Corporate Investment and Equity Market Anomalies through the Lens of Stock Liquidity: Evidence from Pakistan

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Abstract

Using a sample of 100 non-financial firms listed in Pakistan Stock Exchange from 2004 until 2017, this study established a connection among corporate investment and capital market anomalies (momentum effect & short term reversal effect) by emphasizing its role in modeling liquidity of a stock. Panel data regression results indicate that investment significantly positively adds to stock liquidity. Moreover, contrary to the traditional finance perspective, evidence regarding the impact of corporate investment on anomalies is consistent with the behavioral explanation of limit to arbitrage theory, which indicates that corporate investment exhibits significant pricing anomalies. It argues that these findings are attributable to the idea when corporate investment ameliorates stock liquidity through the channel of noise traders (a significant limit to arbitrage) then instead of attenuation it significantly enhances the profitability of contrarian and momentum strategies. Overall, the evidence presented in this study does not validate the existence of market efficiency, which actually describes the different characteristics of emerging markets (like Pakistan). Taking behavioral finance into account this study complements the corporate finance, corporate investment, and market efficiency literature and also provides useful insights to investors seeking optimal portfolio allocation. Additionally, this study guides policy makers that by carefully devising corporate and investment policies they can enhance the stability of equity markets.

Keywords: Corporate Investment, Stock Liquidity, Short Term Reversal Effect, Momentum Effect, Pakistan Stock Exchange, Noise Trading.

1. Introduction

During the past few decades due to an increase in the ratio of market crashes regulators and policymakers making every effort to bring stability in equity markets in order to prevent future economic collapse. Given the importance of the problem, financial economist tries to identify different factors which might play a crucial role in attenuating equity market anomalies (a major source of market turmoil). Meanwhile, a group of researchers highlights the implications of stock liquidity for market efficiency (Groot, Huij, & Zhou, 2012; Campbell, Grossman, & Wang, 1993; Da & Gao, 2010; Avramov, Chordia, & Goyal, 2006).

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Early literature focusing on the effect of stock liquidity on market anomalies revealed a lack of clarity. Chordia, Subrahmanyam, and Tong (2014) in their seminal paper highlight the implications of stock liquidity for market efficiency and demonstrate that increase in liquidity or trading activity causes a decrease in the statistical significance of market anomalies. Also, contrary to the aforementioned study Tetlock (2007) provides some interesting evidence that liquid securities exhibit more pricing anomalies than the illiquid one.

Interestingly, as reported by growing literature of corporate investment (INV), investment decisions significantly contribute to the liquidity of a stock. Considering the positive effect of investment (INV) on liquidity two strands of research are noteworthy, Berk, Green, and Naik (1999) argues that if corporate investment is assessed in real option context, then the investment decision made by firm transform growth options into less risky real assets which in turn change the risk of a stock and ultimately improve liquidity. On the other hand, based on the behavioral approach the assertion is, investment made by a firm improves liquidity through a channel of noise trading. One possible explanation is that corporate investment induces overconfident investors to trade too aggressively, which in turn leads to noise trading and eventually towards high stock liquidity (Pikulina, Renneboog, & Tobler 2017; Huang, Guanghui, & Chen 2016; Kyle & Wang 1997).

Recently via establishing a link between the firm's investment (INV) and market efficiency literature, a study was conducted on NYS which investigate the impact of firm capital investment on short term reversal effect. Empirical evidence reveals that corporate investment diminishes the profitability of contrarian strategy by playing a role in modeling stock liquidity (Kang, Khaksari, & Nam, 2018). However, no research has been conducted in an emerging country context.

Following the previous studies and the argument that PSX is inefficient, in this paper, it tries to investigate the possible implications of corporate investment on two well-known Technical anomalies (momentum effect and short term reversal effect) by considering its role in shaping stock liquidity over a longer 14 years sample period. The investigation is fascinated by the recent financial crisis 2007-2009 (caused by market anomalies) and the fact that these relationships have been theoretically justified and empirically investigated in a developed country (US), whilst, have not been thoroughly analyzed in emerging countries (Pakistan). However, there is a common perception that developing markets have different trends and theoretical results alter when differences in economic state prevail (Batten & Vo, 2014; Young, Peng, Ahlstrom, & Bruton, 2002; Goodspeed, Martinez-Vazquez, & Zhang, 201; Hwang & Satchell, 1999; Girard & Oman, 2007). Nevertheless, mixed and inconclusive results revealed by the studies conducted so far. This research aims to fill these gaps.

For the purpose of empirical investigation, a panel data from PSX over the period 2004-2017 is utilized. In many different settings, the possible implication of corporate investment for market efficiency by

emphasizing on its role in modeling stock liquidity is examined. First, the impact of investment (INV) on liquidity is analyzed in a panel data regression using yearly data. And then, the impact of both liquidity and firm capital investment on equity market anomalies is investigated in a panel data regression using monthly data.

