

The case for low-cost index-fund investing

Vanguard Research

May 2019

James J. Rowley Jr., CFA, David J. Walker, CFA, and Carol Zhu

- Due to governmental regulatory changes, the introduction of exchange-traded funds (ETFs), and a growing awareness of the benefits of low-cost investing, the growth of 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: The authors thank Garrett L. Harbron and Daren R. Roberts for their valuable contributions. This paper is a revision of Vanguard research first published in 2004 as *The Case for Indexing* by Nelson Wicas and Christopher B. Philips, updated in succeeding years by Mr. Philips and other co-authors. The current authors acknowledge and thank Mr. Philips and Francis M. Kinniry Jr. for their extensive contributions and original research on this topic.

Please note: Data included in the following analysis is reflective of the Canadian market.

Index investing¹ was first made broadly available to U.S. investors with the launch of the first index 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-capitalization-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 compose 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.

¹ Throughout this paper, we use the term *index investing* to refer to a passive, broadly diversified, market-capitalization-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.

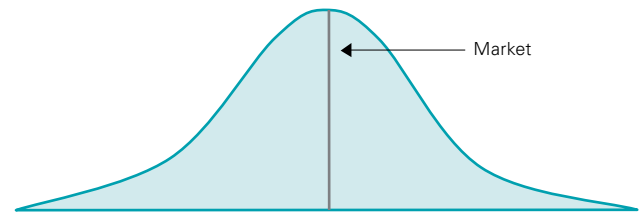
Zero-sum game theory

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

Figure 1. Market participants' asset-weighted returns form a bell curve around market's return



Source: Vanguard.

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.

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.

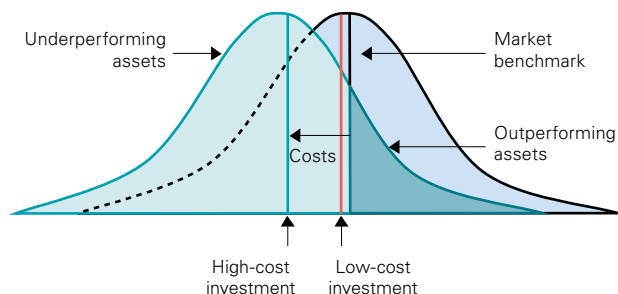
Figure 2 shows two different investments compared to the market. The first investment is an investment with low costs, represented by the red line. The second investment is a high-cost investment, represented by the blue line. As the figure shows, although both investments move the return curve to the left—meaning fewer assets outperform—the high-cost investment moves the return curve much farther 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 at 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.

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

Figure 2. Market participant returns after adjusting for costs



Source: Vanguard.

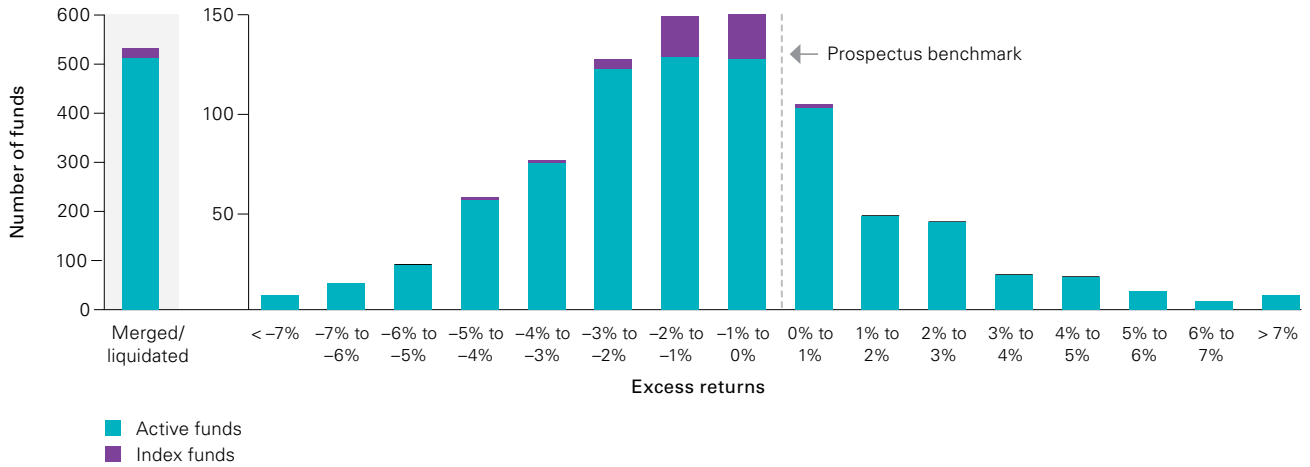
the predictive value of different fund metrics, including a fund’s past performance, Morningstar rating, alpha, and beta. In the study, a fund’s expense ratio was the most reliable predictor of its future performance, with low-cost funds delivering above-average performance relative to the funds in their 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.

