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Role of Liquidity in Explaining Anomalous Returns: Evidence from Emerging Market

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Abstract

This study investigated the role of liquidity in explaining the size and volatility related anomalies in Pakistan Stock Exchange (PSX), Pakistan. Using firm level data from 1993 until 2015, it is identified that these anomalies offer 30% to 50% annual returns in PSX. These returns are quite higher in comparison to comparable evidence for the most efficient market of the US. Furthermore, we rationalized these returns within the framework of Efficient Market Hypothesis (EMH). For this purpose, Liquidity Augmented Capital Asset Pricing Models (LCAPM) proposed by (Acharya & Pederson, 2005) has been used. Results indicate that higher returns are not a vindication of market inefficiency rather, a compensation to investors for being exposed to market and illiquidity related local risks. Moreover, this study also investigated the existence of diversification opportunities in PSX. It is found that PSX provides significant portfolio diversification opportunities to the international investors. These results are also replicated for other two relatively bigger emerging markets of India and Brazil with lesser diversification benefits. Results of this study indicate that liquidity is an important factor in pricing the return structure of equities in PSX. Investors should consider liquidity as a factor in asset pricing models to value their stocks/portfolios more efficiently.

JEL Codes: G10, G12, G15

***Keywords**: Zero-investment strategy, annual returns, Pakistan Stock Market, market risk, illiquidity risk, diversification.*

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1. Introduction

The challenge for Efficient Market Hypothesis (EMH) is the existence of predictable anomalous returns, which can be generated by taking long and short positions on some stocks based on their publicly available information. In the theory of efficient market, such predictable anomalous returns are linked with the predictability of risk premium (Schwert, 2003). This argument reconciles the notion of higher risk with higher gain. This reconciliation is generally established through asset pricing models, like Capital Asset Pricing Model (CAPM) of Sharpe (1964), Linter (1965) and Mossin (1966), Three Factor Model (FF3) of Fama and French (1993) and Four Factor Model (FF4) of (Carhart, 1997).

The recent addition in this context is proposed by Hou, Xue, and Zhang (2014) and Fama and French (2015) Five Factor Model (FF5) with the realization that the investment and operating profitability also constitute market wide risks. These earlier models are tested extensively to explain the anomalous returns for the US market in particular, and for other markets in general[3]. However, there are two issues involved to implement such models in most of the emerging markets. First, the data for firm related measures are not adequately available to construct well-diversified market measures of risk; second, these models assume that markets are perfectly liquid inferring that there are no transaction costs involved in buying and selling of stocks. Hence, the effect of illiquidity[4] is not explicitly accounted for in these models. Holden, Jacobsen, and Subrahmanyam (2014) conducted a comprehensive review on the importance of liquidity in determining the stock prices. Moreover, Lee (2011) documented that emerging markets are more illiquid than developed equity markets. Therefore, it is important to account for the impact of liquidity in these asset-pricing models. For this purpose, the Liquidity Adjusted Capital Asset Pricing Model (LCAMP) of Acharya and Pedersen (2005) is an appropriate choice. LCAPM is an extended version of traditional CAPM. LCAPM incorporates the effect of liquidity in traditional CAPM. Whereas CAPM, FF3, FF4 and FF5 models do not capture the effect of illiquidity.

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[3] *See: Fama and French (2016a) for US, Fama and French (2016b) for international equity markets and Chiah, Chai, Zhong and Li (2016) for Australian market.*

[4] *Investors can easily buy and sell assets at low cost and without significant drop in prices.*

Bekaert, Harvey, and Lundblad (2007) and Lee (2011) studied the role of liquidity in cross section of stock returns in emerging markets. They found that local illiquidity risk is quite relevant for pricing of stocks in emerging markets. However, these studies are panel based. Therefore, the validity of the results cannot be generalized for all countries. Harvey (2001) stated that most of the emerging markets are not fully integrated therefore, asset pricing in such markets is problematic[5]. Moreover, Bekaert and Harvey (2002), reported that local risk factors are more important in determination of asset returns in segmented markets. The generalization based on panel analysis may overstate (understate) the illiquidity premium. For instance, in case of Poland, Lischewski and Voronkova (2012) showed that there are no illiquidity risk premiums. Hence, it is important to analyze the effects of liquidity in Pakistani market[6].

In addition to this, there are a series of papers for example Bekaert (1995), Bekaert and Harvey (1995), Bekaert and Harvey (1997) and Bekaert and Harvey (2000) in which diversification of portfolio risk by the inclusion of the stocks traded in emerging markets were discussed. The volatility of higher returns and higher illiquidity in such markets is compensated at local level (Lee, 2011). However, for international investors this volatility and illiquidity, is not translated into risk till the time it results into higher correlation with the risk factors against which they aspire to hedge their portfolios returns, or demand the compensation for being exposed to. Therefore, this study also tests the diversification opportunities (if available) offered by PSX to international investors.

This study addresses three questions. (1) How much anomalous returns are available in PSX, a less researched market in comparison to the US market based on commonly known strategies such as size and volatility (2) How these anomalous returns (if available), can be rationalized within the risk and return framework offered by some model by implying effect of local illiquidity and

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[5] PSX is a liberalized market however; the degree of integration with other world equity markets is quite low. For example, correlation between PSX and US market is 0.09, PSX and UK is 0.05, and PSX and Japan is 0.02. For details see: (Iqbal, 2012).

[6] A recent study on PSX provided evidence against the random walk hypothesis and concluded that PSX exhibited weak form of market efficiency. For details see: (Khan & Khan, 2016)

market risk (3) Does the PSX offer any diversification benefit to international investors.

This study is important as EMH states that there exists positive association between risks and returns. If in PSX, the size and volatility related anomalies offer higher returns than these returns should be linked with higher risk. Hence, it is vital to accurately model the return structure of these anomalies if they are exposed to some sort of risk i.e. illiquidity. Moreover, if illiquidity significantly explains the variations in returns then ignoring liquidity may lead to suboptimal investment decisions. Lastly, from international perspective, this study is important to understand the dynamics of PSX if there exist any diversification benefits.

It is found that anomalies are of very high magnitude for the data of the period of May 1993-June 2015. However, within the framework of Acharya and Pedersen (2005), these higher returns are linked with premium associated with the level of illiquidity, market and illiquidity risks. Furthermore, results indicate that PSX offers economically meaningful diversification opportunities to the foreign investors.

In robustness test for National Stock Exchange (NSE) India and Sao Paolo Stock Exchange (SAO) Brazil using the size related portfolios results especially for India are quite similar to those of PSX, Pakistan. However, the diversification benefits are not that higher for these markets compared to PSX, Pakistan.

2. Literature Review

Liquidity is defined as the ease with which agents can exchange stocks (i.e. buy or sell) or convert stocks into cash. Stocks which are hard to exchange are considered as illiquid stocks and stocks which are easily exchangeable are called liquid stocks (Bali, Engle, & Murray, 2016). However, liquidity is a complex phenomenon which is unobservable in the market place (Amihud, Mendelson, & Pedersen, 2005). Standard asset pricing models such as CAPM and Arbitrage Pricing Theory (APT) of Ross (1976), it is assumed that markets are liquid (frictionless). It asserts that there are no costs involved in buying and selling of securities. However, existence of trade impediments cause liquidity constraints in the market place, which derive the securities prices away from its intrinsic values (Amihud, Mendelson, & Pedersen, 2005). Numerous researchers study the role of liquidity in deriving the expected returns of financial instruments.

