What Happens "Before the Birth" and "After the Death" of a Hedge Fund?

VIKAS AGARWAL*
Professor of Finance
J. Mack Robinson College of Business, Georgia State University

VYACHESLAV FOS
Assistant Professor of Finance
University of Illinois at Urbana-Champaign

WEI JIANG
Arthur F. Burns Professor of Free and Competitive Enterprise
Graduate School of Business, Columbia University

I. Introduction

While hedge funds may choose to voluntarily disclose private information to commercial databases, the hedge fund's performance before "birth" (i.e., the date on which a fund begins to self-report) and after "death" (i.e., the date on which a fund ceases to self-report) has traditionally been a black box. Because the way in which hedge funds raise capital differs from that of other financial institutions, such as banks and mutual funds, hedge funds have largely avoided mandatory disclosure requirements under federal securities laws. As such, those seeking to understand and analyze the industry have largely relied on self-reported data provided to commercial databases. This sets up an inherent self-selection bias – the data relating to fund performance are disclosed only for the periods in which the fund chooses to share its performance (if it chooses to report at all), so are these data reflective of the true performance of the fund?

We attempt to answer this question by analyzing fund characteristics before birth and after death. Hedge funds will voluntarily report to commercial databases when the benefits outweigh the costs, so there is reason to expect a self-selection bias, although it is difficult to assess the magnitude – or even the direction – of the bias. The primary benefit from voluntary disclosure is that listing in commercial databases increases a fund's exposure to investors, which is particularly beneficial to smaller and younger funds seeking greater publicity. Moreover, choice of listing in a particular database can be driven by client's geographical consideration, e.g., Asian clients may have a preference for Eurekahedge database that has an extensive coverage of Asian hedge funds. However, there can be significant costs associated with listing in databases, namely a loss of privacy and secrecy. Though self-reporting funds generally do not reveal their holdings information to commercial databases, the reported information can reveal the funds' investment strategy. In addition, funds may not want to list subsequent to outflows to prevent further redemptions from investors.

We attempt to quantify the degree of self-reporting bias in hedge fund databases using one of the few mandatory disclosures for hedge funds: Form 13F. The Securities and Exchange Commission (SEC) requires that hedge funds disclose their quarterly equity holdings on Form 13F, so we compare the holdings of voluntary reporters with those of non-reporters for all hedge fund companies that filed Form 13F between 1980 and 2008. Because of the mandatory nature of the 13F filings, this sample is largely free of self-selection for funds that manage more than $100 million in equity positions. Among all 13F-filing hedge fund companies, we determine their self-reporting status by matching them to any of the five major hedge fund commercial databases.

Our analysis consists of two steps. First, we analyze the dynamics of returns and fund flows around the birth and death of a fund. For those funds that choose to self-report, we find that performance deteriorates significantly after birth and after death. The deterioration is economically and statistically significant: Using monthly market-adjusted returns, the deterioration amounts to 73 and 28 basis points after birth and death, respectively. The decrease in fund performance following birth suggests that funds strategically initiate self-reporting after a run of superior performance, while the decrease in fund performance following death suggests that fund death is generally related to performance deterioration. We additionally analyze fund flows before and after death, and the results provide further support for the proposition that fund performance deteriorates following death because net flows to funds decrease sharply following death.

* Corresponding author: J. Mack Robinson College of Business, Georgia State University, 35 Broad Street, Atlanta, GA 30303.
Tel: 404 413 7326
Email: vagarwal@gsu.edu

An expanded version of this article was published in an INFORMS journal: Agarwal, Fos, and Jiang, "Inferring Reporting-Related Biases in Hedge Fund Databases from Hedge Fund Equity Holdings," Management Science, June 2013, Vol. 59, No 6, pp. 1271-1289.

We thank Serge Darolles for his comments.

Second, we compare the characteristics of reporting and non-reporting funds. The findings suggest that funds facing greater costs to disclosure – that is, funds with specialized trading strategies that are more likely to be revealed through disclosure – are less likely to self-report. Though funds with more diversified and higher-turnover trading strategies have a stronger incentive to self-report in general, this is especially true for young and medium-sized fund companies who presumably want to attract potential investors.

While prior literature has attempted to assess the self-selection bias associated with commercial databases using data from funds of funds (e.g., Aiken *et al.* (2013) and Hodder et al. (2013)), our approach avoids the limitations of this approach by using mandatory disclosures for a comprehensive sample of funds. Needless to say, this approach has its own limitations, the most significant of which is that we rely on the quarter-end long-equity positions at the hedge fund company (rather than at the individual fund) level, and ignore intra-quarter trading. Nevertheless, our study provides unique insight into the reliability of commercial databases by estimating the selection bias due to voluntary reporting. Not only can hedge fund researchers and investment managers benefit from the benchmarks we provide, but our results show that mandatory disclosure complements the information from voluntary disclosure and may help to assess the performance and operational risk involved in hedge fund investing.

