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# Association of Mutual Fund Risk Measures and Return Parameters: A Juxtapose of Ranking for Performance in Pakistan

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## Abstract

This purpose of this study is to investigate the association among mutual funds (MFs) risk measures and return parameters, evaluate mutual fund performance and also explore the best appropriate mutual fund performance measure for investment in Pakistan. Therefore, thirty-five mutual funds have been selected for the period 2007-2015. The Sharpe, Treynor, Jensen Alpha, Information ratio and Fama's Net Selectivity measures has been used to analyze MF performance. Our study findings show significant positive relation exist between Sharpe and Jenson alpha & information ratio (IR); Treynor ratio is negatively correlated to Jenson alpha and Jenson alpha is positively allied with IR. Moreover, association among performance measures, Fama's net selectivity is a major driver in leading to other measures but Sharpe and IR lead to Treynor ratio as well. Furthermore, performance measures are ranked in accordance standard deviation with the arrangement of Fama's net selectivity at top, Jenson Alpha at second, Sharpe ratio at third, IR at fourth and Treynor ratio at fifth position according to risk parameters in Pakistan. Overall, Jensen Alpha measure appears to be the best suitable mutual fund performance measure in Pakistan due to its practical nature. Finally, the Pakistani stock market index KSE100 (as benchmark) performs better than MF industry of Pakistan.

**Keywords:** Mutual Fund, Risk-Adjusted Performance, Open and Close Ended Mutual Funds, Portfolio Diversification, Suitable Performance Measure

**JEL Classification Code:** G11, G14, G20, G23

## 1. Introduction

Mutual funds have exhibited tremendous growth all over the world and especially for small investors it is an attractive investment choice because they have limited capacity to diversify their own portfolio risk. Mutual funds collect money from individuals or organizations, specifically from small investors and invest it into several types of stocks or bonds or money market instruments, bank deposits and other asset types that helps investors to diversify their investments in a collective manner. The mutual fund sector has gained much attention of investors worldwide over the past few decades due to its incredible growth and as the most favorable and viable investment choice. In US alone number of NYSE listed stocks less than number of listed mutual funds. Huhmann (2005) elaborated the remarkable mutual fund growth in developed countries discloses it as not only preference of investment of mutual fund investors but also has directed to develop various types of mutual funds.

As the mutual fund history and growth concerns, the mutual fund is one of the earliest investment techniques to put money into stocks or bonds or any other money market tools which collects from small investors (Shah & Hijazi, 2005). This idea was first taken from Dutch merchant Abraham van Katwitch from Europe in the late 1700s as investment enterprise idea queried from investors to make investment contributions with narrow means. However, in 1800s in England the idea of pooling or materializing investments brought this concept nearer to the US shores. The British companies act 1862 or 1867 legitimate investors

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to make a firm investment with profit sharing and investors are only liable up to money they invested in an enterprise. The initial British fund customary developed a connection with the US security market to facilitate financing post-civil war. Gupta & Choudhury (2001) stated that fund pioneer (Robert Fleming) founded in 1873 via investment in US economic potential which finally took over with the US rail-road bonds. In US the mutual fund was initially declared in 1890s as close ended funds but in 1924 it was established first open ended fund by Massachusetts Investors Trust.

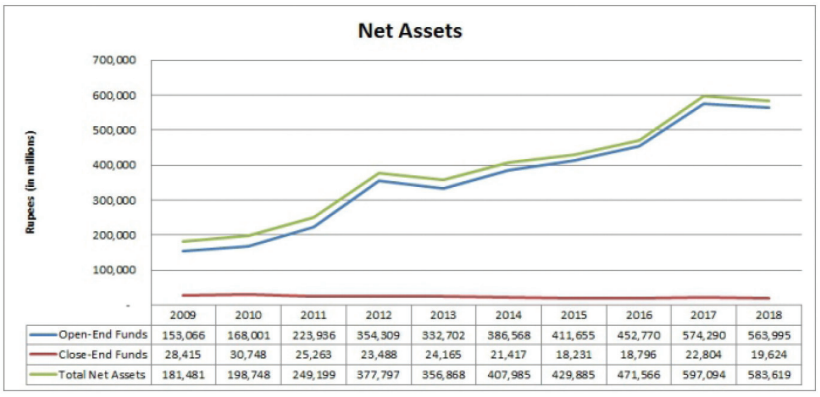
Mutual funds is now considered as one of the leading financial tools for investment in the world markets. The total worldwide mutual funds net assets worth is $46.7 trillion out of which US hold $21.1 trillion, Europe have $16.5 trillion, Asia-pacific $6.4 trillion and rest of the world mutual fund industry hold $2.7 trillion. The total net assets of the managed and regulated mutual funds founded 25% ($46.7 trillion) of $187 trillion in the worldwide capital markets (ICI fact-book 2018). In the past few years, several European economies consider mutual fund industry as one of the fastest booming market sectors (Jordan & Kaas, 2002). However, Ramasamy and Yeung, (2003) studied the developing or emerging economies in the world and found that the mutual funds are also significant financial source of investment in countries like Malaysia, India and the Indonesia.

In Pakistan, firstly in 1962 mutual fund sector was initiated by national investment trust (NIT) as IPO offered, afterwards it was operated through investment corporation of Pakistan (ICP) founded in 1966 by managing 26 mutual funds. However, by the establishment of Mutual fund association of Pakistan (MUFAP) in 2001, the management and control of the mutual fund sector was carried out with AMC's by following the rules and regulations of SECP. The Pakistani mutual fund sector has shown tremendous growth especially in the last decade which was visualized with the expansion of AMC, number and variety of funds enhanced. This sector continues to endure a vital substitute investment avenue because of its inclusive suite of products with numerous investment categories and range of funds offered such as income, growth, money market, tracker, Islamic and equity funds etc.

The historical performance assessment of mutual funds is vital for both fund managers and investors while making their investment decisions. In this regard, the fund managers ability to diversity risk can also be analyzed by the investors. Figure 1 below indicates Pakistan mutual fund industry marvelous growth as net asset value (NAV) of open-ended mutual funds in 2009 is PK rupees 153.06 billion and close ended funds had PK rupees 28.41 billion but in 2018 open-ended funds NAV has jumped to PK Rupees 563.99 billion and close-ended mutual funds down in NAV as PK Rupees 19.62 billion that clearly indicates open-ended funds are more popular investment instrument as compared to close-ended funds in Pakistan.

