A Deep Dive into the Women-Run Hedge Fund Universe

June 2015

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Executive Summary

All too often conversations about women in asset management center on their absence rather than their success. Discussions regarding the representation of women in the industry have a tendency to overshadow the performance and characteristics of those women who are successful in the field. Unfortunately, up until this point little data examining that performance has been available, particularly in the opaque world of hedge funds.

There are approximately 150 to 200 women-run hedge funds currently in existence. These funds are comparably distributed based upon size versus the overall hedge fund universe. The women-run cohort shows a moderate skew by strategy, particularly favoring equity strategies to the detriment of broad multi-strategy funds. In reviewing their performance, a sizeable skew exists by quartile distribution. Women-run funds show a significantly higher presence in the top quartile of performance over the past decade.

By constructing an index of women-run hedge funds, we observe that these funds post compelling risk and return statistics. These statistics are persistent over a variety of time periods and market conditions. Importantly, efficiency ratios show higher return per unit of risk in every environment tested.

Academic research and industry studies have long examined the behavioral differences between the genders. In considering the concept of downside protection, the drawdown experience of women-run hedge funds during the financial crisis was both shallower and significantly shorter than the broader hedge fund industry. This provides some evidence of consistency with academic studies.

The practical application of this research is best observed when replicating a portfolio inclusive of these managers. By combining women-run hedge funds into a portfolio with a large, multi-strategy fund of funds, improvement is seen in the performance of the balanced portfolio on all but a few metrics. As a whole, the correlation between women-run hedge funds and a sampling of 10 of the largest fund of funds is notably low. This implies that incorporating these managers into a diverse portfolio could improve overall diversification and performance for a broad array of investors.

Statistical adjustments to the women-run hedge fund index should be incorporated to provide the most conservative view of the data. Correction for its smaller sample size, strategy skew, and higher propensity to display survivor bias are important to consider. When accounting for all three of these adjustments, it is still observed that women-run hedge funds outperform the broader hedge fund universe with a high degree of statistical significance over the past 10 years.

The sum total of this analysis presents a case for the incorporation of women-run hedge funds into a broad hedge fund allocation. Frequently, the question of inclusion becomes one of social responsibility. We would argue that these funds stand solidly on their own investment merit. It is unfortunate that debate around gender inclusion has a tendency to obscure the investment proficiency displayed by many women-run hedge funds.

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Introduction

When discussing women in finance, the conversation tends to gravitate towards their absence. At issue is that while women have been earning the majority of bachelor's degrees since the 1980s, and most other industries have seen marked appreciation in the participation of women, the level of senior women in finance has been practically unchanged at sub-10% for the last twenty years.

This becomes all the more relevant when considering that academic research and industry studies have long shown a behavioral difference between genders in the investment space. While some studies conflict on the degree and the relevance of the bias, the vast majority of research acknowledges its existence. Despite the integrity of the research performed, few investors have considered the implications of what these studies assert. If women are truly showing differentiated behavior in the investment arena, and yet so few women are playing in it, then an inefficiency exists that deserves consideration.

Our goal with this piece is to delve into the universe of women-run hedge funds. By our estimates, approximately 150 to 200 women-run hedge funds are currently in operation. Detailed data on how they have performed and what that performance looks like has been lacking up until this point. So, too, is a review of whether those behaviors discussed in academic research affect the performance of these funds. Without this data, consideration of an allocation to women-run funds all too often understates the investment opportunity they present.

Behavioral Research in Investing

Richard Thaler originally published his seminal work on behavioral economics, *The Winner's Curse*, in 1992. Since then, the world of behavioral analysis and its influence on economics and investing has exploded. Andrei Schleifer cemented these concepts as they relate to finance in 2000 with *Inefficient Markets: An Introduction to Behavioral Finance*. The base economic assumption of rational market participants has been called into question ever since. In 2011, Daniel Kahneman brought the discussion main stream with his bestselling *Thinking Fast and Slow,* and with it the profound impact of human behavior on market dynamics changed from a question to an accepted fact.

As the study of behavioral finance has grown, so has research relating to the nuances of cognitive bias. From an investment perspective, dozens of academic and industry studies have delved into the review of gender bias on investment behavior. While some studies conflict as to the size and impact of this bias, few question its existence. In fact, in 2008 two researchers stated emphatically that "the question whether women behave differently from men has been extensively researched and reveals robust gender differences."[1]

While a thorough review of the breadth of gender-related behavioral research in finance would warrant its own paper, three common behavioral differentiators are frequently examined. First, experimental and empirical evidence show that women experience fewer losses attributed to overtrading and overconfidence. Second, studies indicate women exhibit increased discipline and consistency as it relates to investment decisions. And third, research suggests that women display an increased focus on downside protection and risk management. Detailed citations of some of the most prominent studies discussing these findings are listed at the end of this paper.

It is entirely possible that few investors are aware of these studies and even more likely that fewer still have considered the implications of these assertions. According to Morningstar, less than 10% of mutual fund portfolio managers are women.[2] In the hedge fund space, fewer than 2% of funds are run by women. If the biases cited in the academic research exist, then the investment community is severely lacking in cognitive diversity. Further, if statements of performance

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impact are accurate, then our markets are inefficient on a level not yet previously considered.

Skepticism in the investment world is generally a positive attribute. Regardless of the integrity of the data, the academic rigor of the studies, or the prominence of their publication, many investors discount anything that does not have a return stream tied directly to it. Given that no research specifically addresses evidence of these traits in female hedge fund managers, the ability for many people to directly translate this research into an investment thesis is limited. Further analysis is needed in order for investors to gain comfort with this concept.