The current study extends the recent empirical literature in four distinct ways. First, although few studies available that have check the impact of corporate activity such as investment on stock liquidity in the context of real option theory (Kang et al., 2017), hence, this study extend the literature in the area of behavior finance by analyzing the possible implications of corporate investment for stock liquidity through demonstrating noise trading as a mechanism. Second, it provided an in-depth analysis regarding the effect of stock liquidity on the two most prominent capital market anomalies (short term reversal effect and momentum effect) simultaneously. Third, the study complements the market efficiency literature by investigating a possible link between corporate investment and market anomalies. Lastly, numerous studies have validated the existence of anomalies in Pakistan, yet no study has found which tries to identify factors that can help in attenuating these abnormalities. Whilst, to the extent of our knowledge, this research is the first effort of its kind that attempts to investigate these questions in an emerging market of Pakistan which is assumed to be inefficient and have different returns and variance characteristics relative to other developed markets.

The research is not only an addition to literature but also provide important implications to investors who make investment decisions according to the information available at that time and to policymakers who try so hard to bring stability in the market.

The paper proceeds in the following manners, Section two reviews the related literature and develop hypotheses, section three describes the data and develops the methodology utilized in this study while empirical findings are reported and discussed in section four, and finally, section five present the conclusion.

2. Literature review

Anomaly refers to a situation where security or group of securities performs differently, which is not supported by theories of traditional finance (Jebran & Khan, 2014). Summarizing an extensive literature on capital market anomalies, it is suggested that these have challenged EMH and based on a notion that based on past stock returns one can forecast future returns. Momentum (relative strength strategy) is a trading strategy of creating a zero-cost portfolio composed of buying winner stocks while shorting loser stocks of the same period (Jegadeesh & Titman, 1993). Whereas, short term reversal effect (contrarian strategy) refers to a situation where, current returns are negatively associated with lag returns. It is a strategy of buying a loser and selling a winner which can lead to abnormal profit (Jegadeesh, 1990; Lehmann, 1990). Likewise, there are plenty of studies that validate the presence of different types of

anomalies in Pakistan. Shah and Shah, (2017) and Tauseef and Nishat, (2018) suggested that by holding a zero-cost portfolio of buying previous winners and selling previous losers can help an investor to get abnormal returns in Pakistan stock market. Similarly, a group of researchers confirm the existence of short term reversal effect is PSX (Kashif et al., 2018; Soomro, Ahmed, & Hussain, 2016; Shah & Shah, 2017).

Liquidity is a subject of great importance and said to be the lifeblood of capital markets. Damodaran (1994) define Liquidity is an ability to convert assets into cash very quickly without incurring any price discount which is resulted by higher transaction cost. Since the documentation of both short term reversal (Jegadeesh, 1990; Lehmann, 1990) and long term momentum effect (Jegadeesh & Titman, 1993) in cross-sectional stock returns, there is a general agreement in the literature on the possible role of stock liquidity in defining these effects. Both theoretical and empirical studies are available that explicitly analyze the association between stock liquidity and market anomalies. Meanwhile, Limit to arbitrage provides two key explanations regarding this relationship. As far as the rational explanation is concerned, the theory suggests that profits which are gained by pursuing anomaly-based strategies are lower in liquid market states. This argument implies that when liquidity increases with a decrease in stock risk it leads towards greater arbitrage activity which attenuated capital market anomalies (Avramov, Cheng, & Hammed, 2016). On the other hand, the behavioral approach presents a different picture, that changes in noise trader‘s sentiments are the significant limit to arbitrage. Furthermore, it is recognized that when liquidity increase by the channel of noise trading then the uncertainty related to noise trader’s beliefs create risk in the price of a security. While arbitrageurs are assumed to be risk-averse and normally have a short horizon. Thus, their ability to take a position against noise traders is limited. As a result, prices largely deviate from their true value even in the absence of fundamental risk (Delong et al., 1990).

Recently, Tarun et al. (2014) empirically investigate the economic notion that increase liquidity attenuated anomalies by giving rise to arbitrage activity. By using an extensive sample of firms listed in NYS their findings reveal that liquidity decreases the statistical significance of equity market anomalies. Meanwhile, by focusing on trading cost, Hühn and Scholz (2018) analyze the dynamics of both short term reversal and momentum effect in Europe. Their empirical findings confirm the presence of reversal of returns over a shorter period and positive correlation of returns over a longer period. Moreover, both of these strategies are examined after the inclusion of transaction cost where the momentum strategy remains profitable but short term reversal strategy vanishes.

Contrary to evidence presented above, after linking the noise trading, liquidity and anomalies together, recently, Tetlock (2007) provides some interesting facts that liquid securities exhibit more pricing anomalies than the illiquid one. A leading explanation is that liquidity serves as a proxy for noise trading in the market and sometimes the rational agents are not able to fully offset noise trader‘s demand which induces prices to largely diverge from their true value (Delong et al., 1990).

