Evaluating Pakistan's Mutual Fund Performance: Validating through CAPM and Fama French 3-Factor Model

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Abstract

Mutual Fund is a choice of investment for the small investors to invest in capital market through skillful professional management. The research paper attempts to validate the Capital Asset Pricing Model and Fama French 3-Factors Model and their preferred suitability in measuring and evaluating the mutual fund performance in Pakistan. The month wise data of one hundred open ended Pakistani mutual funds for the period from 2009 to 2015 is analyzed by both models. The Capital Asset Pricing Model showed significance results for all the portfolios; however the intercepts of this model were found increasing in size, showing poor performance for the high performance portfolios. The Fama French 3-factors model demonstrated poor results for two factors i.e. fund size and fund value, however the market factor showed significant coefficients for all the portfolios. The Gibbon Ross Shanken test was applied to find the best model between the two competing models. This test results revealed that Capital Asset Pricing Model is the preferred model between the two competing models.

Keywords*: Mutual fund, Capital asset pricing model, Fama French 3-factor.*

Introduction

In this modern era of investment most of the investors consider Mutual Fund as a key instrument in the capital market and acknowledge amongst the best profitable investments for the small investors across the world. Mutual funds are fund managing companies that facilitate the small investors in providing profitable business avenues and stock portfolios to invest their savings. Mutual fund has very long history, having its traces from Netherlands in 1774, followed by North America in 1924 and soon became the vital pool of investments around the world. The first Mutual Fund in Pakistan was introduced in 1962 by Investment Corporation of Pakistan and soon it got momentum as an attractive industry reaching today to 170 open ended and close ended Funds (MUFAP). This growth in the industry is a sign of investors' trust that motivates the new

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investors to invest in mutual Fund as it is considered low risk and safer investment. Pakistan holds around 1.4 % assets of Mutual Fund of the world total Mutual fund assets (Bhatti et al, 2015). Pakistan Mutual fund industry is a rich industry in term of its range of funds. Various Mutual Fund categories are; Equity Fund, Fund of Fund, Money market Fund, Capital protected Fund, Balanced Fund, Index tracker Fund, Income Fund and Islamic funds are traded in Pakistan (MUFAP).

Over the years there have been many tools and many measures used for analyzing the performance of Mutual funds. In early days the researcher Sharp (1964) analyzed the stock performance through established ratio. After the introduction of Sharp ratio, Jenesen (1967) introduced Capital Asset Pricing Model, also known as CAPM for the performance analysis of stocks or funds.. The CAPM describes the relationship between risk and expected return and that is used in the pricing of risky securities. The model uses alpha to measure whether the stock or fund outperforms or underperforms the market and denotes as follow:

$$\overline{r_a} = r_f + \beta_a \left(\overline{r_m} - r_f \right)$$

Where:
r_f = Risk free rate
β_a = Beta of the security
$\overline{r_m}$ = Expected market return

After the single factor model developed by Jensen (1967), it was extended to 2-factors and 3- factors models by Fama French (1993). Later on this asset pricing model was extended to 4-factor by Carhart (1997) who introduced another factor of momentum in the Fama French 3- factors model which was covering only size factor and value factors. All of these models have been widely used across the globe in measuring the performance of mutual funds, especially in developed countries. Besides these techniques, models like Data envelopment analysis (DEA), market timing, linear programing and some other techniques are also used for measuring the performance of mutual funds. In Pakistan most of the studies related to mutual funds 'performance are old and traditional in nature and very limited researchers have tested the mutual funds performance through competing models (Sipra, 2006; Afza & Rauf, 2009; Nazir & Nawaz, 2010). They all used traditional methods while evaluating the performance of Mutual Fund in Pakistan such as; sharp ratio, Treynor Ratio, and Jensen alpha.

None of the study is found which has used modern methods in evaluating Mutual fund performance in Pakistan. Then also emerges a question about the validity of modern methods to the Mutual Fund

performance in Pakistan. To fill up the gap this study is conducted to evaluate, measure and test mutual fund performance in Pakistan through the competing models i.e. CAPM and Fame French 3-factors models to predict and explain that which one better predicts the funds' portfolios returns. Hence the research aimed to achieve following objectives:

  i). To measure and evaluate the mutual fund performance through competing models i.e. CAPM and Fama French-3 factor models.
  ii). To Test and investigate the validity of these models in measuring Pakistani mutual funds' performance and determine which model better explain mutual fund performance.

