MAFC Research Papers

Hedge Funds:
A Walk Through the Graveyard

No. 25

by
Ross Barry

Applied Finance Centre
Macquarie University
March 2003

MAFC Research Papers are generally by members or affiliates of the Applied Finance Centre, Macquarie University.

Copies can be obtained by sending a cheque (payable to CMBF Limited) for $2.00 to:

MAFC Papers
Applied Finance Centre
GPO Box 3480
SYDNEY NSW 1043

Alternatively, requests for copies may be sent by facsimile to the above address on 9850 7281(STD code 02; ISD code 61 2).

Copies of this and other MAFC Papers are available on the World Wide Web at *http://www.mafc.mq.edu.au* in Adobe Acrobat 'PDF' format.

MAFC Research Papers

Hedge Funds: A Walk Through the Graveyard

No. 25

by
Ross Barry*

*The author gratefully acknowledges contributions from Rob Trevor of Macquarie University's Applied Finance Centre



Applied Finance Centre



The contents of this publication may be reproduced
provided the source is acknowledged.

Published in 2003 by

Applied Finance Centre
Macquarie University
NORTH RYDE NSW 2109 AUSTRALIA

ISBN No. 1 86408 832 X Copyright © 2002 Ross Barry

Printed in Australia by Macquarie University

Contents

Abstract 1

Introduction 2

Survivorship and instant history bias 6

Probable cause of death 10

Survivorship by style group 15

Fund-of-Hedge-Funds 17

Summary of results 18

References 20

Hedge Funds: A Walk Through the Graveyard

Abstract

Prior research has identified a number of biases in hedge fund databases, notably due to survivorship and selective backfilling of returns. This study finds that survivorship bias in hedge funds has risen in recent years to almost 4% p.a., due mainly to higher attrition among managed futures, fixed income arbitrage and some equity hedge (technology) funds, although prior estimates of 'instant history' bias however, are greatly exaggerated. We extend on prior research by examining the impact of survivorship on higher moments of the distribution of hedge fund returns (volatility, skew and kurtosis) and across different hedge fund style groups. We also consider probable causes of death after trawling the extensive TASS 'notes' fields maintained in the TASS database for over 1000 defunct funds, referred to affectionately by TASS as "the graveyard". We argue that many funds actually close themselves down when their net asset value drifts well below their previous high watermark for incentive fees. We also find sudden short-term losses are more likely to lead to termination than poor returns or high volatility per se. There is little evidence that hedge fund death is related to leverage, the extent of trading discretion, or whether or not managers are personally invested. We do however, find a significantly higher incidence of death among funds that use technical/trend-following processes.

Introduction

Several groups have established databases of hedge fund returns, often used to derive performance benchmarks[1]. Prior research has identified a number of biases in the leading databases, most notably due to survivorship and selective backfilling [see for instance Fung and Hsieh (2000, 2001) and Liang (2000)]. We update prior estimates of these biases and examine the impact of survivorship on higher moments of the distribution of hedge fund returns (volatility, skew and kurtosis) and across different hedge fund *style groups*, including fund-of-funds. Importantly, we also consider the probable causes of death among hedge funds, after trawling through the extensive 'notes' fields maintained by TASS[2] for around 2,600 hedge funds as at June 2001, including information retained for over 1000 defunct funds, referred to affectionately by TASS as "the graveyard". Like every good thriller, we find not everything in the graveyard is actually dead.

Analysis of hedge fund data is complicated by three factors. The first is that not all databases retain historical data about funds that have been liquidated or have stopped reporting for other reasons[3]. This is important since the incidence of death among hedge funds is much higher than for traditional mutual funds. To the extent that hedge fund death is due to poor performance, the average return for hedge funds, conditioned by their survival to the end of the period of study, will have a positive *survivorship bias*. Brown & Goetzmann (1995) have also shown that survivorship is also likely to impact higher moments of the distribution of returns and degree of serial correlation.

The second is that hedge funds are prohibited from marketing directly to US investors under the Investment Companies Act (1940). Maintaining a profile with the leading databases therefore provides

---

1 Most notably TASS, Hedge Fund Research (HFR) and Managed Account Reports (MAR).

2 Liang (2000) argues that the TASS database is better suited for academic research by virtue of its relative completeness and accuracy.

3 Even databases that do now retain information on defunct funds, including TASS, generally have only done so since 1994.

managers the next most effective way of pitching their services to prospective investors. On one hand, this ensures a broad coverage of hedge fund managers for the leading databases. However, once a fund has raised sufficient capital and becomes closed to new investors, there is little motivation to continue to report (and potentially give away current market positioning). Many good hedge fund managers reportedly close very quickly after their initial offering on the back of a future commitments from large *fund-of-fund* managers as they themselves raise funds.

