



# Board of Retirement Regular Meeting

## Sacramento County Employees' Retirement System

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### Agenda Item 14

**MEETING DATE:** March 20, 2024

**SUBJECT:** Global Equity: Manager Recommendation

**SUBMITTED FOR:**  Consent  **Deliberation** and Action  **Receive** and File

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### RECOMMENDATION

- Approve an investment of approximately \$130 million with Arrowstreet Capital LP (ACWI Alpha Extension 130/30/20 strategy) and authorize the Chief Executive Officer to execute necessary documents and agreements; and,
- Authorize Staff to determine the most effective method for transitioning assets and execute any necessary documents or agreements to effectuate the transition of assets.

### PURPOSE

This item provides a manager recommendation for the Global/Unconstrained segment of the Global Equity asset class, which the Board previously authorized as part of the 2024 annual investment plan. This item complies with SCERS' Master Investment Policy Statement implementation protocols for public equity investment managers to have Staff and Consultant perform due diligence and make investment manager recommendations to the Board for consideration and approval.

### SUMMARY

Staff and Verus recommend an investment of \$130 million into the Arrowstreet ACWI Alpha Extension 130/30/20 strategy. With the addition of Arrowstreet, the Global/Unconstrained segment will have four active allocations. The \$130 million allocation to Arrowstreet will bring the Global/Unconstrained portfolio to approximately 3.8%, close to the 4% target while potentially leaving room for an additional smaller allocation.

Arrowstreet is a quantitative, systematic manager that constructs a highly diversified portfolio of global equity securities. Arrowstreet utilizes a global forecasting model (alpha engine) to construct a portfolio designed to outperform the specific benchmark (MSCI ACWI), which is also the benchmark for SCERS' Global Equity asset class. The Alpha Extension strategies at Arrowstreet have several differentiating attributes including:

- A wide range of investment signals used to generate expected return forecasts for securities, including an emphasis on indirect effects from other related companies.

- Shorting securities to generate higher expected return and benefit from negative expected return forecasts (i.e., the “30” in the 130/30/20” nomenclature).
- Use of index futures to capitalize on and generate a higher expected return portfolio while maintaining an overall portfolio beta near 1 and minimizing tracking error risk (i.e. beta arbitrage; the “20” in the 130/30/20” nomenclature).

Despite the ability to short securities, the strategy overall seeks to maintain a beta near 1 and 100% net exposure. These attributes are similar to long only equity mandates and not like an equity long/short hedge fund strategy which will often have beta less than 1 and lower overall net exposure. Arrowstreet’s Alpha Extension strategies have been able to deliver higher returns (versus long only strategies) over time since inception.

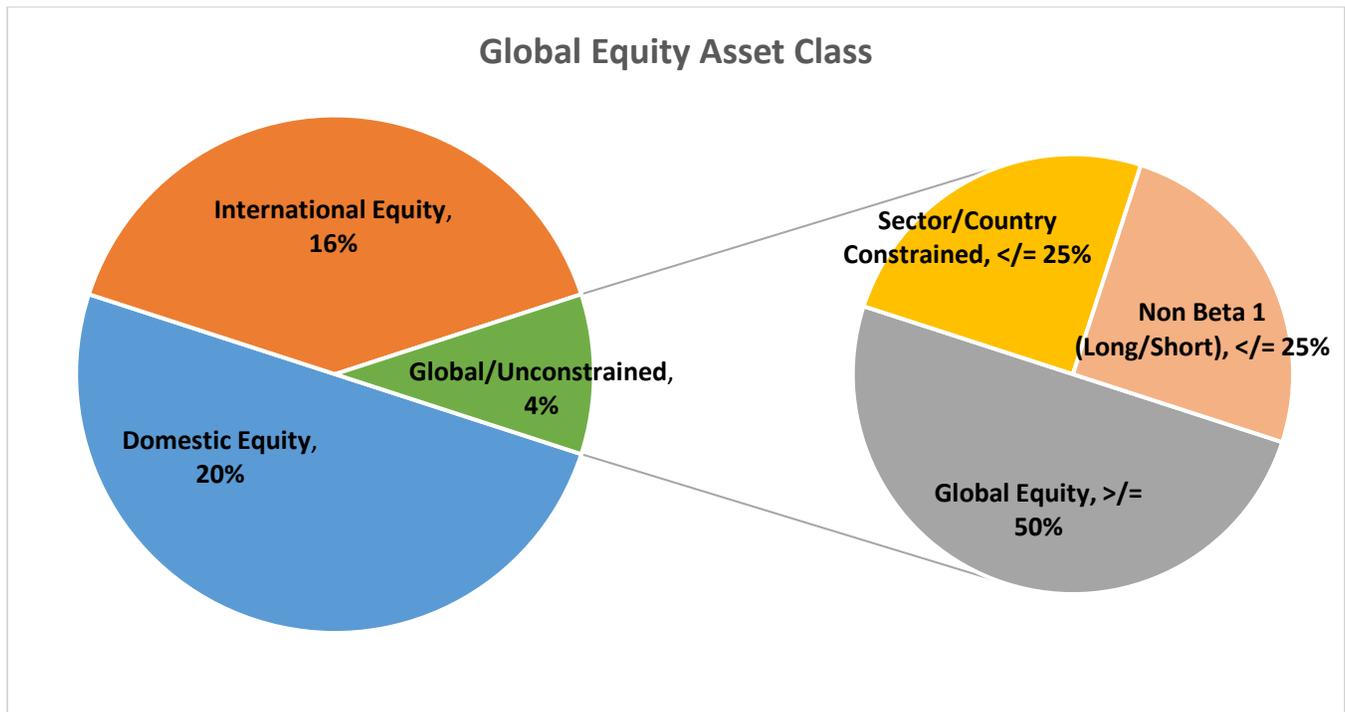
**BACKGROUND**

The investment objectives of the Global/Unconstrained Equity sub-asset class, which is a component of the Global Equity asset class, and resides within the Growth asset category, include the following:

- Enhance total fund performance.
- Invest in a diversified portfolio of global equity securities, across investment styles and market capitalizations, through externally managed strategies.
- Earn net returns in excess of equity index benchmarks, primarily from the selection of investment managers.
- Maintain reasonable levels of aggregate risk, as measured through standard deviation and tracking error.

The structure for SCERS’ Global Equity asset class and Global/Unconstrained Equity sub-asset class are presented below.

Asset Class	Target %	Range
Global Equity	40%	36% - 44%
Sub-Asset Class	Target %	Range
Domestic Equity	20%	18% - 22%
International Equity	16%	14% - 20%
Global/Unconstrained Equity	4%	1% - 6%



As part of the 2024 Annual Investment Plan presented at the November 2023 Board meeting, the Board approved Staff's objective to recommend additions to the Global/Unconstrained segment of Global Equity asset class to increase the allocation toward the 4% target. The Global/Unconstrained segment of Global Equity includes the allocation of at least 50% to Global Equity strategies and up to 50% in Unconstrained strategies. Examples of unconstrained strategies include non-beta 1 (equity long/short), sector specific, and niche strategies. The Arrowstreet Active Extension 130/30/20 strategy, which allows for shorting individual securities and incorporating index futures, has components that align with both traditional global equity strategies and unconstrained strategies. Given that the Arrowstreet Active Extension strategy overall targets a market beta of 1.0, is constructed with benchmark relative constraints, and is designed to deliver excess returns relative to the benchmark (versus being benchmark agnostic and delivering absolute returns), the strategy is a better overall fit with the Global mandates of the Global/Unconstrained sub-asset class, rather than as an Unconstrained mandate.

SCERS initially implemented the Global/Unconstrained sub-asset class with investments in fundamental long-only strategies managed by Artisan Partners and Nikko Asset Management. The strategies were each sized at \$120 million, approximately 1%, when funded in the third quarter of 2022. Per discussion with Verus, Staff determined the appropriate size of the Arrowstreet mandate should align with the fundamental strategies at approximately 1%, or \$130 million. With the target investment amount of \$130 million, the Global/Unconstrained segment would be approximately 3.8% of SCERS' total portfolio and nearly in line with the 4% target.

## **MANAGER SEARCH SUMMARY**

The manager selection process for Arrowstreet first began as identifying the manager and then evaluating the manager universe for comparable strategies. Staff has been familiar with Arrowstreet for several years, including prior public equity manager searches where the firm was a candidate. More recently, Staff had meetings in early 2023 to get re-acquainted with the firm and investment strategies. Following these early meetings with Arrowstreet, initial due diligence was performed, which highlighted the excellent performance history of the Arrowstreet global strategies and the potential fit within SCERS' Global/Unconstrained segment.

During the due diligence process, Staff evaluated several other global alpha extension strategies, including both quantitative and fundamental strategies. This process included screening of potential candidates and in-person meetings with multiple potential managers. While the universe of global alpha extension strategies is fairly limited, there were a few potential interesting managers and strategies that Staff evaluated. During the search process, Arrowstreet stood out as the top candidate, with Staff focusing due diligence efforts on Arrowstreet, including several follow-up video calls and traveling to the Arrowstreet offices in Boston.

Additionally, Verus performed investment and operational due diligence and evaluated the Arrowstreet mandate in the context of SCERS' Global Public Equity portfolio. The manager recommendation memo from Verus includes additional details on their due diligence and evaluation of Arrowstreet.

## **MANAGER OVERVIEW**

### *Firm and Team*

Arrowstreet Capital is a quantitative investment management firm founded in June 1999 and based in Boston, Massachusetts. Arrowstreet is 100% employee owned and has been managing public equity strategies for over two decades, including Global, U.S., International Developed, and Emerging Markets, in both Long Only and Alpha Extension (long/short) structures. As a firm, Arrowstreet has over \$177 billion in assets under management and has over 400 employees, including over 100 investment professionals.

The ACWI Alpha Extension 130/30/20 strategy has an inception date of July 2012. As a firm, Arrowstreet has over \$50 billion in Alpha Extension strategies, including approximately \$13 billion in the ACWI Alpha Extension 130/30/20 fund that SCERS is targeting for investment. Arrowstreet employs a quantitative, systematic, and risk-controlled approach for all of its investment strategies.

## **INVESTMENT STRATEGY**

### *Philosophy & Approach*

The Arrowstreet investment approach adheres to the "Law of One Alpha" which dictates that the investment strategy produces a single forecast per stock for a given time horizon. Following this approach allows the firm to employ a single global alpha engine (i.e. global return forecasting

model) across investment products and strategies. Utilizing a single forecasting model, the firm can then construct active portfolios designed to generate the highest risk-adjusted returns, based on specific parameters designed for each investment strategy, such as benchmark relative constraints, long/short restrictions (alpha extension strategies) and fundamental considerations (beta, volatility, ESG, etc.). Arrowstreet recognizes that the return forecasting process is dynamic in nature and is constantly conducting research to improve the accuracy of forecasts and maintain its ability to generate excess returns (alpha).

Arrowstreet utilizes a quantitative approach to generating expected return forecasts, which allows it to apply its methodology to thousands of securities on a global basis. Arrowstreet investment portfolios are highly diversified and consist of hundreds, and potentially more than 1,000, individual positions. The systematic implementation of the investment approach allows for a repeatable process over time. The Alpha Extension strategies relax the short constraint (versus long-only strategies) and allow for greater underweight to securities with negative return forecasts. Arrowstreet has conducted extensive research to ensure its forecasting models are symmetric in nature, generating successful positive and negative forecasts, versus just emphasizing excess positive returns. The short component (30%) is executed on individual securities and is expected to generate alpha, versus shorting for hedging purposes.

The Arrowstreet investment process utilizes a wide range of investment signals to generate expected return forecasts for thousands of publicly traded equity securities. Arrowstreet includes both direct and indirect effects, with a heavy emphasis on indirect effects. Direct effects represent characteristics of the company itself while indirect effects represent characteristics of other related companies that can inform the forecast for the target company. Indirect effects have specific forecasting relevance, while being less directly obvious to other investors and incorporated into current stock prices, thus increasing the future return opportunity. Arrowstreet has been incorporating indirect effects into their forecasting models since the firm's inception.

#### *Portfolio Construction*

Arrowstreet's investment approach results in a highly diversified portfolio of securities. The Alpha Extension strategies allow for shorting of securities, to generate additional alpha from short positions that have negative expected return forecasts. The portfolios are constructed on a benchmark relative basis, with specific constraints around sector, country, and style exposures. Arrowstreet incorporates expected return forecasts and portfolio constraints into an optimization process that builds the highest expected return portfolio within the expected level of risk. The portfolio is continually updated, taking into consideration security liquidity and trading costs, to incorporate changing market conditions and expected return forecasts.

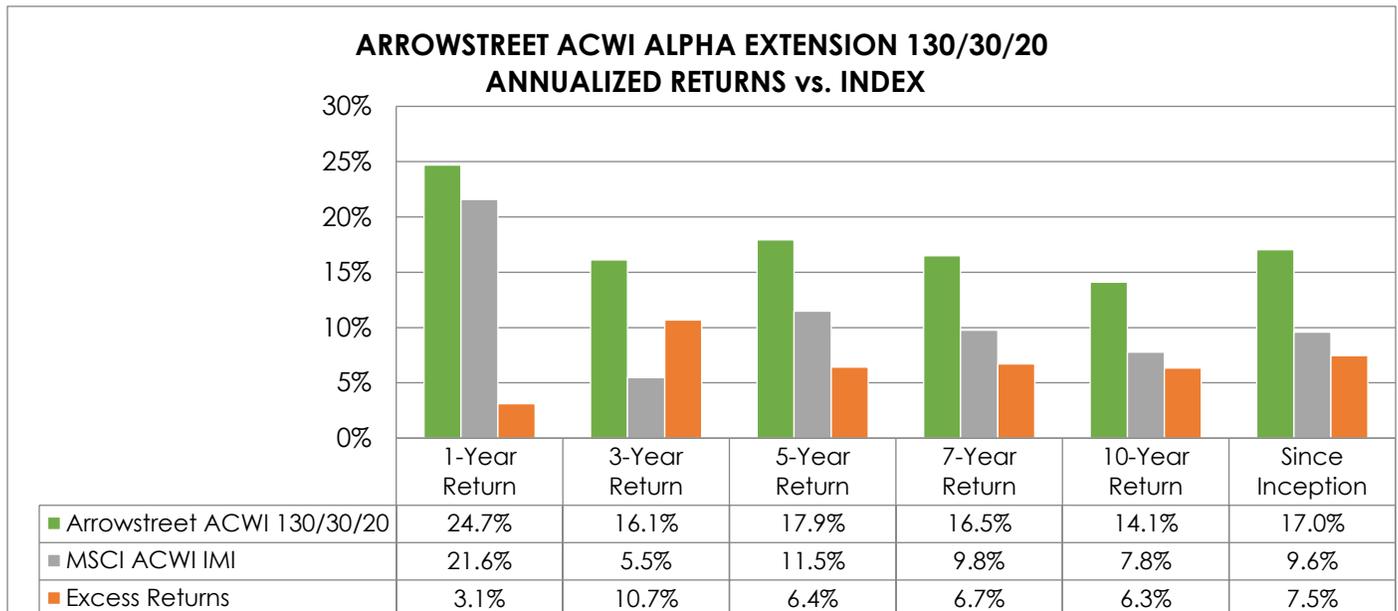
Alpha Extension strategies also incorporate a "Beta Arbitrage" component (20% reflected in 130/30/20 terminology). The Beta Arbitrage component of the strategy is implemented using futures at an index level as a way to reduce volatility. The Alpha Extension strategies often have an overall beta (a measure of volatility compared to the market) of less than 1.0, so futures are utilized to minimize tracking error risk and maintain a beta of 1.0 for the total portfolio. This component of the strategy is based on Arrowstreet's research, which shows that while higher beta at an index level tends to deliver excess returns, at an individual security selection level, lower beta securities often tend to deliver higher returns. Utilizing Beta Arbitrage, Arrowstreet

uses index futures to bring the portfolio beta closer to 1.0, by going long an index basket of higher beta stocks and shorting a basket of lower beta stocks. This allows the forecasting model and portfolio construction process to select the highest expected return portfolio, while utilizing futures to maintain a beta of 1.0 for the total portfolio.

Within Arrowstreet’s risk framework, portfolio exposure tilts are allowed to take advantage of higher return forecasts. While the portfolio will generally be style neutral across a market cycle, it can opportunistically tilt the portfolio to a particular style (i.e. value, growth, momentum, etc.) to take advantage of higher expected return forecasts. The portfolio tilts that occur are based on the expected return forecasts and portfolio construction (optimization) process, which allows for higher expected returns while still maintaining reasonable levels of risk.

**PERFORMANCE**

The Arrowstreet ACWI Alpha Extension 130/30/20 strategy has an inception date of July 2012. Over extended time periods (i.e. greater than 3 years), the strategy ranks in the top decile for Global Equity strategies<sup>1</sup>. As shown in the table below, historical performance has been outstanding, generating over 6% annualized excess returns (gross of fees) for most time periods.



Source: eVestment and SCERS, as of December 31, 2023

The strategy has delivered top decile returns with moderate levels of risk<sup>2</sup>, resulting in exceptional risk adjusted returns (Sharpe and Information Ratio). The risk adjusted performance is also represented by low downside market capture and high upside market capture, as shown in the table below. From a calendar year perspective, the strategy has exceeded benchmark

<sup>1</sup> Per eVestment, as of December 31, 2023.

<sup>2</sup> As measured by Standard Deviation and Tracking Error, relative to MSCI ACWI IMI Index

returns in 8 of the past 10 calendar years, with minimal underperformance in the two years the strategy lagged the benchmark (2019 and 2020).

<b>Risk and Efficiency Measures</b>	<b>3 Yr</b>	<b>5 Yr</b>	<b>7 Yr</b>	<b>10 Yr</b>	<b>Since Inception</b>
Standard Deviation	15.15	17.80	16.36	15.05	14.71
Beta	0.83	0.92	0.94	0.93	0.95
Sharpe Ratio	0.92	0.90	0.90	0.85	1.08
Tracking Error	7.02	5.92	5.56	5.58	5.53
Information Ratio	1.52	1.09	1.21	1.14	1.35
Upside Market Capture	110	106	114	111	117
Downside Market Capture	71	84	87	82	82

Source: eVestment and SCERS, as of December 31, 2023

**MANAGEMENT FEES**

Arrowstreet offers either a flat fee or performance-based fee structure. The recommendation is to use a performance-based fee structure for actively managed public equity investments, given the better alignment of interests and lower overall fees if the manager doesn't deliver outperformance versus the benchmark. The performance-based fee, based on SCERS' targeted investment amount, includes a management fee of 30 basis points and a 20% performance fee for returns above the benchmark. Worth noting is that overall management fees could exceed the flat management fee, which ranges from 98 to 120 basis points, but that would only occur in instances when the manager has added significant value by outperforming the benchmark. The break-even point for management fees, where the flat fee and performance-based fee structure are equivalent, is 3.50% outperformance above the benchmark<sup>3</sup>. The performance-based management fee structure also includes a high-water mark provision, so that SCERS' would not be subject to performance fees until any previous underperformance was recouped.

**TRANSITION OF ASSETS**

SCERS' Global Equity portfolio is above the 40% target allocation, at 41.6% as of February 29, 2024. The Global/Unconstrained segment is below the 4.0% target allocation at 2.8%<sup>4</sup>. With the Global Equity portfolio overweight the target allocation, the funding for the Arrowstreet mandate will come from rebalancing the Domestic and International sub-asset class segments, which are slightly above their target allocations. In addition to the rebalancing required to fund the Arrowstreet mandate, Staff will also look to raise additional funds to bring the Global Equity portfolio closer to the 40% target allocation, which will provide additional liquidity to the SCERS portfolio. The table below shows the current Global Equity allocations, estimated rebalancing amounts, and adjusted target allocations after rebalancing and funding of the Arrowstreet mandate.

<sup>3</sup> Calculated net of the 0.30% base fee under the performance-based fee structure.

<sup>4</sup> Excluding the investment in Third Point Partners, which in process of being liquidated.

	<b>Target Allocation</b>	<b>Current Allocation</b>	<b>Current %</b>	<b>Estimated Rebalance</b>	<b>Estimated Allocation</b>	<b>Estimated %</b>
Domestic Equity	20%	2,834,356,407	21.8%	(130,000,000)	2,704,356,407	20.8%
International Equity	16%	2,218,594,960	17.1%	(140,000,000)	2,078,594,960	16.0%
Global/Unconstrained	4%	358,550,318	2.8%	130,000,000	488,550,318	3.8%
<b>Global Equity</b>	<b>20%</b>	<b>5,411,501,684</b>	<b>41.6%</b>	<b>(140,000,000)</b>	<b>5,271,501,684</b>	<b>40.5%</b>

SCERS’ Staff and Consultants will continue to evaluate the equity market and cash flows needs prior to funding of the Arrowstreet mandate and adjust the estimated rebalancing amounts as necessary. It is anticipated that the accounts used for rebalancing will include a mix of passive and active mandates, focused primarily on large cap equities across domestic and international markets, which are most overweight targets due to strong performance over the previous year. Staff will provide the Board with a summary of proposed rebalancing activity as we get closer to the funding/transition date.

For rebalancing and funding of new public equity mandates, SCERS’ often utilizes the services of a transition manager to facilitate the purchase and sale of securities. The transition manager runs a pre-trade analysis to evaluate liquidity of securities and potential implementation costs, which is compared to cost estimates provided by the manager. The use of a transition manager can also help minimize impacts to performance during the implementation by equitizing cash in instances where securities have less liquidity and initial purchase of securities needs to be extended. As the Arrowstreet mandate is implemented via a commingled fund, this account will likely be funded with cash. Staff will evaluate the need to use a transition manager for the sale transactions to raise capital, which may come from a mix of commingled funds and separately managed custody accounts. The other option if a transition manager is not utilized is to have SCERS’ equity managers involved in the transition sell equity directly to raise the necessary proceeds for SCERS.

**CONCLUSION**

Staff and Verus believe that adding Arrowstreet’s ACWI Alpha Extension 130/30/20 strategy will enhance the returns of SCERS’ Global Equity asset class. Arrowstreet has managed the strategy over many years and delivered strong performance with moderate levels of risk versus the equity index benchmarks. The Board will have the opportunity to hear from Arrowstreet directly at the March Board meeting and ask any questions, prior to considering the recommendation.

Pending Board approval, and the successful legal review of fund documents and negotiation of a SCERS-specific side letter, Staff will target funding the new mandates at the end of April 2024.

**ATTACHMENTS**

- Board Order

- Verus Manager Recommendation and Search Presentation
- Arrowstreet Presentation

Prepared by:

Reviewed by:

/s/  
\_\_\_\_\_  
Brian Miller  
Senior Investment Officer

/s/  
\_\_\_\_\_  
Eric Stern  
Chief Executive Officer

/s/  
\_\_\_\_\_  
Steve Davis  
Chief Investment Officer



# Retirement Board Order

## Sacramento County Employees' Retirement System

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Before the Board of Retirement  
March 20, 2024

AGENDA ITEM:

### **Global Equity: Manager Recommendation**

THE BOARD OF RETIREMENT hereby accepts the recommendation of staff to approve an investment of approximately \$130 million with Arrowstreet Capital LP (ACWI Alpha Extension 130/30/20 strategy) and authorize the Chief Executive Officer to execute necessary documents and agreements; and authorize Staff to determine the most effective method for transitioning assets and execute any necessary documents or agreements to effectuate the transition of assets.

I HEREBY CERTIFY that the above order was passed and adopted on March 20, 2024 by the following vote of the Board of Retirement, to wit:

AYES:

NOES:

ABSENT:

ABSTAIN:

ALTERNATES:  
(Present but not voting)

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James Diepenbrock  
Board President

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Eric Stern  
Chief Executive Officer and  
Board Secretary

# Memorandum

**To:** Sacramento County Employees' Retirement System (SCERS) Board  
**From:** John Nicolini, Senior Consultant  
 Brian Kwan, Senior Consultant  
**Date:** March 20<sup>th</sup>, 2024  
**RE:** Global Equity Search and Recommendation

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## Executive Summary

In December 2021, the SCERS Board (the "Board") approved a new Global/Unconstrained equity allocation within the Global Equity asset class. As part of the build-out, Staff and Verus are recommending the Board approve the hiring of one additional manager to compliment the three existing strategies in Global/Unconstrained. Staff and Verus had been in dialogue about adding a fourth manager to round out the 4.0% allocation to Global/Unconstrained. Having two fundamental bottom-up managers in Artisan and Nikko, and a closed-end fund strategy with Allspring, we were looking for a strategy that would bring a differentiated approach. Arrowstreet is a firm that both Staff and Verus have known for years and began a dialogue with them about a global strategy mandate. Arrowstreet has a few different global equity products; the product we recommend for the Global/Unconstrained portfolio is the Alpha Extension 130/30/20. The Alpha extension approach has greater flexibility in that it can derive returns from both long and short positions and can be modestly net long or short relative to a traditional long-only strategy.

Asset Class	Target Allocation
<b>Global/Unconstrained Equity</b>	<b>4.0%</b>
Artisan Global Opportunities	~1.0%
Nikko AM Global Equity	~1.0%
Allspring Global CEF	<1.0%
Arrowstreet Global Equity Alpha Extension	~1.0%

## Search Summary

Unlike in prior manager recommendations that involved a broad universe search, Verus and Staff were already familiar with Arrowstreet and saw an interesting fit alongside the existing global equity mandates. The objectives of the Global/Unconstrained portfolio are to 1) find compelling long-only/long-biased global equity strategies; and 2) find equity strategies that don't fit directly into a particular style or capitalization box. Currently, the portfolio has two "traditional" global equity strategies (Artisan and Nikko) and one closed-end fund strategy providing uncorrelated sources of alpha (Allspring). With Arrowstreet, the portfolio would add a long-biased product with the ability to hold both long and short positions. A traditional 130/30 product can be long up to 130% but will hold an offsetting short position at 30% to target a net 100% exposure. Arrowstreet has the additional flexibility of having net exposure ranging from 80% to 120%, hence the product name of 130/30/20.

Attached to this memo is an investment due diligence summary on the Arrowstreet Alpha Extension 130/30/20 strategy and a performance book showing historical return analytics. A separate operation due diligence summary has been provided to Staff.

**Verus Summary and Recommendation**

Staff and Verus have performed and completed a thorough review of Arrowstreet Alpha Extension and are recommending to the Board an investment of \$130 million.

# Arrowstreet Capital, Limited Partnership Global Equity - ACWI Alpha Extension 130/30/20

**IQ RATING AS OF:** 02/07/2024  
**RESEARCH UPDATE:** 01/08/2024  
**PRODUCT ID:** 1539213

<b>Asset Class:</b>	Equity	<b>Verus IQ Rating:</b>	IQ1
<b>Sub-Asset Class:</b>	Global Core	<b>Flag:</b>	
<b>Strategy Inception:</b>	8/1/2012	<b>ESG Rating:</b>	B
<b>Benchmark:</b>	MSCI ACWI IMI-ND	<b>Emerging   Diverse:</b>	
<b>Performance Objective:</b>	Benchmark +5.5%	<b>Risk Objective:</b>	Tracking Error 4-5% - 8.5%

## Executive Summary

The Arrowstreet Global Equity ACWI Alpha Extension 130/30/20 product applies a quantitative process to isolate signals of inefficiently priced stocks and uses leverage to exploit mispricing of beta. Net exposure can vary between 80% and 120%. The strategy is designed to avoid systematic tilts in favor of top-down and bottom-up expectations of excess return. The risk process is designed to avoid style, factor, sector and country biases.

Verus recommends Arrowstreet as a disciplined quantitative product supported by: the focused nature of the firm; engaged investment professionals/partners; a highly active research agenda which is owned by all the firm's investment professionals; and a quantitative model that seeks to exploit the typical direct relationships between stocks as well as extended relationships that are less typical in a quantitative product.

Like any quantitative approach, the Arrowstreet product is vulnerable to exogenous shocks that cannot be forecast by the model. Mitigating this risk is the ability of the firm to dynamically adjust the risk model and also to be prepared to take advantage of wider forecast dispersion when observed. The firm is aware of the potential of AUM growth to hamper implementation of its model and is vigilant in monitoring that risk with regular and transparent capacity studies.

The Arrowstreet portfolio can be expected to perform well in stable markets driven by fundamental factors. We expect the portfolio to avoid style-driven underperformance and to perform well on a risk-adjusted basis. The portfolio may at times lean into value on a stock specific basis if that factor is rewarded. The portfolio may be challenged in markets characterized by exogenous shocks.

<b>Firm Assets:</b>	\$177,286.23MM	<b>Separate Accounts:</b>	NA
<b>Strategy Assets:</b>	\$27,157.98MM	<b>Commingled Vehicles:</b>	Available
<b>Location:</b>	200 Clarendon Street Boston Massachusetts, 02116	<b>Mutual Funds:</b>	NA
<b>Key Persons:</b>	Team managed	<b>Status (Open/Closed):</b>	Active

**Alignment - The investment product is supported by a robust and stable organizational and team structure.**

## Description

Arrowstreet was founded in July 1999 by Bruce E. Clarke, Peter L. Rathjens, and John Y. Campbell, with the assistance of seed capital from CalPERS. Arrowstreet is organized as a Massachusetts limited partnership that is wholly owned and controlled by members of the firm's senior management team and external directors. Rathjens, Campbell and Clarke currently own less than 50% of the equity in the company, and no one partner owns more than 25% of firm equity. The founding partners of the firm have slowly been diluting their equity by granting equity stakes to other partners as well as to new partners, and the total number of partners exceeds 40. Arrowstreet manages well over \$150 billion for institutional clients globally. The majority of AUM is managed in long-only and alpha extension equity portfolios in global and global ex-home country mandates.

