Heroes in Haystacks: Index Comparisons for Active Portfolio Performance

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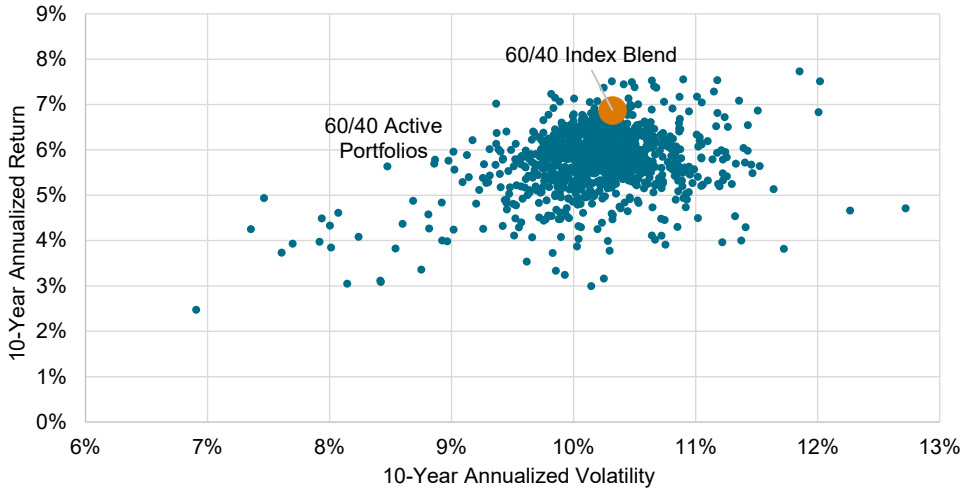
"The whole is more than the sum of its parts."

Aristotle

Since 2002, S&P Dow Jones Indices (S&P DJI) has evaluated individual active fund performance through our SPIVA® Scorecards. In this special report, we compare theoretical multi-asset portfolios of active funds to weighted blends of indices, finding that **96.9% of 60/40 portfolios of active funds would have underperformed equivalent blends of indices over 10 years.** In many cases, portfolios of active funds not only produced lower performance, but also generated higher volatility (see Exhibit 1).

Exhibit 1: 60/40 Index and Active Performance Illustration



Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Data represent 1,000 randomly selected 60/40 portfolios of active funds and the 60/40 blend of indices (see later sections for details). Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Contents

1. Introduction: The Whole and Its Parts

For more than two decades, S&P DJI's regular SPIVA Scorecards have reported rates of success (or failure) among active managers striving to beat category benchmarks. There has been less focus on the resulting challenges for managers or advisors who select and allocate across multiple funds to build portfolios.[1]

Natural questions arise when extrapolating SPIVA results into this real-world context; if individual fund categories have different rates of active underperformance, what is the appropriate way to measure success or failure of a hypothetical portfolio of active funds? Does the combination of active funds across asset classes offer diversification, reducing the influence of underperformers? Finally, if one could identify the set of outperforming funds in advance, in which fund categories would this ability be most amply rewarded? Ultimately, we seek to answer these questions and more by starting with one simple query: **How do portfolios of active funds compare to similarly weighted blends of indices?**

Individual active funds are rarely chosen in isolation; instead, they are more often selected as a component within a broader portfolio of funds representing different styles and asset classes. Some of these may be active funds, others may be passive. Our SPIVA and Persistence Scorecards have collectively shed light upon the prospects for achieving consistent outperformance within specific fund categories such as Government Bonds or Large-Cap U.S. Equities, but they say little about their potential combinations. **This special report extends those results upstream to the arena of the fund selector or portfolio constructor tasked with blending multiple managers into a cohesive and high-performing allocation**.

To begin, we discuss a baseline upon which to make initial comparisons—the humble yet enduring 60/40 allocation.[2]

2. Allocation Discussion

To compare portfolios of funds to similar blends of indices, we much first decide which fund categories to include and how to weigh them. It must be said that none of the combinations, weightings or approaches that follow are intended to suggest ideal approaches. S&P DJI is not a registered investment advisor and does not offer investment or other advice. Instead, these fund combinations are presented as reflections of broad allocations. In other words, a fund category's inclusion in this research is by no means an endorsement of efficacy or fund recommendation, nor is it an indictment of those excluded. Rather, we shall make a subjective

[1] The award-winning research of Richard Ferri and Alex Benke in "A Case for Index Fund Portfolios" (2013) is an exception to the rule, and a partial inspiration for this special report.

[2] While we acknowledge ongoing debates about the efficacy and application of the 60/40 allocation in modern markets, this paper is not intended to take a side in that discussion but rather to use the 60/40 and its related variants as a framework for comparing active funds to indices.

selection of nine categories representing some of the largest, most well-researched and frequently utilized equity and fixed income segments.

Perhaps the simplest starting point of all is the well-traveled and long-studied 60/40 portfolio. With its origins dating back more than 70 years, a portfolio split in a 60/40 proportion between equities and bonds has served as the foundation for myriad tests in academia and real-world investing.[3]

Initially envisioned (for U.S. investors) as a split between domestic blue-chip stocks and U.S. Treasury bonds, subsequent research made the case for more granular size-based and geographic exposures in the pursuit of diversification.

In equities, one of these category subdivisions came in the 1980s when Rolf Banz identified higher risk-adjusted returns for smaller firms relative to larger ones (also known as the “size effect”). Eugene Fama and Kenneth French famously expanded upon Banz’s work, introducing the Three-Factor Model (including the size factor) in their 1992 *Journal of Finance* paper, "The Cross-Section of Stock Returns."[4] These and other works led more investors to deliberately include distinct capitalization-based fund groupings in modern portfolios, as reflected through the SPIVA categories for **Large-Cap Core**, **Mid-Cap Core** and **Small-Cap Core** funds.

Extending the pursuit of optimizing risk and return, the inclusion of international assets was spurred by a number of developments, beginning with research on the diversification benefits of including non-U.S. assets in portfolios.[5] Theory around investment into the emerging subset of international markets became practice shortly thereafter as International Finance Corporation (IFC), a member of the World Bank Group, began tracking the performance of stock markets in developing countries, making data on these regions available for research and coining the term “emerging markets”. In a portfolio context, these are represented by the SPIVA categories **International** and **Emerging Markets** funds.

[3] See for example Markowitz, Harry M. "Portfolio Selection." The Journal of Finance. Vol. 7, no. 1, pp. 77-91. March 1952. While a full discussion of origins and development of modern portfolio theory (MPT) is beyond the scope of this paper, the origins of the 60/40 portfolio can be traced back to researchers including Harry Markowitz and William Sharpe, whose mathematical framework for constructing an efficient portfolio that maximizes expected returns for a given level of risk suggested that the optimal portfolio for investors was the total market universe. Given that the equity market was approximately 50% larger than the bond issuance, the total market was comprised of 60% equity and 40% bonds.

[4] See Banz, Rolf W. “The Relationship between Return and Market Value of Common Stocks.” Journal of Financial Economics. Vol. 9, no. 1. pp. 3-18. Feb. 2, 1981. Also see Fama, Eugene F. and Kenneth R. French. “The Cross-Section of Expected Stock Returns.” Journal of Finance. Vol. 47, no. 2. pp. 427-65. 1992.

[5] See for example Levy, Haim and Marshall Sarnat. “International Diversification of Investment Portfolios.” The American Economic Review. Vol. 60, no. 4, pp. 668-75. 1970; Grubel, Herbert G. “Internationally Diversified Portfolios: Welfare Gains and Capital Flows.” The American Economic Review. Vol. 58, no. 5, pp. 1299-314. 1968; and Bekaert, Geert et al. “The Behavior of Emerging Market Returns.” The New York University Salomon Center Series on Financial Markets and Institutions, pp. 107-73. 1998.

Building on Markowitz's MPT work, Sharpe and others offered rationale for the diversifying role of government bonds as “risk-free” assets through their introduction of the capital asset pricing model (CAPM) and the capital market line (CML) in the 1960s.[6] In fixed income, government bonds are thus well established within portfolios and account for a major portion of total issuance by virtue of their ubiquity and long history. Later growth in issuance of investment grade and high yield bonds also recognizes the potentially differing risk and return characteristics of each.[7] With a well-reported rise in high yield issuance in the 1970s and 1980s, further studies on the diversifying qualities of high yield emerged.[8] Finally, emerging market debt began to be included after becoming more accessible in the early 1990s, with the rise of indices tracking and mutual funds trading in the asset class and subsequent research.[9] Recognizing these developments, we thus include funds from the SPIVA categories **General Government**, **General Investment Grade**, **High Yield** and **Emerging Market Debt** in our analysis.

To assign weights for each category within the allocation, we rely on the same logic that led to the 60/40 ratio in the first place: relative sizes of underlying markets. In the equity portion, for example, fund category weights roughly align with the proportions of total market cap in each category benchmark, relative to the total of all included benchmarks, as of Dec. 31, 2014 (the beginning of our observed 10-year period). In the fixed income portion, weights are similarly based on the relative proportions of global bonds’ outstanding notional in each of the four categories.

These nine allocations are illustrated in Exhibit 2, along with each category’s representative benchmark.

