Portfolio Based Style Analysis of Equity Mutual Funds in Pakistan

U. Azam[1], T. Awan[2], R. Bibi[*3]

[1,3]*National University of Modern Languages, Islamabad, Pakistan*
[2] *Islamic International University, Islamabad*

Abstract. The investment style has become a prominent concept in investment management. The researcher highlights the significance of selecting the right style benchmarks and the use of unsuitable style benchmarks an erroneous decision. This study extends and applies new measures of portfolio performance of the mutual funds, which are primarily based on the characteristics of the equity stocks (book-to-market, price to earnings, market capitalization, dividend yield, and momentum). The technique of style analysis specifically, is the portfolio-based style analysis of the open-ended equity mutual funds of Pakistan. The data has been taken from the Mutual Fund Association of Pakistan from 2010 to 2014. The findings relate to adding a new factor of price to earnings in a model, so the net effect is tested from multivariate regression analysis. All the portfolios are found to be negative and significant for the price to earnings. It is appropriate by making portfolios regarding style analysis of equity mutual funds in Pakistan. Decision-makers of the mutual funds should carefully account for all the factors, to benefit from the returns of the funds regarding investing, financing and valuation decision.

Key words: Style analysis, Portfolio Characteristics, Open-ended Equity Funds

1 Introduction

A mutual fund is a professionally managed fund, which the collective investment scheme uses to pool or generate the funds from the investors and invest in various financial securities, i.e., Bonds, stocks, money market instruments, etc. In the developed financial markets, the number of increasing mutual funds signifies investors' preference for investment (Shah et al., 2005). Mutual funds have now become an extensively accepted and more effective way for investors to take part in the financial market in an easy way (Mason et al., 2010).

In Pakistan, the mutual funds started in 1962 with the enactment of the first open-ended mutual fund. The main purpose of NIT was to make available a channel for middle and lower-income groups for investment in the equity market. In the later stages, the development and the series of initiatives were taken in the industry of mutual funds with the opening of the regulatory body, i.e., Introduction of investment advisor rules and guidelines, and NBFC and NE

---

[*]Corresponding author.
Email: rukhsana.pide@gmail.com

(Non-banking Finance Companies and New Entities) Regulations and establishment of private sector open-ended and close-ended funds (Aras and Yilmaz, 2008). The Securities & Exchange Commission of Pakistan (SECP) acquired an assortment of initiatives for the growth and improvement of the industry along with the representative body of industry i.e. Mutual fund Association of Pakistan (MUFAP). It took part as a key role in the well-being of the industry.

Mutual funds help to minimize the risk of investment in the stock market due to diversification. Professional management in the stock market is provided by the experts. Moreover, the small investors hold a diversified portfolio of funds. The open-ended mutual funds create the new units and redeem issued Units on demand (Barbee Jr et al., 1996). Open-ended mutual funds are also known as Unit Trusts. The Unitholders buy units of the mutual funds and redeem the issued units at the prevailing Net Asset Value (NAV) continuously. The Asset Management Company (AMC) announces the offer and redemption prices so that these units can be purchased or redeemed. The close-ended mutual funds can be floated through an Initial Public Offering (IPO) and have a fixed number of shares. When the close-ended mutual funds are once issued, they can be purchased and sold in the secondary market at the market rate. This market rate is announced by the Stock Exchange on the daily basis.

Investment style is used foremost to classify, analyze and deploy the equity portfolios in the financial market (DiBartolomeo and Witkowski, 1997). The investment firms sort out the equity funds for different purposes along with rating into various categories based on investment style. To achieve diversification individual and institutional investors use investment style to select the funds (Dor et al., 2005). In reaction to the prominence that financial investors put on investment style (Afza and Rauf, 2009). Many equity funds use the phrases "small company value" or "mid-cap growth" to recognize them as a certain style. Style analysis is a technique commonly used to recognize and explain the characteristics of an investment portfolio. Style analysis might disclose as one investment is in large-cap, whereas the other portfolio invests in the small-cap. Financial advisors, managers use style analysis to purchase, classify and build controlled investments and to scrutinize for style. Individual investors make use of style to identify the types of investments they are buying and the way that how they fit into an already existing investment portfolio. Style analysis can also be used to create peer groups and to opt for suitable style-specific benchmarks (Ahmad et al., 2017). Style analysis can be based on the returns of portfolios.

The returns-based style analysis is used to determine the returns of the managers compared with the style indexes to find out the arrangement of indices that tracks the performance of managers more accurately (Sharpe, 1992). Sharpe's model made style analysis readily accessible to every investor who could easily get hold of historical returns data on the portfolio being analyzed on passive indices (Babalos et al., 2015). With the availability of data and the importance of style analysis, Sharpe's model is the most accepted among all the individual or institutional investors. It is examined the collinear regressors in RBSA, thereby limiting the precision of the constrained approximation. Studies state the confidence intervals in the case of RBSA in which coefficient restrictions are not inflicted. Aggregate mutual funds and results are the consistency of investment style exposure.

Portfolio-based style analysis (PBSA) is used to observe the stocks which are held in the investment portfolio and help to map these investments into styles. Portfolio-based style analysis is a "bottom-up" technique in which the characteristics of the funds over time are derived from the characteristics of the securities at various points in time over the period. This analysis determines the choice of characteristics. For example, the index or the asset class membership is needed as the security characteristic, to create a customized benchmark consisting of a portfolio

of indices (Wermers, 1997).

A technique like style analysis is used to get better performance of mutual funds. The return-based approach was applied to investigate the returns of managers compared with the style indexes. The portfolio-based style analysis has not been applied yet in Pakistan mutual fund industry. It is argued that the portfolio-based style analysis has greater accuracy than return-based style analysis. So, the study has been researched by evaluating the performance of mutual funds with the help of a portfolio based on the characteristics of stocks. The users of style analysis in determining the performance of mutual funds in Pakistan should find this study very helpful and useful in determining the returns and how much the portfolio-based style analysis is beneficial for the performance of mutual funds (Capon et al., 1996).

Researchers also suggested making use of the portfolio-based style analysis while assessing the fund's returns (Cox and Ross, 1976; Lehmann and Modest, 1987). It is argued that the portfolio-based style analysis confirms the greater accuracy in forecasting future returns in the case of a smaller data sample. Bogle (1998) observed that portfolio-based style analysis is better at predicting future portfolio compositions. Therefore, this study comes up with the following problem statement "To what extent the portfolio-based style analysis (stock characteristics i.e. market capitalization, book-to-market, price-to-earning, dividend yield, and momentum) impacts the performance of equity mutual funds". So, this study theoretically contributes in a way that portfolio is made based on stock characteristics; market capitalization, book-to-market, price-to-earnings, dividend yield, and momentum (Gohar et al., 2011; Lintner, 1965; Penman, 1996). Portfolio-based style analysis has greater importance as compared to return-based style analysis and hence it is a dominant investment technique. Therefore, this study provides the best option to establish a portfolio's style independently, so the returns can be assessed by adopting the portfolios of the mutual fund investor's choice.

2 Literature Review

2.1 Theoretical Review

2.1.1 Modern Portfolio Theory

The modern portfolio theory (MPT) in which Markowitz introduced the analysis of the portfolios of investments. The portfolio is taken into account by reflecting on the expected rate of return and risk of individual stocks and their interrelationship measured with the help of correlation. Previously the investments are examined individually by the investors and built up of portfolios by not considering their relationships. Markowitz demonstrated the possibility of simplistic portfolios by measuring the correlation between the risk and return of these stocks.

The main important role in the theory of modern portfolio is that of diversification. Markowitz emphasized the single period approach: the investor decides in the beginning that he should be aware of the particular securities to invest in and hold them till the end of the period (Kacperczyk et al., 2008). Because in the portfolio the collection is made by taking the optimal portfolio from the set of all possible portfolios (Rohitraj and Rao, 2015). The method to choose the most advantageous and desirable optimal portfolios is the indifference curves. The investor's preferences for risk and return are represented on the indifference curves (Asad and Siddiqui, 2019). These curves can be drawn by putting risk on the horizontal axis and investment return on the vertical axis (Golec, 1996). There are two important fundamental assumptions than examining and applying indifference curves to Markowitz's portfolio theory. Non-satiation and risk

aversion. In the non-satiation assumption, the preference of the investor is on the higher levels of returns instead of lower levels of returns, because by achieving higher levels of returns the investor can spend more on consumption. In the assumption of risk aversion, the investor is risk-averse so choose the smaller risk when making investment portfolios.

In this study, the performance of mutual funds is tested by comparing the returns of the portfolios constructed based on stock characteristics (Market capitalization, book-to-market, price-to-earning, dividend yield, and momentum) with the returns of mutual funds. The correlation is tested between the independent and dependent variables so that investors of the mutual fund can make the selection by opting appropriate set of portfolios.

