

Performance and persistence of performance of healthcare mutual funds

Abhay Kaushik^{a,*}, Lynn K. Saubert^b, R. Wayne Saubert^c

^{a,b,c}*Department of Accounting, Finance, and Business Law, College of Business and Economics,
Radford University, Radford, VA 24142, USA.*

Abstract

This study analyzes 115 actively managed domestic healthcare mutual funds over the period 1/2000–12/2011. Findings of this study show that, on average, healthcare mutual funds outperform the passive index by roughly 2.97% per year after controlling for the market risk premium, growth and size premiums, and momentum effects. Further, this study documents that the abnormal over- and under-performance does not persist over subsequent periods. In other words, under- and over-performances are mean reverting. © 2014 Academy of Financial Services. All rights reserved.

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1. Introduction

Performance evaluation of mutual funds has generated a great deal of interest among academic researchers, practitioners, retail investors, and financial services professionals. According to the Investment Company Institute (ICI) factbook 2013, ~53.8 million American households and roughly 92.4 million individuals in the United States own mutual funds. These towering figures demonstrate the significance of mutual funds in the lives of common investors in the United States.

It is particularly interesting to evaluate the performance of actively managed mutual funds to determine whether the value of active management outweighs the cost of the expert management. General findings on equity funds have shown that funds do outperform

* Corresponding author. Tel.: +540-831-6426; fax: +1-540-831-6209.
E-mail address: akaushik@radford.edu (A. Kaushik)

corresponding benchmarks on a gross return¹ basis, but there seems to be a consensus that actively managed funds, in general, perform poorly compared to comparative benchmarks after considering expenses.² Although performance evaluation of active funds has been a center piece of attraction for retail investors, practitioners, and academics, persistence of performance has garnered momentum over the last decade. More specifically, both investors and practitioners are interested to know whether funds are able to repeat their performance or whether performance is a random outcome and eventually abnormal performance (positive or negative) follows the mean reversion theory. In other words, market efficiency holds and any over or under performance is mere “luck.” Though a number of studies are available to explain the abnormal performance and persistence of performance for well-diversified funds, only a handful studies exist to evaluate the same phenomenon for sector-specific funds. This research extends the existing literature and analyzes 115 actively managed domestic equity healthcare mutual funds that existed at some point in time over the period 2000–2011. Healthcare mutual funds have experienced an astounding growth over the last 10 years. For example, only 38 actively managed healthcare mutual funds existed in the year 2000 and that number increased to 56 by the end of 2011, a combined growth of 47% over the last 12 years.³ Though the number of funds varies from year to year, overall this study includes 115 healthcare funds that existed at some point in time over the entire period of January 1, 2000 to December 31, 2011. On the contrary, the growth rate was a paltry 2.09% for the combined mutual fund industry over the same period.⁴ The extraordinary growth in healthcare funds warrants a thorough investigation behind the popularity of these types of funds. The main objectives of this research are to assess (1) the abnormal performance of actively managed mutual funds that mainly invest in health-care stocks, (2) the persistence of performance of these funds, that is, whether funds are able to repeat their abnormal performance or not, and (3) which cross-sectional attributes may explain the abnormal performance.

The article is timely and offers a good insight into a very important sector of the U.S. economy. For example, the U.S. economy has been in slowdown mode since the early 2000s and some analysts argue that defensive stocks, like healthcare, should perform better in these conditions. Portfolio managers like to invest in health care stocks because they believe this industry not only weathers business cycles but also includes stocks that create secular demand.⁵ According to Zacks Investment Research “the health care is one of the most desirable avenues for parking investments when markets are headed south. The demand for such services usually remains unchanged even during an economic downturn and investments in the sector provide sufficient protection to the capital invested.”

On the other hand, this sector has been on the “hot-seat” politically. Although lawmakers are homogenous in terms of their support to change the healthcare system in the country, they differ significantly in their approach to modify the healthcare system. Another important aspect of healthcare stocks is the cost of developing new drugs and loss of revenue after the expiration of patents. According to an article published in the *Forbes* magazine “the average cost of bringing a new drug to market is \$1.3 billion whereas the average drug developed by a major pharmaceutical company costs at least \$4 billion, and it can be as much as \$11 billion.”⁶ Pharmaceutical firms invest billions of dollars to invent new drugs, but they lose a large portion of their profits at the time of expiration of their patents. For example, the *New York Times* article dated March 6, 2011 reported an estimated \$10 billion a-year-loss in