Previous studies connected liquidity with asset pricing and provided evidence that liquidity played an important role both at overall market level and at stock specific level. Chordia, Roll, and Subrahmanyam (2000) reported two possible channels through which liquidity can affect asset prices. The first channel is the static channel in which it is assumed that liquidity is important at aggregate market level; commonly referred as liquidity level in asset pricing literature. While the second channel is known as the dynamic channel in which liquidity is considered to effect stock returns via systematic risk factor. Earlier studies such as Amihud and Mendelson (1986); Cooper, Groth, and Avera (1985); Datar, Naik, and Radcliffee (1998) treated liquidity as a stock specific characteristic that affect stock prices. Whereas, the recent studies considered liquidity as a systematic risk factor that is an important factor in explaining the variations in stock returns (Holmstrom & Tirole 2001; Acharya & Pedersen, 2005; Liu, 2006; Pastor & Stambaugh, 2003; Sadka, 2006).

Amihud and Mendelson (1986) developed a theoretical model in which they derive the relationship between illiquidity and expected returns for the first time. They demonstrated that there exist positive association between illiquidity and future returns. Later, Amihud and Mendelson (1989) empirically tested this phenomenon and confirmed that there exist liquidity premiums even after controlling for other systematic risk factors such as market beta and size. Amihud (2002) showed similar relationship and reported that liquidity is a priced factor across cross section. Acharya and Pedersen (2005) developed Liquidity Augmented Capital Asset Pricing Model (LCAPM) in which they incorporated liquidity related betas in traditional CAMP model. They reported that liquidity shocks were positively related to contemporaneous stock return and negatively related to future stock returns. Lee (2011) conducted a study on the role of liquidity in 22 developed and 28 emerging markets using LCAMP framework. He found that there existed commonality in liquidity internationally. However, his results show that liquidity is more important in emerging markets as compared to developed markets. Amihud, Hameed, Kang and Zhang (2015) studied the commonality in 45 countries and their result showed that there exist positive and significant illiquidity premiums. While, Bekaert et al. (2007) studied the role of liquidity in cross section of stock returns in emerging markets. They found that local illiquidity risk is quite relevant for pricing of stocks in emerging markets. However, the liquidity related studies discussed above are manly US-Centric or panel based in which both developed and emerging markets were studied. Therefore, the validity of the results cannot be generalized for all countries. Harvey (2001) stated that most of the emerging markets are not fully integrated therefore, asset pricing in such markets is problematic. Moreover, the generalization based on panel analysis may overstate (understate) the illiquidity premium. For instance, in the case of Poland Lischewski and Voronkova (2012) showed that there were no illiquidity risk premiums. It shows that role of liquidity is country specific. Moreover, there is no such study available on PSX in which role of liquidity is documented. This motivates us to analyze the role of liquidity in explaining the returns of size and volatility based anomalies in PSX. In this regard, we test the following hypothesis:

H_1: There is a role of liquidity in explaining the anomalous returns in PSX.

In addition to investigate the role of liquidity in PSX, this study also investigates the availability of any diversification opportunities in PSX for international investors. In modern finance, it is generally assumed that portfolio risk can be minimized through diversification (Chiou, Lee, & Chang, 2009). Markowitz (1952) presented the seminal framework of risk and return. This framework provides guidelines for the construction of optimal portfolio in such a way that maximizes the rate of return and minimize the level of risk. A common way to achieve maximum returns and to minimize risk, is to include the international assets in the portfolio. The seminal work in this regard was done by Solnik (1995). He considered both local and international assets for portfolio construction. The purpose was to find out the potential benefit from diversification. Results showed that by including the local stocks in portfolio construction failed to reduce the risk of portfolio significantly. However, the portfolio risk was significantly reduced by inclusion of international stocks. Furthermore, Grauer and Hakansson (1987) examined the returns of portfolio after including the international stocks in the portfolio. His results showed that by adding international stocks resulted in increased returns.

Previous studies for instance, Grauer and Hakansson (1987); Meric and Meric (1989); Solnik (1995) provided evidence that by including the assets from other countries result in the reduction of risk without affecting the rate of return. Moreover, recent studies investigated the benefit of adding emerging markets assets in portfolio construction. It is showed that by including emerging markets assets in portfolio significantly reduced the risk of portfolio for US centric investors (Dunis & Shannon, 2005; Marimuthu, 2010).

Errunza (1983) stated that emerging markets should be considered in portfolio construction as opportunity set, as these markets exhibits weak correlation in returns with developed markets having higher returns. There is a series of papers for example Bekaert (1995); Bekaert and Harvey (1995); Bekaert and Harvey (1997); Bekaert and Harvey (2000) in which diversification of portfolio risk by the inclusion of the stocks traded in emerging markets has been discussed.

Surprisingly, few studies provided evidence that by including stocks from emerging markets did not reduce the risk of portfolio. For example, Bhatnagar and Ghosh (2005) found a very high correlation between four developed and ten emerging markets. They concluded that by adding emerging markets stocks did not provide any diversification benefit. Moreover, Yang, Tapon, and Sun (2006) found that the correlation among developed and emerging markets had increased significantly over time, therefore considering the emerging markets for diversification benefits did not reduce the risk of portfolio.

The studies mentioned above provide inconclusive evidence regarding the inclusion of emerging markets securities in portfolio construction to achieve diversification benefits. This motivates us to study the diversification benefit prevails in PSX to the international investors. Moreover, Uppal and Nishat (1993), Harvey (1995) and Khalil (2014) results showed that the returns of PSX are weakly correlated with other world markets such as USA. We therefore, test the following hypothesis:

H_2: There are diversification opportunities available for international investors in PSX.

3. Data

The data for the analysis is downloaded through DataStream (DS) for the period of 1993-2015. In the initial screening of the data all non-common stocks are deleted. However, the dead firms are retained to avoid survivorship problem[7]. Some other cleaning procedures are adopted to clean our data set as DS records data with some systematic errors, which is indicated in previous research. For instance, following Ince and Porter (2006) and Griffin, Kelly, and Nardari (2010) daily returns are set to be missing if they increase and decrease significantly such that, $r_{t-1} > 100\%$ or $r_t > 100\%$ and $(1 + r_t) * (1 + r_{t-1}) - 1 \leq 50\%$. In addition to this criterion, a daily return is equal to missing, if it is greater than 200%. For monthly returns as well, we set those monthly returns to zero, if they increase and then revert such that they satisfy this condition $r_{t-1} > 300\%$ or $r_t > 300\%$ and $(1 + r_t) * (1 + r_{t-1}) - 1 \leq 50\%$. Lastly, all monthly returns that are greater than 800% are set to be missing. Ince and Porter (2006) explained that the returns might lead to an inaccurate estimate if not adjusted for the above-mentioned filters.

After all, cleaning the total coverage of firms including the dead firms is 421 for the period of 1993-2015. The average number of stocks in PSX is 229. However, there is a considerable number of the stocks, which are traded for maximum of three days within a month[8]. If such stocks are excluded, then the average number of stocks reduces to 139. The Figure 1 traces the percentage of such firms in the sample for the period of 1993-2015. It is quite visible that concentration of such firms has decreased substantially over the time. The portion of such firms is lesser than 15% for the last five years, which is significantly lower in comparison to initial years.

