Size and Age Matter: An empirical analysis of the impact of size and age on hedge fund returns

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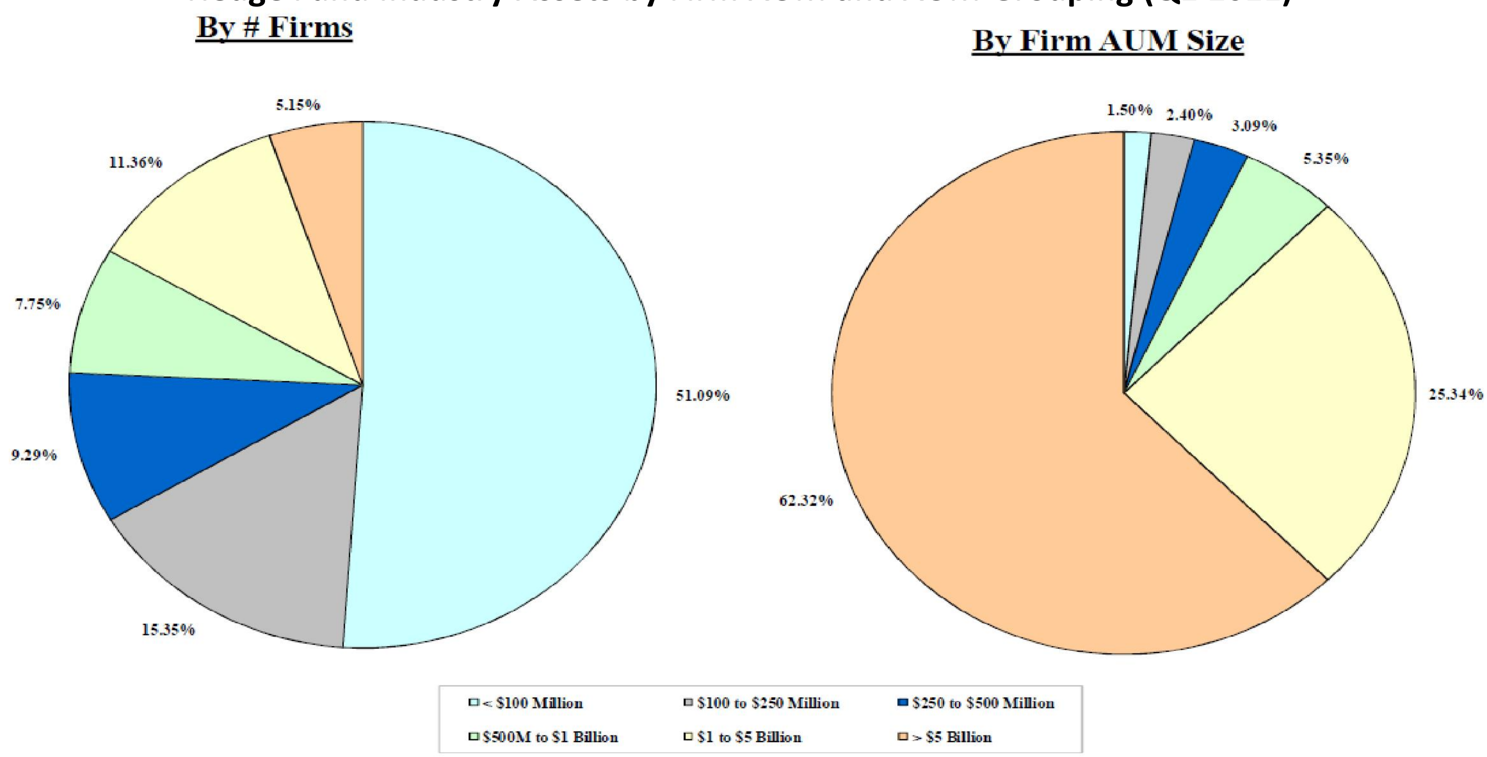
Introduction