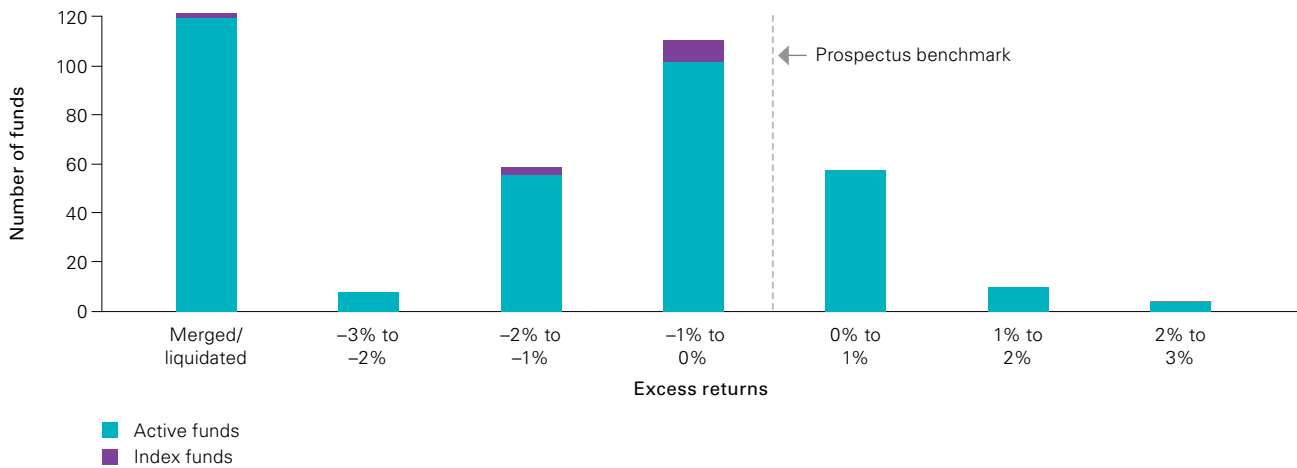
⁴ Survivorship bias and the effect of merged and closed funds on performance are discussed in more detail later in this paper.

Figure 3. Distribution of Canadian equity and fixed income funds' excess return

a. Distribution of equity funds' excess return



b. Distribution of fixed income funds' excess return



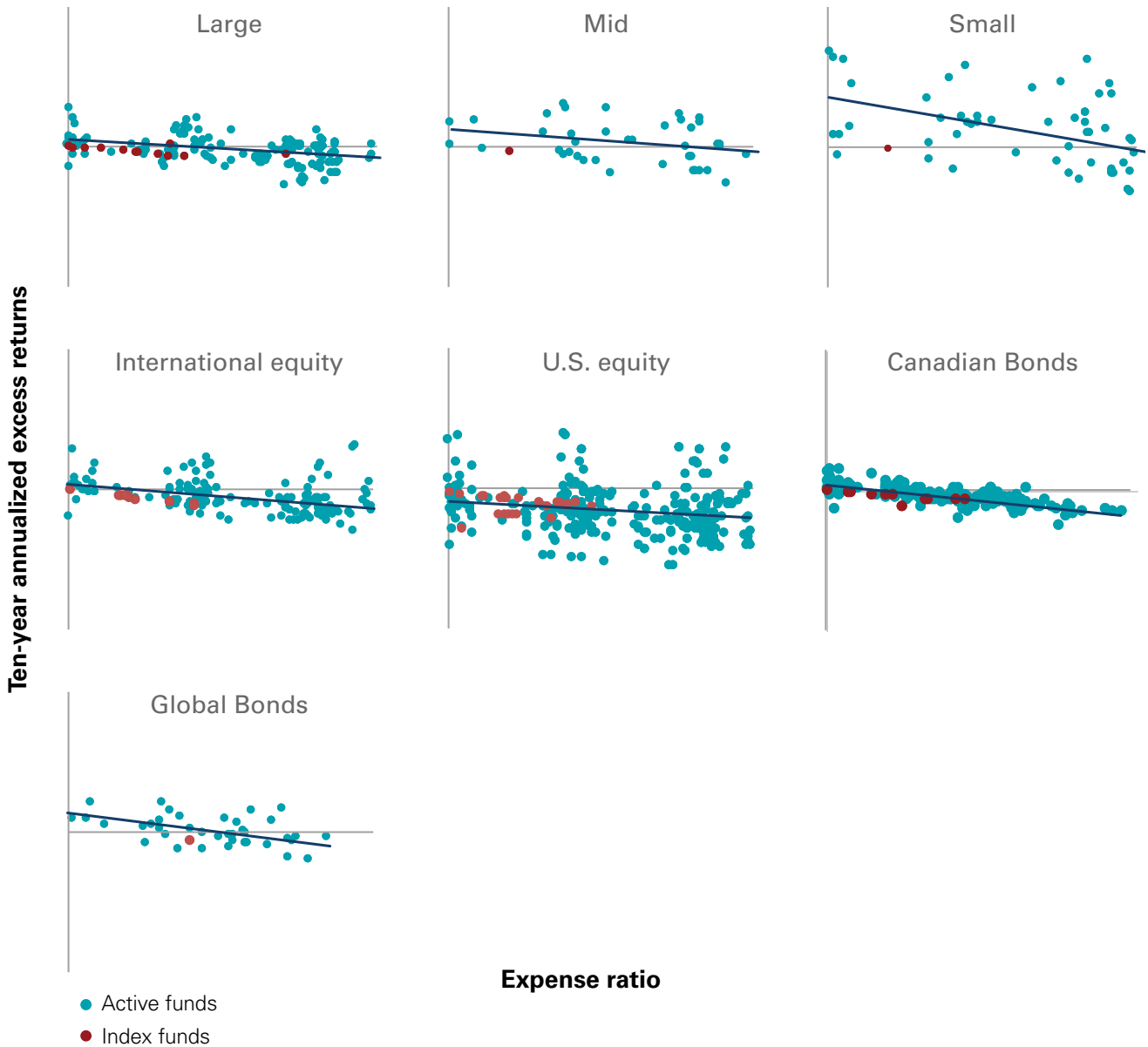
Notes: Past performance is no guarantee of future results. Chart displays the distribution of Canada-domiciled funds' excess returns, relative to their prospectus benchmark, for the ten-year period ending December 31, 2018. Our survivor bias calculation treats all dead funds as underperformers. It's possible, of course, that some of those funds outperformed the relevant index before they died. If we splice fund category average returns onto the existing records of dead funds, we see a modest decline in the percentage of funds that trail the index. The differences from our existing calculations are not material.

