INVESTMENTS

Actively managed versus
passive mutual funds:
A race of two portfolios

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ABSTRACT

This paper demonstrates that the average investor would be better off by following a readily-implementable strategy of investing in a portfolio of the five largest active funds in U.S. equity, fixed income, and international equity asset categories than investing in a corresponding portfolio of passive index funds. The active-fund-portfolio outperforms not only in terms of average returns, but also in risk-adjusted returns, providing far greater downside risk protection than the passive fund portfolio. This paper has important implications for investment advisors because its findings question the "wisdom" of index investing, which has been receiving considerable attention in the financial press in recent years.

1. INTRODUCTION

Many academic studies have claimed, and the financial press have touted, the benefits of passive index funds over actively managed mutual funds. The thrust of the argument is that passive funds provide superior performance relative to their actively managed counterparts primarily because of their lower fees. The objective of this study is to examine this argument from the perspective of an investor.

On April 6, 2016, the U.S. Department of Labor unveiled the final version of a rule designed to ensure that advisors who help customers invest in 401(k), Individual Retirement Accounts, and other retirement plans are putting their customers' interests ahead of their own when it comes to investment products, including mutual funds. In light of this rule, which takes effect in January 2018, the issue of the selection of an appropriate mutual fund has assumed greater significance.

The advice that investors are better off by sticking to a buy-and-hold strategy of investing in passive index funds has dominated academic studies for some time. For example, in a widely-cited study, Malkiel (1995) counseled: "Most investors would be considerably better off by purchasing a low expense index fund than by trying to select an active fund manager who appears to possess a 'hot hand.' Since active management generally fails to provide excess returns and tends to generate greater tax burdens for investors, the advantage of passive management holds, a fortiori."

The "wisdom" of index investing has also been widely covered in the media, particularly in recent times. In August 2014, a Market Watch article asked: "The theoretical benefits of active management have proven to be fables. So why are investors still paying high fees for disappointing, inconsistent and tax inefficient performance?" [Sisti (2014)]. In 2015, the Wall Street Journal commented: "Index funds don't just outperform most actively managed mutual funds. They also make more money for investors" [Clements (2015)].

Morningstar, a leading mutual fund research firm, in a June 2015 report stated: "Actively managed funds have generally underperformed their passive counterparts, especially over longer time horizons and experienced high mortality rates (i.e. many are merged or closed). In addition, the report finds that failure tended to be positively correlated with fees (i.e. higher cost funds were more likely to underperform or be shuttered or merged away and lower-cost funds were likelier to

survive and enjoyed greater odds of success)" [Johnson et al. (2015)].

Investors appear to be listening to the media coverage of the benefits of index investing.[2] For example, 2015 saw record inflows into passive mutual funds and record outflows from actively managed funds. On January 14th, 2016, the Wall Street Journal reported that in 2015 investors removed U.S.$207.3 billion from U.S. actively managed mutual funds, while index funds received an inflow of U.S.$413.8 billion. The same article concluded: "The outflow represents a stark change in investor attitude toward equities as investors wrestle with new stresses in a bull market that has lasted nearly seven years" [Krouse and Driebusch (2016)]. A relatively recent CNBC article commented: "Pity the active fund manager. More dollars have flowed to index strategies that track a market benchmark, such as the S&P 500 index, partly because such funds typically have lower costs than active funds and more investors believe that stock-picking managers can't regularly beat the financial markets" [Anderson (2015)].

"The outflow represents a stark change in investor attitude toward equities as investors wrestle with new stresses in a bull market that has lasted nearly seven years."

[Krouse and Driebusch (2016)]

Yet, a sizeable portion of mutual fund assets continue to reside in actively managed funds. According to Morningstar's 2014 Annual Global Flows Report, passive index funds hold only 24% of the total asset under management (AUM) for U.S. mutual funds [Lamy and Strauts (2015)]. However, this share is markedly higher than what it was ten years ago; another Morningstar article reported that at the end of 2003 only 12% of assets of all U.S. open-ended mutual funds were in passive funds [Zoll (2014)]. This pronounced rise in the AUM-share of passive funds potentially reflects two factors: (a) fund flows, with investors increasingly choosing passives over actives in recent years; and (b) the possible relative outperformance of the passive funds, because the growth of any fund's AUM is affected not only by fund flows but more importantly by its performance. As this paper discusses in more detail, data do corroborate the first factor; examining the veracity of the second is the focus of this study.

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[2] Sirri and Tufano (1998) suggested there is some relationship between media coverage and fund flows.

2. THE PRIOR LITERATURE

A large body of literature has examined the performance of mutual funds. These studies can be categorized into two groups. The ones in the first group have analyzed the performance of actively managed funds relative to the relevant market indices. A subset of these studies has also explicitly evaluated the adverse effects of fees on fund performance. The second strand of literature, which is considerably smaller than the first, has investigated the comparative performance of active and passive mutual funds.

2.1 Studies comparing active funds' performance to benchmark indices

Many prior studies have judged the performance of actively managed funds by comparing their returns to a benchmark index. One of the earliest in this body of literature is the study by Jensen (1968), which used data for the period 1945–1964. He found that a majority of mutual funds, which, at that time, were mainly actively managed equity funds, generated a negative alpha, that is, they underperformed the market after accounting for systematic risk of the fund's returns.