revenue for Pfizer, a well-known pharmaceutical firm, at the expiration of patents for its famous cholesterol drug *Lipitor*. “The loss poses a daunting challenge for Pfizer, one shared by nearly every pharmaceutical company.”⁷ Given the extreme volatility in this sector, some analysts argue that this sector should underperform compared to the broad market. Finally, the number of funds in this sector fluctuated quite vigorously over the last decade. For example, the number of healthcare funds increased rapidly and reached to a record level of 88 funds in 2007 since then healthcare funds experienced a sudden decline and the number reduced to 56 funds by the end of 2011. Given the extreme volatility in this sector, difference of opinions among analysts regarding this sector’s performance, and continued political debate over the healthcare reforms, the performance evaluation of healthcare funds become more interesting and informative. This research argues that the healthcare stocks offer volatility, but they also offer opportunities. Individual investors may not have resources and abilities to select the right mix, but fund managers, especially those who only invest in this sector, should be able to use their information to their advantage. In this research, we analyze whether expert managers have abilities to select the right mix of healthcare stocks? If so, are they able to repeat their performance? In other words, are these managers simply lucky or are they really able to pick good stocks? What fund specific attribute(s) may have explanatory power behind any such abnormal performance?

The remainder of this article is structured as follows: Section 2 reviews the existing literature on sector and equity mutual funds; Section 3 describes the data; Section 4 describes methodology; Section 5 summarizes the empirical results; and Section 6 concludes the article.

2. Literature review

Sector funds are mutual funds with a narrow focus.⁸ In essence sector specific funds only invest in a particular sector/industry of the economy; therefore, these funds are not as diversified as other equity funds. Because of the homogenous risk in their holdings, sector funds tend to be more volatile; however, some may argue that their niche focus should give fund managers more information about the industry in which they invest and in turn, these funds earn higher return despite taking more risk. In other words, sector fund managers may possess better selectivity skills than their well-diversified counterparts. Another argument that might support the diversification of sector funds stems from the fact that although these funds are focused on a specific sector, they do invest in different geographic locations, thus they are not exposed to locational risk exposure. Finally, the argument that these funds are small is not necessarily true as some of these funds only invest in large-cap firms within the given sector. In other words, it is no surprise that some sector funds are larger in terms of assets under management compared to some well-diversified funds.

A number of studies have examined the performance of sector specific funds. The existing research is limited on its findings on sector funds performance and most of these findings are mixed at best or inconclusive at worst. For example, Khorana and Nelling (1997) examined a sample of 147 sector funds to find that these funds do not significantly outperform well-diversified funds or at best perform as good as other general equity funds. Moreover,

they did not find persistence in performance of their sample of sector funds. Their sample also suggests higher risk in sector funds compared to general equity funds. However, in another study on sector funds, Burlacu and Fontaine (2003) analyzed 102 sector funds and find that sector funds outperform well-diversified funds. Their results are robust across different benchmarks. Thus, their results are very different from those reported by Khorana and Nelling (1997) who not only reported no over or under performance by sector funds but also suggested that benchmark selection plays a significant role in estimating abnormal performance of sector funds. Tiwari and Vijn (2004) analyzed more than 600 sector funds and find no over or under performance of these funds. Their abnormal performance models include multifactor models, both conditional and unconditional. Brooks and Porter (2012) analyze equity funds over the period 1994–2005 and find that fund managers were able to allocate funds adequately across sectors but failed to pick superior stocks. However, they also find that fund managers were able to do both during the bear market cycles. On the other hand, Kacperczyk, Sialm, and Zheng (2005) found superior abnormal performance by funds that concentrated on a few industries. Nan and Yan (2011) analyze fund performance from another perspective. They analyze performance of Chinese equity funds. They analyze funds based on two different models—the Sharpe ratio and asset pricing model. Their results show that actively managed Chinese funds can be a better alternative if investors are looking at the total risk-adjusted returns, but they should invest in indexed funds if they are looking at market risk-adjusted returns. Special sector funds like real-estate sector funds also have mixed results of under- or over-performance. For example, LaFever and Canizo (2005) found persistence in the performance of real estate mutual funds on gross return basis that was also true when net returns were used though the performance was less persistent compared to gross returns basis. On the other hand, Lin and Yung (2004) found no positive performance by real estate funds and they also documented fund performance persisted in short run. Dellva, DeMaskey, and Smith (2001) found that sector funds outperform passive markets when the S&P 500 was used as the benchmark; however, results improved dramatically when the benchmark was replaced by Dow Jones industry and subindustry indices. More recently, Kaushik, Barnhart, and Pennathur (2010) analyzed roughly 1,500 sector funds over the period 1990–2005 including healthcare funds and found that healthcare sector funds outperform the market and they did show similar results in recession periods. Their study, however, ignored the most recent recession known as the longest recession since the end of the Great Depression. Larry and Weigand (1998) analyze the persistence effect by using the characteristics of holdings rather than using the factor mimicking portfolios model. Their results indicate that investors should pay more attention to the trends in the overall market rather than chasing the past performance. Fan and Addams (2012) analyzed the United States based international mutual funds over the period 2005–2009 and found that these funds outperform passive benchmarks. Their findings did not find strong persistence of performance effect and fund specific attributes also were not so relevant for their sample of funds. Philpot (2000) evaluates persistence effect for nonconventional bond funds. Findings of his study also show that persistence effect is limited only to high yield bond funds. Manakyan and Liano (1997) also failed to find evidence of persistence effect for funds that were closed to new investors. Given the wide asymmetry in the findings of sector funds and other