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 blue 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 for Canadian funds



Notes: Past performance is no guarantee of future results. All data as of December 31, 2018. Each plotted point represents a Canada-domiciled equity or bond mutual fund within the specific identified Morningstar size, style, and asset group. Each fund is plotted to represent the relationship of its expense ratio (x-axis) versus its ten-year annualized 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 standardized to show the slopes' relationship to each other, with expenses ranging from 0% to 3% and returns ranging from -15% to 15%. Some funds' expense ratios and returns go beyond the scales and are not shown.

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 maximizing net returns over the long term lies in minimizing 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 over their higher-priced, actively managed counterparts.

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 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.

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.

Figure 5. Actively managed domestic funds failed to show persistent outperformance

Excess return quintile, five years ended December 31, 2013	Number of funds	Subsequent five-year excess return ranking, through December 31, 2018						
		Highest quintile	2nd quintile	3rd quintile	4th quintile	Lowest quintile	Merged/closed	Total
1st quintile	179	34.6%	17.9%	16.2%	8.4%	11.2%	11.7%	100.0%
2nd quintile	180	23.9	22.2	14.4	16.7	14.4	8.3	100.0
3rd quintile	179	14.0	27.9	18.4	12.3	17.9	9.5	100.0
4th quintile	179	10.6	10.1	23.5	25.7	14.5	15.6	100.0
5th quintile	180	2.8	8.9	13.3	23.3	28.3	23.3	100.0

Notes: The two left columns rank all active Canadian equity funds within each of the Morningstar style categories 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 these quintiles performed over the next five years.

Sources: Vanguard and Morningstar, Inc.

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 next, 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 subsections following 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 accompanying box titled “Merged and liquidated funds have tended to be underperformers” and Figure 6, on page 9), this skews the average results upward for the surviving funds, causing them to appear to perform better relative to a benchmark.⁶

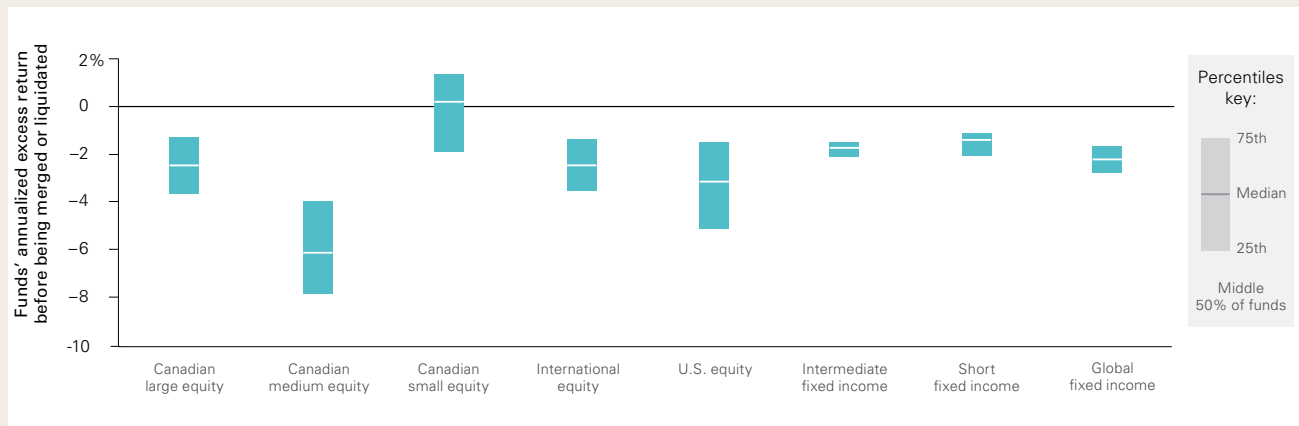
⁶ For a more detailed discussion of the underperformance of closed funds, see Schlanger and Philips (2013).

