ISSN: 2278-3369
International Journal of Advances in Management and Economics
Available online at www.managementjournal.info

RESEARCH ARTICLE

Prediction of Future Performance of Mutual Funds on the Basis of Past Performance

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Abstract

During the past decades, Indian mutual fund industry has reached new heights and witnessed major revolution in terms of number of players and total assets under management. With the plethora of schemes available in the Indian market, an investor before making any investment decision, consider the past performance of these mutual fund schemes. Thus, this paper analyses and presents the empirical evidence with regard to the performance persistence of mutual fund schemes and examines whether their past performance provides useful information for predicting the future performance. For this purpose, a sample of 44 mutual funds schemes has been analysed for a period of eight years from April' 2005 to March' 2013. For the analysis, various parametric and non-parametric techniques as Brown and Goetzmann's Odds Ratio (OR), Kahn and Rudd's χ^2-test and regression analysis have been used. Results confirm the presence of performance persistence in mutual funds.

Keywords: *Mutual funds, Performance Persistence, Non Parametric Techniques, Parametric Techniques.*

Introduction

Mutual fund performance persistence is a topic of great importance for financial planners, advisors, academicians and researchers. Performance persistence means a positive relation between performance ranking in an initial ranking period and the subsequent period [1]. In India, mutual fund industry has witnessed remarkable growth with number of players (asset management companies) increasing from one (i.e., UTI) in 1964 to 46 as on March, 2013. The number of scheme has also increased from one in 1964 to 1,294 in 2013 and the total asset under management has risen to Rs. 8,231,952 millions in March, 2013 from Rs. 250 millions in March, 1965.

With the increase in the number of schemes and total asset under management, the investors' base of mutual fund companies has also been increasing. Mutual fund managers are expected to consistently outperform a benchmark and their peers. Fund managers reputation and remuneration are heavily influenced by their ability to achieve consistently superior performance [2]. Also, much of the marketing of the funds is based on their past performance record [3]. From investors' perspective, historical performance is an important criterion for choosing a fund [4]. Conventional wisdom is that for predicting the future performance of mutual fund schemes, the first place to look at is their past performance.

In other words, investors use past performance figures of mutual fund as a reasonable indicator of their future performance. However, the big issue to explore is, do winners repeat? Are the best performing mutual funds always best performers and underperforming mutual funds always underperformers? Hence, it is a matter of investigation that how a mutual fund's future performance is related to its past performance.

Present study analyses the performance persistence of Indian mutual funds. Understanding the relationship between mutual fund past performance with its future performance shall be helpful for investors to select the right mutual fund. Moreover, it will benefit to the mutual fund companies and fund managers in formulating the investment strategies. A number of studies have examined this issue by comparing the mutual fund schemes' returns.

Review of Literature

Early studies regarding performance of mutual funds indicated that superior past performance did not persist through time [5,6]. Some other studies by, Carlson [7], Friend et al [8], Dunn & Theisen [9], Bird et al. [7], Robson [10], Bogle [11], Vos et al. [12] and Phelps & Detzel [13] supported Sharpe and Jensen's finding that future performance cannot be predicted on the basis of past performance. Yet there were some other studies like Hendricks et al. [14], Goetzmann and Ibbotson [15], Carhart [1], Wermers [16], Davis [17], Bollen and Busse [18],which found the persistence in mutual funds' performance in short run, say one or two years. Droms and Walker [19] studied the persistence of returns, turnover and the expenses over the period from 1971 through 1990 and found the evidence of short term performance persistence.

Grinblatt and Titamn [20], from their study on equity funds concluded the evidence of performance persistence especially in 'aggressive growth' funds. Brown et al. [21], Grinblatt and Titman [22], Shukla and Trzcinka [23], Brown and Goetzmann [24], Elton et al. [25], Gruber [26], Otten & Balms [27] and Ibbotson & Patel [28], Ferruz et al. [29] provided empirical evidences in support of performance persistence. Some other studies provided empirical evidence of partial performance persistence like Malkiel [30], observed the persistence phenomenon in 1970s but not in 1980s. Also Kahn and Rudd [31], found evidence of persistence in fixed income portfolios, but not in equity funds. Capocci and Hubner [32], concluded that the persistence exist for intermediate fund deciles but not for the extremes.