- The hedge fund industry has grown from $38.91 billion in 1990 to $2.02 trillion in Q1 2011[1]. Over the same time period, the number of managers has increased from 530 to nearly 7,285.
- The distribution of industry assets is skewed to large managers with 87.66% of industry assets held by hedge funds with greater than $1 billion in assets under management.
- The number of hedge funds within each AUM grouping tells a completely different story. As of March 31, 2011, 66.44% of hedge funds had less than $250 million in assets under management.
- The dichotomy between the control of industry assets and the number of hedge fund firms naturally leads investors to the following questions:
    - Does hedge fund size and age affect risk-adjusted performance?
    - Does size and age only affect certain strategies?
    - Is there an ideal size and age combination to maximize performance?
- Arden created this empirical analysis to help answer these questions and to provide a foundation of research for investing in emerging hedge funds.

Hedge Fund Industry Assets by Firm AUM and AUM Grouping (Q1 2011)[2]



[1] **Hedge Fund Research(2011)**

[2] **Hedge Fund Research(2011)**

Data Set and Methodology

- Arden's database of hedge fund returns includes data feeds from Hedge Fund Research (HFR), HedgeFund.net, and additional data received from managers Arden tracks that do not report to either database.
- As of March 31, 2011, Arden had 3,526 hedge funds in the database, which excludes duplicates, funds of hedge funds, long-only, and 130/30 funds.
- Arden conducted this analysis from January 1, 2001 to March 31, 2011. The average number of funds in the data set over this time period was 2,067.
- Arden constructed custom hedge fund indices based on size, age, and a combination of size and age. Arden also analyzed these groupings at the strategy level.
- Arden constructed a monthly time series for the custom indices by categorizing each fund based on its size and age at month-end for the given time period.
- The following assets under management size groupings were created based on Arden's analysis of the hedge fund universe and knowledge of investor preferences.
    - Less than $100 million
    - $100 million to $500 million
    - $500 million to $1 billion
    - $1 billion to $4 billion
    - Greater than $4 billion
- The following age groupings were created based on Arden's analysis of the hedge fund universe and knowledge of investor preferences.
    - Less than two years
    - Two to five years
    - Five to ten years
    - Greater than ten years