Merged and liquidated funds have tended to be underperformers

To test the assumption that closed funds underperformed, we evaluated the performance of all domestic funds identified by Morningstar as either being liquidated or merged into another fund. Figure 6 shows that funds tend

to trail their benchmark before being closed. We found the assumption that merged and liquidated funds underperformed to be reasonable.

Figure 6. Dead funds showed underperformance versus style benchmark prior to closing date



Notes: Chart displays the cumulative annualized performance of those equity funds that were merged or liquidated within our sample, relative to a benchmark representative of that fund's Morningstar category. See Appendix for the list of benchmarks used. We measure performance from January 1, 2004, and continue each fund's measurement period up until the month-end prior to it being merged or liquidated. Figure displays the middle 50% distribution of these funds' returns prior to dying.

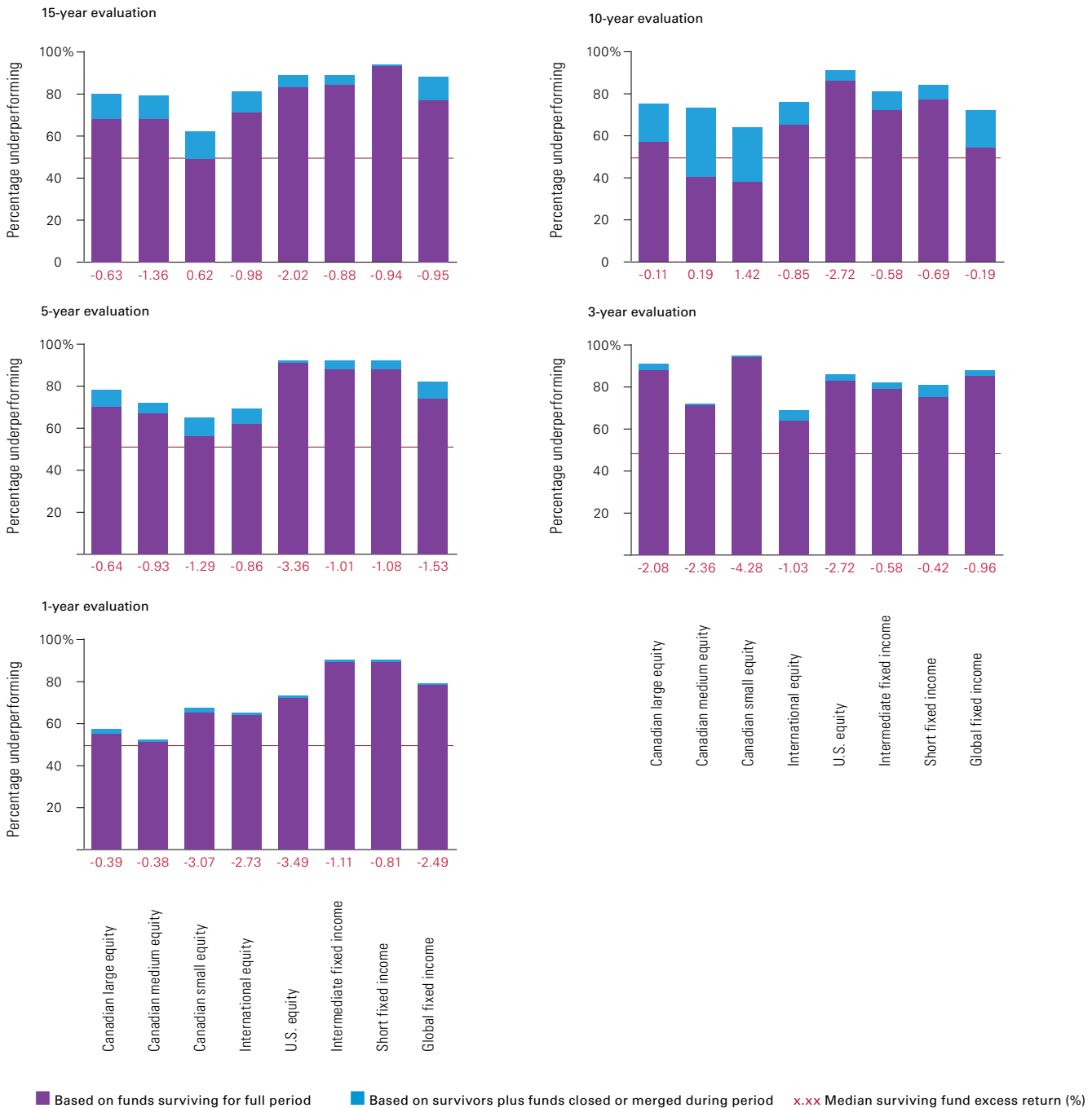
Sources: Vanguard calculations, based on data from Morningstar, Inc., MSCI, and Bloomberg Barclays.

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 7** shows the impact of survivorship bias on the apparent relative performance of actively managed funds versus both their prospectus and style benchmarks.

In either case, a majority of active funds underperformed, and this underperformance became more pronounced as the time period lengthened and survivorship bias was accounted for. Thus, it is critical to adjust for survivorship bias when comparing the performance of active funds to their benchmarks, especially over longer time periods.⁷

⁷ Another way to evaluate the relative success of investors is to view performance results in terms of asset-weighted performance. Please see Appendix I for a discussion of asset-weighted performance.

