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THE RELATIONSHIP BETWEEN STOCK LIQUIDITY AND STOCK RETURNS

(EVIDENCE FROM THE PAKISTAN STOCK EXCHANGE)

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ABSTRACT

The purpose of the proposed study is to find out the association between the stock liquidity and stock returns within the Pakistan Stock Exchange, focusing on firms in the textile sector and utilizing a quantitative research approach. The study examines secondary data from 41 listed firms from January 1, 2014, to June 26, 2024. This study espouses a panel data tactic to explore the influences of skewness and kurtosis of stock returns, stock price, firm size, and stock return volatility on stock liquidity. The turnover ratio, projected by Datar et al. (1998), is employed as a degree of liquidity owed to its efficiency and data availability. Stock returns are restrained by kurtosis and skewness to apprehension the distributional features of returns. The consequences signify a noteworthy association among stock returns and stock liquidity. Indeed, stocks with higher skewness and kurtosis of returns incline to parade increased liquidity, reflecting a predilection for stocks with hypothetically higher returns and extreme return designs. A negative connexion between stock price and liquidity proposes that higher-priced stocks have lower liquidity, likely due to reduced availability for trading. Conversely, larger firms display higher liquidity, accredited to their greater

market existence and investor sureness. Moreover, lower volatility in stock returns associates with higher liquidity, prominence the constancy within the segment. This research highpoints a profounder and stronger considerate for investors, portfolio managers, risk managers, and policymakers. Investors can leverage this knowledge to construct well-diversified portfolios that balance risk and return. Portfolio managers can optimize investment strategies by allocating capital to assets with desired liquidity characteristics. Risk managers can develop robust frameworks to capture potential price fluctuations, while financial institutions can accurately price financial securities. Policymakers can formulate regulations to enhance market liquidity and stability. Overall, this research directs to a deeper understanding of the dynamics between stock returns and liquidity in an emerging market context, offering practical implications for enhancing financial decision-making and market efficiency.

Keywords: *Stock Price, Liquidity, Stock Returns.*

INTRODUCTION

The stock market enables the fund's transfer from creditors to debtors, drives investment, and flourish economic growth (Rose & Marquis, 2008Precisely, it will command investors to divide a part of the firm's profitability. The variation of price indices positively drives the confidence of individual and potential investors impacting the overall economy. As, stock indices sharpens, public commitment in the economy also enhances, forwarding to an increased number of investors in the market. The Pakistani Stock Exchange (PSX), a major player in South Asia's financial landscape, serves as a vital platform for capital mobilization. It facilitates investment opportunities for individuals and institutions, boasting over 1.8 million active investor accounts as of December 2023. However, the relationship between stock liquidity and returns within the PSX remains an under-explored territory compared to developed markets. This gap in knowledge hinders the development of efficient investment strategies, effective risk management practices, and accurate pricing of financial securities in Pakistan.

Stock liquidity is defined as buying and selling security of security rapidly

without any significant impact on price and without incurring high transaction costs (Balasemi et al., 2015). Stock liquidity is a very crucial factor for all stakeholders. In addition, market volatility can be measured by one of the most important variable counts as stock liquidity. Moreover, It is also known as a foundation of an efficient financial market. It promotes for efficient price determination, lower transaction costs, and stabilized market (Amihud et al., 2005).

Specifically, the prevalence of liquidity for investors, incorportaes their profit-oriented strategy. Liquidity is positively associated with stock return (Amihud & Mendelson, 1986) (Bradrania & Peat, 2014) (Brennan & Subrahmanyam, 1996) (Chang et al., 2010) and will definitely be a consideration for investors in throwing rational decision (Bradrania & Peat, 2014) (Cao & Petrasek, 2014). Stock return can be defined as a probability distribution of a stock's price changes over a specific period. It encompasses not only the average return but also the risk associated with an investment. For the purposes of risk reduction, portfolio rationalisation, and appraisal pricing, the universal distribution of stock returns is crucial. The skewness and kurtosis of the gains rallocation can be used to gauge its direction. The distribution's skewness quantifies the relative likelihood of both positive and negative benefits. Kurtosis, which shows the likelihood of stock price fluctuations, analyses the trend of the distribution's tails (Ivanovski et al., 2015) Amihud (1982),

In the context of Pakistan, the Pakistan Stock Exchange is a key component of the country's financial market, playing a crucial role in capital formation and economic growth. Understanding the relationship between stock liquidity and the distribution of returns in the PSX is of great importance for investors, portfolio managers, and policymakers. This study investigates the relationship between stock liquidity and stock returns (as measured by skewness and kurtosis) for 41 textile firms listed on the Pakistan Stock Exchange between January 2014 and June 2024.