specialized funds like real-estate funds, it is relevant to study narrow focused healthcare sector funds especially when this sector of the economy has a very different level of risk and returns and also experienced a big swing in terms of growth over the last decade or so.

3. Data and descriptive statistics

The majority of the data are taken from the Morningstar Direct database. Only those domestic equity funds that invest in health-care stocks are selected from this dataset. Because this research is examining the performance of actively managed domestic equity funds; therefore, funds that are classified as index funds, international funds, hybrid funds, bond funds, fund of funds, global funds, and quant funds are screened out from the selection process.

Monthly returns of Fama-French (FF) (Fama and French, 1993) factors such as SMB (difference in returns between small and large capitalization stocks), HML (difference in returns between high and low book-to-market stocks), Carhart momentum factor, MOM (difference in returns between stocks with high and low past returns), and monthly risk free returns and monthly CRSP value weighted returns are taken from the Web site of Kenneth French. Monthly returns of sample funds, fund and manager specific variables such as turnover ratio, expense ratio, manager tenure, average-market capitalization of holdings, total net assets, fund's investment in its top 10% holdings, cash holdings, investment in common stocks and number of holdings are taken from the Morningstar Direct database. Most of the fund specific variables are reported on monthly basis except a fund's expense ratio and turnover ratio; therefore, funds' expense ratios and turnover ratios are divided by 12 to find their monthly equivalents. Initial screening gives a sample of 124 funds; however, based on the existing literature, we selected only those funds that have at least 36 monthly observations. After removing funds with less than 36 monthly observations, 115 funds are available for empirical purposes.

Table 1 reports descriptive statistics of the sample funds. The average size (net assets under management) over the 12 year period is \$168.50 million that suggests that most of the sample funds are small-cap funds. The investment in cash and common stocks is pretty constant over the period of this study. On average, healthcare funds invested roughly 96% of funds in common stocks and 4% in cash. The turnover ratio varies significantly over the 12 year period. The highest turnover ratio of 584% is observed in year 2000 whereas the lowest of 125% is observed in year 2006. The change in turnover ratio was dramatic; it dropped by almost 50% from an unusually high turnover in year 2000 to year 2001 and then increased for the next two years followed by a sharp decline in the next few years. Even though most of these funds are small-cap funds, the average mean market cap of holdings of these funds is roughly \$15 billion dollars that suggests that these funds tend to invest in a few large-cap stocks and a large proportion of funds is invested in small-cap stocks. The highest number of funds is found in year 2007 and the lowest in year 2000. On average, 101 funds existed per year over the 12 year period.

Table 1 Descriptive statistics

Year	Annual turnover ratio (%)	Cash (%)	Equity (%)	TOP (%)	Expense ratio (%)	TNA (in \$ million)	Average market cap (in \$ million)	Manager tenure (in years)	N
2000	583.40	5.35	94.30	43.20	1.75	358.00	13,160.42	6.09	79
2001	271.30	4.18	95.28	44.87	1.72	188.70	16,453.96	6.10	95
2002	284.95	4.14	93.49	46.41	1.91	141.55	13,178.22	6.14	106
2003	361.08	4.10	95.61	41.22	1.98	123.05	10,738.15	6.07	105
2004	195.02	3.03	96.85	41.44	1.93	139.98	13,617.64	6.00	108
2005	166.90	3.42	96.45	44.64	1.87	154.41	16,720.19	5.96	110
2006	124.59	3.39	96.37	44.58	1.83	159.33	16,598.92	6.08	111
2007	128.78	2.95	96.45	45.48	1.82	150.67	17,675.78	6.07	112
2008	137.50	4.58	94.83	47.60	1.81	138.69	16,874.75	6.12	110
2009	207.71	3.61	95.44	46.23	1.88	121.41	14,182.13	6.11	103
2010	171.37	3.17	95.95	44.56	1.81	148.96	12,288.87	6.07	88
2011	167.61	4.37	94.71	42.16	1.73	197.30	13,321.17	6.36	87
Average	233.35	3.86	95.48	44.37	1.84	168.50	14,567.52	6.10	101

