



Equity Liquidity and Firm Investment: Evidence from Pakistan

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ABSTRACT

This paper examines how equity liquidity affects firms' investment decisions. We use an unbalanced panel data for a sample of 360 non-financial firms of Pakistan for the period 2001-2016. We apply the Hausman specification test to identify whether fixed or random effects model is appropriate. Using two alternative measures of equity liquidity, we find that equity liquidity has a significant positive impact on firms' investment decisions. We also show that several firm-specific factors are significant in determining firms' investment policy. The findings of the paper have significant implications for both policymakers and firm managers. Our results support the liquidity premium hypothesis.

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1. Introduction

Understanding the links between equity liquidity and investment is important in corporate finance. Why stock liquidity is considered important for firms' investment decisions? How equity liquidity lessens the uncertainty about obtaining funds from equity market? Do liquid stocks really reduce the cost of issuing new equity? These questions have recently motivated the financial economists to examine empirically the effect of equity liquidity on firms' valuation and financial policies.

There are several theories regarding the role of equity liquidity in firms' capital structure and investment decisions. Several studies including Hovakimian et al. (2004), Frieder and Martell (2006), Lipson and Mortal (2009), and Udomsirikul et al. (2011) have documented significant evidence that stock market liquidity is an important factor in determining firms' capital structure. One of the main findings of these studies is that the cost of issuing new equity is low for firms with more liquid stocks, and hence, they reduce uses of debt to finance their assets, reducing their leverage ratio significantly. Analogously, Dittmar and Thakor (2007) examine the issuance of security and point out that at the time of high stock

prices, firms are more expected to raise funds by issuing new equity. Similarly, some other studies have also documented that firms opt to raise funds by issuing new equity to fulfill their capital requirements at the time of high stock prices (see, for example, among many others, Asquith and Mullins (1986), Baker and Wargler (2002), Jung et al. (1996), and Mikkelson and Partch (1986)). Similarly, another study by Butler et al. (2005) provides evidence that investment banks charge low fees for seasoned equity offered by firms with higher stock liquidity.

One of the important questions regarding liquidity is that whether firms having liquid stock do more investment? According to finance theory, stock liquidity is significantly related to expected stock returns. Investors required liquidity premium for investing in illiquid stocks. Further, as in Amihud and Mendelson (1986, 1988), the increased equity liquidity results in higher firms' financial value. This is because when the liquidity of stock improves, then the assets in place are discounted at a lower cost of capital. Several other empirical studies have documented evidence supporting these theoretical predictions (Amihud and Mendelson (1989), Haugen and Baker (1996), Anshuman et al. (2001), and Easley and O' Hara (2004)).

Equity liquidity is positively related to firm investment through two channels. First, equity liquidity positively affects the investment of corporate firms by increasing the market value of the existing assets and expanding the pool of viable investment opportunities available to the firms. Indeed, according to Myers (1977), the existing assets of a firm and the available investment opportunities both together constitute the value of the firm. Owing to increased equity liquidity, the required returns on stocks would be lower, and hence, the cost of capital would be lowered. Given this context, one can expect that not only the investment opportunity set would expand but also the market value of assets in place would rise due to increases in equity liquidity. Therefore, we suppose that firms that have relatively more liquid stocks are likely to do more investment spending. Secondly, the liquidity of stock increases firms' investment expenditures by lessening financial constraints. Thus, firms those stocks are more liquid are expected to raise required amount of capital easily and relatively at low costs and thus, they do more investment. Therefore, we, in this paper, departing from most of the existing literature, test in a relatively different way the implication of the liquidity premium supposition by investigating the impact of equity liquidity on firm investment.

Tice et al. (2009) provide evidence that the improved firms' stock liquidity can improve firms' worth because liquidity triggers trade by informed investors that results in more informative prices of stock and better marginal inducement. Xiong (2016) explains that stock liquidity can help firms to avail investment opportunities by investigating the relationship between stock liquidity, firm investment, and capital allocation efficiency.