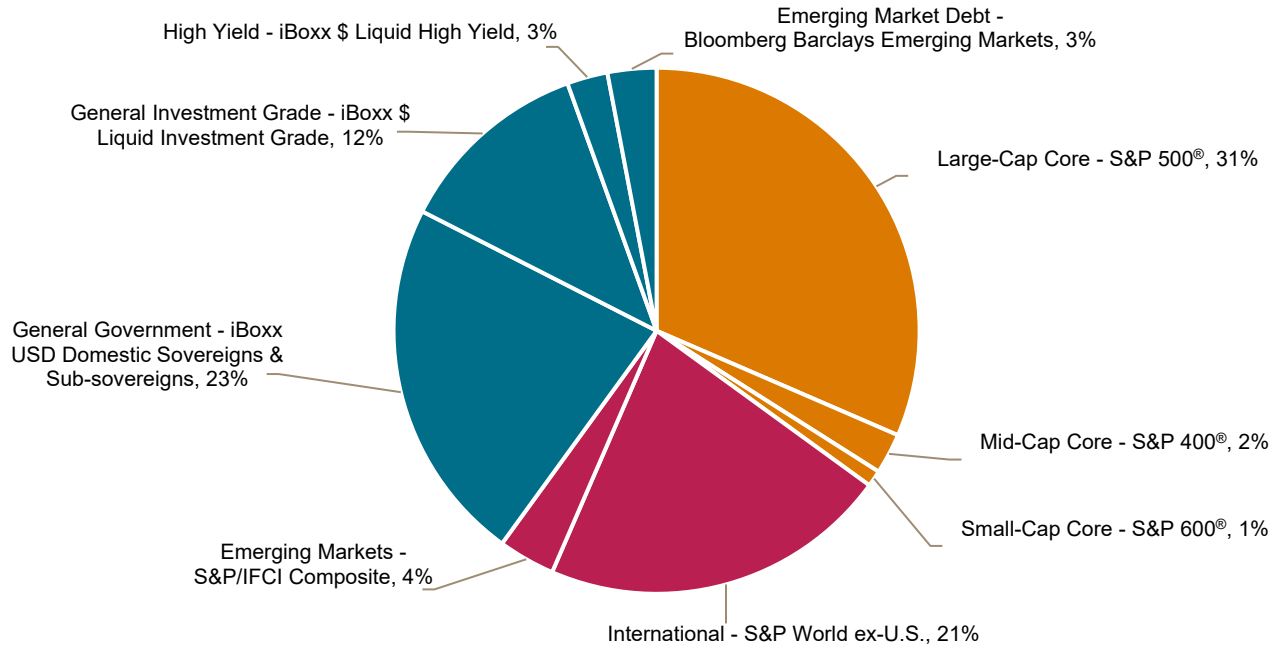
[6] See Sharpe, William F. “Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk.” The Journal of Finance. Vol. 19, no. 3, pp.425-42. 1964.

[7] For one of the earliest academic discussions of high yield versus investment grade bonds, see for example Hickman, W. Braddock. “Corporate Bond Quality and Investor Experience.” National Bureau of Economic Research. Princeton University Press. 1958.

[8] See for example Blume, Marshall E. and Donald B. Keim. “Lower-Grade Bonds: Their Risks and Returns.” Financial Analysts Journal. Vol. 43, no. 4, pp. 26-66. 1987.

[9] Early examples include Nemerever, William L. "Opportunities in Emerging Market Debt." Investing Worldwide VII: Focus on Emerging Markets. Association for Investment Management and Research, Charlottesville, VA. 1996; Dahiya, Sandeep. “The Risks and Returns of Brady Bonds in a Portfolio Context.” Financial Markets, Institutions & Instruments. Vol. 6, no.5, pp. 45-60. December 1997; and Froland, Charles. “Opportunities for Institutional Investors in Emerging Market Debt.” Journal of Pension Plan Investing. Vol. 2, no.3, pp. 84-99. Winter 1998.

Exhibit 2: Active Fund and Index Categories in Blends – 60/40 Example



Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

After establishing initial categories and weights for the 60/40 portfolio, we then scaled each weight proportionally within equities and fixed income, respectively, to create nine different allocations for analysis, from 10% equity and 90% fixed income (10/90) to 90% equity and 10% fixed income (90/10), as shown in Exhibit 3.

Exhibit 3: Fund and Index Category Weights by Allocation

Fund Category	Comparison Index	Weight in Equity/Fixed Income Blend (%)								
		10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
Large-Cap Core Funds	S&P 500	5.25	10.50	15.75	21.00	26.25	31.50	36.75	42.00	47.25
Mid-Cap Core Funds	S&P 400	0.42	0.83	1.25	1.67	2.08	2.50	2.92	3.33	3.75
Small-Cap Core Funds	S&P 600	0.17	0.33	0.50	0.67	0.83	1.00	1.17	1.33	1.50
International Funds	S&P World ex-U.S.	3.58	7.17	10.75	14.33	17.92	21.50	25.08	28.67	32.25
Emerging Markets Funds	S&P/IFCI Composite	0.58	1.17	1.75	2.33	2.92	3.50	4.08	4.67	5.25
General Government Funds	iBoxx USD Domestic Sovereigns & Sub-sov.	50.63	45.00	39.38	33.75	28.13	22.50	16.88	11.25	5.63
General Investment Grade Funds	iBoxx $ Liquid Investment Grade	27.00	24.00	21.00	18.00	15.00	12.00	9.00	6.00	3.00
High Yield Funds	iBoxx $ Liquid High Yield	5.63	5.00	4.38	3.75	3.13	2.50	1.88	1.25	0.63
Emerging Market Debt Funds	Bloomberg Barclays Emerging Markets	6.75	6.00	5.25	4.50	3.75	3.00	2.25	1.50	0.75

Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

3. Methodology

Starting Fund Universe

With the portfolio categories and weights proscribed, we selected and screened actively managed funds to populate them using the same sources and analytical engine underlying S&P Dow Jones Indices' SPIVA U.S. Scorecards, including the selection of fund share classes and assignment into fund categories. In particular, our selection was made from funds in each category that were available as of Dec. 31, 2014, allowing for a ten-year analysis of outcomes through December 31, 2024 (we shall refer to this as the sample universe or "All-Funds"). For funds with multiple share classes, we selected the largest share class. Consequently, the funds represented in this report are precisely those measured in the 10-year underperformance statistics for the relevant nine fund categories that comprise our blends in the SPIVA U.S. Year-End 2024 Scorecard.

Blends: Construction and Rebalancing

From the sample universe, each active portfolio was constructed by randomly selecting one actively managed fund in each of the nine categories and assigning it a weight in alignment with its category target allocation (for example, a Large-Cap Core fund in the All-Funds universe as of Dec. 31, 2014, would be randomly selected and assigned a 31.5% target weight in the 60/40 blend, as shown in section 2, Allocation Discussion).[10] This process was iterated 100,000 times for each of the nine equity/fixed income allocations (from 10/90 to 90/10), resulting in 900,000 active portfolios (each containing nine funds).

The hypothetical performance of each active portfolio was then calculated monthly for 120 months ending December 2024, based on the live history of the selected funds and their weights in the allocation. Importantly, an annual rebalance was implemented at the end of each calendar year to bring each fund's weight back to the target allocation.

Survivorship: Dealing with the Defunct

Regular readers of SPIVA Scorecards may wonder how we addressed the issue of survivorship, recognizing that many funds initially in the sample universe ceased to exist at some point during the 10-year period. The survivorship rates for our nine fund categories were taken from the SPIVA U.S. Year-End 2024 Scorecard and summarized in Exhibit 4.

[10] For details on the negligible impact of selecting more than one fund per category, please see the Appendix.

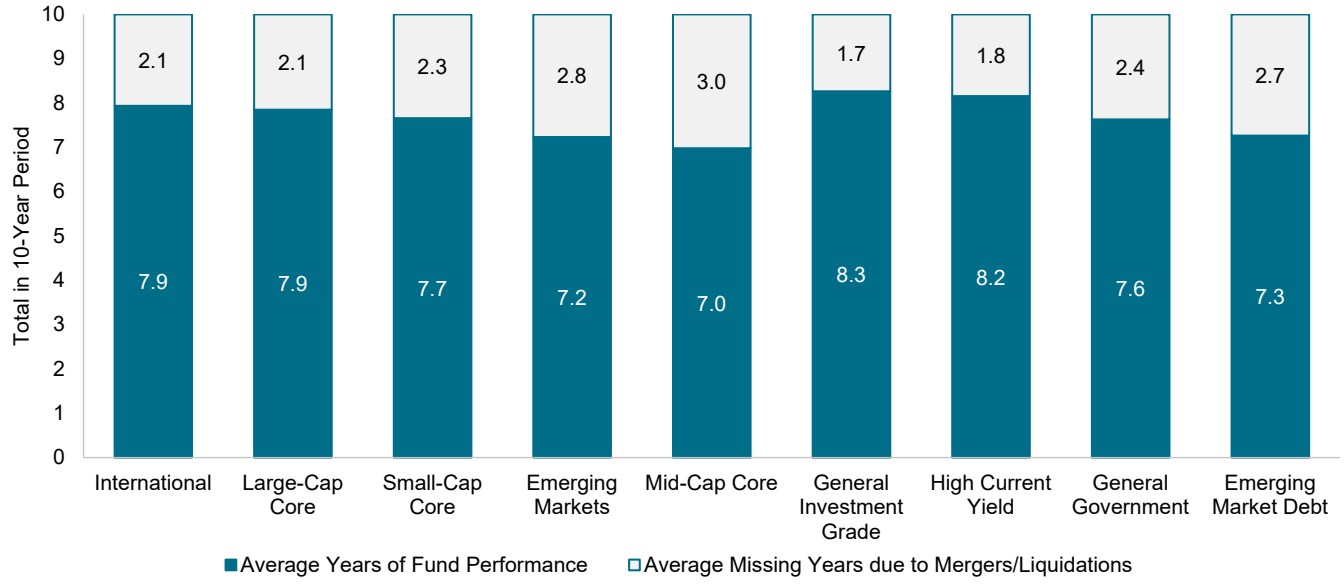
Exhibit 4: Selected 10-Year Survivorship Rates

Fund Category	Number of Funds at Start	Survivorship (%)	Style Consistency (%)
Large-Cap Core Funds	325	65.54	55.08
Mid-Cap Core Funds	125	51.20	42.40
Small-Cap Core Funds	260	61.15	70.77
International Funds	408	63.73	39.46
Emerging Markets Funds	238	53.78	92.86
General Government Funds	59	59.32	79.66
General Investment Grade Funds	98	66.33	77.55
High Current Yield Funds	228	69.30	77.19
Emerging Market Debt Funds	61	52.46	91.80

Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

One way to illustrate the impact of these non-survivors on each blend is to measure the proportion of time that active fund performances were "missing" due to fund closures. With each fund generating performance (or not) over 10 years, we can express this as the proportion of "missing years" out of 10, per category. In Exhibit 5, we illustrate that **on average, active portfolios missed between 1.7 and 3.0 years of performance (out of 10) due to the presence of merged/liquidated funds.**

Exhibit 5: Active Portfolios Missing Years of Performance by Category Over 10 Years

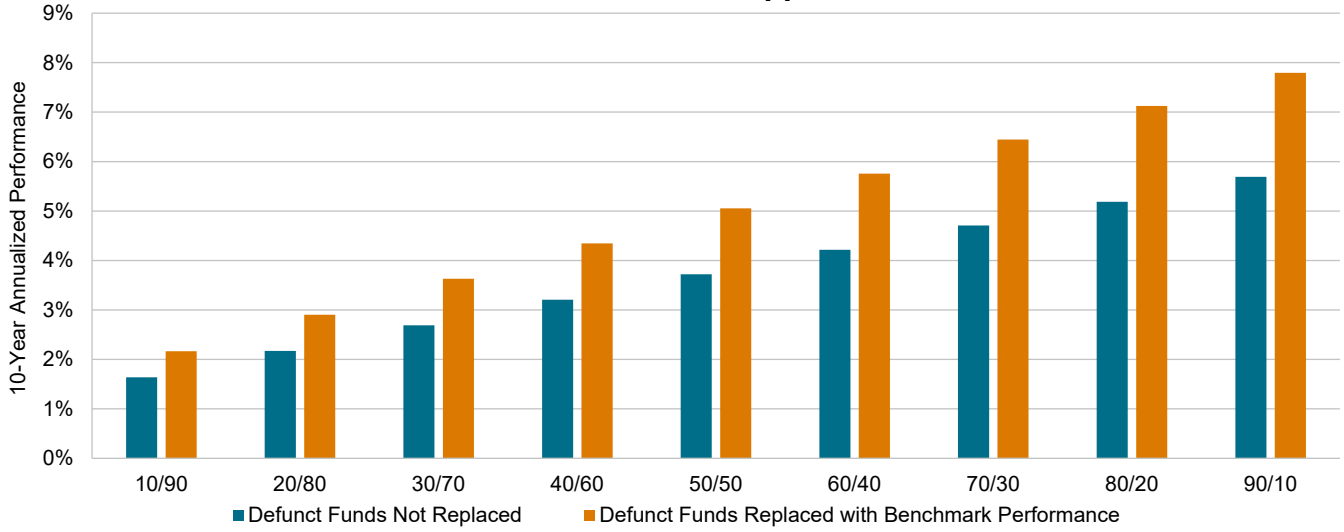


Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Although many funds failed to endure the past decade, an investor might, perhaps overconfidently, assume they possess the ability to avoid selecting such funds, especially since survivorship rates were above 50% in every category. However, given that anywhere from 31% to 49% of funds disappeared within each of our nine observed categories over the span of 10 years, active portfolios were statistically almost certain to contain at least one merged/liquidated fund. In fact, across every allocation, **99% of active portfolios contained at least one fund that eventually merged or liquidated**.[11]

Given the rampant rate of fund closures and the resulting missing years of performance over the 10-year period, it became imperative to implement a method of dealing with such outcomes in our simulations. Rather than leaving affected categories unaltered, which would result in periods of zero performance after the dates that funds were merged or liquidated, we instead proposed a practical alternative that reflected the ease of access to index strategies and generously offered a respite from continued underperformance in affected categories. In our calculation of active portfolio performance, **at the point when any active fund was merged or liquidated, we assigned the benchmark performance to that fund category from that month forward to the end of the 10-year period**.[12] As shown in Exhibit 6, replacing a merged/liquidated fund with the benchmark performance in the months subsequent to its demise had a materially positive impact on average active portfolio performance relative to leaving the subsequent months empty with no return.

Exhibit 6: Active Portfolio Performance between Approaches to Defunct Funds



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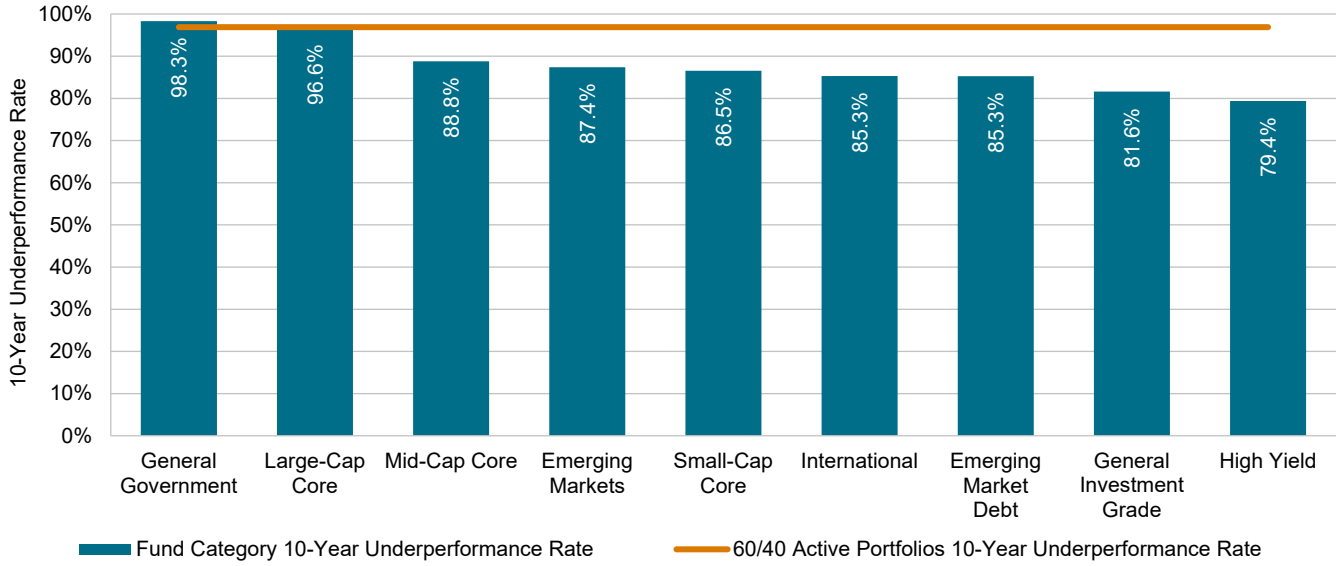
[11] This is not mathematically surprising. If survivorship rates were 50%, then the odds of randomly picking nine funds that all survived would be akin to flipping tails on a coin nine times in a row, or just 1 in 512.

[12] Considering the high historical underperformance rates across our nine fund categories, replacement of defunct funds with the benchmark instead of re-sampling is a conservative approach and perhaps reflects the realities of some investors switching to index-based investing because of fund closures.

Performance Comparisons

Seeking to make “apples to apples” comparisons between active portfolios and index blends, we calculated the monthly performance of each index blend (nine in total, from 10/90 to 90/10) based on the monthly performance of each benchmark and its weight in the blend (annually rebalanced) to generate a hypothetical 10-year performance. Each of these nine index blends served as the performance benchmark for active portfolios of the same allocations. Exhibit 1, at the very start of this whitepaper, was constructed by randomly simulating 1,000 active fund portfolios in this way—using the traditional 60/40 equity/bond allocation and with the associated index blend also highlighted for comparison. In that scenario, 96.9% of 60/40 portfolios of active funds underperformed the index blend—a rate higher than nearly every fund category within the portfolio, as shown in Exhibit 7.

Exhibit 7: Funds Underperforming Benchmarks and 60/40 Active Portfolios Underperforming Index Blend Over 10-Years



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Changing allocations did not qualitatively change the results. Exhibit 8 illustrates underperformance rates for active fund portfolios in each allocation from 10/90 to 90/10, calculated as the proportion of active portfolios (out of 100,000) that trailed the performance of the identically allocated blend of indices. Overall, the underperformance rate for active portfolios across all allocations was 94.6% or higher over the 10-year period.

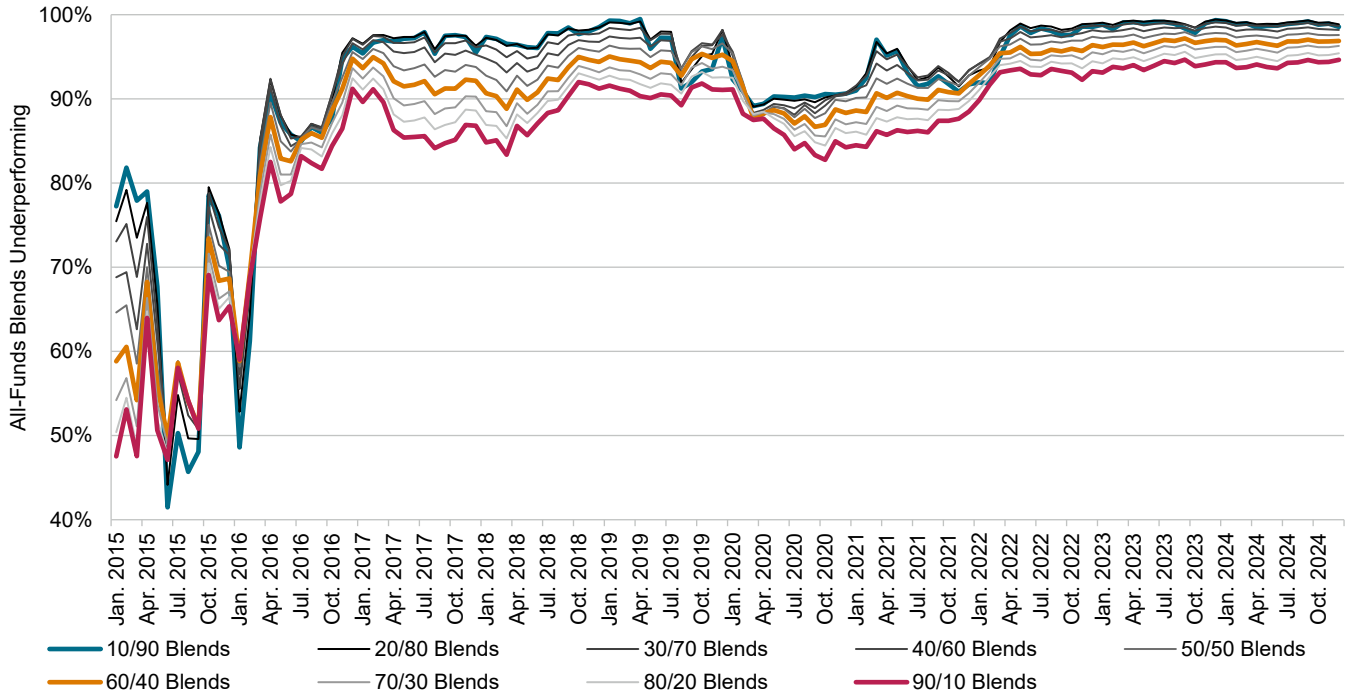
Exhibit 8: Active Fund Portfolios Underperforming Index Blends