Table 1 summarizes the academic literature on the persistence of mutual fund performance along with the key results of each study. About half of the study found no evidence of significant performance persistence in mutual funds. Further majority of the studies have examined the non-Indian mutual funds as U.S. and Europe.

In India, on the performance persistence of mutual funds, scant literature is available. Agarwal and Naik [33], studied the persistence in performance of hedge funds and revealed the evidence of performance persistence for the short term. Roy and Deb [34], evaluated 133 open ended mutual funds over the period of 1999 to 2003 and found that conditional measures past fund performance predicted the future fund returns significantly. Chander [35], examined 80 investment schemes from public as well as private sector during the period January 1998 to December 2002 and found absence of performance persistence. Deb et al. [36], tested Indian equity mutual funds from January 2000 to June 2005 with respect to raw returns, information ratio and tracking error.

Authors found some evidence of performance persistence in case of growth funds but no such evidence was found for equity linked saving schemes. Kaur [37], analysed 37 equity oriented mutual funds in India and found a little evidence of performance persistence.

Objective and Hypothesis

The review of literature shows that researchers have done considerable work internationally on the performance persistence of mutual funds. However, in India this issue has been relatively unexplored and need further investigation. Thus, present study is an attempt to further analyse the persistence in performance of Indian mutual funds.

For meeting the research objective, null hypothesis formulated is, H0: The performance of mutual funds in India is not persistence.

Table 1: Summary of some prominent studies on performance persistence of mutual funds.

Studies	Year	Period Covered	Types of Funds	Evidence of performance Persistence
Sharpe	1966	1954-63	All	No
Jensen	1968	1945-64	All	No
Carlson	1970	20 years	Equity	Yes, persistence for five year time period
McDonald	1974	1960-69	All	No
Kon & Jen	1979	1960-71	All	Yes
Dunn & Theisen	1983	1973-1982	Institutional	No
Chang & Lewellen	1984	1971-79	All	No
Henriksson	1984	1968-80	All	No
Lehmann & Modest	1987	1968-82	All	Yes
Grinblatt & Titman	1989	1975-84	Stock	No
Brown et al.	1992	1981-1990	Pension Funds	Yes
Grinblatt & Titman	1992	1974-84	All	Yes
Hendricks et al.	1993	1974-88	Equity	Yes, positive persistence in returns in short period
Goetzmann and Ibbotson	1994	1976-88	All	Yes, based on returns generated in two years period
Brown & Goetzmann	1995	1976-88	All	Yes, relative performance persistence, especially in "losing" funds
Kahn and Rudd	1995		Fixed-income and equity	Yes, persistence in fixed-income funds but not in equity portfolios
Malkiel	1995	1971-91	Equity	Yes but stronger in 1970's than 1980's
Elton et al.	1996	1977-93	Stock	Yes
Gruber	1996	1985-94	All	Yes
Carhart	1997	1962-93	Equity	Yes, mainly in short term period
Wermers	1997	1974-94	All	Yes, short term, partly related to momentum
Allen & Tan	1999	1989-95	All	Yes
Hallahan	1999	1989-93	Rollover Funds	Yes
Cortez et al.	1999	1994-98	Equity	Yes
Casarin et al.	2000	1988-99	Equity	No
Davis	2001			Partial, persistence for short term
Droms & Walker	2001	1971-90	Equity	Partial, no evidence over long period but strong short term persistence for periods of one, two and three years
Ibbotson & Patel	2002		Equity	Yes
Otten & Bams	2002	1991-98	Equity	Partial, strong evidence of persistence in mean returns, mainly driven by "hot hands"
Capocci and Hubner	2003		Hedge	Partial, in the intermediate fund deciles but not at the extremes
Ferruz et al.	2003	1994-2002	Fixed income	Yes
Bollen & Busse	2005	1985-95	Equity	Partial, short term persistence
Bilson et al.	2005	1991-00	Superannuation Funds	Partial, no evidence over a one-year period but found statistically significant persistence over a three year
Agudo & Magallon	2005	1994-00	Equity	Partial, found evidence of persistence with non-parametric tests and no evidence with parametric test
Christensen	2005	1996-03	Equity & Fixed Income Funds	No
Indian Studies				
Agarwal and Naik	2000		Hedge funds	Partial, persistence for short term
Roy & Deb	2004	1999-03	Equity, Income & Balanced Funds	Yes
Chander	2005	1998-02	All	No
Deb et al.	2008	2000-05	Equity	Partial, found some evidence of persistence in case of growth funds but no evidence in case of equity linked saving schemes
Kaur A.	2011	2003-2011	Equity	Yes, little evidence of persistence