II. Data Description

II.1. COLLECTION OF HEDGE FUND DATA

Our study combines data from two sources. The first source is a merged database containing the self-reported hedge fund data from five major commercial hedge fund databases: Center for International Securities and Derivatives Markets (CISDM), Eurekahedge, Hedge Fund Research (HFR), Morgan Stanley Capital International (MSCI), and Trading Advisor Selection System (TASS) (henceforth, the "Union Database"). The second source is the 13F quarter-end equity holdings database from Thomson Reuters Ownership Data. All institutional investment managers who exercise investment discretion over $100 million of assets in equity and other publicly traded securities are required to file a Form 13F disclosing their quarter-end holdings within 45-day of the end of each calendar quarter.[1] Please note that the reporting unit may differ between the two data sources: The data in 13F filings are aggregated at the management company level, whereas the data in the self-reporting databases are presented at both the fund as well as the management company level. Hence, pairing data from the two sources is often a one-to-multiple match requiring information on the overarching management companies of individual funds in the Union Database.

We start by confirming the results of prior literature showing that there is limited overlap among the commercial databases (Agarwal *et al.* (2009)). In Figure 1, we present a Venn diagram showing the overlap of the five individual databases of our Union Database. The evidence reaffirms the importance of using multiple databases to accurately classify reporting status and to accurately record the dates of fund birth and death. Of the 11,417 hedge funds (including 6,245 equity-oriented funds) in our total sample, 71% of these funds are covered by only one database. Although it may seem that the cost of simultaneously reporting to multiple commercial databases is relatively small, there can be potential benefits for hedge fund companies to sequentially report to one database at a time to benefit from investor flows when funds want to increase assets after good performance (Jorion and Schwarz (2013)).

The next step is to classify the 5,188 unique 13F-filing institutions in the Thomson Reuters Ownership database for the 1980-2008 period into the following five categories: (1) hedge funds; (2) banks and insurance companies; (3) mutual fund management companies; (4) independent investment advisors, and (5) others. We are careful to exclude hedge funds from the last two categories, especially to address the documented problems in the "others" category since 1998. Since Thomson Reuters Ownership database does not explicitly identify hedge fund companies, we manually categorize these companies. There is no official definition of a hedge fund, so we adopt the generally accepted notion that hedge funds are private investment partnerships that adopt performance-based compensation and are largely exempt from securities regulation and registration requirements because they are open to only select investors. Following this notion, we classify a 13F-filing institution as a "hedge fund company" if it satisfies one of the following: (i) the name of the 13F-filer matches one or multiple funds from the Union Database; (ii) industry publications (*e.g.*, *Hedge Fund Group* (HFG), *Barron's*, *Alpha Magazine*, and *Institutional Investors*) list the 13F filer as a top hedge fund; (iii) the website of the 13F filer proclaims that it is a management company or lists hedge fund management as a major line of business;[2] (iv) news articles describe the company as a hedge fund manager/sponsor; or (v) the 13F filer is an individual who is the founder, partner, chairman, or other leading personnel of a hedge fund company.[3] In order to ensure that the 13F filings are informative about the investments of the institutions' hedge funds, our final sample includes only relatively "pure-play" hedge funds (such as Renaissance Technologies and Pershing Square) and investment companies in which hedge funds represent the core business (such as D. E. Shaw and the Blackstone Group/Kailix Advisors). As such, we do not include full-service banks or mutual fund management companies that enter the hedge fund business, e.g., Goldman Sachs Asset Management.

Following this classification procedure yields 1,199 unique hedge fund companies among all 13F filing institutions. As noted previously, many smaller hedge fund companies and most of the companies specializing in non-equity strategies are necessarily excluded from our analysis due to the $100 million reporting threshold for 13F filings. As such, the number of hedge fund companies in our final sample is low relative to the total number of hedge fund companies (our Union Database consists of 5,342 companies), but the total value of equity positions held by 13F hedge funds – $1.25 trillion – is 83% of the

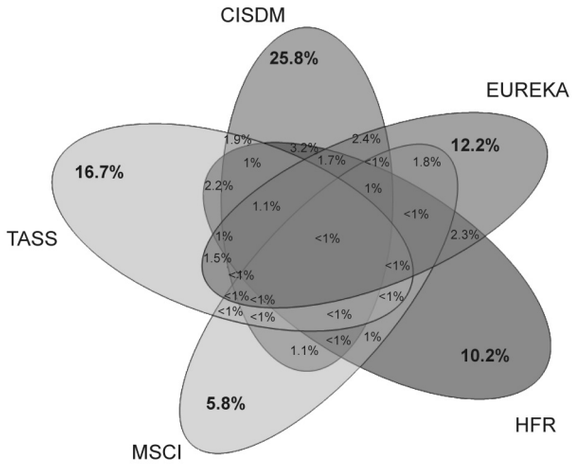
size of the hedge fund industry as of 2008, according to Credit Suisse/Tremont. Because our analysis is based on long-equity holdings, it is reassuring that the largest percentage of our sample funds belongs to the "Equity" or "Equity Long/Short" category (38.4%). Additionally, the other major hedge fund strategies represented in our sample include Event Driven (10.2%), Sector (5.4%), and Multi-Strategy (5.7%), all of which are also likely to involve substantial long equity positions.