2.1.2 Efficient Market Hypothesis

The literature of performance evaluation concerning mutual funds has been closely related for a long time to the imperative question of the efficient market hypothesis presented by Fama and French (1995). According to the efficient market hypothesis (EMH), markets are informationally efficient, so there is no possibility of generating excess returns based on all the historical price data as the stock prices should reveal all publically available information (Aras and Yilmaz, 2008). All this information raises a big question for the role of active portfolio management in mutual funds that if markets are truly and well efficient then it should not be possible to beat over and over again the simple market indices on a risk adjustable basis (Ashraf and Sharma, 2014).

The traditional and also later studies on mutual fund performance undeniably support the efficient market hypothesis, finding no proof and confirmation for the abnormal performance of mutual funds concerning simple market indices.

However, studies related to efficient market hypothesis testing have accepted common patterns in average returns that cannot be clarified by systematic market exposure. It is argued that the stock return is the existence of size effect that the highest average risk returns are delivered by the small firms in contrast to large firms. Fama and French (1995) in their several studies have acknowledged the size factor of the stocks (Bollen and Busse, 2005). The other extensively studied asset pricing anomaly is the value of the stocks, as the prior studies prove the evidence for improved performance of value stocks with high book-to-market ratio put side by side to growth stocks with lower book-to-market ratio Fama and French (1995).

There are some other studies that come across with some contradictory and ambiguous verification for the value premium. It is argued that the average value fund gives a return that is 1% lower than that of the S&P500 index, this study is somehow similar to the proposed studies on the average performance of mutual funds.

In recent times, Fama and French (1995) hold the results of previous studies by finding the proof globally for the existence of widespread patterns in average returns, specifically momentum and value premium. These studies reveal that as the size of the firm gets bigger, the magnitude of both anomalies i.e. momentum and value premium decreases. In this study, the returns and performance of the mutual funds are examined and pointed out the set of portfolios which are better in evaluating the performance of the mutual funds. Small size market capitalization and high book-to-market stocks outperform the market, so these patterns have been accepted by the efficient market hypothesis to evaluate the average returns.

2.1.3 Arbitrage Pricing Theory (APT)

Cox and Ross (1976) introduced Arbitrage Pricing Theory (APT), as an alternating approach for the performance evaluation of mutual funds. The characteristics like size, value, and momen-

tum are captured by zero-cost portfolios that are used in a multi-factor framework. These potential mechanical strategies which are used by the fund managers to apply in portfolio management are controlled by multi-factor models (Fama and French, 1995; Massa et al., 2015; Sharpe, 1994). The insight behind both CAPM and APT is that the purpose of expected asset returns is strongly influenced by the risk factors. An APT model is generally explained as:

$$R_{it} = \alpha_i + \sum b_{ij} F_{jt} + \varepsilon_{it}$$

R_{it} stands for the return of a security, b_{ij} is the sensitivity of the stock or security to each factor, Fjt. the risk premium factor associated with each entity, α is the constant.

This study is tested based on size, book to market, and price to earnings to apply in portfolio management by fund managers, so the investor of the mutual funds can make the appropriate choice in opting for the portfolios.

2.1.4   Generalized Extensions of APT

It can be extended as:

2.1.5   Fama-French 3 Factor Model

Fama and French (1995) presented a three-factor model (FF3F) to improve the capability to capture potential patterns in average returns.

$$R_{it} - R_{ft} = \alpha_i + \beta_{i,}\ (Rm_t - Rf_t) +\ {}_{,}s_i\ SMB_t + h_i\ HML_t\ +\ \varepsilon_{it}$$

where Rit is denoting month t return of a fund or asset I, Rft stands for the risk-free return, Rmt symbolizes the market return, SBMt is the return difference of small minus big market capitalization stocks, HMLt is the return difference between the high minus low book to market stocks. Fama and French (1995) argued that this model is consisting of the additional risk factor which gives significantly greater explanatory power in contrast with the traditional approach of the Capital Asset Pricing Model (CAPM) while investigating the variation of security returns.

The theory is related to this study as the premiums like market, SMB, and HML along with the price to earnings are used to check the performance of equity mutual funds in Pakistan.

2.1.6   Carhart 4 Factor Model

Carhart extends the 3 Factor model of Fama and French (1995) and French with an additional factor of momentum.

$$R_{i,t} - R_{F,t} = \alpha_i + \beta_{i,M}\left(R_{M,t} - R_{F,t}\right) + \beta_{i,S} SMB_t + \beta_{i,V} HML_t\ + \beta_{i,m} MOM_t\ +\ \varepsilon_{it}$$

Where the dependent variable is the quarterly return on portfolio i in quarter t minus the return from the risk-free rate. Whereas in the independent variables $R_{M,t}$-$R_{F,t}$is the excess return that is market portfolio minus risk free rate. SBM is the return difference of small minus big market capitalization stocks, HML is the return difference between the high minus low book to market stocks, and the *MOM*is the difference between the high and low past returns. α is the constant.

The additional factor MOM$_t$ stands for momentum factor, representing the difference in portfolio returns comprising the high past performance stocks and a portfolio of low past performance stocks. Carhart argued that the mutual fund portfolio in which high past performance outperforms the low performance with a monthly average of 1%, gives the proof of persistence in fund's performance.

The momentum factor is added in the study to check the performance of equity mutual funds in Pakistan. The momentum premium is used in making the portfolio choices for the mutual fund investors.

2.2   Empirical Review

The study establishes a relationship of mutual funds' performance and the portfolio characteristics i.e. Market capitalization, book-to-market, price-to-earning, dividend yield and momentum. The academic literature has shown research in all these portfolio characteristics in different studies. In previous research, the performance of mutual funds is studied concerning portfolio characteristics. So, this chapter is all about the relevant literature review. It highlights a sequential form of studies related to the dependent variable, independent variables, and the relationship of both variables.

Asad and Siddiqui (2019) worked on Islamic and conventional mutual funds and investigated that the characteristics of mutual funds have a positive impact on risk and expense ratio. However, the fund size, fund age have no impact on mutual funds, whereas macroeconomic factors like GDP and Interest rate have a negative association with mutual fund returns. Swinkels and Van Der Sluis (2006) argued that the P/E ratio can predict the excess stock returns independently in addition to the dividend price ratio (Babalos et al., 2015). It is argued that on the New York Stock Exchange the small-capitalization achieved high returns than the fair value calculated by CAPM. The phenomenon of the small-cap firm getting the higher returns as compared to large firms as the "Small Firm Effect". A study examined the Canadian stock market and showed that there is an inverse relationship between firm size and risk-adjusted excess returns (Pontiff and Schall, 1998).

Ahmad et al. (2017)showed that the new money and turnover ratio has a positive effect on the Sharpe ratio on overall, Islamic and Conventional mutual funds. In Islamic mutual funds, liquidity is positively related to the Sharpe ratio and on the other hand, the conventional funds' age is positively related to funds' performance.

Detzel and Weigand (1998) argued that the P/E ratio can predict the excess stock returns independently in addition to the dividend price ratio. Bekaert and Harvey (2003) found the strong role of the P/E ratio to predict future dividend growth. An investigation the sample of Japanese firms and argued that the trading strategy along with P/E and book value produces higher returns. The results suggested that the better predictive ability of P/E than book value in forecasting the future expected returns. It is has been examined the US stocks from 1951 to 1986 and analyzed the relationship between stock returns and the effects of P/E ratio and size. The results showed that the earnings yield gives better and significant returns as compared to the size of the firms. Let suppose it is showed that earnings yield gives better and significant returns as compared to the size of the firms.

It is argued that the lower P/E ratio of stocks experienced higher returns as compared to high P/E stocks. It is also found the same results that low P/E ratio tend to show better and higher returns than high P/E ratio. It has been examined the inverse relationship between the market returns and the P/E ratio. It has been argued that the P/E ratio effect tends to have a

better return when distinguishing from the small firm effect after managing the P/E ratio. It has been suggested that the P/E ratio effect is used as a proxy for the size of the firm and given the proof for P/E ratio by using a Canadian sample of stocks.

It is suggested that P/E ratio showed the best predictive ability within the period of four-year investment. YANG et al. (2004) examined that if the holding period was greater than five years, then the P/E ratio affected the stock returns. It is argued that certain phases of the economic cycle are only possible to make evidence of a low P/E ratio. The portfolio managers buy the stocks at the peak of the business cycle with a low P/E ratio, because a low P/E ratio is dependent on the economic cycle.

Fama and French (1995) argued that dividend yield can predict the expected stock returns with some success, as it is confined with the dividend growth and the expected stock returns. It has been investigated five developed countries (France, Germany, Japan, US, and UK) and found the components which are predicting stock returns, and the dividend yield has the best predictive power at short horizons. Researchers investigated the application of dividend yield as the predictor variable to calculate stock returns. It has been examined the multifactor model in explaining the mean return, and the dividend yield effect is captured in the model.

The research shows that dividend yield has predictive power in measuring the returns of the stock. It has been studied the previous research on dividend yields and concluded that the dividend yield is used to calculate the returns of stocks. It has been argued that there is some degree of predictive power in using dividend yield to forecast the returns of the stocks. Researchers have studied the excess returns, interest rates, and cash flows. The results found that for a short horizon the dividend yield can calculate the excess stock returns and the previous studies on dividend yields have weak evidence, so the results are concluded with the estimation of Ordinary Least Square (OLS) regression on equal and value-weighted returns and shown that there is robust evidence of predictability power of dividend yield for the period of 1964-2000. Research has studied the simple graphical approach and concluded the predictability of the dividend ratio.