1.1Research Gap

Literature streams show that a huge portion of studies on stock market liquidity and returns are conducted in most of the developed countries while the gap exists in developing countries specifically in Asia region.Therefore, the proposed research gap highlights the need to investigate the relationship between stock liquidity and returns in the PSX, focusing on the specific

characteristics and dynamics of the Pakistani market. This study aims to examine the relationship between the liquidity of a stock and the returns of Companies listed on the Pakistan Stock Exchange.

1.2Significance of the Study

Considerate the rapport between liquidity and stock returns is vital for numerous investors inside the Pakistani financial system. Investors can customized this information to construct well-diversified portfolios that balance risk and return budding. Portfolio managers can exploit it to enhance their speculation strategies by assigning capital to assets with the anticipated liquidity and return features. Risk managers can hire it to develop vigorous agendas that sufficiently seizure the latent for price variations related with numerous investment choices. Lastly, financial institutions can employ this data to exactly price financial derivatives like options and futures, which are sensitive to both liquidity and return distribution. Additionally, policymakers can utilize this knowledge to develop effective regulations and policies aimed at enhancing market liquidity and stability.

Research Problem

The correlation between liquidity and stock performance is crucial. The relationship between liquidity and stock returns in developed markets has been the subject of numerous research. A fundamental connection was made by Amihud (1982), who showed that less liquid equities usually have greater expected returns to make up for the risk of illiquidity. According to Amihud et al. (2005), liquidity forecasts future profits. Furthermore, Baker and Stein (2004) demonstrate that stock returns and liquidity are positively correlated. Likewise, Chordia et al. (2001) discovered a favourable correlation between illiquidity premiums and return volatility, highlighting the inherent risk associated with less liquid assets (Chordia, Roll, & Subrahmanyam, 2008). These findings suggest that investors in developed markets demand a premium for holding fewer liquid stocks, reflecting the potential for higher transaction costs and difficulty in exiting positions when desired. Therefore, there is a need for a thorough empirical study to recheck the existing relationship between these variables. This is aimed to fill this gap.

Research Objectives

The main objectives of this study are as follows:

1. To examine the relationship between stock liquidity and stock returns (measured by kurtosis and skewness) in the Pakistan Stock Exchange.

2. To investigate the impact of stock returns volatility on the liquidity of stock in the Pakistan Stock Exchange.
3. To investigate the impact of the size of the firm on the liquidity of stock in the Pakistan Stock Exchange.
4. To evaluate the impact of the stock price on liquidity of stock in the Pakistan Stock Exchange.

1.5 Research Questions

To achieve the above objectives, the study will address the following research questions:

1. Is there a significant relationship between stock liquidity and stock returns in the Pakistan Stock Exchange?
2. Does Stock returns volatility affect the stock liquidity in the Pakistan Stock Exchange?
3. Does firm size affect the stock liquidity in the Pakistan Stock Exchange?
4. Does Stock price affect the stock liquidity in the Pakistan Stock Exchange?

LITERATURE REVIEW

2.1 Theoretical Framework

Empirical studies have also supported the liquidity premium theory. For example, Wati and Utama (2024) concluded in a study that stock price volatility (STDV) has a considerable negative impact on firm value, signaling that increase in stock price volatility increases investment risk and declines investor's behavior. Febrianti & Saadah (2023) conducted a study on international markets. They utilized the Amihud measurement as a liquidity measure to explore the impact of liquidity on stock returns across G7 countries and found a positive correlation between liquidity and stock returns. This underscores the significance of liquidity in shaping stock return dynamics on an international scale. Xie et al. (2022) have established a theoretical link between stock price, share volume, and stock return with stock liquidity and found a positive association with stock liquidity through the inventory channel. Meidiaswati & Arif (2022) also noted a positive effect of liquidity on stock returns in the miscellaneous industrial sector on the Indonesia Stock Exchange.