A number of studies have built on Jensen's research. Augmenting the three-factor model in Fama et al. (1993), Carhart (1997) analyzed mutual fund performance using a four-factor model. His study, using equity mutual funds' data from 1962–1993, showed that funds' net returns are negatively correlated with expenses and that the more actively the manager trades, the lower the net return, i.e., return net of fees. Fama and French (2010) used both their three-factor and Carhart's four-factor models to examine active mutual funds' performance. They used data from the period 1984–2006 to create a portfolio of NYSE, Amex, and NASDAQ stocks; they then compared the performance of actively managed U.S. equity funds to this benchmark portfolio. They concluded that the majority of actively managed funds do not generate superior returns relative to the benchmark primarily due to their high fees.

Other studies have assessed both gross and net returns of actively managed mutual funds to specifically determine the impact of fees on fund performance. Malkiel (1995) examined equity mutual funds over the period 1971–1991, comparing their performance to the Wilshire 5000 and the S&P 500 market indices. He found that actively managed funds underperformed these benchmarks both before and after expenses, thus concluding that high fees alone cannot explain

their underperformance. Wermers (2000) analyzed the stock selection acumen of fund managers using data for the period 1975–1994 and found that, on average, these managers' selections outperformed the market benchmark by 1.3% annually. However, their funds' returns net of fees underperformed the market by 1%. Grinblatt and Titman (1989, 1993) showed that certain active fund managers outperformed benchmarks before expenses, especially managers of aggressive growth funds. However, these funds also had the highest expenses; as a result, their performance, net of expenses, lagged their benchmarks.

Notwithstanding the general finding that actively managed funds do not outperform benchmarks, prior research has also shown that in certain market segments and business cycles, actively managed funds can benefit investors. For example, Fortin and Michelson (1999) found that over the period 1976–1995 small-cap active funds outperformed the Russel 2000 index. The authors suggested that inefficiencies in the small-cap market segment allow for more potentially skilled stock pickings. Kacperczyk et al. (2005) showed that between 1984 and 1999 active equity funds that made concentrated industry bets usually beat their benchmark portfolios. They concluded that fund managers' stock-picking abilities are likely to be more evident in industries they specialize in.

2.2 Studies comparing active and passive funds' performance

While many studies have compared actively managed funds to benchmark indices, relatively few have compared the performance of actively managed funds to their index fund counterparts. A possible reason for the paucity of such studies is that much of the prior research on mutual fund performance has relied on data from years when index funds were either nonexistent or a relatively new phenomenon. The relatively few recent studies that have compared actively managed funds to their indexed counterparts have found mixed results on comparative performance.

Fortin and Michelson (2002) compared the performance of actively managed funds to Vanguard index funds that they deemed to be the appropriate counterparts. This study not only confirmed the finding in their 1999 paper (relative outperformance of actively managed small-cap funds to the Russel 2000 index) but also found that international stock funds outperformed the corresponding Vanguard index funds. Interestingly, their 2002 paper also found that actively managed funds

tend to outperform index funds when the economy is transitioning into or out of a recession; in particular, this outperformance was most pronounced during the years: 1979-82, 1991-93, and 1999-2000. Based on this finding they concluded: "It appears that active fund management is better than index funds at guiding portfolios through rough times."

Holmes (2007) compared the performance of actively managed and index funds using data for the period 1995–2004, and segregated the comparative analysis based on the Morningstar asset categorization of funds. Her results were mixed. Actively managed funds in the asset categories of mid-cap value, small-cap blend, and international mid/small cap blend outperformed their respective index funds; however, index funds outperformed in all large cap asset classes, U.S. mid-cap blend, and small-cap value and growth asset categories. She also compared actively managed funds' performance to their respective S&P market segment indices and found that actively managed funds in all asset classes underperformed the market indices. However, she observed that active funds fared better during the 2000-2002 market downturn, which is consistent with Fortin and Michelson's (2002) results.

This study builds upon the foregoing strand of literature that compares active and passive funds' performance. Our paper does not compare the performance of active funds to market indices because these indices are not investment options for investors, but passive funds, which track the indices, are. The realized returns to an investor in an index fund can be different, sometimes not insubstantially, from the returns of the underlying index because of tracking error and fund fees. This paper, therefore, compares the investment performance, net of fund fees, of actively managed funds with that of asset category-matched passive funds. The principal contribution of this paper is the comparison, from an investor's perspective, of the relative performance of two portfolios of active and passive funds based on an implementable investment strategy. This paper begins by investigating the relative sizes and fund flows of active and passive funds.

3. AUM AND FUND FLOW ANALYSIS

This study is based on data from Morningstar's open-end U.S. mutual fund database. Data was downloaded for funds that are categorized as having investment focus in three broad asset categories: U.S. equity (including sector funds), international equity, and

fixed income (including both taxable and municipal funds). The dataset is comprised of 77,687 fund-year observations across 7,469 unique funds; of these, 7,155 were actively managed and 314 were passive index funds. The dataset is free from survivorship bias because it encompasses all funds, dead or alive, during the entire period, 1996-2015. Further details regarding the cleaning and organization of the dataset are available from the authors.

This section first discusses the size of aggregate assets in active and passive funds and then examines the data on fund flows. The findings corroborate the commentary in the financial press regarding the investors' increasing choice of index funds, particularly in recent years.

Figure 1 shows that the AUM for active funds has grown from U.S.$1.3 trillion in 1996 to nearly U.S.$8 trillion in 2015. By contrast, passive funds' AUM exceeded U.S.$1.3 trillion for the first time in 2014. Notwithstanding the growth of passive index funds, and perhaps due to inertia or lack of passive funds in certain retirement accounts, a vast majority of investors' assets continue to reside in actively managed funds.

