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DYNAMIC RELATIONSHIP BETWEEN LIQUIDITY AND FIRM VALUE: THE INDIAN EVIDENCE

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Abstract *This study aims to delve into the ever-changing dynamic connection across stock market liquidity and company value. Using the panel ARDL framework and the Mean Group (MG) and Pooled Mean Group (PMG) models, the study shows that there is an affirmative association amidst liquidity and firm value, measured by 'Enterprise Value to Sales,' both in the long and short term. When Tobin's Q is used as a proxy for the company value, this conclusion is confirmed. Using EV/S as a surrogate for firm value only reveals, over the long term, that operational profitability (ROA) has a significant affirmative effect on firm value. Nevertheless, when Tobin's Q is utilised to gauge the firm's value, a notable positive effect of ROA on the firm's value is observed in both the long and short term. Liquidity is an important factor in a company's valuation, according to the empirical results.*

Keywords: *Liquidity, Illiquidity, EV/S, Tobin's Q, ROA, PMG*

JEL Classification: *G10, G12, G14, G15, G32, G38*

OVERVIEW

A company's market value is mostly determined by two things: its free cash flow and the level of risk associated with it, according to academic studies. The second variable is often defined by the cost of capital. According to Amihud and Mendelson (2008), stock liquidity is a key factor that can significantly impact a company's value. According to Keynes (1930), the capacity to sell an asset quickly without suffering a loss is what determines its liquidity. Therefore, when a large chunk of an asset can be bought or sold rapidly with little price fluctuation, we say that it is liquid. When stocks are not easily traded, this is called illiquidity. In this model, the amount of liquidity is considered to be the only variable, rather than the assets themselves being considered liquid or illiquid (Damodaran, 2005). Investors are not able to put as much money into financial assets that don't have a strong market because of the higher execution costs associated with less liquid assets. The work of Amihud and Mendelson was published in 2012. Because there is not a ready market for illiquid financial assets, investors are understandably wary when dealing with such assets and will likely demand a steep discount as a result (Chen et al., 2015). Direct trading costs and price-impact costs make up the cost of liquidity. Direct trading costs initially include things like taxes, exchange fees, and brokerage commissions. Second, the price-impact cost is the direct effect on the price of an item throughout the trading process, whether buying or selling. For example, if an investor wants to buy a stock, the price-impact cost goes up, and if they want to sell a stock that is difficult to liquidate, it goes down. According to Lo, Mamaysky and Wang (2001), even small trading costs can cause a major drop in market liquidity. Implications of influencing prices are expected to continue to outweigh those of direct trading as long as securities are not marketable (Amihud & Mendelson, 2012). Amihud and Mendelson (2008) state that the required rate of return goes up because investors want a bigger premium to cover liquidity expenses.

Using the Indian Stock Market as a case study of an emerging market, this paper aims to examine the aforementioned relationship in this context. Several factors support the need for this investigation. Firm decision-making is significantly impacted by liquidity in all areas of corporate finance. The limited potential for a company to raise capital through the sale of securities is a result of its illiquidity. Companies with less liquid shares pay more to issue stock, according to research by Butler, Grullon and Weston (2002), who also argue that companies can reduce their cost of capital by making their shares more liquid.

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This introductory chapter is followed by the following sections: a discussion of the relevant literature and the hypotheses in chapter two, the database and techniques in chapter three, the study findings in chapter four, and finally, the conclusion of the paper in chapter five.

REVIEWING THE LITERATURE AND FORMULATING A WORKING HYPOTHESIS

Capital Cost, Required Rate of Return, Leverage and Liquidity

Stocks that are less easily traded are supposedly priced higher than those that are more widely traded, as stated by Amihud and Mendelson (1986). After that, a number of studies (such as Chung et al., 2010; Udomsirikul et al., 2011; Acharya & Pedersen, 2005) also verified the aforementioned correlation.

As interest charges are tax deductible, the cost of capital decreases with leverage (Modigliani & Miller, 1958).

As indicated by Amihud and Mendelson (2008) and Ødegaard (2007), investors who hold stocks that are not easily traded are rewarded with a greater projected rate of return, but this comes at the cost of a lower firm value in the long run. Additionally, business practices that enhance liquidity can contribute to a rise in market value, according to Amihud and Mendelson (2008). It is commonly believed that illiquid stocks are the root cause of information asymmetry, adverse selection costs, and other price effects that lead to a decrease in the firm's value.

