CREB Working Paper No. 01-08

Size and Value Premium in Karachi Stock Exchange

Nawazish Mirza

Centre for Research in Economics & Business
Lahore School of Economics

Centre for Research in Economics and Business (CREB)

Naved Hamid
Director CREB

CREB Advisory Board

Lahore School of Economics

Intersection Main Boulevard Phase VI, DHA and Burki Road
Lahore 53200, Pakistan
Tel: 042-6561230; 042-6560936
Email: creb@lahoreschool.edu.pk

CREB Working Paper No. 01-08

Size and Value Premium in Karachi Stock Exchange

Nawazish Mirza
Assistant Professor (on leave)
Lahore School of Economics
PhD Candidate
Financial Markets Group Paris Dauphine
E-mail: nawazishmirza@gmail.com

Publisher: Lahore School of Economics, Lahore, Pakistan.

Preface

Centre for Research in Economics and Business (CREB) was established in 2007 to conduct policy-oriented research with a rigorous academic perspective on key development issues facing Pakistan. In addition the Centre (i) facilitates and coordinates research by the faculty at the Lahore School of Economics, (ii) hosts visiting international scholars undertaking research on Pakistan and (iii) administers the postgraduate programme leading to the M Phil and PhD Degree at the Lahore School.

An important goal of the Centre is to promote public debate on policy issues through conferences, seminars and publications. In this connection, the Centre organizes the Lahore School's Annual Conference on the Management of the Pakistan Economy. The proceedings of which are published in a special issue of the Lahore Journal of Economics.

The CREB Working Paper Series has been started to bring to a wider audience, the research being done at the Centre. It is hoped that these Papers will promote discussion on the subject and contribute to a better understanding of economic and business processes and development issues in Pakistan. Any comments and feedback on these Papers will be appreciated.

Acknowledgements

This working paper was written at the Centre for Research in Economics and Business (CREB) at Lahore School of Economics. I am grateful to many who contributed in completion of this research. First and foremost, I would like to thank Dr Shahid Amjad Chaudhry, Rector of Lahore School, for the research grant that was vital in initiation and completion of this project. I am indebted to Dr Naved Hamid, Director CREB, for giving me the opportunity to work with him. I am thankful for his important support both in term of logistics at the Centre and valuable comments throughout this research.

I wish to express my most sincere gratitude to the two referees, Dr Sohail Zafar and Dr Farooq Chaudhry, for their detailed review, constructive criticism and advice during the research process. Their understanding, encouragement and personal guidance provided substantial basis for the working paper. I am grateful to Dr Herve Alexandre, my PhD supervisor at Paris Dauphine, for his comments on the technical aspects of this research. I would like to thank the participants of the Finance Group Seminar at CREB for their important comments and suggestions.

During this research I collaborated with many colleagues for whom I have great regard. I wish to extend my warmest thanks to Mr Salaar Farooq for all those valuable discussions, Ms Saima Shahid for assisting me in data collection and Ms Romana Noor, Mr Mohsin Ijaz and Mr Arshad Hassan for the administrative matters.

I owe many loving thanks to my wife Areeba and son Ali for their patience and support. My present and future, I honor it for them.

Abstract

Investment decisions are based on the rational return expectations and investors require returns that are aligned with their risk and utility. This phenomenon has been extensively discussed in the financial theory as well as practice and the first known theory of asset pricing leads back to as early as Bachelier (1900). The current study evaluates the performance of Fama and French Three Factor model in Karachi Stock Exchange (KSE). It employs a multivariate regression approach after sorting six portfolios on size and book to market. The constituent stocks were selected to represent each and every sector of KSE. Daily returns were employed for a period of five years starting from January 2003 to December 2007. The six month Pakistan's T Bill yield was used as proxy for risk free rate to determine excess returns. The excess returns for each portfolio were regressed on market, size and value factors. The results were encouraging for the three factor model. The three factor model was able to explain the variations in returns for most of the portfolios and the results remain consistent when the sample was reduced to control for the size effect. Our findings are consistent with most of the studies that suggested the validity of three factor model in emerging markets. These findings have substantial implications for fund managers, analysts and investors. The results suggest that size and value premium must be incorporated for asset valuations and portfolio management decisions.

JEL Classification: G11, G12, G14

Keywords: Size Premium, Value Premium, Market Premium, Three Factor Model.

Size and Value Premium in Karachi Stock Exchange

1. Introduction

Most behavioral sciences based on rationality have simplistic assumptions. The same is true for financial theory where consumption and investment decisions rely on investor's prudence and each participant aims to maximize his utility or wealth. Financial economics, as a discipline, revolves around a rational investor aiming for maximum returns by assuming some risk. Since investors' expected reward is based on risk taking, the level of risk becomes a critical determinant of target returns. The investor can expect higher returns only by accepting higher level of risk. A risk averse investor might get higher returns in the shorter term but consistent expectation of higher returns can only be materialized by matching with higher level of risk.

In financial markets, risk refers to a position where a participant has exposure to an uncertain situation. If the outcome is certain or the exposure is not there for an investor, then such a participant is not at risk, although risk is always present in the system. Therefore, while targeting returns, it should be obvious that investors are rewarded for their own exposure. Thus a stock market investor can expect returns proportionate to the inherent risk on his own portfolio regardless of the risk assumed by other participants. As discussed earlier, returns are always proportionate to the risk and, therefore, in an informational efficient market, the inherent risks are accurately reflected in the asset prices. Since risk is such a vital determinant of returns, there is an ongoing debate on determining the optimal return at a given level of risk or an optimal risk for a given level of return – making asset pricing a critical issue in financial literature.

The pioneer work in asset pricing leads back to Bachelier (1900) who provided the early foundations in his magnificent dissertation "*Théorie de la Spéculation*" submitted at Sorbonne and his subsequent publications (1906, 1913). The potential of his work was not acknowledged by his peers and it took almost half a century for financial theorists to recognize his ideas about *Random Walk*, *Brownian*

Motion and *Martingales* that became standard practice in financial economics. In his classical work, he recognized that past present and even discounted future events are reflected in security prices. He further ascertained that fluctuations in financial markets cannot be predicted; however the (relative magnitude of) likelihood of financial market fluctuations can be mathematically evaluated. Although from today's perspective the mathematics and economics behind Bachelier's notion were flawed, yet his ideas were acknowledged by the finance practitioners in the later half of the twentieth century.

In the first half of the twentieth century, investors were aware of the risk return relationship and they could quantify returns despite the fact that there was no meaningful measure of risk. The prevailing theory of that era was the maximization of expected returns by Williams (1939). In Williams's framework, investors should invest in assets that bears maximum expected return without accounting for the associated risk. Thus each investor was supposed to invest in the maximum yielding assets ignoring his personal risk tolerance. Williams (1939) assumed *that "the law of large numbers will insure that the actual yield to the portfolio will be almost the same as the expected yields" (Williams 1939, pp. 68-69).*

Inspired by the early work of Bachelier, Markowitz (1952) was the first to challenge William's (1939) notion. He presented a meaningful measure of portfolio risk i.e. the 'variance of returns' that revolutionized the financial theory and opened new avenues for academicians to provide various explanations about the process of asset pricing and determinants of stock returns. Building on this, various asset pricing models and their extensions were proposed[1]. In these extensions, relevance of size and value premium in asset pricing was highlighted by Fama and French (1992). This paper will examine the proposition of Fama and French three factor model therefore it is worthy to discuss their hypotheses relative to size and value premium. The following section provides an overview of the three factor model.

[1] The siginifant literature on asset pricing models and their subsequent extensions include propositions by Tobin's (1958) separation theorem, Sharpe (1964), Linter (1965), Mossin (1966) capital asset pricing model (CAPM), Black's (1972) Zero Beta CAPM, Merton's (1973) Intertemproal CAPM, Breeden's (1979) consumption based CAPM and Ross's (1976) Arbitrage Pricing Theory.

