**The relevancy and applicability of CAPM and Fama French 3 factor model in Pakistani Stock Market.**

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**Introduction:**

**Background:**

Pakistan Stock Exchange Limited (PSX) (formerly Karachi Stock Exchange (Guarantee) Limited (KSE) was incorporated on September 18, 1947. It was incorporated on March 10, 1949. Initially, only five fully paid-up companies were listed with a total paid up capital of 37 million rupees. The first index introduced was based on fifty companies and was called the KSE 50 index. Previously, trading was done with an open calling system. The computerized trading system known as the Karachi Automated Trading System (KATS) was introduced in 2002 with an open calling system capacity of 1 million transactions per day and the capacity to grant connectivity and authentication to an unlimited number of users.

Portfolio management is a group of financial companies. These financial instruments are not difficult to trade and are less infinite. These tools are not necessarily a representation of a longstanding interest. It includes shares, bonds, debt securities, profits and shared assets of various foreign organizations and their domestic countries. This type of management offers dividend payments, conceivable democratic rights and the responsibility of a part of the organization. This type of management is generally geared towards short-term interests as it is considered more unpredictable and questionable. These financial assets, these portfolio investments, are extremely liquid in nature and can easily be converted into cash at any time. The Asian economic crisis of 1997 was born due to the great unpredictability of foreign portfolio investments. Huge resources have turned into cash in times of financial hardship. Lenders can trade their financial instruments from portfolios depending on the lender's decision. Portfolio management will employ corporate capital design in Pakistan, increasing administrative incentives and enhancing the value of the company. If portfolio management increases, it will improve the Pakistani economy by improving job opportunities, business sector performance, per capita payment, and GDP development, scaling and slice improvement balance and so on.

**Problem Statement:**

Volatility is a key factor in determining the total cost of capital. Stock prices usually exhibit non-linear and possibly chaotic behavior. However, some people find that stock prices/returns are not completely predictable in the short-term, but unpredictable in the long-term, and the statistical distribution can measure the irregularity of returns. There are many factors that cause stock market volatility. For example, credit policy, inflation, interest rates, corporate profits, leverage, dividend policy, bond prices, and many other macroeconomic, social and political variables.

**Objectives of the study:**

* Is there any Market Risk Premium in Pakistan equity market?
* Is there any size premium in Pakistan equity market?
* Is there any value premium in Pakistan equity market?
* Which Asset pricing model is suitable for Pakistan’s equity market?

**Significance of the study:**

People who invest in stock market or the portfolio managers who manages stock portfolio needs to evaluate the level of risk and return when they trade securities. They also need to figure out is the assets traded on their actual price or not. This can be done through different Asset pricing model which tells them the investment is worthy enough. In this research paper we will compare different Asset pricing model, their risk factors and how much they are efficient related to Pakistani stock market. This paper mainly focuses on effectiveness and applicability of Capital Asset Pricing Model (CAPM), Fama French three model.

CAPM Model calculates the return on an Asset or portfolio by multiplying risk also known as beta by risk premium and adding risk free rate. CAPM model is widely use but it has many drawbacks. It only considers one risk factors compare to another model; in this regard it oversimplifies the market return.

Fama French three model is sensitive to economy of a specific country and its problem defining variable. According to this model, two of the risk factors is added into CAPM equation which are SMB (Small minus Big) and HML (High minus Low). In SMB, it is a difference between portfolio returns of small companies compare to portfolio returns of large companies. In HML, it is a comparison of portfolio return of high book to market equity to portfolio return to low book to market equity.

The results will have important aspect of risk adjusted stocks. This will tell us which model is more accurate in calculating returns of Pakistani stock market. If these models justify the calculation then only it can be use for security analysis and investment evaluation. It will also tell that how far these models can be implemented on domestic portfolios.

* Industrial Significance of the Study

The study will help the portfolio managers to produce efficient and accurate portfolios in the market according to the desired return of the investor, moreover, this study will also cater the risk appetite of risk aversive investors. This study can also help in the development of the financial market as this will encourage government to bring more financial instruments in the local market so investors can substitute the asset allocation among the instruments and further diversify their portfolios like recently State Bank of Pakistan in 2019, with the support of DFID, has launched the Innovation Challenge Facility(ICF) for Digital Financial Services (DFS) to find and support innovative fin tech solutions to promote DFS in the country.