Reviewing the empirical literature we observe that examination of the equity liquidity effects on firms' investment decisions is still an understudied area of research, particularly in developing and emerging countries like Pakistan. However, for a complete understanding of how equity liquidity affects corporate firms, it would be worthwhile to investigate this issue for developing and emerging economies. The empirical evidence on the effects of equity liquidity on firm investment policy would definitely enhance our understanding about the role of liquidity in firm evaluation and financial decisions.

Keeping in view the gaps given in the existing literature, this paper aims to contribute into the literature by examining the role of equity liquidity in determining firms' investment. While examining the equity liquidity effects we consider several firm-specific factors as control variables in our empirical analysis. We use two alternative measures of equity liquidity, namely, "Pastor and Stambaugh's (2003) measure of equity liquidity" and "Amihud's (2002) measure of equity liquidity" to ensure that our findings are robust to different measures of liquidity. We apply the Hausman specification test to make a choice between random and fixed effects model. By presenting strong evidence on the effect of equity liquidity on firm investment, we compliment the literature supporting the liquidity premium hypothesis.

The paper is structured as follows. Introduction is presented in Section 1. Section 2 presents the brief review of the studies regarding the role of equity liquidity. Section 3 deals data, variables, and estimation methods. Section 4 presents the empirical results. Finally, Section 5 concludes the paper by providing concluding remarks and some policy implication.

2. Literature Review and Theoretical Justification

Amihud (2002) was the first person to initiate the concept of equity liquidity. After this initiative, a lot of research has been done on the equity liquidity effects. He finds that investors generally require a higher required rate of returns for investing in illiquid stocks. This suggests that the liquidity of stocks is negatively linked to the cost of equity financing. According to Ready et al. (1996), stock liquidity is an important aspect of trading equities.

Wurgler et al. (2002) examine that stock prices significantly affect firms' investment that are equity dependent. Choi & Cook (2006) study the stock market liquidity of Japan and find that due to equity liquidity managers can be benefited by information for enhancing investment. Crowin (2003) finds that there is a negative and significant relationship between the level of market liquidity and to the low pricing of seasoned equity offerings. Hennessy and Whited (2005) argue that that firms' stock liquidity makes easy for firms to raise funds by doing external financing because it decreases the cost associated with issuing new equity. Similarly, another study by Butler et al. (2005) also finds that the liquidity of stock market has a significant influence on firms' decision to raise funds through external sources.

Thokar et al. (2007) show that in periods when stock prices are higher, firms opt to raise external capital by issuing stocks, suggesting the negative association between stock liquidity and the cost of capital. Kim and Lee (2014) estimating the "liquidity-adjusted capital asset pricing model" find that liquidity is a significant priced factor, suggesting that equity liquidity is negatively related to the required rate of return.

Zhang et al. (2017) show that there is a positive and statistically significant association between firms' value and stock liquidity. Stulz et al. (2013) explore the links between the issuance of new equity and the liquidity of stock market. They provide strong evidence that equity issuance is significantly and directly related to lagged changes in equity market liquidity. Becker-Blease and Pual (2006) also provide evidence of a positive association between equity liquidity and firm investment spending. Specifically, they show that the liquidity of stocks effectively increases the pool of positive NPV projects, which enables firms to do more investment. Kang et al. (2017) investigate how the investment policy of corporate firms is affected by changes in stock liquidity. They find the positive and significant association between firms' investment spending and liquidity of stocks.

Martel et al. (2006) document evidence that equity liquidity has a significant and positive effect on firms' leverage decisions. Their findings suggest that firms having more liquid stocks significantly reduce their leverage. According to the authors, firms with more equity liquidity carry less proportion of debt because firms having more liquid stocks will prefer equity to debt while raising funds from external sources. However, Anderson (2002) finds a direct relation between equity liquidity and leverage of British companies.