Note. Table 1 shows the mean values of fund specific variables per year over the period 01/2000 to 12/2011. *Turnover ratio* is the minimum of aggregated sales or aggregated purchases of securities divided by the average 12-month total net assets of the fund, *Cash* is the average percentage of investment held as cash, *Equity* is the average percentage of investment in common stocks, *TOP* is the fund's percentage of investment in top 10% holdings, *Expense ratio* is the average expense ratio charged by the fund, *TNA* is the average annual net assets under management, *Average market cap* is average market value of a fund's holdings, *Manager tenure* is the average manager tenure of the fund manager and *N* is the number of funds per year.

4. Methodology

The Sharpe (1964) Capital Asset Pricing Model (CAPM) is the commonly used model to price assets. The CAPM states that in equilibrium, expected returns are linearly related to their level of risk, more specifically, their β or systematic risk. Many tests and models have been developed over the years to measure performance of the mutual funds/funds' managers. Jensen's (1968) α is perhaps the best known primary model.

$$r_{it} - r_{ft} = \alpha_i + \beta_i * RMRF_t + \varepsilon_{i,t} \quad (1)$$

Where:

$r_{it} - r_{ft}$ is the excess return on fund i over the monthly Treasury bill rate,

α_i is the measure of the portfolio's performance (Jensen's α),

$RMRF_t = RM_t - RF_t$ is the excess return on the market (CRSP Value Weighted Index),

and

β_i = is the unconditional measure of risk.

Existing research indicates that returns on equities are heavily influenced by size, growth factor, and past returns besides market risk premium and these factors are commonly known as the FF factors and the Carhart momentum factor. To control any biases that may inflate β loading of the market factor, we estimated the four-factor model of Carhart (1997), which

adjusts fund excess return for the FF factors SMB, HML, and the Carhart's momentum factor.

$$r_{it} - r_{ft} = \alpha_i + \beta_{1i} * RMRF_t + \beta_{2i} * SMB_t + \beta_{3i} * HML_t + \beta_{4i} * MOM_t + \varepsilon_{i,t} \quad (2)$$

Where:

$RMRF_t$ is the excess monthly return (market return net of one month T-Bill return) on the CRSP Value Weighted Index

SMB_t is the difference in returns between small and large capitalization stocks

HML_t is the difference in returns between high and low book-to-market stocks

MOM_t is the difference in returns between stocks with high and low past returns

The use of FF factors is significant for this research as Table 1 shows that most of the sample funds are small in size and because of the narrow focus inbuilt in our sample funds, book-to-market and momentum should play an important role in explaining excess returns and abnormal performance of these funds. Monthly SMB_t , HML_t , and MOM_t factors are taken from the Kenneth French Web site.

4.1. Persistence of performance

In this section, we evaluate whether past winners can continue to outperform in the subsequent period(s) and past losers continue to poorly perform in the subsequent period(s). If this is true then investors and fund managers can definitely take advantage of a continuous trend to their favor. Similar to existing research (e.g., Berk and Green, 2004; Carhart, 1997; Saap and Tiwari, 2004), at the beginning of each year starting from 2001, we divided funds into quintiles based on their previous year's returns. At the beginning of each year, funds are ranked by their annual returns in the previous year and quintiles are formed. Funds in the bottom 20th percentile returns (Q1 also labeled as "losers") are clustered together as one group whereas funds in the top 20th percentile returns (Q5 also labeled as "winners") are grouped together. Because funds' performance may change every year, therefore, Q1 and Q5 are rebalanced every year. Every year, beginning of the year, same step is repeated and two series are formed over the 2000–2011 period where 2000 is the first formation period and 2011 is the last estimation year. We use Eq. (2) to estimate α of Q1 and Q5 to evaluate the persistence effect of past losers and winners.

