Does liquidity mediate between information quality and the cost of equity in China?

Author 1: Raheel Safdar (Corresponding author)
Affiliation: School of Accounting, Dongbei University of Finance and Economics, Dalian, China
Address: Room 334, Bilin Lou, Dongbei University of Finance and Economics, Dalian, China
Phone No: 008615524841125
E-mail: raheelchattha@hotmail.com

Author 2: Chen Yan
Affiliation: School of Accounting, Dongbei University of Finance and Economics, Dalian, China
Address: School of accounting, Dongbei University of Finance and Economics, Dalian, China
Phone No: 008615604081215
E-mail: chenyan2001@126.com

Does liquidity mediate between information quality and the cost of equity in China?

Abstract

This study investigates whether stock liquidity and liquidity risk mediate in the relationship between information quality and the cost of equity in China. We hypothesize that better information quality lowers illiquidity and liquidity risk of a stock and thereby reduces its cost of equity. We perform mediation analysis to test the role of stock liquidity. And to test the role of liquidity risk we examine whether better information quality reduces a firm's beta over liquidity factor in an asset pricing model also having Fama French three factors. Contrary to existing literature, our findings suggest that stock liquidity and liquidity risk do not mediate in the relationship between information quality and the cost of equity in China. We ascribe our findings to the information consumption behavior of Chinese investors.

JEL classification: G14; G12; G11; G10

Keywords: information quality; stock liquidity; liquidity risk; cost of equity

1 Introduction

The role of information quality in shaping the cost of capital of a firm has been the focus of several studies (see Easley and O'Hara 2004; Francis et al. 2005; Cohen 2008; Lambert *et al.* 2007; and Kim and Qi 2010). More recently, studies by Lang *et al.* (2012) and Ng (2011) suggest that the stock liquidity (i.e. the cost of trading) and the liquidity risk (i.e. the vulnerability of a stock's returns to the unexpected changes in overall market liquidity) mediate the relationship between information quality and the cost of capital. The theoretical basis for the stock liquidity channel (for the cost of capital effects of information quality) is founded in the works of Diamond and Verrecchia (1991), Baiman and Verrecchia (1996), and Lambert and Verrecchia (2015). These studies argue that higher information asymmetry about a stock creates greater risk for market makers and uninformed investors in the market, which results into higher bid-ask spread and lowered demand for the stock. It ends into higher expected returns demanded by the investors. And the reasoning behind the liquidity risk channel is that in instances of abnormal liquidity shocks to the market the returns of stocks with lesser ambiguity about their intrinsic value will less severely be affected. In other words, the returns of the stocks with more transparent information environment will be less susceptible to abnormal liquidity shocks to the market, and investors will be willing to pay more for such stocks (see Acharya and Pedersen 2005; and Ng 2011).

However, the proposed efficacy of firm-level transparency to reduce illiquidity and liquidity risk may not be observable in markets suffering from low reliability of accounting information. Also, if the majority of investors (the consumers of information) in a market are unsophisticated and they part in speculation rather than making informed decisions then the linkage between information quality and stock liquidity may not hold. One such potential case is the Chinese

capital market which is notorious for information opaqueness and the individual investors in China, who dominate stock trading, are deemed as "uninformed speculators" (Jiang and Kim 2015). Chinese capital market merits attention also because of its huge size and growing integration with rest of the financial world. Moreover, the relatively high volatility in Chinese capital market provides better setting to test the potential role of information quality in reducing the liquidity risk of a stock. So this study aims at testing whether stock liquidity and liquidity risk mediate the relationship between information quality and cost of equity in China.

To test the role of stock liquidity in channeling the effects of information quality to stock returns we perform mediation analysis. Particularly, Sobel (1982) test is employed to assess the significance of the proposed mediation. And we follow Pastor and Stambaugh (2003) and Ng (2011) to test for the role of liquidity risk in channeling the effects of information quality to stock returns. Specifically, in an asset pricing model containing Fama and French (1993) three factors (namely market, size, and book-to-market factor) and a liquidity factor (*LIQ*), we examine how information quality affects a firm's beta over *LIQ*. *LIQ* is calculated following Pastor and Stambaugh (2003) and shows unexpected changes in the market liquidity. Firms having smaller beta over *LIQ* have lower sensitivity of their returns to the unexpected changes in market liquidity and we test whether better information quality reduces a firm's beta over *LIQ*.

The results from full sample analysis reveal that neither stock liquidity nor liquidity risk play any significant role in channeling the effects of information quality to cost of equity in China. These results are consistent also in subsample analyses of state-owned (SOEs) and non-state-owned enterprises (NSOEs). These results are justifiable considering some peculiar characteristics of Chinese capital market. Specifically, the excessively speculative behavior of Chinese investors (either because the available information lacks reliability or the investors are

not sophisticated enough to infer signals from available accounting information) is potentially the primary reason for better information quality not being translated into lower illiquidity and liquidity risk.

The findings of this study bear some academic and policy implications. From academic perspective, it underscores that the investors' information consumption behavior is important in any relationship concerning information quality. In other words, the effectiveness of accounting information quality with respect to liquidity depends on whether, and in how much proportion, investors use accounting information for making their trading decisions. Moreover, from policy perspective, our findings suggest that investors' training to enable their information consumption is important in conjunction with increased firm level transparency to achieve the objectives of market stability in China.

The next section discusses the peculiarities of Chinese capital market. Section 3 overviews relevant literature to develop hypotheses and section 4 delineates the research design. The results are presented in section 5 along with analysis. And section 6 concludes this study.

2 An overview of Chinese capital market

Chinese capital market is relatively younger (established in early 1990s) and it markedly differ from western developed markets in its composition and institutional setup. Owing to the political history of the country a large proportion of market capitalization is comprised of state owned enterprises (SOEs). SOEs in China are huge in size and they noticeably differ from non-state owned enterprises (NSOEs) in terms of governance structure, agency conflicts, bankruptcy risks, and the cost of capital. Prior to the initiation of non-tradable shares reforms in 2006 a majority of the stocks in SOEs and also in most NSOEs were non-tradable in the market (see Safdar and Yan 2016). The ownership of non-tradable shares could only be transferred through

private placement. SOEs enjoy preferential treatment from state institutions and are favored also in the debt market (see Chen *et al.* 2011; Liao *et al.* 2014; and Ran *et al.* 2015). Moreover, due to inexhaustible state resources, with resultant less dependence of SOEs on external equity market to raise funds, there are little incentives for management in SOEs to improve information environment with intention to secure cheaper financing.

Besides, Chinese capital market is much volatile owing to noise trading by unsophisticated individual investors who dominate trading activity in the market. And the perceived patronage by state for SOEs results into investors perceiving risks differently in SOEs than in NSOEs. Other characteristic features of Chinese capital market include extensive and arbitrary intervention by regulatory institutions, information opaqueness, higher ownership concentration, insider-trading, and inadequate protection of minority shareholders' interests. Also the restrictions on short selling in conjunction with heterogeneous beliefs of overconfident investors in China result into excessive speculation in the market (see Mei *et al*. 2009).

3 Review of literature and hypotheses development

The relationship between information quality and the cost of capital is investigated by various studies (see, e.g., Easley and O'Hara 2004; Francis *et al.* 2005; Cohen 2008; Core *et al.* 2008; Lambert *et al*. 2007; Mouselli *et al*. 2013; Gray *et al*. 2009; and Kim and Qi 2010) and there is growing empirical evidence on the significant role of information quality in a stock's valuation. More recently, a few studies focus on the potential channels through which information quality may affect the cost of capital of a firm. Lambert *et al*. (2007) argue that the quality of firm-specific accounting information affects a firm's cost of capital not only by reducing the *assessed variance* of its cash flows but also by reducing the *assessed covariance* of its cash flows with those of the market. In other words, better information quality reduces a

firm's cost of capital not only by reducing uncertainty of its cash flows but also by reducing its market risk. They maintain that these effects are non-diversifiable in markets not perfectly competitive.