1.2 Theoretical Framework of Research

Fama and French (1992) proposed an extension of CAPM by adding two more factors. This new model started a new debate in financial literature. More fuel was added when in a later article Fama and French (1996) declared single risk factor of CAPM to be dead and commented that systematic risk (measured by the beta coefficient) cannot solely explain expected returns since it over simplifies the complex market situation. Their three factor model is classified as a major set back to CAPM as Fama, till early nineties, had been a great advocate of Sharpe's model. Fama and French started with the observation that two classes of stocks have performed better than the market as a whole. These included stocks with small market capitalization and stocks with high book value per share to price (market value) ratio. Since these stocks yielded higher return than market, FF commented that such phenomenon is explained by the existence of *size* as well as *value* premium in addition to the market risk premium as posited by traditional CAPM, and modeled as $(R_m - R_f)$.

To account for these two premia, FF constructed two more risk factors outside of market risk. They used *SMB* (small minus big) to address size risk and *HML* (high minus low) for value risk. The high book value to market value ratio stocks were termed as value stocks while low book value to market value ratio stocks were termed as growth stocks. The size factor measures the additional returns investors receive for participating in stocks with comparatively small market capitalization. The positive *SMB* factor represents more returns for small market capitalization stocks vis-à-vis big market capitalization stocks and vice versa. The value factor captures the premium investors will get while investing in stocks with high book to market ratio. A positive *HML* signifies more returns for value stocks than growth stocks.

The three factor model can be expressed as follows:

$$R_{it} = R_f + (R_{mt} - R_f)\beta_{1t} + (SMB)\beta_{2t} + (HML)\beta_{3t}$$

Where R_{it} represents expected return on stock *i*, $R_{mt} - R_f$ represents market premium, *SMB* is the size premium and *HML* represents value premium. The coefficients are the risk sensitivities for market risk (β_{1t}) followed by size (β_{2t}) and value (β_{3t}). The market risk coefficient is akin

to Sharpe's CAPM but different in the sense that in this three factor model the explanatory function will be shared by two other risk factors. The three factor model has gained popularity because it is perceived to have highest explanatory power among the numerous variables that have been tested in financial literature and has consistently yielded a high R^2 - sometimes as high as 95%. As mentioned earlier, the introduction of three factor model has spurred much discussion. The scepticism of FF about the validity of CAPM with a single factor has triggered a debate that is seemingly never ending.

An exhaustive literature exists on validity of three factor model in both domestic and international markets. Like all other asset pricing models, research has documented mixed results about its applicability. Some researchers have declared the news of beta's death to be premature while others strongly support the existence of size and value premiums in stock markets. Nevertheless, besides CAPM this is the only proposition that has gained vast attention of financial theorists and practitioners and is considered a real competitor to Sharpe's CAPM. The reasons for its acceptability are many.

Research evidences have shown that returns in the past were related to firm specific factors like size, earnings to price ratio, cash flow to price ratio, book to market ratio, past sales growth and patterns in short term and long term returns etc. Since these relationships are not explained by the CAPM, they were termed as market anomalies. When FF three factor model was applied, the abnormal returns due to firm characteristics disappeared. Although, the absence of these anomalies could also be attributed to irrational pricing or the data problems but similar observations in many studies (domestic as well as international) demonstrated that such results were not obtained merely by chance.

The above discussion does not mean that CAPM should be completely discarded or its main determinant 'beta' is invalid because the three factor model itself is an extension of the basic proposition of CAPM. However, it is important to note that CAPM is under criticism for its econometric and methodological limitations that have resulted in low explanatory power of the model. These limitations include non symmetric asset

returns[2], absence of ex ante returns, inability to observe true market portfolio, non synchronous trading and stability of beta estimates[3].

1.3 Research Rationale and Objectives

As discussed earlier, FF three factor model has emerged as an alternative explanation for the ongoing arguments on asset pricing. The discrepancies in CAPM have contributed towards the success of alternative explanations. Fama and French (1998) advocate a global version of their model. They studied thirteen world markets during 1975 – 1995 and showed that value stocks tend to yield higher returns than growth stocks. They sorted the portfolios on book to market ratio and in twelve out of thirteen countries value stocks out performed growth stocks. Similar results were observed for emerging markets. They commented that an international CAPM did not explain value premium in international markets.

Although the framework of FF is simple, considerable empirical controversy exists, as mentioned earlier, about the interpretation of the risk factors. Some of the researchers have proposed that the existence of book to market premium is not due to investors' compensation for risk bearing but because of investor overreaction [Lakonishok, Shleifer, and Vishny (1994), Haugen (1995)]. They suggest that investors overreact to corporate news and exaggerate their estimates about future growth. Consequently, the value stocks tend to be under priced while growth stocks tend to be over priced. Another group of critics relates the success of FF model to the empirical gimmicks [Ferson, Sarkissian, and Simin (1999)]. They suggest that the explanatory power of three factor model is due to econometric regularities. This could be due to inherent biases or data snooping that exaggerates the results for three factor model. Berk (1995) is of the view that the way in which portfolios for high book to market and size are constructed, they are expected to yield high returns regardless of any economic interpretation.

Markets outside North America and Western Europe have grown rapidly in last couple of decades. A significant change in global financial markets is the growth of emerging markets where the potential for investment in terms of risk and return is reasonably high. International

[2] Akgiray (1989), Malkiel and Xu (1999)
[3] Blume (1974), Baesel (1971), Roenfeldt (1978)

Finance Corporation (IFC) rates approximately 30 countries as emerging markets. In emerging economies the market dynamics and investment behavior is distinct. These economies have smaller financial markets in proportion to their economies size vis-à-vis developed markets. Other important aspects of emerging markets are the level of activity and their openness to foreign investors. In the presence of thin trading, informational inefficiency, panics, bubbles and lack of transparency, the overall investor activity remains range bound to certain stocks [Li, Wei and Hoyer-Ellefsen, Richard (2004)]. These differentiating factors warrant an examination of the behavior of asset pricing in emerging markets. With monetary integration and globalization, investors tend to diversify their portfolios by participating in developed as well as emerging international markets. Therefore, it is vital to analyze the applicability of asset pricing models in an emerging scenario to support investment decisions.

Pakistan has been classified as an emerging market where literature on asset pricing is very rare and almost non-existent on size and value premium. There are three stock exchanges[4] in Pakistan with KSE being the most liquid and largest in terms of market capitalization and trading volume. KSE has been awarded as the best performing emerging stock market of the world in 2002 by Business Week. Like all other markets the investments decisions are backed by some fundamental economic rationale or technical indicators. The aim of this paper is to study the power of FF three factors model to explain returns of KSE traded stocks. The outcome will provide an insight related to the efficacy of FF three factors model in explaining the puzzling risk return relationship in an emerging market.

It should be admitted that this research will not settle the extremely heated debate on the explanatory power of three factor model; but it will surely contribute some evidence to support either the advocates or the critics of three factor model. The rest of the paper is organized as follows. Section II will summarize some of the existing literature on size and value premia. Section III will discuss the data and methodology. Empirical results are presented in Section IV and Section V will conclude.

[4] These include Karachi Stock Exchange (KSE), Lahore Stock Exchange (LSE) and Islamabad Stock Exchange (ISE).

2. Literature Review

As mentioned earlier FF three factors model has been widely discussed in the empirical literature as an alternative to CAPM. Researchers have reported evidences both in support and against the three factor model. This section summarizes some of the research studies that have been done both in domestic as well as international markets.

Chan et al. (1991) attributed risk premium on Japanese stocks to four variables. These included earnings yield, size, book to market and cash flow yield. They used monthly data for stocks from manufacturing and non-manufacturing companies listed on Tokyo Stock Exchange from 1971 – 1988. The stocks were grouped in the portfolios sorted on earnings yield. The employed Seemingly Unrelated Regression (SUR) model as well as Fama Macbeth Regression to test for the significance of the fundamental variables. The findings reveal a significant relationship between returns and the proposed variables. They noted that the book to market ratio variable was statistically and economically significant. The research confirmed the existence of size effect in Japanese market as small firms in the sample outperformed large firms.