The third is that hedge fund managers may exercise a fair degree of discretion in reporting returns, especially in the early stages of a fund's life. For several databases, there is often a significant lag between each fund's inception date and the date at which it enters the database. This often corresponds to an incubation period, typically 12-18 months, sponsored by a seed investor. It is only natural to expect that managers, upon entering the database, would only provide earlier returns if these were strong, or alternatively, to select the start date which casts them in the most favourable light. This is referred to by Park (1995) as *instant history bias*.

There may also be a significant difference in the average return for hedge funds in any given database and the average return for *all* hedge funds since managers may report to just one preferred database, or not at all, or may set up three or four funds but select only the best performing fund, after a year or so, for public offer. Unfortunately, it is impossible to gauge the size of any such *self-selection bias*, although it may be argued (conveniently) that for every sub-par fund that goes unreported, there is a successful fund that can raise capital without registering with a database. A further potential bias, not previously referred to in the literature, occurs where funds refrain from reporting a sudden deterioration in performance to hide positions or protect reputations. If such funds are subsequently liquidated, these and further losses from closing out positions in illiquid markets, may remain forever unreported – the silent screams of a dying fund.

Figure 1 shows how these factors combine to give rise to a chronological left- and right-censoring of the (N x T) array of monthly returns to N

hedge funds over T months. For illustrative purposes, we categorize each individual fund in the TASS database as belonging to one of the following eight broad types of fund:

Type 1 existing funds with a full t=T return history

Type 2 existing funds that enter the database sometime after the start of the period

Type 3 Type 2 funds that elect not to backfill returns

Together, types 1-3 represent the universe of *live funds* for which we can examine returns conditioned by funds' survival to the end of the sample period.

Type 4 funds existing at the start of the period, but become defunct before the end Type 5 funds established after the start of the period that are also now defunct

Type 6 Type 5 funds that elect not to backfill returns

Type 7 funds that may still exist but have stopped reporting for other reasons

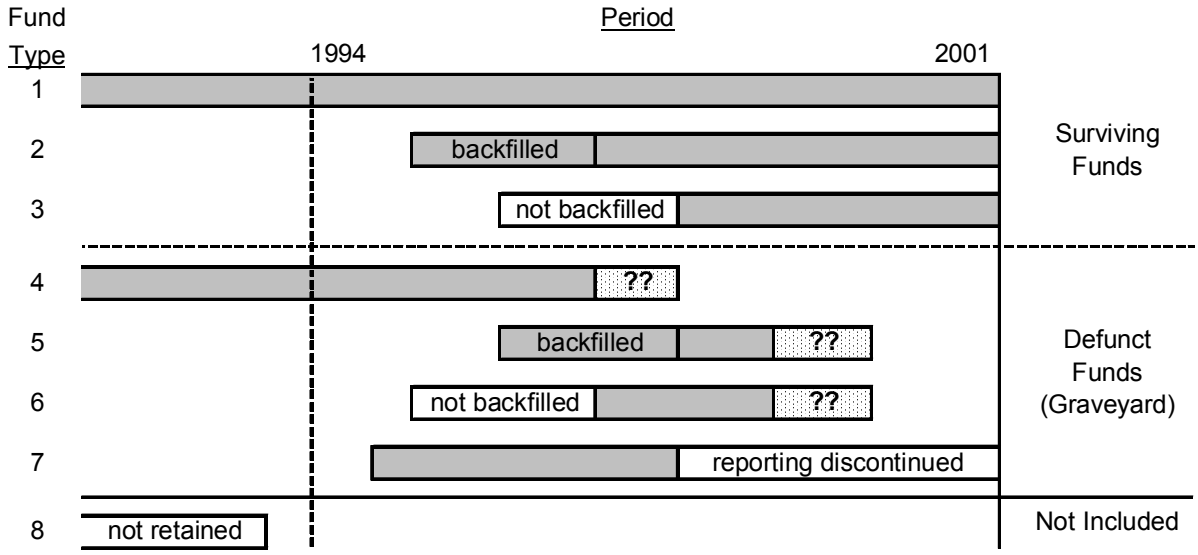
Fund Types 4 – 7 represent the defunct funds retained in the TASS graveyard. This allows us to say something about survivorship bias by comparing the moments of the distribution of the live fund universe with the all fund universe, including the graveyard.

Type 8 funds that become defunct prior to 1994, when TASS began to retain returns for defunct funds. [We remove any bias associated with this type of fund by commencing our period of study from 1994.]

There may, of course, be slight variations to these eight categories, which we ignore without effect for simplicity.

Figure 1. Hedge Fund Return Data Set

Figure 1 illustrates the chronological censoring of the TASS database. Shaded areas show where returns are available, while unshaded areas indicate returns may have been generated but not reported, including during the final months of a fund's life (hatched area). 1994 marks the point at which TASS began to retain returns to defunct funds.