Literature Review

Mutual Fund offers vide area of research investigations. Many researchers have contributed in the area of Mutual Fund in term Mutual Fund performance. Sharp (1964) introduced Capital Asset Pricing theory formally known as a CAPM. The same model was used by researcher like Linter (1965), Treynor (1965) and Mossin (1966). Treynor (1965) investigated the impact of market on portfolio return. Jenesen (1968) found the association of funds performance to particular benchmark. He found that fund having positive alpha outperform market. Carleson (1970) investigated the fund return through regression and fund that majority of fund outperform market return. Modest (1987) tested the Jensen (1968) model and reported that selected portfolio return are very sensitive. Murthi et al (1997) investigated the efficiency the investment funds through DEA Technique and found that some of the portfolios of fund were quite efficient in performing. Fama French (1993) used 2-factor and 3-factor model for the performance evaluation of funds and found different results for market factor, size factor and value factor. He found that value and size factors also affect the fund performance significantly rather than the market factor. The same model was applied by Caietal (1997) and found that market factor better explain the funds return than value and size factor. The researcher found results different from the previous researcher in term of size and value factor. Unlikely the previous researchers, Carhart (1997) used 4-factors model for the performance evaluation of funds and stock portfolio. The researcher evidenced similar results for the market, value and size factor, very much inconsistent with that of Fama French (1993). He added one new factor of momentum, which can affect the funds return. He found that the fund outperform the market in term of all its four factors. The same 4-factor model was tested by Otten & Bams (2002) and found similar results for the first three factor very much consistent with the findings of Carhart (1997) but only found results in contrast for its momentum factor in which he evidenced poor performance by the funds. In a similar study the funds were found outperform market in term of all 4- factors, there

by documenting the results of the previous researchers, who found that all equity funds outperform the market in term of market factor, size, value and momentum factor EGB (2004).

Pakistan is a developing country and here most of the research in the field of mutual fund is carried out through the most traditional measures. Saeed (2004) analyzed mutual fund performance and evidenced that most of the funds do not outperform the market return, however majority of the fund showed positive return. The similar findings were documented in the evaluation of balance and equity funds (Sipra, 2006). However, some of the researchers in contrast found, funds outperforming the market return for the equity funds using the same traditional Sharp Ratio (Sipra, 2006; Nazir & Nawaz 2010). Afzal (2009) analyzed fund performance using Treynor Ratio and evidenced positive return for majority of the funds. In the similar study using same Treynor Ratio non-significant results were found for most of the funds, there by documenting that most of the funds do not capture the market variations. Arshad (2013) stated that funds characteristics have greater impact on funds return. He calculated adjusted return through Sharp and Treynor ratios. However in contrast to the traditional ratios Bhatti et al (2015) generated alpha through Capital asset pricing model and found that most of the high return portfolios do not capture the market variation well as compared to low performing portfolios. This research show that there is need of using more competing and sophisticated evaluation methods or comparing the existing ones to find the best results as for as evaluation of Mutual Fund is concerned. Therefore, the research aims to test the following hypotheses:

H0: Both models i.e. CAPM and Fama French-3 factor models do not equally predict and explain mutual fund performance in Pakistan.

H1: Both models i.e. CAPM and Fama French-3 factor models equally predict and explain mutual fund performance in Pakistan.

Research Methodology

This is a causal and correlational study as mutual funds' portfolios returns have been adjusted with market, size and value factors of the overall market premium. The total 153 open ended mutual funds traded on MUFAP are the population of the study. The one hundred open ended mutual funds were randomly selected. The following steps are used in the analysis of this study.

i). The daily data of one hundred open ended mutual funds have been collected from the MUFAP data base for the period 2009 to 2015.

ii). The T-bills 12 month rate collected for the said period and merged with mutual fund data.

iii). Then collected the data of KSE- 100 index from 2009 and collected the data of stock prices for calculating the SMB and HML factors.

iv). Converted the daily share prices data to monthly and merged with stock financial data.

v). Created market capitalization and market to book ratio. Generated size and BM rankings of firms in each year, size had two groups, Big and Small, B/M had three groups, Low, Medium, and High.

vi). Generated six portfolio returns in each month. Portfolios are BL, BM, BH, SL, SM, SH, where B is for Big size and S is for Small Size, L, M, and H are for Low, Medium, High B/M ratios. Generated SMB and HML factors, as SMB = (SL + SM + SH)/3 - (BL + BM + BH)/3, and HML = (SH + BH)/2 - (SL + BL)/2 .

vii). Created ten portfolios of mutual funds on the basis of their cumulative last one year returns, where lowest returns mutual funds are placed in Portfolio1 and mutual funds with highest returns are placed in Portfolio10.

viii). Time series regression has been applied.

