

# The case for index-fund investing

Vanguard research

March 2015

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- Indexing is an investment strategy that attempts to track a specific market index as closely as possible after accounting for all expenses incurred to implement the strategy.<sup>1</sup> This objective differs substantially from that of traditional investment managers, whose objective is to outperform their targeted benchmark even after accounting for all expenses.
- This paper updates previous research with data through 2014 to explore the theory behind indexing and provide evidence to support its use.
- We first compare the records of actively managed funds with those of various unmanaged benchmarks. We demonstrate that after costs: (1) the average actively managed fund has underperformed various benchmarks; (2) reported performance statistics can deteriorate markedly once “survivorship bias” is accounted for (that is, once the results of funds that were removed from the public record are included); and (3) persistence of performance among past winners is no more predictable than a flip of a coin.
- We then compare the performance of actively managed funds with passive—or indexed—funds. We demonstrate that low-cost index funds have displayed a greater probability of outperforming higher-cost actively managed funds, even though index funds generally underperform their targeted benchmarks.

<sup>1</sup> Throughout this paper, when referring to indexing, we assume a strategy that is weighted according to market capitalization. For an evaluation of indexes that are not weighted according to market capitalization and the strategies that seek to track those indexes, see Philips et al. (2011) and Thomas and Bennyhoff (2012).

Since its beginnings in the early 1970s, indexing as an investment strategy has grown tremendously, to the point that, according to data from Morningstar, assets in U.S.-domiciled index mutual funds and exchange-traded funds (ETFs) accounted for 38% of equity and 19% of fixed income funds as of year-end 2014. An indexed investment strategy—via a mutual fund or an ETF, for example—seeks to track the returns of a particular market or market segment after costs by assembling a portfolio that invests in the same group of securities, or a sampling of the securities, that compose the market. To track the returns of a specific market or market segment, indexing (or passive) strategies use quantitative risk-control techniques that seek to replicate the benchmark's return with minimal expected deviations (and, by extension, with no expected alpha, or positive excess return versus the benchmark). In contrast, actively managed funds, either fundamentally or quantitatively managed, seek to provide a return that exceeds that of a benchmark. In fact, any strategy that operates with an objective of differentiation from a given benchmark can be considered active management and should therefore be evaluated based on the success of the differentiation. (See the accompanying box, "Beyond the active/passive label—Considerations in selecting funds.")

This paper explores indexing theory and evidence to support its use by investors. We first review the performance of actively managed funds across several broad categories. We note the important role of costs, and of "survivorship bias," in any fund analysis or selection process. Next we compare the results of actively managed funds versus indexed strategies. Finally, we emphasize key characteristics of a well-managed index fund.

### Importance of zero-sum game to the case for indexing

The zero-sum game is a theoretical concept underpinning why indexing can serve as an attractive investment strategy. The concept of a zero-sum game starts with the understanding that at every moment, the holdings of all investors in a particular market aggregate to form that market (Sharpe, 1991). Because all investors' holdings are represented, if one investor's dollars outperform the aggregate market over a particular time period, another investor's dollars must underperform, such that the dollar-weighted performance of all investors sums to equal the performance of the market.<sup>2</sup> Of course, this holds for any market, such as foreign stock and bond markets, or even specialized markets such as commodities or real estate.

*Notes about risk and performance data: Investments are subject to market risk, including the possible loss of the money you invest. Past performance is no guarantee of future returns. Bond funds are subject to the risk that an issuer will fail to make payments on time, and that bond prices will decline because of rising interest rates or negative perceptions of an issuer's ability to make payments. Investments in stocks issued by non-U.S. companies are subject to risks including country/regional risk, which is the chance that political upheaval, financial troubles, or natural disasters will adversely affect the value of securities issued by companies in foreign countries or regions; and currency risk, which is the chance that the value of a foreign investment, measured in U.S. dollars, will decrease because of unfavorable changes in currency exchange rates. Stocks of companies based in emerging markets are subject to national and regional political and economic risks and to the risk of currency fluctuations. These risks are especially high in emerging markets.*

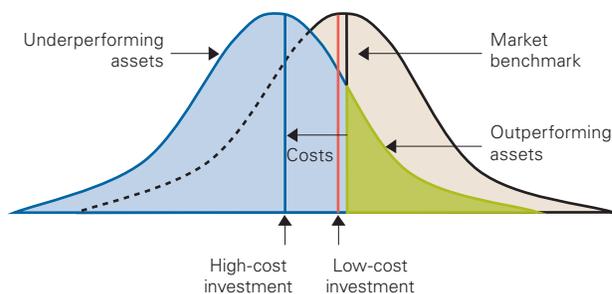
*Funds that concentrate on a relatively narrow market sector face the risk of higher share-price volatility. Prices of mid- and small-cap stocks often fluctuate more than those of large-company stocks. U.S. government backing of Treasury or agency securities applies only to the underlying securities and does not prevent share-price fluctuations. Because high-yield bonds are considered speculative, investors should be prepared to assume a substantially greater level of credit risk than with other types of bonds. Diversification does not ensure a profit or protect against a loss in a declining market. Performance data shown represent past performance, which is not a guarantee of future results. Note that hypothetical illustrations are not exact representations of any particular investment, as you cannot invest directly in an index or fund-group average.*

<sup>2</sup> Dollar weighting gives proportional weight to each holding, based on its market capitalization. Compared with equal weighting, which helps ensure against any one fund dominating the results but also implicitly makes relatively large bets on smaller constituents, dollar weighting more accurately reflects the aggregate equity and bond markets.

The aggregation of all investors' returns can be thought of as a bell curve (see Figure 1), with the benchmark return as the mean. In the figure, the market is represented by the tan region, with the market return as the black vertical line.

At every moment, the dollar-weighted outperformance equals the amount of the dollar-weighted underperformance, such that the sum of the two equals the market return. However, in reality, investors are exposed to costs such as commissions, management fees, bid-ask spreads, administrative costs, market impact,<sup>3</sup> and, where applicable, taxes—all of which combine to reduce investors' realized returns over time. The aggregate result of these costs shifts the investors' curve to the left. We represent the adjustment for costs with a blue curve (see Figure 1). Although a portion of the after-cost dollar-weighted performance continues to lie to the right of the market return, represented by the green region in the figure, a much larger portion is now to the left of the market line, meaning that after costs, most of the dollar-weighted performance of investors falls short of the aggregate

Figure 1. Impact of costs on zero-sum game



Source: Vanguard.

market return. By minimizing costs, therefore, investors have the opportunity to outperform those investors who incur higher costs. This concept is just as relevant in markets often thought to be less "efficient," such as small-capitalization or international equities (Waring and Siegel, 2005).

### Beyond the active/passive label—Considerations in selecting funds

Investors have many considerations to sort through when evaluating a fund as an investment option. Identifying a successful active manager requires due diligence on the investor's part. But once identified, a very talented active manager with a proven philosophy, discipline, and process, and at competitive costs, can provide an opportunity for outperformance. Topping the list of considerations in active management is the importance of finding a manager who can articulate, execute, and adhere to prudent, rational strategies consistently; and then ensuring that the manager's strategy fits into your overall asset and sub-asset allocations. Discipline in maintaining low investment costs—that is, administrative and advisory expenses plus costs due to turnover, commissions, and execution—is also essential to realizing any positive excess return. Another key factor is that of consistency—that is, keeping a good manager, once one is found, rather than rapidly turning over the portfolio. Maintaining the ability to filter out noise—especially short-term measures of performance versus either benchmarks or peers—is furthermore crucial.

Like active managers, investors who choose to index their investments via a passively managed fund or ETF should also realize that not all passive options are alike. An investor should first ensure that the index fund or ETF seeks to track a benchmark that truly represents the targeted objective. For example, if total exposure to U.S. stocks is the object, using an index fund or ETF based only on the 500 stocks in the Standard & Poor's 500 Index would be insufficient, because historically a significant percentage of the total U.S. market capitalization falls outside of the largest 500 names. When comparing similar index funds, investors should focus first on the expense ratio, since cost is one of the largest factors driving tracking error or deviations relative to the target index. Wide tracking error may also be a potential warning sign of inefficient management. Other factors can be considered, too, such as the degree to which a fund engages in securities lending, or whether the fund attempts to match the benchmark through a sampling technique versus full replication.