Given the nature of the data, the preferred approach to aggregating hedge fund returns is to derive an equally weighted index of monthly returns of all constituent funds (similar to the construction of equally-weighted stock indexes). The objective is to replicate the return, over time, that an investor would earn by investing equally in all available funds and rebalancing monthly in response to the entry of new funds and the death of existing ones. This ensures that every return-month for every hedge fund in the database is picked up in the calculation of the index and that it reflects the current mix of hedge fund styles at all times. Unlike the hypothetical investor's portfolio however, the index will not continue to pick up returns for those funds that have stopped reporting but are still in operation (ie- *Type 7* funds). It will be important therefore to examine whether returns to this type of fund differ significantly from the broader universe.

Survivorship & Instant History Bias

Several studies have estimated the impact of survivorship bias on hedge fund returns by comparing annualized returns for the index of *live funds* versus the index of *all funds*, following the approach of Malkiel (1995) in respect of mutual funds. A summary of these studies is set out in Table 1 below. These estimates vary from as little as 0.2% in Ackermann, McEnally and Ravenscraft (1999) to 3.0% in Fung and Hsieh (2000). Liang (2000) shows that differences in these estimates may be explained by compositional differences in the databases and different timeframes. More specifically, the lower estimate by Ackermann et al can be explained in terms of the lower proportion of dead funds retained in the combined HFR/MAR database, the inclusion of fund-of-funds (less susceptible to overall failure) and the pre-1994 start date, since the leading databases only retain returns on dead funds that died after this date. Other studies that yield a relatively low estimate of survivorship bias may be linked to one or more of these three factors. The higher estimate of 3.0% by Fung and Hsieh based on the TASS database from 1994-1998 is therefore likely to be more accurate.

Table 1. Previous Estimates of Survivorship & Instant History Bias

Study	Database	Period	Survivorship Bias	Backfilling Bias
Brown, Goetzmann & Ibbotson (1999)	Offshore Funds Directory	1989-1995	3.0%	-
Ackerman, McNally & Ravencraft (1999)	HFR/MAR (Incl FoF)	1989-1999	0.2%	-
Liang (2000)	TASS (Incl. FOF)	1989-1999	2.4%	-
Fung & Hseih (2000)	TASS	1994-1998	3.0%	1.4%
Bares, Gibson & Gyger (2001)	FRM (Incl FoF)	1996-1999	1.3%	-
Edwards & Caglayan (2001)	MAR (Incl FOF)	1991-1998	1.9%	1.2%

Fewer studies have attempted to estimate instant history bias. Fung and Hseih (2000) study the distribution across funds of the lag between each fund's inception date and the date at which it enters the database. They find a median lag of 343 days and delete the first 12 months of *all* funds reported returns, finding an instant history bias of 1.4% p.a.

We also obtained an estimate of 1.4% p.a. using this methodology for the TASS database with 2½ years of additional data. Edwards and Caglayan (2001) follow the same approach using the MAR database to give an estimate of 1.2% p.a. We have strong reservations however, that these estimates tell us much about instant history bias at all. Indeed, the 1.4% can almost be fully explained by a distortion to the *style mix* of the truncated dataset vis-à-vis the original. More specifically, it removes a large proportion of returns to new funds, most of which are long-bias equity hedge funds that have outperformed other funds in recent years.

Moreover, the estimate of 1.4% p.a. does not make intuitive sense. Comparing the date at which each fund enters the database with the date of its first reported return, we find 80% of funds backfill at least 6 months of data, 65% of all funds backfill by at least 12 months and 50% backfill by more than two years. Assuming a significant proportion of other funds have no prior history to report, it follows that as little as 10-15% of all funds actually contribute to any instant history bias. For this to be 1.4% p.a., or 10½% cumulatively over 7½ years, these funds must have had 60-100% lower returns on average than other funds during the period in which they chose not to report. If this period was around 12 months on average (as per Fung & Hseih, 2000), then these funds would need to have underperformed by an *annualized* 60-100% during this period, which we simply cannot believe.

Table 2 compares the *All Fund* return with the *Live Fund* return (excluding fund-of-funds) for the period 1994 to 2001, showing the survivorship bias on the observed mean, volatility, skew, kurtosis (fat tails) and serial correlation of returns. We consider the average volatility (and higher moments) *across individual funds* rather than for the aggregate indexes, which contain diversification effects relating to the number of constituent funds. We exclude funds with less than two years of returns. Increasing this threshold to three years greatly reduces the number of constituent funds, while reducing it introduces instability to our estimates.