Another potential channel for the effects of information quality on cost of capital is through stock liquidity. In the theoretical model of Diamond and Verrecchia (1991), greater disclosure by a firm to reduce information asymmetry improves its stock liquidity and thereby reduces its cost of capital. Their argument is that lowering the information asymmetry reduces the level of order imbalances for market makers in the future. Resultantly, market makers will get reduced compensation for lowered risk of their positions which they take in anticipation of providing liquidity in the future. Moreover, improved disclosure by a firm attracts demand for its stock from large investors. So, the lowered compensation for the reduced risk of positions taken by market makers and the greater demand by large investors will improve the stock liquidity and will eventually enhance firm value. A somewhat similar conclusion is reached by Baiman and Verrecchia (1996). Balakrishnan *et al.* (2014) find that firms increase their level of disclosure in case of adverse shock to their information environment. This positively affects their stock liquidity and, ultimately, their value. Lang, Lins, and Maffett (2012), using a global sample, provide empirical evidence that firm level transparency is associated with stock liquidity and conclude that stock liquidity is an important channel for association of higher transparency with lower cost of capital. In the theoretical model of Lambert and Verrecchia (2015), the state of illiquidity, which is endogenously determined and partially depends on the quality of information environment, plays a role in channeling the effects of information asymmetry to the cost of capital. They show that, in markets which are not perfectly liquid, greater information asymmetry reduces the stock liquidity which results into higher cost of capital. They further

argue that higher illiquidity (caused by information asymmetry) also reduces the benefits of information precision in reducing the cost of capital. So, based on the reasoning in these studies we develop the following hypothesis:

Hypothesis 1: *Better information quality reduces the cost of equity by improving stock liquidity in China.*

Another closely related strand of research suggests that the association between information quality and the cost of capital is mediated also by various forms of liquidity risks (see, Lang and Maffett 2011; Ng 2011; and Sadka 2011). These studies investigate the mediating role of three kinds of liquidity risks defined in Acharya and Pedersen (2005), i.e. i) the co-variation between stock returns and the market liquidity, $cov(r_i, l_m)$; ii) the co-variation between stock liquidity and the market liquidity, $cov(l_i, l_m)$; and iii) the co-variation between stock liquidity and market returns, $cov(l_i, r_m)$. The underlying rationale is that if a stock's liquidity or its returns strongly co-vary with those of the market then at times of adverse shocks to the market, when there usually is 'flight to quality', the given stock will be more illiquid and will experience more negative returns. However, the stocks with less uncertainty about their intrinsic value, i.e. stocks having more transparent information environment, will be affected less severely in periods of adverse shocks to the market. And the investors will be willing to pay more for stocks which are relatively stable in turbulent times (see, Acharya and Pedersen 2005; Lang and Maffett 2011; and Ng 2011). Acharya and Pedersen (2005) also note that the stocks suffering from greater illiquidity are also the ones having greater liquidity risks of the three kinds stated above. Pastor and Stambaugh (2003) provide evidence of overall market liquidity being relevant in asset pricing and they conclude that stocks with greater sensitivity to the unexpected changes in overall market liquidity face higher cost of capital. Ng (2011), using US sample, finds that better information

quality surrounding a stock plays a significant part in reducing the sensitivity of its returns to the unexpected changes in market liquidity and, thereby, reduces its required returns. Ng (2011) concludes that higher information quality is associated with lower cost of capital through reduced cov(r_i, l_m). Lang and Maffett (2011), using global sample up to year 2008, showed the greater transparency being associated with lower cost of capital through reduced cov(l_i, l_m) and cov(l_i, r_m). So we develop the following hypothesis.

Hypothesis 2: *Better information quality reduces the cost of equity by reducing liquidity risk in China.*

We focus only on cov(r_i, l_m) based on the intuition that the change in a stock's liquidity in response to the unexpected change in overall market liquidity will ultimately translate into stock's returns. Therefore, the covariance of a stock's returns with market liquidity is relatively broader and more relevant measure of overall liquidity risk.

Next, due to characteristic and perceptional differences between SOEs and NSOEs in China (see section 2 for details) it is worth investigating whether the proposed role of liquidity in the relationship between information quality and cost of equity is similar across the two subgroups. The subsample analysis would be intriguing particularly because of the lack of usual incentives for management in SOEs to enhance transparency with intention to secure cheaper financing, and also because the unsophisticated majority of individual traders in the market perceive risks in SOEs differently than in NSOEs. Moreover, Chen et al. (2011) caution that treating SOEs and NSOEs alike in China may result in erroneous conclusions. So the sub-sample analysis will enhance the robustness of the study by ensuring that our conclusions are not driven by a particular subset of firms.

4 Research design

Our initial sample comprises of all the non-financial firms having issued A-shares and are listed over Shanghai Stock Exchange or Shenzhen Stock Exchange during the period 2001-2014. A-shares are denominated in Chinese currency (Yuan) and, in our sample period, are allowed for investment by Chinese nationals only except for limited, but continuously growing, investment quotas granted to foreign institutional investors. A-shares constitute predominant part of market capitalization in China (more than 95% on average during our sample period). Though our initial sample period is 2001-2014, due to computational requirements of certain variables which in some cases require up to six prior yearly observations, our final analysis is limited to the period starting from January 2006 to December 2014. Moreover, the adoption of IFRS in China in the year 2006 and the initiation of tradable-shares reforms in the same year are other justifying factors for limiting our analysis to this period. All the needed data is obtained from RESSET Financial Database (www.resset.cn).

4.1 Measuring information quality

We define information quality as the degree of precision of available information relevant to investors' valuation of a stock (see Lambert, Leuz, and Verrecchia 2012). To measure information quality we resort to accounting based measures as we find the data of analysts' forecast in China being too sparse and available only for few recent years. The widely used and well established accounting based measures of information quality include discretionary accruals and accruals quality (see Dechow et al. 2010). Earnings associated with lower discretionary accruals and with better quality of accruals are deemed as of better quality and they convey more precise information to the investors (see, Jones 1991; and Francis et al. 2005). To measure discretionary accruals we use modified Jones (1991) model and estimate equation (1) for every

industry-year using the second level industry classification of China Securities Regulatory Commission (CSRC).

$$\frac{TA_{i,t}}{Assets_{i,t-1}} = k_1 \frac{1}{Assets_{i,t-1}} + k_2 \frac{\Delta \mathrm{Re}v_{i,t}}{Assets_{i,t-1}} + k_3 \frac{PPE_{i,t}}{Assets_{i,t-1}} + \varepsilon_{i,t} \qquad (1)$$

Where $TA_{i,t}$ represent total accruals of a firm i in year t calculated as the net income minus cash flows from operations. ΔRev is the change in revenue; PPE is the level of property plant and equipment; and $Assets$ represents total assets. To estimate equation (1) industry-years with less than ten observations are excluded. Normal accruals (NA) are calculated as follows.

$$NA_{i,t} = \hat{k}_1 \frac{1}{Assets_{i,t-1}} + k_2 \frac{(\Delta \mathrm{Re}v_{i,t} - \Delta AR_{i,t})}{Assets_{i,t-1}} + k_3 \frac{PPE_{i,t}}{Assets_{i,t-1}} \qquad (2)$$

Where ΔAR is the change in account receivables and $\hat{\kappa}_s$ are the estimated values of κ_s in equation (1). Abnormal accruals are calculated as total accruals minus normal accruals, i.e. $AA_{i,t} = (TA_{i,t}/Assets_{i,t-1}) - NA_{i,t}$. We use the negative of the absolute values of abnormal accruals, i.e. $-|AA_{i,t}|$, as the measure of *discretionary accruals*. Its higher values represent better reporting quality.

Next we measure accruals quality using modified Dechow and Dichev (2002) model. In this regard, following Francis et al. (2005), we estimate equation (3) for every industry-year using the second level industry classification of CSRC.

$$TCA_{i,t} = \phi_o + \phi_1 CFO_{i,t-1} + \phi_2 CFO_{i,t} + \phi_3 CFO_{i,t+1} + \phi_4 \Delta \mathrm{Re}v_{i,t} + \phi_5 PPE_{i,t} + v_{i,t} \qquad (3)$$

Where $TCA_{i,t}$ represents total current accruals of a firm i in year t calculated as the change in current assets minus change in current liabilities minus change in cash plus the change in short term debt. CFO is cash flows from operations obtained from cash flow statement. ΔRev is the change in revenue and PPE is the level of property plant & equipment. All variables are scaled to

average total assets. We drop industry-years with less than ten observations. *Accruals quality* for a given firm-year is the negative of the five-year (from *t*-4 to *t*) standard deviation of firm specific residuals obtained from equation (3). The higher values of *accruals quality* reflect better quality of accruals. It requires seven years of data (five residuals and one lag and one next period value of *CFO* in equation (3)) to calculate *accruals quality* for a given firm-year. Therefore, firms with less than seven years of available data are excluded from further analysis when *accruals quality* is used as measure of information quality.

