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Stock Liquidity and Firm Value: The Mediating Role of Capital Structure

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Abstract

Despite the substantial volume of research on the direct relationship between stock liquidity and firm value, no agreement has been reached on this nexus. This relationship may be influenced by some other intervening factors which have not been captured in the empirical studies. The present study aims to explore the link between stock liquidity and firm value and empirically tests the mediating role of capital structure on this relationship in the Indian context. Using sample data from 97 National Stock Exchange (NSE) listed top non-financial firms from 2010 to 2019 and adopting the Baron and Kenny approach, the results show that higher stock liquidity leads to a greater firm value. Furthermore, firms with liquid stocks are found to have significantly lower leverage. The results also confirm that capital structure fully mediates the relationship between stock liquidity and firm value. The empirical findings have important managerial implications when it comes to devising policies to maximise firms' value.

Keywords: Stock Liquidity, Firm Value, Capital Structure, Mediating Role, India

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Introduction

The global financial crisis that dates back to the middle of 2007 has highlighted the importance of liquidity for both market participants and regulators, among others (Hull, 2015). The credit crisis has certainly aroused consensus amongst market participants that a drop in, or worse, fading of liquidity can cause adverse effects on asset prices that are not warranted by their fundamentals (Florackis et al., 2014). Market liquidity, a fundamental concept of financial economics, is referred to as the ability of investors to buy or sell their stocks at low transaction costs (Chordia et al., 2008; Jang et al., 2012) without affecting the price significantly (Norvaišienė & Stankevičienė, 2014). Notably, it is an important consideration in trading (Kahuthu, 2017), affecting asset pricing efficiency (Chordia et al., 2008) and is closely tied to investors' required rate on investments (Amihud & Medelson, 1986). Broadly speaking, at a micro level, a liquid market provides interfaces to a varied spectrum of investors with a variety of trading tactics. From a macro perspective, market liquidity is essential for efficient capital allocation, ensuring financial stability, and for the growth and development of the financial market (Debata et al., 2020; Naik & Reddy, 2021). Simply put, it is a pre-requisite for sustainable economic growth and development (Zaremba et al., 2021).

The importance of stock market liquidity is well documented in asset pricing literature. Empirical evidence shows that market liquidity has a significant influence on stock prices (see Acharya & Pederson, 2005; Amihud 2002; Amihud & Mendelson, 1986; Brennan et al., 2012; Datar et al., 1998), and is a key factor in calculating predicted stock returns. For a trader, stock market liquidity is crucial since it influences the size of his returns and, in turn, helps him build effective trading strategies. The substantial association between market liquidity and stock returns has been noted in numerous studies (see Amihud & Mendelson, 1986; Chang et al., 2010; Lam & Tam, 2011; Reza Bradrania et al., 2015). Furthermore, studies (e.g., Reza Bradrania & Peat, 2014; Lee, 2011) have looked into how changes in liquidity levels profoundly influence the decisions made about investments. Also, empirical research (e.g., Li et al., 2012; Nadarajah et al., 2018) shows that market liquidity is of prime importance to business enterprises as it affects their cost of capital and firm value by strengthening their corporate governance systems. Thus far, it is clearly evident how important market liquidity is, especially for devising trading strategies, designing portfolios and forecasting appropriate portfolio returns (Gârleanu, 2009; Rubia & Sanchis-Marco, 2013). Notably, even from an economy's standpoint, stock market liquidity is extremely crucial. Lower liquidity levels, as argued by Ellington (2018), impede economic growth during moments of crisis. Nneji (2015) demonstrates that

market liquidity reflects the market's ability to resist any type of economic crisis or disruption. As such, several researchers (e.g., Naes et al., 2011; Smimou, 2014) consider it to be a useful parameter in predicting the prospects of the economy. Last, but not least, a sufficient quantity of market liquidity also improves the progression of security-specific information among market participants, promoting stock market functionality and stability (see Chordia et al., 2008; Chung et al., 2010; Hodrea, 2015). The presence of liquid markets implies a better level of investor confidence and market efficiency, making the market more resilient.

Maximising shareholder wealth or the value-maximisation principle is widely accepted in both theory and practice (Brealey et al., 2014), thus leaving financial managers with only one task, that is, to increase market value. According to the agency theory, more stock liquidity encourages major shareholders to monitor company management, which leads to managers making business decisions that are in line with the value-maximising principle (Edmans, 2009). Certainly, the block-holders have strong reasons for keeping an eye on the organisation's fundamental value; upon bad news the block-holders have the option to sell their shares, prompting managers to strive for long-term growth instead of just short-run profit (Zhang et al., 2021). Thus, stock liquidity provides a strong governance mechanism, restricting manager opportunism and eventually improving the firm value. According to Fang et al. (2009), stock liquidity provides a better information environment, allowing managers to learn from them and make value-enhancing corporate decisions. Khanna and Sonti (2004) show that stock liquidity can improve the firm market value. They put forward that "informed traders factor managerial behaviour into their trading strategy, trading more aggressively, making the price more informative". Several studies (e.g., Bharath et al., 2013; Cheung et al., 2015; Zhang et al., 2021) find a very similar result to this, that is, stock liquidity increases a company's market value. In sharp contrast, Jietaing et al. (2011) show that firms with less liquid stocks have performed better as compared to the firms holding liquid stocks. Eaton (2015) and Leirvik et al. (2017) found results of a similar nature, demonstrating a substantial inverse link between liquidity and firm value. Drawing on short-termism theory, Fang et al. (2014) and Zhang et al. (2021) argued that higher liquidity can attract more transient institutional investors with short investment horizons and lead to overemphasis on short-term success. Such an effect will induce short-termism pressure and increase managers' ex-ante incentives to conceal unfavourable news. This, in turn, facilitates the exit of transient institutions, thus magnifying the ex-post stock price reactions to bad news releases, eventually decreasing firm value (Chang et al., 2017). It is worth noting that the direct relationship between stock liquidity and

firm value has been studied extensively, but the findings are ambiguous and inconclusive. This relationship may be influenced by some other intervening factors which have not been captured in the empirical studies.

According to Amihud and Mendelson (1986), firms' capital structure choice is crucial in bridging the gap between stock liquidity and firm value. Empirical research has provided strong evidence for the relationship between capital structure and the value of the firm (see Luu 2021; Mai, 2020), supporting static trade-off theory, pecking order theory, and the agency cost theory of capital structure, among others. Stock liquidity, on the other hand, is perceived to be a crucial forerunner of capital structure (see Lipson & Mortal, 2009; Udomsirikul et al., 2011). The trade-off theory asserts that firms having higher liquidity of stocks ought to have lower issuance costs since they have to pay lower fees to investment banks, making equity financing more attractive than debt financing and thus lower leverage of firms (Butler et al., 2005; ElBannan, 2017; Frieder & Martell, 2006). This connection can also be explained by taking reference of pecking-order theory, which hypothesise that debt financing is less information sensitive, while equity financing is perhaps the most sensitive to adverse selection problem; equity investors demand higher risk premium for stocks with lower liquidity (Butler et al., 2005). The lower stock liquidity reflects higher adverse selection and results in less equity and more leverage (Dang et al., 2019). This translates to the view that illiquidity forces a firm to use more leverage and less equity. The increasing usage of debt, as argued by Durand (1952) and Modigliani and Miller (1958), increases the risk to investors, and they penalise the stock by demanding a higher risk premium. The higher rate of return on equity is likely to raise the overall cost of capital and lower the firm value (Diaz et al., 2007). Drawing on these theoretical contentions and empirical evidence, we thus argue that capital structure may mediate the relation between stock liquidity and firm value. Thus far, though the relationships between stock liquidity and firm value, between stock liquidity and capital structure, and between capital structure and firm value have been essential topics in the recent past, the investigation of these relationships has been mainly paused at the stage of direct relationships between stock liquidity, capital structure, and firm value, that is, prior studies have focused primarily on the relationships between two of these three constructs of stock liquidity, capital structure or firm value, respectively. Research concerning the interrelations among stock liquidity, capital structure, and firm value has been scant. In fact, there is still no research examining the mediating role of capital structure on stock liquidity–firm value link.