After reviewing the existing literature we can conclude as follows. First, equity liquidity negatively affects the cost of capital by reducing the required rate of returns. Second, equity liquidity effectively enlarges the pool of viable investment opportunities. Third, equity liquidity is one of the important priced factors in asset pricing, supporting the hypothesis of liquidity premium in equity returns. Fourth, we find hand-full evidence suggesting the significant and positive link between equity liquidity and the investment decisions of firms. We notice that the existing empirical studies have examined the role of equity liquidity mainly for developed markets and therefore, we have very limited empirical evidence on the equity liquidity effects on the investment decisions of firms in emerging and developing markets.

Therefore, this paper aimed at filling the gaps given in the literature by investigating the effects of the liquidity of stock on investment spending of firms in Pakistan.

3. Data, Variables, and Methodology

To achieve the objectives of the paper, we carry out the empirical analysis for a large sample of 360 non-financial firms listed at “Pakistan Stock Exchange (PSX)” over the period 2001-2016. Our dataset is an unbalanced annual panel as we allow entry and exit to avoid the survival bias. The data are taken from “Balance Sheet Analysis of Non-Financial Firms” published by “State Bank of Pakistan” (SPB). The data on money supply and GDP are collected from World Bank Indicators, World Bank Database. The standard deviation of cash flows of firms is used as a proxy for business risk.

We achieve the objectives of the study by estimating several models for firm investment. Our model of firm investment includes the variable of interest equity liquidity and several firm-specific control variables. Further, we include firm-specific and year-specific effects. The model takes the following form

$$I_{it} = \beta_1 + \beta_2 EL_{it-1} + \beta_3 FCF_{it-t} + \beta_4 TQ_{it-1} + \beta_5 Lev_{it-1} + \beta_6 Size_{it-1} + \beta_7 CH_{it-1} + \beta_8 Div_{it-1} + \beta_9 Age_{it-1} + \beta_{10} BR_{it-1} + f_i + y_t + \epsilon_{it} \quad (1)$$

where I_{it} represents the investment of firms. It is the ratio of total capital expenditure to total book assets of firms, EL represents equity liquidity which is proxied by two alternative measures namely “Pastor and Stambaugh’s (2003) measure of equity liquidity” and “Amihud’s (2002) measure of stock liquidity”, FCF is free cash flow defined as the ratio of cash flow from operations to total book assets, TQ is Tobin’ Q ratio. It is constructed as the ratio of market to book value of total assets of the firms, The variable Lev is the financial leverage defined as the ratio of liabilities to assets, Size is firm size, which is proxied by the log of assets normalized by inflation, CH is the ratio of cash holdings to assets, Div is the ratio of cash dividends to firms’ book assets, Age is the age of a firm, which is defined as the total number of years in the given year the firm had been in the business, BR is business risk, which is proxied by the standard deviation of cash flows, f_i is firm-specific effects, y_t is year-specific effects, and finally ϵ_{it} is the error term.

3.1 Measuring Equity Liquidity

Liquidity of stock can be measured through several ways. In this paper, we apply the following two measures. Both measures are highly used in the literature.

3.1.1 Pastor and Stambaugh’s (2003) Equity Liquidity Measure

According to Pastor and Stambaugh (2003), lower liquidity of stocks results in higher volume adjusted stock returns. Pastor and Stambaugh’s equity liquidity measures reflects the trading cost. To measure equity liquidity, we estimate the model given in Eq. (5) by applying the ordinary least squares (OLS) estimation method.

$$R_{i,d+1,t}^e = \alpha_{it} + \beta_{it} \times R_{idt}^e + \lambda_{i,t} \times \text{sign}(R_{idt}^e) \cdot TV_{idt} + \epsilon_{i,d+1,t} \quad d = 1, \dots, D \quad (5)$$

where $R_{i,d,t}$ is the stock return on stock i on the day d in the month t , $\beta_{i,t}$ is the liquidity beta.

R_{idt}^e is defined as the difference of $R_{i,d,t}$ and $R_{m,d,t}$, representing the access market return,

TV_{idt} is the trading volume, $\text{sign}(R_{idt}^e)$ is equal to 1 if $R_{idt} > 0$, -1 if $R_{idt} < 0$, and 0 if $R_{idt} = 0$.