Whereas the value of the total NAV shows a dramatic upward trend from PK Rupees 181.48 billion in 2009 to PK Rupees 583.62 billion in 2018 that is an increase of more than 300% approximately, which reflects the fact that mutual fund investment is of keen interest to investors in Pakistan thus highlighting the significance of evaluation and performance of mutual fund industry.

The mutual funds have an ultimate investment medium for a modern complex financial scenario. Lemeshko & Rejnus (2015) followed the basic rule of classical portfolio theory which narrates that mature capital markets are near to efficient and hence do not offer abnormal returns and lowers the possibilities of portfolio diversification at the international level. In a recent study, Pangestuti (2017) revealed that mutual funds have now become one of the major activities in terms of strategic investment particularly for the small investors because they don't have specialty or time to diversity their own portfolio investment in risk-return tradeoff paradigm.




| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| Open-End Funds | 153,066 | 168,001 | 223,936 | 354,309 | 332,702 | 386,568 | 411,655 | 452,770 | 574,290 | 563,995 |
| Close-End Funds | 28,415 | 30,748 | 25,263 | 23,488 | 24,165 | 21,417 | 18,231 | 18,796 | 22,804 | 19,624 |
| Total Net Assets | 181,481 | 198,748 | 249,199 | 377,797 | 356,868 | 407,985 | 429,885 | 471,566 | 597,094 | 583,619 |

**Figure 1:** Net Assets of Mutual fund industry of Pakistan [2009-2018]

*(Source: http://www.mufap.com.pk)*

Therefore, evaluation of mutual funds' performance in developing and emerging markets has become a recurrent issue of debate in the modern portfolio theory and capital market equilibrium theory scenario. In this regard, comparison and evaluation of mutual funds is very significant on diverged grounds of evaluation techniques and methods. Therefore, risk and return trade-off cannot be avoided for mutual funds investment in the present era. The investor tries to make sure after the evaluation of comparative performance of mutual funds and how it is managed on the basis of historical performances based upon cross sectional comparison. Nafees et al. (2011) viewed the performance of open-close ended funds and concluded that asset management companies in Pakistan are still in a developing phase and face difficult macroeconomic encounters.

Although, mutual fund sector of Pakistan is not as mature as other world mutual fund industries but the last decade has shown tremendous growth in Pakistan mutual funds industry with total assets value of more than 300%, this has grabbed the attention of the world investors towards this sector of Pakistan. So, the main objective of this study is to identify the appropriate performance measures and investable mutual funds in Pakistan. Moreover, our aim is to identify the level of association among the performance measures and risk-return trade-off. The study also investigates presence of diversification factors to eliminate the riskiness.

Our study empirical findings are summarized as: firstly, on an average open-ended mutual funds perform better than the close ended mutual funds during the sample period. Secondly, the mutual fund sector of Pakistan underperformed as compared to market index (KSE-100) benchmark during study that is in line with the US, UK, Europe and other emerging mutual fund industries. Thirdly, association among performance measures concerns, the Fama's net selectivity is a major driver in leading to other performance measures though Sharpe and information ratio leads to Treynor ratio as well. Fourthly, the performance measures ranking through standard deviation which shows Fama's net selectivity at top, Jenson Alpha at 2nd, Sharpe ratio at 3rd, Information ratio at 4th and Treynor ratio at 5th position respectively according to risk parameters in Pakistan. Finally, Jensen alpha measure seems best suitable measure for mutual fund performance in Pakistan due to its practical nature. Overall, approximately negative results have been documented with all performance measures that prove dissatisfactory performance for all these mutual funds which displays poor fund selection ability of fund managers.

Our study contributes to existing economic and financial literature by providing empirical evidence on mutual fund performance, evaluation and several performance measures permits us to explore this industry in a broader spectrum. Our results should be carefully attended to by the investors, as they demonstrate that buying and holding approach is desirable in trying to choose fruitful mutual funds, as there are no chances for higher returns about collective investments in Pakistan. Moreover, it is suggested to the local or foreign investors and fund managers that Fama net selectivity measure should be considered while making a ranking of funds and Jensen alpha consider best suitable measures when analyzing the performance of the mutual funds. Furthermore, the outcomes will appeal to the asset management companies, as their inability to deliver positive risk adjusted returns shows likely revisit about their investment policies or level of the expenses which have burden on unit-holders of fund.

The paper is organized as follows: Section 2 explains the literature regarding mutual funds and Section 3 describes our data and reviews the methodology used in this study. Section 4 provide and discusses outcomes of our empirical analysis and Section 5 concludes the paper with future recommendations.

## 2. Literature Review

### 2.1. Evaluation, Association and Performance Measures of Mutual Funds

The performance measurement of managed portfolio has greatly fascinated attention in the economic and financial literatures after key studies of (Treynor, 1965; Linter, 1965a,b; Sharpe, 1966; Jensen, 1968) and its succeeding works (Ippolito, 1989; Sortino & Price, 1994; Sortino et al., 1999; Malkiel, 1995; Modigliani & Modigliani, 1997; Moreno & Rodríguez, 2009; Guo & Xiao, 2016; Pastor et al., 2017) and have some of the most recent studies (Graham et al., 2019; Grau-Carles et al., 2019; Livingston et al., 2019; Smimou & Ayadi, 2019; Martí-Ballester, 2019, Wang et al., 2019; Cujean, 2020). Generally, for performance measurement two basic approaches may be documented and followed; the first considers managed-portfolio returns and the objective is to defined and explained under the symmetric conditions of the traditional funds' performance or reward to risk measures; secondly, examine the managed-portfolio returns by emphasizing on the familiarizing and applying the models or taking measures that makes possible to conjecture the choices that the fund manager takes under the asymmetric condition.

