Hedge Funds: Attrition, Biases and the Survivor Premium

Robert J. Bianchi* and Michael E. Drew

Queensland University of Technology
School of Economics and Finance
GPO Box 2434
Brisbane QLD 4001
Australia

Abstract

This study examines attrition, biases and the survivor premium of hedge fund returns for the period 1994-2001. We estimate an attrition rate of nearly 9 per cent per year which is twice the rate reported in mutual fund studies. We measure the various hedge fund biases and we find that database returns may be overestimated by as much as 45 per cent. This paper finds that chronic poor performance is the common characteristic of non-survivors. We then examine an important concept known as the survivor premium which receives little research attention. The survivor premium measures the difference in returns between survivors and non-survivors which is estimated at nearly 10 per cent per annum. We find that the hedge fund survivor premium is 2 to 4 times the size of the mutual fund survivor premium. This significant hedge fund survivor premium highlights its importance to investors. We develop an economic rationale for the survivor premium for the first time. We propose that the mutual fund survivor premium is associated with idiosyncratic risk only, while the significant hedge fund survivor premium is associated with both systematic and idiosyncractic risks.

JEL Classification: *G11, G20, G23, G29*

Key words: *Hedge Funds, Data Biases, Attrition, Survivorship, Investment Style*

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* Corresponding author: Email: r.bianchi@qut.edu.au; Tel: +61-7-3864-1349; Fax: +61-7-3864-1500. The authors would like to acknowledge and thank Tremont TASS Europe Ltd for the data. We also thank Peter Whelan and Madhu Veeraraghavan for helpful comments. We gratefully acknowledge the 'Applied Modeling in Economics & Finance (AMEF)' Research Centre, School of Economics and Finance, Faculty of Business, Queensland University of Technology for financial assistance. Any remaining errors are our own.

1. INTRODUCTION

The hedge fund debate raises contentious views on whether these fund managers provide return and diversification benefits to investors. While advocates say that hedge funds provide investors with truly alternative investment strategies, critics argue that hedge funds provide little benefit and charge high management fees for the privilege. One of the reasons for these polarised opinions is due to the variations that exist in the returns of individual hedge fund managers and their peer-group indices. It is only in recent times that researchers have had the opportunity to examine hedge fund databases to develop a clearer picture of the return and risk profile of this emerging class of fund manager.

This paper examines a sample of hedge funds in order to derive important information content for investors who wish to analyse individual hedge fund investment. This paper provides four main findings. First, the hedge fund mortality rate in this sample is estimated at 8.43 per cent per year which is twice the size of those reported in mutual fund studies. We find that 59 per cent of hedge funds at the start of the sample do not survive the full sample period. Second, the paper finds that non-survivors are strongly associated with short life-spans (i.e. 3.92 years) and chronic poor performance. Third, this paper estimates survivorship bias at 301 basis points (hereafter 'bps') per year which is twice the size reported in mutual fund studies, and instant history bias at 167 bps per year. We provide an incremental contribution by estimating multiperiod sampling bias across a variety of minimum survival criteria. Multiperiod sampling bias is estimated in this sample at 21, 71 and 90 bps per year across 12, 24 and 36 months, respectively. The biases estimated in this paper suggest that survivor-biases database returns can be inflated by as much as 45 per cent.

Finally, we examine the survivor premium, which is a concept in the data bias literature which receives little research attention. The survivor premium is the reward garnered by investors who by skill or luck invest in survivors-only and avoid non-survivors. We estimate an economic benefit from the survivor premium of 974 bps per year. This significant survivor premium suggests the paramount importance for investors to select survivors and avoiding non-survivors in a hedge fund investment portfolio. In fact, the hedge fund survivor premium is estimated at two to four times the survivor premium estimated in mutual fund studies. In this paper, we develop an economic rationale for the survivor premium for the first time. We propose that the small mutual fund survivor premium is attributed to the idiosyncratic risk of active mutual fund managers. Conversely, the significant hedge fund survivor premium is a result of both systematic and idiosyncratic risks which dominates hedge fund returns.

2. RELATED LITERATURE

While this paper analyses attrition and biases in hedge funds, it is the mutual fund literature which provides the origins of survivorship bias and attrition. The early studies from Grinblatt and Titman (1989, 1992), Brown, Goetzmann, Ibbotson and Ross (1992) and Malkiel (1995) demonstrate that mutual fund returns have been inflated due to the exclusion of non-surviving funds in performance studies. Subsequent studies such as Elton, Gruber and Blake (1996) demonstrated that attrition rates and survivorship are closely linked to poor performance, while Carpenter and Lynch (1999) showed that survivorship not only affects returns but may also affect performance persistence estimations.

Although data biases, attrition and survivorship have been considered in mutual fund studies since Grinblatt and Titman (1989), it is a relatively new area in the hedge fund literature. While some of the bias and survivorship methods can be borrowed from mutual fund studies, industry dynamics exist in hedge fund databases which make them difficult to analyse.[1] Survivorship was one of the first hedge fund biases considered in Brown, Goetzmann and Ibbotson (1999), Fung and Hsieh (2000), Liang (2000, 2001) and Malkiel and Saha (2005). Consistent with mutual fund studies, hedge fund survivorship bias was found to inflate industry-wide return estimates.[2]

The second source of bias found in hedge fund database returns is instant history bias (or backfilling bias) which was explored in Edwards and Park (1996), Fung and Hsieh (2000), Edwards and Caglayan (2001) and Malkiel and Saha (2005). This is a unique bias caused by the voluntary reporting regime in the global hedge fund industry. The voluntary nature of hedge fund reporting allows funds to develop a performance track record in their first few months of operation prior to disclosing their performance to database vendors. If the hedge fund generates favourable returns from its inception, it will report its performance to database vendors in the hope of raising capital for their fund. The database vendor obtains the historical fund performance and inserts or backfills their database with these monthly returns thereby creating an instant history in the database. Alternately, a new hedge fund with poor performance will have a lower tendency to report their performance to database vendors as they have a lower probability of raising capital with poor returns. The literature informs us that this strategic behaviour in the hedge fund industry tends to create an instant history bias which causes inflated hedge fund returns.