4.2 The stock liquidity channel

To test whether stock liquidity mediates in the relationship between information quality and the cost of equity we perform mediation analysis and model monthly excess returns ($r_{i,t}$) as the function of information quality and a set of control variables as shown in equation (4). We expect better information quality to be associated with lower excess returns.

$$r_{i,t} = \beta_0 + \beta_1 Information\_Quality_{i,t} + \varphi_1 Controls_{i,t} + \varepsilon_{i,t} \qquad (4)$$

The expected mediation by stock liquidity in the relationship between information quality and the cost of equity implies that better information quality reduces stock illiquidity which, in turn, results into lower required returns. This mediation channel is modeled in equations (5) and (6).

$$Illiquidity_{i,t} = \beta_0 + \beta_1 Information\_Quality_{i,t} + \varphi_1 Controls_{i,t} + \varepsilon_{i,t} \qquad (5)$$

$$r_{i,t} = \beta_0 + \beta_1 illiquidity_{i,t} + \varphi_1 Controls_{i,t} + \varepsilon_{i,t} \qquad (6)$$

Where *illiquidity* is a reverse measure of stock liquidity and is calculated, following Amihud (2002), as the annual average of the daily ratio of absolute stock returns to trading volume (value of trades in millions of Yuan). If stock liquidity actually mediates between information quality

and the cost of equity, adding *illiquidity* as an addition explanatory variable in equation (4) should significantly mitigate the coefficient on information quality. It is because a proportion of the effects of information quality on the cost of equity should now be channeled through stock liquidity. By including *illiquidity* in equation (4) we obtain the following equation.

$$r_{i,t} = \beta_0 + \beta_1 Information\_Quality_{i,t} + \beta_2 illiquidity_{i,t} + \varphi_1 Controls_{i,t} + \varepsilon_{i,t} \qquad (7)$$

To test the mediation by stock liquidity in the relationship between information quality and the cost of equity we first estimate equations (4) & (7) and then employ Sobel (1982) test to test the significance of proposed mediation by *illiquidity* (i.e. whether the coefficient on information quality is significantly reduced when *illiquidity* is introduced as an explanatory variable). If the Sobel z-statistic suggests significant negative mediation by *illiquidity* we accept our first hypothesis. See table 3 for control variables used in mediation analysis and see appendix A for their definitions.

4.3 The liquidity risk channel

To measure the liquidity risk of a stock we follow Pastor and Stambaugh (2003). They defined liquidity risk as the sensitivity of a stock's returns to the unexpected changes in overall market liquidity. In particular, they constructed a market liquidity factor (*LIQ*) based on unexpected changes in market liquidity and added it to the existing factors in Fama and French (1993) three factor model as follows.

$$r_{i,t} = \alpha_{i,t} + \overset{M}{\beta}_{i,t} MKT_t + \overset{S}{\beta}_{i,t} SMB_t + \overset{H}{\beta}_{i,t} HML_t + \overset{L}{\beta}_{i,t} LIQ_t + \varepsilon_{i,t} \qquad (8)$$

Where $r_{i,t}$ is the monthly stock returns in excess of risk free return. *MKT, SMB,* and *HML* are Fama and French (1993) monthly return factors for market, size, and book to market ratio and are obtained from Resset Financial Database. *LIQ* is the liquidity factor representing the unexpected

changes in market liquidity. The firm-specific estimation of coefficient on *LIQ*, i.e. $\beta^{L}_{i,t}$, represents the liquidity risk of a firm. We expect that better information quality reduces $\beta^{L}_{i,t}$ and thereby reduces the required returns.

To measure *LIQ* we follow Pastor and Stambaugh (2003) and calculate it as follows. First we measured individual stock liquidity by estimating $\gamma_{i,t}$ in the following model for every stock in every month.

$$r^{e}_{i,d+1,t} = \theta_{i,t} + \phi_{i,t} r_{i,d,t} + \gamma_{i,t} sign(r^{e}_{i,d,t}) * v_{i,d,t} + \varepsilon_{i,d+1,t} \quad d=1, \ldots, D \text{ and } D >= 15 \qquad (\ )$$

where $r_{i,d,t}$ is the return on a stock *i* on day *d* in month *t*. $r^{e}_{i,d,t}$ is the return on a stock in excess of market return where market return is the tradable market value weighted return of the stock exchange where the given stock is listed. We used tradable market value weighted returns of the market considering that though non-tradable shares reforms were initiated in China in year 2006 the reformed stocks were not fully tradable until few years later (see Liao, Liu, and Wang (2014) for details). $v_{i,d,t}$ is the trading volume (value of trades). $sign(r^{e}_{i,d,t}) * v_{i,d,t}$ is the daily trading volume signed by stock returns in excess of market returns and it represents order flow. We require at least 15 daily observations to estimate equation (9) for a stock in a given month. $\gamma_{i,t}$ is a measure of liquidity for a given stock *i* in month *t*. It is based on the idea that order flow (i.e. volume signed by contemporary excess return) on a given day should result into return reversal on the next day if the stock is not perfectly liquid on the day of order flow. The more negative $\gamma_{i,t}$ is the more illiquid is the stock. Pastor and Stambaugh (2003) noted that $\gamma_{i,t}$ is an imprecise proxy for liquidity at individual stock level but its equal-weighted monthly average (γ_t) is a more precise proxy for overall market liquidity. We calculated market liquidity (γ_t) for every month in

our sample starting from January 2006 till December 2014. Next, we estimate the following time series regression to estimate the unexpected changes in market liquidity.

$$\Delta\gamma_t = a + b\Delta\gamma_{t-1} + c\left(\frac{m_{t-1}}{m_1}\right)\gamma_{t-1} + u_t \qquad (10)$$

Where $\Delta\gamma_t$ is the change in market liquidity and is calculated as follows.

$$\Delta\gamma_t = \left(\frac{m_t}{m_1}\right)\frac{1}{N_t}\sum_{i=1}^{N_t}(\gamma_{i,t} - \gamma_{i,t-1}) \qquad (11)$$

Where m_t is the sum of month-end tradable market value of the stocks included in a given month t and $m_1$is the sum of month-end tradable market value of included stocks in January 2006. The scaling by m_t/m_1 is done to construct a liquidity measure that reflects the cost of trading which commensurate to the value of 'stock market' at a given point (see, Pastor and Stambaugh 2003; and Ng 2011), which is January 2006 in our case. The unexpected change in market liquidity is the error term in equation (10) and, following Pastor and Stambaugh (2003), we scaled it by 100 to obtain market liquidity factor, i.e. $LIQ_t = u_t/100$.

Figure 1 presents monthly time series of scaled market liquidity (i.e. $(m_t/m_1)*\gamma_t$) representing the cost of trading one million in January 2006 'stock market' value. The presented market liquidity time series corroborates with the observed shocks to market liquidity of Shanghai Stock Exchange and Shenzhen Stock Exchange in the later half of year 2008. The phases of low liquidity in year 2012 and 2013 and the consistent rise in market liquidity in the latter half of 2014 is also observable in figure 1. Table 1 present descriptive statistics of and the coefficients of correlation among LIQ_t, MKT_t, SMB_t, and HML_t factor. Notably, the correlation between HML and MKT factors is significantly positive, suggesting that firms with high book to market ratio (i.e. value stocks) generate higher returns when market performs better. This is in contrast

to what is observed in US market (see Core et al. 2008) where growth stocks (i.e. stocks with lower book to market ratio) generate higher returns when market perform better.

[Insert figure 1 here]

[Insert table1here]

To test if the liquidity risk channelizes the effects of information quality to stock returns we follow Ng (2011) and set β^L in equation (8) as the function of information quality and various other firm and market related characteristics of a stock.

$$\beta_{i,t}^{L} = \psi_0 + \psi_1 Information\ \ Quality_{i,t-1} + \psi_2 Firm\ Characteristics_{i,t-1} + \psi_3 Market\ Characteristics_{i,t} + \varepsilon_{i,t} \quad (12)$$

Substituting the right hand side of equation (12) in equation (8) we obtain the following equation.

$$r_{i,t} = \beta_{i,t}^{0} + \beta_{i,t}^{M} MKT_t + \beta_{i,t}^{S} SMB_t + \beta_{i,t}^{H} HML_t + (\psi_0 + \psi_1 Information\_Quality_{i,t-1} + \psi_2 Firm\ Characteristics_{i,t-1} + \psi_3 Market\ Characteristics_{i,t}) LIQ_t + \varepsilon_{i,t} \quad (13)$$

Equation (13) incorporates time variation in betas (see Shanken 1990) but following Pastor and Stambaugh (2003) and Ng (2011) we restrict ψ_0, ψ_1, ψ_2, and ψ_3 to be fixed across all stocks and estimate them using pooled data to increase precision. In particular, we remove from excess stock returns ($r_{i,t}$) the time-varying exposure to MKT_t , SMB_t, and HML_t and construct a historical series of return residuals ($\varepsilon_{i,t}$) as follows.

$$\varepsilon_{i,t} = r_{i,t} - \hat{\beta}_{i,t}^{0} - \beta_{i,t}^{M} MKT_t - \hat{\beta}_{i,t}^{S} SMB_t - \beta_{i,t}^{H} HML_t \quad (14)$$

Where $\hat{\beta}_{i,t}^{0}, \beta_{i,t}^{M}, \hat{\beta}_{i,t}^{S}, and\ \beta_{i,t}^{H}$ are estimated by firm-specific regressions of excess stock returns ($r_{i,t}$) over MKT_t , SMB_t, and HML_t factors by the end of each year. In this regard, we considered prior 36 (at least 24) monthly observations of a stock up to the time of estimation but we retain coefficients only for the current year to avoid repetition. After removing stock returns' sensitivity to MKT_t , SMB_t, and HML_t factors in equation (13) and adding all variables interacting with LIQ_t

in equation (13) also as direct determinants of returns residuals (see, Ng 2011) we obtain the following equation.

$$\varepsilon_{i,t} = \beta_0 + (\psi_0 + \psi_1 Information\_Quality_{i,t-1} + \psi_2 Firm\ Characteristics_{i,t-1} + \psi_3 Market\ Characteristics_{i,t}) LIQ_t + \varphi_1 InfoQuality_{i,t-1} + \varphi_2 Firm\ Characteristics_{i,t-1} + \varphi_3 Market\ Characteristics_{i,t} + v_{i,t} \quad (15)$$

We estimate equation (15) for the whole panel of data and it is our final model to test the role of liquidity risk in channeling the effects of information quality to stock returns. The coefficient on the cross product of *Information_Quality* and *LIQ* is of major concern in this regard. It captures the role of information quality in reducing the sensitivity of stock returns to unexpected changes in market liquidity and we expect it to be negative. The firm level variables controlled in estimation of equation (15) are mostly those controlled by Ng (2011). However, we also control for the proportion of state owned shares given the pervasiveness of state ownership in China. Appendix A contains detail definitions of firm and market characteristics controlled in estimation of equation (15).