Figure 7a. The performance of actively managed mutual funds versus their prospectus benchmarks

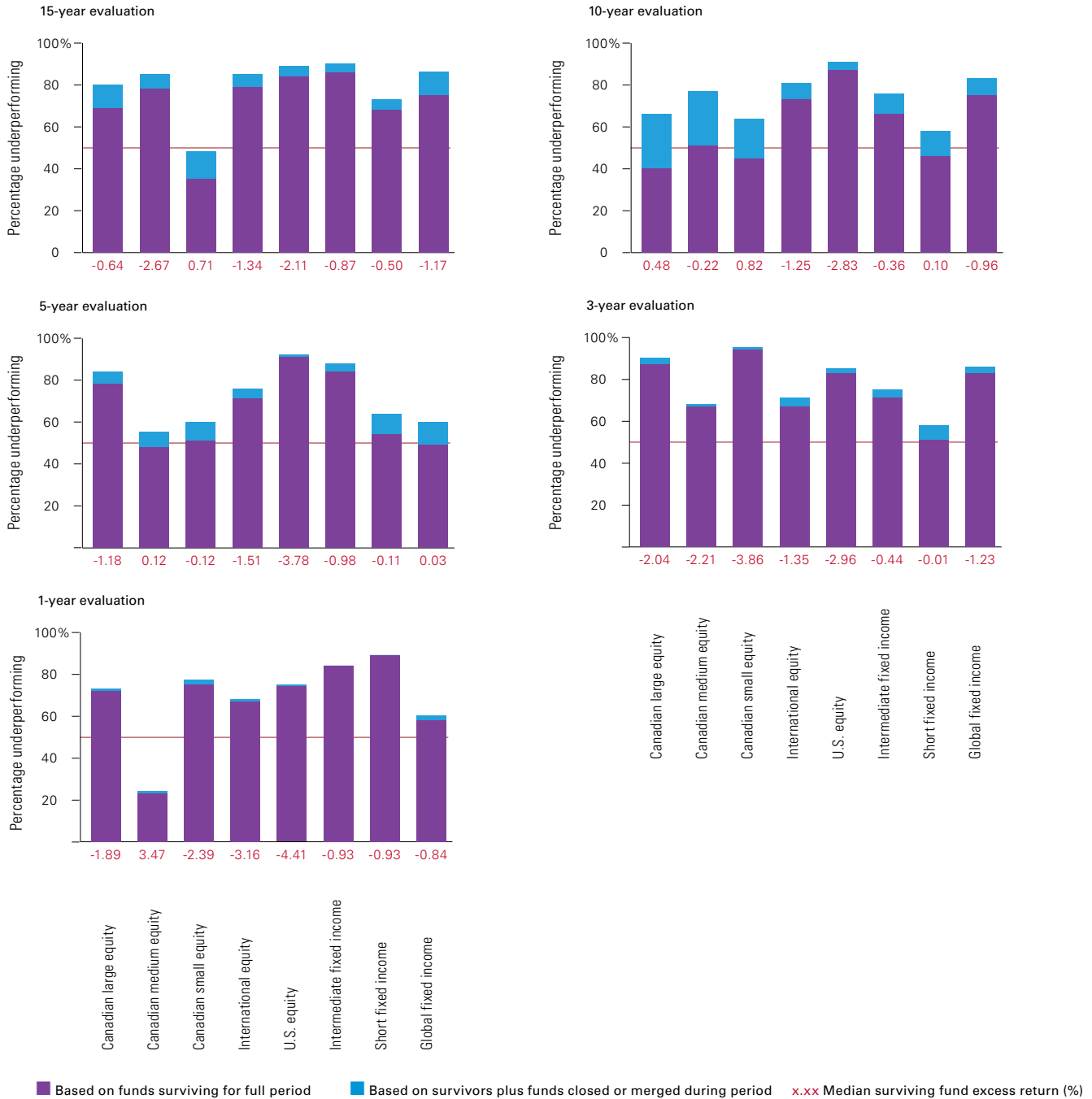


Notes: Data as of December 31, 2018. "Dead" funds are those that were merged or liquidated during the period. Benchmarks reflect those identified in each fund's prospectus.

Sources: Vanguard calculations using data from Morningstar, Inc. and Thomson Reuters Datastream. Fund classifications provided by Morningstar.

Fund universe includes funds available for sale in Canada from the following Morningstar categories: Canadian equity, Canadian small/mid-cap equity, U.S. equity, U.S. small/mid-cap equity, International equity, Global fixed income, Canadian short-term fixed income, and Canadian fixed income. Fund performance is shown in Canadian dollar terms, net of fees, gross of tax withholding, with income reinvested, based on closing NAV prices. Past performance is not a reliable indicator of future results.

Figure 7b. The performance of actively managed mutual funds versus a representative 'style benchmark'



Notes: Data reflects periods ended December 31, 2018. "Dead" funds are those that were merged or liquidated during the period. See Appendix for benchmarks used.

Sources: The Vanguard Group, Inc. calculations, using data from Morningstar, Inc. and Thomson Reuters Datastream.