In May 2007, the firm's senior management team entered into an agreement to repurchase the equity stakes held by CalPERS. Under this agreement, half of these interests were repurchased in May 2007 and the remaining half was repurchased in May 2008.

In March 2023, Peter Rathjens, CIO and founding partner, announced his retirement from the role of Chief Investment Officer at the end of the year. Rathjens continues to work for Arrowstreet on a part-time basis, and Derek Vance, formerly co-head of research, has assumed the CIO role. Chris Malloy has succeeded Vance as head of research. Founding partner John Campbell also retired at the end of 2023. Campbell, a member of the Harvard faculty, had been devoting one day a week to Arrowstreet and will remain involved with the firm through his role on the Board of Directors.

There is broad representation in the partnership by research professionals and portfolio management professionals who average over 15 years in the industry and over 10 years with Arrowstreet. The investment team has experienced a low amount of turnover. The firm reviews candidates for partnership annually and traditionally offers existing partners the opportunity to increase their ownership stake.

Arrowstreet's remuneration structure incorporates a competitive base salary and annual bonus opportunities. Bonus targets are set for each individual at the start of every year, and bonus payment is determined by the firm's investment performance, the firm's business performance, and individual contributions and achievements relative to established goals.

The firm conducts a systematic review of capacity on a regular basis, defining capacity in terms of AUM as a percentage of market free float by region. The firm considers its own transactions costs and trends over time to assess market impact as well as examining the portfolio's turnover, alpha conviction, and potential for style drift. Impact tends to be mitigated by the firm's efforts to pursue more efficient execution. The firm may close the strategy to new business for a period while they examine the effect of their initiatives plus overall market characteristics on the appropriate AUM threshold.

## Justification

The firm focuses exclusively on Global, US, and Non-US equity management, and multiple strategies driven by the same overall model which lends efficiency to the firm's ability to manage its asset base. We see the independent ownership structure as facilitating the partners' ability to reinvest in their own research. Research is supported by informal academic ties via partners and associates with PhD or masters degrees or who have held previous positions at Harvard or other renowned educational institutions. Ownership of the firm by over 40 employee partners aligns interest of management of the firm with investment professionals and promotes continuity among investment

professionals. We believe Arrowstreet’s rigorous and sensible management of capacity is evidence of management that is aligned with clients by not allowing AUM to grow excessively. Although the firm has closed its international and emerging markets strategies in the past, it has not closed the global strategies which represent the broadest investment universe.

**Edge - The manager has articulated an inefficiency or market-based belief that informs its process.**

Description

Arrowstreet’s philosophy assumes that markets are somewhat inefficient, and that a well-conceived investment process can generate excess returns relative to passive benchmarks. In particular, the firm believes that for information to be applicable in an investment process, it must be both relevant to share prices and slowly reflected in share prices. The firm believes the most valuable insights for forecasting equity return are often found by observing information pertaining to groups of related securities and notes this information can be exploited because it is generally reflected more slowly in share prices.

The goal is to use quantitative models to isolate signals that explain drivers of excess returns that are supported by investment theory. The team focus on understanding what information is likely to impact share prices with a predictable and measurable lag. They closely monitor the alpha signals used in the model to ensure efficacy is not diluted over time. Arrowstreet maintains an extensive research agenda looking for ways to systematically capture relationships, not only between sectors, countries and within supply chains, but also one-to-one company relationships that are not well appreciated by the market. This research approach reflects the firm’s belief that active management is an intrinsically dynamic activity and what worked in the past may work less well, if at all, in the future. The strategy seeks to avoid systematic tilts like value/growth in favor of tactical positioning based on both top-down and bottom-up expectations of excess return. All of the firm’s strategies are managed to the same philosophy, and the investment process framework has remained consistent over time.

Justification

Verus believes Arrowstreet’s quantitative approach is sensible in the way in which it exploits direct company-specific relationships impacting a stock’s price. However, the firm stands apart in its continual reinvestment in research that is grounded in investment theory and its ability to exploit indirect relationships. This has allowed Arrowstreet to incorporate features into their quantitative model that are typically the exclusive purview of a fundamental approach. We also have high conviction in the ongoing nature of their research agenda with new factors rigorously tested against the current model. Although quant models by their nature are backward looking, we believe Arrowstreet does a better job than most at ensuring the model adapts to changes in the economic and market environment, for example, examining the dispersion of their own forecasts for indications of greater opportunities and then by rebalancing more frequently to be able to exploit them. The firm also is quite transparent about its efforts to examine bouts of underperformance to determine whether the model is suffering from factors that have become arbitrated away.

**Implementation - The manager has described an investment approach which is sensible, repeatable.**

Description

The Arrowstreet investment approach is driven by its return forecasting model that is optimized for each stock’s contribution to portfolio return, risk, and transaction costs. The components of the return forecasting model are based on the experiences and insights of the senior investment professionals with high-level oversight provided by

the firm's investment committee. Investment model decisions are not made by any individual or dedicated sub-group but are derived from the collective insights and research experience of the firm's investment professionals. Portfolio managers or analysts can make suggestions regarding changes or improvements to the model and signals. Weekly round table discussions are held by the research group as a whole, and the investment committee also meets weekly to review investment ideas. The investment committee is made up of senior members of the research team and portfolio management team.

For the firm's Alpha Extension strategies, the ability to short is intended to allow the firm to express bearish views alongside bullish views over the long term. It expands the opportunity set, allowing expression of views on stocks expected to underperform as well as adding a dimension of diversification to anticipated alpha generation. The Alpha Extension strategy also allows the firm to use leverage to exploit the mispricing of beta. The firm uses long or short equity index futures on top of a portfolio invested 130% long and 30% short to manage the beta exposure and allow net exposure to vary between 80% and 120%.

A quantitative process is used to forecast equity returns. For each stock in the universe, the return forecast reflects both direct and indirect effects. Direct effects are the characteristics of the company itself, while indirect effects include characteristics of companies that are linked by virtue of common sector, country and sector/country interaction linkages. Indirect also include Arrowstreet's proprietary linkages model that identifies other related companies. The following example illustrates indirect effects: if General Motors is selling a lot of cars, it is conceivable that a brake manufacturer will sell more brakes and experience increased revenue. The expanded linkages factor explicitly forecasts the excess return contribution from this factor. Inefficiencies identified may be informational, behavioral or constraint based. This information combines to create an integrated, diversified forecast for each stock in the 25,000-stock universe on a daily basis.

A summary of each type of signal, which may be measured on a direct or indirect basis, is as follows:

- \* Valuation – identifies stocks that are under/overvalued relative to fundamentals, using multiple indicators of value.
- \* Momentum – identifies stocks expected to outperform based on a combination of slow leakage of information and speculative behavior of investors, refining basic measures by combining multiple measures of momentum.
- \* Quality – identifies companies with low risk, sustainable growth, and high profitability that justify higher long-term valuation multiples.
- \* Catalysts – identify changes in stock prices in the near term by using relatively high frequency signals. Catalysts are typically used in timing entry/exit points for longer term trades.
- \* Extreme Sentiment – identifies level of sentiment whereas momentum and catalysts relate to change in sentiment.
- \* High Frequency – identifies short-term opportunities and is useful in timing longer-term trades driven by more persistent signals

The emphasis on each investment signal will organically vary over time to reflect both changing opportunities in the market as well as Arrowstreet's assessment of prospective effectiveness. Rather than completely remove a signal from the model, Arrowstreet may upweight and downweight it at different points in time.

Portfolios are constructed by trading off a stock's expected return, its contribution to portfolio level risk, and its

estimated transaction costs. The team combines individual stock forecasts with several additional inputs in a proprietary optimization process that generates a recommended set of stocks to buy and sell. Inputs to the optimization process include expected return forecasts, expected risk forecasts, transaction costs, and the client-specified benchmark. The process also includes several explicit risk controls to correct for any systematic biases when specific styles are in favor. The team seeks to control correlation of the portfolio's value added with a number of investment styles such as value, small cap, momentum and other style exposures. These style exposures are incorporated into the portfolio construction process by seeking to control the portfolio's benchmark relative beta coefficient with respect to the global style return differential at the time of portfolio optimization. Currency is actively managed in most ACWI accounts. Certain separate accounts may take a different approach, but the commingled vehicles employ active currency management.

The portfolio typically is rebalanced four times per week, although the team may make the decision to rebalance more frequently during periods of high forecast dispersion when opportunities appear shorter-term. There also are several human checks conducted alongside the process: 1) a forecast review as a check on data used to create the forecast; 2) a pre-trade review which may generate modifications; and 3) a trading review which allows the team to make adjustments based on real-time information.

Average emerging markets exposure will generally be in line with the benchmark over long time periods but is limited to +/- 10% relative to the benchmark for both long-only and alpha extension strategies. If small cap equities are included in the investment mandate benchmark, average small cap exposure will generally be in line with the benchmark over long time periods but is limited to +/- 20% relative to the benchmark for long-only and many of the firm's alpha extension strategies.

Arrowstreet's Alpha Extension strategies also make use of futures for implementation to manage the market beta of the portfolio. The portfolio is not tightly managed to have 100% net equity exposure at all times. The portfolio can go long or short equity index futures on top of a portfolio invested 130% long stocks and 30% short stocks to manage market beta of the portfolio and allow net exposure to range from 80% to 120%. For example, if the portfolio is on average long low beta stocks and short high beta stocks, they will use a long equity index futures position to maintain a market beta close to one at the portfolio level.

Sell decisions are integrated with the return forecasting and portfolio construction process. Stocks are evaluated on a daily basis to determine if their contribution to value added has changed. Individual positions may either be sold entirely or scaled down over time, depending on how quickly the attractiveness of a security deteriorates and how its contribution to the risk management of the portfolio has changed.

#### Justification

Arrowstreet's ability to exploit direct and indirect linkages allows greater diversification in the number of types of signals the model can exploit compared to many of its quantitative peers. We believe the active research agenda, owned by the entire team including research team, portfolio managers and analysts, contributes to the continual improvement of the quantitative model. Arrowstreet's structured approach to integration of ESG elements is consistent with the overall scientific approach of the process, and we believe the product is well-placed to adapt to developments in how the market rewards (or doesn't reward) ESG factors.

#### **Optimal use of risk - The manager has an effective framework to assess and manage risk inherent in its process.**

##### Description

Arrowstreet manages the volatility and betas of return relative to benchmark in the following ways:

The team optimizes the portfolio using an objective function that penalizes the expected tracking error variance which is computed using Arrowstreet's proprietary risk model. The risk model is a factor-based model that

decomposes stock returns into two pieces, one that represents the return associated with the stock's exposure to common risk factors and one that represents an idiosyncratic stock return. The process aims to maintain idiosyncratic return while controlling exposure to common risk factors.

The team also imposes position limits to control for event risk. Rather than rely exclusively on historical volatilities and covariances, the strategy employs explicit limits on the active portfolio weights, including for individual stocks, country/sector baskets, countries, global sectors, and currencies. The limits are imposed at optimization. The positions may subsequently drift outside the limits, in which case the positions are brought in line with the limits again at the next optimization.

Additionally, Arrowstreet manages the active betas of the portfolio. For every stock, they measure a number of style betas, such as the beta with respect to overall market and the beta with respect to the performance of value strategy. They then penalize the deviations of the portfolio's average betas from the benchmark's average betas, which allows the portfolio to tactically deviate from the benchmark's style betas when investment opportunities are greater. In the absence of compelling investment opportunities along the style dimension, the optimizer produces a portfolio with style betas in line with the benchmark style betas. Arrowstreet expresses a core belief that what matters to investors as they focus on style considerations is the risk of systematic underperformance of the portfolio at times when specific styles are in favor.

The risk model is built and maintained 100% in-house and generates risk expectations for individual stocks on a daily basis. Its function is to control active risk but not total risk. Portfolio risk levels are dynamically adjusted to reflect the trade-offs between risks and returns in the marketplace. To better capture the changing risk characteristics in the marketplace, a combination of long-term and short-term measures are used to arrive at risk estimates that are stable over time but also sensitive to shorter-term changes.

For the investment process, the risk model is not just a diagnostic, but a core input into portfolio construction given that it seeks to maximize risk-adjusted returns. As such, the team pays strict attention to ensuring that the risk model accurately measures the exposure to proprietary alpha signals to avoid making large bets on strategies the optimizer would otherwise incorrectly perceive as not risky.

Over time, Arrowstreet have added ESG signals to the risk model, a stock specific measure and a country sector basket specific measure. They also have introduced risk factors based on carbon emissions and continue to research efficacy of additional ESG-based risk measures.

Arrowstreet also extend their risk management processes to the additional risks and challenges of its Alpha Extension strategy:

\* **Risks of Leverage:** The Alpha Extension funds tactically employ leverage via direct borrowing or from the use of futures. The firm is aware leverage can increase the risks of margin calls and/or forced liquidations. However, they believe the skill incorporated in their models organically provides sources of compensated risk beyond stock specific risk, which allows them to rely less exclusively on leverage as a means of return enhancement.

\* Counterparty Risk: Arrowstreet are aware of the risk of a default event at the fund’s prime broker. The firm relies on a variety of risk measures focused on market-based measures as well as credit ratings. The firm also aims to have multiple prime brokers for its funds where possible.

\* Ability to Obtain Borrows: To manage the risk that ability to short is limited by the ability of prime brokers to obtain borrows, Arrowstreet have built out a portfolio finance platform that provides portfolios access to numerous prime brokerage and shorting counterparties. They analyze the extent to which these counterparties’ individual inventories complement one another to minimize the inventory-related constraints that could arise.

#### Justification

Arrowstreet’s focus on decomposing risk into systematic and idiosyncratic components informs individual stock positions in the portfolio. The team is notable for incorporation of expected risk forecasts down to the stock level into the risk model which can be dynamically adjusted to respond to market conditions. The firm is differentiated among many of its quant peers by its deliberate allowance of style factor exposure when their alpha model suggests it will add value but controlling it at other times. Transaction costs forecasts also are explicitly included in the optimization process. We believe the firm’s attention to measuring exposure to factors as well as controlling position, sector, country, and currency risks are all indications of a robust structure of taking risk where they have skill and avoiding risk due to systematic factors.

### **Understandable Performance - Historical and future performance sensitivities are consistent with the manager’s process.**

#### Description

The Arrowstreet investment process has been designed to adapt to a wide variety of market conditions in an attempt to outperform in any market. This is done by mitigating systematic biases and by ensuring tactical tilts do not become long-term or persistent.

Arrowstreet’s investment approach is favored in market conditions where fundamentals are rewarded and which offer opportunities for Arrowstreet to take advantage of short-term misvaluation.

The strategy is challenged in markets characterized by abrupt changes to market leadership, which are difficult environments for catalyst-oriented measures such as sell-side analyst earnings signals and measures of price momentum. Poor returns to value also can neutralize one of the advantages of the Arrowstreet investment strategy; the basket-based and indirect value terms usually help identify good value plays, but if the return to conventional value itself is negative, the Arrowstreet strategy may face a headwind.

#### Justification

We believe Arrowstreet’s idea generation and portfolio construction method focusing on both direct and indirect relationships has been key to the portfolio’s steady performance in most market environments. The process is not as adept as a fundamental process might be in an environment characterized by an exogenous shock. In extreme circumstances such as the COVID crisis, the firm is candid they would only be on the right side of these events half of the time. We have been impressed by Arrowstreet’s ability to continually review their model and market

circumstances and reduce risk when necessary and take advantage of dislocation and position for opportunities as they arise.

Depending on the market conditions, the strategy would tilt to larger or smaller market capitalization stocks as well as overweight risk factors that are forecasted to outperform in the future. As a result of this approach, the Global Equity ACWI Alpha Extension 130/30/20 strategy has delivered excess returns in various market conditions. Like many quantitative strategies, it struggled in the first quarter of 2020, but then outperformed enough in the second and fourth quarters of that year to register a -0.23% underperformance for the year. While 2022 was a declining market overall due to rising interest rates and geopolitics, Arrowstreet also registered a negative return but outperformed the ACWI index with a -8.55% return versus -18.40%.

The strategy's tracking error historically has been around 5%-7%; a sign that measured risk has been consistently employed to generate returns within a strategy that employs leverage.

The 130/30/20 version of Arrowstreet's Alpha Extension capability can be considered the flagship of its strategies of this type, accounting for the largest share of AUM among its leveraged product suite and having an expected information ratio of 0.79. Other versions of the capability target higher information ratios by: 1) offering higher gross exposure (IR 0.80-0.84) or by employing greater latitude in the use of futures to manage market beta of the portfolio (IR 0.80-0.84). The firm also offers a small cap version targeting an IR of 0.93.

#### **The manager has described an integration of ESG into their investment philosophy.**

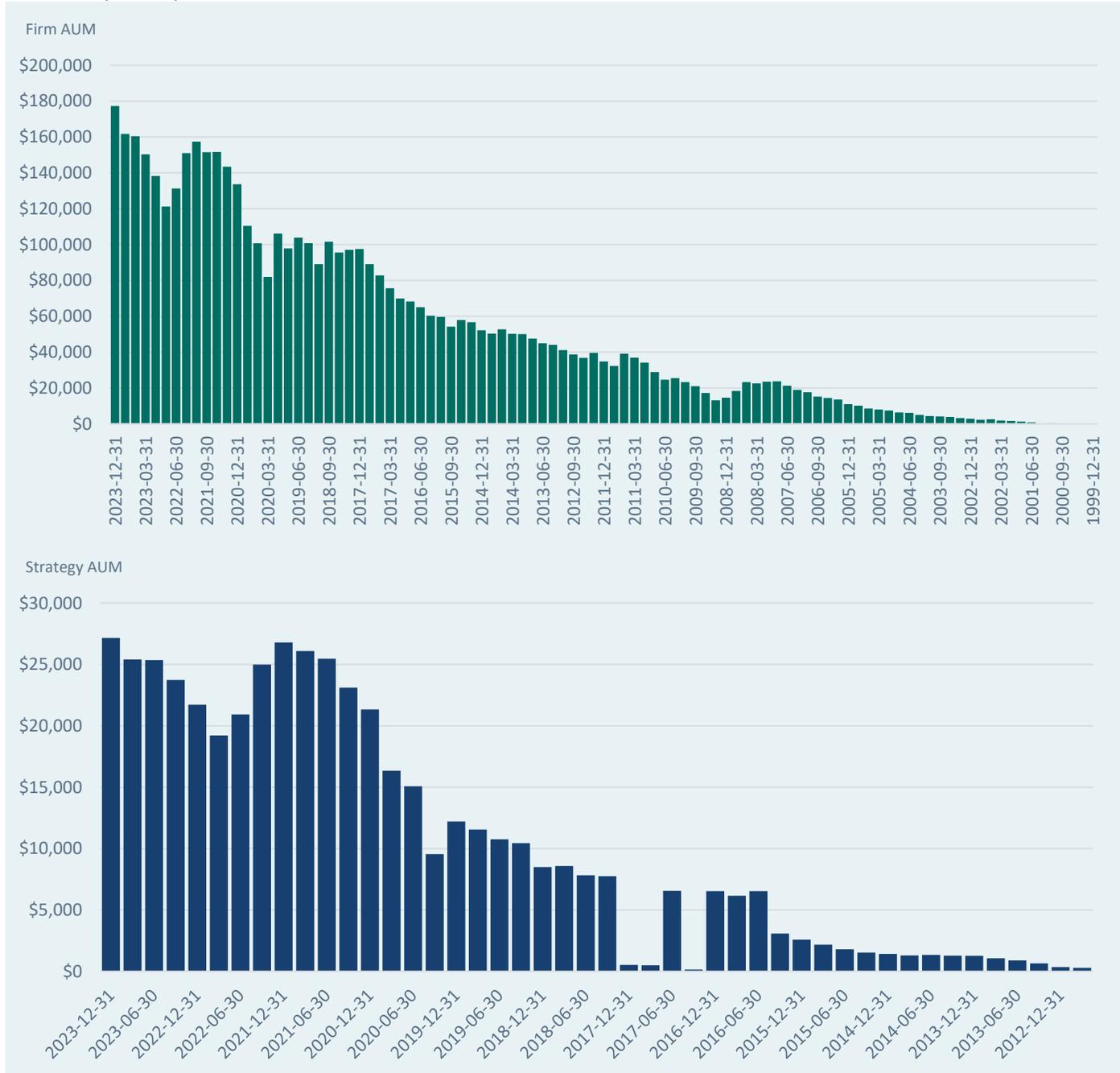
Arrowstreet have tested ESG factors for use in their forecasts and have not found any ESG signals that are additive to the factors already in the model. They see this as evidence for high correlation with the quality elements in the model that are highly correlated with governance elements. Arrowstreet have added ESG signals to the risk model, seeing benefit to the stock and basket models as well as risk factors based on carbon emissions. In their research so far, Arrowstreet have found little evidence to support the inclusion of specific ESG information in their return forecasting models, noting that ESG information that is relevant to stock prices is quickly and fully priced in. The firm continues to evaluate ESG information for potential signals that satisfy both their criteria: 1) they are relevant to stock prices; 2) they are non-obvious to other market participants. While they have seen ample evidence that ESG information is relevant to stock prices, they also find that most ESG information appears to be relatively obvious and therefore not particularly useful in forecasting stock returns. They note an exception for governance information in some emerging markets and attempt to reflect those issues in their quality signals. In any of their products, Arrowstreet have the ability to adjust the risk model to allow a client to choose the extent to which they want the portfolio to be ESG-tilted. They believe they can move the ESG tilt from 0 to 1.5-2 (on a +5/-5 scale) before seeing degradation in value added or information ratio.

Recognizing that engagement is increasingly important to some investors, the firm has partnered with Sustainabilityics on all engagement activities.

### Monthly Returns

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2023	4.78	-0.78	2.15	3.44	-2.23	5.27	1.46	-0.56	-0.69	-0.76	9.00	1.74
2022	-2.87	-2.47	2.37	-2.80	2.41	-9.50	4.54	-3.64	-9.36	7.07	9.51	-2.22
2021	1.23	3.80	5.10	5.65	2.71	1.63	3.28	3.66	-2.93	1.36	-0.92	8.05
2020	-2.49	-9.67	-13.81	12.82	4.15	3.52	4.44	5.62	-3.55	-2.70	13.34	7.07
2019	8.77	2.66	0.16	2.73	-5.00	5.17	0.74	-2.20	2.64	2.55	2.27	3.05
2018	7.39	-2.56	-2.37	1.24	-0.41	-1.71	4.55	2.20	2.21	-8.71	0.33	-6.49
2017	3.09	2.10	1.93	2.89	3.72	-0.60	2.35	3.72	1.12	5.00	2.89	2.09
2016	-6.71	-0.07	7.32	-0.20	-0.73	2.50	3.36	-2.10	1.66	-1.45	2.66	3.32
2015	-1.37	7.51	1.02	-0.65	1.60	-1.88	2.76	-6.37	-2.98	6.61	1.82	-2.66
2014	-3.96	4.68	0.56	-0.10	2.72	1.93	-1.23	-	-1.68	2.76	3.90	2.64

**AUM Growth (\$Millions)**



Author: Marianne Feeley  
 Reviewer: Colleen Flannery

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# **PERSPECTIVES THAT DRIVE ENTERPRISE SUCCESS**



**March 2024**  
Global Equity  
**Sacramento County Employees'**  
**Retirement System**

# Manager overview

# Manager comparison

## Arrowstreet: ACWI 130/30/20

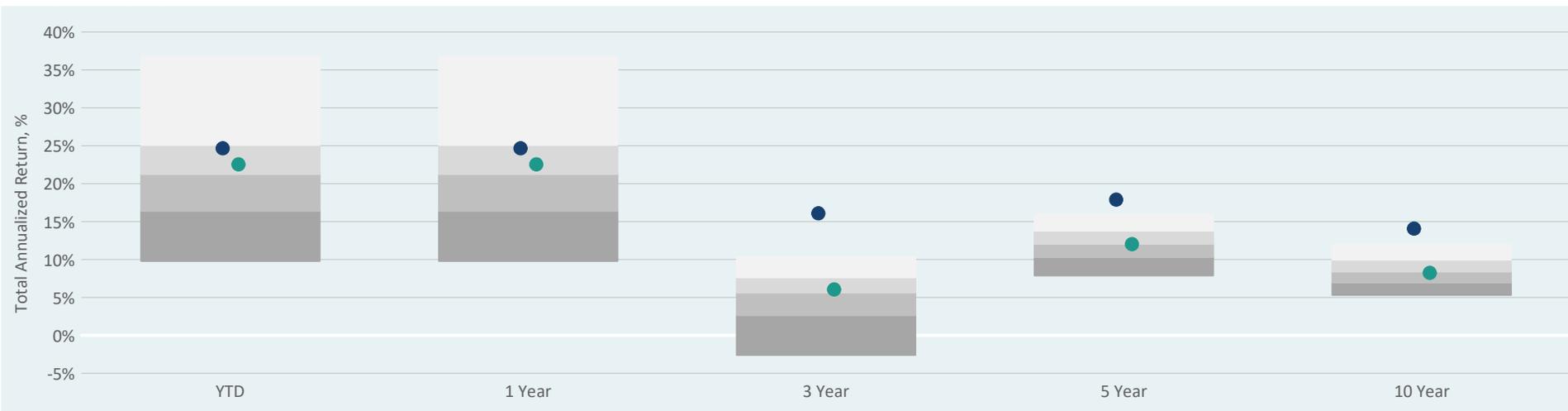
FIRM OWNERSHIP	100% employee owned
FIRM NAME	Arrowstreet Capital, Limited Partnership
PRODUCT NAME	Global Equity - ACWI Alpha Extension 130/30/20
FIRM TOTAL AUM (\$MM)	\$177,286
STRATEGY AUM (\$MM)	\$27,158
INCEPTION DATE	Aug-12
PREFERRED BENCHMARK	MSCI ACWI IMI-ND
INVESTMENT APPROACH	Quantitative
SCREENING APPROACH	Combined

# Performance Analysis

# Performance comparison - as of December 2023

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

## PERFORMANCE TO DATE

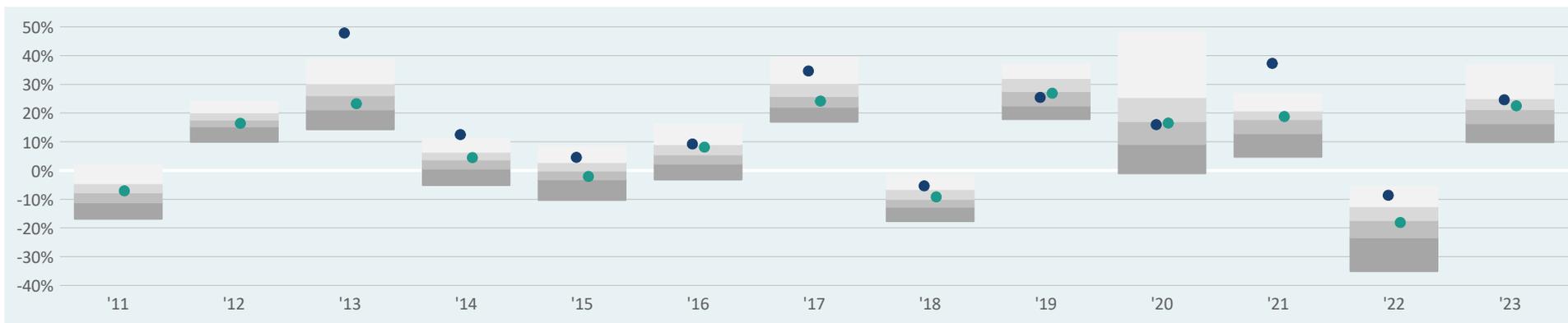


EXCESS RETURNS + RANKING	1 Year	3 Years	5 Years	7 Years	10 Years
Arrowstreet: ACWI 130/30/20	2.5	10.4	6.2	6.4	6.2
Rank	26	1	2	2	2
MSCI ACWI Index	0.4	0.3	0.3	0.3	0.3
Rank	44	44	50	53	57

# Calendar year performance

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

## ANNUAL PERFORMANCE



ANNUAL PERFORMANCE + RANKING	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023 (YTD)
Arrowstreet: ACWI 130/30/20			47.9	12.5	4.6	9.2	34.7	-5.3	25.5	16.0	37.3	-8.5	24.7
Rank			0	3	15	24	10	17	63	54	0	12	26
MSCI ACWI Index	-7.0	16.5	23.3	4.5	-2.0	8.2	24.2	-9.2	26.9	16.6	18.9	-18.0	22.6
Rank	45	62	66	42	70	29	60	42	52	52	40	53	44

