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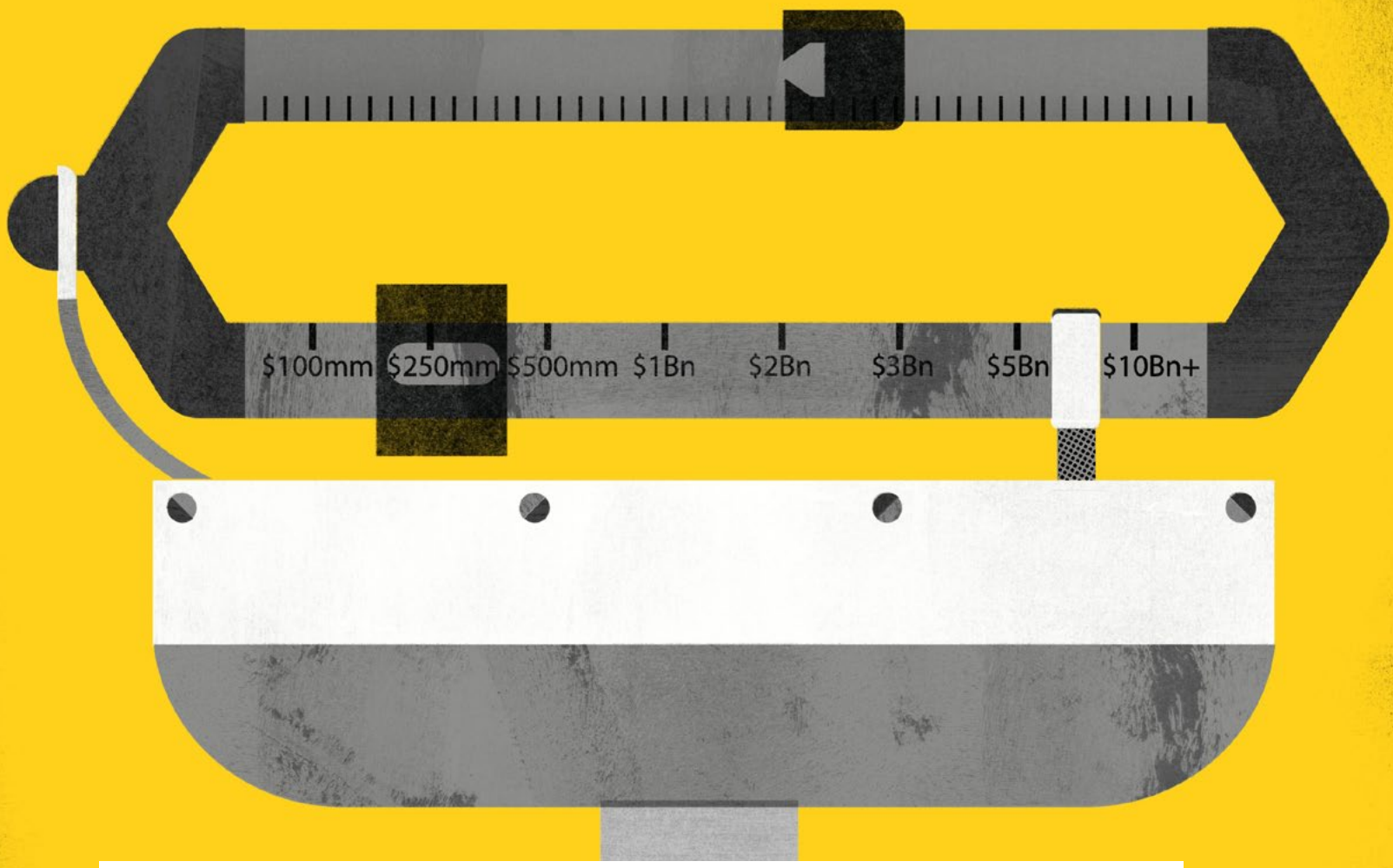


How AUM Growth Inhibits Performance

By Andrea Gentilini

Academic studies and practitioner literature agree that investment performance deteriorates as fund size increases. While useful in principle, all of these studies are based on analysis of fund returns, which gives investors little insight on how to translate this finding into action. In fact, it is well known that fund returns poorly represent the strengths or weaknesses of the underlying investment process. At what point is AUM growth excessive? What are the leading indicators that such growth is having a detrimental impact on the investment process? What data can investors use to build predictive indicators of deteriorating returns? In this paper, we tackle these questions by first reviewing the literature on the subject. Secondly, we develop a fundamental model for the transmission mechanisms through which AUM growth leads to changes in the core

characteristics of an investment process. Thirdly, we present anonymous, in-depth case studies of hedge funds whose AUM growth has led to deteriorating performance via one of the postulated transmission mechanisms. Fourthly, we develop population statistics for two groups of well-known equity long/short funds to assess how often the transmission mechanisms are likely to occur. We conclude by discussing a few actionable checklist items that investors may use to avoid the risk of being trapped in funds with deteriorating future performance.

Having an information edge is key for institutional investors to achieve superior and sustainable performance, which motivates the study of performance drivers within the hedge fund industry. That small managers seem to outperform their larger peers is an information edge that many allocators into hedge funds would like to exploit. However, allocators face two main issues with this approach. The first is that access to small managers may be hindered by a number of considerations, including higher mortality rates, reputation risk, and excessively high fund ownership in the case of investment. This issue has already found a market-driven solution, as many fund of hedge funds are increasingly focusing on young, small, emerging managers as a way to differentiate their value proposition. The second issue facing allocators is that—while useful in principle—the information edge is hard to be put into practice. At what point should an allocator redeem from a manager who has been performing well but whose assets have attracted significant inflows and whose AUM has grown at a worrisome rate? Can allocators trust the strategy capacity reported by the manager, or are the conflicts of interest too big for that figure to be taken at face value?

This study aims to provide hedge fund allocators with an information edge in assessing at what point fund size begins to become an impediment to returns before a deterioration in returns materializes. The overall principle of this study is that going beyond returns and monitoring several key metrics about the investment process can give allocators an edge without significant investment in extensive and invasive manager monitoring. The key is looking beyond returns. By the time returns deteriorate, it's too late to act. By then, the negative impact of AUM on performance has already materialized, and allocators have foregone the opportunity to invest their money elsewhere.

The key metrics to monitor may differ depending on the strategy. Those metrics should best characterize the investment process. In particular, they should represent market areas where track record has been built. A simple metric for a hedge fund claiming to have an edge in small caps would be the median market cap. Using such a "first principles" approach not only adds to the robustness of the analysis, but also opens up a new paradigm for manager selection and monitoring: fundamental manager analysis.

This paper is organized into seven sections. Section 1 reviews the literature on the subject, drawing on research articles published by academics in peer-reviewed journals as well as industry papers. Section 2 postulates three transmission mechanisms along which size may impair performance. We focus on equity long/short strategies and provide three real-life examples validating the selection of the transmission mechanisms. Section 3 discusses the results of a cross-sectional analysis on about 80 equity long/short funds using monthly AUM, number of positions, median market cap and portfolio liquidity data for the period of December 2005 through July 2013. Section 4 discusses the results of analyses of individual funds and summarizes these results across the population. Section 5 highlights the data source and study methodology. Section 6 and 7 summarize conclusions and review the methodology adopted for the study, respectively.