Further descriptive statistics from our sample show that hedge funds are relatively small, young, and more actively managed compared to mutual funds and other financial institutions. The average (median) equity position size of the hedge funds in our sample is $1,041 ($368) million, which is roughly about 16.5% of that of a mutual fund management company. The hedge funds are also younger – the median hedge fund started filing Form 13F only in 2002 compared to other investment adviser and mutual fund that initiated 13F filing in 1995 and 1985 respectively. Finally, all three proxies for the active management indicate that hedge funds are more actively managed than other financial institutions: (1) hedge funds are more concentrated with a median portfolio Herfindahl index of 0.0465, whereas the median score for mutual funds is 0.018, (2) hedge funds exhibit higher median monthly portfolio return volatility (4.93%) than mutual funds (4.48%), (3) hedge funds have a median inter-quarter portfolio turnover rate of 81.5% annually, about twice as high as that of mutual funds, investment advisors, and other institutions, and more than three times that of bank and insurance companies.

II.2. CLASSIFICATION OF VOLUNTARY REPORTERS AND NON-REPORTERS

To classify hedge funds into voluntary reporters and non-reporters, it is necessary to match the self-reporting hedge funds to the 1,199 13F-filing hedge fund companies. We first match by name, allowing for minor variations, and successfully match 645 self-reporting companies, amounting to 53.8% of all 13F filing companies. We then compute the correlation between returns imputed from the 13F quarterly holdings (henceforth, "13F portfolio returns") and returns reported in the Union Database (henceforth, "self-reported returns"). We compute the monthly returns of a 13F fund company assuming it holds the most recently disclosed quarter-end holdings, and compute the monthly returns for a fund company in the Union Database by using the value-weighted average monthly returns of all funds reported in the Union Database belonging to the same fund management company. We discard 279 pairs from our analysis because we are unable to convincingly establish the self-reporting status of these funds – either because the correlation between the returns from the two sources is negative (60 pairs) or because the correlation is not defined due to a lack of overlapping periods of data from both data sources (219 pairs). The resulting dataset includes 920 funds, of which 366 are self-reporting and 554 are non-reporting. The 554 non-reporting funds hold 45.6% of the long-equity positions held by all the 1,199 13F hedge fund companies,

Figure 1. Venn Diagram of the Union Database



underscoring the importance of using mandatory 13F filings to supplement voluntarily provided data because these non-reporters hold almost half of the aggregate equity positions. Although we use the data in the Union Database to properly classify the reporting status and period during which each fund reports, our analyses are almost exclusively based on the information from 13F filings where the unit of observation is at the hedge fund management company level (henceforth "hedge funds").

One limitation of our study is that the 13F filing database provides only the quarter-end long-equity portfolios of hedge fund companies. For our findings to be informative of the reporting bias associated with total portfolio returns of individual funds, the long-equity positions must be a substantial portion of the portfolios of these hedge funds, and the returns calculated from quarter-end equity long positions must be reflective of the hedge funds' total returns. We believe this approach is valid, on average, for several reasons.

First, we find that the average (median) correlation between returns computed from the 13F database (i.e., holdings of only long equity positions, and before fees) and the returns reported to hedge fund databases (aggregated at the company level, and including returns from short positions and non-equity securities, and net of fees) is 0.54 (0.57).[4] As further support, the median slope in a regression of 13F returns on fund returns is 0.91. Second, the importance of equity holdings to total fund returns is evident from the equity market betas of funds. We use the monthly Credit Suisse/Tremont hedge fund indices from January 1993 to May 2009[5] to find that the market beta of the index of all equity-oriented funds is 0.48. This compares favorably to the self-reporting funds in our sample – the average market beta from the Carhart (1997) four-factor model of the return index is 0.40. Finally, hedge funds' consistent objection to man-

datory ownership disclosure, including the 13F filings, implies that the equity positions are critically informative of their investment strategies. As an extreme example, Philip Goldstein, an activist hedge fund manager at Bulldog Investors, applied to exempt his fund from 13F filings because he contended that such holdings are "trade secrets," similar to the protected formula used to make Coca-Cola. He further condemned the 13F rule is equivalent to taking the fund's "property without just compensation in violation of the Fifth Amendment to the Constitution."[6]

■ III. Biases Conditional on Self-Reporting: "Before the Birth" and "After the Death" of a Fund