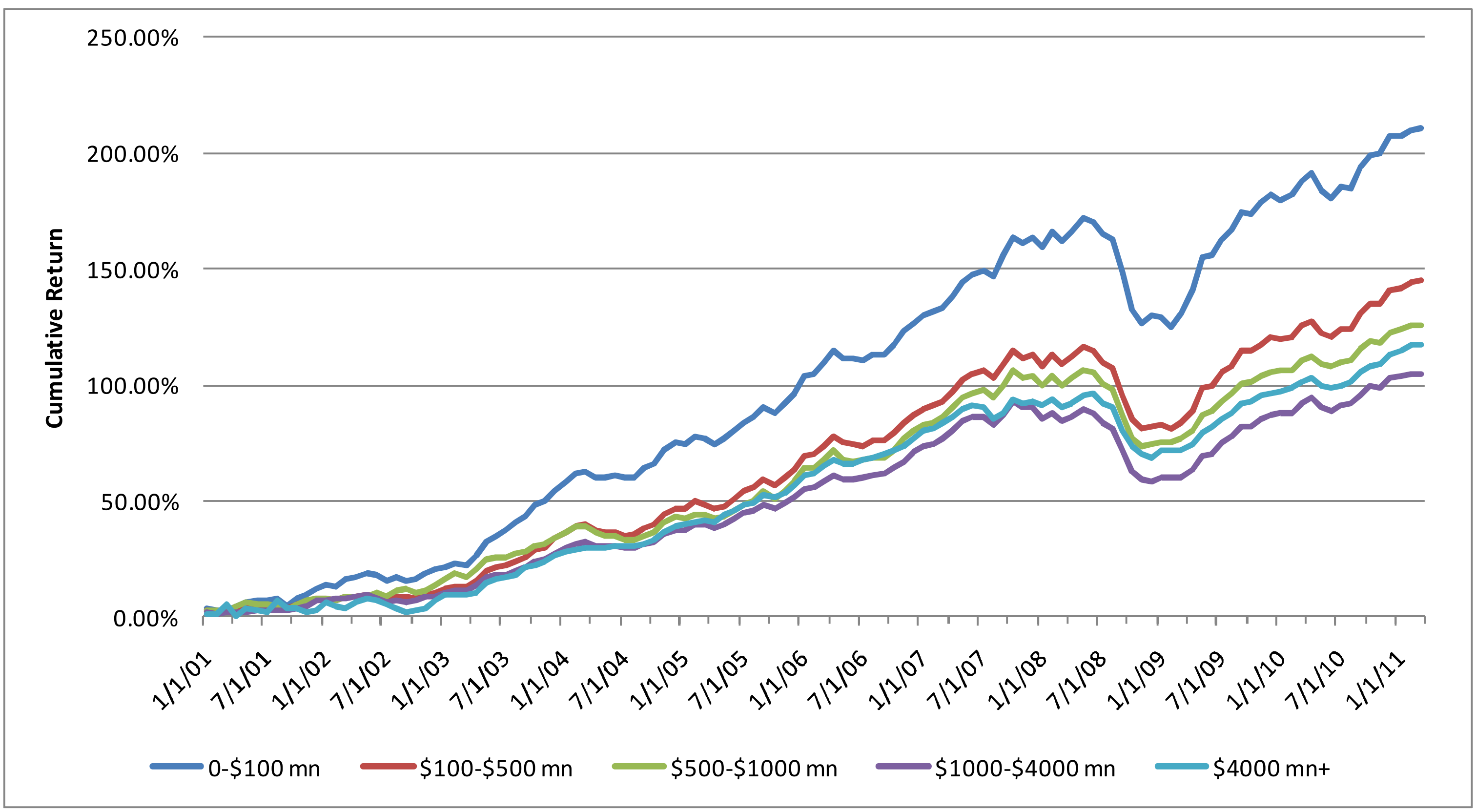
Size Analysis

- The results shown below in Figures 1 and 2 indicate the annualized returns and Sharpe Ratio of hedge funds decrease as size increases.
- Hedge funds with assets under management between 0 and $100 million had the highest annualized returns (11.68%) and Sharpe Ratio (1.46). The funds with greater than $4 billion in AUM had the lowest Sharpe Ratio (0.98), but also performed better in 2008, and had the smallest drawdown (-14.21%).
- These results support the academic and industry research in favor of investing in small and emerging hedge funds, but also illustrate the increased risk of these hedge funds.

Figure 1: Performance Metrics for the Size Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-$100 mn	$100-$500 mn	$500-$1000 mn	$1000-$4000 mn	$4000 mn+
Annualized Return	11.68%	9.13%	8.29%	7.24%	7.85%
Annualized Volatility	6.48%	5.74%	5.66%	4.98%	5.78%
Sharpe Ratio (2.2%)	1.46	1.21	1.08	1.01	0.98
Max Drawdown	-17.20%	-16.21	-15.81%	-17.72%	-14.21%

Figure 2: Cumulative Returns for the Size Indices (1/31/2001 – 3/31/2011)



Source: Hedge Fund Research (HFR), HedgeFund.net, and Arden Research

Size Analysis by Strategy

- The results shown below analyze the size indices within the Global Macro, Event Driven and Relative Value strategies.
- The trend of small fund outperformance was even more pronounced in Global Macro hedge funds. The largest Global Macro hedge funds only had a 0.23 Sharpe Ratio over this time period.
- The trend was less evident across Event Driven managers where there was a minimal difference between the Sharpe Ratio of the smallest funds (1.49) and the largest funds (1.34).
- Relative Value hedge funds exhibited similar results to the entire universe with small hedge funds generating the highest annualized returns (11.83%) and Sharpe Ratio (2.10). The max drawdown for the funds with greater than $4 billion in AUM was also higher at -12.00%.

