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Trading Frequency in KSE – 100 Index Using Pastor and Stambaugh Model

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The study aims to assess Pastor & Stambaugh model on Pakistan Stock Exchange (KSE-100 Index) from 2007 to 2017. Four commonly asset pricing factors are tested including market risk, size, value and liquidity premium. Except for the value premium, all factors are statistically found significant. Pertinent to mention that liquidity factor is initially found insignificant since annual returns are calculated. However, after taking most liquid sector during the period (Chemical Sector) the liquidity measure is derived through monthly returns. The result of the study is backed with Utility preference theory because it is observed that investors do prefer more liquid stocks and as a result when pricing securities liquidity factor holds an important position.

Keyword: market risk; size; value; liquidity premium; utility preference theory

JEL Classification: C52, G11, G12, G17

Introduction

Investments in easiest terms can be described as the commitment of current savings for a specific period of time to derive future returns and benefits which usually compensates an investor in three major dimensions which include the time period for which funds are committed, inflation protection and uncertainty of future payments. Investments can be divided into capital and money markets which are further divided in different ways. This paper primarily focuses on stock markets. Stock markets have a different type of investors wherein the investing strategies of each investor differ significantly based on the profile of investors which is largely influenced by investors' age group, wealth, abil-

ity to take the risk, family structure and other psychological factors (Brealey & Myers, 2000). Each investor requires a certain return given certain security based on his expectations of risk. The same idea was first discussed in modern portfolio theory given by Markowitz (2010) who discussed that investors are risk averse and they construct their portfolios in a such a way to maximize their returns and utility given a level of risk. Moral Philosophers such as Bentham (1996) and Mill (2008) discussed the behavioural aspects of human preferences through utility theory wherein human psychology and preference were discussed in detail. The theory discussed that human being's decision revolves around their own preferences and perception. They make their own preferences based on ex-

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pected utility and rank different choices accordingly. The best possible choice is then selected thereby maximizing their utility. In the financial world, Sharpe (1964) gave the Capital Asset Pricing Model (CAPM) that holds an important position. The model is derived from the earlier works of Harry Markowitz on Modern portfolio theory. This laid the foundation for further studies that we have seen to date in the context of risk and return profile. CAPM assumes that investors maximize their utility function however in reality empirical studies have shown that expected return derived through CAPM is different than what investor actually believes giving room for other studies to be done in this field. Further CAPM is a single factor model wherein market risk premium is the only factor used to determine the required return / cost of equity. This factor cannot be altered as the factor is part of the model. However, after CAPM generic single factor models were introduced wherein the factor could be changed based on investor profiles. Fama & French (1993) further researched through the dynamics of this model and developed another model based on the foundations of Capital Asset Pricing Model (CAPM) to address different anomalies reported in earlier models which most importantly include size effect, value effect, liquidity effect and momentum effect. In comparison to CAPM single factor model, Fama & French (1993) introduced 2 more factors i.e. Small minus big (SMB) and High book to market/Small book to market (HML) along with CAPM.

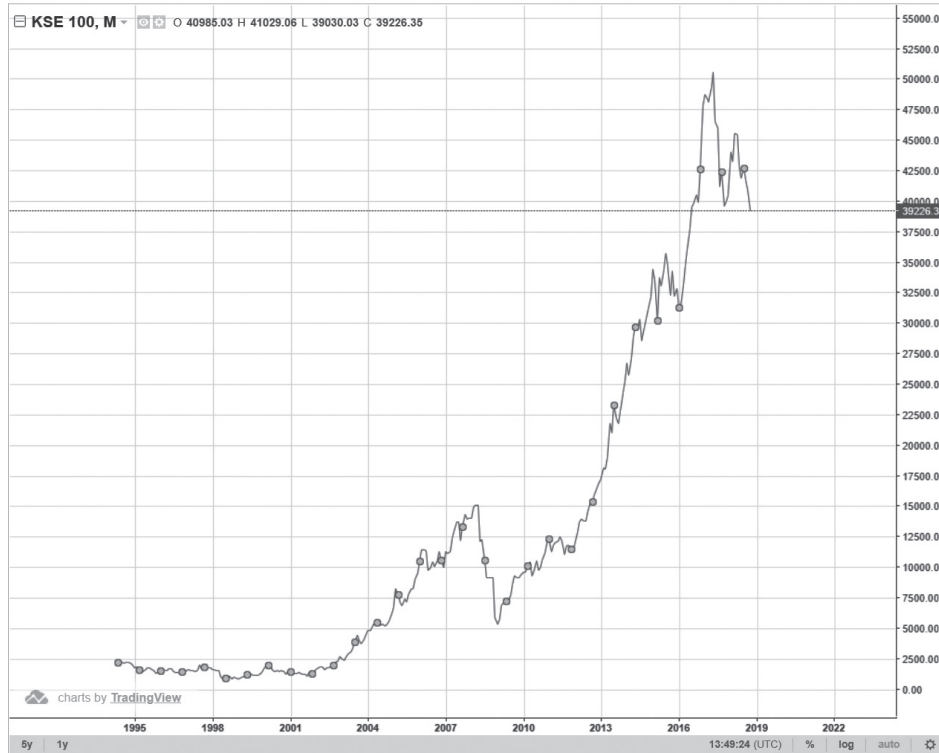
Fama French model opened further boundaries in the field of finance, resulting in the evolution of numerous valuation models. Pastor & Stambaugh (2001) gave the model which was basically an extension of Fama & French (1993) model with the addition of another factor known as liquidity factor. Liquidity in Pastor's model means how fast an asset can be liquidated without any cost. It is widely discussed in finance that investors should be compensated for investing in less liquid assets as compared to those investors who do not take exposure on less liquid assets simply because these assets are riskier (Nsofor, 2016). In contrast to that from a company's perspective stocks that are