India has emerged as the fastest growing economy in the world after China with a growth rate of around 8.7% during the Financial Year (FY) 2021-22 (Ara, 2021; Dahal & Das, 2021). Almost 31 years ago, India started its economic liberalisation path, opening its gateways to globalisation and market forces (Sugre, 2018). Since then, India has become an increasingly important part of the global economic landscape (Cagliarini & Baker, 2010), contributing immensely to the increase in trade and economic activity and, consequently, to the growth of the global economy (Krishnan, 2011). The rapidly growing consumer market, improving infrastructure, a large base of youth population, and its large and dynamic industrial sector have made India an increasingly credible investment destination spot for global investors and global organisations alike (Thippeswamy, 2018). The Centre for Economics and Business Research (CEBR) from the United Kingdom has predicted that by the year 2032, the Indian economy would be larger than the heavyweights, Western European countries of Germany, France and the United Kingdom (U.K.) (CEBR, 2022). And, by the year 2035, according to a recent report shared by the Global Investment Bank, India would be the third largest economy in the world, joining the race with the United States (U.S) and China (Babu et al., 2019). India's incredible transformation and meteoric rise, deserving of the global attention that it has commanded. It is worth noting however that stock markets are the backbone of emerging economies, India's National Stock Exchange (NSE) is no exception. NSE is the largest stock exchange in India with a share trading volume of more than US\$1.2 trillion and more than 2000 total listings during the FY 2021-22. As of March 2022, the NSE has accumulated more than \$ 3.29 trillion in total market capitalisation, making it one of the largest stock exchanges in the world.

Therefore, the present study attempts to fill in the gap by exploring both the direct and indirect effects of stock liquidity on firm value in the Indian context. Manifestly, the mediating role of capital structure on the relationship between stock liquidity and firm value is examined by taking a sample from India. In doing so, this study contributes to the extant literature in several ways. First, prior studies (see Amihud & Mendelson, 2008; Du et al., 2016; Pham et al., 2020) have focused primarily on the direct relationship between stock liquidity (illiquidity) and firm value. The present study contributes to the existing stock liquidity literature and the capital structure literature by investigating the mediating role of capital structure on the stock liquidity–firm value relationship, that is, the indirect relationship between the above two constructs. Second, given the importance of the Indian market, there is a dearth of studies on the aforementioned issue in the Indian context. This study advances the extant literature by presenting the first-ever evidence from the Indian perspective. Lastly, unlike prior studies, this study employs a battery of robustness tests including

alternative model specifications (e.g., structured equation modeling and panel data analysis), advanced estimation techniques (e.g., Sobel's test, Delta test, and Monte Carlo test, among others), and sensitivity analysis.

The remainder of the paper is organised as follows: the next section presents the review of relevant literature and the development of hypotheses, followed by conceptualisation. The sample, research variables, and the model specification are presented thereafter, and this is followed by empirical analysis and hypotheses testing results. The next section discusses the results, while the last section concludes the paper including both theoretical and practical implications of the findings and scope for future research.

Literature Review and Hypotheses Development

Stock Liquidity and Firm Value

The theory of corporate finance has been built on the premise that the market value of the firm primarily gets influenced by just two factors: the company's expected after-tax operating cash flows or earnings and the risk involved in generating them (Amihud & Mendelson, 2008). There is an additional potential factor that might affect its value, that is, the liquidity (Amihud & Mendelson, 2012). There are compelling theoretical arguments to believe so. Because stock shares are the currency that can command both cash flow and control rights, the marketability of this currency is crucial to the governance, valuation, and success of businesses (Fang et al., 2009). Stock market liquidity, according to agency-based causative theory, allows investors to engage in large stakes to gain a majority in voting contests. In an effort to profit from price appreciation, investors promote tighter monitoring and control (Li et al., 2012). This monitoring can amplify economic performance and thus the firm value by laying the groundwork for better corporate governance (Maug, 1998; Nguyen et al., 2016). Notably, this relationship between stock market liquidity and firm value can possibly be explained in another way, that is, by using feedback theory. The proponents of this theory argued that liquid stocks attract and facilitate the entry of informed investors, making prices more informative (Marcet, 2017). Their choice to remain or go affects the cash flows of the company. This is especially valuable when there is a wobbly connection between the firm and its stakeholders or there is a lot of uncertainty around the cash flow of ongoing projects (Khanna & Sonti, 2004; Subrahmanyam & Titman, 2001). This is down to the fact that in this situation, positive canyons—where success or good news leads to additional success—will be most beneficial. By virtue of this feedback effect, operational effectiveness increases, and financial constraints are loosened; both these effects can improve economic

performance and thus the value (Agarwal et al., 2015). On the contrary, short-termism theory advocates that higher liquidity may draw institutional investors who have shorter investment horizons and place an excessive emphasis on short-term success (Fang et al., 2014; Zhang et al., 2021). An effect like this would raise managers' ex-ante incentives to hide adverse news and create short-termism pressure. In turn, this makes it easier for transient institutions to exit, which amplifies ex-post stock price responses to adverse news releases and ultimately lowers firm value (Chang et al., 2017). Bhide (1993) and Coffee (1991) propose an alternative explanation—"Activist Exit Theory" to explain this occurrence. In their opinion, high liquidity permits speedy sales of stocks held by large shareholders, who are potential activists. The loss of intervention by these shareholders declines the inside monitoring and thereby the firm value (Huang, Wu, et al., 2013). The pricing-based theory offers an additional explanation for this form of connection between stock liquidity and firm value. This theory postulates stock liquidity can influence firm value through an illiquidity premium or mispricing (Nguyen et al., 2016). When stocks are illiquid, investors require higher additional returns to offset the increased risk of illiquidity they are taking on (Amihud, 2002; Amihud & Mendelson, 1986). The value of the company may be adversely impacted by such risk premium. Furthermore, high liquidity stocks, as argued, allows investors to trade at higher prices (i.e., at a premium) than illiquid ones (Holmström & Tirole, 1993). Such overvaluation of liquid stocks can also affect firm value adversely (Baker & Stein, 2004).

The empirical findings are mixed. For example, Nguyen et al. (2016) show that higher stock liquidity leads to a greater firm value in the Australian Stock Market, supporting pricing-based theories. Du et al. (2016) and Zhang et al. (2017) find evidence of a positive association between stock liquidity and firm value in China. In the same vein, Cheung et al. (2015) finds a positive linkage between stock liquidity and firm value. More recently, taking a cross-sectional dataset including countries like UK, Germany, France, and Italy, Pham et al. (2020) show a positive association between stock liquidity and firm value, and such influence is strengthened in countries with strong investor protection. Taking a sample from Iraq, Ali (2014) find that stock liquidity has a positive effect on firm value. Notably, several other studies (e.g., Dalvi & Baghi, 2014; Fang et al., 2009; Hansen & SungSuk, 2014; Huang, Wu, et al., 2013) document very similar results. On the contrary, Batten and Vo (2019) find an adverse linkage between stock liquidity and firm value which may further be explained by differences in leverage effects and pricing-based theories. Using 1184 companies listed on Shanghai Stock Exchange as the sample data, Jieting et al. (2011) show that firms with less liquid stocks have performed better as compared to the firms

holding liquid stocks. Eaton (2015) and Leirvik et al. (2017) find results of a similar nature, demonstrating a substantial inverse link between liquidity and firm value. While taking Iranian listed companies as sample, Mehdi et al. (2014) find no significant linkage between stock liquidity and firms' economic performance measured by Tobin's Q, Economic Value Added (EVA), and Return on Assets (ROA).

Based on the above facts and figures, we propose,

H₁: Stock liquidity has a positive effect on firm value.

Stock Liquidity and Capital Structure

The research into how stock liquidity and capital structure are related has been by now extensively studied following the seminal work of Modigliani and Miller (1958, 1963). Prior studies suggest that firms with more illiquid stocks are likely to prefer debt over equity financing. In accordance with the notion of static trade-off theories, every enterprise strives to get a debt-to-equity ratio at an optimal level (Adair & Adaskou, 2015; Banerjee, 2015; Newman et al., 2011; Ross et al., 2012) by balancing the net cost of equity and the net cost of debt, which is influenced profoundly by the tax shield (Jarallah et al., 2018; Miller, 1977; Serrasqueiro et al., 2011; Stiglitz, 1969; Thippayana, 2014). Ceteris Paribus, if an element that increases the cost of equity, for instance, a decrease in liquidity, should make debt financing more desirable than equity financing and cause higher leverage of firms (Lipson & Mortal, 2009). Another possible way through which this relationship can be explained is the pecking-order theory. The core of this theory is the idea of asymmetric information, which holds that managers have more knowledge about a company's prospects than investors have (Agyei et al., 2020; Brealey et al., 2014; Brigham & Houston, 2015). This theory postulates firms often rely on potential earnings first, followed by debt funding and then equity financing (Myers & Majluf, 1984). Under the mechanism of asymmetric information, a decrease in market liquidity can perhaps increase the cost of issuing equity, making debt financing an acceptable source of financing rather than equity financing (Andres et al., 2014; Kyle, 1985; Lesmond et al., 2008).