Research Models

The Models used for the analyses are CAPM and Fama French -3 factor as explained below:

CAPM
This model has been used by Huiji & Verbeek (2005) and EGB (2004).
$(Ri-Rf) = \alpha + \beta(Rm-Rf) + \varepsilon$…………………………………1
Where
(Ri- Rf) represents the actual risk premium on a given stock
$\beta(Rm- Rf)$ represents the expected risk premium as suggested by CAPM, α is the intercept.

Fama French 3-Factor Model
EGB (2004) and Huiji &Verbeek (2006) tested this model in their mutual fund performance evaluation studies.
$(Ri-Rf) = \alpha+ \beta_1(rm-rf) + \beta_{2(SMB)} + \beta_{3(HML)} + \varepsilon$ ………………..2
(Ri-Rf) denotes the actual risk premium on a given stock

SMB represents the monthly premium of the size factor. It is the difference in return on a portfolio that consists of small caps funds and those that contain large caps funds. HML represents the monthly premium of the book to market factor. Or it has been calculated as the

difference in return between a portfolio of high book to market stock and a portfolio of low book to market stocks. α is the intercept.

Data Analysis
Mutual Fund Performance Analysis through CAPM

Table 1: CAPM

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	portfoio1	Portfolio2	portfolio3	portfolio4	portfolio5	portfolio6	portfolio7	portfolio8	portfolio9	portfolio10
rm_rf	1.055***	1.765***	1.324***	0.622***	0.790***	2.123***	1.897***	3.555***	5.765***	9.770***
	(0.232)	(0.322)	(0.399)	(0.143)	(0.211)	(0.514)	(0.419)	(0.765)	(0.644)	(1.888)
Constant	0.001	0.018	0.032	0.041***	0.067***	0.032	0.078***	0.066**	0.123***	0.324**
	(0.016)	(0.029)	(0.030)	(0.008)	(0.020)	(0.037)	(0.031)	(0.057)	(0.019)	(0.087)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The table 1 is showing the results of CAPM. The results indicate that almost all portfolios return significantly related to market factor. All the portfolios from P1 to P10 have significant coefficients, however the portfolios of higher return do not properly explain and predict as its intercepts are bigger in values as compared to low perform portfolios.. The portfolios with high return have significant intercept but high as compared to the low return portfolios. The results indicate that CAPM perform poorly in explaining portfolios with higher return. As the intercept if zero or closer to zero means that return of that portfolio is better explaining the market factor. So funds with higher return are not well predicted by the CAPM meaning that the fund managers do not cope well capturing the market variation.

Table 2: Fama French 3-Factor Model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	portfolio1	portfolio2	portfolio3	portfolio4	porfolio5	portfolio6	portfolio7	portfolio8	porfolio9	portfolio10
rm_rf	0.987***	1.547**	1.084**	0.553***	0.874**	2.098***	1.786***	3.564***	6.012***	10.899***
	(0.231)	(0.621)	(0.480)	(0.235)	(0.333)	(0.564)	(0.544)	(0.977)	(0.774)	(2.044)
SMB	0.112	-0.178	0.178	0.310*	-0.045	0.670	1.077**	1.909**	0.342	1.781
	(0.423)	(0.676)	(0.643)	(0.676)	(0.348)	(0.540)	(0.877)	(0.867)	(2.982)	
HML	-0.787**	-1.343*	-0.904*	-0.164	-0.423	-1.028	0.041	0.324	-0.234	-1.197
	(0.223)	(0.779)	(0.667)	(0.143)	(0.326)	(0.761)	(0.530)	(0.902)	(0.870)	(1.900)
Constant	0.034	0.034	0.071*	0.032***	0.067*	0.067	0.078***	0.123**	0.217***	0.427***
	(0.016)	(0.041)	(0.032)	(0.019)	(0.021)	(0.041)	(0.031)	(0.060)	(0.050)	(0.135)

The table 2 indicates the results of 10 decile portfolios defined and explained by Fama French 3-factor model. The results showing significant results for the market factor, as the coefficients are mostly significant. However the intercepts of both SMB and HML factors are

mostly insignificant. It means that size and value factors have not sufficient explanatory power. Therefore, it is suggested that Fama French model do not offer proper explanation and prediction of mutual fund performance in Pakistan.. The intercepts of all 10 portfolios tend to increase as we move from Portfolio 1 to Portfolio 10.