relatively illiquid are less attractive to investors. In view of this less attractive shares are more expensive as it becomes difficult for the company to raise capital. Liquidation is costlier when liquidity is lower, and those greater costs are especially unwelcome to an investor whose wealth has already dropped and who thus has a higher marginal utility of wealth. Unless the investor expects higher returns from holding these assets, he would prefer assets less likely to require liquidation when liquidity is low, even if these assets are just as likely to require liquidation on average. Globally developed markets tend to price in all these factors which is the reason these markets are less volatile thus giving lower returns. Investors usually make a return in volatile markets since they can take both long and short positions to earn from both ends if movements are tracked properly. Since last few years' Asian markets have outperformed various global markets. These markets are relatively more volatile when compared with developed markets. Under the Asian Markets Pakistani stock market is among the most volatile markets. The time to time stock market volatility in Pakistan can be seen in Figure 1.

This study analyzes and reviews if investors use liquidity aspect while trading in Pakistan stock markets. Secondly, it is then reviewed if all the four factors i.e. market risk premium, size premium, value premium and liquidity premium are priced in or not.

Researchers have studied the Capital Asset Pricing Model in immense details when it comes to Pakistan Stock exchange. Many researchers went further in this field by working on extensions of this model such as the Fama & French 3 factor model. Few researchers have also added various factors in addition to factors addressed by Fama & French. However, in relative terms, very few studies have discussed liquidity aspects of stocks and how to price in liquidity impact when coming up with stock returns and pricing. This study tries to price liquidity factor along with three other factors i.e., size premium, price/book premium and market risk premium. Moreover, this study has tried to compare liquidity aspect with utility functions of investors to check whether investors give

Figure 1. KSE 100 Index Market Volatility



due weight to liquidity aspect thus addressing questions related to investor preference and to what extent these preferences are priced in when coming up with stock return and risk.

The objective of the Research is to determine whether the rate of return on shares increases when all 4 variables are used for portfolio creation. The research methodology is similar to that described by Pastor and Stambaugh (2003). The model used in the empirical study is the expanded version of Fama and French (1993) for the liquidity factor. To be specific the research is all about to evaluate the impact of market risk, size, value and liquidity premium on excess portfolio returns.

Different researchers have tried to understand stock return profile in the context of three factors or in perspective of liquidity alone. In Pakistan, a lot of studies are conducted in the context of Fama & French three-factor and five factors. Similarly, people have also done researches in the context of liquidity. However, researchers haven't combined all these factors to evaluate the impact of all these 4 factors on stock returns, therefore, in this research we tried to cover that aspect by taking all 4 factors in consideration i.e. market risk premium fac-

tor, Size factor, value factor and liquidity factor. In addition to that, there are very few studies where 4 factors have been discussed however, these research did not discuss the impact of utility theory and investor preferences.

The research carries a few limitations which most importantly includes the fact that the research paper does not incorporate momentum factor which is also used when pricing stocks and expected returns. Many researchers have worked on momentum factor to identify stock profiles however, considering the limitation of time the research focuses on aforesaid points. Secondly, in order to get more accurate numbers daily, stock prices are more suitable which a limitation in the subject case is again. Daily values are used in our subsequent researches. At present, the research is restricted to annual numbers while as far as liquidity numbers are concerned monthly values are used. Moreover, this is academic research, therefore, we have time restraints thus the research is limited to few variables. Further variables can be added to an addressed diverse range of factors impacting risk and returns. In addition, the data is taken from secondary sources as per their availability. The main section of an article should start with

an introductory section which provides more details about the paper's purposes, motivation, research methods, and findings. The introduction should be relatively nontechnical, yet clear enough for an informed reader to understand the manuscript's contribution.