5 Results and analysis

5.1 Descriptive statistics and correlation analysis

Panel A in table 2 presents summary statistics for variables used in the analysis. The mean value of *accruals quality* (-0.126) is much lower than its median (-0.078) and it has standard deviation of 0.224. This somewhat positively skewed distribution of *accruals quality* is plausible as there potentially are some firms with very poor information quality. Further, as mentioned earlier, the calculation of *accruals quality* requires at least seven yearly observations which effectively removes younger firms (which are expected to lie on the lower end of *accruals quality* distribution) from our analysis. The distribution of *discretionary accruals* is also positively skewed and has mean and median values of -0.076 and -0.047 respectively. The

frequency of *discretionary accruals* is greater than that of *accruals quality* as its calculation does not require prior years' data.

The mean value of *illiquidity* is greater than its median value and the relatively large values at its right tail suggest that some firms are suffering from severe illiquidity. The mean of monthly *excess returns* is 0.023 with a standard deviation of 0.19. The average state shares percentage in our sample is 13.98 and the non-tabulated statistics show that about 27 percent of the observations in our sample involve firms whose 25 or greater percentage of the outstanding shares are held by the state. In 12.2 percent of the observations firms have reported loss. And the mean (0.583) and median (0.54) values of *leverage* depicts the higher leverage of Chinese firms.

[Insert table 2 here]

Panel B, in table 2, presents coefficients of correlation among variables. Expectedly, the correlation coefficient between *accruals quality* and *discretionary accruals* is significantly positive and suggests the congruency in our proxies of information quality. Further, in accordance with our reasoning, *illiquidity* and *excess returns* are negatively correlated with *accruals quality* and *discretionary accruals*, suggesting that better information quality is associated with better stock liquidity and lower cost of capital. However, the coefficient of correlation between *illiquidity* and *excess returns* is negative. It suggests, contrary to our expectations, that higher liquidity is associated with higher excess returns. Both *accruals quality* and *discretionary accruals* are negatively correlated with *return volatility*, suggesting that better information quality is associated with more stable returns. *Accruals quality* and *discretionary accruals* are also negatively correlated with *Beta* and *Loss*. And the higher *illiquidity* is correlated with more volatile returns. Interestingly, higher percentage of state ownership is

correlated with better information quality but lower stock liquidity. It hints at the peculiarity of state owned enterprises in China which are more capital intense, more leveraged, bigger in size, and have higher book-to-market ratios. Moreover, their returns are higher but more volatile.

5.2 Information quality and the stock liquidity

Table 3 presents results from mediation analysis performed to test our first hypothesis. Specifically, the aim is to test the mediation by stock liquidity in the relationship between information quality and the cost of capital in China. Columns (1) and (2) present results where *accruals quality* is employed to proxy for information quality and columns (3) and (4) present results where *discretionary accruals* are used instead. The coefficient on information quality is negative (significant at 0.01 at least) in all four columns, providing empirical support for the role of better information quality in reducing cost of equity in China. This is in line with existing theory and our expectations. The *illiquidity* is positively associated with excess returns as suggested by significantly positive coefficients of *illiquidity* in columns (2) and (4). This too is in accordance with our expectations and leads us to infer that investors in more illiquid stocks require greater expected returns. These results show that both the information quality and stock liquidity have significant role in shaping the cost of equity in China.

Next, to test if stock liquidity channelizes the effects of information quality to cost of equity, we see whether or not including *illiquidity* as an additional explanatory variable significantly mitigates the coefficient on information quality. Moving from column (1) to column (2), where *illiquidity* is added as an explanatory variable, the coefficient on information quality remains almost same (up to four decimal fractions) but its t statistic declines slightly, from -2.91 to -2.90. The Sobel test statistic for the change in coefficient on information quality (-1.5045) is statistically insignificant (has p-value of 0.1324). The change in the coefficient of information

quality is even less material when moving from column (3) to column (4), as suggested by relatively lower Sobel test statistic and higher p-value.

[Insert table 3 here]

The results from non-tabulated regressions of *illiquidity* over information quality and other control variables (see equation 5) suggest insignificant association between information quality and illiquidity. Particularly, the t statistics for coefficient on *accruals quality* is -1.70 and that for *discretionary accruals* is -1.49, where both of these are used as alternate measures of information quality. This shows a weaker (to the point of insignificance) relationship between information quality and *illiquidity* and suggest that the quality of accounting information is not significant in shaping stock liquidity in Chinese stock market. This in conjunction with insignificant Sobel test statistics discussed in the preceding paragraph provides evidence against our first hypothesis. So we infer that though the stock liquidity and information quality have significant independent effects over required returns the effects of information quality for required returns are not mediated by stock liquidity in China. This is contrary to the existing literature which focuses mainly on US capital market. So we do not accept our first hypothesis that better information quality reduces the cost of equity by improving stock liquidity in China.

Accounting information quality may not be effective in shaping stock liquidity in China due to following reasons. In Chinese capital market institutional investors' holdings constitute relatively small fraction of market capitalization and most of the trading activity in the market is carried by unsophisticated individual investors who mainly trade on rumors and hunches rather than relying on financial statements. The individual investors' trading behavior in China can, in part, be ascribed to the overall low corporate disclosure (potentially because of high ownership

concentration) and the lower frequency and precision of analyst forecasts which leave individual investors informatively disadvantaged. Moreover, the relationship between information quality and illiquidity, as suggested in theory, should hold if investors were rational. However, if irrational speculation by informatively disadvantaged individuals is widespread (as is the case in China) the proposed relationship may break down. Mei et al. (2009) provide evidence for a speculative component in asset prices in Chinese capital market. So we come to the opinion that although accounting information quality in China is somewhat incorporated in required returns (mainly due to the role of institutional investors in price discovery), the same is not true for liquidity due to speculative trading by individual unsophisticated investors. An alternative explanation can be that in markets with overall high information opacity and less reliability of available accounting information, as is the general perception about China, the conventional measures of firm level transparency may not produce familiar results.

The coefficients on control variables in table 3 are plausible and consistent across the alternate measures of information quality. *Prior returns*, *cash ratio, Assets,* and *capital intensity,* are negatively associated with current *excess returns*. Greater *return volatility* and *leverage*, representing higher risk, are associated with higher returns. Higher *book-to-market* ratio, representing poor valuation of a firm's assets by the market, is associated with higher stock returns. And considering that firms with higher state ownership tend to have greater market capitalization and higher return volatility (see correlation coefficients in table 2 panel B) the positive coefficient on c*apitalization* is somewhat tenable. *Loss* is negatively associated with contemporary stock returns and greater *State Shares* percentage is associated with higher stock returns.

[Insert table 4 here]

Next, to ensure that our results are not driven by a particular subset of firms we performed separate analysis for SOEs and NSOEs. The subsample results are reported in table 4. The Sobel test statistics are insignificant in both subgroups and for both measures of information quality. It supports our full sample results and, hence, our earlier inferences remain the same.

5.3 Information quality and the liquidity risk

To test whether liquidity risk mediates in the relationship between information quality and the cost of equity we estimated equation (15) and the results are reported in table 5. The dependent variable in equation (15) is return residuals (ε_{it}) which is obtained after removing returns' time varying sensitivity to Fama-French three factors (see equation 14). *LIQ* is monthly liquidity factor representing the unexpected changes in overall market liquidity. Columns (1) to (4) contain results where *accruals quality* is used and columns (5) to (8) contain results where *discretionary accruals* are used to proxy information quality. In column (1), where all the determinants of β^L are not yet included, the coefficient on *LIQ* is significantly positive (have t statistics of 4.55). It suggests that, even after controlling for time varying sensitivity of stock returns to Fama-French three factors, the higher unexpected change in overall market liquidity is associated with greater required returns in China. This is in line with our expectations. The coefficient on *LIQ* in column (5) is also significantly positive.