Table 2. Survivorship Bias in Hedge Funds (Mean Return & Higher Moments)

Category	No. of funds	%	μ	σ	*skew*	*kurt.*	$\rho(1)$
All Funds (Types 1-7)[a]	2208		12.8%	18.9%	-0.33	5.55	0.108
Live Funds (Types 1-3)	1272	58%	16.6%	18.0%	0.01	5.71	0.123
Survivorship Bias			***3.8%***	***-0.9%***	***0.34***	***0.16***	***0.015***
Defunct Funds (Types 4-7):							
Liquidated	521	24%	-1.5%	23.4%	-0.91	5.75	0.068
Closed	84	4%	2.7%	15.1%	-0.24	2.22	0.059
Merged/Matured	52	2%	9.7%	18.2%	-0.58	5.77	0.095
Stopped Reporting [b]	279	13%	11.4%	17.0%	-0.87	5.15	0.134

a. Excludes fund-of-funds
b. Inlcudes all funds that have ceased reporting or cannot be contacted by TASS.

The mean μ and average volatility σ, skew, kurtosis (*kurt.*) and first-order serial correlation $\rho(1)$ between the *All Fund* and *Live Fund* indexes and various defunct fund categories at June 2001.

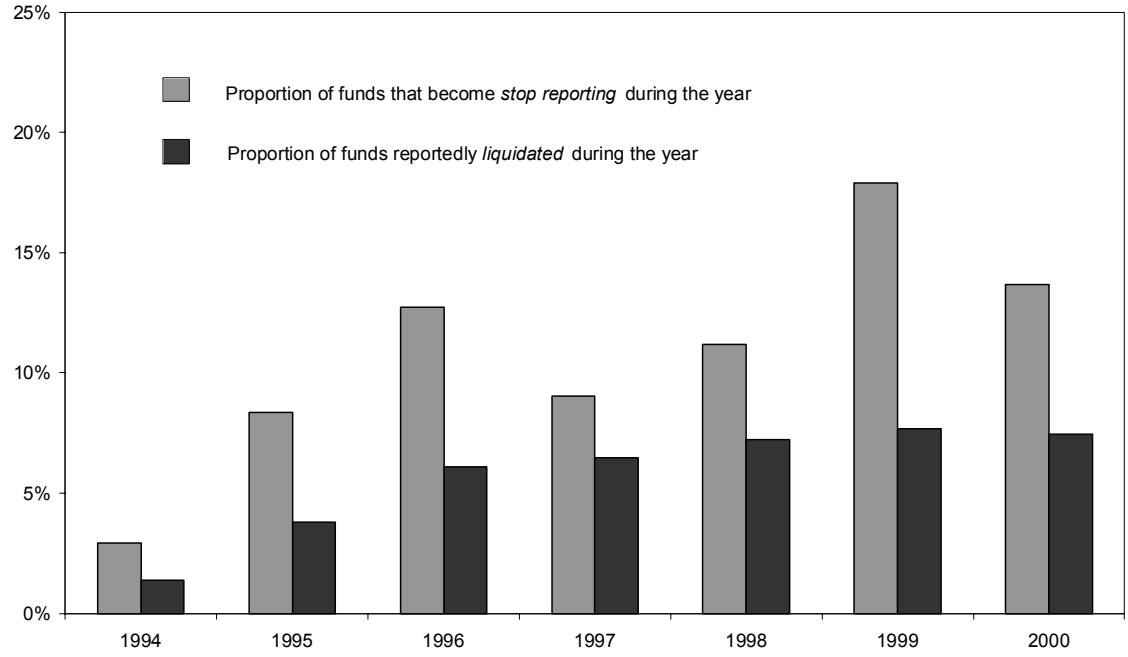
The *Live Fund* return was 16.6% p.a. vis-à-vis the *All Fund* return of 12.8% p.a. – a survivorship bias of 3.8%. This is much higher than in Fung and Hseih (2000). Using the same data, we are able to replicate the 3.0% bias reported by Fung and Hsieh for the period 1994 to 1998. It follows that our higher estimate of survivorship bias can be attributed to a significant increase in the incidence of death since 1998, most notably in managed futures, fixed income arbitrage and some sector-specific equity hedge funds (see below). Survivorship also imparts a downward bias of 0.9% on the average volatility observed for existing funds and leads us to incorrectly conclude that the average skew (across funds) in the distribution of monthly returns is negligible, when in fact it is significant at –0.31. The degree of observed kurtosis and serial correlation does not however, appear to be affected by survivorship.

This increase in the attrition rate in recent years is illustrated in Figure 2, which shows the proportion of funds that become defunct and those reported to have actually been *liquidated* during each year since 1994. Figure 2 shows considerable variation over time in the death rate based on defunct funds. The rise in 1999 may be attributed to the fallout from

the Russian debt and Long-Term Capital Management (LTCM) crises in late 1998 and subsequent decline in liquidity for risky assets [see Liang (2001)]. It is likely that the tech crash beginning in 1999 also led to higher attrition among equity hedge funds. We note however, that the annual death rate based on liquidations has increased much more steadily to around 7.5%. Given some other defunct funds are also likely to have been liquidated, the true death rate is probably somewhere between 8 and 10%.

Figure 2. Annual Attrition Rates Among Hedge Funds

The proportion of funds that become defunct (light grey), and the subset of those funds that actually report having been liquidated (dark grey) in each year since 1994.