Figure 1: AUM of active and passive mutual funds (U.S.$ bln)
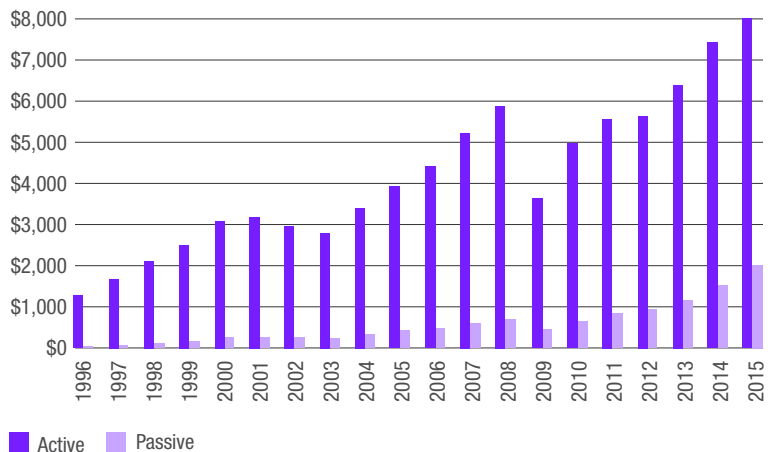
Source: Morningstar

However, the trend in the relative share of the two types of funds is unmistakable: 20 years ago, passive funds had only 3% of the AUM all funds and by the end of 2015 this figure has grown to 20%. The growth in the share of assets garnered by passive funds reflects two related yet distinct factors, fund flows and performance.

The first factor is examined in Figure 2, which shows the net flows as a percent of assets each year for

both active and passive funds from 2000 to 2015.[3] In the past nine years, with the exception of 2009, the inflow percentages in passive funds have remained higher than those of active funds. In fact, in these nine years, active funds have had only three years of positive inflows. These findings are consistent with the commentary in the financial press discussed in the introduction of the paper.

4. FUND FEES AND RELATIVE PERFORMANCE

The popular press has suggested that one of the primary reasons for the observed pattern of fund flows is higher fees charged by the actively managed funds. The academic literature also attributes high fees as the principal reason for the underperformance of these funds [Jensen (1968), Malkiel (1995), Carhart (1997), Fama and French (2010), Grinblatt and Titman (1989), Grinblatt and Titman (1993), and Wermers (2000)]. This section initially examines the relationship between fund fees and the performance of active funds. This is followed by an examination of the relative performance, net of fees, of all active and passive funds in the dataset.

Morningstar provides data on each fund's expense ratio, which is the percent of a fund's assets used to pay for its operating expenses and management fees, including 12b-1 fees.[4] The weighted average expense ratios have been computed for all active and passive funds in the dataset for each of the twenty years. The weights are each fund's annual AUM expressed as a ratio of all funds' total AUM in their respective management style category of active or passive. Specifically, denoting w as the weight, A as the AUM, and N as the number of funds:

$$w_{it}^{j} = \frac{A_{it}^{j}}{\sum_{i=1}^{N} A_{it}^{j}}, \quad i = i^{th} \text{ fund}; \ j = \text{active, passive};$$
$$t = t^{th} \text{ year} \qquad (1)$$

Denoting the expense ratio as er, the weighted average expense ratios were calculated as:

$$\overline{er_{t}^{j}} = \sum_{i=1}^{N} w_{it}^{j} \times er_{it}^{j} \qquad (2)$$

Figure 3 shows the asset-weighted average expense ratios for active and passive funds. As is evident from Figure 3, passive funds have considerably lower fees than active funds, although both categories of funds show a slight downward trend since 2002.

The fact that active funds have higher fees does not necessarily mean that they are bad investments.

Figure 2: Annual fund flows as % of AUM
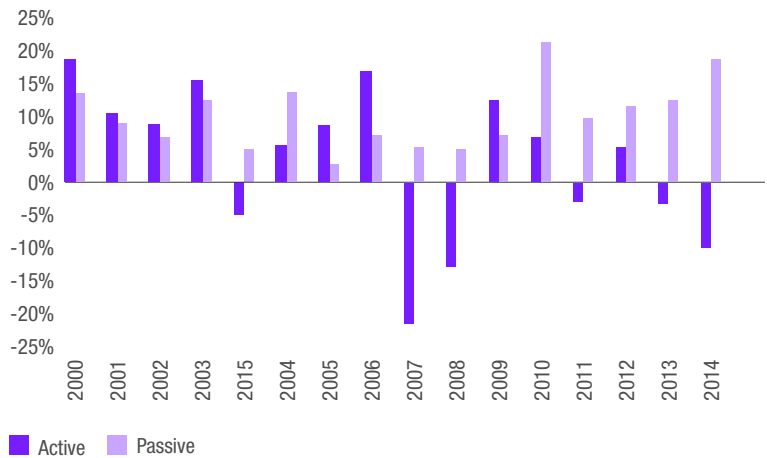
Source: Morningstar