The Opacity of Hedge Funds

Databases such as HFR, Albourne, eVestment, Eurekahedge, Preqin, and Novus do their best to track the hedge fund universe, but there is no requirement for reporting to any of them. The quality of reporting also varies. Some funds provide detailed characteristics and investment information, while others report little beyond their identity and performance statistics. If an investor is considering characteristics beyond basic strategy and performance, such information can be spotty or completely lacking. Ownership, portfolio management team structure, or overall governance makeup of a fund manager are elusive pieces of information frequently omitted.

These issues are just a sampling of the challenges in identifying a specific subset of hedge fund managers. The hedge fund world is highly private and inherently opaque. Sourcing and evaluating managers that stray from the beaten path can be challenging but highly beneficial to the construction of a complementary portfolio. If one of the goals of a hedge fund allocation is to provide a differentiated return stream, seeking out managers with varied approaches, styles, and investment processes should prove to be advantageous to achieving that goal. While the academic research can provide a basis for an interesting concept, it is the performance of the funds themselves that truly matters.

Defining "Women-Run Hedge Funds"

What does it mean to be a woman-run hedge fund? Allocators and investors can, and do, come at this question from a variety of different ways. Most frequently it comes down to some aspect of ownership, portfolio management, and investment oversight.

The first characteristic considered is ownership. Many pension plans have historically focused on women-owned funds. Generally, a firm must qualify as a woman-owned business entity (WBE) according to the Small Business Administration's definition: "a firm must be at least 51% owned and controlled by one or more women, and primarily managed by one or more women."[3] Some investors require certification by a third-party agency such as the US Women's Chamber of Commerce or the Women Business Enterprise National Council (WBENC). Occasionally, majority ownership is not enough. Some investors also evaluate the governance structure of the entity to ensure that the female owner not only holds the majority of the shares of the firm, but also has a majority voice in the management of the business.

The next aspect for consideration is the composition of the portfolio management team. If considering behavioral attributes and their potential impacts, this review is highly relevant. While all teams are different, a general application is to look at the breakdown of the portfolio managers on a given fund. It is important to focus on those people who have direct impact on and control over the investment process and portfolio construction.

The third aspect is investment leadership and oversight. Where a single person has the ability to override the voices of others on the investment team, such power warrants consideration. From a definition perspective, this generally focuses on the position of Chief Investment Officer or Chair of the Investment Committee.

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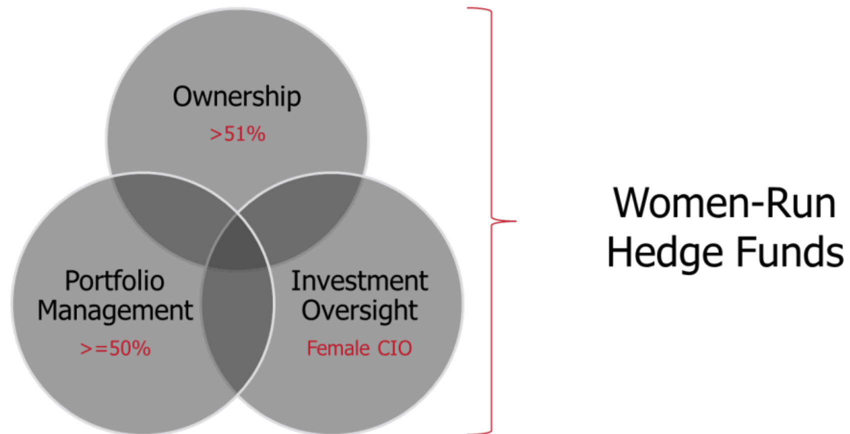
For the purposes of defining "women-run hedge funds," we have included funds that fall into any of these three categories. From an ownership perspective, we adhere to the SBA's guideline of a 51% minimum holding. We also include those funds where at least half the portfolio managers are women. Finally, we consider investment oversight from the perspective of senior leadership where a woman holds is the CIO or has a similarly titled position. The totality of all three of these groups equates to our definition of women-run hedge funds.



Size of the Women-Run Hedge Fund Universe

By our estimates, there are approximately 150 to 200 active women-run hedge funds managed by roughly 125 firms currently in existence. As of June 2015, we have spoken with 173 hedge funds managed by 91 firms. These include 132 "active" funds, 9 "inactive" funds, and 32 "conflict" funds.

Kyria-known Women-Run Hedge Funds

as of June 2015

	Hedge Funds	Hedge Fund Managers
Active	132	77
Inactive	9	8
Conflict	32	6
Total	*173*	*91*

Source: Kyria Capital

"Active" funds are straight-forward – funds currently operating as a going-concern. These funds are actively managing their portfolios, and the majority of them are reporting their performance to at least one database.

"Inactive" funds include those that have closed down and/or ceased operation. Of the nine, five are managers that have shut down completely, one of which operated two different funds. The remaining three funds were run by asset management firms still in existence. We include statistics on "inactive" funds for the time periods where those funds were "active" unless otherwise noted as a means to account for some degree of survivor bias.

We label funds as "conflict" funds either when they self-identify as women-run, but do not fall into that category based upon our criteria, or when they do qualify, but do not wish to be considered women-run. The "conflict" category also includes those funds where a

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change in ownership, portfolio management, and/or investment oversight has meant that the fund no longer qualifies as women-run. For calculation purposes, we only include those "conflict" funds that qualified as women-run for the time period within which they qualified. For example, if a fund had a female CIO for two years but she recently left and the firm no longer qualifies based upon portfolio management composition or ownership, we would include the fund in the calculation of any universe or performance statistics for the time period in which she held the position, but omit the performance after her departure.