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[7] *It refers to such firms, which are dead and therefore excluded from the sample. This may lead to overstate the portfolio returns. For further details see: Ince and Porter (2006).*

[8] *Griffin et al. (2010) and Lee (2011) also used such filters.*

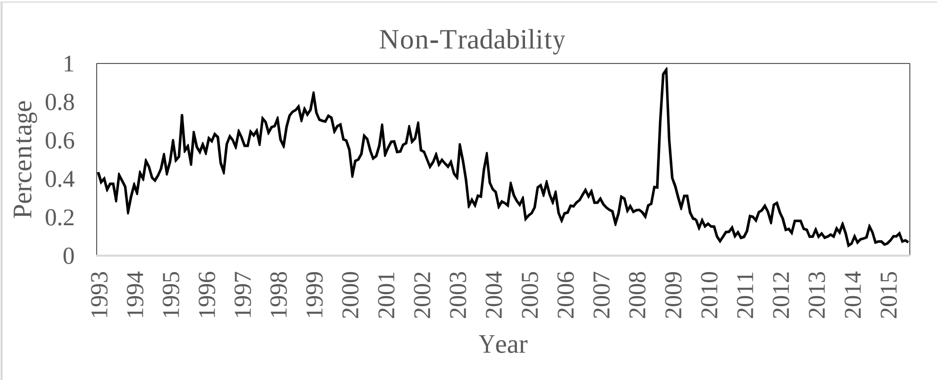

Figure 1: Average Number of Firms Trading for Maximum of Three Days in a Month from 1993-2015

4. Methodology

4.1. The base model

To price the return structure of the above constructed test assets, the unconditional version of LCAPM proposed by Acharya and Pedersen (2005) and also used in Lee (2011) is presented as under,

$$E(R_{it} - R_f) = E(C_i) + \lambda_1\beta_{i,1} + \lambda_2\beta_{i,2} - \lambda_3\beta_{i,3} - \lambda_4\beta_{i,4} \qquad (1)$$

In above model, $E(R_{it} - R_f)$ is the expected returns in excess of risk free rate on a particular portfolio (test assets), $E(C_i)$ is expected level of illiquidity of test assets, whereas the other four indicated betas are estimated using following relationships:

$$\beta_{i,1} = Cov(R_{it}, R_{m,t})/Var(R_{m,t} - C_{m,t}) \qquad (2)$$

$$\beta_{i,2} = Cov(C_{it}, C_{m,t})/Var(R_{m,t} - C_{m,t}) \qquad (3)$$

$$\beta_{i,3} = Cov(R_{it}, C_{m,t})/Var(R_{m,t} - C_{m,t}) \qquad (4)$$

$$\beta_{i,4} = Cov(C_{it}, R_{m,t})/Var(R_{m,t} - C_{m,t}) \qquad (5)$$

The equation (2) represents the usual market beta (CAPM). In equation (3) commonality in illiquidity (studied by Chordia, Roll and Subrahmanyam (2000)) related beta is shown, which captures the impact of covariance of asset illiquidity, shown as C_{it} and market illiquidity, shown as C_{mt} over its returns, which is positive. As the asset that becomes illiquid when market is illiquid requires some compensation for investors to hold such assets that are not, hedged against market-wide illiquidity risk. In equation (4), the illiquidity risk that capture flight to liquidity effect is shown, an asset whose return increases when market illiquidity increases provide the cushion to the investors when illiquidity at market level increases. Resultantly it is priced negatively as shown in equation (1), the studies like Amihud (2002), Pastor and Stambaugh (2003), Bekaert et al. (2007) and others analyzed the pricing implication of this dimension of illiquidity risk. Lastly, in equation (5), the impact of market-wide returns over asset's illiquidity is shown. When market returns are depressed and the illiquidity of the stock reduces then such characteristic of an asset provide an ease to trade in adverse times. Resultantly, this illiquidity beta is priced negatively, showing higher demand of such assets. Studies like Acharya and Pedersen (2005) and Lee (2011) found that this dimension of illiquidity risk is the most important for the US market and for global markets.

4.2. Construction of size and volatility portfolios

There are different characteristics reported in the literature that are linked with the returns around different markets (Hou et al., 2014). Of them, size and volatility of stock returns are chosen for their relevance for small sized emerging market. As illiquidity, which is usually related with the size and volatility is a characteristic that matters the most for the investors in such markets. There is one additional benefit of choosing characteristics such as the level of illiquidity which is linked with the size. The same however, does not hold for volatility. This point is highlighted in coming paragraphs. Nevertheless, there is significant variation in returns of the stocks based upon their apparently dissimilar level of illiquidity.

As the average number of stocks in PSX is 139, we construct only five portfolios using each characteristic (market capitalization for size and standard deviation for volatility related portfolios). Using size[9] based information for the month of January 1993; the returns for the month of March 1993[10] are allocated to five portfolios. Such that portfolio S-1 is the collection of those stocks whose one month's preceding size is less than or equal to 20% percentile of the size of all available firms. Similarly, the portfolios S-2, S-3, S-4 and S-5 are the collection of those stocks whose preceding month's size are increasing monotonically by 20%. We adopt for monthly sorting procedure to incorporate the maximum possible information at firm level into the returns[11].

Similarly, to construct volatility related portfolios, we estimate the standard deviation for each stock in a given month using daily returns data[12]. The portfolio construction mechanism i similar for size based portfolios. Accordingly, V-1 is the collection of those stocks whose volatility is the minimum, whereas V-2, V-3, V-4 and V-5 are the portfolios of those stocks whose volatility is monotonically increasing.

4.3. Measuring illiquidity in PSX

Insights from the previous section indicates that liquidity is increased in PSX over time. To add to this evidence of increased liquidity, the liquidity measure for the stocks listed in PSX market are estimated as the ratio of monthly zero returns over total trading days in a month. This is expressed as under,

$$ZR = ZRD_{it} / TD_{it} \qquad (6)$$

Where ZR measures the level of illiquidity, ZRD_{it} is total zero returns in a month for a stock and TD_{it} shows the total trading days in any month. The logic to opt for this proxy to measure liquidity is that, if on a particular day transaction cost (buying and selling costs) is high, rationale investors will avoid trading on that day. Therefore, y, days on which no trading takes place are denoted as zero return days. A stock having high zero return days are the one with low liquidity (high illiquidity) (Lee, 2011). This liquidity measure is extensively being used in

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[9] Which is number of shares outstanding multiplied by the end of month prices of the firm.
[10] One month is left-out to control for the short-term reversal effect.
[11] A rationale of such strategy is elucidated in foot note 21 of (Sadka, 2006).
[12] We follow the same criteria prescribed on French website.

the literature such as by Bekaert et al. (2007) and Lee (2011) etc. The market illiquidity is simply the average of ZR measure of all firms and it is shown in Figure 2. There is a straightforward exhibition of the effect that number of the firms that are traded are increased over time. This increased trade can be attributed to decreasing illiquidity of the PSX market.

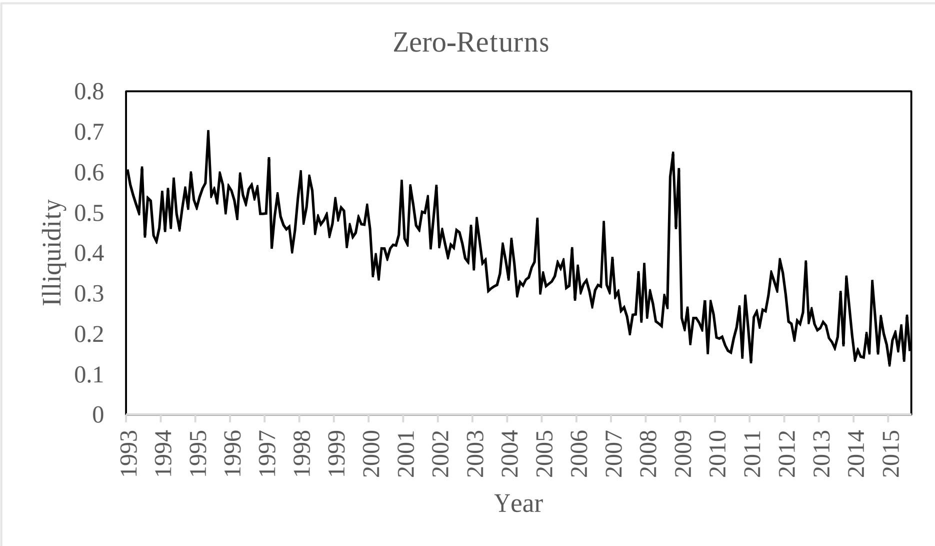

Figure 2: Monthly Average of Zero-Returns of the Firms Traded in PSX for the Period of 1993-2015

In Figure 2, there is a visible hump around December 2008, and that is owed to the imposition of “floor rule” in the context of financial crises (Sharif, 2015). This results in practical shutdown of the PSX market, which led to exit of MCSI Pakistan index from MCSI emerging market index[13]. However, conditions improved in terms of tradability of firms afterwards, which is also visible in Figure 2. Recently PSX is described as the best-hidden frontier market[14], with the 16% growth for last 12 months making it amongst the top ten best performing markets. Thus, the inclusion of PSX in emerging market index provided by MSCI is in the review agenda for the year 2016.