Category	10-Year Underperformance Rate in Equity/Fixed Income Allocation (%)								
	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
Active Portfolios of All-Funds	98.55	98.87	98.65	98.19	97.58	96.89	96.28	95.42	94.64

Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Although underperformance rates for portfolios of active funds relative to index blends were universally high, the path toward this outcome over the 10-year period was not uniform for every allocation. Just as SPIVA Scorecards often reveal wider ranges of outcomes over short-term horizons within each fund category, so too did our active portfolios in the short term. In Exhibit 9 we reveal the cumulative underperformance rates for active portfolios in each of the nine allocations starting from the first month of the 10-year period, with the 10/90, 60/40 and 90/10 blends highlighted. As one might expect, the allocations exhibited a wide range of underperformance rates in the early months, driven primarily by market dynamics that somewhat favored active equity managers (and disfavored active bond managers) in the first months of 2015.[13] However, **over time, underperformance rates across all allocations converged as more and more funds within the active portfolios fell further behind**.

Exhibit 9: Cumulative Active Portfolio Underperformance Rates by Allocation



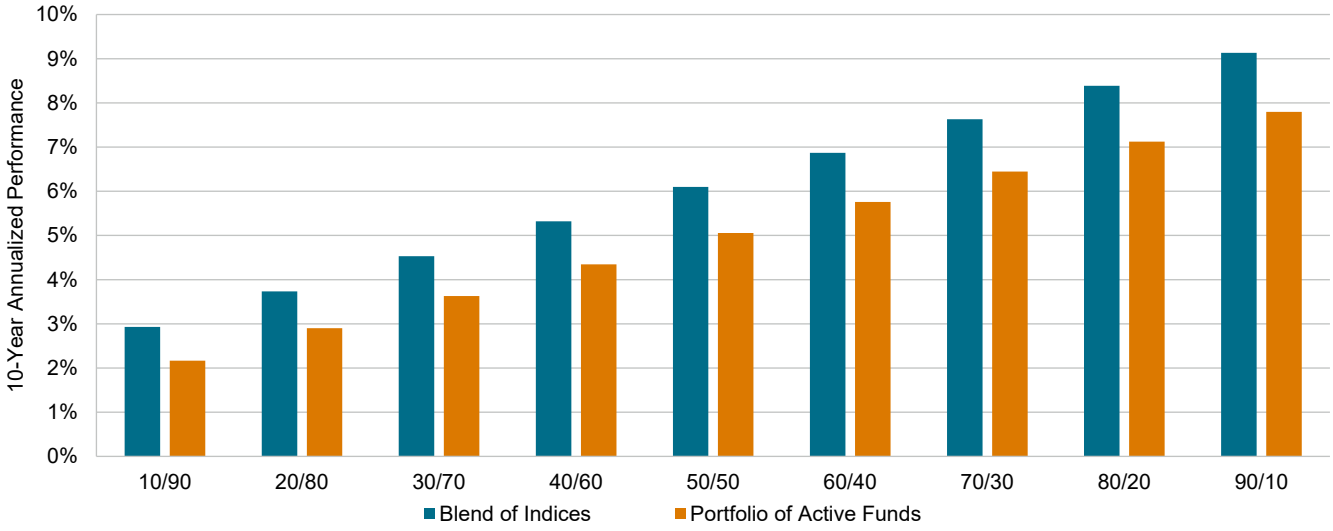
Source: S&P Dow Jones Indices LLC, CRSP. Data from Dec. 31, 2014, to Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

[13] See for example the SPIVA U.S. Mid-Year 2015 Scorecard.

4. Testing Portfolios of Active Funds versus Blends of Indices

While Exhibit 9 illustrated the probability of underperformance, Exhibit 10 offers a perspective on its magnitude. Retaining the approach of randomly selecting one active fund per category (and using index performance if necessary after a fund's liquidation), we compared the performance of all active portfolio allocations to the equivalent blends of indices. We found that, over the 10-year period, **the average performance of active fund portfolios was below that of the same allocation of indices—no matter the allocation**.

Exhibit 10: Performances of Active Fund Portfolios and Index Blends



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While most active portfolios underperformed their respective index blends in these trials, it is important to also point out that volatility comparisons were mixed. Exhibit 1 already illustrated that many of the 60/40 active portfolios generated higher volatility than the index blend; in Exhibits 11 and 12 we see that, on average, portfolio volatility was slightly lower, particularly in the portfolios with higher allocations to fixed income. In the aggregate, this would suggest that although most bond managers do not outperform benchmarks, they are slightly better at reducing risk—or disguising it.[14]

[14] See for exampe: Choi, Jaewon, et al. "Sitting Bucks: Stale Pricing in Fixed Income Funds." Journal of Financial Economics. August 2021.

Exhibit 11: 10-Year Performance and Volatility of Active and Index Blends by Allocation

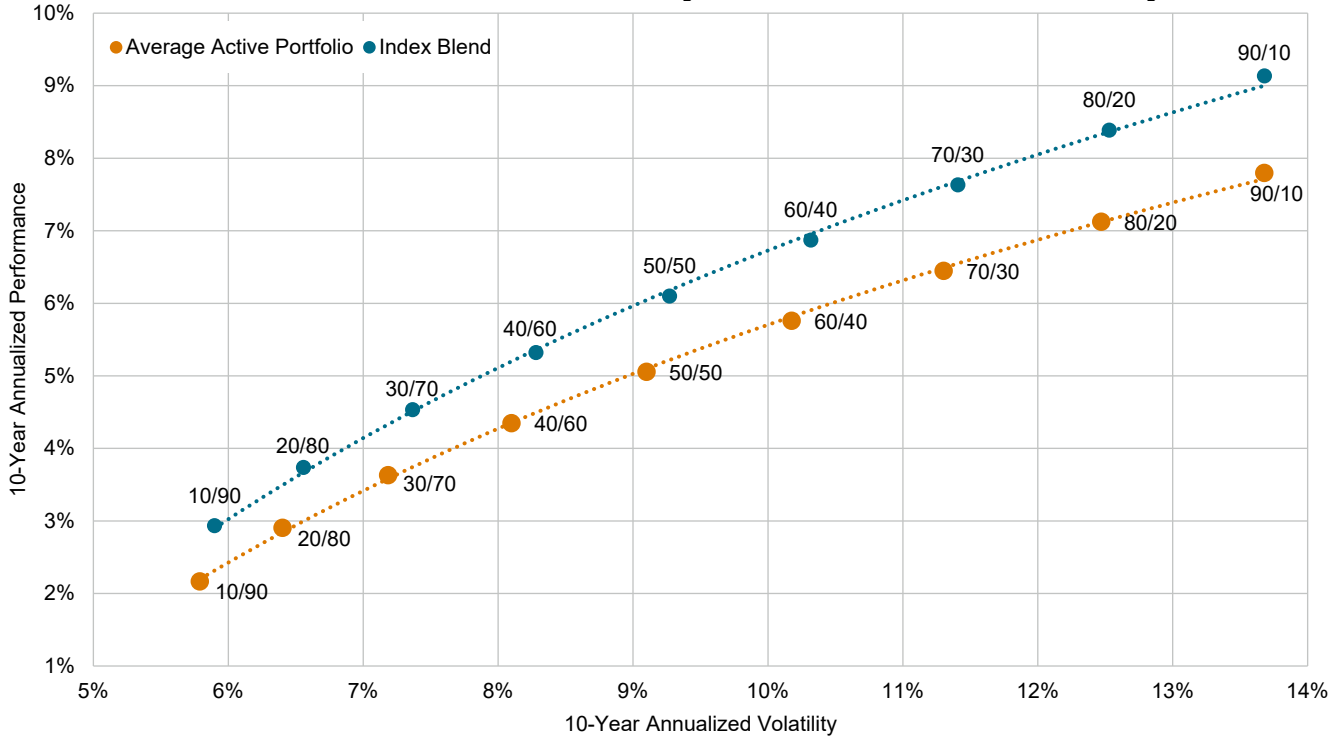

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Exhibit 12: Performance and Volatility by Allocation

Portfolio/Blend	Equity/Fixed Income Allocation								
	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
10-Year Annualized Performance (%)									
Active Portfolios of All-Funds (Average)	2.17	2.90	3.63	4.35	5.05	5.76	6.45	7.12	7.80
Index Blends	2.93	3.74	4.53	5.32	6.10	6.87	7.63	8.39	9.13
10-Year Annualized Volatility (%)									
Active Portfolios of All-Funds (Average)	5.79	6.40	7.19	8.10	9.10	10.18	11.30	12.47	13.68
Index Blends	5.90	6.56	7.37	8.28	9.27	10.32	11.41	12.53	13.68

Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

5. Choosing The "Best" Funds: Feasible or Folly?

Many investors rightly assert that they don't pick random funds to build portfolios but instead choose from the "best" funds. Over the years, SPIVA Persistence Scorecards have shown just how difficult it is to predict future performance based on past results, as many outperforming

active funds tend to mean-revert over time. Nonetheless, we investigated the impact of limiting the active portfolio fund selection universe to higher-performing funds. Specifically, we tested 100,000 iterations of each allocation, randomly choosing from a narrower universe of **only funds that ranked in the top quartile (Top-Q) in their category over the five-year period ending Dec. 31, 2014**.[15] Starting with the 60/40 blends, Exhibit 13 illustrates that portfolios built from Top-Q funds generated slightly higher performance than blends of all active funds.