Fama and French (1992) examined the cross section of stock returns and presented additional factors of size and value premium to clarify the return anomalies that CAPM was unable to explain. They used non financial firms data of NYSE, AMEX and NASDAQ from 1962 – 1989. The stocks were sorted by size (measured by the market value of equity) for all the three markets and ten size based portfolios were constructed. The model was tested using *Fama – MacBeth Regression* approach and the results supported the notion that size helps in explaining the cross section of returns where as beta alone is not sufficient to explain the variations. Similar results were obtained for book to market (value premium). FF noted that although book to market ratio has a stronger impact than size, it cannot replace size in explaining average returns. Also, the model yielded much better results when both factors were included. They concluded that if the asset pricing is rational, then the additional risk factors of size and book to market ratio seem to describe average returns, while the probability that such results were due to chance were remote. They added that economic fundamentals suggested that high book to market ratio firms earn lower vis-à-vis low book to market firms. Moreover, during the sample period small firms underwent a slowdown in earnings as compared to bigger firms. Thus, there is a probability that these variables

are considered by the investors while pricing an asset. As a concluding note they admitted that if the stock prices are irrational then there is a lower chance that these results will persist.

Fama and French (1993) extended the Fama and French (1992) research by applying a time series regression approach. The analysis was extended to both stocks and bonds. The monthly average returns on stocks and bonds were regressed on five other factors. These factors were excess returns on market portfolio, portfolios sorted by size, portfolios sorted by book to market, term premium and default premium. They found that the first three factors were significant for stocks while the last two were significant in explaining returns on bonds. They confirmed the existence of size and value premium in US returns and commented that a three factor model better explained the risk return puzzle.

Black (1993) criticized three factor model and commented that the observed relationship between stock returns and size and value premia is a result of data mining. He suggested that since the significant results of the tests on FF three factor model are by mere chance, such results are not likely to sustain in a different data set with different a time period.

Kothari, Shanken and Sloan (1995) criticized the three factor model on two fronts. They attributed the success of three factor model to survivorship bias[5] in Compustat data base and problems in beta measurement. The results could be biased since only those firms which have survived till present were included in the data. Those firms which ceased to exist in the sample period could be the ones with high book to market ratio with low returns; and if they were included, the significance of book to market might have diminished or even eliminated.

Their second criticism was vis-à-vis estimation issues in beta coefficient. The betas estimated with daily returns are not the same as betas estimated with monthly or yearly data and thus empirical results will be largely dependent on the data frequency. Kothari et al. (1995) argued that the significant relations could be observed for a particular data frequency and when that frequency is changed the results might not remain the same. They suggested that annual betas are more appropriate as the investment horizon for an investor is more likely to be closer to a year than a month

[5] For more on survivorship bias please see Davis (1994).

or a day. Their results demonstrated that relationship between single factor beta and return is established when annual data is used.

Chan, Jegadeesh and Lakonishok (1995) also rejected the notion of survivorship bias. They compared Compustat data with CRSP – a data base assumed to be free of survivorship bias - for a period between 1968 and 1991 and suggested that when firms of the two data bases are matched, not enough firms were found to be missing from Compustat i.e. the missing firms were too few and could not have rendered a significant impact on Fama and French (1992) results. Furthermore, they created another survivorship bias free data set for the similar period and observed a significant relationship between returns and book to market ratio thus confirming that the survivorship bias argument could not cast doubts on FF three factor model.

Fama and French (1995) tried to provide economic rationale for their three factor model by relating return factors to earning shocks. They studied the characteristics of value as well as growth firms. Their analysis reported that firms with high book to market ratio have a tendency to be consistently distressed, while firms with low book to market have sustained profitability. This leads to a conclusion that returns for high book to market stocks compensate for holding less profitable and riskier stocks. The results demonstrated that sensitivities of HML and SMB are a proxy for relative distress. The firms with low earnings had high book to market and positive slopes for HML, while firms with high earnings had low book to market and negative HML slope.

Claessens et al. (1995) examined the cross section of asset returns in emerging markets. They used data from International Finance Corporation (IFC) for 18 developing countries from 1986 – 1993, and in addition to beta, analyzed other risk factors and their impact on asset returns. They concluded that along with beta, two factors i.e. size and trading volume have the highest explanatory power in most of the countries. Dividend yield and earning to price ratio were also significant but in fewer countries. Lastly, they proposed that exchange rate risk is an important determinant of asset returns[6].

[6] Similar results were reported for Italian Market [Aleati et al. (2000), Beltratti and Di Tria (2002)], India [Connor and Senghal (2001)}, Malaysia [Drew and Veeraraghavan (2002)]

Barber and Lyon (1997) used an alternate way to analyze the issue of data mining. They used financial firms as their sample which were excluded in the Fama and French (1992) sample. The underlying idea was that if the results are a consequence of data mining, then the results should not be consistent if a different sample is used. They studied the financial firms for 1973 – 1994 period and found significant evidence on FF three factor model thus rejecting the possibility of data mining.

Daniel and Titman (1997), using a factor analysis approach, analyzed the impact of loadings on stock returns from 1973 – 1993. They investigated whether the portfolios that share similar characteristics, but have different loads, exhibit different returns. After controlling for size and book to market, they found that expected returns are not a function of loadings on the Fama and French Risk factors. They posit that it is the covariance between high book to market ratio stocks that posts similar properties rather than sharing of a common risk factor.

Halliwel et al. (1999) replicated Fama and French (1993) study on Australian data. Their results suggested that some premium exists on small size and high book to market ratio stocks. Despite observing some premium on SMB and HML factors, there were some inconsistencies with respect to FF three factors model. First, the explanatory power of the three factor model was not as strong as that observed in case of US markets. Fama and French (1993) reported that there is a tendency for the size sensitivity to fall when moving from lower to higher book to market portfolios. This was not evident in Halliwel et al. (1999). Moreover, in Fama and French (1993) a significant improvement was reported in adjusted R^2, when they moved from a single factor to three factor model where as for Halliwel et al. (1999), there was only a marginal improvement.

Davis et al. (2000) extensively studied the characteristics, covariances and average returns from 1929 to 1997. They divided the sample into two periods. The first set of observations was from July 1929 to June 1963 while the second was from July 1963 to June 1997. The value premium factor, measured by the *HML*, for the first half was 0.5 percent per month and was statistically significant ($t = 2.80$).This was similar to the value premium observed by other authors for the second period; equal to 0.43 percent per month with a higher significance ($t = 3.38$). However, the observed size premium was lower than the value premium. Represented by *SMB* factor, the size premium was 0.20 percent for the

whole sample period. They concluded that the value premium in average stock returns is robust. They extended the study of Daniel and Titman (1997) by using a longer time period of 1929 – 1997. Their results were in contradiction with Daniel and Titman (1997) as they found a relationship between returns and factor loading. They suggested that the results presented by Daniel and Titman (1997) were subject to low power of tests and comparatively shorter time span.

Griffin (2002)[7] examined the viability of domestic or country specific and international versions of the FF three factor model in explaining equity returns. The equity data used was from US, Canada, Japan and UK. He used portfolio intercept approach and found that none of the model did not completely explain the returns. However, among the domestic and international versions, the domestic model seemed to be a better one in explaining equity returns both in portfolio as well as in the stand alone context. This finding suggested that it is inappropriate to use the FF three factor model for international asset pricing.

Maroney and Protopapadakis (2002) applied FF three factor model on international markets as well as the US. They studied the stock markets of Australia, Canada, Germany, France, Japan, UK and the US. The reported the survival of size and value premium in all countries and they concluded that a three factor model does have an international significance. They used a stochastic discount factor model along with macroeconomic and financial variables and concluded that even these additional variables and the discount factor do not decrease the explanatory power of the three factor model. The positive relation of returns with book to market ratio and their negative relation with size remain strong under a general stochastic discount factor model.

Drew and Veeraraghavan (2003) compared the explanatory power of a single index model with that of the FF three factor model. The countries examined were Hong Kong, Korea, Malaysia and Philippines. They concluded that the size and value premia were present in these markets and the three factor model better explained the variations in returns for these markets. They commented that these premia are the compensation for risk that is not accounted for by CAPM.

[7] Similar results were reported by Moerman (2005) for Euro Zone.