The coefficients on variables interacting with *LIQ* represent the impact of those variables on β^L, i.e. the liquidity risk. The coefficient on the interaction of *Information Quality* and *LIQ* (i.e. *Information Quality* □ *LIQ*) is of main concern to us as it captures the proposed effects of information quality on β^L. The coefficient on *Information Quality* □ *LIQ* in column (2) is 88.99. Though it seems unusually large (because the values assumed by *LIQ* are extremely small), the corresponding t value is very small (0.16) and highly insignificant. It suggests that information

quality is insignificant in reducing a firm's beta over liquidity factor (β^L). The coefficient on *Information Quality* *LIQ* is also insignificant in column (6) where we used *discretionary accruals* as measure of information quality. The results from subsamples of SOEs and NSOEs also report insignificant coefficients on *Information Quality* *LIQ*. It leads us to infer that information quality has no impact on liquidity risk in China. So we do not accept our second hypothesis that better information quality reduces the cost of equity by reducing liquidity risk in China. This contrary to existing literature which suggests a significant role for better information quality in reducing the liquidity risk of a firm (see Ng 2011).

Our results suggest that liquidity risk is significant in shaping required returns in China and though some variables (discussed in forthcoming paragraph) significantly impact the liquidity risk of a firm, the information quality is not among those variables. The inefficacy of information quality to reduce liquidity risk in China can potentially be attributed to individual investors' "disposition" to sell winners (those with better information quality) and keep losers (see Shefrin and Statman 1985) in times of adverse shocks to market liquidity. As market trading in China is driven mostly by individual investors, selling winners will trigger a fall in their prices too and this "disposition effect" may render the initial difference in the performance (based on difference in information quality) of two groups imperceptible. So, in a market dominated by individual unsophisticated investors, the efficacy of information quality in reducing liquidity risk may not be realizable. Moreover, if we consider the often made assertion that the stocks in China are over-valued then it is likely that the stocks with better transparency are more over-valued than the stock with less information transparency. So, in case there is an unexpected negative shock to the market liquidity, the stocks which are greatly overvalued are likely to be affected more

severely. This will render our hypothesized relationship between information quality and the liquidity risk untenable.

[Insert table 5 here]

Among other variables interacting with *LIQ*, t*urnover* has significantly positive coefficient suggesting that higher turnover is associated with higher liquidity risk. It is plausible given that the stocks which are most actively traded are likely to be the ones more severely affected by the unexpected shocks to market liquidity. Firms with higher *prior returns* have lesser liquidity risk, suggesting that recent better performance is likely to shield against unexpected shocks in market liquidity. Firms having higher *book-to-market* ratio have lesser liquidity risk, possibly because stocks having greater book value against a dollar of market value will be of lesser alarm to investors in case of unexpected shocks to market.

To ensure that our results are not driven by extreme values in the data we re-performed our analysis after winsorizing all variables at 1st and 99th percentiles. The non-tabulated results are in consonance with our drawn inferences.

6 Conclusion

This study investigates the role of stock liquidity and liquidity risk in the relationship between information quality and cost of equity in China. The aim is to better understand various channels through which information quality may affect the cost of capital. Based on existing literature we hypothesized that better information quality reduces a firm's cost of equity by reducing its stock illiquidity and liquidity risk. To test the mediatory role of stock liquidity we performed mediation analysis. And to test the mediatory role of liquidity risk we examine if better information quality reduces a firm's beta over liquidity factor in an asset pricing model also having Fama-French three factors. Our results suggest that neither stock liquidity nor

liquidity risk mediates in the relationship between information quality and the cost of equity in China. The results are consistent also in subsample analyses of SOEs and NSOEs.

The peculiar market composition (i.e. a majority of informatively disadvantaged individual investors) and investors' trading behavior (i.e. excessive speculation by so-called unsophisticated investors) are among the potential reasons for inefficacy of information quality to reduce stock illiquidity and liquidity risk in China. Our findings underscore that the effects of information quality for liquidity may differ across markets depending on the attributes of the consumers of information quality. Therefore, understanding market composition and investors' information consumption behavior across markets can help in better understanding the relationship between information quality and the cost of capital. Further, the policy and regulatory initiatives intended to boost firm level transparency may not achieve desired objectives until investors' trading behavior and market composition is aptly considered. Lastly, we acknowledge that our provided explanations for the reported lack of relationship between information quality and liquidity in China are, in most part, based on intuition rather than solid empirical evidence. So we emphasize the need for proper investigation of the role of investors' attributes in the relationship between information quality and liquidity.

References

Acharya, V., and L. Pedersen, 2005, Asset pricing with liquidity risk, *Journal of Financial Economics* 77, pp. 375–410.

Akins, B., J. Ng, and R. Verdi, 2012, Investor competition over information and the pricing of information asymmetry, *The Accounting Review* 87(1), pp. 33-58.

Amihud, Y., 2002, Illiquidity and stock returns: cross-section and time-series effects, *Journal of Financial Markets* 5, pp. 31–56.

Armstrong, C., J. Core, D. Taylor, and R. Verrecchia, 2011, When does information asymmetry affect the cost of capital?, *Journal of Accounting research* 49(1), pp. 1-40.

Baiman, S., and R. Verrecchia, 1996, The relation among capital markets, financial disclosure, production efficiency, and insider trading, *Journal of Accounting research* 31(1), pp.1-22.

Balakrishnan, K., M. Billings, B. Kelley, and A. Ljungqvist, 2014, Shaping liquidity: on the causal effects of voluntary disclosure, *The Journal of Finance* 69(5), pp. 2237-2278.

Bhattacharya, N., F. Ecker, P. Olsson, and K. Schipper, 2012, Direct and mediated associations among earnings quality, information asymmetry and the cost of capital, *The Accounting Review* 87 (2), pp. 449-482.

Chen, H., J. Z. Chen, J. L. Lobo, and Y. Wang, 2011, Effects of audit quality on earnings management and cost of equity capital: evidence from China, *Contemporary Accounting Research* 28(3), pp. 892-925.

Cohen, D. A., 2008, Does Information Risk Really Matter? An Analysis of the Determinants and Economic Consequences of Financial Reporting Quality, *Asia-Pacific Journal of Accounting & Economics* 15, pp. 69–90.

Core, J. E., W. R. Guay, and R. Verdi, 2008, Is accruals quality a priced risk factor?, *Journal of Accounting and Economics* 46, pp. 2-22.

Dechow, P. M., and I. D. Dichev, 2002, The quality of accruals and earnings: the role of accrual estimation errors, *The Accounting Review* 77, pp. 35-59.

Dechow, P., W. Ge, and C. Schrand, 2010, Understanding earnings quality: A review of the proxies, their determinants and their consequences, *Journal of Accounting and Economics 50*(2), pp. 344-401.

Diamond, D., and R. Verrecchia, 1991, Disclosure, liquidity, and the cost of capital, *The Journal of Finance* 46(4), pp. 1325-1359.

Easley, D., and M. O'hara, 2004, Infornation and the Cost of Capital, *The Journal of Finance* 59(4), pp. 1553-1583.

Fama, E., and K. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, pp. 3-56.

Francis, J., R. LaFond, P. Olsson, and K. Schipper, 2005, The market pricing of accruals quality, *Journal of Accounting and Economics* 39, pp. 295–327.

Gray, P., P.S. Koh, and Y. H. Tong, 2009, Accruals Quality, Information Risk and Cost of Capital: Evidence from Australia, *Journal of Business Finance & Accounting* 26(1), pp. 51-72.

Hughes, J. S., J. Liu, and J. Liu, 2007, Information asymmetry, diversification, and cost of capital, *The Accounting Review* 82(3), pp. 705–729.

Jones, J. J., 1991, Earnings Management During Import Relief Investigations, *Journal of Accounting research* 29(2) , pp.193-228.

Kim, D., and Y. Qi, 2010, Accruals quality, stock returns, and macroeconomic conditions, *The Accounting Review* 85, pp. 937–978.

Lambert, R., and R. Verrecchia, 2015, Information, illiquidity, and cost of capital, *Contemporary Accounting Research* 32(2), pp. 438–454.

Lambert, R., C. Leuz, and R. Verrecchia, 2012, Information asymmetry, information precision, and the cost of capital, *Review of Finance* 16(1), pp. 1-29.

Lambert, R., C. Leuz, and R. Verrecchia, 2007, Accounting information, disclosure and the cost of capital, *Journal of Accounting research* 45, pp. 385–420.

Lang, M., and M. Maffett, 2011, Transparency and liquidity uncertainty in crisis periods, *Journal of Accounting and Economics* 52, pp. 101–125.

Lang, M., K. Lins, and M. Maffett, 2012, Transparency, liquidity, and valuation: international evidence on when transparency matters most, *Journal of Accounting research* 50(3), pp. 729-774.