Fund universe includes funds available for sale in Canada from the following Morningstar categories: Canadian equity, Canadian small/mid-cap equity, U.S. equity, U.S. small/mid-cap equity, International equity, Global fixed income, Canadian short-term fixed income, and Canadian fixed income. Fund performance is shown in Canadian dollar terms, net of fees, gross of tax withholding, with income reinvested, based on closing NAV prices. Past performance is not a reliable indicator of future results.

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 cyclicity tend to cancel out, reducing the number of funds that outperform. Market cyclicity 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.

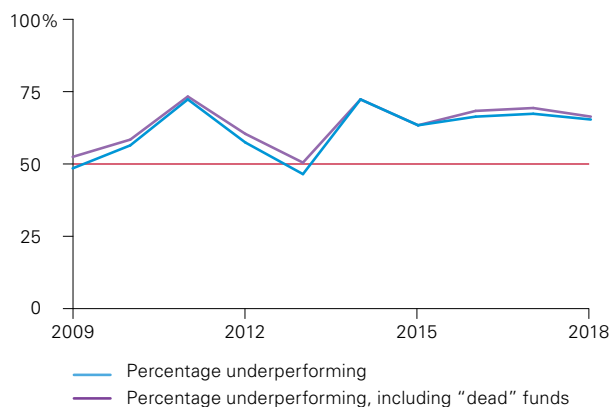
This concept is illustrated in **Figure 8**, which compares the performance of domestic funds over rolling one- and ten-year periods to that of their benchmarks. As the figure shows, active funds were much less likely to outperform over longer periods compared with shorter periods; this was especially 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.

Low-cost indexing—a simple solution

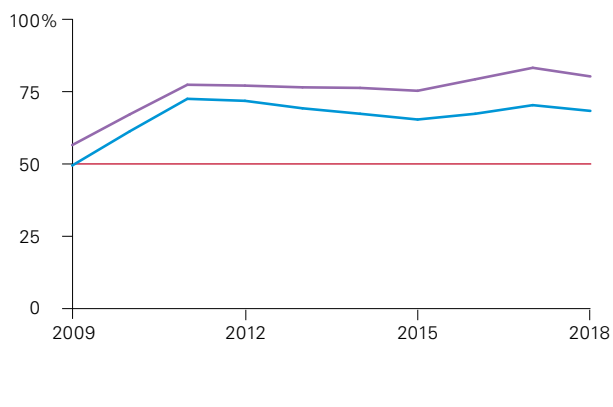
One of the simplest ways for investors to gain market exposure with minimal costs is through a low-cost index fund or ETF. Index funds seek to provide exposure to a broad market or a segment of the market through varying degrees of index replication ranging from full replication (in which every security in the index is held) to synthetic replication (in which index exposure is obtained through the use of derivatives). Regardless of the replication

Figure 8. Percentage of active Canadian equity funds underperforming over rolling periods versus prospectus benchmarks

a. One-year periods



b. Ten-year periods



Notes: Past performance is no guarantee of future results. Performance is calculated relative to funds' prospectus benchmarks. "Dead" funds are those that were merged or liquidated during the period.

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

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 capitalize on opportunities for outperformance (such as research, increased trading costs, etc.) and therefore do not need to pass those costs onto 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 of 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 maximizing 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 bright 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.

References

- Carhart, Mark M., 1997. On Persistence in Mutual Fund Performance. *Journal of Finance* 52(1): 57–82.
- Chow, Tzee-man, Jason Hsu, Vitali Kalesnik, and Bryce Little, 2011. A Survey of Alternative Equity Index Strategies. *Financial Analysts Journal* 67 (5, Sept./Oct.): 37–57.
- Fama, Eugene F., and Kenneth R. French, 1993. Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics* 33(1): 3–56.
- Fama, Eugene F., and Kenneth R. French, 2010. Luck Versus Skill in the Cross-Section of Mutual Fund Returns. *Journal of Finance* 65(5): 1915–47.
- Financial Research Corporation, 2002. *Predicting Mutual Fund Performance II: After the Bear*. Boston: Financial Research Corporation.
- Jensen, Michael C., 1968. The Performance of Mutual Funds in the Period 1945–1964. Papers and Proceedings of the Twenty-Sixth Annual Meeting of the American Finance Association. Washington, D.C., December 28–30, 1967. Also in *Journal of Finance* 23(2): 389–416.
- Kinnel, Russel, 2010. How Expense Ratios and Star Ratings Predict Success (Aug. 9); available at <http://news.morningstar.com/articlenet/article.aspx?id=347327>.
- Pappas, Scott N., and Joel M. Dickson, 2015. *Factor-Based Investing*. Valley Forge, Pa.: The Vanguard Group.
- Rowley Jr., James J., and David T. Kwon, 2015. The Ins and Outs of Index Tracking. *Journal of Portfolio Management* 41(3): 35–45.
- S&P Dow Jones Indices, 2015. SPIVA U.S. Scorecard (Mid-Year 2015); available at spiva-us-midyear-2015.pdf.
- Schlanger, Todd, and Christopher B. Philips, 2013. *The Mutual Fund Graveyard: An Analysis of Closed Funds*. Valley Forge, Pa.: The Vanguard Group.
- Sharpe, William F., 1966. Mutual Fund Performance. *Journal of Business* 39 (1, Part 2: Supplement on Security Prices): 119–38.
- Sharpe, William F., 1991. The Arithmetic of Active Management. *Financial Analysts Journal* 47(1): 7–9.
- Thatcher, William R., 2009. When Indexing Works and When It Doesn't in U.S. Equities: The Purity Hypothesis. *Journal of Investing* 18(3): 8–11.
- Waring, M. Barton, and Laurence B. Siegel, 2005. Debunking Some Myths of Active Management. *Journal of Investing* (Summer): 20–28.