Gaunt (2004) analyzed the impact of three factor model in Australian stock market by extending the study of Halliwel et al. (1999). He employed data for 6,814 Australian firms from July 1991 to June 2000. The firms in the sample were arranged by market capitalization and divided into five size groups (quintiles) with equal number of stocks in each group. The first quintile represented the smallest stocks while the fifth quintile comprised of the biggest market capitalization companies. A similar approach was followed for book to market ratio portfolios. This led to a creation of 25 portfolios formed at the intersection of both book to market ratio and market capitalization. They found that their results were by and large consistent with those of Halliwel et al. (1999) and concluded that three factor model provides a better explanation of returns than CAPM for Australian stock markets. However, they pointed out that unlike US, the main source of the explanatory power of three factor model is the size premium.

3. Research Methodology

As mentioned earlier, emerging markets have their dynamics that are different from developed markets. KSE was declared as an open market in 1991 though the pace of market activity has been stagnant till 2002. Starting from 2003, Pakistani markets have seen a new bull rally that has continued till present (March 2008) with some corrections and few panics. However, the overall investor sentiment is positive and it is believed that market hype is backed by strong fundamentals. The pre 2003 era was dominated by low activity, fewer investors and high transaction costs.

Therefore in this study sample period was from January 1, 2003 and extended to five years till December 31, 2007. Another reason that validates this time period selection is the events of September 11, 2001. The post September 11 world has a totally different investment scenario. The investment behavior is more cautious and risk averse. Thus, it was likely that if the sample period included both pre and post September 11 data, the difference in investment characteristics could create a potential bias in results; so it seemed prudent to include a lag of one year and begin the data from January 2003.

3.1 Model Specification

Fama and French contend for a multifactor asset pricing model and their three factor model is an extension of a single factor CAPM. Besides the

traditional beta it includes two additional factors to account for size and value premia.

Mathematically, we can represent the three factor model as:

$$R_{it} = R_f + (R_{mt} - R_f)\beta_{1t} + (SMB)\beta_{2t} + (HML)\beta_{3t}$$

with $t = 1, 2, 3,\ldots..,T$

Where R_{it} represents expected return on stock *i*, $R_{mt} - R_f$ represents market premium, *SMB* is the size premium and *HML* represents value premium. The coefficients are the risk sensitivities of returns for market risk (β_{1t}) followed by size (β_{2t}) and value (β_{3t}).

In order to test FF three factor model, we follow the traditional multivariate regression framework and transform the above equation into a simple time series model represented as follows:

$$ER_{it} = \alpha_i + RP_t\beta_{1t} + (SMB)\beta_{2t} + (HML)\beta_{3t} + e_t$$

Where $ER_{it} = R_{it} - R_f$ is the excess return on stock *i*, $RP_t = R_{mt} - R_f$ is the risk premium, α_i is the intercept of regression equation representing the non- market return component, while e_t represents the random return component due to unexpected events related to a particular stock. It is assumed that e_t has a multivariate normal distribution and is independently and identically distributed over time. It was hoped that if the model holds then α_i would be non significant.

The above mentioned model represents the three factor model for an individual stock. By replacing security *i* with a portfolio of stocks P, the three factor model can be expressed as follows:

$$ER_{Pt} = \alpha_P + RP_t\beta_{1t} + (SMB)\beta_{2t} + (HML)\beta_{3t} + e_t$$

where $ER_{Pt} = R_{Pt} - R_f$ and $R_{Pt} = \sum_{i=1}^{N} w_i R_{it}$ with *w* representing the weight of stock in portfolio.

Therefore, the excess portfolio return can be rewritten as $ER_{Pt} = \sum_{i=1}^{N} w_i R_{it} - R_f$ and the non-market return component will be $\alpha_P = \sum_{i=1}^{N} w_i \alpha_i$ which is the average of the individual alphas.

3.2 Dependent and Independent Variables

3.2.1 Dependent Variable

The dependent variable for FF three factor model is the excess portfolio return represented by $ER_{Pt.}$ The excess return reflects the return over and above risk free rate required by the investor to justify risk taking. As already mentioned, portfolio return is the weighted average of all stocks included in a portfolio.

3.2.2 Independent Variables

The dependent variables include *market risk premium, size factor and value factor*. Market risk premium, measured as difference between return on market portfolio and risk free rate, represents excess return that investor could earn if he invests in market portfolio instead of investing in a risk free asset. The market risk *premia* and excess return is the same in both CAPM and three factor model, however, three factor model has two other variables. *SMB* or size premium captures the additional return offered by companies of small size companies vis-à-vis big companies. Similarly *HML* or value premium captures additional return offered by companies whose BV to MV ratio is low.

The theoretical foundations of *SMB* and *HML* factors are intuitively appealing. Small size companies are more sensitive to various risk factors due to their less diversified nature of business and even lower financial flexibility as compared to relatively bigger firms. Therefore, investors should require a risk premium while investing in small capitalization firms. The *HML* factor attaches a high risk to value stocks than growth stocks. A high book to market ratio depicts a deviation in the book value of firm from its market value indicating that the market is not placing high value on its stocks. This could be due to current distress or investors' expectations about the future prospects due to which such companies may be vulnerable to business risk as well as

financial risk, making it logical for the investors to demand a premium on such stocks.

3.3 Sample Selection and Criteria Limitations

As discussed earlier, this study tested the performance of FF three factor model in KSE for five years from January 1, 2003 to December 2007. The sample consists of companies from all industrial sectors listed on Karachi Stock Exchange. The following are the list of criterion that were employed to select stocks from these individual sectors. All selected stocks must be public limited companies listed on the Karachi Stock Exchange.

1. For selected companies, daily price data, book value and market value of equity, and market capitalization should be available.

2. The selected stocks must have survived the five year period.

3. In order to avoid thinly traded stocks, only those stocks were included which have been traded for at least 90% of the trading days during the sample period.

4. Fama and French did not include financial sector firms in their study. However, due to very active participation of banking stocks in KSE we have not excluded the financial sector.

5. Once the sample was selected, it was sorted on the basis of market capitalization and was compared across sectors. In order to eliminate extremely small firms and create some homogeneity with respect to size, the lower 5% were excluded. Based on this criterion 81 companies were selected. Table 1 summarizes the participation of each industrial sector in the selected sample.

Table 1: Number of Selected Companies for Each Sector

No.	Sector	No. of Companies	% in Sample
1	Auto Assembler	4	4.94
2	Automobile Parts	1	1.23
3	Banks	10	12.35
4	Cable & Electrical	1	1.23
5	Cement	5	6.17
6	Chemicals	2	2.47
7	Engineering	2	2.47
8	Fertilizers	3	3.70
9	Food and Personal Care	5	6.17
10	Glass and Ceramics	4	4.94
11	Insurance	5	6.17
12	Jute	1	1.23
13	Leasing	3	3.70
14	Leather	2	2.47
15	Oil and Gas Exploration	2	2.47
16	Oil and Gas Marketing	4	4.94
17	Paper & Board	2	2.47
18	Pharmaceutical	3	3.70
19	Power	5	6.17
20	Refinery	2	2.47
21	Sugar	3	3.70
22	Technology	2	2.47
23	Textile	5	6.17
24	Tobacco	2	2.47
25	Transport	2	2.47
26	Vanaspati	1	1.23
	Total	**81**	

The financial sector including banks, insurance and leasing stocks constitute approximately 23% of the total selected sample. The higher proportion of financial firms in the sample is attributed to the activity of these stocks in KSE with stocks like MCB, NBP, Orix Leasing etc. among the volume leaders. As mentioned earlier, most of the studies have been conducted by excluding the banking sector due to highly differentiated risk profiles. Another reason for their exclusion in other studies was that in most of the developed markets banking stocks are subject to thin trading and are not dominant vis-à-vis other sectors. However, the dynamics in emerging markets in general, and Pakistan in particular, are such that the exclusion of banking and financial sector is not justified. The domination of banking sector was deemed to be helpful in

analyzing the robustness of the three factor model. Textile sector has a moderate contribution of 6%. Despite being the largest sector ,the low participation of textile sector in sample is due to the fact that most of the textile scrips are subject to thin trading with a few stocks having zero trade during the sample period. Other dominating sectors in the sample are Auto Assemblers and Power with some highly liquid stocks.

3.4 Types and Sources of Data

The secondary data from KSE is used for this study. As reported by Davis (1994) frequency of the returns estimate does not improve or deteriorate results. The daily closing prices were used to estimate intra-day returns. The observation of the true market portfolio within the framework of various asset pricing models is not possible and for empirical studies *synthetic market portfolios* are used. It was desired to mimic the market portfolio by using KSE 100 index.

