



Liquidity and Systematic Risk: Evidence from Pakistan Stock Exchange (PSX)

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Abstract

The study develops and examines the relationship of the liquidity based ten portfolios with systematic risk using the daily data of 467 non-financial firms in Pakistan between 2014-2018. The study calculated the systematic risk using the Capital Asset Pricing Model (CAPM) whereas, the liquidity of the stock was calculated based on trade volume. Ten liquidity portfolios were constructed using Fama McBeth approach to test the relationship between risk premium and firm returns. The study finds the significant impact of risk premium on firm returns in highly liquid stocks. However, the low liquidated stocks had insignificant role of risk premium on firm returns. The study further suggests that the firms which have low volume of trading in the portfolios are prone to market/systematic risk.

Keywords: Capital Asset Pricing Model, systematic risk, liquidity, Pakistan Stock Exchange

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Introduction

1.1 Background of the study

Investors are focusing upon increasing the return on their investment even though they are injecting money in the organization that contains risk with the high intensity. Investors face two types of risk while they invest in capital markets, i.e., systematic and non-systematic risk.

Systematic risk can be managed through different means, such as increasing the portfolio or using the diversification strategy to eliminate the financial risk in the investment (Lu, Lin, & Wang, 2019). Systematic risk is also known as the market risk, which caused due to the deterioration and odds of the market that impacts the economy (Wen, Wang, Ma, & Wang, 2019). To cope up with the risky investment, investors use the asset pricing model, and Capital Asset Pricing Model (CAPM) is one of them. In the financial world, CAPM is highly known and having credibility as a risk assessing tool for investors (Wen et al., 2019). Professional organizations such as fund managers, portfolio managers, and other investment and finance professionals apply CAPM to model risk. The model suggests that risk and return are related to each other, which is depicted by the risk (Beta) and return relationship. The theory suggests that CAPM is having a significant relationship with the risk and return of the market. The model of CAPM has given a different perspective to the investors and researchers to think differently and assess the risk and return accurately in the complex portfolio management. There is not a consensus on the authenticity of CAPM among the finance researchers, one school of thought is in favor of CAPM while other is against it, believing the model is not capable of capturing the risk appropriately.

Since the development of CAPM, more than four decades have passed away. Still, the cost of equity is assessed by the investors and business managers using CAPM. Its effectiveness and accuracy made the CAPM most efficient and accurate in predicting the return and risk, which has increased the value of this model in the financial markets (Wobst, Gramlich, Röttger, & Spee, 2020). The CAPM results are profoundly different varied in a different situation; till the early 80s, the findings of the studies or researches suggested that CAPM has the validity feature to forecast the return. After 1985; it is indicated by the reviews that CAPM is not having validity to predict the return on investment because in the existing market there are a number of risks associated with the investment that are; organizational size, market value, financial ratios, price earning, country's economic stability or uncertainty, inflation and others. (Hussain, et al; 2021)

PSX (Pakistan Stock Exchange) has a different perspective on the return and risk associated with the investment. The investors are having uncertainty because stock prices fluctuate heavily in different sessions in a single day that increases the risk for them. The critical



concern for the investors and the Pakistan Stock Exchange is to calculate the risk into the numbers that are on the stock and assess the return as well accurately. The assessment of the CAPM's ability to forecast the accurate return from the Pakistan Stock Exchange is the primary objective of this research work. To conduct the analysis researcher has used the ANOVA on ten different portfolios that constitute upon 32 industries that include the 464 organizations excluding (banking and non-banking financial institutions) based on their trading volume. The data is collected from January 1, 2014 to June 30, 2018. The data analysis was performed using Eviews.

1.2 Pakistan Stock Exchange Limited (formerly Karachi Stock Exchange)

In Pakistan, the stock exchange was established back on September 18, 1947, in Karachi, which was known as the Karachi Stock Exchange, but now the name has been changed to Pakistan Stock Exchange Limited (PSX) (Asif, Abid, & Shaikh, 2014). The operations of the stock exchange were started back on March 10, 1949, where only five listed companies were registered that were having the capital of 37,000,000 rupees. The Karachi Stock Exchange introduced the index with the fifty companies and known as the Karachi Stock Exchange 50 index; back in October 1979; Securities and Exchange Ordinance the Pakistani government and Lahore Exchange implemented 1969 was established as the second stock exchange. The third stock exchange was established in Islamabad back on October 25, 1989, to cover the other parts of the northern areas of the country.

KSE 100 Index was introduced in November 1991; KSE All Share Index was added later in 1995, and then in 2006 KSE 30 index was introduced. The trend of Islamic finance globally created a need for Islamic financial products that can be traded in the stock exchange and that became the base for the development of KMI 30 Index in September 2008 and later PSX-KMI All Share index on November 18, 2015. The Islamic index was well supported by the largest Islamic banking group in Pakistan that is Meezan Bank. Until September 14, 2017, 559 organizations were listed in PSX that with the capital of Rs. 8,465.65 billion. Securities exchange commission of Pakistan (SECP) is the relevant authority for the registration of companies in Pakistan. There are 35 sectors in PSX under each industry there are companies related to their industry.