Figure 3: Expense ratios over time
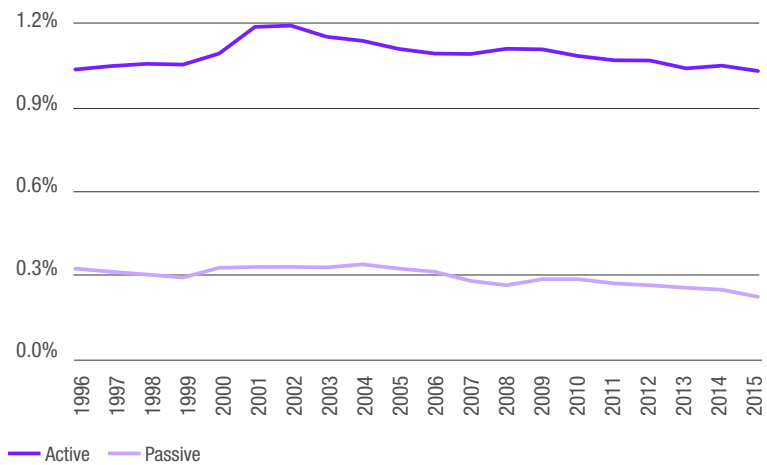
Source: Morningstar

Ultimately, investors care about returns net of fees. Since fees are deducted from a fund's assets, one might be tempted to argue higher fees lead to lower returns for active funds than passives. However, that is not necessarily the case. It is possible for a fund to charge high fees but also deliver above average returns such that its net-of-fee returns are higher than returns offered by a lower-fee fund.

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[3] Morningstar data on fund flows are sporadic, and possibly unreliable, prior to 2000.
[4] Morningstar defines expense ratio as follows: "The percentage of fund assets used to pay for operating expenses and management fees, including 12b-1 fees, administrative fees, and all other asset-based costs incurred by the fund, except brokerage costs. Fund expenses are reflected in the fund's NAV" (net asset value).
[5] All fund returns data used in this paper are returns net of fees and expenses. Also, all returns are logarithmic returns.

Table 1: Regression results

	EXPLAINED VARIABLE: AVERAGE ANNUAL FUND RETURNS (T-STATS IN PARENTHESIS)				
	A	B	C	D	E
Expense ratio (ER)	-2.1954 (-12.88)			-4.3049 (-12.97)	0.5306 3.63
No. of years		0.0034 (22.87)		-0.0003 (-0.82)	
Fund size (in U.S.$ mln)			1.9371 (5.74)	0.4510 (1.36)	
ERxNo. of years				0.2529 (9.24)	
Intercept	0.0673 (25.85)	0.0011 (0.58)	0.0350 (33.35)	0.0646 (12.49)	0.0517 (27.68)
Adjusted-R^2	0.0225	0.0680	0.0045	0.0912	0.0098
Number of observations	7,155	7,155	7,155	7,155	1,239

The relationship between the net-of-fees returns[5] and fees for active funds are examined through cross-sectional regression analyses. The results of the regression analyses are shown in Table 1. In each of the models (models A-E), the explained variable in the regression is the average annual returns of each fund, which is computed over the years of its existence in our dataset. In model A, the explanatory variable is the fund's expense ratio. In model B, the explanatory variable is number of years of fund data, which reflects the number of years the fund has been in existence, i.e., fund-life. In model C, the explanatory variable is fund size, which is captured by the average AUM of the fund. In model D, in addition to the preceding explanatory variables, an interaction variable between expense ratio and fund-life is introduced.

In the first regression (model A), the estimated coefficient for the expense ratio variable is negative and statistically significant, suggesting that higher expenses are, on average, associated with lower returns for active funds; consistent with the findings in the prior literature.

The results of models B and C show that both fund-life and fund size are associated with higher returns for active funds. In model D, the coefficient of the interaction variable, between expense ratio and fund-life, is positive and statistically significant. This result suggests that the negative effect of fees is outweighed by superior performance for funds with longer life. This finding jibes with intuition because funds that have been in existence for many years are likely to be ones that have delivered good performance over the years.

In model E, this issue is further examined by limiting the sample for the regression analysis to the 1,239 funds that have been in existence over the entire twenty years of our dataset. In this regression, the relationship between performance and expense ratio switches sign, becoming positive and statistically significant. This result is consistent with the finding from model D, where the coefficient of the interaction variable was found to be positive. Of course, this subset of 1,239 actively managed funds are the survivors: it is unlikely that these funds would have survived 20 or more years without delivering superior performance, net of fees.

While these survivors constitute a fairly modest percent of the number of actively managed funds, they control a significant portion of assets. As shown in Figure 4, in 1996 they had nearly 80% of assets of all actively managed funds; in 2015 more than half of all active fund assets resided in these funds.

4.1 Relative performance

This paper now turns its attention to the comparison of the performance of actively managed and passive index funds. For this analysis, data on all funds is

Figure 4: Percent of AUM for active funds existing at least 20 years
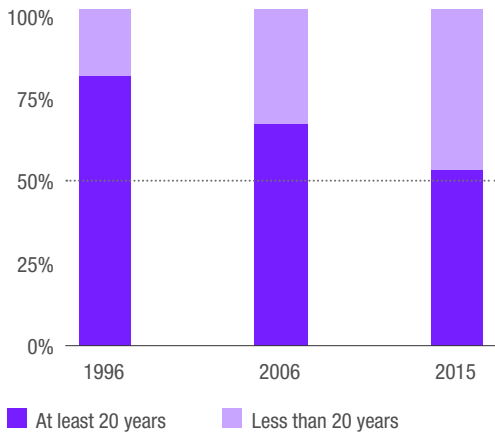
Source: Morningstar

used regardless of the number of years of existence. The question this study seeks to answer is whether, on average, actively managed funds provide superior performance relative to passive index funds. Conditioning this comparative analysis on a certain minimum number of years of a fund's existence would have introduced survivorship bias.