The estimated coefficient of term $\text{sign}(R_{i,d,t}^e) \cdot TV_{idt} \cdot (\hat{\lambda}_{it})$, represents equity liquidity for each stock included in the sample in month t . It can be viewed as the “cost” of liquidity in terms of higher stock return. One should note that we estimate month wise regression only for the stocks those have trading at least 15 days in the underlying month.

Next, we measure the liquidity innovations of ith stock in month t as follows:

$$\Delta \hat{\lambda}_{it} = (mv_{it} / mv_{i1}) \times (\hat{\lambda}_{it} - \hat{\lambda}_{it-1}) \quad i = 1, \dots, N_t \quad (6)$$

where mv_{it} is the market value of ith stock in month t and mv_{i1} is its market value in first observation month. This type of scaling incorporates the time value of liquidity, making the liquidity measure inflation adjusted.

3.1.2 Amihud's (2002) Liquidity Risk Measure

We construct our second measure of equity liquidity in spirit of Amihud (2002) as follows.

$$ILLIQ_{it} = \frac{1}{D_t} \sum_{d=1}^{D_t} |R_{itd}| / (TV_{itd} / N_{it}) \quad i = 1, \dots, N_t \quad (7)$$

where $ILLIQ_{it}$ is the measure of illiquidity of i th stock in the month t , D_t denotes the total number of trading days in month t , N_{it} is the total number of stocks in month t , R_{itd} is the return of i th stock in the month t on day d , TV_{itd}/N_{it} represents the average trading volume per i th stock in month t . We multiple the illiquidity measure $ILLIQ_{it}$ by -1 to get the liquidity measure.

4. Empirical Results

We start by presenting the summary statistics of our both equity liquidity measures and the other variables included in the analysis in Table 1. The statistics show that on average, the sample firms invest about 11 percent of their total assets in fixed assets. The estimated figure of standard deviation of investment reveals that firm investment expenditures significantly vary across the firm-year observations. The mean values of equity liquidity measure 1 (Pastor and Stambaugh's (2003) measure) and measure 2 (Amihud's (2002) measure) are 0.219 and 0, respectively. However, the value of standard deviation shows that equity liquidity measure 1 is more volatile as compared to equity liquidity measure 2. We observe that the average values of cash flows and Tobin's Q ratio are 0.14 and 4.333, respectively. On average, firms keep about 4.8% of total assets in cash reserves. The mean value of firm size is 14.471. The average life of the sample firms is 31.69 years. We can see from the table that on average, firms pay 2.5% of total assets in terms of cash dividends. Finally, the mean value of business risk is 0.131.

Table 1: Descriptive Statistics

Table 1: Summary Statistics

Variable	Obs	Mean	Std.Dev.
Investment	5124	0.114	0.143
Pastor liquidity measure	4606	0.219	14.542
Amihud liquidity measure	4595	0.000	0.004
Cash Flow	5356	0.140	2.302
Tobin Q	5356	4.333	13.700
Size	5356	14.471	1.733
Leverage	4519	0.279	0.378
Cash Holding	5353	0.045	0.088
Dividend Ratio	4814	0.025	0.119
Age	5379	31.697	17.736
Business Risk	5414	0.131	0.931

To get the preliminary evidence on the relationship between dependent variables and a set of explanatory variables, we estimate correlations. The correlation estimates are given in Table 2. It can be observed from the table that both of equity liquidity measures are positively related to investment. Similarly, firm size, and Tobin's Q ratio have positive and significant correlations with firm investment. Although leverage is negatively related to both investments, firms' cash holdings are negatively and significantly correlated with firm investment. The table reveals that that the correlation between firm age and firm investment is negative and statistically significant at the acceptable level of significance. Further, we find that business risk is also negatively correlated with investment.