1.2.1 Comparative Analysis on Stock Exchange with cross border countries

The stock market of Pakistan is in the development phase; although the market is small, it has the potential to develop as an emerging market (Ali, Shahzad, Raza, & Al-Yahyaee, 2018). The development in the stock market that is having a high transactional rate is because of the political stability and betterment of the economy of the country is a short-term strategy. With all these issues and development Pakistan Stock market is considered the best performing market



around the world. In Pakistan, SECP, NCCPL, CDC, and PSX are having their part of improving the code of conduct of corporate governance to trade fairly, and companies should disclose their information adequately in the financial statements, which will attract the attention of the potential investors accordingly (Rashid & Aib, 2021). According to Ali et al. (2018); the Pakistan market is highly emerging and unpredictable, which requires high sensitivity from the investors to monitor the market and make their decisions to manage the risk on the investment. The stock market of Pakistan is divided into a sector that influences the investor to manage and diversify their risk accordingly. (Tauseef, 2021; Ahmed et. al., 2020)

Kashif (2015) comparatively analyzed the Equity Markets of both the SAARC and the European Union nations since these are two of the largest markets of the world, he measured and investigated the relationship on changes within one market (whether good or bad) and the consequent effects on the other market. The study data includes the countries of Pakistan, Sri Lanka, India, Bangladesh (SAARC Contrives), France, Portugal, Germany, and the Czech Republic (European Union countries). He included data of Closing Share Price (CSP) and Trading Volume (TV) and find that there is a presence of co-movement between the two market clusters that is SAARC and the European Union nations. Back in 2013, negative growth has been shown by the 16 countries out of 76 around the world. Peru was on the top that was having a decline rate of -23.63% and Brazil having second in the world that was having -15.50%. The year 2013 was the toughest financial year for the BRICs countries (Brazil, Russia, India, and China). These three countries were having negative growth, while India managed to end up with 8.89%. In Pakistan, the KSE 100 Index was 49.4% in that year and considered the best five performing countries in the world. In the year 2013, BRICs countries had a tight financial market, but KSE was the best performing market in that year with the high growth rate. (Ince, 2022; Bianchi et. al. 2022)

The purpose of this research was testing relationship of liquidity based portfolio returns with market returns in Pakistan Stock Exchange. Thus, this study finds a relationship between Liquidity (Proxied as trading volume) of non-financial firms and their risk (Proxied as CAPM) in the case of the Pakistan Stock Exchange. CAPM was used as an estimation of Systematic Risk. Hence the possible finding from this study will bring research implications related to policymakers and academics. Furthermore, this will be helpful for the fund managers, finance and investment practitioners, and other stakeholders for analyzing the risk and return appropriately and formulate the investment strategies that enable them to optimize their portfolios. To the best of the researchers' knowledge, there is a lack of research in the Pakistani context regarding the evaluation of the effect of liquidity on systematic risk in such a way that the portfolios are constructed following Fama and French methodology. Moreover, even in the international context, most of the researches used monthly data to make the Fama and French portfolio. However, in the current study, we have used daily data. The upcoming sections of the paper; review the relevant literature, provide the research methodology, show data analysis and



results, and in the end, discuss the findings of the study and conclude the article along with providing implications of the study.

Literature Review

2.1 Theoretical Review Literature:

The CAPM history is being traced back in the seventeenth century, and (Bernoulli, 1738) proposed it; about the asset value can be assessed with the help of return, not in the way of determining the price of the asset. The current financial theory has three underlying assumptions that are: 1) There should be Perfect market; 2) Investors are having balanced approach and confident; 3) Investors benefit from the Arbitrage opportunity; Arbitrage is suggested as the stock or security is being purchased with the low price and sell it with the higher price in other market.

In finance; there are number of researchers that have developed different models regarding the asset pricing that explain about the relation among the risk and return. The theory of the asset pricing model was developed in the middle of 20th century. After that technological era was started where information was available through the internet and computers were there to test the data and develop the validity of the different asset pricing models adequately and statistical tools were used to develop the model accordingly. There was the mix statistical result of the test and it is being suggested that the pricing asset model was developed in order to undertake the relations between the risk and return on security or investment. There are different pricing models that assessed the return on investment with the risk associated with it having two kinds of risk that are: Systematic risk which is associated with the investment and cannot be managed because it exist in the investment while the other is the unsystematic risk can be managed through diversification. It is difficult to say that investor can avoid any risk because it is linked with the investment. It is the ability of the investor to measure the risk appropriately and overcome the risk adequately through diversification strategy. (Hussain et. al. 2022; Ahmed et. al. 2020)

The asset pricing model was further development by (Markowitz, 1959) with the name of Portfolio Selection. It is being suggested about the swapping concept between the risk and return. Optimal Portfolio Selection are those that are having low variance of the portfolio and maximize the expected return on the investment which leads to the maximization of return of the investment and reduces the risk. It is suggested from the study that investors are advised to select two different portfolios therefore; the approach of the researcher is being known as the mean variance model. Prior to this research it was assumed that investors are more interested to increase their return on the investment in order to reduce the risk associated with it so the return should be optimal. It is being argued that investors are aware about the rate of the risk that is



associated with the investment, so they want to increase their return through the selection of different portfolios to manage it adequately and minimize the risk on the investment. (Rashid & Aib, 2021; Ince, 2022)

It is required from the investor's perspective that they should consider the asset with the discount risk free rate in order to know about the future cash flows of the investment. If the volatility in the return of return enhanced the investors should be considering more return because the rule of the financial management suggest that high risk will bring high return so; the investor would be considering the high risk will be having the high return and will purchase the asset with the high price to manage their risk with the high returns. The study suggests that if two assets that are having same amount of risk are set together then it is mandatory that their risk should be increased until their returns are similar. Those portfolios are highly optimal which data set is available and investor can assess the risk and return that develops the effective frontier portfolio set for the investor. Those investors are having benefit or able to have the high returns that are able to manage the optimal portfolio which will develop the effective frontier of the investment.