The most developed measures which are worldwide used for mutual fund performance and evaluation like Sharpe (1966) developed the methodology that accommodates the investor for evaluation of mutual fund performance. By using Sharpe ratio, the performance of funds is to find out by taking average excess returns by dividing on the risk. Sharpe indicates that the fund brings further risk if mutual fund

has more degree of volatility. Treynor (1965) drawn from CAPM and includes use of any appropriate returns index in beta calculations which are more appropriate to rank the diversified portfolio because only systematic risk (beta) can be considered for well-diversified portfolios. All risk-averse investors want to maximize it. Jensen (1968) had developed such a method that determined the risk-adjusted performance of mutual fund known as Jensen Alpha. Those also give a right advice for investors that helps in taking decisions about investment which is based on cost benefit analysis. Sharpe (1994) established a measure as information ratio which considers residual risk (S.D of returns difference) of portfolio and market (benchmark) and shows how greatly the worth has been added or shattered by manager of the mutual funds. Fama (1972) designed a measure called Fama net selectivity which have the core objective to evaluating the performance by identifying the mistakes and propose the direction for taking the necessary corrections. This measure allowed not only to capture the overall performance of the portfolio but also to breakdown into diversification and net selectivity which shows diversified portfolio selection and ability to choose the right stocks by a fund manager.

Therefore, some recent global empirical evidence documented via using the traditional or variety of newly developed mutual fund evaluation or association and risk-adjusted performance measures indicates mixed results like developed markets USA (Livingston et al., 2019; Huang et al., 2019; Goldie et al., 2019), Canada (Smimou & Ayadi, 2019), UK (Grau-Carles et al., 2019), Europe (Leite et al., 2018; Martí-Ballester, 2019; Dopierała et al., 2020) and some emerging or developing markets such as China (Zhou et al., 2018; Wang et al., 2019; Huang, 2019), Indonesia (Gusni et al., 2018), Malaysia (Rashid & San, 2019), India (Deb, 2019; Gupta, 2019) etc.

However, several empirical studies about Pakistani mutual funds evaluation and performance measure conducted like Ahmad et al. (2015) evaluated open-and close ended mutual funds by considering balance, income and equity mutual funds schemes and used Sharpe, Treynor, Jensen and Sortino measures; results showed open-ended funds performed superior than the close ended fund; and also KSE 100 (the market portfolios) out-performed than mutual fund industry. Hussain et al. (2016) taken twenty-seven mutual funds selected out of which seven are close ended and twenty are open ended by analyzing through Sharpe, Jensen, Treynor, M2/RAP, Fama's net selectivity, information measures; the outcomes indicate that all mutual funds have below performance as compared to market index (benchmark), manager stock selection ability is also weak and portfolios are also less diversified. Furthermore, close ended mutual funds have better performed than open ended mutual funds. Razzaq et al. (2012) taken nine mutual funds from Islamic schemes that are managed by different fund managers and shows fund returns depend upon the level of risk attached; also, the ability and performance of fund managers influenced by the different models they adopted and concluded that in Pakistan Islamic funds shows tremendous growth and investors are ready to invest in these funds confidently. Bilawal et al. (2016) shows mixed outcomes in terms of mutual fund performance and Treynor and Information ratio discloses acceptable performance measures while the other fund measures imitate robust underperformance.

## 2.2. Mutual Fund Risk Return Trade- off

One of the crucial investment principle is risk and return trade-off that shows possible return over an investment with associated risk-level. The foremost pattern in finance theory contains tradeoff between the risk and return by (Jordan & Kaas 2002). Five decades research work on the mutual fund performance as based on risk return trade-off which is still the question whether mutual fund investment provides superior risk-adjusted performance in comparison with market portfolio (benchmark) remains unsolved.

Typically, work done in economic and financial literature worldwide found on an average lower returns on actively-managed funds than market portfolio as benchmark by (Sharpe, 1966; Jensen, 1968; Shawky, 1982; Bogle, 1991; Elton et al., 1993; Malkiel, 1995 and 2013; Gruber, 1996; George, 2001; Jiang, 2003; Fama & French, 2010; He et al., 2015; Goldie et al., 2019; Martí-Ballester, 2019). However, some other studies concluded that net mutual fund returns which fund investors can gain should be similar to (Chang & Lewellen, 1984; Henriksson, 1984; Grinblatt & Titman, 1989) or may be even higher than market index (benchmark) by (Ippolito, 1989). Though, the inferences of recent work show positive risk-adjusted fund returns which show superiority may occur in performance of mutual funds by (Avramov & Wermers, 2006; Noulas et al., 2005; Berk & van Binsbergen, 2015).

The empirical studies regarding Pakistani mutual funds risk and return trade-off have been done by some researchers such as Ali (2015) who observed risk-return association of open- and close ended funds via rate of return, Sharpe and Treynor ratio with KSE-30 index (benchmark) has brought into play and result shows just only three funds out-performed than benchmark. Ahmad et al. (2015) comparative analysis of open-close ended funds and stated no statistically significant difference in NAV returns of the open-and close ended funds. Razzaq et al. (2012) evaluated mutual funds risk and return tradeoff and concluded that investors avoiding risky fund investment which is a big factor in evaluating fund returns. Shah & Hijaz (2005) report that underperformance

of the mutual funds occurred generally due to diversification problem. Furthermore, each fund annual report must be mentioned risk related to that fund which support investors to compare risk-return relationship before considering an investment decision. Iqbal (2008) stated that investors must consider those funds to capitalize on the gain which have minimum chances of risk but high level of return when taking investment decision. Moreover, return on the funds cannot be considered as performance until the consideration of associated risk features and the previous performance of the fund can be used to predict future results. Sipra (2006) explained that fund performance is not continual and benchmark outperformed when risk-adjusted through Fama net selectivity.

While examining the financial and economics literature, the majority of empirical work documented on developed mutual fund industries like US, Canada, Europe, UK, Australia etc. but off late several studies have also explored emerging markets, where mutual funds industry is still in the developing phase. However, management or performance of mutual funds sector across the globe studied by many researchers while Pakistani mutual fund industry failed to gain the much attention of scholars in this area due to which limited empirical work has been documented with respect to Pakistan. The only way to guard the interest of small investors is via the institutional investors and effective corporate governance of mutual funds (Cheema & Shah, 2006) and almost half close-ended funds better perform than the market (Sipra, 2006). Overall, various works has been done across the globe over mutual fund industry but there are mixed results. However, in Pakistan the mutual fund industry has shown tremendous growth especially in last decade and this study assesses the evaluation and performance of mutual fund measures. The theoretical framework includes the interaction of performance evaluation measures and their level of associations.