Universe Characteristics & Comparisons

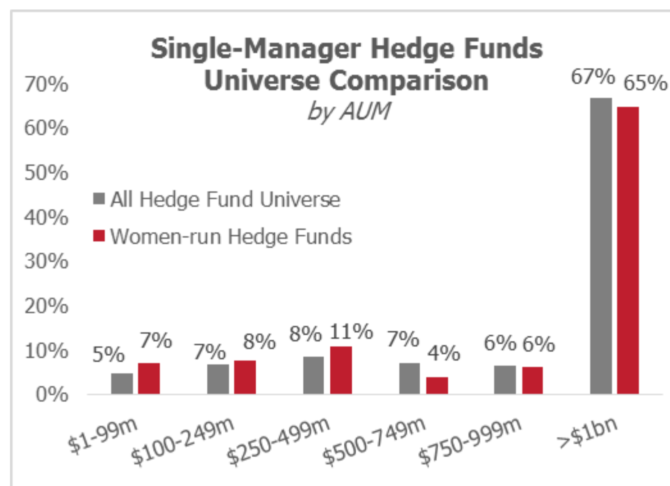
Now that we have defined the women-run fund universe, we can begin looking at some comparisons to the broader hedge fund universe. For this, we use eVestment hedge fund universe statistics unless otherwise noted. The funds included were last updated in June 2015.

No analysis of the investment and behavioral differentials of two groups can occur without a review of whether or not you are comparing apples to apples. Since evidence has shown that smaller hedge funds have had a tendency to outperform over certain time periods, are there size differentials between the two universes? What about the breakdown of strategies? Is there an overabundance of a specific type of fund? What are the overall characteristics of the hedge fund universe versus the universe of women-run hedge funds? Addressing these questions allows for a more thorough review of the outcomes of the cohort of women-run hedge funds.

Distribution of Hedge Funds Based Upon Size

Let us begin with the size question. Statistics in the early 2000s were frequently cited showing that smaller funds had a tendency to outperform. While it has been recently argued that this performance differential has dissipated, an analysis of the distribution of the size of the women-run hedge fund universe versus the broad universe is nonetheless a relevant exercise.

In analyzing the universe of women-run hedge funds versus the overall single-manager hedge fund universe based upon size, most of the differences are insignificant. This is consistent when looking at the segmentation on an assets under management or fund count basis.



Source: eVestment[4], Kyria Capital

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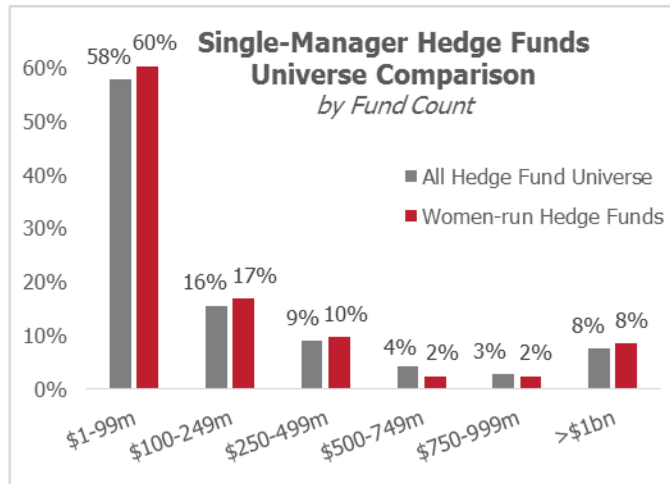
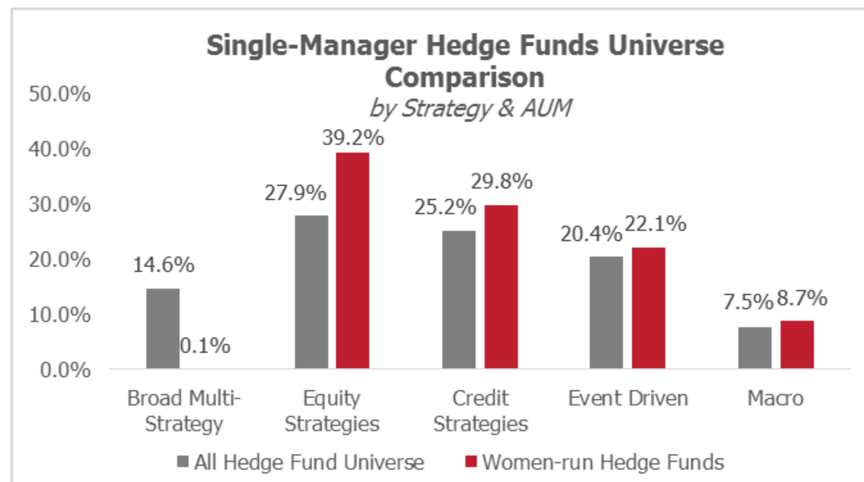


Source: eVestment[5], Kyria Capital

The similarity in the breakdown of assets and fund count is fairly uniform between the two universes. This shows that the distribution of assets in the women-run hedge fund cohort is representative of the overall single-manager hedge fund universe. The vast majority of assets is held by the largest funds whereas the vast majority of the number of funds is concentrated in those funds managing <$100 million. The largest difference between the universes in any bucket in either comparison is 3.1%, and the average difference is 1.5%. From this review, we do not conclude that any adjustments need to be made to analytics on the women-run hedge fund universe based upon size differential when comparing to a broader hedge fund universe.

Distribution of Hedge Funds Based Upon Strategy

The next characteristic for review is an analysis of the breakdown of each universe based upon investment strategy. For this purpose we categorized the two universes into five categories: Broad Multi-Strategy, Equity Strategies, Credit Strategies, Event-Driven, and Macro.