Another researcher gives a different perspective which is Separation Theorem which makes the easy selection of portfolio (Tobin, 1958). With the help of this theorem investors can segregate the problem of the portfolio selection in two sections such as: investor should select the optimal mixture of the risky investment and then analyze whether to lend or borrow according to the perceived risk. In last only one portfolio will be left with the lending or borrowing that will be called the market portfolio. Tobin also discussed that an investor can find the optimal portfolio that are having the expected rate of return with the minimum risk. It is also suggested that investor can have the risky investment which enable him to lend or borrow the stock on certain risk or having risk free asset then the rate should remain the same that will be the best frontier for the investor to have the risky asset with the induction of lending or borrowing the asset; that suggest the mixture of this will be best in getting the expected rate of return. The data and testing the statistical tools will be difficult in this situation.

The study of (Tobin, 1958) suggests that in the accounting of any investment in the market; the risk premium per share for the i^{th} investment is having the proportionate of the covariance of the investment of the market.

Simplified Model for Analysis of Portfolio is being suggested by Sharpe, (1964). The researcher has developed the effective method of computing the capital asset pricing. The return on the investment is associated with the return on the common index. The variable that is having impact upon the stock is required to be undertaken as the common index. The model is also effective for the portfolio as well the reason for that is expected return of the portfolio is the weighted average rate of return on the investor's stock.



The combined research work of (Lintner, 1965; Markowitz, 1959; Mossin, 1966; Sharpe, 1964; Treynor, 1961) enable to develop the first asset pricing model which is known as the Capital Asset Pricing Model (CAPM). Investment is having non manageable risk but CAPM is able to calculate the relation between risk and return on the investment; but it is necessary that investor should be having different portfolios. Investor is being shown the risk regarding the portfolio in that case portfolio risk is the major element that determines the expected return on investment. In CAPM beta considers the market risk that is incorporated in the stock price return. The findings of the studies were in the benefit of the CAPM till the 1993(Fama & French, 1996). After 1993; the results of the CAPM was not effective and less attractive for the investors. It is because the model is based upon the assumption and theoretical approach was less that did not produce the results of the model. In that case; CAPM presumes that investor can have the stock through lending or borrowing at the risk free rate. In the case of practicality it is not effective and implementable because there are many hurdles for the investors to borrow or lend the security. CAPM is not able to give the desired result because the index of the market which is used is not original therefore; refined and extended version of CAPM is being suggested by the different researchers.

Investors are required to take decision for one time to develop the consideration for the CAPM for a single time period model. This consideration is highly severe in nature because investor redesigns their portfolio according to the time. CAPM did not predict about the change in the prices on the daily basis which is the lacking of this model (Hakansson, 1975; Malkiel & Fama, 1970; Samuelson & Merton, 1969) established an Inter Temporal CAPM (ICAPM) considers that time flows consistently using the same model for the asset pricing model. This feature enables the model to become more effective and realistic in approach towards assessing the price of the model.

Those variables that are affecting the risk-free rate may have an impact upon the model in the macroeconomic environment. The findings of the model may be able to generalize over the other portfolios as well to get the desired rate of expected return. The theoretical development can be made with the help of data collection and using the statistical tools to get the findings of the model accurately. In the below table 4 illustrates the important feature in the development of capital asset pricing model. It started from the Markowitz mean variance algorithm; researcher illustrates the CAPM model into two different categories such as static and dynamic.

**Table 1: Theoretical Development of CAPM**

Model	Originator(s)
Static Models	
Markowitz Mean-Variance Algorithm	Markowitz (1952;1959)
Sharpe-Lintner CAPM	Sharpe (1964), Lintner (1965), Mossin (1966)
Black Zero-beta CAPM	Black (1972)
The CAPM with Non-Marketable Human Capital	Mayers (1972)
The CAPM with Multiple Consumption Goods	Breeden (1979)
International CAPM	Solnik (1974a), Adler and Dumas (1983)
Arbitrage Pricing Theory	Ross (1976)
The Fama-French Three Factor Model	Fama and French (1993)
Partial Variance Approach Model	Hogan and Warren (1974) and Bawa and Lindenberg (1977) Harlow and Rao (1989)
The Three Moment CAPM	Rubinstein (1973), Kraus and Litzenberger (1976)
The Four Moment CAPM	Fang and Lai (1997), Dittmar (1999)
Dynamic Models	
The Intertemporal CAPM	Merton (1973)
The Consumption CAPM	Breeden (1979)
Production Based CAPM	Lucas (1978), Brock (1979)
Investment-Based CAPM	Cochrane (1991)
Liquidity Based CAPM	Acharya and Pedersen (2005)
Conditional CAPM	Jagannathan and Wang (1996)

Ref: Şaban Çelik: Theoretical and Empirical Review of Asset Pricing Models: A Structural Synthesis, *International Journal of Economics and Financial Issues*, Vol. 2, No. 2, 2012, pp.141-178 ISSN: 2146-4138

The important feature and categorization of the model development is being shown in the table 4 as the development of the history in the asset pricing and theoretical development is being developed by the Sharpe Lintner CAPM. The model is being divided into two frameworks that are static and dynamic in order to develop theoretical plot to facilitate the findings of the models from the discrete to continuous. Model is not a complete reality but researcher has brought some findings that are effective and efficient for the investors to consider and calculate the return in an easy way.