# Performance summary - as of December 2023

	Arrowstreet: ACWI 130/30/20	MSCI ACWI Index
<b>PERFORMANCE ANALYSIS - (3 Years)</b>		
Alpha %	10.0	0.3
Beta	0.8	1.0
R-squared %	82.4	100.0
Sharpe Ratio	0.9	0.2
Treynor Ratio	0.2	0.0
Tracking Error %	6.9	0.1
Annualized Std Dev %	15.2	16.5
Information Ratio	1.4	4.5
Max Drawdown %	-20.2	-25.4
Calmar Ratio	0.8	0.2
Excess Ann. Return %	10.4	0.3
<b>PERFORMANCE TO DATE</b>		
1 Year	24.7	22.6
3 Year	16.1	6.1
5 Year	17.9	12.1
7 Year	16.5	10.4
10 Year	14.1	8.2
Common Inception (Aug-12)	17.0	10.0
<b>CALENDAR YEAR RETURNS</b>		
2023	24.7	22.6
2022	-8.5	-18.0
2021	37.3	18.9
2020	16.0	16.6
2019	25.5	26.9
2018	-5.3	-9.2
2017	34.7	24.2
2016	9.2	8.2
2015	4.6	-2.0
2014	12.5	4.5

# Rolling performance

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

## TOTAL 36 MONTH ROLLING PERFORMANCE



## EXCESS 36 MONTH ROLLING PERFORMANCE



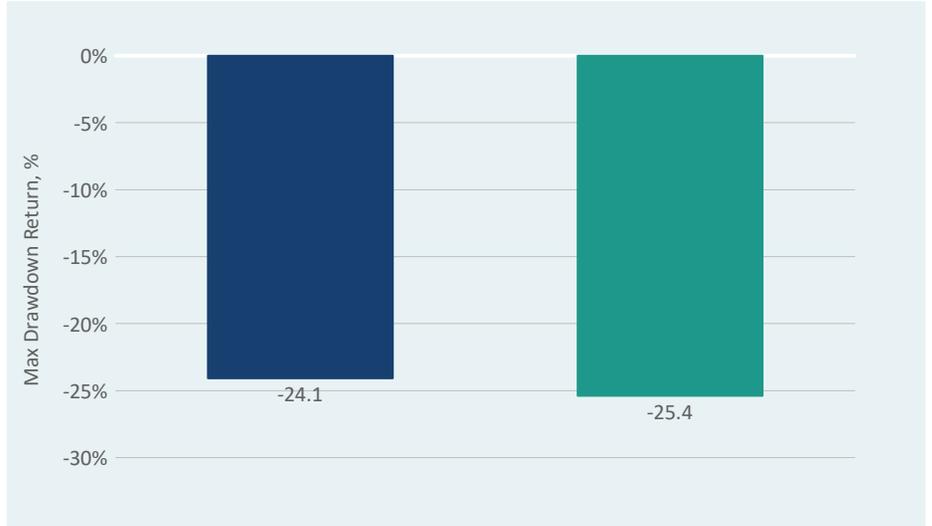
# Performance statistics

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

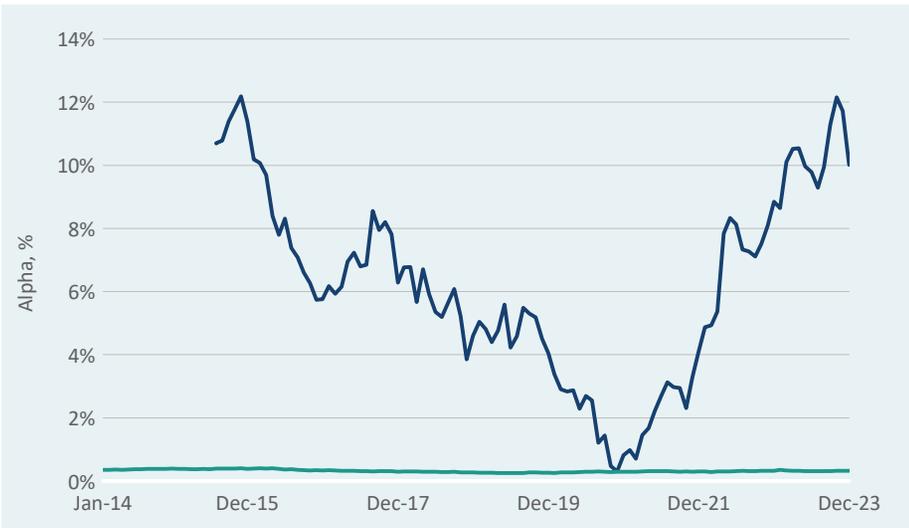
EXCESS PERFORMANCE VS. RISK, JAN-19 TO DEC-23



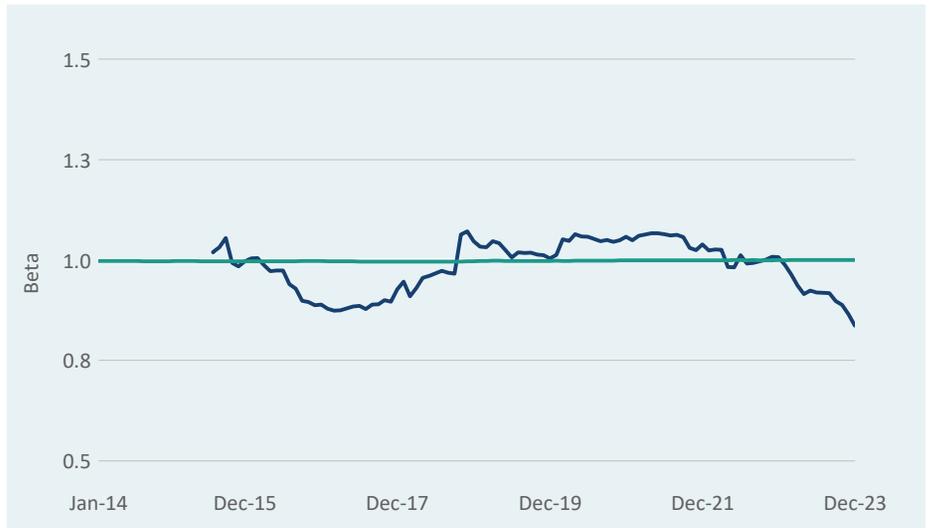
MAX DRAWDOWN RETURN, JAN-19 TO DEC-23



36 MONTH ROLLING ALPHA



36 MONTH ROLLING BETA

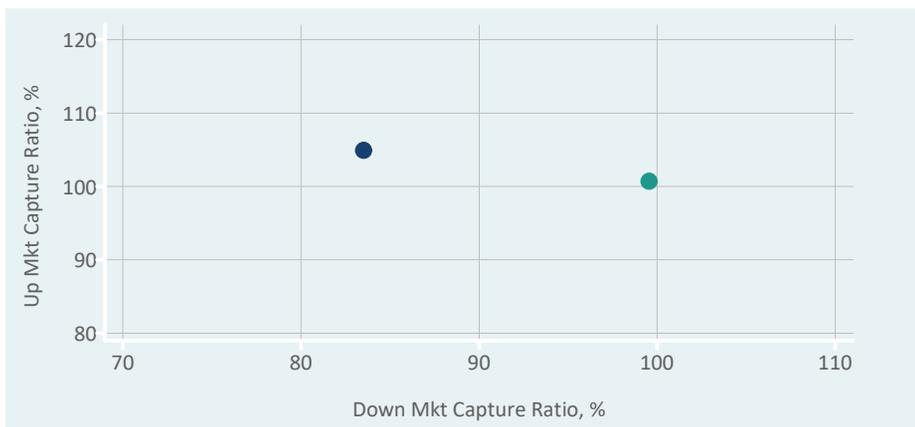


# Style Analysis and Portfolio Analytics

# Style and portfolio comparison

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

UP/DOWN MARKET CAPTURE, NOV-18 TO DEC-23



MSCI AC WORLD STYLE, NOV-18 TO DEC-23



	Arrowstreet: ACWI 130/30/20	MSCI ACWI Index
% HOLDINGS IN 10 LARGEST STOCKS	---	18.6%
ANNUAL TURNOVER	---	25.6%
CASH	-17.2%	0.2%
CURRENT DIVIDEND YIELD	2.7%	2.0%
CURRENT P/E	11.9	18.6
CURRENT P/B	1.7	2.7
PORTFOLIO HOLDINGS	1503	2983
WGTD. AVG. MKT. CAP	\$ 296,578	\$ 427,613
MAX CASH POSITION	---	---
MAX POSITION SIZE	---	---

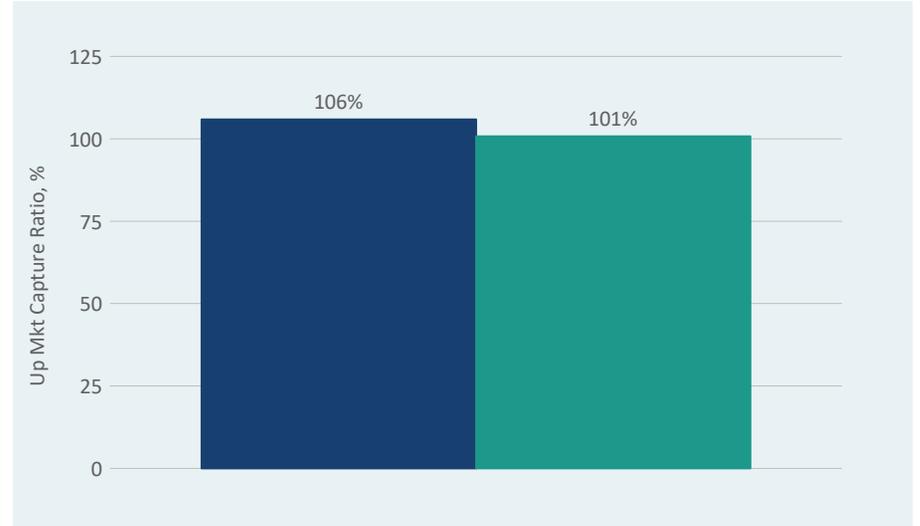
# Up & down market analysis

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

36 MONTH ROLLING UP MKT CAPTURE RATIO



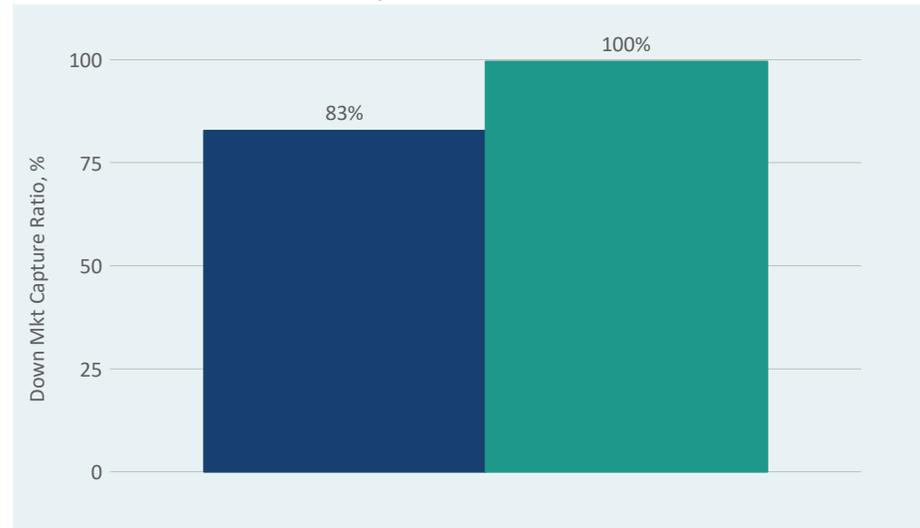
UP MARKET CAPTURE RATIO, JAN-19 TO DEC-23



36 MONTH ROLLING DOWN MKT CAPTURE RATIO



DOWN MARKET CAPTURE RATIO, JAN-19 TO DEC-23



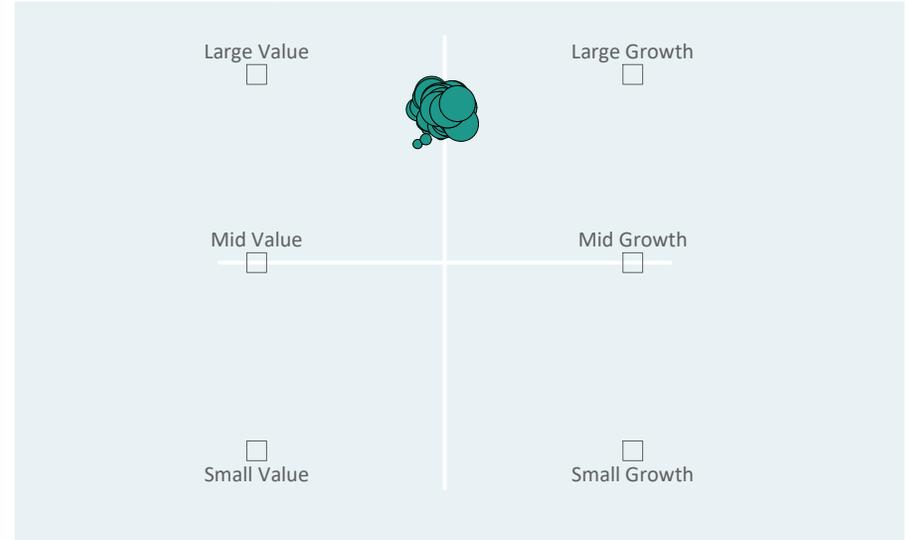
# Style analysis (MSCI AC World Style)

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

MSCI AC WORLD STYLE, FEB-13 TO DEC-23



MSCI AC WORLD STYLE, JAN-07 TO DEC-23

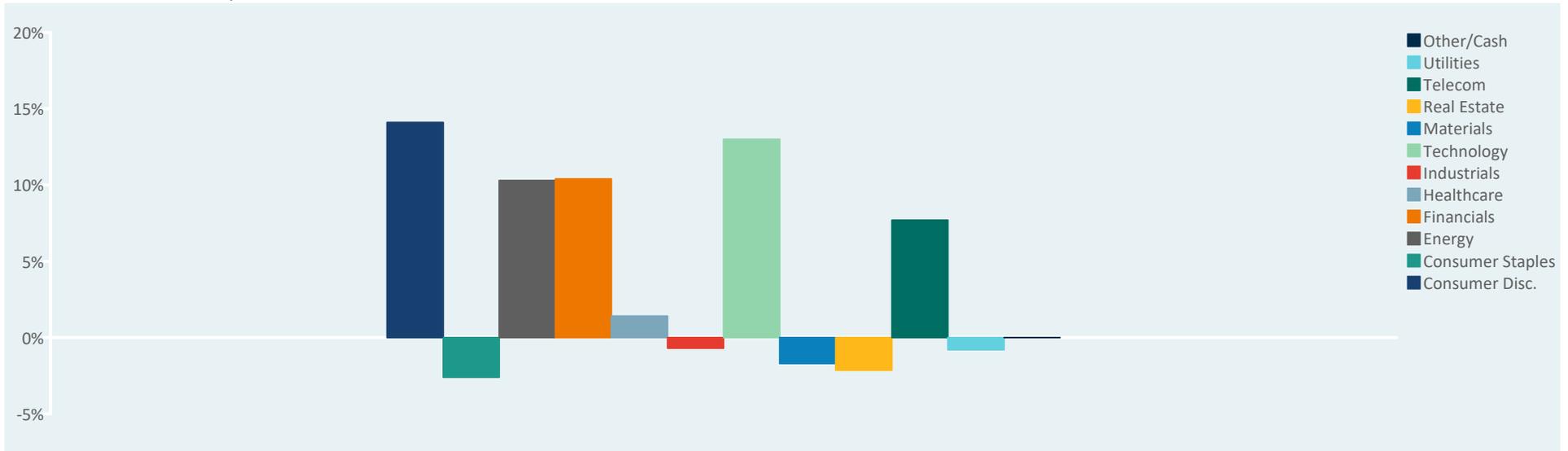


# Equity sector exposure

CURRENT SECTOR POSITION, AS OF DEC-23

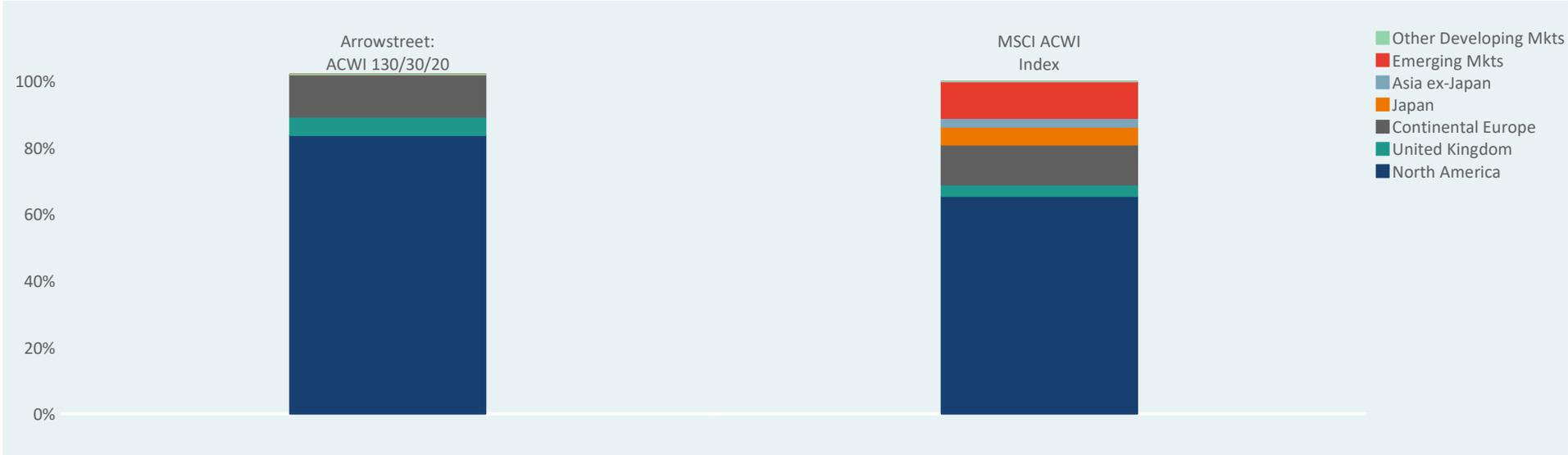


RELATIVE TO MSCI ACWI, AS OF DEC-23

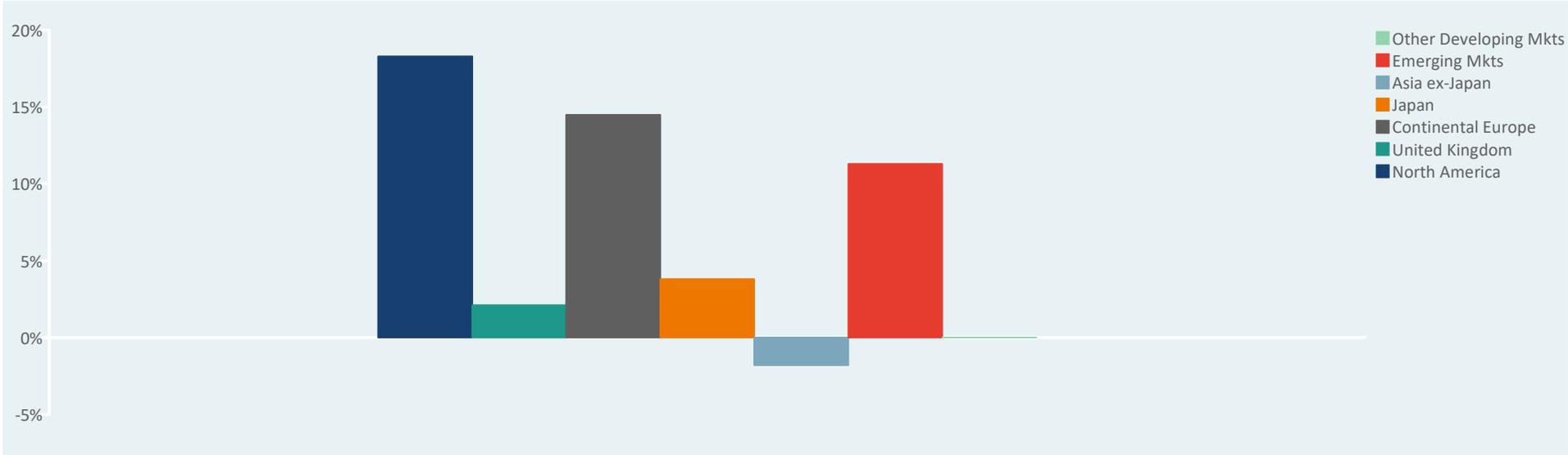


# Regional exposure

CURRENT REGIONAL EXPOSURE, AS OF DEC-23



RELATIVE TO MSCI ACWI, AS OF DEC-23



# Risk Analysis

# Correlations

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

**CORRELATION - 3 YEAR ROLLING vs. MSCI ACWI NR USD**



# Correlations

## 3 YEAR ENDING 12/2023

	Arrowstreet: ACWI 130/30/20	MSCI ACWI Index
Arrowstreet: ACWI 130/30/20	1.00	0.91
MSCI ACWI Index	0.91	1.00

## 5 YEAR ENDING 12/2023

	Arrowstreet: ACWI 130/30/20	MSCI ACWI Index
Arrowstreet: ACWI 130/30/20	1.00	0.95
MSCI ACWI Index	0.95	1.00

## 7 YEAR ENDING 12/2023

	Arrowstreet: ACWI 130/30/20	MSCI ACWI Index
Arrowstreet: ACWI 130/30/20	1.00	0.94
MSCI ACWI Index	0.94	1.00

# Excess return correlations

## 3 YEAR ENDING 12/2023

	Arrowstreet: ACWI 130/30/20	MSCI ACWI Index
Arrowstreet: ACWI 130/30/20	1.00	0.13
MSCI ACWI Index	0.13	1.00

## 5 YEAR ENDING 12/2023

	Arrowstreet: ACWI 130/30/20	MSCI ACWI Index
Arrowstreet: ACWI 130/30/20	1.00	0.15
MSCI ACWI Index	0.15	1.00

## 7 YEAR ENDING 12/2023

	Arrowstreet: ACWI 130/30/20	MSCI ACWI Index
Arrowstreet: ACWI 130/30/20	1.00	0.13
MSCI ACWI Index	0.13	1.00

# Rolling excess return correlation

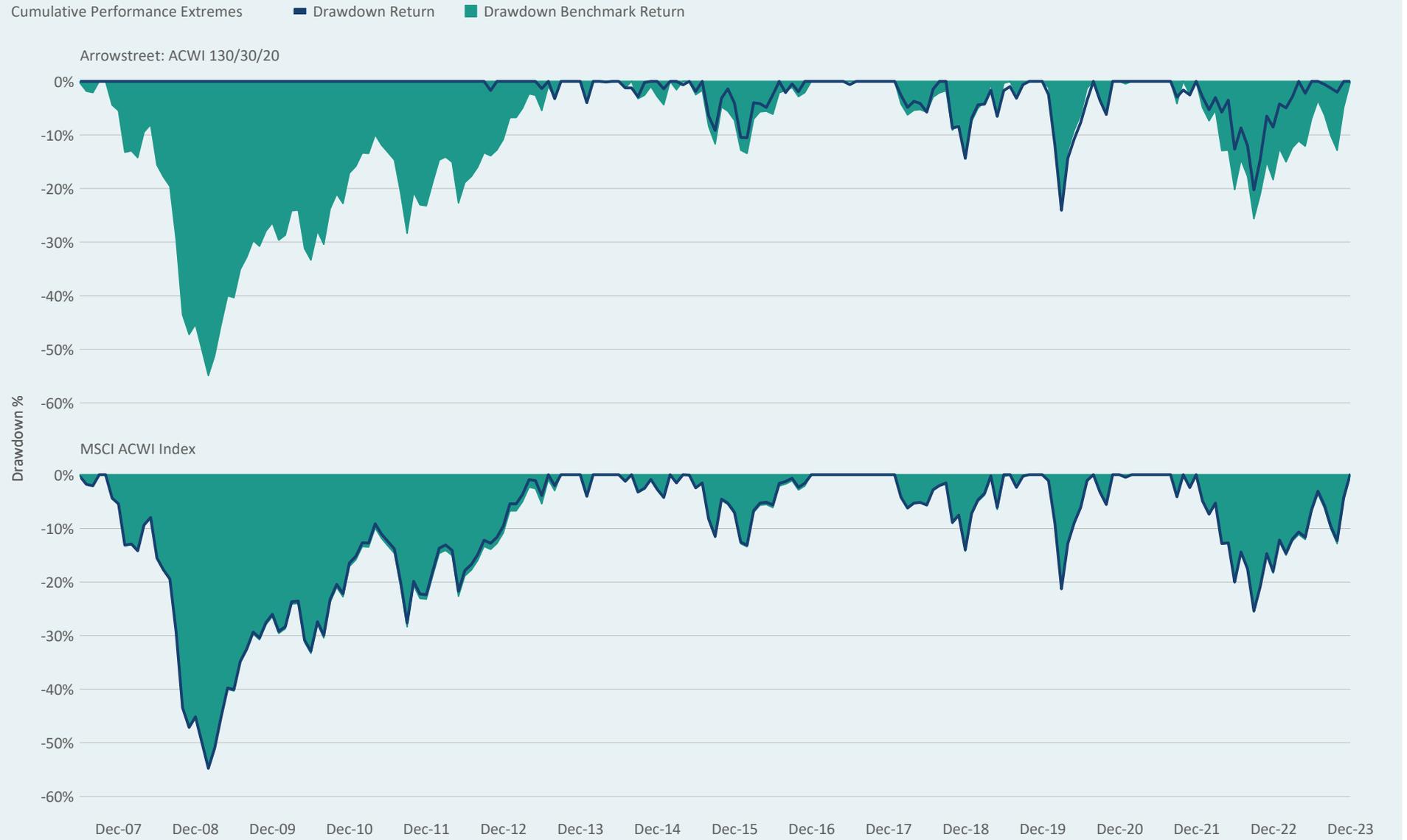
● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

## 36 MONTH ROLLING



# Historical drawdowns

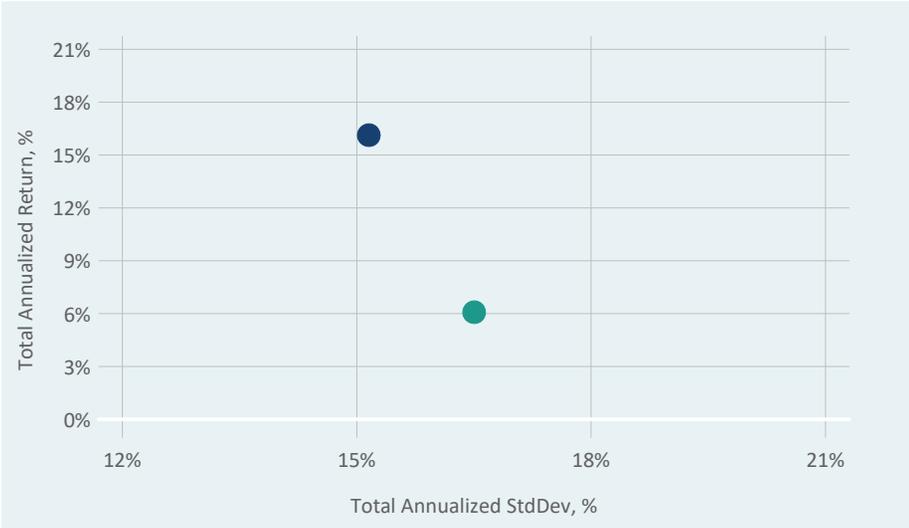
## CUMULATIVE PERFORMANCE EXTREMES



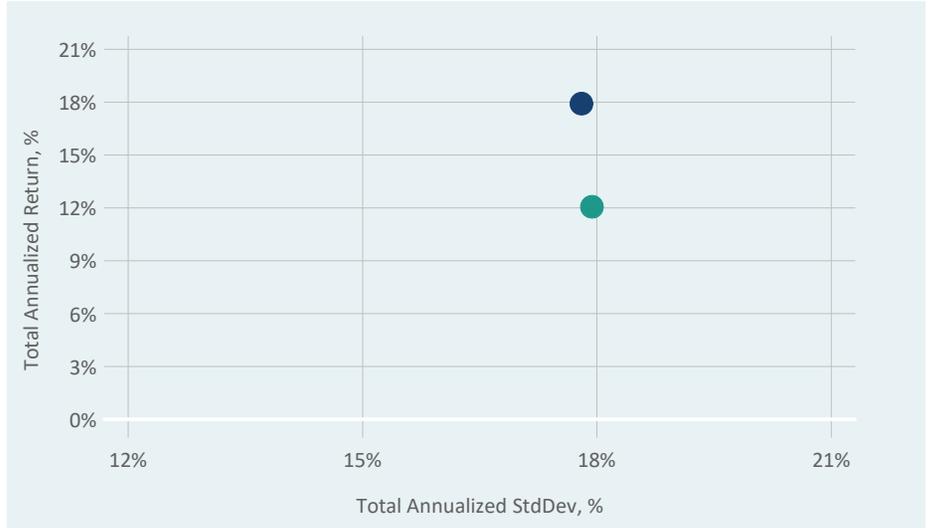
# Risk vs. return

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

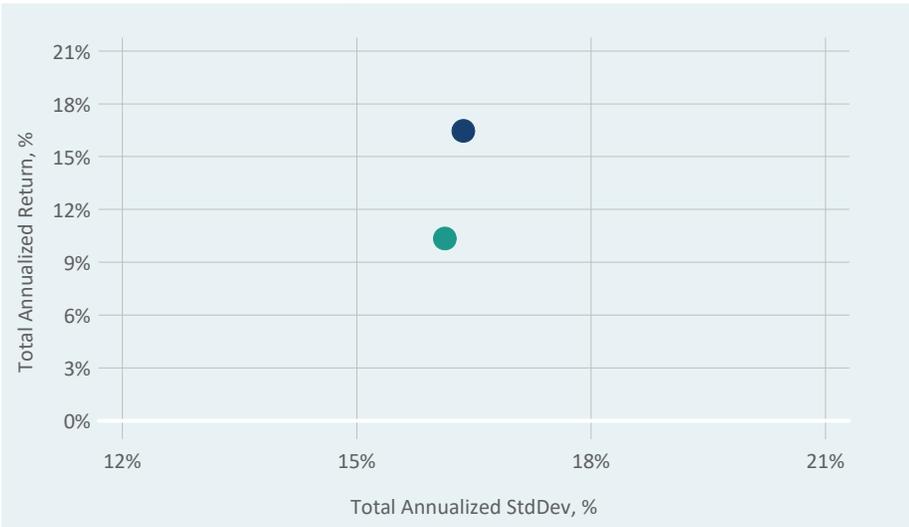
**TOTAL PERFORMANCE VS. RISK, JAN-21 TO DEC-23**