Source: eVestment[6], Kyria Capital

In reviewing this comparison, a larger differential can be seen. Specifically, very few Broad Multi-Strategy assets are managed in the women-run hedge fund cohort. This difference is almost entirely attributed to an increase in Equity Strategies. This is relevant given Equity Strategies have outperformed Broad Multi-Strategy funds over the past 10 years.

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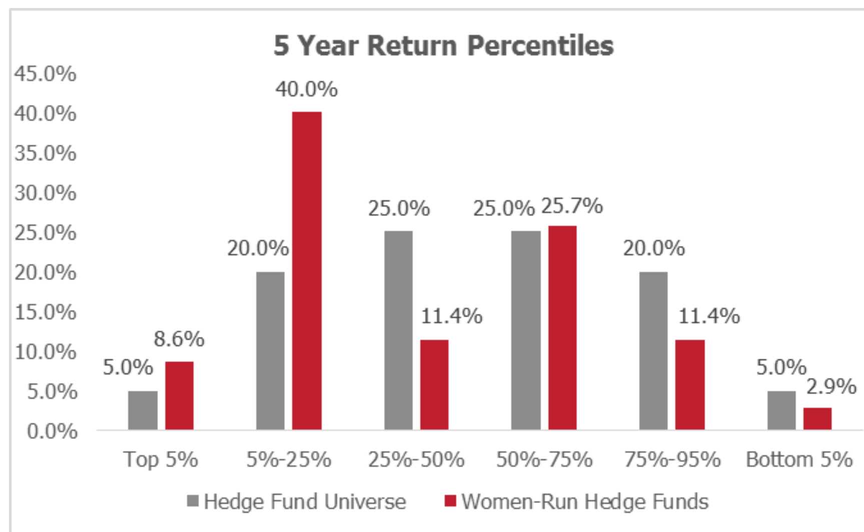
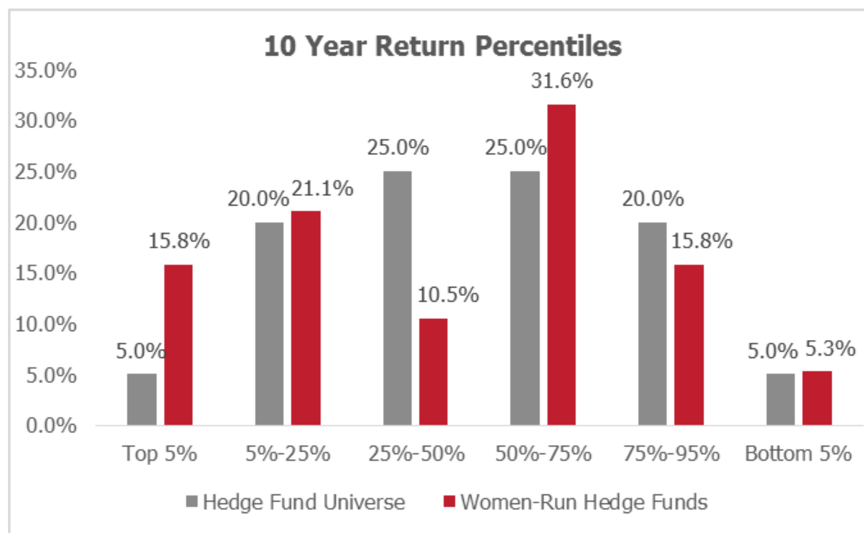
The degree of that differential has annualized around 1.5%. Given the skew shown between the universes, this would give the women-run hedge fund universe roughly a 22 basis point annual advantage versus the overall hedge fund universe. It will also manifest in a slight increase in the volatility measures of the women-run hedge fund cohort as well as any correlation statistics versus equity indices. These skews are important to account for when reviewing any analytical measurement differentials between the two groups.

Distribution of Hedge Funds Based Upon Performance

Dispersion of the hedge fund universe is always a question. Is this outperformance coming from a handful of exceptionally strong funds or is it a more even distribution? In an attempt to address this issue, we ran the percentile ranking of all of the women-run hedge funds versus where they fall in the overall eVestment hedge fund universe. We then bucketed all funds by quartile performance and further highlighted the top and bottom 5% buckets. We ran this analysis over the past five and 10 years.





Source: eVestment[7], Kyria Capital

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In both the past five and 10 years, women-run funds show a large skew to the top quartile. Specifically, 48.6% of women-run hedge funds fall into the top quartile of performance over the past five years, and 36.9% over the past 10 years. The third quartile (50%-75% performers) shows a slightly elevated membership of women-run hedge funds versus the overall hedge fund universe, particularly over 10 years. These disparities are coming from significant reductions in the frequency of women-run hedge funds to appear in the second quartile (25%-50% performers) and the bottom quartile of hedge funds. Only 14.3% of women-run hedge funds are in the bottom quartile over the past five years, and 21.1% over the past 10 years. It is worthy to note that the only women-run hedge funds in the bottom 5% for both five and 10 years are dedicated short sellers.

Constructing an Index

While we can analyze the overall hedge fund universe versus the women-run hedge fund universe based upon some qualitative characteristics and a few quantitative metrics, any comprehensive quantitative evaluation of risk and performance metrics requires an index comparison. Given the lack of any available such index in the marketplace, we have constructed our own for this purpose.

To do this, we follow methodology similar to that used by large hedge fund index providers. The Kyria Index is an equal-weighted average of the monthly returns of all known women-run hedge funds where we confidently received performance information. Once a fund's performance is included, it stays in the index regardless of whether that fund closes in an effort to mitigate survivor bias. For managers reporting performance on two funds that are essentially run *pari passu* (i.e.: an onshore and an offshore version or a separate account with a duplicative mandate), we count only the primary vehicle.