## 3. Data and Research Methodology

### 3.1. Data

The thirty-five mutual funds (32 open ended and 3 close ended mutual funds) have been taken for this study because all necessary information regarding all mutual funds have not been obtainable for whole 9-years period from 2007 to 2015. The nine-year daily net asset value (NAV) of the funds in sample has been taken from mutual fund association of Pakistan (MUFAP). The daily return of the funds has been derived from differences of daily NAV of the fund and average has been used to find overall yearly funds return. The stock market index KSE-100 (value-weighted) returns used as benchmark and 12-month T-bills cut-off yield used as risk-free rate taken from published statistics of State Bank of Pakistan.

### 3.2. Research Methodology

In this study, following five measures have been developed that are based on CAPM and its assumptions have been used for both open and close ended mutual funds for comparison and evaluation of mutual funds in Pakistan.

1. Sharpe ratio 2. Treynor ratio 3. Jensen Alpha ratio 4. Information ratio 5. Fama's Net Selectivity.

#### 3.2.1. Sharpe Ratio

This ratio was developed in (1966) by Sharpe. The sharpe ratio is calculated as return of the portfolio subtracted risk free return and divided by portfolio return standard deviation. The Sharpe ratio is a product from CML and helps to identify less diversified portfolios performance.

$$\text{Sharpe ratio} = (Rp - Rf) / \sigma\rho \quad (1)$$

Whereas,
$R_p$ =Return on the fund
$R_f$ = Risk free rate
$\sigma_p$= Standard deviation of funds

A positive and higher value of the Sharpe ratio indicates better risk- adjusted performance of the funds, whereas negative and lower value of Sharpe ratio shows unfavorable performance.

#### 3.2.2. Treynor Ratio

Treynor ratio was found by the Treynor in (1965). This ratio is calculated as return of the fund subtracted by the risk free return and then divided by beta of fund return. Treynor ratio results from CAPM and includes use of any appropriate index returns in beta calculations. This ratio is more appropriate to rank the diversified portfolio because only systematic risk (beta) is considered for well-diversified portfolios.

$$\text{Treynor Ratio} = (Rp - Rf) / \beta\rho \quad (2)$$

Whereas,
$R_p$= Return on the fund
$R_f$= Risk free rate
$\beta_p$ =Beta of the fund

All risk-averse investors want to maximize Treynor ratio value. Although positive and high value of Treynor ratio indicates the better fund risk-adjusted performance; whereas, negative and lower value of the Treynor ratio demonstrates unfavorable performance for investors.

### 3.2.3. Jensen's Alpha Ratio

Michael Jensen developed the Jensen Alpha ratio in 1968 which measures risk- adjusted performance and is calculated as on average mutual fund return over or above the predicted fund return as computed by CAPM, average market return and portfolio beta.

$$\alpha = R\rho - [Rf + \beta(Rm - Rf)] \quad (3)$$

Whereas,
$R_p$ = Average return on the fund
$R_f$ = Risk free return
$\beta$ = Beta of the fund
$R_m$ = Average on market return

The alpha value obtained as results of regression t-value that usually more than 2 which shows the outcomes are gained due to greater stock selection ability and chances that the outcomes probability due to luck have (< 5%). The Treynor ratio is better in analyzing and comparing within peer portfolio and portfolio holding alike risk. The alpha positive value shows fund managers greater stock choosing ability to beat the stock market.

### 3.2.4. Information Ratio

The information ratio was established by Sharpe in (1994). The information ratio explains the excess returns attained on benchmark for taking every extra residual risk unit. The residual risk here considers as tracking error results S.D of returns difference of portfolio and market (benchmark). Therefore, it shows how greatly the worth has been added or shattered by manager of mutual fund. The information ratio formula is given as below.

$$IR = \frac{\alpha p}{\sigma e} \quad (4)$$

Whereas,
$\sigma e$ = The standard error of the regression.
$\alpha\rho$ = Jensen alpha

### 3.2.5. Fama's Net Selectivity

This ratio was developed by Fama (1972). The core objective of this measure is to evaluate the performance and to identify the mistakes and the direction for taking necessary corrections. This measure allowed not only captures the overall performance of the portfolio but also breakdowns the diversification and net selectivity which shows the fund manager's ability to choose a diversified portfolio and the stocks.

$$R\rho = Rf + \beta(Rm - Rf) + (Rm - Rf)(\sigma\rho / \sigma m - \beta) + (R\rho - Rf) - (\sigma p / \sigma m)(Rm - Rf) \quad (5)$$

Here,
i. Risk free returns = Rf
ii. Compensation of systematic risks {$\beta$(Rm – Rf)}
iii. Compensation of inadequate diversifications (Rm – Rf)($\sigma$p/$\sigma$m – $\beta$)
iv. Net higher return due to the net selectivity (Rp – Rf) – ($\sigma$p/$\beta$m) (Rm – Rf)

Whereas,
$R_p$ = Average return of Fund
$R_f$ = Risk free returns
$R_m$ =Average market return
$\beta$= Systematic risks of Fund
$\sigma_p$ = Standard Deviations of Fund returns
$\sigma_m$ = Standard Deviations of Market returns

## 4. Results and Discussions

The mutual funds' performance measures summary results for the period are given in table 1. According to the Panel A, Sharpe and information ratio 5 mutual funds, Jenson alpha ratio has 6 funds and Treynor ratio 17 mutual funds have positive returns but Fama's net selectivity has no funds with positive returns. Sharpe and Treynor measure show open ended mutual funds as better performers than close ended mutual funds. Jensen Alpha ratio shows that managers using defensive approach in terms of risk and Information ratio earned excess negative returns on the per unit of volatility. Fama's Net selectivity displaying results that poor stock-selection ability of the fund managers that are consistent with some local and global mutual fund industries like in US, Europe, UK, Canada, China, etc. The Panel B (table 1), results revealed that KSE100 (benchmark) average returns (0.0006) with S.D (0.0119) but average industry returns (0.0003) with S.D (0.0236) that indicates none of mutual funds could earn better risk-adjusted returns as compared to benchmark and these funds attached more risk as compared to specified benchmark. These results documented that KSE100 index (benchmark) outperformed than mutual fund industry due to higher average returns and lowest risk which is consistent with the literature of some of the local studies reported by (Ali & Qudous, 2012; Naz. et al, 2015; Bilawal et al., 2016; Ahmad et al., 2015, Hussain et al., 2016; Naveed & Farooq, 2018) and with some international studies (Sharpe, 1966; Ippolito, 1989; Hendricks et al., 1993; Sirri & Tufano, 1998; Fama & French, 2010; He et al., 2015; Goldie et al., 2019; Martí-Ballester, 2019).