Sharpe (1994); Shefrin and Thaler (1988); WAJID and MOHISN (2015) studied for the very first time the prediction of future performance based primarily upon past performance. He took the sample of mutual funds for the following two periods 1944-53 and 1954-63, and the results are significantly positive, although there is an imperfect relationship between the two periods rankings. Jensen (1968) observed that the past performance of the mutual funds did not keep it up through time. Bogle (1998) analyzed the equity market funds by one-year total return by ranking them for each year throughout 1980-1990. He then concluded that in the previous year the rank of the mutual funds was top twenty performers, so he reported that the prior year ranks do not point out the future ranks. Other research studies conducted in 1990 proposed that there is a positive persistence performance in the mutual funds.

Grinblatt and Titman (1992) findings specified the weak support for the hypothesis that average performance carries on with time. Brown et al. (1996); Grinblatt and Titman (1993) studied the surviving and non-surviving funds from 1976 to 1988 and their results found proof of performance persistence. A research on surviving and non-surviving for 1971-1991 states the results that there is some proof of performance persistence during the period of the 1970s, but the performance persistence did not find in the period 1980s. A sample of 165 mutual funds of no-load growth-oriented from 1974 to 1988 has been collected. They concluded the results that there is a positive persistence performance in shorter periods.

A study argues that the portfolio-based style analysis confirms the greater accuracy in forecasting future returns in the case of the smaller data sample. Studies observe the 18 U.S based

funds investing generally in U.S stocks and verified that portfolio-based style analysis is better at predicting future portfolio compositions. Brown and Goetzmann (1997) and Carhart (1997) illustrated that the value and size are the dimensions that help in elucidating the deviation in the performance of mutual funds. Daniel et al. (1997) examined the performance of mutual funds based on the fund's holdings-based approach. It has been observed that in explaining the cross-sectional behavior of average returns of the mutual funds, factor loadings are less effective than stock features.

Chan et al. (2002) argued in their research, whether differences in investment style are linked with differentiation in performance have implemented a style classification based on two characteristics: value growth orientation and market capitalization. Their research classification draws upon the academic study on the behavior of stock returns and their use in a mutual fund industry to a great degree. Research has examined that the funds perform better by taking growth stocks instead of value stocks and also gave the proof and verification on the operating performance of value-size equity asset classes.

A study tested 19 U.K based funds from 1989 to 1995 by using ordinary least square regression analysis, Spearman rank correlation coefficient analysis, chi square test, and contingency table analysis. They revealed that there is persistence in the long run as compared to short run. Another study tested the Australian investment funds i.e. Rollover funds from 1989 to 1993 and revealed that the future performance cannot be found through the unreliable guide of past performance. Adding to this, a study tested the funds on chi square test and two-way contingency tables and suggested no long-run persistence on risk-adjusted returns.

Another study observed 943 growth mutual funds from 1988 to 1996 by using the winners and loser methodology. He found that the tested sample of mutual funds pointed out the occurrence of persistence in performance and observed the persistence in the performance of mutual funds, turnover rates, and expense ratios of 151 equity funds for the year 1971-1990 with the help of multivariate models. They concluded the results that there is strong proof of short-term persistence.

Cortez and Silva (2002) tested 12 Portuguese funds for four years and suggested little confirmation of performance persistence. Otten and Bams (2002) studied 506 European mutual funds from five countries i.e. Germany, Italy, France, Netherlands, and U.K. the authors revealed the strong persistence in the performance of U.K mutual funds and the weak evidence in case of other four countries. Elton et al. (1996) researched performance persistence for the sample of 181 funds from 1977 to 1993. Their results supported that in both the long and short run, the continuation of performance persistence exists. Wermers (1997) observed the survivorship bias-free mutual fund database from 1974 to 1994. His results gave evidence of momentum effects on the stock returns and hence suggested that persistent use of active momentum investment strategies drive the performance persistence in the mutual funds.

Detzel and Weigand (1998) took the sample of 1,892 diversified equity funds from 1962 to 1993 by using the two models: CAPM Sharpe (1992) and Lintner (1965) and a four-factor model. His results suggested the short-term persistence performance in the mutual funds. Cai and Wei (1997) researched Japanese 64 open-ended mutual funds from 1981 to 1992. Their result suggested little proof for the performance persistence. Cortez and Silva (2002) studied the 12 Portuguese mutual funds for the period of 1994-1998. The results found proof of some persistence in the performance of mutual funds quarterly.

Detzel and Weigand (1998) took the sample of 61 open-ended mutual funds from 1975 to 1995. They suggested the contributing factors in the persistent performance of mutual funds. Their findings concluded that to explain the persistence in the mutual fund performance; the

size of the firm and the investment style are the contributing factors. Furthermore, research has verified that the useful descriptors of fund styles are book-to-market (value growth) and size (small, mid, and large) (Pattarin et al., 2004).They further argued that the investment styles that gather around a widespread market benchmark are attained by most of the mutual funds. Few funds that hold the extreme positions are taken away from the index (market benchmark), but past winners and growth stocks are in the favor.

A couple of studies argued that if the portfolios are managed with better-quality information would give a result that typical returns that show evidence of option-like features even when managers do not do business in options explicitly. It has been argued that the behavioral circumstances and agency problem may be revealed by the prejudice in the direction of glamour and the nature of poorly performing value funds to modify styles. When the investment style is once adjusted, there is evidence that the growth managers conquer the value managers (Monarcha, 2009). The same results are concluded in the investment style produced by the factor loadings of funds and its portfolio characteristics; the approach of using the portfolio-based style analysis gives better results than the returns-based style analysis. In the previous literature, the differences in dividend preferences are well documented (Graham and Kumar, 2006). The existence of dividend clientele is explained as some of the investors of mutual funds may use regular stock dividend income streams for financial consumption. In this case, the preference of the investors is not only high dividend assets rather more frequent distributions as well.

Following are the hypotheses that are derived from all the endogenous and exogenous variables.

H_1: *Market capitalization has a significant impact on the performance of mutual funds.*

H_2: *book-to-market has a significant impact on the performance of mutual funds.*

H_3: *Price-to-earnings ratio has a significant impact on the performance of mutual funds.*

H_4: *Momentum has a significant impact on the performance of mutual funds.*

H_5: *Dividend yield has a significant impact on the performance of mutual funds.*

3   Methodology

The study uses secondary data regarding the portfolio characteristics and returns of equity mutual funds.

The dataset comprises all companies listed in the Securities & Exchange Commission of Pakistan (SECP). All open and close-ended mutual funds that belong to the categories like equity, bonds, money market, pension, income, aggressive fixed income, asset allocation, balanced funds, commodity funds, Islamic equity funds, and Islamic Income are included. Mutual funds are operating in the asset management companies (AMC) in Pakistan under the duly licensed by the Government of Pakistan and trade body for the mutual fund industry i.e. Mutual Funds Association of Pakistan (MUFAP).

In this study, the sample has been taken by considering all the open-ended equity mutual funds from the websites of Asset Management Companies (AMC) and the Mutual Funds Association of Pakistan (MUFAP). The portfolios are made based on equity characteristics i.e. Market capitalization, book-to-market, price-to-earnings, dividend yield, and momentum and the data for these portfolio characteristics has been taken from Karachi stock exchange(KSE-100) Index companies.

This study includes all the 30 open-ended equity mutual funds and excludes the bonds, sector funds and preferred funds, and all the other investment funds that are not tilting towards

general equity. The mutual fund data is taken from the fund manager's guide report and the company yearbook during the period of 2005-2014. The accounting data used in the research has been gathered from the official announcements of "Balance Sheet Analysis" issued by the State Bank of Pakistan.

The portfolio characteristics data i.e. market capitalization and stock prices have been collected from the websites of Karachi Stock Exchange and Business Recorder which are reliable and authentic sources of gathering information. The mutual funds that are taken in the study are; See Appendix B. put all data/ variable abbreviation definition in one table and put it in appendix once

3.1 Variable Definition

3.1.1 Rate of Return

The fund's return has been calculated as the increase and decrease of net asset values (NAV) plus the income or capital gain distributions divided by the net asset value at the beginning of the investment period. The net asset value at the start is denoted by NAV_0 and the net asset value at the end of the period is denoted by NAV_1. So, the return formula is:

$$\text{Rate of Return} = (NAV_1 - NAV_0 + \text{Income or Capital gain distributions}) / NAV_0$$

whereas the NAV is representing a price per unit. The NAV is calculated as the market value of the asset held in the portfolio of a mutual fund minus the liabilities divided by the total number of outstanding units (Arshad, 2012).

$$NAV = (\text{Current Market Value of all Assets - Liabilities}) / \text{Total Number of outstanding units}$$

3.2 Market Capitalization

The independent variables like Market Capitalization, Book-to-Market, Price-to-earnings, Dividend yield, and Momentum of the KSE-100 Index companies are used to make a portfolio of equity mutual funds. So, by calculating the returns of this portfolio, the regression has been done with the monthly returns of the mutual funds

The concept of market capitalization is used for the market value of the firm's outstanding shares. It is calculated by multiplying the stock price by the number of outstanding shares (Daniel et al., 1997). The closing stock prices daily are taken in the study.

$$\text{Market Capitalization} = \text{Stock price} * \text{Number of outstanding shares}$$

The price-to-earning is the valuation ratio of the firm's current share price compared to its earnings per share. The price-to-earning (P/E) ratio is calculated by dividing the market price of the firm's stock from the Earning per share (EPS). The Earning Per Share (EPS) is determined as the Net Income after tax subtracting preferred stock, divided by the number of outstanding shares. EPS is also estimated by taking net income before tax. The closing stock prices daily are taken in the study.