Probable Cause of Death

Table 2 also provides information about defunct funds, which made up over 40% of all funds in the TASS database as at June 2001. As stated, not everything in the graveyard is truly dead. Only 57% of defunct funds (24% of all funds) are clearly identified by TASS as actually having been *liquidated*. Not surprisingly, these funds have, on average, fairly chronic returns (-1.5%) and much higher levels of volatility (23.4%). Other dead funds retained in the TASS graveyard have stopped reporting returns because they reportedly are closed to new investors, have been merged with other funds, are closed-ended funds that have matured, or have simply stopped reporting for other reasons[4].

The slightly lower average return for *merged/matured* funds of 9.7% is consistent with some of these being non-performing funds that have been absorbed into other funds. It is the *closed* and *stopped reporting* categories that are of key interest however, since as stated above, the *All-Fund* index treats these as if they had been terminated and the portfolio rebalanced, while the hypothetical investor, who allocates equally to all funds, would in fact continue to earn the returns generated by these funds. If these returns are collectively lower than the broader universe, our estimate of survivorship bias will understate the true bias.

With respect to the *stopped reporting* category, we find the average return, volatility and kurtosis are not too different to the *All-Fund* group. This is not so for *closed* funds however, which yielded a much lower average return of 2.7%. While it is tempting to conclude that these funds have in fact been liquidated and managers are seeking to protect their reputation, this is not consistent with their much lower average volatility[5] (15.1%) and kurtosis (2.22) and slightly lower skew.

One explanation for this is that there are a significant proportion of

---

4 This generally includes managers whom have been instructed by clients to cease reporting, have asked to be taken off the database (reasons not given), or cannot be contacted by TASS.

5 Especially given a large proportion of reportedly closed funds are managed futures funds that typically have higher levels of return volatility.

managers that close themselves down following a period of sub-par performance due to their incentive fee arrangements. More specifically, where a fund's Net Asset Value (NAV) drifts well below its previous high watermark level for incentive fees (the main source of revenue for most funds), the manager may be faced with the prospect of working for a couple of years or more before earning a bonus. There is little incentive in such situations to continuing trading as opposed to setting up a new fund somewhere else. This is consistent with the lower volatility, skew and kurtosis observed for these funds since managers in such situations would tend to wind down their trading activities well before closure.

With respect *liquidated* funds, it would appear at first glance that the primary cause of death is poor returns, excessive volatility or significant negative skew in returns. On closer inspection however, we find that in many cases, causality works in the other direction. That is, it is not so much that persistent poor returns or high volatility lead to the termination of a fund, but rather that the death of fund (and unwinding positions in illiquid markets) causes the mean, standard deviation and skew to deteriorate sharply in the final 6-12 months of a fund's life. In many cases, returns are stronger and volatility lower than the average fund prior to this sudden change in fortune. This is most notable in merger and credit-based arbitrage strategies, where specific events such as a series of aborted mergers or jump in default rates can lead to large and sudden losses.

The importance of the *suddenness* of losses is reflected in Table 3, which shows a much higher incidence of large drawdowns by *liquidated* funds from their maximum NAV prior to closure. It suggests that investors focus more heavily on recent short-term performance when evaluating hedge funds. More specifically, they respond unfavourably to any sudden deterioration in performance, but tend to be more tolerant of a slow and less conspicuous erosion of NAV over time.

Table 3. Percent of Funds with Large Drawdowns in NAV

Percentage of funds with a drawdown in NAV from the previous high of more than two standard deviations in the last 2 years of reported returns, denoted *f*.

Category	ϕ
Live	9%
Liquidated	30%
Closed Funds	12%
Merged/Matured	6%
Stopped Reporting	10%

This phenomenon is further reflected in Table 4, which shows that even when we focus on just the bottom quartile of all funds by long-term performance[6] (of which one-third are Live Funds), we find that liquidation appears to have been a fate suffered mainly by funds that earnt their spot in the bottom quartile by virtue of a sudden sharp loss in NAV. We also note that the low level of large NAV drawdowns for *closed* funds (vis-à-vis *liquidated* funds) in Table 3 is consistent with our earlier prognosis that many of these funds may have wound back their trading activities in response to their NAVs drifting well below previous high watermarks for the payment of performance-based fees.

Table 4. NAV Drawdowns for Bottom Quartile Performers (All Funds)

The percent of funds in the bottom quartile of all funds (by return) that suffered a NAV drawdown of more than two standard deviations (based on style group averages) in the last two years of reported returns, denoted ϕ.