A risk free asset is one which yields a certain return. In practice, no such assets exist and investors use government issued securities as risk free assets and their returns as risk free rate. However, at the minimum these securities (considered to be risk free by default) face inflation risk. For this analysis, six months Pakistan's T Bill yield as a risk free proxy was used.

3.5 Estimation of Variables

3.5.1 Daily Portfolio and Market Returns

The portfolio returns are weighted average returns of individual stocks. The returns for the portfolio was estimated as follows:

$R_{Pt} = \sum_{i=1}^{N} w_i R_{it}$, and $R_{it} = LN\left[\frac{P_t}{P_{t-1}}\right]$, where P_t and P_{t-1} are closing prices on day t and t-1 respectively. These individual returns are then weighted according to their contribution in the portfolio to obtain portfolio returns.

Similarly the return on market portfolio represented by return on KSE-100 index $R_{mt} = LN\left[\frac{KSE(100)_t}{KSE(100)_{t-1}}\right]$, with $KSE(100)_t$ and $KSE(100)_{t-1}$ as the closing index values on day t and t-1. The portfolio and market returns

were then used to estimate excess portfolio returns ($R_p - R_f$) and market risk premium ($R_m - R_f$).

3.5.2 Size and Book to Market Portfolios

The selected sample stocks were ranked on market capitalization (price times number of shares) to denominate size from 2003 to 2007 taking December 31st of each year as the reference point. The median of the sample was used to split the stocks into two categories namely *Big* (B) and *Small* (S). Table 2 represents the largest, median and smallest capitalization stocks in the sample.

Table 2: Size Sorted Portfolios (2003 – 2007)

No.	Size	Capitalization (Million of PKR)
1	Maximum(B)	180,308
2	Median	4,682
3	Minimum (S)	31

Book to Market (BM) ratio was calculated by dividing book value of equity to market value of equity on December 31st for each year of the sample. The stocks were then ranked and categorized into three BM groups based on the break points of bottom 30% classified as Low (L), middle 40% classified as Medium (M) and top 30% classified as High (H). Six portfolios were formed on the intersection of two size and three book to market portfolios. These six portfolios were B/L, B/M, B/H, S/L, S/M and S/H. B/L portfolio contained stocks that were in big group and have low BM ratio where as S/H portfolio contained stocks that were in small size group and high book to market ratio.

Fama and French (1996) and Lakonishok, Shliefer and Vishny (1994) favored equally weighted portfolios and suggested that three factor model performed even better in equally weighted portfolios than in value weighted portfolios. Therefore, for this study equally weighted portfolios were built to compute portfolio returns. Table 3 represents sector wide participation in these six portfolios.

Table 3: Sector wise Size and Book to Market Portfolios

No.	Sector	S/H	S/M	S/L	B/H	B/M	B/L	Total
1	Auto Assembler	1	0	1	0	0	2	**4**
2	Automobile Parts	0	1	0	0	0	0	**1**
3	Banks	1	0	0	1	6	2	**10**
4	Cable & Electrical	0	1	0	0	0	0	**1**
5	Cement	1	0	0	2	2	0	**5**
6	Chemicals	0	0	0	1	0	1	**2**
7	Engineering	0	1	0	0	0	1	**2**
8	Fertilizers	0	0	0	0	0	3	**3**
9	Food and Personal Care	2	1	1	0	0	1	**5**
10	Glass and Ceramics	2	2	0	0	0	0	**4**
11	Insurance	0	3	0	0	0	2	**5**
12	Jute	0	0	1	0	0	0	**1**
13	Leasing	1	2	0	0	0	0	**3**
14	Leather	0	1	1	0	0	0	**2**
15	Oil and Gas Exploration	0	0	1	0	0	1	**2**
16	Oil and Gas Marketing	0	0	0	0	2	2	**4**
17	Paper & Board	0	1	0	0	0	1	**2**
18	Pharmaceutical	0	2	0	0	0	1	**3**
19	Power	3	0	0	1	1	0	**5**
20	Refinery	0	0	0	0	0	2	**2**
21	Sugar	2	1	0	0	0	0	**3**
22	Technology	1	0	0	0	1	0	**2**
23	Textile	2	2	0	0	1	0	**5**
24	Tobacco	0	0	0	0	1	1	**2**
25	Transport	0	0	0	1	1	0	**2**
26	Vanaspati	1	0	0	0	0	0	**1**
	Total	**17**	**18**	**5**	**6**	**15**	**20**	**81**

3.5.3 Market Premium SMB and HML Factors

Market premium was estimated as the difference between the return on KSE100 index and the 6 month T bill yield. As mentioned before, this factor is similar to CAPM, however, for three factor model there are two more risk factors namely SMB and HML. Market risk premium was estimated as follows:

$$RP_t = R_{mt} - R_f$$

SMB capture the risk premium in returns related to firm size. It is the difference between the average returns of the equal weighted three small markets capitalization portfolio and the three big market capitalization portfolios. Mathematically,

$$SMB = \frac{\left[S/_L + S/_M + S/_H\right]}{3} - \frac{\left[B/_L + B/_M + B/_H\right]}{3}$$

HML accounts for the risk premium that is related to firm value. It is the difference between the return on portfolio of high book to market ratio stocks and return on a portfolio of low book to market value, constructed to be neutral vis-à-vis size. It can be represented as follows:

$$HML = \frac{\left[S/_H + B/_H\right]}{2} - \frac{\left[S/_L + B/_L\right]}{2}$$

Given that the data frequency was daily; all our estimates were on intraday basis.

3.6 Hypotheses

The regression model was applied for testing the validity of FF three factor model. This model was tested for the six size and book to market portfolios. The excess returns on each portfolio were regressed on three factors namely market risk premium, size premium and value premium. The model is:

$$ER_{it} = \alpha_i + RP_t\beta_{1t} + (SMB)\beta_{2t} + (HML)\beta_{3t} + e_t$$

Since this is a multivariate regression model, the following hypotheses (alternative) will be tested.

$$H_1 : \alpha_P \neq 0$$
$$H_2 : \beta_{1t} \neq 0$$
$$H_3 : \beta_{2t} \neq 0$$
$$H_4 : \beta_{3t} \neq 0$$

Where α_P represents regression intercept and β_{1t}, β_{2t} and β_{3t} represent risk sensitivities of portfolio returns. The three factor model will hold if the intercept is not significant (statistically zero) and the three slope coefficients are significant (statistically different from zero).

4. Empirical Results and Analysis

4.1 Descriptive Statistics

The daily returns between January 2003 and December 2007 were computed on six sorted portfolios. Table 4 represents the descriptive statistics of these portfolios.

Table 4: Descriptive Statistics of Daily Returns (2003 - 2007)

(percent)

	S/M	S/L	S/H	B/M	B/L	B/H
Mean	0.07	0.00	-0.01	-0.03	0.04	-0.06
Median	0.15	0.06	-0.07	-0.04	0.12	-0.10
Maximum	4.93	8.77	4.80	10.08	4.48	5.30
Minimum	-6.06	-10.80	-5.37	-7.02	-5.42	-5.57
Std. Dev.	1.20	2.04	1.24	1.55	1.21	1.43

For the sample period, S/M portfolio offered the highest average daily return of 0.07% followed by B/L (0.04%). The maximum per day return was yielded by big stocks having average book to market (10.08%) and the minimum daily return in the observation period was offered by small stocks with low book to market ratio.

The daily standard deviations were on a higher side with 2.04% for S/L stocks being the maximum and 1.20% for S/M portfolio at the minimum. The higher standard deviations for all these portfolios demonstrate a high risk profile for the sample stocks in specific and the Pakistani market in general. The graphical representation (in Figure 1) also reveals highly volatile returns for the six sorted portfolios.