[13] *Pakistan Economic Survey 2008-09.*

[14] *Bloomberg date June 30, 2015. Link http://www.bloomberg.com/news/articles/2015-06-30/in-best-hidden-frontier-market-boom-signals-pakistan-revival.*

4.4. Stock-based test assets

As the number of stocks traded in PSX are not that high to construct larger number of portfolios for cross-sectional analysis. Therefore, we use stocks as our test assets, this procedure has multiple advantages. First, a lot of information of stock returns is wasted when analysis is conducted at portfolio's level, since individual stock returns are averaged out (Ang, Liu & Schwarz 2008). For small underdeveloped markets when return variation is quite high, the potential loss of information is higher. Second, the number of portfolios is usually small and when coefficient of interest is estimated the degree of freedom are reduced. To circumvent this, using the stocks for cross-sectional analysis significantly improves the estimation procedure. There is also a drawback associated with stock-based analysis, which is the model related risk, the betas are estimated with large estimation errors. The usual procedure to handle error in variable (EIV) problem is that betas are estimated at portfolios level.

For example, for the portfolio of smaller size stocks S-1, the respective betas are estimated using equation (2), (3), (4) & (5), afterwards each stock in S-1 is allocated the respective betas of the that portfolio. The same procedure is adopted for other portfolios. However, the level of illiquidity for each stock is its zero-returns in preceding months. This procedure of allocating the level of illiquidity of stock and its betas risk breaking the strong correlation between them. Which hich is handful in disentangling the effect of level of illiquidity from beta risks (Acharya & Pedersen, 2005). As level of illiquidity changes for each stock time, betas remain same.

4.5. Testing the diversification opportunities

To test for the existence of diversification benefit, we take the example of the US investor and assume that the three factors, market, size and value of Fama and French (1993) are the true source of risk. Now if the size and volatility related portfolios in PSX are equally exposed to such factors, as are the returns on comparable portfolios in the US market. The US investor can achieve no hedging benefits. Naturally, we concentrate on alphas of three-factor model (constructed for the US market) for five size and volatility related portfolios (test assets based on PSX stocks). The returns in PSX market are converted into US dollars. In order to get excess returns the risk-free rates given in Fama and French website are used2.

5. Analysis and Discussion

5.1. Preliminary descriptive analysis

The results for the size based portfolios are shown in Table 1, as expected the smallest size portfolio S-1 is giving the highest annual excess returns[15] amounting to (3.629% x 12) 43.548%, whereas the S-5 the biggest size portfolio is giving the minimum annual excess returns of (0.923% x 12) 11.076%. The column with the caption firms shows the average number of firms within each portfolio, in column ZR the average zero-returns of the firms in each portfolio is given. It is obvious that level of illiquidity is intrinsically linked with size of the firms and the returns. This can be ascertained by the column size in Table 1, which are monotonically increasing.

In Table 2, the characteristics of volatility related portfolios are shown. The results in Table 2 are quite expected, the most volatile portfolio is the one giving the maximum annual returns of (4.162% x 12) 49.944%, whereas V-1, the least volatile portfolio is giving the annual returns of (-0.039% x 12) -0.468%. The column ZR and volatility shows that illiquidity is not monotonically linked, either with returns or with volatility. Therefore, the construction of volatility related portfolios is unlike the size related portfolios is independent of level of illiquidity. Nevertheless, both of these portfolios may be exposed to market-wide illiquidity risk, which is a systematic dimension of illiquidity effect.

Table 1: Size Portfolios Related Characteristic

Portfolios	Returns	Firms	ZR	Size	β_1	β_2	β_3	β_4
S-1	3.629%	23	49.441%	0.094	1.121	0.911	-0.340	-0.271
S-2	2.396%	24	40.653%	0.485	0.935	1.089	-0.325	-0.247
S-3	1.650%	25	34.605%	1.483	0.921	1.034	-0.291	-0.233
S-4	1.575%	26	27.806%	4.141	0.831	0.967	-0.230	-0.138
S-5	0.923%	27	20.562%	38.765	0.814	1.251	-0.214	-0.107

[15] *The risk-free rates for Pakistan is taken from State Bank of Pakistan.*

This Table summarizes the characteristics of size related portfolios. S-1 is the portfolio, which is comprised of approximately 20% of least capitalized stocks in PSE, Pakistan. Portfolios like S-2, S-3, S-4 and S-5 are those firms whose market capitalization is increasing monotonically by 20% for each portfolio, such that S-5 is the portfolio composed of approximately 20% of highly capitalized stocks. The monthly returns of these portfolios for the period 1993-2015 are shown under the heading of returns, firms' shows average number of stocks in each portfolio. ZR is monthly average of zero returns of the firms whereas, size is the average market capitalization of these firms which is product of number of shares outstanding and end of month prices, size is shown in Pak Rupees (in billion). The market beta and illiquidity related betas for these portfolios are shown as β_1, β_2, β_3 and β_4 and estimated using equation (2), (3), (4) & (5).

Table 2: Idiosyncratic Volatility Portfolios Related Characteristic

Portfolios	Returns	Firms	ZR	Volatility	β_1	β_2	β_3	β_4
V-1	-0.039%	23	33.480%	2.012%	0.498	1.033	-0.141	-0.247
V-2	0.916%	25	30.920%	2.488%	0.698	1.088	-0.226	-0.206
V-3	1.689%	25	30.877%	2.890%	0.872	0.945	-0.247	-0.066
V-4	2.258%	25	32.607%	3.841%	1.121	1.193	-0.283	-0.175
V-5	4.162%	24	42.052%	6.851%	1.419	1.066	-0.342	-0.234

This Table summarizes the characteristics of Volatility related portfolios. V-1 is the portfolio, which is comprised of approximately 20% of those stocks whose volatility is the least in PSE, Pakistan. Portfolios such as V-2, V-3, V4 and V-5 are those firms whose market volatility is increasing monotonically each by 20%, such that V-5 is the portfolio composed of approximately 20% of highly volatile stocks. The monthly returns of these portfolios for the period 1993-2015 are shown under the heading of returns, firms' shows average number of stocks in each portfolio. ZR is monthly average of zero returns of the firms included in each portfolio whereas; Volatility is the average volatility of these firms. The market beta and illiquidity related betas for these portfolios are shown as β_1, β_2, β_3 and β_4 and estimated using equation (2), (3), (4) & (5).

In Table 3, under the column of ZR, the correlation between levels of illiquidity with betas risks is shown for size and volatility related portfolios. These correlations are significantly reduced at stock level in comparison to the correlations estimated at portfolio level[16]. Nevertheless, the betas related correlations are unaffected, as these are the same for stocks and portfolios. These correlations are quite high especially between β1 and β3 for both types of stocks, either size related or volatility. For size related stocks, this correlation is -.885 and for volatility stocks it is -0.972.

[16] *The correlations at portfolios level can be provided upon request.*

Table 3: Correlation Structure

Panel A:	ZR	β_1	β_2	β_3	β_4
ZR	1				
β_1	0.375	1			
β_2	-0.270	-0.634	1		
β_3	-0.377	-0.885	0.538	1	
β_4	-0.370	-0.863	0.587	0.987	1
Panel B:	**ZR**	β_1	β_2	β_3	β_4
ZR	1				
β_1	0.151	1			
β_2	0.014	0.313	1		
β_3	-0.140	-0.972	-0.287	1	
β_4	-0.064	0.020	-0.462	-0.118	1

This Table presents the correlation among model constituent variables for the size and volatility related portfolios. In Panel A, the correlation between level of illiquidity shown as ZR, and market beta β1 and other illiquidity related betas β2, β3 and β4 are shown. The ZR is estimated, as previous month's number of zero returns for each stock whereas, each stock is allocated its portfolio related beta. In Panel B, the same correlation structure is shown for volatility related portfolios.

