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KEY FINDINGS

- Buffer funds, options-based strategies that aim to limit downside risk while capping upside, often underperform their reference assets in both returns and risk-adjusted terms, despite being marketed as investor-friendly solutions to equity volatility.
- The promised downside protection is inconsistent in practice—realized losses frequently exceed what investors might expect based on option payoff diagrams, especially outside narrowly defined periods.
- Simple alternatives like mixing equities with cash generally outperform buffer funds on average and even in drawdowns, raising questions about whether these products truly serve investor goals or just cater to behavioral preferences.

ABSTRACT

Being an equity investor is hard. Volatility can be high, drawdowns can be long, and nobody can definitively (or a considerably lower bar than definitively) say when returns are going to be good or bad. Products catered to investor preferences of achieving equity-like returns with less downside risk have been around for decades. "Defined outcome" strategies such as buffer funds are the most recent in a line of products designed to accommodate this desire and offer a wide range of customizations to fit investor objectives. Like their predecessors, however, buffer funds don't hold up to scrutiny, either empirically or theoretically. Once again Robert Heinlein, and his TANSTAAFL, is a better investment manager than the industry.

The future of asset management will be shaped by not just new technologies and regulations but on how effectively the industry meets investors' desire for smoother, more predictable returns. One widely embraced innovation is *defined outcome* or *buffer funds*—a class of options-based products marketed as making equity investing a little easier. Their rapid adoption, especially among retirees and retail investors, reflects an evolution in product engineering and a growing tilt toward product customization.

This article places buffer funds in the broader lineage of structured products. Though positioned as a solution to the emotional and financial challenges of investing, we show buffer funds are less a breakthrough and more a familiar repackaging: the promise of comfort, cloaked in complexity, at the cost of risk-adjusted returns.

Using new data and historical parallels, we test whether buffer funds deliver on their marketing claims. Our analysis suggests that, despite the modern branding, many of the weaknesses that plagued earlier structured products persist. As the asset management industry continues to evolve, the lessons from buffer funds raise essential questions about innovation, investor utility, and long-term value creation—precisely the kinds of questions this special issue seeks to explore.

DEFINED OUTCOMES IN CONTEXT

Defined outcome investing—also known as outcome-based or target outcome investing—is an options-based approach that seeks to deliver a specific return profile over a specific period based on a specific market outcome, typically the performance of an equity market (though fixed income and cryptocurrency variants also exist).

Products like these are not new. Their forebears, structured products, go back at least to the 1990s, when banks began issuing strategies to deliver an array of payoffs depending on the behavior of an underlying reference asset. This flexibility allowed issuers to cater to specific investor preferences, such as capital protection, yield enhancement, or exposure to particular market scenarios. Such products became especially popular in retail and high-net-worth markets in Europe, Asia, and the United States.[1]

Although advocates of these products emphasize the benefits of tailored return distributions, their investors bear at least three costs: 1) options may be naturally too expensive (i.e., negative expected returns via being long the volatility risk premium),[2] 2) transaction costs of trading options may be high,[3] and 3) fees managers charge may be meaningfully higher than in a passive allocation to the reference asset. Combined, these costs make it unlikely that most structured products would be a good deal for investors.

Indeed, empirical research on structured products has been generally pessimistic as to their true value. Various studies have shown them to produce inferior outcomes than the asset whose returns they seek to modify.[4] Other, more theoretical, work has shown these strategies to be disappointing ex-ante, tending to reduce returns and increase tail risk, even when fairly priced and when transaction costs are ignored.[5]

Theoretically, this makes perfect sense. Strategies that use options to reduce risk tend to be long-volatility and thus should be expected to offer lower risk-adjusted returns than the underlying asset on which they are based. Israelov and Klein (2016) and Ilmanen et al. (2021) show that a negative capital asset pricing model (CAPM) alpha due to the put option's volatility risk premium and skewness exposure is a well-documented, economically rational empirical observation.[6] This can be seen most simply in the Cboe PPUT and the PPUT3M indexes, which track the returns of the S&P 500 Index while continuously purchasing 5% out-of-the-money (OTM) monthly put options and 5% OTM quarterly put options, respectively. As shown in Exhibit 1, this approach to equity investing has led not only to lower average returns than the index (which is expected, given the reduction in equity risk) but also to worse risk-adjusted returns (from the volatility risk premium exposure).[7]

Even strategies that seek to alleviate some of the long-term cost of being long the volatility risk premium are not a solution to this return (and risk-adjusted return) drag.

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[1] Li, Subramanyan, and Yang (2018).

[2] See, for example, Ilmanen (2011, 2012). We refer loosely to the volatility risk premium in this article but note it may embed related skewness/convexity/gamma or jump/gap/crash premia.

[3] See, for example, Kaeck, van Kervel, and Seeger (2022) for SPX options or O'Donovan and Yu (2024) for how transaction costs are consistent in the cross-section of stock options and that transactions costs in 24 long–short portfolios of delta-hedged options erode any significant positive return.

[4] See for example Henderson and Pearson (2011), who focused on Stock Participation Accreting Redemption Quarterly-pay Securities (SPARQS), the most popular subset of the US publicly issued structured equity products. Vokata (2021) focuses on yield enhancement products and finds the embedded fees are large enough for their ex-ante and ex-post returns to be negative. As well, Entrop et al. (2015) show that investors typically realize negative alphas in structured financial products, even when transaction costs are ignored and that this underperformance increases with product complexity.

[5] Perusset and Rockinger (2023).

[6] And intuitively, investors may be even more averse to downside risk and to losses amid high volatility than a strategy's CAPM beta implies.

[7] There is always a possible state of the world where a sufficiently horrible, sudden short-term crash would change these results, but it's unlikely (see Israelov and Nielsen 2015).

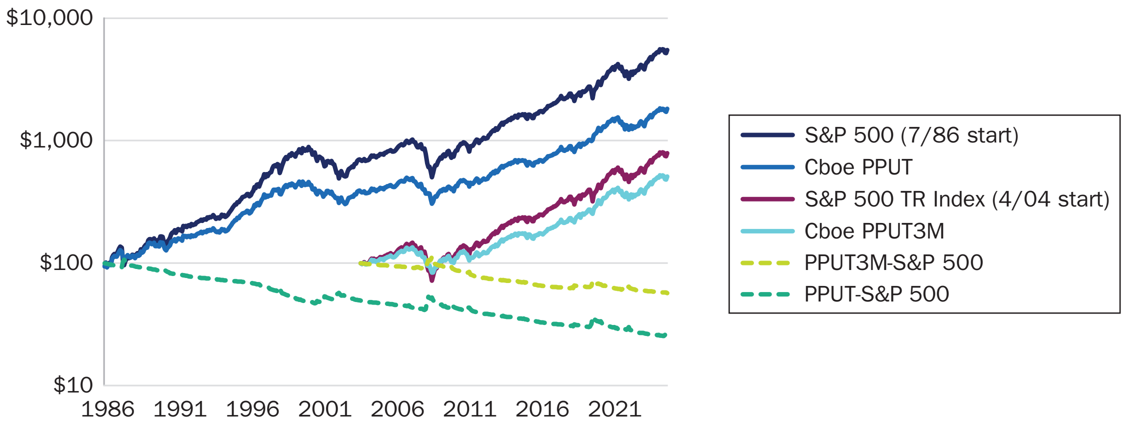
EXHIBIT 1

The Long-Term Cost of Being Long Puts (July 1, 1986–May 31, 2025 for PPUT; April 2004–May 2025 for PPUT3M)

Panel A: Summary Statistics

	July 1986–May 2025			April 2004–May 2025		
	S&P 500 TR Index	Cboe S&P 500 5% Put Protection Index (PPUT)	PPUT-S&P 500	S&P 500 TR Index	Cboe S&P 500 Tail Risk Index (PPUT3M)	PPUT3M-S&P 500
Return (AM)	11.5%	8.2%	–3.3%	10.9%	8.4%	–2.5%
Return (GM)	10.8%	7.7%	–3.4%	10.3%	8.0%	–2.6%
Volatility	15.3%	12.3%	6.4%	14.8%	11.8%	5.2%
Sharpe Ratio (AM)	0.54	0.41	–1.02	0.62	0.57	–0.80
Skew	–0.70	–0.28	4.38	–0.59	–0.26	2.38

Panel B: Growth of $100 (since inceptions of PPUT and PPUT3M)



NOTES: Panel A reports performance statistics for the S&P 500 Total Return Index, Cboe S&P 500 5% Put Protection Index, Cboe S&P 500 Tail Risk Index, and the latter two indices' monthly returns in excess of the S&P 500. AM is arithmetic average return; GM is geometric annualized return. Panel B shows the growth of $100 for the S&P 500 Total Return Index, Cboe S&P 500 5% Put Protection Index, Cboe S&P 500 Tail Risk Index, and the latter two indices' monthly returns in excess of the S&P 500. Results since inception are shown for each of the two Cboe indices. All statistics, except for skew, are annualized.

SOURCES: AQR, Bloomberg.

As shown in Israelov and Klein (2016), this is true even in the case of so-called "cashless collars," where proceeds from selling calls are used to offset the price of purchasing puts. Exhibit 2 shows that even for popular collar indexes, such as the Cboe's CLL and CLLZ,[8] the net value-added of selling a call to make up for the cost of the long put is still negative, both in returns and risk-adjusted returns. In all cases, rational investors should derive greater utility from simply holding less in equities, an approach that clearly reduces equity risk while keeping risk-adjusted return the same.

This article is the first to our knowledge focused on the buffer fund industry and adds to the considerable literature showing structured-type strategies to generally be a bad deal for investors. We find the majority of buffer funds have produced inferior risk-adjusted returns than their reference asset, have more often than not realized returns that are worse than what is implied by their payoff diagrams, and

[8]The Cboe S&P 500 95-10 Collar Index (CLL) tracks an investment in S&P 500 (SPX) stocks with a long 5% out-of-the money SPX put option and a short position in a 10% out-of-the-money SPX call option. The Cboe S&P 500 Zero-Cost Put Spread Collar Index (CLLZ) is a variation of the Cboe S&P 500 Collar Index (CLL) that tracks an investment in SPX stocks hedged with a 2.5%–5% put spread funded by selling an SPX call (at a strike such that the call premium offsets the cost of the put spread). Both indexes are rebalanced monthly after the expiration of the portfolios' calls/puts.