Performance & Statistical Analysis

As of June 2015, the Kyria Index includes performance information on 88 unique hedge funds. All performance and statistical data is as of the quarter ended March 31, 2015 unless otherwise noted.

10 Year Performance & Statistical Analysis

	Kyria Index	HFN Hedge Fund Aggregate Index	S&P 500
Annualized Return	9.58	5.86	8.01
Cumulative Return	149.71	76.68	116.10
Std Dev	7.06	5.88	14.76
Gain Dev	6.10	4.49	10.64
Loss Dev	4.49	3.96	10.44
Max Drawdown	14.20	17.72	50.95
Sharpe	1.16	0.76	0.45
Treynor (S&P 500)	20.90	13.98	6.60
Sortino	1.95	1.12	0.63
Skewness	-0.51	-0.87	-0.86
Kurtosis	0.94	2.23	2.13
Kyria Index Versus Benchmarks			
Excess Return		*3.73*	*1.57*
Alpha		*2.76*	*6.14*
Beta		*1.14*	*0.39*
Corr [R]		*0.95*	*0.82*
R^2		*0.90*	*0.67*
Info Ratio		*1.58*	*0.16*
Up Mkt Capture		*134.35*	*54.00*
Down Mkt Capture		*99.59*	*34.34*

Source: eVestment, Kyria Capital

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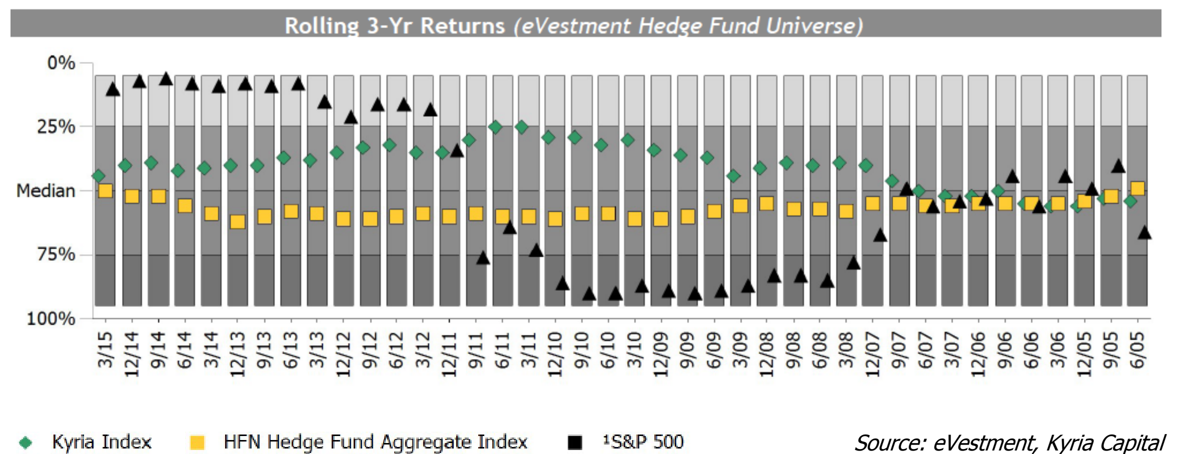
The degree of outperformance immediately stands out. The Kyria Index shows an annualized 3.73% excess return over the HFN Hedge Fund Aggregate Index, which compounds to almost twice the performance over the 10-year time period. The volatility metrics on the Kyria Index are slightly higher, but it posts less than half the volatility of the S&P 500. In breaking down the volatility numbers into upside and downside swings, a skew to upside volatility is observed by the larger degree of gain deviation versus loss deviation. These observations are consistent with the data displayed in the Sharpe, Sortino, and Treynor ratios. These show a larger amount of excess return per unit of risk for the Kyria Index than either the HFN Hedge Fund Aggregate Index or the S&P 500. If considerations of risk are viewed not as volatility, but as loss of capital, then the maximum drawdown of the Kyria Index is markedly better than the broader universe. Versus the S&P 500, the Kyria Index demonstrates slightly more than half the upside with approximately a third of the downside.

One question this analysis raises is of "recency bias," or believing that recent trends are indicative of all past periods. To account for this, it is a good practice to review trends in the data over a variety of time periods. The graph below plots all three indices versus the performance of the universe of all hedge funds in the eVestment database by percentile ranking. On a rolling 3-year basis for the past 10 years, the outperformance of the Kyria Index versus the HFN Hedge Fund Aggregate Index can be seen fairly consistently, frequently by a significant margin.



Source: eVestment, Kyria Capital

Given the fact that the Kyria Index shows slightly higher volatility measures than the HFN Hedge Fund Aggregate Index, this begs the question of whether those returns are a result of higher risk taking on the part of women-run hedge funds. In performing a similar, rolling 3-year analysis of the Sharpe ratio, or the excess return per unit of risk above a risk-free benchmark (in this case the Citigroup 3-month Treasury Bill Index), it shows that this is not the case. The Kyria Index shows consistently higher Sharpe ratios than the HFN Hedge Fund Aggregate Index.