A growing body of empirical research supports the theoretical contentions. For example, Udomsirikul et al. (2011) show an adverse linkage between stock liquidity and capital structure of the firm in Thailand. Using data from Australian companies, Nadarajah et al. (2018) find that firms with high liquidity have significantly lower leverage. More recently, Chen et al. (2020) shows that companies with higher stock market liquidity tend to have lower leverage in China. In the same vein, using Chinese

A-share listed companies as the sample, Zilin et al. (2020) show that higher stock liquidity significantly reduces a firm's excess leverage. Notably, several other studies (e.g., Dang et al., 2019; Frieder & Martell, 2006; Lipson & Mortal, 2009; Nguyen et al., 2021; Rashid & Mehmood., 2017) document a very similar result to this. On the other hand, ElBannan (2017) and Haddad (2012) find stock liquidity has no effect on capital structure choices. Similarly, taking Saudi listed firms as the sample, Abdulla and Ebrahim (2020) document that stock liquidity has an insignificant effect on leverage.

Based on the above facts and figures, we propose,

H₂: Stock liquidity has a negative effect on capital structure represented by debt-equity ratio.

Stock Liquidity and Firm Value: The Mediating Role of Capital Structure

Much controversy has developed since the middle of the last century over whether a firm can affect its market value by changing the mix of its permanent long-term financing (Abdulla & Ebrahim, 2020). The net operating income theory (Durand, 1952) advocates that the value of an enterprise is independent of capital structure. In the world of no taxes and absence of other market imperfections, no matter how the capital structure of a firm is split among debt, equity and other claims; an enterprise value depends primarily on its underlying profitability (Durand, 1952; Modigliani & Miller, 1958) and risk (Modigliani & Miller, 1958). With the use of 'cheaper' debt funds, it becomes increasingly risky; investors penalise the stock by demanding a higher risk premium, increasing the cost of equity (Kruk, 2021). The fact that the cost of debt is lower than the cost of equity is exactly offset by the increase in the required rate of return on equity (Durand, 1952; Modigliani & Miller, 1958). On the other hand, the proponents of traditional theory argue that the firm can initially lower its weighted average cost of capital and raise its total value through the use of financial leverage (Van Horne & Wachowicz, 2015). Although investors raise the required rate of return on equity, the increase in the cost of equity does not entirely offset the benefit of using 'cheaper' debt funds. The implication is that capital structure decision is relevant and there is an optimal capital structure. Several other theories of capital structure, viz. the M-M theory in an economy with taxes (Modigliani & Miller, 1958), the signalling theory (Ross, 1977), the static trade-off theory (Mursalim & Kusuma, 2017), and the pecking order theory (Myers, 1984), among others, also do acknowledge the importance of the role of debt financing in a firm's value. The signalling theory posits that information asymmetry exists between management and investors, and it has an important effect on the optimal capital structure. Ross (1977) argued that an action taken by a firm's management conveys

information (signal or clues) to investors about the profitability and risk of the firm. Management is inclined to issue debt if it believes the existing stock is undervalued and common stock if it believes the stock is overvalued. Investors however are aware of this phenomenon, and they generally regard debt issues as a ‘good signal’ and the issue of common stock as a ‘bad signal’. This signal, in turn, tends to raise or depress the stock price. Disentangling the assumption of no corporate taxes, Modigliani and Miller (1963) argued that the tax code allows a firm to deduct interest payments as an expense, but dividend payments to shareholders are not deductible. When two firms, levered and unlevered, are compared, the former firm will have a higher value for the said differential treatment. On the contrary, the proponents of the trade-off theory argued that there is a certain threshold level of debt below which the probability of bankruptcy is almost zero. Beyond that point, however, bankruptcy-related costs become increasingly important, and they begin to offset the tax shelter benefits of debt. This means that an optimal capital structure exists when the tax benefit from an extra dollar in debt exactly equals the increase in expected financial distress costs (Ross et al., 2013). According to the pecking order theory, there is no optimal capital structure in the long run, but management can decide upon a rational sequence of raising capital to fund their firm’s new investment projects (Gajdka & Szymanski, 2019). Myers (1984) argued that profitable firms have greater internal cash flow; they say no to external financing whenever possible. If the internal funds are insufficient to meet the requirements, they sort for external financing. Equity will be sold pretty much as a last resort; issuing common stocks to raise cash can be expensive (Ross et al., 2013).

The empirical results are mixed. Some studies demonstrate the positive association between capital structure and enterprise value, substantiating traditional theory and signaling theory (see Antwi et al., 2012; Ater, 2017; Draniceanu et al., 2013; Farooq et al., 2016; Ghosh et al., 2000). While others show a negative relationship between the constructs, supporting trade-off and pecking order theories (see Chadha & Sharma, 2015; Luu 2021; Mai, 2020; Pratheepkanth, 2011; Zeitun & Tian, 2007).

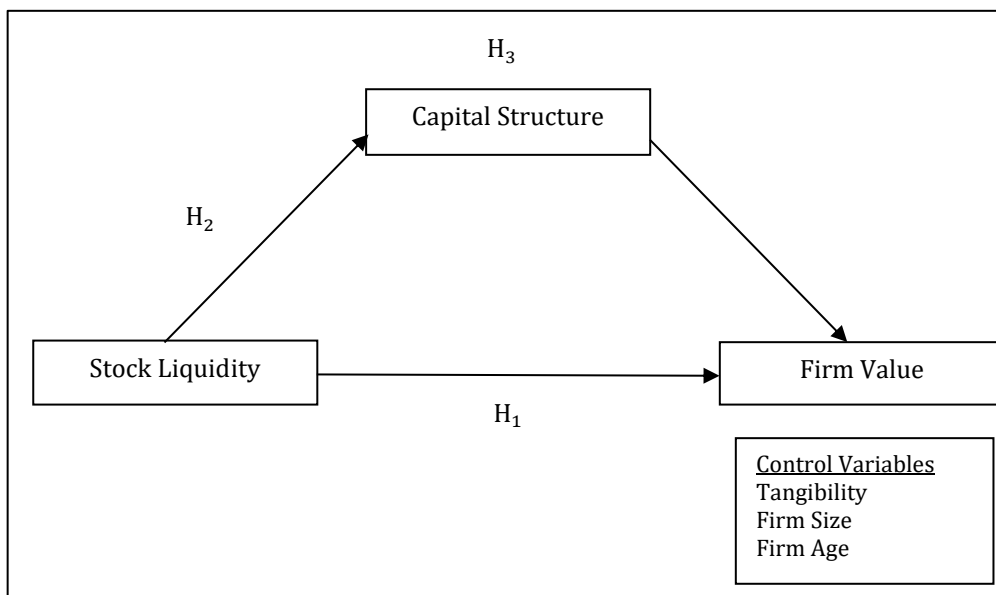
Importantly, firms’ capital structure choice is crucial in bridging the gap between stock liquidity and the firm value (Amihud & Mendelson, 1986). Although empirical studies show quite divergent outcomes toward the direction of impact between the two constructs, viz. capital structure and enterprise value, they unanimously reach an agreement that the firm’s financing choice is relevant, when it comes to value creation. Stock liquidity, on the other hand, is perceived to be a crucial forerunner of

capital structure (see Lesmond et al., 2008; Lipson & Mortal, 2009; Frieder & Martell, 2006; Udomsirikul et al., 2011). As discussed earlier, debt financing is less information sensitive, while equity financing is perhaps the most sensitive to adverse selection problem; equity investors demand a higher risk premium for stocks with lower liquidity (Weston et al., 2005). The lower stock liquidity reflects higher adverse selection and results in less equity and more leverage (Dang et al., 2019). Drawing on these theoretical contentions and empirical evidence, it can be fairly argued that illiquidity forces a firm to use more leverage and less equity. The increasing usage of debt increases the risk to investors, and they penalise the stock by demanding a higher risk premium (Durand 1952; Modigliani & Miller, 1958). The higher rate of return on equity is likely to raise the overall cost of capital and lower the firm value (Diaz et al., 2007).