III.1. COMPARISON OF FUND COMPANIES BEFORE AND AFTER THE BIRTH

We start with a simple question regarding self-reporting funds: When do fund companies initiate reporting? The Union Database provides information on the hedge funds' initial reporting date (i.e., the date of the fund's birth), so we use the earliest date on which the fund first reports to any of the five databases in the Union Database. Because the 13F database provides equity holdings at the company level whereas the Union Database provides data at the fund level, we assume that the first (last) reporting date of a company is the earliest and latest of the first (last) reporting dates of all funds in a company. Our tests of fund performance before birth require a minimum of 12 months of return information preceding and following the initial reporting date as well as accurate information on the initial reporting date. This information is available for 77 of the 366 self-reporting funds, and we use this subsample of 77 funds to test fund performance before birth. For each of these funds, we compute the returns from the 13F holdings during the 24-month period before birth and the 24-month period thereafter (or as many months as possible subject to a minimum of 12 months in total on both sides of the month of reporting initiation). We report the results in Table I and Panel A of Figure 2.

Table I indicates that fund performance after birth is significantly lower than before birth. The average (median) raw monthly returns deteriorates by 90 (49) basis points, while measures of risk-adjusted performance (market-adjusted returns, CAPM alpha, four-factor alpha, and the Daniel *et al.* (1997) characteristic-based benchmark-adjusted return (henceforth the "DGTW abnormal return")) decline by an average (median) of 22 to 73 (19 to 33) basis points per month. Not only is the magnitude economically significant, but all four average differences (except four-factor alpha) are also statistically significant.

Panel A of Figure 2 plots the average monthly market-adjusted returns from the 24 months preceding fund's birth through the 24 months following birth. The two dotted horizontal lines mark the averages of the two sub-periods. The figure confirms that funds initiate self-reporting after a run of superior performance, but that such performance does not persist and instead deteriorates. The results showing that the performance of funds decreases after their birth suggests that funds strategically time their initiation of reporting.

III.2. HAZARD ANALYSIS FOR BIRTH

To further understand the fund characteristics that influence a fund's decision to initiate reporting, we conduct a hazard analysis of reporting initiation for the subsample of 77 fund companies. Using the terminology of hazard analysis, the "failure" event here is the hedge fund's birth. Thus, the hazard rate is the hedge fund's probability of initiating reporting in a given period, conditional on not reporting in any of the previous periods. We estimate our instantaneous hazard model with respect to a set of time-varying explanatory variables, and we discuss the main findings of this model below.

Our analysis presents five main findings. First, funds are more likely to initiate reporting if they have exhibited high performance in the recent past. This result, which is consistent with the pattern uncovered in Figure 2, is economically significant – an interquartile change in the performance when measured by four-factor alpha is associated with 1.34 times higher probability of birth in the current period. Second, hedge funds are less likely to initiate reporting when aggregate flow to the hedge fund industry is high and therefore funds' need to attract potential investors through reporting is lower. Third, the probability of reporting initiation is significantly lower during periods of higher portfolio return volatility, an attribute that investors dislike. Fourth, hedge funds that do report are more likely to begin reporting in their youth stage, again an intuitive result as young funds are the most likely to benefit from the increased exposure provided by commercial databases. Finally, hedge funds operating more concentrated portfolios (as measured by the average portfolio Herfindahl index) are less likely to initiate reporting. This result suggests that those funds that are more likely to reveal trade secrets through disclosure – and hence have higher costs – are less likely to voluntarily report.

III.3. COMPARISON OF FUND COMPANIES BEFORE AND AFTER DEATH

Our sample contains 187 funds that terminated reporting to the Union Database at some point during the 1980-2008 period. We use the same methodology as we used for Table I to analyze the factors that influence reporting termination (i.e., the death of a fund) and to analyze fund performance after death. We observe that performance after death is significantly lower than that before death. This is not surprising given that most funds cease voluntary reporting after their performance starts deteriorating (Ackermann *et al.* (1999), Liang (2000), and Fung and Hsieh (2000, 2002) among others). Further, Darolles, Gagliardini, and Gourieroux (2013) show that there can be clustering in the deaths of funds from common exogenous shocks

Table 1. Comparison of Return Performance before and after the Initial Reporting Date

	(1) Raw return	(2) Market-adjusted Return	(3) One-factor alpha	(4) Four-factor alpha	(5) Difference-in-Difference	(6) DGTW abnormal return
Before initial reporting						
Mean	0.0160	0.0059	0.0034	0.0007	0.0024	0.0093
Median	0.0161	0.0033	0.0018	0.0011	0.0012	0.0088
# funds	77	77	76	76	76	75
After initial reporting						
Mean	0.0070	– 0.0014	– 0.0024	– 0.0017	– 0.0033	0.0071
Median	0.0112	0.0001	– 0.0014	– 0.0008	– 0.0014	0.0058
# funds	76	76	76	76	76	76
Differences (*t*-statistics)						
Mean	– 0.0090***	– 0.0073***	– 0.0058***	– 0.0024	– 0.0057***	– 0.0022*
	[– 3.09]	[– 3.32]	[– 2.85]	[– 1.42]	[– 2.82]	[– 1.83]
Median	– 0.0049***	– 0.0032**	– 0.0033**	– 0.0019	– 0.0026**	– 0.0030**
	[– 2.88]	[– 2.36]	[– 2.51]	[– 1.33]	[– 1.97]	[– 2.53]

or from contagion. What is interesting and unique about our analysis here is that we are able to evaluate fund performance after death. The results for the full sample of 187 funds are reported in Panel A of Table II.