4.2. Cross-section analysis

Existing research (e.g., Carhart, 1997; Chan et al., 2004; Wermers, 2000, 2003 among others) has shown that a fund's abnormal performance is heavily affected by its attributes such as expense ratio, turnover ratio, size, investment in best ideas, cash holdings, to name a few. Moreover, it is also a known fact that funds differ from each other in terms of their attributes; therefore, cross-sectional analysis plays a significant role in explaining the average abnormal performance of a portfolio of different funds. Finally, funds may have uneven number of observations, that is, some funds might have existed the entire period of the study

whereas some others may have shorter life span. To avoid any bias from the funds with more observations than others, we follow the existing literature and use Fama and Macbeth (1973) methodology to estimate the cross-sectional effects of fund specific attributes on funds' α . Under Fama and Macbeth methodology, the entire data are divided by time period (months in our study) and α and β s of each period are estimated. The average of all the monthly α s and β s is the portfolio's cross-sectional α and β s as opposed to the average of α s and β s of individual funds. We follow existing research (e.g., Brown, Harlow, and Starks, 1996; Carhart, 1997; Wermers, 2000 among others) to estimate dependent variable α by using the following model.

$$\alpha_{it} = r_{it} - r_{ft} - \tilde{\beta}_{1it} * RMRF_t + \tilde{\beta}_{2it} * SMB_t + \tilde{\beta}_{3it} * HML_t + \tilde{\beta}_{4it} * MOM_t \quad (3)$$

$\tilde{\beta}_{1it} * \dots * \tilde{\beta}_{4it}$ are the β loading estimated using Eq. (2).

Once α s are estimated by using Eq. (3) then we use these α s as the dependent variable and apply Fama and Macbeth (1973) to estimate the cross-sectional effects of fund specific attributes on funds' abnormal performance. We use the following model to estimate the impact of cross-sectional effects.

$$\alpha_{it} = \beta_0 + \beta_1 Expense Ratio_{it} + \beta_2 Turnover_{it} + \beta_3 Size_{it} + \beta_4 TOP_{it} \\ + \beta_5 Tenure_{it} + \beta_6 Cash_{it} + \varepsilon_{it}$$

Where:

<i>Expense Ratio</i>	is the average expense ratio charged by the fund
<i>Turnover ratio</i>	is the minimum of aggregated sales or aggregated purchases of securities divided by the average 12-month total net assets of the fund
<i>Size</i>	is the log value of a fund's monthly TNA
<i>TOP</i>	is the fund's percentage of investment in top 10% holdings,
<i>Tenure</i>	is the average manager tenure of the fund manager and it is log value of manager tenure
<i>Cash</i>	is the average percentage of investment held as cash

5. Empirical results

5.1. Abnormal performance

To estimate abnormal performance, we use both the single-factor market model and the Carhart (1997) four-factor model. Results in Table 2 show that abnormal performance (α) is positive and statistically highly significant for both models. On average, healthcare mutual funds outperformed the passive index by 0.2847% per month (3.42% per year) when the single-factor model is used. The abnormal performance is 0.2473% per month (2.97% per year) when the four-factor model is used. As mentioned above, both α s are statistically highly significant. In both models, the coefficients for the market are also positive and highly significant, thus suggesting a strong positive correlation between funds and market returns. Furthermore, the four-factor model shows positive and statistically significant β loadings for

Table 2 Abnormal performance of healthcare funds

Parameter	Estimate	<i>t</i> value	<i>p</i> value
Panel A: Single factor model			
α	0.2848***	7.58	0.0000
RMRF	0.7089***	81.80	0.0000
Adj. R^2	0.3444		
<i>N</i>	14,072		
Panel B: Four-factor model			
α	0.2473***	7.58	0.0000
RMRF	0.6947***	54.92	0.0000
SMB	0.2900***	7.80	0.0000
HML	-0.2094***	-10.60	0.0000
MOM	0.1198***	10.38	0.0000
Adj. R^2	0.4196		
<i>N</i>	14,072		

Note. The above table shows the abnormal performance of the sample funds over the period 1/2000 to 12/2011. The abnormal performance (α) is based on the single factor and four-factor models. r_{it} is the excess monthly return of fund *i* over one month U. S. T-Bill return. RMRF is the excess monthly return of the value weighted CRSP Index over the one month U.S. T-Bill return. SMB, HML, and MOM are monthly returns of size (the difference in returns between small and large cap stocks), book to market (the difference in returns between high and low book-to-market stocks), and momentum (the difference in returns between stocks with high and low past returns) portfolios, respectively. The dependent variable is the individual fund's monthly excess return over the corresponding one month T-Bill rate. α is expressed in percentage per month. Results are based on Newey-West heteroscedasticity and autocorrelation adjusted standard errors. *N* is the number of fund month observations.