The impact of firm's capital investment on the liquidity of stock has attracted attention among policymakers and investors, given the recent liquidity crisis 2007-2008. However, the empirical evidence is not seen as conclusive. Recent corporate investment literature illustrates that a firm's decision to invest can change the risk of the stock. In a real option context, optimal investment decisions transform growth options into real assets. However, new assets are risky these are assumed to be less risky than the options they are converted with, which in turn lower the risk of stock and improve stock liquidity (Kang et al., 2017). Likewise, Xiong (2016) in his paper document that investment has a positive relationship with liquidity and the relationship is more pronounced for the financially constrained firm. Stock liquidity decrease by an increase in corporate investment. In the meantime, Carlson, Fisher, and Giammarino (2004) demonstrate that firm investment decision resulted in the exercising of growth options. Whenever an option is exercised it changes the riskiness of stock in many ways. Firstly, if growth options are finite then an investment decision of the firm will change the ratio of its options to physical assets, where an increase in the level of physical assets lead towards an increase in the long-term obligation of a firm (operating leverage). Eventually, higher corporate investment tends to increase in the riskiness of stock through an increase in its operating leverage. Concerning investor sentiment models, it argues that firm capital investment is positively related to overconfidence (Pikulina, Renneboog, & Tobler 2017; Huang, Guanghui, & Chen 2016). Similarly, Kyle and Wang (1997) demonstrate that overconfidence cause investors to trade too aggressively, which in turn leads to noise trading and ultimately towards high stock liquidity.

Given the importance of corporate investment to market efficiency, Kang et al. (2018) conducted a study by linking two strands of research; the corporate investment literature and market microstructure literature. Their findings suggest that short term reversal effect is less evident for firms with high capital investment, whereas, momentum effect is strongly observed for these stocks. Moreover, using a large panel of U.S. firms Mortal and Schill, (2018) investigate their proposed investment-based momentum hypothesis. According to the hypothesis, the momentum effect does not occur in isolation, it is dependent on firm investment. More precisely, a firm experience delay between the anticipation and execution of investment opportunity which creates a time delay in stock returns that is generally seen in momentum regularities. They argue that some of the investment based returns are earned with the anticipation of investment opportunity and remaining coming with the execution of investment opportunity, the same patterns that are seen in momentum regularities.

In short, it hypothesizes that corporate investment can significantly affect market anomalies by giving rise to stock liquidity, either through the channel of noise traders or by decreasing the security risk. Overall, this particular study analyzes the possible implications of firm capital investment (INV) for market anomalies by exploring its role in modeling stock liquidity.

3. Research Methodology

The sample covers 100 non-financial companies listed at PSX between 2004 and 2017. Financial firms are excluded because these have different capital structure and reporting standards than the rest of the sample. In line with previous studies, only those firms are included who have positive equity and whose data is available during the sample period. Moreover, this study is quantitative in nature and uses market data and accounting for empirical analysis. Accounting data is gathered from the firm's financial statements available on their websites and analysis of balance sheet published by SBP, whereas, market data is drawn mainly from business recorder database. The market data including prices, trade volume, and returns was taken on three different frequencies (daily, monthly and yearly). Moreover, stock prices are defined as a security closing price at time *t*. The precise overview of how variables are measured in this study is presented in the table below.

Table 1: Measurement of research variables

Name	Symbol	Measurement	References
Illiquidity	ILLIQ	$\text{Avg Ln}\left(\frac{\text{Absloute Daily Returns}}{\text{Daily trade volume}}\right)$	(Amihud, 2002)
Corporate Investment	INV	$\frac{\text{Capital expenditures}}{\text{Begining of year Assets}}$	(Kang et al., 2018)
Lagged liquidity	LILLIQ	Past one month ILLIQ	(Kang et al., 2017)
Size	SIZE	Natural Log (market capitalization)	(Banz, 1981)
Turnover	TNV	Natural Log of daily turnover	(Kang et al., 2017; Chordia et al., 2014)
Volatility	VOL	Natural Log of S.D of daily stock returns	(Kang et al., 2017)
Stock Returns	RET	$\left(\frac{\text{Current price} - \text{Priavious Price}}{\text{Previouce price}}\right)$	(Kang et al., 2017)
Liquid Assets	CB	$\left(\frac{\text{Cash \& Bank balance}}{\text{Begning of year Assets}}\right)$	(Gopalan et al., 2009)
Book-Market ratio	BM	Log of BM ratio	(Fama & French 1992)
Lagged returns	LRET	Lagged monthly returns	(Jegadeesh, 1990)
Cumulative returns	CRET	Monthly returns in t-12 to t-2	(Jegadeesh & Titman, 1993)

A panel data regression approach is employed to investigate whether corporate investment affects capital market anomalies (momentum effect & short term reversal effect) by modeling liquidity of a stock. Three different models are developed, where each model possesses a different set of dependent and explanatory variables.