Panel A of Table II shows that fund performance deteriorates significantly following death. The average monthly raw return declines by 1.9%, and the average monthly risk-adjusted return declines by 12 to 28 basis points using the four different measures of market-adjusted returns, CAPM alpha, four-factor alpha, and the DGTW abnormal return. Although the decline in the risk-adjusted returns is more modest than raw returns, the differences are uniformly negative and significant. Panel B of Figure 2 provides a graphical illustration of the decrease in performance following the termination date.[7]

These results are subject to a potential survivorship bias because funds that drop below the $100 million threshold will drop out of our sample. To address this concern, we present additional analysis using only the subsample of "large" (greater than $250 million) funds. The findings for this subsample, presented in Panel B of Table II, also show that fund performance deteriorates following death – the average monthly raw returns and the four risk-adjusted performance measures are lower by 2.21 percentage points and 8-54 basis points, respectively. Overall, Panels A and B together show that our results are not driven by survivorship bias associated with the $100 million threshold required for filing 13F forms.

Roughly 64% of the funds (119 funds) that terminate reporting in our sample provide the commercial databases with an explanation for their decision. Theoretically, funds can terminate reporting for positive or negative reasons. On the positive side, a fund may no longer have an incentive to attract capital because it is closed to new investors due to its success and lack of scalable investment opportunities. On the negative side, a fund may terminate reporting because of embarrassing losses or even the prospect of liquidation. In our sample, the funds that terminated reporting did so for reasons that were overwhelmingly negative – in 112 cases, the given reasons indicated distress (such as liquidation, fund dormancy, or the data vendor's inability to contact the fund). While there were a limited number responses that were positive (such as being closed to new investors) or unclear (such as being merged with another fund), such cases were rare.

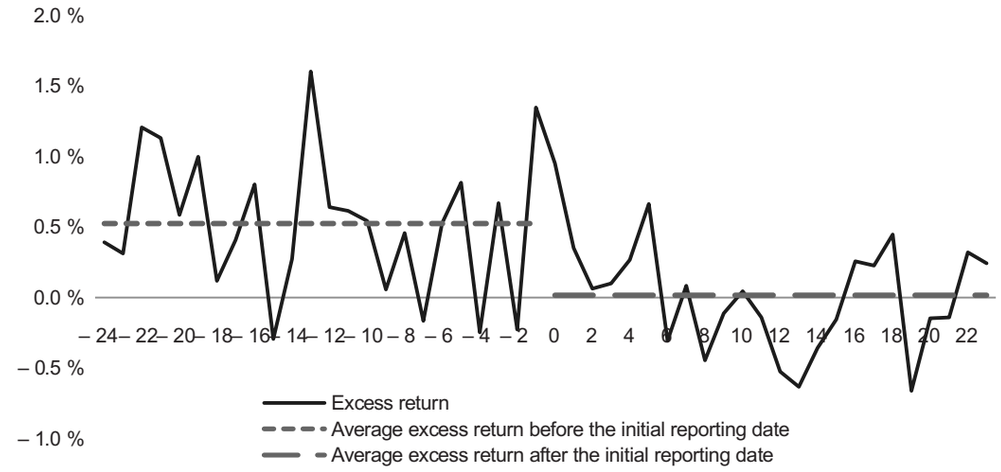
III.4. EFFECTS OF SELF-REPORTING ON HEDGE FUND FLOWS

A primary explanation for why hedge funds choose to report to databases is that voluntary reporting provides the fund with increased exposure that is beneficial in attracting investors and flow.[8] Here we test the effects of reporting and termination on fund flow. The analysis indicates that the long-term fund flow does not increase following initiation, but that it does decrease following termination. Our sample includes all funds that initiated reporting during our sample period, and we isolate the quarterly observations from four quarters before the initial reporting date to four quarters afterwards. We then estimate the below regression at the fund (indexed by i)-quarter (indexed by t) level:

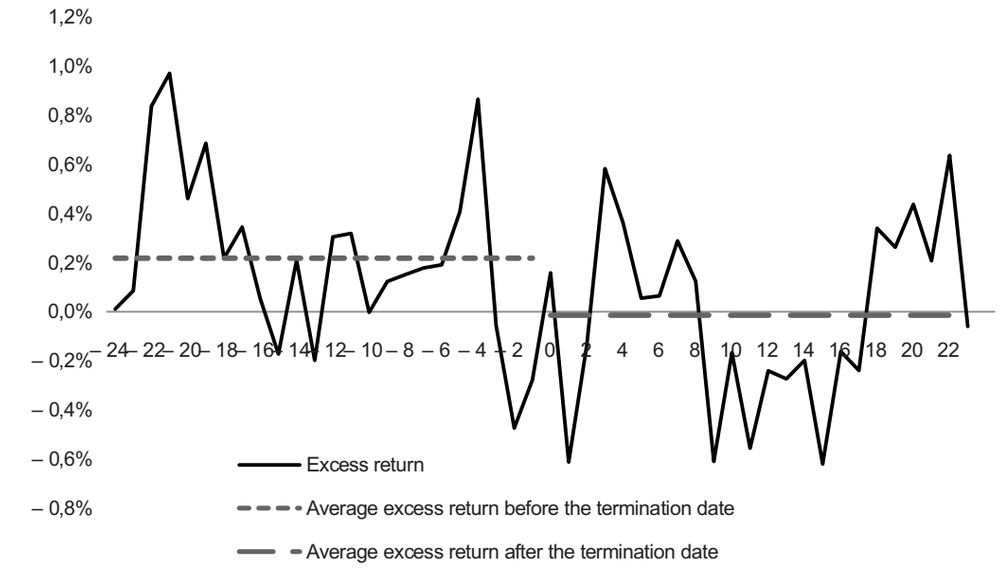
$$Flow_{i,t} = \sum_{j=-4}^{4} \lambda_j D_{t-j} + \beta Performance_{t-3:t} + \gamma Control_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

Figure 2. Return Performance around the Initial Reporting Date and the Reporting Termination Date

Panel A: Market-adjusted Returns around the Initial Reporting Date



Panel B: Market-adjusted Returns around the Reporting Termination Date



The proxy for the net fund flows $Flow_{i,t}$ is calculated as $(Size_{i,t} - Return_{i,t} * Size_{i,t-1}) / Size_{i,t-1}$.[9] It measures the change in the value of a fund's equity portfolio due to changes in investment by the funds' investors and excludes changes due to stock price movements. For the full sample, the average (median) percentage flow to hedge funds companies is 3.6% (1.4%). $Performance_{t-3:t}$ is the monthly average of one of the four performance measures (market-adjusted returns, one-factor alpha, four-factor alpha, or DGTW abnormal returns) during the past four quarters. The regression additionally includes indicator variables for the four quarters before and after the initial reporting date (D_{t-j}) and lagged control variables including portfolio size (in log), fund age (logarithm of the numbers of quarters since first appearance in Thomson Reuters), portfolio turnover rate, and portfolio return volatility.

The results show that flows are highly sensitive to performance, but that reporting to databases does not lead to higher flows over a longer window. The coefficients on performance are both statistically and economically significant. For example, for a one percentage point increase in monthly market-adjusted return, net fund flows increase by 2.5% of the total portfolio value. However, although there does appear to be a slight increase in flow immediately

Table 2. Comparison of Return Performance before and after Reporting Termination

Panel A: Overall sample

	(1) Raw return	(2) Market-adjusted Return	(3) One-factor alpha	(4) Four-factor alpha	(5) Difference-in-Difference	(6) DGTW abnormal return
Before reporting termination						
Mean	0.0118	0.0028	0.0018	0.0016	0.0001	0.0075
Median	0.0131	0.0032	0.0016	0.0019	0.0003	0.0067
# funds	187	187	187	187	187	180
After reporting termination						
Mean	– 0.0072	0.0000	0.0006	– 0.0001	0.0003	0.0063
Median	– 0.0015	0.0014	0.0013	0.0002	0.0007	0.0065
# funds	187	187	187	187	187	181
Differences (*t*-statistics)						
Mean	– 0.0190***	– 0.0028**	– 0.0012	– 0.0017	0.0002	– 0.0012
	[– 8.92]	[– 2.13]	[– 0.98]	[– 1.57]	[0.19]	[– 1.09]
Median	– 0.0146***	– 0.0018	– 0.0003	– 0.0017***	0.0004	– 0.0002
	[– 4.54]	[– 1.55]	[– 0.81]	[– 2.80]	[0.21]	[– 0.23]

