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MEASURING PERFORMANCE OF MUTUAL FUND MANAGERS THROUGH PARAMETRIC AND NON-PARAMETRIC TESTING

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ABSTRACT

This paper analyses the performance of mutual fund managers during January 1995 to June 2010. Using the single period performance measures, i.e., the parametric measures, which are the three measures of skill: outperformance (Jensen's Alpha), the selectivity skill (Treynor and Mazuy's Alpha) and the market timing skill (Treynor and Mazuy's Beta 2), the empirical results illustrate no persistence in performance. Therefore, it is shown that mutual fund managers did not exhibit the skills to consistently outperform the market.

Furthermore, using the two period performance (persistence) analyses, i.e., the non-parametric measures, which were the Cross Product Ratio, Z-Test and Chi-Square statistic, the empirical results illustrate no persistence in performance and that mutual fund managers did not exhibit the skills to consistently outperform the market before the financial crisis (January 1995 to December 2006) and after the financial crisis (January 2007 to June 2010).

Key Words: Mutal Fund, Performance, Parametric

INTRODUCTION

Mutual fund is an investment vehicle wherein money, from many investors, is pooled together which is then managed by an expert manager. Theoretically, a mutual fund should produce better results in terms of wealth maximization for investors. The recent immense growth in the number of mutual funds and in the volume of money managed by these funds implies the liking of investors for this instrument of investment. With so many mutual funds emerging in the market, investors will opt for those where their wealth is efficiently managed; that is to say, earn maximum return while bearing minimum risk. This notion of efficient management necessitates gauging the performance of mutual funds.

In this paper, performance of mutual funds is analyzed via data collected between January 1995 and June 2010. Main objective is to investigate any existence of outperformance on the part of mutual fund managers in Pakistan and whether these fund managers possess necessary skills to identify the winning funds and to outperform the market, that is, earn excess return over and above that of the market and whether the outperformance was due to luck or superior skills.

Furthermore, the data has been split into two periods to identify whether there has been two period performance persistence, by comparing the performance of the mutual fund prior to 2007 (before the financial crisis) and post 2007 (during and after

the financial crisis). Additionally, mutual funds employ a wide variety of investment schemes as per the objectives of their managers and investors. To name a few, these investment methodologies include Global macro, directional, event- driven, relative value (economic), and the list goes on as new categories of investors pour in. Mutual funds must act in accordance with many of the same legal and regulatory restrictions as other institutional participants.

Investors typically seek to maximize their return whilst minimizing their risk. Mutual funds enable them to do so. Given the risks associated with investing in mutual funds, investors often utilize risk management strategies to minimize their exposure to risk. Furthermore, by investing in mutual funds, investors are able to diversify their portfolios.

It is also deemed useful to measure the performance of these mutual funds. However, historic information regarding fund performance is not easily available. This can pose to be detrimental in assessing fund performance. If data is available, one can assess the performance of funds based on the assessment of risk versus return, through measures such as the Sharpe Ratio (SR), Treynor and Mazuy's (TM) measure and Jensen's Alpha, all of which will be discussed later.

The paper is structured as follows: Section 2 discusses a brief literature review, Section 3 discusses the methodologies of performance assessment, Section 4 highlights the empirical results and Section 5 details some concluding remarks.

LITERATURE REVIEW

Cesari and Panetta (2000) investigated the performance of Italian equity funds between 1984 and 1995. They made use of the Treynor and Mazuy estimates of alpha and beta to identify the selectivity and market timing skill respectively. Cesari and Panetta (2000) showed that the Italian capital market was efficient over the period studied.

Jordao and De Moura (2010) analyzed the performance of Brazilian mutual funds between January 2000 and August 2009. They also utilized the Treynor and Mazuy estimates of alpha and beta to identify the selectivity and market timing skill respectively. Jordao and De Moura (2010) showed that the Brazilian mutual funds market was efficient over the period studied.

