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The case for low-cost index-fund investing

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- Due to governmental regulatory changes, the introduction of exchange-traded funds (ETFs) and a growing awareness of the benefits of low-cost investing, index investing has become a global trend over the last several years, with a large and growing investor base.
- This paper discusses why we expect index investing to continue to be successful over the long term – a rationale grounded in the zero-sum game, the effect of costs and the challenge of obtaining persistent outperformance.
- We examine how indexing performs in a variety of circumstances, including diverse time periods and market cycles, and we provide investors with points to consider when evaluating different investment strategies.

Acknowledgements: This paper is a revision of Vanguard research first published in 2004 as *The Case For Indexing* by Nelson Wicas and Christopher B. Philips. We acknowledge the various authors who have contributed to prior versions of this research.

Please note: Funds included in the following analysis are available for sale in one (or more) of the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain or Sweden.

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Index investing[1] was first made broadly available to US investors with the launch of the first indexed mutual fund in 1976. Since then, low-cost index investing has proven to be a successful investment strategy over the long term, outperforming the majority of active managers across markets and asset styles (S&P Dow Jones Indices, 2015). In part because of this long-term outperformance, index investing has seen exponential growth among investors, particularly in the United States, and especially since the global financial crisis of 2007–2009. In recent years, governmental regulatory changes, the introduction of indexed ETFs and a growing awareness of the benefits of low-cost investing in multiple world markets have made index investing a global trend. This paper reviews the conceptual and theoretical underpinnings of index investing's ascendancy (along with supporting quantitative data) and discusses why we expect index investing to continue to be successful and to increase in popularity in the foreseeable future.

A market-capitalisation-weighted indexed investment strategy – via a mutual fund or an ETF, for example – seeks to track the returns of a market or market segment with minimal expected deviations (and, by extension, no positive excess return) before costs, by assembling a portfolio that invests in the securities, or a sampling of the securities, that comprise the market. In contrast, actively managed funds seek to achieve a return or risk level that differs from that of a market-cap-weighted benchmark. Any strategy, in fact, that aims to differentiate itself from a market-cap-weighted benchmark (e.g., "alternative indexing", "smart beta" or "factor strategies") is, in our view, active management and should be evaluated based on the success of the differentiation[2].

This paper presents the case for low-cost index-fund investing by reviewing the main drivers of its efficacy. These include the zero-sum game theory, the effect of costs and the difficulty of finding persistent outperformance among active managers. In addition, we review circumstances under which this case may appear less or more compelling than theory would suggest, and we provide suggestions for selecting an active manager for investors who still prefer active management or for whom no viable low-cost indexed option is available.

Notes on risk and performance data:

Investments are subject to market risk, including the possible loss of the money you invest. 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. 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.

1 Throughout this paper, we use the term index investing to refer to a passive, broadly diversified, market-capitalisation-weighted strategy. Also for purposes of this discussion, we consider any strategy that is not market-cap-weighted to be an active strategy.

2 See Pappas and Dickson (2015), for an introduction to factor strategies. Chow et al. (2011) explained how various alternatively weighted index strategies outperformed market-cap-weighted strategies largely on the basis of factors.

Zero-sum game theory

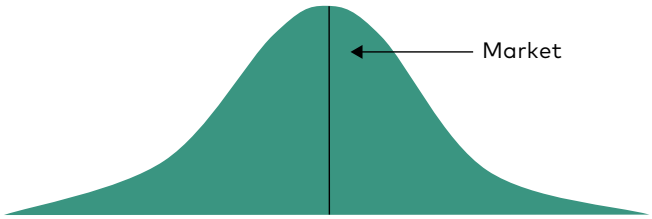
The central concept underlying the case for index-fund investing is that of the zero-sum game. This theory states that, at any given time, the market consists of the cumulative holdings of all investors, and that the aggregate market return is equal to the asset-weighted return of all market participants. Since the market return represents the average return of all investors, for each position that outperforms the market, there must be a position that underperforms the market by the same amount, such that, in aggregate, the excess return of all invested assets equals zero[3]. Note that this concept does not depend on any degree of market efficiency; the zero-sum game applies to markets thought to be less efficient (such as small-cap and emerging market equities) as readily as to those widely regarded as efficient (Waring and Siegel, 2005).

Figure 1 illustrates the concept of the zero-sum game. The returns of the holdings in a market form a bell curve, with a distribution of returns around the mean, which is the market return.

It may seem counterintuitive that the zero-sum game would apply in inefficient markets, because, by definition, an inefficient market will have more price and informational inefficiencies and, therefore, more opportunities for outperformance. Although this may be true to a certain extent, it is important to remember that for every profitable trade an investor makes, (an)other investor(s) must take the opposite side of that trade and incur an equal loss. This holds true regardless of whether the security in question is mispriced or not. For the same reason, the zero-sum game must apply regardless of market direction, including bear markets, where active management is often thought to have an advantage. In a bear market, if a manager is selling out of an investment to position the portfolio more defensively, another or others must take the other side of that trade, and the zero-sum game still applies. The same logic applies in any other market, as well.