**Literature Review**

It is a universal fact that if an investor is seeking a higher return on the investment the existence of higher risk will also exist in the transaction, in other words the financial instruments clench of greater risk but rewards the transaction with the greater premium. There are two types of risks that are correlated with the financial market known as systematic risk (Refers to the risks inherent in the entire market or market segments. systematic risk is also called "non-diversified risk", "unpredictability" or "market risk". It affects the entire market, not just a specific stock or industry. This type of risk is widespread and difficult to avoid. It cannot be alleviated by improvement or just by helping or using the right resource allocation system) whereas unsystematic risk (Unsystematic risks are known to particular organization or industries. Compared with speculative investment portfolios, also known as "explicit risk", "dispersible risk" or “remnant risk", unsystematic risks can be reduced through enhancement. Financial managers or potential financial investors usually use the Capital Asset Pricing Model (CAPM) to spot speculative risks and predict the normal return of stocks. CAPM reports the abundance of resources, thereby reducing some or non-dispersible parts of the Beta risk. Financial investors require both the time value of money and effective risk returns to find returns, so the expected total profit of resources corresponds to risk-free rate (zero beta resource interest rate) and risk premium. The model shows that any entrepreneur and financial investor interested in a particular asset or security should be weighed between required and expected return. If the result of the expected rate of return is negative, the potential interest target for a particular security must be terminated (Jarlee, 2007).

The CAPM states that when lenders of a particular security holds a market portfolio, financial investors should know how the said security or asset will perform in the market, not as it would discretely. For example, if the variability of the securities the financial investor holds are similar to the market, the expected return of the financial investor and the market should be the same, furthermore some tests show that beta is a non-measurable risk indicator and, on this basis, we can further assess the relevant risk components. Overall, the beta coefficient estimates the instability and unpredictability of the costs of the listed portfolio and calculates how the normal profit of the listed portfolio normally evolves with the development of the market portfolio. The results suggest that the CAPM depends on simple assumptions and that these few assumptions are not realistic and cannot remain unchanged in reality. CAPM's skepticism is that investors should set the caps better. In the case of a single transaction, investors can choose risk-free loans or yields and the stock market should be excellent (Head, 2008).

Some analysts believe the CAPM is inaccurate and has some flaws. The price theory of arbitrage (APT) proposed by Ross in 1976 showed inaccuracies within CAPM (Laubscher, 2002). As the research confirmed that the estimations of expected returns determined by utilizing CAMP are marginally not the same as the real returns in specific years. In each and every one of the instances of beta, the outcomes show a slight contrast in the real and anticipated returns. The total consequences of the investigation are appeared in the index. The applicability of CAPM in Pakistan Stock Market seems invalid. Taking into account, the consequences, they inferred that the CAMP isn't relevant for the Pakistan Stock Market, yet in a couple of cases and for a specific time span, it gives somewhat correct results (Int. J. Manag. Bus. Res., 4 (1), 1-9, Winter 2014).

The observation impact of the CAPM is low since it is utilizing market return for the count of profits and just single Beta for the dynamic and remuneration for the risk. The low explaining impact of the CAPM is due to the affordable determination, which uses market returns as the solitary free factor, it ignores different factors that are utilized in various assessment models (for example Fama-French 3 factor model) for giving exact outcomes. As from the outcomes obviously CAPM isn't giving precise outcomes, majority of the time. CAPM isn't completely significant on KSE (Pakistani stock market) in its unique structure furthermore, required returns determined through CAPM condition may misdirect financial investors in valuation of elemental securities. (Validity of Capital Assets Pricing Model: Evidence from KSE-Pakistan)

Basu (1977) examined conventional stocks and made it clear that stocks are organized according to the E/P ratio at all times, and future profits with higher return-to-price ratios often lead to stock estimates showing more pricing models. The CAPM cannot fully determine the future earnings of low-income / price stocks. When stocks are organized by market value (value multiplied by specialty stocks), the normal returns of small stocks are above CAPM expectations. Statman (1980) pointed out that the return on stocks that are “rated” or have a higher book-to-ad ratio is not captured by market beta. (Impact of Capital Asset Pricing Model (CAPM) on Pakistan (The Case of KSE 100 Index).