<sup>3</sup> In this context, *market impact* refers to the effect of a market participant's actions—that is, buying or selling—on a security's price.

## Record of actively managed mutual funds

The clear objective of actively managed portfolios is to outperform a given benchmark. Depending on the active strategy, the target benchmark could be a traditional market index such as the Standard & Poor's 500 Index or the Barclays U.S. Aggregate Bond Index, or the objective could be to generate a positive return in excess of that of U.S. Treasury bills (that is, an absolute-return strategy), with Treasury bills the benchmark. Some managers even seek to deliver outperformance while taking on less risk than their targeted benchmark. Of course, all managers experience times when their investing style is out of favor, but over a reasonably long period—covering multiple market cycles and environments—a skilled active manager should be able to deliver positive excess returns versus the targeted benchmark for the full period. Although the theory of such active outperformance is intuitive, the actual track record of actively managed funds is underwhelming, suggesting that such skill is difficult to find.

### Data

To examine how successful active managers have been in achieving these aims, we begin by examining the performance of a range of funds available to U.S. investors, focusing on a few broad investment categories: U.S. and non-U.S. equities as well as U.S. fixed income. (For an evaluation of actively managed global bond portfolios, see Philips, Schlanger, and Wimmer, 2013.) For all of our comparisons, we use the open-end fund universe provided by Morningstar. Fund classifications are provided by Morningstar, as are the expense ratios, assets under management, inception dates, and termination dates (if relevant). Fund returns are reported net of cost; however, front- or back-end loads and taxes are unaccounted for. We excluded sector funds and specialist funds from our analysis. For our evaluation of index funds, we excluded ETFs because of the lack of adequately long back-runs of data. However, we would expect the conclusions of our results using index funds to extend to index ETFs because index ETFs operate with a similar objective to index funds. We used all share classes of funds to capture the broadest perspective on investor performance, and thus also the influence of differential costs on returns of otherwise identical funds. Even so, we ran the risk of overweighting particular investment strategies. To check the robustness of our findings, we therefore also present, in a later section, our results in terms of asset-weighted performance. When evaluating fixed income, long-term U.S. government and long-term corporate funds were excluded because of their small sample size and consistent duration mismatch versus the available long-

bond benchmarks. For international equity funds, we excluded small-capitalization-focused funds from the style analysis because of a lack of history.

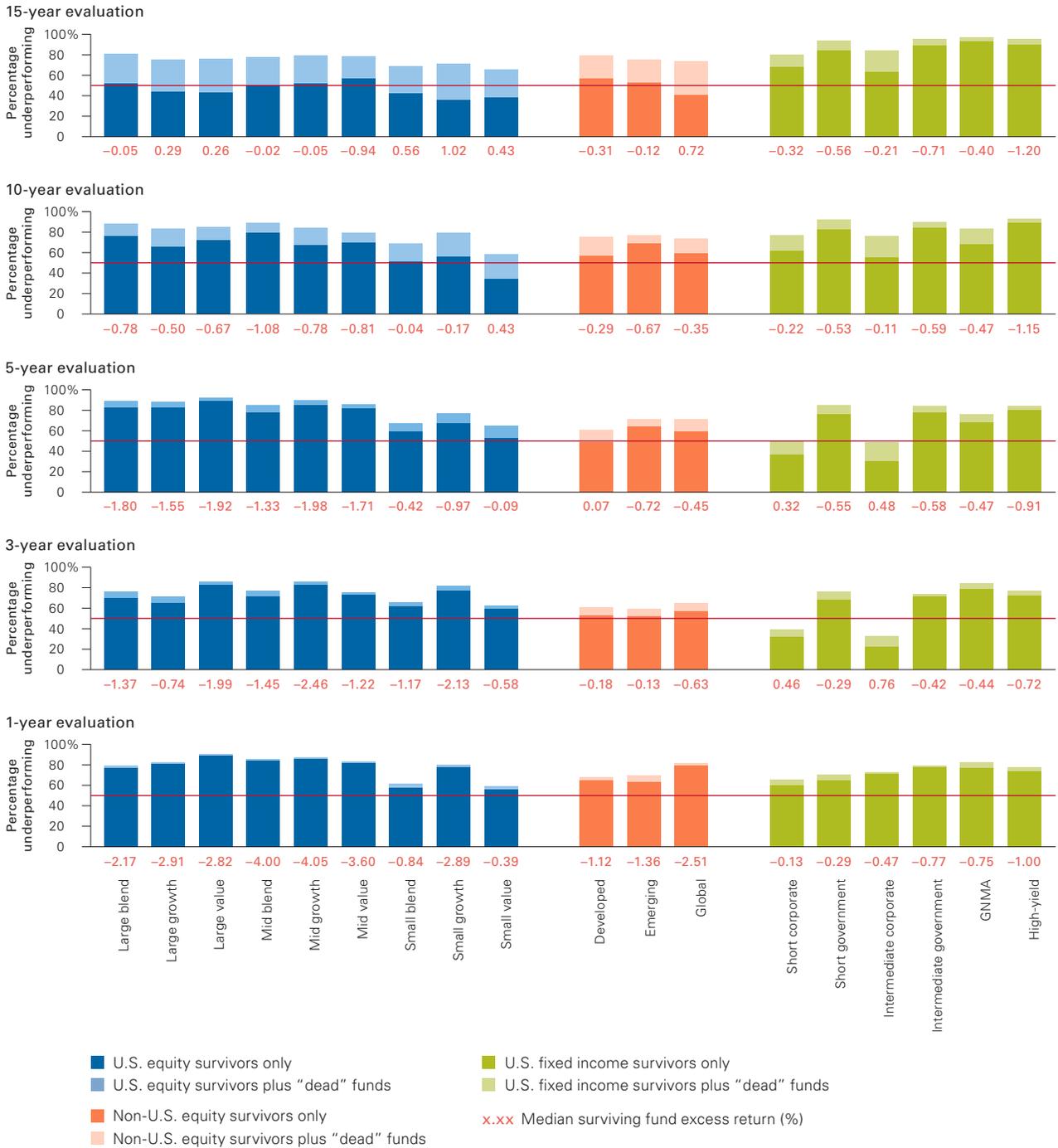
### The results show: Active managers underperformed their benchmarks

Figure 2 shows the relative performance of actively managed mutual funds when evaluated against the funds' benchmarks (as identified in each firm's fund prospectus) over the 1, 3, 5, 10, and 15 years through December 31, 2014. For each period we show three results:

1. The percentage of funds in each category that survived the time period but underperformed their benchmarks and were unadjusted for so-called survivorship bias (that is, the results do not reflect those funds that dropped out over time).
2. The percentage of funds in each category that started the given period but either underperformed or dropped out of the sample (thereby accounting for survivorship bias—that is, the practice of removing “dead” funds from a performance database—see the box on page 6 for more on the importance of accounting for dead funds).
3. The annualized excess return for the median surviving fund.

Figure 2's major finding is that active fund managers as a group have underperformed their stated benchmarks across most of the fund categories and time periods considered. To take one example, 72% of U.S. large-cap value equity funds underperformed their benchmarks over the ten years ended December 31, 2014. The case for indexing has been strong over shorter horizons, too, although shorter sample periods have tended to produce slightly more erratic results. The case for indexing over longer horizons such as 15 years has also tended to be strong. We also show median annualized excess returns in Figure 2 because to evaluate managers using solely the percentage underperforming assumes that a manager who underperforms by –10% has achieved a result as meaningful as one who underperforms by just –0.01%. Using again the example of U.S. large-cap value equity funds at the ten-year horizon, the median surviving fund returned an annualized –0.67% less than the targeted benchmark. In fact, the median fund trailed its benchmark in the majority of fund categories and time horizons we examined. It is important to note, however, that the median returns cited are only for those funds that survived, as we do not have full-period statistics for funds that closed along the way.