FIGURE 1.

Market participants' asset-weighted returns form a bell curve around market's return



Sources: Vanguard.

Some investors may still find active management appealing, as it seemingly would provide an even-odds chance of successfully outperforming. As we discuss in the next section, though, the costs of investing make outperforming the market significantly more difficult than the gross-return distribution would imply.

Effect of costs

The zero-sum game discussed here describes a theoretical cost-free market. In reality, however, investors are subject to costs to participate in the market. These costs include management fees, bid-ask spreads, administrative costs, commissions, market impact and, where applicable, taxes – all of which can be significant and reduce investors' net returns over time. The aggregate result of these costs shifts the return distribution to the left.

3 See Sharpe (1991) for a discussion of the zero-sum game.

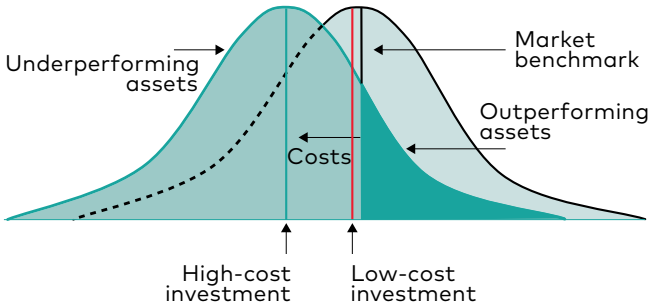
Figure 2 shows two different investments compared to the market. The first investment is an investment with low costs, represented by the red line. The second investment is a high-cost investment, represented by the green line. As the figure shows, although both investments move the return curve to the left – meaning fewer assets outperform – the high-cost investment moves the return curve much further to the left, making outperformance relative to both the market and the low-cost investment much less likely. In other words, after accounting for costs, the aggregate performance of investors is less than zero sum, and as costs increase, the performance deficit becomes larger.

This performance deficit also changes the risk-return calculus of those seeking to outperform the market. We previously noted that an investor may find active management attractive because it theoretically provides an even chance of outperforming the market. Once we account for costs, however, underperformance becomes more likely than outperformance. As costs increase, both the odds and magnitude of underperformance increase until significant underperformance becomes as likely as, or more likely than, even minor outperformance.

Figure 3 illustrates the zero-sum game on an after-cost basis by showing the distribution of excess returns of domestic equity funds (**Figure 3a**) and fixed income funds (**Figure 3b**), net of fees. Note that for both asset classes, a significant number of funds' returns lie to the left of the prospectus benchmark, which represents zero excess returns. Once merged and liquidated funds are considered, a clear majority of funds fail to outperform their benchmarks, meaning that negative excess returns tend to be more common than positive excess returns[4]. Thus, as predicted by the zero-sum game theory, outperformance tends to be less likely than underperformance, once costs are considered.

FIGURE 2.

Market participant returns after adjusting for costs



Sources: Vanguard.

This raises the question of how investors can reduce the chances of underperforming their benchmark. Considerable evidence supports the view that the odds of outperforming a majority of similar investors increase if investors simply 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. In the study, a fund's expense ratio was the most reliable predictor of its future performance, with low-cost funds delivering above-average performance relative to the funds in their peer group in all of the periods examined. Likewise, Morningstar performed a similar analysis across its universe of funds and found that, regardless of fund type, low expense ratios were the best predictors of future relative outperformance (Kinnel, 2010).