Also, when assets do not trade as frequently as the market index, the standard ordinary least squares (OLS) beta exhibits thin trading bias. Several beta adjustment techniques exist to correct for this bias; however, no consensus exists as to which adjustment is best. (Katscher, et al, 2020)

2.2 Empirical Literature Review

2.2.1 International Scenario

2.2.1.1 Australian Context

The comparison of Asset pricing theory and CAPM was performed by (Groenewold Fraser, 1997). They applied GARCH and compared eight different sectors of the Australian market for 11 years from 1983 to 1993.

2.2.1.2 European Economies

In the literature of finance, CAPM is the most discussed model in terms of implementation. Therefore; different scholars have used this model to test and present the findings and ensure the validity some are in favor and some are in oppose of the validity of CAPM.

In the study of (Toraman & Gul, 2016); Risk and return ration of eight different banks were assessed in the country of Istanbul (Borsa) by taking data from December 31, 2004, to December 31, 2015. Research is divided into two parts, before 2008 and after 2008 crises, the researcher has taken the median September 15, 2008, for before and after the crises period. The researcher has used the t-test to assess the average of beta, which is having volatile findings prior and post predicament. Researcher has also used the F-test to determine the variance among the risk rate. The findings of the study suggested that there are significant changes and differences among the beta and averages of the selected banks in two time periods.

In the Istanbul Stock Exchange Turkey, (Demircioglu, 2015) performed research on cement and power generation and distribution sectors. He used the data from 2012 to 2013 of ten organizations from the two different sectors. The findings of the study suggest that there is a relationship between the beta and CAPM in both sectors. Regression tests also being applied by the researcher who suggests there are insignificant findings between the beta and CAPM in both sectors organizations. The conclusion of the study indicated that CAPM is not applicable in Turkey's cement and power distribution and generation sector.



CAPM is also being analyzed in Poland (Warsaw Stock Exchange) by (Lipiec, 2014). The researcher has used the data since 2006 to 2012, and the analysis were conducted in different time slots such as: prior to the crisis from 2006 to 2007; in crisis since 2008 to 2009; post-crisis session of 2010 to 2012 to assess the efficiency of the two portfolios of construction companies; with the segregation of family and non-family-operated companies. The study aimed to evaluate that how firms are managed during the crisis by the family and non-family companies. The construction sector was selected by the researcher because of the recession directly impact the construction business. Once the crisis has occurred, the construction companies face a high-risk factor. The efficiency of the companies is being assessed with the help of CAPM through statistical tools. The findings of the study suggested that family companies are having high performance as compared to the non-family companies in the crisis.

2.2.1.3 Asian Economy

In the literature of finance, CAPM is the most discussed model in terms of implementation. Different scholars used the CAPM to test its validity, but a few of them found it to be useful in the real market. CAPM is a renowned tool to assess the return on stock (Ratra, 2017). Investors in National Stock Exchange (NSE) also use it extensively. Her study aims to find the applicability of CAPM in NSE and to establish risk and return relationship for individual securities. In her paper, she tried to see whether the individual securities are overvalued or undervalued using CAPM to help the investors to take their buy and sell decisions. The researcher has used the different ten company's data and their closing prices from 2012 to 2016. The study CAPM to be invalid in NSE.

(Bhatt & Chauhan, 2016) aimed to examine the applicability of CAPM on the Indian Securities market concerning selected companies of BSE Sensex. Top five companies, namely SBI, Tata Steel, Sunpharma, ICICI Bank and Maruti Suzuki ltd of BSE Sensex are chosen based on their market turnover and data regarding their daily closing pricing has been collected from 2011 to 2015. Stock valuation has been examined by comparing CAPM return with the actual return of financial assets. The finding shows that inconsistency in the CAPM and returns observed in the stock market. The findings contradict the underlying assumption that higher beta will lead to higher returns. The study also states that no statistics influence CAPM on returns, which reconfirms the non-applicability of CAPM on selected companies for the duration studied.

Alqisie & Alqurran (2016) also tested CAPM in the Amman Stock Exchange (ASE) from 2010 to 2014. The researcher has used the 60 stock returns in the Jordanian companies that are listed in the stock exchange of Amman. The methodology has been used to analyze the CAPM in different sub-sessions (Black, Jensen, & Scholes, 1972). The findings of the study suggested that high risk is not the guarantee to get the high return that deviates from the consideration of CAPM. The study findings did not match the assumptions of the CAPM that it enables the



investor to predict risk and return. The results of the beta coefficient were not significant in the different sub-session. The testing of SML did not comply with the assumption of CAPM, and it's equal to the risk premium. Non-linearity test validates the relation between return and risk is linear. The conclusion of the study suggested that the researcher was not able to find the CAPM effective and efficient in the Amman Stock Exchange.

CAPM is also used in the Dhaka Stock Exchange (DSE) in order to assess the risk and return relations by using the 80 non-financial companies data on the monthly basis during the period of 2005 to 2009 (January to December) (Hasan, Kamil, Mustafa, & Baten, 2011). The findings of the study suggested that there is a positive relation between the risk and return but the results of the intercept are different from zero to insignificant. The hypothesis of CAPM is not proved from the study in the case of Dhaka Stock Exchange but it is suggested that there is a linear relation among the securities of the market. The risk and return are having normality rather than excess return rate in the period of the study.