Panel B: Subsample of funds with long-equity holdings of more than $250 million

	(1) Raw return	(2) Market-adjusted Return	(3) One-factor alpha	(4) Four-factor alpha	(5) Difference-in-Difference	(6) DGTW abnormal return
Before reporting termination						
Mean	0.0143	0.0048	0.0034	0.0027	0.0021	0.0083
Median	0.0141	0.0036	0.0023	0.0020	0.0015	0.0067
# funds	135	135	135	135	135	134
After reporting termination						
Mean	– 0.0078	– 0.0006	0.0006	0.0000	0.0001	0.0075
Median	– 0.0026	0.0011	0.0013	0.0001	0.0007	0.0065
# funds	135	135	135	135	135	135
Differences (*t*-statistics)						
Mean	– 0.0221***	– 0.0054***	– 0.0028***	– 0.0027***	– 0.0020	– 0.0008
	[– 9.54]	[– 4.40]	[– 2.48]	[– 3.14]	[– 1.72]	[– 0.83]
Median	– 0.0167***	– 0.0025***	– 0.0010	– 0.0019***	– 0.0008	– 0.0002
	[– 3.94]	[– 2.74]	[– 1.80]	[– 2.58]	[– 0.76]	[– 0.06]

following reporting initiation, this increase is only temporary. Using an F-test, we compare total flow in the four quarters prior to initiation with that in the four quarters following initiation, and our test fails to reject the null of equality. While this result may be related to decreasing performance following birth, the results show that reporting to databases does not lead to a higher level of flows over the long term.

Lastly, we repeat the prior analysis using reporting termination rather than reporting initiation. The results show that funds receive significantly lower net flows (or more outflows) after reporting termination. Our F-test comparing net flows in the four quarters prior to reporting termination with the net flows in the four quarters following termination strongly rejects the null hypothesis (at the 5% level), and instead indicates that flows decrease after termination. The decrease

Table 3. Comparison of Self-Reporting and Non-Reporting Fund Companies

	(1) Self-reporting fund companies	(2) Non-reporting matches	(3) Difference	(4) t-statistics of the difference
Portfolio Herfindahl Index				
Mean	0.0798	0.0860	– 0.0062	– 0.91
Median	0.0458	0.0551	– 0.0093**	– 2.13
Volatility				
Mean	0.0557	0.0541	0.0016	1.15
Median	0.0509	0.0497	0.0013	0.90
Annualized portfolio turnover rate				
Mean	1.0562	0.7596	0.2967***	7.40
Median	0.9909	0.6652	0.3258***	5.49
Market Factor				
Mean	1.0940	1.0870	0.0070	0.37
Median	1.0787	1.0429	0.0358**	2.40
SMB Factor				
Mean	0.3863	0.2935	0.0928***	3.04
Median	0.3416	0.2489	0.0927***	2.76
HML Factor				
Mean	0.1284	0.0782	0.0502	1.48
Median	0.1140	0.0616	0.0524**	2.11
Momentum Factor				
Mean	– 0.0083	– 0.0340	0.0258	1.27
Median	– 0.0019	– 0.0220	0.0201	1.49
Number of institutions				
	366	366	–	–

is economically significant: the analysis suggests that the cumulative net outflows from the quarter of reporting termination through four quarters afterwards amount to 23-29 percent of the lagged portfolio size. This evidence provides support for the hypothesis that delisting from hedge fund databases is in general a sign of deterioration.

■ IV. The Unconditional Self-Reporting Bias: Comparing Self-Reporting and Non-Reporting Hedge Funds

IV.1. COMPARISON OF FUND CHARACTERISTICS

As a final step, we compare the subsample of self-reporting funds to the full sample, and investigate the characteristics of the funds associated with reporting. We answer by comparing the 366 self-reporting fund companies that appear in the database for some time during our sample period with a matched sample of 554 13F-filing hedge fund companies that never report in the Union Database.[10] We match reporting funds to their non-reporting counterparts based on fund size and age at the time the self-reporting fund first appears in the Thomson Reuters database, and the matched fund is the non-reporting fund that minimizes the two-dimension "distance score," where the "distance score" is calculated as the sum of the absolute values of the percentage differences of the non-reporting fund's size and age from the reporting fund. If the matched fund disappears from the 13F database, we find a new matched fund and continue using the new fund.

Table III reveals several interesting fund characteristics. First, the self-reporting hedge funds have lower median portfolio concentration (as measured by the portfolio Herfindahl index) than the non-reporting funds. Second, the average monthly return volatilities of self-reporters and non-reporters are almost identical, but the self-reporting funds have significantly higher average annualized

portfolio turnover rate of 106% compared to 76% for the non-reporting funds. This finding is intuitive because the risk that trading strategies will be revealed through self-reporting is lower for funds with higher turnover.

Table III further compares the loadings on common risk factors for self-reporting and non-reporting funds and finds that reporting funds have more exposure to the Fama and French (1993) risk factors. The differences are most significant with regard to the size (SMB) factor (the differences in both mean and median are significant at the 1% level). The differences for the market and book-to-market (HML) factors follow the same pattern using the median statistic only, and the two fund categories do not differ significantly with regard to the momentum factor. These results support the hypothesis that funds with less conventional trading strategies (*i.e.*, lower factor loadings) face higher costs of disclosure and are therefore more reluctant to self-report.

