05%	0.04%	0.04%	0.04%	0.02%	0.06%	0.09%

5. Conclusion

Commonality in liquidity, as has been documented by empirical testing in many countries, is drawing increasing attention from researchers. The systematic liquidity risk caused by the liquidity co-variation in the stock market makes investors, regulators and researchers increasingly conscious. But so far we do not know much about what are the sources of commonality in liquidity. And as a result, we cannot do much to reduce the liquidity risk in financial market.

This study finds one possible source of commonality in liquidity—investors, especially institutional investors' correlated trading behavior could cause a pervasive shock in either liquidity provision or liquidity demanding for many stocks simultaneously, resulting in a co-variation in liquidity level among many stocks in the market. Our empirical results show that institutional investors tend to trade large, liquid stocks that are not very actively traded. Such findings are consistent with both intuition and theoretical prediction about institutional investors. As sophisticated traders, institutional investors trade carefully, and they try to reduce their transaction costs by trade liquid stocks and by not to trade too frequently.

We also find that stocks with high institutional ownership have higher systematic liquidity risk, that is, these stocks co-moves more with other stocks in liquidity than their peer stocks that are widely held by individual investors. These stocks are also correlated with other stocks in trading volume. These findings suggest that institutional investors' trading is more correlated than individual investors', and that institutional investors tend to trade many stocks at the same time. Such correlated trading, especially trading with large size orders, in many stocks will cause correlated liquidity shock among many stocks at the same time, inducing commonality in liquidity.

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