5.2. Estimation of betas and their characteristics

Illiquidity for market portfolio and for other five size and volatility related portfolios each, is estimated using equation (1). FollowingAcharya and Pedersen (2005), Lee (2011) and Sadka (2006), instead of working with monthly illiquidity series directly, innovation in illiquidity series are used. As the illiquidity series are generally highly auto correlated, for instance this autocorrelation is 0.84 for the aggregate zero returns series of market portfolio. Similarly, for size related five portfolios the auto correlation coefficient is from the 0.54 to .73, and for volatility related five portfolios, the range is 0.67 to 0.81. To get the innovation in zero returns ARMA (1, 1)[17] is used. The innovations from this model are collected for monthly illiquidity of the market and for other ten portfolios. Now the autocorrelations are significantly dropped, for market-wide illiquidity this

[17] *By using AR (2) model the innovation is illiquidity series the autocorrelation is higher, however the overall content of the results presented in coming section of empirical analysis remain the same.*

correlation is now 0.02 and it is insignificant. Similarly, the innovation in illiquidity series for size related portfolio is now within the range of 0.002 to 0.08 and for volatility portfolio the innovation in illiquidity series lies in the range of 0.03 to 0.18.

Using these innovations in illiquidity series and excess return series for test portfolios and market portfolio, the betas shown in equation (2), (3), (4) and (5) are calculated. The characteristics of these betas are shown in Table 1 and 2.

Table 1 summarizes the betas related relationship of size portfolios, the β_1 shows the market beta associated with each portfolio, the exposure of smaller size S-1 portfolios is higher (1.121) to market risk in comparison to bigger size portfolio S-5 (0.814). The commonality in liquidity β_2 is showing counterintuitive exposures. As it is generally expected that illiquidity of smaller portfolio increases more with the increase in market-wide illiquidity. However, its value for S-1 is 0.911 and for S-5, it is 1.251. Another form of illiquidity risk is β_3, now there is significant dispersion, for instance β_3 for S-1 is -0.340 and for S-5 it is -0.214, the higher time series negative relationship indicates as in Amihud (2002), that the returns of the smallest portfolio decreased the most when market's illiquidity increases. Lastly, the β_4 also varies monotonically in relation with size, such that S-1 has the highest negative exposure of -0.271, whereas S-5 has the minimum exposure of -0.107. Intuitively when returns on market portfolio decreases, then innovation in zero returns increases the most for S-1, that is, under depressed market conditions the smaller stocks becomes more illiquid.

Table 2 summarizes the betas related relationship with volatility portfolios, the market beta β_1 shows significant variation with volatility related portfolio returns, the commonality in liquidity manifested through β_2 is not directly linked, whereas with, β_3 and β_4 this linkage is visible, particularly the β_3 is quite monotonically linked with the returns on volatility portfolios. These characteristics of betas indicate that market risk β_1 and illiquidity related risk β_3 for both, size and volatility related portfolios capture the variation in returns over the time.

5.3. Liquidity related analysis

The following testable version of LCAPM proposed by Acharya and Pedersen (2005) is estimated using Fama and Macbeth (1973) cross-sectional procedure, to analyze the explanatory power of local level of illiquidity, illiquidity risk and market risk,

$$E(R_t - R_f) = \alpha E(C_i) + \lambda_1\beta_{i,1} + \lambda_2\beta_{i,2} - \lambda_3\beta_{i,3} - \lambda_4\beta_{i,4} \qquad (7)$$

To test the above model, owing to high correlation among betas as shown in Table 3, the betas are not included within any regression except for the last one, and that is to highlight the issue of muticollinearity (Lee, 2011). In Table 4, M1 is a model in which only the level of illiquidity is included to find its impact on the pricing of size related portfolios. In M2, level of illiquidity along with the market beta is tested to see the total impact of these two risk factors. In M3, M4 and M5, the level of illiquidity with illiquidity related betas are separately tested to see among three different illiquidity related risk candidates, which is the most relevant. Lastly, in M5 the model is tested with the inclusion of level of illiquidity, market risk and constituent illiquidity related risks. In Panel-B, the same procedure is repeated for volatility related portfolios.

In Table 4, the coefficient on the level of illiquidity for the size related portfolio is positive with the value 0.034 and associated t-stat of 3.62. Using this coefficient and following relationship,

$$\alpha * \{E(C_1) - E(C_5)\} \qquad (8)$$

Where $E(C_1)$ is expected illiquidity on the smallest portfolio S-1, and $E(C_5)$ is expected illiquidity on the S-5 portfolio, these values are given in Table 1. Using the coefficient of expected illiquidity 0.034 and the average illiquidity of the respective portfolios, the annual return differential 0.034 x (0.494-0.205) x 12 =0.114 is explained by the level of illiquidity. Whereas, the actual annual return dispersion between these two portfolios is 0.325 as given in Table 1, Hence, the total of (0.114/0.325) 35.077% variation return is explained by the level of illiquidity. In M2 model, the total explanation of return through level of illiquidity and market risk can be gauged by the following relationship,

$$\alpha * \{E(C_1) - E(C_5)\} + \lambda_1 * (\beta_{i,1} - \beta_{i,5}) \quad (9)$$

The coefficient on level of illiquidity α is now 0.020 and price of market risk is λ_1 0.060; both are positive and statistically significant. Using the differential between expected illiquidity and market risk between the portfolio S-1 and S-5 given in Table 1, the relationship (9) predicts this differential {0.020 x (0.494-0.205) + 0.060 x (1.121-0.814)} x 12 to be 0.288. That is, M2 explains (0.288/0.325) 88.615% of returns differential. Of this, level of illiquidity explains 21.341% and market risk explain 67.274%. In the M3 model the price commonality is liquidity risk. This is counter intuitive, using M4 and relationship (9), with price of risk associated with flight to liquidity effect of -0.107, level of illiquidity coefficient of 0.022 as shown in Table 4 and respective illiquidity risk given in Table 1 under β_3, the predicted yearly premium is 0.236. That is 73% of the returns differential is explained by level and risk associated with illiquidity effect. Therefore, the contribution of level of illiquidity premium is 23% and of illiquidity risk is 50%. Similarly, the premium explained by model M5, using the illiquidity risk β_4 and associated price of risk and relationship in equation (9) is 0.227 per annum. As such, the most economically meaningful illiquidity risk is β_3 in the context of PSX, this result is different from the results in Acharya and Pedersen (2005) and Lee (2011), as in their studies β_4 is the most significant illiquidity related risk.

It seems that significance of indicated illiquidity risk is country specific. Lastly, in M6 all of the constituent risk factor of equation (7) are estimated, although only level of illiquidity and β_3 have theoretically tenable signs and significance but nevertheless, these results are affected by multicollinearity. For instance, the magnitude of price of risk associated with flight to liquidity effect is increased but its statistical significance is reduced in comparison to model M4.

In Panel B of Table 4, the results for volatility related portfolios are summarized. Here we find the negative coefficient on the level of illiquidity, as the stocks related with their volatility show no monotonic relationship with the level of illiquidity as shown in Table 2, column ZR.