Source: Literature review done by author

Research Methodology

Sampling

For analysing the persistence in performance of mutual funds, a sample of 44 open ended mutual fund schemes has been taken. The population for the study and the sample selection process has been explained further.

All the open ended mutual fund schemes as on 1 April, 2005 are the population for the study. On 1st April, 2005, there were 404 open ended mutual fund schemes. Out of these 69 mutual fund schemes were liquid/ money market and gilt fund schemes. These funds invest exclusively in safer instruments like treasury bills, commercial papers, government securities, etc. and do not have their primary objective as capital appreciation. Therefore, these funds have been excluded from the study. Further, out of rest 335 schemes, some schemes have been closed down due to bad performance or have been redeemed during the above said period or have been merged with the existing schemes. Further complete information for the data analysis was not available for some of the schemes. All such schemes have been excluded from the study and finally a sample of 44 mutual fund schemes has been taken. Appendix A. provides the list of schemes of the open ended mutual funds taken for the study.

Data

Present study evaluates the performance persistence of Indian mutual funds. For this purpose, monthly net asset values (NAV) of 44 open-ended equity mutual fund schemes for the period of eight years i.e. from April 1, 2005 to March 31, 2013 have been taken from the website of Association of Mutual Funds in India (AMFI) and Centre for Monitoring Indian Economy (CMIE's) Alpha database. The 91-day treasury bills have been used as a surrogate for risk-free rate of return. Monthly Yield on 91-day treasury bills (T-91) for the period under study has been collected from the bulletin of Reserve Bank of India.

The unadjusted monthly return has been calculated for each mutual fund through rate of return measure as:

$$R_{it} = [NAV_t - NAV_{(t-1)}] / NAV_{(t-1)} \quad (1)$$

Where, NAV_t = Net Asset Value at time t
$NAV_{(t-1)}$ = NAV at time t-1
R_{it} = Return for mutual fund i at time t.

Therefore, for each mutual fund scheme 96 monthly returns have been calculated and then the mean of monthly returns have been used for calculating Sharpe ratio. The Sharpe ratio Sp, for each mutual fund scheme has been calculated as:

$$Sp = (R_i - R_f) / \sigma i \quad (2)$$

Where, R_i = Mean return on mutual fund scheme i,
R_f = Mean risk free rate of return and
σ_i = Standard deviation of returns for mutual fund scheme i.

Data Analysis

In order to analyze the persistence in performance of India mutual funds, the Winner- Loser test has been determined. The present study has taken cues from various empirical evidences as Goetzmann and Ibbotson [15], Malkiel [30] and Christensen [38]. The time period of study has been split up into four intervals or sub-periods, each representing a two-year period of equal intervals, i.e. April 2005-March 2007 (Period 1), April 2007- March 2009 (Period 2), April 2009-March 2011 (Period 3) and April 2011-March 2013 (Period 4). Winners (W) of a particular period are the funds with a return equal to or higher than the median return, and losers (L) are the funds with a return below the median return. For Period 1, the funds were ranked and accordingly winners and losers were identified. Similarly, an equivalent ranking was made for Period 2. Based on these rankings, the number of funds being winners in both periods 1 and 2 (i.e., WW), winners in period 1 & losers in Period 2 (i.e., WL), losers in period 1 and winners in period 2 (i.e., LW) and losers in both periods 1 and 2 (i.e., LL) were determined. The same procedure has been applied for other periods that is, for periods 2 & 3 and the periods 3 & 4. This exercise has been done for both the raw returns i.e. average returns and the risk-adjusted returns.