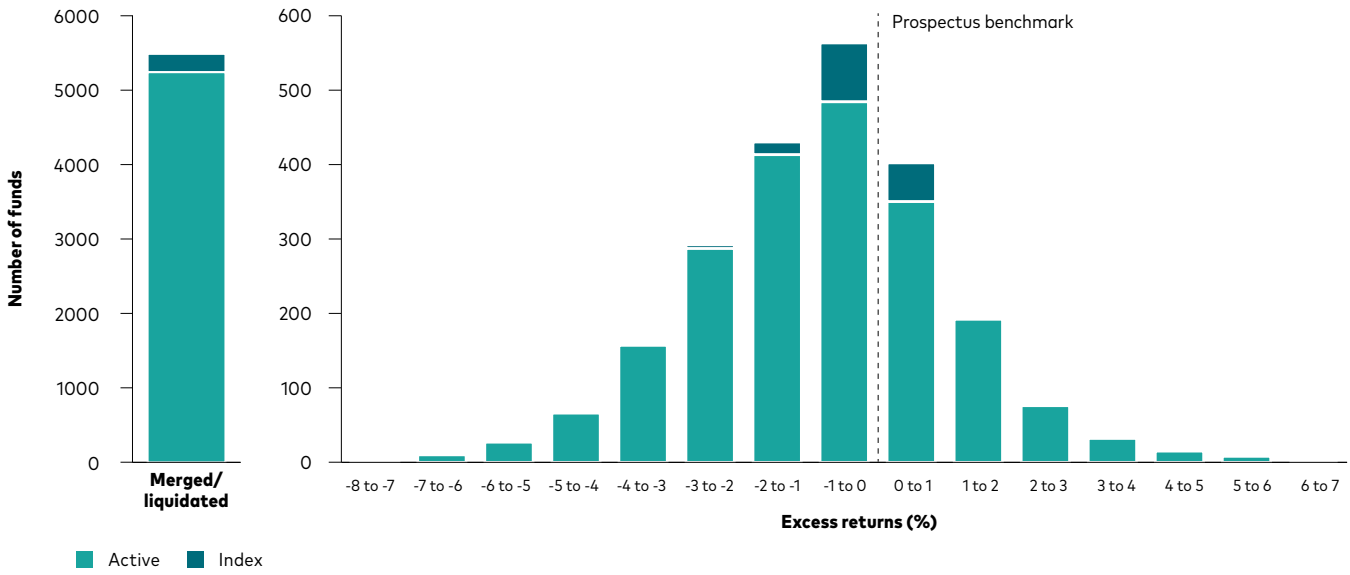
This negative correlation between costs and excess return is not unique to active managers. Rowley and Kwon (2015) looked at several variables across index funds and ETFs, including expense ratio, turnover, tracking error, assets under management, weighting methodology and active share, and found that expense ratio was the most dominant variable in explaining an index fund's excess return.

4 Survivorship bias and the effect of merged and closed funds on performance are discussed in more detail later in this paper.

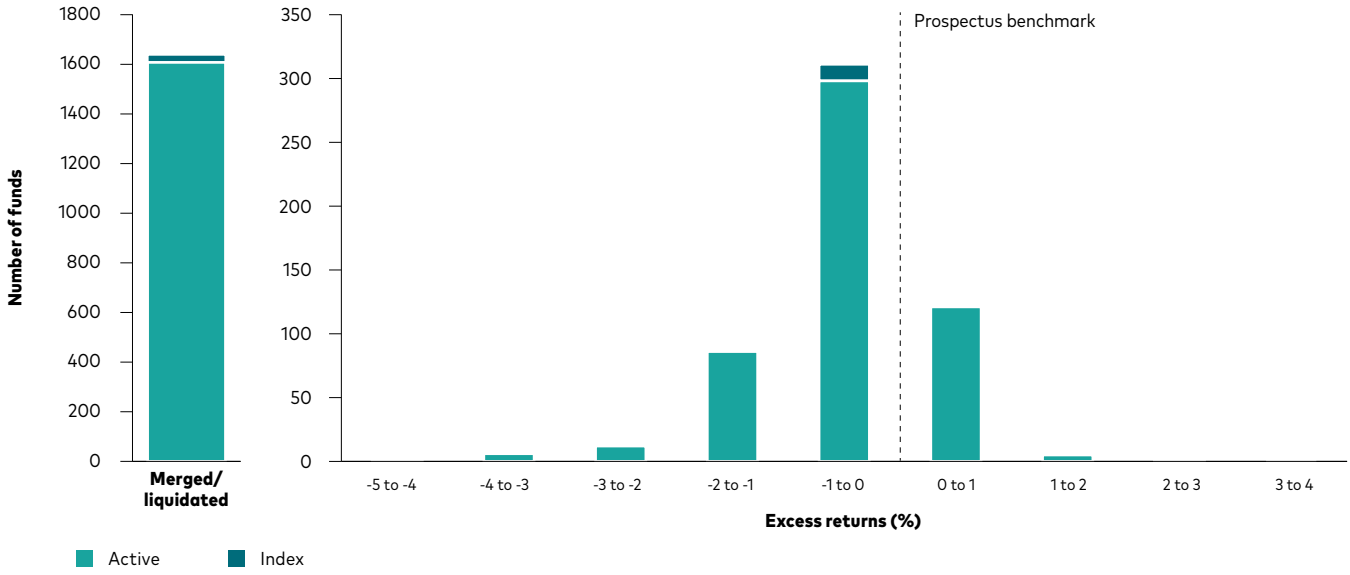
FIGURE 3.

Distribution of equity and fixed income funds' excess return

a. Distribution of equity funds' excess return



b. Distribution of fixed income funds' excess return



Past performance is no guarantee of future results.