Table 4: Stock based Analysis for Size and Volatility based Portfolios using Fama-MacBeth Regressions

Panel A: Size Based Portfolios						
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
ZR	0.034	0.0197	0.028	0.022	0.024	0.023
	(3.62)	(2.10)	(3.13)	(2.30)	(2.43)	(2.41)
β_1		0.060				0.004
		(3.08)				(0.10)
β_2			-0.037			-0.048
			(-2.77)			(-1.76)
β_3				-0.107		-0.336
				(-2.85)		(-2.17)
β_4					-0.075	0.199
					(-2.65)	(1.75)
Constant	0.018	-0.031	0.059	-0.007	0.008	0.014
	(2.40)	(-1.89)	(3.36)	(-0.66)	(1.05)	(0.31)
Panel B: Volatility Based Portfolios						
	M1	M2	M3	M4	M5	M6
ZR	-0.050	-0.064	-0.049	-0.062	-0.050	-0.062
	(-5.99)	(-7.02)	(-5.79)	(-6.85)	(-6.02)	(-6.95)
β_1		0.052				0.049
		(6.10)				(3.55)
β_2			0.035			-0.051
			(2.51)			(-2.74)
β_3				-0.246		-0.036
				(-6.14)		(-0.69)
β_4					-0.027	-0.059
					(-1.44)	(-2.38)
Constant	0.042	-0.004	0.004	-0.017	0.037	0.033
	(5.45)	(-0.54)	(0.28)	(-2.17)	(4.21)	(2.32)

This Table presents the estimation of the Acharya and Pedersen (2005) Liquidity Adjusted CAPM,

$$E(R_t - R_f) = \alpha E(C_i) + \lambda_1\beta_{i,1} + \lambda_2\beta_{i,2} - \lambda_3\beta_{i,3} - \lambda_4\beta_{i,4}$$

The tests assets are the stocks, which are grouped into five portfolios, based upon their previous month's size and volatility. Subsequently, each stock is assigned market and illiquidity related betas of the portfolio to which that stock belongs. These betas are calculated using equation (2), (3), (4) and (5). The expected illiquidity ZR is stock's previous month average zero returns. Panel A, represents the estimated coefficients of the test assets on expected illiquidity and model related risk, the t-stat are shown below the coefficients in parenthesis. Panel B, repeats the same procedure for volatility-based portfolios. These results are based for the period of 1993-2015.

Therefore, this result means, level of illiquidity for the volatility related stocks is not economically important. Using the output of the model M2 in Table 4, the corresponding variables given in Table 2 and equation (9), the predicted premium is 0.511. Whereas, the actual return dispersion between V-5 and V-1, given in Table 2 is 0.504 on annual basis. Similarly using the output of M4, this predicted premium is 0.526. Generally, the excess return is predicted either by the market risk or by the illiquidity risk β_3. The other two illiquidity risks are not important for the pricing of volatility related stocks. These results also hint that even if level of illiquidity is not linked with the stock returns, the market-wide illiquidity risk is still significant part of the pricing of such stocks.

5.4. Diversification analysis

In Table 5, the estimated out-put of the three-factor model of Fama and French (1993) is given. There is statistically significant exposure of the returns of these PSX size and volatility related portfolios on risk factors for the US market. Nevertheless, the annual excess dollar returns on the portfolio S-1 and S-5 are 44.165% and 12.643% in the PSX. Whereas, 34.440% and 5.280% annual returns of these portfolios are not explained as shown in Table 5. Similarly, for portfolio V-5, the excess returns are 51.243%, whereas 39% are not explained, whereas for the least volatile portfolio V-1, the alpha is insignificant. On the other hand, the excess returns on size related ten portfolios for the US market are well explained by the three-factor model[18]. For instance, the yearly alpha on S-1 and S-10, for the US based sized related portfolios are -2.040% and -1.444%, that is after accounting for the risks there is no excess returns for such these portfolios that remain available.

The above analysis indicates that an international investor by investing in stocks traded in PSX can get higher returns and at the same time reduce the risk. As returns on PSX are not that correlated with the risk factors that are quite

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[18] The ten-equal weighted size related portfolios and respective three risk factors are downloaded by Fama and French data library, the detail results on the estimation of this model are available upon request.

pertinent for international investor. Nevertheless, these results are based on the extreme assumption of equity market liberalization[19]. However, as indicated in previous research that markets like PSX are neither fully integrated nor segmented. Although the official liberalization date[20] for Pakistan is February 1991, nevertheless all stocks remain practically inaccessible to foreigners.

Table 5: Relationship between Local Returns with International Risk Factors

Panel A: Size Portfolios					
Portfolios	**Constant**	**MR**	**SMB**	**HML**	**R^2**
S-1	0.029	0.415	0.929	0.557	0.084
	(3.56)	(2.56)	(3.59)	(2.12)	(0.074)
S-2	0.019	0.454	0.557	0.216	0.086
	(2.73)	(3.40)	(2.51)	(1.00)	(0.076)
S-3	0.011	0.407	0.283	0.174	0.056
	(1.80)	(3.19)	(1.39)	(0.84)	(0.045)
S-4	0.013	0.334	0.308	0.100	0.059
	(2.11)	(2.75)	(1.59)	(0.05)	(0.049)
S-5	0.004	0.446	0.333	0.167	0.075
	(0.72)	(3.63)	(1.70)	(0.84)	(0.065)
Panel B: Volatility Portfolios					
Portfolios	Constant	MR	SMB	HML	R^2
V-1	-0.004	0.286	0.187	0.082	0.070
	(-0.90)	(3.49)	(1.51)	(0.65)	(0.059)
V-2	0.006	0.294	0.289	0.029	0.060
	(1.15)	(2.71)	(1.76)	(0.17)	(0.049)
V-3	0.012	0.417	0.289	0.074	0.060
	(1.86)	(3.06)	(1.41)	(0.35)	(0.049)
V-4	0.018	0.446	0.497	0.087	0.069
	(2.34)	(2.94)	(2.05)	(0.35)	(0.059)
V-5	0.033	0.622	0.725	0.594	0.066
	(3.28)	(3.13)	(2.28)	(1.84)	(0.055)

[19] *Stocks are easily accessible to foreign investors without any restrictions. For details see: (Bekaert, Harvey & Lundblad, 2003)*

[20] *These liberalization dates for different markets are given in (Bekaert & Harvey, 2000).*

This Tables presents the results of Fama and French (1993) three factor model, by using the risk factors for the US market which are excess market return MR, size factor SMB, value factor HML.

$$E((R_i - R_f)_t = \alpha_{it} + \lambda_{i,m}(MR - R_f)_t + \lambda_{i,smb}(SMB)_t + \lambda_{i,hml}(HML)_t$$

The test assets are excess return on the size and volatility based five portfolios for the PSE, Pakistan. The returns are denominated in US$, the time period of the analysis is 1993-2015. The t-stats for each coefficient is presented below in prentices, the last column shows the R2 of each model and adjusted R2 is presented below in prentices.

To proxy for the investable stocks, we download S&P/IFCG Extended Frontier 150 Index for Pakistan from DS, which include the most liquid and larger capitalized firms traded in PSX. The index is available from November 2008 onwards; the average number of stocks from PSX are 17. If this portfolio is held by the US investor, then the alpha from three factor Fama and French (1993) model is 19.683% annually. On the other hand, the annual alpha is -0.049%, that is, practically non-existent when the CAPM implying local market risk is used. Therefore, even for the most investable stocks in PSX the local risk matters the most, the risks for instance for the US investor do not count. These results indicate the diversification opportunities are available for foreign investors by holding the stocks from emerging markets in their portfolios.

6. Out of Sample Analysis

6.1. Estimation of betas for India and Brazil

In this paper, the detailed analysis is mainly conducted for PSX, Pakistan and our finding is that magnitude of anomalous returns are quite higher in comparison to the US market which is probably the most liquid market. Further, these higher returns are linked with local pricing factors, such as level of illiquidity of the stocks, market risk and illiquidity risk. However, to show that, these results are not just confined to PSX, Pakistan. Other emerging markets such as India and Brazil have also been analyzed. We have repeated the analysis in section 4, for the size based portfolios for Indian and Brazilian markets.