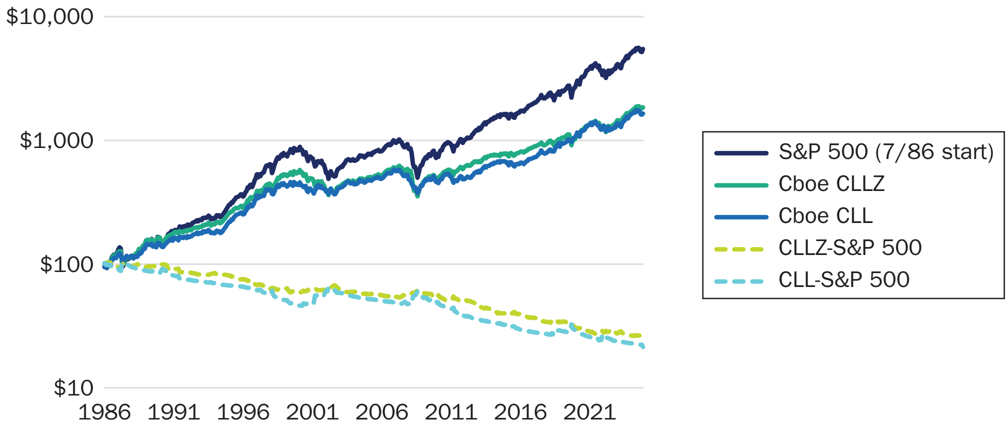
EXHIBIT 2

The Long-Term Cost of Collars and Cashless Collars (July 1986–May 2025)

Panel A: Summary Statistics

	S&P 500 TR Index	Cboe S&P 500 95-110 Collar Index (CLL)	Cboe S&P 500 Zero-Cost Put Spread Collar Index (CLLZ)	CLL-S&P 500	CLLZ-S&P 500
Return (AM)	11.5%	7.8%	8.2%	–3.7%	–3.3%
Return (GM)	10.8%	7.5%	7.8%	–3.9%	–3.4%
Volatility	15.3%	10.8%	11.7%	7.0%	5.1%
Sharpe Ratio	0.54	0.42	0.42	–0.99	–1.27
Skew	–0.70	–0.18	–0.96	2.81	–0.27

Panel B: Growth of $100 (since inceptions of CLL and CLLZ)



NOTES: Panel A reports performance statistics for the S&P 500 Total Return Index, Cboe S&P 500 95-110 Collar Index, Cboe S&P 500 Zero-Cost Put Spread Collar Index, and the latter two indices' monthly returns in excess of the S&P 500. AM is arithmetic average return; GM is geometric annualized return. Panel B shows the growth of $100 for the S&P 500 Total Return Index, Cboe S&P 500 95-110 Collar Index, Cboe S&P 500 Zero-Cost Put Spread Collar Index, and the latter two indices' monthly returns in excess of the S&P 500. Results since inception are shown for each of the two Cboe indices. All statistics, except for skew, are annualized.

SOURCES: AQR, Bloomberg.

have overwhelmingly underperformed simple appropriately comparable stock/cash portfolios during the worst drawdowns in their (still short)[9] history.

A BRIEF INTRODUCTION TO BUFFERS

Buffer funds are often marketed as providing equity market exposure with some downside protection, so they broadly share the perceived benefits, costs, and risks of long-put and collar strategies.[10] That said, buffer funds are different from traditional structured products in two major ways: access and design. For the former, they became available in 2016 as index-based mutual funds and in 2018 as exchange-traded funds (ETFs)—helping to facilitate massive industry AUM growth, as shown in Exhibit 3.[11]

[9] While short, this period notably includes meaningful drawdowns that were "fast" and "slow": the February/March 2020 COVID-19 crash, and the nearly full-year 2022 drawdown, respectively.

[10] The industry is fairly split between "buffer" and "buffered" funds. We use "buffer" throughout this article for consistency.

[11] In August 2018, Innovator listed the world's first Defined Outcome Buffer ETF. Sources: Cboe, Vest, Innovator.

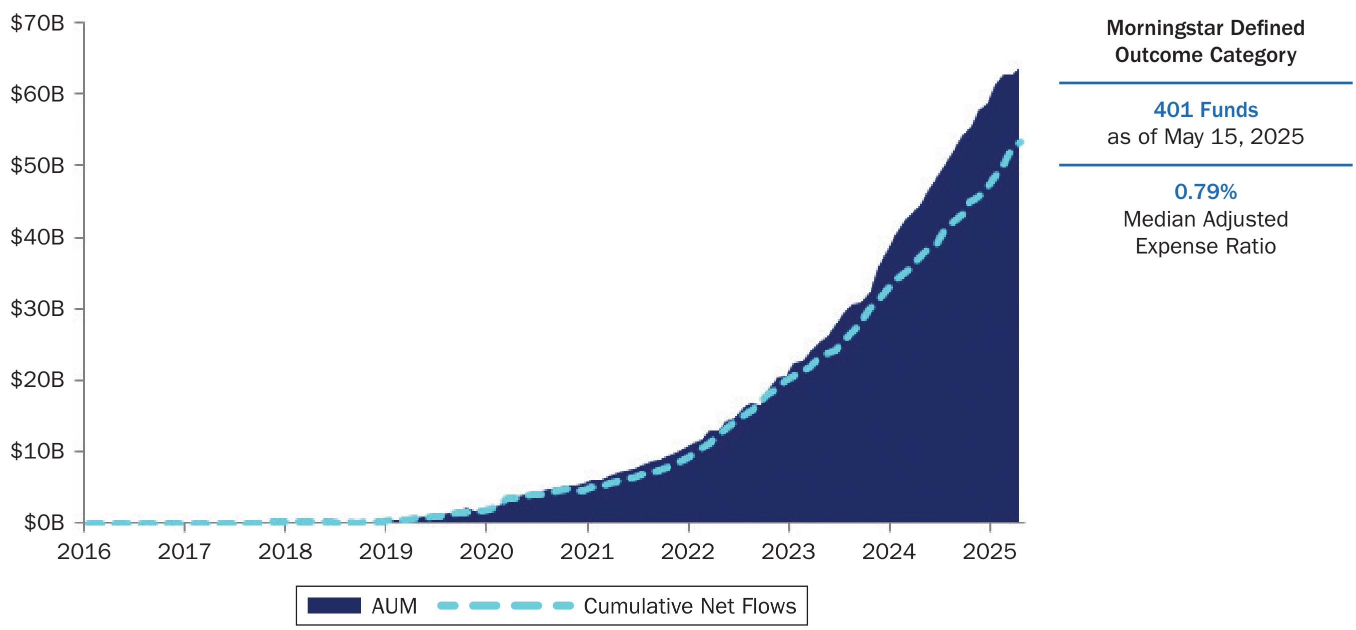
In terms of design, the most popular style of buffer fund today is different from a collar in one important way: It typically sells an out-of-the-money put option, which leads to an expected 1-period payoff function shown in Exhibit 4. This short OTM put brings with it two economic ramifications: 1) it reduces the implicit cost of insurance via making the product less long volatility, and 2) it weakens the hedging capabilities of the product, as it does not promise a guaranteed floor (unlike a collar strategy) but merely a buffer to losses. In other words, this lower cost of insurance is in exchange for weakening the ultimate downside protection.[12]

In terms of underlying holdings, buffer funds are most typically made of four European-style options contracts against the same reference asset:

1) Long a deep in-the-money (ITM) call option (far enough ITM to have a near-1 delta to the reference asset)
2) Long an at-the-money (ATM) put option to act as the buffer[13]
3) Short an OTM put option (the location of the kink between the "buffered downside" and "buffer")
4) Short an OTM call option to act as the "cap." The capped level is typically determined on each roll date such that there is no premium or discount to enter into the hypothetical investment compared with an investment in the index.[14]

EXHIBIT 3

Growth of the Defined Outcome Industry (January 1, 2016–May 15, 2025)



NOTES: The exhibit shows the total assets under management and cumulative net flows for all funds in the Morningstar Defined Outcome category.

SOURCES: AQR, Morningstar.

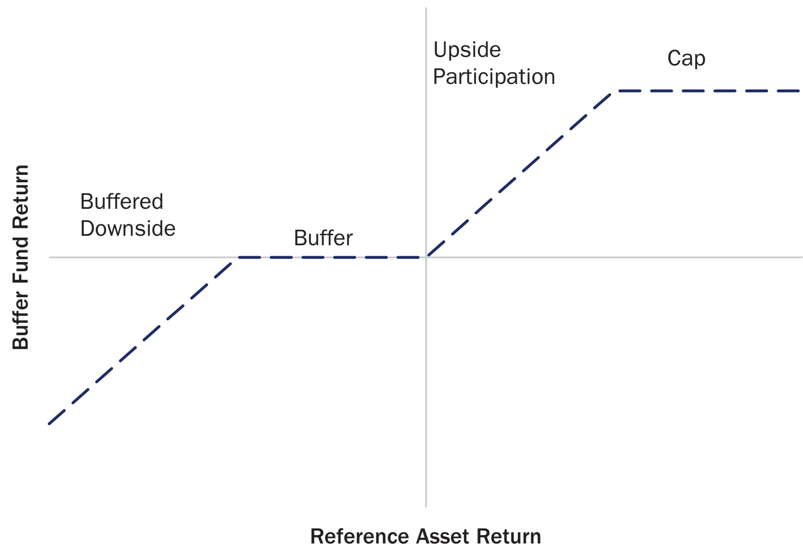
[12] Selling this OTM put also rules out conventional, Taleb-type, arguments of big gains amid extremely bad markets that would make these funds a good idea.

[13] Most, but not all, products have buffers that start at zero (e.g., some others buy this put out-of-the-money).

[14] The capping of upside thus effectively finances the cost of protection in the buffer region. Compared with a simple linear exposure to the reference asset, the four options together shift payoffs from the return distribution's right tail to the buffer region just below the current market price.

EXHIBIT 4

Illustration of Typical Buffer Fund Payoff Diagram



NOTES: This exhibit shows the hypothetical payoff diagram for a typical buffer fund over a single outcome period. For illustrative purposes only.

SOURCE: AQR.