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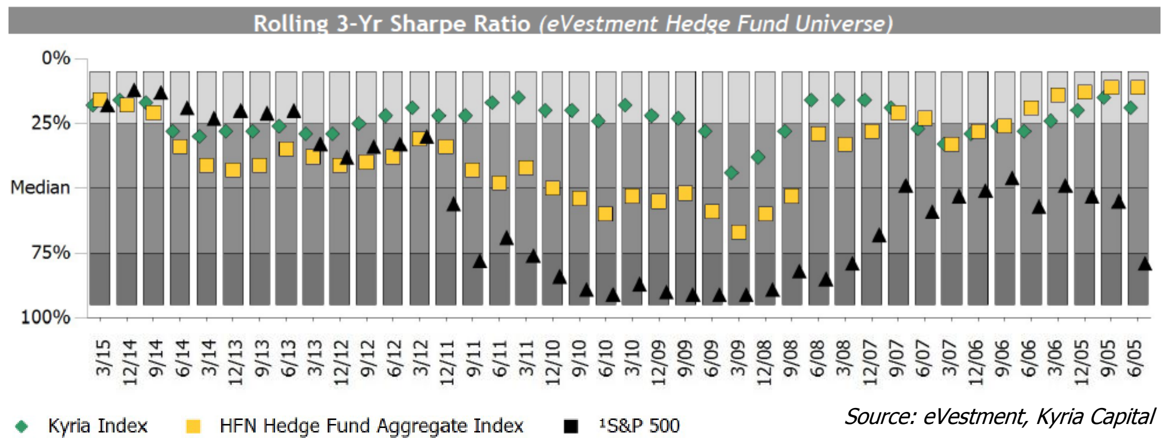
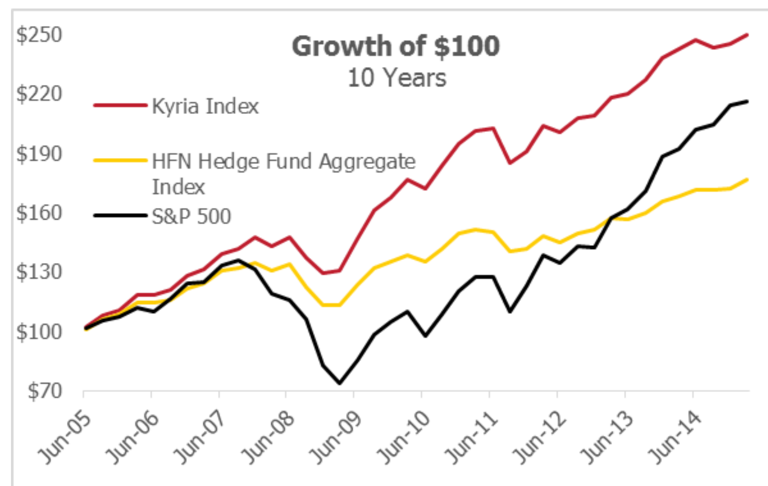


Source: eVestment, Kyria Capital

The performance differential between the Kyria Index and these two benchmarks is particularly apparent when viewed cumulatively. Hedge funds as a whole have lost ground to equity indices over the past five years, and women-run funds are no different. The performance differential between the Kyria Index and the S&P 500 has compressed, especially over the past three years. Yet in viewing the Kyria Index versus the HFN Hedge Fund Aggregate Index, that differential has continued to widen both in the recent past and steadily over the past decade.



Source: eVestment, Kyria Capital

Behavioral Analysis

The behavioral research discussed earlier begs the question of whether evidence of such cognitive biases is impacting the performance of the Kyria Index. Analyzing this question is highly complex. Given the range of strategies and variants of hedge fund trading styles, the behavioral assertions of the academic research are difficult to evaluate from the data on the Kyria Index. Of the three behavioral biases discussed – overtrading/overconfidence, investment consistency, and downside protection – the question of downside protection is the only one for which we can view directly relevant data.

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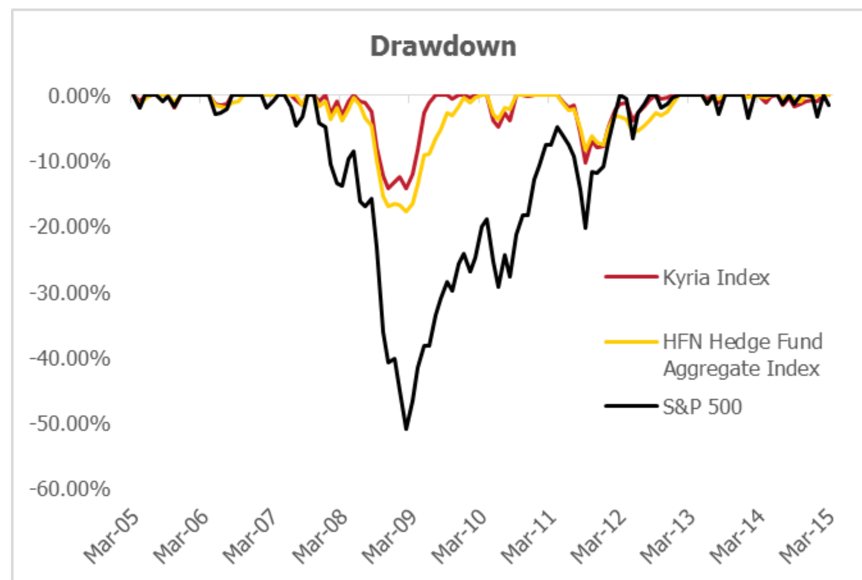
Max Drawdown Statistics (April 2004 to March 2015)

	Kyria Index	HFN Hedge Fund Aggregate Index	S&P 500
Max Drawdown	14.20%	17.72%	50.95%
Drawdown Length (months)	9	16	16
Recovery Length (months)	5	13	37
Max Underwater Period (months)	14	29	53

Source: eVestment, Kyria Capital

The drawdown experience of the Kyria Index was not only shallower than the HFN Hedge Fund Aggregate Index, but the duration of the drawdown was less than half the length of time. The comparison to the S&P 500 is even more stunning. The Kyria Index had approximately a quarter of the loss of the S&P 500 and experienced those losses for a quarter of the time.