Since the establishment of CAPM, while reviewing CAPM, new strategies for evaluating capital market resources have been tested. Many scholars and scientists have begun to verify that the legitimacy of CAPM is attributed to real market information. Beta is the only risk factor; however, many analysts have not conceded. Roll and Rose (1976) proposed the stock market valuation hypothesis (APT), in which they take the risk of handling various components. It can be said that Move (1977) and Rose (1977) studied this beta. The risk component was not enough to summarize the absolute market risk, and CAPM liquidated it. Value-added the ratio, book-to-market ratio, and the impact on scale and energy can be considered as risk factors for assessing risk. In addition, the relevance of CAPM was also considered after the fact. After exploration in these studies, this review ensures the availability of the exact test and the consequences of CAPM. Restrictions are clearly applicable to Ex-Beta. According to the meaning of Sharpe (1964) and Linter's CAPM (1965), it was tried as an ex-ante bet rather than an ex-post restriction. Considering the experimental consequences of ex risk, CAPM, cannot be completely ruled out and can be used for valuation and cost of capital (Review and Validity of Capital Asset Pricing Model: Evidence from Pakistan Stock Exchange ISSN 2529-8038).

Black (2006) uses the Fama and French Three Factor Model to study the Macroeconomic risks. This study tells that CAPM model does not fully cater the excess portfolio returns above risk free rate therefore the better substitute is Fama French three model. This study analyzes the volatility of the portfolio returns on small firm as compared to large firms. It is also known as size premium. This study also considers the market value of firms, high book to equity stock vs low book to equity stocks also known as value premium. It provides empirical evidence which supports value risk premium and small company risk premium.

Drew, Malin, and Veeraraghavan (2006) This research uses French Fama model to clarify that there is a solid connection between the size of the organization and the expected of return of the organization. The primary concern featured in this exploration was whether an asset valuing model, utilizing different elements, can be compelling in foreseeing cross-sectional returns. The information gathered was divided into six unique classes. The consequence of this examination is that the significance of the French three-factor model was affirmed by that small organizations are positive while large organizations make a negative impact to variable SMEs. The profits of small organizations with high unpredictability are riskier than those of big organizations with low volatility. It was reasoned that the profits correspond with the instability of the business.

Guna, Hansen, Leikam and Shaw (2007) research study investigates that the CAPM does not cater the distinct variables that help finding the cross-sectional return in asset price modeling. Furthermore, CAPM does not account for the shifting of the beta like the statistical model explains. These researchers finds that the Fama French model is not statistically relevant in making a connection between beta and cross sectional returns, thus it proves Fama French model is sets out to nullify the CAPM.

Simlai (2009) This research centers around the exhibition of common stocks by interfacing two factors, organization size and book-to-market ratio. The researcher uses information from the New York Stock Exchange from 1926 to 2007. The aftereffects of the investigation showed that these factors assume a significant part in unpredictability, stock returns and time arrangement variety. The idea of the examination showed that there is a distinction in the risk premium for various resources, due to systematic risk. Better returns because of these variables expects the French three-factor model to have more relevancy with regards to clarifying returns by market, size and value.

Veysel Eraslan (2013) The point of the study was to clarify the variety of the portfolio return utilizing the French three-factor model of Fama. The factors utilized in this exploration were the book value to market value and the size risk factor. The outcomes show that the model can possibly clarify variances in excessive returns brought about by stock operation in Istanbul. Factual outcomes show that in large and small portfolios, small portfolio beat big portfolios with acknowledged returns. What's more, high BE/ME value portfolios have higher more returns than low BE/ME value portfolios. Market risk is a viable proportion of excessive return on portfolios. The size factor has been demonstrated to be very viable for little and medium portfolios, while it has all the earmarks of being ineffectual on enormous portfolios. Varieties in little and medium portfolios can be clarified by the size risk factor. The third factor distinguished by HML didn't influence low book value portfolios and market capital at a critical 1% level. Thus, Fama and the French three-factor model have some force in clarifying in portfolio returns, however this force isn't solid and broad. The market risk factor strongly affects portfolio returns than the other two risk factors.