Following which, the two-way contingency tables have been prepared on the basis of winner-loser categorization. Results provided through contingency tables have been empirically tested through non-parametric tests proposed by Brown and Goetzman [21] and Kahn and Rudd [31]. The robustness of the findings through non parametric techniques has been tested further by employing parametric techniques as regression analysis.

Brown and Goetzmann's Odds Ratio (OR)[1]:

OR = (WW × LL) / (WL × LW)
Z test that follows normal distribution is calculated on the basis of this value as: [2]
Z = ln(OR) /σ ln(OR)

Kahn and Rudd's χ^2 –test[3]: $\chi^2 = \sum_{i=1,j=1}^{n=1} \frac{(Oij-Eij)2}{Eij}$

Where, O_{ij} represents the actual frequency of the i^{th} row and j^{th} column and E_{ij} represents the expected frequency of the i^{th} row and j^{th} column

Regression Analysis

In order to analyze the robustness of the results, regression analysis has been used. Grinblatt and Titman [20] tested performance persistence by regressing returns obtained in a later period over the previous period. If the return in the later period can be predicted by the previous period return, performance is persistence. Equation (iii) presents the regression equation as:

$$R_1 = a_0 + a_1 R_2 + e \quad (3)$$

Where, R_1 and R_2 represent the returns from the former and the later periods respectively. a_1 is the coefficient of R_2 and its statistically significant positive value represents the performance persistence in mutual fund schemes.

Empirical Analysis and Findings

Findings of Non Parametric Technique

Contingency tables (Table 2) for the two performance measures as raw returns and risk adjusted return (i.e., Sharpe ratio). For raw returns, during the period Period 1 vs Period 2 higher values in the right and left corners (i.e., 12 and 12) as compared to values in the middle (i.e., 10 and 10). It shows that out of 44 sample mutual fund schemes, 24 schemes have not changed their status as winner (or loser) from period 1 to period 2 and 20 mutual fund schemes have changed their status from winner (or loser) in period 1 to loser (or winner) in period 2. That is, most of the mutual fund schemes that were winners (or losers) in the first period remained winners (or loser) in the second period as well and hence affirm the persistence in their performance.

However, for the period 2 vs period 3, only 18 mutual fund schemes have continued with their status as winner (or loser) in both the periods. And 26 fund schemes have changed their status from winner (or loser) in period 2 to loser (or winner) in period 3. Similarly, only 17 mutual fund schemes have maintained their status as winner (or loser) in both the period 3 and period 4. On the other hand, 27 schemes have changed their status from winner (or loser) in period 3 to loser (or winner) in period 4. As larger number of mutual fund schemes have changed their status from winner (or loser) to loser (or winner) and lesser number of schemes have sustained their status as winner or loser during the period 2 vs. period 3 and period 3 vs. period 4, therefore, performance persistence is not present during these periods.

For risk adjusted return, most of the funds as 22 during the period 1 vs. period 2, 36 in period 2 vs. period 3 and 36 during period 3

[1] Brown and Goetzmann's (1995) Odds ratio or Cross Product Ratio (CPR). A cross product ratio of 1 would fail to reject the null hypothesis whereas, a CPR greater than one indicates the persistence in performance.

[2] For large sample the log of the estimated Odds Ratio is normally distributed with standard error:
$\sigma_{ln(OR)} = \sqrt{1/WW + 1/WL + 1/LW + 1/LL}$ as in Christensen (1990).

[3] For a general 2 × 2 matrix in the format: a b c d, N = a + b + c + d,
the observed frequencies are equal to :

$$\chi 2 = \frac{N\,(ad-bc)2}{(a+b)(c+d)(a+c)(b+d)}$$

vs. period 4 have not changed their status from winner (or loser) to loser (or winner). Since the number of funds repeating as winner or loser is higher than the number of funds that change their status from winners (or losers) to losers (or winners), we may assert that there exists a certain degree of persistence. However, the persistence in performance has been checked further by employing various non parametric and parametric techniques.