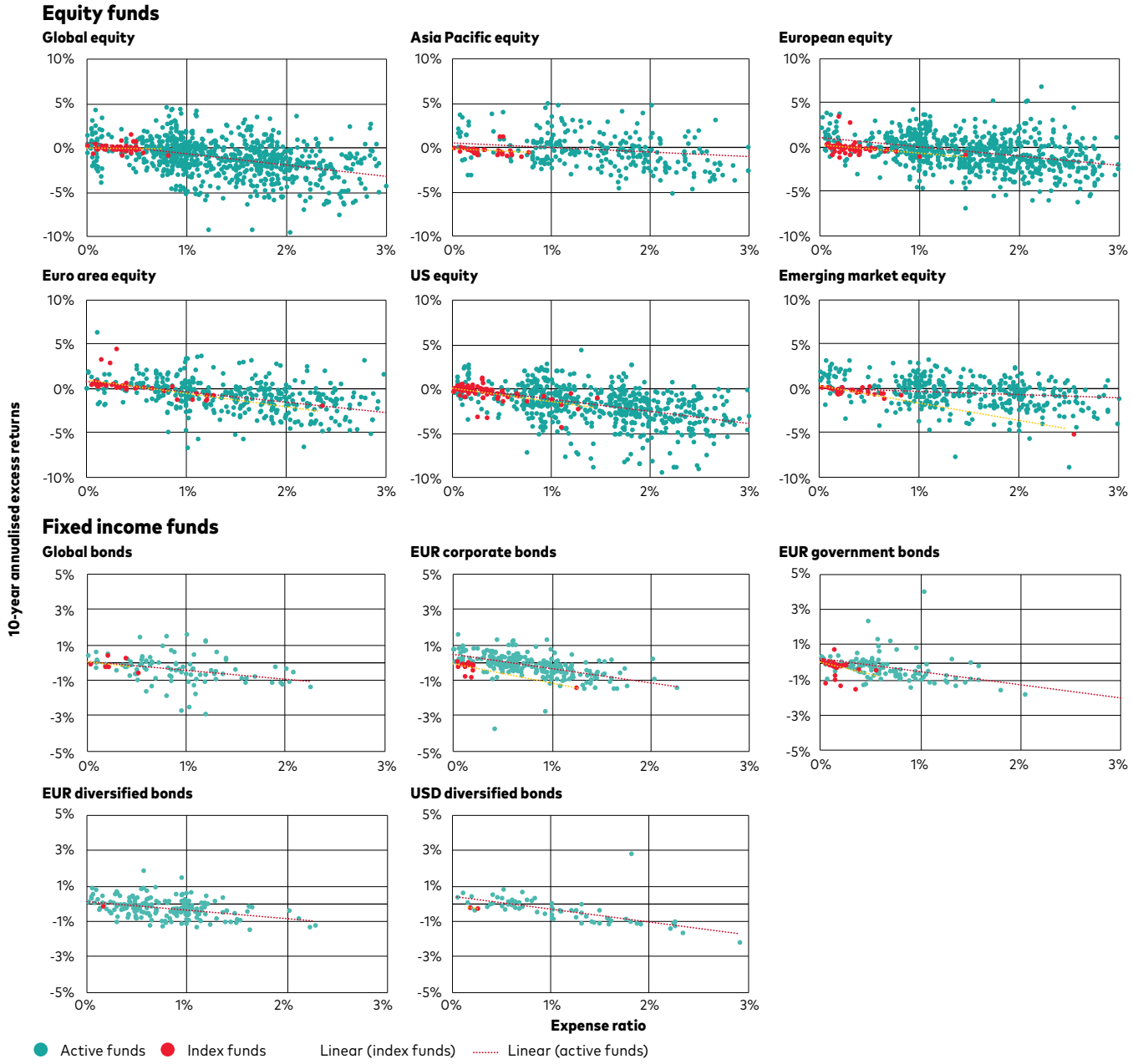
Notes: Charts a. and b. display distribution of equity and bond mutual funds' and ETFs' excess returns relative to their prospectus benchmarks for the 15 years to 31 December 2022. Performance is shown in EUR, net of fees, gross of tax, with income reinvested. Fund universe includes funds available for sale in Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain and Sweden. Please refer to the Appendix for a list of fund categories considered.

Sources: Vanguard calculations, based on data from Morningstar, Inc.

To quantify the impact of costs on net returns, we charted managers' excess returns as a function of their expense ratios across various categories of funds over a ten-year period. **Figure 4** shows that higher expense ratios are generally associated with lower excess returns. The red line in each category in the figure represents the simple regression line and signifies the trend across all funds for each category. For investors, the clear implication is that by focusing on low-cost funds (both active and passive), the probability of outperforming higher-cost portfolios increases.

FIGURE 4.

Higher expense ratios were associated with lower excess returns



Past performance is no guarantee of future results.