Exhibit 13: 60/40 Active Portfolios of All-Funds and Top-Q Funds Excess Performance versus Index Blends

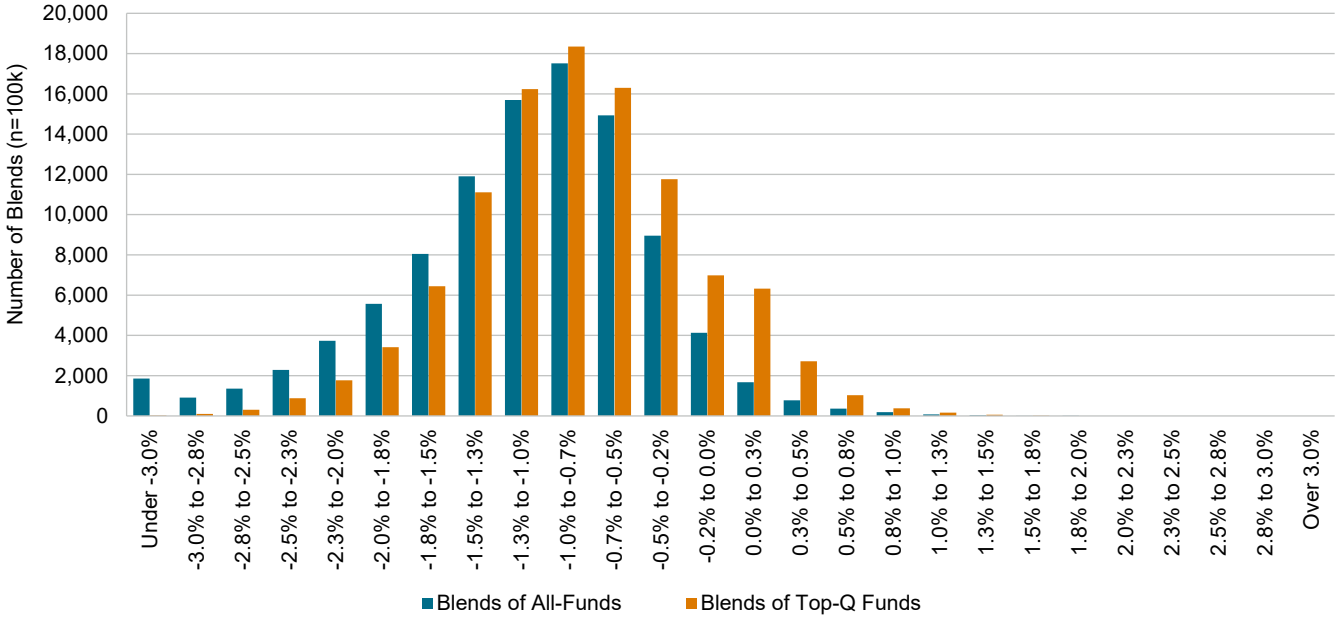

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Exhibit 14 reveals that underperformance rates for active portfolios of Top-Q funds were slightly lower than for active portfolios of All-Funds but remained near or above 90%.

Exhibit 14: Underperformance Rates for Active Portfolios of All-Funds and Top-Q Funds

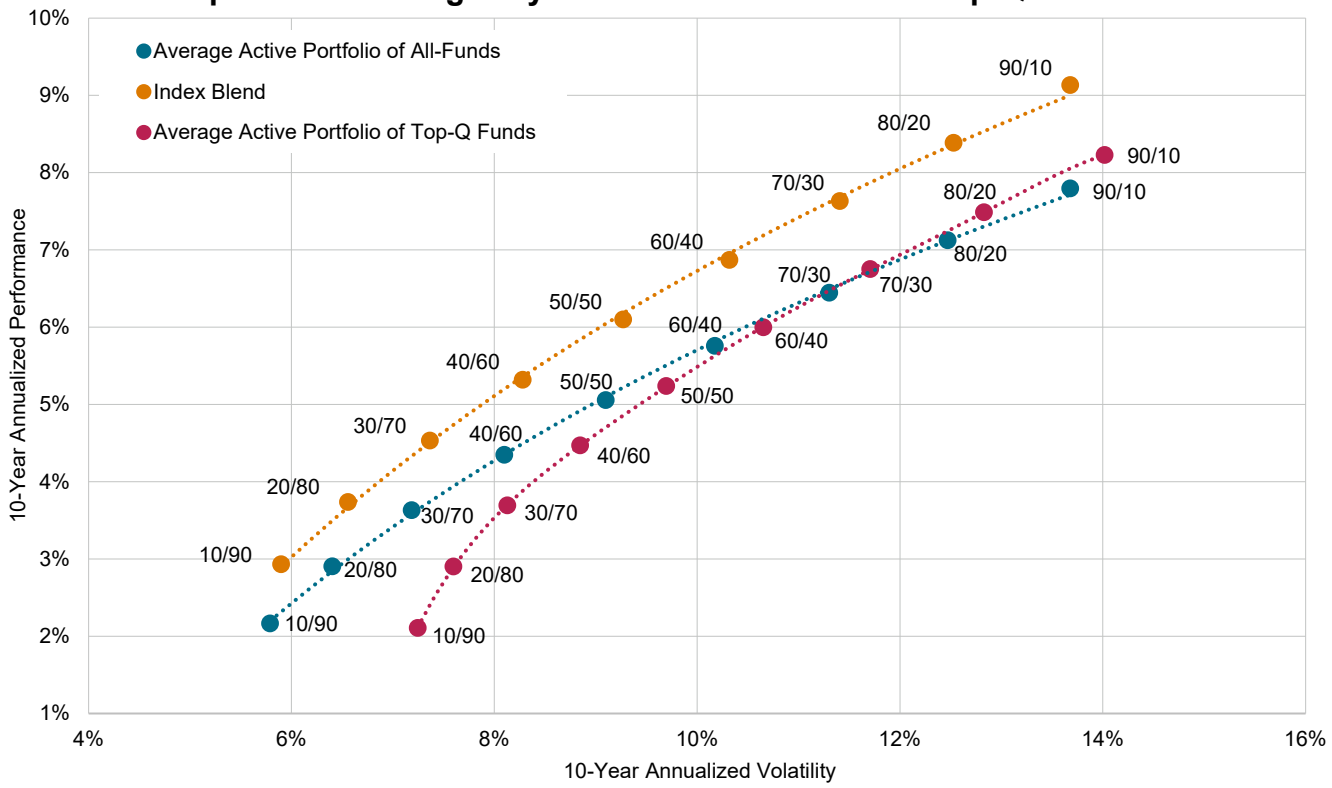
Category	10-Year Underperformance Rate of Equity/Fixed Income Allocation (%)								
	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
Active Portfolios of All-Funds	98.55	98.87	98.65	98.19	97.58	96.89	96.28	95.42	94.64
Active Portfolios of Top-Q Funds	97.71	97.68	97.17	96.15	94.94	93.68	91.92	90.16	87.96

Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

[15] Thus, our sample is limited to those funds that were incepted prior to and available (not merged/liquidated) during the full five-year period ending Dec. 31, 2014, and that also performed in the top quartile among all funds in their SPIVA category over the same period.

The annualized performance and volatility for these active portfolios of Top-Q funds, along with the same metrics for active portfolios of All-Funds as well as blends of indices, are shown in Exhibit 15.

Exhibit 15: Impact of Selecting Only from Previous Five-Year Top-Q Funds



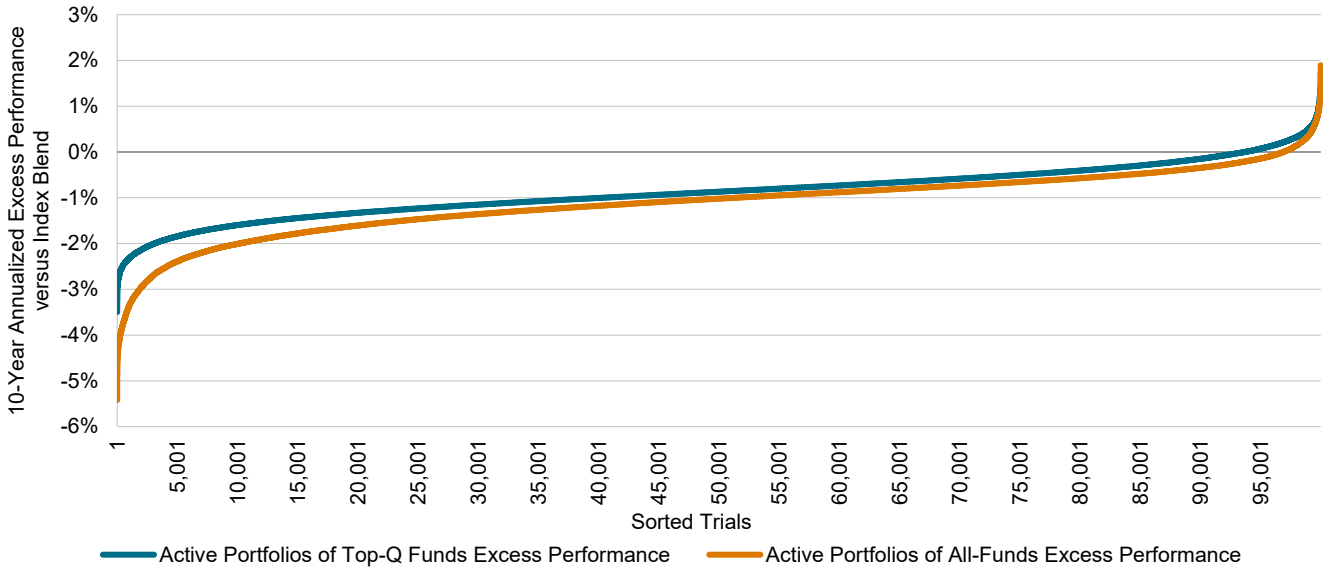
Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibits 14 and 15 together show that across the allocation range, average active portfolios constructed from previous prior Top-Q funds added significant amounts of volatility for very little performance improvement relative to the active portfolios of All-Funds. This difference is particularly observable in the fixed-income-heavy allocations, where on average, **bond managers previously ranked in the top-quartile seemed to subsequently display a higher risk profile in a generally failed pursuit of higher performance**. In the 10/90 allocation, for example, active portfolios comprised of previous Top-Q funds averaged lower annualized performance (2.1%) than the active blends of All-Funds (2.2%), but increased volatility (from 5.8% to 7.2%). At the other end of the spectrum, active portfolios with heavier equity allocations benefited slightly from the presence of Top-Q funds, but not to the extent of outperforming the index blends.