Analysis through Odds ratio reveals that in totality, the value of Odds ratio for raw returns is 2.456 and 6.142 respectively with p as 0.01 and for risk adjusted return these values are 4.84 and 28.11 respectively with p as 0. These are significant at 5 percent level of confidence and hence, for raw returns as well risk adjusted returns, mutual fund schemes show the performance persistence in totality.

Analysis of non-parametric techniques reveals that for raw returns as well risk adjusted returns, mutual fund schemes show the performance persistence in totality as both the Odds Ratio and Chi Square test are statistically significant at five percent level in total period. Further, there was no evidence of performance persistence in case of raw returns when the three periods have been considered separately. However, Period 2 vs. Period 3 and Period 3 vs. Period 4 have shown significant statistic of Odds Ratio and Chi Square test (p value as 0.0001 and 0.00 respectively) with risk adjusted performance measure i.e., Sharpe Ratio. Therefore, these two periods indicate performance persistence in Indian mutual funds.

Table 2: Contingency table of raw return and risk adjusted return (Sharpe Ratio) over successive time period intervals

	WW	WL	LW	LL	Odds Ratio			χ^2 Test	
					OR	Z	p	χ^2	p
Raw Returns									
Period 1 vs. Period 2	12	10	10	12	1.44	0.67	0.55	0.36	0.55
Period 2 vs. Period 3	10	12	14	8	0.298	1.797	0.07	3.35	0.07
Period 3 vs. Period 4	10	14	13	7	0.385	1.528	0.127	2.38	0.12
Total	22	36	37	24	**0.396**	**2.456***	**0.01**	**6.142***	**0.01**
Risk Adjusted Return (Sharpe Ratio)									
Period 1 vs. Period 2	2	0	22	20	4.556	0.960	0.34	1.75	0.19
Period 2 vs. Period 3	19	5	3	17	21.53	3.83*	0.0001	17.97*	0.00
Period 3 vs. Period 4	18	4	4	18	20.25	4.375*	0.0001	17.82*	0.00
Total	39	9	29	55	**8.218**	**4.84***	**0.00**	**28.11***	**0.00**

Notes: *Significant at 99% level of confidence.

Findings of Parametric Technique

The analysis with regards to the raw returns and risk adjusted returns i.e., Sharpe Ratio of the sample mutual fund schemes has been presented in table 3. In case of raw returns, for all the periods that is, period 1 vs. period 2, period 2 vs. Period 3 and Period 3 vs. Period 4 the value of coefficient a_1 is not statistically significant. The value of R^2 for these three periods is also very low as 0.022, 0.062 and 0.152 respectively. Therefore, no significant conclusion can be drawn from the raw returns of mutual fund schemes. This result is consistent with the results obtained from contingency tables as the statistics from Odds Ratio and Chi Square test was not significant for all the three periods in case of raw returns.

Further, from risk adjusted return i.e., Sharpe Ratio, the value of a1 coefficient is statistically significant at one percent level (as 11.106, 11.111 and 23.319) for all the periods that is, period 1 vs. period 2, period 2 vs. Period 3 and Period 3 vs. Period 4 respectively. Also the value of R^2 is also quite high as 0.746, 0.746 and 0.928 respectively for these three periods. Therefore, regression analysis shows the performance persistence in mutual fund schemes for all the time periods under study.

This result is in accordance with the results obtained by contingency tables as, in case of Sharpe Ratio, the statistics from Odds Ratio and Chi Square Test is significant for the time period 2 vs. Period 3 and Period 3 vs.

Period 4 Overall it can be concluded that there exists the evidence of persistence in performance of mutual fund schemes when regression analysis has been used and these results are consistent with the results from non-parametric techniques.