Figure 2. Performance of actively managed mutual funds versus their prospectus benchmarks



Note: Data reflect periods ended December 31, 2014.

Sources: Vanguard calculations, using data from Morningstar, Inc. Fund classifications provided by Morningstar; benchmarks reflect those identified in each fund's prospectus.

### Impact of survivorship bias on performance results

Schlanger and Philips (2013) discussed the importance of accounting for dead funds when evaluating the performance of various fund categories. The study found that: Surviving funds generally outperformed funds that were liquidated or merged; a significant majority of liquidated funds underperformed before closure; a significant majority of funds that were eventually merged underperformed before the merger; and a fund merger generally led to better relative performance compared with periods before the event, but the merged funds' performance still lagged their unmanaged benchmarks.

To test the assumption that closed funds underperformed over the time period evaluated in this paper, we analyzed the performance of all the funds identified by Morningstar as either being liquidated or merged into another fund. We measured the closed funds' excess returns versus a style-box benchmark for the 6, 12, and 18 months previous to the funds' date of closure. Figure 3 presents the results. Clearly, a possible factor leading to the closure of these funds was relative underperformance.<sup>4</sup>

Figure 3. Performance prior to fund closure



**Notes:** Data reflect periods ended December 31, 2014. The figure reflects the median funds' excess return versus a style benchmark as noted in the Appendix, on page 18. We show here the returns for any fund that was removed from the Morningstar database for any reason.

**Sources:** Vanguard calculations, using data from Morningstar, Inc.

We attempted to account for survivorship bias in Figure 2 by identifying those funds that were alive at the start of each period but dropped out of the database at some point along the way. (See the box above, and Figure 3.) If underperforming funds drop out of the database, this tends to exaggerate the proportion of active managers who outperform their chosen index—and that is exactly what the empirical results seem to suggest. This adjusted percentage is shown in Figure 2 as the light blue bar above the blue bar. For example, in the case of U.S. large-cap value equity funds, at the ten-year horizon, the adjustment for survivorship bias increases the proportion underperforming from 72% to 85%. Indeed, after accounting for this survivorship bias, the degree of underperformance increased across all categories.

### Importance of benchmark selection

Comparing a fund's results with those of its designated benchmark provides perspective on how the fund has fared relative to its stated objective. However, this may not be so informative for investors interested in a

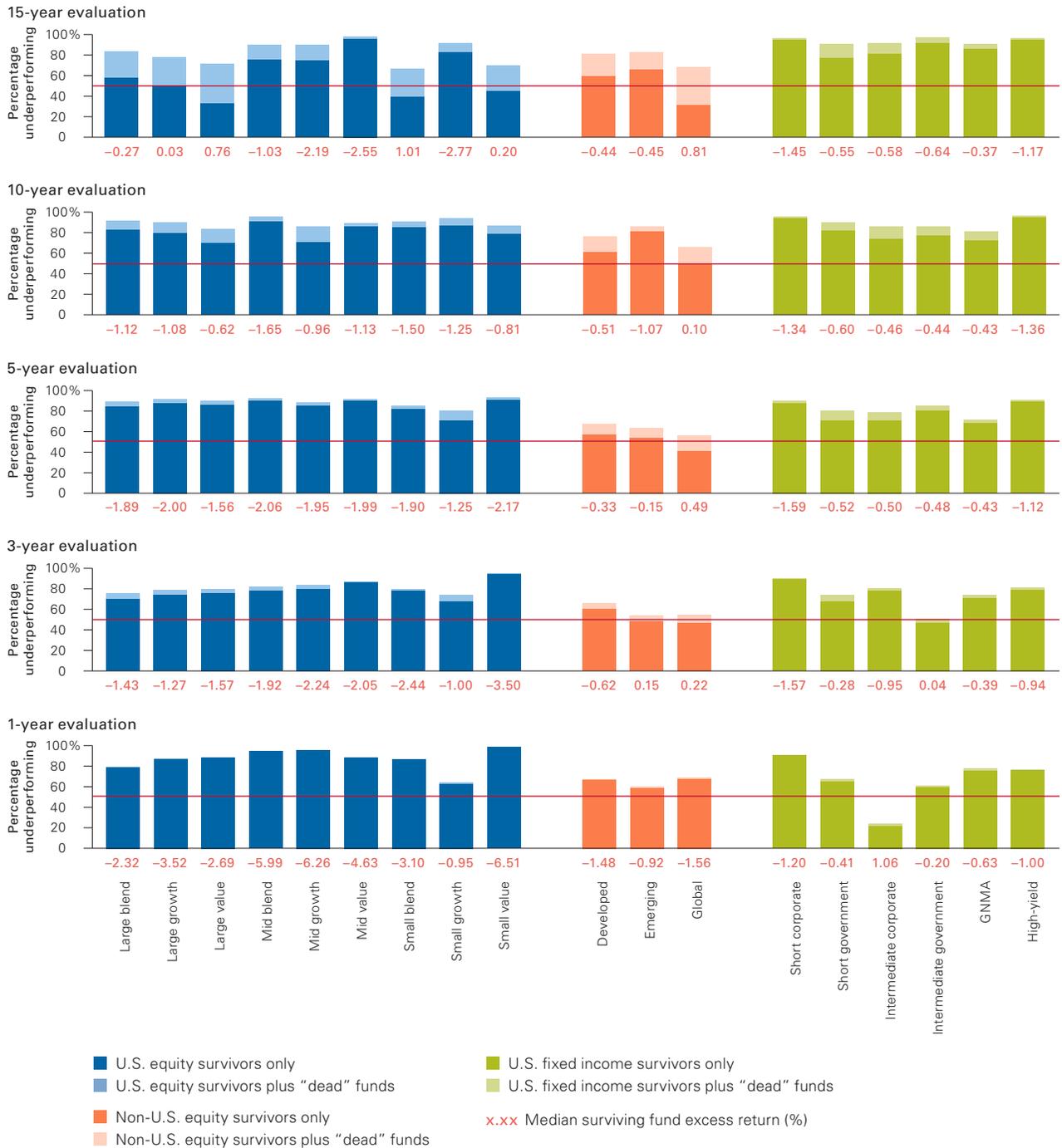
fund from a particular market segment. This is because managers may in fact be using benchmarks that do not align with their fund's investment style. For example, a global manager may be comparing a fund to the S&P 500—a U.S. large-cap index—when an index that includes a global sampling of countries would be a more appropriate match. Figure 4 assigns an appropriate "style benchmark" to each fund based on the fund's Morningstar category. For example, funds categorized by Morningstar as "large-cap U.S. value" were compared against a representative U.S. large-cap value index and so on. In most cases, the perception of how the average manager performed differs from that conveyed by Figure 2.<sup>5</sup>

These results highlighted several important findings. First, the relative underperformance of actively managed funds versus their style benchmarks has been consistent across asset classes (both equity and fixed income). Second, within each asset class, we again observed consistency with respect to relative underperformance across the Morningstar style boxes (for example, as in

<sup>4</sup> These results corroborate previous studies on the impact of survivorship bias. Brown and Goetzmann (1995), for example, showed that funds tend to disappear owing to poor performance. In addition, Carhart et al. (2002) showed that the performance impact of dead funds increases as the sample period increases.

<sup>5</sup> For the time periods with available data, we used benchmarks provided by MSCI and CRSP for the U.S. fund categories; however, we found similar results using benchmarks provided by Russell and by Standard & Poor's. See Philips and Kinniry (2012) for more on the nuances of benchmark construction.