Figure 3: Performance Metrics for the Global Macro Size Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-$100 mn	$100-$500 mn	$500-$1000 mn	$1000-$4000 mn	$4000 mn+
Annualized Return	12.85%	10.42%	7.14%	8.90%	4.78%
Annualized Volatility	6.92%	7.96%	11.81%	9.84%	11.13%
Sharpe Ratio (2.2%)	1.54	1.03	0.42	0.68	0.23
Max Drawdown	-6.54%	-9.53%	-18.07%	-11.10%	-17.37%

Figure 4: Performance Metrics for the Event Driven Size Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-$100 mn	$100-$500 mn	$500-$1000 mn	$1000-$4000 mn	$4000 mn+
Annualized Return	10.97%	8.27%	7.78%	9.07%	9.55%
Annualized Volatility	5.88%	5.85%	5.73%	6.04%	5.50%
Sharpe Ratio (2.2%)	1.49	1.04	0.97	1.14	1.34
Max Drawdown	-18.38%	-21.62%	-19.60%	-23.90%	-19.73%

Figure 5: Performance Metrics for the Relative Value Size Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-$100 mn	$100-$500 mn	$500-$1000 mn	$1000-$4000 mn	$4000 mn+
Annualized Return	11.83%	8.31%	7.07%	5.04%	8.13%
Annualized Volatility	4.59%	3.68%	4.30%	4.04%	4.17%
Sharpe Ratio (2.2%)	2.10	1.66	1.13	0.70	1.42
Max Drawdown	-10.18%	-10.08%	-12.26%	-13.20%	-12.00%