The third type of bias in hedge fund returns is multiperiod sampling bias which has been explored in the mutual fund literature by Carpenter and Lynch (1999) and Carhart, Carpenter, Lynch and Musto (2002), and has also been considered in hedge fund studies such as Fung and Hsieh (2000) and Edwards and Caglayan (2001). Multiperiod sampling bias is a contamination caused by the researcher who impose a minimum survival criteria (e.g. the requirement of at least 36 months of performance history) for funds to be included in an analysis. The mutual and hedge fund literature demonstrates that this simple but subtle restriction by the researcher tends to cause survival requirements on the data which tends to induce biases in mutual fund and hedge fund performance estimates.

While the focus of research attention has been on data biases and survivorship, the recent introduction of non-survivors provides the researcher with new types of information content. One of these new areas of interest is the ‘survivor premium’ which was introduced by Blake and Timmermann (1998) to describe the difference in mean returns between an equal-weighted portfolio of survivors-only less the equal-weighted portfolio of non-survivors over the same sample period. It describes the economic significance that can be earned by those skilled or lucky enough to have invested in a portfolio that is exclusively composed of surviving funds versus the

[1] A possible end-of-life reporting bias may exist in hedge fund returns, however, there is no data or valid methodology to comprehensively measure this form of bias.

[2] Ackermann, McEnally and Ravenscraft (1999) documents another bias which exists whereby successful funds cease reporting their results to database vendors as they have raised the capital they required and have no need to continue to report their results to anyone other than their investors. These funds that do not report imply that current disclosed returns may be downward bias as they do not include these successfully managed funds. Numerous examples of this include the renowned Renaissance Technologies Medallion Fund and the Global Asset Management GAMUT Fund managed by Caxton Corp who have been closed to investors for numerous years.

performance drag of a portfolio that is selected exclusively with non-survivors.[3] In this paper, we estimate the hedge fund survivor premium for the first time and we compare it with the mutual fund survivor premium. Although Blake and Timmermann (1998) define the survivor premium, we contribute to the literature developing an economic rationale to better understand the variation in the survivor premium between mutual funds and hedge funds.

3. DATA

The database employed in the analysis was sourced from Tremont (TASS) Europe Limited which consists of ninety-two monthly return observations of both surviving and non-surviving hedge funds for the period January 1994 to August 2001. A total of 3,012 hedge funds were available for analysis, composed of 1,836 survivors and 1,176 non-survivors. The funds in the dataset are divided into 11 distinct investment styles as defined by TASS.[4] The summary statistics of the individual funds in the sample are presented in Table 1. The descriptive statistics show hedge fund returns possess extreme values within each investment style while the third and fourth moments provide information that the distributions of hedge fund returns are not symmetrical. The descriptive statistics in this study are consistent with similar results reported in Ackermann, McEnally and Ravenscraft (1999), Brown *et. al*., (1999) and Asness, Krail and Liew (2001).[5]

Table 1
Hedge Fund Descriptive Statistics

This table presents the descriptive statistics of the hedge fund dataset. The sample consists of 3,012 funds consisting of both survivors and non-survivors. The statistics reported in this table are the mean values of the descriptive statistics reported by each individual hedge fund. FOF denotes fund of funds. * and ** denote statistical significance at the 5% and 1% levels, respectively.

Categories	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
All Funds (inc FOFs)	0.962	6.631	-5.105	1.866	0.256	4.008	4.898
All Funds (ex FOFs)	1.042	6.837	-5.312	1.916	0.212	4.055	4.959
Convertible Arbitrage	0.993	3.799	-3.895	1.272	-0.931	4.758	25.145**
Dedicated Short Bias	0.404	22.484	-12.103	5.596	0.688	4.511	16.014**
Emerging Markets	0.673	12.094	-21.608	5.026	-0.772	6.022	44.140**
Equity Market Neutral	1.087	3.378	-1.032	0.835	0.010	2.988	0.002
Event Driven	1.057	4.269	-6.904	1.412	-1.808	12.393	388.332**
Fixed Income Arbitrage	0.789	2.669	-6.291	1.104	-3.343	21.015	1415.385**
Fund of Funds (i.e. FOFs)	0.636	5.632	-4.156	1.730	0.342	3.591	3.132
Global Macro	0.752	7.111	-3.792	2.085	1.017	4.348	22.838**
Long/Short Equity Hedge	1.506	11.547	-8.522	3.105	0.249	4.562	10.297**
Managed Futures	0.635	7.788	-4.054	2.428	0.343	2.860	1.884
Other	0.742	6.661	-6.565	2.290	-0.151	3.467	1.186

[3] It is important to recognize that the survivor premium and survivorship bias are different calculations as they measure different data estimates.

[4] These investment style categories were: Convertible Arbitrage, Dedicated Short Bias, Emerging Markets, Equity Market Neutral, Event-Driven, Fixed Income Arbitrage, Fund of Funds, Global Macro, Long/Short Equity Hedge, Managed Futures and Other.

[5] There are very few studies that report descriptive statistics on individual hedge funds. A large proportion of hedge fund studies limit their analysis to hedge fund indices or aggregate the results in the form of equal weighted averages rather than results on individual hedge funds.

4. RESULTS

A. Attrition Rates

To appreciate the impact of hedge fund non-survivors, we estimate the mean annual attrition rate at 8.67 per cent per year. The sample also shows only 371 funds (or 40.9 per cent) of the 907 funds reporting in January 1994 survived the full sample period. The attrition estimates in this paper are consistent with those found in Fung and Hsieh (1997b), Brown *et. al.,* (1999), Liang (2000), Liang (2001), Brown, Goetzmann and Park (2001) and Chan, Getmansky, Hass and Lo (2005) who estimated hedge fund attrition rates in a range from 4.3 per cent to 15 per cent per year. The age distribution data shows that, on average, 50 per cent of non-survivors die within 30 months (i.e. 2.50 years), while 70 per cent of the non-survivors die within 47 months (i.e. 3.92 years). When survivors are included with the non-survivors, the average and median life span of all hedge funds in the sample are 47 months (i.e. 3.92 years) and 44 months (i.e. 3.67 years), respectively. These estimates of very short life-spans of hedge funds are similar to the works of Edwards and Caglayan (2001a) and Brown *et. al.,* (2001).