Daryaei & Fattahi (2021) further emphasized that companies tend to improve stock liquidity to enhance returns and company value. Zhang et al. (2021) examined the relationship between liquidity, stock returns, and

investor risk aversion, particularly focusing on the variance risk premium. Their findings help to understand how investor behavior and risk preferences interact with liquidity to shape stock market outcomes. Studies by Sethy and Tripathy (2024) suggest that higher return volatility tends to reduce stock liquidity. Supporting that (Budhathoki et al, 2024) conducted a study in which results highlighted that trading volume, a proxy of liquidity, affecting stock returns positively in Nepalese commercial banks. Furthermore, asset growth and return on assets show a weakly favorable link with stock returns in Nepal. Similarly, when taking into account the international financial liquidity element, Lee (2011) and Liu (2006) found that liquidity had a positive and significant impact on the predicted return. According to Papavassiliou's (2013) research on liquidity pricing in the Greek stock market, shocks occur because liquidity has a big impact on portfolio diversification. According to V. Maurice and Stephen (2015), the average cross-sectional stock return variation before and after removing noise from the closing price caused by microstructure is captured by systematic liquidity risk. Illiquidity shocks and return and volatility in many markets and assets are significantly correlated (Andrikopoulos, Timotheos, & Vasiliki, 2014).

Additively, Naik & Reddy (2021) emphasized the role of institutional ownership in determining a positive relationship between liquidity and stock returns. Additionally, they pointed out that liquidity influences expected returns by determining the relationship between expected returns and volatility. Nugroho & Pristiana (2021) also highlighted the importance of liquidity in determining stock prices, noting a positive relationship between excess returns and liquidity.

In the other dimension, Gushendri and Yunita(2024) commented a negative and significant relationship between stock liquidity and company size, profitability, leverage, growth, inflation, and dividend policy among non-financial firms listed on the IDX30.Moreover, Assagaf & Kartikasari (2019) highlighted that liquidity significantly moderates the relationship between profitability and stock returns. Abdullahi & Fakunmoju (2019) linked market liquidity and macroeconomic factors with stock returns, emphasizing the importance of liquidity in this relationship. Sitorus et al. (2019) explored the connection between company size growth, stock liquidity, and stock returns, emphasizing the role of mispricing. Stere-czak (2017) discussed different forms of illiquidity risk and their impact on stock returns. Additionally,

Isshaq & Faff (2016) showed the positive impact of stock liquidity risk on the earnings-return relationship. Singh et al. (2015) found a correlation between stock market liquidity and firm performance. Tripathy & Ahluwalia (2015) discussed the positive relationship between a stock's uncertainty elasticity of liquidity and its expected return. Batten & Vo (2014) noted a strong seasonal component in the liquidity-stock return association, revealing a positive relationship in January.

Moreover, Kilonzo and Nkuru(2024) accentuated a notable contact of liquidity on the share returns of the agricultural firms whie it a profound negative interaction of profitability on share returns in this sector. Emerging markets have lower stock liquidity, compared to developed economies (D, Lesmond, 2005). However, the negative link between liquidity and returns is not established in these emerging markets. Rouwenhorst (1999) suggested that returns in emerging markets cannot be explained by liquidity. A study by Amihud and Levi (2022) suggested that stocks with illiquidity tend to offer potentially higher stock returns. This implies that some of the expected excess return on stock might be a reward for dealing with its less liquid nature. Interestingly, Amihud's research found that both anticipated and unanticipated illiquidity mattered in the past. However, Harris and Amato (2019) argued that only unexpected illiquidity seems to be linked to overall market movements. Furthermore, they criticize Amihud's methods for measuring liquidity, suggesting simpler alternatives might be equally effective.

Wang et al. (2021) examined the relationship between liquidity and return distribution, focusing on firms listed on the London Stock Exchange between 2002-2018. Their study contributes to understanding how liquidity influences the distribution of returns in the stock market. (Wang, A., 2021) suggests that stocks with high asymmetry are less liquid. Wang's (2021) investigation into the empirical relationship between return distribution and liquidity also revealed a negative impact of kurtosis on a stock's liquidity. Loukil et al. (2010) also examined the return-liquidity relationship and found evidence of a substantial positive premium for companies with low trading frequency and a strong price effect. This research also suggests that investors value stocks with lower spreads. The relationship between stock returns and potential execution delays is non-linear. Finally, Loukil et al. (2010) highlighted the need for a premium to compensate for historical cumulative liquidity risks,

which include the impact of high prices, low turnover, and the potential for significant execution delays.

2.2 Conceptual Framework

The constructed model has theoretically and practically evidenced in previous studies interconnecting stock liquidity to market and firm oriented variables. Kurtosis and Skewness indicate risks and return un-uniformity which may determine the relation between investor's behaviour and market collinearity by linking liquidity(Wang and Yadav, 1995) (Bali et al, 2011) (Bekaert et al, 2011) (Asmussen, 2022) (Benuzzi and Ploner, 2024) recommended mathematically proof of interrelation of the selected variables. In the other dimension, (Fama and French, 1993) (Chordia et al, 2001) (Karanasos et al, 2022) emphasized that size of the firm has positive relation with liquidity of the firm because firm with a huge capital may attract the number of investors and which can make the market highly efficient for the potential investors.