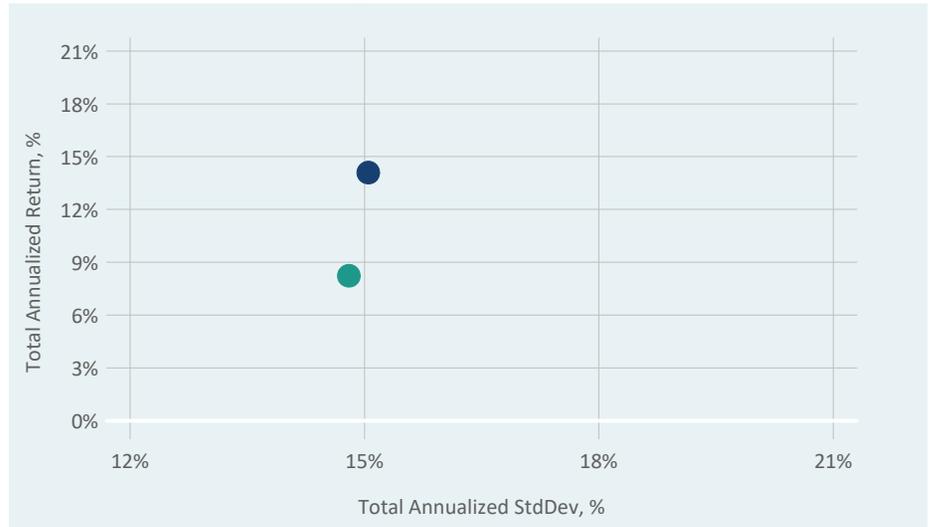
**TOTAL PERFORMANCE VS. RISK, JAN-19 TO DEC-23**



**TOTAL PERFORMANCE VS. RISK, JAN-17 TO DEC-23**



**TOTAL PERFORMANCE VS. RISK, JAN-14 TO DEC-23**



# Performance efficiency

● Arrowstreet: ACWI 130/30/20 ● MSCI ACWI Index

**EXCESS PERFORMANCE VS. RISK, JAN-21 TO DEC-23**



**EXCESS PERFORMANCE VS. RISK, JAN-19 TO DEC-23**



**EXCESS PERFORMANCE VS. RISK, JAN-17 TO DEC-23**



**EXCESS PERFORMANCE VS. RISK, JAN-14 TO DEC-23**



# Notices & Disclosures

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ARROWSTREET  
CAPITAL

A grayscale photograph of a cable-stayed bridge tower and its supporting cables against a cloudy sky. The tower is a tall, rectangular structure with a series of cables fanning out to support the bridge deck. The cables are white and create a strong geometric pattern against the dark sky. The bridge deck is visible at the bottom of the frame.

# Sacramento County Employee Retirement System

Fourth Quarter 2023



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## Section 1

### Firm Overview

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### Supporting Materials

The information set forth herein are being provided by Arrowstreet Capital, Limited Partnership (“we,”us,”our,”or “Arrowstreet”), or on its behalf by Arrowstreet Capital Europe Limited, solely for the benefit of select, qualified institutional investors for educational, informational and discussion purposes only. These materials are being provided on a confidential basis and are not intended for public use or distribution. All information contained herein is proprietary and confidential. Any reproduction or distribution of these materials, in whole or in part, or the disclosure of its contents, without Arrowstreet’s prior written consent, is prohibited. Please see Important Information and Legal Disclosures at the end of these materials.

# Arrowstreet Attendees

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**Michael Ahern, CFA**  
**Director, Business Development**

Mike is a member of the Business Development team responsible for Arrowstreet's sales, marketing and client service efforts.

Prior to joining Arrowstreet, Mike was a Senior Director of Consultant Relations and Institutional Sales at Aegon Asset Management, and prior to that he was a Senior Vice President of Business Development at KBI Global Investors. From 2011 through 2018, Mike held several roles with Manulife Financial Corporation, collaborating with institutional investors at Manulife Investment Management, and working with retail investors at John Hancock Investment Management. Mike began his career in Corporate Finance with Time Warner Cable, which was acquired by Charter Communications in 2016.

Mike received a BS in Finance from Providence College in 2010. He is a CFA charterholder.



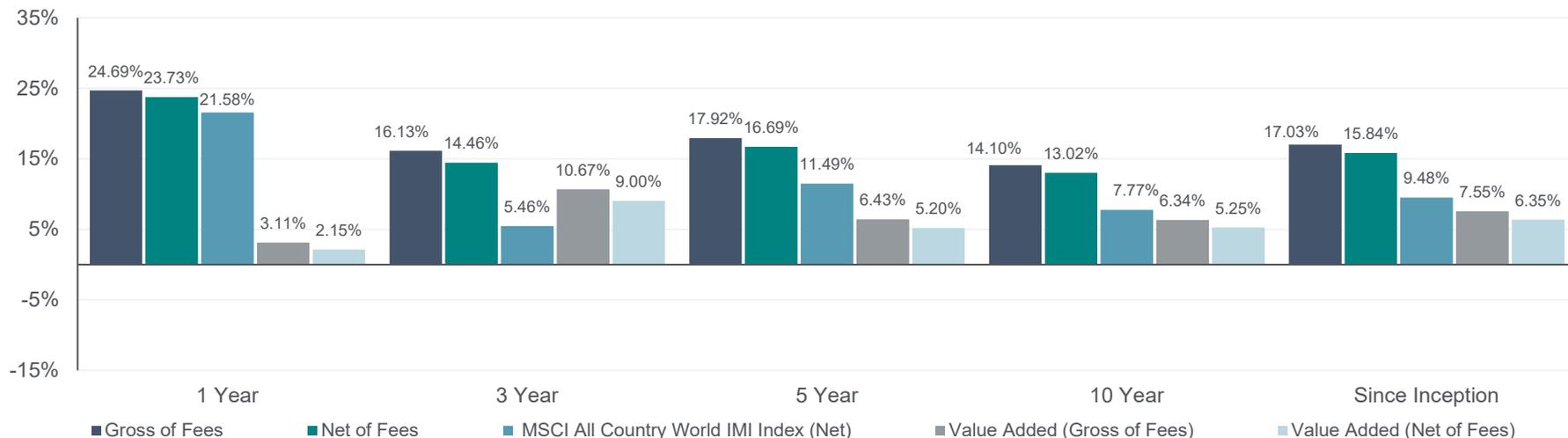
**Anne Luisi**  
**Partner, Portfolio Management**

Anne is responsible for many of the functions associated with the day-to-day implementation of the firm's investment strategies, including communicating Arrowstreet's investment approach and performance to clients, consultants, and prospective investors. Anne joined Arrowstreet in 2014 as an investment specialist and transitioned to portfolio management in 2017.

Prior to joining Arrowstreet, Anne was an investment specialist with J.P. Morgan's Private Bank from 2011 to 2014. In that role, she managed multi-asset class investment portfolios for high net worth and ultra-high net worth individuals, in addition to advising on various investment and wealth management related topics. From 2002 to 2008, Anne worked in the Investment Bank at J.P. Morgan, first as an analyst in syndicated and leverage finance, and later on the high yield credit sales team. She was responsible for the distribution of a range of leveraged credit products, including high yield corporate bonds, CDs, leveraged loans, and distressed credit, in both the primary and secondary markets.

Anne graduated from Dartmouth College with a BS in Economics in 2002. She received her MBA from the Darden Business School at the University of Virginia in 2012.

# Global Equity - ACWI 130/30/20 Strategy Composite<sup>1,2,3,11,12</sup> Performance Since Inception as of December 31, 2023



	1 Year	3 Year	5 Year	10 Year	Since Inception (08/01/2012)
Composite Total Return (Gross of Fees) <sup>4</sup>	24.69%	16.13%	17.92%	14.10%	17.03%
Composite Total Return (Net of Fees) <sup>5,6</sup>	23.73%	14.46%	16.69%	13.02%	15.84%
Benchmark: MSCI All Country World IMI (Net) <sup>7</sup>	21.58%	5.46%	11.49%	7.77%	9.48%
Value Added (Gross of Fees) <sup>8</sup>	3.11%	10.67%	6.43%	6.34%	7.55%
Value Added (Net of Fees) <sup>8</sup>	2.15%	9.00%	5.20%	5.25%	6.35%

Representative Account Statistics <sup>9, 10</sup>	Since Inception of Strategy (August 01, 2012)
Tracking Error	5.52%
Information Ratio	1.35

Source: Arrowstreet Internal Databases. Return periods greater than 1 year are annualized.

Please see the Performance Disclosures for important disclosures to be read in conjunction with the performance results presented above

# Firm Overview

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**Specialist Global Equities Manager**



**Commitment to Ongoing Research Program**



**Privately Owned**

# Senior Investment Team

**Derek Vance, CFA - Partner, CIO**  
**Joined ASC: 2008**

## Research

**Christopher Malloy, PhD**  
*Partner, Head of Research*  
 2019

**James Bothwick, CFA**  
*Partner*  
 2015

**Naveen Kartik C. K., CFA**  
*Partner*  
 2013

**Yosef Klein**  
*Partner*  
 2012

**Jonathan Kluberg, PhD**  
*Partner*  
 2015

**Tom Knox, PhD**  
*Partner*  
 2016

**Jeff Li, CFA**  
*Partner*  
 2010

**April Rathe**  
*Partner*  
 2020

**Julia Yuan, CFA**  
*Partner*  
 2012

**Yijie Zhang, PhD**  
*Partner*  
 2006

## Investment Processes

**Sam Thompson, PhD**  
*Partner, Head of Investment Processes*  
 2005

**Marta Campillo, PhD**  
*Partner*  
 1999

**Hui Wang, PhD**  
*Partner*  
 2012

## Investment Services

**Katie McHardy**  
*Partner, Head of Investment Services*  
 2010

**Joe Tiano**  
*Partner*  
 2014

## Investment Analytics

**Rachel Xiao**  
*Partner, Head of Investment Analytics*  
 2016

## Portfolio Management

**Manolis Liodakis, PhD**  
*Partner, Head of Portfolio Management*  
 2012

**Brandon Berger**  
*Partner*  
 2013

**John Capeci, PhD**  
*Partner*  
 1999

**Harry Gakidis, PhD**  
*Senior Director*  
 2022

**Anne Luisi**  
*Partner*  
 2014

**Jonathan Noel**  
*Partner*  
 2015

**Alex Rodin, CFA**  
*Partner*  
 2016

**Zach Vernon, CFA**  
*Partner*  
 2008

**Michael Zervas, CFA**  
*Partner*  
 2004

**Peter Rathjens, PhD - Partner, Former CIO**  
**Co-Founded Arrowstreet: 1999**

**Average Industry Experience: 19 Years**

**Average Tenure with Arrowstreet: 12 Years**

**Supported by 97 Additional Investment Team Members**

Note: Year denotes when team member started at Arrowstreet.  
 As of December 31, 2023

# Assets Under Management

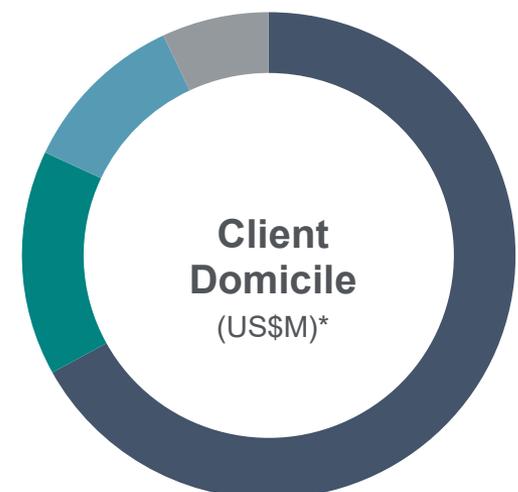
— US\$177,286M —



\$124,545	■ Global Equities
\$42,167	■ Non-US Equities
\$8,157	■ Emerging Markets Equities
\$2,418	■ US Equities



\$120,048	■ Long-Only Equities
\$52,744	■ Alpha Extension Equities
\$3,575	■ Beta Neutral Equities
\$919	■ 250/150 Alpha Extension Equities



\$118,725	■ United States
\$26,489	■ EMEA
\$19,527	■ Asia-Pacific
\$12,444	■ Canada

Data as of December 31, 2023.  
 \*Top four Client Domiciles by AUM.  
 Figures presented above are in USD.  
 Source: Arrowstreet Internal Databases.

# Representative Clients - By Type



## Corporations

American Honda

Boeing

Caterpillar

Eastman Kodak

Hewlett-Packard

Raytheon Technologies

Southern Company

Trans-Canada Capital



## Endowments & Foundations

Calgary Foundation

Casey Family Programs

Iowa University Board of Regents

Nuffield Foundation

University of Washington

The University of Texas/Texas  
A&M Investment Management  
Company (UTIMCO)



## Financial Services

Annuitas Management

Blue Sky Group

Macquarie Bank



## Health Systems

BCBS of Michigan

CommonSpirit Health

Elevance Health

Geisinger Health

Kaiser Permanente

Prisma Health



## Public Plans

CalPERS

Illinois Municipal Retirement  
Fund

Indiana Public Retirement  
System

Missouri Education Pension Trust

New York State Teachers'  
Retirement System

Ohio Public Employees  
Retirement System

Oregon State Treasury

Sonoma County Employees'  
Retirement Association

State Teachers Retirement  
System of Ohio

Teacher Retirement System of  
Texas

Virginia Retirement System

Selection Criteria: For illustrative purposes. Representative clients are chosen due to their recognition in the marketplace. It is not known whether the listed clients approve or disapprove of Arrowstreet or the advisory services provided by Arrowstreet.

# Investment Strategies Overview

Strategy	Preferred Benchmark <sup>7</sup>	Strategy Inception Date	Strategy AUM (US\$M)	Target Value Add (Gross) <sup>13</sup>	Target Value Add (Net) <sup>13</sup>	Target Tracking Error Range <sup>9</sup>	Target Information Ratio <sup>9</sup>
<b>Long-Only Equities</b>							
Global Equity – ACWI	MSCI ACWI IMI Index (Net)	Feb-06	\$55,980	3%	2.25%	3-7%	0.55
Global Equity – ACWI Low Active Risk	MSCI ACWI IMI Index (Net)	Nov-22	\$2,039	1%	0.76%	1-3%	0.67
Global Equity – ACWI Universal	MSCI ACWI ESG Universal Index (Net)	Feb-23	\$77	3%	2.25%	3-7%	0.55
Global Equity – Min Vol	MSCI ACWI Min Vol Index (Net)	Dec-09	\$2,410	3%	2.35%	3-7%	0.55
Global Equity – World	MSCI World IMI Index (Net)	Aug-01	\$18,094	3%	2.25%	3-7%	0.55
Global Equity – World Low Carbon	MSCI World Low Carbon Target Index (Net)	Oct-22	\$994	3%	2.25%	3-7%	0.55
US Equity	Russell 3000 Index (Net)	Sep-17	\$594	2%	1.55%	2.5-6.5%	0.4
<b>Alpha Extension Equities</b>							
Global Equity – ACWI 130/30/20	MSCI ACWI IMI Index (Net)	Jul-12	\$27,158	5.5%	4.12%	4.5-8.5%	0.79
Global Equity – ACWI 150/50/60	MSCI ACWI IMI Index (Net)	Jan-20	\$1,974	8%	6.04%	6-12%	0.84
Global Equity – ACWI Min Vol Alpha Ext	MSCI ACWI Min Vol Index (Net)	Sep-19	\$389	5.5%	4.12%	4.5-8.5%	0.79
Global Equity – ACWI Reduced Carbon Alpha Ext	MSCI ACWI Climate Paris Aligned Index (Net)	Jun-21	\$529	5.5%	4.12%	4.5-8.5%	0.79
Global Equity – World Alpha Ext	MSCI World IMI Index (Net)	May-08	\$4,588	5.5%	4.12%	4.5-8.5%	0.79
Global Equity – World ESG Min Vol Alpha Ext	MSCI World Min Vol ESG Reduced Carbon Target Index (Net)	Sep-21	\$378	5.5%	4.12%	4.5-8.5%	0.79
US Equity Alpha Ext	Russell 3000 Index (Net)	Sep-18	\$526	3.5%	2.6%	3.5-7.5%	0.58
US Equity Small Cap Alpha Ext	Russell 2000 Index (Net)	Sep-18	\$379	3.5%	2.56%	3.5-7.5%	0.58
<b>250/150 Alpha Extension Equities</b>							
US Equity 250/150 Alpha Ext	S&P 500 / MSCI USA IMI Index (Net)	Sep-22	\$919	8%	5.44%	6.5-10.5%	0.94
International Equity 250/150 Alpha Ext	MSCI ACWI ex USA IMI Index (Net)	Jan-24	*	8%	5.44%	6.5-10.5%	0.94
<b>Beta Neutral Equities</b>							
Global Equity – Beta Neutral	FTSE 3-Month Treasury Bill Index	Jan-14	\$3,295	9%	6.24%	7-11%	1
Global Equity – ESG Beta Neutral	FTSE 3-Month Treasury Bill Index	Jun-19	\$280	9%	6.24%	7-11%	1

Data as of December 31, 2023.

\*The International Equity ACWI ex US 250/150 strategy launched on 1/02/2024 with approximately US\$39M in assets.

Please see the Performance Disclosures at the end of this presentation for important disclosures to be read in conjunction with the performance results presented herein, including disclosures with respect to Target Value Add and hypothetical performance. There can be no assurance any target will be achieved. Actual results may vary.

Figures presented above are in USD. Source: Arrowstreet Internal Databases.



## Global Equity - ACWI Alpha Extension

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# Strategy Objectives

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## Consistently Outperform Broad Global Indices

Target Value Add<sup>13</sup> (Gross of Fees): 5.5% Per Year Over a Full Market Cycle

Target Value Add<sup>13</sup> (Net of Fees): 4.12% Per Year Over a Full Market Cycle

(Full Market Cycle defined here for this purpose as 5 to 7 years)

Target Tracking Error Range<sup>9</sup>: 4.5%-8.5% Per Year



## Investment Characteristics

Broadly diversified, style neutral

Long-term Market Beta Expectation: Close to benchmark

Portfolio Exposure:

- Target gross equity exposure expected to be approximately 160-180%
- Target net equity exposure expected to be approximately 80-120%



## Diversification from Other Managers

# Portfolio Construction

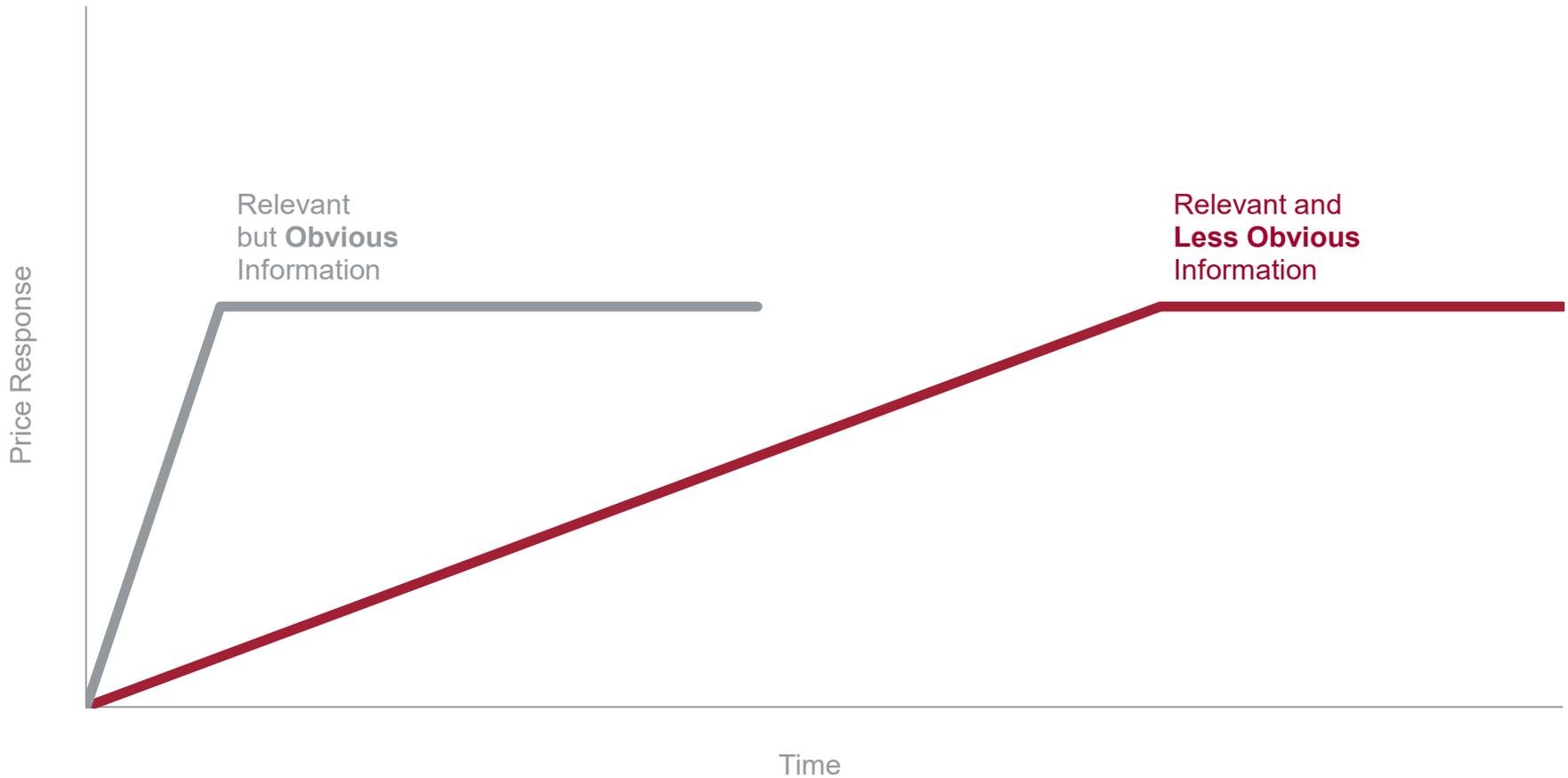
Client Portfolios Built Considering Forecasts, Transaction Costs, and Risks



# Investment Philosophy

Adding Value by Identifying Investment Signals that are

**Relevant to Price & Less Obvious to Investors**



Stylized representation. For illustrative purposes only.

# Defining Direct Effects

## Influence of Stock Information

### Signal Groups

- > Catalysts
- > Extreme Sentiment
- > High Frequency
- > Momentum
- > Quality
- > Value

		Consumer Staples	Comms	Consumer Disc	Energy	Finance	Healthcare	Industrials	Info Tech	Materials	Real Estate	Utilities
ASIA-PACIFIC	China											
	Malaysia											
	Thailand											
	Other											
EUROPE	Austria											
	Switzerland											
	Germany											
	Other											
AMERICAS	Canada											
	US											
	Other											

**Example Stock**  
Semperit

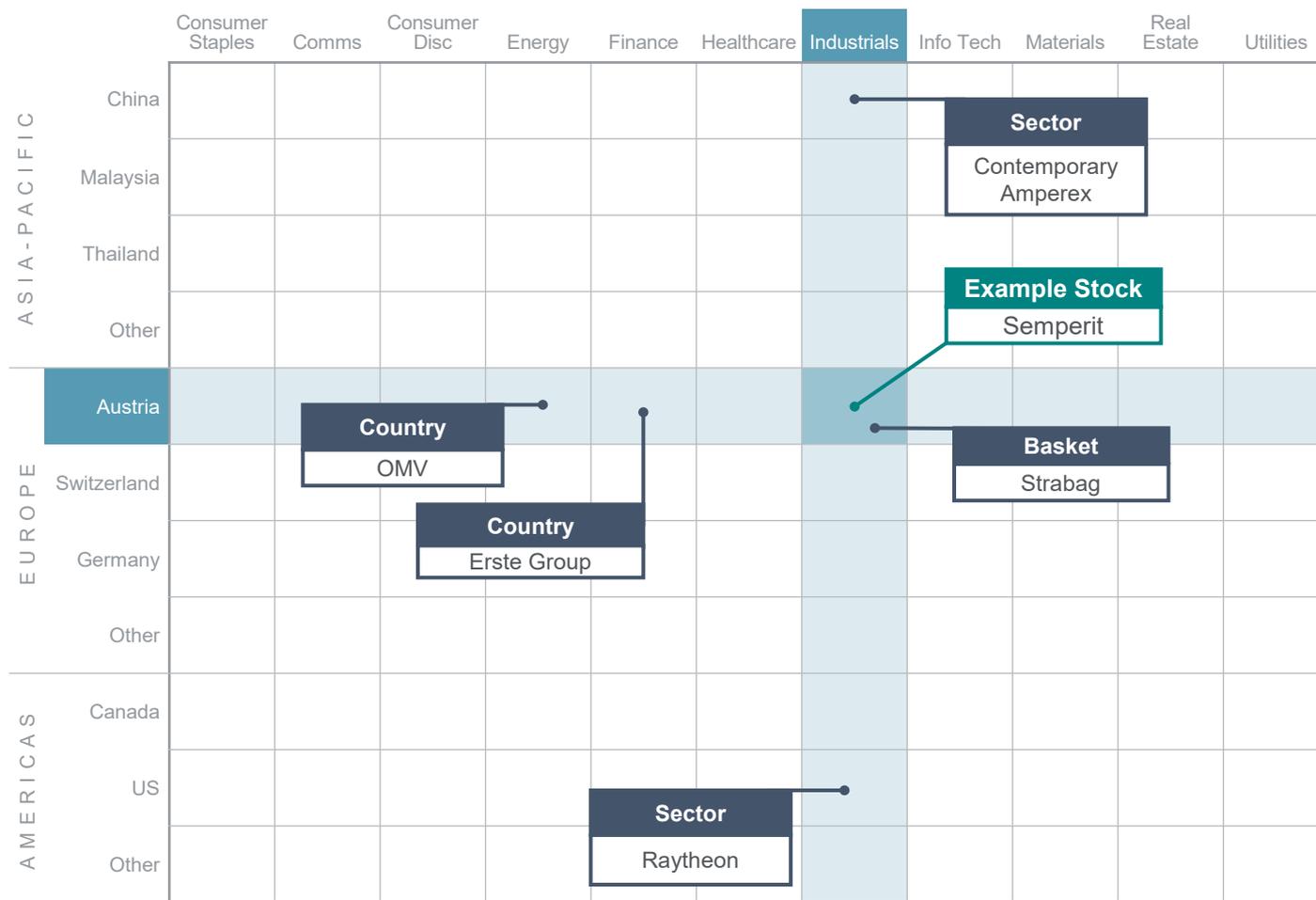
Data as of June 2023.  
Source: Arrowstreet Internal Databases.