Table 3: Regression of raw returns and risk adjusted returns i.e., sharpe ratio

	a_0	a_1	R^2
Raw Return			
Period 1 vs. Period 2	2.024 (10.644)*	-0.184 (0.973)	0.022
Period 2 vs. Period 3	0.748 (1.818)	-0.256 (1.665)	0.062
Period 3 vs. Period 4	2.879 (14.668)*	-1.218 (2.743)	0.152
Risk Adjusted Return (Sharpe Ratio)			
Period 1 vs. Period 2	-1.386 (2.311)**	0.499 (11.106)*	0.746
Period 2 vs. Period 3	0.353 (0.333)	1.499 (11.111)*	0.746
Period 3 vs. Period 4	0.163 (0.497)	0.319 (23.319)*	0.928

Note:* Means statistically significant at one percent level of confidence
** Means statistically significant at five percent level of confidence

The numbers in parentheses below the estimated parameters indicates t-statistics. The results reject the null hypothesis and indicate that performance of Indian mutual fund schemes is persistence.

Conclusions

The present paper puts forth the empirical results with regards to the performance persistence of mutual funds for the period April, 2005 to March, 2013. Both the parametric and non-parametric techniques have been applied in order to test whether performance persistence exists in Indian mutual funds.

This study might be helpful for investors in taking investment decisions in mutual funds. It will allow mutual fund managers to track the investment strategies that might yield higher returns. However, a certain limitations of the study can be identified. Firstly, this study has been done on a sample of 44 schemes therefore more evidence are needed on the performance of mutual funds before any generalisation of results can be made. Secondly, empirical tests have been conducted only on Indian mutual funds for the period March, 2005 to April, 2013. Hence the results of the study cannot be assumed to extend beyond this group of mutual funds or to a different study period.

Scope for further research is also there as two empirical tests of Brown & Goetzmann and Kahn and Rudd can be applied to a series of past performance periods separately for judging the impact of increase in the past performance period on its explanatory power for performance persistence. Thus, the robustness of the impact of volume of past performance data on the future performance can be analysed further [39-49].

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APPENDIX A

Sample Mutual Fund Schemes Taken

1. BNP Paribas Equity Fund, Growth
2. Baroda Pioneer Balance Fund , Dividend
3. Birla Sun Life Dividend Yield Plus, Dividend
4. Birla Sun Life Frontline Equity Fund, Growth
5. Birla Sun Life M I P, Wealth 25 Plan Growth
6. Birla Sun Life M I P, Wealth 25 Plan Payment
7. Birla Sun Life Midcap Fund, Dividend
8. Birla Sun Life Midcap Fund, Growth
9. Birla Sun Life Monthly Income, Growth
10. Canara Robeco Balance, Dividend
11. Canara Robeco Equity Diversified, Dividend
12. Canara Robeco Equity Tax Saver, Dividend
13. D S P Blackrock Balanced Fund, Dividend
14. D S P Blackrock Balanced Fund, Growth
15. D S P Blackrock India TIGER Fund, Regular Plan Growth
16. D S P Blackrock Short Term Fund, Growth
17. D W S Premier Bond Fund, Regular Plan Growth
18. D W S Short Maturity Fund, Growth
19. F T India Balanced Fund, Dividend
20. F T India Balanced Fund, Growth
21. Franklin India Bluechip Fund, Growth
22. Franklin India Flexi Cap Fund, Growth
23. Franklin India Prima Fund, Growth
24. Franklin India Taxshield, Growth
25. H D F C Growth Fund, Dividend
26. H D F C Growth Fund, Growth
27. Principal Dividend Yield Fund, Dividend
28. Principal Dividend Yield Fund, Growth
29. Principal Tax Savings Fund, Growth
30. S B I Magnum Balanced Fund, Growth
31. S B I Magnum Global Fund, Dividend
32. S B I Magnum Index Fund, Growth
33. S B I Magnum Multiplier Plus Fund, Dividend
34. Sahara Income Fund, Growth
35. Sundaram Select Focus, Growth
36. Tata Balanced Fund, Dividend
37. Tata Balanced Fund, Growth
38. Tata Equity Opportunities Fund, Dividend
39. Tata Floater Fund, Growth
40. Tata Tax Saving Fund, Growth
41. Taurus Tax Shield, Growth
42. UTI Balanced Fund, Growth
43. UTI Banking Sector Fund, Dividend UTI Master Equity Plan Unit Scheme, Growth