Therefore, we propose,

H₃: Capital structure negatively and significantly mediates the relation between stock liquidity and firm value.

Figure 1: Proposed Conceptual Model



A conceptual model is a blueprint or roadmap that helps researchers organise, conceptualise, and carry out their research, irrespective of its nature and type (Grant & Osanloo, 2015; Ying et al., 2021). Based on the theoretical perspectives and the empirical evidence, this study proposed an empirical research model, as shown in Figure 1, which has been designed to explore both the direct and indirect effect of

stock liquidity on firm value. More specifically, the proposed model is designed to investigate the mediating role of capital structure on the relationship between stock liquidity and firm value after controlling for the effects of firm-specific variables. This conceptual model includes stock liquidity as an explanatory variable, capital structure as a mediating variable, firm value as a dependent variable, and the control variables are firm-specific factors, viz. tangibility, firm size, and firm age.

Research Design

Data and Research Sample

Drawing on purposive sampling, we select a sample of the top 100 non-financial Indian companies listed in the National Stock Exchange (NSE). This selection is in line with Sen et al. (2021). The reasons are two-fold for such selection: first, the selected are the blue-chip companies; common stocks of these companies are regularly traded at NSE. It is noteworthy that our study is manifestly centered around the construct—stock liquidity, and thus the companies with more visibility and greater activeness in terms of their stock trading would serve the objectives of the study more practically. Second, unlike the majority of previous studies, this selection would reasonably minimise the sectoral biases in our sampling procedure. We exclude a set of three companies from our sample owing to their conflicting year-ending norms. Notably, this study is carried out on uniformly arranged panel data as per financial years. After this filtering, the final sample of 97 non-financial companies is considered. The required data, financial or otherwise of the selected companies have been collected over the time frame 2010 to 2019 from varied secondary sources. In particular, the financial data have been gathered and compiled from the ‘capitaline database’; the non-financial data to build the framework or background of the study is collected from several academic books and articles in top-rated journals.

Research Variables

Dependent Variable(s)

Firm value is the sole dependent variable in this study. Several accounting and market-based metrics, for example, EVA (Behera, 2020), Price-Book Value (see Sudiyatno et al., 2020), Market Value Added (MVA) (see Carini et al., 2017), Long-term Investor Value Appropriation (LIVA) (see Wibbens & Siggelkow, 2019) and Cumulative Abnormal Returns (CARs) (see Zhang et al., 2021), among others, have been used to quantify firm value in earlier researches. Following prior studies (e.g., Almahadin & Oroud, 2020; Doorasamy, 2021; Luu, 2021), we measure firm value by using a widely used market-based metric, Tobin’s Q. Tobin’s Q is defined as the

ratio of the market value of equity plus book value of total debt to book value of total assets at t period (see Jawed & Kotha, 2018).

Predictor and Mediator Variable(s)

Stock liquidity is used as the predictor variable in the present study. But due to its multifaceted nature, stock liquidity is difficult to both define and quantify (Lesmond, 2005). The previous literature has proposed four key tenets of liquidity: tightness, immediacy, depth, and breadth. Given these four tenets, a wide array of liquidity measures has been used in the prior studies; volume or quantity measures and price impact measures, to name a few. Following Dang et al. (2019) and Zhang et al. (2021), this study adapts the illiquidity metrics outlined by Amihud (2002). This is because of three potential reasons: first, Amihud's illiquidity logarithm is a widely accepted measure of stock liquidity; second, it captures both trading volume and price impact in the process of trading; finally, Amihud's illiquidity measure requires only daily trading data and thus overcomes the paucity of international stock transaction information problem (Huang, Wu, et al., 2013). Amihud's (2002) illiquidity indicator is defined as the average ratio of the weekly absolute return to the volume of that week. This measure gives the absolute (percentage) price change per rupee of weekly trading volume or the weekly price impact of the order flow. It is noteworthy however that Amihud's (2002) illiquidity metrics is the reciprocal of stock liquidity (i.e., inverse measure of stock liquidity), thus we multiply by -1 to measure the stock liquidity (see Zhang et al., 2021). The modified Amihud's illiquidity metric is outlined as follows:

$$\text{Stock Liquidity } (LIQ_{iy}) = - \frac{1}{W_{iy}} \sum_{y=1}^{W_{iy}} \frac{|R_{iyw}|}{WVOLRS_{iyw}}$$

where W_{iy} is the number of weeks for which data are available for stock i in year y ; R_{iyw} is the return on stock i in week w of year y ; $WVOLRS_{iyw}$ is the weekly volume of stock i in week w of year y in Indian rupees.

Note: To get a meaningful result of stock liquidity, the above figure is multiplied by 10^7 .

Capital structure is the mediating variable in this study. Following prior literature (e.g., ElBannan, 2017; Udomsirikul et al., 2011), we measure capital structure using book leverage, which is defined as the ratio of total book debt to total assets of firm i over t period. Total book debt is simply total assets less book value of equity, where the book value of equity is total assets less preferred stock plus deferred taxes and debt.

Table 1: Operationalisation of Variables

Variables	Coding	Definition and Measurement	Source
<i>Dependent Variable(s):</i> (a) Firm Value	TQ	We measure firm value by using Tobin's Q. $TQ = \frac{\text{Market value of equity} + \text{Book value of total debts}}{\text{Book value of total assets}}$	Almahadin and Oroud (2020); Doorasamy (2021); Luu (2021);
<i>Predictor and Mediator Variable(s):</i> (a) Stock Liquidity	LIQ	We measure stock liquidity by using Amihud's illiquidity metrics. It is noteworthy however that Amihud's (2002) illiquidity metrics is the reciprocal of stock liquidity (i.e., inverse measure of stock liquidity), thus we multiply by -1 to measure the stock liquidity (see Zhang et al., 2021). $\text{Stock Liquidity (LIQ)}_{iy} = -\frac{1}{W_{iy}} \sum_{y=1}^{W_{iy}} \frac{ R_{iyw} }{WVOLRS_{iyw}}$ where W_{iy} is the number of weeks for which data are available for stock i in year y ; R_{iyw} is the return on stock i in week w of year y ; $WVOLRS_{iyw}$ is the weekly volume of stock i in week w of year y in Indian rupees. Capital structure is proxied by book leverage.	Amihud (2002) Zhang et al. (2021)
(b) Capital Structure (Mediator)	BLEV	$\text{BLEV} = \frac{\text{Total book debt}}{\text{Total assets}}$	ElBannan (2017)
<i>Control Variable(s):</i> (a) Tangibility	TAN	$\text{TAN} = \frac{\text{Net PPE}}{\text{Book value of total assets}}$	Dang et al. (2019)
(b) Firm Size	FS	We gauge firm size by the natural logarithm of the book value of total assets.	Jawed and Kotha, (2018); Zhang et al. (2021)
(c) Firm Age	FAGE	Firm age is measured by the number of years since its date of incorporation.	Jawed and Kotha, (2018); Zhang et al. (2021)

Control Variable(s)

Following prior studies (e.g., Dang et al., 2019; Jawed & Kotha, 2018; Zhang et al., 2021), a set of firm-specific variables, namely asset tangibility, firm size, and firm age, has been employed as control variables in the present study. Asset tangibility is defined as the ratio of net PPE to the book value of total assets. Firm size is computed by the natural logarithm of the book value of total assets. The third control variable, firm age is measured by the number of years since its date of incorporation. The definition and construction details for each variable are provided in Table 1.