Although active portfolios of Top-Q funds underperformed at a slightly lower rate than active portfolios of All-Funds, **this outcome had more to do with screening out the worst performers than it did with more frequently choosing alpha-producers**. As illustrated in

Exhibit 16, showing sorted distributions of 60/40 active portfolios, the absolute best active portfolios of Top-Q funds and All-Funds outperformed the blend of indices by 1.9% and 1.7% (annualized), respectively. In other words, limiting the selection universe to Top-Q funds didn't have much of an impact on the potential magnitude of outperformance. In contrast, the worst-performing portfolios of Top-Q and All-Funds underperformed the blend of indices by 3.5% and 5.4%, respectively.

Exhibit 16: Excess Performance of 60/40 Active Portfolios of All-Funds and Top-Q Funds



Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclose for more information regarding the inherent limitations associated with back-tested performance.

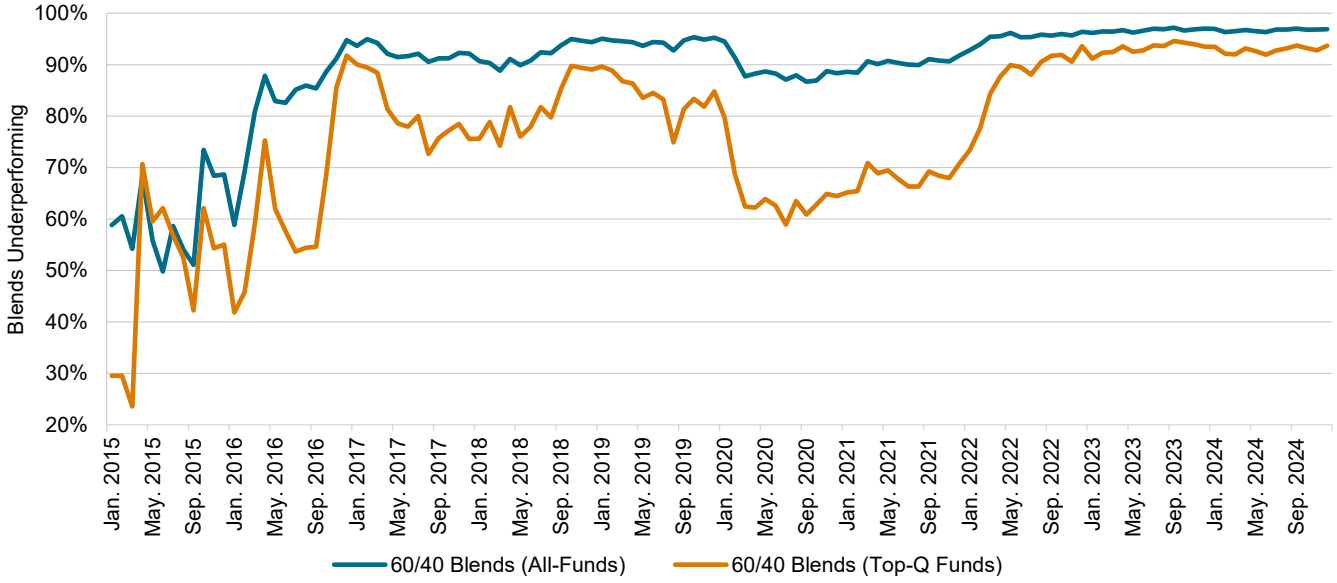
The fact that the best-performing portfolios from each fund universe (All-Funds and Top-Q) are not identical can be explained by the fact that some outperforming funds in the All-Funds universe were not ranked Top-Q (or in some cases had yet to launch) in the five-years prior and vice versa.

For readers of SPIVA Persistence Scorecards, these results may be intuitive, as years of evidence have shown that funds ranked in the top quartile (which can still mean underperformance) tend to fall out of this ranking over time. The results of our approach were consistent with prior research, as 18% of funds ranked in the Top-Q from December 2009 to December 2014 failed to survive the subsequent 10-year period (and thus are not displayed), and among those that did endure, 78% underperformed their benchmarks.

Revisiting our analysis of cumulative underperformance rates (see Exhibit 9), we examined the impact of a selection universe of Top-Q funds versus All-Funds on the resilience of the 60/40 active portfolio. Exhibit 17 illustrates that although the vast majority of active portfolios comprised of Top-Q funds ultimately underperformed, there were periods (such as during the

pandemic) when the differences in performance relative to the All-Funds active portfolios widened dramatically, suggesting that previous top-quartile funds retained at least some of their higher performance versus peers, even though outperforming index benchmarks is often a bridge too far.

Exhibit 17: Underperformance Rates of 60/40 Active Portfolios of All-Funds and Top-Q Funds



Source: S&P Dow Jones Indices LLC, CRSP. Data from Dec. 31, 2014, to Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

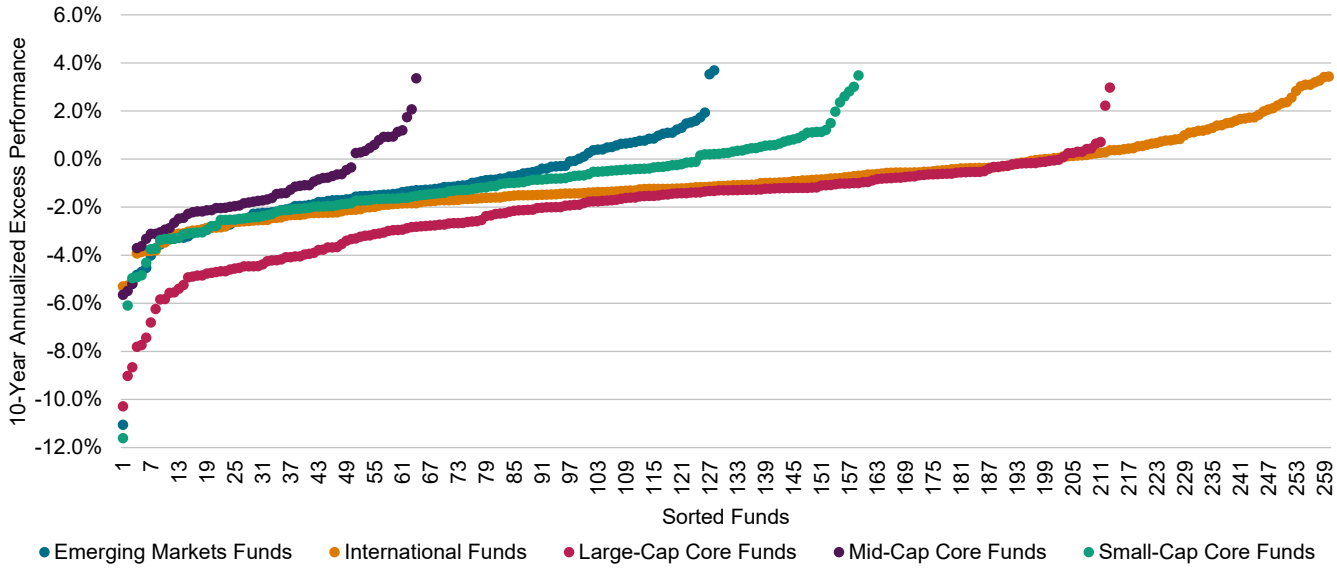
Ultimately, largely due to the lack of persistence among previous high performers, active portfolios of All-Funds and active portfolios of Top-Q funds all converged to underperformance rates averaging well above 90% over the 10-year period. Choosing from prior top-quartile funds was not sufficient to change the long-term outcome. Perhaps an even more diligent approach to fund selection would be required in order to identify a small subsect of funds capable of driving overall portfolio outperformance, if such funds even exist.

6. Hero Funds: Myth or Reality?

Discovering that even portfolios comprised solely from prior top-quartile funds still failed to outperform blends of indices with high probability, we are left wondering what characteristics define the small sliver of winning portfolios. A narrower fund selection universe than prior top-quartile funds is at least required. And if we knew in advance what the set of outperforming funds were in each category, which category would most reward that foresight? In other words, we are left to question what features define winning portfolios. Are they the product of minor degrees of outperformances adding up across the fund categories or, perhaps, are they driven by a small number of funds punching above their weight, heroically producing outsized results that carry the rest of the portfolio to victory?