Notes: All data as at 31 December 2022. Each plotted point represents an equity or bond mutual fund or ETF within the specific style and asset group. Fund universe and categories are as defined in Figure 3 and the Appendix. Each fund is plotted to represent the relationship of its expense ratio (x-axis) versus its ten-year annualised excess return relative to its stated benchmark (y-axis). The straight line represents the linear regression, or the best-fit trend line – that is, the general relationship of expenses to returns within each asset group. The scales are standardised to show the slopes' relationship to each other, with expenses ranging from 0% to 3% and returns ranging from -10% to 10% for equity funds and from -5% to 5% for bond funds. Some funds' expense ratios and returns may go beyond the scales and are not shown. NAV-based performance; returns calculated in EUR, net of fees with income reinvested.

Sources: Vanguard calculations, based on data from Morningstar, Inc.

Costs play a crucial role in investor success. Whether invested in an actively managed fund or an index fund, each basis point an investor pays in costs is a basis point less an investor receives in returns. Since excess returns are a zero-sum game, as cost drag increases, the likelihood that the manager will be able to overcome this drag diminishes. As such, most investors' best chance at maximising net returns over the long term lies in minimising these costs. In most markets, low-cost index funds have a significant cost advantage over actively managed funds. Therefore, we believe that most investors are best served by investing in low-cost index funds.

Persistent outperformance is scarce

For those investors pursuing an actively managed strategy, the critical question becomes: Which fund will outperform? Most investors approach this question by selecting a winner from the past. Investors cannot profit from a manager's past success, however, so it is important to ask: Does a winning manager's past performance persist into the future? Academics have long studied whether past performance can accurately predict future performance. About 50 years ago, Sharpe (1966) and Jensen (1968) found limited to no performance persistence. Three decades later, Carhart (1997) reported no evidence of persistence in fund outperformance after adjusting for both the well-known Fama-French (1993) three-factor model as well as momentum. 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 outperform its benchmark regularly.

To test if active managers' performance has persisted, we looked at two separate, sequential, non-overlapping five-year periods. First, we ranked the funds by performance quintile in the first five-year period, with the top 20% of funds going into the first quintile, the second 20% into the second quintile, and so on. Second, we sorted those funds by performance quintile according to their performance in the second five-year period. To the second five-year period, however, we added a sixth category: funds that were either liquidated or merged during that period. We then compared the results. If managers were able to provide consistently high performance, we would expect to see the majority of first-quintile funds remaining in the first quintile. **Figure 5** however, shows that a majority of managers failed to remain in the first quintile[5].

It is interesting to note that, once we accounted for closed and merged funds, persistence was actually stronger among the underperforming managers than those that outperformed. These findings were consistent across all asset classes and all markets we studied globally. From this, we concluded that consistent outperformance is very difficult to achieve. This is not to say that there are not periods when active management outperforms, or that no active managers do so regularly. Only that, on average and over time, active managers as a group fail to outperform; and even though some individual managers may be able to generate consistent outperformance, those active managers are extremely rare.

FIGURE 5.

Actively managed domestic funds failed to show persistent outperformance

Initial excess return quintile, five years ending 31 December 2017	Number of funds	Subsequent five-year excess return rank, to 31 December 2022					
		Highest quintile (%)	2nd quintile (%)	3rd quintile (%)	4th quintile (%)	Lowest quintile (%)	Merged/ liquidated (%)
Highest quintile	915	22.40%	13.88%	15.96%	16.17%	15.74%	15.85%
2nd quintile	914	18.82%	19.26%	16.41%	12.36%	11.16%	21.99%
3rd quintile	915	12.57%	20.11%	15.85%	12.68%	13.22%	25.57%
4th quintile	914	11.38%	13.35%	15.54%	16.63%	12.58%	30.53%
Lowest quintile	915	9.18%	7.65%	10.49%	16.39%	21.64%	34.64%

Past performance is no guarantee of future results.

Notes: The far left column ranks all active equity funds available in the countries specified above based on their excess returns relative to their stated benchmark during the five-year period as of the date listed. The remaining columns show how funds in each quintile performed over the next five years. NAV-based performance; returns calculated in EUR, net of fees. Fund universe and benchmarks as defined in Figure 3 and the Appendix.

Source: Vanguard and Morningstar, Inc.

5 We define consistently high performance persistence as maintaining top quintile excess return performance. It should, however, be noted that a manager may fall below the top quintile when measured against peers, but still generate positive outperformance versus a benchmark. Of course, it could also be the case that a manager remains in the top quintile but does not generate outperformance versus a benchmark.

When the case for low-cost index fund investing can seem less or more compelling

For the reasons already discussed, we expect the case for low-cost index fund investing to hold over the long term. Like any investment strategy, however, the real-world application of index investing can be more complex than the theory would suggest. This is especially true when attempting to measure indexing's track record versus that of active management. Various circumstances, which we discuss below, can result in data that at times show active management outperforming indexing while, at other times, show indexing outperforming active management by more than would be expected. As a result, the case for low-cost index fund investing can appear either less or more compelling than the theory would indicate. The following subsections address some of these circumstances.