Table 2
Births and Deaths of Hedge Funds

The birth and death rates were calculated as the number of funds that were born or died during a particular calendar year divided by the number of funds in existence at the end of the previous year. The attrition rates were calculated as the number of funds that died in a particular year divided by the funds alive at the end of the previous year. Please note that the 2001 data contains 8 months only from January to August.

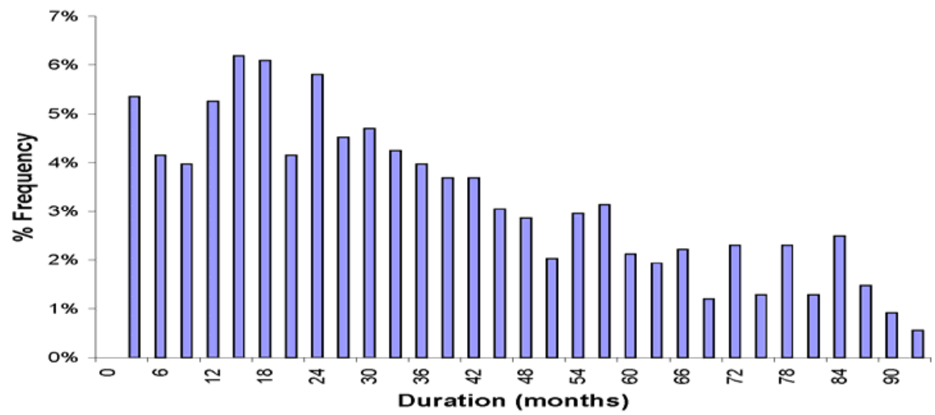
Year	Funds born during year	Birth rate (%)	Funds dying during year	Death rate (%)	Funds alive at end of year
< 1994	907	NA	NA	NA	907
1994	263	29.1	21	2.3	1150
1995	276	24.1	68	5.9	1359
1996	306	22.6	136	10.0	1530
1997	334	21.9	109	7.1	1756
1998	310	17.7	174	9.9	1893
1999	307	16.3	197	10.4	2004
2000	223	11.2	249	12.4	1979
2001	87	4.4	222	11.2	1860
				μ =8.67	

In order to appreciate hedge fund attrition rates, a comparison can be made with the mutual fund industry. The Lunde, Timmermann and Blake (1999) study found that 70 per cent of UK mutual funds died within 3 to 15 years and the annual attrition rate was 4.56 per cent per annum. In another article, Carhart, Carpenter, Lynch and Musto (2002) estimate US mutual fund attrition at no more than 3.6 per cent per year. In terms of life-spans (see Figure 1), this paper estimates that 70 per cent of hedge funds die within 47 months (i.e. 3.92 years) and the annual attrition rate is 8.67 per cent per annum. The evidence provided shows that hedge funds have relatively short life-spans and hedge fund attrition rates are twice the levels of those reported in mutual fund studies.

The high attrition rates in this sample inform us that non-survivors must have a significant influence on the level of data bias in this sample. The significant number of non-survivors terminating over the 1994-2001 period suggests that hedge fund research that excludes non-survivors will lead to empirical results that are spurious and misleading. The inclusion of non-survivors leads us to consider survivorship and instant history bias.

Figure 1

Age Distribution of Non-Survivors



B. Survivorship Bias

Survivorship bias in hedge fund returns has been extensively recognized in Brown, Goetzmann and Ibbotson (1999), Fung and Hsieh (2000), Liang (2000, 2001), Malkiel and Saha (2005) who all follow the Malkiel (1995) methodology in defining this bias. Table 2 presents the survivorship bias estimates on this hedge fund sample and summarises the return and volatility estimates of the full sample and across investment styles.[6] The focus of this paper is in the category, "All Funds (ex FOFs)" which excludes fund of funds as they invest their funds in individual hedge funds. The results presented in Table 2 show that survivors-only generated an annual rate of return of 15.12 per cent while the dataset containing both survivors and non-survivors generated an annual return of 12.11 per cent. These calculations produce an estimated survivorship bias in this sample of 301 basis points per year. The survivorship bias estimate from this study is consistent with the findings in Brown *et. al.,* (1999), Fung and Hsieh (2000), Liang (2001) and Malkiel and Saha (2005) who estimated survivorship bias in the global hedge fund industry at 300, 300 and 243 and 432 bps per year, respectively.

[6] It is important to recognise that the TASS classification categories are specific to TASS themselves. Other hedge fund data vendors categorise the hedge fund industry using other categories and classifications. For example, HFR Research divides the hedge fund industry into:- Convertible Arbitrage, Distressed Securities, Emerging Markets, Equity Hedge, Event Driven, Fixed Income, Fund of Funds, Macro, Merger Arbitrage, Relative Value Arbitrage, and Sector. As a second example, the VAN Hedge Fund Advisors classify funds into: Aggressive Growth, Distressed Securities, Emerging Markets, Fund of Funds, Income, Macro, Market Neutral – Arbitrage, Market Neutral – Securities Hedging, Market Timing Opportunistic, Several Strategies, Short Selling, Special Situations, and Value. We can see that each hedge fund data vendor has their own investment style classification system.