This is not an academic paper. Rather, it is a study by practitioners for practitioners. The innovative aspects and contributions of this research are not to be found in the breadth

Cover illustration by Jesse Lefkowitz

of the sample size or the sophistication of the mathematical approach. Rather, it's in the data-driven, fundamental manager analysis. While obvious in principle, it's been obfuscated by our industry's obsession with returns and returns-based analyses.

Literature Review

In a study released in early 2013 [1], Beachhead Capital found that smaller managers (defined as managers with firm AUM between $50 mn and $500 mn) outperformed larger managers (firm AUM greater then $500 mn) by 220 bps per annum over the past 10 years. Over the past five years, outperformance was 254 bps per annum. The study analyzed returns from 2,827 equity long/short funds within the categories Fundamental Value, Fundamental Growth, Technology/Healthcare and Energy. The study found that small managers outperformed both before and after the financial crisis. Both living and dead funds were used for the study. To limit the backfill bias, the authors only considered fund returns from the first reporting date. The best-performing small managers were found to outperform the top-performing big managers in almost every year since the late 1990s. With a beta between small and big managers of just 1.09 and an annualized alpha of 1.70%, the authors exclude that the outperformance was solely driven by higher beta.

In another study to investigate the role of managerial incentives and discretion in hedge fund performance, the authors reported a negative and significant relationship between size and performance [2].

In conducting a broad review of hedge fund performance measurement methods, the Risk and Asset Management Research Center of the EDHEC Institute found that large funds outperform small funds, and that such difference is statistically significant (at the 5% level) for five out of the 10 performance measures adopted [3]. The authors split the study's population of about 600 hedge funds into two subsets divided by their median. However, they did not report where the median lies or simple aggregate statistics for the two populations (e.g., minimum, maximum, median and average values). It is therefore hard to compare the statistical significance of the results with other studies.

In another study whose main objective was to investigate the predictability of hedge fund returns based on returns data from about 8,000 hedge funds [4], the authors found a negative and statistically significant correlation between past inflows and future returns. While inflows are technically not the same as AUM, they are an important contributor. The authors reported that an increase in net flows leads to lower future returns for about 30% of the funds in the population studied, thus concluding that capacity constraints are an important factor in determining optimal allocation to funds.

Avramov et al. [5] found that optimal fund of hedge fund portfolios constructed on the basis of predictable manager skill tend to have a bias for small managers. This corroborates our hypothesis, though it does not test it directly. This study is significant in that it proves that measuring repetitive managerial skill—which is the mantra of the entire fund of hedge fund industry—does indeed represent a competitive edge versus other portfolio construction techniques.

Barras et al. [6] set out to measure "true" alpha—defined as alpha that can be statistically distinguished from alpha generated by luck—among a large mutual fund population. The authors reported that bigger and older funds tend to be associated more often with unskilled managers. They also found that high-inflow funds tend to be associated with the most significant reduction in investment skill during the subsequent five years. Although these results refer to a different segment of the asset management industry (mutual funds versus hedge funds), they provide evidence to the hypothesis postulated here. As an interesting side note, this analysis revealed that 75.4% of all analyzed funds

deliver zero alpha, 24.0% deliver negative alpha, and only 0.6% are skilled. Also, the authors note that the proportion of skilled managers has declined over time, moving from 14.4% in early 1990 to 0.6% in 2006.

In analyzing whether performance persistence was driven by fund age and size from 1994 through 2004 [7], Boyson reported that small funds tend to show higher and more consistent performance versus their large peers. The author also reported that the best-performing small funds outperform the best-performing large funds, thus adding evidence to our conclusion. A portfolio of small, young funds outperforms their larger peers by as much as 10 percentage points (p.p.) per year. These results were weakest for fund of hedge funds and strongest for hedge fund strategies where security selection skill is a key determinant to performance (e.g., in equity long/short).

Beyond hedge funds and mutual funds, asset growth also seems to impair the performance of listed securities. In analyzing a panel of U.S. stocks from 1968 to 2003, Cooper et al. [8] reported that asset growth is negatively correlated to future stock price returns. While the bottom decile of U.S. stocks by asset growth exhibit 18% future annual returns, the top decile shows only 5% annualized growth.

In studying persistence of hedge fund manager skill [9], Edwards et al. reported that hedge fund returns decline as size increases with the exception of global macro and global funds. Also, they found that persistence among winners and losers exists, and that higher incentive fees tend to be associated with better-performing funds.

Fung et al. [10] studied performance, risk and capital formation in the hedge fund industry from 1995 to 2004 and found that a small subset of the investigated funds systematically delivers alpha, which the authors interpret as evidence of skill. Those funds also exhibit lower mortality and are more likely to attract higher and more continuous inflows. While alpha-funds grew at an average annual rate of 30% from 1997 to 2004, their peers grew by only 8%. However, the authors found that inflows tend to diminish the capability of alpha-funds to deliver alpha in the future, which supports our hypothesis.

Getmansky [11] reported a concave relationship between AUM and performance for capacity-constrained and illiquid strategies, suggesting the existence of an optimal size for hedge funds. Below the optimal size, performance tends to increase with AUM. Above the optimal size, performance deteriorates with AUM. No concave relationship appeared for more liquid strategies, i.e., "Dedicated Short Bias," "Equity Market Neutral" and "Short Bias."

In analyzing hedge fund persistence of returns under different measurement methods, Harri et al. [12] reported strong evidence of AUM growth leading to lower future returns, which the authors interpreted as evidence that hedge fund strategies exploit market inefficiencies.

Joenväärä et al. analyzed whether the selection of a given hedge fund database has an impact on certain stylized facts, such as average performance, its persistence over time, and key relationships between fund performance and fund characteristics, e.g., fund size, tenure, management fees and lock-ups. The authors aggregated fund information from five commercial databases (BarclayHedge, EurekaHedge, Hedge Fund Research [HFR], Morningstar, and TASS) consisting of aggregate 60,000 share classes into a consolidated database with 11,217 unique management firms and 30,040 unique hedge funds. The study is particularly useful for hedge funds, as the overlap among databases is less significant compared to the mutual fund industry. In fact, the authors report that 67% of all share classes are covered by only one of the databases. Different conclusions can be attributed to differences in composition between small and large funds, AUM coverage and survivorship biases among the various databases. The authors found that while some stylized facts are highly sensitive to database selection (i.e., performance persistence), small funds outperform larger funds across all databases and their consolidated

versions. Also, they found that small funds tend to exhibit the highest performance persistence. The annual spread in alpha generated between small funds (AUM less than $10 mn) and large funds (AUM higher than $1 bn) is 480 bps (6.47% for small vs. 1.67% for large funds). When analyzing data at the firm level (as opposed to fund level), the spread is 616 bps (7.67% for small vs. 1.51% for large firms). Given the sample size considered and the robustness of the results across a variety of databases, the study lends the most significant support to our hypothesis.

In another study [13], the same authors addressed the size/performance relationship in the context of understanding the effect of investment constraints on hedge fund investor returns. The authors uniquely distinguished between backward- and forward-looking size/performance relationships using monthly returns for about 6,000 funds during an 18-year period. The authors reported "larger funds tend to have generated higher returns than smaller funds in the past but that larger funds tend to perform worse than smaller funds in the future."