In terms of expected returns, buffer funds, like many of their predecessor structured products, can be thought of as bundling four things:

1) the expected return of the reference asset,
2) the negative expected return of being long the volatility risk premium,
3) the negative expected return from transactions costs of trading the options, and
4) the negative expected return from higher management fees.

FUND DESIGN AND INVESTOR PREFERENCES

Morningstar's Defined Outcome category is dominated by buffer funds (Exhibit 5, Panel A). Within buffer funds (Panel B) the vast majority, both in number and assets, use annual options (top left), although the month in which they are struck is fairly evenly divided (right side).[15] Perhaps for this reason, laddered funds, which are only 6% of funds by number, represent three times as much by AUM; that is, investors have a desire for protection not only over a specific horizon (which is what most buffer funds can only offer) but rather more generally across the full calendar year.

Two statistics worth noting relate to the protective properties of the funds in our sample and the extent to which they may be long the volatility risk premium. The first is that the vast majority by number (89%) and assets (98%) are capped; that is, they sell an OTM call to finance the purchased put. This suggests most investors are willing

[15] With the exception of December and January being more popular than any other month. We hypothesize that investors may in aggregate have calendar-year preferences for protection, but given these options are struck on the third Wednesday of the month (as opposed to January 1 of each year), those investors have decided to "split the difference" between the December and January series. Regardless, we see little reason why discrete protection over some arbitrary interval, including the calendar year, would be preferred versus more continuous protection.

EXHIBIT 5

Major Design Types of Defined Outcome Funds (as of May 15, 2025)

Panel A: All Defined Outcome Funds

Type	Count	% of AUM
Buffer	360	97.3%
Income Barrier	16	0.3%
Accelerated	13	0.2%
Floor	5	1.8%
Buffer Step-Up	2	0.2%
Uncapped Accelerated	2	0.0%
Long Option	2	0.0%
Bond	1	0.1%
Total	**401**	**100%**

Panel B: Focusing on Buffer Funds Only

Outcome Period	Count	% of AUM
12	322	90.4%
3	20	7.3%
6	9	1.5%
24	9	0.8%

Laddered?	Count	% of AUM
Unladdered	339	81.8%
Laddered	21	18.2%

Uncapped?	Count	% of AUM
Capped	322	98.4%
Uncapped	38	1.6%

Buffer Level	Count	% of AUM
15%	115	33.8%
10%	73	36.3%
100%	58	4.7%
20%	36	6.7%
9%	22	5.3%
12%	18	0.2%
25%	17	8.2%
30%	11	2.6%
Mixed/Other	10	2.2%

Series	Count	% of AUM
January	34	9.2%
February	22	5.9%
March	26	6.1%
April	32	6.6%
May	20	3.7%
June	22	5.4%
July	32	7.3%
August	21	5.2%
September	26	5.5%
October	30	6.9%
November	21	4.5%
December	25	8.2%
Other	49	25.7%

NOTE: In this exhibit, we tally fund counts falling into certain subcategories and properties of buffer funds, as determined through the fact sheets and prospectuses of all funds in the Morningstar Defined Outcome universe.

SOURCES: AQR, Morningstar.

to exchange upside participation for downside protection. This fact may seem at odds with the second statistic: buffer level. Only a small minority of funds by number (15%) and even smaller by assets (4.7%) have 100% buffers—that is, are designed to offer full downside protection.

Putting these two together, it seems as if buffer fund investors are focused on downside protection, but only up to a point. Curiously, "up to a point" is not to protect losses *beyond* a threshold (e.g., protect from losses beyond 10%) but *within* a threshold (e.g., protect only against the first 10% of losses). This seems at odds with well-documented investor desire for protection from so-called "black swans."

One way to reconcile this may be that buffer fund investors understand they give up a lot in expected returns to hedge downside risk (the reason 98% of assets are in funds with upside caps) and that the cost of protection increases with buffer size (the reason <5% have 100% floors). In other words, Exhibit 5 may suggest that investors are aware that protection—or even desired payoff profiles—comes at a cost and are thus willing to make trade-offs in protection for expected returns.

DATA AND METHODOLOGY

The rest of the analysis in this article uses all "Defined Outcome" funds in the Morningstar database with at least 24 months of history (a restriction to comfortably reduce noise in beta estimation). To benchmark these funds, we use their stated "reference asset," specifically, the reference asset's total returns, not price returns.

The vast majority of funds in the database (329 of 401) use an index's total returns as the reference asset, so this choice of total versus price returns is of limited economic importance for the full dataset (e.g., the median reported in Exhibit 3 is the same to two decimal places regardless of this choice). However, two providers of buffer funds refer exclusively to price returns for comparison to their reference asset, and two other providers use price returns for a few of their funds and total returns for most of their others (4 out of 153 for the first, and 8 out of 104 for the second). Despite these funds' choice of price return, economically, total return is the correct benchmark to use. Regardless of whether an option's payoff depends on a price index, arbitrage and no-arbitrage pricing relationships must account for dividends.[16] Whether or not payoffs are tied to price returns is irrelevant to the total return being the economically appropriate benchmark. So, why do some funds use a price return as their reference asset? It's likely for marketing purposes—price returns are by definition a lower hurdle to beat.

Finally, buffer funds as a category are diverse in implementation (see Exhibit 5). Due to the relatively limited history of this asset class, we analyze them collectively. Dividing them into smaller, more homogeneous groupings may introduce noise and lead to potentially misleading conclusions. For example, consider all buffer funds with 12-month outcome periods: one group resets in October, while another resets in November. Empirically, the November group has shown worse risk-adjusted returns than their reference asset, whereas the October group has shown the best performance. However, this is almost surely a sample-specific fluke, and it would be erroneous to conclude that investors should allocate only to funds resetting in October and avoid those resetting in November.

RESULTS

Our analysis separately evaluates the main advertised benefits of these funds: risk-adjusted returns, buffered downside, convexity, and peak-to-trough drawdowns. In the Appendix, we consider returns to these products in the presence of taxes.

To preview our empirical results, buffer funds in aggregate have delivered worse risk-adjusted returns than their reference assets; this degradation generally worsens with time; realized returns can vary wildly from payoff diagrams for all periods other than the exact dates on which the underlying options are purchased and sold; and these funds have generally performed worse than a simple beta-matched stock/cash combination over the three largest drawdowns over the past decade—regardless of whether beta is measured in-sample or out-of-sample.

Risk-Adjusted Returns

Exhibit 6 compares the Sharpe ratio (SR) of each fund's since-inception returns minus the SR of its period-matched reference asset.[17] As shown in Panel A, the

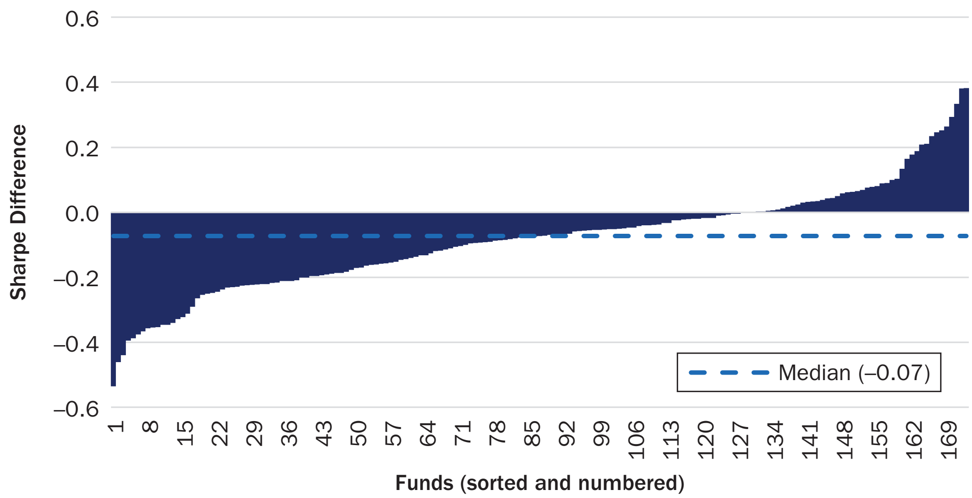
[16] Because options are priced off expected dividends, if you construct the arbitrage you are exposed to expected versus realized dividends in the same way you are exposed to expected versus realized volatility. In fact, the dividend swap market, and later the dividend futures market, developed as means of hedging this dividend risk.

[17] Because buffer funds' expected volatilities and exposures to their reference assets can vary widely, Sharpe ratio is a better performance metric than average return. Additionally, unlike a regression-based approach, SRs do not require estimation of beta. That said, SRs (and volatilities) can be problematic performance (and risk) measures for investments with asymmetric payoff profiles. They can be a good starting point, though, and we supplement them with left-tail properties in Exhibit 9.

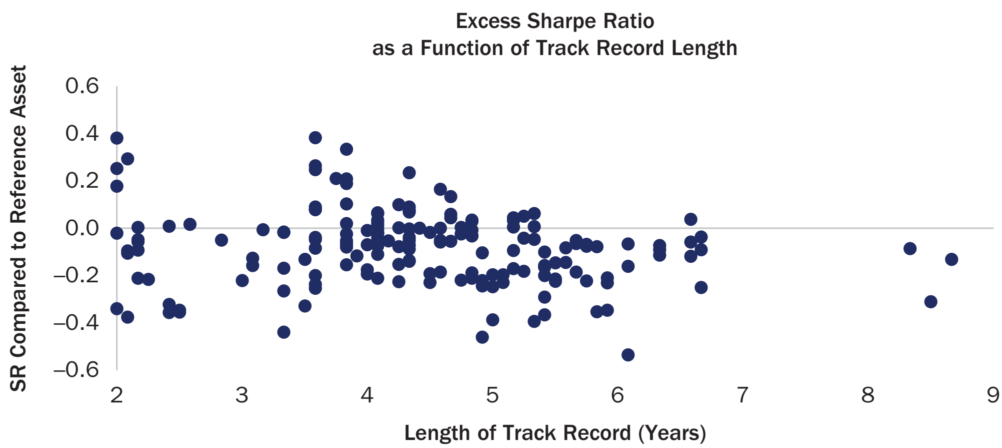
EXHIBIT 6

Risk-Adjusted Returns (since inception per fund to April 30, 2025)