Methods

Following Mostafa and Kasamani (2020), Saeidi et al. (2015), and Shahzad et al. (2021), we test the mediating effect of capital structure on the relationship between stock liquidity and firm value by employing the four-step approach outlined by Baron and Kenny (1986). This approach is perhaps the most extensively used method to evidence mediation till-date (Pardo & Roman, 2013). According to Baron and Kenny (1986), to establish mediation, the following three conditions must be met (Preacher & Hayes, 2004; Salhi et al., 2019; Shahzad et al., 2021): First, the predictor variable must significantly predict the outcome variable in the first equation. Second, the predictor variable must significantly predict the mediator in the second equation. Finally, the mediator must significantly predict the outcome variable controlling for the effect of the explanatory variable in the third equation. If all of these criteria hold good in the predicted direction, then the effect of the predictor variable on the outcome variable must be less in the third equation than in the first. Simply put, to establish that mediator completely mediates the concerned link, the effect of the predictor variable on the outcome variable controlling for the mediator in the third equation should be zero.

Drawing on the Baron and Kenny (1986) approach, the following three econometric models have been developed to test our hypotheses.

Model (1) captures the direct impact of stock liquidity on firm value controlling for tangibility, firm size, and firm age. More specifically, to test the hypothesis H_1 this model is used. In this model, the dependent variable is the firm value measured by using the proxy Tobin's Q. The concerned explanatory variable in the model is stock liquidity, and the firm-specific variables, viz. tangibility, firm size, and firm age, are taken as control variables. We expect the coefficient on stock liquidity to be positive.

$$TQ_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 TAN_{it} + \beta_3 FS_{it} + \beta_4 FAGE_{it} + \varepsilon_{it} \quad \text{Model (1)}$$

Model (2) examines the impact of stock liquidity on capital structure controlling for tangibility, firm size, and firm age. More specifically, to test the hypothesis H₂ this model is used. In this model, the dependent variable is capital structure measured by using the proxy book-leverage. The concerned explanatory variable in the model is stock liquidity, and the firm-specific variables, viz. tangibility, firm size, and firm age, are taken as control variables. We expect the coefficient on stock liquidity to be negative.

$$BLEV_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 TAN_{it} + \beta_3 FS_{it} + \beta_4 FAGE_{it} + \varepsilon_{it} \quad \text{Model (2)}$$

Model (3) shows the effect of the intermediate variable, capital structure on firm value controlling for stock liquidity, tangibility, firm size, and firm age. More specifically, to test the hypothesis H₃ this model is used. In this model, the dependent variable is firm value measured by using the proxy Tobin's Q. The explanatory variable(s) in the model is stock liquidity and capital structure, and the firm-specific variables, viz. tangibility, firm size, and firm age, are taken as control variables. We expect capital structure negatively and significantly mediates the relation between stock liquidity and firm value.

$$TQ_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 BLEV_{it} + \beta_3 TAN_{it} + \beta_4 FS_{it} + \beta_5 FAGE_{it} + \varepsilon_{it} \quad \text{Model (3)}$$

where TQ = Tobin's Q; LIQ = Stock Liquidity; BLEV = Book Leverage; TAN = Tangibility; FS = Firm Size; FAGE = Firm Age; ε = Error term; The definition and construction details for each variable are provided in Table 1.

The econometric models, viz. model (1), model (2), and model (3) have been estimated by applying ordinary least square (OLS) regression technique (see Baron & Kenny, 1986). Unlike other estimate techniques, OLS method, as argued by Gujarati and Porter (2009), has a unique property of 'Best Linear Unbiased Estimator' (BLUE). Moreover, this method possesses "consistency, unbiased, minimal variance, efficiency estimates" (Fagbemi et al., 2022).

Empirical Results

Descriptive Statistics

Table 2 presents the summary statistics of the dependent and explanatory variables employed in our models. There is a total of 970 firm-year observations for each variable. The mean value of TQ is 3.57 with a minimum of 0.36 and a maximum

of 32.67. The average LIQ is -6.56, which is significantly lower than Dang *et al.* (2019) observed for emerging countries (-4.30). Considering BLEV, the mean value is 0.24 (varies from 0.00 to 0.78), which is slightly lower than the figure published by Dang *et al.* (2019) for emerging countries (0.26). TAN has a range between 0.01 and 1.02 with a mean value of 0.40. The FS average is 8.53. This figure is slightly higher than that reported in Jawed and Kotha (2018). The FAGE varies from 2.00 to 116.00 with a mean value of 46.07, indicating that the selected firms in the sample are fairly old and well established (see Mukherjee & Sen, 2022). Table 2 further shows the skewness and kurtosis values for all employed variables. The statistics show that skewness and kurtosis values for variables are within the threshold ranges of ± 0.5 and ± 3.00 , respectively. This suggests that the variables, viz. TQ, LIQ, BLEV, TAN, FS, and FAGE, maintains normal, symmetrical spreads together with normally distributed curves.

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
TQ	970	3.57	3.97	0.36	32.67	0.48	2.47
LIQ	970	-6.56	62.60	-1573.21	3.95e-09	-0.50	2.51
BLEV	970	0.24	0.20	0.00	0.78	0.43	2.37
TAN	970	0.40	0.21	0.01	1.02	0.45	2.41
FS	970	8.53	1.54	5.32	12.98	0.38	2.32
FAGE	970	46.07	23.25	2.00	116.00	0.46	2.43

Note: This table shows the summary statistics of the employed variables. TQ is Tobin's Q; LIQ is Stock Liquidity; BLEV represents Book Leverage; TAN represents Tangibility; FS is Firm Size; FAGE represents Firm Age. The operationalisation of variables is provided in Table 1.

Panel Unit-root Test

We applied both first generation and second-generation panel unit-root tests in order to look at whether our data series are stationary at level. More specifically, following Khan *et al.* (2021) and Paul and Mitra (2018), initially, we applied Levin-Lin-Chu (LLC) test (Levin *et al.*, 2002) –a conventional approach; thereafter, we adopted the Pesaran test (Pesaran, 2007)—a second-generation approach to panel unit root testing getting inspired by Koç and Şenol (2020). The results of these tests are reported in Table 3. The LLC test results show that all employed variables are stationary at their levels at the 1% level of significance. It is noteworthy that very similar results to that of LLC test are displayed by the Pesaran test. The empirical results suggest that the employed variables have no unit root. More importantly, to validate these results obtained from the adopted panel unit-root tests, viz. LLC test

and Pesaran test, we employ a more robust panel unit-root test within the framework of second generation approach— the Pesaran’s CIPS test. We run the Pesaran CIPS test using two deterministic: first, with constant, and second, with both constant and trend. The maximum and BG lags used in the models are not more than three. As expected, the results of the test with constant as well as with both constant and trend deterministic substantiate the results of the earlier two adopted panel unit-root tests. This re-affirms that our employed variables have no unit root.

Table 3: Estimation Results for Panel Unit-Root Tests

Variable	First	Second	Second	Second
	Generation	Generation	Generation	Generation
	LLC test	Pesaran test	Pesaran (CIPS test (Constant))	Pesaran CIPS test (Constant + Trend)
	Adj. t-statistics	t-bar	CIPS	CIPS
TQ	-22.27*	-1.94**	-2.16**	-2.89**
LIQ	-3.6e+02*	-3.62*	-3.81*	-3.84*
BLEV	-1.7e+04*	-2.15*	-2.15**	-2.78**
TAN	-59.73*	-2.33*	-2.14**	-2.77**
FS	-9.87*	-2.44*	-2.59**	-2.87**
FAGE	-40.52*	-2.58*	-2.16**	-2.70**

Notes: 1. *, ** and *** denote significance levels $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

2. This table shows the results for panel unit-root tests. TQ is Tobin’s Q; LIQ is Stock Liquidity; BLEV represents Book Leverage; TAN represents Tangibility; FS is Firm Size; FAGE represents Firm Age. The operationalisation of variables is provided in Table 1.

Correlation Analysis

Table 4 summarises the results of the Pearson correlation analysis. The results show that stock liquidity and firm age are significantly positively correlated with firm value measured by Tobin’s Q, while capital structure and firm size appear to be significantly negatively correlated. The results also show that stock liquidity is significantly positively correlated with firm size, whereas capital structure and tangibility are negatively correlated with stock liquidity at the 1% level of significance. Moreover, capital structure, as measured by book leverage is significantly positively correlated with tangibility and firm size.