First, the effect of capital investment (INV) on the liquidity of a stock is analyzed by using yearly data. The estimation model is expressed as:

$$ILLIQ_{i,t} = \alpha_{i.t} + \beta_1 INV_{i,t} + \beta_2 LILLIQ_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 TNV_{i,t} + \beta_5 VOL_{i,t} + \beta_6 RET_{i,t} + \beta_7 CB_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where β_i represents the regression coefficients and $\varepsilon_{i,t}$ represent the error term. The dependent variable is Amihud (2002) daily illiquidity ratio which is used as a measure of stock liquidity. An important thing that needs to be noted is the results of Illiquidity will be interpreted inversely in order to get a picture of stock liquidity. The primary variable of interest is corporate investment (INV) which expressed as a ratio of capital expenditures to the prior year total assets. We follow Kang et al. (2017) and Chordia et al. (2014) in order to select our control variables that can possibly affect stock liquidity. These variables include, *LILLIQ* (Past one month ILLIQ), *SIZE* (Ln of market capitalization), *TNV* (Ln of turnover ratio), *VOL* (Ln of S.D of daily stock returns), *RET* (stock returns) and *CB* (the ratio of cash & bank balance to the prior year total assets). Each variable detail is provided in Appendix.

Then the impact of stock liquidity on momentum effect and short term reversal effect is estimated in a panel data regression using monthly data for a period 2004-2017. The empirical model employed is:

$$RET_{i,t} = \alpha_t + \beta_1 ILLIQ_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 BM_{i,t} + \beta_4 LRET_{i,t} + \beta_5 CRET_{i,t} + \beta_6 LRET_{i,t} \times ILLIQ_{i,t} + \beta_7 CRET_{i,t} \times ILLIQ_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where, the dependent variable *RET* stands for monthly stock returns. ILLIQ is the main explanatory variable. An important thing that needs to be noted is that the results of Illiquidity will be interpreted inversely in order to get a picture of stock liquidity. Based on literature review, fundamental determinants of RET are controlled in analysis. These are *SIZE, BM, LRET* (lag returns), and *CRET* (Cumulative returns). Additionally, to empirically analyze the possible effect of stock liquidity on short term reversal and momentum effect, the model is extended by adding two interaction terms *LRET×ILLIQ* and *CRET×ILLIQ*.

Lastly, following Kang et al. (2018) the impact of firm capital investment (INV) on momentum and short term reversal effect is analyzed in a panel data regression using monthly data for a period of 2004-2017. The estimation model expressed as follows:

$$RET_{i,t} = \alpha_t + \beta_1 INV_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 BM_{i,t} + \beta_4 LRET_{i,t} + \beta_5 CRET_{i,t} + \beta_6 LRET_{i,t} \times INV_{i,t} + \beta_7 CRET_{i,t} \times INV_{i,t} + \varepsilon_{i,t} \quad (3)$$

Similar to model 2, the dependent variable is *RET,* while rather than ILLIQ the main explanatory variable is *INV*. This study further control the fundamental determinants of stock returns that are *SIZE, BM, LRET* (Lag returns), and *CRET* (Cumulative returns). Additionally, to empirically access the possible effect of investment (INV) on momentum and short term reversal effect, the model is extended by adding two interaction terms *LRET*×*INV* and *CRET*×*INV*.

4. Empirical Results

4.1 Descriptive statistics and Correlation matrix

Table 2 exhibits the summary statistics of different variables measured over an annual basis. The average value of ILLIQ is -3.0242 while, MAX and MIN values are -0.94781 and -6.05451 respectively, with a deviate of 1.679346. Accordingly, the mean for corporate investment ratio of non-financial firms listed in Pakistan is 0.422944 which shows that during the period of analysis on average firms had a moderate level of corporate investment. The mean value of LILLIQ is -2.79853 in additions the maximum average is -0.61462 and the minimum average is -6.05451. Similarly, the average values of TNV and VOL are -5.27963 and -2.97181 respectively. The statistics reveal that the mean value of returns is 0.2858 with a maximum value of 1.5055 and a minimum value of -0.3764. With respect to firm size, the mean value is 24.01676, indicating that averagely the sample firms have high capitalization, while the maximum and minimum averages are 25.36267 and 22.46839 respectively. Lastly, the CB averages around a value of 0.094016 with a deviate of 0.095714 which indicate that usually, non-financial firms listed in Pakistan holds a very low amount of illiquid assets in their balance sheet.

Table: 2 Descriptive statistics

Variable	Mean	Median	Max.	Min.	Std. Dev.
ILLIQ	-3.0242	-3.2346	-0.9478	-6.0545	1.6793
INV	0.4229	0.4268	0.52226	0.3145	0.0560
LILLIQ	-2.7985	-2.6835	-0.61462	-6.0545	1.7731
TNV	-5.2796	-5.5823	-1.3285	-11.449	3.1832
VOL	-2.9718	-3.7948	2.79191	-4.3179	2.0798
RET	0.2858	0.2156	1.5055	-0.3764	0.4828
CB	0.0940	0.0644	0.2613	0.0034	0.4828
SIZE	24.016	23.841	25.362	22.468	0.9513

The table reports the descriptive statistics of different variables computed on monthly basis. The sample span is 2004-2017.