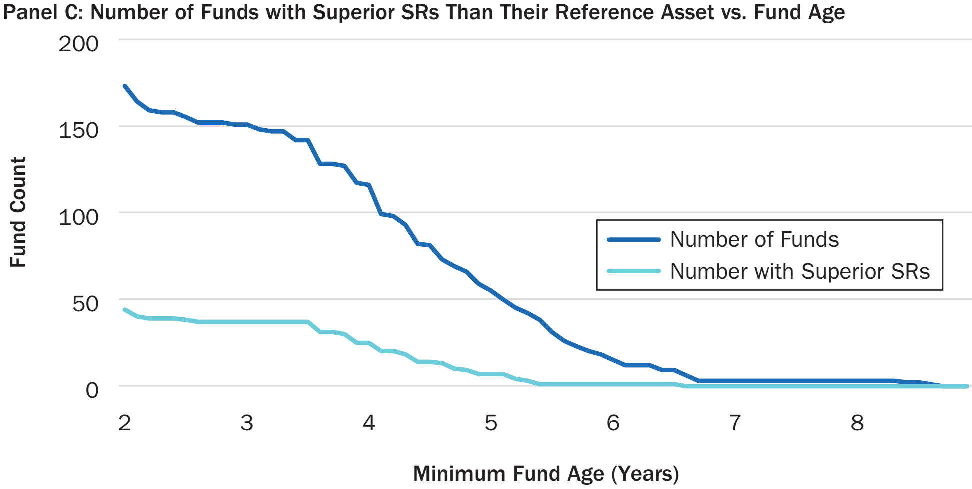
Panel A: Difference in Since-Inception Sharpe Ratios, Buffer Fund Compared with Reference Asset



Panel B: Relationship between Fund Age and Difference in Sharpe Ratio



Panel C: Number of Funds with Superior SRs Than Their Reference Asset vs. Fund Age

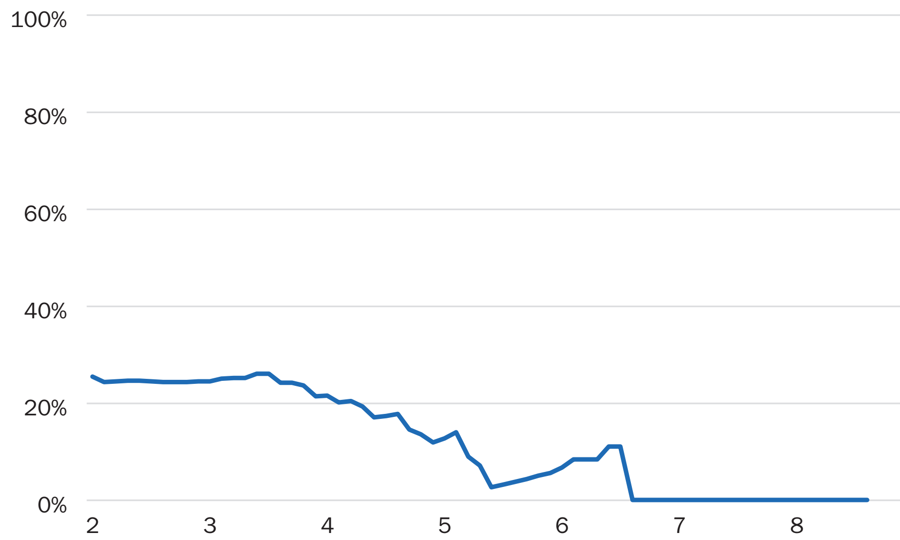


(continued)

EXHIBIT 6 *(continued)*

Risk-Adjusted Returns (since inception per fund to April 30, 2025)

Panel D: Percentage of Funds with Superior SRs Than Their Reference Asset vs. Fund Age



NOTES: Panel A shows the since-inception Sharpe ratio for each fund in excess of its reference asset's Sharpe ratio over the same period. Panel B plots the excess Sharpe ratio of each fund (from Panel A) against its track record length in years. Panel C shows the number of funds in our sample versus track record length in years and the number of funds with positive Sharpe ratios in excess of its reference asset Sharpe ratio over the same since-inception period. Panel D shows the percentage of all funds at each track record length (in years) that delivered higher Sharpe ratios than their reference asset. The universe is the Morningstar Defined Outcome category filtered down to funds with a track record of at least 24 months. Cash series used in Sharpe ratio calculation is the ICE BofA 3-Month T-Bill Index.

SOURCES: AQR, Morningstar.

average and median buffer fund delivered risk-adjusted returns that are inferior to its reference asset. In other words, by customizing the reference asset's return payoff, most of these funds delivered worse risk-adjusted returns than the reference asset left alone.[18]

Panel B looks at these SR differences over time, specifically the relationship between length of track record and relative risk-adjusted returns. If buffer funds have a negative expected return from being long volatility (and/or from trading costs and/or from fees), and if they exhibit significant tracking error to their reference index, we would expect them to underperform roughly 50% of the time over short horizons due to randomness. Over longer horizons, the odds of underperformance would increase as the negative expected return component(s) dominates. This is precisely what we find in Panel B.

Panels C and D illustrate this point more simply. Panel C shows the number of funds with track records at least as long as the horizontal axis (top line) and the number of those funds that have delivered a superior since-inception risk-adjusted return (bottom line). Panel D expresses this as a percentage. Consistent with the premise that these funds tend to be long a negative expected return risk premium (the volatility risk premium) and that these funds tend to take meaningful tracking error to their reference asset, we find longer track records are worse than

[18] Not shown for brevity, but the difference in realized skew between the buffer funds and their reference assets is near zero on average.

shorter. Taken together, the panels in Exhibit 6 suggest investors should be wary of concluding that a buffer fund with a decent, short track record will look as good over the longer term.

Performance Relative to Payoff Diagrams

Much of the marketing (and we suspect investor expectations) for options-based strategies are based off of diagrams such as in Exhibit 7, Panel A. The dashed line shows the expected annual payoffs for the Cboe S&P 500 Buffer Protect Index Jan Series (SPRO01) versus the period-matched performance of the S&P 500.[19] The dots show annual since-inception returns of SPRO01 starting on the third Wednesday of each January (i.e., the same day the underlying options are bought). The dots' adherence to the dashed line is what would be expected over this horizon.[20] In other words, an investor might assume based on results such as these that the buffer will work as intended.

However, charts like these are deeply misleading. As shown in Israelov (2017), they describe an investor's experience for a very specific period: in this case, the return from the third Wednesday of January to the following third Wednesday of January. For literally any other evaluation horizon—be it shorter than a year, longer than a year, or even a year starting any day other than the third Wednesday of January—the investor's returns will look different from what is shown in Panel A.

Panel B of Exhibit 7 shows this clearly. Here we plot the same SPRO01 returns, but rather than starting on the 3rd Wednesday of January, we report annual returns starting every day of the year. The "kinked" payoffs are nowhere to be seen, and any convexity that might have been expected is visually gone. Instead, we find a range of annual returns above and below the buffered protection area; and to the left of that, the majority of returns in the "buffered downside" region are below the dashed line. In other words, the buffered region doesn't seem to actually buffer, and losses past that are often worse than implied by option payoff diagrams.

Exhibit 7, Panel C turns from a single index to the overall industry. We group buffer funds by buffer level (columns) for comparability. For each group, we count annual observations where the reference asset return is within the buffered range (first row) and annual observations where the reference asset return is below the buffered range (second row). The percentages in each row are the frequency of times the buffer funds realized a return worse than implied by their payoff diagram; that is, negative returns within the buffer region and returns worse than the "buffered downside."[21] In other words, how likely is it that an investor in these funds would be disappointed with the protection they are supposed to give?

Across all funds, we find that most of the time, when the reference asset's annual return is within the buffer, the buffer fund has lost value (top row). Similarly (and even more frequently), when the reference asset's annual return has breached the buffer, buffer funds have underperformed what's implied by their payoff diagrams. Clearly, a strategy's ability to guarantee an outcome over a single period means very

[19] This buffer index tracks the performance of a portfolio of hypothetical FLEX Options based on the S&P 500 Index, with annual expiry in January. It aims to protect against the first 10% of losses over a year while providing gains up to a capped level that varies with market prices. For visual simplicity, we illustrate a single horizontal line for the cap.

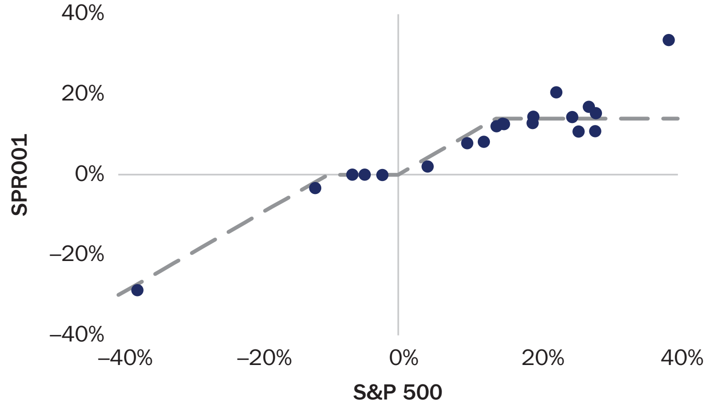
[20] Note that the observations on the right-hand side of the chart do not align with the cap because the cap varies over time such that there is no premium or discount to enter into the buffer strategy compared with an investment in the index.

[21] The "N/As" here are due to funds with very limited track records. For example, even the oldest funds with a 12% buffer have not been around long enough to see a 12% annual decline in their reference asset.