Return volatility as another independent variable in the proposed model presents uncertainity and declining trend in trade volume of any stock, therefore negative relation with liquidity of the stock liquidity (Pastor & Stambaugh, 2003; Chordia et al., 2001) (Uremadu and Efobi) (2012). Collectively, these factors provide a robust foundation for modeling liquidity as a function of stock-specific statistical and financial attributes.

The conceptual framework used in this study is described as follows:

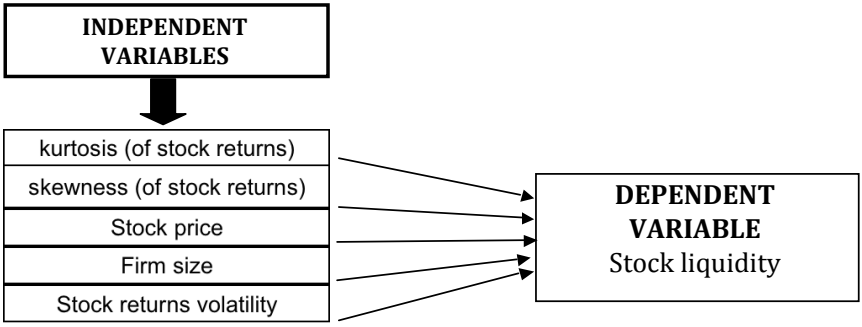

Figure 01- Conceptual Framework

2.3 Hypotheses Development

1. Stock Liquidity and Skewness:

H_1: There is a significant impact of Skewness of stock returns on the

liquidity of stock.

2. **Stock Liquidity and Kurtosis:**
   H_2: There is a significant impact of Kurtosis of stock returns on the liquidity of stock.
3. **Stock Liquidity and Price:**
   H_3: There is a significant impact of the price of the stock on the liquidity of the stock.
4. **Stock Liquidity and Size of Firm:**
   H_4: There is a significant impact of the size of the firm on the liquidity of stock.
5. **Stock Liquidity and Stock Returns Volatility:**
   H_5: There is a significant impact of Stock returns volatility on the liquidity of stock.

RESEARCH METHODOLOGY

3.1. Data Profile

The study uses a quantitative research approach. The sample of this study includes 41 listed firms on the Pakistan Stock Exchange. These firms belong to the textile sector. This study uses daily data on closing value and the trading volume series of each firm from January 01, 2014, to June 26, 2024. These secondary data have been collected from the database of scstrade.com. The study employs a panel data analysis to estimate the relationship between stock liquidity and stock returns in the PSX and regression analysis has been conducted to examine the relationship between stock liquidity and stock returns.

3.2 Measurement of Stock Liquidity

Stock liquidity is a complex variable due to its various interpretations and the inability to directly measure it. In previous studies, researchers have used different proxies to measure liquidity. This study utilizes the trading volume turnover ratio, proposed by Datar et al. (1998) as a liquidity measure. This method has been employed in previous research (Aitken & Forde, 2003; Barinov, 2014; Prommin et al., 2014). The turnover ratio's advantage lies in its use of readily available data, unlike other methods that require data that is unavailable in the Pakistani market for extended periods (bid-ask data, transaction/quote details). Additionally, the turnover ratio surpasses other techniques (Roll 1984, LOT, Amihud 2002, Effective Tick Spread) in its strong correlation with actual stock liquidity. Therefore, considering both

data accessibility and effectiveness in capturing liquidity, the turnover ratio by Datar et al. (1998) is a suitable choice for this study. The formula and calculation method for the turnover ratio are as follows,

$$\textbf{Turnover rate} = \frac{\textit{No of shares traded}}{\textit{No of outstanding shares}}$$

3.3 Measurement of Stock Returns

In this study, stock returns are measured by kurtosis and skewness to capture the distributional characteristics of returns. Stock returns will be calculated by taking the log difference of the daily closing price of stock. The following equation can be used to find the stock returns.

$$\textbf{Stock return} = \ln(P_n) - \ln(P_{n-1})$$

Where P_n represents the current closing price of the given stock and P_{n-1} represents the previous day's closing price of the given stock.