Table 3 presents the descriptive statistics of variables included in analysis and measured over a monthly basis. RET has a mean of 0.0200, ranging from 0.4117 to -0.4311, with a standard deviation of 0.092. The lag returns (LRET) has mean and median values 0.0198, 0.0068 respectively. The average value of cumulative returns (CRET) is 0.230663 with median 0.197946. Similarly, the average value of SIZE is 29.18179 and the lowest and highest values are 30.55408 and 27.65923 respectively. Specifically, the results of the size variable show that during the sample period sample firms have high market capitalization. BM has a mean of -5.708325, ranging from -5.046748 to -6.303966. In the case of ILLIQ, it lies between the values 0 to -9.790382, with a mean and standard derivation -3.176996, 2.262003 respectively. INV has the lowest value of 0.52226 and the highest value of 0.314532, with the average value of 0.419294 and a deviate of 0.046233.

Table: 3 Descriptive statistics

Variable	Mean	Median	Max.	Min.	Std. Dev.
RET	0.02	0.0068	0.4117	-0.4311	0.092
LRET	0.0198	0.0068	0.4116	-0.4318	0.092
CRET	0.2306	0.1979	1.047	-0.5208	0.3741
SIZE	29.1819	29.098	30.554	27.6592	0.88794
BM	-5.7081	-5.6717	-5.0467	-6.3039	0.38601
ILLIQ	-3.1769	-2.744	0	-9.7903	2.262
INV	0.4196	0.4174	0.5222	0.3145	0.0462

The table reports the descriptive statistics of different variables computed on monthly basis. The sample span is 2004-2017.

Table 4 presents correlations among variables measured on an annual basis. The value of -0.028195 shows that ILLIQ is weekly negatively correlated with INV confirming the literature (Kang et al., 2017). In simple words, ILLIQ and INV have a week inverse linear relationship such that, when INV decreases ILLIQ increase but to a lesser extent. However, ILLIQ is very persistent with a coefficient 0.6135972 with its lag value, confirming the liquidity literature. Consistent with previous literature the table shows that stock liquidity varies with firm size, turnover, and volatility. Moreover, stock liquidity increases with Liquidity of firm assets as evident by Gopalan et al., (2012). The correlation coefficient of 0.0707779 shows that firm with low stock liquidity offers high returns as addressed by market microstructure literature. Furthermore, INV is positively related to RET, SIZE, and CB while exhibiting an inverse relation with LILLIQ, TNV, and VOL.

Table 4: Correlations Matrix

	ILLIQ	INV	LILLIQ	RET	SIZE	TNV	VOL	CB
ILLIQ	1							
INV	-0.028	1						
LILLIQ	0.613	-0.122	1					
RET	0.070	0.198	0.178	1				
SIZE	-0.704	0.329	-0.733	0.0159	1			
TNV	0.883	0.229	-0.664	0.1439	-0.481	1		
VOL	0.487	0.161	0.423	-0.141	-0.371	0.469	1	
CB	-0.486	0.257	-0.405	-0.333	0.666	-0.225	-0.405	1

Table 3 provides the correlations among variables computed on an annual basis. The sample span is 2004-2017

Table 5 reports the correlations among variables measured on a monthly basis. We document the noticeable findings as follows. Firstly, RET exhibit a positive correlation with LRET (lag monthly returns) and CRET (Cumulative returns) with values of 0.1059465 and 0.071303 respectively. The result of CRET is in line with the previous literature that a strategy of buying a winner while shorting a loser over the long horizon can help an investor to gain abnormal returns (Jegadeesh & Titman, 1993). Whereas, the positive value of LRET contradict the short term reversal effect introduced by Jagadeesh, (1990) and Lehman, (1990). Secondly, consistent with literature RET exhibit a negative correlation with SIZE variable while the positive correlation with BM ratio. Thirdly, INV is slightly positively associated with stock returns, such as INV increases stock returns also increases. Conversely, INV and ILLIQ seem to move in the opposite direction, specifically, a firm with high investment tends to have high stock liquidity as suggested by previous literature (Kang et al., 2017).

Table 5: Correlation Matrix

	RET	**LRET**	**CRET**	**SIZE**	**BM**	**ILLIQ**	**INV**
RET	1						
LRET	0.10594	1					
CRET	0.071303	0.091842	1				
SIZE	-0.005595	0.002329	0.102387	1			
BM	0.005347	-0.00170	-0.10162	-0.09994	1		
ILLIQ	-0.06573	-0.01279	-0.01256	-0.43157	0.430757	1	
INV	0.002788	0.010174	-0.00033	0.530316	-0.52995	-0.1347	1

4.2 Estimation Results

The analysis begins by analyzing the impact of corporate investment on liquidity of a stock. Table 6 reports the results of model 1. In this setting, stock liquidity (ILLIQ) is our dependent variable. The coefficient of -0.355765 with a t-statistics of -2.87133 implies that past stock liquidity (LILLIQ) significantly negatively related to current liquidity. These findings are in line with the explanation of feedback effect hypothesis, which suggest that lag values of a variable have an influence on its current value. Moreover, it is observed that firm size also positively affect liquidity, as reveals in the negative coefficient of -0.71107. The result shows that an increase of 1 unit in firm size decreases stock illiquidity by 0.711 units. The findings are consistent with the previous literature. Investors who take a position in small stocks face higher transaction cost because of infrequent trading (illiquidity) than those who invest in large-cap stocks (Strool & Whaley, 1983). Kang et al., (2017) report the same results and argue that big stocks enjoy high stock liquidity because these have a large investor base that trade more frequently. Empirical evidence, however, indicates that share turnover significantly contributes to stock liquidity. The coefficient of turnover ratio 0.488133 reveals that if turnover is increased by one percent, the illiquidity of a stock will increases by 48%. The result contradicting the argument of inventory holding cost theory that the risk of holding security is high for low turnover stocks (Stroll, 1978).