Literature Review

Pakistani stock market is among the most volatile markets and such markets have given a diverse range of results. There were times when the market performed so well that it was categorized among best performing stock markets and there are times when the market performed too low that it was considered among the worst markets. The main point to consider is that the shift from best to worst is transitioned within a few years. This makes Pakistan Stock market too volatile and risky. In relation to this, it is widely perceived and believed that risk and return are proportional to each other and has a direct relationship. In simple terms, it can be said that higher the risk, higher the return. However, studies have opposed this view in some dimensions that it's not that simple to leverage on risk in order to achieve lucrative profits (Nsofor, 2016). Studies have shown contradicted results specially in under developing economies like Kenya where size, book to market and market risk premium slightly effect expected return in Nairobi Stock exchange as well (Odera, 2013). Since the theory provided by Markowitz (1959) researchers have worked to identify well diversified, low risk and optimum portfolio. The latest researches have discussed this portfolio is the context of security market lines and efficient frontiers (Abbas, Khan, Aziz, & Sumrani, 2015), (Garcia & Borrego, 2017).

In modern portfolio theory, the Capital Asset Pricing Model (CAPM) was the first model that tried to explain asset returns in detail (Chatterjee et al., 1999). According to CAPM, no matter how we invest; the probability of risk will still exist (Çelik, 2012). The model discussed that there are two types of risks; systematic and unsystematic risk. Fama & French (2004) studied that unsystematic risk is priced in well-diversified portfolio only. To counter this risk,

CAPM explained the concept of the required rate of return in the context of risk itself which stated that an investor should demand return based on the risk characteristics of the security. This concept of demanding is called the required rate of return where investors match their required returns with the risk profile of the security and based on that, they decide whether to go for that security or not. The whole model revolves around one notion which is of the view that returns are normally distributed. However, Fama & French (2004) negated this view by giving a counter-argument that in essence, the risk is not variance number but; it is an ability to lose value. Moreover, CAPM does not explain complete details of variation caused in stock returns also known as a beta in this context. Discussing it further CAPM does not discuss consumption-related decisions and utility preferences. To some extent, these issues were addressed in consumption based Capital Asset Pricing Model (CCAPM) which discussed consumption and covariance among different preferences and risk-return tradeoffs (Srisuksai, 2015). These problems created a gap for further research in capital asset pricing domain and as a result, Fama & French model was introduced in 1992 which tried to fulfil a few gaps reported against CAPM. They introduced 2 more factors in addition to the CAPM model that were size and value premium. The new model explained returns relatively better compared to previous models. (Fama & French, 1993). Adjusting beta with simple market risk premium has very less explanatory power, however incorporating size and book to market factors have relatively more power in explaining risk-return profile (Fama & French, 1993).

The market risk premium is the return earned over and above risk-free rate. Risk-free rate in simple term means rate earned over government securities (Duan & Zhang, 2010). Investors do not invest in government securities always, therefore they must be compensated for taking the additional risk (Zenner et al., 2008). Government securities guarantee a specific return, which means that an investor knows exactly what will be his rate of return when his investment retires thus negating the view of risk

that the investor is exposed to risk in this case.

Size premium is not captured in the traditional capital asset pricing model (CAPM) (Fama & French, 1993). The reason behind this is that the size premium is part of systematic risk which was not discussed in CAPM. Size premium was later discussed by Fama & French (1993), where they explained that size premium is the return earned on small capitalization stocks versus large capitalization stocks. The theory discussed that small-cap companies tend to outperform large cap firms in the long run (Fama & French, 1993; Abbas et al., 2015).