The funds are segregated by asset category, based on Morningstar's categorization. For each of the three asset categories (U.S. equity, fixed income, and international equity) and for each of the two management styles (active and passive) the weighted average annual returns are computed, where the weights are each fund's annual AUM as a ratio of all funds' AUM in that asset category and management style for that year.

Specifically, for each of the three asset categories, the weighted average annual returns, denoted by r, are calculated as:

$$\overline{r_t}^{\text{j}} = \sum_{i=1}^{N} w_{it}^{j} \times r_{it}^{j} \text{ , } i = i^{th} \text{ fund}; j = \text{active, passive};$$
$$t = t^{th} \text{ year} \quad (3)$$

where the weights in equation (3) are given by the expression in equation (1), with the exception that these weights are computed separately for each of the three asset categories.

The performance metrics shown in Table 2 are computed from the weighted average annual returns over the twenty-year period, 1996-2015.

Table 2 shows that active funds, on average, underperform their passive fund counterparts in the U.S. equity and fixed income categories. This underperformance is also evident on a risk-adjusted basis, as seen from the Sharpe and Sortino ratios. For fixed income funds, the Sortino ratio, which measures downside risk, is markedly superior for passive funds. These results, however, do not carry over to international equity funds.[6] Both in absolute and in risk-adjusted returns, actively managed funds, on average, outperform passive funds. One possible explanation for this result could be that fund managers' acumen and research play an important role for investment choices in foreign equities. This result is consistent with similar findings in the prior literature that found outperformance of active funds in certain market segments, such as mid-cap value, small-cap blend, and international mid/small cap blend [Fortin and Michelson (2002)].

Table 2: Performance metrics for all active and passive mutual funds: 1996-2015

	U.S. EQUITY		FIXED INCOME		INTERNATIONAL EQUITY	
	ACTIVE	PASSIVE	ACTIVE	PASSIVE	ACTIVE	PASSIVE
Mean returns	6.4%	7.7%	4.2%	4.9%	5.3%	3.7%
5th percentile	-27.2%	-25.6%	-1.6%	-1.0%	-20.9%	-24.9%
Standard deviation	19.6%	19.3%	5.0%	3.3%	22.0%	22.3%
Sharpe ratio	0.21	0.28	0.37	0.75	0.13	0.06
Sortino ratio	0.13	0.18	0.25	1.37	0.08	0.04
Number of funds	3,560	220	2,372	38	1,223	56

[6] Note that the difference in mean returns were not statistically significant for any category.

5. A HORSE RACE OF TWO PORTFOLIOS

Based on the results in Table 2, one might be tempted to conclude that investors should avoid actively managed funds, particularly in the U.S. equity and fixed income asset categories. However, it would be injudicious to jump to this conclusion without considering two important issues. First, Table 2 reflects the average performance of thousands of funds. As a result, these findings provide little guidance as to how one would go about choosing a fund or a set of funds to invest in. Expressed differently, because average performance metrics do not provide an implementable investment strategy, one cannot objectively determine how a typical investor's portfolio of active or passive funds would have performed over time. Second, most investors hold a diversified portfolio of funds, allocating investments across asset categories, such as U.S. and international equity, fixed income, etc.[7] Consequently, to evaluate the relative performance of active and passive funds one must account for the relative weights of these asset categories (U.S. equity, international equity, fixed income) in investors' portfolios.

The horse race of active and passive fund portfolios based on actual historical returns addresses both these issues. Specifically, two investable portfolios of active and passive funds are constructed adopting the following steps:

Step 1: for each management style (active, passive), equally-weighted portfolios of the five largest funds (by AUM as of November 30th of the prior year) are created in each of the three categories: U.S. equity, fixed income, and international equity. So, each year, the two portfolios of active and passive funds have 15 funds each, corresponding to the five largest funds in the three asset categories.

Step 2: each year, the returns of the fifteen funds are then combined to a single portfolio return of either active or passive funds, using asset category weights. These asset category weights are computed as follows: first, in any given year t, the aggregate AUM of funds, regardless of management style or asset category, is computed by summing the AUMs of all 30 funds; let this aggregate AUM be denoted by AS_t. Then the asset category weight, denoted by aw, is calculated as follows:

$$aw_{kt} = \frac{\sum_{i=1}^{10} S_{it}^k}{A S_t}, \; i = i^{th} \text{ fund}; \; t = t^{th} \text{ year};$$
$$k = k^{th} \text{ asset category (4)}$$

where S denotes the AUM of each fund in each asset category. Note in (4), the summation in the numerator is across all top ten funds (five actives and five passives) in each asset category; and the denominator is the combined AUMs of all 30 funds. Thus, in any given year, the asset category weights are the same for active and passive funds.

This weighting scheme was chosen because in the early years of the sample period a vast majority of the passive funds were U.S. equity funds; as a result, had weights based on management style been used, the portfolio of passive funds would have received disproportionately higher weights for U.S. equity in the early years, especially through 2007. This weighting scheme would have merely reflected the fact that far fewer passive non-U.S. equity funds existed in the 1996-2007 period, and would not have captured investors' actual asset allocation choices.