Ghafoor, Khan (2014) Fama and French model took two limits and found that size and book lead to the market impact. Others have followed similar standards to approve Fama and French for various business sectors. Some have utilized time-changing beta impacts and others have contrasted the Fama and French models with the CAPM to clarify the risk reward relationship for the expected market. On the off chance that it utilizes two limit focuses when building portfolios to track down the necessary loan cost, you may not get the real outcome. It very well may be misrepresented or distorted. Since risk can never be static, it is a dynamic idea. Iqbal and Brooks (2007) inspected the Pakistani market to decide the connection among risk and return and the impact of size and book on market factors. Look at Beta and Fama and French, one of which prompts the risk/reward proportion. It was inferred that there are size and book-to-market impacts in the Pakistani market, and the beta clarifies that the cross-sectional variety didn't show a positive relationship among risk and return. Furthermore, the information type has been given day by day since day-by-day information is more productive.

Abbas, Khan, Aziz and Sumrani (2015) The goal of this study is to test whether the three-factor model of Fama and France applies to the Pakistani stock exchange. As per Fama and French (1992, 1993), the three-factor model can more readily clarify cross-sectional changes in normal stock returns than the CAPM. In the CAPM, just the market risk factor is utilized to clarify the extreme returns of stocks. Nonetheless, the Fama and France three factor model considers two extra risk factors for the CAPM, which are identified with the size of the firm and the risk of market development of the firm equity. To check if the model applies to the Pakistani securities exchange, they use firm recorded in the KSE-100 list from July 2004 to June 2014. They make 6 portfolios by intersection 2 size portfolios and 3 value portfolios. The worth weighted month to month returns of every portfolio is contrasted with the month-to-month market premium (Rm-Rf), size premium (SMB) and value premium (HML). The aftereffects of the research show that the model applies to stocks recorded on the KSE-100 from July 2004 to June 2014. The consequences of these appraisals are additionally in concurrence with the aftereffects of the investigation by Fama and French (1992, 1993). which have a better yield for small stocks, which is clarified by the distinctive incline of little and enormous stocks with a positive normal return for SMEs. The results show that the incline of small stocks is higher than that of big stocks and the normal return of SMEs. Moreover, they additionally find that worth (stocks with a high B/M) produce a better return than development (stocks with a low B/M). The outcomes show that every one of the three variables are significant in clarifying cross-sectional variation in normal stock returns and accordingly each of the three elements function admirably in clarifying normal cross-sectional returns.

Iqbal, AliPeter and D’Abreo (2017) This research was depended on trial of the appropriateness of the French Fama French model to emerging stock markets. The excess return determined for the portfolio of selected stocks on the Pakistan Stock Exchange and three autonomous variable market risk premium, size risk premium and value risk premium have been accepted for a very long time. The outcomes were that the three-factor model can be utilized in emerging stock exchanges like the Pakistani stock trade. The consequence of the measurable test shows that these three factors are huge. Two of the three factors, in particular MKT and HML, have a positive sign, while a SMB variable has a negative sign. The positive indication of the market risk premium (MRP) legitimizes the risk of putting resources into the portfolio with a higher excess return. large organizations on the Pakistan stock exchange request a higher return on their stocks contrasted with smaller organizations recorded on the Pakistani stock trade. The outcome is steady with the past aftereffects of (Gagnon and Khalaf, 2009; Ward and Djajadikerta 2009). This three-factor model is more applicable to the Pakistani financial exchange than the CAPM.