# Defining Indirect Effects

## Influence of Sector, Country & Basket Information

### Signal Groups

- > Catalysts
- > Extreme Sentiment
- > High Frequency
- > Momentum
- > Quality
- > Value



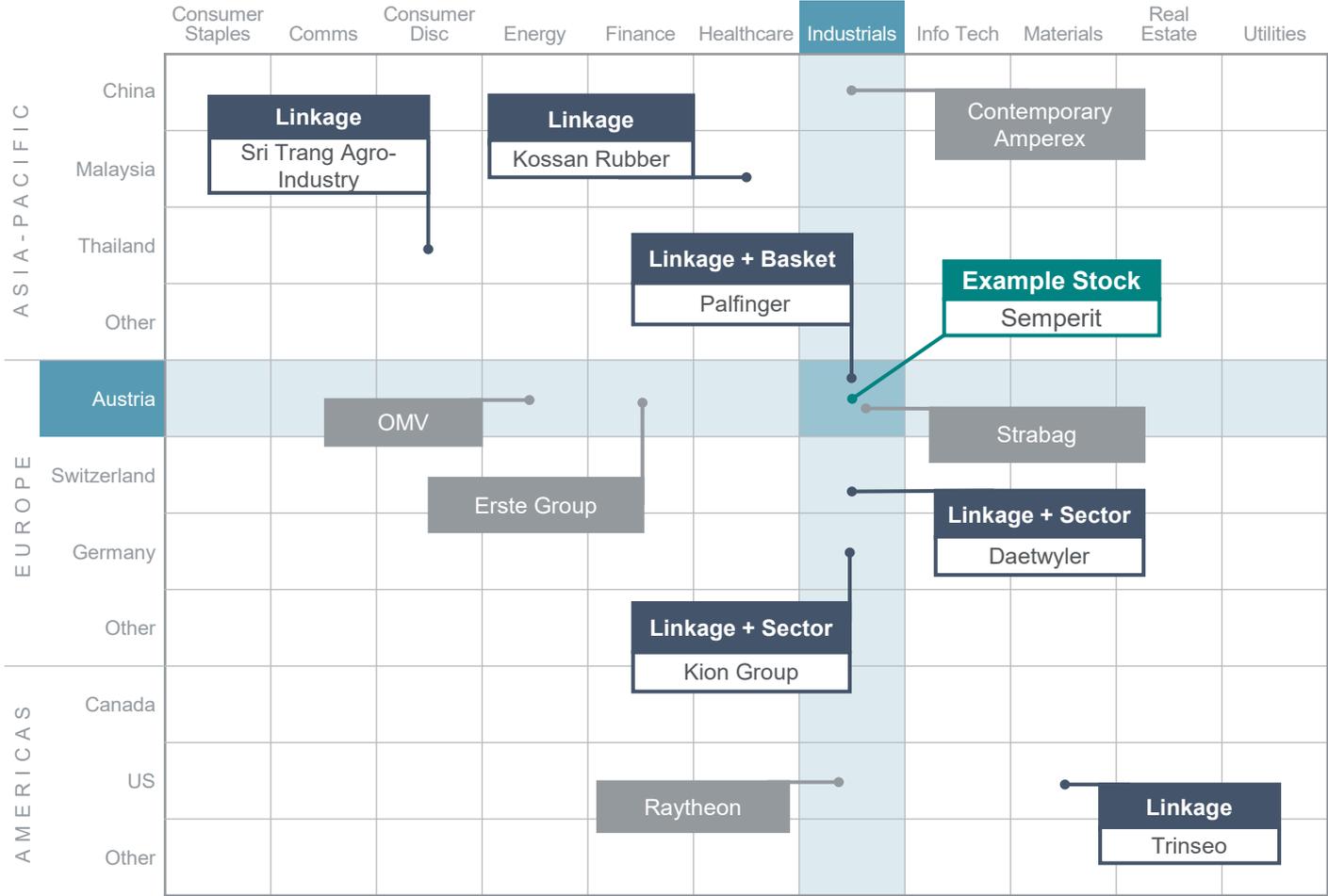
Data as of June 2023.  
Source: Arrowstreet Internal Databases.

# Enhancing Indirect Effects

## Influence of Expanded Linkages

### Signal Groups

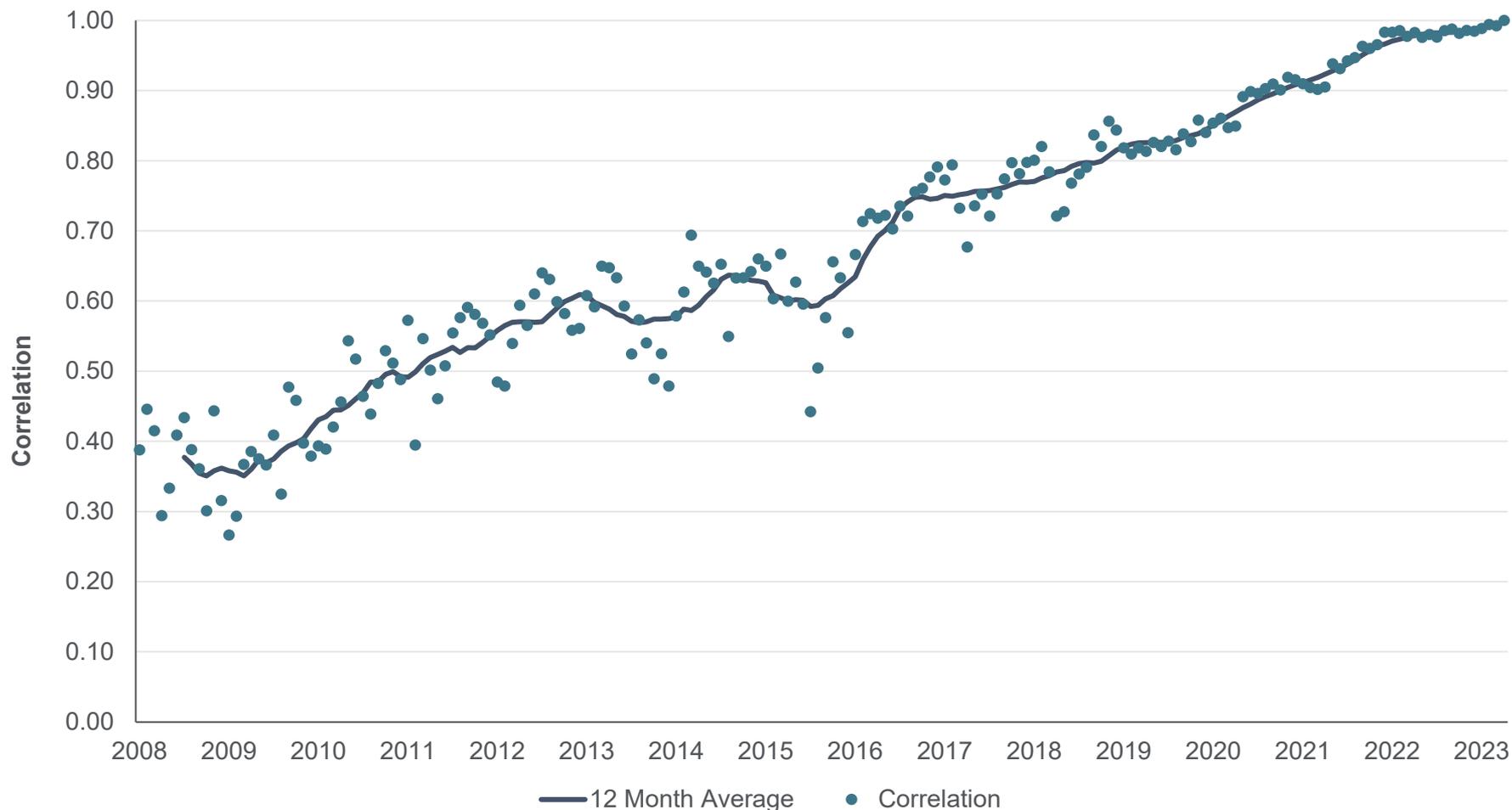
- > Catalysts
- > Extreme Sentiment
- > High Frequency
- > Momentum
- > Quality
- > Value



Data as of June 2023.  
Source: Arrowstreet Internal Databases.

# The Impact of Ongoing Research Innovations

## Correlation of As-Reported and Current Model Equity Forecasts



Data as of December 31, 2023. Source: Arrowstreet Internal Databases.

Demonstrates declining similarity, as one moves backwards through time, between the "Current Model" historical unhedged equity forecasts that would have been produced by the model specification in use at the end of the reported timeline and the "As-Reported" unhedged equity forecasts that were produced by our model as it was specified at each point in time historically. By construction, the correlation of Current Model with itself, the last data point in the series, is equal to 1.

# Portfolio Construction

Client Portfolios Built Considering Forecasts, Transaction Costs, and Risks\*



\* Portfolio construction as of the reporting period end date

\*\* Based on a portfolio of \$500M USD

# Short Sale Considerations

---

## > **Evaluation and Selection of Prime Brokers**

Key components of prime broker selection process include the following factors: stock loan pricing, debit finance rates, breadth and depth of stock loan availability and technological capabilities

## > **Selecting Short Sell Candidates**

Shorting candidates are determined based on a number of factors including: short- and long-term alpha forecasts, portfolio risk and transaction costs inclusive of stock loan fees

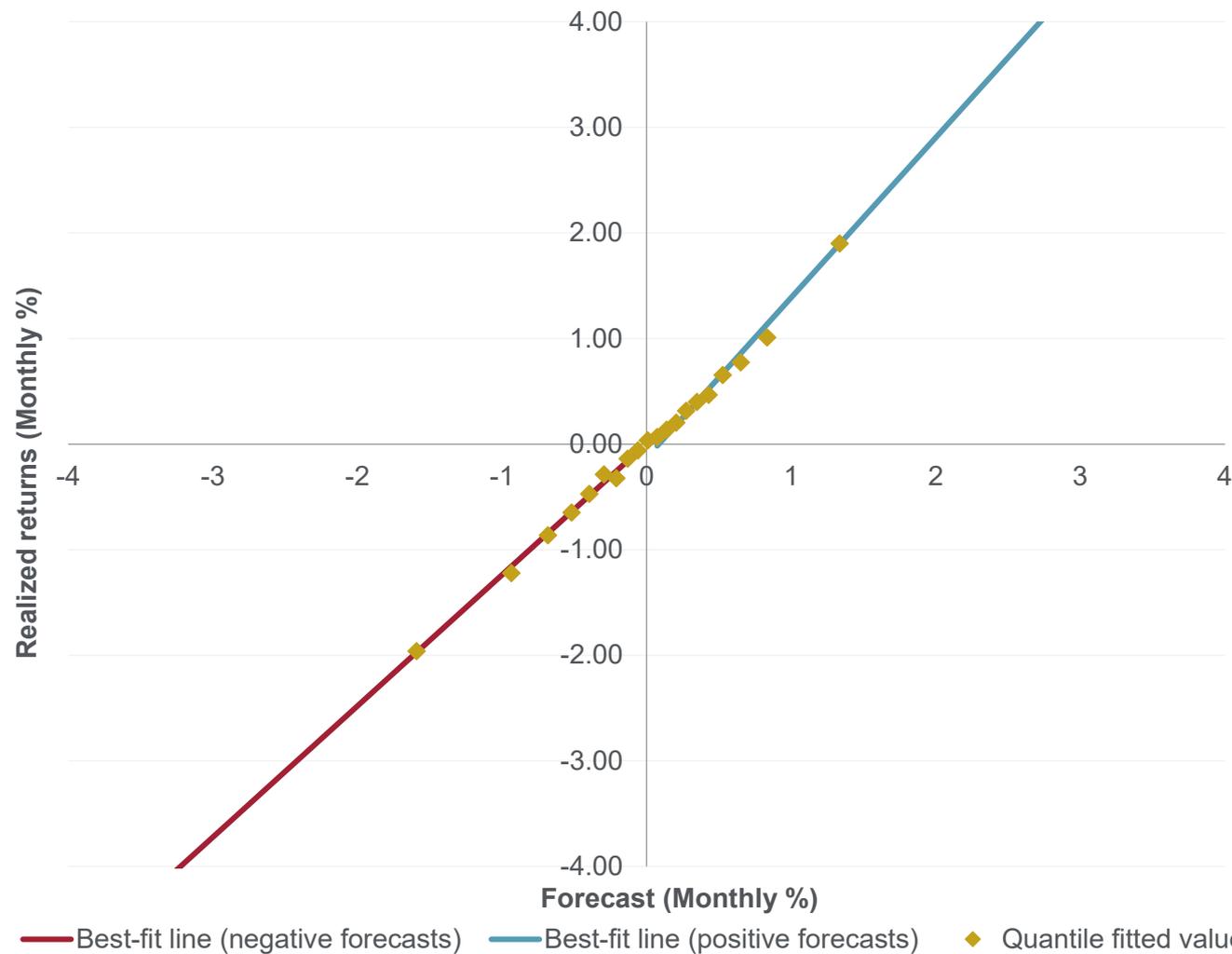
## > **Obtaining an Official Locate**

Before trades are executed, official locates are obtained for delivery of stock

## > **Recognition of Current Short Sales Environment**

Need to adapt to different country/sector restrictions

# Symmetry of Forecasting Success



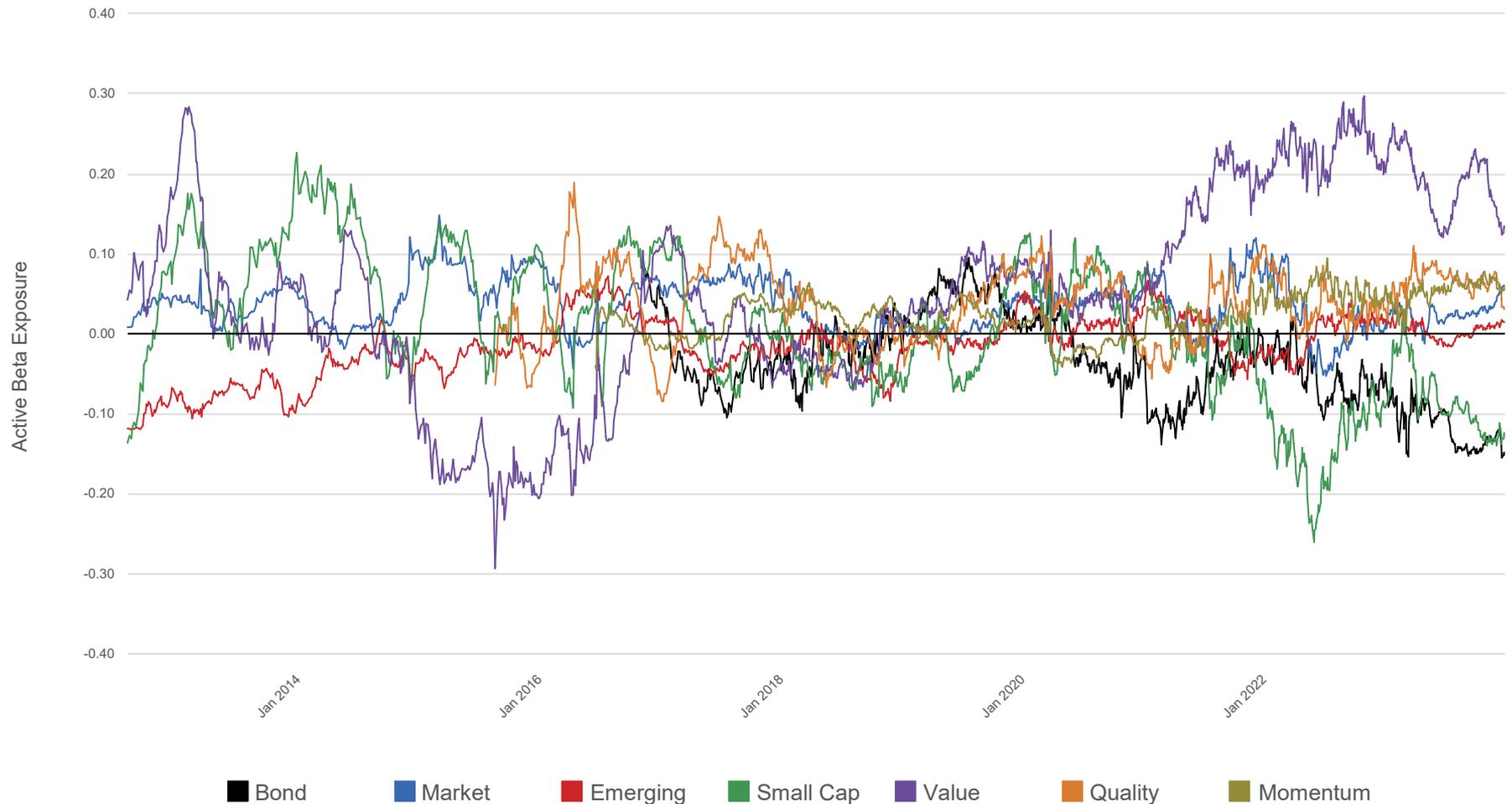
Our forecasting models display symmetric power in generating successful positive and negative forecasts.\*

\*Please refer to Risk Disclosures included herein.

Source: Arrowstreet Internal Databases. Represents current model integrated forecasts (our forecasts for returns of stocks relative to their country-sector basket plus our forecasts for returns of baskets relative to global stock market, hedged) for the MSCI IMI universe, January 31, 1996 to November 30, 2023.

# Style Controls: Active Beta Exposure History

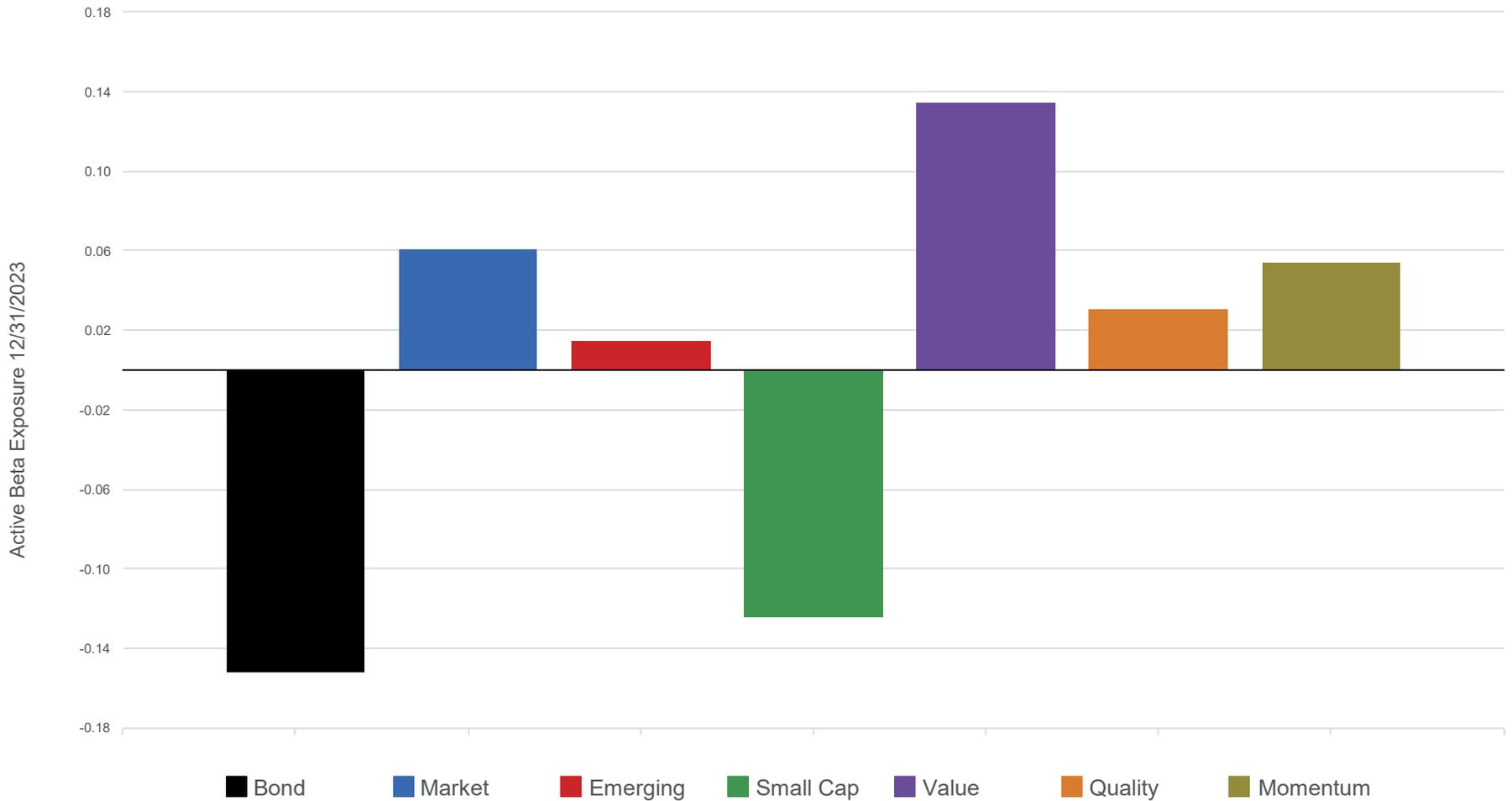
Global Equity - ACWI Alpha Extension 130/30/20 Representative Portfolio<sup>10</sup>



Data as of December 31, 2023. For illustrative purposes. Represents Arrowstreet's proprietary measures of ex ante style betas.  
Source: Arrowstreet Internal Databases.

# Style Controls: Active Beta Exposure Snapshot

Global Equity - ACWI Alpha Extension 130/30/20 Representative Portfolio<sup>10</sup>



Data as of December 31, 2023. For illustrative purposes. Represents Arrowstreet's proprietary measures of ex ante style betas.  
Source: Arrowstreet Internal Databases.

# Why Arrowstreet Capital?

---

- > Dedicated, experienced investors using quantitative tools to exploit investment insights in global markets
- > Continuous re-investment in research to maintain competitive advantage
- > Demonstrated ability to deliver sustainable risk-adjusted alpha across different market environments
- > Alignment of firm and client interests
- > Institutional business focus and private ownership reinforce stability and continuity



## Exhibits

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# Arrowstreet Implementation Options

	Global Low Active Risk	Global Long-Only	Global Long-Only + Futures Beta Management	US Equity Alpha Extension 130/30/20	Global Alpha Extension 130/30/20	Global Alpha Extension 140/40/20	Global Alpha Extension 150/50/60	US Equity 250/150	Non-US Equity 250/150	Global Equity Beta Neutral
<b>Target Gross Equity Exposure</b>	100%	100%	100%-130%	160%–180%	160%–180%	180%–200%	200%–260%	400%	400%	400%
<b>Target Net Equity Exposure</b>	100%	100%	70%-130%	80%–120%	80%–120%	80%–120%	40%–160%	50%–150%	50%–150%	+/- 50%
<b>Target Value Add (Gross of Fees)<sup>13</sup></b>	1%	3%	3.5%	3.5%	5.5%	6%	8%	8%	8%	9%
<b>Target Value Add (Net of Fees)<sup>13</sup></b>	0.76%	2.25%	2.75%	2.6%	4.12%	4.48%	6.04%	5.44%	5.44%	6.24%
<b>Target Tracking Error Range<sup>9</sup></b>	1–3%	3–7%	3.5%–7.5%	3.5%–7.5%	4.5%–8.5%	5%–9%	6%–12%	6.5%–10.5%	6.5%–10.5%	7–11%
<b>Long-term Market Beta Expectation</b>	Close to benchmark									Close to zero

As of December 31, 2023

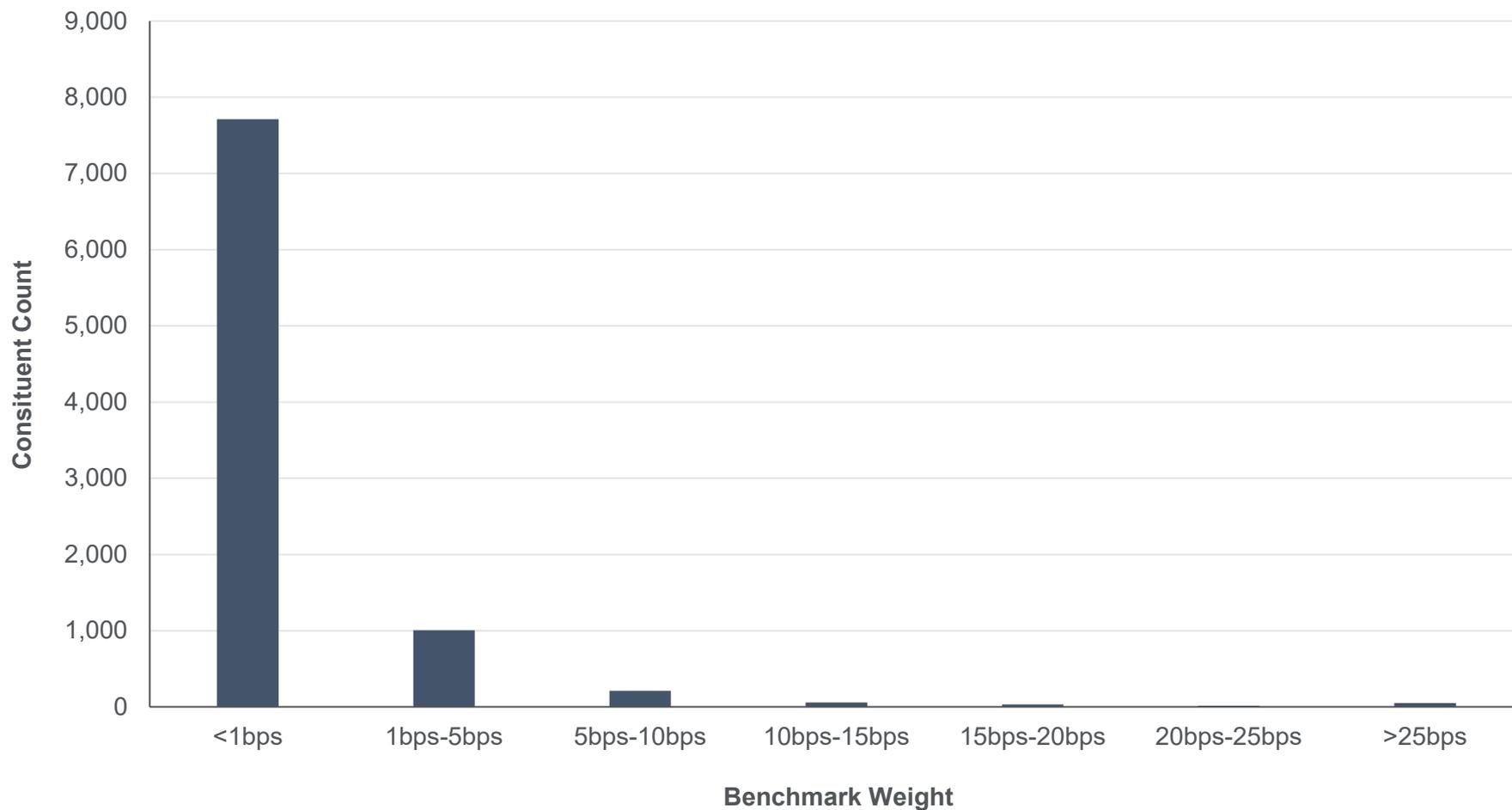
We offer responsible investing solutions across our various implementations.

Please see Important Information and Legal Disclosures at the end of this presentation for disclosure information.

Arrowstreet currently manages multiple strategies. The strategies shown herein were selected to communicate the breadth of our capabilities. A complete list of all of our available strategies/implementations is available upon request.

# Constituent-Level Benchmark Weight

MSCI All Country World IMI Index<sup>7</sup>:  
Constituent Count by Benchmark Weight



Data as of December 31, 2023.  
Source: Arrowstreet Internal Databases.