Pruchnicka-Grabias (2009) examined the performance of 20 mutual funds during the period 2007-2008. They made use of the Treynor and Mazuy estimates of alpha and beta to identify the selectivity and market timing skill respectively. Pruchnicka-Grabias (2009) illustrated that the mutual funds market was efficient over the period analyzed.

Although this paper focuses on the Treynor and Mazuy's alpha and beta two and the Jensen's alpha to indicate mutual fund managers' performance, Gupta et al (2003) evaluate the performance of mutual funds using conditional approaches and GMM. Gupta et al (2003) tried to utilize conditional approaches because as much as the Treynor and Mazuy's alpha and beta two and the Jensen's alpha are the most common, these measures are best suited when the returns are normally distributed and without

autocorrelation, which we know does not always play out in reality. Interestingly, the results of their study are similar irrespective of whether they use Jensen's alpha or conditional approaches. Furthermore, Gupta et al (2003) show that the estimated alphas are very close to the true alphas and therefore concluded that mutual fund managers do actually possess the necessary skills to ensure persistent performance. However, Gupta et al (2003) highlight that the mutual fund managers, as per their study, lacked the market timing skill.

Capocci and Hübner (2004) investigate mutual funds performance using various asset pricing models. Of particular relevance to this paper, was Capocci and Hübner (2004) examination of mutual fund performance for several different strategies and different sub-periods, including the Asian Crisis period. Capocci and Hübner (2004) are able to show that there is limited existence of persistence performance. Capacci et al (2005) test the performance of mutual funds in a market where bullish and bearish trends were evident. Capacci et al (2005) illustrate that mutual fund managers were able to outperform the market. Furthermore, the results from the study indicate persistence performance, which Capacci et al (2005) hypothesizes is owing to "extreme adaptability and a very active investment behavior".

However, parametric testing of persistence in mutual fund performance tends to exhibit several weaknesses when matched with nonparametric testing (see, for example, Cuthbertson, Nitzsche and O'Sullivan, 2010). Jiang (2003) illustrates numerous improvements in nonparametric testing of mutual fund performance including unconditional distribution for parameter estimates and robustness to diverse information structures. Data envelopment analysis (Barros and Garcia (2006) and Eling (2008) and cross product ratio analysis (Brown and Goetzman (1995) are the two common approaches used in literature on nonparametric testing of mutual funds performance.

METHODOLOGY

Performance measurements are based on the basic capital asset pricing model (CAPM) of Sharpe (1958). It is also worth mentioning that in an efficient market a fund manager through active management has no chance of out classing the common perception of market participants about the risk and return expectations. CAPM in excess return form can be given as;

$$Rit - Rf = \alpha + \beta i1\,(Rmt - Rf) + \varepsilon it \qquad (1)$$

Where, Rit is the return on asset i at time t, Rf is the risk free rate, α is a measure of fund manager's skills, $\beta i1$ measures the co-efficient or market loading factor, εit is the random effect.

When α in (1) is statistically equal to zero, market participants are thinking on the same lines about prices which means no pricing strategy will yield abnormal returns. Statistically, to bring the value of alpha different from zero a fund manager will try to explore any opportunity, if it exists, of yielding above normal return. Following will

simplify the interpretation of alpha values;

a. Positive alpha values suggest positive excess returns could be earned by going long
b. Negative alpha values suggest positive excess returns could be earned by going short

Outperformance is either a result of superior methodology by the manager or luck. However, outperformance through luck lacks consistency in contrast to the consistent results of outperformance employing skills by a fund manager.