Validation of the model through GRS
This test was first introduced and applied to the funds and investment portfolio analysis by Gibbon, Ross & Shanken (1989). The same model was applied to predict and compare the competing models results (EGB, 2004, Huiji &Verbeek, 2006)

Table 3: GRS Test

GRS tests Mean Absolute Intercepts and Returns Dispersions								
Factors	GRS_F-test	P-value	GRS-Wald	P-value	Mean Abs. Alpha	A|ai|/A|ri|	A(a2i)/A(r2i)	Avg. Adj R2
10- Returns portfolios								
rm_rf	5.0536	0	125.7887	0	0.0454	0.626596	0.4537	0.2006
rm_rf ,SMB, HML	8.6754	0	181.8776	0	0.0765	0.982003	1.3421	0.2190

The table 3 showing the results of GRS test. The test has been applied to find out which model between the two better explain and predict mutual fund performance in Pakistan. GRS tests whether the combined intercepts of 10 regressions are equal to zero. If the intercepts are equal to zero, then the model is a good model. However, the above statistics show that none of the models can sufficiently explain mutual funds returns, however CAPM perform better as compare to Fama French 3-Factor model as its mean absolute alpha is closer to zero.

Conclusion
Mutual Fund is a vital investing instrument for the small investors across the world. Mutual fund facilitates small investors to get the benefits of capital investment through skillful and professional management. This research paper attempts to find the most suitable model in measuring the mutual fund performance in Pakistan. The monthly data of one hundred open ended mutual funds, selected randomly were analyzed. The study analyzed the sample funds for the period 2009 to 2015.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES		portfolio2	portfolio3	portfolio4	porfolio5	portfolio6	portfolio7	portfolio8	porfolio9	portfolio10
rm_rf	0.987***	1.547**	1.084**	0.553***	0.874***	2.098***	1.786***	3.564***	6.012***	10.899***
	(0.231)	(0.621)	(0.480)	(0.235)	(0.333)	(0.564)	(0.544)	(0.977)	(0.774)	(2.044)
SMB	0.112	-0.178	0.178	0.310*	-0.045	0.670	1.077**	1.909**	0.342	1.781
	(0.423)	(0.676)	(0.643)	(0.676)	(0.348)	(0.861)	(0.540)	(0.877)	(0.867)	(2.982)
HML	-0.787**	-1.343*	-0.904*	-0.164	-0.423	-1.028	0.041	0.324	-0.234	-1.197
	(0.223)	(0.779)	(0.667)	(0.143)	(0.326)	(0.761)	(0.530)	(0.902)	(0.870)	(1.900)
Constant	0.034	0.034	0.071*	0.032**	0.067***	0.067	0.078***	0.123**	0.217***	0.427***
	(0.016)	(0.041)	(0.032)	(0.019)	(0.021)	(0.041)	(0.031)	(0.060)	(0.050)	(0.135)

Standard errors in parentheses
*** *p<0.01, ** p<0.05,p<0.1*

CAPM and Fama French 3-factor model applied to generate results. The CAPM was found, showing significance results for all of its portfolios; however the intercepts of this model were found increasing in size, showing poor performance for the high performance portfolios. The Fama French 3-factor model showed poor results for both size factor and value factor; however the market factor showed significant coefficients for all the portfolios. The GRS was applied to find the best model between the two competing models. The GRS revealed that CAPM is the preferred model between these two competing models. The CAPM results evidenced, that the majority of Mutual Funds do not properly capture the market variation in Pakistan. The findings of this study supports previous studies findings, who also evidenced, a good investing strategy of the fund managers considering the market variations as for as market factor is concerned (EGB, 2004, Huiji &Verbeek, 2006; Afza & Rauf, 2009, Nazir & Nawaz, 2010). The CAPM explain the Mutual Fund performance better in Pakistan, However Fama French 3-Factor model evidenced poor results for the funds' portfolios, which declares that the fund managers in Pakistan do not capture well the size and value factor of the overall market premium. These results of Fama French 3-factor model are in contrast to the findings of some previous researcher who explored the mutual fund performance in developed world and found the fund's managers capturing well the value and size factor as well (EGB, 2004, Huiji & Verbeek, 2006). In future similar studies if to be conducted in Pakistan are recommended to apply Carhart 4-factor and Fama French 5-factor model in evaluation and measurement of Mutual Fund performance and Close Ended Mutual Funds to be analyzed in the same study, in order to provide clear picture of both kinds of funds.

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