3.3   Price to Earning

Price-to-Earning = Market value of the share / Earning per share (EPS)

The value of the company has been found by using the book-to-market ratio when the book value is compared by its market value. The Book value is determined by taking the historical costs, the market value is calculated in the stock market through its market capitalization. The book-to-market ratio is determined by dividing the book value of the firm from market value of the firm (Daniel et al., 1997). The closing stock prices daily are taken in the study.

3.4   Book-to-Market

Book-to-market = Book value of the firm / Market value of the firm

The dividend yield is the financial ratio of a company that shows that how much the company pays a dividend each year concerning the price of the share. In the absence of any capital gains, dividend yield can be found as the return on the investment of the stocks (Raza et al., 2011). The closing stock prices daily are taken in the study.

3.5   Dividend Yield

Dividend Yield = Annual Dividends per share/price per share

Momentum is representing the difference in portfolio returns comprising the high past performance stocks and a portfolio of low past performance stocks. argued that the mutual fund portfolio in which high past performance outperforms the low performance with a monthly average of 1%, gives the proof of persistence in fund's performance and thus supports the previous research findings.

Momentum is measured by taking price differences continually for a fixed interval of time (Daniel et al., 1997).

$$M = V - Vx$$

where V is representing the latest price of the stocks,Vx symbolizes closing price x number of days ago.

3.6   Portfolio Formation

The market capitalization of each stock is calculated for size sorted portfolios at the end of June for year t-1 and then these stocks are assembled on descending order. Now, this sample is divided into two sets of portfolios and median is calculated. First portfolio is said to be "Big" as the market capitalization is more than median (Naz et al., 2015). The other portfolio is named as. After these portfolios are constructed, the researcher computed the equal weight average returns for each portfolio and estimated the SMB.

Here the portfolios are constructed the same as they were estimated in the SMB, but the only difference is that the base used here is the book to market ratio. Based on book to market ratio, the size sorted portfolios are subdivided into portfolios (Raza et al., 2011; Rekenthaler et al., 2006). When Small is further divided into two portfolios based on book to market, they

are named as Small High (SH) Small Low (SL). Likewise, the Big size sorted portfolio is further divided into two portfolios based on book-to-market, named Big High (BH) and Big Low (BL). After the portfolios are constructed, the High minus Low (HML) is calculated by computing the equal-weighted average return.

The new factor of Price to earnings is added in the study to check the portfolio-based style analysis of equity mutual funds. For this purpose, first, the researcher calculated the price-to-earnings ratio, then based on this ratio, the book-to-market sorted portfolios are further divided into other portfolios. Here the High Price to earning portfolio is named PE1, and Low price to earning portfolio is denoted as PE2. After constructing all the portfolios regarding price to earnings, then an equal weighted average return is calculated.

The market risk premium (Rm-Rfr) has been computed by taking the difference of the average returns of the KSE 100 Index as a market representative and 12 months weighted average yield of Market Treasury Bills (T-Bills). The value for T-Bills is taken from the website of the State Bank of Pakistan. The study develops the time series of the market, size, book to market, price to earnings premium, and regressed with Rt-Rfr.

Based on Net asset values (NAVs), the monthly returns of the equity and Islamic equity mutual funds are taken from MUFAP. By arranging the firm's data vertically,15 portfolios were made. The study equally divided all the firms in every sorted portfolio, so the study has 3 companies in the last portfolio. Here Rt is the average return of each portfolio, so Rt-Rfr is calculated by taking the difference between the average return of all 15 portfolios and the 12-month weighted average yield of Market Treasury Bills (T-Bills).

Initially, the data is taken for portfolio characteristics i.e. market capitalization, book to market, price to earnings, dividend yield, and momentum from all KSE 100 index companies. Equity mutual funds data is collected for all equity and Islamic equity funds from the website of Mutual Funds Association of Pakistan (MUFAP). But due to limited data available for equity funds in Pakistan, so the research sample has been confined to get the most desired results.

For that purpose, the two factors i.e., dividend yield and momentum are cut down, and the stock data of the companies are limited to 24 because the mutual funds' data availability is for 24 equity and Islamic equity funds. The companies are selected based on the top holdings of the funds according to the mutual fund's manager's report. The top holdings include mainly the following sectors; commercial banks, power generation, and distribution, oil and gas exploration companies, cement, and fertilizer (Nazir and Nawaz, 2010). The period is also reduced to 5 years to make the appropriate portfolios as the initial period proposed in the study was 10 years. The companies that are taken in the study are; See Appendix C.

Firstly, the year based has collected for the KSE-100 Index companies and also for the monthly NAVs of equity mutual funds and Islamic equity. Then to make portfolios, 24 companies are selected based on top holdings of the mutual funds along with 24 equity mutual funds. The returns of the mutual funds are arranged vertically and made 15 portfolios like P (portfolio), S (small), B (big), SH (small high), SL (small low), BH (big high), BL (big low), SHPE1 (small high book to market and high price to earnings), SHPE2 (small high book to market and low price to earnings), SLPE1 (small low book to market and high price to earnings), SLPE2 (small low book to market and low price to earnings), BHPE1 (big high boom to market and high price to earnings), BHPE2 (big high book to market and low price to earnings), BLPE1 (big low book to market and low price to earnings) and BLPE2 (big low book to market and low price to earnings). Then equal-weighted portfolios are made based on stock characteristics as market, SMB, HML, and PE premiums, and returns are calculated.

After calculating the Rt-Rfr of all the 15 portfolios, the premiums are regressed against all

these portfolio returns. These multiple regressions have been done also for CAPM and FF3F model equations to check the performance of mutual funds as compared to the returns of the stocks held in the portfolios. The model of the study with the additional factor PE checked the significance of the model and also the performance of the equity mutual funds.

3.7   Model Specification and Regression Estimation Method

Initially, the study has five variables i.e. portfolio characteristics (Size, Book to market, price to earnings, dividend yield, and momentum). The model for the study is:

$$Y_{i,t}= \alpha_i + \beta1_{i,t}\ MC_{i,t} + \beta2_{i,t}BTM_{i,t} + \beta3_{i,t}\ PE_{i,t} + \beta4_{i,t}\ MOM_{i,t} + \beta5_{i,t}\ DY_{i,t} + \varepsilon_{i,t}$$

Whereas,Y= Mutual fund returns, MC= Market capitalization, $\beta1$= Coefficient of market capitalization, BTM= Book-to-market, $\beta2$= Coefficient of book-to-market, PE= Price to earnings $\beta3$= Coefficient of Price to earnings, MOM= Momentum, $\beta4$= Coefficient of momentum, DY= Dividend yield, $\beta5$= Coefficient of dividend yield, α = constant and ε = error term.

To examine the regression between the mutual fund returns and the portfolio characteristics), the OLS (ordinary least square) regression model best suits our study. So,model is presented as:

$$R_t - R_{fr}= \alpha + \beta1\ (Rm_t - Rf_r) + \beta2SMB + \beta3\ HML + \beta4\ PE + \varepsilon_t$$

Whereas, Rt = Return of Portfolio for period "t", Rfr = Risk Free Rate (12 Months Weighted average yield of T-Bills), The regression equation captures the following dimensions:$Rm_t - Rf_r$ market premium$\beta1$= Coefficient of market premium, SMBSize premium, $\beta2$= Coefficient of size premium, HMLValue premium, $\beta3$= Coefficient of the value premium, PEPrice to earning premium, $\beta4$= Coefficient of price to earning premium, α = constant and ε = error term.

4   Results

The descriptive statistics of portfolios that are sorted based on size, book to market, and price to earnings show that the higher level of return is given in the case of SHPE1(small high book to market and high price to earnings) i.e. 0.00816 or 0.816% with the lowest level of standard deviation 0.0508 or 5.08%. After that, the highest returns are in the case of SH (small high) 0.0047 or 0.47% and BLPE2 (big low book to market and low price to earnings) 0.0045 or 0.45% with the standard deviation 0.0547 or 5.47% and 0.0889 or 8.89% respectively. The lowest return is in the portfolio BHPE2 (big high book to market and price to earnings) 0.0012 or 0.12% with the risk 0.059 or 5.9%. write only in one form either write 0.059 or write 5.9%

In the case of stocks, BL (big low boot to market) earns the lowest return which is in line with the empirical work of the three-factor model of Fama & French which is further tested by Stattman (1980), those big companies earn the low level of return, but in the case of mutual funds, BL (big low book to market) earns 0.0039 or 0.39% with the standard deviation of 0.0632 or 6.32%.