High minus low (HML) is basically the difference between growth and value stocks. Here growth stock means stocks of firms that do not offer any dividends based on market to book ratio. It is not always the case that there is correlation between market to book ratio and dividend other factors like size and liquidity also tends to bring variation in the expected returns (Ahmed & Kashif, 2018). Moreover, the main intuition behind HML is that companies who do not give dividend usually grow fast as they have ample cash available to be reinvested in the company; therefore these companies grow fast as compared to those who pay a high dividend at the cost of the future growth (Fama & French, 1993). Conversely, value stocks are those stocks that are relatively undervalued on the basis of Price/book (Abbas, Khan, Aziz, & Sumrani, 2015)

Investors should be compensated for liquidity aspect. Empirical studies show that liquidity factors play an important role, therefore, stock return should encompass this aspect (Keith & Lam, 2011; Florackis et al., 2011). In the literature, trading costs and trading volume are usually studied in isolation however few researchers combined both the effects to check whether they have an impact on each other. It was found that stock that is illiquid tend to have costs associated with it therefore while pricing these assets required return must incorporate liquidity factor (Keith & Lam, 2011). They have found that even small fixed costs can give rise to large “no-trade” regions for each agent’s optimal trading policy. Liu (2004) re-affirms the findings of Lo et al. (2004) in the presence of

multiple risky assets. A recent study in the field of liquidity and stock return argued that stock liquidity also has an impact on the company’s corporate finance decisions such as dividend policy, firm valuations, stock splits and capital structure. The same concept was recently investigated in another research wherein it concluded similar results. However, the additional findings included that stocks with high free float tend to be more liquid (El-Nader, 2018; Misra & Kumar, 2015). Liquidity in stocks tend to vary with the business cycle hence it is important for investors to be compensated (Choi & Cook, 2005).

Liquidity Factor was first discussed by Pastor & Stambaugh, (2003) in their research and they were of the view that investors investing in less liquid securities carry risk. To compensate these investors required return should be more as compared to those investors who are investing in liquid securities keeping other factors the same. Liquidity in finance means the ability of any security to be converted into cash without taking the time or without incurring significant costs to liquidate that asset (Pastor & Stambaugh, 2003). There are various factors why stocks are illiquid. The major reason includes high transaction costs, difficulty in finding counterparties to execute transactions and high spread between the bid and ask price. In addition, another factor which makes stocks illiquid is that at times investors are stuck at their long/short position whereby they do not change their position due to unrealized losses (Bogdan, Bareša, & Ivanovic, 2012). It is also reported that free float is another important factor which determines liquidity. Researchers discuss that if the ill liquidity tends to stay for longer time against specific security then over time returns and ill liquidity premium tend to co-move in the same direction which eventually yield higher returns. This implies that investors demand liquidity premium when investing in ill liquid stocks (Acharya & Pedersen, 2005). Further, they also supported the notion reported earlier with regards to the persistence of illiquidity that since the illiquidity is persistent investors usually believe that in cases of illiquidity shocks future shocks are perceived

to be even more higher thus the required return is increased Acharya & Pedersen, (2005). Later The same idea was tested in more detail and in different dimensions by Holmström & Tirole (2001) in their research on “A Liquidity-Based Asset Pricing Model” where he concluded that liquidity plays an important role in deciding security returns (Opler, Pinkowitz, & Stulz, 1999), (Holmström & Tirole, 2001). They added that this is the reason why large institutions and banks invest heavily in liquid securities and have ready lines with different banks in order to maintain liquidity (Opler, Pinkowitz, & Stulz, 1999), (Holmström & Tirole, 2001). The research paper has focused on Amihud measure of liquidity which primarily revolves around three notions. Firstly, when the market is illiquid, a rational investor will demand illiquidity premium, secondly, illiquidity occurs where markets are illiquid and the investors are willing to pay more if the security offers higher return considering the liquidity premium. Thirdly when market is down, investors are willing to pay more for liquid stocks (Acharya & Pedersen, 2005). Pastor & Stambaugh (2003) discussed the aforesaid concept in preferences and utility theory context also. They were of the view that during economic downturns investor wealth is reduced whereby they have forced to liquidate their positions in order to fund their purchases therefore in such downturn liquidity tend to be lower thus the investors are forced to liquidate their assets at lower costs. They concluded that in such cases wealth is decreased while margin utility is high hence to hold such risky assets investors demand liquidity premium to compensate for this risk (A. Martínez, Nieto, Rubio, & Tapia, 2005).

Latest studies in the field of liquidity discuss liquidity in further detail where the researchers argue that liquidity cannot be measured through a single factor as it encompasses various factors. Such factors can include price impact, turnover ratios, the difference in bid-ask spreads and trading frequency (Luo, 2016). Secondly, the researchers have tried to identify demand analysis in the context of crises and normal market scenarios wherein they noticed preferences between both institutional investors and

individual investors. They were of the view that “institutional investors in United States equities tend to view less liquidity-sensitive stocks (i.e. small, volatile, and high liquidity beta stocks) as liquidity hedge assets and, thus, shifted their selling activity away from the more liquidity-sensitive stocks to the less liquidity-sensitive stocks during the financial crisis of 2007–2009”. In addition, the same research concluded that leverage position plays an important position as investors dealing in highly leveraged assets or portfolios tend to panic in unforeseen circumstances. Conversely, these investors, in general, are never forced to buy such assets. This theory concluded that investors are more sensitive to liquidity in times of poor market scenarios (Shih & Su, 2016).