***, **, and * show the significance at 1%, 5%, and 10% level, respectively.

Model A: $r_{it} - r_{ft} = \alpha_i + \beta_{1i} * RMRF_t + \varepsilon_{i,t}$; Model B: $r_{it} - r_{ft} = \alpha_i + \beta_{1i} * RMRF_t + \beta_{2i} * SMB_t + \beta_{3i} * HML_t + \beta_{4i} * MOM_t + \varepsilon_{i,t}$.

SMB and MOM factors. These results indicate that abnormal performance of sample funds is heavily influenced by size and past returns of their holdings. Of interest to the author, descriptive statistics in Table 1 shows that majority of funds in our sample are small cap funds with average size of \$168.50 million over the time period of this study. Another interesting observation is the coefficient of HML that is statistically highly significant and negative. The negative coefficient of HML indicates positive value premium for healthcare mutual funds' abnormal performance. Results in Table 2 suggest that healthcare mutual funds have potential to outperform the market after controlling for the market risk premium, premiums for small and value stocks, and net of momentum effects. These findings are particularly interesting and worth noting as majority of the existing literature suggests that active funds, on average, underperform the market index especially after incorporating the effects of market and other biases. Thus, the findings of this study reverse the general notion and support the selectivity skills of active management.

5.2.1. Persistence of performance

Next, we estimate the persistence effect, that is, whether the performance is a random event or funds are able to repeat their under- and over-performances to the subsequent periods. Table 3 documents results for the past losers (Q1) and winners (Q5). Panel A reports α estimate of a series of funds that were ranked in the bottom 20% based on their previous

Table 3 Persistence of performance

Parameter	Estimate	<i>t</i> value	<i>p</i> value
Panel A			
α	0.0215	0.28	0.7824
RMRF	0.8275***	29.34	0.0000
SMB	-0.2205***	-4.53	0.0000
HML	-0.1841***	-4.17	0.0000
MOM	0.0443	1.78	0.0746
Adj. R^2	0.4207		
<i>N</i>	2,375		
Panel B			
α	0.0547	0.90	0.3689
RMRF	0.7900***	39.38	0.0000
SMB	0.1569***	4.18	0.0000
HML	-0.3076***	-9.64	0.0000
MOM	0.1156***	5.30	0.0000
Adj. R^2	0.5482		
<i>N</i>	2,628		
Year	Positive α	Negative α	Insignificant α
Panel C: Short term persistence of performance of Q5 funds			
2001	25	0	75
2002	0	55.6	44.4
2003	23.8	0	76.2
2004	0	0	100
2005	4.8	0	95.2
2006	0	18.2	81.8
2008	0	0	100
2010	0	0	100
2011	0	0	100
Panel D: Short term persistence of performance of Q1 funds			
2001	20	0	80
2002	0	89.4	10.6
2003	0	0	100
2004	0	10	90
2005	9	0	91
2006	0	0	100
2008	0	0	100
2009	0	0	100
2011	0	0	100

Note. The above table shows the persistence of performance of the sample funds over the period 1/2000 to 12/2011. Every year, at the beginning of year, sample funds are sorted based on previous year's returns and quintiles are formed. Q1 is the group that consists of funds that are ranked as bottom 20% funds based on previous year's annual returns and Q5 is the group that consists of funds that are ranked as top 20% funds based on previous year's annual returns. This step is repeated every year. Q1 is a series of worst performing funds and Q5 is a series of best performing funds. A positive α of Q5 and a negative α of Q1 based on the four-factor Carhart model indicate persistence of performance. Panel A reports persistence of performance for Q1 and panel B reports the same for Q5. Panels C and D show short term persistence of performance for Q5 and Q1 portfolios, respectively. Results are based on Newey-West heteroscedasticity and autocorrelation adjusted standard errors. *N* is the number of fund month observations.