Zada, Rehman, Khwaja (2018) This study is completed to quantify the direct connection between the excessive returns of the portfolio contrasted with the risk-free rate of return and the market premium, the size premium, the value premium, the Profitability premium and the Investment premium. It intends to test the materialness of the Fama and France five-factor model to clarify the time series variation of excess portfolio returns for the Pakistani financial exchange. Altogether, 16 portfolios are made dependent on size, book-to-market ratio, operational profitability and four risk factors, SMB, HML, RMW and CMA. It is assumed that in Pakistan, the arrangement of little stocks outflanks the arrangement of big stocks, the arrangement of stocks with a high book-to-market value beats the arrangement of stocks with a low book-to-market value, and that Equity portfolio with a hearty operational return outflanks the value portfolio with a low Operational profitability and the value portfolio with conservative investment beat the value portfolio with aggressive investments which is dependent on risk changed returns. The HML ends up being repetitive. Fama and Macbeth's relapse investigation in the second round shows that previous betas can't be utilized to foresee future returns on the grounds that the coefficients of past beta variables are insignificant for practically all portfolios.

**Conceptual frame work:**

Our conceptual frame work consists of one independent variable which is excess return. Depended variable excess portfolio return is the difference between the portfolio return and risk-free rate that market offers this rate is usually quoted by the risk-free government securities. This research consists of five independent variables which are Market risk premium, size risk premium, value risk premium, RMW and CMA. Betas are the associated risk to each factor. Market risk premium is the difference of portfolios return and risk-free rate also known as CAPM model. Size risk premium is difference between return offered on small stocks compare to big stocks (SMB). Value premium is the difference between return offered on high book to market equity compare to low book market equity (growing stocks), also known as HML.

r - Rf = beta1 (R - Rf) + beta2 x SMB + beta3 x HML.

**Hypothesis:**

H10: There is no association between Market risk premium and Excess portfolio return.

H1A: There is association between Market risk premium and Excess portfolio return.

H20: There is no relation between size risk premium and excess portfolio return.

H2A: There is relation between size risk premium and excess portfolio return.

H30: There is no influence of Value risk premium on excess portfolio return.

H3A: There is influence of Value risk premium on excess portfolio return.

**Research Methodologies:**

**Data Collection**

In the model we have collected data from PSX All from the year 2020 and have selected 200 companies on the basis of random sorting, the illiquid companies were excluded from the population, then we have compiled the share prices of these 200 companies to compute market cap for the year 2020 for each stock and to calculate return for each stock in the in the time span of 2006-2010.

**Method of analysis:**

We will used multivariate regression model to test these hypotheses. We will apply mean, standard deviation and T test for all the three independent variables to find the results of portfolio returns.

**Empirical Approach**

To evaluate cross section of excess return of 200 companies we employ Capital Asset Pricing Model (CAPM), Fama-French three factor model. CAPM is a single index model in which only systemic risk passes through risk market. Subsequently, a multi-factor model was developed based on empirical results factor premium. In the next section, we will briefly introduce these models and Estimation techniques used to determine asset prices.

**Capital Asset Pricing Model**

The Financial Asset Pricing Model (CAPM) describes the relationship between the risk of the system and the expected return on assets (stocks). CAPM is widely used in all financing to evaluate high risk securities and achieve expected returns on assets based on the risks of those assets and the cost of capital. No matter how diverse your investment is, there is always a certain risk. Hence, investors will naturally seek a return that can offset this risk. The Capital Asset Pricing Model (CAPM) can help calculate the investment risks and return on investment that investors should expect. The Standard equation that we have used in the research is as follows:

***ERi*​=*Rf*​+*βi*​(*Rm*​−*Rf*​)**

Where,

ERi = βi(ERm-Rf)

ERi = Expected return of investment

Rf = Risk-free rate

βi = Beta of the investment

Rm = Expected return of the market

(Rm – Rf) = The market risk premium, which is calculated by subtracting the risk-free rate from the expected return of the investment account.

**Fama French three-Factor Model**

Fama and French (1993) featured two significant elements that portray business risks. In addition to the market trial version. These include: ratio of book value to market value and business stature. The scale is estimated by the market stature. In this manner, they refer to three variables

Model, its formula is as follows:

𝑅𝑖𝑡 − 𝑅𝐹𝑡 = 𝛽0 + 𝛽𝑀 (𝑅𝑀𝑡 – 𝑅𝐹𝑡) + 𝛽𝑆𝑀𝐵(𝑆𝑀𝐵𝑡) + 𝛽𝐻𝑀𝐿(𝐻𝑀𝐿𝑡) + 𝑢𝑖𝑡

Where,

𝑅𝑖𝑡 − 𝑅𝐹𝑡 represents the return on portfolio 𝑖 in excess of risk free rate over a given period.