While demonstrating that the performance exhibited by top hedge funds cannot be attributed to luck alone and that evidence of performance persistence exists, Kosowski et al. [14] noted that results are not sensitive to fund size, which refutes our hypothesis. However, they also reported that persistence tends to diminish for funds experiencing high inflows, which counterbalances the argument.

Naik et al. [15] investigated whether capacity constraints play a significant role in the hedge fund industry by analyzing data from January 1994 through December 2004 from the combination of four large databases (HFR, TASS, CISDM, and MSCI), resulting in about 7,000 funds. The authors found that while hedge funds generate alpha in excess of standard factor models, alpha has decreased in the four most recent years of the period analyzed. They also found that alpha is negatively correlated with past inflows for four out of the eight strategies considered (Relative Value, Emerging Markets, Fixed Income and Directional Traders). A 10% increase in annual flows was found to lead to average declines in alpha between 36 and 94 bps in the subsequent six months. Considering that alpha over the entire period was 25 bps per month across all funds, the impact is significant and broadly supports our hypothesis.

In reviewing the existing literature on the relationship between fund flows, asset size and performance for hedge funds and fund of hedge funds, Xiong et al. [16] concluded—against our hypothesis—that asset size positively correlates with performance. Our objection to this conclusion is that the literature reviewed consists of only four studies that are solely focused on hedge funds. Of the four, two indicate the presence of a concave relationship, which suggests that after a certain AUM level, further increase in AUM leads to deteriorating performance. The literature discussed here draws on a larger sample of studies and also includes investigations whose main purpose was not to test the relationship between AUM or flows versus performance but nonetheless found evidence of it, which we regard as strong support for our hypothesis.

Since small hedge funds also tend to be newer, it makes sense to investigate whether age (and not size) is the key discriminator of superior performance. In a study that proves younger hedge funds and hedge fund management firms perform better than their older peers, Agarwal et al. [17] found that each year of age decreases alpha by 42 bps and that performance persistence vanishes after the fifth year of existence. They also discovered that funds launched by larger hedge fund management firms tend to perform better than their peers. The authors found no variations in the results when controlling by size, highlighting that age may be more important than size as the main driver behind superior performance. However, we note that their top performance quintile includes funds whose AUM exceeds just $50 mn, which for most practical

purposes also makes them small funds.

In a study directly aimed at understanding the relationship between fund size and future performance, Teo [18] found negative and convex relationships between hedge fund size and future measures of returns. Specifically, the author reported that small managers outperform large managers by 3.65 p.p. per year and that such excess performance is not a consequence of age, leverage, serial correlation or self-selection biases. The convexity manifests in that equal dollar increases in AUM tend to lead to lower performance deterioration the larger the starting AUM.

The evidence in favor of our hypothesis seems to hold true throughout the entire asset management industry. Berk and Green [19] developed a model that explains why flows appear to be chasing past performance in the mutual fund industry that fits well with observed data and is compatible with the existence of managerial skill. Cheng et al. [20] reported that fund growth is a strong predictor of deteriorating future performance for the mutual fund industry, before and after fees.

Overall, we reviewed 23 papers related to hedge funds, of which eight (35%) belong to the peer-reviewed academic literature; the remaining 15 (65%) are either practitioner studies or publications undergoing the peer-review process at the time of this writing. Of all papers reviewed, 14 (61%) find evidence that AUM growth deteriorates performance, two (9%) find evidence of the opposite, while seven (30%) remain inconclusive on the matter. In most cases, the deterioration is directly attributable to AUM. In some cases—which we considered as supporting our hypothesis—the deterioration is attributable to inflows rather than AUM directly. We take comfort in that articles finding negative correlation between AUM and desirable performance attributes utilize on average a

TABLE 1: LITERATURE ON THE SUBJECT

Author	Title	Publishing Date	Peer Reviewed Journal	Number of Funds Analyzed	Time Period	Does AUM Growth Spoil Performance
Oliver Scaillet, Laurent Barras, Russ Wermers	False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alphas	Jul-13	Yes	2,076	Jan 1975 - Dec 2006	Yes
Beachhead Capital Management	Performance of Emerging Equity Long/Short Hedge Fund Managers	Feb-13	No	2,827	Jan 2003 - Aug 2012	Yes
Juha Joeväärä, Robert Kosowski, Pekka Tolonen	New 'Stylized Facts' about Hedge Funds and Database Selection Bias	Nov-12	No	30,040	Jan 1994 - Dec 2002	Yes
Ardian Harri, B. Wade Brorsen	Performance Persistence and the Source of Returns for Hedge Funds	Jul-12	No	1,209	Jan 1997 - Dec 1998	Yes
Mila Getmansky	The Life-Cycle of Hedge Funds; Fund Flows, Size, Competition, and Performance	May-12	No	3,501	Jan 1994 - Dec 2002	Yes
Doron Avramov, Laurent Barras, Robert Kosowski	Hedge Fund Return Predictability Under the Magnifying Glass	Feb-12	Yes	8,376	Jan 1994 - Dec 2008	Yes
Andrea Buraschi, Robert Kosowski, Worrawat Sritrakul	Incentives and Endogenous Risk Taking: A Structural View on Hedge Fund Alphas	Feb-12	No	4,828	Jan 1994 - Dec 2010	No
Franklin R. Edwards, Mustafa Onur Caglayan	Hedge Fund Performance and Manager Skill	May-11	No	1,665	Jan 1990 - Aug 1998	Yes
Melvyn Teo	Does Size Matter in the Hedge Fund Industry?	May-10	No	7,417	Jan 1994 - Jun 2008	Yes

TABLE 1: LITERATURE ON THE SUBJECT (CONTINUED)