Figure 1: Returns for Size and Book to Market Portfolios

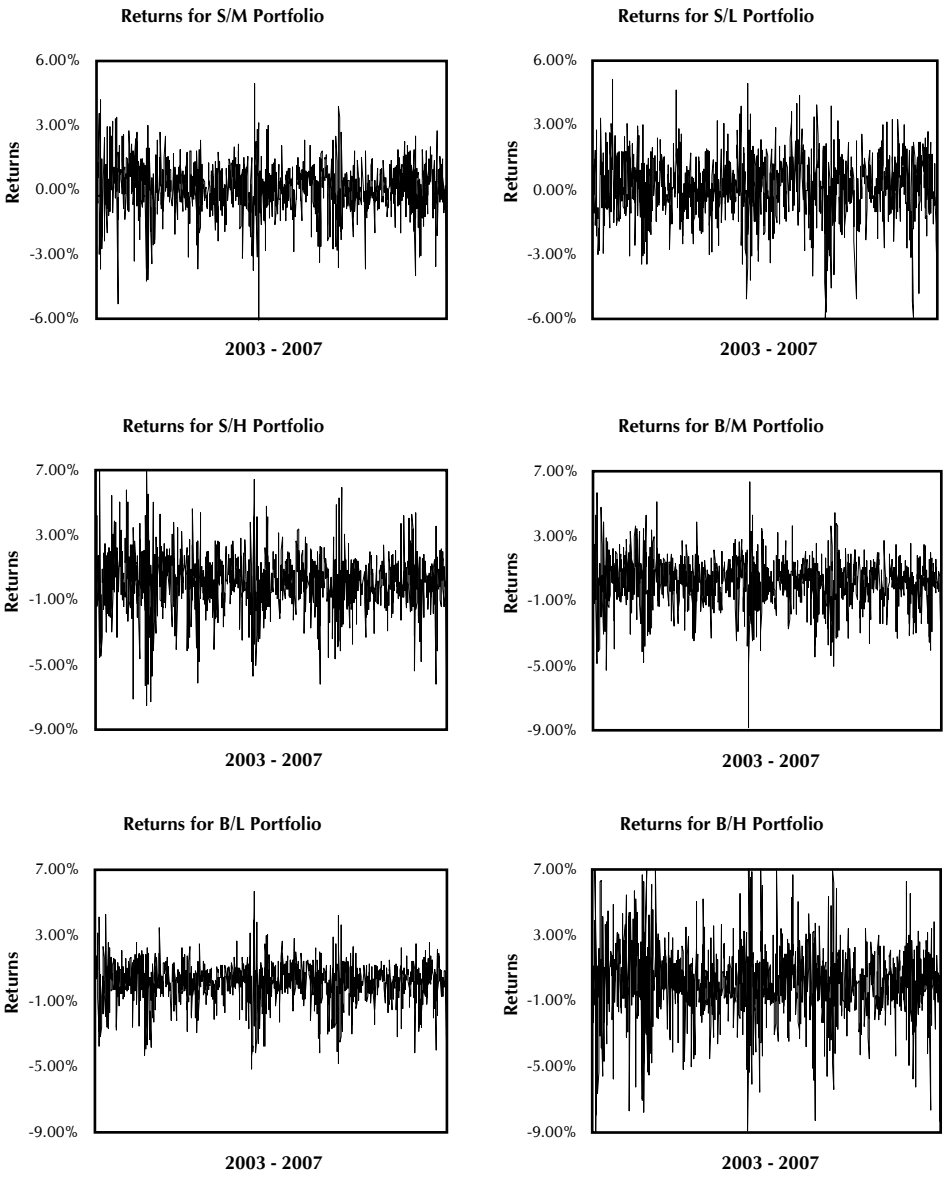


Table 5 documents similar characteristics for KSE 100 index returns.

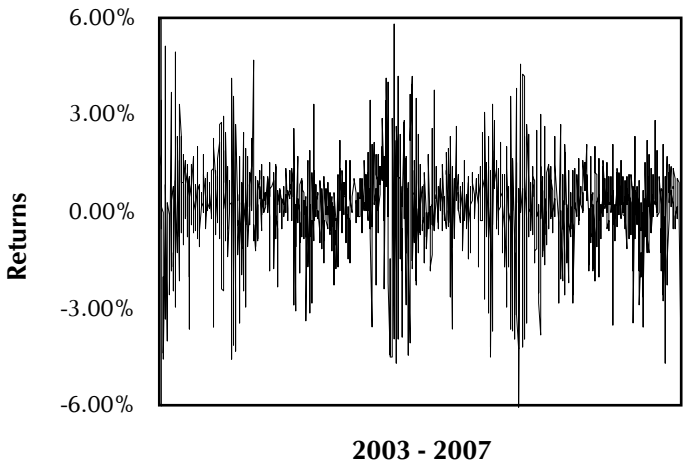
Table 5: Descriptive Statistics of KSE 100 Daily Returns (2003 - 2007)

(percent)

	Mean	Median	Maximum	Minimum	Std. Dev.
KSE100	0.133	0.244	5.797	-6.042	1.515

The mean average daily returns on the index portfolio are 0.133% with a maximum of 5.7% and a minimum of - 6.04% with a standard deviation of 1.51%. Figure 2 represents the daily returns on market portfolio.

Figure 2: Returns on Market Portfolio



The pattern of market portfolio was similar to the sorted portfolios and it was evident that the turbulence that was apparent in size and book to market portfolios can also be observed in returns of the market portfolio.

From 2003 to 2007 the average daily market risk premium was dominant as compared to size and value premia. Interesting thing to note was the magnitude of average value premium which was negative. This was due to negative mean returns on S/H and B/H portfolios. Given negative mean returns for HML factor, it can be concluded that on average growth stocks outperformed value stocks in terms of returns. However, the size premium was positive with small stocks generating

higher average returns and thus small caps outperformed large caps. Table 6 summarizes the results for the three factors.

Table 6: Factors Statistics (2003 – 2007)

(percent)

	RP	SMB	HML
Mean	0.114	0.012	-0.065
Median	0.224	0.002	-0.122
Maximum	5.782	3.075	4.906
Minimum	-6.065	-3.919	-4.540
Std. Dev.	1.516	0.862	1.336

Table 7 shows the correlations between the returns on portfolios. The maximum correlation of 32% was found between small stocks with medium and low book to market ratio. B/H and S/M portfolios also depicted a similar level of correlation of returns.

Table 7: Correlations Between Sorted Portfolio Returns

(percent)

	S/M	S/L	S/H	B/M	B/L
S/L	32.22				
S/H	8.42	13.19			
B/M	24.21	-37.24	17.70		
B/L	-29.73	-12.24	-74.16	-9.23	
B/H	32.07	16.57	29.72	-4.54	-31.38

4.2 Regression Results

The analysis is based on a multivariate regression analysis. The dependent variable is the excess returns on six size and book to market portfolios; while the three independent variables were risk premia (RP), size premium (SMB) and value premium (HML). Table 8 provides the correlation matrix of independent variables i.e. three risk premia.

Table 8: Correlations between Independent Variables (2003–2007)

(percent)

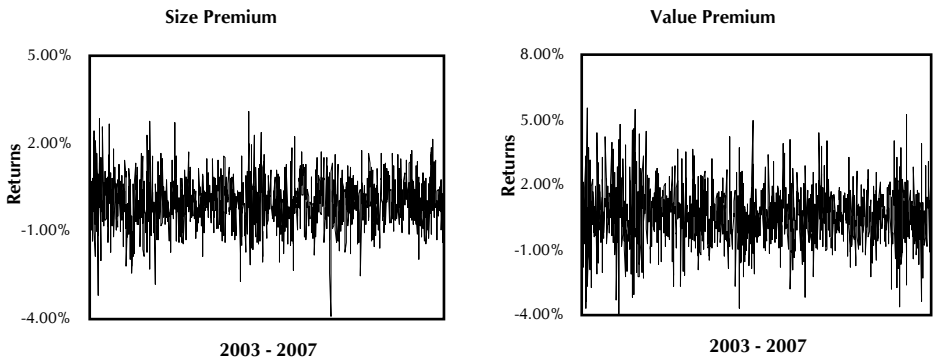
	RP	HML
HML	0.76	
SMB	-5.58	-49.64

The observed correlations between the three independent variables were negligible between market premium and value premium (0.76%); and between market risk premium and size premium (-5.5%). On the contrary, the coefficient was high for size risk premium and value risk premium, though in the opposite direction.