In addition to a greater expected rate of return compared to liquid stocks, illiquid equities are characterised by higher transaction costs, order handling fees, etc. According to Amihud and Mendelson (1980), Amihud and Mendelson (1986), and Amihud and Mendelson (1989), investors may face increased capital restrictions or greater transaction costs if they depreciate these illiquid equities in the future. Further, their research indicates that investors hold onto these types of assets for longer, which makes them less liquid. As a result, when transaction costs are greater, asset returns are also generally higher. One of the primary causes of financial market illiquidity, according to Glosten and Harris (1988), is adverse selection cost.

A lower cost of equity is the result of higher liquidity and greater liquidity risk, according to Hsu and Yu (2015), provided that information asymmetry is low and that the main factors are the trading volume and degree of liquidity risk. The higher the degree of illiquidity, the higher the cost of capital for the firm, as shown by Foucault (2006) in his study, which indicated that the cost of capital increased as stock became less liquid.

According to research by Butler et al. (2005), an opposing link holds across equity capital cost and stock market liquidity. Consistent with previous research by Saad and Samet (2017) and Bundgaard and Ahm (2012), their research demonstrated that by raising the float of their shares, firms may lower their cost of capital.

Liquidity and Firm Value

Dalvi and Baghi (2014) examined the connection between liquidity on the Tehran Stock Exchange and company performance. Their results were consistent with those of Fung et al. (2009) who used US data and found a direct and substantial relationship between liquidity and the behaviour of listed companies on the Tehran Stock Exchange as measured by Tobin's Q ratio.

In their 2014 study, Arian et al. looked at how stock market liquidity affects a company's value. When they compared Tobin's Q, a measure of firm value, with the bid-ask spread, a proxy for stock market liquidity, they found no such association. The relationship between illiquidity as measured by Amihud (2002) and company value as estimated by Tobin's Q ratio was found to be negative by Cheung et al. (2015). Sharma and Paul (2015) observed that when the cost of capital decreased, stock market liquidity improved in their research on Indian firms. This indicates that stock market liquidity increases as capital costs decrease. A company's worth on India's stock market is positively related to its liquidity (Sidhu, 2016). Nguyen et al. (2016) examined the connection between stock market liquidity and firm value in their research on the Australian market. Their research showed that when liquidity improves, company value goes up. Recent research by Batten and Vo (2019) on emerging nations like Vietnam looked at how Tobin's Q, a measure of company value, relates to liquidity. The researchers discovered that liquidity and firm value are inversely related. According to Nguyen's (2017) research, there exists an opposing association across illiquidity and the value of the firm. Consistent with previous research by Singh et al. (2015) and Fang et al. (2009), the results confirmed that liquidity has an affirmative association with firm value and illiquidity has an antagonistic relationship with firm value. In China, Zhang et al. (2017) found that a rise in stock liquidity might significantly boost company value. Research by Tahir M. (2020) and Jawed and Kotha (2018) has also shown very comparable outcomes. Chia et al. (2020) in their study observed an affirmative association between stock liquidity and firm value.

In light of the foregoing, one possible hypothesis is as follows:

H_0: The stock's liquidity (or lack thereof) has no bearing on the company's worth.

H_1: The firm's worth is affected by the liquidity (or lack thereof) of the stock.

DATA AND METHODOLOGY

Data and Sample

The necessary data have been compiled and integrated using the "Capitaline" database. The 97 companies that made it into the sample are from a wide variety of sectors included in the NIFTY 100 index, including consumer goods, energy, pharmaceuticals, industrial manufacturing, and automobiles, among others. Despite covering a whole decade (April 1, 2008–March 31, 2018), three companies have been ruled out due to their dissimilar financial years. All the data that contribute to the study are consistently organised by the financial year. Importantly, this study encompasses the period beginning with the COVID-19 pandemic and ending with the subprime crisis. Selection of samples must be completed no later than March 31, 2018.

Research Variables

The 'illiquidity' metric proposed by Amihud (2002) is used here as a stand-in for the (denoted as 'ill') for metric representing stock liquidity. Just one variable is being considered here: this one. The inverse of stock liquidity, Amihud's illiquidity is calculated as the absolute weekly return divided by the volume for that particular week (denoted as 'Ill'). This is the only independent variable. Amihud's illiquidity is the reciprocal of stock liquidity and it's defined as the weekly return in absolute terms divided by the volume for that week. / . is the return of stock *i* on week *w* of year *t* and *VOLW* is the weekly volume. The aforementioned ratio is the absolute change in price per rupee of weekly trading volume or the order flow's weekly price impact.