V. Conclusion

This paper presents a comprehensive study that formally analyzes what happens before the birth and after the death of a hedge fund. We find that funds initiate reporting after an extended period of strong performance, but that such performance does not persist. Additionally, we find that fund performance deteriorates significantly following a fund's decision to terminate reporting. The analysis shows that the combination of good performance prior to birth and poor performance following death act as offsetting forces that tilt the performance tracked by the commercial database towards average. Our research provides important references and benchmarks for practitioners and academics using commercial databases and publicly available information on portfolio holdings of hedge funds. ■

1 Although institutions are required to disclose all securities that appear on the official list of "Section 13(f) Securities" – this list is published by the SEC periodically and includes almost all *long* positions in publicly traded equity, some preferred stocks, bonds with convertible features, warrants, and exchange-traded call and put options. However, the Thomson Reuters database contains only equity holdings.

2 Regardless of whether a company's website mentions hedge fund management as part of their business, we classify the company as a hedge fund manager/sponsor if it manages investment vehicles whose descriptions fit our definition of hedge funds.

3 For example, Carl Icahn (founder and chairman of the hedge funds, Icahn Capital, L.P. and Icahn Partners) and George Soros (founder and chairman of Soros Fund Management, a hedge fund management company) would be in this category.

4 We further note that the inter-quartile range is 0.34 to 0.77 and that the ten hedge fund companies exhibiting the highest return correlations (ranging from 0.96 to 0.99) all have funds in equity-oriented strategies including long/short equity, equity hedge, event driven, and sector.

5 Available at: http://www.hedgeindex.com/hedgeindex/en/default.aspx?cy=USD.

6 For more detail, see Philip Goldstein's interview in the September 11, 2006 issue of Business Week: http://www.businessweek.com/stories/2006-09-11/do-hedge-funds-hold-trade-secrets-businessweek-business-news-stock-market-and-financial-advice.

7 The estimates of performance following death are underestimated because the extremely distressed funds that exit from the commercial databases will also be exempt from 13F reporting if the value of their equity portfolios drops below $100 million. Indeed, of the 221 companies that file 13F forms prior to death, 61 (71) also disappear from the 13F database two (three) quarters after. This attrition rate of 28% (32%) is much higher than unconditional average of 10% (12%).

8 We conducted interviews with several investment professionals who indicated that listing in commercial databases is often necessary for investors to identify and select hedge funds.

9 We obtain the value of the fund's equity portfolio from the Form 13F filings.

10 To reduce noise, we do not include the 279 fund companies whose reporting status cannot be accurately verified.

References

- Ackermann C., McEnally R. and Ravenscraft D. (1999), The Performance of Hedge Funds: Risk, Return and Incentives, *Journal of Finance* 54, p. 833-874.
- Agarwal V., Daniel N.D. and Naik N.Y. (2009), Role of Managerial Incentives and Discretion in Hedge Fund Performance, *Journal of Finance* 64, p. 2221-2256.
- Aiken A.L., Clifford C.P. and Ellis J (2013), Out of the Dark: Hedge Fund Reporting Biases and Commercial Databases, *Review of Financial Studies* 26, p. 208-243.
- Carhart M. (1997), On Persistence in Mutual Fund Performance, *Journal of Finance* 52, p. 57-82.
- Daniel K., Grinblatt M., Titman S. and Wermers R. (1997), Measuring Mutual Fund Performance with Characteristic-Based Benchmarks, *Journal of Finance* 52, p. 1035-1058.
- Darolles S., Gagliardini P. and Gourieroux C. (2013), Survival of Hedge Funds: Frailty Versus Contagion, *Working Paper*, CREST, Paris Dauphine University, University of Lugano and University of Toronto.
- Fama E.F. and French K.R. (1993), Common Risk Factors in the Returns on Stocks and Bonds, *Journal of Financial Economics* 33, p. 3-56.
- Fung W. and Hsieh D.A. (2000), Performance Characteristics of Hedge Funds and CTA Funds: Natural Versus Spurious Biases, *Journal of Financial and Quantitative Analysis* 35, p. 291-307.
- Fung W. and Hsieh D.A. (2002), Hedge-Fund Benchmarks: Information Content and Biases, *Financial Analysts Journal* 58, p. 22-34.
- Hodder J.E., Jackwerth J.C. and Kolokolova O. (2013), Recovering Delisting Returns of Hedge Funds, *Journal of Financial and Quantitative Analysis* forthcoming.
- Jorion P. and Schwarz C. (2013), The Strategic Listing Decisions of Hedge Funds, *Journal of Financial and Quantitative Analysis*, forthcoming.
- Liang B. (2000), Hedge Funds: The Living and the Dead, *Journal of Financial and Quantitative Analysis* 35, p. 309-326.