Single Period Performance Measures: Parametric Measures

Returns of a skilled manager in comparison to market returns will not be linear. For this non liner relationship we may take help of the following;

$$Rit - Rf = \alpha + \beta i1\ (Rmt - Rf) + \beta i2\ (Rmt - Rf)\ 2 + \varepsilon it \qquad (2)$$

According to Admati et al (1986), alpha is interpreted as the selectivity component of performance and βi2 (Rmt – Rf) 2 is the timing component of performance. Outperformance on the part of a skilled manager could be judged using Jensen's Alpha. The manager's selection ability can be evaluated by Treynor and Mazuy's alpha while the timing ability could be evaluated using Treynor and Mazuy's beta two (Treynor and Mazuy, 1966). Slope of the efficient portfolio frontier is referred to as the Sharpe ratio (SR). Sharpe ratio is another measure of performance and provides this measurement on risk adjusted basis. It is the difference between the rate of return on the asset and the risk free asset, adivided by the standard deviation of the asset, as illustrated below;

$$SR = \frac{E\ (Rit - Rf)}{\sigma} \qquad (3)$$

Two Period Performance (Persistence) Analyses:

Non -Parametric Measures

Continuation of consistent outperformance over long period will confirm that manager has skills to constantly do better than (beat) the market. Portfolio manager is an outperformer (O) if his/her investment method produces a performance measure (SR or TM) greater than the median of all measures (SR or TM) in that asset group; and an underperformer (U) otherwise. Two period persistence analyses are conducted as follows;

Contingency table of Os and Us is used for classification. Persistence in this context relates to fund managers that are Os in two consecutive periods (monthly and quarterly returns): OO, Us in two consecutive periods: UU, Os in the first period and Us in the second period are denoted by OU and UO vice versa. Cross product ratio (CPR), as

posited by Christensen (1990) and the Chi-Square test statistic can be utilized to identify consistency in performance of portfolio managers. The CPR is given by;

$$CPR = (OO \times UU) / (OU \times UO) \qquad (4)$$

CPR is the proportion of funds which show consistency in performance to those which are not consistent. We will test the null hypothesis of no consistency, i.e., CPR exhibits unity.

Secondly Chi-Square ($\chi 2$) is used which is given by;

$$\chi 2 \text{ cal} = \underset{D1}{(OO - D1)2} + \underset{D2}{(OU - D2)2} + \underset{D3}{(UO - D3)2} + \underset{D4}{(UU - D4)2} \qquad (5)$$

Where $D1 = \{(OO + OU) \times (OO + UO)\}/N$, $D2 = \{(OO + OU) \times (OU + UU)\}/N$, $D3 = \{(UO + UU) \times (OO + UO)\}/N$, $D4 = \{(UO + UU) \times (OU + OO)\}/N$

Calculated value $\chi 2$ can then be compared with the tabulated value of $\chi 2$ with one degree of freedom. To reject the null hypothesis, or otherwise, we can use Z – Statistic which is given by;

$$Z - \text{Statistic} = \text{Ln CPR} / \sigma \text{ Ln CPR} \qquad (6)$$

$$\text{Where, } \sigma \text{ Ln CPR} = \sqrt{\{(1/OO) + (1/OU) + (1/UU) + (1/UO)\}}$$

For example, we can conclude, with 0.95 confidence level, that statistically significant consistent performance is exhibited if the calculated value of Z-Statistic is greater than 1.96.

EMPIRICAL RESULTS

Data was collected for the mutual fund returns for the period January 1995 to June 2010. Building on from previous investigations conducted, this study includes all strategies that mutual fund managers could have deployed. In order to compare performance to that of the market, data was also collected for the returns of the market as well as a treasury bill which was used as a benchmark for a risk free rate.

In an attempt to explore the persistence of the performance of the fund managers, this paper looks at the returns of the fund before the financial crisis i.e. from January 1995 to December 2006 and returns on the fund during and after the financial crisis i.e. from January 2007 to June 2010. Given that the dataset includes two subsets of data i.e. before and after the financial crisis, only the two period performance (persistence) analyses were conducted. Table I illustrates the contingency table depicting the outperforming (O) and underperforming (U) portfolios before and after the financial crisis. The CPR is 0.28 and Z-Statistic is 1.46475. The null hypothesis is that there is no

persistence in performance. At the 0.01, 0.05 and 0.10 significance levels, one will not reject the null hypothesis, given that the z- statistic lies within the range of the two tail z-score. Given this, one can say with 0.99 confidence that the fund managers did not exhibit persistence in performance before and after the financial crisis and therefore, the fund managers do not possess the skill to persistently outperform the market and that the OO outcomes were based solely on luck, rather than skill.