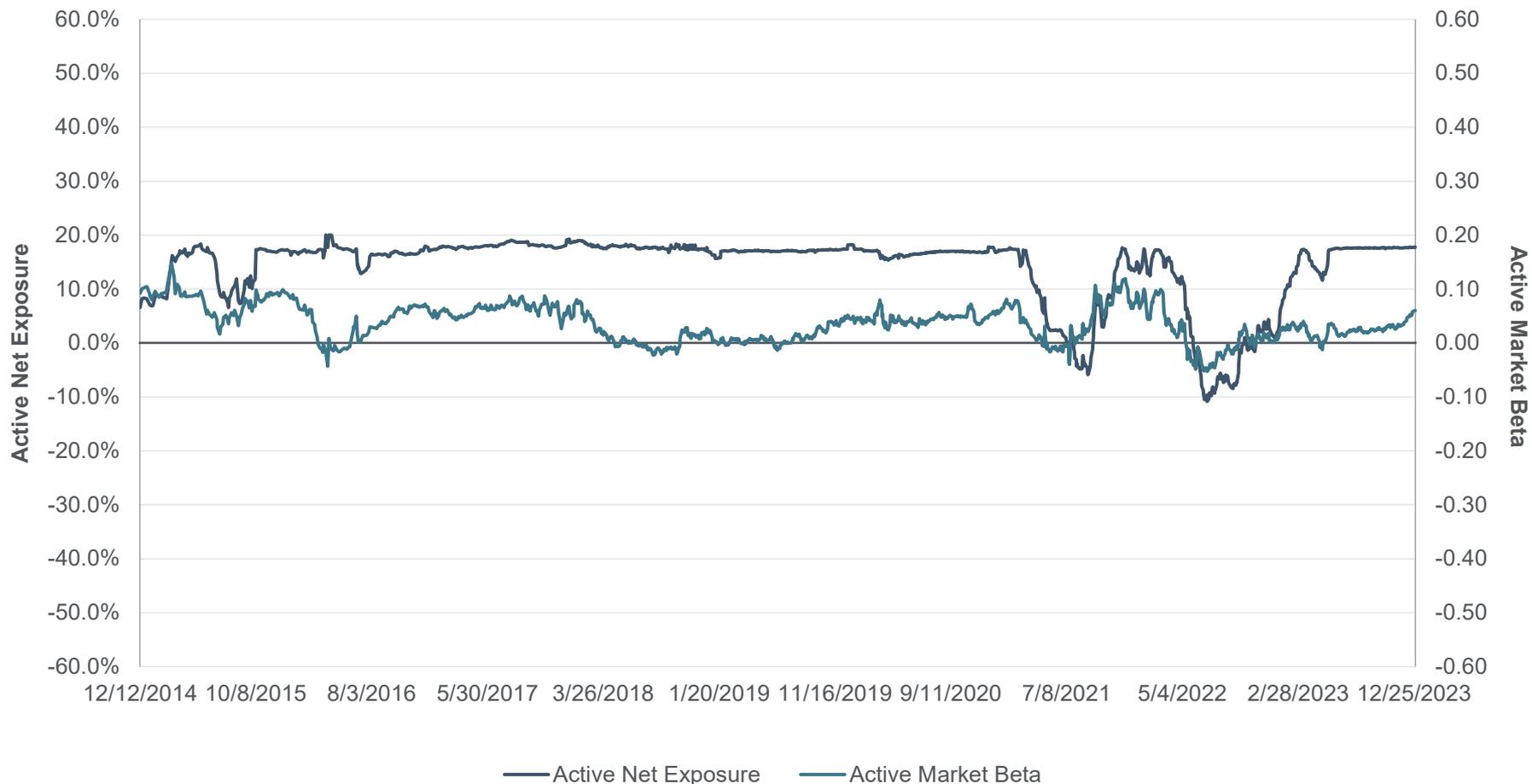
# Beta Arbitrage

What	Why	How
<ul style="list-style-type: none"> <li>&gt; Asset class beta (equities vs. cash) typically relatively well rewarded</li> <li>&gt; Individual instrument level beta (high-beta instruments vs. low-beta instruments) typically relatively poorly rewarded</li> <li>&gt; Both forms of beta tend to engender similar beta risk</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Historical differences driven by a combination of behavioral and constraint inefficiencies</li> <li>&gt; Substantial barriers to arbitrage exist</li> <li>&gt; Tactical but persistent</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Asset class beta overweight through futures overlay or physical leverage</li> <li>&gt; Tilt toward low-beta instruments offsetting asset class beta overweight</li> <li>&gt; Overall active beta is tactical and consistent with portfolios not exploiting beta arbitrage</li> </ul>

Type Of Beta Premium	Equity Premium (EP)	Cross-Sectional Beta Premium (CSBP)
Beta Arbitrage Return	Difference between EP and CSBP: (equities – cash) – (high-beta instruments – low-beta instruments)	
ASC Beta Arbitrage Return Forecast	Tactical, generally positive forecast of EP – CSBP	

# ACWI 130/30/20 History

## Active Net Exposure and Active Market Beta<sup>10</sup>



Data as of December 31, 2023.

For illustrative purposes. The data presented above includes results from the representative portfolio.

Source: Arrowstreet Internal Databases. Represents Arrowstreet's proprietary measures of ex ante style betas.

# Active (Benchmark Relative) Portfolio Weights

## Global Equity – ACWI Alpha Extension Representative Account<sup>10</sup>

Country	Total	Comm. Services	Consumer Disc.	Consumer Staples	Energy	Financials	Health Care	Industrials	Info Tech	Materials	Real Estate	Utilities
<b>Total</b>		5.04	8.76	-2.92		7.28	-5.10	-4.55	11.47	-4.61	-2.83	-0.88
<b>Developed Markets</b>	7.06	3.86	7.94	-2.27	0.98	4.77	-4.67	-4.61	8.60	-4.38	-2.58	-0.58
Australia	-1.50	-0.05	0.09	-0.08	0.12	-0.57	-0.18	-0.13	0.01	-0.54	-0.13	-0.03
Austria	0.06				0.02	0.06		-0.01	0.00	0.00	0.00	-0.01
Belgium	-0.22	0.00	-0.01	-0.01	0.00	-0.05	-0.10	-0.01	0.00	-0.02	-0.02	0.00
Canada	0.36	-0.04	0.05	-0.13	-0.09	-0.86	-0.02	0.14	2.91	-1.43	-0.05	-0.10
Denmark	-0.11		0.02	-0.02	0.00	0.02	-0.12	0.04	0.00	-0.03		-0.01
Finland	0.54	-0.01	-0.01	-0.01	-0.09	0.76	-0.01	-0.05	0.01	-0.05	0.00	-0.01
France	1.15	0.17	-0.06	-0.03	0.47	0.74	-0.03	-0.15	-0.05	0.20	-0.04	-0.08
Germany	5.62	0.17	1.62	0.01	0.00	1.07	0.24	0.98	1.23	0.15	0.02	0.13
Hong Kong	-0.28	-0.01	-0.04	0.07	0.00	-0.23	0.00	0.07	0.01		-0.09	-0.04
Ireland	-0.12		-0.04	-0.02		-0.02	0.00	-0.02		-0.01	0.00	
Israel	0.67	0.04	-0.01	0.00	0.00	0.13	-0.02	-0.02	0.57	0.01	-0.02	-0.01
Italy	5.19	0.20	0.85	0.03	0.87	2.53	0.05	0.14	0.01	0.01		0.48
Japan	2.92	-0.38	1.50	-0.25	0.52	0.54	0.17	-0.24	1.10	-0.05	-0.25	0.25
Netherlands	-1.00	-0.05	-0.88	-0.06	-0.01	0.04	-0.03	-0.03	0.06	-0.05	0.00	0.00
New Zealand	-0.07	-0.01	0.00				-0.02	-0.02			0.00	-0.02
Norway	1.06	-0.02	0.00	-0.03	0.97	-0.04	0.00	0.00	-0.01	0.20	0.00	0.00
Portugal	-0.04	0.00		-0.01	0.01	0.00		0.00		0.00		-0.04
Singapore	-0.20	-0.04	0.13	-0.01		-0.15	0.00	-0.03	-0.01	0.00	-0.08	-0.01
Spain	2.26	0.09	0.28	0.00	0.17	1.30	0.01	0.09	0.01	-0.01	-0.01	0.34
Sweden	0.56	0.52	0.07	-0.03		0.29	-0.04	-0.38	0.13	0.06	-0.06	
Switzerland	-1.97	-0.02	-0.12	-0.46		-0.38	-0.74	-0.27	0.24	-0.19	-0.03	0.00
United Kingdom	1.77	0.09	-0.24	-0.63	2.50	-0.03	0.12	-0.05	-0.02	0.27	-0.09	-0.15
United States	-9.58	3.21	4.74	-0.58	-4.49	-0.37	-3.96	-4.66	2.41	-2.89	-1.72	-1.27
<b>Emerging Markets</b>	10.09	1.17	0.82	-0.65	4.56	2.48	-0.44	0.06	2.87	-0.23	-0.25	-0.30
Brazil	1.58	-0.01	0.01	-0.05	1.14	0.64	-0.02	-0.06	-0.01	0.00	-0.01	-0.06
Chile	0.04	0.00	0.00	0.00	0.00	0.08		-0.02		0.00	0.00	-0.01
China	9.52	1.55	0.96	-0.14	3.53	2.37	-0.14	0.53	0.50	0.48	-0.08	-0.06
Colombia	-0.01					-0.01						0.00
Czech Republic	-0.01			0.00		0.00		0.00				-0.01
Egypt	-0.02	0.00	0.00	0.00		-0.01	0.00	0.00		0.00	0.00	
Greece	0.00	0.00	-0.01	0.00	0.01	0.00		0.00		0.01	0.00	-0.01
Hungary	0.01	0.00			0.01	0.01	0.00	0.00				
India	-2.06	-0.06	-0.24	-0.15	-0.17	-0.54	-0.12	-0.21	-0.24	-0.20	-0.03	-0.08
Indonesia	-0.19	-0.02	-0.01	-0.02	0.00	-0.11	0.00	-0.01	0.00	-0.02	0.00	0.00
Korea	1.33	-0.08	0.24	-0.04	-0.01	0.72	-0.09	-0.17	0.89	-0.13	0.00	-0.01
Kuwait	-0.09	-0.01	0.00	0.00		-0.07		-0.01		0.00	0.00	0.00
Malaysia	-0.16	-0.01	0.00	-0.02	-0.01	-0.05	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
Mexico	-0.29	-0.03	0.00	-0.10		-0.05	0.00	-0.04		-0.05	-0.02	
Peru	-0.03					-0.01				-0.01		
Philippines	-0.07	0.00	0.00	0.00	0.00	-0.02		-0.02		0.00	-0.02	0.00
Poland	0.01	-0.01	-0.02	-0.01	0.04	0.02		0.00	0.00	-0.01		0.00
Qatar	-0.09	0.00	0.00	0.00	-0.01	-0.06	0.00	-0.01		0.00	0.00	0.00
Saudi Arabia	-0.45	-0.04	-0.01	-0.02	-0.04	-0.18	-0.02	-0.01	-0.01	-0.09	-0.01	-0.02
South Africa	-0.31	-0.02	-0.05	-0.03	-0.01	-0.09	-0.01	-0.01	0.00	-0.07	-0.01	
Taiwan	1.26	-0.04	-0.02	-0.03	0.00	-0.22	-0.02	-0.07	1.76	-0.09	-0.01	0.00
Thailand	0.03	-0.02	-0.02	-0.03	0.08	0.09	0.00	-0.02	-0.01	-0.02	-0.02	-0.02
Turkey	0.19	0.00	0.00	-0.01	0.00	0.02	0.00	0.21	0.00	-0.01	0.00	0.00
UAE	-0.13	-0.03	-0.01	0.00	0.00	-0.06		-0.01			-0.03	0.00
<b>Frontier Markets</b>	0.05		0.00	0.00	0.01	0.04	0.00			0.00		0.00
Argentina												
Kazakhstan	0.03					0.03						
Pakistan												
Panama												
Russia	0.01		0.00	0.00	0.01	0.00				0.00		0.00
Slovenia	0.01					0.00	0.00					

Active Cash Position	2.52
Futures Cash	-19.72

Legend	Color Code
> 0.15	<span style="background-color: #ADD8E6; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>
< -0.15	<span style="background-color: #FF0000; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>

Note: For illustrative purposes. Information presented above is based on the representative account in the Global Equity – ACWI Alpha Extension Composite as of December 31, 2023. The information presented above is not an endorsement of any particular region, sector, or stock. Portfolio weights are measured at the end of the calendar period indicated. Weights may temporarily drift beyond position limits in between trading sessions because of price movements.

Source: Arrowstreet Internal Databases.

# Performance History - Gross

Geographic Focus	Exposure	Investment Strategy <sup>7 8 11</sup>	Trailing Composite Gross Returns <sup>2 3 4 11</sup>						Composite Inception Date	
			3 Mos	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs		Since Inception
Global Equity	Long-Only	<b>ACWI</b>	8.69%	22.30%	22.30%	9.97%	15.58%	11.39%	10.09%	Apr-06
		MSCI ACWI	<i>Value Add:</i> -2.34%	<i>0.09%</i>	<i>0.09%</i>	<i>4.22%</i>	<i>3.86%</i>	<i>3.47%</i>	<i>3.43%</i>	
		<b>World</b>	10.51%	24.87%	24.87%	12.62%	16.27%	11.74%	10.81%	Mar-04
		MSCI World	<i>Value Add:</i> -0.91%	<i>1.08%</i>	<i>1.08%</i>	<i>5.35%</i>	<i>3.46%</i>	<i>3.14%</i>	<i>3.14%</i>	
		<b>World Futures Beta Management</b>	8.45%	23.86%	23.86%	11.77%	16.05%		13.57%	Apr-14
		MSCI World	<i>Value Add:</i> -2.96%	<i>0.08%</i>	<i>0.08%</i>	<i>4.50%</i>	<i>3.25%</i>		<i>4.88%</i>	
		<b>ACWI Minimum Volatility <sup>14</sup></b>								Feb-18
		MSCI ACWI Minimum Volatility	<i>Value Add:</i>							
		<b>ACWI Small Cap</b>	7.50%	20.27%	20.27%	9.80%	15.02%	10.02%	18.21%	Mar-09
		MSCI ACWI Small Cap	<i>Value Add:</i> -4.48%	<i>3.43%</i>	<i>3.43%</i>	<i>6.47%</i>	<i>5.17%</i>	<i>3.35%</i>	<i>5.56%</i>	
	<b>World Small Cap</b>	9.27%	21.43%	21.43%	11.21%	15.48%	10.58%	13.43%	Oct-09	
	MSCI World Small Cap	<i>Value Add:</i> -3.21%	<i>5.67%</i>	<i>5.67%</i>	<i>8.34%</i>	<i>5.72%</i>	<i>3.80%</i>	<i>4.16%</i>		
	<b>ACWI Low Active Risk</b>	11.29%	25.32%	25.32%				18.98%	Dec-22	
	MSCI ACWI IMI	<i>Value Add:</i> 0.14%	<i>3.73%</i>	<i>3.73%</i>				<i>3.46%</i>		
	Alpha Extension	<b>ACWI 130/30/20</b>	10.06%	24.69%	24.69%	16.13%	17.92%	14.10%	17.03%	Aug-12
		MSCI ACWI IMI	<i>Value Add:</i> -1.08%	<i>3.11%</i>	<i>3.11%</i>	<i>10.67%</i>	<i>6.43%</i>	<i>6.34%</i>	<i>7.55%</i>	
		<b>World 130/30/20</b>	11.00%	27.77%	27.77%	19.37%	19.43%	14.87%	13.82%	May-08
		MSCI World IMI	<i>Value Add:</i> -0.53%	<i>4.90%</i>	<i>4.90%</i>	<i>12.62%</i>	<i>6.99%</i>	<i>6.50%</i>	<i>7.06%</i>	
		<b>World Small Cap 130/30/20</b>	8.92%	16.72%	16.72%	15.39%	17.71%		14.80%	Apr-17
		MSCI World Small Cap	<i>Value Add:</i> -3.55%	<i>0.96%</i>	<i>0.96%</i>	<i>12.52%</i>	<i>7.95%</i>		<i>7.60%</i>	
<b>ACWI Min Vol 130/30/20 (USD)</b>		7.19%	16.52%	16.52%				7.74%	Jan-22	
MSCI ACWI Minimum Volatility (USD)		<i>Value Add:</i> 0.71%	<i>8.78%</i>	<i>8.78%</i>				<i>9.44%</i>		
<b>ACWI Min Vol 130/30/20 (CAD)</b>	5.83%	16.05%	16.05%	16.57%			13.02%	Oct-19		
MSCI ACWI Minimum Volatility (CAD)	<i>Value Add:</i> -0.72%	<i>8.96%</i>	<i>8.96%</i>	<i>13.57%</i>			<i>9.81%</i>			
Beta Neutral	<b>Beta Neutral</b>	2.61%	11.67%	11.67%	24.54%	12.79%	13.07%	13.07%	Jan-14	
	FTSE 3-Mo Tbill Index	<i>Value Add:</i> 1.21%	<i>6.41%</i>	<i>6.41%</i>	<i>22.30%</i>	<i>10.88%</i>	<i>11.81%</i>	<i>11.81%</i>		
	<b>ESG Beta Neutral</b>	-0.88%	11.52%	11.52%	26.20%			15.51%	Jun-19	
FTSE 3-Mo Tbill Index	<i>Value Add:</i> -2.28%	<i>6.26%</i>	<i>6.26%</i>	<i>23.95%</i>			<i>13.65%</i>			

Data as of December 31, 2023.

Gross-of-fee performance results are shown gross of management fees (including performance fees, where applicable). Any fees charged will reduce actual performance.

Please see the Performance Disclosures at the end of this presentation for important disclosures to be read in conjunction with the performance results presented herein.

Unless otherwise noted, all data presented within has been sourced from ASC internal databases.

# Performance History - Gross

Geographic Focus	Exposure	Investment Strategy <sup>7 8 11</sup>	Trailing Composite Gross Returns <sup>2 3 4 11</sup>							Composite Inception Date
			3 Mos	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	Since Inception	
Non-US Equity	Long-Only	ACWI ex-US	7.52%	21.10%	21.10%	7.59%	13.41%	8.13%	7.98%	Jun-00
		MSCI ACWI ex-US	<i>Value Add:</i> -2.23%	5.48%	5.48%	6.05%	6.33%	4.30%	3.75%	
		EAFE	8.14%	20.81%	20.81%	7.34%	11.52%	6.91%	7.64%	Jul-01
		MSCI EAFE	<i>Value Add:</i> -2.28%	2.57%	2.57%	3.32%	3.36%	2.63%	2.36%	
	Alpha Extension	ACWI ex-US 130/30/20	8.67%	22.61%	22.61%	13.28%	14.64%		10.46%	Jun-15
		MSCI ACWI ex-US IMI	<i>Value Add:</i> -1.14%	6.99%	6.99%	11.75%	7.45%		6.22%	
		EAFE 130/30/20	8.31%	19.72%	19.72%	13.56%	14.23%	10.53%	11.36%	Sep-08
		MSCI EAFE IMI	<i>Value Add:</i> -2.21%	2.21%	2.21%	10.25%	6.30%	6.20%	7.16%	
US Equity	Long-Only	US Equity	12.45%	23.52%	23.52%	13.45%	17.14%		14.05%	Oct-17
		Russell 3000	<i>Value Add:</i> 0.51%	-1.84%	-1.84%	5.40%	2.53%		2.51%	
	Alpha Extension	US Equity 130/30/20	15.50%	29.00%	29.00%	20.92%	19.27%		14.92%	Sep-18
		Russell 3000	<i>Value Add:</i> 3.56%	3.64%	3.64%	12.86%	4.66%		4.53%	
		US Equity Small Cap 130/30/20	16.19%	19.69%	19.69%	17.79%	18.78%		12.45%	Sep-18
		Russell 2000	<i>Value Add:</i> 2.29%	3.28%	3.28%	15.95%	9.23%		8.55%	
	250/150 Alpha Extension	US Equity 250/150	11.88%	27.82%	27.82%				17.30%	Sep-22
	S&P 500 Index (Net)	<i>Value Add:</i> 0.33%	2.15%	2.15%				0.86%		
Emerging Markets	Long-Only	Emerging Markets	6.93%	19.91%	19.91%	4.22%	13.79%	7.54%	12.53%	May-01
		MSCI Emerging Markets	<i>Value Add:</i> -0.94%	10.08%	10.08%	9.30%	10.11%	4.88%	4.82%	
	Alpha Extension	Emerging Markets 150/50/60	6.69%	26.70%	26.70%	17.16%			22.77%	Feb-19
		MSCI Emerging Markets IMI	<i>Value Add:</i> -1.33%	15.02%	15.02%	20.87%			19.93%	

Data as of December 31, 2023.

Gross-of-fee performance results are shown gross of management fees (including performance fees, where applicable). Any fees charged will reduce actual performance.

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# Performance History - Net

Geographic Focus	Exposure	Investment Strategy <sup>7 8 11</sup>	Trailing Composite Net Returns <sup>2 3 4 5 6 11</sup>						Composite Inception Date	
			3 Mos	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs		Since Inception
Global Equity	Long-Only	<b>ACWI</b>	8.58%	21.75%	21.75%	9.40%	14.86%	10.62%	9.37%	Apr-06
		MSCI ACWI	<i>Value Add:</i> -2.46%	-0.45%	-0.45%	3.66%	3.14%	2.70%	2.72%	
		<b>World</b>	10.24%	24.06%	24.06%	11.76%	15.59%	11.12%	10.20%	Mar-04
		MSCI World	<i>Value Add:</i> -1.18%	0.27%	0.27%	4.49%	2.78%	2.52%	2.52%	
		<b>World Futures Beta Management</b>	8.36%	23.41%	23.41%	11.25%	15.28%		12.65%	Apr-14
		MSCI World	<i>Value Add:</i> -3.06%	-0.38%	-0.38%	3.98%	2.48%		3.96%	
		<b>ACWI Minimum Volatility <sup>14</sup></b>								Feb-18
		MSCI ACWI Minimum Volatility	<i>Value Add:</i>							
		<b>ACWI Small Cap</b>	7.41%	18.81%	18.81%	8.46%	13.98%	9.11%	17.10%	Mar-09
		MSCI ACWI Small Cap	<i>Value Add:</i> -4.57%	1.97%	1.97%	5.13%	4.13%	2.45%	4.44%	
	<b>World Small Cap</b>	9.11%	20.74%	20.74%	10.48%	14.62%	9.69%	12.54%	Oct-09	
	MSCI World Small Cap	<i>Value Add:</i> -3.36%	4.98%	4.98%	7.61%	4.86%	2.91%	3.27%		
	<b>ACWI Low Active Risk</b>	11.24%	25.09%	25.09%				18.76%	Dec-22	
	MSCI ACWI IMI	<i>Value Add:</i> 0.10%	3.50%	3.50%				3.24%		
	Alpha Extension	<b>ACWI 130/30/20</b>	9.46%	23.73%	23.73%	14.46%	16.69%	13.02%	15.84%	Aug-12
		MSCI ACWI IMI	<i>Value Add:</i> -1.68%	2.15%	2.15%	9.00%	5.20%	5.25%	6.35%	
		<b>World 130/30/20</b>	9.88%	26.29%	26.29%	17.13%	17.95%	13.60%	12.61%	May-08
		MSCI World IMI	<i>Value Add:</i> -1.66%	3.41%	3.41%	10.38%	5.51%	5.22%	5.85%	
		<b>World Small Cap 130/30/20</b>	8.16%	15.71%	15.71%	12.95%	16.04%		13.24%	Apr-17
		MSCI World Small Cap	<i>Value Add:</i> -4.31%	-0.05%	-0.05%	10.08%	6.28%		6.03%	
		<b>ACWI Min Vol 130/30/20 (USD)</b>	5.82%	14.85%	14.85%				5.79%	Jan-22
		MSCI ACWI Minimum Volatility (USD)	<i>Value Add:</i> -0.66%	7.12%	7.12%				7.49%	
	<b>ACWI Min Vol 130/30/20 (CAD)</b>	4.22%	13.97%	13.97%	13.95%			11.04%	Oct-19	
	MSCI ACWI Minimum Volatility (CAD)	<i>Value Add:</i> -2.33%	6.88%	6.88%	10.95%			7.83%		
Beta Neutral	<b>Beta Neutral</b>	2.15%	9.55%	9.55%	19.90%	9.89%	10.16%	10.16%	Jan-14	
	FTSE 3-Mo Tbill Index	<i>Value Add:</i> 0.75%	4.29%	4.29%	17.65%	7.98%	8.90%	8.90%		
	<b>ESG Beta Neutral</b>	-0.72%	9.51%	9.51%	21.71%			12.50%	Jun-19	
FTSE 3-Mo Tbill Index	<i>Value Add:</i> -2.13%	4.25%	4.25%	19.47%			10.64%			

Data as of December 31, 2023.

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# Performance History - Net

Geographic Focus	Exposure	Investment Strategy <sup>7 8 11</sup>	Trailing Composite Net Returns <sup>2 3 4 5 6 11</sup>							Composite Inception Date
			3 Mos	YTD	1 Yr	3 Yrs	5 Yrs	10 Yrs	Since Inception	
Non-US Equity	Long-Only	ACWI ex-US	7.39%	20.51%	20.51%	7.01%	12.68%	7.37%	7.30%	Jun-00
		MSCI ACWI ex-US	<i>Value Add:</i> -2.37%	4.89%	4.89%	5.46%	5.60%	3.54%	3.07%	
		EAFE	7.99%	20.26%	20.26%	6.82%	10.87%	6.21%	6.96%	Jul-01
		MSCI EAFE	<i>Value Add:</i> -2.43%	2.02%	2.02%	2.81%	2.70%	1.93%	1.69%	
	Alpha Extension	ACWI ex-US 130/30/20	7.85%	21.32%	21.32%	11.97%	13.64%	9.67%	Jun-15	
		MSCI ACWI ex-US IMI	<i>Value Add:</i> -1.95%	5.70%	5.70%	10.44%	6.46%	5.43%		
		EAFE 130/30/20	7.36%	18.18%	18.18%	11.88%	13.00%	9.43%	10.27%	Sep-08
		MSCI EAFE IMI	<i>Value Add:</i> -3.17%	0.67%	0.67%	8.57%	5.08%	5.10%	6.07%	
US Equity	Long-Only	US Equity	12.45%	22.25%	22.25%	12.83%	16.67%	13.65%	Oct-17	
		Russell 3000	<i>Value Add:</i> 0.51%	-3.11%	-3.11%	4.77%	2.06%	2.12%		
	Alpha Extension	US Equity 130/30/20	14.57%	27.83%	27.83%	19.25%	18.21%	13.90%	Sep-18	
		Russell 3000	<i>Value Add:</i> 2.63%	2.47%	2.47%	11.19%	3.61%	3.52%		
		US Equity Small Cap 130/30/20	15.22%	18.57%	18.57%	15.26%	17.12%	10.91%	Sep-18	
	Russell 2000	<i>Value Add:</i> 1.32%	2.16%	2.16%	13.42%	7.58%	7.00%			
	250/150 Alpha Extension	US Equity 250/150	11.66%	27.00%	27.00%	16.57%	Sep-22			
S&P 500 Index (Net)	<i>Value Add:</i> 0.10%	1.33%	1.33%	0.13%						
Emerging Markets	Long-Only	Emerging Markets	6.51%	18.84%	18.84%	3.32%	12.80%	6.61%	11.66%	May-01
		MSCI Emerging Markets	<i>Value Add:</i> -1.35%	9.01%	9.01%	8.40%	9.12%	3.95%	3.95%	
	Alpha Extension	Emerging Markets 150/50/60	4.43%	23.67%	23.67%	13.02%	19.41%	Feb-19		
		MSCI Emerging Markets IMI	<i>Value Add:</i> -3.59%	12.00%	12.00%	16.73%	16.58%			

Data as of December 31, 2023.

Please see the Performance Disclosures at the end of this presentation for important disclosures to be read in conjunction with the performance results presented herein.

Unless otherwise noted, all data presented within has been sourced from ASC internal databases.

# Performance History Calendar Years - Gross

Geographic Focus	Exposure	Investment Strategy <sup>7 8 11</sup>	Calendar Year Gross Returns <sup>2 3 4 11</sup>					Composite Inception Date
			2023	2022	2021	2020	2019	
Global Equity	Long-Only	<b>ACWI</b>	22.30%	-11.85%	23.36%	23.70%	25.38%	Apr-06
		MSCI ACWI	<i>Value Add:</i> 0.09%	6.52%	4.82%	7.44%	-1.21%	
		<b>World</b>	24.87%	-8.89%	25.55%	19.87%	24.09%	Mar-04
		MSCI World	<i>Value Add:</i> 1.08%	9.25%	3.73%	3.96%	-3.58%	
		<b>World Futures Beta Management</b>	23.86%	-8.15%	22.72%	15.08%	31.00%	Apr-14
		MSCI World	<i>Value Add:</i> 0.08%	9.99%	0.91%	-0.82%	3.33%	
		<b>ACWI Minimum Volatility <sup>14</sup></b>				17.02%	19.30%	Feb-18
		MSCI ACWI Minimum Volatility	<i>Value Add:</i>			13.61%	-2.95%	
		<b>ACWI Small Cap</b>	20.27%	-9.76%	21.96%	23.47%	23.18%	Mar-09
	MSCI ACWI Small Cap	<i>Value Add:</i> 3.43%	8.91%	5.86%	7.15%	-1.47%		
	<b>World Small Cap</b>	21.43%	-7.31%	22.20%	20.28%	24.14%	Oct-09	
	MSCI World Small Cap	<i>Value Add:</i> 5.67%	11.44%	6.44%	4.32%	-2.06%		
	<b>ACWI Low Active Risk</b>	25.32%	-3.67%				Dec-22	
	MSCI ACWI IMI	<i>Value Add:</i> 3.73%	0.17%					
	Alpha Extension	<b>ACWI 130/30/20</b>	24.69%	-8.55%	37.33%	16.03%	25.47%	Aug-12
		MSCI ACWI IMI	<i>Value Add:</i> 3.11%	9.86%	19.11%	-0.22%	-0.88%	
		<b>World 130/30/20</b>	27.77%	-5.40%	40.72%	14.03%	25.28%	May-08
		MSCI World IMI	<i>Value Add:</i> 4.90%	12.81%	19.68%	-1.87%	-2.20%	
		<b>World Small Cap 130/30/20</b>	16.72%	-5.25%	38.92%	16.20%	26.58%	Apr-17
		MSCI World Small Cap	<i>Value Add:</i> 0.96%	13.50%	23.16%	0.24%	0.39%	
		<b>ACWI Min Vol 130/30/20 (USD)</b>	16.52%	-0.38%				Jan-22
MSCI ACWI Minimum Volatility (USD)	<i>Value Add:</i> 8.78%	9.94%						
Beta Neutral	<b>ACWI Min Vol 130/30/20 (CAD)</b>	16.05%	-0.18%	36.75%	4.20%	1.91%	Oct-19	
	MSCI ACWI Minimum Volatility (CAD)	<i>Value Add:</i> 8.96%	9.62%	23.61%	3.11%	-1.63%		
Beta Neutral	<b>Beta Neutral</b>	11.67%	11.27%	55.47%	-2.79%	-2.80%	Jan-14	
	FTSE 3-Mo Tbill Index	<i>Value Add:</i> 6.41%	9.77%	55.42%	-3.37%	-5.05%		
	<b>ESG Beta Neutral</b>	11.52%	20.58%	49.46%	-6.33%	2.87%	Jun-19	
FTSE 3-Mo Tbill Index	<i>Value Add:</i> 6.26%	19.08%	49.42%	-6.91%	1.64%			

Data as of December 31, 2023.