Some researchers have tested these three variables i.e. Small minus big (SMB), market risk premium and high minus (HML) low where they concluded that all three variables contributed to stock returns (Blanco, 2012), (Zakaria & Abdalla, 2012). Many researchers have added different factors by taking these 3 factors as a baseline. The model was tested on Italian stock exchange. The research concluded that these variables price in significant factors as compared to CAPM that only included one factor (Annalisa & Gottardo, 2000). These three factors in itself encompass multiple dimensions such as cash flows of the company, dividends, sales, book value of equity and market capitalization. All these factors are based on fundamentals of the company which in another word means that all these factors or dimensions are derived from the company itself, therefore any analysis based on these numbers will portray better results regarding the subject company. Conversely, some researchers have identified some anomalies in this model and concluded that size and price to book factors are dependent on the estimation of the researchers which brings subjectivity to analysis (Aleati et al., 2000). The model was also applied to Indian stock exchange where the results were positive but at the same time, researchers believed that there are few questions that are still unanswered (Connor & Sehgal, 2001). One question that they believe is to check whether size and

value factor always explain variation in stock returns (Connor & Sehgal, 2001). The issues raised by Connor and Sehgal in their research were addressed by another researcher who applied this model on the Australian Stock exchange (Faff, 2001). In Pakistani context, Fama & French (1993) three factor model was tested to check the applicability and it was concluded that the model holds for the Karachi Stock Exchange and it was concluded that value stocks (high book to market) performed well by giving higher returns as compared to growth stocks with low book to market (Abbas et al., 2015).

Liquidity methodology can also yield different results as few researchers have used different liquidity measures. In contrast to Amihud measure researchers have also used Amivest model (Amihud et al., 1997) to measure liquidity however there are few differences between the two models which most importantly is that the Amivest model discusses the ratio of the traded volume to the returned earned whereas Amihud measure discuss illiquidity measure (Akbari, Zarrin, & Yaghobi, 2017). Continuing the debate further there are researchers who have used different mechanisms to measure liquidity which is essentially proxies for liquidity such as coefficient of variation of turnover ratio, trading volume, liquidity ratio suggested by Chordia et al. (2001). All these methods have yield similar results thus reiterating the fact that liquidity is priced and it should always be made part of pricing as being a rational investor liquidity premium should be demand for ill liquidity stocks keeping all other factors same (Ahmed & Kashif, 2018).

It is pertinent to discuss here that some researchers went on further to discuss the dynamics of liquidity where they tried to bifurcate and associate liquidity to various dimension. The research discussed that transaction costs of liquidity are technically width. Conversely, the depth factor is due to asymmetric information where an uninformed investor is reluctant to invest due to agency-related costs. The researcher further discussed that it might be the case that stock is liquid in one dimension while the stock may be illiquid in another dimension. It all depends on perception how the investor perceives

ill liquidity and according to him what factors decide liquidity. It might be the case the stock is liquid where it trades in small values at regular intervals where the stock is traded in routine but here the problem is small chunks of stocks that are being traded. In this case stocks depict other factors of illiquidity (Saman, 2016). To calculate these impacts, the researcher used LCAPM (Liquidity Capital Asset Pricing Model) to factor liquidity. The research of said researcher is supported by another research where he said that the variables discussed above have a high correlation in between thus the effects of ill liquidity is encompassed in all the factors (Chollete & Skjeltorp, 2006).

Considering the aforesaid researchers have widely used Amihud measure of liquidity. In contrast to this all other factors i.e. market risk premium, size and value factor is derived in a similar method the way Fama & French (1993) did. Further with respect to methodology original Fama-French model is used to derive 3 factors stated in Fama & French model. Further for the fourth factor, Amihud liquidity factor is used and after combining all these factors the model is reviewed for its significance in terms of individual betas.