Additional selected Vanguard research on active and index investing

Low cost: *A key factor in improving probability of outperformance in active management. A rigorous qualitative manager-selection process is also crucial.*

Wallick, Daniel W., Brian R. Wimmer, and James Balsamo, 2016. *Keys to Improving the Odds of Active Management Success*. Valley Forge, Pa.: The Vanguard Group.

Balsamo, James, Daniel W. Wallick, and Brian R. Wimmer, 2015. *Shopping for Alpha: You Get What You Don't Pay For*. Valley Forge, Pa.: The Vanguard Group.

Factor investing: *The excess return of smart beta and other rules-based active strategies can be partly (or largely) explained by a manager's time-varying exposures to various risk factors.*

Philips, Christopher B., Donald G. Bennyhoff, Francis M. Kinniry Jr., Todd Schlanger, and Paul Chin, 2015. *An Evaluation of Smart Beta and Other Rules-Based Active Strategies*. Valley Forge, Pa.: The Vanguard Group.

Benchmark mismatch: *A manager's exposure to market-risk factors outside the benchmark may explain outperformance more than individual skill in stock selection.*

Hirt, Joshua M., Ravi G. Tolani, and Christopher B. Philips, 2015. *Global Equity Benchmarks: Are Prospectus Benchmarks the Correct Barometer?* Valley Forge, Pa.: The Vanguard Group.

When the case for indexing can seem less or more compelling: *Despite the theory and publicized long-term success of indexed investment strategies, criticisms and misconceptions remain.*

Rowley, James J., Joshua M. Hirt, and Haifeng Wang, 2018. *Setting the record straight: Truths about indexing*. Valley Forge, Pa.: The Vanguard Group.

Active versus index debate: *Examining the debate from the perspective of market cyclicity and the changing nature of performance leadership.*

Philips, Christopher B., Francis M. Kinniry Jr., and David J. Walker, 2014. *The Active-Passive Debate: Market Cyclicity and Leadership Volatility*. Valley Forge, Pa.: The Vanguard Group.

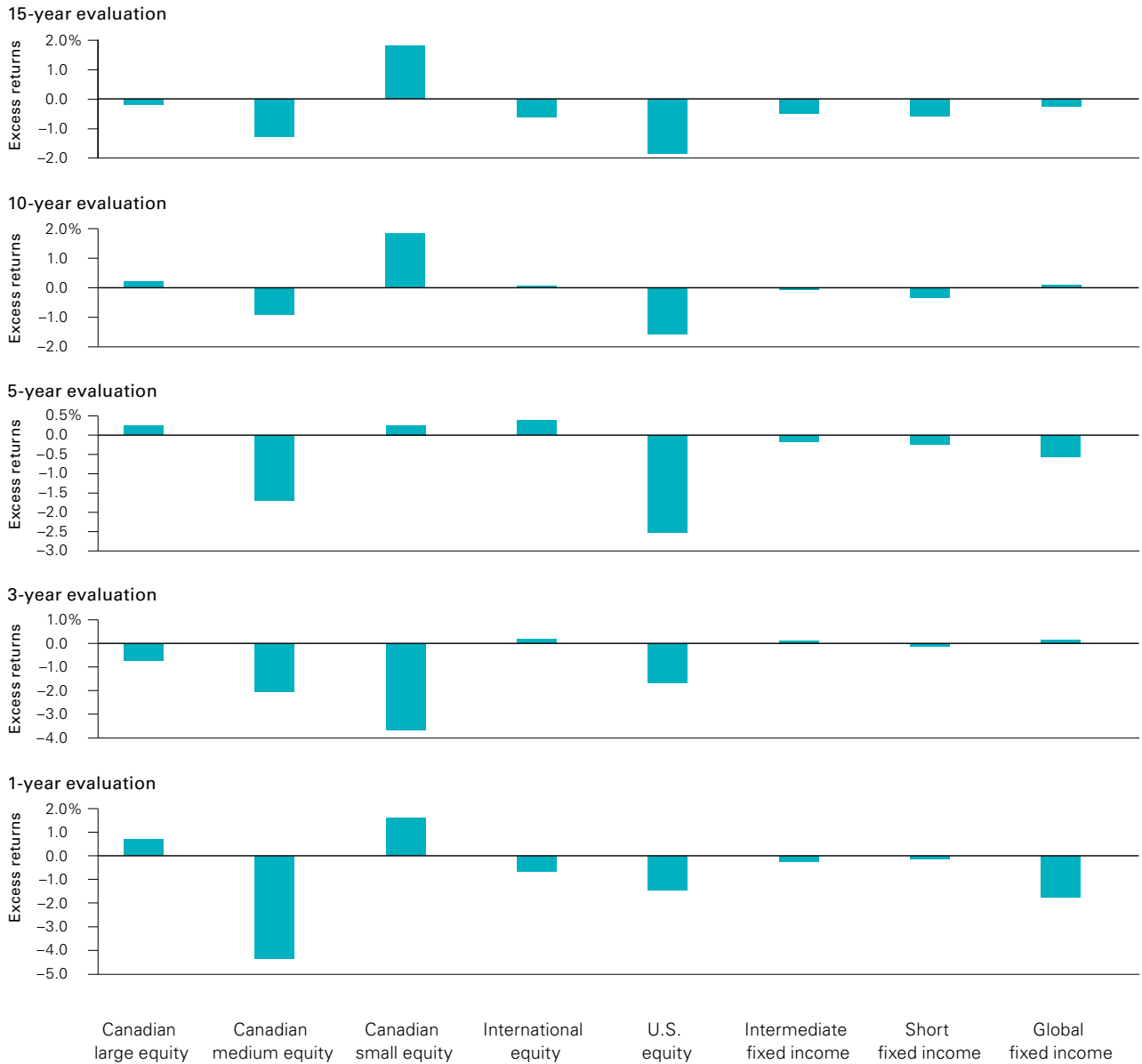
Appendix I. Assessing investors' performance