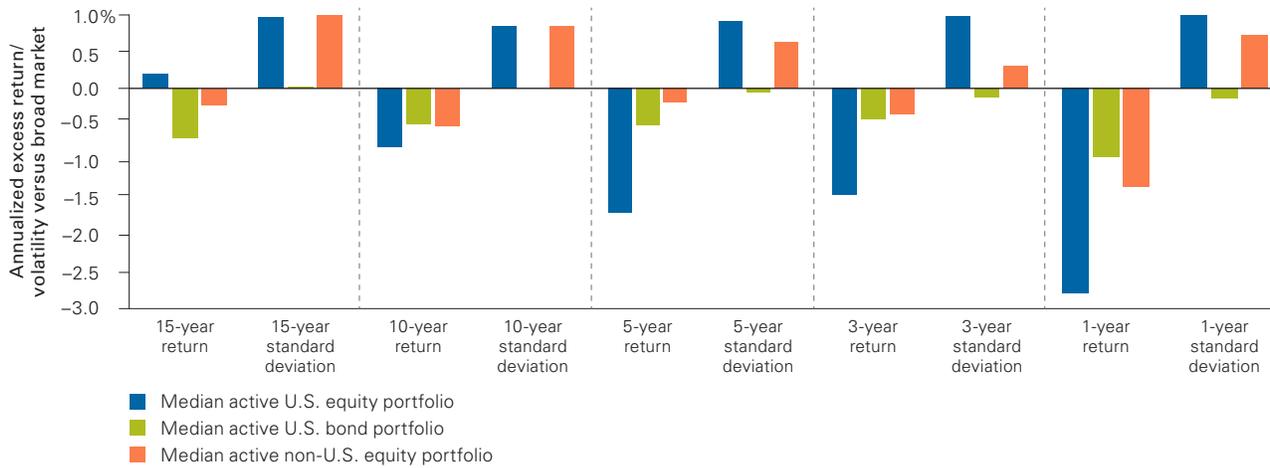
Figure 4. Performance of actively managed mutual funds versus a representative 'style benchmark'



Notes: See Appendix, page 18, for a listing of all benchmarks used in this analysis. Data reflect periods ended December 31, 2014.

Sources: Vanguard calculations, using data and fund classifications from Morningstar, Inc., MSCI, CRSP, Standard & Poor's, and Barclays. Fund classifications provided by Morningstar.

Figure 5. Portfolios of actively managed funds can lead to increased volatility



**Notes:** This illustration of hypothetical portfolios does not represent the returns of any particular investment. Portfolio weights approximate the relative allocations within each market as of December 31, 2014. Allocations are as follows: Median active U.S. equity portfolio—70% median large-cap fund/20% median mid-cap fund/10% median small-cap fund; median active U.S. bond portfolio—60% median government bond fund/40% median corporate bond fund; median active non-U.S. equity portfolio—80% median developed markets fund/20% median emerging markets fund. The U.S. bond market is represented by the Barclays U.S. Aggregate Bond Index; the U.S. stock market is represented by the Wilshire 5000 Index through April 22, 2005, and the MSCI US Broad Market Index through June 2, 2013, and the CRSP US Total Market Index thereafter; and the international stock market is represented by the MSCI All Country World Index ex USA.

Sources: Vanguard calculations, using data from Morningstar, Inc.

capitalization and size within equities). Finally, and of particular interest, a *significant majority* of actively managed funds in so-called inefficient sectors such as mid- and small-cap stocks, high-yield bonds, and emerging market stocks underperformed their benchmark, particularly when accounting for those funds that were closed. As mentioned earlier, a common myth is that actively managed funds have a leg up in market segments perceived as inefficient. Clearly, funds invested in these inefficient areas have not delivered on the promise of outperformance.

### Implications for investors

While we have demonstrated the challenges of investing in actively managed funds with respect to outperformance, investors building portfolios of active funds may also be subject to higher volatility than a given benchmark. For example, **Figure 5** shows the median excess return and median excess volatility for portfolios of actively managed funds from Figure 4 relative to the market benchmark. In many cases the active portfolio had both lower returns and higher volatility than the market benchmark. Of course this was not always the case, and particularly with respect to the U.S. equity portfolios for the 15-year period, higher risk generally came with higher returns. (See also the upcoming Figure 12).

Although the median portfolio generally underperformed its indexes, investors do have the opportunity to select funds that rank in the upper half of all managers. Indeed, our analysis has so far shown that even over a relatively long period, some actively managed funds survived and outperformed their benchmarks. Including such outperformers in a portfolio is the primary objective of investors who use actively managed funds. And if we were to re-create Figure 5 using top-quartile-performing funds, the results would surely shift. (See also the box, “Assessing investors’ performance,” on page 9.)

### Can investors consistently pick winning funds?

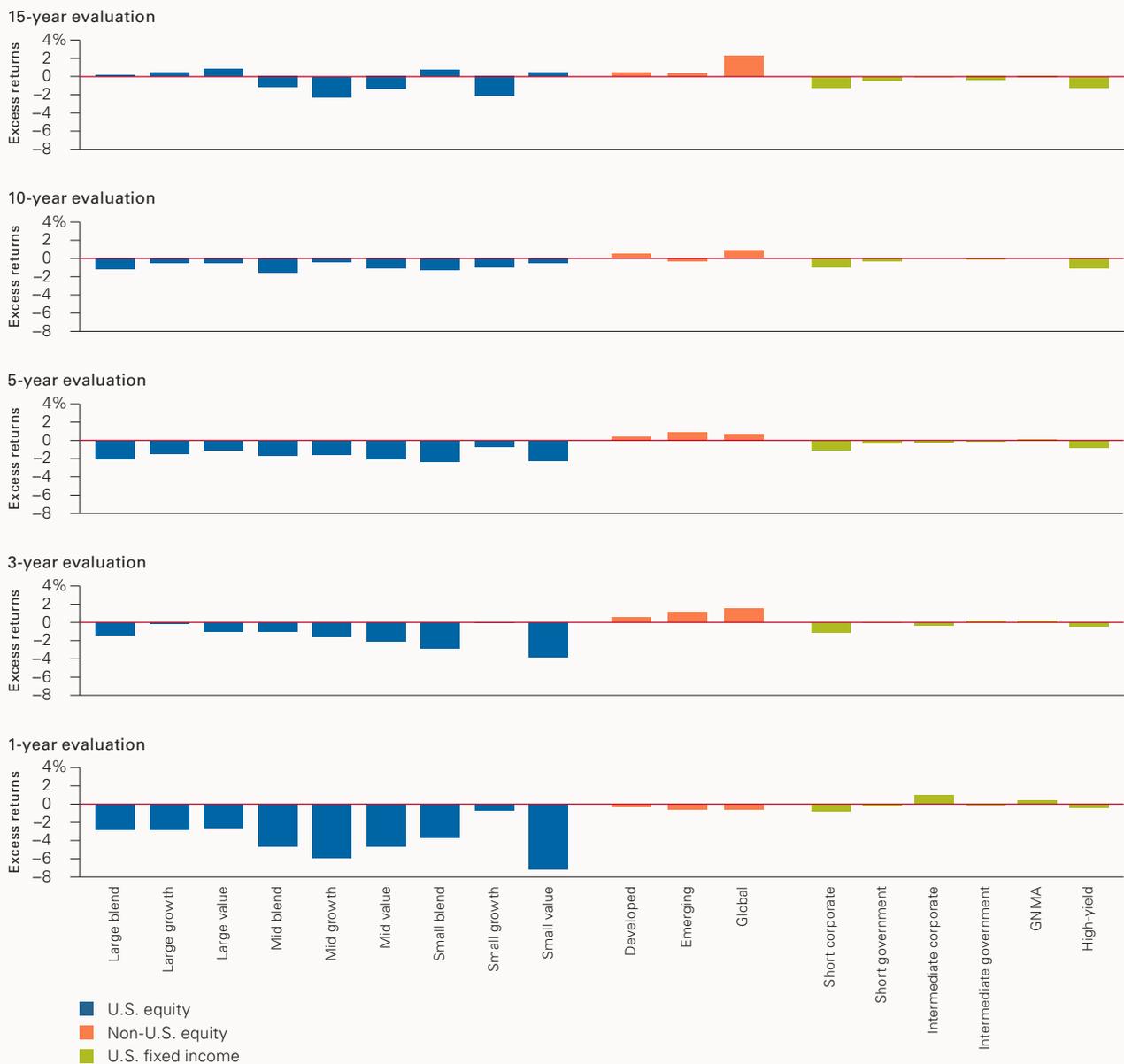
Two critical questions for investors, therefore, are: “Do I have the ability to pick a winning fund in advance?” and “Will the winning fund continue to win for the entire life of my portfolio?” In other words, can an investor expect to select a winner from the past that will then persistently outperform in the future? Academics have long studied whether past performance can accurately predict future performance. More than 40 years ago, Sharpe (1966) and Jensen (1968) found limited to no persistence. Three decades later, Carhart (1997) reported no evidence of persistence in fund outperformance after adjusting for both the well-known Fama-French three-

## Assessing investors' performance

Another way to evaluate the relative success of investors is to view performance results in terms of asset-weighted performance. In such a computation, larger funds account for a larger share of the results because they reflect a greater proportion of investors' assets. Relative to "equal weighting" or using a category's median fund, which may be large or small, asset weighting provides a clearer sense of how investors collectively performed. One caveat to such an approach, however, is that not all funds report

asset values on a regular basis. To be included in our analysis, a fund had to have both monthly assets and monthly returns. As a result, the funds represented in **Figure 6** may not be the same as those shown in Figures 2 and 4. Note also that although we have a sizable sample to evaluate, nearly one-third of all funds shown in Figures 2 and 4 are excluded in Figure 6 because of failure to report assets. This is especially relevant for the 10- and 15-year periods.