Category	No. of Funds	Average Return	ϕ
Live Funds	114	-27.1	25%
Liquidated Funds	174	-28.8	42%
Other Defunct Funds	65	-25.3	24%

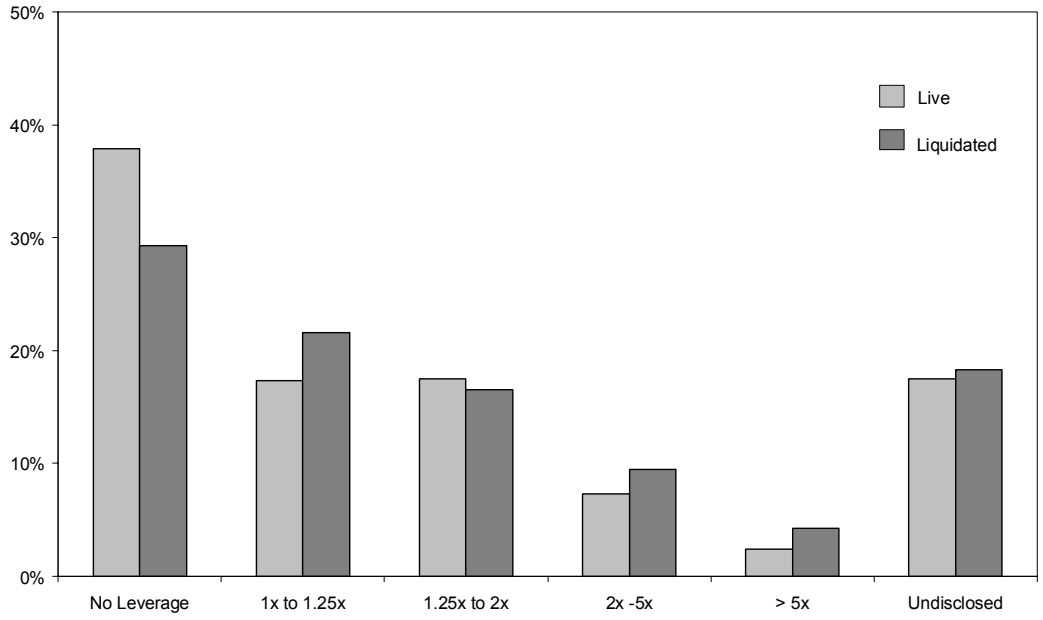
* Excludes fund-of-funds and funds with less than two years performance data.

6 Excludes all funds with less than two years of performance history.

Other qualitative (non-return) factors have also been linked to the failure of hedge funds, namely (i) excessive use of leverage; (ii) fund size[7]; (iii) trading flexibility (extent to which managers use discretionary or opportunistic styles); (iv) the use of technicals; and (v) whether or not managers are personally invested in their own fund. With respect to *leverage*, we compared the distribution of *live* funds versus *liquidated* funds according to their reported average leverage ratio, illustrated in Figure 3. We find that, although a significantly higher proportion of *live* funds use no leverage at all, we find no compelling evidence that liquidated funds were more reckless with their use of leverage. In particular, the proportion of liquidated funds with an average leverage in excess of two times NAV was only slightly higher than for live funds.

Figure 3. Use of Leverage: Live vs Liquidated Funds

The proportion of all *live* and *liquidated* funds in each leverage ratio range, where the leverage ratio is the total value of all long and short positions, divided by the fund's NAV.