With a low correlation between market risk premium and size risk premium and value risk premium, it was clear that SMB provided a valid rationale for size premium that is relatively free of market risk premium. Similarly, HML could be regarded as a measure of value premium that was not dependent on market risk premium.

Figure 4 represents the size and value premium for five years.

Figure 4: Size and Value Premium (2003–2007)



The following three factor regression was used for the sample:

$$ER_{Pt} = \alpha_P + RP_t\beta_{1t} + (SMB)\beta_{2t} + (HML)\beta_{3t} + e_t$$

Table 9 summarizes the results of FF three factor model. The tests of the three factor assumes that intercept should not be significantly different from zero and slope coefficient should be significant. This study has mixed results on the validity of three factor model. The estimated coefficients were encouraging for the existence of size and value premia in KSE, but they negate the presence of market risk premium. In six size to value portfolios, the results were significant for four portfolios (B/H, B/M, B/L, S/H) while in S/M and S/L portfolios, null hypotheses could not be rejected for the intercept.

Table 9: Three Factor Regression on Portfolios Sorted for Size and Book to Market

	α	β_1	β_2	β_3	$t(\alpha)$	$t(\beta_1)$	$t(\beta_2)$	$t(\beta_3)$	R^2
B/H	-0.0001	-0.012	-0.013	0.692*	-0.475	-0.593	-0.312	25.821	0.424
B/M	0.0001	-0.003	-1.057*	0.352*	0.205	-0.158	-28.806	14.869	0.617
B/L	-0.0001	-0.015*	-1.070*	-0.957*	-0.792	-1.972	-69.324	-96.197	0.890
S/H	0.0003	0.024	0.371*	0.674*	0.929	1.321	10.117	28.573	0.408
S/M	0.0009*	0.046*	0.137*	0.444*	2.928	2.258	3.352	16.865	0.210
S/L	0.0010*	-0.921*	0.334*	0.006	2.465	-33.661	6.019	0.167	0.498

The existence of market risk premium along with size and value premia was supported in B/L portfolio with R^2 of 0.89. The value premium is significant for all portfolios and dominated the other two factors; however, the size effect was not there in B/H portfolio. The signs of coefficients for the four portfolios were consistent with the FF proposition. The SMB coefficient was positive for small portfolio (S/H) and negative for big size firms (B/M[8] and B/L) supporting the presence of a size premium. Similarly, HML factor was negative for low BM stocks (B/L) and was positive for high value stocks (B/H and S/H) demonstrating existence of value premium. The overall performance of model was adequate with high R^2. In order to test the robustness of the model and control for size effect, 1/5th of the sample firms around the median (17 in total) were eliminated. The remaining firms were sorted on size and book to market ratio and resulting factors were regressed on excess returns. The regression results for reduced sample are reported in Table 10. These results confirm the existence of size and value premium in Karachi Stock Exchange for B/H, B/M, B/L and S/H portfolios. Moreover, the insignificant coefficients, for S/L portfolio in full sample became significant in reduced sample on controlling for size effect.

Given these regression results it can be deduced that majority of results favor the FF three factor model – atleast in case of Karachi Stock Exchange. There are plausible explanations for these results. In emerging markets investors are more concerned about the trading volumes and size of the firm. Since, panics are common in such markets, investment decisions are driven by large liquid stocks.

[8] The model was also tested by excluding the banking stocks for B/M portfolio as it was likely that higher proportion of banks in portfolio could have contributed towards significant results. In the absence of banking stocks the results remained robust with significant market risk premium with α (0.001), β_1 (0.05)*, β_2 (-0.88)*, β_3 (0.36)* and (R^2 of 0.43).

Table 10: Three Factor Regression on Portfolios with Reduced Sample Sorted for Size and Book to Market

	α	β_1	β_2	β_3	$t(\alpha)$	$t(\beta_1)$	$t(\beta_2)$	$t(\beta_3)$	R^2
B/H	0.0007	0.0836*	-0.6744*	0.8308*	1.4633	2.6832	-12.9119	23.5228	0.6062
B/M	0.0011	0.0911*	-0.5953*	0.0932*	0.9788	3.7042	-14.4442	3.3431	0.2872
B/L	0.0011	0.0675*	-0.5233*	0.0188*	0.7790	3.1645	-14.6280	3.5039	0.2468
S/H	0.0012	0.0892*	0.6090*	0.9329*	1.0802	3.5352	14.3986	32.6181	0.4829
S/M	0.0010*	0.0477*	0.1400*	0.2651*	3.3848	2.3989	4.1982	11.7544	0.1162
S/L	0.0007	0.1053*	0.4579*	-0.2552*	1.4520	3.1493	8.1720	-6.7351	0.2071

In this study, portfolios supporting the existence of size and value premium constituted of stocks that were considered the best pick for the local investors, based on the market activity and size of these companies. An important point also needs to be mentioned here. The sample period was overall a bull rally in Pakistan, therefore results only confirm the presence of size and value premium in a bullish market.

An alternative explanation is also possible for the portfolios with significant intercepts. Daniel and Titman (1997) have highlighted that non-zero intercepts can be expected in a characteristics model when stocks have value premium loadings that are not balanced with their book to market ratio. Therefore, it is likely that the value loadings for S/M and S/L portfolios are not in proportion vis-à-vis their size and book to market ratios.

5. Conclusion

Asset pricing or alternatively expected rate of return is a puzzle that financial economists have been trying to solve for almost half a century. There have been some propositions that gained attention but most were laid to rest without being noticed. The single and multi factor asset pricing models have mixed results in different parts of the world. Some researchers advocate for the single factor beta as the most viable risk factor determining returns; others report that beta has long been dead. This paper tried to explore the power of FF three factor model in an emerging market.

The stocks were selected from Karachi Stock Exchange and sorted into six portfolios at the intersection of size and book to market ratio. Sample period constituted daily stock returns between 2003 and 2007, and KSE100 index was used as the benchmark for market returns with 6 month T bill rate as the risk free proxy. A multivariate framework was deployed to test for the validity of three factors model. The results showed that except for two portfolios (S/M and S/L) the intercept terms were insignificant and thus FF three factor model seems to explain returns for Karachi Stock Exchange. The model remains robust after controlling for the size effect. However, the market risk premium factor was relevant in explaining returns only in one of the six portfolios.

This empirical evidence suggests that FF three factor model is valid for KSE. This observation has important implications for fund managers,

investors and corporate managers. Traditionally, fund managers, analysts and investors have been using a single factor model for portfolio management and asset valuation. The presence of two additional risk factors warrants their inclusion for investment analysis. The use of size and value premia in addition to market risk premium will result in a different risk return structure as compared to single factor model. Inclusion of additional risk premia might require a portfolio rebalancing by the fund managers. Similarly, investors are likely to be willing to invest in small firms and value stocks to target higher returns. Moreover, with additional factors in place, the estimation of cost of equity might vary that could ultimately change the estimates for project appraisals, financing choices and composition of capital structure.

However, caution should be exercised since this research was conducted in a bull market and it is not clear that size and value premia will be present in bearish market and is proposed for further research. It is also proposed that on same data set the model should be tested without sorting the portfolios and its robustness should be checked for sub time periods (Jan 2003 – June 2005 and June 2005 – Dec 2007). It is further proposed that various data frequency (weekly, monthly etc) should be used to test the efficacy of the model.

Lastly it must be added that asset pricing models are valuable to deduce economic rationale behind investment decisions, but are also burdened with problems when used to analyze the human behavior. Financial economists have encountered problems whenever they have tried to model investor psychology as the results for a particular time period might not be representative of actual investment behavior in subsequent time periods. This is due to uncertain future economic environment that causes the deviation between the theoretical models and practice, and the same could be the case with this study.

References

Akgiray, V. 1989. "Conditional Heteroscedasticity in Time Series of Stock Returns: Evidence and Forecast." *Journal of Business* 62: pp.55-80.

Aleati, A., Gottardo, P., Murgia, M., 2000. "The Pricing of Italian Equity Returns", *Economic Notes* 29 (2), pp.153–177.

Bachelier, L., 1900, "Théorie de la Spéculation", *Annales de l'Ecole Normale Supérieure de Paris*.

Baesel, Jerome B, 1974, "On the Assessment of Risk: Some Further Consideration", *Journal of Finance* 29, No. 5, pp.1491-1494.

