ANCHOR TO WINDWARD
Aligning Absolute Return Objectives

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Following the financial crisis, institutional investors began to place greater focus on investment objectives such as downside diversification, lower tail risk, and performance consistency. Absolute return, broadly, incorporates a range of strategies that are designed with these kinds of objectives in mind, and are intended to provide investors with a different payoff profile than traditional equity and bond strategies do. In this paper, we evaluate an array of strategies across the "liquid absolute return" opportunity set, using performance evaluation metrics that are aligned with these common objectives. We introduce a new measure of performance sustainability, the Anchor ratio, which can help investors identify strategies and funds with more consistent and sustained performance, as well as other desirable performance characteristics.

Introduction

Following the 2000-2002 downturn, institutional investors increasingly turned to hedge funds and other alternatives to incorporate more stable, diversifying return streams into their portfolios. However, investors experienced several unexpected shortcomings with their hedge fund investments during the financial crisis, including illiquidity, opacity and, at times, market-like returns. As a consequence, investors have become increasingly interested in more liquid, transparent strategies designed to generate returns that are consistent, less volatile, and are not highly correlated with the broad market.

The breadth of potential sources for this kind of "liquid absolute return" can make the identification and evaluation of strategies challenging for investors.[1] We attempt to better characterize the institutional opportunity set by analyzing a wide range of strategies reported in the eVestment Hedge database, and employing screens to focus in on liquid absolute return-oriented strategies.[2]

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1   See also Yesim Tokat-Acikel, Macro Aiolfi, and Stephen Brundage, "Investing in Liquid Alts: An Outcomes-Based Approach," QMA (April 2017) and Michael Collins, "The Return of Absolute Return Fixed Income," PGIM Fixed Income (June 2017).
2   See also Christopher Clifford, Bradford Jordan, and Timothy B. Riley, "Do Absolute-Return Mutual Funds have Absolute Returns?" *Journal of Investing* 22, no. 4 (Winter 2013): 23-40, wherein the authors analyze the risk-adjusted performance of both absolute return-style mutual funds and market-neutral hedge funds. Liquid institutional absolute return-style strategies are not necessarily represented in these samples.

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Common investment objectives for absolute return strategies include downside diversification, better tail risk protection, and consistent outcomes that are independent of the market. We examine how a variety of absolute return strategies delivered against these investment objectives over the nine years from January 2008 through December 2016.

We recommend different performance metrics to evaluate different investment objectives. To measure the consistency of absolute returns, we introduce the "Anchor ratio" (AR), which measures whether an investment strategy generates sustained and consistent outcomes independent of the market environment. To measure tail risk control, we use conditional value-at-risk (CVaR) and maximum drawdown. Finally, to measure diversification to traditional public markets in downturns, we use downside correlation to the equity market.[3]

We calculate these measures at the fund level and at the strategy level. Ranking by each of these performance metrics enables us to determine which absolute return strategies may be best suited to meet different investors' objectives.

On average, we found that:

- **Absolute Return, Event Driven,** and **Credit Long Short** strategies provided relative consistency (as measured by the Anchor ratio), together with attractive risk-adjusted returns.

- **Equity Long Short** was attractive from a risk-adjusted return perspective.

- **Absolute Return, Multi Strategy, Event Driven**, and **Discretionary Macro** were most effective in controlling tail risk.

- **Managed Futures** alone stood out for downside diversification.[4]

Methodology

We used the eVestment Hedge database to identify absolute return-style funds across a range of strategies in the Alternatives and Hedge Funds asset classes. We included only those funds with continuously reported performance for the entire period from January 2008 to December 2016.[5] We screened for more "liquid" absolute return by limiting the data set to those funds with monthly, or more frequent, redemption terms. Since the majority of funds in the database were reported on a net of fees basis, we excluded funds that were only reported gross of fees. Further, because many self-defined "absolute return" funds have, in fact, significant market exposures, we eliminated any fund that demonstrated a beta of greater than or equal to 0.5, or less than or equal to -0.5, to traditional equity and bond index returns.[6] In all these filters left us with 300 funds.[7] Strategy-level averages were calculated only for those categories that had at least five funds meeting all of the criteria, resulting in a total of 287 funds across strategies.

We analyzed results at the strategy level, based on the products' reported "main strategy," which was self-defined by reporting managers.[8] The resulting funds comprised several strategy types: Multi Strategy, Event Driven, Volatility, Credit Long Short, Equity Long Short, and Macro (all within the "Hedge Funds" asset class), as well as Absolute Return[9] (within the "Alternatives" asset class).[10]

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3 Refer to Appendix A1 for performance metric definitions.
4 CTA/Managed Futures. "CTA" represents Commodity Trading Advisors. For brevity, we refer to CTA/Managed Futures as Managed Futures throughout the paper.
5 This creates survivorship bias in addition to the self-reporting bias that may already be present in the database. However, this should not have a material impact on the rankings that we develop across strategies.
6 To determine market exposure, we conducted two factor regressions, using either S&P 500 or MSCI AWCI and Bloomberg Barclays US Aggregate or Global Aggregate total returns as independent variables and fund returns as the dependent variable. We then screened out those funds with significant absolute beta, with a magnitude greater than 0.5 to either of the two factors.
7 Refer to Appendix A2 for fund selection details. Had the liquidity screen not been applied, there would be another 299 funds meeting the reporting, geographic, and beta requirements. Most of these were in Multi Strategy (126 less-liquid vs. the 40 liquid analyzed here), Equity Long Short (84 less-liquid vs. the 79 more liquid analyzed here), and Credit Long Short (36 less-liquid vs. the 8 liquid analyzed here). We separately conducted analysis on less-liquid funds; these results are not reported here, but can be made available upon request.
8 While not provided here, results are also available at the "primary universe" level, wherein funds are grouped by universes as defined by eVestment, rather than self-defined by the reporting managers.
9 "Absolute Return" strategies, reported within the Alternatives asset class, were associated with a range of universes identified by eVestment, including Macro, Multi Strategy, Event Driven, Relative Value, Fund of Funds and Fundamental. Therefore, there may be some style crossover between the funds represented in "Absolute Return" and those in the Hedge Funds asset class.
10 The determination to exclude those categories with fewer than five funds meeting all the screens resulted in the exclusion of four strategy types: Currency, Commodities, Insurance, and Niche. In addition, several other strategy types that were reported in the Alternatives asset class (Private Equity, Infrastructure, Mezzanine Debt, Real Estate Financing, Secondary Markets, Special Situations, Venture Capital, and Distressed Debt, as well as Portable Alpha, a total of 405 funds) were automatically excluded as they did not meet the liquidity and history requirements, irrespective of the fact that most would not be considered "absolute return."

Figure 1: Traditional Performance Metrics
(USD returns, January 2008 – December 2016)

eVestment Hedge (Net Returns)	Count	Return	Risk	Sharpe ratio	Sortino ratio	95% VaR	95% CVaR	Maximum Drawdown
		Annual				Monthly		
Absolute Return	20	3.7%	8.3%	0.52	1.32	-3.2%	-4.8%	18.6%
Multi Strategy	40	3.3%	6.8%	0.48	1.21	-2.7%	-4.5%	18.4%
Event Driven	13	4.3%	5.7%	0.86	1.98	-2.2%	-4.0%	13.6%
Volatility	9	5.4%	13.9%	0.38	0.66	-5.9%	-10.0%	29.0%
Credit Long Short	8	7.8%	9.7%	0.75	1.24	-2.2%	-6.2%	28.4%
Equity Long Short	79	4.9%	9.3%	0.47	0.96	-3.8%	-5.4%	19.5%
Macro	118	3.4%	11.4%	0.24	0.50	-4.6%	-6.4%	23.2%

Note: Please see Appendix A1 for performance metrics definitions. Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies.
Source: PGIM IAS, eVestment. For illustrative purposes only.

Performance Evaluation

To evaluate this broad set of strategies relative to absolute return-oriented objectives, we focus on measures of conditional value-at-risk (CVaR) and downside correlation, in addition to a new measure that is designed to capture the consistency of absolute returns, the "Anchor ratio" (AR). We do not analyze the presence of factors as drivers of return, which has been addressed elsewhere.[11] But first, we provide a brief summary of the strategies using traditional performance metrics (Figure 1).

On average, the strategies evaluated demonstrated low to moderate annual volatility, ranging from 5.7% (Event Driven) to 11.4% (Macro) over the period studied. In comparison, over the same period, US equities had 15.8% annual volatility. But just as risk was low to moderate, so was performance, with average annual net of fees performance of three to five percent across the strategies. Credit Long Short was an exception, with close to eight percent annual return. Event Driven and Credit Long Short strategies had superior risk-adjusted returns, with Sharpe ratios of 0.86 and 0.75 respectively. From a downside risk-adjusted return perspective (Sortino ratio, 95% CVaR), Absolute Return and Multi Strategy, in addition to Event Driven strategies, delivered strong results.

The Anchor Ratio as a Measure of Consistency

Consistency of performance is a frequently-sought characteristic of absolute return strategies, and has also been shown to be a potential indicator of skill.[12] It is commonly measured using the concept of "hit rate"[13], or the frequency of positive outcomes relative to all outcomes. Some researchers have developed measures aimed at capturing the consistency and magnitude of returns[14], or the cumulative effects of consistency.[15] Here, we introduce the "Anchor ratio" as a measure of consistency, which captures not only the frequency of positive outcomes, but the degree to which a fund generates *sustained* positive outcomes.[16]

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11 See, for example, Clifford et al. (2013); Harsh Parikh and Tully Cheng, "Revisiting the Role of Alternatives in Asset Allocation," *Alternative Investment Analyst* Review 6, no. 2 (Q2 2017): 7-18; William Fung and David Hsieh, "Hedge Fund Benchmarks: A Risk Based Approach," *Financial Analysts Journal* 60, no. 5 (September 2004): 65-80; and Momtchil Pojarliev and Richard M. Levich, "Evaluating Absolute Return Managers," *Financial Markets and Portfolio Management* 28, no. 1 (February 2014): 95-103.

12 See: Scott D. Stewart, "Is Consistency of Performance a Good Measure of Manager Skill?" *Journal of Portfolio Management* 24, no. 3 (Spring 1998): 22-32, wherein the author found that more consistent managers were more likely to demonstrate higher subsequent annualized returns.

13 Also known as "batting average."

14 See: John V. Sturiale, "In Search of Excess," *Financial Planning* (October 2000), wherein the author develops the Sturiale Consistency Ratio, which is essentially the hit rate plus the relative cumulative performance of a fund against its benchmark, minus one.

15 See: Michael Villaverde, "Measuring investment performance consistency," *Quantitative Finance* 10, no. 6 (June 2010): 565-574, wherein the author proposes combining information ratio, maximum drawdown and maximum breakeven time capture the cumulative impact of consistent, or inconsistent, performance.

16 In Appendix A3, we also provide an alternative definition for "Anchor ratio" using a statistical process control technique that calculates failure rates. While such process control techniques have been successfully used to monitor active manager performance, we use a technique that allows us to determine sustainability, i.e., sustained positive over negative performance of a manager. Refer to Thomas K. Philips, Emmanuel Yashchin, and David M. Stein, "Using Statistical Process Control to Monitor Active Managers," *Journal of Portfolio Management* 30, no. 1 (Fall 2003): 86-94.