In both the markets, we use only one major stock exchange on which majority of the stocks in that country is listed. For India, we use National Stock Exchange (NSE) and for Brazil, we use Sao Paulo Stock Exchange (SAO). We follow the procedure described in section 2 to clean our data set[21]. Our final sample comprises of 1,475 stocks for India and 475 stocks for Brazil. Using the data of market capitalization for these countries, we construct five size-based portfolios following the same procedure that is described in section 3. The results are shown in Table 6, panel A for NSE, India. Under the column returns, the size premium is 39.060% ((0.041-0.009) x 12) on the annual basis. The size premium is as high as is for PSX, Pakistan, although the number of firms in each quintile and average market capitalization (shown as firms and size in the Table 6, panel A) of these firms[22] listed in NSE, India are quire higher than PSX, Pakistan. This indicates, that the high premiums are not just restricted for smaller size hybrid[23] natured markets like PSX, Pakistan. As expected the zero returns, ZR are higher for smaller sized portfolio and this points to their higher level of illiquidity. Lastly, the fours risks, one is market risk β_1 and other three illiquidity related risks β_2 β_3 β_4 are also shown, the gap of exposure between S-1 and S-5 with market risk β_1 and illiquidity risk exhibited through β_3 and β_4 are well alighted with the theoretical notion of the pricing of size premium. For instance, the higher β_1 for S-1 indicates, the returns for least capitalized portfolio co vary more with market returns. Similarly, the higher negative exposure for β_3 and β_4 indicates, in the case of later beta that the higher market illiquidity decreases the return of S-1 the most, and for the former beta, when the market returns decrease the most, the cost of trade for S-1 increases the most.

In panel B of table 6, the information for five size related portfolios is summarized for the SAO, Brazil. Here the average annual size premium is (0.059-0.013) x 12 = 55.404%. Which is highest among the size related premiums calculated for the three markets. Although firms market capitalizations listed in SAO, Brazil is higher[24] than the firms listed in NSE, India. However, in comparison to India, the average zero returns for the firms noted under the column ZR are quite higher for the

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[21] *For Brazil, Lee (2011), retained a certain type of preference stocks with the symbol 'PN' as these are like common equity. We also retain these types of preference stocks in our sample.*

[22] *As the Indian currency is stronger than Pak Rupees, therefore the market capitalization of Indian firms is even higher once their currency denomination is changed to Pak Rupees.*

[23] *Pakistan for most of the time been an emerging market, then this status is changed to frontier market in 2008 and it is to come back to emerging market index in 2017.*

[24] *It is because the Brazilian Real is stronger than Indian Rupee.*

Brazilian market[25]. However, for S-1 portfolio of the ZR is even higher in comparison to PSX, Pakistan. The market and illiquidity related risks captured by β_1, β_2, β_3, and β_4, exposue the signs that reconcile with the returns pattern for size related portfolio expected for the β_2. Thus, these characteristics of size-related portfolios and their relationship with level of illiquidity, market and illiquidity related risks for PSX, Pakistan, NSE, India and SAO, Brazil have quite similar features.

Table 6: Size Portfolios Related Characteristic for NSE, India and SAO Brazil

Panel A: Size Portfolios (India)								
Portfolios	**Returns**	**Firms**	**ZR**	**Size**	**β_1**	**β_2**	**β_3**	**β_4**
S-1	4.121%	178	27.098%	0.131	1.134	0.978	-0.211	-0.120
S-2	2.310%	177	18.724%	0.531	1.098	1.017	-0.168	-0.074
S-3	1.719%	177	15.161%	1.490	1.031	1.007	-0.128	-0.052
S-4	1.205%	177	12.146%	4.826	0.950	0.993	-0.153	-0.020
S-5	0=.865%	178	9.526%	77.249	0.768	0.986	-0.151	0.010
Panel B: Size Portfolios (Brazil)								
Portfolios	**Returns**	**Firms**	**ZR**	**Size**	**β_1**	**β_2**	**β_3**	**β_4**
S-1	5.878%	29	53.989%	0.023	1.117	0.795	-0.146	-0.059
S-2	3.491%	28	40.081%	0.208	0.974	0.946	-0.107	0.000
S-3	2.767%	28	30.567%	0.681	1.033	1.126	-0.064	-0.028
S-4	1.860%	28	24.504%	1.994	0.901	1.034	-0.075	0.019
S-5	1.261%	29	22.580%	29.664	0.954	1.088	-0.040	0.000

In this table Panel A summarizes the characteristics of size related portfolios for NSE, India. S-1 is the portfolio, which is comprised of approximately 20% of least capitalized stocks in NSE, India. Portfolios like S-2, S-3, S-4 and S-5 are those firms whose market capitalization is increasing monotonically by 20% for each portfolio, such that S-5 is the portfolio composed of approximately 20% of highly capitalized stocks. The monthly returns of these portfolios for the period 1994-2015 are shown under the heading of returns, firms' shows average number of stocks in each portfolio. In panel A, ZR is monthly average of zero returns of the firms included in each portfolio. The size is the average market capitalization of these firms which is product of number of shares outstanding and end of month prices, size is shown in local currency (in billion). The market beta and illiquidity related betas for these portfolios are shown as β1, β2, β3 and β4 and estimated using equation (2), (3), (4) & (5). In panel B, the same analysis is repeated for Brazil.

[25] *In Lee (2011), as well the average of zero returns for Brazil are quite higher in comparison*

6.2. Liquidity related analysis for India and Brazil

Following the procedure defined in section 3.4, our test assets are the stocks. Which provided us with huge degrees of freedom for testing the LCAPM presented in equation (1). In panel A of table 7, the model based estimated premiums are indicated for the NSE, India. In M1, the estimated coefficient of level of illiquidity of stock is positively priced as per expectation. As per relationship given in equation (8), the predicted premium associated with level of illiquidity [26]{(.271-.095) x 0.054} x 12 is 0.113 yearly. This signifies that 28.900% of total realized annual premium is 0.391 and is explained by the level of illiquidity. In M2, the level of illiquidity and market risk predicted premium {(.271-.095) x 0.036+ (1.134-0.768) x 0.056} x 12 is 0.322 yearly, which is 82.353% of total realized premium of 0.391.

For brevity, we next enunciate the best level of illiquidity and illiquidity risk related model, which is M5. The predicted annual premium {(.271-.095) x0.027+ (-0.120-0.010) x-0.241} x12 is 0.433, which is higher than the realized size related premium of 0.391 for NSE, India.

In panel B of table 7, the results for testing the equation (7) are shown for Brazil. As expected the level of illiquidity of stocks is positively priced. Equation (8) predicts 0.158 yearly premium for the realized difference between S-1 and S-5, which is 0.554. Therefore, 28.520% of illiquidity premium is associated with the level of illiquidity. In model M2, level of illiquidity and marker risk predicts the annual premium to be 0.226, which is 40.794% of total realized premium. Lastly, the best model for level of illiquidity and illiquidity risk is M4. This model predicts yearly premium of 0.312, which amounts to 56.318% explanation of the total premium. In a nutshell, our results remain consistent with previous studies carried out on the subject. We find that the high premiums for investing in emerging markets like PSX, Pakistan, NSE, India and SAO, Brazil are linked with local risk factors.