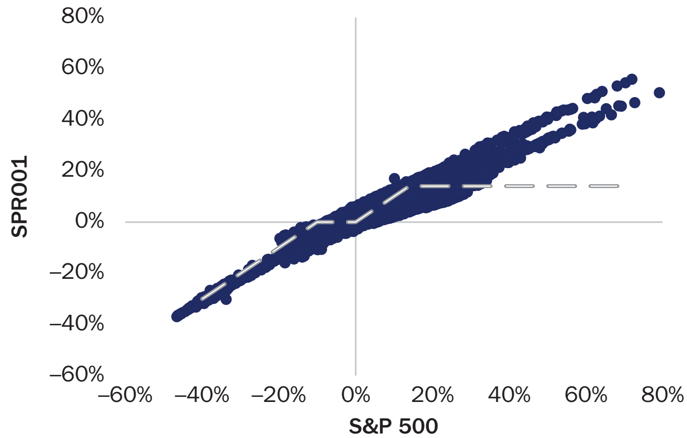
EXHIBIT 7

Pathetic Protection: The Cboe S&P 500 Buffer Protect Index Jan Series (SPRO01)

Panel A: Example of SPRO01 (annual returns from the day the options are bought and sold) January 20, 2005–January 15, 2025



Panel B: Rolling Annual Returns of SPRO01 (i.e., annual return starting every day of the year) January 20, 2005–May 19, 2025



Panel C: Percentage of Annual Observations Worse Than Implied by the Buffer and Buffered Downside (since inception per fund to April 30, 2025)

Buffer Level	9%	10%	12%	15%	20%	25%	30%
% of Obs. below Protected Level (i.e., reference asset within protected zone)	75%	62%	42%	59%	36%	92%	94%
% of Obs. below Buffered Downside (i.e., reference asset below buffer)	84%	87%	N/A	84%	N/A	N/A	N/A

NOTES: Panel A plots annual returns (from the day the options are bought and sold) of the Cboe S&P 500 Buffer Protect Index Jan Series (SPRO01) against those of the S&P 500 TR Index. Panel B plots rolling annual returns (ending each day of the year) of the SPRO01 against those of the S&P 500 TR Index. In Panel C, the first row shows the percentage of rolling annual returns (ending each day of the year) for each buffer fund that is negative when the corresponding annual return for the fund's reference asset is in the "buffered zone" of the fund. The second row shows the percentage of rolling annual returns (ending each day of the year) for each buffer fund that is less than the buffered downside segment of the line for the fund's implied payoff diagram. These statistics are calculated since inception per fund, and we report the averages across all funds in the Morningstar Category universe under the "Buffer" subcategory as determined by prospectuses/fact sheets, the number of which we report in Exhibit 5, Panel A.

SOURCES: AQR, Bloomberg, Cboe Global Markets (2025).

little for periods that don't exactly align with it (nor for horizons that are longer or shorter than the single period).

The fact that most investors' experiences (and objectives) will not align with single-period outcomes may explain the popularity of "laddered" buffer funds. The idea is that by holding not just one series of (say) annual options at a time and having the path dependence of when reference asset drawdowns occur (as shown in Braun et al. 2023), the investor instead diversifies across multiple option periods. A typical approach is to allocate 1/12 of the portfolio to annual options initiated in every month of the year. Unfortunately, this more continuous protection is no free lunch: Laddered funds on average have had even worse SRs compared with their reference assets than the median shown in Exhibit 3, have provided no since-inception statistically significant convexity (Exhibit 7), and in general, have had worse drawdowns than a beta-matched combination of the reference asset and cash (Exhibit 9). This should be no surprise: A negative-alpha trade done annually shouldn't get better when done monthly. For laddered funds, the noise from rebalancing luck is smoothed away and more consistently reveals the long-run drag of buffer strategies.

Convexity

Convex returns are one of the purported benefits of buffer funds, but visual inspection of Exhibit 7 already casts doubt on this as an empirical reality. To test this, we follow the methodology from Treynor and Mazuy (1966), by adding a quadratic term to the regression (for brevity, we do not report other tests of convexity, such as in Henriksson and Merton (1981), which produce similar results).[22] Exhibit 8, Panel A ranks all buffer funds by the coefficient on the quadratic term, with statistically significant observations filled in. Of the total, only 10% of them have statistically significant betas on this quadratic term (and even fewer—only 5%—have statistically significant betas to the absolute value of equity returns).

In Panel B of Exhibit 8, we graph these quadratic betas against the length of each fund's track record, finding that the funds with the highest positive loadings on the quadratic term have generally also had the shortest track records. Visually, positive and negative loadings on the quadratic term appear to cluster with track record, suggesting realized convexity is more a function of period than fund design (for example, 10% buffer funds appear with similar frequency in the left- and right-most funds in Panel A).

Peak-to-Trough Drawdowns

Maybe the biggest selling point for these strategies is that they help investors "sleep better at night" because of their buffered downsides. Exhibit 7 already showed that these strategies often deliver outcomes worse than implied by their buffers (i.e., the strike prices of their underlying long and short put options). In Exhibit 9, we test whether investors concerned about drawdowns would be better off instead simply holding less in the reference asset (i.e., a mix of the reference asset and cash).

Specifically, Exhibit 9 takes the three largest peak-to-trough drawdowns for the S&P 500 since January 1, 2020, and compares the performance of every buffer fund with a combination of its reference asset and cash. The amount allocated to the reference asset is the since-inception beta to its reference asset and the amount allocated to cash is (1-beta). For brevity, we report results for full-sample beta estimation. Our conclusions would have been unaffected if we had reported results using an expanding window to estimate beta.[23]

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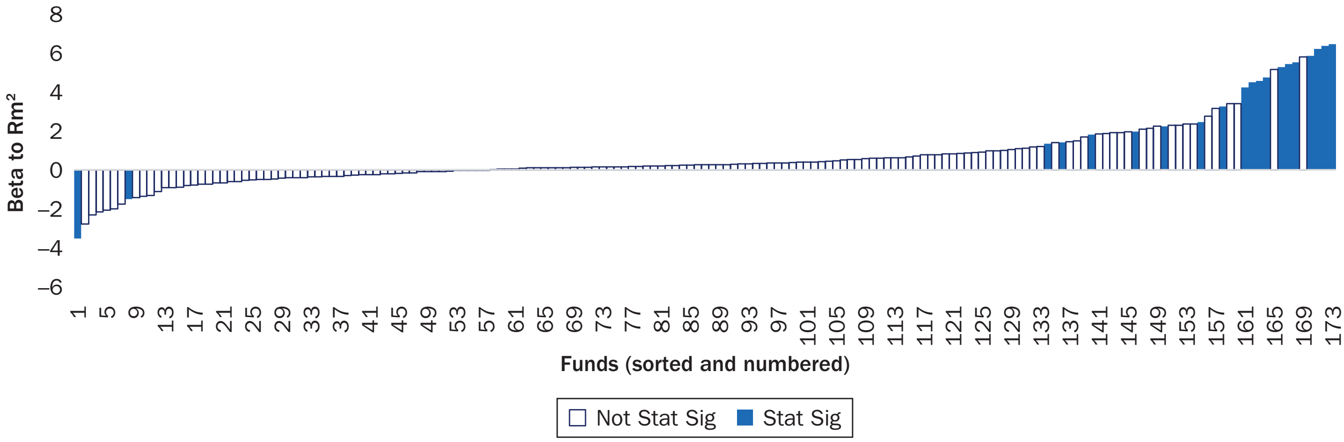
[22] Our general conclusions are unaffected using full-sample or out-of-sample beta estimation.

[23] This alternative approach uses an expanding window starting with 12 months of data to set the next month's coefficient and skips the first 12 months to make the analysis fully out-of-sample.

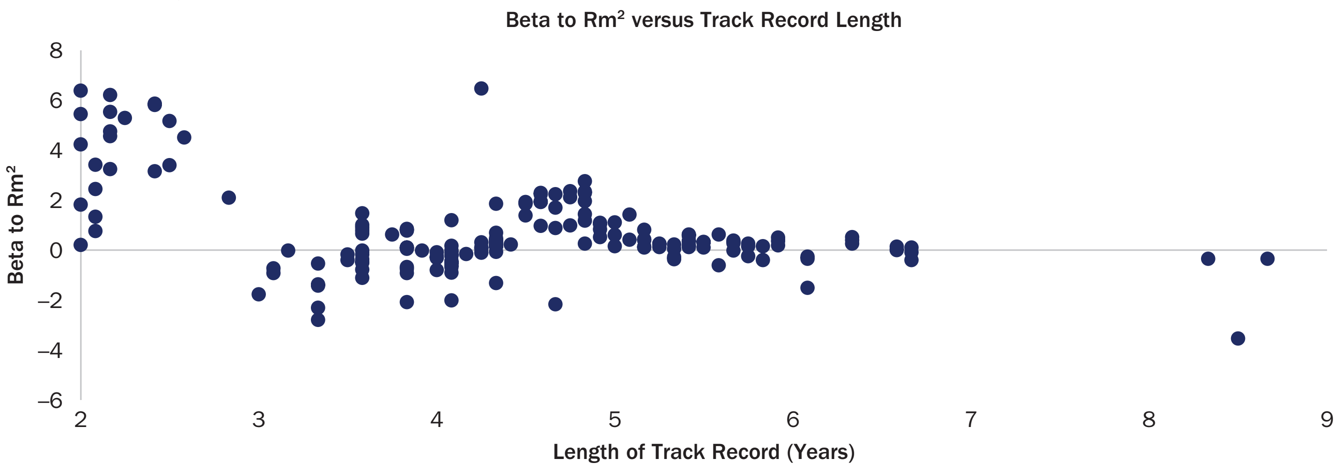
EXHIBIT 8

Convexity (since inception per fund to April 30, 2025)

Panel A: Distribution of Betas to Abs (Rm²) Term, since Each Fund's Inception (*t*-Stats. >1.96 in blue)



Panel B: Convexity vs. Length of Track Record



NOTES: Panel A shows each fund's beta to the squared value of its reference asset's returns (Rm^2) since inception, with statistically significant (*t*-Stats. > 1.96) observations highlighted in blue. We report this for all funds in the Morningstar Defined Outcome universe with at least 24-month track records. Panel B plots each fund's beta to the squared value of its reference asset's returns (Rm^2) (i.e., the values reported in Panel A) against its track record length in years. Analysis using absolute value of reference asset returns (as opposed to squared values) yields similar results.

SOURCES: AQR, Morningstar.