Barber, B. and J. Lyon, 1997, "Detecting long-horizon abnormal stock returns: the empirical power and specification of test statistics", *Journal of Financial Economics* 43(3), pp.341-72.

Beltratti, Andrea. and di Tria, Massimo., 2002, "The Cross-section of Risk Premia in the Italian Stock Market", *Economic Notes*, Vol. 31, pp.389-416.

Berk, J., 1995, "A Critique of Size-Related Anomalies", *Review of Financial Studies* 8, pp 275-286.

Black, Fischer, 1972. "Capital Market Equilibrium with Restricted Borrowing", *Journal of Business*, 45(3), pp.444-55.

Black, Fischer. 1993. "Beta and Returns", *Journal of Portfolio Management*, vol. 20, no. 1, pp.8–18.

Blume, E. Marchall 1971, "On the Assessment of Risk", *Journal of Finance* 6, No. 1, March, pp.1-10.

Breeden, Douglas T., 1979, "An Intertemporal asset pricing model with stochastic consumption and investment opportunities", *Journal of Financial Economics* 7, pp.265–296.

Chan, Louis K., Narasimhan Jegadeesh and Josef Lakonishok, 1995, "Evaluating the performance of value versus glamour stocks: The impact of selection bias", *Journal of Financial Economics*, vol. 38, no. 3, pp.269-296.

Chan, Louis K.C., Yasushi Hamao, and Josef Lakonishok. 1991. "Fundamentals and Stock Returns in Japan", *Journal of Finance*, vol. 46, no. 5, pp.1739–64.

Claessens, S., S. Dasgupta, and J. Glen., 1995, "Return Behavior in Emerging Stock Markets", *World Bank Economic Review* 9(1), pp.131-151.

Connor Gregory, Sehgal Sanjay, 2001, "Tests of the Fama and French Model in India", *Working Paper*, pp.1-23.

Daniel and Titman (1997), "Evidence on the Characteristics of Cross Sectional Variation inStock Returns", *Journal of Finance*, 52(1), pp.1-33.

Davis, J. 1994, "The Cross-Section of Realised Stock Returns: The pre-COMPUSTAT Evidence", *Journal of Finance*, Vol. 49, pp.1579-1593.

Davis, James L., Eugene F. Fama and Kenneth R. French, 2000, "Characteristics, covariances and average returns: 1929 to 1997", *Journal of Finance*, 55, pp.389-406.

Drew, E. Michael and Madhu Veeraraghavan., 2002, "A Closer Look at the Size and Value Premium in Emerging Markets: Evidencefrom the Kuala Lumpur Stock Exchange", *Asian Economic Journal*, 17, pp. 337-51.

Drew, M.E and M. Veeraraghan., 2003, "Beta, Firm Size, Book-to-Market Equity and Stock Returns", *Journal of the Asia Pacific Economy,* 8(3), pp.354-379.

Fama, Eugene F., and Kenneth French., 1992. "The Cross-Section of Expected Stock Returns", *Journal of Finance*, vol. 47, no. 2, pp.427–465.

Fama, Eugene F., and Kenneth French., 1993, "Common Risk Factors in the Returns on Stocks and Bonds", *Journal of Financial Economics*, vol. 33, no. 1, pp. 3–56.

Fama, Eugene F., and Kenneth French.. 1995. "Size and Book-to-Market Factors in Earnings and Returns", *Journal of Finance*, vol. 50, no. 1, pp. 131–155.

Fama, Eugene F., and Kenneth French., 1996, "The CAPM is Wanted, Dead or Alive", *Journal of Finance*, Vol. 51, No. 5, pp.1947-1958.

Fama, E. F. and K.R. French., 1998, "Value versus Growth: The International Evidence", *Journal of Finance,* Vol. 53, pp.1975-1979.

Ferson, W.E., S. Sarkissian and T. Simin., 1999, "The Alpha Factor Asset Pricing Model: A Parable", *Journal of Financial Markets,* 2, pp 49-68.

Gaunt, C., 2004, "Size and book to market effects and the Fama French three factor asset pricing model: evidence from the Australian stock market", *Accounting and Finance,* 44, pp. 27-44.

Griffin, J.M., 2002, "Are the Fama and French Factors Global or Country Specific?", *Review of Financial Studies*, Vol. 15, pp.783-803.

Grubel, Herbert G. 1968, "Internationally Diversified Portfolios", *The American Economic Review*, 58, pp. 1299-1314.

Halliwell, J., R. Heany R. and J. Sawicki, 1999, "Size and Bood to Market Effects in Australian Share Markets: A Time Series Analysis", *Accounting Research Journal,* 12, pp. 123-137.

Haugen, Robert A., 1995, The New Finance: The Case against Efficient Markets (Prentice Hall, Englewood Cliffs, New Jersey.)

Kothari, S.P., Jay Shanken, and Richard G. Sloan. 1995. "Another Look at the Cross-Section of Expected Stock Returns", *Journal of Finance*, vol. 50, no. 1, pp. 157–184.

Lakonishok, Josef, Andrei, Shleifer and Robert W. Vishny, 1994, "Contrarian Investment, Extrapolation and Risk", *Journal of Finance,* 49, pp 1541-1578.

Lintner, J., 1965, "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets", *Review of Economics and Statistics,* 47, pp. 13–37.

Li, Wei and Hoyer-Ellefsen Richard., 2004, "Characteristics of Emerging Markets". *UVA-F-1453 Available at SSRN*
http://ssrn.com/abstract=909890

Malkiel B.G and Y. Xu., 1999 "The Structure of Stock Market Volatility", *Working Paper*, Princeton University Center for Economic Policy Studies

Markowitz, H., 1952, "Portfolio Selection", *Journal of Finance*, March pp.77-91.

Maroney, N. and A. Protopapadakis., 2002, "The Book-to-Market and Size Effects in a General Asset Pricing Model: Evidence from Seven National Markets", *European Finance Review,* 6, pp.189-221.

Merton, Robert C. 1973, "An Intertemporal Capital Asset Pricing Model", *Econometrica,* 41, pp. 867-887.

Moerman, G. A., 2005, "How Domestic is the Fama and French Three-Factor Model? An Application to the Euro Area", *Working Paper SSRN*, pp. 1-32.

Mossin, J., 1966, "Equilibrium in a Capital Asset Market", *Econometrica*, 34, pp. 768–783.

Roenfeldt, R. 1978, "Further Evidence on the Stationarity of Beta Coefficients", *Journal of Financial and Quantitative Analysis*, pp.11-21.

Ross, Stephen A., 1976, "The Arbitrage Theory of Capital Asset Pricing", *Journal of Economic Theory*, 13, pp. 341-360.

Sharpe, W. 1964, "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk", *Journal of Finance*, September, pp.425-442.

Tobin, J. 1958, "Liquidity Preference as Behaviour Towards Risk.", *Review of Economic Studies*, 67.

Williams, J. B., 1939, "The Theory of Investment Value" *The Economic Journal*, Vol. 49, No. 193, pp. 121-122.

The Lahore School of Economics (established in 1993) is one of Pakistan's leading centres of learning for teaching and research in Economics, Finance and Business Administration. The Lahore School of Economics' objectives include: (i) The training of young Pakistanis as professional economists, finance managers, accountants, financial analysts, bankers and business executives, and (ii) Undertaking research in Economics, Management, Finance and Banking to further deepen understanding of major facts, issues and policies.

Centre for Research in Economics and Business (CREB) is an independent research centre of the Lahore School of Economics. The mission of CREB is to conduct and facilitate research, coordinate and manage the postgraduate program of the Lahore School, and promote discussion on policy issues facing Pakistan. The research focus at CREB is on management of the Pakistan economy, income distribution and poverty, and the role of the modern service sector in the area of economics, and financial markets in the area of business management.

The Lahore School's publication program comprises The Lahore Journal of Economics, Lahore Journal of Policy Studies, a Text Book Series, the Lahore School Case Study Journal and the CREB Working Paper Series. The program encourages both in-house and external contributors.

Lahore School of Economics
Intersection Main Boulevard Phase VI, DHA and Burki Road,
Burki Lahore 53200, Pakistan