In a game of cricket, the anchor is a top-order batsman capable of batting for a long duration throughout the innings. Despite playing defensively, the anchor is often the top scorer. In finance, we often use the "hit rate" to evaluate consistency of a manager's skill, where the hit rate is defined as the ratio of the number of correct decisions as a percentage of total decisions. However, missing from this concept is the notion of performance sustainability. How long can a manager hit without having a miss? The Anchor ratio (AR) addresses this question of sustainability.

The Anchor ratio may also help to identify managers with greater outperformance. Just as an anchor batsman in cricket plays long innings and often ends up as the high runs scorer, we might expect to find superior performance associated with the funds in the top Anchor ratio quartile.

When determining the AR, if fund performance is positive for any given month, we call this a "hit," and otherwise, a "miss." We call consecutive hits "a hit run," with each hit run score denoted by h. Similarly, we call consecutive misses "a miss run," with each miss run score denoted by m. We disregard the magnitude of the performance, focusing solely on whether performance is positive or negative.[17] For example, if a manager has five consecutive months of positive performance followed by three consecutive months of negative performance, we say that the manager had two runs: a hit run (of score five) followed by a miss run (of score three).

For the entire sample period, we collect hit runs and miss runs. We then calculate the ratio of sum of squared hit runs to the sum of squared miss runs; the square root of this ratio is the Anchor ratio (AR), as below (where p is the number of hit runs, and q is the number of miss runs):

$$AR = \sqrt{\frac{\sum_{i=1}^{p} h_i^2}{\sum_{i=1}^{q} m_i^2}}$$

Figures 2A and 2B: Hypothetical Hit and Miss Run Scores and Anchor Ratio

Return Series	1	2	3	4	5	6	7	8
#1	+	-	+	-	+	-	+	-
#2	+	+	-	-	+	+	-	-
#3	+	+	+	+	-	-	-	-
#4	+	+	+	+	+	+	+	+
#5	-	+	+	+	+	+	-	-
#6	+	-	-	-	-	-	+	+
#7	-	+	+	-	+	+	-	+

This hypothetical example is provided for illustrative purposes only, and is not intended to represent the actual performance of any strategy or fund.

Return series	Hit run scores				Miss run scores				Sum of squared hit runs (a)	Sum of squared miss runs (b)	Anchor ratio Sqrt(a/b)
#1	1	1	1	1	1	1	1	1	4	4	1.00
#2	2	2			2	2			8	8	1.00
#3	4				4				16	16	1.00
#4	8				0				64	0	Inf.
#5	5				1	2			25	5	2.24
#6	1	2			5				5	25	0.45
#7	2	2	1		1	1	1		9	3	1.73

This hypothetical example is provided for illustrative purposes only, and is not intended to represent the actual performance of any strategy or fund.

17 For our analysis we use total return, rather than excess return, since the implied benchmark would generally be expected to be a cash equivalent and the cash total return was near zero for the evaluation period. However, the measure can also be employed using excess returns (positive and negative excess returns relative to a given benchmark), which may be more relevant for market-linked strategies and for absolute return strategies when cash rates are materially higher.

We square each *h* score before summing to ensure that the more sustained (i.e., longer) hit runs (higher *h* values) have a higher weight than shorter hit runs (smaller *h* values). Similarly, we square each *m* before summing to penalize runs with more sustained periods of negative performance (higher *m* values).

Figures 2A and 2B provide some examples. While two managers may have similar overall performance (i.e., return, risk and "hit rate") over a given period, their Anchor ratios can be very different. A greater Anchor ratio indicates more sustained and consistent positive performance. For example, return series #5 has three runs: one hit run (score five) and two miss runs (scores of one and two). The Anchor ratio for series #5 is 2.24. In contrast, return series #7 has six runs: three hit runs (the first two with score two, and the third with score one) and three miss runs (each with a score of one). The Anchor ratio for series #7 is 1.73. It is evident from this example that the Anchor ratio is a path dependent measure.

To improve sustainability, an investor would prefer the sum of squared hit runs to be greater than the sum of squared miss runs, thus achieving a greater Anchor ratio (as in the case with return series #5 and #7).

It is important to note that this measure has its weaknesses.[18] Certain strategies, such as put-writing or catastrophe funds, might demonstrate a very high Anchor ratio, but may also carry significant tail risks that simply have not been realized over the period of evaluation. As with any other ex-post performance measure, one should not rely on the AR alone; rather, it should be incorporated into a framework that employs several different measures of performance.[19]

Strategy Level Characteristics

In the following pages, we evaluate the set of strategies screened, as described[20], from the eVestment Hedge database by these key measures that we believe are aligned with some common objectives of absolute return investors: Anchor ratio (to measure sustainability), conditional value-at-risk (to measure tail risk), and downside correlation (to measure diversification to equities in a downturn). Results are presented at the strategy level.[21]

Sustainability of positive results

We use the Anchor ratio (AR) to measure each strategy's sustainability of positive results. In Figure 3A, we provide the equal-weighted average of funds' Anchor ratios for each strategy evaluated. The average AR across all funds was 1.9. Absolute Return, Credit Long Short, Event Driven, Multi Strategy, and Volatility strategies all demonstrated higher than average AR. In aggregate, Equity Long Short and Macro strategies delivered relatively lower performance sustainability, with lower AR on average.

Figure 3A: Average Anchor Ratio
(USD returns, January 2008 – December 2016)
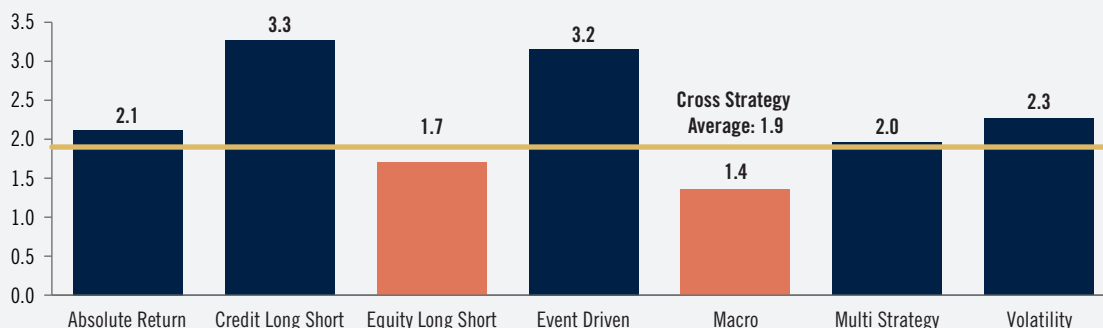
Note: Anchor ratio at the strategy level is determined by the equal weighted average of all funds' Anchor ratios in that strategy. The average Anchor ratio of all funds was 1.9. The strategies with higher than average Anchor ratio are in blue (Absolute Return, Credit Long Short, Event Driven, Multi Strategy and Volatility), and others (Equity Long Short and Macro) are in red. Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies. Source: PGIM IAS, eVestment. For illustrative purposes only.

18 See Neil Constable and Jeremy Armitage, "Information Ratios and Batting Averages," *Financial Analysts Journal* 62, no. 3 (May/June 2006): 24-31, wherein the authors illustrate that for a given information ratio, a manager with a higher batting average can have a more negatively skewed return distribution.

19 An important question when considering a new measure for potential strategy selection is whether the measure itself demonstrates persistence. Detailed results are provided in the Appendix A4.

20 Please see Appendix A2 for full screening details.

21 For those strategy groups comprising a relatively large number of funds after screening (Equity Long Short, with 79 resulting funds, and Macro, with 118 resulting funds), we also conduct the analysis at the sub-strategy level, as fund-level characteristics may in fact vary widely, and more finely tuned groupings may reveal additional insights. Detailed results are provided in the Appendix A5.

Figure 3B: Average One Month 95% CVaR
(USD returns, January 2008 – December 2016)
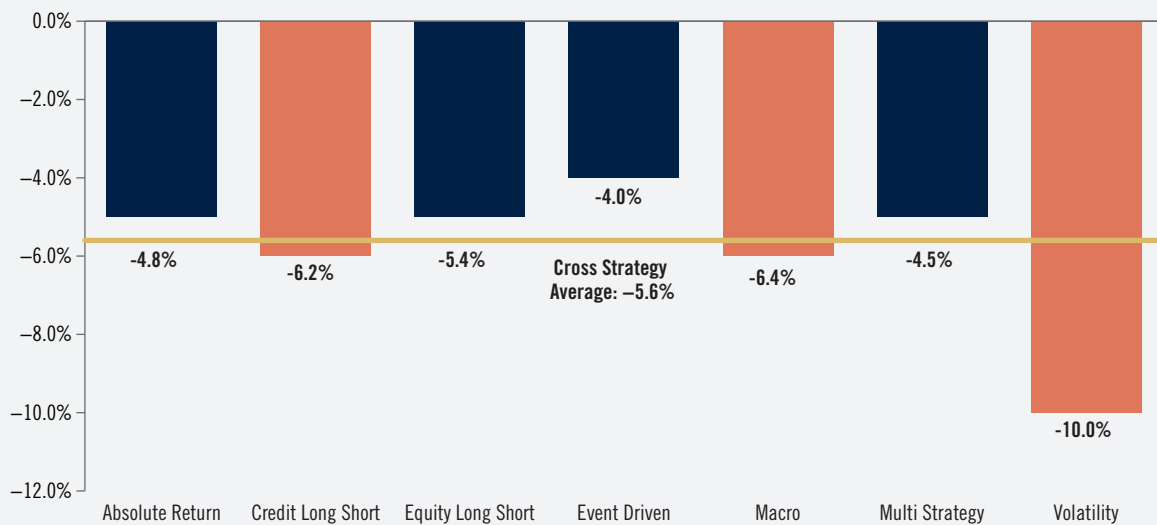
Note: We calculate 95% CVaR for every fund over the evaluation period, and use this to calculate equal weighted averages at the strategy level. 95% CVaR is the average left tail performance, based on monthly returns at the 5th percentile or lower. The average 95% CVaR of all funds evaluated here was -5.6%. The strategies with an average 95% CVaR less severe than the overall average are presented in blue (Absolute Return, Equity Long Short, Event Driven and Multi Strategy), and others (Credit Long Short, Macro and Volatility) are in red. Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies. Source: PGIM IAS, eVestment. For illustrative purposes only.