Author	Title	Publishing Date	Peer Reviewed Journal	Number of Funds Analyzed	Time Period	Does AUM Growth Spoil Performance
Rajesh K. Aggarwal, Philippe Jorion	The Performance of Emerging Hedge Funds and Managers	May-10	Yes	1,000	Jan 1996 - Dec 2006	No
Doron Avramov, Robert Kosowski, Narayan Y. Naik, Melvyn Teo	Hedge Funds, Managerial Skill, and Macroeconomic Variables	Feb-10	Yes	8,207	Jan 1990 - Dec 2008	Yes
Doron Avramov, Robert Kosowski, Narayan Y. Naik, Melvyn Teo	Hedge Funds, Managerial Skill, and Macroeconomic Variables	Feb-10	Yes	8,207	Jan 1990 - Dec 2008	No
Vikas Agarwal, Naveen D. Daniel, Narayan Y. Naik	Role of Managerial Incentives and Discretion in Hedge Fund Performance	Oct-09	Yes	7,535	Jan 1994 - Dec 2002	Yes
Nicole M. Boyson	Hedge Fund Performance Persistence: A New Approach	Dec-08	Yes	3,333	Jan 1994 - Dec 2004	Yes
Michael J. Cooper, Huseyin Gulen, Michael J. Schill	Asset Growth and the Cross-Section of Stock Returns	Aug-08	Yes	10,000	Jun 1968 - Jun 2003	Yes
William Fung, David A. Hsieh, Narayan Y. Naik, Tarun Ramadorai	Hedge Funds: Performance, Risk, and Capital Formation	Aug-08	Yes	1,603	Jan 1995 - Dec 2004	Yes
James Xiong, Thomas Idzhorek, Peng Chen, Roger G. Ibbotson	Dynamics of Fund of Hedge Funds: Flow, Size, and Performance	Oct-07	No	4,312	Jan 1995 - Nov 2006	No (the opposite)
Robert Kosowski, Narayan Y. Naik, Melvyn Teo	Is Stellar Hedge Fund Performance For Real?	May-07	No	5,533	Jan 1990 - Dec 2002	No
Narayan Y. Naik, Tarun Ramadorai, Maria Stromqvist	Capacity Constraints and Hedge Fund Strategy Returns	Oct-06	No	7,610	Jan 1994 - Dec 2002	Yes
Daniel Wessels and Niel Krige	The Persistence of Active Fund Management Performance	Dec-05	Yes	N/A	Jan 1998 - Dec 2003	No
Burton G. Malkiel and Atanu Saha	Hedge Funds: Risk and Return	Nov-05	Yes	2,000	Jan 1996 - Dec 2003	No
Nicole M. Boyson	Another Look at Concerns: Study on Hedge Fund Managers	May-05	No	2,275	Jan 1994 - Dec 2004	No
Nicole M. Boyson	Another Look at Hedge Fund Career Concerns	Apr-05	No	2,275	Jan 1994 - Dec 2004	No
Joseph Chen, Harrison Hong, Ming Huang, Jeffery D. Kubik	Does Fund Size Erode Mutual Fund Performance? The Role of Liquidity and Organization	May-04	Yes	27,431	Jan 1962 - Dec 1999	Yes
Juha Joeväära, Robert Kosowski, Pekka Tolonen	The Effect of Investment Constraints on Hedge Fund Investor Returns	Dec-13	No	6,012	Jan 2004 - Dec 2012	Yes
Noel Amenc, Lionel Martellini	The Alpha and Omega of Hedge Fund Performance Measurement	Feb-03	No	581	Jan 1996 - Dec 2002	No (the opposite)
Ardian Harri, B. Wade Brorsen	Performance Persistence and the Source of Returns for Hedge Funds	Jul-02	No	1,209	Jan 1977 - Dec 1998	Yes

larger number of funds in their sample (6,467 vs. 3,446). It is interesting to note that comparable dis-economies of scale were found in three out of the four articles that relate to either the mutual fund segment or capital markets in the broader sense. Table 1 lists the details of all 27 papers reviewed (23 for the hedge fund industry and four for asset management/capital markets in the broader sense) as well as the summary conclusions reported. Overall, we are comfortable in concluding that the initial hypothesis is corroborated by academic and practitioner evidence. AUM growth can indeed be detrimental to future performance.

Transmission Mechanisms

As just discussed, most of the literature finds that performance deteriorates with increasing AUM. Without addressing why and how this happens, this insight is only partially useful for a practitioner. At what point of AUM growth does it make sense to start worrying about a manager's capability to sustain returns moving forward? By the time performance deteriorates, it is already too late.

The real practitioner edge lies in anticipating performance deterioration due to increasing AUM via leading indicators. In other words, are there metrics that can indicate a potentially disruptive impact of growing AUM on the investment process? Our reasoning is as follows: if a few key metrics start deviating from their historical range because of AUM growth, then it may be likely that performance will eventually deteriorate. To find out, we postulated a few transmission mechanisms through which the impairment may take place. We did so based on simple, first-principles considerations.

The transmission mechanisms are likely to be strategy-dependent. This is where the practitioner's experience comes into play. The experienced hedge fund investor would know which metrics best characterize the investment process of the manager with whom she/he is investing. Let's consider a hypothetical equity long/short strategy as an example while noting that the reasoning can be extended or generalized for other strategies. Consider a $100 mn European mid-cap portfolio with a total of 25 ideas and a median market cap of $600 mn. Further, assume that on average each position represents 15% of the average daily volume traded in that security. Assume AUM quadruples to $400 mn within a year, which is not an unreasonable assumption. Three results may occur, which are discussed next.

Number of positions

As AUM grows, managers may start deploying capital into new ideas, as the potential to scale into existing ideas is limited due to liquidity constraints. With 25 ideas and a large addressable universe, this is a plausible approach to manage growth. Assuming all else remains constant, the portfolio would now consist of 100 ideas, which means that the manager's attention per position has now decreased to one-fourth of what it had been. Some lower-conviction ideas may trickle into the portfolio and ultimately lower performance. Also, less time invested by the key risk-taker in each idea means a higher probability of missing important details about the trade itself.

Median market cap

As AUM grows, managers may start roaming into names with higher market capitalizations, which tend to have better liquidity and thus allow them to avoid a potential asset-liability mismatch. If assets quadrupled to $400 mn, a manager would have to invest in $2,400 mn market caps to maintain the same liquidity. Based on the median

market cap, the portfolio goes from a small-cap to mid-cap portfolio. While the manager may do well in this new market capitalization segment, it may be uncharted territory based on its previous track record.

Liquidity

If AUM grows and neither of the above happens, liquidity inevitably deteriorates. In our example, the portfolio would own 60% of the ADV in each of the securities it is invested. A potential asset-liability liquidity mismatch is not the only reason for concern. For example, if the manager derived most of its performance from tactical trading, exploiting that skill under lower liquidity constraints may not be possible without significant trading costs, which would ultimately impair net returns. While the first two mechanisms are under manager control, liquidity is less so. That is why we think that this metric should be the most closely monitored of the three. In reality, we find that it's the least observed.

Individual Examples

In this section, we provide evidence of individual situations where the three drifts described above have materialized in real-life situations. All data were extracted from public filings. Please review the methodology section of this paper for more information. For the sake of anonymity, we will refer to these managers as Managers A, B and C.