Recent studies in the field of liquidity have discussed various aspects of liquidity. Researchers have now discussed liquidity in various aspects. A recent study reviewed this aspect in three different dimensions. The researcher associated liquidity to price impact, turnover ratio and trading frequency (Luo, 2016). Moreover, it also discussed that continuous trading doesn't mean that stock is liquid like it may be the case that stock is trading daily but the traded volumes are low thus making it ill liquid. In addition, it might be the case that stock is liquid in one dimension while ill liquid at another dimension. Secondly in another research researcher concluded that leveraged positions are more sensitive to liquidity risk wherein in times of economic crises the investor is forced to liquidate assets at higher costs to reduce down side risk of the assets (Shih & Su, 2016) Further they divided this into institutional investors and individual inventors where it was found that individual investors are more sensi-

tive to this risk. Continuing the debate further a recent study discussed that liquidity is also impacted by the free float. Shares that have high free float tend to be more liquid (El-Nader, 2018). This has more to do with appropriate capital structure and theories related to Miller and Modigliani. In contrast to aforesaid liquidity is also related to the economic cycle and the relative age of the market. In the latest study researchers believed that young economies tend to be less liquid. They studied Portuguese market where they reported that during 1988 to 1997 the Portuguese market was emerging wherein the market was not competitive with other stock markets. They found that at that time market was not liquid however with the passage to time their market has developed and so the liquidity has also improved with the passage of time. They concluded that market type such as frontier, emerging, developed market etc. also impact the liquidity of assets (Miralles-Quirós, Oliveira, & Miralles-Quirós, 2017). The study was supported by another researcher where they concluded that monetary policy and avenues of investment also impact the liquidity of assets. It was reported that if monetary policy rate is less than the required return on equity than equity market will be more liquid. They discussed that difference between equity return and policy rate can be termed as a liquidity premium (Kiyotaki & Moorey, 2018).

Though the Fama & French model has some anomalies the explanatory power of this model ranges from 70-95% depending on the variables taken and the effectiveness of efficient market hypothesis (EMH) in a market where this study is being conducted (Annalisa & Gottardo, 2000). The research would cover all those dimensions discussed in the original model along with another factor of liquidity. Moreover, all the anomalies identified in previous studies would be taken into account to ensure less subjectivity when it comes to betas of individual factors along with an estimation of each factor.

Research Methods

The subject research follows Positivism approach as the model would test the empirical

relationship between the returns with firm size, value, liquidity and risk. Since every stock market has its own dynamics and sentiments, there is a possibility to have a different rate of returns in a different market. Thus, the scope of this study is to determine the portfolios that outperform other portfolios irrespective of the return they generate. Therefore, the focus would be what portfolios make the most return, instead of how much more a portfolio makes than others. (Ahmad & Abdullah, 2015), evaluated the driving forces of market returns and stock valuations and determined that each market has different sentiments for investments, impacting book to market value: By virtue of this model book to market value is already a part of our valuation model. The portfolios and their return are also discussed in the context of all 4 factors along with their relationship with investors' preferences and utilities.

Considering all these factors, this research follows Positivism philosophy followed by a deductive approach. The deductive approach is based on the existing theory where researcher formulates a hypothesis and based on that hypothesis research strategy is devised. This research is based on Longitudinal data of 11 years (2007-2017) which makes it inclined to quantitative research. Stock details are obtained from Pakistan Stock Exchange's website, whereas, Risk-free rates are taken from monetary policies of Pakistan available on www.finance.gov.pk and www.sbp.org.pk. In addition, data pertaining to liquidity and stock prices are selected from www.khistocks.com.

Model specifications of Pastor & Stambaugh (2003) are as followed:

$$(R_i - R_f) = \alpha_i + b_i(R_m - R_f) + s_i(SMB) + h_i(HML) + l_i(LIQ) + \varepsilon_i \quad (1)$$

Where:

- $(R_i - R_f)$ represents the excess portfolio return which is the dependent variable
- $(R_m - R_f)$ represent the market premium
- (SMB) represent the size premium
- (HML) represent the value premium
- (LIQ) represent the liquidity premium

CAPM

$$E(R) = R_f + b_i(R_m - R_f) \quad (2)$$

FAMA & FRENCH THREE FACTOR MODEL WITH LIQUIDITY AUGMENTED

$$(R_i - R_f) = \alpha_i + b_i(R_m - R_f) + s_i(SMB) + h_i(HML) + l_i(LIQ) + \varepsilon_i \quad (3)$$

$(R_m - R_f)$, (SMB) , (HML) , (LIQ) represent the expected premiums and b_i , s_i , h_i , and l_i represents the slopes in the Time series regression, $(R_i - R_f)$ represents the excess portfolio return which is the dependent variable, $(R_m - R_f)$, (SMB) , (HML) , and (LIQ) represent the market premium, size premium, value premium and liquidity premium respectively and are the independent variables.

Represent the slopes of α_i , b_i , s_i , h_i , and l_i respectively.

The dependent variable i.e. excess portfolio return $(R_i - R_f)$ is regressed against the independent variables i.e. market premium $(R_m - R_f)$, size premium (SMB) , value premium (HML) and liquidity premium (LIQ) .