Table I: Contingency Table – Jensen Alpha

Jensen Alphas						
Period 1				Period 2		
Fund	Alpha	Median	O/U	Alpha	Median	O/U
AKD_AF	0.88053	0.88053	O	1.0206	1.0206	O
ALF_AF	0.68274		U	1.0688		O
PAK_AF	1.23985		O	0.6591		U
ALF_AA	0.62351	0.62351	O	0.6801	0.9684	U
AM_AA	0.563		U	0.9684		O
ASK_AA	1.5989		O	1.1628		O
AHL_AA	0.6234		U	1.3831		O
JS_AA	0.9393		O	0.2517		U
AKD_IF	0.3129	0.37685	U	1.5868	1.4395	O
JS_IF	0.4391		O	1.3487		U
KAS_IF	0.3146		U	1.5303		O
UBL_IF	1.4998		O	0.9728		U
ASK_EQ	0.54641	0.514435	O	0.6758	0.7427	U
KAS_EQ	0.45587		U	0.7289		U
PAK_EQ	0.6516		O	1.09489		O
UBL_EQ	0.48246		U	0.7565		O
AM_IE	0.47828	0.43573	O	0.27771	0.324805	U
ASK_IE	0.39318		U	0.3719		O
KAS_IE	0.79302		O	0.43269		O
UBL_IE	0.35118		L	0.24636		U
NIT	0.75572	0.75572	O	0.5808	0.5808	O
ALF_GF	0.759275	0.645145	O	0.69884	0.352355	O
JS_GF	0.55709		U	0.36372		O
NAF_GF	0.61162		U	0.34099		U
UBL_GF	0.67867		O	0.14355		U

Table II: $\chi 2$ Test

D_1	7.84
D_2	6.16
D_3	6.16
D_4	4.84
χ^2	2.23

Alternatively, using $\chi 2$ data were calculated in Table II. At the 0.01, 0.05, and 0.10 significance level, one will not reject the null hypothesis, given that the chi square statistic is less than the associated critical values. Given this, one can say with 0.99 confidence levels that the fund managers did not exhibit persistence in performance before and after the financial crisis and therefore, the fund managers do not possess the skill to persistently outperform the market and their outperformance were based solely on luck, rather than skill.

Table III illustrates the contingency table depicting the outperforming (O) and underperforming (U) portfolios before and after the financial crisis based on alpha and beta 2 of equation (2). The CPR is again 0.28 and Z-Statistic is 1.46475. The null hypothesis is that there is no selection ability on part of the fund managers. At the 0.01, 0.05 and 0.10 significance levels, one will not reject the null hypothesis, given that the z-statistic lies within the range of the associated two tail z-score. Given this, one can say with 0.99 confidence level that the fund managers did not exhibit superior investment selection skills before and after the financial crisis.

Alternatively, using $\chi 2$ data calculated were same as that of Table II. At the 0.01, 0.05, and 0.10 significance level, one will not reject the null hypothesis, given that the chi square statistic is less than the associated critical values. Given this, one can say with 0.99 confidence level that the fund managers did not exhibit persistence in superior selection before and after the financial crisis and therefore, the fund managers do not possess the skill to persistently select better than market portfolios and their outperformance was based solely on luck, rather than skill.

Table IV illustrates the contingency table depicting the outperforming (O) and underperforming (U) portfolios before and after the financial crisis based on market timing ability. The CPR is calculated to be 9.78 and Z-Statistic is 2.42705. The null hypothesis is that there is no market timing ability on part of the fund managers. At the 0.01 significance level, one will not reject the null hypothesis, given that the z- statistic lies within the range of the associated two tail z-score. Given this, one can say with 0.99 confidence level that the fund managers did not exhibit superior market timing skills before and after the financial crisis. However, at the 0.05 and 0.10 significance levels, one will reject the null hypothesis, given that the tabulated z-scores are less than the calculated z-score. Therefore, fund managers show persistence in market timing ability and our claim is supported at 0.90 to 0.95 confidence levels.