**Figure 6. Asset-weighted performance gives additional perspective on how investors performed**



Notes: See Appendix, page 18, for a listing of all benchmarks used in this analysis. Data reflect periods as of December 31, 2014.

Sources: Vanguard calculations, using data from Morningstar, Inc., MSCI, CRSP, Standard & Poor's, and Barclays.

factor model (that is, the influence of the equity market, fund size, and fund style, as delineated by Eugene Fama and Kenneth French in 1993) as well as for momentum. Carhart’s study reinforced the importance of fund costs and highlighted how not accounting for survivorship bias can skew results of active/passive studies in favor of active managers. More recently, Fama and French (2010) reported results of a separate 22-year study suggesting that it is extremely difficult for an actively managed investment fund to regularly outperform its benchmark. (By the same token, see also our upcoming analysis in this paper of persistence among previously losing funds.)

To analyze consistency among actively managed funds, we ranked all U.S. equity funds in terms of excess return versus their stated benchmarks over the five years ended 2009. We then divided the funds into quintiles, separating out the top 20% of funds, the next-best-performing 20% of funds, and so on. We then tracked their excess returns over the following five years (through December 2014) to check their performance consistency. If the funds in the top quintile displayed consistently superior excess returns, we would expect a significant majority to remain in the top 20%. A random outcome would result in about 20% of funds dispersed evenly across the five subsequent buckets (that is, if we ignore the possibility of a fund closing down).

It is interesting that, as **Figure 7** shows, the results for U.S. investors in U.S. equity funds do not appear to be significantly different from random. Although about 13% of the top funds (147 of 1,091) remained in the top 20% of all funds over the subsequent five-year period, an investor selecting a fund from the top 20% of all funds

in 2009 stood a 33% chance of falling into the bottom 20% of all funds or seeing his or her fund disappear along the way. Indeed, we found that the percentage of highest-quintile active funds falling to the lowest quintile (23.5%) exceeded the probability that the funds would remain in the top quintile (13.5%). Stated another way, of the 5,375 funds available to invest in 2009, only 147 (3%) achieved top-quintile excess returns over both the five years ended 2009 and the five years ended 2014.

The subsequent performance of funds that were in the bottom quintile in 2009 (from Figure 7) was furthermore revealing. Nearly 45% of the 1,032 funds were liquidated or closed by 2014, and 8.7% remained in the bottom quintile, while only 25% managed to “right the ship” and rebound to either of the top-two quintiles. Indeed, persistence has tended to be stronger for previous losers than previous winners.

This high turnover with respect to outperformance and market leadership is one reason the temptation to change managers because of poor performance can simply lead to more disappointment. For example, Goyal and Wahal (2008), in a well-reported study, found that when sponsors of U.S. institutional pension plans replaced underperforming managers with outperforming managers, the results were far different than expected. For example, the authors evaluated the performance of both hired and fired managers before and after the decision date. They found that following termination, the fired managers actually outperformed the managers hired to replace them by 49 basis points in the first year, 88 basis points over the first two years, and 103 basis points over the first three years.

**Figure 7. Analyzing persistence of ranking in actively managed U.S. funds**

Quintile	No. of funds	Excess return ranking (5 years ended 12/31/2009)	Quintile ranking in subsequent nonoverlapping 5-year period ended 12/31/2014 (percentage of funds)						
			Highest quintile	High	Medium	Low	Lowest quintile	Merged/closed	Total
1	1,091	Highest quintile (1)	13.5%	16.6%	20.3%	16.2%	23.5%	9.9%	100.0%
2	1,083	High (2)	12.4	13.5	16.0	20.6	15.5	22.1	100.0
3	1,084	Medium (3)	14.9	13.9	14.2	17.7	13.4	25.9	100.0
4	1,085	Low (4)	13.8	15.1	11.0	12.3	10.0	37.9	100.0
5	1,032	Lowest quintile (5)	13.8	11.5	10.9	10.6	8.7	44.6	100.0

**Notes:** The first two columns rank all active U.S. equity funds within each of the Morningstar style categories based on their excess returns relative to their stated benchmarks during the period cited. The shaded columns show how the funds in each quintile performed over the next five years.

**Sources:** Vanguard and Morningstar, Inc.

**Figure 8. Relative performance can be volatile over time and in shorter evaluation windows**

Percentage of actively managed equity funds underperforming benchmark for five years ended . . .

Category	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Large blend	95%	89%	75%	65%	56%	49%	44%	58%	67%	74%	65%	64%	68%	72%	77%	76%	84%
Large growth	99	90	63	67	56	33	44	65	55	36	55	63	74	79	88	76	88
Large value	86	93	82	55	39	41	31	34	74	81	70	50	49	45	51	56	86
Mid-cap blend	84	73	76	79	70	61	67	64	83	86	73	71	70	72	65	83	90
Mid-cap growth	87	69	89	94	88	78	77	82	84	77	45	53	48	51	53	73	85
Mid-cap value	78	65	86	85	86	72	84	84	93	77	77	64	51	58	75	73	90
Small blend	42	63	21	20	20	19	22	39	52	83	62	66	69	69	78	78	82
Small growth	28	24	28	35	61	59	79	83	86	73	74	81	81	83	85	77	71
Small value	81	77	86	79	47	25	28	22	30	34	55	48	45	42	60	61	91

Notes: See Appendix, page 18, for benchmarks used for each Morningstar style box. Data reflect periods through December 31, 2014.

Sources: Vanguard calculations, using data from Morningstar, Inc., MSCI, CRSP, and Standard & Poor's.