An alternate 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. For our analysis, a fund would need to have both asset and return figures for any given month in order for its performance for that month to be included. As a result, the funds represented in **Figure A-1** are not necessarily the same as those shown in **Figure 7**.

Appendix II. Benchmarks represented in this analysis

Equity benchmarks represented by the following indexes: Large—MSCI Canada Large-Cap Index; mid—MSCI Canada Mid-Cap Index; small—MSCI Canada Small-Cap Index. Non-Canadian equity benchmarks represented by the following indexes: International equity—MSCI EAFE Index; U.S. equity—MSCI USA Investable Market Index. Bond benchmarks represented by the following Bloomberg Barclays indexes: Intermediate—Bloomberg Barclays Global Aggregate Canadian Float Adjusted Bond Index; short—Bloomberg Barclays Global Aggregate Canadian Gov/Credit 1–5 year Float Adjusted Bond Index; global—Bloomberg Barclays Global Aggregate Bond Index (CAD).

Figure A-1. Asset-weighted relative performance of actively managed mutual funds versus their benchmarks



Notes: Data reflects periods ended December 31, 2018. Asset weighted excess returns were calculated by taking a time series of monthly cross-sectional average excess returns relative to each fund's prospectus benchmark. Monthly excess returns were weighted by previous month end asset size.

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

This page intentionally left blank.

The views expressed in this material are based on the author's assessment as of the first publication date April 28, 2019, are subject to change without notice and may not represent the views and/or opinions of Vanguard Investments Canada Inc. The author may not necessarily update or supplement their views and opinions whether as a result of new information, changing circumstances, future events or otherwise. Any "forward-looking" information contained in this material should be construed as general investment or market information and no representation is being made that any investor will, or is likely to achieve, returns similar to those mentioned in this material or anticipated in this material.

While this information has been compiled from proprietary and non-proprietary sources believed to be reliable, no representation or warranty, express or implied, is made by The Vanguard Group, Inc., its subsidiaries or affiliates, or any other person (collectively, "The Vanguard Group") as to its accuracy, completeness, timeliness or reliability. The Vanguard Group takes no responsibility for any errors and omissions contained herein and accepts no liability whatsoever for any loss arising from any use of, or reliance on, this material.

This material is for informational purposes only. This material is not intended to be relied upon as research, investment, or tax advice and is not an implied or express recommendation, offer or solicitation to buy or sell any security or to adopt any particular investment or portfolio strategy. Any views and opinions expressed do not take into account the particular investment objectives, needs, restrictions and circumstances of a specific investor and, thus, should not be used as the basis of any specific investment recommendation.

Information, figures and charts are summarized for illustrative purposes only and are subject to change without notice.

This material does not constitute an offer or solicitation and may not be treated as an offer or solicitation in any jurisdiction where such an offer or solicitation is against the law, or to anyone to whom it is unlawful to make such an offer or solicitation, or if the person making the offer or solicitation is not qualified to do so.

In this material, references to "Vanguard" are provided for convenience only and may refer to, where applicable, only The Vanguard Group, Inc., and/or may include its affiliates, including Vanguard Investments Canada Inc.

All investments, including those that seek to track indexes, are subject to risk, including the possible loss of principal. Diversification does not ensure a profit or protect against a loss in a declining market. While ETFs are designed to be as diversified as the original indexes they seek to track and can provide greater diversification than an individual investor may achieve independently, any given ETF may not be a diversified investment.

Connect with Vanguard® > vanguardcanada.ca

WE'RE IN IT TOGETHER



**Vanguard Investments
Canada Inc.**

© 2019 Vanguard Investments Canada Inc.
All rights reserved.

ISGIDX_CA 052019

CFA® is a registered trademark owned by CFA Institute.