Panel A shows the relative performance during the Covid-19 pandemic, Panel B during 2022's inflation-driven drawdown, and Panel C during global tariff uncertainty (peak-to-trough drawdowns in the S&P 500 of –33.8%, –24.5%, and –18.7% respectively). Panel D shows the average of Panels A, B, and C—in other words, the relative performance to a stock/cash benchmark on average in these three drawdowns.[24,25]

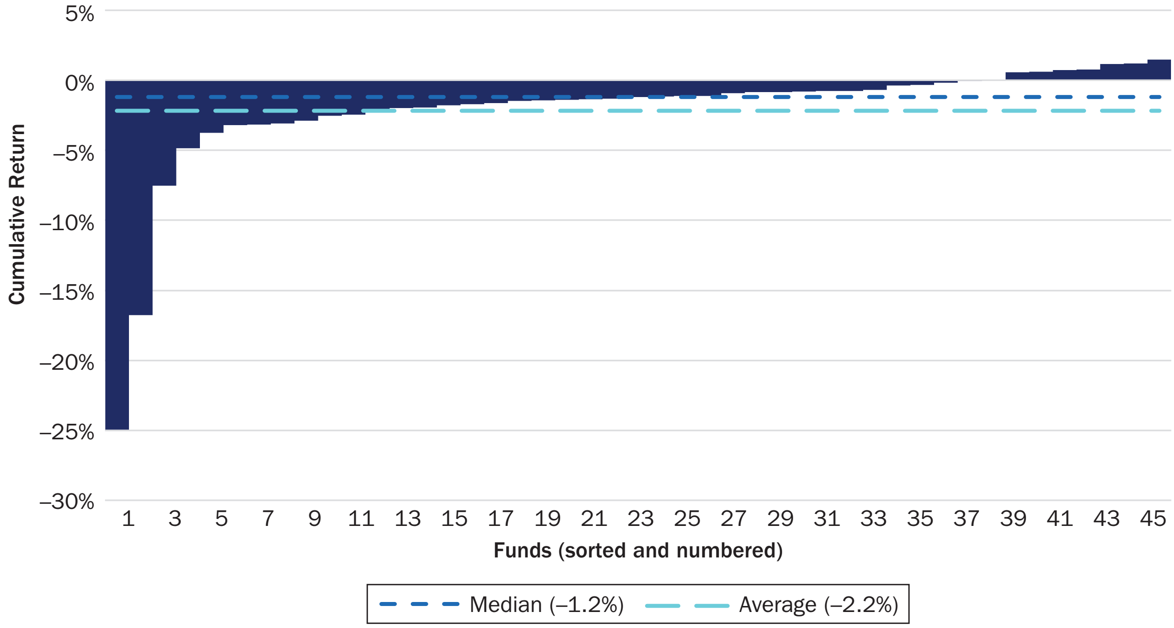
[24] Given that some funds had not been incepted for certain drawdowns, Panel D is not a "true" average but rather an attempt to use as much of the data as available.

[25] We find generally worse results for buffer funds if we require two years of history preceding the drawdown (i.e., to have more observations to estimate beta to the reference asset), but this also shrinks the number of managers with enough data (e.g., to having only nine in Panel A).

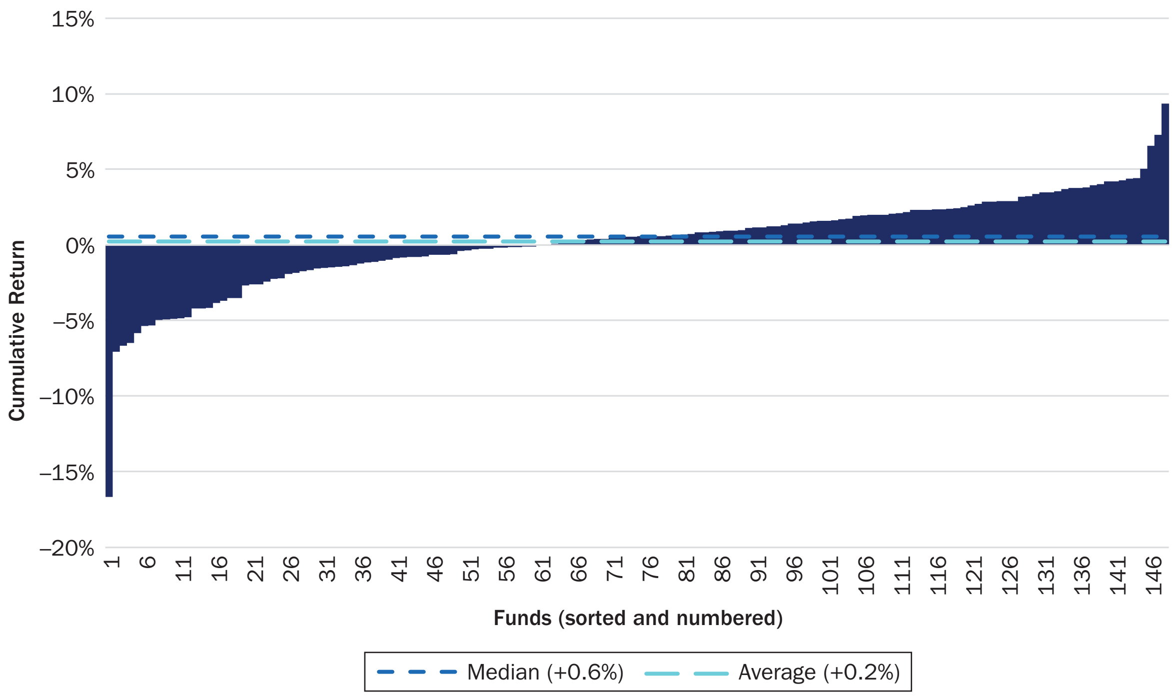
EXHIBIT 9

Peak-to-Trough Drawdowns Compared with (Reference Asset + Cash) Combination (in-sample beta estimation)

Panel A: February 21, 2020–March 23, 2020



Panel B: January 5, 2022–October 12, 2022

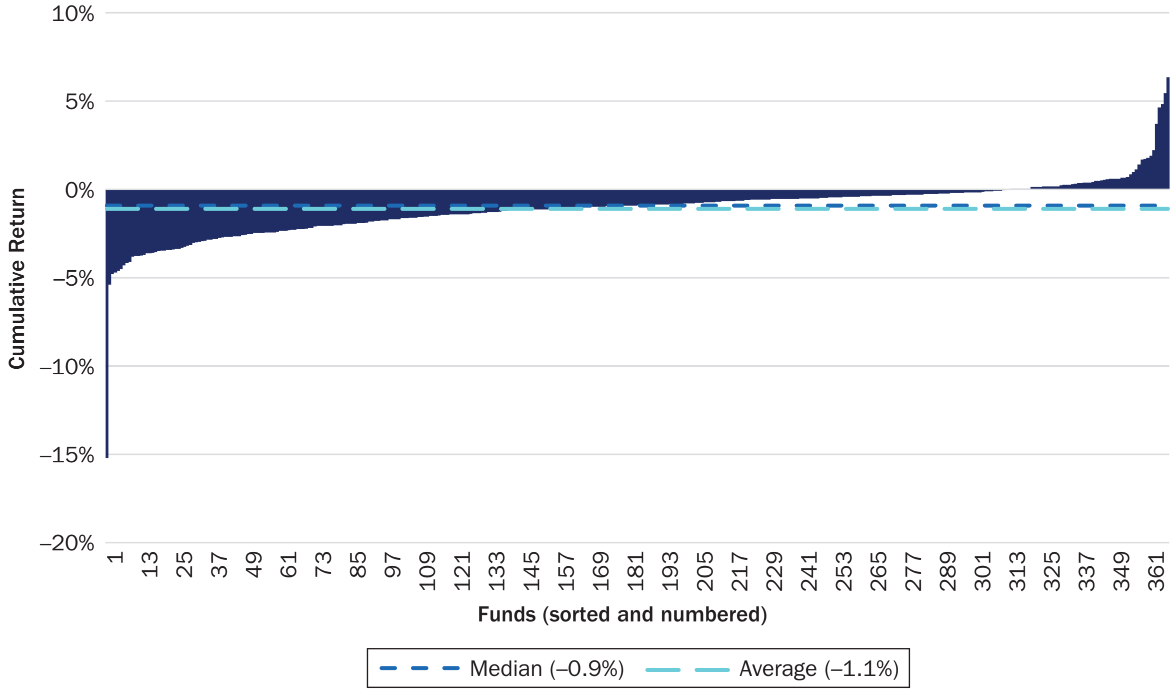


(continued)

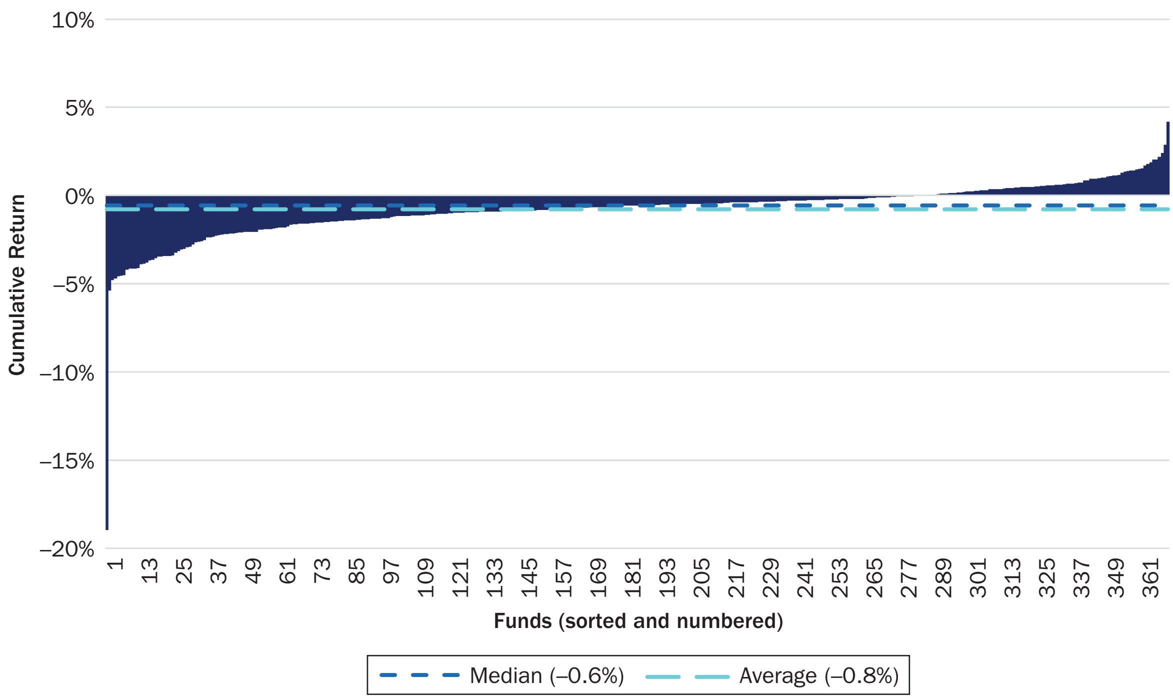
EXHIBIT 9 *(continued)*

Peak-to-Trough Drawdowns Compared with (Reference Asset + Cash) Combination (in-sample beta estimation)

Panel C: February 21, 2025–April 8, 2025



Panel D: Average Relative Performance in Three Worst Drawdowns



NOTES: The universe is buffer funds in the Morningstar Defined Outcome Category. We report each fund's cumulative return during the three largest drawdowns for the S&P 500 since January 1, 2020, relative to the return of a reference asset/cash benchmark. The reference asset/cash benchmark of each fund is a weighted combination of the fund's reference asset and cash, where the weight in the reference asset is the fund's in-sample beta to the reference asset since inception and the weight in cash is (1 – beta).
In each panel, we sort from least to greatest relative cumulative return. Panel D shows the average return across all three drawdowns. Depending on fund inception, this average may be across 1, 2, or all 3 drawdowns.