Thus Illiquidity ($ILLIQ_{iy}$) = $1/\ W_{iy}\ \sum_{t=1}^{Wiy}|R_{iyw}|/VOLW_{iyw}$

The value of W_(iy) represents the number of weeks for which information about stock I in year y is accessible. Multiplying the given amount by 10^7 yields a significant result for illiquidity.

Enterprise Value is given below:

Enterprise Value (EV) = Market value of Debt + Market Value of Equity – Cash –Market value of Marketable Securities and Other non-operating investments (Mohanty, 2015).

The value of the firm is the dependent variable (Denoted as 'EV/S'). In this study, EV/S has been taken as a measure of the value of the firm which is calculated as follows (Titman, 1988; Schueler, 2020; Mohanty, 2015).

$$\frac{EV}{Sales} = \frac{\cancel{EV}}{Sales} * \frac{EBITDA}{\cancel{EV}} * \frac{EV}{EBITDA} = \frac{EBITDA}{Sales} * \frac{EV}{EBITDA}$$

EV stands for Enterprise Value given in the above equation.

Furthermore, another proxy to quantify the firm's value (Denoted as 'TQ') represented by Tobin's Q ratio has been used to check the results' robustness. The following standard definition has been used for this purpose:

$$\text{Tobin'sQ(TQ)} = \frac{(Market\ capitalization + Book\ value\ of\ Debt)}{Book\ value\ of\ Assets}$$

Along with the independent variable, the Return on Assets (ROA) has been taken as a control variable following (Chia et al., 2020; Huang et al., 2013), and (Mehdi et al; 2014).

Unit Root Test

Panel data must undergo the unit root test to guarantee that no series surpasses the I(1) integration order. After that, we can look into the short- and long-term trends.

This reason led to the selection of the Im, Pesaran, and Shin (IPS) exam. To begin, IPS provides an independent ADF regression for every cross-section, complete with distinct effects and devoid of any temporal trend:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t-j} + \varepsilon_{it} \qquad (1)$$

where *i = 1,...,N and t = 1,...,T are integers, respectively.*

All groups' Augmented Dickey-Fuller (ADF) statistics are averaged in this test. Following the estimation of the individual ADF regressions, the average of the t-statistics for p_i, $t_{iTi}(p_i)$:

$$\bar{t}_{NT} = \frac{1}{N} \sum_{i=1}^{N} t_{iT}(p_i \beta_i) \qquad (2)$$

After that, the t-bar is standardised, yielding N and T, which converge to the standard normal distribution $\rightarrow \infty$. If the W-t-bar statistic is significant there is no unit root.

The Mean Group Model and the Pooled Mean Group Model

Following Loayza and Ranciere (2006), a Panel ARDL (p,q) model can be written as:

$$Y_{it} = \sum_{j=1}^{p-1} \gamma_y^i \, (y_i)_{t-j} + \sum_{j=0}^{q-1} \delta_y^i \, (X_i)_{t-j} + \varphi^i [\, (y_i)_{t-1} - \{\beta_0^i + \beta_1^i (X_i)_{t-1}\}] + \varepsilon_{it} \quad (3)$$

Where $X_{i,,t-j}$*the (k x 1) is the* vector of explanatory variables for group i, The short-run coefficients of the dependent and independent variables are symbolised by y and δ. The long-run coefficients are marked by β.

A VECM system can be used to represent this model:

$$\Delta Y_{it} = \theta_i (Y_{i,t-1} - \beta_i X_{i,t-1}) + \sum_{j=1}^{p-1} \gamma_y^i \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \delta_y^i \Delta (X_i)_{t-j} + \mu_i + \varepsilon_{it} \quad (4)$$

θ_i; are the equilibrium (or error) correction parameters. are common across groups (in this case companies).

The Mean Group (MG) estimator proposed by Pesaran, Shin and Smith (1995) and the Pooled Mean Group (PMG) estimator produced by Pesaran et al. (1999) can both be used to estimate Equation (4). The MG estimator calculates the panel's long-run parameters by averaging the long-run parameters from ARDL models for each i (in this paper, companies). The ARDL (p,q) model in the error correction form (Equation 4) is used to evaluate dynamic panels, and then estimation is carried out based on the MG. The preceding equations show how the model calculates the coefficients as an unweighted mean of the estimated coefficients for each group (in this case, company) and estimates distinct regressions for each group (in this case, companies) (company). All the coefficients in this process may vary and be heterogeneous in the long and short run. However, a sufficiently large t is required for the consistency and validity of this technique.