Alternatively, using $\chi 2$ data calculated were same as that of Table II except for chi-square calculated which in this case 1.270 is. At the 0.01, 0.05, and 0.10 significance level, one will not reject the null hypothesis, given that the chi square statistic is less than the associated critical values. Given this, one can say with 0.99 confidence level that the fund managers did not exhibit persistence in market timing ability before and after the financial crisis and therefore, the fund managers do not possess the skill to time the market and their outperformance was based solely on luck, rather than skill.

Table III: Contingency Table – Alpha & Beta 2 of Equation (2)

Alpha & Beta 2								
	Period 1				Period 2			
Fund	Alpha	Beta 2	Median	O/U	Alpha	Beta 2	Median	O/U
AKD_AF	0.88053	-0.07963	0.88053	O	1.0206	0.308	1.0206	O
ALF_AF	0.668274	-0.12383		U	1.0688	0.1332		O
PAK_AF	1.23985	-0.08653		O	0.6591	0.1062		U
ALF_AA	0.62351	-0.22506	0.62351	O	0.6801	0.03469	0.9684	U
AM_AA	0.563	0.546		U	0.9684	0.4514		O
ASK_AA	1.5989	0.1979		O	1.1628	0.6362		O
AHL_AA	0.6234	0.6871		U	1.3831	0.371		O
JS_AA	0.9393	-1.3146		O	0.2517	-0.6355		U
AKD_IF	0.3129	0.2151	0.37685	U	1.5868	0.553	1.4395	O
JS_IF	0.4391	0.2976		O	1.3487	0.4395		U
KAS_IF	0.3146	0.4307		U	1.5303	0.53		O
UBL_IF	1.4998	0.5599		O	0.9728	0.9118		U
ASK_EQ	0.54641	-0.14161	0.514435	O	0.6758	0.1802	0.7427	U
KAS_EQ	0.45587	-0.03426		U	0.7289	0.2152		U
PAK_EQ	0.6516	-0.19		O	1.09489	0.01102		O
UBL_EQ	0.48246	0.13359		U	0.7565	0.2985		O
AM_IE	0.47828	0.36463	0.43573	O	0.27771	0.33085	0.324805	U
ASK_IE	0.39318	0.20448		U	0.3719	0.3346		O
KAS_IE	0.79302	0.73004		O	0.43269	0.33227		O
UBL_IE	0.35118	0.36898		U	0.24636	0.32213		U
NIT	0.75572	0.33839	0.75572	O	0.5808	-0.02919	0.5808	O
ALF_GF	0759275	0.009982	0.645145	O	0.69884	0.11581	0.352355	O
JS_GF	0.55709	0.14182		U	0.36372	0.35362		O
NAF_GF	0.61162	0.08949		U	0.34099	0.26638		U
UBL_GF	0.67867	0.19764		O	0.14355	0.29384		U

CONCLUSION

The aim of this paper was to investigate the performance of mutual fund managers before the financial crisis, where P1 indicates the period January 1995 until December 2006 and P2 indicates the period January 2007 until June 2010. Using the single period performance measures i.e. the parametric measures, which are the three measures of skill, i.e., outperformance (Jensen's alpha), the Selection ability (Treynor and Mazuy's alpha) and the timing ability (Treynor and Mazuy's beta two), the empirical results illustrate that the null hypothesis of no persistence in performance cannot be rejected and it is therefore shown that mutual fund managers did not exhibit the skills to consistently outperform the market.