Table 4 also shows that each pair of predictors has a correlation coefficient of less than 0.80 (see Gujarati, 1995), suggesting that there is no multicollinearity issue in our dataset. To validate this result, we re-check the multicollinearity issue by their Variance Inflation Factor (VIF). The VIFs for all the employed explanatory variables

ranges from 1.01 to 1.15, which is within the acceptable threshold of 10 (see Hair et al., 1995). This re-affirms that our dataset is free of multicollinearity problem.

Table 4: Correlation Matrix

Variable	TQ	LIQ	BLEV	TAN	FS	FAGE	VIF
TQ	1.00						
LIQ	0.06**	1.00					1.05
BLEV	-0.43*	-0.11*	1.00				1.15
TAN	-0.05	-0.09*	0.32*	1.00			1.13
FS	-0.19*	0.17*	0.12*	-0.09*	1.00		1.07
FAGE	0.07**	0.05	-0.03	-0.05	0.05	1.00	1.01

Notes: 1. *, ** and *** denote significance levels $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

2. This table shows the Pearson correlation matrix. TQ is Tobin's Q; LIQ is Stock Liquidity; BLEV represents Book Leverage; TAN represents Tangibility; FS is Firm Size; FAGE represents Firm Age. The operationalisation of variables is provided in Table 1.

Mediation Analysis – Hypothesis Testing

Table 5 presents the results of OLS regressions for baseline models. Following Baron and Kenny (1986) approach of mediation analysis, the results for model (1) show that stock liquidity maintains a significant and positive relationship with value of the firm measured by Tobin's Q ($\beta = 0.01$; $p < 0.01$). This result supports our Hypothesis 1. Controlling certain firm-specific variables, the results for model (2) show a significant and negative association between stock liquidity and capital structure of the firm ($\beta = -0.01$; $p < 0.01$). The empirical results offer strong support to our Hypothesis 2. Analysing the mediation effect of capital structure in model (3), the regression results show that the relationship between capital structure and value of the firm is negative and significant ($\beta = -8.43$; $p < 0.01$). Interestingly, in presence of the mediator—capital structure, the coefficient on stock liquidity turns out to be insignificant ($\beta = 0.01$; $p > 0.05$) from a significant relationship as reported in model (1), exhibiting existence of complete mediation (see Baron & Kenny, 1986). Therefore, Hypothesis 3 is also supported.

Table 5 also shows the results of OLS diagnostic tests, namely Durbin and Watson (1950, 1951) test for autocorrelation, Breusch and Pagan (1979) test for heteroscedasticity, Pesaran's (2007) CD-test for cross-sectional dependence, and Shapiro and Wilk (1965) test for Normality (i.e., normality of the distribution of the error term). The results show that these test statistics are within the desired/accepted range. This suggests that our data set satisfies the fundamental premises of OLS regression and that the reported estimates do not suffer from biasness or inaccuracy.

Table 5: Estimation Results of OLS Regressions

Variables	Dependent Variables		
	TQ Model (1)	BLEV Model (2)	TQ Model (3)
LIQ	0.01* (0.01)	-0.01* (0.00)	0.01 (0.00)
BLEV			-8.43* (0.60)
TAN	-1.05 (0.61)	0.32* (0.03)	1.63* (0.58)
FS	-0.55* (0.08)	0.02* (0.01)	-0.37* (0.08)
FAGE	0.02** (0.01)	0.01 (0.01)	0.01** (0.00)
Constant	8.22* (0.80)	-0.07 (0.04)	7.61* (0.73)
R ²	0.06	0.13	0.22
R ² Change			0.16
F-Stat.	13.75*	37.19*	53.27*
Durbin-Watson (d) Statistics	2.01	2.19	2.28
Breusch-Pagan Test	2.33	4.67	6.12
Pesaran CD-Test Statistics	1.47	1.98	1.65
Shapiro-Wilk Test Statistics (W)	0.92	0.85	0.23
No. of Obs.	970	970	970

Notes: 1. *, ** and *** denote significance levels $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

2. This table shows the results of OLS regressions for baseline models. TQ is Tobin's Q; LIQ is Stock Liquidity; BLEV represents Book Leverage; TAN represents Tangibility; FS is Firm Size; FAGE represents Firm Age. The operationalisation of variables is provided in Table 1. Model (1) and Model (2) examine direct effects, while Model (3) investigates indirect effect. Standard errors are reported in parentheses. Chi-square values are reported for Breusch-Pagan Test.

Robustness Check

Alternative Model Specification

We perform a battery of robustness tests to ensure the consistency of the mediating effects of capital structure on the association between stock liquidity and firm value. Following Hossain et al. (2016) and Salhi et al. (2019), at the outset, we use the Structural Equation Modeling (SEM) to substantiate our findings. The SEM

analysis is arguably the second most effective method for evaluating mediation effects (Hoyle & Smith, 1994; Li, 2011; Saeidi et al., 2015). The SEM analysis incorporates both path and factor analyses, yielding a hybrid equation with several components for each variable (Garson, 2007). The estimation results of SEM and the decomposition of effects into total, direct and indirect are shown in Table 6 and Table 7, respectively.

The results show that stock liquidity, in the absence of the mediator maintains a significant and positive association with enterprise value ($\beta = 0.01$; $p < 0.01$). This result echoes the findings of our baseline model (1) reported in Table 5. The analysis of the effect of stock liquidity on capital structure of the firm shows that liquidity holds a significant and negative relationship with capital structure ($\beta = -0.01$; $p < 0.01$). This result also corroborates the findings of our baseline model (2). Interestingly, with capital structure as the mediator, the effects of stock liquidity on firm value decreased from $\beta = 0.01$ ($p < 0.01$) to $\beta = 0.0028$ ($p > 0.05$), re-affirming the existence of full mediation.

Table 6: Estimation Results of SEM: A Recursive Model

Paths	Expected Sign	Unstandardised Coefficients	Standardised Coefficients	OIM Std. Err.	Z	$p > z $
<i>BLEV</i> ←						
LIQ	-	-0.01	-0.11	0.00	-3.46	0.00*
TAN	+	0.32	0.32	0.03	10.70	0.00*
FS	+	0.02	0.16	0.01	5.39	0.00*
FAGE	+	-0.00	-0.02	0.00	-0.50	0.62
Constant	N.A.	-0.07	-0.35	0.04	-1.82	0.07
<i>TQ</i> ←						
BLEV	-	-8.43	-0.43	0.59	-14.19	0.00*
LIQ	+	0.01	0.04	0.00	1.49	0.136
TAN	+	1.63	0.09	0.58	2.81	0.00*
FS	+	-0.37	-0.14	0.08	-4.91	0.00*
FAGE	+	0.01	0.06	0.00	2.18	0.03**
Constant	N.A.	7.61	1.91	0.73	10.42	0.00*
Log likelihood	-13803.405					
R ²	0.17					

Paths	Expected Sign	Unstandardised Coefficients	Standardised Coefficients	OIM Std. Err.	Z	$p > z $
<i>Goodness-of-fit indices:</i>						
Chi-sq.	375.72**					
	(Low)					
RMSEA	0.06					
	(< 0.08)					
CFI	0.96					
	(> 0.90)					
TLI	0.94					
	(> 0.90)					
SRMR	0.07					
	(< 0.08)					
No. of Obs.	970					

Notes: 1. *, ** and *** denote significance levels $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

2. This table shows the SEM results of a recursive model. TQ is Tobin's Q; LIQ is Stock Liquidity; BLEV represents Book Leverage; TAN represents Tangibility; FS is Firm Size; FAGE represents Firm Age. The operationalisation of variables is provided in Table 1. BLEV and TQ are endogenous variables, while LIQ, FS, and FAGE are exogenous variables in the model. Estimation is done using the maximum likelihood method with observed information matrix. Threshold limit values are reported in parentheses (see Ying et al., 2021; Peterson et al., 2020; Xia & Yang, 2019; Hooper et al., 2008).