Figure 5: Weighted portfolio
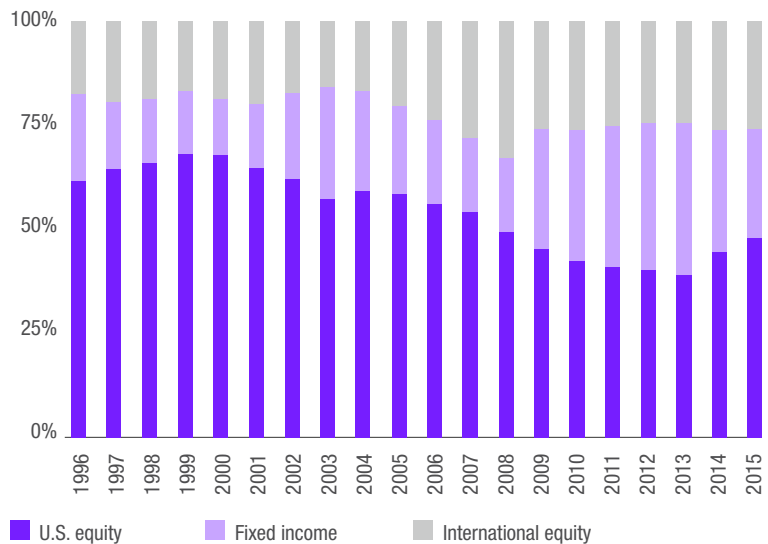
Source: Morningstar

It important to note that these asset category weights were determined by funds' AUM data and are not arbitrarily assigned (such as 60% equity, 40% fixed income, etc.) in the construction of the portfolios for the horse race. These weights, therefore, reflect both the investor choices and performance of funds for the three asset categories. Additionally, so as to not create a bias in the comparison of active and passive funds,

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[7] These are top-level asset categories from Morningstar. Other equity funds invest in both developed and emerging market equities.

the same asset category weights are applied to both portfolios. The yearly asset category weights computed using (4) above are shown in Figure 5. It shows, notwithstanding the slight uptick in the last two years, that there has been a gradual shift away from U.S. equity to the other two categories, especially during 2001-2013. Over the entire 20-year period, the average weights were: U.S. equity 55%, fixed income 23% and international equity 22%.

Once the asset category weights have been determined, the 15 funds' annual returns are aggregated to a single portfolio return of either active or passive funds using those weights as follows:

$$Pr_{jt} = \sum_{k=1}^{3} aw_{kt} \times \overline{r_{jt}}^{k} , \quad j = \text{active, passive,}$$
$$k = \text{asset category} \quad (5a)$$

where,

$$\overline{r_{jt}}^{k} = 1/5 \sum_{i=1}^{5} r_{ijt}^{k} , \quad k = 1, 2, 3 \quad (5b)$$

Thus, in (5a), Pr denotes the asset-category weighted annual returns of the portfolio of either active or passive funds.

Table 3 contains the results of this real-world horse-race; it shows the annual returns of the two portfolios

Table 3: Performance metrics for asset category – weighted portfolios

	ACTIVE	PASSIVE	LOST U.S.$ MLN
1996	12.8%	14.6%	-544
1997	18.8%	19.3%	-234
1998	17.4%	19.5%	-1,783
1999	14.0%	17.3%	-4,150
2000	-2.8%	-9.3%	12,312
2001	-8.9%	-11.6%	5,013
2002	-14.9%	-16.6%	3,215
2003	19.2%	21.0%	-3,116
2004	9.3%	10.3%	-2,315
2005	8.2%	6.4%	4,733
2006	11.9%	14.5%	-8,032
2007	9.3%	8.3%	3,973
2008	-41.1%	-42.0%	3,915
2009	22.9%	21.5%	4,397
2010	9.7%	11.9%	-9,300
2011	-2.9%	-1.7%	-7,149
2012	13.7%	11.6%	13,446
2013	15.2%	11.4%	29,426
2014	4.9%	6.0%	-10,888
2015	0.5%	-1.5%	27,298
			60,218
Mean returns	5.9%	5.5%	
5th percentile	-16.2%	-17.9%	
Standard deviation	14.8%	15.7%	
Sharpe ratio	0.24	0.20	
Sortino ratio	0.13	0.12	

of active and passive funds for the years 1996-2015. The bottom part of this table also contains the relevant performance metrics.

The results in Table 3 show that the portfolio of top 15 active funds outperformed the top 15 passive index funds, both in terms of average returns and risk adjusted returns.[8] Importantly, the active portfolio also provided superior downside risk protection as is seen by the better Sortino ratio; this is further corroborated by the active portfolio's outperformance in years the market experienced severe downturns, 2000-2001 and 2008.

Consistent with the performance numbers shown in Table 2, the performance difference between the active and passive fund portfolios is largely driven by the outperformance of active funds in the other-equity category. As noted earlier, the other equity category includes both developed and emerging market funds. We explored the impact of removing emerging markets funds from the category of other equity. Specifically, we reconstructed the other equity portfolios excluding those funds that were exclusively emerging market funds, and reran the horse race, keeping the funds in the U.S. equity and fixed-income categories unchanged. While this reconstruction does reduce the difference between the mean returns of the active and passive portfolios over the 1996-2015 period by 0.08% (i.e., the annual average return difference drops from 0.31% to 0.23%), our main conclusion still holds: the active portfolio outperforms the passive portfolio.

The economic implications of the horse-race results are also illustrated in the last column of Table 3; it shows the incremental sum investors would have gained had they invested in the top-15 active funds as compared to the top 15 passive funds. These figures are computed by multiplying the annual differences in the two portfolio's returns by the total assets in the top-15 passive funds each year. As shown in the bottom of the column, over the 20-year period this difference sums to over U.S.$60 billion; however, a sizeable portion of this difference, U.S.$59 billion, occurs in the last four years. While it is unlikely that the assets in the top 15 passive funds could actually be redeployed to the top 15 active funds without impacting fund performance, the result shown in Table 3 illustrates the economic impact of small performance differences.