Note. Model: $r_{it} - r_{ft} = \alpha_i + \beta_{1i} * RMRF_t + \beta_{2i} * SMB_t + \beta_{3i} * HML_t + \beta_{4i} * MOM_t + \varepsilon_{i,t}$
 *** and ** show the significance at 1% and 5% level, respectively.

year's annual returns whereas Panel B reports α value of those funds that were ranked in the top 20% based on their previous year's annual returns. A negative α for Q1 and a positive α for Q5 suggest that performance persists. Results in Panel A show a positive value of 0.0215% value of α (0.258% per year), however, it is statistically insignificant. Results in Panel B show a positive α value of 0.0547% per month (0.656% per year), but it is also statistically insignificant. The results in Table 3 show that performance of both losers and winners is mean reverting and does not persist in the subsequent periods. In other words, a theoretical long position in past winners and a short position in past losers will not deliver a net positive superior α to fund investors. The results are consistent with the findings of Saap and Tiwari (2004) and Berk and Green (2004) who documented that non-persistence of performance for well-diversified mutual funds. Results also go against the common notion that fund managers of specialized funds such as healthcare funds are " α " managers because they have more insight on the stocks of these sectors and therefore they, especially the winners, should be able to outperform passive benchmarks over the subsequent periods. Results of this study show that investors in healthcare funds do not enjoy superior α s consistently. The most important coefficient of interest is α ; however, we are also interested to see how β loadings affect excess returns earned by Q1 and Q5 portfolios. A closer inspection of results in Panels A and B shows very similar pattern for RMRF, HML, and MOM factors; however, the coefficient of SMB is negative and highly significant for Q1 whereas it is positive and statistically highly significant for Q5. These diametrically opposite coefficients of SMB for Q1 and Q5 suggest that Q1 excess returns are negatively affected by size whereas Q5 excess returns increase with small size bias.

5.2.2. Short term persistence of performance

Because persistence of performance was not visible in long term, therefore, we also evaluated whether performance persists in short term or not by using the four-factor model. Results in Panels C and D (Table 3) show that short term persistence is only thinly visible. Only 25% of funds that earned positive α in year 2000 (the first year of this study) continued to earn positive α in the next period, year 2001, whereas 75% of those positive α funds returned insignificant α s in the next period, year 2001. The short term persistence results vary from year to year. For example, in year 2002, 55.6% of those funds that earned positive α in year 2001 earned negative α in year 2002 whereas 44.4% of those funds earned insignificant α in year 2002. No fund was able to repeat its positive performance in year 2002. Similar results were obtained for those funds that earned lowest α s in the previous period. Results of Panels C and D of Table 3 confirm that healthcare funds were not able to repeat their over- or under-performance and prove that performance is a random event.

5.3. Cross-sectional analysis

Numerous studies on mutual funds have shown that performance of actively managed funds is heavily dependent on their size, expense ratio and other fund specific attributes. Moreover, it is crucial to analyze the impact of these factors on performance of a portfolio of different funds especially when a portfolio includes funds that are of different sizes, have different fee structures, and the portfolio sample is free of survivorship bias. For example,

Table 4 Cross-sectional analysis

Variable	Estimate	t value
Intercept	−0.009	(−0.85)
Expense ratio	−2.006	(−1.94)
Turnover ratio	0.020	(0.32)
Size	−0.000	(−0.63)
TOP	0.006	(0.8)
Tenure	0.004	(1.11)
Cash	0.110	(1.63)
Adj. R2	0.381***	
N	5,253	

Note. The above table shows cross-sectional analysis over the period 1/2000 to 12/2011. The dependent variable is monthly α that is estimated by using $\alpha_{it} = r_{it} - r_{ft} - \tilde{\beta}_{1it-1} * RMRF_t + \tilde{\beta}_{2it-1} * SMB_t + \tilde{\beta}_{3it-1} * HML_t + \tilde{\beta}_{4it-1} * MOM_t$ where $\tilde{\beta}_{1it-1} * \dots * \tilde{\beta}_{4it-1}$ are the beta loading estimated using equation $r_{it} - r_{ft} = \alpha_{it} + \beta_{1i} * RMRF_t + \beta_{2i} * SMB_t + \beta_{3i} * HML_t + \beta_{4i} * MOM_t + \varepsilon_{i,t}$. Monthly expense ratio, turnover ratio, size, a fund's investment in its top 10% assets, managerial tenure, and cash holdings are the explanatory variables.

Model: $\alpha_{it} = \beta_0 + \beta_1 Expense Ratio_{it} + \beta_2 Turnover_{it} + \beta_3 Size_{it} + \beta_4 TOP_{it} + \beta_5 Tenure_{it} + \beta_6 Cash_{it} + \varepsilon_{it}$.
*** and ** show the significance at 1% and 5% level, respectively.