Table 7: Decomposition of Effects into Total, Direct and Indirect

Paths	Direct effects	Indirect effects	Total effects
<i>TQ ←</i>			
LIQ	0.01 (0.00)	0.01* (0.00)	0.01* (0.00)
TAN	1.63* (0.58)	-2.68* (0.31)	-1.05** (0.60)
FS	-0.37* (0.08)	-0.18* (0.04)	-0.55* (0.08)
FAGE	0.01** (0.00)	0.01 (0.00)	0.01** (0.00)

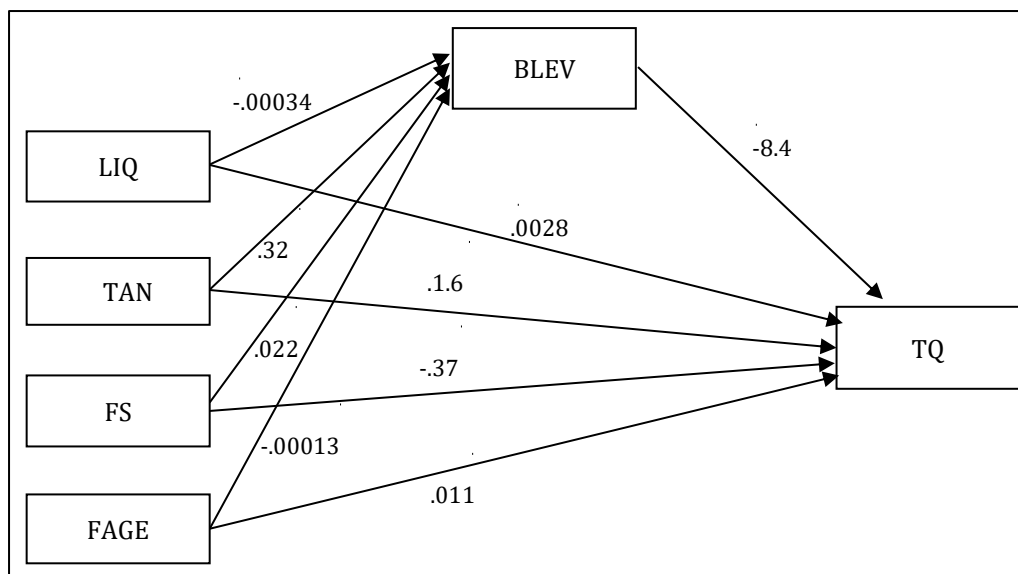
Notes: 1. *, ** and *** denote significance levels $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

2. This table shows the decomposition of effects into total, direct and indirect. TQ is Tobin's Q; LIQ is Stock Liquidity; BLEV represents Book Leverage; TAN represents Tangibility; FS is Firm Size; FAGE represents Firm Age. The operationalisation of variables is provided in Table 1. Standard errors are reported in parentheses.

Table 6 also shows the summary of the model fitness estimates. The performance of the derived model has been examined and validated using recommended goodness of fit indexes such as chi-square, root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), and standardised root mean square residual (SRMR) (see Hossain et al., 2016; Saeidi et al., 2015; Salhi et al., 2019; Ting et al., 2021; Wang, 2018). The results show that the actual values (chi-square, RMSEA, CFI, TLI, and SRMR) sufficiently fulfilled the expected requirements, suggesting that the model is appropriate and fits.

Next, we ensured the robustness of our findings reported in Table 5 by using fixed-effect regression technique under the panel data approach. Technically speaking, unobserved firm characteristics may correlate with the explanatory variables and thus may result in omitted variable bias—one of the potential sources of endogeneity (Hermalin & Weisbach, 2003). It is also possible that our baseline model(s) faces such a problem in parameter estimation. Because the OLS estimators in certain cases yield biased and inconsistent results (Arora & Sharma, 2016). Thus, to respond to this omitted variable bias, in line with prior empirical research (e.g., Arora & Sharma, 2016; Ayalew, 2021; Mukherjee & Sen, 2022), fixed-effect regression technique is employed, and the baseline models are re-estimated. The results of Hausman test (reported in Table 9) support the choice of FEM over an alternative REM. The results of fixed-effect regression models are reported in Table 9. It is noteworthy that once again the results corroborate the findings of our baseline models reported in Table 5.

Figure 2: Path Diagram



To sum up, the estimation results of SEM analysis and panel data analysis are qualitatively and quantitatively similar to those previously reported in Table 5. The path diagram model is shown in Figure 2.

Different Mediation Tests

Further, to check the validity, consistency and reliability of our main findings reported in Table 5, we carried out a number of mediation tests of indirect effect, viz. Sobel's test, Delta test, and Monte Carlo test, following prior studies (e.g., Shahzad et al., 2021; Tofighi & MacKinnon, 2015; Ying et al., 2021). Table 8 shows the results of those mediation tests. Consistently, the empirical results for mediation tests, namely Sobel's test (z-statistic = -3.37; $p < 0.01$), Delta test (z-statistic = -3.37; $p < 0.01$), and Monte Carlo test (z-statistic = -3.23; $p < 0.01$) offer strong evidence that capital structure is a significant mediator in the stock liquidity and value of the firm nexus.

Table 8: Mediation Tests of Indirect Effect

Tests		Path: TQ \leftarrow BLEV \leftarrow ILL	
	Z-Statistics	Indirect effect	Type of Mediation
Sobel	-3.37*	Supported	Full/Complete
Delta	-3.37*	Supported	Full/Complete
Monte Carlo	-3.23*	Supported	Full/Complete

Notes: 1. *, ** and *** denote significance levels $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

2. This table shows different mediation tests of indirect effect. TQ is Tobin's Q; LIQ is Stock Liquidity; BLEV represents Book Leverage; TAN represents Tangibility; FS is Firm Size; FAGE represents Firm Age. The operationalisation of variables is provided in Table 1.

Sensitivity Analysis

Additional robustness tests have been carried out to ensure the consistency of the mediating effects of capital structure on the association between stock liquidity and firm value. In particular, sensitivity analysis is performed with alternative measure and controlling for additional variable. In this section, initially, we re-estimate our baseline models (2) and (3) by using market leverage, an alternative proxy for the capital structure (see ElBannan, 2017; Ting et al., 2021; Udomsirikul et al., 2011). The market leverage is calculated employing the ratio of book debt to the market value of assets. The results are presented in Table 9 and appear to be largely consistent with the findings from the estimations of the baseline models shown in Table 5. Finally, we re-estimate our baseline models (1) - (3) controlling further the effects of corporate image. Corporate image is taken as the ratio of market price to book value of assets, where market price is represented by market capitalisation (Chandra, 2017).

Table 9: Robustness Check: Estimation Results of Regression Models

Variables	Fixed-effect Regression Model				OLS Regression Model (with alternative measure)				OLS Regression Model (controlling for additional variable)			
	TQ Model (4)	BLEV Model (5)	TQ Model (6)	TQ Model (7)	MLEV Model (8)	TQ Model (9)	TQ Model (10)	BLEV Model (11)	TQ Model (12)			
LIQ	0.02* (0.01)	-0.01* (0.00)	0.02 (0.00)	0.01* (0.01)	-0.01* (0.00)	0.01 (0.00)	0.01* (0.01)	-0.01* (0.00)	0.01 (0.00)			
BLEV			-5.63* (0.61)						-8.43* (0.60)			
MLEV						-12.93* (0.85)						
TAN	-0.08 (0.58)	0.08* (0.03)	0.37** (0.56)	-1.05 (0.61)	0.20* (0.02)	1.60* (0.57)	-1.05 (0.61)	0.32* (0.03)	1.63* (0.58)			
FS	-9.36e-06** (4.19e-06)	9.29e-08** (2.24e-07)	-8.83e-06** (4.00e-06)	-0.55* (0.08)	0.02* (0.00)	-0.34* (0.08)	-0.55* (0.08)	0.02* (0.00)	-0.37* (0.08)			
FAGE	0.18* (0.01)	0.02 (0.00)	0.12* (0.02)	0.02** (0.01)	0.00 (0.00)	0.01* (0.00)	0.12** (0.01)	-0.00 (0.00)	0.01** (0.00)			
CIM								-9.88e-06 (0.00)	-0.01 (0.00)			
Constant	-4.52* (0.93)	0.74** (0.05)	-0.35 (0.49)	8.22* (0.80)	-0.11* (0.03)	6.83* (0.73)	8.21* (0.81)	-0.07 (0.04)	6.83* (0.73)			
R ² :within	0.10	0.15	0.18									
:between	0.05	0.02	0.07									
:overall	0.07	0.06	0.09	0.06	0.14	0.24	0.05	0.13	0.22			
R ² Change			0.02			0.18			0.17			
F-Stat.	24.11*	38.54*	38.51*	13.75*	37.46*	60.43*	10.99*	29.90*	44.37*			
Hausman Test	44.94*	132.08*	121.47*									
Durbin-Watson (d) Statistics				2.03	2.15	2.24	2.01	2.11	2.23			