(Wang, 2013); has conducted the study by taking the sample of 90 stock from the Hushen 300 Index during the period of January 2010 to December 2010. Researcher has used the CAPM for testing in order to assess with the statistical tools of time series regression and cross sectional regression. The findings of the study suggested that CAPM is not fully applicable in the China's stock market and the influence of return on stock is low. Due to the short of time of the stock market there is a lacking in the market maturity therefore; market can be controlled through speculations. The conclusion of the study suggested that CAPM is not applicable in the China Stock market.

2.2.2 National Scenario

Javid et al (2008) conducted a research to analyze the risk and return relation in the stock of Karachi Stock Exchange (KSE). The researchers have used the data from the daily trading and monthly data of 49 KSE listed companies for the period of 1993 to 2004. The aim of the study was to analyze the validity and efficiency of CAPM. The findings of the study suggested that CAPM is not applicable in the Pakistani stock market context. The Pakistani stock market is having highly unpredictable condition that varies the rate of return and increases the risk premium as well with the economic condition and the information that is being used in the development of business information. The variables of the business cycle that impact the rate of return and risk premium as well are: inflation, forex rate, increased in oil prices, increased industrial production, and others. The developed hypotheses about the risk premium are tending to grow with the time in the Pakistani Stock Market context supportive that balanced asset pricing is in operation with the ineffectiveness of economic and business conditions. To analyze the mean-variance of the CAPM presented in the Pakistan Stock Exchange on the individual based stock traded by using the data from 1993 to 2004 on a daily and monthly basis (Attiya



Yasmin Javid, 2009). The findings of the study suggested that CAPM is not effective for the Pakistani Stock Market, and for that researcher has used the model of the statistical interface such as Mean-Variance Skewness and Mean-Variance Skewness Kurtosis.

Bhatti & Hanif (2010) conducted the study in the Pakistani Institutional context during the period of 2003 to 2008. The study aimed to validate and authenticate the CAPM model in the Pakistani context. The methodology of the survey includes the beta valuation with the help of variance and covariance method to forecast the required rate of return, which constitutes the pricing of the asset. The investors must assess the risk and pricing of the investment before deciding on portfolio selection. The study uses the return as a capital gain because the dividend information was not available. The findings of the study suggest that CAPM is effective in delivering the desired result only for some companies that are selected for the study. The selection of 360 observations only 28 supports the CAPM, but the rest are not validating the hypotheses. Amna (2011) has conducted a study on the KSE, (2011); the research focuses upon the comparative study of four models of the asset pricing model that are; CAPM; Fama and French Three-Factor Model, (1993); ICAPM and Carhart Four factor Model. The researcher's aim was to assess asset pricing in the emerging stock market. The findings of the study suggested that emerging markets are having an index are not presenting the reality because of the thin trading. Consistent and active trading is being observed in a small size of stock. The lack of application of the CAPM in the emerging market; because it does not represent the full market trading or features. The risk premium of the four models has insignificant value during the study.

Ali et al., (2018) conducted the study to validate the capital asset pricing model in KSE. The sample was selected of 387 companies of 30 sectors; the data was based upon the quarterly, monthly, and half-yearly. The researcher has applied the paired T-Test to analyze the relationship between the expected and actual return. The findings of the study suggested that CAPM is useful in assessing the expected return in the short run rather than long term investment. It is recommended from the study that investors should focus upon the CAPM while forecasting the return for the Short-term rather than the long-term in the case of PSX. Another study conducted by (Shah, Dars, & Haroon, 2014) tested the CAPM in Karachi Stock Exchange (30 Index) with the help of cross-sectional regression in the duration of Feb 2009 to Jan 2013 by using the ten companies' weekly return. CAPM is the most study topic around the world, but empirical testing has shown little impact on the emerging market of Pakistan. (Rizwan, Shaikh, & Shehzadi, 2013) analyzed the CAPM in the Pakistani stock market and for that, cement companies for the duration of Jan 2004 to Dec 2009. The CAPM model is not valid and cannot be applicable in the cement companies because they are not able to predict the accurate rate of return. The findings of the study do not support the underlying assumption of the theory that high risk brings a high return for the investors on the investment. It is evident from the study that the model illustrates the excess return, and lending advocates the linear model of CAPM. The hypotheses are unsupportive and give the negative findings of the CAPM. The study also



analyzed the CAPM provides the overall return that residual variance on the stock. It is suggested that residual risk has no impact on the return of the stock.

Shaikh (2013) used the panel regression using the 30 traded stocks in KSE and daily prices of the stock from 2008 to 2012. The findings suggest that CAPM is not adequate and has no impact on the selected study. Moreover, Shamim, Abid, & Shaikh (2014) calculated the value-added economy through cost of equity using CAPM. The researcher has selected one company from different 22 sectors that are trading in the Karachi Stock Exchange. The panel data from 2008 to 2012 was used for analysis. The findings of the study suggested that CAPM is not valid in the Pakistani stock market and cannot be relied upon the results of its estimated expected return.

Furthermore, for validating the CAPM in the Pakistani stock market Shah et al. (2014) using the data from July, 2004 to December, 2012 found that when the emerging markets are having a decline in their growth, then the model is not valid and not able to predict the excess return on the stock. The estimation of the risk is not adequate and cannot be applicable in PSX. The model of the asset pricing can be useful when the stock market has the growth trend and it enables the investor to estimate the beta effectively but on the individual basis which is based upon the availability of the data or information. The condition model of asset pricing can be effective for the financial managers or investors to estimate the return and risk relationship.