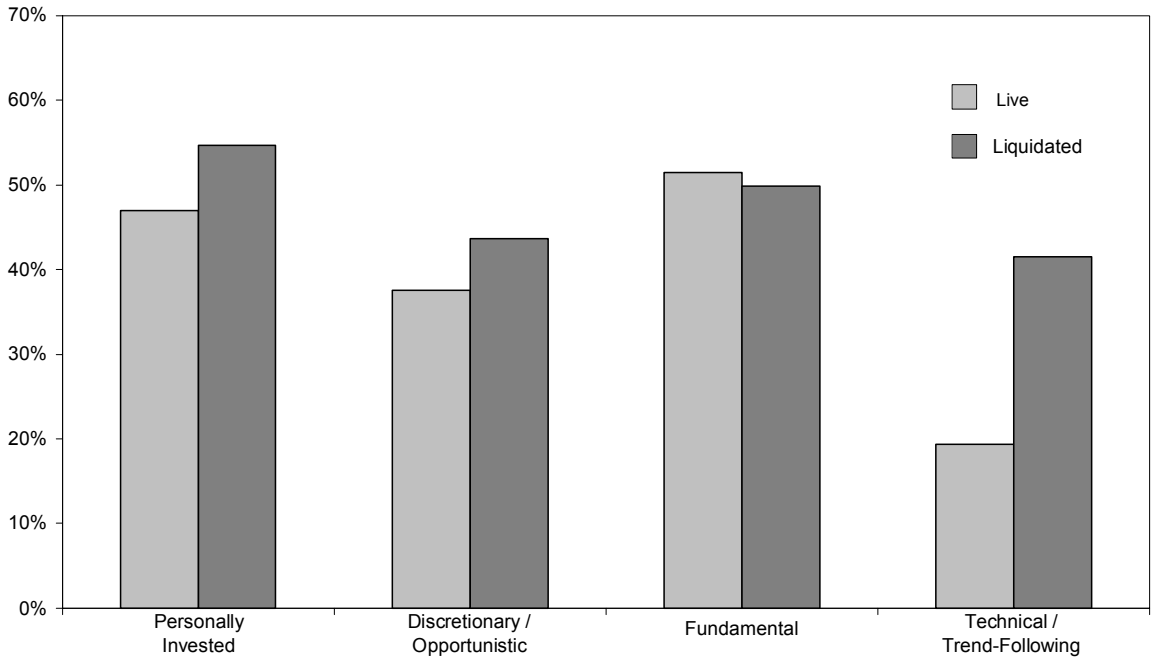


It is difficult to assess the impact of very small or large *fund size* on survivorship using the TASS data. *Liquidated* funds may have a lower

7 Very small funds may have limited access to some securities while very large funds may suffer from illiquidity.

estimated asset size due to poor returns rather than a low *initial NAV*. While TASS provides initial NAVs, these do not reconcile with current NAVs for each fund and their returns in the interim (implying large net redemptions over the life of most funds[8]). With respect to *investment style*, Figure 4 shows little difference between the proportion of *live* and *liquidated* funds with discretionary or opportunistic styles and even less difference between the proportion of funds using fundamental strategies. We do find however, a much higher proportion of *liquidated* funds (40% vs 18%) use a technical or trend-following style, suggesting such strategies offer little information edge. Such strategies are most common among managed futures funds. Finally, the data does not support the popular view that funds in which the manager is personally invested are more likely to survive than other funds.

Figure 4. Other Factors: Live vs Liquidated Funds



[8] The average current NAV/initial NAV for all *live* funds is 0.2, notwithstanding annualized returns of 16.6% p.a.

Survivorship by Style Group

TASS allows us to sort hedge funds according to specific trading strategies (eg. merger arbitrage) or higher-level themes (eg. relative value). Two potential problems with using these classifications to define style groups are that we are reliant on managers' own self-classification (which can be a bit fickle) and that managers may change the focus of their trading strategies over time. Indeed defining style groups at all only makes sense at all if we find the returns of individual hedge funds are similar to some extent to other funds in the same group, but different to those in other groups.

Accordingly, Brown and Goetzmann (2001) develop a set of generalized style classifications (GSC)[9] based on an algorithm that sorts funds into groups to minimize the within-group sum of squared deviations from the mean in a kind of statistical analogy to the Hogwart's sorting hat[10]. They find around 20% of the variance of individual hedge fund returns may be explained by virtue of their membership to one of eight endogenously defined GSCs. Bares, Gibson and Gyger (2001) use a similar approach based on minimizing the sum of linear distances between returns for individual funds within four endogenous theme-based style groups. Both studies lend support to style groups based on specific trading strategy. In Brown and Goetzmann, for instance, funds classified according to two higher-level themes, namely *event driven* and *relative value* were spread across the eight GSCs, while managers of five more narrowly defined strategies, namely equity hedge, non-US equity hedge, emerging markets, global macro and property) tended to map *en masse* onto 5 corresponding GSCs.

Table 5 shows the degree of survivorship bias on both the mean and volatility of returns varies markedly across 18 strategy-based style groups. The high incidence of death in managed futures and fixed income arbitrage strategies, especially since late 1998, have contributed to a very large

---

9 Details of the GSC algorithm are set out in Brown & Goetzmann (1997).

10 From Harry Potter & The Philosopher's Stone, JR Rawlings (1997) Bloomsbury Publishing plc.

survivorship bias in those sectors. This is consistent with Liang (2000) who attributes this rise in attrition in 1999 to the fallout from the Russian debt and LTCM. Comparing the *All Fund* versus the *All Fund (ex Managed Futures)* results in Table 5, we see that managed futures funds contributed 1.3% to the 3.8% total bias. Equity risk arbitrage, distressed security and directional fixed income strategies, on the other hand, had significantly less survivorship bias.

Table 5. Survivorship Bias by Style Group

Table 5 shows the difference (bias) in the annualized mean return μ and volatility σ, between the universe of *live* funds and *all* funds for 18 style groups (n=no. of individual funds in each group).