Furthermore, using the two period performance (persistence) analysis, i.e., the non-parametric measures, which were the Cross Product Ratio and Chi-square statistic, the empirical results illustrate that the null hypothesis of no persistence in performance cannot be rejected and it is therefore shown that mutual fund managers did not exhibit the skills to consistently outperform the market. It can be said that the persistence analysis indicates that irrespective of market conditions during the period January 1995 to June 2010, fund managers were unable to outperform the market. This could be as a result of the level of efficiency in the mutual fund market, where news and information

is quickly taken into account and mutual fund prices adequately reflect all available information

Table IV: Contingency Table – Market Timing Skill

Market Timing Skill												
	Period 1						Period 2					
Fund	Beta 2	Median	Avg. Squared Returns	Market Timing Skill Measure	Median	O/U	Beta 2	Median	Avg. Squared Returns	Market Timing Skill Measure	Median	O/U
AKD_AF	-0.08	-0.09	33.37	-2.66	-2.89	O	0.31	0.13	67.08	20.66	8.93	O
ALF_AF	-0.12			-4.13		U	0.13			8.93		O
PAK_AF	-0.09			-2.89		O	0.11			7.12		U
ALF_AA	-0.23	0.20	33.37	-7.51	6.60	U	0.03	0.37	67.08	2.33	24.89	U
AM_AA	0.55			18.22		O	0.45			30.28		O
ASK_AA	0.20			6.60		O	0.64			42.67		O
AHL_AA	0.69			22.93		O	0.37			24.89		O
JS_AA	-1.31			-43.87		U	-0.64			-42.63		U
AKD_IF	0.22	0.36	33.37	7.18	12.15	U	0.55	0.54	67.08	37.09	36.32	O
JS_IF	0.30			9.93		U	0.49			32.59		U
KAS_IF	0.43			14.37		O	0.53			35.55		U
UBL_IF	0.56			18.68		O	0.91			61.16		O
ASK_EQ	-0.14	-0.09	33.37	-4.73	-2.93	U	0.18	0.20	67.08	12.09	13.26	U
KAS_EQ	-0.03			-1.14		O	0.22			14.43		O
PAK_EQ	-0.19			-6.34		U	0.01			0.74		U
UBL_EQ	0.13			4.46		O	0.30			20.02		O
AM_IE	0.36	0.33	33.37	12.17	12.24	U	0.33	0.33	67.08	22.19	22.24	U
ASK_IE	0.20			6.82		U	0.33			22.44		O
KAS_IE	0.37			12.35		O	0.33			22.29		O
UBL_IE	0.37			12.31		O	0.32			21.61		U
NIT	0.34	0.34	33.37	11.29	11.29	O	-0.03	-0.03	67.08	-1.96	-1.96	O
ALF_GF	0.01	0.11	33.37	0.33	3.86	U	0.12	0.28	67.08	7.77	18.79	U
JS_GF	0.14			4.73		O	0.35			23.72		O
NAF_GF	0.09			2.99		U	0.27			17.87		U
UBL_GF	0.20			6.59		O	0.29			19.71		O

Table V below illustrates the findings of this study, by detailing the outcomes across the different significance levels.

Table V: Findings

Measure	0.01 Significance	0.05 Significance	0.10 Significance
Jensen's Alpha (Outperformance Measure)	Do not reject the null hypothesis of no persistence in performance, therefore no skill.	Do not reject the null hypothesis of no persistence in performance, therefore no skill.	Do not reject the null hypothesis of no persistence in performance, therefore no skill.

Treynor & Mazuy's Alpha (Selection Skill Measure)	Do not reject the null hypothesis of no persistence in performance, therefore no skill.	Do not reject the null hypothesis of no persistence in performance, therefore no skill.	Do not reject the null hypothesis of no persistence in performance, therefore no skill.
TM's Beta 2 (Market Timing Ability)	Do not reject the null hypothesis of no persistence in performance, therefore no skill.	Reject the null hypothesis of no persistence in performance, therefore skills are there.	Reject the null hypothesis of no persistence in performance, therefore skills are there.

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