𝛽𝑀 represents the market risk premium.

𝑅𝑀𝑡 − 𝑅𝐹𝑡 represents the return on market portfolio in excess of risk free rate over a given period.

𝛽𝑆𝑀𝐵 represents the size premium.

𝑆𝑀𝐵𝑡 is computed by deducting the average return on small-size firms minus the average return on big size firms.

𝛽𝐻𝑀𝐿 represents the market value premium.

𝐻𝑀𝐿𝑡 is computed by deducting the average return on high book-to-market equity firms minus the average return on low book-to-market equity firms.

To create SMB and HML factors we sorted stocks into two categories in size factor where we took market cap to total assets and sorted data with highest 50th percentile to create a big(B) factor and sorted data to lowest 50th percentile to create a small(S) factor. To compute the second category we used book equity to market equity to create low (L), medium (M) and high (H). By sorting data through book equity to market cap, we get stock into three categories with 0-30th percentile representing stocks with low be/mc and 70th percentile onwards representing stocks with high be/me, hence through this we get 6 portfolios by using conditional formatting: S/L, S/M, S/H, B/L, B/M, B/H Where S and Displays small or big, L, M and H mean growth (low book value / market value), neutral Medium book-to-market equity) and value (High book-to-market equity) portfolios.

SMB is the equally weighted average of the returns of the three small portfolios minus the average of the returns of the three main big stock portfolios:

SMB = 1/3 (S/L + S/M + S/H) – 1/3 (B/L + B/M + B/H)

HML is the equally weighted average of the returns of the two high B / M portfolios minus the average returns for low B / M portfolios:

HML = 1/2 (S/H + B/H) – 1/2 (S/L + B/L)

We regress the Fame-French regression for six portfolios individually in each of these six regressions separately, the independent variable are equal between the variables depends on return on a given portfolio Higher than the risk-free rate over a period of time.

**Discussion and Analysis of Results**

In this section, our findings and results show the average monthly returns in which we can observe that the returns (RP) on companies is higher compared with market returns (RM) in the span of (2006-2020), moreover if we compare the trend with different time frames like (2006-2010, 2011-2015 and 2016-2020) companies return (RF) is higher compared with market returns (RM) in absolute terms. The coefficient of variation (RP) is less compared with coefficient of variation (RM) which indicates that if a investment in RP would have provide better returns compared with an investment in RM, with less risk involved in the transaction as coefficient of variation (RP) is less compared with coefficient of variation (RM) in absolute terms.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Portfolio type | Returns  (RP) | Standard Deviation (RP) | Coefficient of Variation (RP) | Market Returns (RM) | Standard Deviation  (RM) | Coefficient of Variation (RM) |
| 2006-2020 | 2.99% | 13.75% | 4.5985T | 1.01% | 6.88% | 6.7856 |
| 2006-2010 | 3.96% | 22.43% | 5.6706 | 0.64% | 8.65% | 13.6217 |
| 2011-2015 | 3.36% | 7.18% | 2.1335 | 1.81% | 5.03% | 2.7759 |
| 2015-2020 | 1.72% | 6.15% | 3.5817 | 0.59% | 6.56% | 11.1225 |

|  |  |  |
| --- | --- | --- |
| Portfolio | Return | S.D |
| Small size- Low value | 3.32% | 18.91% |
| Small size- Medium value | 2.18% | 13.25% |
| Small size- High value | 2.61% | 10.69% |
| High size- Low value | 2.93% | 14.13% |
| High size- Medium value | 4.32% | 24% |
| High size- High value | 0.05% | 4.22% |
| Risk Free Rate | -8.70% | 7.49% |
| SBM-Value sorted | 0.27% | 9.3% |
| HML | -1.79% | 9.77% |
| Market Index Return | 1.01% | 6.88% |