3.3.1 Skewness and Kurtosis of Returns

Skewness quantifies the asymmetry of the distribution, with negative skewness indicating a higher probability of positive returns and positive skewness indicating a higher probability of negative returns. Following Hutson et al. (2008), the traditional test for the skewness of returns on a financial asset, *i*, is calculated using the following formula.

$$\text{Skewness} = \frac{E\,(x_t^i - x^i)^3}{\sigma_i^3}$$

Where x_t^i is the return on investment *i* at time *t*, and σ_i is the standard deviation.

Kurtosis measures the shape of the tails of the distribution, with higher kurtosis indicating a higher probability of extreme values. Following Ivanovski et al. (2015) Kurtosis is calculated using the following formula,

$$\text{Excess Kurtosis} = \frac{E\,(x_t^i - x^i)^4}{\sigma_i^4} - 3$$

Where x_t^i is the return on investment *i* at time *t*, and σ_i is the standard deviation.

3.4. Stock Prices

Stock price and liquidity are organised, with indication from several studies supportive this association. Wang et al. (2020) accentuate that an upsurge in stock price data gratified can augment stock liquidity, leading to amended interior novelty inducements within initiatives. Additionally, Lisdawati et al. (2022) established that liquidity ratios have a noteworthy influence on stock prices, additional underpinning the joining between stock price and liquidity. In supposition, the communal indication from these studies ropes the concept that stock price arrangements effect liquidity stages, which in shot can influence stock returns. The stock price variable cast-off in this study is the final price of apiece stock.

3.5. Stock Returns Volatility

The stock returns volatility represents variation in stock returns from their mean. It plays a significant role in influencing stock liquidity. Studies by Sethy and Tripathy (2024) suggest that higher return volatility tends to reduce stock liquidity. Moreover, the study by Viratama et al. (2022) found that stock returns volatility has a positive effect on stock liquidity in the Indonesia Stock Exchange. This implies that as stock returns become more volatile, there is an increase in stock liquidity.

Statistically, it is calculated by the standard deviation of stock returns. The formula for the standard deviation of stock returns is given by,

$$\sigma_{i,t} = \frac{\Sigma\left(x_t^i - \overline{x^i}\right)^2}{N}$$

Where x_t^i is the return on investment *i* at time *t*, and *N* is the total number of observations in the population.

3.6. Size of Firm

Market capitalization is a significant metric for measuring the size of a firm due to its unique characteristics and implications. Other metrics like total assets, sales, and earnings are commonly used to measure firm size. In various studies, market capitalization is widely utilized as a proxy for firm size because it stands out as the only market-based metric (Roosmawarni et al., 2023). Moreover, market capitalization is price-sensitive and reflects a firm's intrinsic value in an efficient capital market, making it an important measure that adjusts according to market conditions. The selection of

market capitalization as a measure of firm size is further reinforced by its relationship with stock returns and the growth potential of firms based on economies of scale (Hsieh et al., 2012). Larger firms with higher market capitalization typically have greater access to capital markets for external financing, indicating a relationship between firm size and financial leverage (Oliveira et al., 2006).

Moreover, market capitalization has been associated with identifying stock market bubbles and the impact of external factors such as the COVID-19 outbreak on stock market performance (Kumar et al., 2021) (Mizuno et al., 2019). In conclusion, market capitalization serves as a valuable proxy for measuring the size of a firm due to its market-driven nature, price sensitivity, and implications for financial performance, capital structure decisions, and access to capital markets.

Statistically size of the firm is calculated as the natural logarithm of the market capitalization.

$$\text{Size of firm} = \ln(M_{i,t})$$

Where $M_{i,t}$ is market capitalization for stock *i* at time *t*, which is calculated as the number of shares traded multiplied by the daily closing price of the stock

3.7 Empirical Model

Based on the discussion given above, the empirical model of this study is given as under.

$$L_{i,t} = \alpha + \beta_1(SK_{i,t}) + +\beta_2(KR_{i,t}) + \beta_3(P_{i,t}) + \beta_4(S_{i,t}) + \beta_5(SD_{i,t}) + \varepsilon$$

Where $L_{i,t}$ denotes liquidity for stock *i* at time *t*, which is the dependent variable and is measured as the trading volume turnover ratio. $SK_{i,t}$ which is skewness of stock *i* at time *t*. $KR_{i,t}$ is the return kurtosis of stock *i* at time *t*. $P_{i,t}$ denotes price which is the natural logarithm of the daily closing price of stock *i*. $S_{i,t}$ denotes the size of the firm which is the natural logarithm of the market capitalization of stock *i* at time *t*. $SD_{i,t}$ is the stock returns volatility at time *t*, which is calculated as the standard deviation of daily returns and ε ε is the random error in the model.