5.1 A real-world illustration

Table 3 shows that the average annual returns of the

active and passive portfolios are 5.9% and 5.5%, respectively. This difference of 0.4%, while small, can have a non-trivial effect on an investment account balance over time. This is illustrated through a simple exercise in this sub-section. It is assumed that two individual retirement accounts (IRA) start with the identical sum of $10,000 in 1995; one IRA account invests in the largest active funds discussed in the horse-race, while the other invests in the largest passive funds. Additionally, it is assumed that each account receives the maximum allowable IRA contribution at the beginning of each year. The annual returns each account would experience between 1996 and 2015 are listed in Table 3. The performance of the two IRA accounts over time is shown in Figure 6.

Figure 6: Investment balance in a portfolio of active versus passive funds
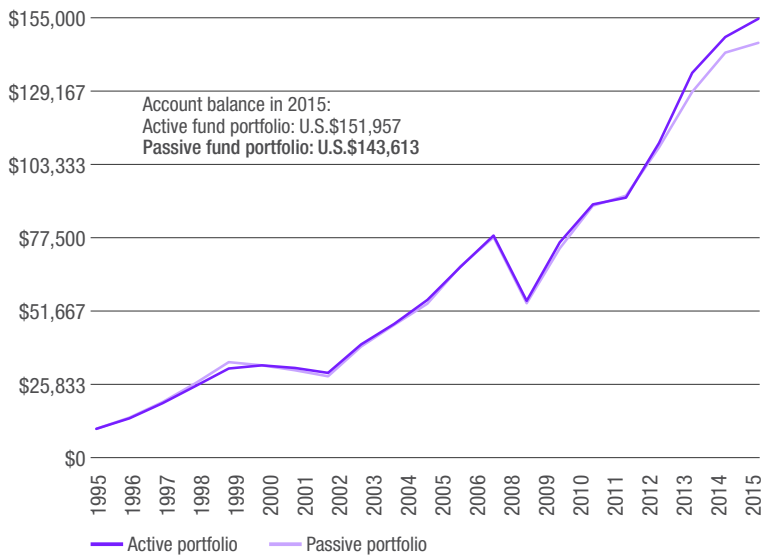
Figure 6 shows that the account comprised of the active funds cumulatively outperforms the passive one over the twenty-year period. By 2015, the active fund portfolio has an account balance of approximately $152k dollars, while the passive fund portfolio's balance is about $144k. Additionally, it is also found that in 14 of the 20 years, the active fund account balance is higher, despite the fact that in the horse-race the active portfolio's return is superior only in 10 years. It is important to note that, up through 2015, the cumulative performance of the active fund is higher than that of the passive one regardless of the start year of the horse-race.

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[8] These results hold even when, in constructing the horse race portfolios, fixed weights of 55%, 23%, and 22% are used across all years, for the three asset categories, U.S. equity, fixed income, and international equity. These weights are average category weights over the period 1996-2015.

5.2 Monte Carlo analysis

We also undertook a Monte Carlo simulation analysis using the data on the twenty years of returns of the active and passive portfolios (shown in Table 3). In each iteration of this simulation, a fixed number of years' (5, 10, 15, or 20) returns were randomly drawn and the average calculated for that set of returns for each portfolio. For example, if a set of five random returns were drawn, those returns were not necessarily for five consecutive years, but were any random five years within the twenty-year period, 1995 through 2015. The simulation was undertaken with 50,000 iterations for each set of years (5, 10, 15, or 20). The results of the simulation analysis are shown in the Table 4.

Not surprisingly, the average returns of the two portfolios, for the various sets of years, are very close to the single-pass average returns shown in Table 3. Table 4 also reports the percent of the 50,000 random draws in which the active portfolio's average return is better than the passive portfolio's. These results suggest that the outperformance of the active portfolio is not driven by a set of superior returns, which are clustered in the recent or in the early years of the twenty-year period. Furthermore, because the years in each iteration are randomly selected, the simulation allows for examination of the two portfolios' performance in different market environments. The results of the Monte Carlo simulation provide additional support for the robustness of the paper's key finding.

5.3 Portfolio turnover and transaction costs

To the extent that the active and passive portfolios are reconstituted each year by selecting the largest funds in each asset class in each category, the investor would incur transaction costs in the form of trading costs and, potentially, capital gains taxes. However, it is unlikely these costs would alter our findings, and, in fact, may even add to the performance advantage of the active portfolio.

First, these costs would increase with the frequency of the portfolio turnover, i.e., reconstitution of the portfolio constituents. However, the data show that this reconstitution is infrequent for either portfolio. This is because the largest funds, in both management styles, have a high degree of persistence: the largest fund in a category in any given year continues to be the largest fund in subsequent years. Specifically, out of the 15 largest funds in the active and passive portfolios, typically only one or two funds change per year, over the 20 years considered. Both portfolios also have 13 funds that are held for more than 10 years out of the 20-year period.

Second, we evaluated the taxable gains and losses from each portfolio based upon the sales necessary to rebalance and reconstitute the portfolio each year. Overall, we found that the passive portfolio has larger taxable gains regardless of how one accounts for carry-forward losses. As a result, the impact of capital gains taxes does not alter our key finding that the active portfolio outperforms the passive portfolio. Thus, it is highly unlikely that transaction costs would change the results of the horse-race.