Table 3

Survivorship Bias Estimates

The table presents the return and volatility estimates of the full sample, survivors and non-survivors in their respective investment style categories. These results allows survivorship bias to be calculated which is the return of survivors only minus the return of all funds. The sample period is from January 1994 to August 2001. Ann. ROR denotes annualised rate of return. Ann. S.D. denotes annualised standard deviation. Survivor Bias denotes the bias between survivors only and the full sample of all funds. Bias S.E. denotes the standard error mean of the survivorship bias. A variety of statistical equality tests are presented to test the difference between the sample of survivors `and non-survivors. The p-value for Mean Difference is the parametric two-tailed t-test for equality of means. The p-value for Median Difference is the nonparametric Wilcoxon Signed Ranks two-tailed test for equality of medians. The p-value for Variance Difference is the two-tailed F-test for equality of variances. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	All Funds		Survivors		Non-survivors		Bias Estimate		Survivors/Non-survivors Difference in Sample Tests		
Categories	Ann. ROR (%)	Ann. S.D. (%)	Ann. ROR (%)	Ann. S.D. (%)	Ann. ROR (%)	Ann. S.D. (%)	Survivor Bias (%)	Bias S.E. (%)	p-value for Mean Diff.	p-value for Median Diff.	p-value for Variance Diff.
All Funds (inc FOFs)	11.18	6.51	13.99	6.53	4.47	7.54	2.81	0.034	0.000**	0.010**	0.172
All Funds (ex FOFs)	12.11	6.70	15.12	6.78	5.07	7.70	3.01	0.035	0.000**	0.009**	0.227
Convertible Arbitrage	11.79	4.39	12.51	4.22	7.77	8.01	0.72	0.031	0.000**	0.365	0.000**
Dedicated Short Bias	6.33	19.72	6.50	18.77	2.42	22.64	0.17	0.134	0.051	0.566	0.075
Emerging Markets	7.28	17.46	10.21	19.44	2.83	15.88	2.93	0.105	0.000**	0.404	0.055
Equity Market Neutral	12.91	2.90	15.38	3.04	6.02	4.44	2.47	0.058	0.000**	0.000**	0.000**
Event Driven	12.23	5.03	12.92	4.77	9.28	7.04	0.69	0.034	0.000**	0.128	0.000**
Fixed Income Arbitrage	9.38	3.81	12.49	4.08	0.51	9.70	3.11	0.059	0.000**	0.000**	0.000**
Fund of Funds (i.e. FOFs)	7.41	5.99	9.54	5.59	2.71	7.78	2.13	0.053	0.000**	0.017*	0.002**
Global Macro	8.89	7.19	13.63	10.15	3.23	7.59	4.74	0.264	0.000**	0.045*	0.006**
Long/Short Equity Hedge	17.40	10.86	19.57	10.46	9.87	14.00	2.17	0.038	0.000**	0.187	0.006**
Managed Futures	7.96	8.42	12.20	10.08	2.67	8.13	4.24	0.090	0.000**	0.070	0.042*
Other	8.65	7.67	12.53	7.41	1.16	10.11	3.88	0.209	0.000**	0.006**	0.003**

In order to appreciate the magnitude in hedge fund survivorship bias, a comparison can be made with the traditional mutual fund industry. Brown and Goetzmann (1995), Malkiel (1995), Elton, Gruber and Blake (1996) and Carhart, Carpenter, Lynch and Musto (2002) estimated survivorship bias in mutual funds at 20 to 140 bps per year. When one considers that hedge fund survivorship bias has been estimated in a range between 300 to 432 bps per year, the empirical evidence suggests that hedge fund survivorship bias is at least twice the size than those reported in mutual fund studies.[7] These results demonstrate that exclusion of non-survivors in a hedge fund analysis will result in the gross overestimation of industry-wide hedge fund returns.

C. Instant History Bias (or Backfilling Bias)

The second bias calculated on this dataset is instant history bias (IHB) which employs the same methodology as Fung and Hsieh (2000) and Edwards and Caglayan (2001). IHB is estimated by excluding the first twelve months of every hedge fund's performance.[8] The results in Table 4 estimate the IHB on the full sample at 167 bps per year (i.e. 12.11 per cent in Table 3 minus 10.44 per cent in Table 4) from 1994 to 2001. This estimate is consistent with Fung and Hsieh's (2000) annual IHB estimate of 140 bps per year. The results in Table 4 show that IHB is evident across the full sample and investment styles. The estimates of IHB in Table 4 in comparison to Table 3 are significant as they show that across all investment styles, the IHB adjustment reduces the annual rates of return for survivors and non-survivors except for the Dedicated Short Bias non-survivor group. These results confirm that hedge fund returns, on average, permeate an upward bias due to the inclusion of the first twelve months of a hedge fund's performance record. This is further evidence of the importance of the data collection process when conducting hedge fund research, as IHB is a unique bias due to the voluntary reporting regime of the global hedge fund industry.

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[7] While Brown *et. al*., (1999), Fung and Hsieh (2000), Liang (2001) and Malkiel and Saha (2005) report annual hedge fund survivorship bias estimates of 3.00, 3.00 and 2.43 per cent respectively, the work of Ackermann *et al*., (1999) reported an unusually low annual hedge fund survivorship bias at 0.16%, however, their research methodology has been heavily criticised in the subsequent hedge fund literature.

[8] Fung and Hsieh (2000) and Brown, Goetzmann and Park (2001) estimate a fund incubation period of 15 months prior to funds appearing on hedge fund databases. Given this finding, Fung and Hsieh (2000) remove the first twelve months of performance history in order to estimate instant history bias.