Table 6: Results of Model 1

Variable	Coefficient	Std. Error	t-Statistic
Constant	17.6078***	2.7235	6.4649
INV	-4.0275**	1.6029	-2.5125
LILLIQ	-0.3557***	0.1239	-2.8713
SIZE	-0.7110***	0.1277	-5.5668
TNV	0.4881***	0.0470	10.3812
VOL	0.0336	0.0655	0.5123
RET	0.02715	0.3843	0.0706
CB	-1.8865	1.7336	-1.0882
Adjusted R^2	0.9435	**Durbin-Watson Stat**	2.2930
S.E. of reg	0.3988	**F-statistic**	221.73***

The table presents the coefficients of panel data regression. The dependent variable ILLIQ used as a measure of stock liquidity. Sample period is from 2004 to 2017. *= significant at 0.1, **= significant at 0.05, ***= significant at 0.01

Confirming the market microstructure literature the coefficient of 0.033608 shows that return volatility is negatively affected stock liquidity but results are statistically insignificant as the p-value is 0.6085.
The empirical results indicate that cash balance significantly positively affect stock liquidity. The coefficient of -1.88654 is similar to the findings of Gopalan et al., (2012) based on valuation uncertainty hypothesis. The researcher implies both assets liquidity and stock liquidity co-vary in the same direction. The rationale behind the valuation uncertainty hypothesis is, more cash in hand can lower the valuation uncertainty associated with assets that will, in turn, improve stock liquidity. The coefficient of 0.027156 and a t-statistics of 0.8233 reveals that firms with high stock liquidity usually have lower average returns but results are statistically insignificant as the p-value is more than 0.05.

Finally, it is observed that corporate investment measured by the ratio of capital expenditures to the beginning of year assets also contributes to stock liquidity. The coefficient of -4.027571 with a t-statistics of -2.51257 exhibit corporate investment significantly improves stock liquidity. The result shows that an increase of 1 unit in corporate investment might leads towards a decrease of -4.03 units in stock illiquidity as other variables remain constant. In view of this, the first hypothesis of this study; Higher corporate investment significantly leads towards higher stock liquidity is accepted. Concerning the positive impact of corporate investment on stock liquidity, two streams of research are noteworthy. First, according to Berk et al., (1999) capital expenditures made by a firm transforms growth options into less risky assets in place, which in turn lower the risk of stock i.e. improves stock liquidity. Second, the relationship can be better explained by investor sentiment models. It is argued that corporate investment is positively related to investor overconfidence which gives rise to noise trading and consequently to stock liquidity (Pikulina, Renneboog, & Tobler 2017; Arif & Lee, 2014).

Table 7: Results of Model 2

Variable	Coefficient	Std. Error	t-Statistic
C	5.7521***	1.2071	4.7649
SIZE	-0.3540***	0.0751	-4.7089
BM	-0.8027***	0.1728	-4.6440
ILLIQ	-0.0034***	0.0004	-8.1017
LRET	-0.0431***	0.0151	-2.8479
CRET	0.0215***	0.0034	6.1466
LRET×ILLIQ	-0.0393***	0.0035	-11.1356
CRET×ILLIQ	0.0013	0.0008	1.5642
Adjusted R^2	0.0298	**Durbin-Watson stat**	2.0313
S.E. of regression	0.0906	**F-statistic**	70.031***

The table exhibits the coefficients of panel data regression. The dependent variable is monthly tock returns (RET). Sample period is from 2004 to 2017. *= significant at 0.1, **= significant at 0.05, ***= significant at 0.01

Table 7 reports the estimates of Model 2 which was formulated to examine the possible implications of stock liquidity for market efficiency by highlighting its impact on both short term reversal effect and momentum effect. Firstly, the coefficient of SIZE and BM shows that returns are significantly related to the fundamental determinants (BM ratio & size). The negative coefficient of SIZE -0.35402 with a t-statistics of -4.70894 reveals that firms with a high market value of equity have had lower risk-adjusted returns than those having a lower market value of equity (Banz, 1981). Considering the negative coefficient of BM -0.80273 it could be assumed that growth stocks outperform value stocks in Pakistan as evident by Shoaib & Siddiqui, (2017). There is no theoretical base for this effect while one possible explanation is that in emerging markets growth factor are used as a risk factor leading towards investor irrationality and dissection of the value premium. The negative coefficient of ILLIQ -0.00342 surprisingly implies that liquidity positively contributes to stock returns. The empirical findings contradict the negative relationship suggested by market microstructure theories that typically found in developed countries while supporting the notion that when a market (emerging market) is not fully harmonized with the world economy then illiquidity is not taken as a risk factor.