5.4 Characteristics of the largest active funds

Recall that the results in Table 2 showed that on average actively managed funds did not outperform their passive counterparts in two of the three asset categories, and a majority of fund assets reside in these two categories. The horse race results in Table 3 paint a different picture. The explanation for this difference must be that the largest active funds have different characteristics than the rest.

Table 4: Results of the Monte Carlo simulation

NO. OF YEARS	AVERAGE RETURN		DIFFERENCE	% OF DRAWS ACTIVE BETTER
	ACTIVE	PASSIVE		
5	5.85%	5.54%	0.312%	59.5%
10	5.86%	5.55%	0.306%	64.4%
15	5.88%	5.57%	0.311%	68.1%
20	5.85%	5.54%	0.311%	71.2%

Table 5: Largest active versus other active funds (1996-2015)

	U.S. EQUITY		FIXED INCOME		INTERNATIONAL EQUITY	
	LARGEST	OTHERS	LARGEST	OTHERS	LARGEST	OTHERS
Number	11	3,549	16	2,356	11	1,212
Average annual return (%)	7.2%	6.0%	4.5%	4.0%	6.1%	4.5%
Standard deviation	17.8%	19.2%	3.7%	4.7%	21.1%	23.6%
Average Sharpe	0.27	0.23	0.58	0.38	0.18	0.11
Average expense ratio (%)	0.91%	1.47%	0.69%	1.05%	1.16%	1.72%

We explore this issue by examining a related but distinct issue: the persistence of size for these active funds. That is, how frequently do the same funds appear in the list of the five largest funds across the years? If every year a new set of active funds were the largest, then, over the twenty years, one would have observed 100 unique funds in each asset category (20 times 5 funds/year); conversely, if there were no churn at all, then the same five largest active funds would have persisted across all 20 years. Consequently, in each asset category, the range for the number of unique active funds is bounded by a floor of 5 and a ceiling of 100. Table 4 shows that the largest active funds display a fair degree of persistence of size; the number of unique funds in the U.S. equity, fixed income, and international equity categories are: 11, 16, and 11, which means that the numbers of the unique funds were approximately a tenth of the maximum possible number of funds.

Table 5 presents a comparison of the performance characteristics of these largest active funds and other active funds in each asset category. The average for each metric is computed over the years of a fund's existence within the sample period, 1996-2015.

Table 5 shows that the largest funds have performed markedly better than the remainder of the active funds. In all three asset categories, the largest active funds have demonstrably better absolute and risk-adjusted performance and substantially lower fees than the other active funds. Given these characteristics, it is not surprising that investors have shown a preference for these funds and they have continued to grow over time, explaining the phenomenon of size persistence.

Our finding regarding the outperformance of the larger funds is consistent with the prior academic literature. A key explanation for this characteristic of the largest mutual funds is increased efficiencies due to economies of scale. Some examined benefits of economies of scale generally include: greater ability to diversify risk through larger capital pools and more efficient use of information, as well as a reduction of labor, risk absorption, and physical capital costs [Hughes and Mester (1998), Bossone and Lee (2004)].

Studies have also confirmed that economies of scale play a role in the mutual fund industry. Banko et al. (2010) write that "The economies of scale have the effect of decreasing fund expenses and hence cost to investors… In summary, our results suggest that a mutual-fund investor should invest in a fund, matching the investor's individual goals, that is of sufficient size to have significant scale economies" (p. 335). Other studies have also found that due to fixed costs of investing, there exists significant economies of scale in the mutual fund industry [Latzko (1999)].

Another reason presented for the better performance of these largest mutual funds is the impact of increased (decreased) fund flow due to higher (lower) performance. Matallin-Saez (2011) looked at Spanish mutual funds and determined that the outperformance of larger funds was due to increasing fund flows rather than the initial size of the fund itself. He argued that his analysis implied that, "a positive relation between average size and performance would not be due to the causality initially supposed from the economies of scale hypothesis; in other words, in any case, the performance would have caused an increase in fund size, and not the other way [a]round."

6. IMPLICATIONS

This paper showed that over the twenty-year period, 1996-2015, the average net of fees performance of actively managed U.S. equity and of fixed income funds was worse than that of passive index funds in these two categories. For international equity funds, however, actively managed funds outperformed the passive index funds. These results are generally consistent with the existing literature.

The result unique to this paper is: an investor would be better off by following a readily-implementable strategy of investing in a portfolio of the five largest active funds in each of the three asset categories than investing in a corresponding portfolio of passive funds. It is important to note that this paper's methodology is free from hindsight bias because the portfolio was reconstructed every year based on which funds were the largest ones in the preceding year. This paper shows that the portfolio of the largest actively managed funds outperformed a similarly constructed portfolio of passive funds.

The active-fund-portfolio outperformed not only in terms of average returns, but also in risk-adjusted returns, providing far greater downside risk protection than the passive fund portfolio. These findings call into question the veracity of the "wisdom" of index investing, which has been receiving a lot of attention in the financial press in the recent years. Furthermore, the results have important implications for financial advisors' mutual fund recommendations, particularly in light of the U.S. Department of Labor's new fiduciary rule, which will govern the way advisors help their customers invest for retirement.

Given the findings of this study, investors and their advisors should consider the potential benefits offered by a portfolio of the largest actively managed funds. While the popular press and new guidelines might suggest that passive funds offer superior returns, this analysis clearly shows that active funds can provide superior returns when compared with a portfolio of similar passive funds.

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