Survivorship bias can skew results

Survivorship bias is introduced when funds are merged into other funds or liquidated, and so are not represented throughout the full time period examined. Because such funds tend to be underperformers (see the following section titled "Merged and liquidated funds have tended to be underperformers"), this skews the average results upward for the surviving funds, causing them to appear to perform better relative to a benchmark.

However, the average experience of investors – some of whom invested in the underperforming fund before it was liquidated or merged – may be much different. **Figure 6** shows the impact of survivorship bias on the apparent relative performance of actively managed funds versus both their prospectus and style benchmarks.

Merged and liquidated funds have tended to be underperformers

In a study by Vanguard researchers[6], we tested the assumption that closed funds underperformed by evaluating the performance of all domestic funds identified by Morningstar as being either liquidated or merged into another fund. We found that funds tended to trail their benchmark before being closed and that the assumption that merged and liquidated funds underperformed was reasonable.

6 For a more detailed discussion of the underperformance of closed funds, see Schlanger and Philips (2013).

FIGURE 6.

Percentage of actively managed mutual funds that underperformed versus their benchmarks

Past performance is no guarantee of future results.

Notes: Data reflect periods ending 31 December 2022. Fund style categories provided by Morningstar; prospectus benchmarks reflect those identified in each fund's prospectus, see Appendix for style benchmarks. "Dead" funds are those that were merged or liquidated during the period. Fund universe and categories are as defined in Figure 3 and the Appendix. Performance is calculated relative to benchmark in EUR terms, net of fees, gross of withholding tax, with income reinvested, based on closing NAV prices.

Sources: Vanguard calculations, based on data from Morningstar, Inc., MSCI and Bloomberg.

In either case, we found that the share of active funds that underperformed tends to become more pronounced as the time period lengthens and survivorship bias is accounted for. Thus, it is critical to adjust for survivorship bias when comparing the performance of active funds to their benchmarks, especially over longer periods.[7].

Mutual funds are not the entire market

Another factor that can complicate the analysis of real-world results is that mutual funds, which are used as a proxy for the market in most studies (including this one), do not represent the entire market and therefore do not capture the entire zero-sum game. Mutual funds are typically used in financial market research because their data tend to be readily available and because, in many markets, mutual fund assets represent a reasonable sampling of the overall market. It is important to note, however, that mutual funds are merely a market sampling. In cases where mutual funds constitute a relatively smaller portion of the market being examined, the sample size studied will be that much smaller, and the results more likely to be skewed. Depending on the direction of the skew, this could lead to either a less favourable or a more favourable result for active managers overall.

Portfolio exposures can make relative performance more difficult to measure

Differences in portfolio exposures versus a benchmark or broader market can also make relative performance difficult to measure. Benchmarks are selected by fund managers on an ex ante basis, and do not always reflect the style in which the portfolio is actually managed. For example, during a period in which small- and mid-cap equities are outperforming, a large-cap manager may hold some of these stocks in the portfolio to increase returns (Thatcher, 2009). Similarly, managers may maintain an over/underexposure to certain factors (e.g., size, style, etc.) for the same reason. These portfolio tilts can cause the portfolio to either outperform or underperform when measured against the fund's stated benchmark or the broad market, depending on whether the manager's tilts are in or out of favour during the period being examined. Over a full market or factor cycle, however, we would expect the performance effects of these tilts to cancel out and the zero-sum game to be restored.

Short time periods can understate the advantage of low-cost indexing

Time is an important factor in investing. Transient forces such as market cycles and simple luck can more significantly affect a fund's returns over shorter time periods. These short-term effects can mask the relative benefits of low-cost index funds versus active funds in two main respects: the performance advantage conferred on index funds over the longer term by their generally lower costs; and the lack of persistent outperformance among actively managed funds.

A short reporting period reduces low-cost index funds' performance advantage because the impact of their lower costs compounds over time. For example, a 50-basis-point difference in fees between a low-cost and a higher-cost fund may not greatly affect the funds' performance over the course of a single year; however, that same fee differential compounded over longer time periods can make a significant difference in the two funds' overall performance.