Figure 3C: Average Downside Equity Correlation
(USD returns, January 2008 – December 2016)
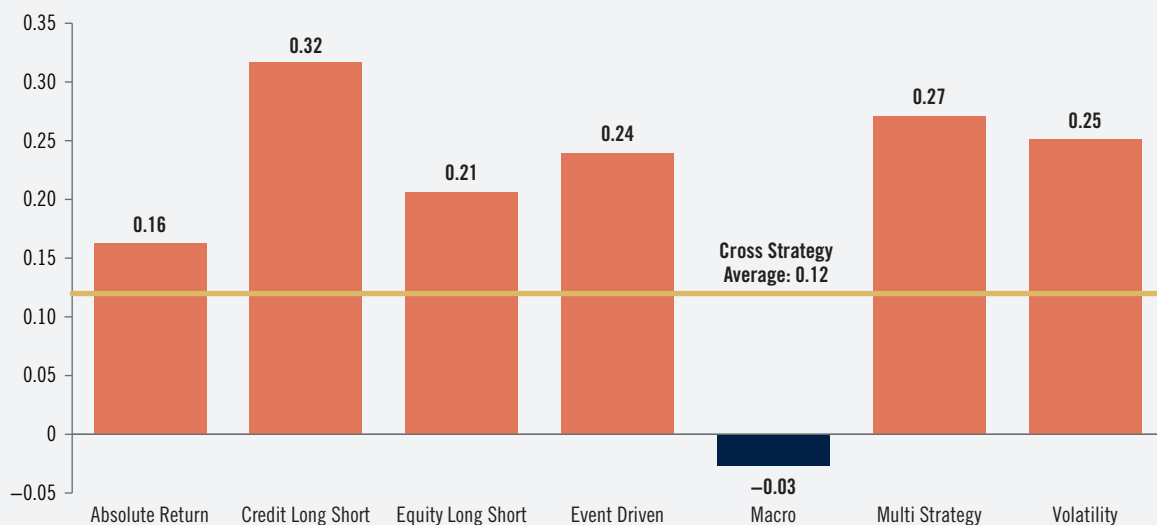
Note: We determine the average equity downside correlation at the strategy level by calculating the equal-weighted average of the equity downside correlation for all funds in that strategy. The equity downside correlation is calculated as the correlation with US equity returns when equity returns were lower than one-half standard deviation from the sample mean. The average downside equity correlation of all funds analyzed was 0.12. The strategy with an average downside equity correlation that was lower than the overall average is in blue (Macro), and others are in red. Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies. Source: PGIM IAS, eVestment. For illustrative purposes only.

Tail risk

We represent "tail risk" by measuring the conditional value at risk (CVaR) associated with each fund, and then averaging at the strategy level.[22] 95% CVaR measures the average of 5th percentile and lower returns of a given return distribution. In Figure 3B, we provide the equal-weighted average of funds' 95% CVaR values within each strategy evaluated. Event Driven, Multi Strategy and Absolute Return strategies demonstrated relatively limited downside risk (better than -5% 95% CVaR at the one-month horizon). In contrast, the average 95% CVaR for Credit Long Short, Macro and Volatility strategies was worse than -6% at the one-month horizon.

Maximum drawdown, though not shown here, follows a similar pattern. The benefit of considering both measures is that while CVaR provides some notion of average losses in the tails, it is still a single-period risk measure. In contrast, maximum drawdown is a multi-period, path-dependent measure of the maximum cumulative drop experienced historically. This is particularly relevant if performance is serially correlated (i.e., negative performance is followed by further negative performance).[23]

Downside diversification

We use downside correlation, or the correlation to equity markets during periods when equity returns are lower than one-half standard deviation from the sample mean, to measure whether diversification holds up over weak markets. Figure 3C shows that most of the strategies analyzed, except for Credit Long Short, exhibited relatively low (less than 0.30) downside correlation to equity market returns. At the strategy level, Macro in fact demonstrated a negative downside correlation to equities, suggesting countercyclical performance. This is noteworthy in light of the fact that Macro strategies had greater tail risk (CVaR), indicating that these strategies' more negative outcomes tended not to manifest during equity down markets.[24]

Distribution of Funds

Next, we rank all funds, regardless of strategy, by each one of the three measures: AR, CVaR, and downside correlation. We then group the funds into quartiles (by number of funds) based on these rankings. From here we are able to determine percentage of funds of each strategy that are represented in each quartile.

Figure 4A shows these results when funds are sorted by Anchor ratio. Across this set of absolute return-style funds, an Anchor ratio greater than 2.04 would rank in the top quartile and an Anchor ratio less than 1.16 would be in the bottom quartile.

Focusing on the darker blue segments, representing the top quartile (Q4) for Anchor ratio, we observe that 88% of the Credit Long Short (7 out of the 8) and 85% of the Event Driven (11 out of the 13) funds scored in the top Anchor ratio quartile across all of these strategies. Absolute Return (40%) and Multi Strategy (43%) also had relatively strong representation in the top quartile. In contrast, only 19% of Equity Long Short and 8% of Macro were in the top quartile, suggesting that particular care would need to be taken in order to identify consistent funds in these strategies.

We also find that 40% of the Macro strategies fell into the bottom quartile (Q1) for Anchor ratio. In other words, these funds, and in aggregate, the strategy, did not appear to deliver sustained positive returns as well as other strategies did.[25]

Funds were also ranked by their 95% CVaR values and grouped into quartiles (Figure 4B). Here we find that the strategies scoring well (top quartile, Q4, with low CVaR) included, once again, Event Driven (46%), Absolute Return (40%), and Multi Strategy (33%). These strategies appeared to be more likely to contain extreme events. In contrast, 50% of Credit Long Short, 44% of Volatility and 31% of Macro funds were in the worst quartile. In other words, these strategies appeared more likely to expose the investor to larger losses on the downside.

The picture changes when we rank funds by equity downside correlation (Figure 4C). Here, we find that 41% of Macro funds score in the top quartile (Q4, with the lowest correlation to equity in equity downturns). The rest of the strategies were underrepresented in the top quartile. Thus, for those investors seeking countercyclical performance, Macro strategies provided the

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22 Investors interested in measuring tail risk relative to a given fund's overall risk level may wish to take the additional step of normalizing observed tail risk by overall fund risk level before ranking, particularly when comparing across individual funds.

23 While strategy rankings using the maximum drawdown metric were similar to rankings based on 95% CVaR, there can be differences at the fund level. Funds can have lower maximum drawdowns and higher average tail losses, or lower average tail losses and higher maximum drawdowns. Therefore, investors particularly concerned about downside risk protection may want to review these measures in tandem.

24 While these observations hold at the strategy level, please see Appendix A5 for greater detail at the sub-strategy level. In particular, we find that Managed Futures Macro funds were attractive from a downside correlation perspective (but with high tail risk), while Discretionary Macro tended to have better tail risk control.
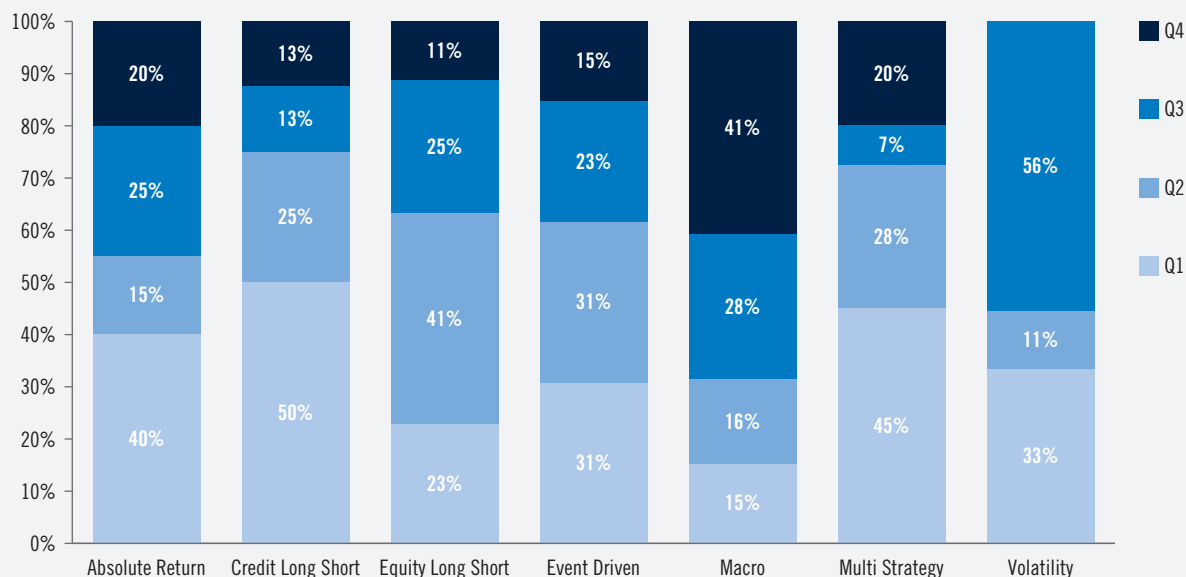
25 Because Anchor ratio is a path dependent measure, for robustness we also evaluated the period from 1999-2007, using the same fund screening methodology as described in Appendix A2 (in this case, resulting in 301 eligible funds). Full results are available upon request. Some of the more notable comparisons between the two periods include: (a) Eight of the 28 credit long/short funds (about 30%) were in the top Anchor ratio quartile over 1999-2007, compared to 88% in the top quartile over 2008-2016 (as seen in Figure 4A); however, only 8 credit long/short funds were eligible for analysis from 2008-2016, which likely had a significant impact on results. (b) 17% of Macro funds were in the top Anchor ratio quartile over 1999-2007, compared to 8% over 2008-2016 (Figure 4A), resulting in less than a 25% representation in the top quartile over either period. (c) Over 1999-2007, the top quartile for Anchor ratio was dominated by the Event driven, Multi-strategy and Volatility strategies, each with about 50% of its funds in the top quartile.

Figure 4A: Percentage of Funds in each Anchor Ratio Quartile
(USD returns, January 2008 – December 2016)
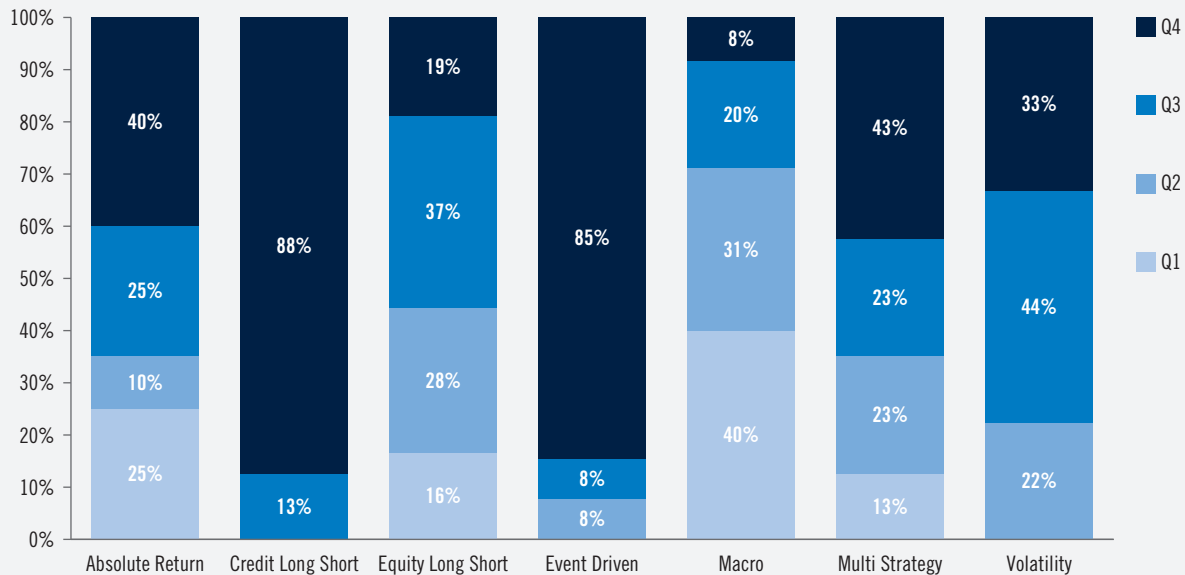
Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies. Source: PGIM IAS, eVestment. For illustrative purposes only.