On the other hand, PMG estimation allows short-run coefficients, such as intercepts, the pace of adjustment to long-run equilibrium values, and error variances, to be heterogeneous from one business to the next. The long-run slope coefficients, on the other hand, must be homogenous among enterprises. The main requirement for this methodology is mentioned as under:

If the variables are related in the long run, the coefficient of the error correction term should be negative, and it shouldn't be less than -2. If $\theta_i = 0$, there would be no indication of a long-term relationship in that case.

Before proceeding further, it is necessary to determine the optimal lag selection. For this study, the optimal lag selected for all the variables is (1,1,1). Finally, once the results of both estimators are derived the confirmatory test between the two is the Hausman test.

RESULTS AND DISCUSSION

Descriptive Statistic

Table 1 displays the descriptive statistics of the variables utilised in this study. There are 970 observations per firm-year for each variable. EV/S ranges from a minimum of .0417 to a maximum of 41.3284, with a mean of 3.2064. The range of values for Tobin's Q (TQ) is 0.3629–32.6677, with 3.5652 being the mean. ILL ranges from 3.95E-09 at its lowest point to 1573.2110 at its highest point, with an average value of 6.5639. The control variable has a mean Return On Investment (ROI) of .2513, a range of 1.8245 to -.2172.

Table 1: Descriptive Statistic

	EV/S	TQ	ILL	ROA
Mean	3.2064	3.5652	6.5639	.2513
Standard Error	.1110	0.1277	2.0099	.0069
Median	2.2010	2.2302	0.1283	.2065
Standard Deviation	3.4588	3.9789	62.5982	.2157
Sample Variance	11.9637	15.8323	3918.5410	.0465
Minimum	.0417	0.3629	3.95E-09	-.2172
Maximum	41.3284	32.6677	1573.2110	1.8245
Count	970	970	970	970

Source: Authors' tabulation.

Correlation Analysis

Table 2 displays the results of the analysis of the correlations across the variables, which were used to determine the degree of association. The findings show that, in the face of illiquidity, enterprise value as expressed by EV/S and Tobin's Q (TQ) has an affirmative association, which is desired according to traditional theory. At the same time, both measures of enterprise value, namely, TQ and EV/S have a negative association with illiquidity which is also desired according to the empirical analysis. Likewise, ROA, a control variable bears a negative correlation with both illiquidity (ILL) and EV/S and a positive correlation with Tobin's Q.

Table 2: Correlation Matrix

	EVS	TQ	ILL	ROA
EVS	1.0000			
TQ	0.3855*	1.0000		
ILL	-0.0721**	-0.0613	1.0000	
ROA	-0.0280	0.5620*	-0.0394	1.0000

Source: Authors' tabulation.

Note: * 1% level of significance, ** 5 % level of significance.

Unit Root Test

Table 3 displays the outcomes of the unit root test performed on the variables being examined. The statistics for ILL (W-t bar: -1.5e+02), TQ (W-t bar: -2.1362), and (ROA (W-t bar: -7.9600) are significant at the level, while EV/S (W-t bar: 1.9304) is significant ($p<0.01$) after first-order differentiation, supporting the alternative hypothesis that there are no unit roots within the variables. This indicates that ILL, TQ and ROA concerned variables are I (0) and EV/S is I (1). Since EV/S is an I (1) panel ARDL model can be applied.

Table 3: Unit Root Test Results

Variables	At Level I (0)		At 1st Difference I (1)	
	W-T Bar Statistic	P-Value	W-T Bar Statistic	P-Value
EV/S	1.9304	0.9732	-13.6674	0.0000
TQ	-2.1362	0.0163		
ILL	-1.5e+02	0.0000		
ROA	-7.9600	0.0000		

Source: Authors' tabulation.

Panel ARDL Results

Table 4 shows the estimated regression estimates for MG and PMG, respectively. The findings reveal that illiquidity has a strong adverse influence on the firm's worth as assessed by EV/S in both the long and short run. In this respect, the long-run estimate of MG (68.0269) is larger than that of PMG (-.0032). However, the sign of the coefficient is inconsistent in both cases. The MG estimate finds no significant link between the variables in the long haul when it comes to ROA and EV/S. On the contrary, the long-run coefficient of ROA in the case of the PMG estimate is positive and significant (1.4958). The error correction terms are negative and statistically significant in both cases. They are (-.5977) and (-.3523) for MG and PMG estimates, respectively. Moreover, most importantly both these values are greater than -2, which is desirable for the model. This means that any departure from the long run will be rectified at a rate of 60 per cent and 35 per cent for each model, respectively. However, in the short run, an insignificant relationship is shown between ILL and EV/S in both models, (1.8984) and (-9.4616), respectively. ROA, which stands in for the control variable, does not show a statistically significant association with firm value as assessed by EV/S in the short run. Lastly, the Hausman test serves as a confirmatory test between the two estimators once their results have been derived. Outcome of this test has been shown in Table 5. The null hypothesis can not be rejected if the p-value is bigger than 0.05. PMG outperforms the other estimator in terms of fit to the data, according to the Hausman test. Therefore, the value of a company is influenced by the liquidity (illiquidity) of its stock. Consequently, it is possible to accept the alternative hypothesis and reject the null hypothesis.