Table 4

Instant History (Backfilling) Bias Estimates

The table presents the return and volatility estimates of the full sample, survivors and non-survivors in their respective investment style categories. These results are adjusted for instant history bias as each individual fund in each category has the first twelve months of performance history removed. Instant history bias is calculated as the return of all funds in Table 3 minus the returns of all funds in this table. The sample period is from January 1994 to August 2001. Ann. ROR denotes annualised rate of return. Ann. S.D. denotes annualised standard deviation. IHB Bias denotes the level of instant history bias between the returns of all funds in Table 3 and Table 4. Bias S.E. denotes the standard error mean of the instant history bias. A variety of statistical equality tests are presented to test the difference between the sample of survivors and non-survivors. The p-value for Mean Difference is the parametric two-tailed t-test for equality of means. The p-value for Median Difference is the nonparametric Wilcoxon Signed Ranks two-tailed test for equality of medians. The p-value for Variance Difference is the two-tailed F-test for equality of variances. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	All Funds		Survivors		Non-survivors		Bias Estimate		Survivors/Non-survivors Difference in Sample Tests		
Categories	Ann. ROR (%)	Ann. S.D. (%)	Ann. ROR (%)	Ann. S.D. (%)	Ann. ROR (%)	Ann. S.D. (%)	IHB Bias (%)	Bias S.E. (%)	p-value for Mean Diff.	p-value for Median Diff.	p-value for Variance Diff.
All Funds (inc FOFs)	9.69	6.53	12.46	6.59	3.20	7.47	1.49	0.027	0.011**	0.014**	0.250
All Funds (ex FOFs)	10.44	6.70	13.37	6.83	3.63	7.64	1.67	0.028	0.009***	0.014**	0.292
Convertible Arbitrage	10.81	4.70	11.39	4.63	7.48	8.52	0.98	0.031	0.232	0.507	0.000***
Dedicated Short Bias	5.81	19.67	5.96	19.16	2.70	21.82	0.52	0.132	0.915	0.556	0.165
Emerging Markets	4.94	18.24	6.69	20.00	1.48	16.56	2.34	0.097	0.546	0.540	0.081*
Equity Market Neutral	11.46	3.02	13.83	3.41	4.72	4.52	1.45	0.046	0.000***	0.000***	0.011**
Event Driven	11.35	5.04	12.18	4.92	8.20	7.11	0.88	0.030	0.234	0.105	0.001***
Fixed Income Arbitrage	7.83	3.70	9.65	4.26	-0.55	9.79	1.55	0.072	0.013**	0.008***	0.000***
Fund of Funds (i.e. FOFs)	6.91	6.17	9.14	5.78	1.76	7.97	0.50	0.046	0.045**	0.017**	0.003***
Global Macro	6.70	7.43	10.26	8.06	1.93	7.92	2.19	0.091	0.044**	0.043**	0.844
Long/Short Equity Hedge	15.02	10.93	17.33	10.58	7.07	14.20	2.38	0.034	0.110	0.201	0.005***
Managed Futures	7.41	8.57	12.15	10.25	1.82	8.50	0.55	0.098	0.036**	0.056*	0.080*
Other	8.18	8.03	11.53	7.21	-0.81	12.53	0.47	0.324	0.033**	0.018**	0.000***

Table 5
Multiperiod Sampling Bias

This table reports the effect of multiperiod sampling bias on annual returns and standard deviation estimates on the full sample and across investment styles. The results suggest an upward bias on returns as you impose a longer minimum performance history, however, there is little impact on standard deviation estimates. Ann. ROR denotes annualized rate of return. Ann. S.D. denotes annualised standard deviation. Ratio denotes annualized rate of return divided by annualised standard deviation. MB Bias denotes the multiperiod sampling bias which are the returns of each respective panel minus the returns in Panel A. Bias S.E. denotes the standard error mean of the multiperiod sampling bias.

Panel A: Survivors and non-survivors adjusted for survivorship and instant history bias.
Panel B: Panel A data and funds must have an additional 12 months of performance data.
Panel C: Panel A data and funds must have an additional 24 months of performance data.
Panel D: Panel A data and funds must have an additional 36 months of performance data.

	Panel A:					Panel B:				
Categories	Ann. ROR (%)	Ann. S.D. (%)	Ratio	MS Bias (%)	Bias S.E. (%)	Ann. ROR (%)	Ann. S.D. (%)	Ratio	MS Bias (%)	Bias S.E. (%)
All Funds (inc FOFs)	9.69	6.53	1.48	NA	NA	9.88	6.53	1.51	0.19	0.003
All Funds (ex FOFs)	10.44	6.70	1.56	NA	NA	10.65	6.70	1.59	0.21	0.003
Convertible Arbitrage	10.81	4.70	2.30	NA	NA	10.84	4.73	2.29	0.03	0.004
Dedicated Short Bias	5.81	19.67	0.30	NA	NA	5.95	19.66	0.30	0.14	0.025
Emerging Markets	4.94	18.24	0.27	NA	NA	4.97	18.24	0.27	0.03	0.007
Equity Market Neutral	11.46	3.02	3.79	NA	NA	11.76	2.99	3.93	0.30	0.006
Event Driven	11.35	5.04	2.25	NA	NA	11.40	5.03	2.27	0.05	0.002
Fixed Income Arbitrage	7.83	3.70	2.12	NA	NA	8.13	3.70	2.20	0.30	0.009
Fund of Funds (FOFs)	6.91	6.17	1.12	NA	NA	7.00	6.17	1.13	0.09	0.003
Global Macro	6.70	7.43	0.90	NA	NA	6.90	7.54	0.92	0.20	0.011
Long/Short Equity Hedge	15.02	10.93	1.37	NA	NA	15.08	10.95	1.38	0.06	0.005
Managed Futures	7.41	8.57	0.86	NA	NA	7.77	8.59	0.90	0.36	0.009
Other	8.18	8.03	1.02	NA	NA	8.85	7.65	1.16	0.67	0.032