Source: eVestment, Kyria Capital

This behavior suggests that the academic assertion that female asset managers may have a propensity to focus on downside protection is accurate. With both a shallower and shorter drawdown, the ability for this cohort to preserve capital is shown to be higher than in the overall hedge fund universe.

Portfolio Construction Impact

The sum of this analysis begs the question of how this research can be utilized in an investment context. In building diversified portfolios, the higher the diversity of the return streams of the components, the greater the benefits of diversification. Given the performance statistics shown on the Kyria Index, the implication is that inclusion of women-run hedge funds into an overall portfolio should be additive to the performance of that portfolio.

To analyze this question, we ran a correlation matrix of 10 of the largest multi-strategy fund of funds (FOFs) in the eVestment database versus the Kyria Index. While imperfect,

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this provides a basis for analyzing what a combined multi-strategy portfolio could look like.

10 Year Correlation Matrix

	FOF 1	FOF 2	FOF 3	Kyria Index	FOF 4	FOF 5	FOF 6	FOF 7	FOF 8	FOF 9	FOF 10
FOF 1	1.00	0.88	0.92	**0.89**	0.89	0.93	0.91	0.91	0.85	0.92	0.96
FOF 2	0.88	1.00	0.87	**0.73**	0.91	0.86	0.91	0.79	0.81	0.83	0.87
FOF3	0.92	0.87	1.00	**0.83**	0.85	0.90	0.87	0.82	0.84	0.87	0.90
Kyria Index	**0.89**	**0.73**	**0.83**	**1.00**	**0.70**	**0.81**	**0.77**	**0.79**	**0.76**	**0.87**	**0.86**
FOF 4	0.89	0.91	0.85	**0.70**	1.00	0.85	0.93	0.82	0.83	0.85	0.92
FOF 5	0.93	0.86	0.90	**0.81**	0.85	1.00	0.88	0.87	0.85	0.89	0.91
FOF 6	0.91	0.91	0.87	**0.77**	0.93	0.88	1.00	0.84	0.84	0.92	0.92
FOF 7	0.91	0.79	0.82	**0.79**	0.82	0.87	0.84	1.00	0.81	0.85	0.87
FOF 8	0.85	0.81	0.84	**0.76**	0.83	0.85	0.84	0.81	1.00	0.84	0.84
FOF 9	0.92	0.83	0.87	**0.87**	0.85	0.89	0.92	0.85	0.84	1.00	0.93
FOF 10	0.96	0.87	0.90	**0.86**	0.92	0.91	0.92	0.87	0.84	0.93	1.00

Source: eVestment, Kyria Capital

The lower correlation of the Kyria Index versus the majority of these FOFs seems consistent with the assessment that this cohort should be complementary to a diversified portfolio. This being the case, we took the largest of these FOFs, FOF 8, and constructed a 50/50 portfolio with the Kyria Index. We ran this portfolio back 10 years, rebalancing quarterly. The results are shown in the chart below.

10 Year Performance & Statistical Analysis Comparison

	FOF 8	Kyria Index	Kyria/FOF 8 Blend
Annualized Return	8.28	9.58	**8.96**
Cumulative Return	121.61	149.71	**135.85**
Std Dev	6.79	7.06	**6.50**
Gain Dev	5.46	6.10	**5.45**
Loss Dev	4.52	4.19	**4.13**
Gain/Loss	0.85	1.18	**1.00**
Skewness	-0.91	-0.51	**-0.84**
Kurtosis	1.80	0.94	**1.50**
Sharpe	1.01	1.16	**1.16**
Sortino	1.52	1.95	**1.83**
Max Drawdown	20.67	14.20	**16.52**
Max Underwater Period	29.00	14.00	**15.00**
Versus S&P 500			
Alpha	*6.11*	*6.14*	***6.13***
Beta	*0.26*	*0.39*	***0.32***
Corr (r)	*0.56*	*0.82*	***0.74***
R^2	*0.31*	*0.67*	***0.54***
Info Ratio	*0.02*	*0.16*	***0.09***
Up Mkt Capture	*41.21*	*54.00*	***47.61***
Down Mkt Capture	*21.50*	*34.34*	***27.95***

Note: **Green** indicates an improvement in the statistics over a portfolio of FOF 8 alone, **Red** indicates a worsening of the statistics.

Source: eVestment, Kyria Capital

More than any other, this chart shows the benefit of the behavioral diversity that women-run hedge fund managers can bring to a multi-strategy hedge fund portfolio. In comparison to a portfolio holding just FOF 8, the inclusion of the Kyria Index in an

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allocation improves the metrics in all but a handful of statistics. Returns are better while volatility measures are lower. Both the Sharpe and Sortino ratios increase in a meaningful way. The maximum drawdown is reduced significantly, and the period underwater is halved. While the combined portfolio shows a slight increase in beta and correlation to the S&P 500, the alpha and information ratio to the S&P 500 is improved at the same time. The resulting portfolio captures almost half the upside of the S&P 500 versus only slightly more than a quarter of the downside.

Statistical Adjustments to the Data

While we believe this analysis to be robust, there are some additional adjustments that can be made to further increase investor comfort with the integrity of the data. These adjustments are based on strategy skew, sample size, and survivor bias. Incorporating modifications to the data in relation to these issues offers a highly conservative approach to the viewing the performance of this cohort of managers.

The first adjustment to consider is to account for the skew in strategy between the women-run hedge fund universe and the overall hedge fund universe. As we have already discussed, this equates to about 22 basis points in excess performance on an annualized 10-year basis.