Figure 4B: Percentage of Funds in each 95% CVaR Quartile
(USD returns, January 2008 – December 2016)
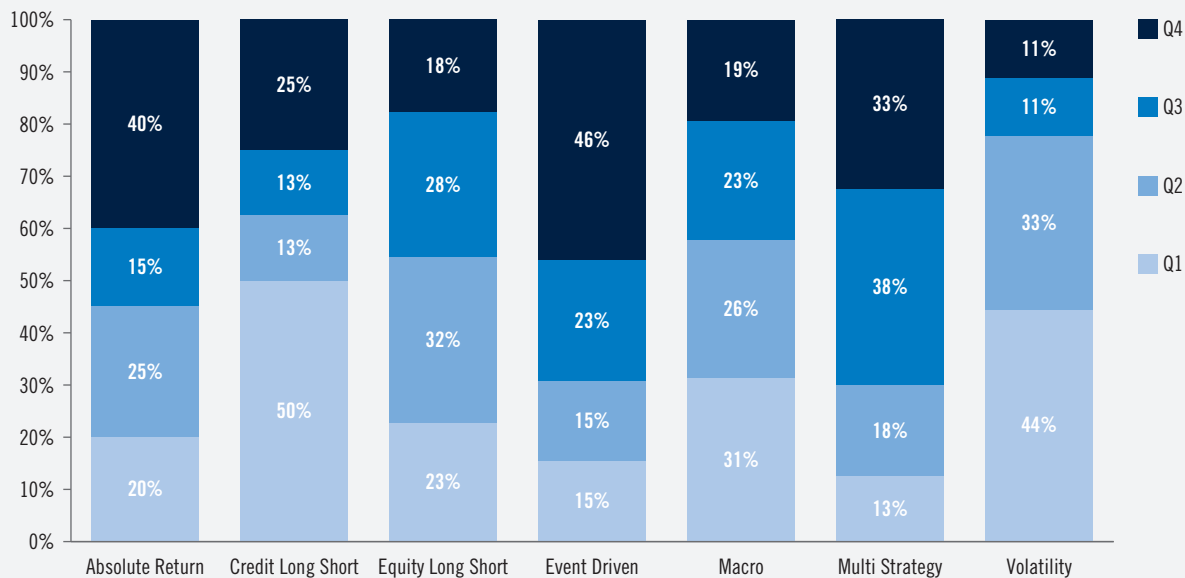
Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies. Source: PGIM IAS, eVestment. For illustrative purposes only.

Figure 4C: Percentage of Funds in each Downside Correlation Quartile
(USD returns, January 2008 – December 2016)

Strategy	Q1	Q2	Q3	Q4
Absolute Return	40%	15%	25%	20%
Credit Long Short	50%	25%	13%	13%
Equity Long Short	23%	41%	25%	11%
Event Driven	31%	31%	23%	15%
Macro	15%	16%	28%	41%
Multi Strategy	45%	28%	7%	20%
Volatility	33%	11%	56%	

Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies. Source: PGIM IAS, eVestment. For illustrative purposes only.

most attractive downside diversification.[26] We would note, though, that our sub-strategy level analysis shows that this is particularly true for Managed Futures, as opposed to Discretionary Macro.

Return and Risk by Quartile

Sorted by Anchor ratio quartiles

Next, we analyze performance results by Anchor ratio, CVaR, and downside correlation quartiles to study if any patterns emerge with respect to return and volatility. Beginning with Anchor ratio, in Figures 5A and 5B, we plot the average return and volatility values for each strategy, by Anchor ratio quartile. In Figure 5A, we observe that average returns were higher, in aggregate, for funds with top quartile (Q4) Anchor ratios, despite the fact that calculation of the Anchor ratio does not incorporate the magnitude of performance. For the most part, top quartile (Q4) Anchor ratio funds also had lower volatility (Figure 5B). These results confirm our hypothesis that there are performance benefits associated with consistent, positive results as measured by the Anchor ratio.

Sorted by 95% CVaR quartiles

In Figures 6A and 6B, we consider the average return and volatility values associated with each quartile of 95% CVaR. We find here that while returns do not necessarily improve as the tail risk (represented by 95% CVaR) declines, volatility does generally decline with decreasing tail risk (Q4 of CVaR).[27]

Other dependencies

We found no discernible patterns in any of the strategies' performance across quartiles of downside equity correlation. Thus, even if a given strategy is characterized by countercyclical performance (with low to negative equity downside correlation), it would not necessarily be expected to demonstrate particularly strong overall performance. Rather, its benefits would be more likely borne out when evaluated in the context of the whole portfolio.

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26 This is consistent with our earlier paper (Parikh and Cheng, 2017), wherein we found that Macro hedge funds exhibited low correlation to equities during periods of stress, such as the height of the financial crisis.
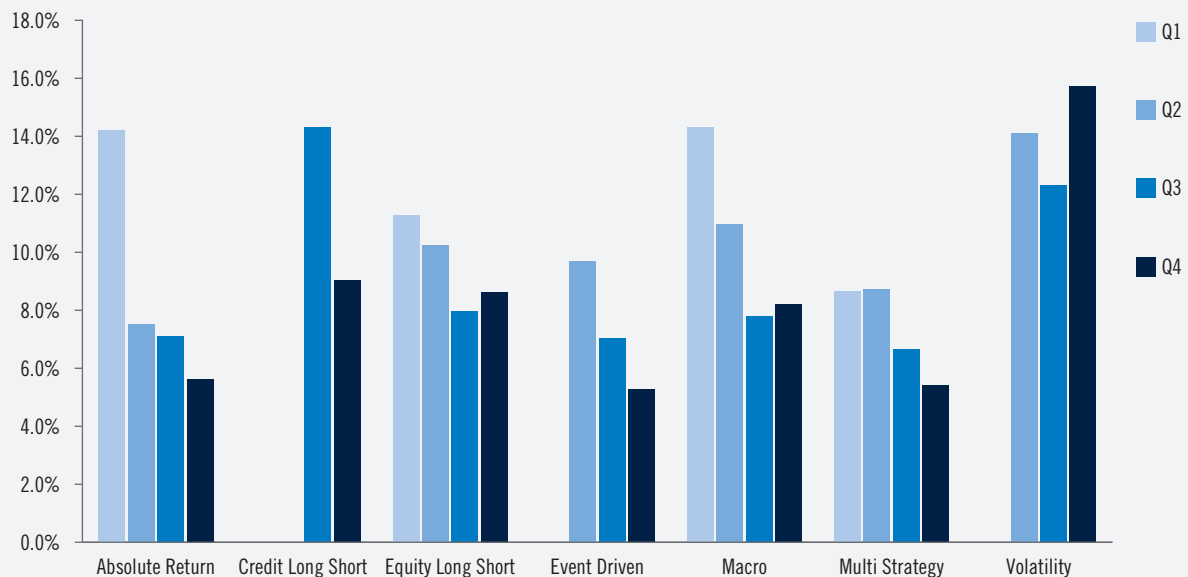
27 This in turn leads to an increase in Sharpe and Sortino ratios, not shown here.

Figure 5: Average Return and Volatility
Sorted by Anchor Ratio Quartile
(USD returns, January 2008 – December 2016)

### 5A. Average return sorted by Anchor ratio quartile
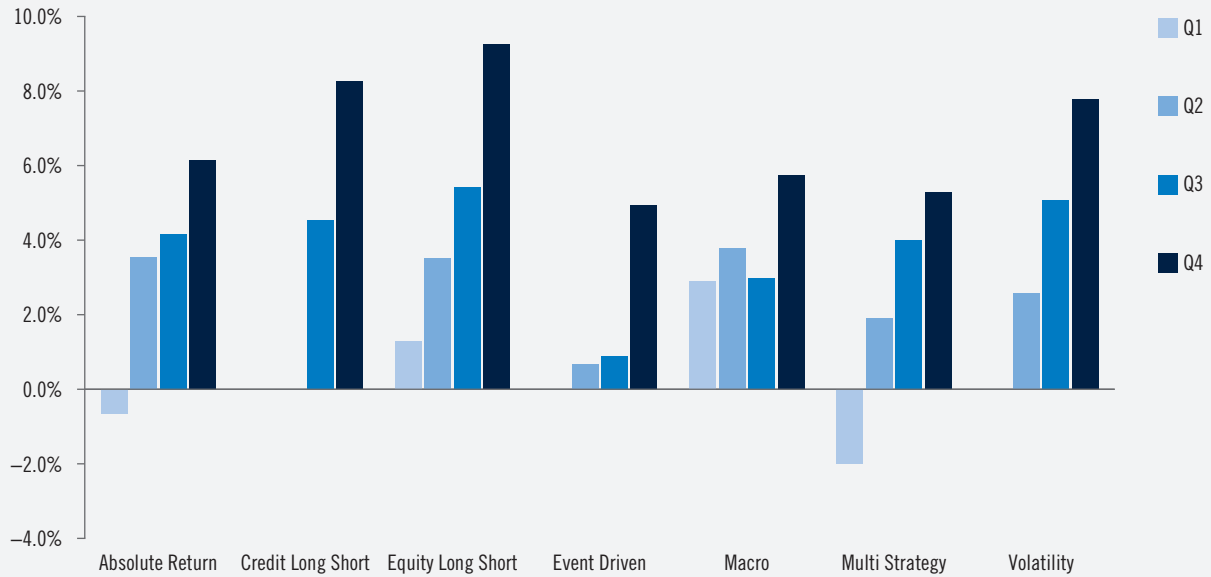
### 5B. Average volatility sorted by Anchor ratio quartile

Note: We rank all funds across all asset classes based on their Anchor ratio in ascending order and then take performance averages in each quartile. The returns and volatility are annualized averages. Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies. Source: PGIM IAS, eVestment. For illustrative purposes only.

Figure 6: Average Return and Volatility
Sorted by 95% CVaR Quartile
(USD returns, January 2008 – December 2016)