	Panel C:					Panel D:				
Categories	Ann. ROR (%)	Ann. S.D. (%)	Ratio	MS Bias (%)	Bias S.E. (%)	Ann. ROR (%)	Ann. S.D. (%)	Ratio	MS Bias (%)	Bias S.E. (%)
All Funds (inc FOFs)	10.31	6.57	1.57	0.62	0.009	10.48	6.55	1.60	0.79	0.015
All Funds (ex FOFs)	11.15	6.75	1.65	0.71	0.010	11.34	6.72	1.69	0.90	0.018
Convertible Arbitrage	11.06	4.81	2.30	0.25	0.009	10.85	5.04	2.15	0.04	0.022
Dedicated Short Bias	6.16	20.01	0.31	0.35	0.033	6.94	20.22	0.34	1.13	0.058
Emerging Markets	5.00	18.61	0.27	0.06	0.025	4.55	18.53	0.25	-0.39	0.049
Equity Market Neutral	11.94	3.07	3.89	0.48	0.017	11.54	3.00	3.85	0.08	0.025
Event Driven	11.31	4.98	2.27	-0.04	0.007	11.79	4.94	2.39	0.44	0.021
Fixed Income Arbitrage	8.52	3.71	2.30	0.69	0.016	8.42	3.78	2.23	0.59	0.022
Fund of Funds (FOFs)	7.20	6.17	1.17	0.29	0.010	7.47	6.21	1.20	0.56	0.014
Global Macro	7.78	7.61	1.02	1.08	0.027	8.06	7.96	1.01	1.36	0.040
Long/Short Equity Hedge	15.57	10.90	1.43	0.55	0.013	15.80	11.07	1.43	0.78	0.022
Managed Futures	8.48	8.85	0.96	1.07	0.028	9.05	9.28	0.98	1.64	0.040
Other	9.06	8.03	1.13	0.88	0.082	9.99	7.32	1.36	1.81	0.330

D. Multiperiod Sampling Bias

There is no generally accepted method to calculate multiperiod sampling bias (MSB), so we therefore employ the same methodology as Fung and Hsieh (2000) and Edwards and Caglayan (2001). MSB is calculated by comparing the results of the adjusted set of returns against the same data conditional upon funds requiring a further 12, 24 and 36 month minimum history, respectively.[9] The results in Table 5 show that MSB increases with sample length. MSB is estimated at 0.21, 0.71 and 0.90 per cent per annum for 12, 24 and 36 months respectively. These results are consistent with similar findings in Edwards and Caglayan (2001) and Fung and Hsieh (2000). The results in Table 5 demonstrate that hedge fund researchers who impose a minimum performance history on hedge fund track records are inadvertently creating an upward bias in their hedge fund return estimates. MSB is an issue in hedge fund research as the conditioning on survival towards a required minimum sample length results in an analysis that excludes hedge funds with short life-spans, which tends to be non-survivors who exhibit poor performance.

E. Survivor Premium

An important aspect in an analysis of survivors and non-survivors is the estimation of the survivor premium which has received little research attention. Blake and Timmermann (1998) who coined the term, survivor premium, define it as the mean portfolio return of survivors minus the mean portfolio return of non-survivors. The survivor premium therefore measures the premium earned if investors are skilled or lucky enough to invest in a portfolio of survivors and avoid non-survivors. Mutual fund investors can eliminate the variability of returns from the survivor premium by naively allocating their capital to a passive index fund manager. By making a passive investment decision, the survivor premium can therefore be eliminated. In the case of hedge funds, the risk of the hedge fund survivor premium can not be avoided. As there is no generally accepted passive benchmark portfolio in the hedge fund industry, investors are exposed to the survivor premium at all times.

The estimates in Table 4 show that an equal-weighted portfolio of survivors-only generates a return of 13.37 per cent per year while an equal-weighted portfolio of non-survivors returns 3.63 per cent per year, resulting in a significant annual survivor premium of 974 bps. This result is consistent with Malkiel and Saha (2005) who estimated an implied average hedge fund survivor premium of 835 bps.

To appreciate the magnitude of the hedge fund survivor premium, we can compare it with mutual fund estimates. Blake and Timmerman (1998) estimate the annual survivor premium on the UK mutual fund industry at 240 bps, while Drew and Stanford (2001) estimate the premium at 281 bps per year on Australian pension equity fund managers. In US studies, Carhart, Carpenter, Lynch and Musto (2002) estimate an implied survivor premium of 400 bps per year while Malkiel and Saha (2005) report an average annual survivor premium of 429 bps. It is clear that the size of the survivor premium in hedge fund returns is two to four times the magnitude of that in mutual funds.

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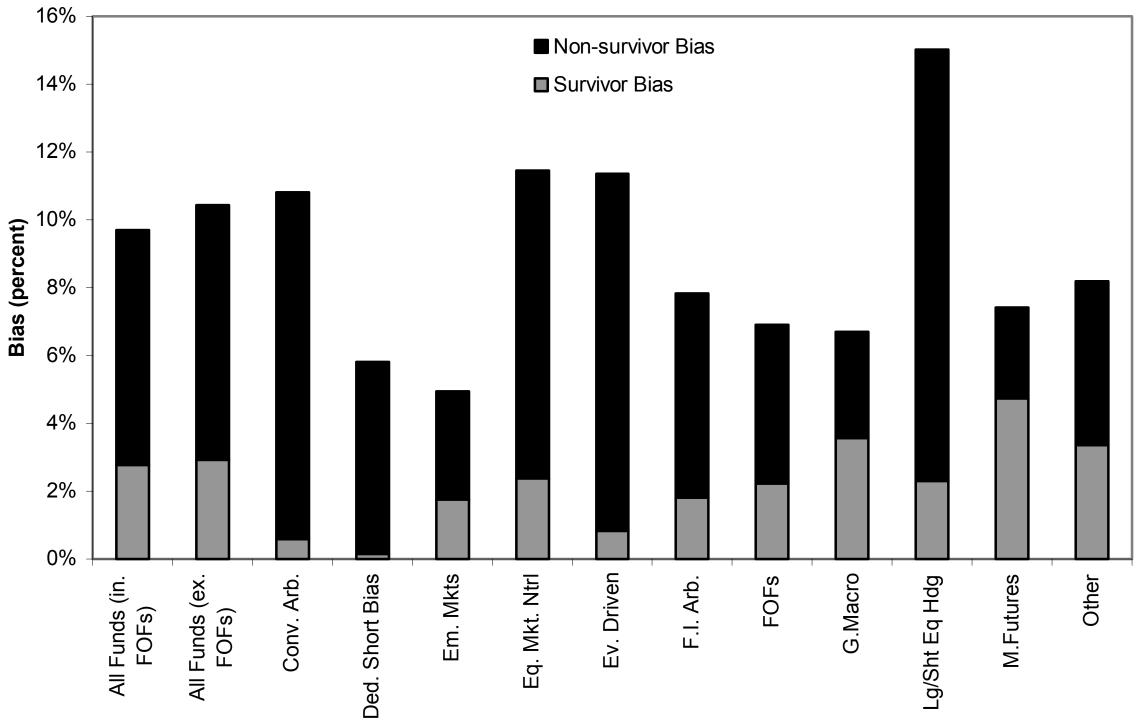
[9] It is important to note that the adjusted dataset which has accounted for both survivorship and instant history bias contains funds whereby the first 12 months of history has been removed. To estimate multiperiod sampling bias, the dataset has a further 12, 24 and 36 month minimum history requirement imposed on the funds.