FIGURE 1: HOW AUM GROWTH AFFECTED # OF POSITIONS FOR MANAGER A

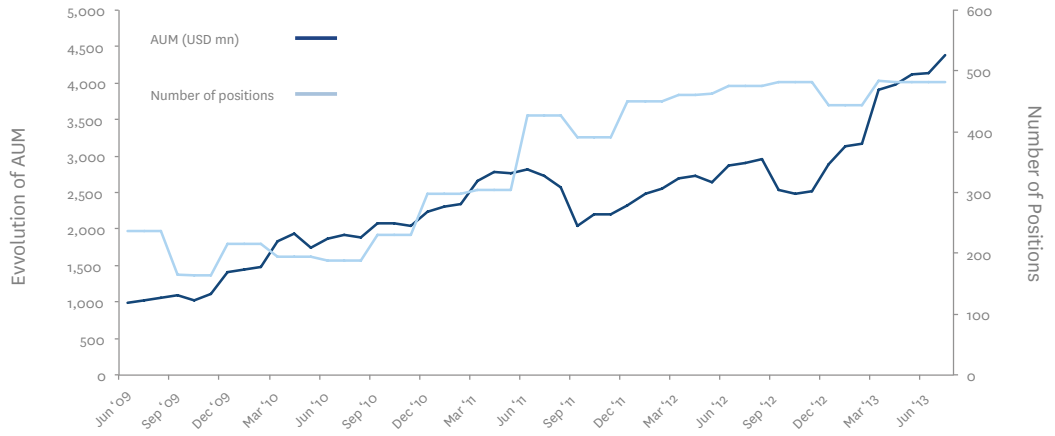
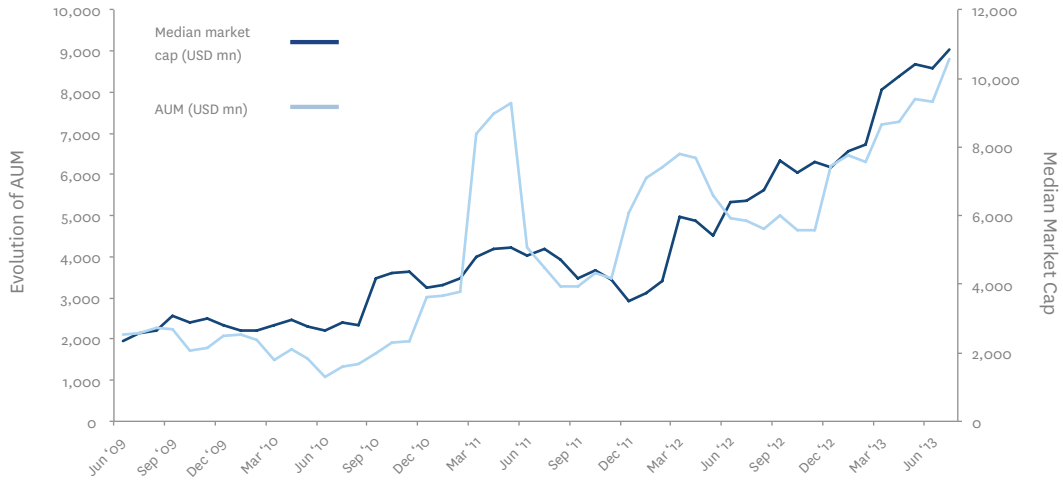


FIGURE 2: HOW AUM GROWTH AFFECTED MEDIAN MARKET CAP FOR MANAGER B



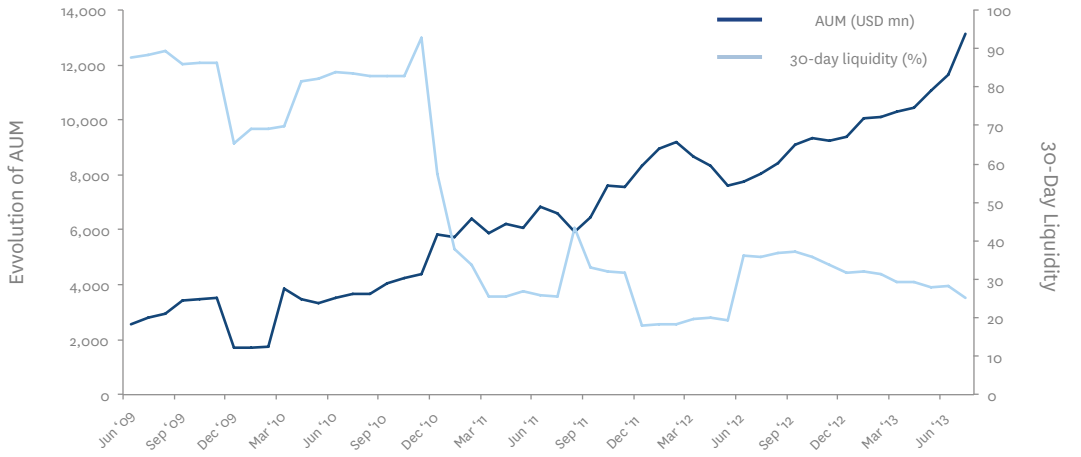
Note: CACEIS, Alps Fund Services, Vastardis Capital Services, West Hedge are additional four fund administrators with whom Novus has established connections.

Consider Manager A, an equity long/short manager specialized in a few industry sectors. Figure 1 depicts the evolution of AUM (left axis) and number of positions (right axis) from June 2009 to July 2013. AUM increased from $1.0 to 4.4 bn, whereas its number of positions increased from 236 to 482. That is, the number of positions almost doubled for a four-fold increase in AUM.

Manager B has also experienced significant recent AUM growth. Figure 2 depicts the evolution of AUM (left axis) and median market cap (right axis) from June 2009 to July 2013. While AUM more than quadrupled from $2.0 to 9.0 bn, median market cap increased nearly by the same amount from $2.5 to 10.8 bn. Over the same period, data indicate that liquidity and the number of positions did not increase significantly. This suggests that in some circumstances, one mechanism alone (as opposed to all three together) is put to work to absorb AUM growth. As we will show later, this indeed seems to be the general rule.

Consider Manager C, a manager specialized in activist situations. Figure 3 depicts the evolution of AUM (left axis) and 30-day liquidity (right axis) over time. Thirty-day liquidity represents the percent of the overall portfolio that can be liquidated in 30 days, assuming that one can trade out of a position in a day when holding 20% of its ADV. While AUM grew from $2.6 to 13.1 bn, 30-day liquidity decreased from 88% to 25% over the period represented in the figure. Compared

FIGURE 3: HOW AUM GROWTH AFFECTED 30-DAY LIQUIDITY FOR MANAGER C



to the two previous examples, the deterioration in liquidity was sudden and permanent. In the other two cases, the drift in the considered metrics was more gradual. In our experience, this is not atypical when considering liquidity metrics.

Aggregate Analysis

To test whether the strong relationships discussed above are visible on an aggregate basis, we plotted AUM versus number of positions, median market cap and 30-day liquidity on a monthly basis for all Tiger Cubs in Figures 4, 5 and 6 respectively. (Tiger Cubs is the name given to a group of successful hedge fund managers who were all trained under Julian Robertson, one of the most renowned and successful portfolio managers. For more details, please consult the methodology section of this paper.) In aggregate, only a weak version emerges of the relationship explored earlier.

No direct relationship between AUM and number of positions appears in Figure 4, except if one were to focus only on the subset between

FIGURE 4: AUM VS. NUMBER OF POSITIONS (ALL TIGER CUBS)