### Impact of market cycles on results of actively managed funds

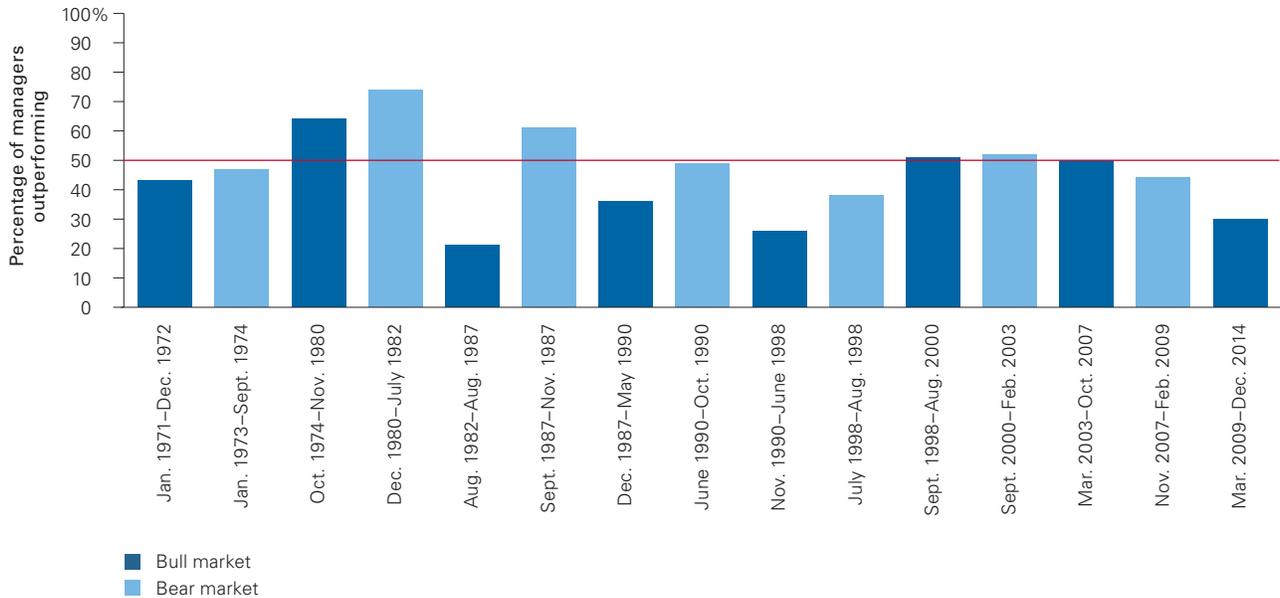
Over time and over specific periods, the percentage of funds underperforming a particular index will vary. Much of this variation is due to the cyclical nature of the financial markets. **Figure 8** shows five-year evaluation windows for the U.S. equity style boxes. These shorter time windows reveal the presence of significant volatility. For example, the percentage of large-cap value funds that underperformed the large-cap value benchmark ranged from 93% for the five years ended 1999 to just 31% for the five years ended 2004.

Style-box cyclicity is influenced by the relative performance of one style benchmark versus another. First, because many managers have holdings that fall within other boxes, when there are significant differences in returns between style boxes, managers in the lower-performing boxes can be expected to stand a greater chance of outperforming their respective style box. For example, if mid-cap value outperforms large-cap value by 300 basis points, and mid-cap value stocks constitute 20% of a large-cap value manager's portfolio, the large-cap manager would realize 60 basis points of excess return relative to the large-cap value benchmark, which could result in that manager outperforming the large-cap value benchmark. For a more in-depth analysis of the cyclicity of indexing, see Philips and Kinniry (2009).

A second perspective with respect to market cycles is the performance of actively managed funds during bear markets. A common perception is that actively managed funds will outperform their benchmark in a bear market because, in theory, active managers can move into cash or rotate into defensive securities to avoid the worst of a given bear market.

In reality, the probability that these managers will move fund assets to defensive stocks or cash at just the right time is very low. Most events that result in major changes in market direction are unanticipated. To succeed, an active manager would not only have to time the market but also do so at a cost that was less than the benefit provided. **Figure 9**, on page 12, illustrates how hard it has been for active fund managers to outperform the broad U.S. stock market. In four of seven bear markets since January 1973, and six of the eight bull markets, the average mutual fund did not outperform the index. When considering the implications of these results, it's important to note that to win over time a manager must not only accurately time the start and end of the bear market but select winning stocks during each period. Combining these results with those from previous figures in this paper demonstrates the challenges for long-term investors when choosing active management. For more on the challenges of outperforming during bear markets, see Philips (2009) and Davis and Philips (2007).

Figure 9. Percentage of managers outperforming market during bull and bear cycles



Sources: Vanguard calculations, using data from Morningstar, Inc., and Dow Jones.

### Comparing performance of index and active funds

The results presented so far showing the average underperformance of actively managed funds would seem to be consistent with the theory of the zero-sum game explained earlier. Before costs, for every invested dollar that outperforms the market, there has to be a dollar that underperforms. But once costs are taken into account, more funds will inevitably undershoot their desired benchmark than overshoot. Moreover, the evidence shows that the population of actively managed funds that we have examined is unable to outperform the rest of the population of investors. Our earlier theoretical discussion also suggested that passive funds ought to be able to outperform actively managed funds if: (1) active funds are unable, on average, to outperform their chosen benchmarks after costs, and (2) passive funds have lower average costs. Having demonstrated the first thesis, we now turn to the second.

Considerable evidence already exists that the odds of achieving a return that outperforms a majority of similar investors are increased if investors simply aim to seek the lowest possible cost for a given strategy. For example, Financial Research Corporation (2002) evaluated the predictive value of different fund metrics, including a fund's past performance, Morningstar rating, alpha, and beta.<sup>6</sup> In the study, a fund's expense ratio was the most reliable predictor of its future performance, with low-cost funds delivering above-average performances in all of the periods examined. Similar research conducted at Vanguard by Wallick et al. (2011) evaluated a fund's size, age, turnover, and expense ratio, and concluded that the expense ratio was the only significant factor in determining future alpha. In addition, Philips and Kinniry (2010) showed that using a fund's Morningstar star rating as a guide to future performance was less reliable than using the fund's expense ratio. Practically speaking, a fund's expense ratio is a valuable guide (although not a sure thing), because the expense ratio is one of the few characteristics known in advance.

<sup>6</sup> Alpha refers to a portfolio's risk-adjusted excess return versus its effective benchmark. Beta is a measure of the magnitude of a portfolio's past share-price fluctuations in relation to the movement of the overall market (or appropriate market index).

Figure 10 shows the average dollar-weighted expense ratios for various categories of mutual funds. As of December 31, 2014, investors in actively managed large-cap equity mutual funds were paying an average of approximately 0.77% annually, and those in actively managed government bond funds were paying 0.45% annually, versus 0.11% and 0.12% for the respective index funds and 0.14% and 0.15%, respectively, for ETFs.

Figure 11, on page 14, provides evidence for the inverse relationship between investment performance and cost across multiple categories of funds, including both indexed and active mandates. Specifically, the figure shows the ten-year annualized excess return of each fund relative to its style benchmark and the way in which those excess returns relate to the fund's expenses. The red line in each style box represents the simple regression line and signifies the trend across all funds for each style box. Generally speaking, the results show that higher costs are associated with lower excess returns. For investors, the clear implication is that by focusing on low-cost funds (both active and passive), the probability of outperforming higher-cost portfolios increased.

Taken together, Figures 10 and 11 suggest that indexed strategies can provide investors the opportunity to outperform higher-cost active managers. This is because index funds generally operate with lower costs than actively managed funds. The higher expenses for actively managed funds often result from both the research process required to identify potential outperformers and the generally higher turnover<sup>7</sup> associated with the attempt to best a benchmark.

Figure 12, on page 15, demonstrates the relative success of low-cost indexed strategies when compared with their higher-cost actively managed counterparts. For this analysis we were limited in our evaluations by the existence of both indexed and active funds within each market. As a result, we focused on large-cap blend stocks, small-cap blend stocks, foreign developed markets stocks, emerging markets stocks, and U.S. diversified bonds.

In keeping with the zero-sum theory, a majority of actively managed funds underperformed the average low-cost index fund across investment categories and

### Figure 10. Asset-weighted expense ratios of active and passive investments

Average dollar-weighted expense ratios as of December 31, 2014

	Investment type	Actively managed funds	Index funds	ETFs
U.S. stocks	Large-cap	0.77%	0.11%	0.14%
	Mid-cap	0.94	0.15	0.24
	Small-cap	1.00	0.17	0.19
U.S. sectors	GICS sectors	0.87	0.49	0.31
	Real estate	0.90	0.12	0.20
International stocks	Developed market	0.87	0.16	0.27
	Emerging market	1.12	0.19	0.38
U.S. bonds	Corporate	0.56	0.10	0.12
	Government	0.45	0.12	0.15

Note: GICS = Global Industry Classification System.

Sources: Vanguard calculations, using data from Morningstar, Inc. Discrepancies are due to rounding.