SOURCES: AQR, Morningstar, Bloomberg.

There is a wide range of outcomes (i.e., buffer funds have not been reliably helpful when portfolios have needed the help), and the overall mean and median are negative, with buffer funds underperforming their simple reference asset/cash benchmarks by –0.8% on average. In two of the three drawdowns, more than 80% of funds underperformed their benchmarks, on average by –2.9% in the Covid 2020 drawdown and by –1.5% in the 2025 policy-fueled drawdown. Together, these results show little evidence of reliable tail hedging compared with simply holding less in the reference asset. Buffer funds may provide defined outcomes over fixed calendar periods, but financial market drawdowns don't adhere to those exact timetables.

OTHER (MOSTLY THEORETICAL) CONSIDERATIONS

There are at least two elements to the buffer fund story that empirical analysis cannot directly address: 1) whether the period studied is a sufficient guide for the future and 2) whether investor preferences can be fairly described using the tests we've considered so far (e.g., investors may have oddly asymmetric preferences—for example, having massive disutility for losses in the buffer region, but a willingness to absorb losses worse than that). We consider both possibilities here.

Is the Past a Practical Guide?

Despite higher-than-average returns, recent history has thrown a fairly rich variety of challenges at equity markets. A very different set of circumstances caused the 2020 drawdown than the 2022 one, which in turn was very different than what caused the sell-off for the S&P 500 in the first few months of 2025. Volatility going into, during, and coming out of them was also different. Macroeconomic risks differed in each (i.e., growth shock in the first, inflationary shock in the second, policy shock in the third), and interest rates were historically low for the first and meaningfully higher in the second and third. While the 2020 and 2025 peak-to-trough drawdowns were sharp and short-lived, the 2022 drawdown lasted more than nine months.[26]

We would argue the most important type of drawdown that is underrepresented in our sample is a slow, long-lasting one (e.g., akin to the Tech Bust of 2000/2001 and Global Financial Crisis of 2007/2008). However, it is precisely during these times that we would expect options-based protection to perform especially poorly, consistent with AQR Portfolio Solutions Group (2022) and Ilmanen et al. (2021), which document that such strategies tend to look worse in longer-term drawdowns than shorter ones, particularly ones with many bad months but no horrendous ones. Making matters worse for buffer funds, McQuinn, Thapar, and Villalon (2021) show that these longer-term drawdowns have been more damaging to investor wealth.

More theoretically, it's worth asking whether we should expect history to repeat itself and long-put and buffer strategies to again underperform in the future. For any options-based strategies that seek to hedge equity market losses, it's rational for the risk premium to be negative. At the core of virtually all asset pricing models is the idea that investors require (and earn) positive long-term rewards for investments that deliver bad returns in bad times. Thus, at a high level, the negative equity beta of long puts should, in and of itself, warrant a negative premium. Additional theories point

[26] Granted, it's possible that neither of these fast drawdowns was "fast enough" to showcase the risk-mitigating value of buffer funds, and it's only in horrendous events like those where the true value of convexity emerges. Nobody can dismiss this possibility, but Ilmanen et al. (2021), going back to January 1985 (i.e., including October 1987), show the same pattern from put options—that is, despite their convexity, they are a drag on long-term (and even medium-term) returns.

to even worse expected returns due to the long volatility exposure, or a skewness or jump/gap risk premium.[27,28] Even the specter of black swan events may be insufficient justification to rationalize purchasing put options as part of a risk-reduction strategy (compared with simply reducing equity risk), as shown in Israelov and Nielsen (2015). This is particularly true for the vast majority of buffer funds that sell OTM puts, making those black swan considerations less relevant.

Finally, it's worth returning to what's going on economically under the hood of these strategies. There are four sources of expected returns: the expected return of the reference asset, the negative expected return from being long the volatility risk premium, the negative expected return from the cost of trading the underlying options, and the negative expected return of the fund's fees (compared with holding the reference asset passively). The disappointing results of the past have likely been a directionally accurate guide for how buffer funds, as designed today, should be expected to perform going forward.

Do Investors Have Reasonably Rational Utility Functions?

A common refrain from advocates of buffer funds is "they help investors sleep better at night." Presumably, this is because these products can clearly frame upside participation and downside protection in advance. However, as shown in Exhibits 6 and 9, there is little evidence to suggest these funds actually help with any of the challenges of being an equity investor. They generally offer worse risk-adjusted returns than their reference assets and worse peak-to-trough drawdowns than a beta-matched benchmark. Furthermore, to the extent black swans are what's keeping investors from sleeping soundly, one would expect there to be more assets in 100% buffer funds (5% by AUM) as opposed to in 10% buffer and 15% buffer funds (70% of AUM).

Investor preferences, of course, can be at odds with rational, "mean–variance optimal" portfolios. It's been well-documented that investors experience greater pain from losses than enjoyment of gains (aka, prospect theory, as formalized by Kahneman and Tversky 1979). This goes a long way toward explaining why investors would be willing to accept lower *returns*, but it doesn't explain why investors would want something that has both lower returns *and* higher risk. Again, suppose an investor wants to sleep better at night. In that case, they can do so in an appropriate combination of the reference asset and cash, and—according to theory and data—usually outperform the comparable buffer fund.

It may be most reasonable to suppose that investors have flocked to buffer funds because of the marketed prospect of improved outcomes, rather than all evidence to the contrary of being able to deliver them. If that's the case, the (growing) popularity of these products may best be described by an investor's *placebo effect*,[29] where because investors believe the product will help them sleep better at night, they convince themselves to act more consistently with their objectives and horizon.[30]

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[27] See Ilmanen (2011, 2012) for a summary and reference to various theories, as well as Bondarenko (2014), who argues that "rational" arguments such as equilibrium models and "peso problems" fall short in explaining why puts are empirically overpriced.

[28] Another strand of research focuses on whether low-probability, high-impact events are underestimated or overestimated. Prospect theory's decision-weighting function as described by Kahneman and Tversky (1979) suggests overweighting of rare events is the more common error. In contrast, the concept of disaster myopia suggests that extremely rare events are ignored. Bordalo, Gennaioli, and Shleifer (2012) reconcile these views by arguing that salient possibilities are less likely to be underweighted. Indeed, the danger of losing a large fraction of wealth seems salient, which would be consistent with the empirical richness of puts and the survey evidence of high expectations of crash probabilities found by Goetzmann, Kim, and Shiller (2016).

[29] As described by Asness and Villalon (2025).

[30] This shares some features with so-called "volatility laundering" in illiquids, as argued by Asness (2023).

But once we (and others) show it to be a costly placebo, investors should just take the real (and near-free) thing: cash plus the reference asset.

CONCLUSION

The future of asset management depends not just on delivering what investors want to hear, but on delivering what actually works. Buffer funds, despite their explosive growth and behavioral appeal, fall short of that standard. Their promise of downside protection and tailored outcomes is rarely matched by their actual performance, and in most cases, these products underperform simple, transparent combinations of equities and cash.

This article adds to a growing body of evidence that much of the innovation in this space is superficial, engineered more for sales than for substance. If the industry is to earn and retain investor trust in the years ahead, it must hold new products to a higher bar: evidence of improved outcomes, not just clever diagrams and compelling narratives. Buffer funds may thrive for now, but their long-term role in asset management will, and should, depend on whether they can deliver more than just comfort. In the absence of that, the future should favor simplicity over illusion.

APPENDIX

ADJUSTING FOR TAXES

The analysis in this article focuses on pre-tax returns, which may be relevant for tax-exempt institutions and to some extent taxable individuals who locate these investments in a tax-preferred account. In this section, we consider the presence of taxes and find they do not affect our conclusions.

To our knowledge, the first writing on the tax efficiency of buffer ETFs is by Sullivan (2025), which explains how these funds indefinitely defer capital gains realization, so that investors realize capital gains only upon selling their shares. This is due to 1) buffer ETFs using European-style FLEX options, which cannot be exercised early and therefore avoid assignment that could result in capital gains realization and 2) an in-kind redemption process that takes place shortly before option expiration. Mechanically, the ETF delivers the entire structure of options (i.e., all four underlying options) in-kind to an authorized participant and acquires new options, either by purchasing them directly following cash creation or by sourcing them through an auction facilitated by dealers. Because there are no closing transactions, no capital gains are realized during the rollover.