When the price to earning factor is considered, the highest return of the PE sorted portfolio is that of SHPE1 (small high book to market and high price to earnings) with the mean value of 0.00816 or 0.816% with a risk level of 0.0508 or 5.08% and minimum and maximum values are -0.1668 or -16.68% and 0.1421 or 14.21% respectively. The mean and median values of all these

portfolios are not close to each other. Rather mean values are less than median values in the case of all portfolios.

The skewness in all cases of size, the book to market, price to earnings sorted portfolios is negative. It means there is an asymmetrical distribution with the long tail to the left from the mean point. In the case of kurtosis, the values are positive because distribution has more peaked values except for the BLPE1 (big low book to market and high price to earnings) that has negative value.

The higher positive values are observed in the case of SLPE2 (small low book to market and low price to earnings) that is 4.910462, BHPE1 (big high book to market and high price to earnings) that is 4.447158, and BLPE2 (big low book to market and low price to earnings) that is 8.775623. So, when the kurtosis values are largely positive, the distribution is known as leptokurtic. All the descriptive statistics are shown in Table 1.The descriptive statistics show that all these market premiums, size premium, value premium, and PE premium are positive. But among all premiums, the market premium and PE premium are more volatile in comparison to size premium and value premium. The PE premium shows that PE stocks have the highest mean than value and growth stocks. In the comparison of size, value, and price to earnings premium, the market premium is more volatile and so it is worth mentioning here that market premium is on a higher side as compared to all other premiums. The highest mean of PE premium is 0.001671 or 0.1671% with the standard deviation 0.027384 or 2.7384%. The standard deviation of market premium is higher i.e. 0.047454 or 4.7454% with the mean value 0.020509 or 2.0509%. The large dispersion shows that how much returns of the funds are deviating from the expected normal returns of the stocks.

The mean and median are almost close to each other in market premium, but in all other cases there is a difference between mean and median. The market and size premiums are negatively skewed which means there is an asymmetrical distribution with the long tail to the left from the mean point, and some are slightly skewed results have been observed in case of value and PE premiums, which means the asymmetrical distribution is towards the right side from the mean. In the case of kurtosis, the distribution has a peaked curve because there are positive values in case of all the premiums. The data is not normally distributed and leptokurtic distribution has observed in case of these premiums. All the descriptive statistics are shown in Table 2.

The conventional capital asset pricing model is found to be valid in the Pakistani equity market in general (Arshad, 2012). Here in case of mutual funds, the results of using the CAPM equation are also positive and significant. So, the investor of the equity mutual funds will get benefited by considering the market factor, because the equity returns of the mutual funds are significantly explained by the market factor. In case of market premium, it is noticed that there is a positive and significant relationship with the portfolio returns of the equity mutual funds, and these results are consistent with the conventional capital asset pricing model CAPM.

Jensen (1968) examined the performance of mutual funds by applying a regression equation. CAPM assumed that by increasing the exposure to the market which is measured by Beta coefficient, the higher average returns can be achieved. The statistical properties by using CAPM equation are shown in Table 3.In case of Fama and French three-factor model, the positive and significant size premium is observed in the portfolios including, SL (small low book to market) and SLPE2 (small low book to market and low price to earnings), but it is highly significant in case of SLPE2 (small low book to market and low price to earnings) with 3.90 t-statistics. Some studies have verified that growth stocks outperform the value stocks, so the highest-level mutual funds on average hold smaller stocks. While observing the results of a value premium in

case of Fama and French three-factor model, the significant results of the portfolios are shown in the portfolios like SL (small low), SLPE1 (small low book to market and high price to earnings), SLPE2 (small low book to market and low price to earnings) and BLPE2 (big low book to market and low price to earnings). The BL (big low) returns are negative and significant, this result is in line with the pragmatic and empirical findings on the subject matter that low returns are earned by the big companies as compared to small companies and the stocks with low book to market underperform in contrast with high book to market stocks which outperform the market. The statistical properties of the Fama and French three-factor model variables are shown in Table 4.

It is worth mentioning that value premium i.e. book to market is significant for the portfolios like SH (small high), SHPE1 (small high book to market and high price to earnings), SHPE2 (small high book to market low price to earnings), BH (big high), BL (big low), BHPE1 (big high book to market and high price to earnings) BHPE2 (big high book to market and low price to earnings) and BLPE2 (big low book to market and low price to earnings). However, in some portfolios, it is positive but insignificant as the t-statistics is not more than 1.96.

It is deduced from the results that high book-to-market stocks outperform and do better than low book-to-market stocks. Therefore, in making economic decisions, the factor of HML cannot be overlooked. In Investment style analysis, the managers of the mutual funds tend to favor the small market capitalization and high book to market ratio stocks, these results are consistent with previous studies.

In the same way, size premium is found to be significantly related to the returns of small portfolios. But it is significantly positive with only S (small), SL (small low), SLPE2 (small low book to market and low price to earnings), B (big), BL (big low), and BLPE2 (big low book to market and low price to earnings). The prior studies of Maria and Ishaq (2010) analyzed that the mutual fund managers consider the small size and low book to market stocks.

It is noted from the results that size premium is negative but significant in case of B (big), BH (big high), BL (big low), BHPE1 (big high book to market and high price to earnings), BHPE2 (big high book to market and low price to earnings), BLPE1 (big low book to market and high price to earnings), BLPE2 (big low book to market and high price to earnings).

It indicates that in the case of SMB the returns of the big stocks are not positive. So, it is said that however behavior of size is priced in many of the stylized portfolios, but it is inconsistent to opt for the portfolio-based style analysis.

The PE premium is found negative, but significant in all portfolios, except SLPE1 (small, low book to market and high price to earnings) and BLPE1 (big low book to market and high price to earnings). Hence it indicates that the investor will give importance to making portfolios for equity mutual funds considering the PE premium.

So, the investor of the equity mutual funds will get benefited by considering the market factor, because the equity returns are significantly explained by the market factor. Now the explanatory power of all these premiums including SMB, HML, and PE has been observed and the results of multivariate regression analysis that is performed to show the relationship between these premiums and portfolio return are reported in Table 5.

It has been proposed different categories of the mutual funds for the better performance. "Value" consisted of the Small Cap funds, with low price to earnings and book to market ratios. "Growth" category comprised the Small stocks. "Glamour" included small company funds with high book to market and price to earnings ratio. The results of this study suggested that in order to provide maximum benefit to the investors of mutual funds, the managers should adopt such strategies.

The investor of the equity mutual funds will get benefited by considering the market factor,

because the equity returns are significantly explained by the market factor. But the three-factor model of Fama and French explains the portfolio returns to a large extent. So, these results show that the procedures based on Fama and French three factor model are somewhat better than based on capital asset pricing model. Here we see in case of adding one more factor i.e. Price to Earning to observe the style analysis technique in case of mutual funds, and it shows that the investor can make his own portfolio in case of equity mutual funds to get the desired returns from the set of portfolios. So, this indicates that "style analysis" is constructive in benchmarking mutual fund returns.

4.1   Comparative statement of Adj. R^2

The statistical measure R-squared is used to gauge the closeness of the data to the fitted regression line. It is also recognized as the coefficient of determination or in some cases the coefficient of multiple determination for multiple regression. It tells us that how much variation is being explained by the independent variable(s). In other words, it is a tool to know that till what extent the model is selected for the forecasting for independent variable is appropriate. In general, it is assumed that the higher the value of R-square, the better is the model that fits the data.

Here we can see that the Fama and French three factor model leads to increase in Adjusted R-square than single factor model CAPM. The values for the coefficient of multiple determination for multiple regression are even more in case of price to earning factor added in the model as compared to CAPM and Fama-French three factor model. The results are shown that highest R^2 is 0.816 in case of PE Factor added model, which means that 81.6% of the independent variables influenced the dependent variable i.e. monthly returns of equity mutual funds. So higher R^2 values make certain that the model is fit and appropriate.

In case of CAPM the higher R^2 value is 0.644 which means that market factor explained the monthly returns of equity mutual funds by 64.4%. The higher value of R^2 is 0.637 that shows the dependent variable i.e. monthly returns of equity mutual funds are controlled by size and value premium along with market premium. The comparison of all these models are reported in Table

5   Findings & Conclusion

The prior knowledge of the mutual funds by Thaler and Shefrin (1981) also suggest that the portfolio-based style analysis is more reliable and consistent method than that of Sharpe -style (Returns Based Style Analysis). The results of the study have a great significance for both the institutional and the individual investors in conjunction with the mutual fund managers of the company.