Gross-of-fee performance results are shown gross of management fees (including performance fees, where applicable). Any fees charged will reduce actual performance.

Please see the Performance Disclosures at the end of this presentation for important disclosures to be read in conjunction with the performance results presented herein.

Unless otherwise noted, all data presented within has been sourced from ASC internal databases.

# Performance History Calendar Years - Gross

Geographic Focus	Exposure	Investment Strategy <sup>7 8 11</sup>	Calendar Year Gross Returns <sup>2 3 4 11</sup>					Composite Inception Date
			2023	2022	2021	2020	2019	
Non-US Equity	Long-Only	ACWI ex-US	21.10%	-10.46%	14.87%	22.01%	23.45%	Jun-00
		MSCI ACWI ex-US	<i>Value Add:</i> 5.48%	5.55%	7.04%	11.36%	1.94%	
	Alpha Extension	EAFE	20.81%	-9.23%	12.79%	14.27%	22.05%	Jul-01
		MSCI EAFE	<i>Value Add:</i> 2.57%	5.23%	1.52%	6.45%	0.03%	
	Alpha Extension	ACWI ex-US 130/30/20	22.61%	-5.79%	25.84%	10.07%	23.75%	Jun-15
		MSCI ACWI ex-US IMI	<i>Value Add:</i> 6.99%	10.80%	17.32%	-1.05%	2.12%	
		EAFE 130/30/20	19.72%	0.04%	22.28%	10.00%	20.71%	Sep-08
		MSCI EAFE IMI	<i>Value Add:</i> 2.21%	15.57%	11.20%	1.53%	-1.73%	
US Equity	Long-Only	US Equity	23.52%	-12.30%	34.81%	19.62%	26.25%	Oct-17
		Russell 3000	<i>Value Add:</i> -1.84%	7.28%	9.65%	-0.65%	-4.03%	
	Alpha Extension	US Equity 130/30/20	29.00%	-8.85%	50.37%	10.52%	23.50%	Sep-18
		Russell 3000	<i>Value Add:</i> 3.64%	10.73%	25.20%	-9.75%	-6.78%	
	Alpha Extension	US Equity Small Cap 130/30/20	19.69%	-11.50%	54.28%	20.25%	20.30%	Sep-18
		Russell 2000	<i>Value Add:</i> 3.28%	9.26%	39.79%	0.75%	-4.70%	
	250/150 Alpha Extension	US Equity 250/150	27.82%	-3.22%				Sep-22
	S&P 500 Index (Net)	<i>Value Add:</i> 2.15%	-0.70%					
Emerging Markets	Long-Only	Emerging Markets	19.91%	-14.60%	10.56%	33.34%	26.39%	May-01
		MSCI Emerging Markets	<i>Value Add:</i> 10.08%	5.49%	13.10%	15.03%	7.97%	
	Alpha Extension	Emerging Markets 150/50/60	26.70%	-2.97%	30.83%	49.83%	13.76%	Feb-19
		MSCI Emerging Markets IMI	<i>Value Add:</i> 15.02%	16.87%	31.11%	31.44%	5.22%	

Data as of December 31, 2023.

Gross-of-fee performance results are shown gross of management fees (including performance fees, where applicable). Any fees charged will reduce actual performance.

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# Performance History Calendar Years - Net

Geographic Focus	Exposure	Investment Strategy <sup>7 8 11</sup>	Calendar Year Net Returns <sup>2 3 4 5 6 11</sup>					Composite Inception Date
			2023	2022	2021	2020	2019	
Global Equity	Long-Only	<b>ACWI</b>	21.75%	-12.24%	22.56%	22.72%	24.40%	Apr-06
		MSCI ACWI	<i>Value Add:</i> -0.45%	6.12%	4.02%	6.47%	-2.19%	
		<b>World</b>	24.06%	-9.79%	24.74%	19.44%	23.73%	Mar-04
		MSCI World	<i>Value Add:</i> 0.27%	8.35%	2.93%	3.54%	-3.94%	
		<b>World Futures Beta Management</b>	23.41%	-8.49%	21.92%	13.97%	29.75%	Apr-14
		MSCI World	<i>Value Add:</i> -0.38%	9.65%	0.10%	-1.94%	2.08%	
		<b>ACWI Minimum Volatility <sup>14</sup></b>				16.65%	18.92%	Feb-18
		MSCI ACWI Minimum Volatility	<i>Value Add:</i>			13.24%	-3.33%	
		<b>ACWI Small Cap</b>	18.81%	-10.98%	20.63%	22.96%	22.63%	Mar-09
	MSCI ACWI Small Cap	<i>Value Add:</i> 1.97%	7.68%	4.53%	6.63%	-2.02%		
	<b>World Small Cap</b>	20.74%	-7.82%	21.17%	19.21%	23.04%	Oct-09	
	MSCI World Small Cap	<i>Value Add:</i> 4.98%	10.94%	5.42%	3.25%	-3.15%		
	<b>ACWI Low Active Risk</b>	25.09%	-3.69%				Dec-22	
	MSCI ACWI IMI	<i>Value Add:</i> 3.50%	0.15%					
	Alpha Extension	<b>ACWI 130/30/20</b>	23.73%	-9.69%	34.20%	15.54%	24.88%	Aug-12
		MSCI ACWI IMI	<i>Value Add:</i> 2.15%	8.72%	15.98%	-0.71%	-1.47%	
		<b>World 130/30/20</b>	26.29%	-7.02%	36.83%	13.74%	24.89%	May-08
		MSCI World IMI	<i>Value Add:</i> 3.41%	11.20%	15.80%	-2.16%	-2.59%	
		<b>World Small Cap 130/30/20</b>	15.71%	-6.79%	33.60%	15.78%	26.11%	Apr-17
		MSCI World Small Cap	<i>Value Add:</i> -0.05%	11.97%	17.85%	-0.19%	-0.08%	
		<b>ACWI Min Vol 130/30/20 (USD)</b>	14.85%	-2.56%				Jan-22
MSCI ACWI Minimum Volatility (USD)	<i>Value Add:</i> 7.12%	7.75%						
Beta Neutral	<b>ACWI Min Vol 130/30/20 (CAD)</b>	13.97%	-1.49%	31.77%	3.57%	1.85%	Oct-19	
	MSCI ACWI Minimum Volatility (CAD)	<i>Value Add:</i> 6.88%	8.32%	18.64%	2.48%	-1.69%		
	<b>Beta Neutral</b>	9.55%	9.41%	43.81%	-3.58%	-3.57%	Jan-14	
FTSE 3-Mo Tbill Index	<i>Value Add:</i> 4.29%	7.91%	43.76%	-4.16%	-5.83%			
Beta Neutral	<b>ESG Beta Neutral</b>	9.51%	17.45%	40.18%	-6.94%	2.25%	Jun-19	
	FTSE 3-Mo Tbill Index	<i>Value Add:</i> 4.25%	15.95%	40.14%	-7.52%	1.02%		

Data as of December 31, 2023.

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# Performance History Calendar Years - Net

Geographic Focus	Exposure	Investment Strategy <sup>7 8 11</sup>	Calendar Year Net Returns <sup>2 3 4 5 6 11</sup>					Composite Inception Date
			2023	2022	2021	2020	2019	
Non-US Equity	Long-Only	ACWI ex-US	20.51%	-10.90%	14.13%	21.05%	22.48%	Jun-00
		MSCI ACWI ex-US	<i>Value Add:</i> 4.89%	5.10%	6.31%	10.39%	0.97%	
	Alpha Extension	EAFE	20.26%	-9.61%	12.15%	13.42%	21.15%	Jul-01
		MSCI EAFE	<i>Value Add:</i> 2.02%	4.84%	0.89%	5.60%	-0.86%	
	Alpha Extension	ACWI ex-US 130/30/20	21.32%	-6.76%	24.10%	9.63%	23.16%	Jun-15
		MSCI ACWI ex-US IMI	<i>Value Add:</i> 5.70%	9.82%	15.58%	-1.49%	1.52%	
		EAFE 130/30/20	18.18%	-1.54%	20.35%	9.62%	20.03%	Sep-08
		MSCI EAFE IMI	<i>Value Add:</i> 0.67%	13.99%	9.27%	1.15%	-2.40%	
US Equity	Long-Only	US Equity	22.25%	-12.72%	34.61%	19.60%	25.84%	Oct-17
		Russell 3000	<i>Value Add:</i> -3.11%	6.86%	9.44%	-0.67%	-4.44%	
	Alpha Extension	US Equity 130/30/20	27.83%	-10.46%	48.17%	10.36%	23.36%	Sep-18
		Russell 3000	<i>Value Add:</i> 2.47%	9.13%	23.00%	-9.91%	-6.93%	
	Alpha Extension	US Equity Small Cap 130/30/20	18.57%	-11.67%	46.18%	19.82%	20.15%	Sep-18
		Russell 2000	<i>Value Add:</i> 2.16%	9.09%	31.69%	0.32%	-4.85%	
250/150 Alpha Extension	US Equity 250/150	27.00%	-3.40%				Sep-22	
S&P 500 Index (Net)	<i>Value Add:</i> 1.33%	-0.88%						
Emerging Markets	Long-Only	Emerging Markets	18.84%	-15.25%	9.50%	32.17%	25.28%	May-01
		MSCI Emerging Markets	<i>Value Add:</i> 9.01%	4.84%	12.04%	13.86%	6.86%	
	Alpha Extension	Emerging Markets 150/50/60	23.67%	-5.76%	23.87%	47.02%	12.70%	Feb-19
		MSCI Emerging Markets IMI	<i>Value Add:</i> 12.00%	14.08%	24.15%	28.62%	4.15%	

Data as of December 31, 2023.

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# Expanded Linkages Example

Stock: Semperit

Country: Austria

Sector: Industrials

## Largest Basket Constituents

Stock	Country	Sector	Market Cap (\$US mil)
1 Andritz	Austria	Industrials	5,560
2 Strabag	Austria	Industrials	4,341
3 Flughafen Wien	Austria	Industrials	4,072
4 Oesterreichische Post	Austria	Industrials	2,359
5 DO & Co.	Austria	Industrials	1,212

## Largest Country Constituents (Different Basket)

Stock	Country	Sector	Market Cap (\$US mil)
1 OMV	Austria	Energy	15,543
2 Erste Group Bank	Austria	Financials	14,579
3 Verbund	Austria	Utilities	12,768
4 Voest-Alpine	Austria	Materials	5,803
5 Raiffeisen Bank	Austria	Financials	4,936

## Largest Sector Constituents (Different Country)

Stock	Country	Sector	Market Cap (\$US mil)
1 Contemporary Amperex Technology	China	Industrials	141,951
2 Raytheon	United States	Industrials	140,617
3 Siemens	Germany	Industrials	134,513
4 Honeywell	United States	Industrials	132,370
5 Boeing	United States	Industrials	128,332

## Most Linked Securities (Ranked)

Stock	Country	Sector	Market Cap (\$US mil)
1 Daetwyler	Switzerland	Industrials	3,081
2 Andritz	Austria	Industrials	5,560
3 Sri Trang Agro-Industry	Thailand	Consumer Discretionary	839
4 Trelleborg	Sweden	Industrials	6,004
5 Lenzing	Austria	Materials	1,534
6 Kion Group	Germany	Industrials	4,560
7 Hartalega	Malaysia	Health Care	1,708
8 Wacker Neuson	Germany	Industrials	1,533
9 Kossan Rubber	Malaysia	Health Care	820
10 Lonking	China	Industrials	629
11 Palfinger	Austria	Industrials	1,130
12 Korea Petro Chemical	Korea	Materials	665
13 KGHM Polska Miedz	Poland	Materials	4,919
14 SKF	Sweden	Industrials	6,728
15 First Majestic Silver	Canada	Materials	1,520
16 Zoomlion Heavy Industry Science & Technology	China	Industrials	6,304
17 Pan American Silver	Canada	Materials	5,542
18 Sri Trang Gloves	Thailand	Health Care	757
19 Eurazeo	France	Financials	5,397
20 China General Plastics	Taiwan	Materials	425
21 NORMA Group	Germany	Industrials	573
22 Trinseo	United States	Materials	434
23 Siemens Energy	Germany	Industrials	20,230
24 Supermax	Malaysia	Health Care	569
25 Osterreichische Post	Austria	Industrials	2,359

Data as of June 2023.  
Source: Arrowstreet Internal Databases.

# Example Trade

**Stock:** Semperit  
**Region:** Europe  
**Country:** Austria  
**Sector:** Industrials

**Optimization Date:** 27-June-23

**Trade (% Portfolio NAV):** Sell 0.02

Stock Model Signal Groups		
	Level 27-Jun	Change Since 26-Jun
Catalysts	-0.35	-0.13
Extreme Sentiment	0.12	0.09
High Frequency	-0.20	-0.09
Indirect Momentum	-0.62	-0.08
Indirect Value	0.00	0.00
Price Momentum	-0.07	0.02
Quality	0.00	0.00
Value	0.54	0.04
<b>Subtotal</b>	<b>-0.58</b>	<b>-0.13</b>

Basket Model Signal Groups		
	Level 27-Jun	Change Since 26-Jun
Catalysts	-0.21	-0.02
Extreme Sentiment	-0.27	-0.02
High Frequency	-0.02	0.01
Indirect Momentum	0.06	0.05
Price Momentum	-0.02	-0.04
Quality	-0.13	-0.01
Value	0.44	0.02
<b>Subtotal</b>	<b>-0.15</b>	<b>-0.00</b>

Portfolio Construction (Optimization)		
Return Forecasts		
	Level 27-Jun	Change Since 26-Jun
Monthly Integrated Stock & Basket Forecast	-0.73	-0.13
Transactions Costs and Risk		
Transaction Cost Estimate (% Value Traded)	0.37 (High)	
Risk Contribution	Increases Risk (Momentum, Value, and Quality Betas)	

Proposed Trade			
	New Position	Initial Position	Change
Portfolio Weight (% NAV)	0.20	0.22	<b>-0.02</b>
Benchmark Weight (% NAV)	0.00	0.00	
Active Weight (% NAV)	0.20	0.22	

Data as of June 2023.  
 Source: Arrowstreet Internal Databases.

# ACWI 130/30/20 Strategy Commercial Terms

Fund Structure	Designed For	Liquidity
US Group Trust	US Retirement Plan (DB)	Bi-monthly

Account NAV Range	Standard Management Fees*
US\$100M - US\$250M	0.30% base + 20% carry

> Commingled vehicle minimum: US\$10 million

All terms and conditions described herein are subject to and will be superseded by the portfolio's applicable governing documents. A prospective investor should carefully review such documents and consult its own advisers before making a decision to invest.

\*Target Value Add (Net) is calculated by utilizing the highest fee currently available for the applicable strategy; where such fee includes performance fees, performance results equaling that of the strategy's Target Value Add are assumed. Please see performance disclosures at the end of this presentation for more information.

# Biographies – Senior Management

Name/Title	Responsibilities	Began at Firm	Years of Exp.	Education	Prior Experience
 <b>Derek Vance, CFA</b> <i>Partner, Chief Investment Officer</i>	Responsible for investment process; Chairs Investment Committee	2008	17	Harvard College, AB in Economics: 2007	2007–2008: Analyst, Goldman Sachs
 <b>Anthony Ryan, CFA</b> <i>Partner, Chief Executive Officer</i>	Develops and implements strategic business plan	2011	37	London School of Economics, MS: 1986 University of Rochester, BA: 1985	2009–2011: Chief Administrative Officer, Fidelity Investments 2006–2009: U.S. Treasury Department 2000–2006: Partner, Head of Global Business Development & Client Relations, Grantham, Mayo, van Otterloo & Co. LLC 1994–2000: State Street Global Advisors, Principal, State Street Corporation 1988–1994: Manager, Global Investments, PanAgora 1987–1988: Manager, Equity Investments, The Boston Company

# Biographies – Investment Professionals

Name/Title	Responsibilities	Began at Firm	Years of Exp.	Education	Prior Experience
 <p><b>Christopher Malloy, PhD</b> <i>Partner, Head of Research</i></p>	<p>Develops and implements research agenda</p>	<p>2019</p>	<p>21</p>	<p>University of Chicago, PhD and MBA in Finance: 2003 Yale University, BA in Economics: 1996</p>	<p>2007–2019: Sylvan C. Coleman Chaired Professor of Financial Management, Harvard Business School 2003–2007: Assistant Professor of Finance, London Business School 1998–2003: Teaching Assistant, University of Chicago 1996–1998: Analyst, Federal Reserve Board, Washington, DC</p>
 <p><b>James Bothwick, CFA</b> <i>Partner</i></p>	<p>Develops and enhances return and risk forecasting models</p>	<p>2015</p>	<p>8</p>	<p>Harvard College, BS in Chemistry and Physics, Economics: 2015</p>	
 <p><b>Naveen Kartik C. K., CFA</b> <i>Partner</i></p>	<p>Develops and enhances forecasting and risk models</p>	<p>2013</p>	<p>11</p>	<p>MIT, SM in Computation for Design and Optimization: 2013 Indian Institute of Technology, Madras BTech in Chemical Engineering: 2011</p>	
 <p><b>Yosef Klein</b> <i>Partner</i></p>	<p>Develops and enhances forecasting and risk models</p>	<p>2012</p>	<p>16</p>	<p>University of Chicago, MBA in Analytic Finance, Econometrics, and Statistics: 2008 University of Illinois at Chicago, MS in Mathematics: 2005 University of Chicago, BA in Mathematics: 2000</p>	<p>2008–2012: Quantitative Analyst, Wellington Management 2002–2004: Operations Manager, The Aryeh Goldbloom Team, Financial Planners</p>

# Biographies – Investment Professionals

Name/Title	Responsibilities	Began at Firm	Years of Exp.	Education	Prior Experience
 <b>Jonathan Kluberg, PhD</b> <i>Partner</i>	Develops and enhances forecasting and risk models	2015	13	MIT, PhD in Operations Research: 2011 Ecole Polytechnique, MS and BS in Applied Mathematics and Computer Science: 2006	2011–2015: Investment Analyst, HighVista Strategies
 <b>Tom Knox, PhD</b> <i>Partner</i>	Develops and enhances forecasting and risk models	2016	20	Harvard University, PhD in Business Economics: 2003 SM in Applied Mathematics and AB in Applied Mathematics: 1999	2009–2016: Quantitative Portfolio Manager, Convexity Capital Management 2007–2009: Portfolio Manager, QVT Financial 2004–2007: Bracebridge Capital, Vice President 2003–2004: Assistant Professor of Finance, University of Chicago
 <b>Jeff Li, CFA</b> <i>Partner</i>	Develops and enhances forecasting and risk models	2010	14	Boston University, BS in Computer Systems Engineering, Management MS in Economics: 2009	2009–2010: Economic Consultant, Cornerstone Research Software and Mechanical Engineer, Raytheon
 <b>April Rathe</b> <i>Partner</i>	Develops and enhances forecasting and risk models	2020	24	University of Iowa, BSE in Industrial Engineering, Computer Science concentration: 1999	2015–2020: AQR, Team Development Manager 2008–2015: Manager, Data and Analytics Development, UBS Investment Bank 2000–2006: Technology Consultant

# Biographies – Investment Professionals

Name/Title	Responsibilities	Began at Firm	Years of Exp.	Education	Prior Experience
 <b>Peter Rathjens, PhD</b> <i>Partner</i>	Former Chief Investment Officer	1999	43	Princeton University, PhD in Economics: 1990 Oberlin College, BA in Economics and Mathematics: 1981	1998–1999: CIO, PanAgora 1995–1999: Director of Global Investments, PanAgora 1991–1995: Director of Research, PanAgora 1990–1991: Equity Analyst, Colonial Management 1988–1990: Assistant Professor of Economics, Brandeis University 1986–1988: Instructor of Economics, Princeton University 1983–1984: Quantitative Analyst, Lehman Brothers 1981–1983: Analyst, Data Resources
 <b>Julia Yuan, CFA</b> <i>Partner</i>	Develops and enhances forecasting and risk models	2012	12	Massachusetts Institute of Technology, MS in Finance: 2012 Peking University, BS in Economics: 2011	
 <b>Yijie Zhang, PhD</b> <i>Partner</i>	Develops and enhances forecasting and risk models	2006	18	Yale University, PhD in Finance: 2006 Rutgers University, MS in Economics: 2000 Tsinghua (Qinghua) University, BA in Finance: 1997	2003–2006: Teaching Assistant, Yale University
 <b>Manolis Liodakis, PhD</b> <i>Partner, Head of Portfolio Management</i>	Implements investment strategies	2012	26	City University, London, PhD in Finance: 1999 University of Birmingham, MBA in Finance: 1996 Athens University of Economics & Business, BS in Economics and Business: 1994	2008–2011: Managing Director of Global Equities Hybrid Strategies, Citadel Asset Management 2001–2008: Managing Director, Head of European Quantitative Equity Research, Citigroup Global Markets 2000–2001: Strategist, Morgan Stanley 1998–2000: Associate, Salomon Brothers

# Biographies – Investment Professionals

Name/Title	Responsibilities	Began at Firm	Years of Exp.	Education	Prior Experience
 <b>Brandon Berger</b> <i>Partner</i>	Implements investment strategies	2013	14	Fordham University, MBA in Finance: 2011 Fordham University, BS in Business Administration with concentrations in Finance & International Business: 2010	2011–2013: Derivatives Market Maker, ABR Management LLC 2010–2011: Derivatives Trader, Toro Trading LLC
 <b>John Capeci, PhD</b> <i>Partner</i>	Implements investment strategies	1999	30	Princeton University, PhD in Economics: 1990 Harvard College, AB in Economics: 1984	1998–1999: Director of Research, PanAgora 1994–1998: Senior Investment Manager, PanAgora 1990–1995: Assistant Professor, Brandeis University
 <b>Harry Gakidis, PhD</b> <i>Senior Director</i>	Implements investment strategies	2022	21	Harvard University, AB: 1993 Massachusetts Institute of Technology, Ph.D. in Economics: 1998	2014–2022: Lead Portfolio Manager, Acadian Asset Management 2009–2014: Senior Quantitative Strategist, Loomis Sayles 2003–2009: Fixed Income Specialist, Putnam Investments
 <b>Anne Luisi</b> <i>Partner</i>	Implements investment strategies	2014	18	University of Virginia, MBA: 2012 Dartmouth College, BS in Economics: 2002	2011–2014: Associate, Investment Specialist, J.P. Morgan Private Bank 2002–2008: Associate, High Yield Credit Sales, J.P. Morgan Securities

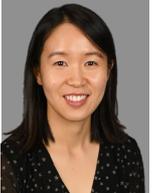
# Biographies – Investment Professionals

	Name/Title	Responsibilities	Began at Firm	Years of Exp.	Education	Prior Experience
	<b>Jonathan Noel</b> <i>Partner</i>	Implements investment strategies	2015	20	Cornell University, BS in Applied Economics: 2004	2010–2015: Program Trading, ITG 2009–2010: Proprietary Trader, Chimera Securities 2004–2009: Electronic Sales and Trading, ITG
	<b>Alex Rodin, CFA</b> <i>Partner</i>	Implements investment strategies	2016	12	Emory University, BS in Business Administration: 2012	2012–2015: Equity Research Analyst, Spot Trading
	<b>Zach Vernon, CFA</b> <i>Partner</i>	Implements investment strategies	2008	18	Boston College, BS in Finance: 2006	2006–2008: Equity Derivatives Trading Operations Analyst, Blackrock
	<b>Michael Zervas, CFA</b> <i>Partner</i>	Implements investment strategies	2004	23	Stonehill College, BS in Business Administration: 2001	2001–2004: Consultant, FactSet Research Systems

# Biographies – Investment Professionals

Name/Title	Responsibilities	Began at Firm	Years of Exp.	Education	Prior Experience
 <p><b>Sam Thompson, PhD</b> <i>Partner, Head of Investment Processes</i></p>	Designs, develops, and maintains the investment systems used to support the management of client portfolios	2005	19	University of California at Berkeley, PhD in Economics and MA in Statistics: 2000 Yale University, BA in Economics: 1995	2005–2006: Consultant, Arrowstreet Capital 2004–2005: Associate Professor of Economics, Harvard University 2000–2004: Assistant Professor of Economics, Harvard University
 <p><b>Marta Campillo, PhD</b> <i>Partner</i></p>	Designs, develops, and maintains the investment systems used to support the management of client portfolios	1999	28	Boston University, PhD in Economics: 2000 Universidad Complutense, MA: 1992 Institute of Fiscal Studies, MA: 1990 Universidad de Autonoma, BS: 1989	1997–1999: Teaching Assistant, Dept. of Economics, Boston University 1995–1997: Research Assistant, Prof. Jeffrey Miron, Boston University 1990–1993: Research Associate, Foundation of Applied Economics Studies, FEDEA
 <p><b>Hui Wang, PhD</b> <i>Partner</i></p>	Designs, develops, and maintains the investment systems used to support the management of client portfolios	2012	12	University of Rochester, PhD in Physics: 2012 University of Science and Technology of China, BS in Physics: 2006	2007–2012: Research Assistant, University of Rochester 2006–2007: Teaching Assistant, University of Rochester
 <p><b>Katie McHardy</b> <i>Partner, Head of Investment Services</i></p>	Oversees pre- and post-trade activities including account, data, and market operations	2010	24	University of Massachusetts, Amherst, BA in Accounting: 2000	2002–2010: Auditor, Financial Services Practice, Deloitte LLP 2000–2002: Auditor, Arthur Andersen LLP

# Biographies – Investment Professionals

Name/Title	Responsibilities	Began at Firm	Years of Exp.	Education	Prior Experience
 <p><b>Joe Tiano</b> <i>Partner</i></p>	<p>Oversees post-trade activities including account, data, and market operations</p>	<p>2014</p>	<p>17</p>	<p>Boston University, MS in Computer Information Systems: 2019 Bentley University, BS in Economics-Finance: 2006</p>	<p>2010–2014: Trader, Sanford C. Bernstein HK Ltd. 2008–2010: Associate, Arrowstreet Capital, LP 2007–2008: Consultant, FactSet Research Systems</p>
 <p><b>Rachel Xiao</b> <i>Partner, Head of Investment Analytics</i></p>	<p>Oversees and produces analytics to support the investment process, including portfolio attribution</p>	<p>2016</p>	<p>9</p>	<p>Boston University, MS in Mathematical Finance: 2015 Wuhan University, BS in Financial Engineering: 2013</p>	<p>2015-2016: Research Analyst, State Street</p>

# Performance Disclosures

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1. These materials are solely for the benefit of select, qualified institutional investors for educational, informational and discussion purposes only.
2. See the applicable composite presentation for important disclosures to be read in conjunction with the performance results presented herein. Portfolios included in the Composite may have different base currencies. Currency exchange fluctuations will impact performance results. All returns are calculated and presented in U.S. Dollars. Returns for periods greater than one year are annualized.
3. The presented composite returns have been calculated by asset-weighting individual portfolio monthly returns using their beginning-of-month values. Individual portfolio returns are time-weighted and based on the accounting, pricing and asset pricing methodologies of Arrowstreet's middle-office data provider or those of the fund administrator, both of which may include the use of an independent pricing service, as applicable to separately managed portfolios and Arrowstreet Sponsored Funds, respectively, and include the reinvestment of income. The returns presented may differ from the results calculated by the portfolio's official record keeper.
4. Prior to January 1, 2019, gross-of-fees returns for both separately managed portfolios and pooled investment funds for which Arrowstreet is the investment adviser, sponsor and promoter (the Arrowstreet Sponsored Funds) were calculated net of trading expenses, net of operating expenses (where, as applicable for separately managed portfolios, such expenses were, at the discretion of the client, paid through the portfolio, and gross of operating expenses otherwise) and gross of management fees (including performance fees, where applicable).

Beginning January 1, 2019, gross-of-fees returns for separately managed portfolios are calculated net of trading expenses, gross of operating expenses and gross of management fees (including performance fees, where applicable). The gross-of-fees returns for Arrowstreet Sponsored Funds continue to be calculated net of trading expenses, net of operating expenses and gross of management fees (including performance fees, where applicable).