Source: Hedge Fund Research (HFR), HedgeFund.net, and Arden Research

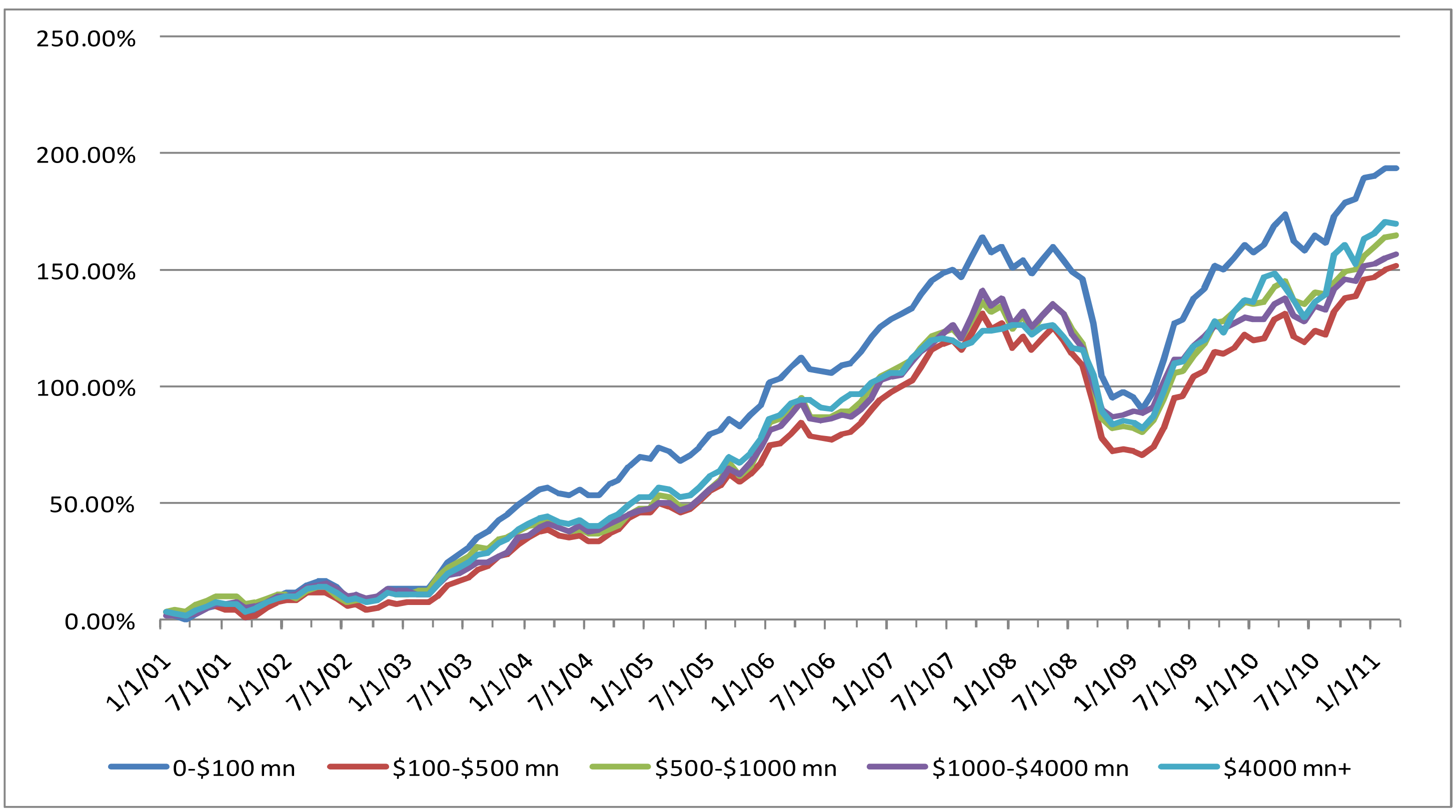
Size Analysis by Strategy

- The most interesting results were observed from the largest hedge fund strategy, Equity Long/Short.
- In Equity Long/Short, the largest hedge funds outperformed all other groups on a risk-adjusted basis with a Sharpe Ratio of 1.03. The largest funds also had the smallest drawdown of -19.41%.
- The cumulative returns chart illustrates the cumulative performance difference between the smallest and largest managers was only 24.17%, but the largest managers had much lower annualized volatility (7.72%).

Figure 6: Performance Metrics for the Equity L/S Size Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-$100 mn	$100-$500 mn	$500-$1000 mn	$1000-$4000 mn	$4000 mn+
Annualized Return	11.09%	9.42%	9.98%	9.64%	10.16%
Annualized Volatility	9.03%	8.19%	8.12%	7.56%	7.72%
Sharpe Ratio (2.2%)	0.98	0.88	0.96	0.98	1.03
Max Drawdown	-28.15%	-26.25%	-23.61%	-22.37%	-19.41%

Figure 7: Cumulative Returns for the Equity L/S Size Indices (1/31/2001 – 3/31/2011)