This study examined that the style analysis technique regarding equity mutual funds in Pakistan for the period 2010 to 2014 by using yearly equity data and mutual funds' monthly NAVs. The conventional CAPM equation, Fama-French three factor model equation and the new model incorporating price to earning has been used to check the influence of equity mutual funds on portfolios. The results for each model equation are different for every portfolio, but this study suggests the results related to add new factor of price to earnings in a model, so that the new effect can be tested from multivariate regression analysis.

Value premium is found to be positively significant in case of all the portfolios except for

low book to market stocks. So, it is to be said that book to market effect is present in Pakistani mutual fund market. It is deduced from the results that high book to market stocks outperform and do better than low book to market stocks. In case of size premium, the results are found to be positive and, in some portfolios, it is significantly positive related to small portfolio returns, but the findings are negative and insignificant for the big stock portfolios.

In case of additional factor added in the model i.e. Price to earnings, the results for all the portfolios are found to be negative but significant. So, this factor is not considerable by making portfolios regarding style analysis of equity mutual funds in Pakistan. Therefore, decision makers of the mutual funds should carefully account for all the factors in their decision making to get benefited by the returns of the funds regarding investing, financing and valuation decision.

When an investment strategy proposed by a professional manager that is based on the style analysis of equity mutual funds, the presumption is that the investor of the equity mutual fund expects the strategy that outperform the market and that mechanical strategy is purely based on the stock characteristics like size, book to market, price to earnings, dividend yield and momentum etc. The achievement of the mutual fund industry depends on the role of regulatory bodies and also the performance of mutual funds. The stringent and rigorous regulations and exceptional performance will boost the recognition of mutual funds in Pakistan.

6 Policy Recommendations

The study has the following recommendations or implications for the mutual fund industry in Pakistan. The investors of the equity mutual fund can make more informed selection of the funds if they consider the portfolio-based style analysis. The study provides all the information and previous knowledge to the investors to invest in Open-ended Equity funds. The patterns of volatility in fund returns help the investors and other parties like Govt., Regulators etc. in case of portfolio optimization and risk management.

7 Directions for Future Research

It is highly suggested that other funds like hedge funds and pension funds should also be incorporate in the research with different portfolio characteristics according to the nature of the funds. The portfolios of the mutual funds are made diversified to get benefit from the premiums of the stocks. The comparison between Return based style analysis and Portfolio based style analysis should be made to check the effectiveness of these techniques.

References

Afza, T. and Rauf, A. (2009). Performance evaluation of pakistani mutual funds. *Pakistan economic and social review*, pages 199–214.

Ahmad, Y., Sun, G., and Khidmat, W. B. (2017). Fund-specific determinants of performance: An empirical study of islamic and conventional mutual funds of pakistan. *International Journal of Economics and Financial Issues*, 7(5):359.

Aras, G. and Yilmaz, M. K. (2008). Price-earnings ratio, dividend yield, and market-to-book ratio to predict return on stock market: Evidence from the emerging markets. *Journal of Global Business & Technology*, 4(1).

Arshad, A. (2012). Net present value is better than internal rate of return. *Interdisciplinary journal of contemporary research in business*, 4(8):211–219.

Asad, M. and Siddiqui, D. A. (2019). Determinants of mutual funds performance in pakistan.

Asad, M. and Siddiqui, DA (2019). Determinants of Mutual Funds Performance in Pakistan. International Journal of Social and Administrative Sciences, 4(2):85–107.

Ashraf, S. H. and Sharma, D. (2014). Performance evaluation of indian equity mutual funds against established benchmarks index. *International Journal of Accounting Research*, 2(1):1000113.

Babalos, V., Mamatzakis, E. C., and Matousek, R. (2015). The performance of us equity mutual funds. *Journal of Banking & Finance*, 52:217–229.

Barbee Jr, W. C., Mukherji, S., and Raines, G. A. (1996). Do sales–price and debt–equity explain stock returns better than book–market and firm size? *Financial Analysts Journal*, 52(2):56–60.

Bekaert, G. and Harvey, C. R. (2003). Market integration and contagion.

Bogle, J. C. (1998). The implications of style analysis for mutual fund performance evaluation. *Journal of Portfolio Management*, 24(4):34.

Bollen, N. P. and Busse, J. A. (2005). Short-term persistence in mutual fund performance. *The Review of Financial Studies*, 18(2):569–597.

Brown, K. C., Harlow, W. V., and Starks, L. T. (1996). Of tournaments and temptations: An analysis of managerial incentives in the mutual fund industry. *The Journal of Finance*, 51(1):85–110.

Brown, S. J. and Goetzmann, W. N. (1997). Mutual fund styles. *Journal of financial Economics*, 43(3):373–399.

Cai, J. and Wei, K. J. (1997). The investment and operating performance of japanese initial public offerings. *Pacific-Basin Finance Journal*, 5(4):389–417.

Capon, N., Fitzsimons, G. J., and Alan Prince, R. (1996). An individual level analysis of the mutual fund investment decision. *Journal of financial services research*, 10(1):59–82.

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of finance*, 52(1):57–82.

Chan, L. K., Chen, H.-L., and Lakonishok, J. (2002). On mutual fund investment styles. *The Review of Financial Studies*, 15(5):1407–1437.

Cortez, M. D. C. and Silva, F. (2002). Conditioning information on portfolio performance evaluation: a reexamination of performance persistence in the portuguese mutual fund market. *Finance India*, 16(4):1393.

Cox, J. C. and Ross, S. A. (1976). A survey of some new results in financial option pricing theory. *The Journal of Finance*, 31(2):383–402.

Daniel, K., Grinblatt, M., Titman, S., and Wermers, R. (1997). Measuring mutual fund performance with characteristic-based benchmarks. *The Journal of finance*, 52(3):1035–1058.

Detzel, F. L. and Weigand, R. A. (1998). Explaining persistence in mutual fund performance. *Financial Services Review*, 7(1):45–55.

DiBartolomeo, D. and Witkowski, E. (1997). Mutual fund misclassification: Evidence based on style analysis. *Financial Analysts Journal*, 53(5):32–43.

Dor, A. B., Jagannathan, R., and Meier, I. (2005). Understanding mutual fund and hedge fund styles using return-based style analysis. In *The world of hedge funds: characteristics and analysis*, pages 63–108. World Scientific.

Elton, E. J., Gruber, M. J., and Blake, C. R. (1996). The persistence of risk-adjusted mutual fund performance. *Journal of business*, pages 133–157.

Fama, E. F. and French, K. R. (1995). Size and book-to-market factors in earnings and returns. *The journal of finance*, 50(1):131–155.

Gohar, R., Ahmed, S., and Niazi, U. (2011). Performance comparison of mutual funds in pakistan. *African journal of Business management*, 5(14):5583–5593.

Golec, J. H. (1996). The effects of mutual fund managers' characteristics on their portfolio performance, risk and fees. *Financial Services Review*, 5(2):133–147.

Graham, J. R. and Kumar, A. (2006). Do dividend clienteles exist? evidence on dividend preferences of retail investors. *The Journal of Finance*, 61(3):1305–1336.

Grinblatt, M. and Titman, S. (1992). The persistence of mutual fund performance. *The Journal of finance*, 47(5):1977–1984.

Grinblatt, M. and Titman, S. (1993). Performance measurement without benchmarks: An examination of mutual fund returns. *Journal of business*, pages 47–68.

Jensen, M. C. (1968). The performance of mutual funds in the period 1945-1964. *The Journal of finance*, 23(2):389–416.

Kacperczyk, M., Sialm, C., and Zheng, L. (2008). Unobserved actions of mutual funds. *The Review of Financial Studies*, 21(6):2379–2416.

Lehmann, B. N. and Modest, D. M. (1987). Mutual fund performance evaluation: A comparison of benchmarks and benchmark comparisons. *The journal of finance*, 42(2):233–265.

Lintner, J. (1965). Security prices, risk, and maximal gains from diversification. *The journal of finance*, 20(4):587–615.

Maria, B. and Ishaq, B. (2010). Legality of corporate governance in islamic finance. *Journal of Asian Politics and Policy*, 2:25–38.

Mason, A., Thomas, S., and McGroarty, F. (2010). Combining returns based and characteristics based style analysis for us diversified equity funds. *Available at SSRN 1675471*.

Massa, M., Simonov, A., and Stenkrona, A. (2015). Style representation and portfolio choice. *Journal of Financial Markets*, 23:1–25.

Monarcha, G. (2009). A dynamic style analysis model for hedge funds (un modèle d'analyse de style dynamique pour les hedge funds)(french). *Available at SSRN 1485339*.

Naz, S., Ul, A., Arslan, M., and Nawaz, M. S. (2015). Risk adjusted performance evaluation of balanced mutual fund schemes in pakistan.

Nazir, M. S. and Nawaz, M. M. (2010). The determinants of mutual fund growth in pakistan. *International research journal of finance and economics*, 54(10):1051–1060.

Otten, R. and Bams, D. (2002). European mutual fund performance. *European financial management*, 8(1):75–101.