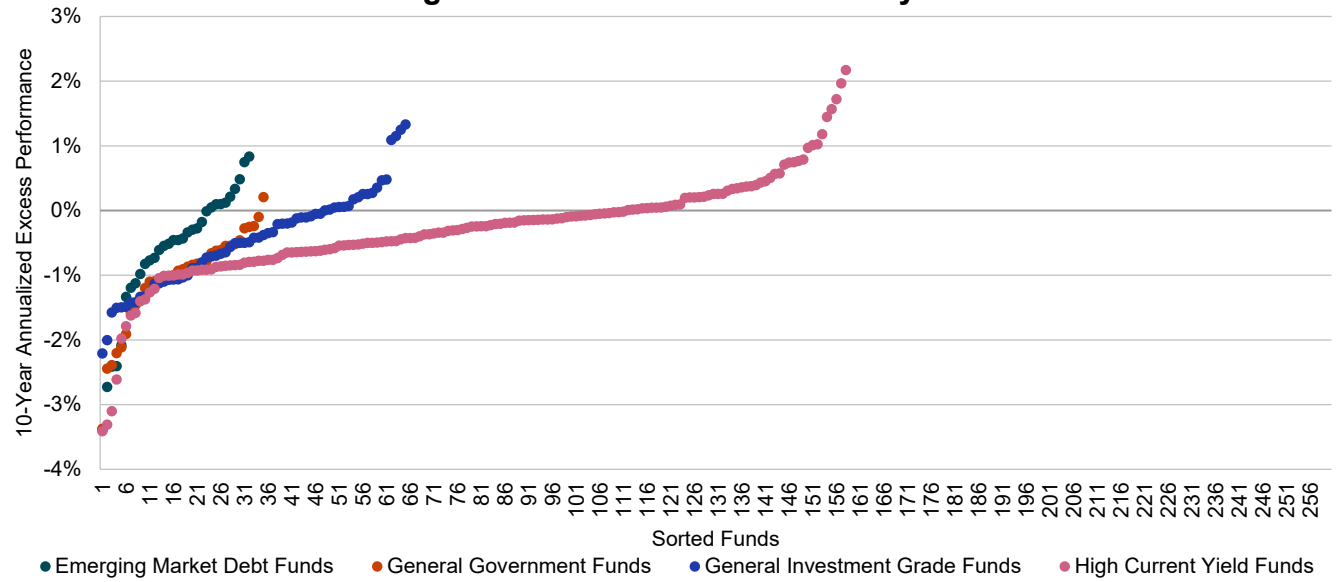
Intuitively, each outperforming fund's contribution to the portfolio's outperformance is determined by a combination of what weight that fund has in the portfolio and the magnitude of that fund's outperformance. The weights are already known, but to address the magnitude, we identified the small subset of funds in each category that both survived and outperformed over the 10-year period, shown along with their underperforming brethren in Exhibit 18 and Exhibit 19 for equity and fixed income categories, respectively.

Exhibit 18: 10-Year Surviving Equity Funds Sorted by Excess Performance



Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 19: 10-Year Surviving Fixed Income Funds Sorted by Excess Performance

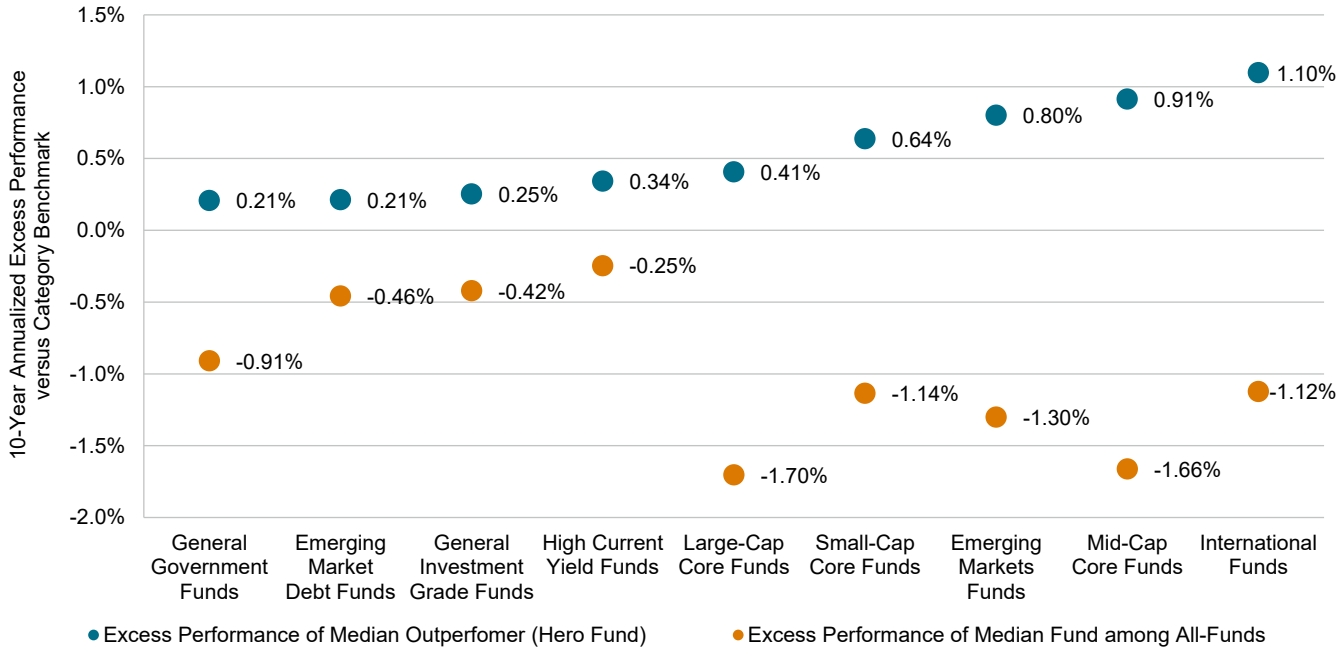


Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The rewards for identifying outperformers were not evenly distributed. Notably, the range of individual fund relative performance outcomes (both positive and negative) was wider in equity categories than in fixed income. In particular, funds that survived and outperformed in equity categories such as International, Mid-Cap Core and Emerging Markets generated proportionally higher 10-year excess returns than those in the fixed income categories.

Exhibit 20 illustrates this point in detail, showing the magnitude of outperformance among each category's outperformers and among all funds in the category. These data suggest that picking funds from only (future) outperformers in the International, Mid-Cap Core and Emerging Markets categories would have had the widest margins of excess performance, with the median outperforming funds in each category (which we shall dub "Hero Funds" from now on) outperforming their benchmarks by 1.1%, 0.9% and 0.8%, respectively.

Exhibit 20: Excess Performance of Median Outperformer (Hero Fund) and Median of All-Funds

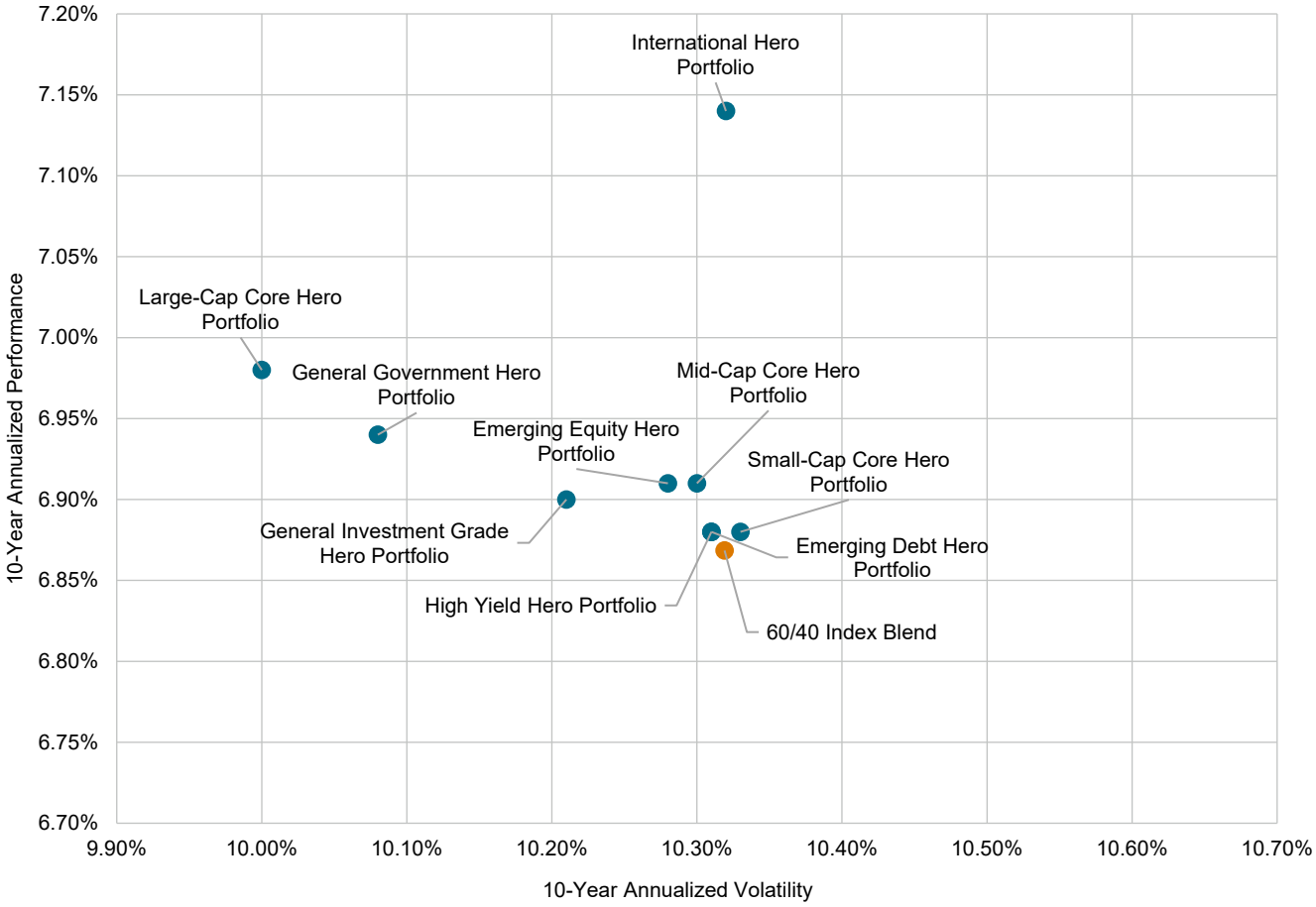


Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Moving forward to study the impact of our so-called Hero Funds on active portfolios, we conducted additional trials of the 60/40 active portfolio under a new scenario and with the benefit of perfect hindsight over the 10-year period. In each condition, the Hero Fund (median outperformer) from one category was included in every active portfolio iteration, surrounded by index performances in each of the eight other categories. The return and volatility characteristics of these "Hero Portfolios" are shown in Exhibit 21, where three observations are clear. First, return and volatility results for many of the blends are closely clustered, suggesting the Hero Funds had little impact over the rest of the portfolio. Second,

reassuringly, the portfolio impact of a Hero Fund was largely a function of its magnitude of total performance and its allocation weight. Third, **the fund category that stood out the most was International, where selection of an International equity Hero Fund surrounded by indices produced the best performance among all active fund portfolios, in absolute terms**.