Following hypothesis are tested to check whether they are statistically significant thus proving our point whether all these factors contribute to stock return or not?

$$H_0: \alpha_i = 0, H_1: \alpha_i \neq 0, H_2: b_i = 0, H_3: b_i \neq 0, H_4: s_i = 0, H_5: s_i \neq 0, H_6: h_i = 0, H_7: h_i \neq 0, H_8: l_i = 0, H_9: l_i \neq 0,$$

This model holds statistically significant and true if the intercept α_i is not significant, and slope coefficients are significant. In contrast, H_0 or alternate hypothesis is that all variables are $\neq 0$. This research is based on longitudinal data of 11 years. Data is collected from 2007-2017. KSE 100 index is selected as sample size which is comprised of top 100 companies as per market capitalization. Each year top 100 companies are changed where only 60 to 70 companies retain their position, therefore, our major focus is on those top 60 to 70 companies. The research process is built upon secondary data collection.

Excess Market Portfolio is the dependent variable while Market Risk Premium, Size,

Value Premium and liquidity premium are independent variables. The metamorphosis between the Portfolio Return and Risk-Free Rate is termed as Excess Market Portfolio Return. Risk-Free rates are taken as a 12 Month T-bill rate. The difference between the Total Market Return and Risk-Free Rate for that period is the Market Risk Premium. Size Premium is the difference between small market cap stocks return vs High market cap stock return (SMB). Value Premium, on the other side, shows the difference in return seen in High Book to Market stocks v/s the low B/M stocks (HML).

Liquidity factor is incorporated by using Amihud Function where the liquidity function is calculated using average daily rupee based stock volume, daily stock return and times a share is traded in a given year.

Data is obtained through portfolios, constructed on the basis of market capitalization, Book/Market equity and liquidity factors. Regression and correlation are then run on the gathered data of Pakistan Stock Exchange 100 Firms. For this study, PSX-100 stocks are divided into Small (S) and Big (B) stocks on the basis of PSX-100 median market capitalization. Stocks that have a greater market capitalization above the median value are treated as Big (B) stocks and vice versa.

The stocks are then grouped into two, as per their book to market value in comparison to median value stock. Through the intersection of Size and Value, four portfolios are created i.e. Small High, Small Low, Big High and Big Low. Each portfolio has a specific liquidity number based on Amihud measure. Linear Regression is then used between the factors and the premiums in order to estimate each factor's significance in the model. This further leads to the Beta calculation to validate the results against Pastor & Stambaugh model.

$$(R_i - R_f) = \alpha_i + b_i(R_m - R_f) + s_i(SMB) + h_i(HML) + l_i(LIQ) + \varepsilon_i \quad (4)$$

The Value Weighted Portfolio Return is calculated as the return of each individual stock as per the weight of its market equity in total capitalization within its categorization over time 't'.

Table 1. Model Analysis

WHEN ALL 4 VARIABLES ARE REGRESSED					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	3816.425	954.1062	380.6563	0.0000
Residual	1041	2609.242	2.506477		
Total	1045	6425.667			
CHEMICAL SECTOR LIQUIDITY PREMIUM VS. EXCESS RETURN					
Regression	1	277.7824	277.7824	64.58691	0.0000
Residual	1821	7831.955	4.300909		
Total	1822	8109.738			

Table 2. Regression Analysis

WHEN ALL 4 VARIABLES ARE REGRESSED				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	2.131561	0.096092	22.18241	-
Market Risk Premium	0.96485	0.031767	30.37308	0.0000
Size Premium	0.663231	0.150886	4.395592	0.0000
Value Premium	-0.13665	0.202644	-0.67431	0.500261
Liquidity Premium	-15.0744	21.37578	-0.70521	0.480836
CHEMICAL SECTOR LIQUIDITY PREMIUM VS. EXCESS RETURN				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	1.3209	0.049977	26.43	0
Amihud Measure	1.70638	0.212326	8.036598	0

Single Stock Return is calculated through this formula:

$$R_{it} = \ln[(P_t + D)/P_{t-1}] \quad (5)$$

Here $P_t + D)/P_{t-1}$ are the closing prices on Year t and $t-1$ respectively and D is the dividend announced during the year.

Return on Market Portfolio is calculated using historical data to find return difference over time 't' (t-t1). Value-weight Annual returns on the portfolios are calculated from January to the following December. Excess annual return on these portfolios is calculated by averaging overall excess returns of the entire portfolio i.e. Stocks' excess return in time 't' minus risk-free rate in time 't'. All the portfolios along with their returns are evaluated in order to determine the relationship between factors and profitability for valuation.