Pattarin, F., Paterlini, S., and Minerva, T. (2004). Clustering financial time series: an application to mutual funds style analysis. *Computational Statistics & Data Analysis*, 47(2):353–372.

Penman, S. H. (1996). The articulation of price-earnings ratios and market-to-book ratios and the evaluation of growth. *Journal of accounting research*, 34(2):235–259.

Pontiff, J. and Schall, L. D. (1998). Book-to-market ratios as predictors of market returns. *Journal of financial economics*, 49(2):141–160.

Raza, S. A., Raza, S. A., and Zia, A. (2011). Equity mutual funds performance in pakistan: risk & return analysis.

Rekenthaler, J., Gambera, M., and Charlson, J. (2006). Estimating portfolio style in us equity funds: A comparative study of portfolio-based fundamental style analysis and returns-based style analysis. *The Journal of Investing*, 15(3):25–33.

Rohitraj, S. and Rao, D. (2015). Performance evaluation of open ended large cap equity mutual fund and mid & small cap equity mutual fund growth scheme with special reference to sbi mutual fund and hdfc mutual fund. *Journal Impact Factor*, 6(1):661–669.

Shah, S. A., Hijazi, S. T., and Hamdani, N. H. (2005). Performance evaluation of mutual funds in pakistan [with comments]. *The Pakistan Development Review*, pages 863–876.

Sharpe, W. F. (1992). Asset allocation: Management style and performance measurement. *Journal of portfolio Management*, 18(2):7–19.

Sharpe, W. F. (1994). The sharpe ratio, the journal of portfolio management. *Stanfold University, Fall*.

Shefrin, H. M. and Thaler, R. H. (1988). The behavioral life-cycle hypothesis. *Economic inquiry*, 26(4):609–643.

Swinkels, L. and Van Der Sluis, P. J. (2006). Return-based style analysis with time-varying exposures. *The European Journal of Finance*, 12(6-7):529–552.

Thaler, R. H. and Shefrin, H. M. (1981). An economic theory of self-control. *Journal of political Economy*, 89(2):392–406.

WAJID, M. and MOHISN, H. M. (2015). Portfolio tilting: Hunt for positive alpha through style tilts.

Wermers, R. (1997). Momentum investment strategies of mutual funds, performance persistence, and survivorship bias. Technical report, Citeseer.

YANG, C.-j., CAI, M.-c., and XU, H.-q. (2004). Style classification analysis of chinese mutual funds. *Journal of Shanghai Jiaotong University*.

APPENDICES

Appendix A: List of Acronyms

ADF	Augmented Dicky-Fuller Test
AMC	Asset Management Company
APT	Arbitrage Pricing Theory
B/M	Book to Market
BH	Big High
BL	Big Low
CAPM	Capital Asset Pricing Model
DY	Dividend Yield
EMH	Efficient Market Hypothesis
EPS	Earnings per share
FF3F	Fama and French three factor model
HML	High minus Low
IA	Investment Advisor
IPO	Initial Public Offering
KSE	Karachi Stock Exchange
MC	Market capitalization
MOM	Momentum
MPT	Modern Portfolio Theory
MUPAF	Mutual fund Association of Pakistan
NAV	Net Asset Value
NBFC&NE	Non-banking Finance Companies and New Entities
NIT	National Investment Trust
OLS	Ordinary Least Square
P/E	Price to Earning
PBSA	Portfolio Based Style Analysis
PE1	High Price to Earnings
PE2	Low Price to earnings
RBSA	Returns Based Style Analysis
RFR	Risk Free Rate
RM	Market Returns
Rm-Rfr	Market Risk Premium
SECP	Securities and Exchange Commission of Pakistan
SH	Small High
SL	Small Low
SMB	Small minus Big

Appendix B: Names of the Equity Mutual Funds in Pakistan

Equity Mutual Funds in Pakistan

1.   ABL Islamic Stock Fund
2.   ABL Stock Fund
3.   AKD Opportunity Fund
4.   Al Ameen Shariah Stock Fund (Formerly: UBL Shariah Stock Fund)
5.   Al Meezan Mutual Fund
6.   Alfalah GHP Alpha Fund
7.   Alfalah GHP Islamic Stock Fund (Formerly: Alfalah GHP Islamic Fund)
8.   Alfalah GHP Stock Fund (Formerly: IGI Stock Fund)
9.   Askari Equity Fund
10.   Atlas Islamic Stock Fund
11.   Atlas Stock Market Fund
12.   Crosby Dragon Fund
13.   First Capital Mutual Fund
14.   First Habib Stock Fund
15.   HBL Islamic Stock Fund
16.   HBL Stock Fund
17.   JS Growth Fund
18.   JS Islamic Fund
19.   JS Large Cap Fund
20.   Lakson Equity Fund
21.   MCB Pakistan Islamic Stock Fund (Formerly: Pakistan Strategic Allocation Fund)
22.   MCB Pakistan Stock Market Fund (Formerly: Pakistan Stock Market Fund)
23.   Meezan Islamic Fund
24.   NAFA Stock Fund
25.   National Investment Unit Trust
26.   PICIC Energy Fund
27.   PICIC Islamic Stock Fund
28.   PICIC Stock Fund
29.   PIML Islamic Equity Fund
30.   United Stock Advantage Fund

Companies from KSE100 Index

1.   Oil and Gas Development Company Limited

2.   Pakistan Petroleum Limited
3.   MCB Bank Limited
4.   Habib Bank Limited
5.   K-Electric Limited
6.   United Bank Limited
7.   Fauji Fertilizer Company Limited
8.   Pakistan Oilfields Limited
9.   Lucky Cement Limited
10.   Engro Corporation Limited
11.   Pakistan State Oil Company Limited
12.   GlaxoSmithKline (Pakistan) Limited
13.   Hub Power Company Limited
14.   Packages Limited
15.   Nishat Mills Limited
16.   D.G. Khan Cement Company Limited
17.   Mari Petroleum Company Limited
18.   Pak Suzuki Motor Company Limited
19.   Atlas Honda Limited
20.   Attock Refinery Limited
21.   Adamjee Insurance Company Limited
22.   Pak Elektron Limited
23.   Kot Addu Power Company Limited
24.   Cherat Cement Company Limited

Table 7.1: Descriptive Statistics (Portfolios)

Variable	P	S	B	SH	SL	SHPE1	SHPE2	SLPE1	SLPE2	BH	BL	BHPE1	BHPE2	BLPE1	BLPE2
Mean	0.00332	0.003317	0.00292	0.00477	0.00187	0.00816	0.00137	0.001734	0.001997	0.001923	0.003912	0.002639	0.001207	0.003273	0.00455
Median	0.0121	0.008425	0.00843	0.0146	0.01197	0.01633	0.01419	0.012753	0.010098	0.017131	0.013782	0.01822	0.011062	0.012878	0.01463
Standard Deviation	0.05652	0.059599	0.0596	0.05479	0.06393	0.05084	0.06291	0.053106	0.085929	0.062847	0.063244	0.071849	0.059226	0.051135	0.088923
Kurtosis	1.69538	2.227958	2.22796	2.44742	3.85899	2.01324	2.86325	1.437057	4.910462	2.673923	2.816304	1.842276	4.447158	-0.10952	8.775623
Skewness	-0.92968	-0.92671	-0.92671	-1.0324	-1.03847	-0.86214	-1.32013	-0.83289	-0.90276	-1.25286	-0.39779	-1.26777	-1.53474	-0.54979	-0.349
Minimum	-0.188	-0.21719	-0.21719	-0.19959	-0.25034	-0.16688	-0.23231	-0.17965	-0.32104	-0.23787	-0.1965	0.23338	-0.24235	-0.11919	-0.33251
Maximum	0.126	0.130127	0.13013	0.13878	0.17155	0.14216	0.1354	0.131047	0.265967	0.13151	0.21328	0.130991	0.132029	0.106205	0.377055

Table 7.2: Descriptive Statistics (Four Factors)

Variable	Rm-Rfr	SMB	HML	PE
Mean	0.02051	0.0004	0.00046	0.001671
Median	0.02716	0.00063	0.00341	-6.10E-05
Standard Deviation	0.04745	0.02465	0.03157	0.027384
Kurtosis	0.099629	3.87931	2.61399	4.109389
Skewness	-0.6774	-0.9137	0.25004	0.635289
Minimum	-0.1117	-0.0912	-0.0768	-0.08374
Maximum	0.13945	0.05838	0.1058	0.094303

Table 7.3: Comparative statement of Adj. R^2

DEPENDENT	CAPM	3FM-FF	PE FACTOR
P	0.419699	0.415973	0.58198779
S	0.378887	0.4059896	0.5748226
B	0.4209	0.4747154	0.624032175
SH	0.488709	0.4896525	0.651568517
SL	0.226607	0.4269128	0.567416971
SHPE1	0.644125	0.6370039	0.702814174
SHPE2	0.321157	0.3301616	0.571233027
SLPE1	0.321438	0.3612715	0.366196301
SLPE2	0.123477	0.4117341	0.649665243
BH	0.391475	0.4069224	0.552327581
BL	0.357653	0.6168311	0.738397665
BHPE1	0.286162	0.3054602	0.385073166
BHPE2	0.456953	0.4610031	0.672415354
BLPE1	0.506045	0.517816	0.511689098
BLPE2	0.189789	0.592874	0.816251832