Liao, L., B. Liu, and H. Wang, 2014, China's secondary privatization: Perspectives from the Split-Share Structure Reform, *Journal of Financial Economics* 113, pp. 500–518.

Mouselli, S., A. Jaafar, and J. Goddard, 2013, Accruals quality, stock returns and asset pricing: Evidence from the UK, *International Review of Financial Analysis* 30, pp. 203–213.

Mei, J., J. Scheinkman, and W. Xiong, 2005, Speculative trading and stock prices: Evidence from Chinese AB share premia (No. w11362), National Bureau of Economic Research.

Ng, J. 2011, The effect of information quality on liquidity risk, *Journal of Accounting and Economics* 52, pp. 126–143.

Pastor, L., and R. F. Stambaugh, 2003, Liquidity risk and expected stock returns, *The Journal of Political Economy* 111(3), pp. 642-685.

Ran, G., Q. Fang, S. Luo, and K. Chan, 2015, Supervisory board characteristics and accounting information quality: Evidence from China, *International Review of Economics and Finance* 37(1), pp. 18-32.

Sadka, R., 2011, Liquidity risk and accounting information, *Journal of Accounting and Economics* 52, pp. 144–152.

Safdar, R. and C. Yan, 2016, Information risk, stock returns, and the cost of capital in China, *China Finance Review International 6*(1), pp.77-95.

Shefrin, H. and M. Statman, 1985, The disposition to sell winners too early and ride losers too long: Theory and evidence, *The Journal of finance 40*(3), pp.777-790.

Shanken, J., 1990, Intertemporal asset pricing: an emperical investigation, *Journal of Econometrics* 45, pp. 99-120.

Sobel, M. E., 1982, Asymptotic confidence intervals for indirect effects in structural equation models, *Sociological Methodology* 13, pp. 290-313.

Appendix A. Variables' definitions

Variable Name	Definition
Accruals quality	The negative of the five-year standard deviation of residuals obtained using modified Dechow and Dichev (2002) model. It higher values represent better information quality. See section 4.1 for details.
Assets	The natural log of total assets at year end.
Beta	The CAPM beta of a stock for a given month and is calculated using stock returns from immediately preceding 36 (at least 24) months.
Beta_LIQ	It is the historic liquidity beta of a stock and is the coefficient on liquidity factor in firm specific asset-pricing regressions of excess stock returns to market, size, book-to-market, and liquidity factors where historical data up to the current year is used in its calculation. See section 4.3 for details.
Book-to-Market	The book value of equity of a firm at the end of previous year divided by firm's market capitalization at the end of previous month.
Capital intensity	The ratio of fixed assets subject to depreciation divided by total assets.
Capitalization	The natural log of total market capitalization at the end of previous month.
Cash ratio	The cash and equivalents divided by current liabilities.
Discretionary accruals	The negative of the absolute residuals obtained using modified Jones (1991) model. Its higher values represent smaller discretionary accruals and, hence, better information quality. See section 4.1 for details.
ε_{it}	The return residuals obtained after removing return's sensitivity to Fama and French (1993) market, size, and book-to-market factors. See section 4.3 for details.
Excess returns	The monthly stock returns in excess of risk free rate.
Illiquidity	The Amihud (2002) measure of stock illiquidity calculated as the annual average of the daily ratio of absolute stock returns to trading volume (value of trades in millions of Yuans).
Leverage	Total liabilities divided by total assets.
LIQ	The liquidity factor calculated following Pastor and Stambaugh (2003). It represents unexpected changes in market liquidity. See section 4.3 for details.
Liquidity	A stock's liquidity in a given month calculated following Pastor and Stambaugh (2003). See section 4.3 for details.
Loss	A dummy variable assuming value 1 if firm has reported loss in previous year and 0 otherwise.
NSOE	A dummy variable assuming value 1 if less than 25 percent of a firm's total outstanding shares are owned by the state and 0 otherwise.

Operating cycle	The sum of inventory turnover days and accounts receivables turnover days.
Prior return	The previous month's stock return in excess of risk-free rate.
Return volatility	The standard deviation of the daily stock returns during the current year.
Sales growth	The change in revenue during the current year divided by previous year's revenue.
SOE	A dummy variable assuming value 1 if 25 percent (or greater) of a firm's total outstanding shares are owned by the state and 0 otherwise.
State shares	The percentage of shares held by the state or its agencies.
Turnover	The ratio of monthly trading volume to number of shares outstanding.

Table 1. Factor statistics and correlations

Panel A presents descriptive statistics for monthly liquidity factor (*LIQ*) of Pastor and Stambaugh (2003) and Fama and French (1993) three factors namely *MKT*, *SMB*, and *HML* (representing market, size, and book-to-market factors respectively) for 108 months starting from January 2006 to December 2014. Statistics for *LIQ* are calculated after multiplying *LIQ* with 10000. Panel B presents pairwise correlation coefficients of the four factors where *** and ** represent significance level at 0.001 and 0.01 respectively.

Panel A- Summary Statistics

Variables	Mean	Std. dev.	Q1	Median	Q3
LIQ	-0.0000	0.0472	-0.0128	-0.0001	0.0134
MKT	0.0173	0.0956	-0.0455	0.0231	0.0759
SMB	0.0113	0.0452	-0.0111	0.0145	0.0396
HML	0.0005	0.0315	-0.0171	-0.0008	0.0150

Panel B- Correlations

	LIQ	*MKT*	*SMB*
MKT	-0.0268		
SMB	-0.0748	0.0501	
HML	0.0266	0.2650**	-0.3174***

Table 2. Descriptive statistics and correlation analysis

Panel A presents descriptive statistics and panel B presents Spearman's rank correlation matrix of variables used in analyses. See Appendix A for variables' definitions.

Panel A- Descriptive statistics

	Mean	St. dev.	Min	1st Per.	Median	99th Per.	Max	N
Accruals quality	-0.126	0.224	-6.017	-1.036	-0.078	-0.016	-0.005	113763
Discretionary accruals	-0.076	0.137	-5.180	-0.470	-0.047	-0.001	0.000	136640
Illiquidity	0.002	0.108	0.000	0.000	0.001	0.010	36.163	113763
Excess returns	0.023	0.190	-0.754	-0.335	0.011	0.499	22.052	113763
Return volatility	0.032	0.029	0.000	0.016	0.030	0.054	2.559	113763
Turnover	33.47	29.31	0.001	2.256	24.457	137.81	376.15	113763
Cash ratio	0.686	1.736	0.000	0.009	0.375	5.700	102.18	113763
Book-to-market	0.408	0.365	-9.810	-0.177	0.339	1.534	6.028	113763
Capital intensity	0.262	0.184	0.000	0.002	0.229	0.758	0.960	113763
Beta	1.084	0.352	-2.702	0.341	1.067	1.966	14.557	113763
Capitalization	22.03	1.02	18.15	19.97	21.92	24.91	26.93	113763
Assets(Millions ¥)	9101	30739	3.1	172.2	2794.2	107567	784109	113763
Leverage	0.583	1.151	0.007	0.083	0.540	1.616	100.595	113763
Loss	0.122	0.327	0.00	0.00	0.00	1.00	1.00	113763
State shares	13.98	20.78	-0.62	0.00	0.00	70.48	97.12	113763

Panel B- Spearman's rank correlation matrix (n=108613)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1)	*Accruals quality*	1.00													
(2)	*Discretionary acc*	0.18	1.00												
(3)	*Illiquidity*	-0.12	-0.04	1.00											
(4)	*Excess returns*	-0.02	-0.02	-0.04	1.00										
(5)	*Return volatility*	-0.13	-0.10	0.15	0.11	1.00									
(6)	*Turnover*	-0.07	-0.06	-0.18	0.27	0.40	1.00								
(7)	*Cash ratio*	0.15	0.05	-0.18	0.00 ns	-0.10	-0.03	1.00							
(8)	*Book-to-market*	0.17	0.18	0.04	0.09	-0.21	-0.15	0.00 ns	1.00						
(9)	*Capital intensity*	0.12	0.16	0.05	0.00 ns	0.00 ns	0.00 ns	-0.15	0.12	1.00					
(10)	*Beta*	-0.12	-0.04	0.03	0.02	0.17	0.10	-0.12	0.06	0.00 ns	1.00				
(11)	*Capitalization*	0.14	0.06	-0.74	0.00 ns	-0.17	-0.19	0.18	-0.08	-0.05	-0.05	1.00			
(12)	*Assets*	0.16	0.09	-0.55	-0.05	-0.25	-0.28	-0.03	0.40	0.00 ns	0.01	0.74	1.00		
(13)	*Leverage*	-0.11	-0.09	0.07	-0.01	0.02	-0.02	-0.63	-0.01	0.01 ns	0.10	-0.05	0.28	1.00	
(14)	*Loss*	-0.10	-0.13	0.20	-0.02	0.06	0.03	-0.23	-0.03	0.13	0.09	-0.22	-0.18	0.20	1.00
(15)	*State shares*	0.01	0.04	0.10	0.06	0.33	-0.02	-0.08	0.04	0.12	0.03	0.02	0.06	0.07	0.00 ns

For Panel B, The numbers in column heads represent the variables shown next to the corresponding numbers in the first column.
All coefficients are significant at 0.05 or lesser except those superscripted "ns".