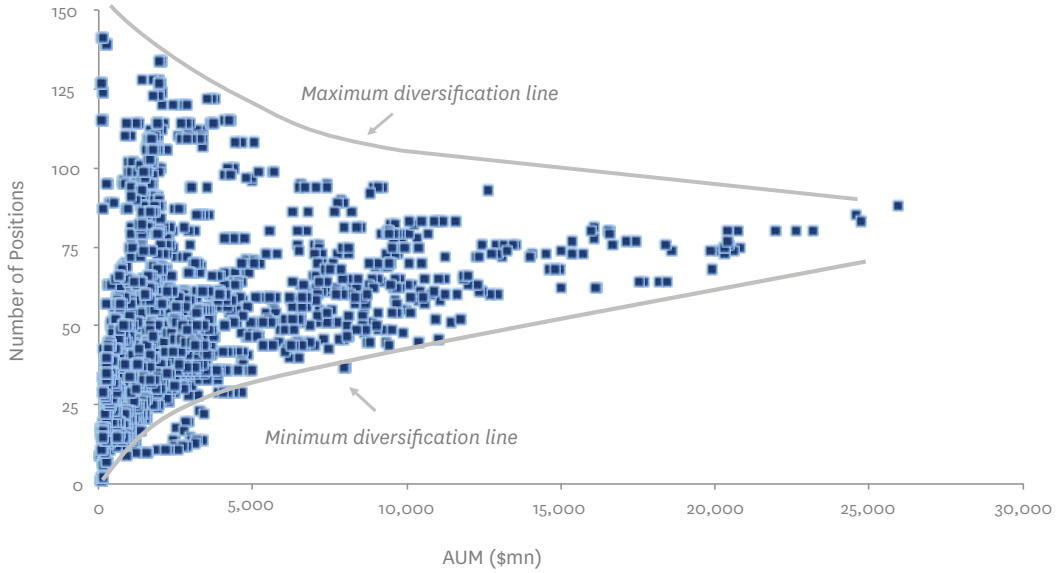
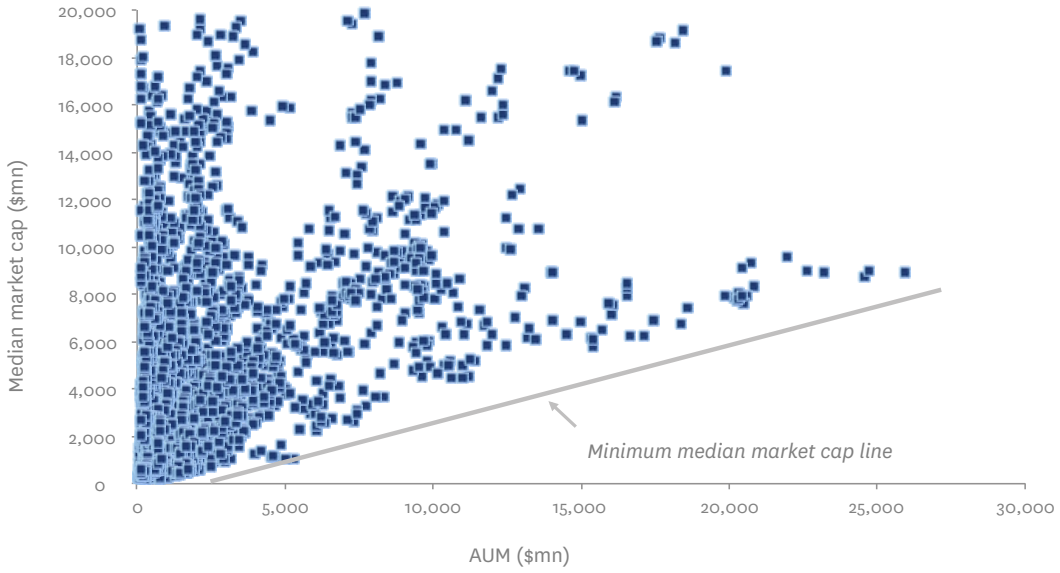


FIGURE 5: AUM VS. MEDIAN MARKET CAP (ALL TIGER CUBS)



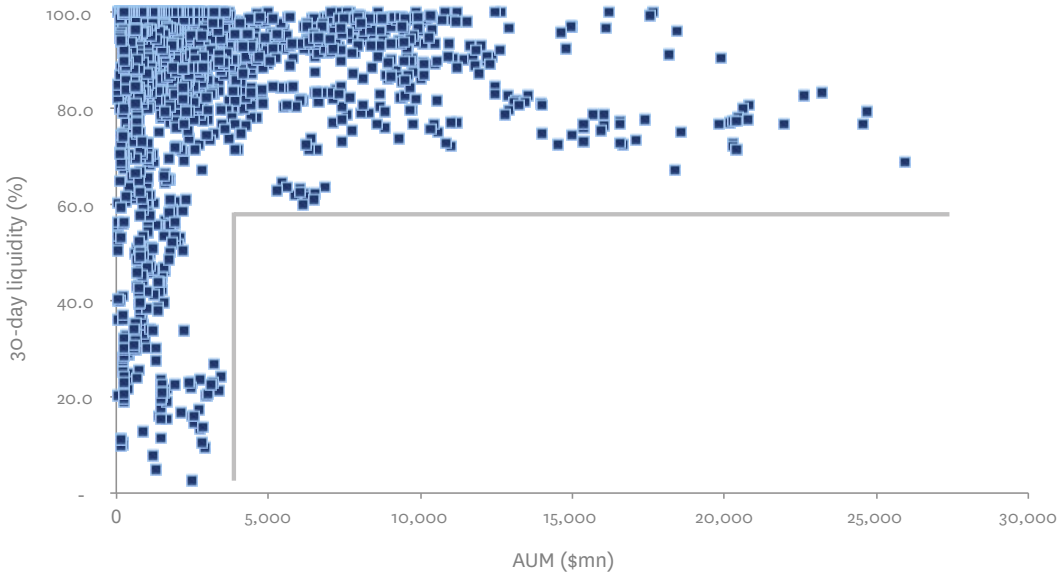
$5 and 25 bn in AUM. Note that the y-axis has been limited to 150 positions, although a limited number of funds traded up to 300 positions. In creating this positions limit, we only excluded about 1% of the roughly 2,850 data points available. Still, there seem to be diversification lines that define the minimum and maximum number of positions for a given AUM. For example, no fund with AUM of $5 bn or more has less than 30 positions, whereas no fund with $15 bn or above has less than 50 positions. Conversely, no fund with AUM of $5 bn or more seems to trade more than 100 positions. Although it would be tempting to conclude that funds with AUM of $15 bn and above seem to consistently trade around 75 positions, the conclusion is approximate at best given the relatively few number of data points in that AUM region.

Figure 5 also shows no direct relationship between AUM and median market cap. As before, we capped the y-axis to make the chart more legible and excluded data points with median market caps of $20 bn and above. In doing so, we excluded 77 data points, which is equivalent to about 3% of all data points available. As before, for a given AUM level, there seems to be a line below which no fund had portfolios with median market cap below that level. For example, no fund with AUM of $5 bn or higher has portfolios with a median market cap below $1.5 bn. No fund with AUM of $3 bn or higher has portfolios with a median market cap below $1 bn.

Figure 6 depicts the relationship between AUM and 30-day liquidity, expressed as the percentage of the portfolio that can be liquidated in less than 30 days. It is interesting to note that illiquid funds—defined as portfolios with less than 50% of their AUM tradable in 30 day or less—do not exceed $4 bn in AUM. Also, only between 60% and 80% of funds with AUM of $20 bn or above can be liquidated in 30 days.

Consider the individual examples discussed

FIGURE 6: AUM VS. 30-DAY LIQUIDITY (ALL TIGER CUBS)



earlier. In a few cases, we demonstrated strong evidence of a relationship between AUM growth and number of positions, median market cap growth or deteriorating liquidity. Now contrast that with the weak evidence offered by the cross-sectional analysis of all funds. It suggests that the postulated transmission mechanisms occur on a one-to-one basis but are not a phenomenon of the industry as a whole. But if and when they manifest, they are strong indicators that AUM growth creates shifts in the fundamentals of the underlying investment process. That's why it makes sense to evaluate whether AUM growth leads to changes in number of positions, median market cap and liquidity for each fund individually and then summarize findings across all of them. We do so in the next section.