5. Net-of-fees returns for both separately managed portfolios and Arrowstreet Sponsored Funds are arrived at by deducting management fees (including performance fees, where applicable) from the calculated gross returns, which are net of trading expenses and other applicable expenses or fees as outlined above. With the exception of the Global Equity – Beta Neutral Composite and the Global Equity – ESG Beta Neutral Composite, performance fees are deducted once realized; unrealized performance fees are not reflected in the net-of-fees returns. Prior to October 1, 2022, realized performance fees, if any, were reflected in the applicable month or not until the quarter end in which they were realized, depending on the timing of the calculation of the fee and other characteristics of the portfolio. Effective October 1, 2022, all realized performance fees are reflected in the applicable month in which they were earned. For the Global Equity – Beta Neutral Composite and the Global Equity – ESG Beta Neutral Composite, both realized and unrealized performance fees are included in the net-of-fees returns. Please refer to the applicable composite presentations for additional detail on the methodology applied to calculate composite net returns historically.

Where management fees are not charged to an investor or share class, a model fee is applied utilizing the highest fee currently available for the applicable strategy; where performance fees are a component of the management fee based on the strategy and characteristics of the portfolio, performance results equaling that of the applicable portfolio's actual value add are assumed. Note that the use of a model fee makes the corresponding net-of-fees return hypothetical in nature, as it does not reflect the actual return to any investor. Hypothetical returns have inherent limitations and prospective investors should not rely on any hypothetical performance shown herein.

6. Prior to July 1, 2020, depending on the characteristics of the portfolio, management fees (including performance fees) were calculated and reflected on either a monthly or quarterly basis. Where management fees were calculated and reflected on a quarterly basis, the impact of the base management fee component of the quarterly management fee has been applied evenly to each month within the quarter and the impact of the performance fee component has been applied to the month in which the fee was realized; these fees were then used to calculate the net-of-fees returns reported herein. Beginning July 1, 2020, monthly net-of-fees returns are calculated using actual and/or estimated management fees (including performance fees) for the applicable monthly period, depending on the timing of the calculation of the management fee and other characteristics of the portfolio.
7. The benchmark name presented reflects the current benchmark. The benchmark may have changed over time and as such all presented benchmark performance figures were calculated with respect to the benchmark applicable at each point in time. Please refer to the applicable composite presentation(s) for additional detail on benchmark changes, if any.

The MSCI data is comprised of a custom index calculated by MSCI for, and as requested by Arrowstreet Capital, Limited Partnership. The MSCI data is for internal use only and may not be redistributed or used in connection with creating or offering any securities, financial products, or indices. Neither MSCI nor any other third party involved in or related to compiling, computing or creating the MSCI data (the "MSCI Parties") makes any express or implied warranties or representations with respect to such data (or the results to be obtained by the use thereof), and the MSCI Parties hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to such data. Without limiting any of the foregoing, in no event shall any of the MSCI Parties have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) even if notified of the possibility of such damages.

# Performance Disclosures

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FTSE 3-Month Treasury Bill Index – The FTSE 3-Month Treasury Bill Index (formerly referred to as the S&P/Citigroup 3-Month Treasury Bill Index) is an unmanaged index representative of three-month U.S. Treasury Bills. Index returns do not include any transaction costs, management fees or other costs.

8. Value Added represents gross or net performance relative to the benchmark, calculated as the difference between the total return (gross-of-fees or net-of-fees, as applicable) and the benchmark.

9. Tracking Error represents the annualized standard deviation of the difference between the portfolio's gross return and the portfolio's benchmark return. Information Ratio is determined by dividing the portfolio's annualized value added by the portfolio's annualized tracking error. Tracking Error and Information Ratio are calculated as of the first full month under management.

10. The data presented above includes results from the representative portfolio. Representative portfolios are selected by taking into consideration a number of factors which include: (i) the length of time the portfolio has been part of the composite; (ii) ability to invest in a broad opportunity set (for example, portfolios that include securities of all market capitalization, opportunistic emerging markets, or which utilize active currency management); (iii) minimal security restrictions, if any (for example, portfolios that have few restrictions or screens); (iv) portfolio assets close to, or greater than, the minimum portfolio size for the strategy; (v) portfolio stability and whether the client is likely to make changes to its benchmark and strategy implementation (which could indicate the portfolio may be short-lived going forward); and/or (vi) use of the strategy's or composite's standard benchmark. The representative portfolio may be replaced from time to time if, for example, the portfolio terminates or changes strategy.

11. The performance of the composite shown herein reflects the actual combined performance of portfolios in the composite and does not reflect the actual performance of any one individual portfolio, and is therefore deemed to be hypothetical. Hypothetical returns have inherent limitations and prospective investors should not rely on any hypothetical performance shown herein. No representation is made that any fund or investor will or is likely to achieve the results shown. While managed pursuant to the same strategy, the portfolios have unique investment permissions and/or restrictions that result in differences in each portfolio's holdings.

12. The information contained herein reflects Arrowstreet's views on the matters set forth herein as of the date this information is being provided and not as of any other date. Arrowstreet undertakes no duty to update the information provided herein.

13. Target Value Add represents our ex-ante objective for outperformance per year relative to the benchmark over a full market cycle (defined here for this purpose as 5 to 7 years) based upon our assessment of the available investment opportunities when managed at the applicable tracking error range. Tracking error represents the typical expected range of annualized standard deviation of the difference between the portfolio's gross-of-fees return and the portfolio's benchmark return. The stated Target Value Add figure is hypothetical and does not reflect investments actually managed or results actually achieved. In no way should the Target Value Add be considered indicative or a guarantee of future performance.

While Target Value Add (Gross) does consider trading expenses, it does not incorporate other expenses that a portfolio may experience such as operating expenses or management fees (including performance fees). Target Value Add (Net) is calculated by deducting management fees (including performance fees) from the Target Value Add (Gross), which does consider trading expenses. Management fees are calculated utilizing the highest fee currently available for the applicable strategy; where such fee includes performance fees, performance results equaling that of the strategy's Target Value Add are assumed. Target Value Add (Net) does not take into account operating expenses, which vary by investment vehicle. Where investment in an Arrowstreet Sponsored Fund is contemplated, please refer to the corresponding fund's offering materials for further details on such expenses. Target Value Add (Net) would be lower if such expenses were reflected.

# Performance Disclosures

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Target Value Add is based upon certain assumptions and the judgment of Arrowstreet. Such assumptions include that Arrowstreet's forecasting models work as intended and that on an ex-post basis, Arrowstreet's forecasting models will work as intended over long periods of time. It can be expected that some or all of such assumptions will not materialize or that actual facts will differ materially from such assumptions. Any change or inaccuracy in the assumptions will have a material impact on actual results, and it should not be assumed that any target returns shown herein will be achieved. Such assumptions are subject to change. Hypothetical returns have inherent limitations and prospective investors should not rely on any hypothetical performance shown herein. No representation is made that any fund or investor will or is likely to achieve the results shown. Actual results will differ and may be materially lower than the target shown herein.

For actual realized returns, please refer to the applicable composite presentation(s).

14. As of February 1st, 2021, there are no longer any active constituents in the strategy.

# Risk Disclosures

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All investment strategies have the potential for profit or loss. Past performance may not be indicative of future results. It should not be assumed that the future performance of any specific investment or investment strategy (including those described herein), will be profitable or equal to past performance levels. Changes in investment strategies, investable assets, or contributions or withdrawals may materially alter the performance and results of a client's portfolio.

Economic factors and market conditions will affect the performance of any portfolio and there are no assurances that it will match or outperform any particular benchmark. Different types of investments involve varying degrees of risk, and there can be no assurance that any specific investment will be profitable for a client's portfolio.

Our equity investment strategies involve the risks of investing in equities and currencies (which may include entering contracts over the counter) globally. In addition, our alpha extension strategies and long/short strategy involve the risk of shorting equities and leverage.

We actively manage our client assets and therefore the performance of a portfolio will reflect, in part, our ability to make investment decisions that seek to achieve a given strategy's investment objectives. Due to the active management, a portfolio could underperform the target benchmark and/or investment mandates with similar investment objectives.

We use proprietary quantitative models in our investment process. While we expect these models to perform as expected, deviation between model predictions and the actual events can result in either no advantage or in results opposite to those desired by us and our clients. In particular, these models draw from historical data that may not predict future returns, volatilities, correlations or market performance adequately. In addition, market conditions may be such that they are outside of the confidence level employed by the models. There can be no assurances that the models behave as expected. An error in the coding of data or formulas within the models could be magnified by the model and may be difficult to detect. While we maintain internal controls and human oversight of our investment models, no guarantee or warranty can be provided that any quantitative investment model is or will be completely free of errors. Any such errors could have a negative impact on investment results.

Unexpected market turbulence or unanticipated extraneous events could also cause the actual results to fall outside

# Risk Disclosures

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of the range predicted from the models' forecasts.

Our equity strategies invest in equity securities of companies with varying market capitalizations. Investment in companies with relatively small market capitalizations generally involve greater risk and price volatility than investment in larger, more established companies, and the equity securities of such companies are typically less liquid than larger capitalization companies.

Where investment in an Arrowstreet Sponsored Fund is contemplated, please refer to the corresponding fund's offering materials for further details on risks specific to such fund.

# Important Information and Legal Disclosures

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# Important Information and Legal Disclosures

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Global Equity - ACWI 130/30/20 Strategy Composite<sup>1</sup>  
December 31, 2023

Time Period	Total Returns <sup>2</sup>			Value Added <sup>2</sup>		Annualized Three-Year Standard Deviation <sup>8</sup>		End of Period Composite Assets (\$Mil)	Number of Portfolios	Composite Dispersion <sup>3</sup>	Total Firm Assets (\$Mil) <sup>10</sup>
	Composite Gross-of-Fees <sup>3</sup>	Composite Net-of-Fees <sup>4</sup>	Benchmark <sup>5</sup>	Gross <sup>6</sup>	Net <sup>7</sup>	Composite	Benchmark <sup>3</sup>				
08/01/2012 - 12/31/2012	8.85%	8.49%	8.43%	0.41%	0.06%	--	--	\$350	1	--	\$41,117
2013	47.92%	45.23%	22.80%	25.12%	22.43%	--	--	\$1,268	1	--	\$50,053
2014	12.52%	11.39%	3.84%	8.68%	7.56%	--	--	\$1,427	1	--	\$52,206
2015	4.64%	3.80%	-2.19%	6.83%	5.98%	12.13%	10.66%	\$2,204	2	--	\$59,622
2016	9.24%	8.64%	8.36%	0.88%	0.29%	11.31%	11.05%	\$5,540	3	--	\$69,939
2017	34.71%	32.97%	23.95%	10.76%	9.02%	11.00%	10.33%	\$7,860	3	--	\$97,465
2018	-5.29%	-5.91%	-10.08%	4.79%	4.17%	11.94%	10.64%	\$8,494	3	--	\$89,032
2019	25.47%	24.88%	26.35%	-0.88%	-1.47%	11.93%	11.33%	\$12,210	3	--	\$106,168
2020	16.03%	15.54%	16.25%	-0.22%	-0.71%	19.49%	18.59%	\$21,341	3	--	\$133,621
2021	37.33%	34.20%	18.22%	19.11%	15.98%	18.15%	17.29%	\$26,793	4	--	\$157,410
2022	-8.55%	-9.69%	-18.40%	9.86%	8.72%	20.84%	20.24%	\$21,723	4	--	\$138,245
2023 1st Quarter	6.20%	6.13%	6.95%	-0.75%	-0.82%	17.64%	17.93%	\$23,739	4	--	\$150,371
2023 2nd Quarter	6.47%	6.36%	5.89%	0.58%	0.48%	16.71%	17.12%	\$25,352	4	--	\$160,392
2023 3rd Quarter	0.20%	0.13%	-3.40%	3.60%	3.53%	16.31%	16.98%	\$25,410	4	--	\$161,675
2023 4th Quarter	10.06%	9.46%	11.14%	-1.08%	-1.68%	14.94%	16.38%	\$27,158	4	--	\$177,286
2023 Year-to-Date	24.69%	23.73%	21.58%	3.11%	2.15%	--	--	\$27,158	4	--	\$177,286
2023 Trailing 1 Yr	24.69%	23.73%	21.58%	3.11%	2.15%	--	--	\$27,158	4	--	\$177,286

Time Period	Annualized Returns <sup>2</sup>			Value Added <sup>2</sup>		Annualized Standard Deviation <sup>8</sup>	
	Composite Gross-of-Fees <sup>3</sup>	Composite Net-of-Fees <sup>4</sup>	Benchmark <sup>5</sup>	Gross <sup>6</sup>	Net <sup>7</sup>	Composite	Benchmark <sup>3</sup>
Trailing 3 Year	16.13%	14.46%	5.46%	10.67%	9.00%	14.94%	16.38%
Trailing 5 Year	17.92%	16.69%	11.49%	6.43%	5.20%	17.65%	18.12%
Trailing 7 Year	16.48%	15.29%	9.77%	6.71%	5.52%	16.26%	16.31%
Trailing 10 Year	14.10%	13.02%	7.77%	6.34%	5.25%	14.98%	14.96%
Since Inception	17.03%	15.84%	9.48%	7.55%	6.35%	14.66%	14.32%

See the following footnotes for important disclosures to be read in conjunction with the performance results presented herein.

Data as of December 31, 2023.

Past results are not necessarily indicative of future results.

See the following footnotes for important disclosures to be read in conjunction with the performance results presented herein.

Note: For illustrative purposes. The data presented above includes results from the representative portfolio. Representative portfolios are selected by taking into consideration a number of factors which include: (i) the length of time the portfolio has been part of the composite; (ii) ability to invest in a broad opportunity set (for example, portfolios that include securities of all market capitalization, opportunistic emerging markets, or which utilize active currency management); (iii) minimal security restrictions, if any (for example, portfolios that have few restrictions or screens); (iv) portfolio assets close to, or greater than, the minimum portfolio size for the strategy; (v) portfolio stability and whether the client is likely to make changes to its benchmark and strategy implementation (which could indicate the portfolio may be short-lived going forward); and/or (vi) use of the strategy's or composite's standard benchmark. The representative portfolio may be replaced from time to time if, for example, the portfolio terminates or changes strategy.

<sup>1</sup>The Risk Disclosure and Important Information and Legal Disclosures included herein are not subject to independent GIPS verification; they have not been examined as part of the Firm's annual GIPS verification process that is applicable to the accompanying GIPS Composite Report.

Source: Arrowstreet Internal Databases.

## Past results are not necessarily indicative of future results.

- (1) These materials are solely for the benefit of select, qualified institutional investors for educational, informational and discussion purposes only.
- (2) The presented composite returns have been calculated by asset-weighting individual monthly portfolio returns using their beginning-of-month values. Individual portfolio returns are time-weighted and based on the accounting, pricing and asset pricing methodologies of Arrowstreet's middle-office data provider or those of the fund administrator, both of which may include the use of an independent pricing service, as applicable to separately managed portfolios and Arrowstreet Sponsored Funds, respectively, and include the reinvestment of income. The individual portfolio returns used to calculate the presented composite returns may differ from the individual portfolio returns calculated by the individual portfolio official record keepers.
- (3) Prior to January 1, 2019, gross-of-fees returns for both separately managed portfolios and pooled investment funds for which Arrowstreet is the investment adviser, sponsor and promoter (the Arrowstreet Sponsored Funds) were calculated net of trading expenses, net of operating expenses (where, as applicable for separately managed portfolios, such expenses were, at the discretion of the client, paid through the portfolio (and gross of operating expenses otherwise) and gross of management fees (including performance fees, where applicable). Beginning January 1, 2019, gross-of-fees returns for separately managed portfolios are calculated net of trading expenses, gross of operating expenses and gross of management fees (including performance fees, where applicable). The gross-of-fees returns for Arrowstreet Sponsored Funds continue to be calculated net of trading expenses, net of operating expenses and gross of management fees (including performance fees, where applicable).
- (4) Net-of-fee returns for both separately managed portfolios and Arrowstreet Sponsored Funds are arrived at by deducting management fees (including performance fees, where applicable) from the calculated gross returns, which are net of trading expenses and other applicable expenses or fees as outlined above. Performance fees are deducted once realized; unrealized performance fees are not reflected in the net-of-fees returns. Prior to October 1, 2022, realized performance fees, if any, were reflected in the applicable month or not until the quarter end in which they were realized, depending on the timing of the calculation of the fee and other characteristics of the portfolio. Effective October 1, 2022, all realized performance fees are reflected in the applicable month in which they were earned.

Base and performance fees are computed using actual fees charged to the portfolio for the relevant period and are assumed to be paid on the last day of the relevant period. Depending on the performance of a given portfolio, there exists the potential that no performance fees will be assessed for the relevant period. Prior to July 1, 2020, where management fees were calculated and reflected on a quarterly basis, the impact of the base management fee component of the quarterly management fee has been applied evenly to each month within the quarter and, if applicable, the impact of the performance fee component has been applied to the month in which the fee was realized; these fees were then used to calculate the net-of-fees returns reported herein. Actual fees charged vary from portfolio to portfolio. Please refer to the Required Fee and Expense Disclosure for Pooled Funds included within this Composite Presentation for the fee schedule, operating expense ratios and total expense ratios for each pooled fund included within the Composite.

The Firm's standard investment advisory fee schedule applicable to the Composite is 0.35% for the first \$100 million under management, 0.30% for the next \$150 million under management, 0.25% for the next \$250 million under management and 0.20% thereafter with an annual performance fee for clients meeting the requirements of Rule 205-3 under the Investment Advisers Act of 1940, as amended. The performance fee is typically 20%, calculated on cumulative long-term performance over an agreed upon benchmark subject to a high watermark provision. Actual fees charged are negotiated on a portfolio basis and may vary significantly. The Firm may also enter into other special fee arrangements with portfolios in the Composite.

The Composite includes one or more Arrowstreet Sponsored Funds for which (i) the investors include Arrowstreet Capital Holding LLC, the parent company of Arrowstreet, and (ii) the investors may include participants in the 401(k) plan sponsored by Arrowstreet (such participants are generally employees and former employees of Arrowstreet). There are no management fees or incentive allocations attributable to the interests in the Arrowstreet Sponsored Fund held by such investors. The interests held by such investors represented less than 0.01% of the total composite assets as of December 31, 2023, less than 0.01% of the total composite assets as of December 31, 2022, less than 0.01% of the total composite assets as of December 31, 2021, less than 0.01% of the total composite assets as of December 31, 2020, less than 0.01% of the total composite assets as of December 31, 2019, less than 0.01% of total composite assets as of December 31, 2018, less than 0.01% of total composite assets as of December 31, 2017, and less than 0.01% of total composite assets as of December 31, 2016.

- (5) The Composite was reported against the MSCI All Country World (Net), from August 1, 2012 through December 31, 2013. Starting on January 1, 2014, the benchmark for the Composite was prospectively changed to the MSCI All Country World IMI (Net). This prospective change was made in order to serve as a better reflection of the current investment universe. We believe there is no significant change in this strategy as a result of the benchmark change.

The MSCI All Country World (Net), and the MSCI All Country World IMI (Net), are fully invested capitalization weighted indices that assume reinvestment of dividends and are net of withholding taxes retained at the source for entities which do not benefit from a double taxation treaty. Index returns do not include any transaction costs, management fees or other costs. Benchmark Source: MSCI. The MSCI data is comprised of a custom index calculated by MSCI for, and as requested by Arrowstreet Capital, Limited Partnership.~ The MSCI data is for internal use only and may not be redistributed or used in connection with creating or offering any securities, financial products, or indices.~ Neither MSCI nor any other third party involved in or related to compiling, computing or creating the MSCI data (the "MSCI Parties") makes any express or implied warranties or representations with respect to such data (or the results to be obtained by the use thereof), and the MSCI Parties hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to such data.~ Without limiting any of the foregoing, in no event shall any of the MSCI Parties have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) even if notified of the possibility of such damages.

- (6) Value Added represents the Composite's performance relative to the Benchmark, calculated as the difference between the Composite Gross-of-Fees Returns and Benchmark Returns.
- (7) Value Added represents the Composite's performance relative to the Benchmark, calculated as the difference between the Composite Net-of-Fees Returns and Benchmark Returns.
- (8) Standard deviation is calculated using the gross-of-fees returns. The three-year annualized ex-post standard deviation is not presented for the Composite or its Benchmark where, at the time presented, the Composite inception less than thirty-six months prior.
- (9) Presented only for years where the Composite included more than five portfolios for the entire calendar year, and a portfolio is only included in this computation to the extent it was included in the Composite for the entire calendar year. Composite dispersion is computed using an asset weighted standard deviation measure based on portfolio gross of fee returns and the assets in a portfolio at the beginning of each year. Several factors, individually or in combination, may lead to dispersion of performance among portfolios within the Composite, including cash flows in and out of a portfolio, differences in the instruments and markets available for investment and other individual portfolio restrictions.
- (10) The 2020 GIPS Standards require disclosure of total firm assets as of each annual period ending on or after December 31, 2020. For reporting periods prior to December 31, 2020, composite assets as a percentage of total firm assets were disclosed as permitted under the GIPS Standards at the time. Total firm assets presented for periods prior to December 31, 2020 were not examined as part of our composite performance examination.

## General Information

The Firm is defined as Arrowstreet Capital, Limited Partnership ("Arrowstreet" or the "Firm"), which includes all assets managed by Arrowstreet. Arrowstreet is a registered investment adviser with the United States Securities and Exchange Commission (SEC) under the U.S. Investment Advisers Act of 1940, as amended.

Arrowstreet claims compliance with the Global Investment Performance Standards (GIPS®) and has prepared and presented this report in compliance with the GIPS standards. Arrowstreet has been independently verified for the periods December 1, 1999 through December 31, 2022.

A firm that claims compliance with the GIPS standards must establish policies and procedures for complying with all the applicable requirements of the GIPS standards. Verification provides assurance on whether the Firm's policies and procedures related to composite and pooled fund maintenance, as well as the calculation, presentation, and distribution of performance, have been designed in compliance with the GIPS standards and have been implemented on a firm-wide basis. The Global Equity - ACWI 130/30/20 Strategy Composite has had a performance examination for the periods January 1, 2017 through December 31, 2022. The verification and performance examination reports are available upon request.

A complete list of composite descriptions is available upon request; the type of portfolios included within each composite are indicated on such list. In addition, Firm policies for valuing portfolios, calculating performance and preparing GIPS Composite Reports are available upon request. Dividend income is recorded on an accrual basis net of non-reclaimable withholding taxes.

The Global Equity - ACWI 130/30/20 Strategy Composite (the "Composite"), created on February 1, 2017, consists of each discretionary fee paying portfolio that seeks to outperform its benchmark by investing primarily in long and short equity securities of issuers within its benchmark without seeking alignment with the Paris Agreement requirements. The portfolios within the Composite use futures contracts to manage portfolio beta, which results in economic leverage. The benchmark includes equity securities of issuers in markets generally considered to be developed or emerging markets. The portfolios within the Composite utilize short selling. For periods prior to February 1, 2017, the average gross economic leverage of each portfolio within the Composite was approximately 1.6 times the net asset value of such portfolio. Since February 1, 2017, the average gross economic leverage of each portfolio within the Composite has been, and is expected to be, approximately, but not greater than, 1.8 times the net asset value of such portfolio over time. The amount of economic leverage can have a material impact on the performance of a portfolio, and as a result the returns for periods following February 1, 2017 may be materially different than the returns for periods prior to February 1, 2017.

A portfolio is included in the Composite in the first full month following inception and a terminated portfolio is removed from the Composite following its last full month preceding its termination.

Each portfolio in the Composite utilizes exchange-traded futures as part of its investment policy, including for investment purposes, hedging purposes, and to manage a portfolio's exposure to cash. These instruments are often highly volatile, involve certain special risks that are not present in trading equities and may expose portfolios to a higher risk of loss than if only equities were traded. A low initial margin deposit is typically required to establish a futures position, which presents the potential for a high degree of leverage. As a result, a relatively small movement in the price of a futures contract may result in a profit or a loss which is high in proportion to the amount of funds actually placed as initial margin and may result in unquantifiable further losses exceeding any margin deposited. Further, when used for hedging purposes there may be an imperfect correlation between these instruments and the investments or market sectors being hedged.

Portfolios in the Composite may utilize over-the-counter forward foreign exchange contracts as part of their investment policy, including for investment or hedging purposes. These instruments are often highly volatile, involve certain special risks that are not present in trading equities and may expose portfolios to a higher risk of loss than if only equities were traded. Transactions in over-the counter derivatives may involve additional risk as there is no exchange or market on which to close out an open position. It may be impossible to liquidate an existing position, to assess or value a position, or to assess the exposure to risk. The use of such contracts involves counterparty risk, which is the risk that the contracting party will not fulfill its contractual obligation to deliver the currency contracted for at the agreed upon price. Further, when used for hedging purposes there may be an imperfect correlation between these instruments and the investments being hedged.

Portfolios in the Composite invest in non-US equities, which may include investment in securities of companies in developed, emerging and/or frontier market countries. Such investments often involve special risks beyond those in US equities, including currency fluctuation, lower liquidity, different accounting methods and economic and political systems, and higher transaction costs. Furthermore, such risks in emerging and frontier market countries may be magnified as compared to the risks in developed market countries, and such risks in frontier market countries may be magnified as compared to the risks in emerging market countries.

The use of short sales involves distinct investment risks and transaction costs. The potential loss from an uncovered short position in an equity security is unlimited. The use of short sales increases the market exposure of a portfolio and allows leverage in the portfolio. Such leverage will exaggerate the effect of any increase or decrease in the value of the account's assets and, therefore, may increase the volatility of the account.

Results presented above are based on their U.S. Dollar (USD) equivalency. Portfolios included in the Composite may have different base currencies. Currency exchange rate fluctuations will impact performance results.

The performance of the Global Equity - ACWI 130/30/20 Strategy Composite shown herein reflects the actual combined performance of portfolios in the Global Equity - ACWI 130/30/20 Strategy Composite and does not reflect the actual performance of any one individual portfolio. No representation is made that any fund or investor will or is likely to achieve the results shown. Combined performance has inherent limitations, and while managed pursuant to the same strategy, the portfolios often have unique investment permissions and/or restrictions that result in differences in each portfolio's holdings.

The information contained herein reflects Arrowstreet's views on the matters set forth herein as of the date this information is being provided and not as of any other date. Arrowstreet undertakes no duty to update the information provided herein.

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## Required Fee and Expense Disclosure for Pooled Funds included within the Composite\*

As of December 31, 2023:

Fund Name	Management Fee (Base Fees Only) <sup>1</sup>	Management Fee (Base & Performance Fees) <sup>2</sup>	Operating Expenses <sup>3</sup>	Total Expense Ratio <sup>4</sup> (Base Fees Only)	Total Expense Ratio <sup>5</sup> (Base & Performance Fees)
Arrowstreet Canadian Pooled Funds - Arrowstreet (Canada) Global All-Country Alpha Extension Fund I	Not Applicable <sup>6</sup>	Not Applicable <sup>6</sup>	0.06%	Not Applicable <sup>6</sup>	Not Applicable <sup>6</sup>
Cayman Fund (CAY) - Arrowstreet Capital Global All Country Alpha Extension Fund (Cayman) Limited	0.90% <sup>6</sup>	0.35% and 20% <sup>6</sup>	0.08%	0.98% <sup>6</sup>	2.40% <sup>6</sup>
Delaware LP Fund - Arrowstreet (Delaware) Alpha Extension Fund LP	Not Applicable <sup>6</sup>	Not Applicable <sup>6</sup>	0.05%	Not Applicable <sup>6</sup>	Not Applicable <sup>6</sup>
Arrowstreet US Group Trust - Arrowstreet Global Equity - Alpha Extension Fund	Not Applicable <sup>6</sup>	Not Applicable <sup>6</sup>	0.05%	Not Applicable <sup>6</sup>	Not Applicable <sup>6</sup>

1 - Represents the fund's highest management fee schedule (including base fees and not performance fees) as of the above-noted date, expressed on an annualized basis. Actual fees charged may vary significantly between investors.

2 - Represents the fund's highest management fee schedule (including both base and performance fees) as of the above-noted date, expressed on an annualized basis. Actual fees charged may vary significantly between investors.

3 - Represents the fund's highest operating expense ratio (excluding transaction costs), as of the above-noted date, expressed on an annualized basis.

4 - Represents the fund's highest total expense ratio (including base fees and not performance fees; excluding transaction costs), as of the above-noted date, expressed on an annualized basis. Actual fees charged may vary significantly between investors.

5 - Represents the fund's highest total expense ratio (excluding transaction costs), as of the above-noted date. Operating expenses (excluding transaction costs) and base management fees are expressed on an annualized basis. Performance fees are expressed based on the amount of such fees accrued as of the above-noted date (note that the Composite Net-of-Fees returns presented on page 1 include performance fees once realized).

6 - Management and performance fees, if any, are negotiated and paid directly to the investment manager by investors and are not paid by the Fund. Actual fees charged may vary significantly between investors.

\* Please refer to the applicable fund fact sheet and fund offering documents for additional details on all available share classes, including descriptions of the management fee structures offered.



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