Table I- Variables and their measurement

Variables Name	Symbol	Measurement	Reference
Stock liquidity	*L*	Trading volume turnover ratio	Datar et al. (1998)
Skewness of returns	*SK*	Cross-sectional skewness of return series of each day.	Hutson et al. (2008)
Kurtosis of returns	*KR*	Coefficient of kurtosis of return series of each day	Ivanovski et al. (2015)
Stock Price	*P*	Natural logarithm of the daily closing price of each stock	(Sitorus & Elinarty, 2017) (H. Wang et al., 2020) (Lisdawati et al., 2022)
Size of firm	*S*	Natural logarithm of the market capitalization of each stock where market capitalization is calculated as the number of shares traded multiplied by the share price	(Roosmawarni et al., 2023) (Hsieh et al., 2012) (Kumar et al., 2021) (Mizuno et al., 2019)
Stock returns volatility	*SD*	Cross-sectional standard deviation of daily returns	(Sethy & Tripathy, 2024) (Viratama et al., 2022)

Source: Authors' Desk

DATA ANALYSIS AND FINDINGS

In this part of our study, the relationship between stock liquidity and stock returns is addressed empirically. For this purpose, some pre-diagnostics on the data have been performed. This includes the presentation of descriptive statistics such as averages and standard deviation which help find any outlier in the dataset so that it can be addressed accordingly. The pre-diagnostics also include exploring the variance inflation factor among various variables to avoid the probability of spurious results. It is recommended to have no strong or perfect correlation between the two variables in the dataset. Another important test is the unit root test for the panel data statistics in the last part of the pre-diagnostic. For this purpose, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, are suitable panel data unit root tests for an unbalanced panel.

The pooled OLS is used to check whether it is appropriate for estimates using the Bruesh-Pagan test. If the data is not suitable for Pooled OLS estimates, the fixed and random effect models are employed using the Hausman specification test that provides the best of Fixed or Random Effect Models. Once the selection of pooled, fixed, or random effect model is done, the robustness of

the model is tested by checking if the estimates are serially correlated with the error terms and if they are heteroscedastic. After considering all aspects of robust estimates, the relationship between stock liquidity and stock returns is explored. The impact of different variables on the stock liquidity of the sample companies is described by using the suitable panel data model.

4.1Descriptive Statistics

The empirical strategy, first, involves the selection of a sample of companies according to the availability of data. Unbalanced panel data is used for a sample of 41 textile companies over 10 years. More specifically, for the period from January 01, 2014, to June 26, 2024. The selection of 41 textile companies is based on the availability of data from several sources. The sample companies are listed in Appendix 1. The descriptive statistics of the variables used are presented in Table II below:

Table II- Descriptive statistics of variables

Variables	Obs	Mean	Std. Dev.	Min	Max
Stock liquidity	70295	94539.176	184217.72	0	999610
Kurtosis of returns	75555	2.076	3.304	-1.346	32.55
Cross-sectional skewness of returns	75555	0.265	1.09	-5.387	5.574
Price	75702	78.409	175.934	0.39	2104.28
Size of firm	75702	2976355.2	10490210	0	3.335e+08
Cross-sectional SD	75702	0.048	0.028	0.019	0.837

Table-II shows that just stock liquidity has a large standard deviation value. In general, there is no universal benchmark to determine whether a standard deviation is high or low, as the context and the nature of the variable under consideration matter. A high or low standard deviation is relative to the specific dataset and the research context. However, comparing the standard deviation with the mean and standard deviation can help in better understanding the data. One possible reason for a large amount of standard deviation could be the presence of an outlier. Descriptive statistics allow us to move for calculating the correlation matrices.

4.2Multicollinearity Detection

The multicollinearity test in panel data analysis verifies if there is a high correlation among two or more independent variables in a panel regression model. This high correlation can lead to issues in estimating the model

coefficients accurately, as it becomes difficult to disentangle the individual effects of the correlated variables on the dependent variable. The presence of multicollinearity can, thus, result in unstable parameter estimates and reduce the reliability of the model. Therefore, it is crucial to detect multicollinearity in panel data analysis to ensure the validity and reliability of the model's results. Identifying multicollinearity allows researchers to address the issue by either removing or combining the highly correlated variables or by applying statistical techniques like ridge regression or principal component analysis, which can handle multicollinearity. Multicollinearity is identified by using collinearity diagnostics such as the Variance Inflation Factor (VIF), tolerance, and condition number. These diagnostic tools help identify potential multicollinearity issues among the independent variables and provide a basis for making informed decisions on the inclusion or exclusion of variables in the model. Table III shows the results of the multicollinearity test.