The relationship between the return and risk on the portfolio has been analyzed (Lal, Mubeen, Hussain, & Zubair, 2016). It is analyzed that the CAPM is not adequate, so it is suggested to use the higher moment in the model for the analysis purpose. The researcher has selected the 60 companies that are listed in the Karachi Stock Exchange (100 Index) from the duration of Jan, 2007 to Dec 2013. The findings of the study suggested that intercept terms and higher moments coefficient are having significance and having a value different from zero. It is being observed that the higher moment is being used, then the adjusted R square increases with the value. In the CAPM testing, higher moment efficiency was effective. Khan, Baloch, Arif & Alvi (2020) critical examined the application of CAPM in PSX using the data from Jan 2014 to Dec 2016. They used seemingly unrelated regression (SUR) to test the model. They had developed ten equally weighted portfolios based on the trade volume found that CAPM is valid in PSX.

Mubeen et al (2021) also showed that Systematic Risk also based on Investors' Sentiment Herding hence it results in mispricing of assets hence systematic risk is difficult to capture due to behavioral aspect of investor.



Methods

3.1 Econometrics Methodology

In this paper, we have applied Fama McBeth methodology of ten portfolios with respect to trading volume order (ascending in nature) from January 1, 2014 to June 30 2018 with the help of 340,194 daily observations from Pakistan Stock Exchange Limited. we have run OLS regression equation on return of each portfolio to market return (KSE-100 index) as well as illiquidity factor to find the relationship between portfolios returns with market return along with returns of portfolio based on trading volumes.

3.2 Sample Selection and Criteria Limitations

As mentioned earlier, the aim of this study is to empirically test the validity of the capital assets pricing model and its applicability in an emerging market like PSX. The sample is used to test model from the day 1 of the year 2014 to the day June 30 2018. During this time period there was mix of both high and low trading volume observed. The sample firms include companies from all of the industrial sectors listed on KSE having non-financial nature of working. Daily price data file obtained on each trading date during the period, which include opening Price, High Price, Low Price, Closing Price and Trading Volume. Daily KSE-100 Index closing is also obtained during mentioned time period.

3.3 Source of Secondary Data

The secondary data was collected from Pakistan Stock Exchange website as well as Thomson Reuters Datastream terminal was used. In order to estimate the daily returns, the daily closing prices is used. In order to estimate the market return KSE 100 index is used.

3.4 Portfolio formation

In order to facilitate the validity of CAPM, ten portfolios were made to empirically test the model according to trading volume of firms. In order to construct, the average trading volume of past four years and 6 months (January 1, 2014 to June 30, 2018) were taken and individual stocks were ranked and allocating to specified portfolio according to the trading volume.

Table 2 shows complete description of selection of portfolios with respect to average daily volume. There are 464 firms taken and first 45 highest average daily trading volume firms



are allocated in Portfolio 1, second 45 highest average daily trading volume firms are allocated in Portfolio 2 and so on.

Average daily trading Volume in Thousand	No. of firms in sample	Portfolio
Above 1,197	45	P1
Above 473 and below 1,197	45	P2
Above 188 and below 473	45	P3
Above 73.68 and below 188	45	P4
Above 37.8 and below 73.68	45	P5
Above 22.69 and below 37.8	45	P6
Above 12.86 and below 22.69	45	P7
Above 6.61 and below 12.86	45	P8
Above 2.68 and below 6.61	45	P9
Less than 2.68	59	P10
Total:	464	



Table 3: Portfolio Selection Industry wise breakup

Industry Name	Portfolio										Grand Total
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	
AUTOMOBILE ASSEMBLER	2	1	1	3	1	2		1	1		12
AUTOMOBILE PARTSACCESSORIES		1	1			2	1		2		9
CABLE & ELECTRICAL GOODS	2		1				1	1		2	7
CEMENT	6	3	4	4	1	2			1		21
CHEMICAL	3	4		4	4	4	3	2	3	1	28
ENGINEERING	3	2	3	1		3	1	3		1	17
FERTILIZER	4	2	1								7
FOOD & PERSONAL CARE PRODUCTS	3	3	1	1	1	1	1	2		8	21
GLASS & CERAMICS		3	1	1	1	1	1		1		9
INV. BANKS / INV. COS. / SECURITIES COS.	2	4	4	2	3	5	2		1		23
LEASING COMPANIES				3	1		1	1	1		7
LEATHER & TANNERIES						1		1		1	3
MISCELLANEOUS	1	1	1	4	2	3	1	1	5	3	22
MODARABAS			1	2	11	3	3	5	2	2	29
OIL & GAS EXPLORATION COMPANIES	1	1	2								4
OILGAS MARKETING COMPANIES	2	3	1			2					8
PAPER & BOARD			3		3	1		1			8
PHARMACEUTICALS	1		2	1	2	2	1			3	12
POWER GENERATION & DISTRIBUTION	2										2
Industry Name	Portfolio										Grand Total
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	
POWER GENERATIONDISTRIBUTION	1	4	4	3	1	1	1	1			16
REAL ESTATE INVESTMENT TRUST		1									1
REFINERY	1	2	1								4
SUGAR & ALLIED INDUSTRIES		1		8	3	3	6	2	6	4	33
SYNTHETIC & RAYON	1		1				2	2		2	8
TECHNOLOGY & COMMUNICATION	4	3	2	1				1			11
TEXTILE COMPOSITE	3	1	5	2	1	3	11	5	4	7	42
TEXTILE SPINNING	1	4	4	2	5	6	10	10	12	22	76
TEXTILE WEAVING			1	2	2	1		3	3	1	13
TOBACCO									1	2	3
TRANSPORT	2			1					1		4
VANASPATI & ALLIED INDUSTRIES		1						1	1		3
WOOLLEN					1						1
Grand Total	45	59	464								