To account for taxes, Exhibit A1 compares post-liquidation values of the buffer ETF to a combination of its reference asset and three-month Treasury bills. We multiply each buffer fund's since-inception cumulative return by (1 – 23.8%) to account for long-term capital gains taxes and do the same for each fund's reference asset over the same period. To estimate after-tax returns for cash, we assume a 40.8% tax rate (the highest marginal federal tax rate for income as of 2025), deducted monthly.[31] Exhibit A1 reports the differences between the total, after-tax cumulative returns of the buffer fund to its "benchmark."[32]

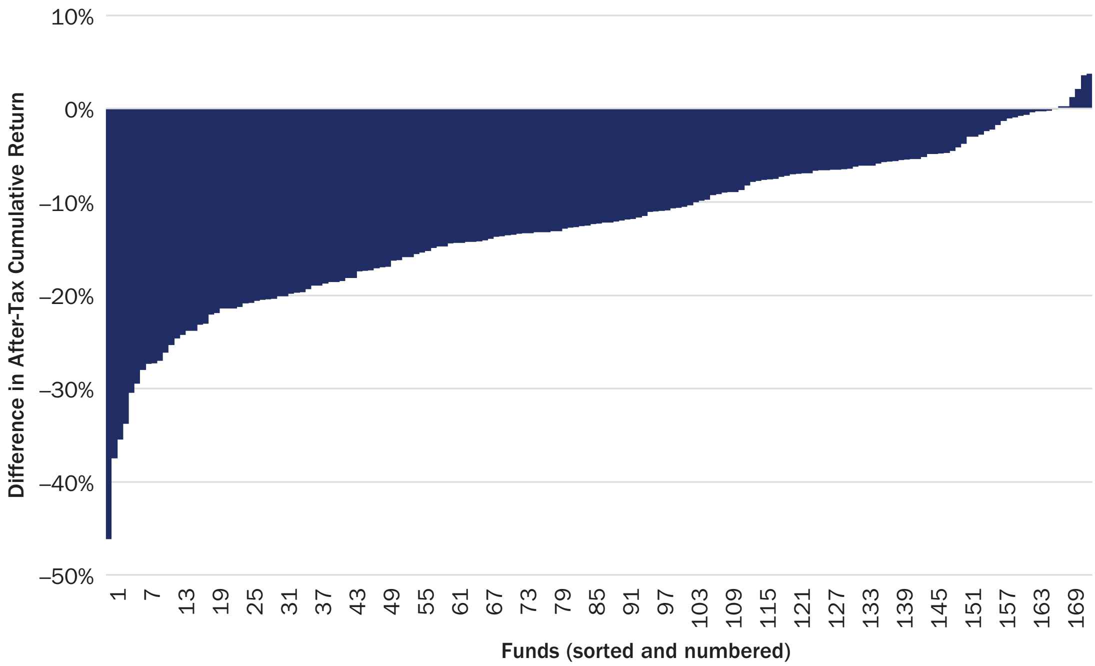
[31] We believe this to be a particularly conservative comparison (favoring buffer funds), as taxable accounts currently have other options to seek Treasury bill returns using substantially similar strategies as buffers (e.g., funds that pursue the "box spread," as originally described in Billingsley and Chance 1985).

[32] We use full histories for estimating the betas to the reference asset, but this choice doesn't matter much to the general results (both here and throughout this article).

EXHIBIT A1

In the Presence of Taxes (since fund inception to April 30, 2025)

Panel A: Post-Liquidation Cumulative Return of Buffer Funds vs. Their (Reference Asset + Cash) Combination (after-tax, in-sample beta)



Panel B: Post-Liquidation Cumulative Return Difference vs. Length of Track Record (after-tax, in-sample beta)

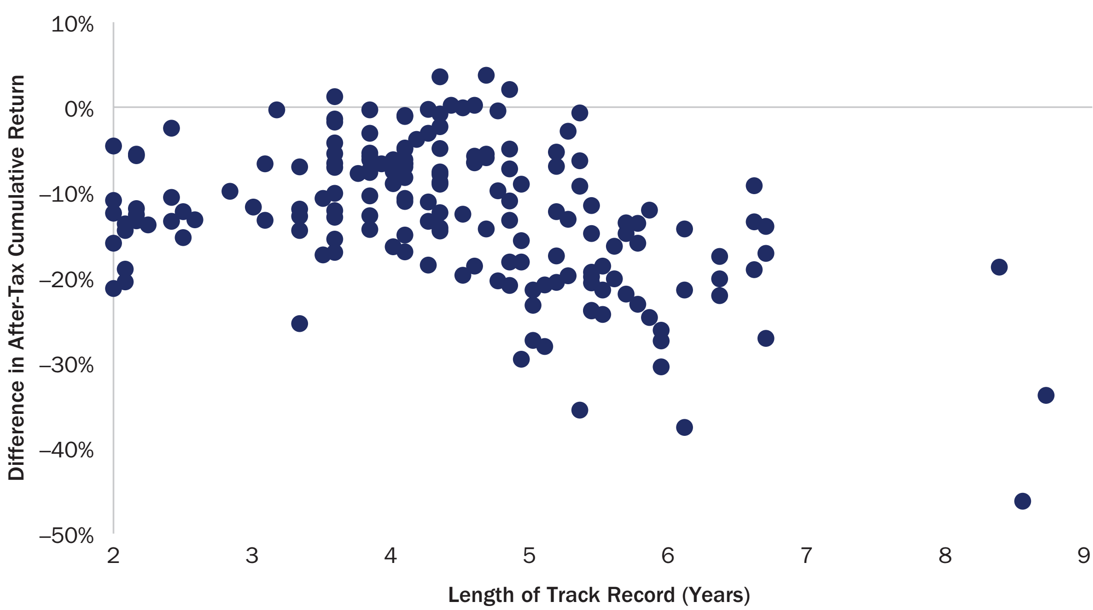


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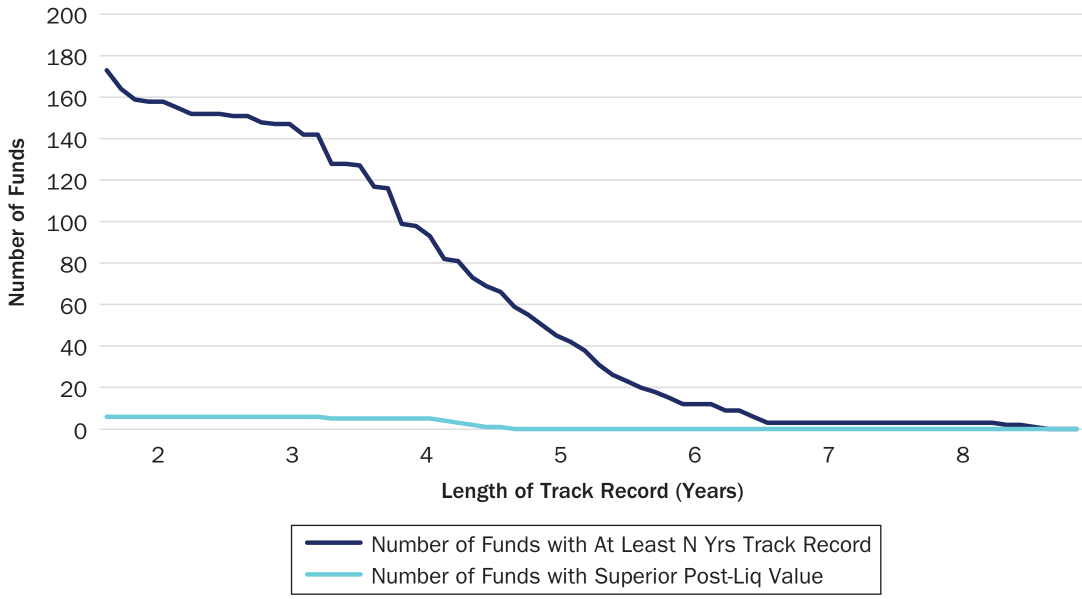
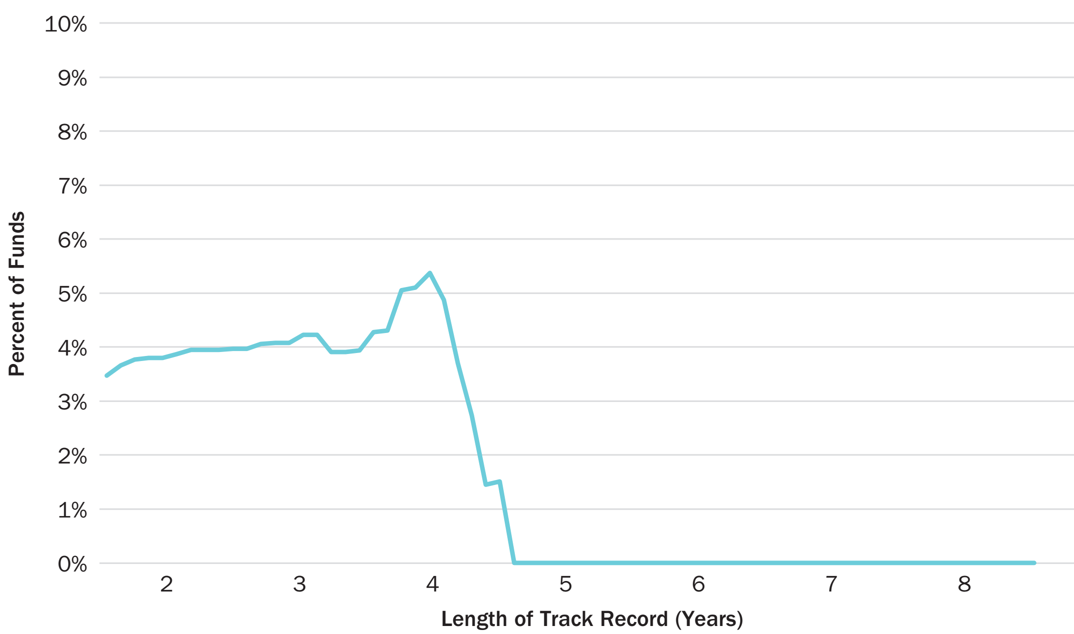
EXHIBIT A1 *(continued)*

In the Presence of Taxes (since fund inception to April 30, 2025)

Panel C: Number of Funds and Number That Have Delivered Higher Since-Inception Post-Liquidation Returns Than Their Reference Asset/Cash Combination (after-tax, in-sample beta)



Panel D: Percentage of All Funds That Have Delivered Higher Since-Inception Post-Liquidation Return Than Their Reference Asset/Cash Combo (after-tax, in-sample beta)



NOTES: The universe is all buffer funds in the Morningstar Defined Outcome universe with track records of at least 24 months. We report the since-inception post-liquidation cumulative return of each fund relative to the post-liquidation cumulative return of a reference asset/cash benchmark over the same period. The reference asset/cash benchmark of each fund is a weighted combination of the fund's reference asset and cash, where the weight in the reference asset is the fund's in-sample beta to the reference asset since inception and the weight in cash is (1 – beta). To estimate the impact of taxes, we multiply the monthly return of cash by (1 – 40.8%) and the final cumulative returns of the fund and its reference asset by (1 – 23.8%). We plot each buffer fund's post-liquidation returns (in excess of the reference/cash benchmark's post-liquidation return) against each fund's track record length and show the number of funds with positive excess-of-benchmark post-liquidation return as a percentage of all funds with a given track record length.

SOURCES: AQR, Morningstar.

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