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[26] *Level of illiquidity are taken from the table 5, panel A for India under the column ZR.*

Table 7: Stock based Analysis for Size-based Portfolios using Fama-MacBeth Regressions

Panel A: Size Portfolios (India)						
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
ZR	0.054	0.036	0.049	0.040	0.027	0.025
	(4.01)	(2.97)	(3.82)	(3.28)	(2.32)	(2.15)
β_1		0.056				0.002
		(5.29)				(0.03)
β_2			0.336			-0.261
			(3.70)			(-2.06)
β_3				-0.120		-0.001
				(-4.89)		(-0.01)
β_4					-0.241	-0.293
					(-6.36)	(-3.72)
Constant	0.013	-0.040	-0.321	-0.025	-0.008	0.244
	(1.99)	(-4.66)	(-3.69)	(-3.63)	(-1.44)	(2.31)
Panel B: Size Portfolios (Brazil)						
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
ZR	0.042	0.035	0.032	0.029	0.036	0.028
	(4.62)	(4.01)	(3.55)	(3.22)	(4.13)	(3.10)
β_1		0.048				0.119
		(2.84)				(0.69)
β_2			-0.037			0.068
			(-3.11)			(2.54)
β_3				-0.159		-0.357
				(-4.24)		(-3.86)
β_4					-0.113	0.315
					(-2.50)	(0.69)
Constant	0.011	-0.034	0.051	0.001	0.011	-0.197
	(1.73)	(-1.97)	(3.49)	(0.16)	(1.81)	(-1.25)

This Table presents the estimation of the Acharya and Pedersen (2005) Liquidity Adjusted CAPM,

$$E(R_t - R_f) = \alpha E(C_i) + \lambda_1\beta_{i,1} + \lambda_2\beta_{i,2} - \lambda_3\beta_{i,3} - \lambda_4\beta_{i,4}$$

The tests assets are the stocks, which are grouped into five portfolios, based upon their previous month's size. Subsequently, each stock is assigned market and illiquidity related betas of the portfolio to which that stock belongs. These betas are calculated using equation (3), (4), (5) and (6). The expected illiquidity ZR is monthly average of zero returns of the firms included in each portfolio. The estimated coefficients on expected illiquidity as measured by ZR and model related risk are shown in the table, the t-stat are shown below the coefficients in parenthesis. These results are based for the period of 1994-2015. In panel A, the results are for NSE, India and in panel B; the results are for SAO, Brazil.

6.3. Diversification analysis for India and Brazil

In table 8, panel A and B the result is repeated for NSE, India and SAO, Brazil for five size related portfolios. Here the results are different from PSX, Pakistan, although local risk factors are important for all three emerging markets. However, the international risk factors are more important for NSE, India than PSX, Pakistan and SAO, Brazil... This is shown that for India, S-5 the annual alpha is (0.001x12) 0.014 with a t-stat of 0.23, further the extent of exposure of S-5 towards US market returns and adjusted R^2 of the model is more than twice as comparable to the level of the most capitalized portfolios for PSX, Pakistan. Although, the least capitalized portfolio S-1 still has the yearly alpha of (0.033x12) 0.404 with the t-statistics of 4.39. These stocks are generally too small to attract any attention of foreign investors. The results for SAO, Brazil indicates that it is a more integrated market and the variations in market returns of the US market have economically significant bearing for the returns in SAO. For instance, the market beta of the 3-factor model and adjusted R^2 is more than twice-in comparison to NSE, India for highly capitalized portfolios. For instance, S-5 and S-4 portfolio, which carry more than 80% of market capitalization of SAO, have negative alphas and exposure to US market return for portfolios S-2, S-3, S4 and S-5 are more than one. Like India though only the least capitalized portfolio S-1 has significant positive alphas, but probably due to their smaller size and high illiquidity they remain out of reach of foreign investors.

Table 8: Relationship between Local Returns for India and Brazil with international risk factors

Panel A: Size Portfolios (India)					
Portfolios	**Constant**	**MR**	**SMB**	**HML**	**R^2**
S1	0.034	0.674	0.295	0.182	0.067
	(4.39)	(3.77)	(1.21)	(0.74)	(0.056)
S2	0.014	0.765	0.338	0.235	0.100
	(2.07)	(4.70)	(1.53)	(1.05)	(0.089)

S3	0.009	0.774	0.324	0.239	0.114
	(1.39)	(5.09)	(1.57)	(1.14)	(0.103)
S4	0.004	0.786	0.378	0.233	0.139
	(0.63)	(5.59)	(1.98)	(1.20)	(0.129)
S5	0.001	0.751	0.38	0.106	0.182
	(0.23)	(6.42)	(2.39)	(0.66)	(0.172)
Panel B: Size Portfolios (Brazil)					
Portfolios	Constant	MR	SMB	HML	R^2
S1	0.040	0.951	0.411	0.133	0.128
	(4.89)	(5.12)	(1.63)	(0.52)	(0.117)
S2	0.0127	1.185	0.419	0.153	0.261
	(1.95)	(8.13)	(2.11)	(0.77)	(0.252)
S3	0.006	1.305	0.298	0.184	0.298
	(0.90)	(9.24)	(1.55)	(0.95)	(0.289)
S4	-0.003	1.209	0.456	0.188	0.330
	(-0.56)	(9.55)	(2.65)	(1.08)	(0.321)
S5	-0.010	1.465	0.251	0.152	0.348
	(-1.60)	(10.46)	(1.32)	(0.79)	(0.34)

This Tables presents the results of Fama and French (1993) three factor model, by using the risk factors for the US market which are excess market return MR, size factor SMB, value factor HML.

$$E((R_i - R_f)_t = \alpha_{it} + \lambda_{i,m}(MR - R_f)_t + \lambda_{i,smb}(SMB)_t + \lambda_{i,hml}(HML)_t$$

The test assets are excess return on the size and volatility based five portfolios for the NSE, India and SAO, Brazil. The returns are denominated in US$, the time period of the analysis is 1993-2015. The t-stats for each coefficient is presented below in prentices, the last column shows the R2 of each model and adjusted R2 is presented below in prentices.

7. Conclusion

The anomalous returns using the publicly available information are reported extensively across different markets as a challenge to EMH. Although, these returns in terms of magnitude are not that high in the developed markets, but still managed to attract a lot of empirical inquisition. For instance, for the US market the return differential between the least and the largest capitalized equally weighted portfolio is 4.690% on annual basis for the period of 1993-2015. Same this holds true for other firm's characteristics as well, such as volatility, book-to-market, operating profits and investment etc. On the other hand, for the emerging markets like PSX, the annual returns based on size and volatility based strategy are 32.472% and 50.412% on annual basis. The lesser focus is given to emerging markets in the literature to rationalize these higher returns within the framework of EMH. This study fulfils this gap and analyzes the higher returns in emerging markets is not a manifestation of inefficiency of the market. As within the pricing model of LCAPM proposed by Acharya and Pedersen (2005), almost all of the extra-ordinary returns are linked with the local risk premiums that investors demand in terms of the effect of illiquidity and market risks to which investors are exposed. Further, the high magnitude of anomalous returns is not just confined to relatively smaller sized market like PSX; in fact, the bigger emerging markets like India and Brazil have this tendency of yielding enormous premiums too. Nevertheless, even in these markets these higher premiums can be rationalized through local asset pricing factors.

Therefore, these local risks are very important for pricing of the stocks in PSX. However, their return structure remains isolated to international risk factors proxy by the market, size and value factors for the US market. Such that for size and volatility based PSX portfolios the return differential of 2.432% and 3.607% between the extreme portfolios is not explained. These results just do not confine for such stocks, which are least capitalized, illiquid, and therefore inaccessible to foreign investors. Even for highly capitalized and liquid stocks in PSX that constitute a part of S&P/IFCG extended 150 Index, the annual returns of 19.682% is not explained. Whereas, the returns on these stocks are totally rationalized within the simple CAPM using the local market risk factor. This indicates that the opportunities for portfolio diversification for international investors are quite real. However, these results are not repeated with the same vigor for India and Brazil. This could be due to the larger size of NSE, India and geographic proximity of SAO, Brazil market to the US, market. Thus, the results of this study indicate that liquidity is an important factor in pricing the return structure of equities. Investors should incorporate liquidity as a factor in asset pricing models to value their stocks/portfolios accurately. While, international investors should consider PSX to diversify their portfolios.

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