TABLE 2: SIGNIFICANCE OF RELATIONSHIP VS. AUM (TIGER CUBS)

Statistic	# of positions	Mediam Market cap	liquidity
Meaningful R^2 (#)	4	7	-
Meaningful R^2 (%)	19%	35%	-
Significant p-value (#)	15	16	16
Significant p-value (%)	71%	80%	80%
Meaningful R^2 and significant p-value (#)	4	7	-
Meaningful R^2 and significant p-value (%)	19%	35%	-
Total	21	20	20

Individual Analysis

We investigated for how many equity long/short managers the transmission mechanisms postulated above exist and are significant. Also, we investigated whether they all manifest at the same time or whether one of them dominates above the others.

Tiger Cubs

Table 2 summarizes the results of linear regression analyses performed individually for each Tiger Cub manager when number of positions, median market cap and 30-day liquidity were each regressed against AUM. We reported for how many funds the R-squared statistic was meaningful (defined as whenever R-squared exceeded 50%), for how many the slope of the regression line was statistically significant (at the 5% confidence level), and for how many of the same both were meaningful and significant. We excluded Tiger Cubs for whom monthly data from December 2005 to July 2013 were not entirely available, which corresponds to 92 data points in total. That's why we reported statistics in absolute (#) and relative terms (%).

For example, Table 2 indicates that in four out of the 21 cases, the R-squared for the regression between number of positions and AUM was significant (equivalent to 19% of the total). We also observe that in 15 out of those 21 (i.e., 71% of the cases), the p-value was statistically significant. If we were to derive conclusions in the most conservative way (i.e., only accepting situations where the R-squared and the p-value are both significant), we could conclude that AUM growth leads to a significant impact on the number of positions and median market cap

in approximately one of five (19%) and one of three (35%) cases, respectively. In a hedge fund manager's market of high mortality and abnormal growth, these results are significant.

Liquidity appears to behave differently than number of positions and median market cap. Indeed, there were no situations where the linear regression returned a meaningful R-squared. However, note that p-value significance is as high as for number of positions and median market cap (80% vs. 71% and 80%, respectively). This seems to indicate that—while the relationship is significant in most cases—it is not best described by a linear relationship. This is due to the nature of liquidity deterioration and the metric used. Indeed, recall the example discussed in Figure 3, which is typical of what happens when liquidity gets impaired. In that case—like in many others—liquidity deterioration manifests suddenly and permanently. Also, note that the metric used (% of the book which can be traded in less than 30 days) is a "threshold" metric. Assume, for example, that a fund has 80% of the book tradable in 29 days (no more, no less). It's clear that a minimum increase in AUM would shift that 80% to the opposite area (i.e., tradable in more than 30 days).

Although an admittedly extreme case, this example suggests how concentrated portfolios are more prone to such risks. Both of these considerations lead us to conclude that liquidity deterioration exists, must be closely monitored and that it is not well-described by a linear model that assumes regular, continuous variations.

Interestingly, there were no managers for which all three relationships were simultaneously significant (in the conservative sense). As mentioned before, a relationship is considered significant in the conservative sense if both a meaningful R-square and a significant p-value were found. This seems to suggest that the impact of AUM growth manifests typically through one—but no more—of the key metrics considered.

TABLE 3: SIGNIFICANCE OF RELATIONSHIP VS. AUM (ALL EQUITY L/S FUNDS)

Statistic	# of positions	Mediam Market cap	liquidity
Meaningful R^2 (#)	12	14	1
Meaningful R^2 (%)	21%	33%	2%
Significant p-value (#)	43	34	43
Significant p-value (%)	74%	81%	77%
Meaningful R^2 and significant p-value (#)	12	14	1
Meaningful R^2 and significant p-value (%)	21%	33%	2%
Total	58	42	56

Broader Equity L/S

Given the many similarities among Tiger Cubs in as far as they manage investments (after all, they are disciples of the same "investing school"), we analyzed whether the results discussed above hold true when adding other equity L/S manager to the Tiger Cub sample. This combined universe consists of 78 managers, of which Tiger Cubs represent approximately half (36). Table 3 summarizes the results with notation analogous to Table 2.

The results and conclusions are strikingly similar to Table 2, which proves that the transmission mechanism between AUM growth and number of positions, median market cap and liquidity are valid for all equity L/S strategies, and not only for the narrowly defined market segment represented by Tiger Cubs.

Conclusions

In this paper, we hope to have offered actionable insight about how AUM growth can (and does) inhibit performance by examining the possible transmission mechanisms for that phenomenon. These findings are insightful because, to the best of our knowledge, no study has used public regulatory filings to formally test hypotheses around transmission mechanisms. And these findings are actionable because hedge fund allocators can now turn them into a competitive edge by monitoring a few aggregate statistics for the hedge funds into which they invest (i.e., median market cap, number of positions and liquidity). This will allow allocators to cross-check whether AUM growth is causing changes to the investment process and act before those changes materialize in disappointing performance.

Our study has several limitations, none of which we believe materially jeopardizes the validity of our conclusions. First, our findings are based on public regulatory filings, which only capture a portion of a manager's portfolio. We overcame this limitation by focusing on managers whose investment process (i.e., mainly equities with holding periods of one year or more) can be suitably approximated by public regulatory filings. It is clear to us that the short side for such managers is not captured by the data. However, all considerations made here can be easily transposed to the short side of the book. Also, we note that private portfolios monitored on behalf of allocators over the years have displayed identical dynamics to those discussed above. Hence, the data source is no limitation at all.

Second, our conclusions were derived for a limited portion of the hedge fund market, i.e., equity long/short funds with relatively long holding periods. We would argue that this portion of the market still represents how the lion's share of hedge fund assets is invested nowadays (about 40% according to industry estimates). Even if our results only held for this portion of the market, it would still be meaningful to put them into action in the context of portfolio construction. Nonetheless, these results can be easily extrapolated to other situations. Swap market cap for any other meaningful characteristic of a manager's process (e.g., geography, sector, asset class). Swap number of positions for number of independent ideas (for example, number of deals in merger arbitrage strategies or number of independent bets for a fixed income arbitrage fund). Keep liquidity just as it is, and the approach can be easily extended to cover all strategies. The experience of the hedge fund allocator best drives the selection of key metrics to monitor.

Finally, what we discussed here is less of a step-by-step recipe and more of a general approach: for hedge fund allocators seeking a competitive edge, there is no better way to perform thorough fundamental manager analysis than the approach presented here. It is time to complement classical, returns-based quantitative analyses (which have little to no predictive power in determining whether a manager will perform well in the future) with serious fundamental analyses on a manager's investment process. Focusing on qualitative aspects of that process is useful in formulating hypotheses about what to monitor later. Yet as a stand-alone approach to manager selection and monitoring, it is prone to significant psychological biases, utterly inefficient and time-consuming. Most of our clients ask themselves "Why do I need to sit through an hour-

long monthly call with the manager and get past the marketing veil of the investor relations team if I had all the data I need right before my eyes? Then, when something jumps out among the data, I could call with a very precise agenda."

All this requires data and meaningful analytics on top of that data. Unfortunately, as an industry, we operate in one of the few performance-driven arenas where data (and consequently analytics) are extraordinarily poor, and often ignored. Consider instead Formula 1 teams, professional tennis or Olympic disciplines, where coaches use vast amounts of data and insights to push their teams to gain the minuscule, incremental edge that is so important to reach the top and remain there.