Table III- Collinearity Diagnostics

Variables	VIF	Tolerance
Kurtosis of returns	1.42	0.7066
Cross-sectional skewness of returns	1.16	0.8643
Price	1.00	0.9986
Size of firm	1.00	0.9986
Cross-sectional SD	1.34	0.7437

Mean VIF = 1.18
Condition Number = 5.5699
Det (correlation matrix) =0.6523

With Table III, the following interpretation can be extracted:

4.2.1 Variance Inflation Factor (VIF): VIF measures the inflation in the variance of the coefficient estimates due to multicollinearity. A VIF value greater than 5 is often considered an indication of multicollinearity and in such cases, the variable is not included in the model (Salmerón, García, & García, 2018). In the output, all the VIF values are below 5, with the highest being 1.42 for kurtosis of returns. The mean VIF is 1.18, suggesting that multicollinearity is well below the benchmark.

4.2.2 Tolerance: Tolerance is the inverse of VIF and represents the proportion of the variance of the independent variable that is not explained by the other variables in the model. Lower values of tolerance (below 0.1 or 0.2) indicate potential multicollinearity issues (O'Brien, 2007; Salmerón et

al., 2018). In the output, all tolerance values are above 0.1, suggesting that multicollinearity is not a severe problem.

4.2.3 Condition Number: The condition number is a summary statistic that measures the sensitivity of the regression model to small changes in the data. A condition number above 30 is often considered a sign of severe multicollinearity (Salmerón et al., 2018). In the output, the condition number is 5.5699, which indicates that multicollinearity is not a significant concern.

Overall, the collinearity diagnostics suggest that multicollinearity is not a major issue in this regression model, and the parameter estimates are likely to be stable and reliable.

4.3 The Unit Root Test

One of the uses of the Unit root test is to find whether the series under consideration is stationary or has a unit root. For a model to be non-spurious, the variables must be stationary (Marmol, 1995, 1996; Noriega & Ventosa-Santaulària, 2007). Since fundamentals are macroeconomic variables and subject to random fluctuations characterized by the presence of a stochastic trend that can influence the statistical behavior of estimators, the first step in estimating Parameters of the fundamentals calls for determining the order of integration of the different series. Among the appropriate unit root tests, we used the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, using Fisher transformations at lag 0 for variables. Table-IV summarizes the results of the stationarity test for the panel.

Table IV- Panel Unit Root Test Results

Variables	ADF-Fisher lags(0)		PP-Fisher lags(0)	
	Z-Statistics	Prob.*	Z-Statistics	Prob.*
Stock liquidity	-52.0016	0.0000***	-52.0016	0.0000***
Kurtosis of returns	-52.0311	0.0000***	-52.0311	0.0000***
Cross-sectional skewness of returns	-52.0311	0.0000***	-52.0311	0.0000***
Price	-1.5783	0.0572**	-1.5783	0.0572**
Size of firm	-51.9583	0.0000***	-51.9583	0.0000***
Cross-sectional SD	-52.0311	0.0000***	-52.0311	0.0000***

The VIF and Tolerance values for the independent variables indicate minimal to no multicollinearity issues in the regression model. Specifically, the variables “Kurtosis of returns” and “Stock returns volatility” have VIF

values of 1.42 and 1.34, respectively, suggesting low to moderate correlations with other predictors but within acceptable limits. Tolerance values for all variables are close to 1 (ranging from 0.7066 to 0.9986), indicating that each variable contributes largely unique variance to the model without being excessively influenced by multicollinearity. These findings support the reliability of interpreting the effects of "Cross-sectional skewness of returns," "Price," "Size of the firm," and the other variables on the dependent variable, ensuring robust and accurate regression results.

4.4VCE Robust Regression Analysis

Considering the results of unit root tests, we move towards estimating the relationship between the variables. The methodology used is panel data regression, combining cross-section data with time series. Results are reported for pooled ordinary least squares (OLS), fixed effect, and random effect estimates. The analysis focuses on the estimate of Pooled OLS by Breusch and Pagan Lagrangian multiplier test for random effects, which identifies whether the Pooled OLS regression is suitable for the estimate or whether we should move to the selection of fixed or random effect models. The null hypothesis of no panel effect is rejected (p-value in both samples is <5%), showing that pooled OLS is unsuitable. This allows us to conclude whether the model of fixed effect is more appropriate than the OLS model with stacked data; by the Hausman test (random effect vs fixed effect), which assesses whether there are unobserved effects that do not vary in time and are correlated with explanatory variables.