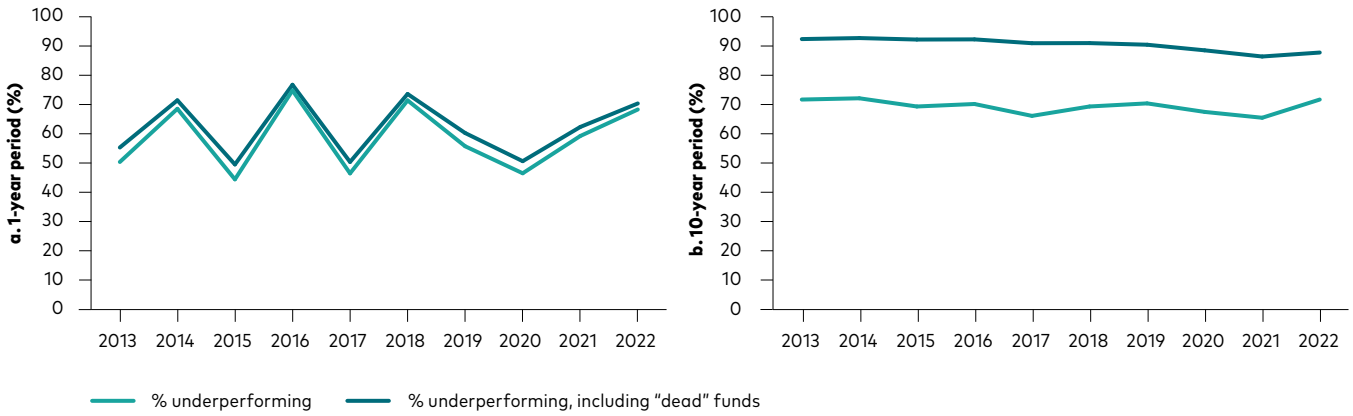
Time also has a significant impact on the application of the zero-sum game. In any given year, the zero-sum game states that there will be some population of funds that outperforms the market. As the time period examined becomes longer, however, the effects of luck and market cyclicality tend to cancel out, reducing the number of funds that outperform. Market cyclicality is an important factor in the lack of persistent outperformance as investment styles and market sectors go in and out of favour, as noted earlier.

7 It can also be useful to consider performance results in terms of asset-weighted performance. In doing so, larger funds account for a larger share of the results because they reflect a larger proportion of investors' assets. This can give a clearer perspective on how investors collectively performed and is consistent with the zero-sum game theory as it relates to aggregate fund performance.

This concept is illustrated in **Figure 7**, which compares the performance of domestic funds over rolling one- and ten-year periods to that of their benchmarks. As the figure shows, active funds were much less likely to outperform over longer periods compared with shorter periods; this was especially true when merged and liquidated funds were included in the analysis. Thus, as the time period examined became longer, the population of funds that consistently outperformed tended to shrink, ultimately becoming very small.

FIGURE 7.

Percentage of active equity funds available in Europe underperforming over rolling periods versus prospectus benchmarks



Past performance is no guarantee of future results.

Notes: Performance is calculated relative to funds' prospectus benchmarks. "Dead" funds are those that were merged or liquidated during the period. Fund universe and categories are as defined in Figure 3 and the Appendix. NAV-based performance; returns calculated in EUR, net of fees with income reinvested.

Sources: Vanguard calculations, based on data from Morningstar, Inc. Performance is calculated relative to prospectus benchmark, observed from 31 December 2012 to 31 December 2022.

Low-cost indexing – a simple solution

One of the simplest ways for investors to gain market exposure with minimal costs is through a low-cost index fund or ETF. Index funds seek to provide exposure to a broad market or a segment of the market through varying degrees of index replication ranging from full replication (in which every security in the index is held) to synthetic replication (in which index exposure is obtained through the use of derivatives). Regardless of the replication method used, all index funds seek to track the target market as closely as possible and, by extension, to provide market returns to investors. This is an important point and is why index funds, in general, are able to offer investors market exposure at minimal cost. Index funds do not attempt to outperform their market, as many active managers do. As such, index funds do not require the significant investment of resources necessary to find and capitalise on opportunities for outperformance (such as research, increased trading costs, etc.) and therefore do not need to pass those costs on to their investors.

By avoiding these costs, index funds are generally able to offer broad market exposure, with market returns at very low cost relative to the cost of most actively managed funds. Furthermore, because index funds do not seek to outperform the market, they also do not face the challenges of either persistent outperformance or beating the zero-sum game. In short, by accepting market returns while keeping costs low, low-cost index funds lower the hurdles that make successful active management so difficult over the long term.

Although we believe that low-cost index funds offer most investors their best chance at maximising fund returns over the long run, we acknowledge that some investors want or need to pursue an active strategy. For example, investors in some markets may have few low-cost, domestic index funds available to them. For those investors, or any investor choosing an active strategy, low-cost, broadly diversified actively managed funds can serve as a viable alternative to index funds, and in some cases may prove superior to higher-cost index funds; keep in mind that the performance advantage conferred by low-cost funds is quickly eroded as costs increase.

Conclusion

Since its inception, low-cost index investing has proven to be a successful investment strategy over the long term, and has become increasingly popular with investors globally. This paper has reviewed the conceptual and theoretical underpinnings of index investing and has discussed why we expect the strategy to continue to be successful, and to continue to gain in popularity, in the foreseeable future.