Results and Discussions

The results are promising wherein two factors that are market risk premium and size premium are found statistically significant while the other two factors that are value premium and liquidity premium are found to be statistically insignificant. The liquidity factor was

calculated through annual numbers, therefore, the factor was found insignificant. To verify our axiom that liquidity is priced and should be reflected in numbers most liquid sectors was selected i.e. Chemical Sector. Monthly numbers were selected and Amihud's measure was used to find liquidity related numbers for all stocks that are traded in the chemical sector. The numbers were regressed with an excess return which is our independent variable. The results were found statistically significant. It can be seen in the below-appended results that the adjusted R square is 59.1% which is significant enough to validate our assertion. This helps assess the goodness of the model. In addition, the Multiple R in Chemical Sector results is 18.5% which has improved considering our original results here Multiple R is used to assess model instead of Adjusted R square because for one independent variable multiple R is used while for various independent variable Adjusted R square is better determinant to verify the model. In contrast to all above considering the descriptive analysis, it can be viewed that results pertaining to kurtosis and skewness are slightly above 1 for nearly all factors. The slight increase is due to extreme values and volatility of the market which created a bit of noise. The same thing is also observed by high standard deviations since

the volatility in Pakistan stock market is too high. However, in nutshell, it can be concluded that results are promising. Liquidity factor is also positive which means that keeping utility theory in context investors do consider liquidity as a major component. For better results, daily figures can be used to further assess the impact of all these factors and to analyze how investors behave and price different factors. Moreover, using daily numbers will also reduce noise and outliers which will most probably reduce kurtosis and skewness of the results.

The analysis computed in Table 1 and Table 2, is in line with many empirical studies which showed that the size factor has an impact on liquidity. Empirical studies have shown that Large-cap stocks tend to be more liquid as compared to small stocks (Bogdan, Bareša, & Ivanovic, 2012). In the subject research, both size and liquidity factors were found to be statistically significant. Moreover, empirical studies have shown that firm-specific factors also contribute to the liquidity of stocks (Shieh, Lin, & Hoc, 2012). The size factor, value factor and liquidity factors are all related to the company thus being a specific factor and that too being statistically significant reiterate our point that the aforesaid points are important to consider. The research further discussed that patterns of large stock price changes can tell us many things. These patterns can be identified to draw risk factors that can be priced. The subject research has tried to price 4 factors as discussed throughout the paper. Another researcher discussed that liquidity tends to vary among markets and industries (Gold, Wang, Cao, Huang, &, 2017). The said research tested only one market however the trading behaviour is based on multiple cities of Pakistan which encompass different profile of investors. Thus the point discussed in said research is largely addressed in the KSE 100 index as its market capitalization based index which represents more than 80% of our market. Thus in nutshell, it can be said that

liquidity is priced and investors give due weight to this factor. A study done in the UK reported the same that liquidity is part of systematic risk, therefore, it is essential to price this factor. Additionally, the factor is positively priced in the cross-section of stock (Foran, Hutchinson, & O’Sullivan, 2015). The detailed model summary output can be seen in Table 3 and Table 4 given in Appendix.

Conclusions

The results of the said research are in line with many studies and in many ways better than previous studies. Usually, liquidity factor is checked alone, however, the said paper discussed it keeping other major factors in consideration. This validates our axiom that investors do prefer liquidity as they prefer other characteristics of the stocks.

Investors can use these betas calculated for each factor to identify risk-adjusted returns for their pricing mechanisms. In addition, they can amend this model by taking specific betas as per their requirements and use them as per requirements. Investors can also amend the equation by adding more factors to check how the beta change when more factors are added. Moreover, adjusted R squared can also be used to check whether it increases when more factors are added. In this way, if the ratio is increasing then it means model appropriateness is increasing. In this way, different combinations can be review and checked.

The research has laid further dimensions for future researchers to be carried out in this field. More factors can be tested such as momentum factor, fundamental factors that are company specific and systematic factors. The research can be done in the context of the different profile of investors to check how liquidity tend to behave among a different set of investors. Moreover, the data can also be selected on a daily basis to have a better understanding of results.

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Appendix

Table 3. Summary Output

<i>Regression Statistics</i>	
Multiple R	0.770671393
R Square	0.593934395
Adjusted R Square	0.591803563
Standard Error	1.58318565
Observations	1045

Table 4. Summary Output (Chemical Sector)

<i>Regression Statistics</i>	
Multiple R	0.185076
R Square	0.034253
Adjusted R Square	0.033723
Standard Error	2.073863
Observations	1823