Table 2:		
		Investment
Pastor	liquidity	0.0136
Amihud	liquidity	0.0111

Cash Flows	-0.0306*
Tobin Q	0.00230
Size	0.0879*
Leverage	-0.0674*
Cash Holding	-0.0536*
Dividend Ratio	-0.0150
Age	-0.0420*
Business Risk	-0.1007*

To achieve the first objective of study, we estimate two models of investment. In Model 1, we consider “Pastor and Stambaugh’s (2003) measure of equity liquidity” while in Model 2 we consider “Amihud’s (2002) measure of equity liquidity”. We carry out our empirical analysis in several different steps. First of all we identify whether the data should be pooled or it should be considered as a panel. Therefore, we test pooled regression versus fixed effect model.

4.1 Testing pooled regression versus fixed effects model

To identify whether pooled regression or fixed effects model is appropriate we apply the coefficient restriction test on the estimated coefficient of individual firms. The test has the following null and alternative hypotheses.

Ho: Pooled regression is appropriate

H1: Fixed effects model is appropriate

The test results are given in Table 3

	Model 1	Model 2
F-stat.	1.810	1.810
Prob > F	0.000	0.000

The calculated F-statistic and its p-value suggest that we reject null hypothesis and conclude that pooled regression is not appropriate. After having confirmed that pooled regression is not suitable for our data set we examine the appropriateness of pooled regression against random effects model.

4.2 Random Coefficient Models (Another Poolability test)

Table 4 presents the estimated value of chi-square for both models. The test has the following hypotheses.

Ho: Pooled regression is appropriate, i.e., variance of residuals is equal to zero.

H1: Random effects model is appropriate, i.e., variance of residuals is not equal to zero.

	Model 1	Model 2
Chi-square	29.27	29.01
P-value	0.0000	0.0000

* p<0.10, ** p<0.05, *** p<0.01

It is clear from the Table the p-values associated with the chi-square statistics are zero. Thus, we reject the null hypothesis. Therefore, we conclude that the variance of the residuals is not equal to zero, suggesting that we cannot pool the data. Rather, the test suggests that the random effects model is appropriate.

4.3 Random versus fixed effects model

After having rejected the pooled regression against both fixed as well as random effects models, we next identify whether the fixed or random effects model is appropriate. For this purpose, we apply the Hausman specification test. This test has the following null and alternative hypotheses.

H₀: Random effects model is appropriate

H₁: Fixed effects model is appropriate

The results of the Hausman test are given in Table 5. The estimated values of chi-square provide strong evidence to reject the null hypothesis. Therefore, we conclude that the appropriate estimator for both models is fixed effects. We proceed further by applying fixed effect estimator to examine the impact of equity liquidity on firm investment decisions. The results of both models are given in Table 6.

The results indicate that equity liquidity is positively and statistically significantly related to the investment decisions of firms. The positive and significant impact of equity liquidity on the investment decisions of firms hold for both proxies of liquidity used in the study. Specifically, the estimated coefficient of the equity liquidity measure of Pastor and Stambaugh (2003) is positive and statistically significant at any acceptable level of significance. This finding implies that firms those stock are more liquid do more investment, on average. The positive relationship between equity liquidity and firm investment is explained as follows:

Liquid stocks provide more information about firm-specific information that managers do not know as well as investors that helps in making more investment. This implies that firms those stocks are more liquid do more investment. This is because as these firms may easily raise required capitals by issuing new equities as their stock are liquid and required less premium, decreasing the cost of capital. By improving in stock market liquidity we can reduce cost of raising capital for firms. The finding of positive impact of equity liquidity on investment is consistent with the findings of pervious study (e.g. Deveureux and Schiantarelli (1989)). However, our findings are not consistent with the studies that have provided evidence of the negative links between stock market liquidity and the investment decisions of firms (Fang et al. (2014) and Ha and Vinh (2017)).