Table 4: MG and PMG Estimation Results

Variables	MG	PMG
ILL		
LR	68.0269	-0.0032**
	(1.3100)	(-1.8500)
SR	1.8984	-9.4616*
	(0.3000)	(-2.6300)
ROA		
LR	27.0476	1.4958*
	(0.9400)	(16.0900)
SR	-0.7618	-0.8787
	(-0.4300)	(-0.6400)

Variables	MG	PMG
ECT		
SR	-0.5977*	-0.3523*
	(-10.1800)	(-6.9700)
Cons.		
SR	2.2896*	1.2487*
	(3.3400)	(6.6700)

Source: Authors' tabulation.

Notes: p<0.01*, p<0.05 **. Figures in the parenthesis denote z-values.

Nore: The findings of the PMG Estimation are presented in this table. Number of observation. = 873; Number of groups = 97; Observations per group: Min. = 9, Avg. = 9.0, Max. = 9; Log Likelihood = -476.1424.

Table 5: Hausman Test Results

	(b)	(B)	(b-B)	Sqrt(diag (V_b-V_B)
	MG	PMG	Difference	S.E
ILL	68.0269	-.0032	68.0301	112.4321
ROA	27.0476	1.4958	25.5517	62.2475
chi2(2)	0.53			
Prob > chi2	0.7656			

Robustness Check

To confirm the above findings the same steps have been repeated only altering the dependent variables i.e., TQ has been used in place of EV/S. In Table 6, the regression estimation results have been reported. The best model, according to the Hausman test (Table 7), is the PMG.

From the figures depicted in Table 6, it is observed that there is a significant adverse impingement of illiquidity on the firm value. Hence, the result that liquidity (illiquidity) of a stock positively (adversely) affects the value of a firm (Tobin's q) is confirmed. It may be observed that one unit downfall in the liquidity will adversely affect Tobin's q by 0.09 in the long haul and -7.86 in the short run. There is a strong affirmative association between ROA and firm value over both the long and short run when Tobin's q has been employed as a surrogate of firm value.

Table 6: MG and PMG Estimation Results

Variables	MG	PMG
ILL		
LR	38.5143	-0.0877*
	(0.5400)	(-7.97)
SR	3.3929	-7.8656**
	(0.3000)	(-2.2900)
ROA		
LR	22.2764	1.6282*
	(1.15)	(12.0500)
SR	6.8107*	5.2295*
	(3.63)	(5.97)
ECT		
SR	-0.7002*	-0.4210
	(-9.16)	(-4.43)
Cons.		
	1.8974*	1.5652*
	(2.3700)	(7.13)

Source: Authors' tabulation.

Notes: p<0.01*, p<0.05 **. Figures in the parenthesis denote z-values.

Nore: The findings of PMG Estimation are presented in this table. Number of Obs. = 873; Number of groups = 97; Obs. per group: Min = 9, Avg. = 9.0, Max = 9; Log Likelihood = -478.9972.

Table 7: Hausman Test Results

	MG	PMG	Difference	S.E.
ILL	38.5143	-.0877	38.6020	70.8107
ROA	22.2764	1.6282	20.6482	19.2953
chi2(2) = 2.43				
Prob>chi2 = 0.2963				

Source: Authors' tabulation.

Notes: p<0.01*, p<0.05 **.

CONCLUSIONS

This study set out to answer the question, "Does liquidity, as measured by Amihud (2002)'s illiquidity, affect both the short- and long-term value of a company?" with ROA serving as the control variable. The firm's value has been calculated using the relative measure, EV/S. During the study period, illiquidity (liquidity) seems to influence firm value adversely as shown by the Panel ARDL Model. By repeating the same analysis using Tobin's Q, another metric for company value, this study verified its findings. This only confirms the results. In order to determine how operational profitability might affect the regression, the present study employed ROA as a control variable. ROA and company value (as measured by EV/S) have a weak association over the short haul, but an affirmative and statistically significant link in the long haul. However, when ROA and Tobin's Q, have been employed you see a significant effect is observed in both the short- and long-term, and ROA boosts the company's value in the long haul.

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