Exhibit 21: 60/40 Hero Portfolios versus Index Blend



Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

7. Conclusion

For more than two decades, S&P DJI's SPIVA Scorecards have provided a factual and quantitative perspective on the prospects for selecting active funds that surpass benchmark performance. In this new analysis, we extended this research effort into the context of multi-asset portfolios using the assumptions and methodologies described above. The focus shifted slightly away from the challenges facing fund selectors and toward the equally difficult task faced by portfolio builders. We conclude with some summary observations.

1. Portfolios of funds from categories that already had high underperformance rates underperformed blends of indices at even higher rates.
2. These results did not change significantly for differing equity/fixed income allocations.
3. Composing active portfolios from prior top-quartile funds did not significantly change long-term rates of underperformance relative to blends of indices.
4. Some active funds, particularly funds boasting prior top-quartile returns in fixed income categories, may add disproportionately more risk than return in subsequent periods.

And finally,

5. Among portfolios employing a skillful (or lucky) selection process for active funds in one category with a passive approach in other categories, the identification of outperformers among International Funds offered the highest positive impact at the portfolio level.

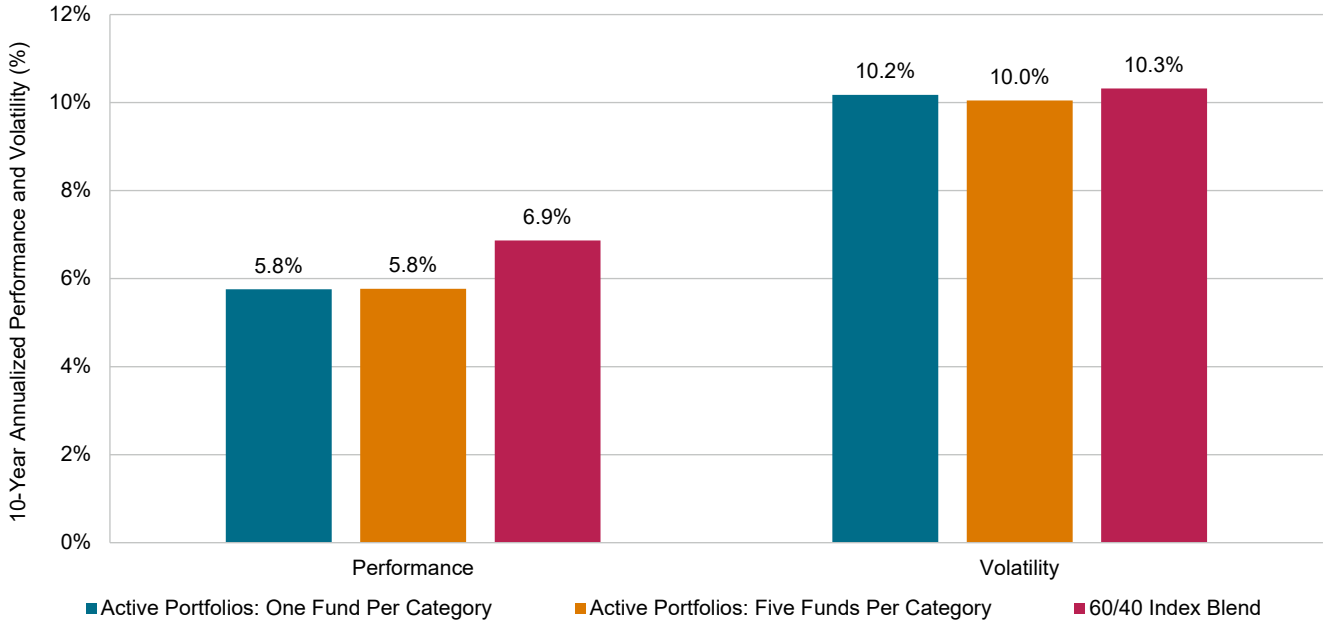
Appendix

Diversification Consideration: Number of Funds per Category

As discussed previously, our methodology constructed active portfolios by randomly selecting one fund per category, but is one enough? Does adding more funds per category help performance via diversification and perhaps mitigate the impact of non-survivors?[16]

To answer this question, we created and compared two versions of the 60/40 active portfolio, one constructed as previously described by selecting 1 fund per category (for a total of 9 funds in the portfolio) and another selecting 5 funds per category (9 categories x 5 funds = 45 funds in the portfolio). Again, each approach was repeated 100,000 times and average performance was compared. As shown in Exhibit 22, return and risk measures for each method were virtually identical, lending support to our approach using one fund per category for the remainder of our analyses.

Exhibit 22: 60/40 Index Blend and Active Portfolios with One Fund or Five Funds per Category



Source: S&P Dow Jones Indices LLC, CRSP. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Chart is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

[16] See for example Ferri, Richard and Alex Benke. "A Case for Index Fund Portfolios." 2013.

Summary Data

Exhibit 23: Active Portfolios Underperforming Index Blends over the 10-Year Period (Based on Absolute Return)

Active Portfolio	Underperformance Rate of Equity/Fixed Income Allocation (%)								
	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
Active Portfolios of All-Funds, 1 Active Fund per Category	98.55	98.87	98.65	98.19	97.58	96.89	96.28	95.42	94.64
Active Portfolios of Previous Top-Quartile (Top-Q) Funds, 1 Active Fund per Category	97.71	97.68	97.17	96.15	94.94	93.68	91.92	90.16	87.96

Source: S&P Dow Jones Indices LLC, CRSP. Missing monthly performances of merged/liquidated funds are replaced with benchmark performance. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 24: Average Active Portfolios and Index Blends Annualized Performance (Equal Weighted) over the 10-Year Period

Index Blend or Active Portfolio	Equity/Fixed Income Allocation Performance (%)								
	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
Index Blend	2.93	3.74	4.53	5.32	6.10	6.87	7.63	8.39	9.13
Active Portfolios of All-Funds, 1 Active Fund per Category	2.17	2.90	3.63	4.35	5.05	5.76	6.45	7.12	7.80
Active Portfolios of Previous Top-Quartile (Top-Q) Funds, 1 Active Fund per Category	2.11	2.90	3.69	4.47	5.24	6.00	6.75	7.49	8.23

Source: S&P Dow Jones Indices LLC, CRSP. Missing monthly performances of merged/liquidated funds are replaced with benchmark performance. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 25: Average Active Portfolios and Index Blends Annualized Volatility (Equal Weighted) over the 10-Year Period

Index Blend or Active Portfolio	Equity/Fixed Income Allocation Volatility (%)								
	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
Index Blend	5.90	6.56	7.37	8.28	9.27	10.32	11.41	12.53	13.68
Active Portfolios of All-Funds, 1 Active Fund per Category	5.79	6.40	7.19	8.10	9.10	10.18	11.30	12.47	13.68
Active Portfolios of Previous Top-Quartile (Top-Q) Funds, 1 Active Fund per Category	7.25	7.60	8.13	8.85	9.70	10.65	11.71	12.83	14.02

Source: S&P Dow Jones Indices LLC, CRSP. Missing monthly performances of merged/liquidated funds are replaced with benchmark performance. Data as of Dec. 31, 2024. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

General Disclaimer

Performance Disclosure/Back-Tested Data

All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. Complete index methodology details are available at www.spglobal.com/spdji. Past performance of the Index is not an indication of future results. Back-tested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financial risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results. Please refer to the methodology for the Index for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations. Back-tested performance is for use with institutions only; not for use with retail investors.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the index is set to a fixed value for calculation purposes. The Launch Date designates the date when the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its data feed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Typically, when S&P DJI creates back-tested index data, S&P DJI uses actual historical constituent-level data (e.g., historical price, market capitalization, and corporate action data) in its calculations. As ESG investing is still in early stages of development, certain datapoints used to calculate S&P DJI's ESG indices may not be available for the entire desired period of back-tested history. The same data availability issue could be true for other indices as well. In cases when actual data is not available for all relevant historical periods, S&P DJI may employ a process of using "Backward Data Assumption" (or pulling back) of ESG data for the calculation of back-tested historical performance. "Backward Data Assumption" is a process that applies the earliest actual live data point available for an index constituent company to all prior historical instances in the index performance. For example, Backward Data Assumption inherently assumes that companies currently not involved in a specific business activity (also known as "product involvement") were never involved historically and similarly also assumes that companies currently involved in a specific business activity were involved historically too. The Backward Data Assumption allows the hypothetical back-test to be extended over more historical years than would be feasible using only actual data. For more information on "Backward Data Assumption" please refer to the FAQ. The methodology and factsheets of any index that employs backward assumption in the back-tested history will explicitly state so. The methodology will include an Appendix with a table setting forth the specific data points and relevant time period for which backward projected data was used.

Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices maintains the index and calculates the index levels and performance shown or discussed but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US $100,000 investment for a 12-month period (or US $10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US $1,650), the net return would be 8.35% (or US $8,350) for the year. Over a three-year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US $5,375, and a cumulative net return of 27.2% (or US $27,200).