VCE robust regression is a statistical technique that ensures more reliable results in regression analysis. Regular regression assumes constant variance in the data, but VCE robust is less sensitive to this assumption (heteroscedasticity) and others, providing more accurate standard errors for the coefficient estimates. This translates to more trustworthy confidence intervals and strengthens the overall conclusions drawn from the analysis.

Table V- Results for pooled OLS, fixed effects, random effects, and VCE robust regression adjustment models

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects	(4) VCE Robust
Kurtosis of returns	-1,119***	-1,119***	-1,119***	-1,119***
	(161.6)	(161.5)	(161.6)	(314.1)

Cross-sectional skewness of returns	4,987***	4,991***	4,987***	4,987***
	(440.4)	(440.2)	(440.4)	(970.3)
Price	-48.17***	-46.24***	-48.17***	-48.17
	(6.157)	(6.215)	(6.157)	(33.44)
Size of firm	0.0103***	0.0103***	0.0103***	0.0103***
	(5.96e-05)	(5.97e-05)	(5.96e-05)	(0.00210)
Cross-Sectional SD	-44,296**	-44,558**	-44,296**	-44,296
	(21,300)	(21,293)	(21,300)	(38,780)
Constant	63,537***	68,423***	63,537***	63,537***
	(8,664)	(1,131)	(8,664)	(11,389)
Observations	70,155	70,155	70,155	70,155
R-squared		0.301		
Number of company	41	41	41	41
chibar2(01)	4.924e+06		4.905	
Prob > chibar2	0		0.297	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The result of the above analysis shows that all the independent variables (cross-sectional skewness, kurtosis, price, size, and cross-sectional standard deviation) have a statistically significant relationship with stock liquidity at the 1% level of significance (denoted by ***). The Positive coefficients of kurtosis and cross-sectional skewness of returns suggest that stocks with skewed data distributions (more data points towards positive returns) and higher kurtosis (fatter tails) tend to be more liquid. The positive coefficient of size suggests that larger firms (presumably with a larger market capitalization) tend to have more liquid stocks, likely due to easier access to financial markets. The negative coefficient of price indicates that higher stock prices are associated with lower liquidity. This makes sense because expensive stocks might have a smaller portion readily available for trading. The negative coefficient of Cross-Sectional Standard Deviation (Stock Return Volatility) implies that lower volatility in stock returns across companies is associated with higher liquidity. This suggests that companies within a sector with more consistent return patterns might have more liquid stocks. Moreover, Standard errors in parentheses provide the precision of these estimates. The R-squared value of 0.301 indicates that the model explains approximately 30.1% of the variance in liquidity, suggesting moderate explanatory power.

CONCLUSION

This study investigated the empirical relationships between stock liquidity and stock returns within the Pakistan Stock Exchange, exploring the influences of skewness and kurtosis of returns, stock price, firm size, and stock returns volatility. Through rigorous panel data and regression analyses spanning a sample of 41 textile sector firms from January 2014 to June 2024, the analysis reveals several key insights regarding stock liquidity and stock returns:

Firstly, both skewness and kurtosis of stock returns significantly influence stock liquidity. Stocks with positively skewed returns (more data points towards positive returns) tend to exhibit higher liquidity levels, reflecting investor preference for potentially higher returns and increased trading activity. Similarly, higher kurtosis (fatter tails) in stock returns is associated with higher liquidity, suggesting that stocks with more extreme return patterns are also more liquid. Conversely, a negative relationship is observed between stock price and liquidity, indicating that higher stock prices are associated with lower liquidity. This relationship suggests that expensive stocks may have a smaller portion readily available for trading, impacting liquidity negatively.

Conversely, a positive relationship is found between firm size and stock liquidity, indicating that larger firms tend to have more liquid stocks. This is likely due to larger firms having greater market presence, better access to financial markets, and possibly higher investor confidence. Additionally, lower stock returns volatility (measured by cross-sectional standard deviation) is associated with higher stock liquidity. Companies with more stable return patterns are perceived as less risky and thus attract more trading activity, thereby enhancing liquidity.

In summary, the findings help in understanding the multifaceted nature of stock liquidity in the PSX, influenced by not only traditional financial metrics like firm size and stock price but also by the statistical properties of stock returns such as skewness, kurtosis, and volatility. These insights are crucial for investors, policymakers, and market regulators aiming to understand and potentially enhance liquidity in Pakistan's stock market. It offers practical guidance for stakeholders, helping to enhance market efficiency and investor confidence in the Pakistan Stock Exchange.

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