**Table 1:** Performance Ratios for Mutual Funds

| Name of Fund | Sharpe Ratio | Treynor Ratio | Jenson Alpha Ratio | Information Ratio | Fama's Net Selectivity |
|---|---|---|---|---|---|
| **Panel A: Performance measures analysis with open-close ended mutual funds** | | | | | |
| **Open Ended Funds** | | | | | |
| AGHPIF | -0.06254 | 0.02693 | -0.00025 | -0.06388 | -0.00035 |
| AIF | -0.06624 | -0.02905 | -0.00029 | -0.06782 | -0.00039 |
| ASMF | -0.01182 | 0.03260 | -0.00022 | -0.01215 | -0.00068 |
| FBDF | -0.02978 | -0.00729 | -0.00040 | -0.03169 | -0.00071 |
| FSGF | 0.01840 | -0.12515 | 0.00366 | 0.01840 | -0.00145 |
| FCMF | 0.01141 | 0.00689 | 0.00063 | 0.01077 | -0.00084 |
| FHIF | -0.07852 | -0.05668 | -0.00028 | -0.08126 | -0.00036 |
| HBLIF | -0.06155 | -0.01065 | -0.00027 | -0.06494 | -0.00036 |
| HBLMAF | -0.01296 | 0.00311 | -0.00019 | -0.01222 | -0.00060 |
| HBLSF | -0.01302 | -0.15258 | -0.00020 | -0.01358 | -0.00057 |
| JSGF | -0.02045 | 0.00758 | -0.00025 | -0.01976 | -0.00057 |
| JSIF | -0.08536 | -0.08561 | -0.00033 | -0.08339 | -0.00042 |
| JSLCF | -0.01042 | 0.01701 | -0.00017 | -0.01066 | -0.00056 |
| JSVF | -0.01476 | 0.02455 | -0.00016 | -0.01519 | -0.00043 |
| UTP | -0.01824 | 0.03022 | -0.00022 | -0.01819 | -0.00051 |
| NIUT | -0.00398 | 0.00452 | -0.00006 | -0.00428 | -0.00040 |
| NAFAIOF | -0.05184 | -0.10926 | -0.00027 | -0.05261 | -0.00039 |
| NAFAMAF | -0.00887 | -0.01301 | -0.00010 | -0.00952 | -0.00034 |
| NAFASF | -0.00756 | -0.00931 | -0.00012 | -0.00807 | -0.00048 |
| USAF | -0.01542 | 0.01226 | -0.00027 | -0.01476 | -0.00072 |
| AMMF | 0.00533 | -0.00265 | 0.00019 | 0.00570 | -0.00068 |
| MBF | -0.01806 | -0.01159 | -0.00020 | -0.01932 | -0.00045 |
| MIF | -0.00883 | 0.01919 | -0.00015 | -0.00905 | -0.00057 |
| MIIF | -0.06523 | -0.01299 | -0.00028 | -0.06980 | -0.00037 |
| AGHPIMF | -0.04498 | 0.24079 | -0.00026 | -0.04632 | -0.00040 |
| AGHPVF | -0.01486 | 0.25325 | -0.00016 | -0.01547 | -0.00042 |
| AHYS | -0.06046 | -0.15659 | -0.00029 | -0.06462 | -0.00040 |
| AISF | -0.01172 | -0.00796 | -0.00022 | -0.01263 | -0.00065 |
| JSFF | 0.01680 | -0.17319 | 0.00299 | 0.01598 | -0.00159 |
| UGIF | -0.06222 | 0.04516 | -0.00037 | -0.07014 | -0.00051 |
| BMACRSF | -0.02765 | 0.01658 | -0.00031 | -0.02787 | -0.00059 |
| AASSF | -0.01375 | 0.02824 | -0.00017 | -0.01433 | -0.00046 |
| ***Average Open-Ended Funds*** | -0.02654 | -0.00608 | 0.00003 | -0.02758 | -0.00057 |
| **Closed Ended Funds** | | | | | |
| PICICGF | 0.00572 | 0.00164 | 0.00018 | 0.00445 | -0.00079 |
| PICICIF | -0.01669 | -0.01405 | -0.00025 | -0.01757 | -0.00060 |
| GASSF | -0.00968 | -0.00695 | -0.00015 | -0.01068 | -0.00050 |
| ***Average Closed Ended Funds*** | -0.00688 | -0.00645 | -0.00007 | -0.00793 | -0.00063 |
| **Panel B: Average returns and S.D of all mutual funds and Benchmark (KSE-100)** | | | | | |
| | **Average Returns** | **Std. deviation** | | **Average Returns** | **Std. deviation** |
| All mutual funds | 0.0003 | 0.0236 | KSE-100 index (Benchmark) | 0.0006 | 0.0119 |

**Table 2:** Descriptive Statistics

| Measures | Fama's Net Selectivity | Information Ratio | Jenson Alpha Ratio | Sharpe Ratio | Treynor Ratio |
|---|---|---|---|---|---|
| Mean | -0.0006 | -0.0263 | 0.00001 | -0.0253 | -0.0061 |
| Median | -0.0005 | -0.0153 | -0.0002 | -0.0151 | -0.0005 |
| Maximum | -0.0003 | 0.0184 | 0.0037 | 0.0184 | 0.2533 |
| Minimum | -0.0016 | -0.0834 | -0.0004 | -0.0854 | -0.1732 |
| Std. Dev. | 0.0003 | 0.0289 | 0.0009 | 0.0280 | 0.0863 |
| Skewness | -2.4636 | -0.5775 | 3.5355 | -0.5743 | 0.8717 |
| Kurtosis | 9.2354 | 2.1780 | 14.2454 | 2.2872 | 5.8257 |
| Jarque-Bera | 89.4741 | 2.8471 | 249.9811 | 2.5887 | 15.6174 |
| Probability | 0.0000 | 0.2409 | 0.0000 | 0.2741 | 0.0004 |
| Sum | -0.0198 | -0.8958 | 0.0009 | -0.8601 | -0.2071 |
| Sum Sq. Dev. | 0.0000 | 0.0276 | 0.0000 | 0.0259 | 0.2460 |

The descriptive test results are reported in table 2 of the mutual funds' performance measures. The Sharpe, information and Fama's net selectivity measures has negative mean (-0.0253, -0.0263 and -0.0006 respectively) and positive S.D (0.0280, 0.0289 and 0.0003 respectively) but negatively skewed (-0.5743, -0.5775 and -2.4636 respectively) that indicates negative outcome are possible for investors. However, Treynor and Jensen alpha measures has positive S.D but only Jensen alpha have positive mean (0.00001) but both are positively skewed that shows positive outcome are possible for investors.