Source: Hedge Fund Research (HFR), HedgeFund.net, and Arden Research

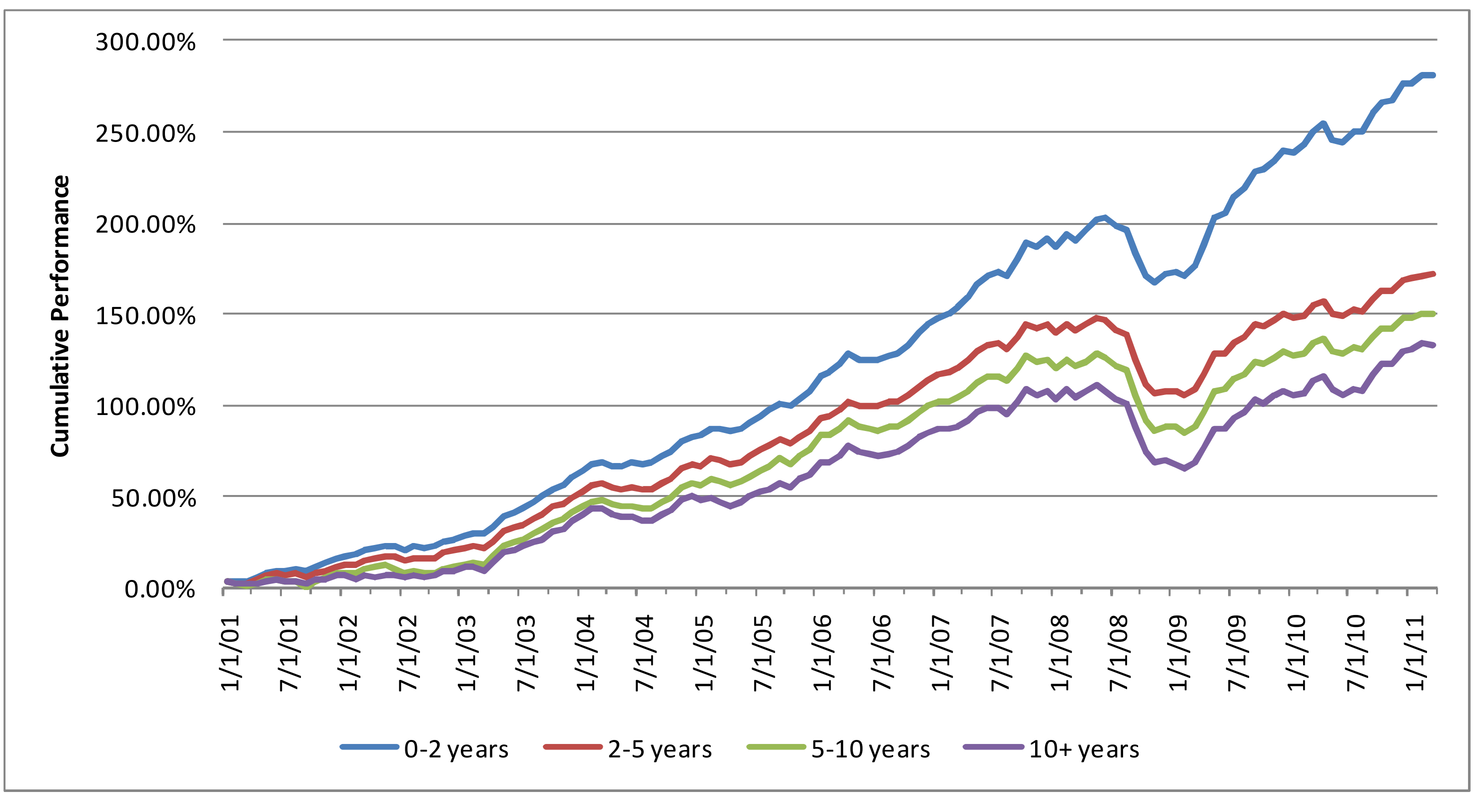
Age Analysis

- The results shown below in Figures 8 and 9 indicate the annualized returns, annualized volatility, and Sharpe Ratio of hedge funds decrease as age increases.
- Hedge funds that are less than 2 years old had the highest annualized returns (13.93%), lowest annualized volatility (5.38%), highest Sharpe Ratio (2.18), and lowest drawdown (-11.75%). Figure 9 shows that these funds generated nearly double the performance of all other groups.
- The most tenured group of hedge funds generated the worst annualized returns (8.62%) and had the largest drawdown (-22.09%).

Figure 8: Performance Metrics for the Age Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-2 years	2-5 years	5-10 years	10+ years
Annualized Return	13.93%	10.25%	9.36%	8.62%
Annualized Volatility	5.38%	6.05%	6.71%	7.43%
Sharpe Ratio (2.2%)	2.18	1.33	1.07	0.86
Max Drawdown	-11.75%	-17.25%	-19.24%	-22.09%

Figure 9: Cumulative Returns for the Age Indices (1/31/2001 – 3/31/2011)



Source: Hedge Fund Research (HFR), HedgeFund.net, and Arden Research

Age Analysis by Strategy

- The results shown below analyze the age indices for the Relative Value, Global Macro, Event Driven, and Equity Long/Short strategies.
- The results across each strategy were similar to the results for the entire universe. The youngest funds with less than two years of performance history outperformed all other groupings by a wide margin with higher annualized returns, higher Sharpe Ratios, lower volatility, and smaller drawdowns.
- The most tenured hedge funds had the worst risk adjusted performance across all strategies with all Sharpe Ratios below 1, and had the largest drawdown for all strategies except Relative Value.