Instead, here is where we are: A small minority of hedge fund allocators relies exclusively on returns-based analyses and qualitative manager assessment and monitoring. Those with the willingness to start monitoring and measure manager data related to investment process have found themselves fighting blown-up and opaque IT budgets, circular references in Excel and other systems where more time is spent gathering, querying, harmonizing, coding, and rebooting than analyzing. Hedge fund selection and portfolio construction and monitoring are talent-based activities where small scale is an advantage; data and IT infrastructure are exactly the opposite. Keeping them separate is sound business practice (assuming one cares about P&L). Few service providers have pushed for a standard reporting nomenclature for all managers regardless of their strategies, instruments and asset class traded. This was done with the aim of allowing allocators (who typically invest in more than one manager and ought to know their aggregate exposures to geography, asset classes and strategies) to sum up their exposures across managers and get a sense of their overall portfolio positioning. While this effort is laudable, one often forgets that each manager is different, and while harmonization may serve allocators in terms of allowing them to aggregate, it doesn't help establish a more fluid, efficient and transparent dialogue between allocators and managers.

Remember when fundamental analysis of a company's income statement, balance sheet and cash flow gave a competitive advantage to those who embraced it first? And do you remember when that advantage grew as professionals stopped wasting time transcribing data from annual reports into their handmade spreadsheets and started using direct feeds from Capital IQ, Thomson Reuters and others? We stand now at just such an inflection point. Data is becoming more and more available, yet it's getting harder to build DIY solutions to collect and make sense of them. Practitioners who understand this are partnering with Novus so they can focus on what they do best: analyzing data to achieve greater returns. We at Novus take care of the rest.

Study Methodology

All data analyzed in this study stem from public regulatory filings, which Novus aggregates from over 100 countries around the globe on a daily basis. Among many others, this data set includes U.S. 13(f) filings and EU short regulatory disclosure. Portfolios are valued on a daily basis, and it is assumed that the reporting date corresponds to the date at which portfolios are rebalanced. Portfolio aggregate measures such as median market cap and sector information were derived by aggregating position-level information with the security properties of the Novus

proprietary security master database.

We took a list of the top 500 hedge funds by assets under management (AUM) at the end of March 2013, and then excluded the largest (over $5 bn) and smallest (below $1 bn). Of the 200 remaining, we excluded another six, as no data were available about them through public filings. For the rest, we analyzed market value, median market cap, number of positions and 30-day liquidity from December 2005 to July 2013 on a monthly basis from the Novus Platform.

We then categorized hedge funds into two groups, "Tiger Cubs" and "Other Equity L/S." In doing so, we reinserted Tiger Cubs whose assets exceeded $5 bn or fell below Number of Positions 1 bn. Tiger Cubs were established by managers who worked for Julian Robertson and were supported by him in establishing their own firm. This group contains 36 funds. Since all Tiger Cubs share their origins, it is plausible that similarities in their investment approaches are reflected in the metrics analyzed here.

For both groups, we calculated the slope, the R-squared value, and the p-value to examine the relationship between median market cap, number of positions and liquidity to market value.

Acknowledgment

The authors would like to thank Alessandro Morra for aggregating and analyzing the data and results presented in this paper during a week of hard work during the summer of 2013. Not even 18 years old and completely unexposed to alternative investments, Alessandro quickly grasped the fundamental principles of the hypotheses we were testing and duly collected all the pieces we needed to move forward with our analyses. The authors would also like to thank Kira Golenko—an analyst on the Novus team—for having patiently reviewed all literature related to previous work on whether AUM deteriorates performance and for succinctly summarizing these findings. Finally, we would like to thank the whole research team at Novus for having selected—one by one—the equity long/short funds from the list of top 500 funds available to us.

References

[1] B. C. Management, "Performance of emerging equity long / short hedge fund managers," February 2013, available at: http://www.beachheadcapital.com/images/ResearchPapers/Beachhead

[2] V. Agarwal, N. D. Daniel, and N. Y. Naik, "Role of managerial incentives and discretion in hedge fund performances," The Journal of Finance, vol. 64, no. 5, pp. 2221–2256, 2009.

[3] N. Amenc and L. Martellini, "The alpha and omega of hedge fund performance measurement," February 2003, available at: http://www.edhecrisk. com/.

[4] D. Avramov, L. Barras, and R. Kosowski, "Hedge fund return predictability under the magnifying glass," February 2012, available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract id=1650293.

[5] D. Avramov, R. Kosowski, N. Y. Naik, and M. Teo, "Hedge funds, managerial skill, and macroeconomic variables," Journal of Financial Economics, vol. 99, pp. 672–692, February 2010.

[6] L. Barras, O. Scaillet, and R. Wermers, "False discoveries in mutual fund performance: measuring luck in estimated alphas," The Journal of Finance, vol. 65, no. 1, pp. 179–216, 2010.

[7] N. M. Boyson, "Hedge fund performance persistence: a new approach," Financial Analysts Journal, vol. 64, no. 6, pp. 27–44, 2008.

[8] M. J. Cooper, H. Gulen, and M. J. Schill, "Asset growth and the crosssection of stock returns," The Journal of Finance, vol. 63, no. 4, pp. 1609–1651, August 2008.

[9] F. R. Edwards and M. O. Caglayan, "Hedge fund performance and manager skill," May 2001, available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract id=281524.

[10] W. Fung, D. A. Hsieh, N. Y. Naik, and T. Ramadorai, "Hedge funds: performance, risk, and capital formation," The Journal of Finance, vol. 63, no. 4, pp. 1777–1803, August 2008.

[11] M. Getmansky, "The life cycle of hedge funds: fund flows, size, competition, and performance," May 2012, available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract id=2084410.

[12] A. Harri and B. W. Brorsen, "Performance persistence and the source of returns for hedge funds," July 2002, available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract id=318379.

[13] J. Joenväärä, R. Kosowski, and P. Tolonen, "The effect of investment constraints on hedge fund investor returns," December 2013, available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract id=2362430.

References Continued

[14] R. Kosowski, N. Y. Naik, and M. Teo, "Is stellar hedge fund performance for real?" 2007, available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract id=675765.

[15] N. Y. Naik, T. Ramadorai, and M. Stromqvist, "Capacity constraints and hedge fund strategy returns," European Financial Management, vol. 13, no. 2, p. 239256, 2007.

[16] J. Xiong, T. Idzorek, P. Chen, and R. G. Ibbotson, "Dynamics of fund of hedge funds: flow, size, and performance," October 2007, available at: https://corporate.morningstar.com/.

[17] R. K. Aggarwal and P. Jorion, "The performance of emerging hedge funds and managers," Journal of Financial Economics, vol. 96, pp. 238–256, 2010.

[18] M. Teo, "Does size matter in the hedge fund industry?" August 2010, available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract id=1331754.

[19] J. B. Berk and R. C. Green, "Mutual fund flows and performance in rational markets," Journal of Political Economy, vol. 112, no. 6, pp. 1269–1295, 2004.

[20] J. Chen, H. Hong, M. Huang, and J. D. Kubik, "Does fund size erode mutual fund performance? The role of liquidity and organization," The American Economic Review, vol. 94, no. 5, pp. 1276–1302, 2004.

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