In this table below we can observe that the constant negative HML indicates the absolute low growth stocks value form the model. The SBM shows the model is flagging a portfolio weighted toward small cap stocks. We accentuate that this is related with the coexistence of both "M" the market and "SMB" the portfolio for size in the Fama–French three-factor model.

|  |  |  |  |
| --- | --- | --- | --- |
| Fama French Three Factor Model | | | |
| Portfolio | Book to Market Equity | | |
|  |  |  |  |
|  | Beta (Slope) | |  |
| Size | Low | Medium | High |
| Small | -0.0131 | -0.0725 | -0.126 |
| Big | -0.0187 | -0.286 | 0.0938 |
|  |  |  |  |
|  | SMB/Size (Slope) | |  |
| Size | Low | Medium | High |
| Small | 0.844\*\*\* | -0.864\*\* | -0.283 |
| Big | -1.144\*\*\* | -2.142\*\*\* | -0.0167 |
|  |  |  |  |
|  | HML/Value (Slope) | |  |
| Size | Low | Medium | High |
| Small | -1.363\*\*\* | -0.986\*\*\* | -0.702\*\* |
| Big | -1.265\*\*\* | -1.861\*\*\* | 0.0747 |
|  |  |  |  |
|  | Constant |  |  |
| Size | Low | Medium | High |
| Small | 0.00534 | 0.000192 | 0.00339 |
| Big | 0.00811 | -0.00925 | 0.0101\* |
|  |  |  |  |
| Robust t-statistics in parentheses | | | |
| \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 | | |  |

We created six portfolios where we divided all 200 companies according to their parameters

Analysis:

We run the liner regression over our six portfolios where the results show us the significance of size risk primum and value risk premium of the company on excess portfolio return.

The regression results show there is a significance in the excess portfolio return and SMB and HML. If we analyze SH portfolio the F test result is above 2 and P value of F test is less than 0.05 which means one of the model or portfolios shows a significant result. It means dependent variable have influence on independent variable. The R squared value is 0.3262 which shows only 32.6% data lies on regression line. If we talk about the individual coefficient, only HML lies in the level of significance with a negative sign. A negative sign indicates more sensitivity towards low book to market equity stocks. The T value of HML is above 2 and Coefficient lies between the critical value under a significance level of 0.05. Therefore, we cannot accept the null hypothesis hence alternative hypothesis is true which is there is a there is an influence of value risk premium on excess portfolio return. Furthermore, market risk premium and SMB factor is in significant and does not lie in the critical value.

The second liner regression of SL portfolio shows a f value of 129.57 which is above 2 and P value is less than 0.05 therefore this regression model is significant, one of the variables is significant in this model. The R squared value for SL portfolio is 0.9268 which means 92% of the data lies on the regression line. This indicates that the model explains 92% variability of the response data around its mean. R square value is ideal for the model. If we look into individual variable the SMB and HML are significant. SMB P value lies in the significant level of 0.01%. The T value of SMB and HML are above 2 and the coefficient does not lie in the range therefore we can not accept the null hypothesis and alternative hypothesis is accepted. There is relation between size risk premium and excess portfolio return and There is influence of Value risk premium on excess portfolio return respectively. The positive sign of SMB indicates a portfolio is weighted towards small cap stocks. A negative sign for HML indicates more sensitivity towards low book to market equity stocks. Hence the model proves that excess portfolio return is dependent on SMB and HML (Size risk and value risk premium respectively). Other independent variable such as market risk premium is insignificant.

The third liner regression was done on SM portfolio where the R squared result shows that 50.057% data fits in regression line therefore its accuracy is less compared to SL portfolio but results are still be acceptable. The F value is above 2 and P values of F test is less than 0.05% therefore the model is significant. This shows any one of the dependent variables is dependent on independent variable. If we look into individual coefficients SMB and HML is significant because its Coefficient value does lie in the critical region. The T value of SMB and HML is above 2 and p value is less than 0.05. SMB is significant till 0.05 but HML is significant at a level of 0.01. therefore, we can not accept null hypothesis hence the alternative hypothesis is accepted. There is relation between size risk premium and excess portfolio return and there is influence of Value risk premium on excess portfolio return. Excess portfolio return does depend on SMB and HML (independent Variable) in SM portfolio. The negative sign of SMB indicates the portfolio is weighted towards high cap stocks. The excess return is been reached because the company size is large. A negative sign for HML indicates more sensitivity towards low book to market equity stocks.