Figure 10: Performance Metrics for the Relative Value Age Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-2 years	2-5 years	5-10 years	10+ years
Annualized Return	12.95%	10.38%	8.59%	7.62%
Annualized Volatility	3.74%	4.10%	4.72%	6.08%
Sharpe Ratio (2.2%)	2.87	2.00	1.35	0.89
Max Drawdown	-7.25%	-9.70%	-14.10%	-13.20%

Figure 11: Performance Metrics for the Global Macro Age Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-2 years	2-5 years	5-10 years	10+ years
Annualized Return	16.16%	11.01%	10.38%	10.28%
Annualized Volatility	5.95%	6.93%	7.71%	10.79%
Sharpe Ratio (2.2%)	2.35	1.27	1.06	0.75
Max Drawdown	-4.91%	-7.42%	-5.95%	-13.75%

Figure 12: Performance Metrics for the Event Driven Age Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-2 years	2-5 years	5-10 years	10+ years
Annualized Return	14.19%	9.70%	7.73%	6.99%
Annualized Volatility	5.43%	5.50%	6.30%	6.79%
Sharpe Ratio (2.2%)	2.21	1.36	0.88	0.71
Max Drawdown	-12.12%	-20.11%	-23.96%	-25.08%

Figure 13: Performance Metrics for the Equity L/S Age Indices (1/31/2001 – 3/31/2011)

Performance Metrics	0-2 years	2-5 years	5-10 years	10+ years
Annualized Return	13.56%	10.29%	9.81%	8.73%
Annualized Volatility	8.03%	8.70%	9.32%	10.01%
Sharpe Ratio (2.2%)	1.41	0.93	0.82	0.65
Max Drawdown	-20.88%	-28.67%	-29.26%	-33.39%