6A. Average return sorted by 95% CVaR quartile
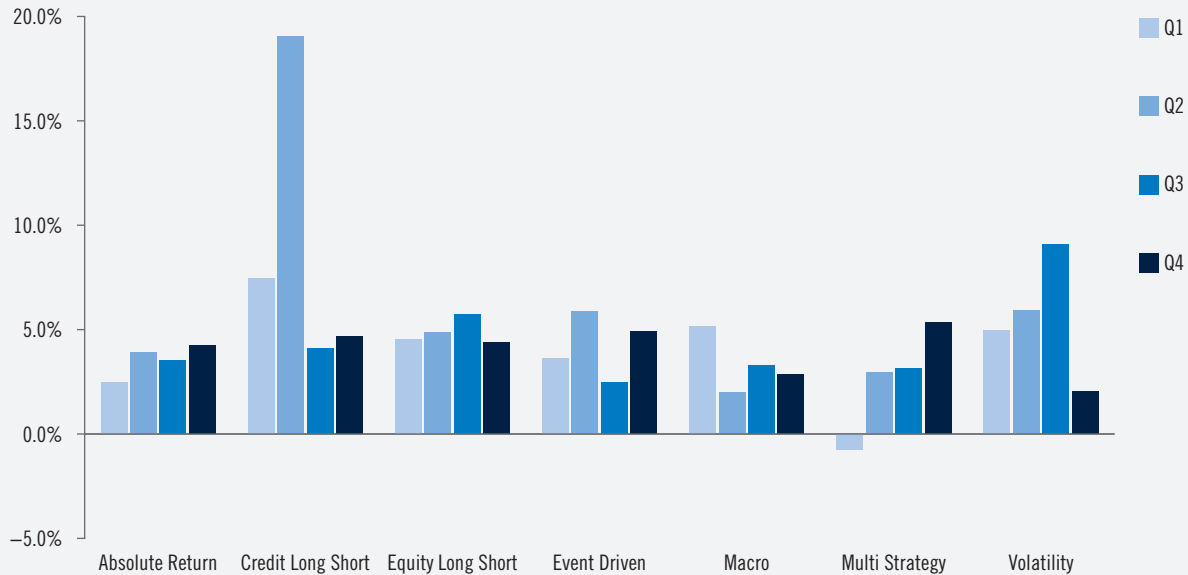
6B. Average volatility sorted by 95% CVaR quartile
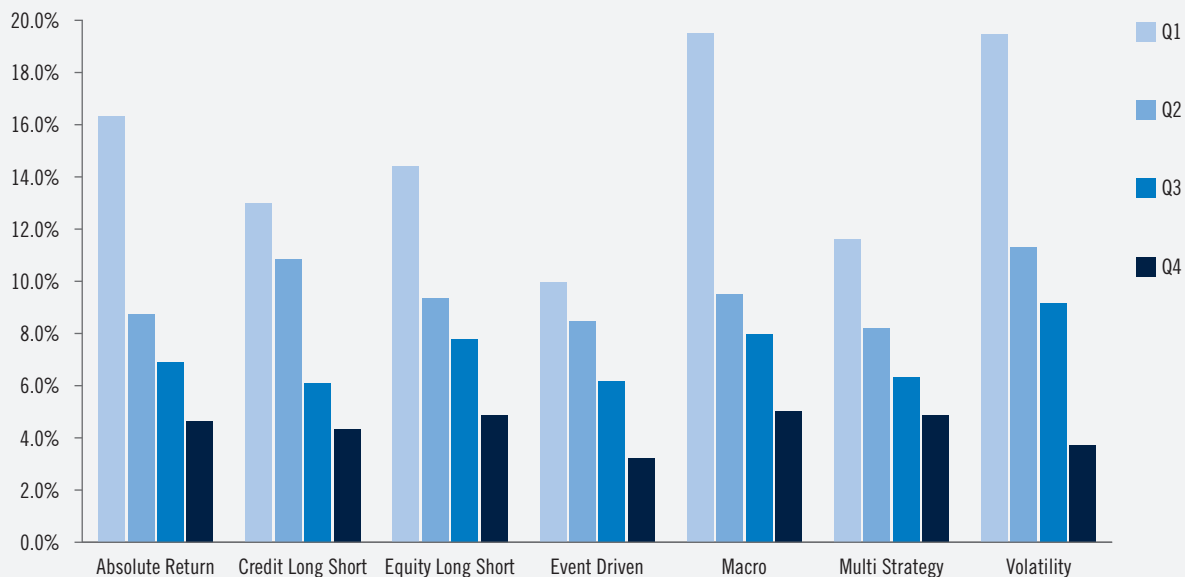
Note: We rank all funds by their 95% CVaR, in ascending order, and then take performance averages in each quartile. The top quartile has funds with least negative 95% CVaR and the bottom quartile has funds with most negative 95% CVaR. Returns and volatility are annualized averages.

Please note that the Macro group represents primarily (a) Discretionary Macro and (b) Managed Futures; the number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each; as such, the results presented here are not meant to be representative of those sub-strategies. Source: PGIM IAS, eVestment. For illustrative purposes only.

Additionally, we did not ascertain any interdependencies among the Anchor ratio, CVaR, and downside correlation measures. In other words, when sorting strategies by Anchor ratio quartiles, we found no discernible pattern in the associated averages for CVaR or for downside correlation. Similarly, when sorting by CVaR quartiles or by downside correlation quartiles, no patterns were found in the other two measures.[28] This reinforces their value as distinct measures that may be used in concert in the evaluation process.

Summary of Results

We summarize our findings in the table below, with an indication of the relative attractiveness of each strategy when evaluated under each of the three absolute return-oriented metrics we employed (Anchor ratio, 95% CVaR and downside equity correlation), as well as the Sharpe ratio.[29] Results are provided at the sub-strategy level for Macro, given the large number of funds and distinct characteristics observed in this group.[30]

We note that most of the strategies evaluated had at least one area of relative strength, and some were strong in more than one area. Several were attractive from an Anchor ratio perspective, suggesting that the Anchor ratio is particularly well-suited to capturing the desired characteristics associated with absolute return style funds. Three of those strategies (Absolute Return, Event Driven and Multi Strategy) were also attractive when viewed through the lens of tail-risk control, and two of the three (Absolute Return and Event Driven) were additionally attractive from a Sharpe ratio perspective.

Credit Long Short and Equity Long Short also scored well for risk-adjusted return, as measured by Sharpe ratio. Managed Futures alone stood out for downside diversification (though it was not as strong in other areas), while Discretionary Macro demonstrated success in controlling tail risk, as measured by 95% CVaR.

While the results presented here can serve as a guide to help investors understand how different strategies might broadly fit relative to objectives, the importance of understanding a *specific* manager's characteristics cannot be overemphasized. The same measures used here to evaluate the overall (or average) characteristics for groups of funds can, and should, be applied at the individual manager level as well. Manager-level results can then be compared to help determine which might be more likely to help fulfill a particular objective, or to diversify existing exposures.

Figure 7

Objective	Performance Sustainability	Lower Tail Risk	Downside Diversification	Risk-Adjusted Return
Measure	Anchor Ratio	95% CVaR	Downside Equity Correlation	Sharpe Ratio
Absolute Return	x	x		x
Multi Strategy	x	x		
Event Driven	x	x		x
Volatility	x			
Credit Long Short	x			x
Equity Long Short				x
Macro*				
Discretionary Macro		x		
Managed Futures			x	

Note: An "x" indicates relatively favorable results for the given strategy when evaluated based on the given measure. In each case, an "x" is marked if (a) the strategy-level average of that measure was greater than the overall average of that measure (of all funds evaluated across strategies) and (b) if more than 30% of the individual funds evaluated in that strategy were associated with top quartile results of the given measure. Quartile results for the Sharpe ratio measure, not presented in the paper, are available upon request.

*Macro results are presented at the sub-strategy level here for (a) Discretionary Macro and (b) Managed Futures, given the relatively large number of funds and unique characteristics in each of these categories. The number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each, and therefore were not reported at the sub-strategy level, and overall "Macro" strategy-level results are not meant to represent the characteristics of these sub-strategies.

Source: PGIM IAS, eVestment. For illustrative purposes only.

28 Results are available upon request.
29 While not reported here, strategies were also ranked by Sortino ratio and hit rate. We found that, at the strategy level, Sortino ratio-based rankings were similar to Sharpe ratio-based rankings, and hit rate-based rankings were similar to Anchor ratio-based rankings. Still, notable differences between Sortino and Sharpe rankings, and between Anchor ratio and hit rate rankings, were found at the individual fund level.
30 Please see Appendix A5 for Macro sub-strategy results. The number of eligible funds in GTAA, Systematic Macro, Fixed Income Relative Value and Foreign Exchange sub-strategies were fewer than five each, and therefore were not reported at the sub-strategy level.

Conclusions

We evaluate a broad range of liquid absolute return strategies, focusing on performance consistency, tail risk control, downside correlation, and risk-adjusted return, and find different strategies to be suitable for different objectives.

We also introduce a new performance measure, the Anchor ratio, to evaluate funds through the lens of performance sustainability. For investors seeking sustained positive returns, we find Credit Long Short and Event Driven to be particularly strong potential candidates, with Absolute Return, Multi Strategy, and Volatility strategies showing promise as well. We also find, across strategies, that funds with high Anchor ratio had relatively higher returns, and that the Anchor ratio tended to be more persistent than the Sharpe ratio.

Absolute Return, Event Driven, Credit Long Short, and Equity Long Short strategies all delivered strong results from a risk-adjusted return perspective, as measured by Sharpe ratio.

Investors particularly focused on tail risk control may look to Event Driven strategies, Multi Strategy, Absolute Return, and Discretionary Macro, all of which had favorable average tail risk profiles.

Managed Futures, within Macro, were attractive from an equity downside diversification perspective, although they did not fare as well when measured for sustainability or tail risk control. However, the strategy's capacity for diversification suggests that it has the potential to help reduce risk at the whole portfolio level, provided that it is sized appropriately and combined with offsetting assets.

Individual metrics, when considered in isolation, will always have limitations. Managers should be evaluated through multiple analytical lenses, together with thorough diligence and understanding of investment processes. The framework presented here can be play a valuable role in this process, lending clarity to those strategies, and managers, that are more likely to satisfy investors' specific absolute return-related objectives.

Acknowledgement

Appendix

Appendix A1: Performance Metrics Definitions[31]

Hit Rate (also known as Batting Average) – As the name would imply, hit rate is a measure of the frequency of success. This ratio is calculated by taking the number of periods where the manager equals or outperforms the selected benchmark, divided by the total number of periods. This measure indicates a manager's frequency of success, without regard to degree of outperformance.

$$\text{Hit Rate} = \frac{\text{number of positive observations}}{\text{total number of observations}}$$

Sharpe Ratio – This statistic is computed by subtracting the return of the risk-free index (typically 91-day T-bill or some other cash benchmark) from the return of the manager to determine the risk-adjusted excess return. This excess return is then divided by the standard deviation of the manager.

Sortino Ratio – This measure is similar to the Sharpe ratio except that it is concerned only with downside volatility (unfavorable) versus total volatility (both favorable, upside volatility and unfavorable, downward volatility). This statistic is computed by subtracting the return of the risk-free index (typically 91-day T-bill or other cash index) from the return of the manager to determine the risk-adjusted excess return. This excess return is then divided by the downside risk of the manager.

Downside Volatility – Downside risk (also known as downside deviation) attempts to further break down volatility between upside volatility – which is generally favorable since it implies positive outperformance – and downside volatility – which is generally unfavorable and implies loss of capital or returns below an expected or required level.

Max Drawdown – The maximum of the peak-to-trough declines during a specific period. Going sequentially through time with a manager's cumulative return, it is the "loss" from the highest portfolio value to its lowest point. This is a commonly used hedge fund measure since such funds often employ hedging strategies to protect returns in down markets; hence, the max drawdown is expected to be low.

Downside Correlation – Correlation of a manager performance to the benchmark or market when the benchmark is lower than a threshold percentage on the downside. In this paper, we use one standard deviation as the threshold.

p% VaR – p% VaR (Value at Risk) is defined as a value of loss, for a given investment horizon, when the probability of loss is less than or equal to (1-p)%.

p% CVaR – Conditional Value at Risk (CVaR) is the average of all losses greater or equal than Value at Risk (VaR), also known as Expected Shortfall, the average loss in the worst (1-p)% cases, where p is the confidence level.

Appendix A2: Fund Screening

We based our analysis on the strategies reported in the eVestment Hedge database, which comprises two asset classes: Alternatives and Hedge Funds.[32] Each of these asset classes are further composed of several strategy types (see table below).[33] Several screens were applied. First, to focus on "liquid" strategies, we screened for funds that allowed for monthly, or more frequent, redemption. ETFs and funds reported gross of fees were excluded. In all, 2,270 funds met these criteria. We further screened the results for geographic focus (focusing on Global, ACWI[34], North America or United States), full history (2008-2016, inclusive) and diversification to traditional assets (less than 0.5 beta, in absolute value terms, to S&P 500 Composite Index, MSCI ACWI Index, Barclays US Aggregate Bond Index and to Barclays Global Aggregate Bond Index). This left us with 300 funds.