Table 3. The stock liquidity channel.

This table presents results from mediation analysis performed to test the mediation by stock liquidity in the relationship between information quality and excess returns. The estimations are for the period from January 2006 to December 2013. Sobel (1982) test is used to test if *illiquidity* mediates the relationship between information quality and the excess returns. A*ccruals quality,* and *discretionary accruals* are used as alternate proxies of information quality. See appendix A for definitions of variables. *t*-statistics are reported in parentheses and are calculated using robust standard errors clustered at firm level. Year dummies are included to control time specific effects but their coefficients are not tabulated for parsimony. ***, **, and * present two-tailed significance at 0.001, 0.01, and 0.05 respectively. Sobel(1982) test statistics and corresponding p-values are presented with bold face.

	Accruals quality		*Discretionary accruals*	
Dependent: *Excess return*	(1)	(2)	(3)	(4)
Illiquidity		0.0179		0.4535
		(3.26)***		(2.27)*
Information quality	-0.0172	-0.0172	-0.0322	-0.0318
	(-2.91)**	(-2.90)**	(-3.21)***	(-3.19)***
Sobel test:				
test statistic [p-value]	**-1.5045 [0.1324]**		**-1.2433 [0.2138]**	
Prior return	-0.1628	-0.1629	-0.1143	-0.1149
	(-13.06)***	(-13.06)***	(-9.38)***	(-9.36)***
Cash ratio	-0.0018	-0.0018	-0.0012	-0.0012
	(-2.16)*	(-2.16)*	(-2.79)**	(-2.8)**
Return volatility	1.7045	1.7047	1.2922	1.3102
	(13.14)***	(13.14)***	(4.82)***	(4.88)***
Turnover	0.0014	0.0014	0.0015	0.0015
	(43.74)***	(43.78)***	(31.6)***	(31.58)***
Book-to-market	0.1176	0.1177	0.1545	0.1550
	(5.77)***	(5.78)***	(6.08)***	(6.1)***
Loss	-0.0101	-0.0101	-0.0184	-0.0185
	(-4.64)***	(-4.64)***	(-5.2)***	(-5.25)***
State shares	0.0002	0.0002	0.0002	0.0002
	(5.53)***	(5.54)***	(6.29)***	(6.3)***
Capital intensity	-0.0173	-0.0172	-0.0233	-0.0233

	(-3.61)***	(-3.61)***	(-4.49)***	(-4.49)***
Beta	0.0157	0.0157	0.0322	0.0321
	(1.88)	(1.88)	(2.00)*	(2.00)*
Assets	-0.0412	-0.0413	-0.0573	-0.0573
	(-7.25)***	(-7.26)***	(-7.15)***	(-7.16)***
Capitalization	0.0558	0.0559	0.0716	0.0721
	(9.77)***	(9.77)***	(8.98)***	(9.05)***
Leverage	0.0081	0.0081	0.0400	0.0399
	(2.14)*	(2.14)*	(3.07)**	(3.09)**
intercept	-0.4061	-0.4069	-0.4440	-0.4556
	(-16.52)***	(-16.54)***	(-12.5)***	(-12.83)***
Year dummies	included	included	included	included
N	113,763	113,763	136,640	136,640
R-squared	0.2221	0.2222	0.1815	0.1824
F-statistics	760.08	724.34	760.98	760.64
#clusters	1635	1635	2234	2234

Table 4 Subsample analysis of stock liquidity channel

This table presents results from subsample mediation analysis performed to test the mediation by stock liquidity in the relationship between information quality and excess returns. The estimations are for the period from January 2006 to December 2013. A*ccruals quality,* and *discretionary accruals* are used as alternate proxies of information quality. Sobel (1982) test is employed to test the significance of expected mediation by *illiquidity* between information quality and excess stock returns. See appendix A for definitions of variables. *T-statistics* are reported in parentheses and are calculated using robust standard errors clustered at firm level. Year dummies are included to control time specific effects but their coefficients are not tabulated for parsimony. ***, **, and * present two-tailed significance at 0.001, 0.01, and 0.05 respectively. Sobel test statistics and corresponding p-values are presented with bold face. NSOE and SOE denote subsamples of non-state-owned and state-owned enterprises respectively.

	Accruals quality				*Discretionary accruals*			
	NSOE		SOE		NSOE		SOE	
Dependent: *Excess return*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Illiquidity		0.0154		0.4738		0.3630		0.7887
		(4.04)***		(1.89)		(1.75)		(4.57)***
Information quality	-0.0144	-0.0144	-0.0504	-0.0487	-0.0291	-0.0288	-0.0077	-0.0050
	(-2.61)**	(-2.6)**	(-2.42)**	(-2.39)**	(-2.97)**	(-2.96)**	(-0.32)	(-0.21)
Sobel test:								
Test statistic [P-value]	**-1.46 [0.144]**		**-0.85 [0.393]**		**-0.97 [0.333]**		**-1.75 [0.08]**	
Prior return	-0.1441	-0.1442	-0.2083	-0.2088	-0.1205	-0.1209	-0.1052	-0.1066
	(-17.53)***	(-17.53)***	(-5.86)***	(-5.88)***	(-7.06)***	(-7.06)***	(-8.22)***	(-8.25)***
Cash ratio	-0.0015	-0.0015	-0.0049	-0.0049	-0.0010	-0.0010	0.0010	0.0011
	(-1.93)	(-1.93)	(-2.94)**	(-2.95)**	(-2.91)**	(-2.91)**	(0.49)	(0.5)
Return volatility	1.4188	1.4193	2.1221	2.1149	1.0562	1.0828	1.9897	1.9391
	(4.57)***	(4.58)***	(7.12)***	(7.08)***	(4.81)***	(4.94)***	(2.59)**	(2.55)**
Turnover	0.0014	0.0014	0.0018	0.0018	0.0014	0.0014	0.0018	0.0018
	(41.48)***	(41.53)***	(19.24)***	(19.3)***	(26.67)***	(26.69)***	(17.7)***	(18.01)***
Book-to-market	0.1113	0.1114	0.1346	0.1362	0.1446	0.1448	0.2216	0.2248
	(4.63)***	(4.64)***	(3.97)***	(3.98)***	(5.14)***	(5.15)***	(4.21)***	(4.24)***
Loss	-0.0100	-0.0100	-0.0121	-0.0119	-0.0174	-0.0176	-0.0366	-0.0367
	(-3.95)***	(-3.95)***	(-2.55)**	(-2.52)**	(-4.88)***	(-4.94)***	(-3.83)***	(-3.82)***
State shares	-0.0001	-0.0001	0.0005	0.0005	-0.0001	-0.0001	0.0006	0.0006
	(-0.5)	(-0.49)	(4.26)***	(4.23)***	(-0.56)	(-0.58)	(6.34)***	(6.3)***
Capital intensity	-0.0182	-0.0182	-0.0100	-0.0108	-0.0249	-0.0247	-0.0215	-0.0228
	(-3.16)**	(-3.15)**	(-1.28)	(-1.37)	(-3.84)***	(-3.82)***	(-3.14)**	(-3.36)***
Beta	0.0111	0.0111	0.0474	0.0473	0.0360	0.0360	0.0136	0.0135
	(1.13)	(1.13)	(1.7)	(1.7)	(1.87)	(1.87)	(1.82)	(1.81)
Assets	-0.0393	-0.0394	-0.0473	-0.0477	-0.0545	-0.0544	-0.0874	-0.0886
	(-6.21)***	(-6.22)***	(-4.65)***	(-4.65)***	(-6.2)***	(-6.19)***	(-4.68)***	(-4.71)***
Capitalization	0.0543	0.0543	0.0635	0.0646	0.0694	0.0696	0.1003	0.1025

	(8.85)***	(8.85)***	(5.95)***	(5.98)***	(8.19)***	(8.22)***	(5.44)***	(5.5)***
Leverage	0.0067	0.0067	0.0122	0.0123	0.0328	0.0326	0.1689	0.1709
	(1.56)	(1.56)	(2.37)*	(2.36)*	(3.11)**	(3.12)**	(3.46)***	(3.48)***
intercept	-0.3881	-0.3889	-0.5253	-0.5392	-0.4375	-0.4465	-0.5470	-0.5694
	(-13.62)***	(-13.63)***	(-8.0)***	(-8.17)***	(-12.1)***	(-12.4)***	(-8.36)***	(-8.54)***
Year dummies	Included	Included	included	included	included	included	included	included
N	83306	83306	30457	30457	104868	104868	31772	31772
R-squared	0.1958	0.1959	0.2795	0.2803	0.1744	0.175	0.213	0.2153
F-statistics	493.6	471.22	294.65	282.43	517.14	503.93	284.73	272.92
# clusters	1587	1587	873	873	2161	2161	958	958

Table 5. The liquidity risk channel for the effects of information quality on stock returns.