This size of the hedge fund survivor premium is so significant that considerable economic gain can be derived by selecting survivors and avoiding non-survivors when making hedge fund investment decisions. Figure 2 decomposes the hedge fund survivor premium into its two components of the survivor-bias and non-survivor bias and we report across all investment styles. The results in Figure 2 suggest that the primary contributor of the hedge fund survivor premium is the chronic poor performance from non-survivors.

Figure 2
Survivor Premium Decomposition



To understand the time-varying effects of the survivor premium, Figure 3 reports the monthly survivor premium over the 1994-2001 sample period. The results in Figure 3 shows that the survivor premium is predominantly positive through time with the monthly premium reaching 1.90 per cent in October 1998 (in the 58^{th} month in the sample period) during the time of the LTCM and Russian financial market crisis. The survivor premium continues to be generated with the highest monthly premium reaching 4.15 per cent in April 2000 which coincides with the associated historical peaks in the United States equities markets the month before. We regress the survivor premium over time and report the results in Table 6.

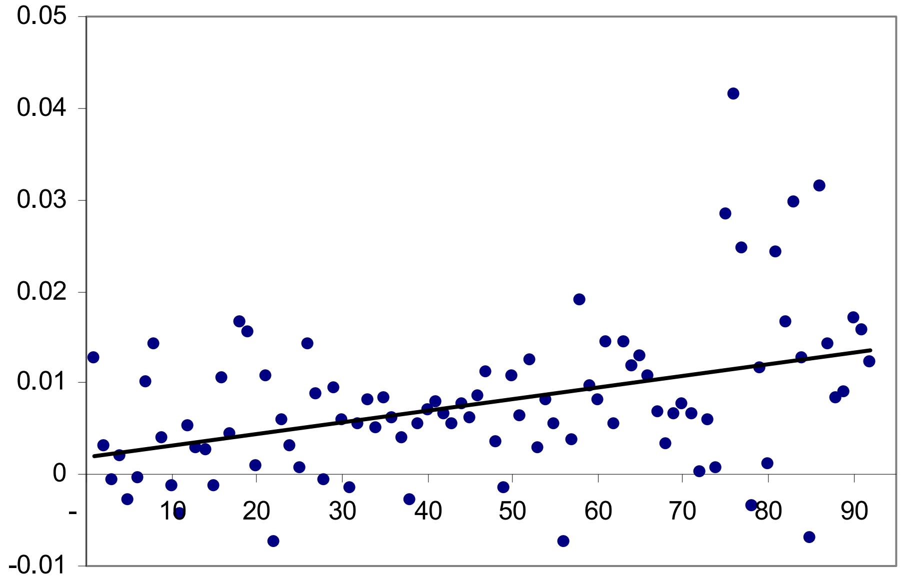
Table 6
Regressing Survivor Premium on Time

This table reports the regression of the monthly survivor premium for the 1994-2001 sample period.

Variable	Coefficient	SE	p-value	Adj. R-Sq
Intercept	0.0019	0.0013	0.154	0.153
Month	0.0001	0.0001	0.000	

Figure 3
Monthly Survivor Premium (1994-2001)

The graph reports the mean portfolio of survivors minus the mean portfolio return of non-survivors for the 1994-2001 period. The survivor premium earned over time shows the premium increasing in October 1998 during the LTCM and Russian financial market crisis. The highest monthly survivor premium is 4.15 per cent which occurs in April 2000.



Finally, we examine the relationship between the survivor premium and fund age in Table 7 and Figure 4. In other words, is the survivor premium related to the age of the funds? To evaluate this relationship, we re-calculate the survivor premium by grouping the mean monthly returns of surviving funds based on age minus the mean portfolio return of non-survivors based on age also. The results in Figure 4 show that the survivor premium exhibits higher variability for younger aged funds and becomes more stable as fund age lengthens. These results must be tempered by the regression results in Table 7 which suggest that there is no statistical significance between the survivor premium and fund age.

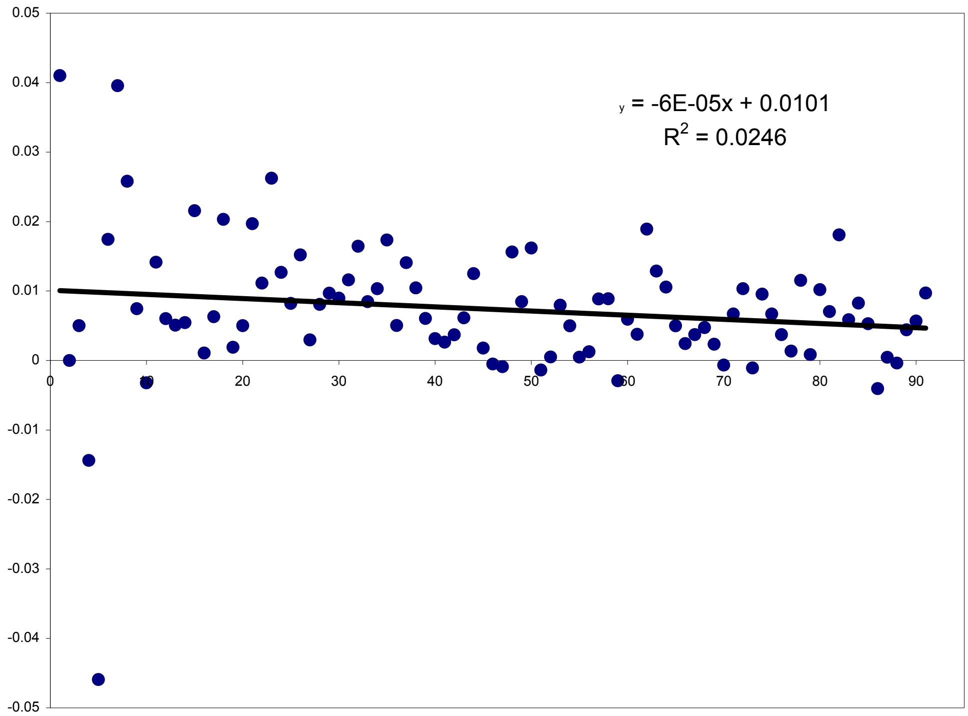
Table 7
Regressing Survivor Premium on Fund Age