3.6 Daily Portfolio Returns and Market Returns

The returns for an individual stock i , is estimated as follows:

$$R_{it} = \ln\left(\frac{P_t}{P_{t-1}}\right)$$

Where P_t and P_{t-1} are the closing prices on day t and $t - 1$ respectively. The return of portfolio for the time t is the average return of all the individual stocks in that portfolio.

$$R_{pt} = \frac{\text{Sum of daily Return of all individual stock in that portfolio}}{\text{Number of Stocks in that Portfolio}}$$



The returns for market for a particular time t estimated as follows:

$$R_{mt} = \ln\left(\frac{KSE100_t}{KSE100_{t-1}}\right)$$

Where $KSE100_t$ and $KSE100_{t-1}$ are the closing numbers of KSE 100 index respectively & R_{mt} , daily returns of KSE-100 index.

3.7 Illiquidity Factor¹

For robustness of results, illiquidity factor was created by taking a long position in the bottom 35 illiquid stocks and a long position in the top 35 most liquid stocks. We called this factor IML or illiquid minus liquid. So that we can run a two-factor model (market + illiduidity) and test what may happens to the estimates of abnormal returns (alphas) as robustness. This was done equation by equation across all 10 portfolios.

3.8 Econometric Model

Two Econometric Model has been used, first single factor model as follow:

$$R_{pt} = \alpha + \beta_1 KSE100_t + \varepsilon_t$$

Then Two Factor CAPM model was use to capture empirical evidence

$$R_{pt} = \alpha + \beta_1 KSE100_t + \beta_2 Illiquidity_t + \varepsilon_t$$

Where R_{pt} was the Portfolio return at day t , $KSE100_t$ was market return of day t , and $Illiquidity_t$ was the Illiquidity Premium on day t

Results

4.1 Descriptive Results of Ten Portfolios

Table 4 shows the average daily return of each portfolio for the sample period. We can see that Portfolio 1 has 1.5 basis point positive returns. In contrast, Portfolio 2 has 1.9 basis point positive return which increases as we go to portfolio 3. Portfolio 4 as 3.2 basis point and 6.4 basis point respectively this increasing trend remains till portfolio 7, the average daily return of P4, P5, P6 and P7 are 6.6 basis points, 6.7 basis points, 8.0 basis points and 10.32 basis points respectively. The highest return is at Portfolio 7 with 10.32 basis point which ultimately starts declining when we reach at portfolio 8 and 9 as 7.6 and 6.8 respectively and again it is lowest at Portfolio 10 which is 6.7 basis points. These results slightly indicates non-linearity of returns relationship with trading volume, i.e. liquidity. However, for the concrete conclusion, we may have to go for in-depth analysis of return and liquidity relationship as a separate study.

¹ We would like to thank our anonymous reviewer to suggest including illiquidity factor for robustness
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 from Pakistan Stock Exchange (PSX)

**Table 4: Descriptions of Returns of Ten Portfolio based on Trading Volume**

<i>Portfolio</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
P1 Average	1101	17.20815	0.015630	2.171104
P2 Average	1101	21.04293	0.019113	1.613017
P3 Average	1101	46.90688	0.042604	1.633873
P4 Average	1101	73.35564	0.066626	1.334753
P5 Average	1101	73.91942	0.067138	0.912458
P6 Average	1101	88.42332	0.080312	0.700033
P7 Average	1101	113.6229	0.103200	0.516468
P8 Average	1101	83.73475	0.076053	0.249072
P9 Average	1101	74.97893	0.068101	0.188543
P10 Average	1101	74.27041	0.067457	0.082707

4.2 Empirical Results of Single Factor Regression

In the Table 7 below the results of 10 regressions from ten portfolios are presented. Each portfolio was constructed based on Market Liquidity i.e., trading volumes. The beta of each regression shows the systematic risk present in each portfolio. It shows the relationship between beta (systematic risk) and trading volume (liquidity).

Portfolio	Average daily Trading Volume ('000)	No. of Firms	Intercept (Prob)	Market Beta (Prob)	Adj R square	F Statistics
P1	Above 1,197	45	- 0.04 (0.118)	1.278 (0.000)	0.654	2073.76
P2	Above 473 and below 1,197	45	- 0.02 (0.261)	1.066 (0.000)	0.612	1729.45
P3	Above 188 and below 473	45	-0.002 (0.939)	1.041 (0.000)	0.576	1486.01
P4	Above 73.68 and below 188	45	0.031 (0.244)	0.824 (0.000)	0.442	866.76
P5	Above 37.8 and below 73.68	45	0.039 (0.079)	0.652 (0.000)	0.404	740.45
P6	Above 22.69 and below 37.8	45	0.057 (0.004)	0.561 (0.000)	0.391	710.68
P7	Above 12.86 and below 22.69	45	0.088 (0.000)	0.389 (0.000)	0.255	375.42
P8	Above 6.61 and below 12.86	45	0.068	0.215	0.161	210.01



			(0.000)	(0.000)		
P9	Above 2.68 and below 6.61	45	0.059 (0.000)	0.178 (0.000)	0.144	185.51
P10	Less than 2.68	59	0.065 (0.000)	0.075 (0.000)	0.058	68.43

4.3 Empirical Results of Two Factor Regressions

In the Table 6 the regression results of two factor CAPM (market and Illiquidity) has been shown. We can see that alpha of P1 and P2 has remained insignificant as compared to Table 5 where alpha of five portfolios from P1 to P5 were insignificant. However, there is not pattern changed in shape of alpha, for both Table 5 and Table 6 we can see that alpha is low in highly liquid as well as highly illiquid portfolio where has alphas of moderately liquid portfolios are high as compared to tail ended portfolios. It shows that our results are robust for both single factor CAPM as well as two factor CAPM (market and illiquidity). Also, the pattern of Market Beta in two factor CAPM is similar in Table 6 as it was in Table 5 i.e. declining. Hence, this robustness provided concrete evidence that Higher the liquid assets higher the market risk. Hence, including highly liquid stocks in your portfolio will make investor exposed to market risk. However, moderately liquid portfolio has less market risk. The Illiquidity Factor is highly significant and increasing as we move towards less illiquid portfolios.