So as not to draw fund specific conclusions, we only report our findings for strategies with more than 5 funds. Therefore, in the paper we do not report for currency, commodities and insurance strategies (results can be made available from the authors).

The table on the following page shows the filtering steps and number of funds accounted for in our final analysis.

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31 Definitions, except for 95% CVaR and downside correlation, as provided by eVestment and are included for the reader's reference.
32 The eVestment Hedge database, which includes the Alternatives and Hedge Funds asset classes, is distinct from the traditional eVestment database, which includes the Equity, Fixed Income, Balanced/Multi-Asset, and Real Estate asset classes. Both the asset class and the strategy associated with a given product are self-reported by the reporting managers.
33 The table provides statistics on absolute return-style strategies, which were the focus of this study. Note that the Alternatives asset class within the eVestment Hedge database also includes the following strategies, many of which might be perceived as more "directional" than "absolute return": Private Equity, Infrastructure, Mezzanine Debt, Real Estate Financing, Secondary Markets, Special Situations, Venture Capital, and Distressed Debt, as well as Portable Alpha. In all, there were 405 funds in these strategies. However, after applying the liquidity screen, the total number of funds in these strategies fell to 69. Further, after accounting for full history, none of the strategies had more than five funds. These strategies were therefore excluded from the analysis.
34 MSCI All Country World Index

Asset Class	Strategy	Liquid (net, non-ETF)	Geographic Focus	Full History	Beta < 0.5
Alternatives		303	237	47	24
	Absolute Return	287	225	42	20
	Currency	16	12	5	4
Hedge Funds		1,967	1427	514	276
	Commodities	75	74	25	5
	Credit Long Short	143	86	12	8
	Equity Long Short	846	469	160	79
	Event Driven	82	71	23	13
	Insurance	13	13	4	4
	Macro	504	463	210	118
	Multi Strategy	228	183	66	40
	Niche	21	15	1	0
	Volatility	55	53	13	9
Total		2,270	1,664	561	300

Note: The Credit Long Short and Volatility strategies comprise relatively few funds; readers should be cautious when extending the conclusions associated with those strategies to other funds. Source: PGIM IAS, eVestment, as of 12/31/2016. For illustrative purposes only.

We also screened for the presence of identical funds in each strategy. For example, 14 funds in the macro strategy group showed near-perfect correlation (greater than 0.99) with another fund offered by same fund family. However, given the large sample size (118 funds in the Macro strategy group), this should not have a significant impact on our results. The other instances of near-perfect correlation within a given strategy group were fewer, but readers should note that two of the funds in the relatively small "Volatility" strategy group (2 of the 9 funds overall) were nearly identical. The table on the right provides the number of funds showing pairwise correlation greater than 0.99 with another fund in the same strategy.

Strategies	Number of Funds with > 0.99 Pairwise Correlation
Absolute Return	2
Equity Long Short	3
Macro	14
Volatility	1

Source: PGIM IAS, eVestment, as of 12/31/2016. For illustrative purposes only.

Appendix A3: Alternative Definition for Anchor Ratio

While our earlier definition is adequate, we also provide a continuous time alternative formula. This measure also allows to account for periodicity such that specific investment horizon can be accounted for.

In order to understand performance sustainability, we can fit the hit runs to Weibull distribution.[35] x is score of hit runs. We separately fit for miss runs.

$$f(x)= \frac{\beta}{\alpha} \left(\frac{x-\mu}{\alpha}\right)^{\beta-1} \exp\left(-\left(\frac{x-\mu}{\alpha}\right)^{\beta}\right) \text{ for } x \geq \mu; \beta, \alpha > 0$$

Where β is the shape parameter, μ is the location parameter and α is the scale parameter of the distribution.

After distribution fitting and estimating distribution parameters, we can calculate the probability for the strategy or an individual manager to have greater than j-months of hit run score.

$$P(>j \text{ hit run score})= \exp\left(-\left(\frac{j}{\alpha_p}\right)^{\beta_p}\right)$$

Where j is the score of hit runs, α_p is the scale parameter and β_p is the shape parameter of Weibull distribution fitted by hit run scores.

35 A continuous probability distribution.

Similarly, we can measure probability of the strategy or an individual manager to have greater than k-months of miss run score.

$$P(>k \text{ miss run score}) = \exp\left(-\left(\frac{k}{\alpha_n}\right)^{\beta_n}\right)$$

Where k is the score of miss runs, α_n is the scale parameter and β_n is the shape parameter of Weibull distribution fitted by miss run scores.

Using these two probabilities we can quantify an alternative Anchor ratio as below. If this measure is close to zero it implies lower performance sustainability of the strategy or manager in delivering positive returns. This formula is different from our originally proposed Anchor ratio as it can also account for the investment horizon at which the ratio is calculated.

Modified Anchor ratio= P(>j hit run score) ÷ P(>k miss run score)

Where k is less than or equal to j, for example k is one month and j is six months.

At the strategy level, to have more sample for fitting to the distribution we can take all hit and miss runs from all the managers. In the figure on the right, event driven strategy is demonstrated and as we saw before event driven has higher probability of more than three months of positive performance than negative.

Appendix A4: Anchor Ratio vs. Sharpe Ratio Persistence

While the Anchor ratio appears to be a distinct and useful measure of fund consistency, an important question when considering a new measure for potential strategy selection is whether the measure itself demonstrates persistence. We address this question by comparing the persistence of the Anchor ratio to that of the frequently-used Sharpe ratio.

Figures A and B show a transition matrix, representing the percentage of strategies transitioning from one quartile of a given measure, over a given period, to another quartile of that measure in a following period. We conduct this analysis for both the Anchor ratio and the Sharpe ratio measures. Strategies are organized into quartiles according to their rank based on the given measure over the first half of the period studied (4.5 years, from Jan. 2008 - Jun. 2012) and then again according to their rank based on that same measure over the second half of the period studied (4.5 years, from Jul. 2012 - Dec. 2016). The percentages represent the likelihood of moving from a given quartile in the first subsample to a given quartile in the second subsample. A high percentage in same-quartile (diagonal) cells implies that the measure is relatively persistent, and high persistence in a high-ranking quartile (such as in the Q4 ➔ Q4 cell, lower right corner of each matrix) would be of particular interest to investors seeking to use the given measure for fund selection.

With Q4 ➔ Q4 transition probability at 45%, the Anchor ratio (Figure A) demonstrates notably higher persistence than the Sharpe ratio does (at 32%, Figure B). Still, due to the shorter time periods used in this analysis, we checked for

Event Driven
Positive - Shape: 1.19 Scale: 3.7
Negative - Shape: 1.76 Scale: 1.77
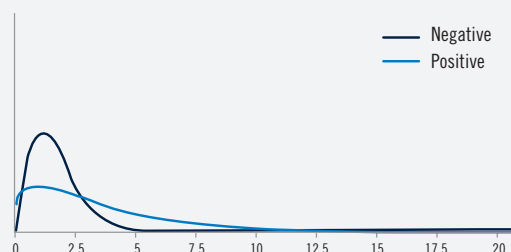
Note: For illustrative purposes only. Here we contrast distribution for Event Driven. Event Driven has much higher probability for sustained positive performance for more than six months and lower probability of sustained negative performance for more than six months, which would lead to a large modified Anchor ratio.

Figure A: Anchor Ratio Persistence

		Subsequent Period (54 months)			
		Q1	Q2	Q3	Q4
Prior Period (54 months)	Q1 (Low)	33%	39%	20%	8%
	Q2	25%	33%	23%	19%
	Q3	20%	21%	31%	28%
	Q4 (High)	21%	7%	27%	45%

Figure B: Sharpe Ratio Persistence

		Subsequent Period (54 months)			
		Q1	Q2	Q3	Q4
Prior Period (54 months)	Q1 (Low)	31%	21%	23%	25%
	Q2	28%	31%	24%	17%
	Q3	20%	31%	24%	25%
	Q4 (High)	21%	17%	29%	32%

Note: The values in the matrices above represent the percentage of funds transitioning from one quartile to another quartile in two consecutive periods. For example, in Figure 7A, the {Q4, Q2} value of 7% means that 7% of the funds classified as Q4 (high Anchor ratio) in the first period were subsequently classified as Q2 (mid-low Anchor ratio) in the next period. A high {Q4, Q4} transition percentage implies that funds with a high ratio in the past are likely to maintain a high ratio in the future; here we find the Anchor ratio measure to have a higher persistence than the Sharpe ratio measure.
Source: PGIM IAS, eVestment. For illustrative purposes only.

robustness by conducting the same analysis for the nine-year period from 1999-2007. Over this earlier time period, we found that the Q4 ➔ Q4 transition probabilities for the Anchor ratio and Sharpe ratio were in fact the same, at 39%.

Appendix A5

For those strategy groups comprising a relatively large number of funds after screening (Macro, with 118 resulting funds, and Equity Long Short, with 79 resulting funds), we also conduct the analysis at the sub-strategy level, as fund-level characteristics may vary widely.

Macro: Sub-Strategy Analysis

The Macro strategy group, which had 118 funds after screening, includes two sub-strategies (# of funds): CTA[36]/Managed Futures (55) and Discretionary Macro (45). Results for these sub-strategies are presented below, and are also included in the "Summary of Results" (Figure 7). The number of funds in GTAA[37], systematic macro, fixed income relative value and foreign exchange sub-strategies were no more than five, and were therefore excluded for reporting purposes; hence we are unable to provide specific conclusions for these sub-strategies.

Average Anchor Ratio
(USD returns, January 2008 – December 2016)
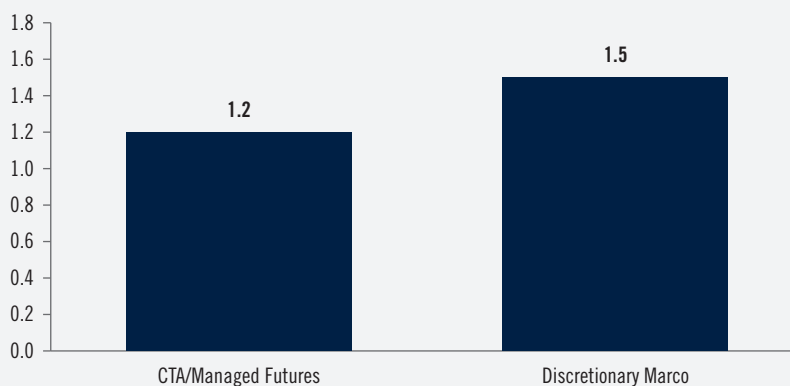
Source: PGIM IAS, eVestment. For illustrative purposes only.

Average 95% CVaR
(USD returns, January 2008 – December 2016)
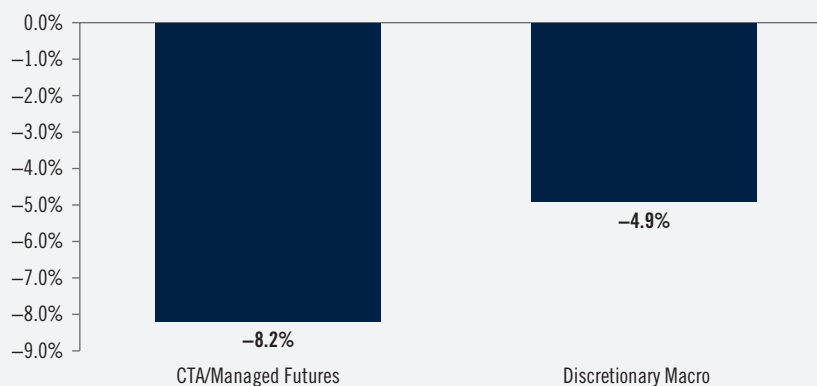
Source: PGIM IAS, eVestment. For illustrative purposes only.