The common rationale behind the positive liquidity return relationship in the emerging market is that foreign investor invests due to better prospect for economic growth and ready to forgo liquidity premium in order to gain diversification benefit in these markets. Indeed, local investors also get benefit from international diversification (Batten & Vo, 2014; Jun, Marath, & Shawky, 2003). Another reason for contradictory findings could be the unique Pakistani context where the sources and pricing of risk are different and where the investment opportunities in term of risk and return are high (Shahid, 2008). A similar idea but from a slightly different point of view was suggested by Campbell, Grossman, and Wang (1993), stock prices that are more likely to decline in high trading days than a decline in low trading days are attributable to an increase in expected stock returns. In simple words, market makers are awarded high returns for accommodating the trade pressure caused by the non-informational traders. The results of this analysis are in line with the findings of recent studies conducted to investigate the relationship in Pakistan (Akram, 2014) and in other emerging markets (Rouwenhorst, 1999; Jun et al., 2003; Dey, 2005).

Moreover, the coefficient of LRET -0.04319 shows that return is negatively associated with lag returns. The results are in line with the short term reversal documented by Jegadeesh and Lehmann, (1990). While, on the other hand, monthly returns significantly positively associated with cumulative returns, as shown in the positive coefficient of CRET 0.021503 (Jegadeesh & Titman, 1993). Overall, the momentum effect and short term reversal effect are significantly observed in Pakistan Stock Market. Specifically, a strategy of

buying a winner and shorting losers in the long run, and buying loser and selling winners in the short run can help an investor to gain abnormal profits (Khan et al., 2016; Shah & Shah, 2017).

Furthermore, after taking liquidity into consideration it is observed that illiquidity attenuate both short term reversal effect and momentum effect by interacting with LRET and CRET. The coefficient of the interaction term between LRET×ILLIQ is -0.03935 with a t-statistics of -11.1356 implies that a one standard deviation increase in illiquidity attenuate short term reversal effect by almost 1%. In addition, the coefficient CRET×ILLIQ is 0.001326 suggest that illiquidity attenuate momentum effect but results are insignificant as the p-value is more than 0.05. Thus, by interpreting the results inversely it is shown that the empirical evidence contradicts the rational explanation of limit to arbitrage theory that liquidity by its own account makes capital market anomalies unstable and lead towards attenuation.

In this setting, the results of ILLIQ×LRET contradict the theoretical model which claims that liquidity enhances market efficiency. Specifically, it is observed that high liquidity securities exhibit significant anomalies. Empirical evidence is in line with the behavioral aspect of limit to arbitrage theory. A leading explanation is when liquidity improves by the activity of noise traders, the unpredictability of noise trader's sentiments work as a significant limit to arbitrage. Arbitrageurs are risk-averse and normally have a short horizon. Thus, their ability to take positions against noise traders is limited. Consequently, even in the absence of some major risks stock prices largely deviate from their true value (Tetlock, 2007). The empirical results of ILLIQ*CRET are in line with previous literature that liquidity doesn't matter in the determination of momentum payoffs, investor's overconfidence along with self-attribution bias in their reaction to public information cause return continuation (Avramov, Cheng, & Hammed, 2016).

Table 8 depicts the panel data regression result of model 3 which was used to investigate the possible implications of corporate investment for market efficiency by highlighting its impact on both short term reversal effect and momentum effect. First, the results of SIZE and BM ratio are similar to results obtain under liquidity model. Specifically, returns are significantly negatively associated the fundamental determinants such as BM ratio and firm size. Second, the negative coefficient of INV -0.04354 with a t-statistics of -2.184 implies that a firm with high corporate investment tends to have low monthly stock returns. The evidence presented in this study is in line with the real option theory. According to the theory whenever firm decided to invest it basically convert its growth option into less risky assets in place, which in turn lower the risk of stock and ultimately the returns (Berk, Green, & Naik, 1999).

Despite the results obtained under the liquidity model, it is noticed that both short term reversal and momentum effect disappears when examined under the investment model. The coefficient of LRET 0.460577 with a t-statistics of 5.499814 implies that returns are positively serially correlated over one month,

while the coefficient of CRET -0.16901 exhibits that returns are negatively correlated over a period of one year.

Table 8: Results of Model 3

Variable	Coefficient	Std. Error	t-Statistic
Constant	5.1609***	1.2062	4.2783
SIZE	-0.3188***	0.0751	-4.2430
BM	-0.7314***	0.1727	-4.2330
INV	-0.0435**	0.0199	-2.1846
LRET	0.4605***	0.0837	5.4998
CRET	-0.1690***	0.0174	-9.6888
LRET×INV	-0.8660***	0.1982	-4.3686
CRET×INV	0.4512***	0.0421	10.7114
Adjusted R^2	0.0238	**Durbin-Watson stat**	2.0072
S.E. of reg	0.0909	**F-statistic**	55.7934***

This table presents the coefficients of panel data regression. The dependent variable is monthly stock returns (RET). Sample period is 2004-2017. *= significant at 0.1, **= significant at 0.05, ***= significant at 0.01