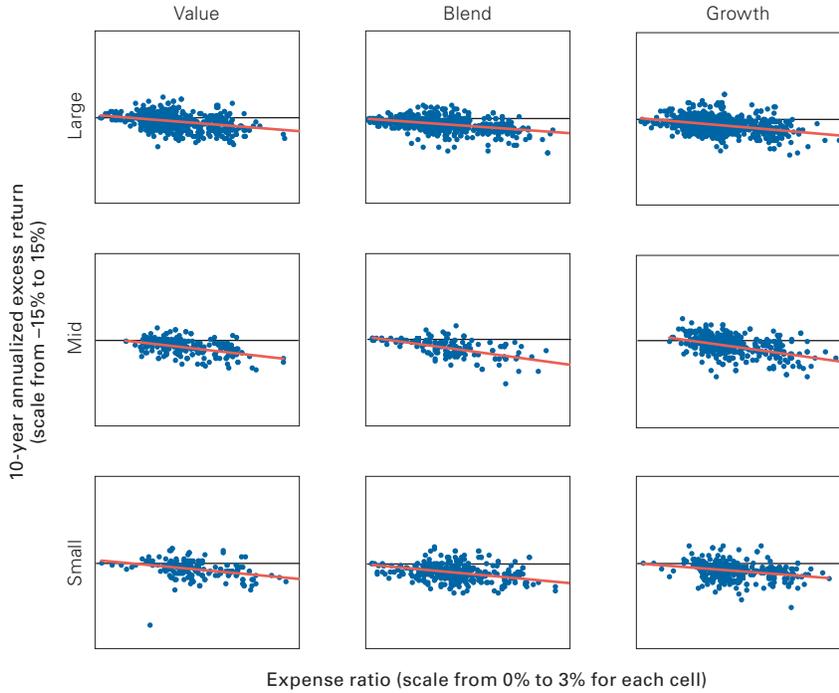
time periods. These results are also in line with the conclusions of McGuigan (2006), who found that the probability of selecting the "wrong" active fund in terms of the degree of possible underperformance relative to a benchmark was always greater than the probability of selecting actively managed large- and mid-cap funds that would outperform by the same amount for the 20 years ended 2003.

It is important to note that we compared actively managed funds to low-cost indexed funds because when it comes to passive fund management, it's not just about picking any index fund. To track the returns of a specific market or market segment, indexing strategies use quantitative risk-control techniques that seek to replicate the benchmark's return with minimal expected deviations (and, by extension, with no expected alpha). However, because the targeted benchmark incurs no expenses, inefficiencies, or implementation costs, the return an investor receives in an index fund will reflect those implementation costs (transaction costs and other operational or trading frictions) and, therefore, should

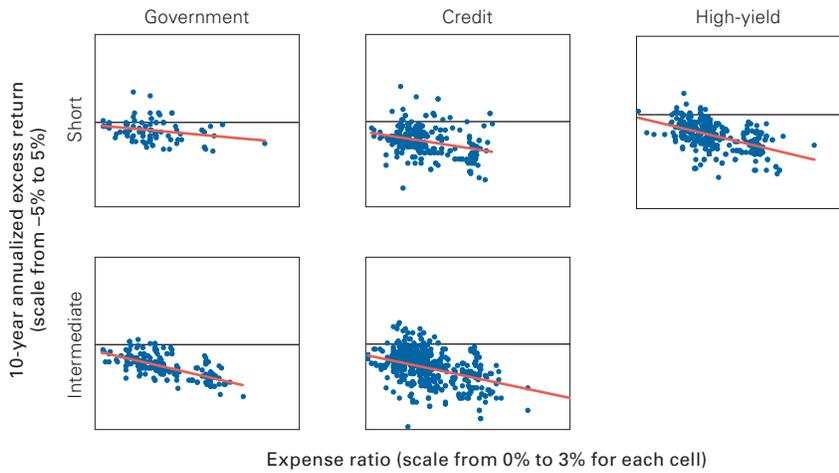
<sup>7</sup> Turnover, or the buying and selling of securities within a fund, results in transaction costs such as commissions, bid-ask spreads, market impact, and opportunity cost. These costs, although incurred by every fund, are generally opaque, but do detract from net returns. A mutual fund with abnormally high turnover would thus likely incur large trading costs. All else being equal, the impact of these costs would reduce total returns realized by the investors in the fund.

Figure 11. Inverse relationship between expenses and excess returns for all U.S. funds

a. U.S. equity funds



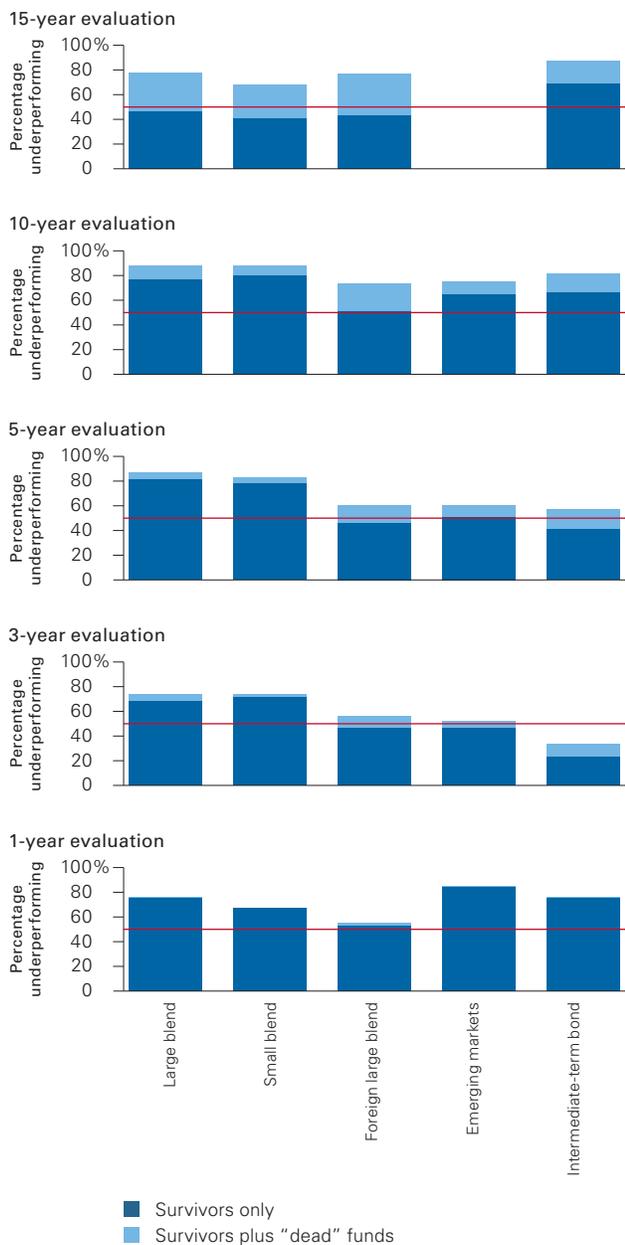
b. U.S. bond funds



**Notes:** Each plotted point represents a fund within the specific size, style, and asset group. The funds are plotted to represent the relationship of their expense ratio (x-axis) versus the ten-year annualized excess return relative to their style benchmark (y-axis). The straight line represents the linear regression, or the best-fit trend line, showing the general relationship of expenses to returns within each asset group. The scales are standardized to show the slopes' relationships to each other, with expenses ranging from 0% to 3% and returns ranging from -15% to 15% for U.S. equities and -5% to 5% for U.S. fixed income. Some funds' expense ratios and returns go beyond the scales and are not shown. See the Appendix, on page 18, for benchmarks used for each Morningstar style box. Data reflect periods ended December 31, 2014.

**Sources:** Vanguard calculations, using data from Morningstar, Inc., MSCI, CRSP, and Standard & Poor's.

**Figure 12. Percentage of active funds underperforming the average return of low-cost index funds**



**Notes:** The actively managed funds are those listed in the respective Morningstar categories. Index funds are represented by funds with expense ratios of 20 basis points or less as of December 31, 2014. Data reflect periods ended December 31, 2014.

**Sources:** Vanguard and Morningstar, Inc.

provide investors with the best proxy for the achievable or investable index return. Any investor seeking to capture the performance of a specific benchmark must therefore identify and then invest in an appropriate product that seeks to track that index, while acknowledging that not all indexed investment strategies are created equal.