This table reports the regression of the monthly survivor premium for the 1994-2001 sample period based on the age of the funds.

Variable	Coefficient	SE	p-value	Adj. R-Sq
Intercept	1.011	0.211	0.000	0.014
Fund Age	-0.006	0.004	0.138	

Figure 4
Monthly Survivor Premium (1994-2001)

The graph reports the monthly survivor premium conditional upon the age of the funds. The results show that the highest variability in the survivor premium is evident in funds in their infancy. As the age of a fund matures, it survivor premium steadily declines.



F. Economic Rationale for the Survivor Premium

Why is the hedge fund survivor premium so large in comparison to the mutual fund survivor premium? An economic rationale must be developed in order to better understand the differences in the size of the survivor premium. Can we directly compare the mutual fund survivor premium with the hedge fund survivor premium? In this section, we develop an economic rationale which argues that the survivor premium estimate in these two sectors of the funds management industry actually measures different types of risk. Following the theory of Sharpe (1964) we know that;

Total Risk = Systematic risk (SR) + Idiosyncratic risk (IR).

As stated in Waring and Siegel (2003), a mutual fund's objective is to earn an excess return over a pre-specified benchmark portfolio subject to a predetermined set of limits. In the case of mutual funds, the benchmark return is generally an associated index and the active fund manager can over or underweight portfolio exposures relative to their predefined benchmark. The deviation in benchmark portfolio weightings determine the level of active risk taken by the fund manager. The level of active risk determines the level of excess returns and the variability of these returns. The dispersion of returns from the benchmark measures the variability of returns derived from the idiosyncratic risk. It is the idiosyncratic risk of active managers which eventually determines the difference in the returns of survivors and non-survivors. By relating idiosyncratic risk to the survivor premium, we can formally propose that the survivor premium in the mutual fund industry is derived as follows;

Mutual Fund Survivor Premium = IR. of Survivors – IR. of Non-Survivors.

In the case of hedge funds, the variability of returns reflects a different set of risks which are not well-defined. First, hedge funds generally tend to be managed as an absolute return fund rather than a traditional mutual fund based on relative performance. This shift in investment policy results in a more flexible mandate for the hedge fund manager. At times, a hedge fund investment may include idiosyncratic risk only (eg. market neutral and fixed-income arbitrage funds) while other hedge fund investment strategies possess both systematic and idiosyncratic risk (such as global macro and managed futures funds). The hedge fund investment styles that maintain both systematic and idiosyncratic risk possess a flexible mandate to actively asset allocate between the investment strategy (ie. risky assets) and the risk-free rate (ie. cash). This causes the variability in hedge fund returns to be attributed to both systematic and idiosyncratic risks. This flexibility in hedge fund portfolios to possess elements of total risk therefore causes a wider dispersion in hedge fund returns. Overall, the higher variability between the mean portfolio return of survivors and the mean portfolio return of non-survivors results in a larger survivor premium. We can formally express the hedge fund survivor premium as;

Hedge Fund Survivor Premium = SR and IR of Survivors – SR and IR of Non-Survivors.

This paper develops an economic rationale for the difference in the size of the survivor premium for the first time. For this rationale to hold true, we would expect a relatively small survivor premium for active funds whose performance can be directly related and measured to a passively replicated benchmark portfolio. Conversely, we would expect a large survivor premium for fund managers which possess mandates which provide them flexibility to possess both systematic and idiosyncratic risks.

5. CONCLUSION

This paper demonstrates the problematic nature of hedge fund data biases. We highlight that the high attrition rates in hedge funds are twice the levels of those reported in mutual fund studies. These high hedge fund attrition rates are caused by the chronic poor performance of non-survivors resulting in short life-spans. These characteristics raise the profile of non-survivors as important contributors to any hedge fund analysis. The importance of non-survivors is further evidenced in the survivorship bias estimate at 301 basis points per year which is twice as high as those reported in mutual fund studies. We estimate the instant history bias at 167 basis points per year and the various impacts of multiperiod sampling bias at 21 to 90 basis points per year. This evidence demonstrates that hedge fund returns possess an upward bias when they are conditioned for minimum sample length requirements. When these biases have been accounted for, we find that survivor-only returns are inflated by as much as 45 per cent.

Finally, we examine the hedge fund survivor premium which is an important concept in data biases which receives little research attention. The survivor premium informs us that investors who are skilled or lucky enough to invest in surviving funds and avoid non-survivors can garner a survivor premium of 974 basis points per year. We find that the hedge fund survivor premium is two to four times the size of the mutual fund survivor premium. This finding is pivotal to investors wishing to construct hedge fund investment portfolios. For the first time, we develop an economic rationale in order to explain the differences in the size of the mutual fund and hedge fund survivor premiums. We show that the mutual fund survivor premium incorporates the variability in returns caused by idiosyncratic risk only. Conversely, the significant hedge fund survivor premium reflects the variability of returns caused by exposures to both systematic risks and idiosyncratic risks.

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