Table 7.4: Fama and French Three Factor Model

Dependent	intercept	SMB	HML	MKT	Adj. R Sq	F Statistic	F sig.
P	-0.0138905	-0.11417249	-0.220120008	0.790799564			
T Statistic	-2.172339	-0.49109553	-1.2183759	6.530525846*	0.41597	15.0076	0.000
p value	0.0336151	0.625278045	0.228189071	2.05815E-08			
S	-0.01318905	0.38582751	-0.22012008	0.790799564			
T Statistic	-2.17823391	1.659578115	-1.21837659	6.530525846*	0.40599	14.4416	0.000
p value	0.033615124	0.102589988	0.228189071	2.0581E-08			
B	-0.01318905	-0.61417249	-0.22012008	0.790799564			
T Statistic	-2.17823391	-2.64176917*	-1.21837659	6.530525846*	0.47472	18.7734	0.000
p value	0.033615124	.010671327*	0.22819071	2.05815E-08			
SH	-0.01179164	-0.01451691	0.235394167	0.791077963			
T Statistic	-2.148837	-0.06889962	1.437658912	7.208406892*	0.48965	19.8692	0.000
p value	0.035985048	0.945314955	0.156095587	1.56582E-09			
SL	-0.01458646	0.786171927	-0.67563432	0.790521166			
T Statistic	-2.15003604	3.018053017*	-3.33763174*	5.826396794*	0.42691	15.6504	0.000
p value	0.035885594	.003824224	0.001506317	2.9077E-07			
SHPE1	-0.00958863	0.021205247	0.11886162	0.85464113			
T Statistic	-2.23260664	0.127500083	0.927530925	9.950167343*	0.637	35.5121	0.000
p value	0.029590939	0.899001351	0.357631501	5.47811E-14			
SHPE2	-0.01399465	-0.05005906	0.351926713	0.727514796			
T Statistic	-1.93883956	-0.18062418	1.63404055	5.039788005*	0.33016	10.6936	0.000
p value	0.057566432	0.85731467	0.107860435	5.1934E-06			
SLPE1	-0.01280339	0.188136391	-0.37956013	0.697131517			
T Statistic	-2.1518368	0.823513444	-2.13794169*	5.858545732*	0.36127	12.1237	0.000
p value	0.035736682	0.413709506	.036899874	2.57931E-07			
SLPE2	-0.01636953	1.384207463	-0.97170851	0.883910815			
T Statistic	-1.77198732	3.902465426*	-3.5252609*	4.78435665*	0.41173	14.7649	0.000
p value	0.081836922	.000257931	.000851454	1.28969E-05			
BH	-0.01458646	-0.21382807	0.324365678	0.790521166			
T Statistic	-2.15003604	-0.82086938	1.602365582	5.826396794*	0.40692	14.4937	0.000
p value	0.035885594	0.415201462	0.114701111	2.9077E-07			
BL	-0.01179164	-1.01451691	-0.76460583	0.791077963			
T Statistic	-2.148837	-4.8150641*	-4.66979452*	7.208406892*	0.61683	32.6597	0.000
p value	0.035985048	1.15707E-05	1.92909E-05	1.56582E-09			
BHPE1	-0.01343949	-0.2443235	0.41731306	0.766724452			
T Statistic	-1.60110693	-0.75808197	1.666212084	4.567383693*	0.30546	9.64944	0.000
p value	0.114980019	0.451580491	0.101255838	2.75647E-05			
BHPE2	-0.01573343	-18333264	0.231418297	0.814317814			
T Statistic	-2.5817296	-0.78350315	1.272670627	6.681471275*	0.461	17.8209	0.000
p value	0.01247469	0.436632987	0.208393604	1.16122E-08			
BLPE1	-0.01259315	-0.2470829	-0.2128119	0.77069575			
T Statistic	-2.53032754	-1.2900016	-1.43307585	7.743121649*	0.51782	22.12	0.000
p value	0.014234217	0.201319969	0.157395641	2.0486E-10			
BLPE2	-0.01099013	-1.78195092	-1.31639977	0.811460176			
T Statistic	-1.38185884	-5.83539285*	-5.54727301*	5.101745564*	0.59283	29.6339	0.000
p value	0.172502942	2.81184E-07	8.1827E-07	4.15574E-06			

Significant level at 1.96

Table 7.5: Additional Factor (Price to Earning) Model

Dependent	Intercept	SMB	HML	PE	MKT	Adj. R sq	F Statistic	F sig.
P	-0.0111	-0.0314	0.171057	-0.94913	0.755679			
T Statistic	-2.1659	-0.159	0.988484	-4.82085*	7.357763*	0.58199	21.5361	0.000
p value	0.03467	0.87427	0.327244	1.17E-05	9.78E-10			
S	-0.0111	0.468613	0.171057	-0.94913	0.755679			
T Statistic	-2.1659	2.373516*	0.988484	-4.82085*	7.357763*	0.57484	20.943	0.000
p value	0.03467	0.02114	0.327244	1.17E-05	9.78E-10			
B	-0.0111	-0.53139	0.171057	-0.94913	0.755679			
T Statistic	-2.1659	-2.69146*	0.988484	-4.82085*	7.357763*	0.62403	25.4821	0.000
p value	0.03467	.009406	0.327244	1.17E-05	9.78E-10			
SH	-0.0098	0.064498	0.608754	-0.9059	0.757557			
T Statistic	-2.1604	0.369076	3.974305*	-5.19838*	8.333249*	0.65157	28.5826	0.000
p value	0.03511	0.713488	.000207	3.04E-06	2.51E-11			
SL	-0.0124	0.872729	-0.26664	-0.99236	0.753801			
T Statistic	-2.1028	3.841626*	-1.3391	-4.38052*	6.378574*	0.56742	20.3475	0.000
p value	0.04008	.000319	0.186047	5.36E-05	3.91E-08			
SHPE1	-0.0084	0.068714	0.344201	-0.54675	0.83441			
T Statistic	-2.1553	0.458781	2.621928*	-3.66073*	10.70946*	0.70281	35.8823	0.000
p value	0.03553	0.648199	.011287	.000565	4.52E-15			
SHPE2	-0.0113	0.060828	0.873307	-1.26505	0.680704			
T Statistic	-1.9422	0.270836	4.476481*	-5.69962*	5.879063*	0.57123	20.651	0.000
p value	0.05724	7.87531	3.87E-05	4.89E-07	2.52E-07			
SLPE1	-0.0122	0.211939	-0.26709	-0.2729	0.687034			
T Statistic	-2.0534	0.927771	-1.33394	-1.19797	5.781474*	0.3662	9.52219	0.000
p value	0.04481	0.35758	0.187722	0.236065	3.62E-07			
SLPE2	-0.0127	1.533518	-0.26619	-1.71183	0.820568			
T Statistic	-1.77	5.58114*	-1.1053	-6.24761*	5.740898*	0.64967	28.3526	0.000
p value	0.08227	7.56E-07	0.273842	6.39E-08	4.2E-07			
BH	-0.0124	-0.12727	0.73336	-0.99236	0.753801			
T Statistic	-2.1028	-0.56023	3.63022*	-4.38052*	6.378574*	0.55233	19.1982	0.000
p value	0.04008	0.577597	.000527	5.36E-05	3.91E-08			
BL	-0.0098	-0.9355	-0.39125	-0.9059	0.757557			
T Statistic	-2.1604	-5.35319*	-2.55428*	-5.19838*	8.333249*	0.7384	42.6333	0.000
p value	0.0351	1.74E-06	.01344	3.04E-06	2.51E-11			
BHPE1	-0.0116	-0.16827	0.776665	-0.87192	0.734461			
T Statistic	-1.4575	-0.55278	2.910877*	-2.87231*	4.638084*	0.38507	10.2366	0.000
p value	0.15067	0.582654	.005195	.005778	2.21E-05			
BHPE2	-0.0133	-0.08627	0.690055	-1.11281	0.733141			
T Statistic	-2.7947	-0.47113	4.2995*	-6.0943*	8.116575*	0.67242	31.2765	0.000
p value	0.00714	0.639409	7.06E-05	1.13E-07	5.63E-11			
BLPE1	-0.0124	-0.23793	-0.16955	-0.10497	0.766812			
T Statistic	-2.4605	-1.23256	-1.00211	-0.54531	7.63633*	0.51169	16.4562	0.000
p value	0.01704	0.222982	0.320681	0.587745	3.42E-10			
BLPE2	-0.0073	-1.63308	-0.61294	-0.61249	-1.70684			
T Statistic	-1.3604	-7.93066*	-7.93066*	-3.39604*	-8.31216*	0.81625	66.5229	0.000
p value	0.17924	1.13E-10	1.13E-10	0.001276	2.71E-11			

* Significant level at 1.96