Carhart (1997) shows that expense ratios and turnover ratios negatively affect a fund's abnormal performance. In his study of 1,892 well-diversified funds, Carhart documented, on average, diminishing abnormal performance by 154 basis points for every 100 basis points increase in a fund's expense ratio and 95 basis points decrease in a fund's abnormal performance for every 100 basis points increase in its turnover ratio. In a related study, Dahlquist et al. (2000) analyzed Swedish mutual funds and found that larger size funds, both equity and bond funds, beat their smaller counterparts. They also showed that funds that charge higher fees perform poorly compared to funds that charge low fee. In a similar note, Kaushik and Pennathur (2012) found a significant positive relationship between the performance of real-estate sector funds and size. Haslem et al. (2008) showed a strong relationship between fund specific attributes and funds' abnormal performance. Similar to this study, they analyzed roughly 1,779 actively managed domestic only equity funds and documented that funds with low expense ratios and larger size perform better than funds with higher expense ratios and smaller sizes. They also found a negative relationship between turnover ratio and abnormal performance.

In this study, we use cross-sectional analysis to study the impact of fund specific attributes on the performance of a portfolio of different healthcare mutual funds. Specifically, we evaluate the α of a portfolio of healthcare funds as a function of funds' size, expense ratio, turnover ratio, investment in top 10% assets, cash holdings, and managerial tenure.

$$\alpha = f: (\text{expense ratio, turnover ratio, size, top, tenure, and cash}).$$

Cross-sectional results reported in Table 4 show that abnormal performance is negatively affected by expense ratio. The coefficient of expense ratio is −2.006 and it is marginally statistically significant. This finding suggests that for every 100 basis points increase in expenses, abnormal performance decreases by 200 basis points. Although coefficients of turnover ratio, investment in top 10% holdings, and managerial tenure are all positive, but

they are statistically not significant. Our results are similar to those found in the existing literature for both well-diversified and other specialized funds (e.g., Carhart, 1997; Haslem et al., 2008 among others).

6. Conclusion

Investments in Mutual funds have been growing consistently for the past five decades. Various studies have examined the performance phenomenon of actively managed mutual funds. Though results pertaining to the abnormal performance have been mixed, but a majority of studies indicated underperformance of these funds especially after incorporating funds fees and expenses. In this study, we examined the abnormal performance of 115 healthcare mutual funds that existed at some point in time over the period 2000–2012. Our motivation stems from the fact that healthcare funds have grown at a rapid rate over the last 10 years and yet not many studies are available to explain their abnormal performance. Moreover, this sector of the economy has been a center piece of attention for both the politicians and policy makers. Most of the last decade has witnessed global economic slowdown and many analysts may argue that a defensive stock like healthcare should perform better under these conditions. Our results indicate that healthcare funds outperform passive market index by as much as 0.2847% per month (3.42% per year) when the single-factor model is used. The abnormal performance outshines passive market index by 0.2473% per month (2.97% per year) when the four-factor model is used. In other words, after controlling for known biases such as the market risk premium, growth and size premiums, and momentum effects, healthcare funds outperform the market by roughly 3% per year. Results of this study suggest that retail investors can add value to their overall portfolio by including a portion of their investment in healthcare funds. This will not only give them necessary diversification, but also improves their chances of earning higher return on invested capital. The other point of enquiry was to evaluate whether this performance persists over subsequent periods? We follow Carhart (1997) and Berk and Green (2004) methodologies and created quintiles based on previous year's annual returns and formed "winner" and "loser" portfolios that were rebalanced every year. We use portfolio based approach to evaluate persistence effect for both short and long terms. The results of this study show that both winner and loser portfolios are unable to repeat their over and under performances. Results show that performance is mean reverting for both winner and loser portfolios.

Notes

- 1 Grinblatt and Titman (1989, 1994), Wermers (1997) findings show that managers' are able to beat corresponding benchmarks before any expenses are considered.
- 2 Analyzing the performance of equity funds, Wermers (2000) finds that funds outperform corresponding benchmark by 1.3%; however, the same funds on net return basis underperform corresponding benchmark by 1%.

- 3 Source: Morningstar Direct Database.
- 4 Source: Investment Company Institute factbook 2012.
- 5 *Why might an investor consider the Health Care sector?* Fidelity Investments.
- 6 “The Truly Staggering Cost Of Inventing New Drugs,” *Forbes*, February 10, 2012.
- 7 “Drugs Firms Face Billions in Losses in ’11 as Patents End,” *the New York Times*, March 6, 2011.
- 8 Many articles (Dellva, DeMaskey, and Smith, 2001; Khorana and Nelling, 1997); the Investment Company Institute among others define sector funds as funds that seek capital appreciation through their own specialized (narrow) objectives.

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