## 4.1. Relationship among Performance Measures

The correlation results obtained through all five mutual fund performance measures which has been used in this study are shown in table 3. Sharpe ratio is significantly and positively correlated with Jenson alpha and information ratio at ($p<0.05$).

The salient features of present study are that the Treynor ratio is significantly negatively associated to Jenson Alpha ratio at ($p<0.05$). Jenson alpha ration is significantly positively correlated with information ratio at ($p<0.05$). The table outcomes clearly shows that most values are less or negatively correlated. The negative values also confirmed each measure with varying outcomes and also inveterate that no individual fund under or over performed in comparison to other funds by using all these measures. While one-thing which is common for all these mutual fund performance measures that mutual fund industry is significantly under-performs as compared to the Pakistani stock market (as benchmark) during sample period used in this study. Correlation results indicate that though the measures give general associations but it is a weak measure. Therefore, for better association of these measures and causality go for Granger Causality test.

## 4.2. Causality among Performance Measures

Table 4 indicates causal relationship in pair wise manner among the performance measures. Results indicate that Fama's net selectivity granger causes to Information ratio, Jenson Alpha ratio and Sharpe ratio at $p<0.01$ and Treynor ratio at $p<0.05$ level of significance. However, Information ratio and Sharpe ratio granger causes to Treynor ratio at $p<0.10$ level of significance. It means Fama's net selectivity is a major driver in leading the other measures, however Information ratio and Sharpe ratio leads to Treynor ratio as well.

Figure 2 demonstrates the comparative graph of performance measures and movements indicate different perspective behavior for each measures towards each fund. Figure 3 presents the bar chart for overall performance of the mutual funds. Figure 4 reports the ortho-normal loading bi-plot for factor dimensions and loadings of measures and mutual funds.

According to table 5 the performance measures are ranked on the basis of standard deviation and here SD specifies dispersion from the mean value. According to above table Fama's net selectivity is ranked at top with S.D (0.0003) and Jenson Alpha ratio S.D (0.0009) on the second position. However, it is interesting that only Jenson alpha ratio has positive mean value (0.00001). Sharpe is ranked as third on the basis of its characteristics. Further information ratio is ranked at four and Treynor is ranked at fifth position according to risk parameters in Pakistan.

**Table 3:** Correlations Matrix of Performance Measures

| | Fama's Net Selectivity | Information Ratio | Jenson Alpha Ratio | Sharpe Ratio | Treynor Ratio |
|---|---|---|---|---|---|
| Fama's Net Selectivity | 1.000000 | | | | |
| Information Ratio | -0.099631 | 1.000000 | | | |
| Jenson Alpha Ratio | -0.048836 | 0.496534 | 1.000000 | | |
| Sharpe Ratio | -0.106008 | 0.998500 | 0.502989 | 1.000000 | |
| Treynor Ratio | 0.128123 | 0.010999 | -0.388924 | 0.011063 | 1.0000 |

*Significance at 0.05 level

**Table 4:** Panel Pair wise Granger Causality among Ratios for Mutual Fund Portfolios

| Null Hypothesis: | | Obs. | F-Statistic | Prob. |
|---|---|---|---|---|
| Information Ratio → | Fama's Net electivity | 33 | 1.28494 | 0.2660 |
| Fama's Net Selectivity → | Information Ratio | | 17.6919 | 0.00028* |
| Jenson Alpha Ratio → | Fama's Net Selectivity | 33 | 0.93368 | 0.3416 |
| Fama's Net Selectivity → | Jenson Alpha Ratio | | 122.157 | 0.0000* |
| Sharpe Ratio → | Fama's Net Selectivity | 33 | 1.22379 | 0.2774 |
| Fama's Net Selectivity → | Sharpe Ratio | | 18.2575 | 0.0002* |
| Treynor Ratio → | Fama's Net Selectivity | 33 | 0.36409 | 0.5508 |
| Famas Net Selectivity → | Treynor Ratio | | 4.57222 | 0.0408** |
| Jenson Alpha Ratio → | Information Ratio | 34 | 0.25665 | 0.6160 |
| Information Ratio → | Jenson Alpha Ratio | | 0.24651 | 0.6230 |
| Sharpe Ratio → | Information Ratio | 34 | 0.11142 | 0.7408 |
| Information Ratio → | Sharpe Ratio | | 0.08765 | 0.7692 |
| Treynor Ratio → | Information Ratio | 34 | 0.51201 | 0.4796 |
| Information Ratio → | Treynor Ratio | | 3.17057 | 0.0848*** |
| Sharpe Ratio → | Jenson Alpha Ratio | 34 | 0.26743 | 0.6087 |
| Jenson Alpha Ratio → | Sharpe Ratio | | 0.13738 | 0.7134 |
| Treynor Ratio → | Jenson Alpha Ratio | 34 | 0.05087 | 0.8230 |
| Jenson Alpha Ratio → | Treynor Ratio | | 0.18570 | 0.6695 |
| Treynor Ratio → | Sharpe Ratio | 34 | 0.56261 | 0.4589 |
| Sharpe Ratio → | Treynor Ratio | | 2.98672 | 0.0939*** |

*Significant at 0.01 Level
** Significant at 0.05 Level
***Significant at 0.10 Level