36 Commodity Trading Advisors.
37 Global tactical asset allocation.

Average Downside Equity Correlation
(USD returns, January 2008 − December 2016)

0.30	
0.15	0.27
−0.15	
−0.21	
−0.30	

CTA/Managed Futures   Discretionary Macro
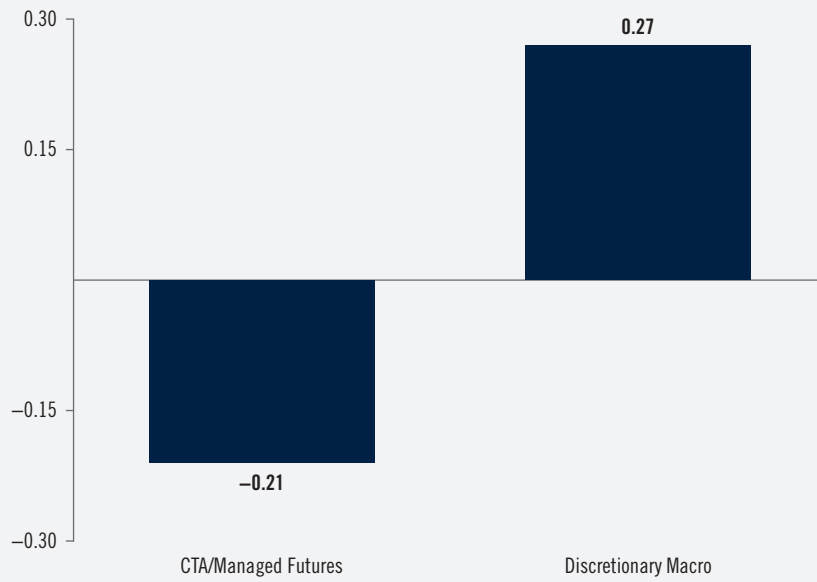
Source: PGIM IAS, eVestment. For illustrative purposes only.

Percentage of Funds in each in Anchor Ratio Quartile
(USD returns, January 2008 − December 2016)
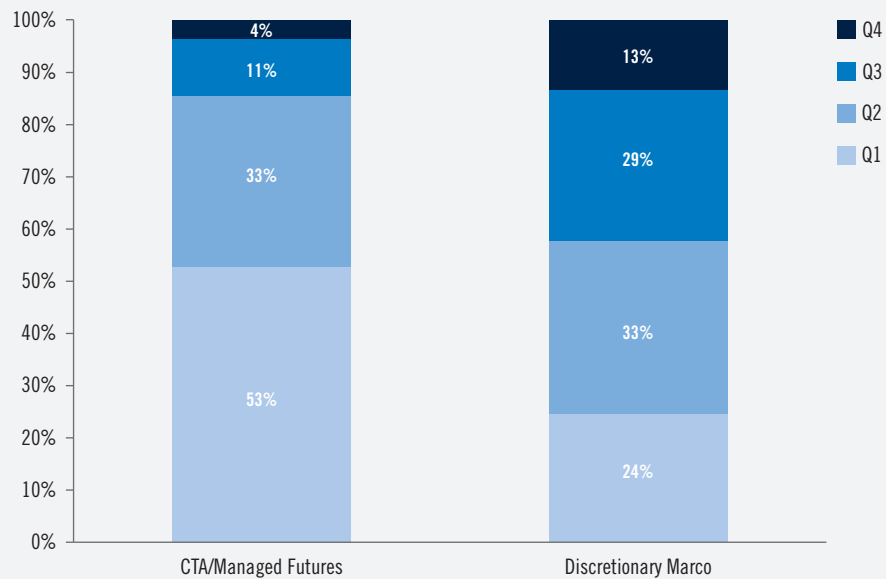
CTA/Managed Futures: Q4 4%, Q3 11%, Q2 33%, Q1 53%

Discretionary Marco: Q4 13%, Q3 29%, Q2 33%, Q1 24%

Legend: Q4, Q3, Q2, Q1

Source: PGIM IAS, eVestment. For illustrative purposes only.

Percentage of Funds in each 95% CVaR Quartile
(USD returns, January 2008 – December 2016)
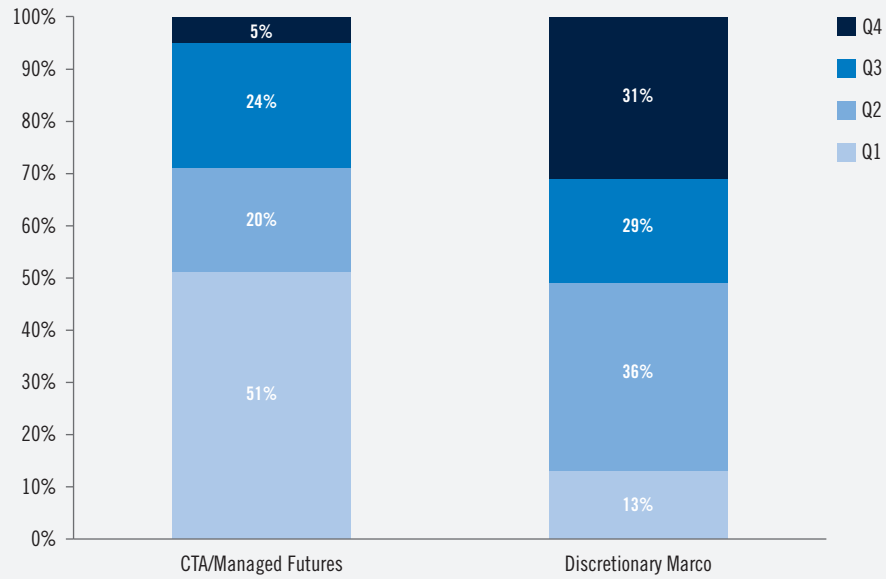
Source: PGIM IAS, eVestment. For illustrative purposes only.

Percentage of Funds in each Downside Correlation Quartile
(USD returns, January 2008 – December 2016)
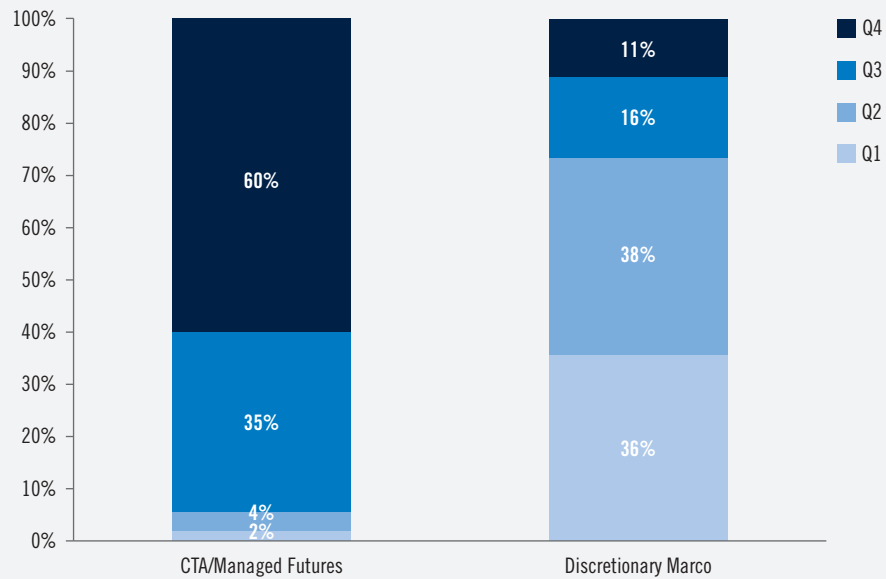
Source: PGIM IAS, eVestment. For illustrative purposes only.

Equity Long Short: Sub-Strategy Analysis

The Equity Long Short strategy group, which had 79 funds after screening (see Appendix A2), includes four sub-strategies (# of funds): Multi Strategy (13), Sector Focus (15), Market Neutral (23) and Variable Net Exposure (26). Results for these sub-strategies are presented below.

Average Anchor Ratio
(USD returns, January 2008 – December 2016)
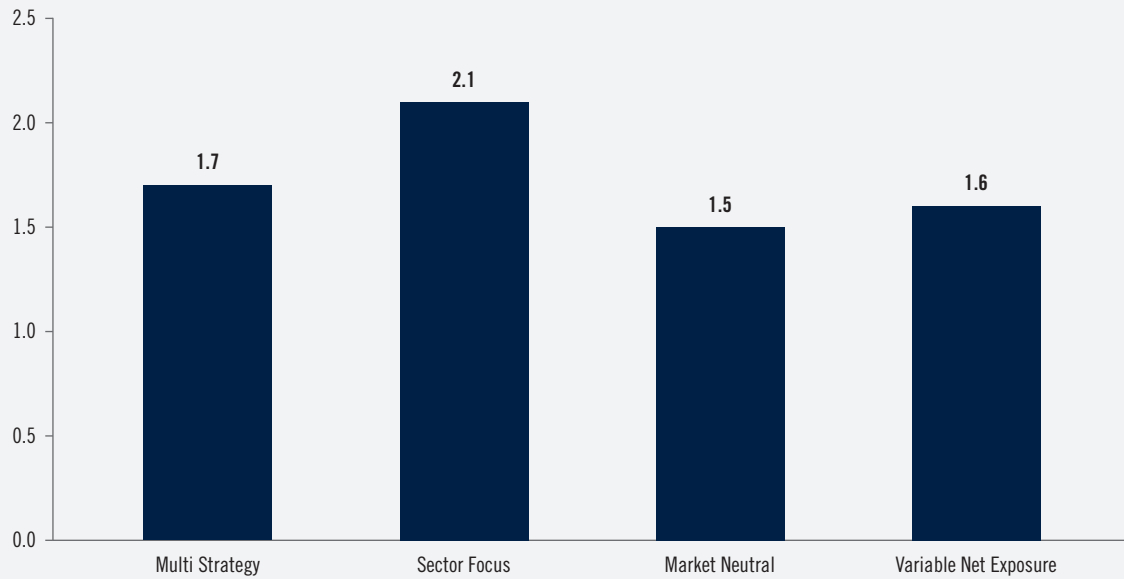
Source: PGIM IAS, eVestment. For illustrative purposes only.