The second adjustment to consider is statistical in nature relating to the sample size of the Kyria Index. The confidence interval around the performance of the 88 funds in the Kyria Index versus the interval around the 3,074 funds included in the HFN Hedge Fund Aggregate Index is not the same. At a 95% confidence level, the Kyria Index is more accurately stated to have a 10-year annualized return of 9.58% +/- 1.48% versus the HFN Hedge Fund Aggregate Index of 5.86% +/- 0.21%.

Statisical Adjustment Based Upon Sample Size

	Kyria Index	HFN Hedge Fund Aggregate Index
10 Year Annualized Return	9.58	5.86
10 Year Std Dev	7.06	5.88
Sample size	88	3074
95% Conf. Interval	+/- 1.48	+/- 0.21

Source: eVestment, Kyria Capital

The third adjustment that should be considered is one of "survivor bias," or the positive skew of hedge fund index returns versus the realized performance of the universe caused by the closing of funds. Given annual attrition rates estimated north of 10%, this phenomenon can be impactful. To mitigate some of this issue, most hedge fund indices now require reporting through the life cycle of all funds they are aware of, as we have done in the construction of the Kyria Index. Investor pressure, particularly over the past 10 years, has helped to encourage this practice and has led to more expansive and comprehensive reporting.

Several studies have been done to estimate survivor bias in the hedge fund industry since 2000. Given the development and rate of growth of the industry since then, when older studies have been reviewed, their estimates appear inflated compared to the actual experiences of the more recent past. In our review of the research, the most recent broad-based study we found on the topic was published in the Journal of Financial Economics in November 2011 incorporating data from 1994 through 2010.[8] The study estimates survivor bias to be approximately 1.91% annually. They arrived at this number by analyzing the returns of "graveyard funds" that had closed versus live, active funds. This performance discount should be incorporated into any review of hedge fund return statistics that are not actively mitigating the bias in requiring ongoing reporting through a fund's lifecycle.

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In regards to the Kyria Index, while we have a strong degree of confidence around our inclusion of fund closures in the past two years, we are significantly less confident regarding the prior eight. To account for this, we would need to incorporate the 1.91% adjustment to the first eight years of the calculations on the index. That adjustment accounts for an annualized reduction of 1.53% on the 10-year return. In the interest of being conservative, we will assume a perfect capture of fund closures by the HFN Hedge Fund Aggregate Index and will make no adjustments to that return. We have no means of estimating what percentage of closing funds they might be missing and will err towards the integrity of their information. Without knowledge of that adjustment however, we will remove comparisons to the S&P 500 from this point forward.

While each of these adjustments are discussed individually, combining them provides for the most holistic view of the data. The strategy skew and survivor bias would both need to be deducted from the performance of the Kyria Index. The confidence interval expands the range of possible outcomes and thus needs to be both deducted to provide a lower bound to the range and added to provide an upper bound.

10 Year Statistical Adjustments w/ Confidence Interval

	Kyria Index	HFN Hedge Fund Aggregate Index	*Differential*
Annualized Return	9.58	5.86	*3.73*
- Strategy Skew	-0.22		
- Survivor Bias	-1.53		
Ann. Rtrn. w/ Adjustments	*7.83*	*5.86*	*1.98*
Confidence Interval	+/- 1.48	+/- 0.21	
Ann. Rtrn. - Upper Bound	*9.31*	*6.07*	*3.24*
Ann. Rtrn. - Lower Bound	*6.35*	*5.65*	*0.70*
Cum. Rtrn. - Upper Bound	*143.56*	*80.27*	*63.29*
Cum. Rtrn. - Lower Bound	*85.09*	*73.26*	*11.83*

Source: eVestment, Kyria Capital

As can be seen in the chart above, the effects of these adjustments are not negligible. In looking at the lower bound, these adjustments have reduced the annualized 10-year return of the Kyria Index by 3.23%. Even in that scenario however, the outperformance of the Kyria Index remains.

In running this analysis, we can state with a 95% confidence level that the Kyria Index has posted an annualized 10-year return of between 6.35% and 9.31%. This equates to an annualized outperformance over the HFN Hedge Fund Index of between 0.70% and 3.24%. Cumulatively, the total outperformance over the past 10 years can be stated to be between 11.83% and 63.29%.

Conclusion

Diversity mandate or social implications aside, investments should have the integrity to stand on their own merit. All too often, investing in women-run hedge funds is argued to be about affirmative action, not investment prowess. We would assert that this approach has a propensity to understate the attractiveness of these managers.

Women-run hedge funds are doing something rarely seen in finance – performing well with little to no fanfare. This cohort of managers has quietly been posting returns that warrant consideration. From stronger risk/return characteristics to lower correlations to smaller drawdowns and quicker recoveries, the group has performed impressively. Even

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while adjusting for strategy skew and survivor bias, women-run hedge funds have produced attractive returns versus their peers.

While it is impossible to know precisely the degree that behavioral differences account for this outperformance, the fact that academic research demonstrates the diversification of thought and style that women bring to investing should draw attention from investors interested in seeking cognitive diversity in their portfolios.

Investment discussions are analytical. When an entity proposes the use of an initial screen such as a trading style or strategy to narrow the field to a subgroup of managers, the discussion regarding the relevance and appropriateness of that screen is likely to remain both abstract and academic. Using a gender lens as an initial screen frequently adds the dynamic of emotion, some positive and some negative. If investors can divorce themselves from their opinions on gender representation in finance and evaluate the cohort of women hedge fund managers based upon objective information, significant opportunities emerge.

END NOTES

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A Sampling of Notable Academic & Industry Research on Gender Bias in Finance

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