The zero-sum game, combined with the drag of costs on performance and the lack of persistent outperformance, creates a high hurdle for active managers in their attempts to outperform the market. This hurdle grows over time and can become insurmountable for the vast majority of active managers. However, as we have discussed, circumstances exist that may make the case for low-cost indexing seem less or more compelling in various situations.

This is not to say that a red line necessarily exists between actively managed funds and index funds. For investors who wish to use active management, either because of a desire to outperform or because of a lack of low-cost index funds in their market, many of the benefits of low-cost indexing can be achieved by selecting low-cost, broadly diversified active managers. However, the difficult task of finding a manager who consistently outperforms, combined with the uncertainty that active management can introduce into the portfolio, means that, for most investors, we believe the best chance of successfully investing over the long term lies in low-cost, broadly diversified index funds.

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Appendix I. Categories and benchmarks represented in this analysis

Overview of style benchmarks used in study

Category	Morningstar Category	Asset Class	Assigned benchmark index[1]	Notes[1]
Asia Pacific equity	EAA Fund Asia-Pacific ex-Japan Equity	Equity	MSCI Pacific IMI (NR) Index	
Asia Pacific equity	EAA Fund Japan Large-Cap Equity	Equity	MSCI Pacific IMI (NR) Index	
Asia Pacific equity	EAA Fund Japan Small/Mid-Cap Equity	Equity	MSCI Pacific IMI (NR) Index	
Emerging market equity	EAA Fund Global Emerging Markets Equity	Equity	MSCI Emerging Markets IMI (NR) Index	Until 04/2010: MSCI Emerging Markets (NR) Index
European equity	EAA Fund Europe Flex-Cap Equity	Equity	MSCI Europe IMI (NR) Index	
European equity	EAA Fund Europe Large-Cap Blend Equity	Equity	MSCI Europe IMI (NR) Index	
European equity	EAA Fund Europe Large-Cap Growth Equity	Equity	MSCI Europe IMI (NR) Index	
European equity	EAA Fund Europe Large-Cap Value Equity	Equity	MSCI Europe IMI (NR) Index	
European equity	EAA Fund Europe Mid-Cap Equity	Equity	MSCI Europe IMI (NR) Index	
European equity	EAA Fund Europe Small-Cap Equity	Equity	MSCI Europe IMI (NR) Index	
Euro area equity	EAA Fund Eurozone Flex-Cap Equity	Equity	MSCI EMU IMI (NR) Index	
Euro area equity	EAA Fund Eurozone Large-Cap Equity	Equity	MSCI EMU IMI (NR) Index	
Euro area equity	EAA Fund Eurozone Mid-Cap Equity	Equity	MSCI EMU IMI (NR) Index	
Euro area equity	EAA Fund Eurozone Small-Cap Equity	Equity	MSCI EMU IMI (NR) Index	
Global equity	EAA Fund Global Flex-Cap Equity	Equity	MSCI World IMI (NR) Index	
Global equity	EAA Fund Global Large-Cap Blend Equity	Equity	MSCI World IMI (NR) Index	
Global equity	EAA Fund Global Large-Cap Growth Equity	Equity	MSCI World IMI (NR) Index	
Global equity	EAA Fund Global Large-Cap Value Equity	Equity	MSCI World IMI (NR) Index	
Global equity	EAA Fund Global Small/Mid-Cap Equity	Equity	MSCI World IMI (NR) Index	
US equity	EAA Fund US Flex-Cap Equity	Equity	MSCI USA IMI (NR) Index	
US equity	EAA Fund US Large-Cap Blend Equity	Equity	MSCI USA IMI (NR) Index	
US equity	EAA Fund US Large-Cap Growth Equity	Equity	MSCI USA IMI (NR) Index	
US equity	EAA Fund US Large-Cap Value Equity	Equity	MSCI USA IMI (NR) Index	
US equity	EAA Fund US Mid-Cap Equity	Equity	MSCI USA IMI (NR) Index	
US equity	EAA Fund US Small-Cap Equity	Equity	MSCI USA IMI (NR) Index	
EUR corporate bonds	EAA Fund EUR Corporate Bond	Fixed Income	Bloomberg Euro Aggregate (TR) Index Unhedged	
EUR diversified bonds	EAA Fund EUR Diversified Bond	Fixed Income	Bloomberg Euro Aggregate (TR) Index Unhedged	
EUR government bonds	EAA Fund EUR Government Bond	Fixed Income	Bloomberg Euro Aggregate Treasury (TR) Index Unhedged	
Global bonds (Euro hedged)	EAA Fund Global Bond - EUR Hedged	Fixed Income	NA	Not included in category analyses
Global bonds	EAA Fund Global Bond	Fixed Income	Bloomberg Global Aggregate (TR) Index Unhedged	
USD diversified bonds	EAA Fund USD Diversified Bond	Fixed Income	Bloomberg US Aggregate (TR) Index Unhedged	

1 All indices are in EUR

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