Average 95% CVaR
(USD returns, January 2008 – December 2016)
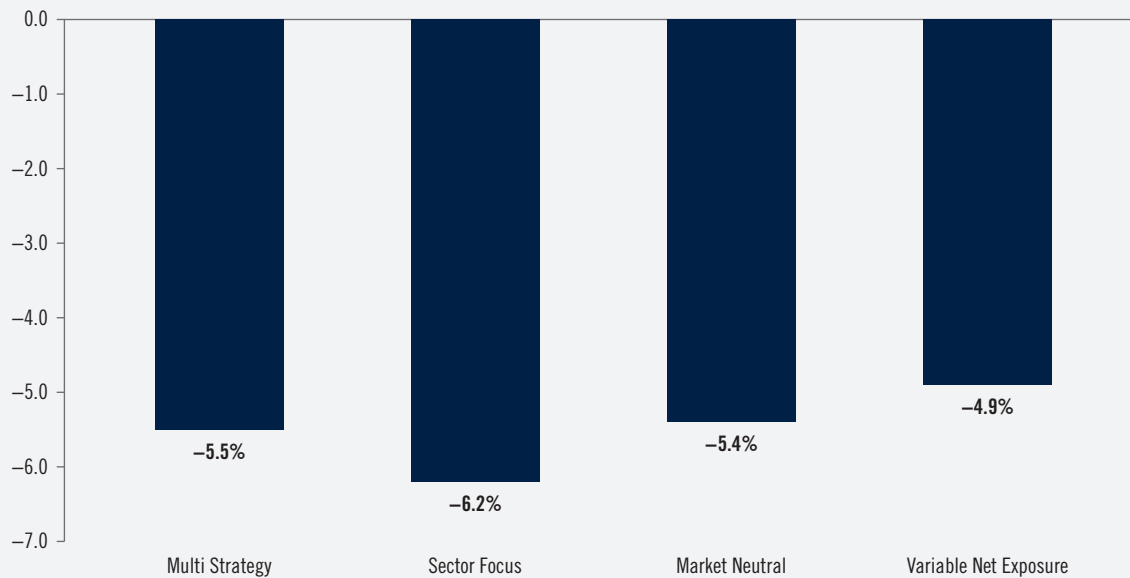
Source: PGIM IAS, eVestment. For illustrative purposes only.

Average Equity Downside Correlation
(USD returns, January 2008 – December 2016)
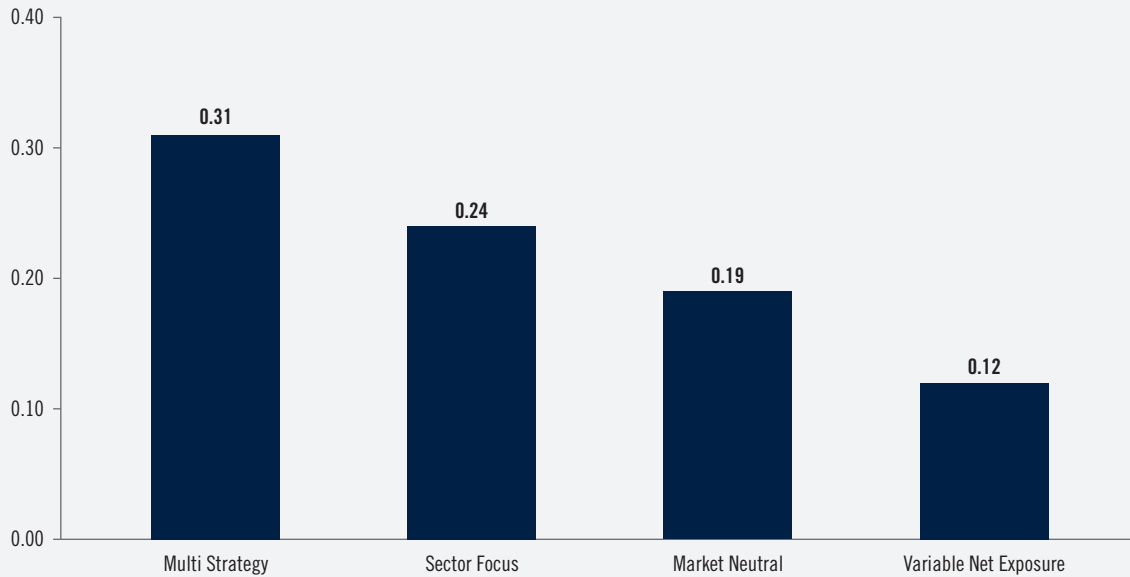
Bar chart values:
- Multi Strategy: 0.31
- Sector Focus: 0.24
- Market Neutral: 0.19
- Variable Net Exposure: 0.12

Source: PGIM IAS, eVestment. For illustrative purposes only.

Percentage of Funds in each Anchor Ratio Quartile
(USD returns, January 2008 – December 2016)

Stacked bar chart values (Q1, Q2, Q3, Q4):

	Multi Strategy	Sector Focus	Market Neutral	Variable Net Exposure
Q4	9%	15%	33%	23%
Q3	48%	38%	33%	23%
Q2	30%	31%	20%	31%
Q1	13%	15%	13%	23%

Source: PGIM IAS, eVestment. For illustrative purposes only.

Percentage of Funds in each 95% CVaR Quartile
(USD returns, January 2008 – December 2016)

Legend: Q4, Q3, Q2, Q1

	Multi Strategy	Sector Focus	Market Neutral	Variable Net Exposure
Q4	17%	—	20%	27%
Q3	22%	38%	20%	35%
Q2	35%	46%	13%	27%
Q1	26%	15%	47%	12%

Source: PGIM IAS, eVestment. For illustrative purposes only

Percentage of Funds in each Downside Correlation Quartile
(USD returns, January 2008 – December 2016)

Legend: Q4, Q3, Q2, Q1

	Multi Strategy	Sector Focus	Market Neutral	Variable Net Exposure
Q4	4%	—	20%	19%
Q3	30%	23%	7%	35%
Q2	57%	31%	47%	31%
Q1	9%	46%	27%	15%
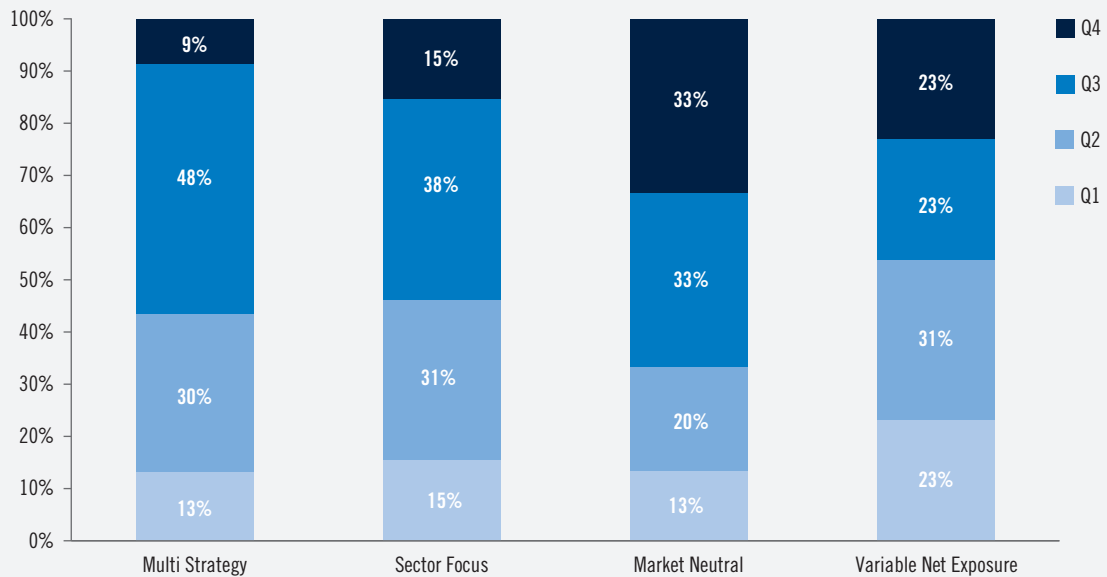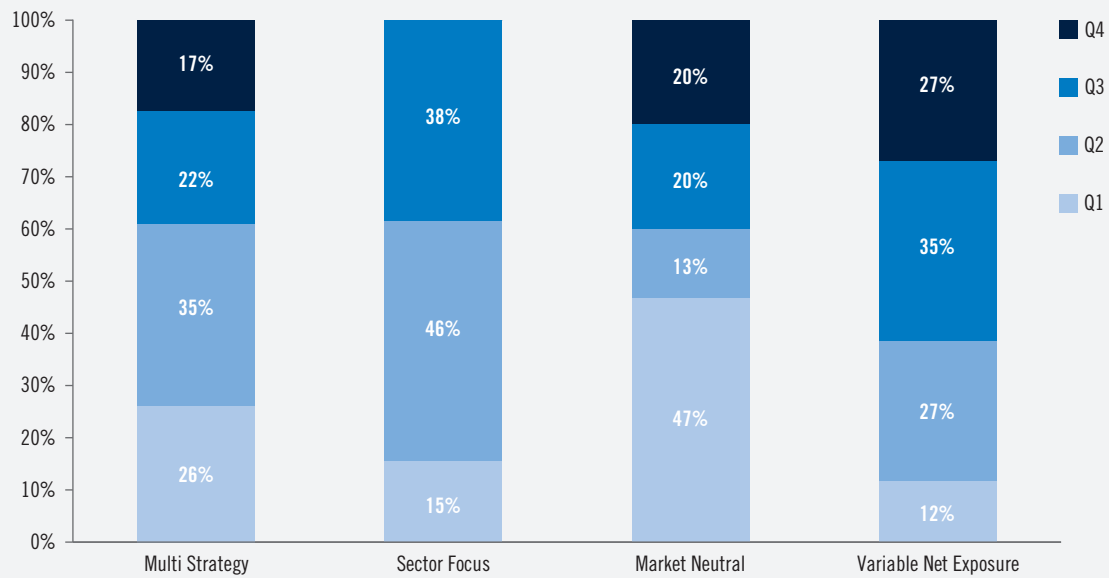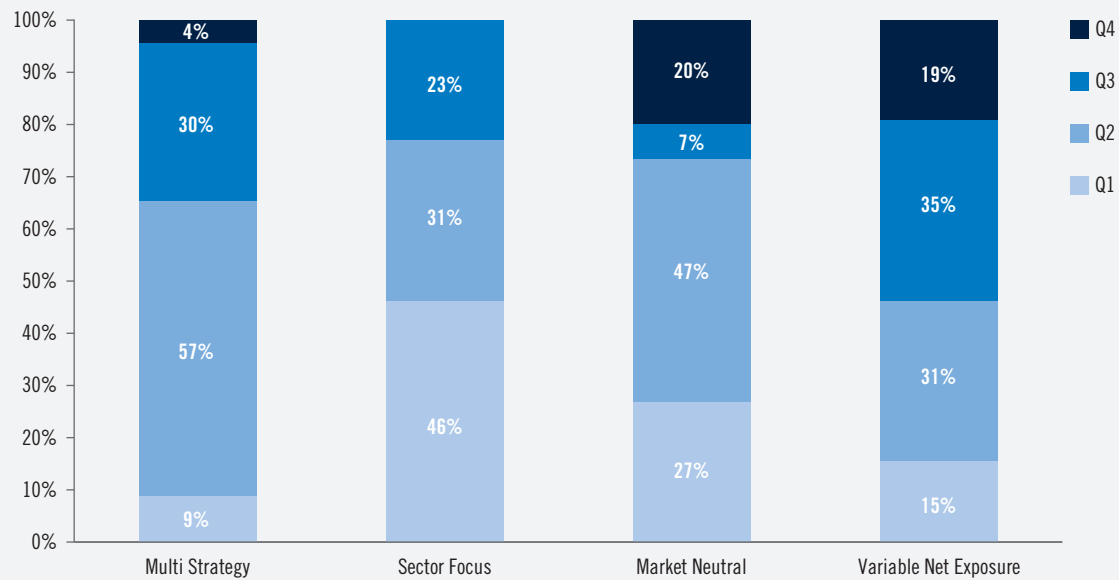
Source: PGIM IAS, eVestment. For illustrative purposes only.

Important Information