Table 6: Two Factor CAPM (Market + Illiquidity) Results of All 10 Portfolios

Portfolio	Average daily Trading Volume ('000)	No. of Firms	Intercept (Prob)	Market Beta (Prob)	Illiquidity (Prob)	Adj-R	F Stats
P1	Above 1,197	45	- 0.009 (0.6467)	0.845 (0.00)	-34.973 (0.00)	0.763	1758.09
P2	Above 473 and below 1,197	45	- 0.003 (0.8639)	0.7412 (0.000)	-26.291 (0.000)	0.695	1243.3
P3	Above 188 and below 473	45	0.019 (0.428)	0.755 (0.000)	-23.051 (0.000)	0.638	964.32
P4	Above 73.68 and below 188	45	0.051 (0.0383)	0.543 (0.000)	-22.698 (0.000)	0.517	582.82
P5	Above 37.8 and below 73.68	45	0.051 (0.0187)	0.485 (0.000)	-13.392 (0.000)	0.442	431.55
P6	Above 22.69 and below 37.8	45	0.065 (0.0008)	0.439 (0.000)	-9.897 (0.000)	0.418	391.79
P7	Above 12.86 and below 22.69	45	0.0959 (0.000)	0.281 (0.000)	-8.789 (0.000)	0.2845	216.98



P8	Above 6.61 and below 12.86	45	0.0714 (0.000)	0.172 (0.000)	-3.3482 (0.000)	0.1706	112.23
P9	Above 2.68 and below 6.61	45	0.0595 (0.000)	0.1768 (0.000)	-0.056 (0.949)	0.145	92.674
P10	Less than 2.68	59	0.064 (0.000)	0.083 (0.000)	0.7344 (0.227)	0.058	34.961

Discussion

The main results of this thesis indicate that Market-wide liquidity should be part of asset pricing models. As evidence shows that shares of highly traded firms. i.e highly liquid firms have high betas, i.e. high systematic risk (beta of top two portfolios was more than 1) in single factor model and consistently high in highly liquid firms in two factor models too. This evidence allows us to conclude that liquidity risk premium exists in developing markets, i.e. Pakistan Stock Market. The same conclusion was supported by the work done in the Spanish market (Martinez, Nieto, Rubio, & Tapia, 2005), in (Demircioglu, 2015) Turkey (Sensoy, 2017) for USA and rest of the world.

As evidence also suggest that as trading volume declines, the systematic risk declines too, thus having less liquid firms in the portfolio allows portfolio and funds managers as well as investor to avoid risk. It will also allow them to have benefits of diversification.

High R Square in highly liquid firms i.e. (Portfolio 1 – Portfolio 4 regressions) show that there is strong relationship between systematic risk and highly traded firms where as low R square in less liquid firms (Portfolio 7 - Portfolio 10 regressions) show that there is weak relationship between systematic risk and low traded firms. Thus having firms in the portfolio from both the end will also reduce correlation and allow the benefit of diversification for the portfolio and fund managers. This research was limited to use of trading volume of stocks as a proxy of liquidity while there is certain literature regarding liquidity measurement through Bid and Ask spread (Acharya & Pedersen, 2005; Amihud & Mendelson, 1986) Acharya & Pedersen, 2003. Additionally, a comparison of difference markets is also suggested. This will provide more insights of the application of the CAPM and its variants.

Conclusion

This paper examined the impact of systematic risk on liquidity and found that highly traded stocks are more affected by systematic risk. The findings of this study indicate that Market-wide liquidity should be part of asset pricing models, thus investors and portfolio managers may consider the highly traded stocks as part of their portfolio. The Pakistani Stock



Market is quite responsive and volatile against the news circulate in the market either the news is about industry, politics or macro-economy. As still there exist weak market efficiency and still the market is in emerging phase. The study of these joint dynamics of stock prices allow us to understand that both high liquid stocks as well as low liquid stocks are helpful for the investors in diversification of their portfolio. Hence investors or funds managers may consider including moderately liquid stock as they have abnormal returns but still less correlated with markets.

Abbreviations

ASE: Amman Stock Exchange;

BSE: formerly *Bombay Stock Exchange*;

CAPM: Capital Asses Pricing Model;

CDC: Central Depository Company;

CSP: Closing Share Price;

DSE: Dhaka Stock Exchange;

GARCH: Generalized Autoregressive Conditional Heteroskedasticity;

KMI: Karachi Meezan Index;

KSE: formerly Karachi Stock Exchange;

NCCPL: National Clearing Company of Pakistan;

NSE: National Stock Exchange;

PSX: Pakistan Stock Exchange;

SAARC: South Asian Association for Regional Cooperation;

SECP: Security and Exchange Commission of Pakistan;

TV: Trade Volume;

OLS: Ordinary Least Square

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