Variables	Fixed-effect Regression Model				OLS Regression Model (with alternative measure)				OLS Regression Model (controlling for additional variable)			
	TQ	BLEV	TQ	TQ	TQ	MLEV	TQ	TQ	TQ	BLEV	TQ	TQ
	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)	Model (12)			
Breusch-Pagan Test												
Pesaran CD-Test												
Statistics Shapiro-Wilk Test												
Statistics (W)												
No. of Obs.	970	970	970	970	970	970	970	970	970	970	970	970

Notes: 1. *, ** and *** denote significance levels $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

2. This table shows the results of FE regressions for the models (4) - (6), OLS regressions for the models (7) - (9), and OLS regressions for the models (10) - (12). The models are constructed as follows:

$$\text{Model (4): } TQ_{it} = \alpha_1 + \beta_2 LIQ_{it} + \beta_3 TAN_{it} + \beta_4 FS_{it} + \beta_5 FAGE_{it} + \mu_{it};$$

$$\text{Model (5): } BLEV_{it} = \alpha_1 + \beta_2 LIQ_{it} + \beta_3 TAN_{it} + \beta_4 FS_{it} + \beta_5 FAGE_{it} + \mu_{it};$$

$$\text{Model (6): } TQ_{it} = \alpha_1 + \beta_2 LIQ_{it} + \beta_3 BLEV_{it} + \beta_4 TAN_{it} + \beta_5 FS_{it} + \beta_5 FAGE_{it} + \mu_{it};$$

$$\text{Model (7): } TQ_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 TAN_{it} + \beta_3 FS_{it} + \beta_4 FAGE_{it} + \epsilon_{it};$$

$$\text{Model (8): } MLEV_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 TAN_{it} + \beta_3 FS_{it} + \beta_4 FAGE_{it} + \epsilon_{it};$$

$$\text{Model (9): } TQ_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 MLEV_{it} + \beta_3 TAN_{it} + \beta_4 FS_{it} + \beta_5 FAGE_{it} + \epsilon_{it};$$

$$\text{Model (10): } TQ_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 TAN_{it} + \beta_3 FS_{it} + \beta_4 FAGE_{it} + \beta_5 CIM_{it} + \epsilon_{it};$$

$$\text{Model (11): } BLEV_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 TAN_{it} + \beta_3 FS_{it} + \beta_4 FAGE_{it} + \beta_5 CIM_{it} + \epsilon_{it};$$

$$\text{Model (12): } TQ_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 BLEV_{it} + \beta_3 TAN_{it} + \beta_4 FS_{it} + \beta_5 FAGE_{it} + \beta_6 CIM_{it} + \epsilon_{it};$$

where, TQ is Tobin's Q; LIQ is Stock Liquidity; BLEV represents Book Leverage; MLEV represents Market Leverage; TAN represents Tangibility; FS is Firm Size; FAGE represents Firm Age; CIM represents Corporate Image. The operationalisation of variables is provided in Table 1. Models (4), (5), (7), (8), (10) and (11) examine direct effects, while Models (6), (9), and (12) investigate indirect effect. Standard errors are reported in parenthesis. Chi-Square value is reported for Hausman test and Breusch-Pagan Test.

Table 9 also presents the estimation results of OLS regressions controlling for corporate image. The results appear to be the mirror image of the findings reported in Table 5. Therefore, our results are robust.

Discussion

The present study examined the mediating effect of capital structure on the relationship between stock liquidity and firm value. The empirical findings strongly support all our hypotheses. More distinctively, the results for model (1) show that stock liquidity maintains a significant and positive relationship with firm value measured by Tobin's Q, indicating that firms with more liquid stocks are likely to generate more market value; stock illiquidity poses a serious threat to the firms' market value. This result is consistent with the findings of Jawed and Kotha (2018), Nguyen and Dinh Vu (2017), and Zhang et al. (2021). The agency theory suggests that higher stock liquidity tend to enhance large shareholders' monitoring of firm management; effective monitoring reduces the possibility of management opportunism, improving the governance mechanism and thus the firm value. Amihud and Mendelson (2008), on the other hand, argued that improvement in stock liquidity reduces the discount rate or cost of capital, which in turn enhance the firms' value. As expected, the results for model (2) show a significant and negative association between stock liquidity and capital structure of the firm, suggesting that firms with more liquid stocks tend to employ lower proportion of debts in their capital structure. This result is in line with pecking order theory and research by Dang et al. (2019) and Udomsirikul et al. (2011), but contradicts the findings of Abdulla and Ebrahim (2020) who observe that stock liquidity has an insignificant association with capital structure. The pecking order theory suggests that debt financing is much less information-sensitive, while equity financing is the most sensitive to adverse selection problem. As such, equity investors require a higher risk premium. Indeed, lower liquidity implies higher adverse selection and it possibly ends up with less equity and more leverage (Dang et al., 2019). To put simply, higher stock liquidity lowers the costs of equity, making equity more attractive than debt (Udomsirikul et al., 2011). The empirical results also show that capital structure negatively and significantly mediates (fully) the relation between stock liquidity and enterprise value. This suggests that stock liquidity in conjunction with lower leverage improves corporate value, ensuring its long-term sustainability and existence.

Conclusion

The relationship between stock liquidity and firm value is more complicated than the central premise in the literature. Strictly speaking, prior research has not paid

enough attention to the indirect influence of the capital structure on the stock liquidity-firm value relationship. This study attempts to explore the link between stock liquidity and firm value and empirically tests the mediating role of capital structure on this relationship. Focusing on the Indian stock market, data is collected from leading 97 non-financial companies listed on NSE using purposive sampling technique for the time period 2010 to 2019. Adopting the approach recommended by Baron and Kenny (1986), the results show that stock liquidity measured by modified Amihud's (2002) illiquidity metric (see Zhang et al., 2021) is positively related to enterprise value, while stock liquidity appears to have a significant and negative association with capital structure. The results also show that capital structure fully mediates the relationship between stock liquidity and firm value. The empirical findings are in line with prior studies, supporting pecking-order theory of capital structure.

Our study offers several theoretical and managerial implications. Theoretically, this study enriches the extant literature by providing new evidence of both direct and indirect effects of stock liquidity on firm value. We contend and confirm that capital structure mediates the effect of stock liquidity (illiquidity) on firm value. The relation between stock liquidity (illiquidity) and firm value showed in our study is more convoluted than the straightforward—direct relationship as widely assumed in the previous research. Consistent with earlier studies, our empirical results support pecking order theory and agency theory, advancing the literature of capital structure and firm value. Besides the above, our study has some managerial implications. First, our empirical findings would aid corporate managers to realise the importance of capital structure. In line with Jensen (1986) and Lesmond et al. (2008), our findings indicate that illiquidity of stock causes a firm's capital structure to rely too heavily on debt, which raises the cost of information asymmetry for stocks and, in turn, lowers firm value (Huynh et al., 2020). A reduction in agency cost helps to increase firm value by reducing the cost of capital (Byun et al., 2008; Skaife et al., 2004). Consequently, managers should make every effort to keep debt within a certain range because a capital structure that is overly dependent on debt reflects stock illiquidity and increased information asymmetry, both of which degrade firm value. Second, this study could be of great assistance to stock analysts when it comes to guide the investors on investment decisions (common stocks). Finally, the present study can be a valuable information source for the potential investors when it comes to evaluating the underlying risk and investment attractiveness of common stocks. More specifically, when making investment-related decisions (common stocks), investors should give due importance to the debt-equity mix besides stock liquidity so that the

management's factual capacity to increase firm value can be determined and funds are allocated to the appropriate stocks.

Besides the aforementioned implications, this study paves the way for further research that could expand this domain. First, the research scholars and academics, among others, could extend this work to other nations for comparison. Second, employing more observations, such as small and mid-cap organisations, would allow for additional study in this area. Third, academicians and scholars could extend this research by increasing the firm-year observations or by considering other proxies of stock liquidity and capital structure or by including a few more control variables. Lastly, it would be interesting to see the moderating role of corporate governance on the market liquidity- value link in the context of emerging economies.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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