Source: Hedge Fund Research (HFR), HedgeFund.net, and Arden Research

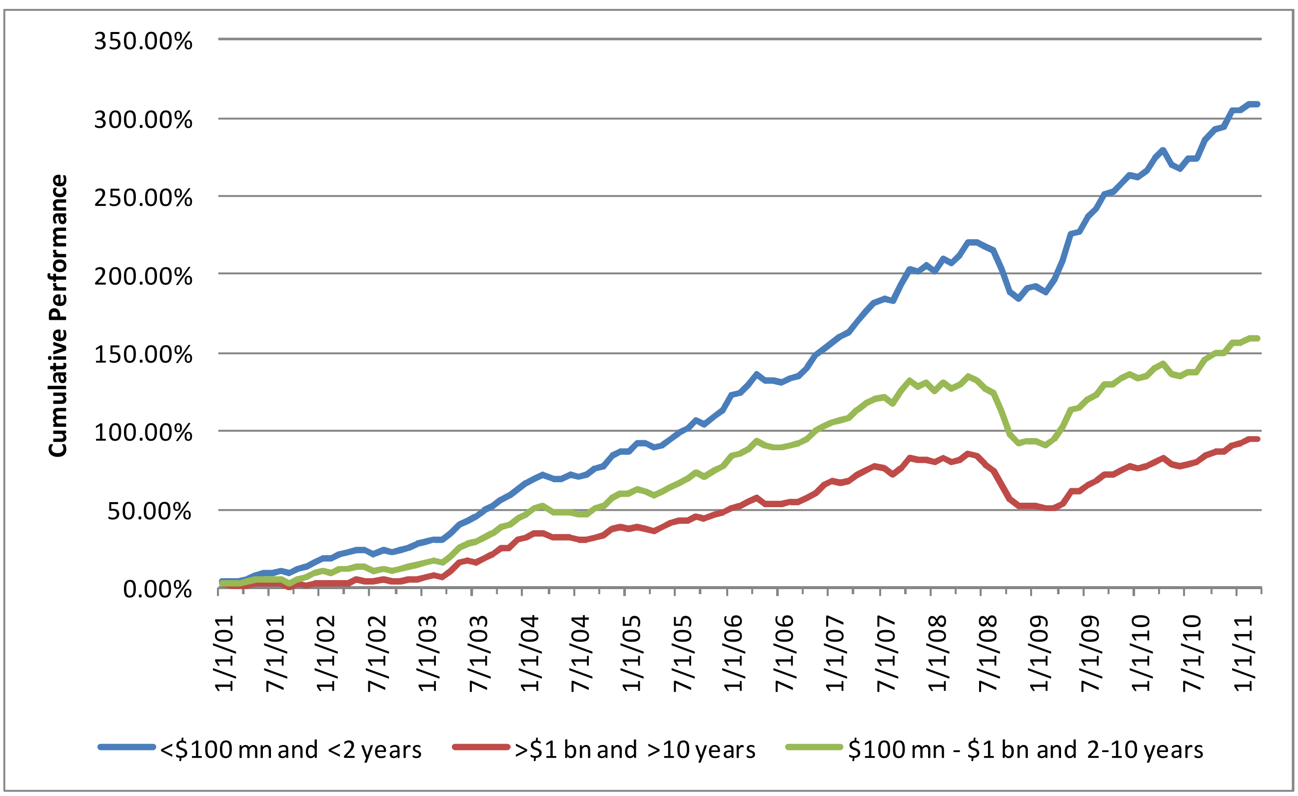
Size and Age Analysis

- The analysis shown below in Figures 14 and 15 were conducted to illustrate three combinations of size and age.
- The results indicated outperformance by hedge funds with less than $100 million in AUM and less than two years of performance history. These hedge funds generated the highest annualized performance (14.73%), lowest annualized volatility (5.57%), highest Sharpe Ratio (2.25), and smallest drawdown (-11.21%).
- The hedge funds with greater than $1 billion in AUM and greater than 10 years of performance history generated the lowest annualized returns (6.72%), lowest Sharpe Ratio (0.75) and had the largest drawdown (-22.09%).

Figure 14: Performance Metrics for the Age/Size Indices (1/31/2001 – 3/31/2011)

Performance Metrics	<$100 mn and <2 years	$100 mn - $1 bn and 2-10 years	>$1 bn and >10 years
Annualized Return	14.73%	9.74%	6.72%
Annualized Volatility	5.57%	6.39%	5.99%
Sharpe Ratio (2.2%)	2.25	1.18	0.75
Max Drawdown	-11.21%	-18.53%	-18.89%

Figure 15: Cumulative Returns for the Size/Age Indices (1/31/2001 – 3/31/2011)



Source: Hedge Fund Research (HFR), HedgeFund.net, and Arden Research

Potential Biases

- Funds with less than a two year track record and less than $100 million of assets under management outperformed the other groupings across all performance metrics. The strong outperformance by these funds is partially explained by self-selection and backfill bias.

- Self-selection bias arises from hedge funds being able to choose if they will report to HFR, HedgeFund.net, and Arden. As a result, funds with strong performance will start reporting to hedge fund databases, while funds with weak performance will choose to not report.

- Back-fill bias occurs as a result of self-selection bias. Hedge fund databases backfill the performance history of managers that choose to report, which skews the performance of young and small hedge funds significantly higher.

- In the academic paper, "The Performance of Emerging Hedge Fund Managers,"[3] Aggarwal and Jorion highlighted these biases and estimated the median back-fill period to be 1.3 years for HFR and Hedgefund.net.

- As a result, the funds with less than two years of performance history and less than $100 million in AUM will have positively skewed data for the first 1.3 years on average.

- Survivorship bias is less concerning for this analysis because HFR, HedgeFund.net , and Arden all attempt to retrieve performance and AUM information until a fund is fully liquidated[4]. Arden's database also stores information on liquidated hedge funds. There are cases where a hedge fund is unwilling to provide information while in the process of liquidating or after experiencing poor performance, but the bias generated from these managers does not have a significant impact on this analysis.

[3] **Aggarwal and Jorion (2008)**

[4] **Hedge Fund Research(2008)**

Conclusion

- These results support academic and industry analysis of outperformance by small and young hedge funds.
- Small managers had the most significant outperformance across Global Macro managers, but underperformed the largest Equity Long/Short managers.
- The youngest funds, with less than two years of performance history, outperformed all other groups by a wide margin across all strategies.
- Notwithstanding the aforementioned biases, there is a clear benefit to including emerging managers in a portfolio of hedge funds.
- Arden has been actively researching emerging managers and will continue to increase its allocations to these funds in the future.

References

1. "Alternative Investment Industry – Performance and Trends," Hedge Fund Research, May, 16, 2011.

2. Rajesh K. Aggarwal and Philippe Jorion, "The Performance of Emerging Hedge Fund Managers," Social Science Research Network, January 23, 2008.

3. "HFR Indices – Basic Methodology and FAQ," Hedge Fund Research, 2008.

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