Because an indexed strategy's objective is to mimic a given benchmark as tightly as possible, we stated earlier that any significant deviations from a benchmark's return over time can potentially indicate inefficient management.<sup>8</sup> For index funds, a key driver of potential deviations is the expense incurred along the way to manage the portfolio. **Figure 13**, on page 16, performs a similar analysis as that in Figure 11, but focuses solely on those indexed strategies seeking to track the S&P 500 Index. The strength of the relationship is notable. Investors interested in the S&P 500 Index as a beta for large-cap stocks should consider investing in an index fund or ETF with the lowest possible expenses.

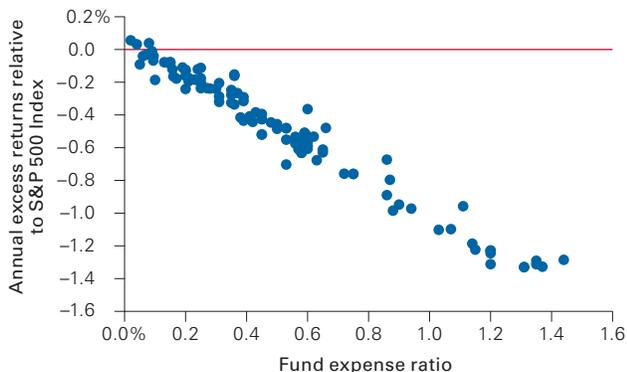
Beyond expense ratio, other factors that might contribute to the effectiveness of mimicking a targeted benchmark include the extent to which the index is replicated (which can be a function of portfolio size and the number of securities in the benchmark), the liquidity of the targeted market (resulting in larger or smaller bid-ask spreads), the nature and size of the portfolio's cash-flow profile, and the index strategy provider's portfolio- and risk-management processes. The net result of the factors discussed is that an ideal index fund or ETF would have low expenses, a greater level of index replication, and an efficient and risk-controlled portfolio-management process. Together, these factors would permit an index fund or ETF to deliver returns very close to, if not identical to, the targeted benchmark consistently over time.

### Other benefits of indexed strategies

Indexed investments can provide several benefits to investors. First and foremost, indexed strategies benchmarked to broad-market indexes can provide greater control of the risk exposures in a portfolio. For example, filling a recommended equity allocation with an actively managed fund can result in meaningfully different risk-and-return characteristics than the broad market (see Figure 4, for instance). This could expose the investor to greater (or less) risk than he or she targeted by way of the asset allocation decision.

<sup>8</sup> Tracking error results from numerous causes, some of which may be tied to government regulations. For example, in very narrow indexes such as those focusing on a specific stock market sector or an individual country, such regulations may establish limits on how much of any one security can be represented in a portfolio. As such, the index fund or ETF cannot replicate the targeted benchmark, even given the desire to do so. This leads to unavoidable tracking error, but may not be indicative of a poorly managed strategy, since the strategy may still reflect the most efficient investable vehicle available.

**Figure 13. Relationship between expense ratio and excess returns for S&P 500 Index funds**



**Notes:** Dataset represents index funds (all share classes) with an objective of replicating the S&P 500 Index. Data cover ten years ended December 31, 2014.

**Sources:** Vanguard, using data from Morningstar, Inc.

### Diversification

Index funds typically are more diversified than actively managed funds, a by-product of the way indexes are constructed. Except for index funds that track narrow market segments, most index funds must hold a broad range of securities to accurately track their target benchmarks, whether by replicating them outright or by a sampling method. The broad range of securities dampens the risk associated with specific securities and removes a component of return volatility.

### Style consistency

An index fund maintains its style consistency by attempting to closely track the characteristics of the index. An investor who desires exposure to a particular market and selects an index fund that seeks to track that market is expecting to receive a consistent allocation. An active manager may have a broader mandate, causing the fund to be a “moving target” from a style point of view.

### The tax advantage

From an after-tax perspective, broad index funds and ETFs may provide an additional advantage over actively managed funds. Because of the way index funds are managed, they often realize and distribute capital gains less frequently than actively managed funds. That said, it’s important to note that the tax efficiency of index funds and ETFs can vary tremendously, depending on

the index the fund is attempting to track (all else equal, narrower indexes may require greater turnover) as well as the management process of the fund (all else equal, a full replication strategy would likely lead to less turnover than an optimization strategy). A 2010 study from Lipper (Thomson Reuters) reported that over the 16 years ended 2009, the highest portfolio turnover ratio for the average S&P 500 Index fund was 19.00% (in 1994), while the lowest was 6.54% (in 2004). This is because turnover of index funds is primarily driven by changes in index membership.

Because turnover is much lower in an index fund, there is less opportunity to distribute capital gains. For example, the same 2010 study reported that index funds or index-based funds posted the top returns, both on a before- and after-tax return basis, in 7 of 11 classification groups over the ten years ended 2009.

Of course, the actual impact of taxes, as well as the relative results between indexed strategies and active strategies, can and does change over time, depending on how markets perform and how the tax code may change. For example, the Lipper study (Thomson Reuters, 2010) reported that U.S. diversified equity funds reported an average one-year tax drag of 2.75% from 1996 through 2000, but only 0.68% from 2001 through 2009. And in 2009, actively managed equity funds showed a lower tax burden than passively managed funds.<sup>9</sup>

### Conclusion

Since its start in the early 1970s, indexing has grown rapidly because the strategy can provide a low-cost option to gain investment exposure to a wide variety of market benchmarks. Of course, index funds are not all created equal, and an investor cannot assume that all index funds will perform similarly. In addition, investors should not expect indexed strategies to outperform 100% of actively managed funds in a particular period. However, as a result of the zero-sum game, costs, and the general efficiency of the financial markets, consistent outperformance of any one active manager has been very rare. The challenge facing investors is to correctly identify those managers who they believe may outperform in advance and stick with them through good times and bad. Finally, when deciding between an indexed or actively managed strategy, investors should not overlook the advantages in portfolio construction that well-managed indexed strategies bring to bear.

<sup>9</sup> Underscoring the difficulty of evaluating performance data, poorly performing funds that do not pass through capital gains or income distributions can appear to be tax-efficient.

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## Appendix. Benchmarks represented in this analysis

Equity benchmarks are represented by the following indexes—Large blend: MSCI US Prime Market 750 Index through January 30, 2013, CRSP US Large Cap Index thereafter; Large growth: S&P 500/Barra Growth Index through May 16, 2003, MSCI US Prime Market Growth Index through April 16, 2013, CRSP US Large Cap Growth Index thereafter; Large value: S&P 500/Barra Value Index through May 16, 2003, MSCI US Prime Market Value Index through April 16, 2013, CRSP US Large Cap Value Index thereafter; Mid blend: S&P MidCap 400 Index through May 16, 2003, MSCI US Mid Cap 450 Index through January 30, 2013, CRSP US Mid Cap Index thereafter; Mid growth: MSCI US Mid Cap Growth Index through April 16, 2013, CRSP US Mid Cap Growth Index thereafter; Mid value: MSCI US Mid Cap Value Index through April 16, 2013, CRSP US Mid Cap Value Index thereafter; Small blend: Russell 2000 Index through May 16, 2003, MSCI US Small Cap 1750 Index through January 30, 2013, CRSP US Small Cap Index thereafter; Small growth: S&P SmallCap 600/Barra Growth Index through May 16, 2003, MSCI US Small Cap Growth Index through April 16, 2013, CRSP US Small Cap Growth Index thereafter; Small value: S&P SmallCap 600/Barra Value Index through May 16, 2003, MSCI US Small Cap Value Index through April 16, 2013, CRSP US Small Cap Value Index thereafter. Bond benchmarks are represented by the following Barclays indexes: U.S. 1–5 Year Government Bond Index, U.S. 1–5 Year Corporate Bond Index, U.S. Intermediate Government Bond Index, U.S. Intermediate Corporate Bond Index, U.S. GNMA Bond Index, U.S. Corporate High Yield Bond Index. International and global benchmarks are represented by the following indexes: Global—Total International Composite Index through August 31, 2006, MSCI EAFE + Emerging Markets Index through December 15, 2010, MSCI ACWI ex USA IMI Index through June 2, 2013, FTSE Global All Cap ex US Index thereafter; Developed—MSCI World ex USA Index; Emerging markets: MSCI Emerging Markets Index.

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