The fourth liner regression was done on BL portfolio where the R squared result shows that 76% of the data fits in regression line therefore its accuracy is high. Results are acceptable. The F value is above 2 and P values of F test is less than 0.05% therefore the model is significant. This shows any one of the dependent variables is dependent on independent variable. If we look into individual coefficients, SMB and HML is significant because its Coefficient value does fall in the critical region. The T value of SMB and HML is above 2 and p value is less than 0.05. SMB and HML is significant at a p-value of 0.01 or 1%. Therefore, we cannot accept the null hypothesis hence the alternative hypothesis is accepted. There is relation between size risk premium and excess portfolio return and there is influence of Value risk premium on excess portfolio return. Excess portfolio return does depend on SMB and HML (independent Variable) in BL portfolio. The negative sign of SMB indicates the portfolio is weighted towards high cap stocks. The excess return is been reached because the company size is large. A negative sign for HML indicates more sensitivity towards low book to market equity stocks. All the other variables are insignificant because their p-values does not lie in the critical region.

The fifth liner regression was done on BM portfolio where the R squared result shows that 70.03% of the data fits in regression line therefore its accuracy is high. Results are acceptable. The F value is above 2 which is 4.99 and P values of F test is less than 0.05% therefore the model is significant. This shows any one of the dependent variables is dependent on independent variable. If we look into individual coefficients, SMB and HML is significant because its Coefficient value does fall in the critical region. The T value of SMB and HML is above 2 and p value is less than 0.05. SMB and HML is significant at a p-value of 0.01 or 1%. Therefore, we cannot accept the null hypothesis hence the alternative hypothesis is accepted. There is relation between size risk premium and excess portfolio return and there is influence of Value risk premium on excess portfolio return. Excess portfolio return does depend on SMB and HML (independent Variable) in BL portfolio. The coefficient value of of SMB and HML regardless of the sign is very high which shows it is strongly related with the dependent variable which is excess portfolio return. The negative sign of SMB indicates the portfolio is weighted towards high cap stocks. The excess return is been reached because the company size is large. A negative sign for HML indicates more sensitivity towards low book to market equity stocks. All the other variables such as Rm are insignificant because their p-values does not lie in the critical region.

The sixth regression model was done oh BH portfolio where R squared results shows that only 6.04% data lies on the regression line which is we low and the results cannot be acceptable. The F value is blow 2 and P-value of F test is greater than 0.05% therefore this model is not significant. There is no relationship between excess portfolio return and Rm, SMB and HML. The individual coefficients gave us the same results which indicates non off the value falls in the critical region except the constant which is Y intercept value. Hence BH portfolio accepts all the three-null hypothesis. there is no association between Market risk premium and Excess portfolio return, there is no relation between size risk premium and excess portfolio return and There is no influence of Value risk premium on excess portfolio return. The reason of BH not compliant because of the limited number of companies in this portfolio. The random selection of the companies does not cater many stocks which have big capitalization as well as high growth stocks therefore the data is very limited and regression analysis is used for large number of data therefore, the results of BH is insignificant.

**Conclusion:**

* There is no association between Market risk premium and Excess portfolio return.
* There is relation between size risk premium and excess portfolio return.
* There is influence of Value risk premium on excess portfolio return.
* So hence fama French three factor model can be a suitable tool to find excess portfolio return in Pakistan stock market.

**Recommendation:**

In my opinion we can make it a better model by taking different parameters for portfolios creation. Such as we can take operating profit or investment parameters to create different portfolios and then we can compare those portfolios SMB and HML with excess returns

There are other factors as well which can create impact on excess returns. We can extend our research to fama French five factor model where we can incorporate profitability of a portfolio (RMW) and investment factor (CMA)

There are other model to find the out the excess returns therefore we can do a comparative study with other model as well like we can compare fama French three factor model with market model or arbitrage pricing model. This comparison will give us a broader view that which model is more suitable on Pakistan’s stock market.