Surprisingly, it is observed that when corporate investment interact with lag returns it enhance the profitability of contrarian strategy. The coefficient of an interaction term between LRET×INV -0.86609 with a t-statistics of -4.36868 implies that the impact of firm capital investment is economically substantial. Interestingly, INV also enhances the momentum profits. The coefficient of CRET×INV 0.451245 implies that returns of high investment stocks tend to follow a constant pattern. The result of corporate investment and momentum effect is consistent with the investment-based momentum hypothesis developed by Mortal and Schill, (2018). According to the hypothesis, momentum effect does not occur in isolation, it is dependent on firm investment. More precisely, a firm encounters a delay between the anticipation and execution of investment opportunity which in turn lead towards a delay in stock returns that is observed in momentum regularities. They argue that some of the investment based returns are earned with the anticipation of opportunity and remaining coming with the execution of opportunity. Moreover, the adjusted R-square is 2.4% which is in line with existing literature (see Kang et al. 2018; Mortal & Schill, 2018) and there is a general assumption that a model with low adjusted R-square but statistically significant predictor still yields excellent goodness of fit (Chin, 1998). Additionally, consistent with our predictions the lower value is associated with information uncertainty and more noise in returns as documented by West (1988), Zhang (2006) and Teoh, Yang, and Zhang (2011). It argues that when securities traded more heavily by noise

traders, who are assumed to be irrational, and are subjected to certain behavioral biases the value of adjusted r square is low.

Taken together, another explanation is that corporate investment significantly contributes to the liquidity of stock as suggested by investor sentiment models, so as securities with high liquidity exhibit significant pricing anomalies (Tetlock, 2007). One possibility is, liquidity serves as a proxy for noise trading and sometimes the rational agents are not able to fully offset noise trader's demand which causes prices to follow abnormal patterns than otherwise in an illiquid market. In short, the empirical findings strongly justified the existence of noise traders in PSX.

5. Conclusion

Corporate investment decision because of its great significance to the company financial management has long fascinated researchers and covers a vast body of the empirical literature. Meanwhile, the recent global financial crisis 2007-2009 has enhanced the interest of financial economists to further investigate the possible implications of corporate investment for market efficiency. The current study probes into defining the corporate investment's effect on stock liquidity and ultimately on capital market anomalies for Pakistan stock exchange over a longer 14 years' sample period (2004-2017).

The findings of model 1 affirm that corporate investment positively contributes to stock liquidity. Concerning the positive impact, two streams of research are noteworthy. First, according to Berk et al., (1999) corporate investment decision transforms growth options into less risky assets in place, which in turn lower the risk of stock i.e. improves the liquidity of a stock. Second, the relationship can be better explained by investor sentiment models. It is argued that corporate investment is positively related to investor overconfidence which gives rise to noise trading and consequently to stock liquidity (Pikulina, Renneboog, & Tobler 2017; Arif & Lee, 2014). Surprisingly, the empirical evidence does not support the rationale that corporate investment improves liquidity through a change in the risk. However, this does not mean the argument of real option theory is not valid, it only means that in the context of Pakistan (as an emerging economy) corporate investment is more likely to affect stock liquidity through the channel of noise traders than by risk shift. Moreover, the empirical results of model 2 validate the existence of different types of anomalies which give us a clue that the PSX is inefficient. Interestingly, the results regarding the impact of liquidity on short term reversal effect contradict the theoretical model which claims that liquidity attenuates short term reversal effect. It is observed that securities with high liquidity exhibit significant pricing anomalies. Meanwhile, the findings of the impact of liquidity on momentum effect are in line with previous literature that liquidity doesn't matter in the determination of momentum payoffs, investor's overconfidence along with self-attribution bias in their reaction to public information cause return continuation (Avramov, Cheng, & Hammed, 2016).

Contrary to the traditional finance perspective, the result regarding the impact of corporate investment on capital market anomalies (Model 3) is in line with the behavioral explanation of limit to arbitrage theory, which indicates that corporate investment exhibits significant pricing anomalies. A key assumption of this theory is that liquidity serves as a proxy for noise traders and the unpredictability of noise trader's beliefs generates risk in the price of a security. However, on the other hand, arbitrageurs are risk-averse and normally have a short horizon. Thus, their ability to take a position against noise traders is limited. As a result even in the absence of fundamental risk stock prices largely diverge from their true value (Tetlock, 2007). As we know, this is the first empirical study connecting corporate investment to market anomalies by exploring its (INV) implications for stock liquidity in the context of emerging markets (like Pakistan).

Put it in a nutshell, this study reinforces that theoretical results altered when significant differences in market states and environment prevail. From a practical point of view, this study has important implications for investors seeking optimal portfolio allocation. While investing, rather following market noise more emphasize should be given to financial capabilities and the true fundamental value of companies. Also, this research guides policymakers in a way they can avoid a financial crisis by devising new investment related policies to alleviate the irrational behaviors of investors that cause market inefficiencies. Further, this research opens interesting topics for future studies, first to analyze the corporate investment's impact on other capital market anomalies and also to extend the analysis to other emerging economies to check if the same results herein also apply to other countries with the same environment.

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