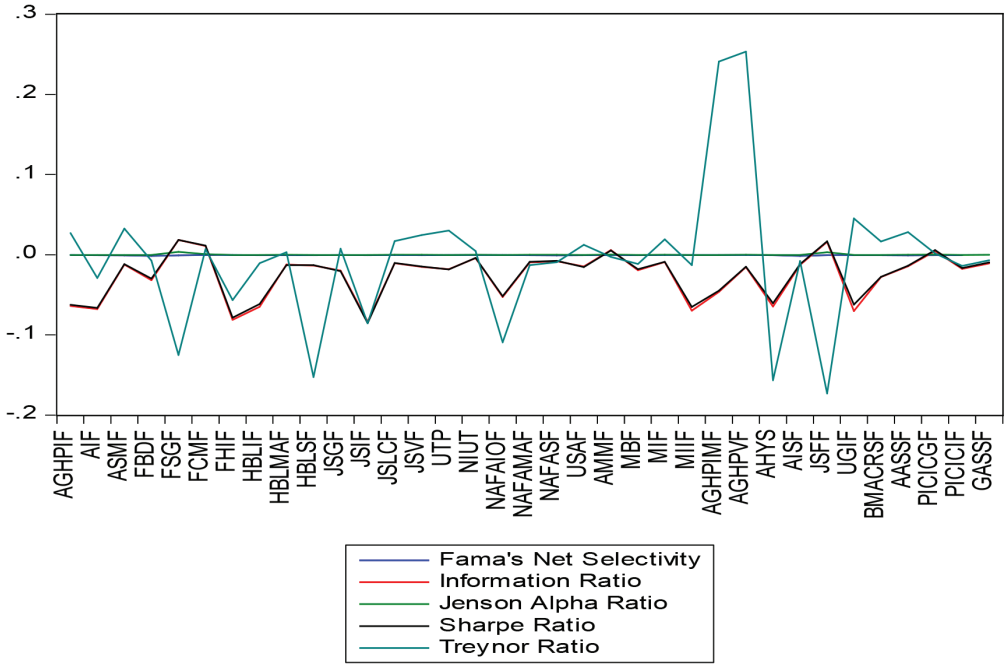



**Figure 2:** Comparative Graph of Performance Measures

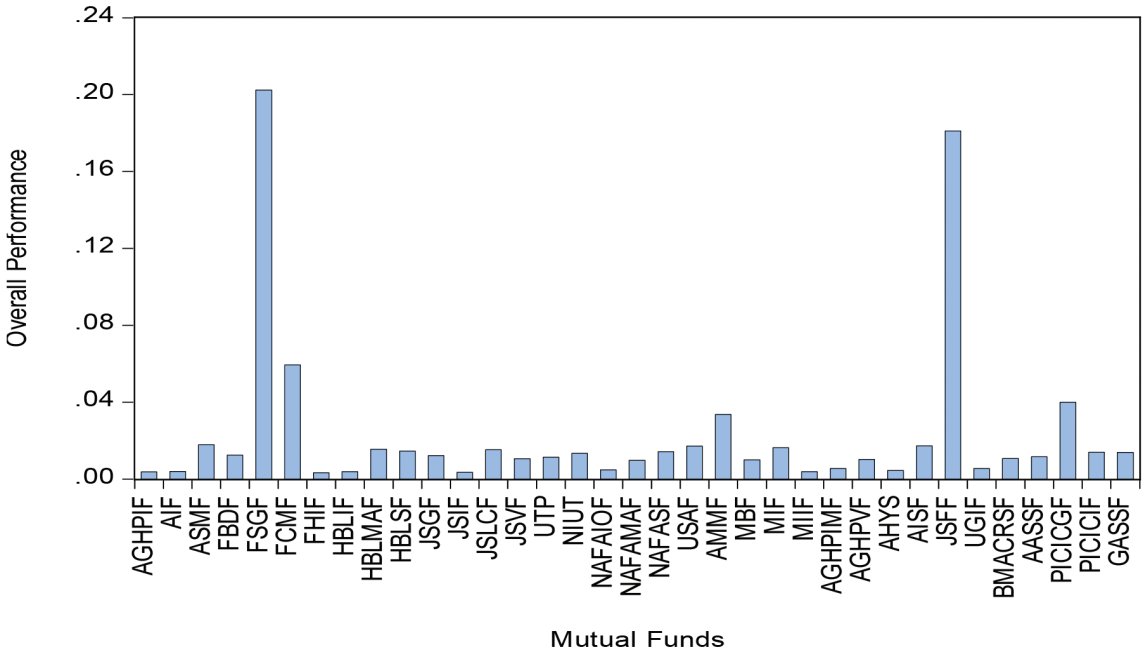



**Figure 3:** Mutual Fund Overall Performance

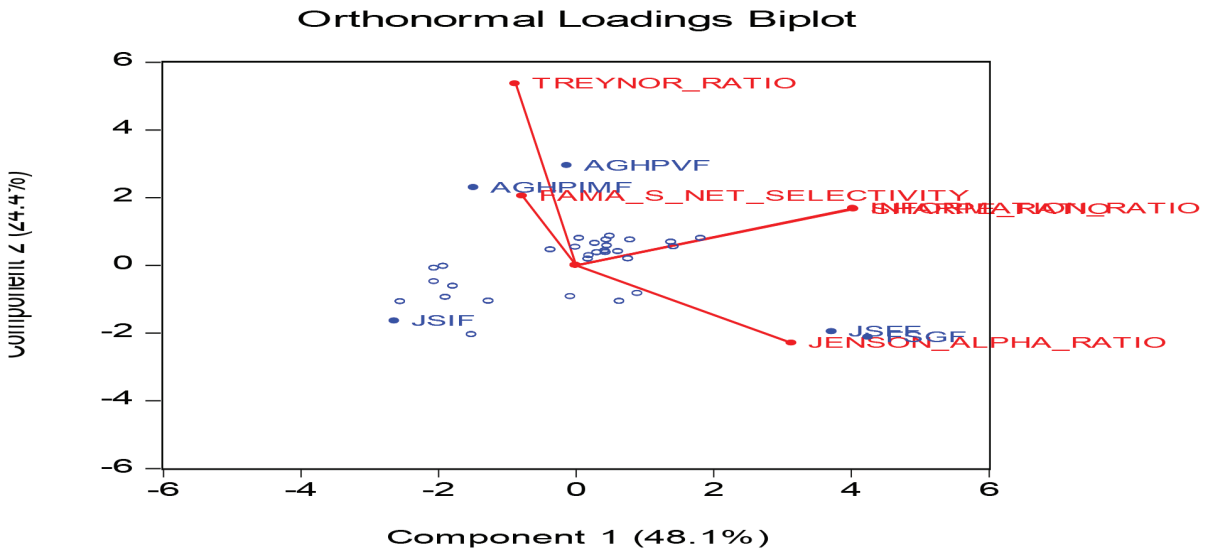



**Figure 4:** Orthonormal Loading Biplot: Factor Dimensions and Loadings

**Table 5:** Performance Measures Ranking

| Mutual Fund Performance Measures | S. D | Mean | Measures Ranking |
|---|---|---|---|
| Fama's Net Selectivity | 0.0003 | -0.0006 | 1 |
| Jenson Alpha Ratio | 0.0009 | 0.00001 | 2 |
| Sharpe Ratio | 0.028 | -0.0253 | 3 |
| Information Ratio | 0.0289 | -0.0263 | 4 |
| Treynor Ratio | 0.0863 | -0.0061 | 5 |