	Model 1	Model 2
Chi-square	101.19	101.86
P-value	0.0000	0.0000

	(1)	(2)
	Coff./Std	Coff./Std
Pastor liquidity measure	0.423***	
	(0.112)	
Amihud liquidity measure		0.314***
		(0.067)
Cash Flow	0.012**	0.013**
	(0.006)	(0.005)
Tobin Q	0.001***	0.001***
	(0.0003)	(0.0003)
Size	0.029***	0.029***
	(0.0066)	(0.0066)
Leverage	-0.029**	-0.029**
	(0.0132)	(0.0133)
Cash Holding	-0.083**	-0.082**
	(0.0419)	(0.0419)
Dividend Ratio	-0.021	-0.021
	(0.0617)	(0.0618)
Age	-0.007***	-0.007***
	(0.0011)	(0.0011)

Business Risk	0.218***	0.223***.
	(0.0670)	(0.0581)
Constant	-0.098	-0.095
	(0.0747)	(0.0749)
No. firms	346.000	346.000
No. obs.	3378.000	3371.000
F-stat.	9.36	9.56
p-value	0.000	0.000

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results of control variables indicate that free cash flows, Tobin's Q, firm size are positively related to firms' investment decisions. On the flip side, the cash ratio, leverage, dividend ratio, Business risk, and firm age are negatively related to firm investment spending. The negative relation of leverage with the investment policy of firms is consistent with the findings of Ogawa (2013) and Westphal et al. (2017). We also find that firms having more free cash flow do more investment spending. This finding is consistent with the free cash flow theory, stating firms having excess cash flow are expected to increase their investment spending. Further, the positive impact of free cash flow of investment is in line with the findings of several existing studies (e.g., Guariglia (2008), Soumaya (2012), and Kazu Ogawa (2013)).

The estimation results also reveal that firms having more growth opportunities do more investment. This finding strongly compliments the findings of Beck and Levine (2004), who also shows the positive association between firm investment policy and growth opportunities. The finding regarding firm size suggests that the larger the firm the higher the investment. A possible explanation for this finding is that large firms generally have more human capital and enjoy more economies of scale and scopes. Therefore, they do more investment spending. Several studies in the literature like Soumaya (2012) also find the positive impact of firm size on firm investment.

The results for the model where we include Amihud's (2002) equity liquidity measure are generally consistent, in terms of both sign and statistical significance, with the results of the model where we include "Pastor and Stambaugh's (2003) measure of equity liquidity". Practically, Amihud's (2002) equity liquidity measure is also positively and significantly related to the investment decisions of firm. This indicates that our findings of the positive impact of equity liquidity on firms' investment decisions are robust to different proxies of equity liquidity. The results of the control variables included in the specification are also consistent with our earlier findings. Although the magnitude of the estimated coefficients is different in both models, they are quite similar in terms of sign and statistical significance.

5. Conclusions

In this paper, we empirically examine the impact of equity liquidity on firms' investment decisions. Our empirical analysis is based on a large unbalanced panel dataset of Pakistani non-financial firms listed at "Pakistan Stock Exchange". The study covers the period 2001-2016. We apply "Fixed effects model". We use two different measures of equity liquidity namely, "Pastor and Stambaugh's (2003) measure of equity liquidity" and "Amihud's (2002) measure of equity liquidity".

Our empirical results suggest that the both measures of equity liquidity have positive and significant effects on the investment decisions of firms operating in Pakistan. This implies that firms whose stocks are more liquid do more investment. This is because as these firms may easily raise required capitals by issuing new equities as their stock are liquid and required less premium, decreasing the cost of capital. The finding of the positive sensitivity of firm investment to equity liquidity is in support of the liquidity premium hypothesis. The results also reveal that cash flows, Tobin's Q ratio, business risk, and the size of firm size have significant positive effects on firms' investment decisions. On the other hand, the variables namely, leverage, dividends ratio, and cash holdings are significantly and negatively linked with the

investment decisions of firms. Finally, we show that mature firms do less investment.

Our findings are of great interest to policymakers and firm managers. In particular, the findings suggest that the liquidity of firms' stocks has a very important role to play for determining firms' investment policy. Our findings regarding firm-specific control variables have also several policy implications for investors and firm managers.

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