This table presents estimated results for equation (15) which aims at testing the mediatory role of liquidity risk in channeling the effects of information quality to stock returns. The estimations are for the period from January 2007 to December 2014. The dependent variable (ε_{it}) presents residual returns which are obtained after removing return' s sensitivity to Fama and French (1993) market, size, and book-to-market factors. *Accruals quality* and *discretionary accruals* are the alternate proxies of *information quality*. *LIQ* is the liquidity factor calculated following Pastor and Stambaugh (2003). See appendix A for detail definitions of all variables. *T-statistics* are reported in parentheses and are calculated using robust standard errors clustered at firm level. Year dummies are included to control for time specific effects but their coefficients are not tabulated for parsimony. ***, **, and * present significance level of 0.001, 0.01, and 0.05 respectively. Columns headed 'Overall' contain results from full sample estimations whereas columns headed 'NSOE' and 'SOE' present results from subsample estimations of non-state-owned and state-owned enterprises respectively.

	Accruals quality				*Discretionary accruals*			
Dependent variable: ε_{it}	Overall (1)	Overall (2)	NSOE (3)	SOE (4)	Overall (5)	Overall (6)	NSOE (7)	SOE (8)
Determinants of liquidity risk								
Information Quality □ LIQ	-	**86.99**	**399.82**	**-852.26**	-	**225.18**	**803.58**	**966.80**
		(0.16)	**(0.65)**	**(-1.02)**		**(0.32)**	**(1.25)**	**(-1.82)**
Turnover □ LIQ	-	12.27	13.62	13.83	-	10.53	5.58	2.85
		(3.42)***	(2.6)**	(4.88)***		(2.81)**	(2.26)*	(4.78)***
Prior return □ LIQ	-	-3509	-3348	-3436	-	-3179	745.3	499.8
		(-6.31)***	(-4.14)***	(-6.73)***		(-6.21)***	(-4.2)***	(-6.33)***
Book-to-market □ LIQ	-	-1280	-1683	862.1	-	-1185	535.1	362.6
		(-2.07)*	(-3.05)**	(2.24)*		(-2.03)*	(-2.96)**	(2.32)*
Return volatility □ LIQ	-	-18482	-40392	36634	-	1550.7	57450	13574
		(-0.46)	(-0.74)	(2.69)*		(0.04)	(-0.28)	(3.13)**
Capitalization □ LIQ	-	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000
		(-0.04)	(-0.94)	(1.25)		(0.03)	(-0.44)	(0.31)
Sales growth □ LIQ	-	0.6809	0.7661	11.804	-	28.718	22.837	106.77
		(2.59)**	(2.95)**	(0.11)		(1.31)	(1.21)	(0.07)
Operating cycle □ LIQ	-	-0.0250	-0.0220	-0.0767	-	-0.0256	0.0151	0.0122
		(-1.68)	(-1.43)	(-6.3)***		(-1.79)	(-1.48)	(-6.44)***
Capital intensity □ LIQ	-	884.82	1429.8	233.46	-	622.83	631.46	302.28
		(1.97)*	(2.13)*	(0.76)		(1.57)	(2.03)*	(0.88)
Cash ratio □ LIQ	-	239.58	248.49	109.46	-	59.18	42.82	63.58
		(2.14)*	(1.65)	(1.35)		(1.45)	(1.03)	(1.26)
Loss □ LIQ	-	705.07	874.62	271.17	-	558.84	414.42	284.92
		(2.11)*	(2.02)*	(0.92)		(1.79)	(1.59)	(0.91)
State shares □ LIQ	-	8.8151	6.2438	2.3145	-	7.7443	17.273	6.1704
		(1.68)	(0.37)	(0.38)		(1.46)	(0.29)	(0.84)
Liquidity □ LIQ	-	261415	254762	346858	-	310574	226789	226202
		(1.55)	(1.11)	(1.38)		(1.89)	(1.32)	(1.68)
Beta_LIQ □ LIQ	-	0.2202	0.1354	0.7632	-	0.2450	0.1819	0.0254
		(1.13)	(0.78)	(28.53)***		(1.24)	(0.9)	(30.31)***
Other variables and intercept								

LIQ	469.22	651.02	1497.67	-2075.75	462.81	119.26	2019.72	718.19
	(4.55)***	(0.41)	(0.74)	(-2.76)**	(4.78)***	(0.08)	(0.37)	(-3.33)***
Information Quality	-0.0013	-0.0011	-0.0006	-0.0031	-0.0080	-0.0074	0.0033	0.0121
	(-0.83)	(-0.63)	(-0.39)	(-0.33)	(-2.59)**	(-2.45)**	(-1.71)	(-1.61)
Turnover	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0000	0.0000
	(45.66)***	(44.73)***	(41.5)***	(23.51)***	(49.95)***	(48.09)***	(45.34)***	(24.55)***
Prior return	-0.0707	-0.0719	-0.0749	-0.0644	-0.0749	-0.0756	0.0035	0.0048
	(-22.07)***	(-23.52)***	(-19.67)***	(-13.17)***	(-25.33)***	(-26.65)***	(-23.47)***	(-13.0)***
Book-to-Market	0.0244	0.0239	0.0218	0.0336	0.0255	0.0250	0.0025	0.0036
	(9.87)***	(9.88)***	(8.18)***	(8.53)***	(11.21)***	(11.18)***	(9.25)***	(9.18)***
Return volatility	-0.1507	-0.1772	-0.1743	-0.2304	-0.1960	-0.2150	0.0335	0.1013
	(-3.58)***	(-3.31)***	(-2.76)**	(-2.06)*	(-7.02)***	(-7.26)***	(-6.28)***	(-2.71)**
Capitalization	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(4.54)***	(4.57)***	(3.39)***	(6.75)***	(3.92)***	(3.91)***	(3.36)***	(4.06)***
Sales growth	0.0000	0.0000	0.0000	0.0006	0.0001	0.0001	0.0001	0.0005
	(-0.93)	(1.57)	(1.53)	(1.28)	(2.99)**	(2.57)**	(2.51)**	(1.31)
Operating cycle	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
	(-1.86)	(-2.52)**	(-2.05)*	(-1.56)	(-1.7)	(-2.79)**	(-2.41)**	(-1.62)
Capital intensity	-0.0007	-0.0003	-0.0023	0.0047	-0.0012	-0.0007	0.0026	0.0037
	(-0.31)	(-0.14)	(-0.85)	(1.2)	(-0.53)	(-0.33)	(-1.19)	(1.82)
Cash ratio	0.0008	0.0009	0.0008	0.0008	0.0004	0.0004	0.0001	0.0003
	(2.55)**	(2.69)**	(2.47)**	(2.0)*	(3.03)**	(3.25)***	(2.79)**	(3.83)***
Loss	-0.0063	-0.0061	-0.0065	-0.0044	-0.0085	-0.0082	0.0012	0.0022
	(-5.7)***	(-5.47)***	(-5.12)***	(-1.98)*	(-8.02)***	(-7.65)***	(-6.99)***	(-3.08)**
State shares	0.0001	0.0001	-0.0003	0.0003	0.0001	0.0001	0.0001	0.0001
	(3.5)***	(3.69)***	(-3.72)***	(4.53)***	(3.8)***	(3.95)***	(-4.89)***	(6.0)***
Liquidity	-0.7423	-0.7589	-2.8834	5.9564	-0.7634	-0.6703	0.9862	3.3501
	(-0.59)	(-0.56)	(-2.49)**	(1.62)	(-0.72)	(-0.59)	(-2.54)**	(1.67)
Beta_LIQ	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
	(-12.5)***	(-11.76)***	(-8.98)***	(1.52)	(-14.37)***	(-18.51)***	(-15.35)***	(2.08)*
intercept	-.0468	-0.0458	-0.0417	-0.0619	-.0435	-0.0425	0.0025	0.0059
	(-18.03)***	(-15.75)***	(-12.35)***	(-9.82)***	(-19.44)***	(-19.37)***	(-15.27)***	(-10.73)***
Year Dummy	Included	included	included	included	Included	included	included	included
N	99468	99468	75882	23586	119906	119906	93568	26338
R-squared	0.065	0.074	0.0744	0.1054	0.066	0.0755	0.0759	0.1048
#Clusters	1618	1618	1558	752	2253	2253	2173	865

Figure caption(s):

1. **Figure 1** Time series of scaled monthly market liquidity, i.e. $(m_t/m_1).\gamma_t$, from January 2007 to December 2014 calculated following Pastor and Stambaugh (2003). It represents cost of trading one million in terms of market value of January 2006, where more negative value represents higher average cost of trading.