**Table 6:** Performance Matrix for Pakistan

| Performance Measure Ranking | Measures | Risk Consideration | Top 10 Mutual Funds Ranking | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | Fama Net Selectivity | Systematic risk +Total Risk | NAFA-MAF | AGHPIF | HBLIF | FHIF | MIIF | AIF | NA-FAIOF | NIUT | AGH-PIMF | AHYS |
| 2 | Jensen Alpha Ratio | Maket+Portfolio Risk | FSGF | JSFF | FCMF | AMMF | PICICGF | NIUT | NAFA-MAF | NA-FASF | GASSF | MIF |
| 3 | Sharpe Ratio | Total Risk | FSGF | JSFF | FCMF | PICICGF | AMMF | NIUT | NAFASF | MIF | NAFA-MAF | GASSF |
| 4 | Information Ratio | Residual Risk | FSGF | JSFF | FCMF | AMMF | PICICGF | NIUT | NAFASF | MIF | NAFA-MAF | JSLCF |
| 5 | Treynor Ratio | Systematic Risk | AGHPVF | AGH-PIMF | UGIF | ASMF | UTP | AAS-SF | AGHPIF | JSVF | MIF | JSLCF |
| | Average Funds Return | | FSGF | JSFF | FCMF | PICICGF | AMMF | NIUT | NAFA-MAF | NA-FASF | GASSF | MIF |

Table 6 reports the cross-matrix performance of measures and funds rank in accordance with these measures. The result of this table summarizes the whole story of juxtaposition for authenticated version of rankings in Pakistan. The measures rank top 10 of the mutual funds' performance and does not produce alike ranking of the performances. Fama's net selectivity measure is the best in ranking for the following mutual funds as from top one to ten, i.e. NAFAMAF, AGHPIF, HBLIF, FHIF, MIIF, AIF, NAFAIOF, NIUT AGHPIMF, and AHYS by considering systematic and total risk but these results do not match with the average fund returns performance except NAFAIOF. Jensen Alpha measure ranks as 10 best mutual funds with market and portfolio risk and Sharpe measure rank funds with total risk. However, Information ratio utilized residual risk and Treynor measure take systematic risk for ranking these mutual fund performances. However, Jensen, Sharpe and information measures and most results match with the average fund returns performance (without consideration of risk).

At a glance, Jensen alpha measure is the best suitable measure for Pakistani mutual fund evaluation and comparison because it mostly matches with the average returns performance in practical essence. Results of all measures demonstrate that fluctuation in the market is subject to the ranking of open and close-ended mutual funds in the industry. On an average open-ended funds perform better as compared to the close-ended mutual funds with all relevant performance measures. Approximate negative results have been found with all measures that prove dissatisfactory performance for all these funds; however, indicators of better market performance will lead mutual fund industry at its peak performance in near future if risk is managed in a proper domain by the managers and investors in Pakistan. The Pakistani stock market (as benchmark) performs better than mutual fund industry during sample period that are consistent with literature of some recent local studies reported by (Bilawal et al., 2016; Hussain et al., 2016; Naveed & Farooq, 2018) and with some international studies (Sharpe, 1966; Ippolito, 1989; Hendricks et al., 1993; Sirri & Tufano, 1998; Fama & French, 2010; He et al., 2015; Goldie et al., 2019; Martí-Ballester, 2019).

## 5. Conclusion and Implications

The study evaluated Pakistani mutual funds risk-adjusted performance and level of association between well recognized developed mutual fund performance measures over nine-year period. Empirical analysis carried out of open-close ended mutual funds through these performance measures. After evaluation of open-close ended funds risk-adjusted performance the summary statistics concluded that all measures have negative mean except Jenson alpha and are negatively skewed values except Jenson alpha and Treynor ratio. The negatively skewed measures value indicates high negative outcomes are possible for investors and vice versa. Overall benchmark outperformed than mutual fund industry of Pakistan that is in line with US, European and other emerging markets. In terms of association among mutual fund performance measures, Fama's net selectivity is a major driver in leading to other measures but Sharpe and information ratio leads to Treynor ratio as well. Furthermore, performance measures are ranked on the basis of standard deviation that have been documented; Fama's net selectivity is ranked at top, Jenson Alpha holds second position, Sharpe ratio at third on the basis of its characteristics, information ratio at four and Treynor is ranked at fifth position according to risk parameters in Pakistan. Finally, the cross-matrix performance of measures and mutual funds ranking is in accordance with these measures. The result summarizes the whole story of juxtaposition for authenticated version of rankings in Pakistan; and measures ranks top ten mutual funds' performance and does not produce alike ranking of the performances. At a glance, Jensen alpha measure is the best suitable measure in terms of performance and evaluation of Pakistani mutual funds industry as it mostly matches to average fund returns performance in practical essence.

Thus, the study improves literature in terms of outcomes of international comparisons and evaluation increasing understanding of mutual funds performances, managed by fund managers in developing or emerging nations in general and Pakistan in specific. The study objectives have been rationalized by the results and appropriate performance measures has been identified along with the best investable mutual funds available in Pakistan as concluded above one by one. Moreover, level of association among the performance measures and risk return trade-off has been visualized which indicates the role of various risk adjusted measures association within the relevant ratios in a more dynamic way. Investors can have the opportunity to diversify their investments as the results concluded regarding to the various returns and risk association trade-off.

Pakistani mutual fund managers should utilize superior stock selection skills for giving better diversified portfolio for the investors. However, in many domains mutual fund managers did quite good work in generating the positive returns. This may lead to the regaining of the investor's confidence. Pakistan mutual fund has bright future because it is growing marvelous especially in the last decade as multibillion industry and meeting local and foreign investors need to a large extent. It is deemed that if the market is strengthened and a culture of investment is flourished then more local or foreign investors will be attracted to invest in mutual funds.

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