Style Group	n	μ			σ		
		Live	All	Bias	Live	All	Bias
1 Equity Hedge US/Global	208	22.8%	20.3%	**2.5%**	21.2%	22.2%	**-1.1%**
2 Equity Hedge: Value	65	20.0%	16.6%	**3.4%**	18.8%	20.5%	**-1.7%**
3 Equity Hedge: Growth	93	19.4%	18.0%	**1.4%**	24.7%	26.2%	**-1.6%**
4 Equity Hedge: Small-Cap	112	25.1%	22.4%	**2.6%**	23.2%	22.8%	**0.4%**
5 Equity Hedge: Sector	145	25.9%	22.7%	**3.2%**	33.7%	31.4%	**2.4%**
6 Equity Hedge: Non-US	182	18.1%	15.5%	**2.7%**	19.3%	18.5%	**0.8%**
7 Market Neutral	131	14.7%	13.3%	**1.3%**	12.7%	12.3%	**0.4%**
8 Ded. Short Seller	27	3.4%	1.7%	**1.7%**	28.6%	27.8%	**0.8%**
9 Merger Arbitrage	111	14.8%	14.5%	**0.3%**	7.3%	8.0%	**-0.8%**
10 Other Risk Arbitrage	45	11.4%	11.7%	**-0.2%**	7.1%	9.8%	**-2.7%**
11 Convertible Arbitrage	114	14.1%	12.6%	**1.5%**	7.5%	7.6%	**-0.1%**
12 Distressed/Hi-Yield	110	13.1%	12.5%	**0.6%**	10.7%	12.4%	**-1.7%**
13 FI Directional	26	8.7%	8.9%	**-0.1%**	14.1%	12.8%	**1.3%**
14 MBS / FI Arbitrage	85	16.6%	6.3%	**10.3%**	8.2%	9.1%	**-0.9%**
15 Global Macro	69	10.6%	7.8%	**2.8%**	18.8%	19.8%	**-1.0%**
16 Emerging Markets	211	9.3%	7.0%	**2.3%**	29.1%	27.9%	**1.1%**
17 Currencies	99	10.6%	6.2%	**4.4%**	14.4%	20.1%	**-5.7%**
18 Managed Futures	259	12.7%	4.1%	**8.6%**	17.2%	19.3%	**-2.1%**
All Funds	2088	16.6%	12.8%	**3.8%**	18.0%	18.9%	**-0.9%**
All Funds (ex Managed Futures)	1829	16.8%	14.3%	**2.5%**	18.0%	18.8%	**-0.8%**

n = number of individual fundsas at 30 June 2001
μ = mean return (annualised) for the period 1994:1 to 2001:6
σ = standard deviation of returns (annualised) for the period 1994:1 to 2001:6

Fund-of-Hedge-Funds

Many investors invest in hedge funds via a multi-manager Fund-of-Hedge-Fund (FOHF) configuration. These structures typically offer a more diversified vehicle to capture the return to hedge funds per se, or to add value through style rotation and manager selection decisions. Intuitively, we would expect far less attrition for FOHFs, since they should be able to absorb the death of just one or two constituent funds without becoming defunct themselves. Of the 413 FOHFs in TASS, only 180 are truly diversified in the sense of including managers across at least three of the four broad style groups (equity long/short, equity arbitrage, fixed income and global trading strategies). The rest are sector-based FOHFs (smaller configurations of 3-6 equity long/short and arbitrage funds) and single strategy FOHFs (mainly managed futures and emerging markets).

Table 6. Fund-Of-Hedge-Funds (FOHF)

The mean return μ for the *All Fund* and *Live Fund* universe of FOHFs and associated survivorship bias plus the average standard deviation σ, skew and kurtosis of returns across individual FOHFs. Equity based FOHFs only include equity long/short and equity arbitrage funds, while Fixed Income based FOHFs only include fixed income directional and arbitrage strategies.

Category	No. of Funds	μ			σ	*skew*	*kurt.*
		All	Live	Bias			
Fully Diversified FOHF*	**180**	**9.8%**	**10.4%**	**0.6%**	**8.5%**	**-0.94**	**6.2%**
Sector-Based: Equities	62	10.5%	11.3%	0.8%	13.6%	-0.32	3.0%
Sector-Based: Fixed Income	15	7.4%	9.7%	2.3%	6.1%	-2.84	13.6%
All FOHF*	413	8.0%	10.1%	2.1%	12.4%	-0.62	5.8%

* FOHF - Fund-of-Hedge-Funds; Fully diversified FOHFs have at least one constituent fund from each of the broad strategy groups (equity long/short, equity arbitrage, fixed income/hybrid strategies, global trading strategies)

Table 6 shows that the survivorship bias for *Fully Diversified FOHFs* is in fact relatively low at 0.6% p.a. This is also true of equity-based strategies, with a bias of 0.8%. The survivorship bias across *All FOHFs* was much higher at 2.1, attributable to higher rates of attrition among fixed income-based FOHF and single strategy funds. We also note that the average volatility for Fully Diversified FOHFs of 8.5% was much lower than the 18.9% average volatility for individual funds reported in Table 5. However, the average level of skew and kurtosis was not lower for FOHF vis-à-vis individual funds.

Summary of Results

Survivorship bias in hedge funds has increased significantly in recent years from around 3.0% to 3.8% due mainly to higher attrition among managed futures, fixed income arbitrage and some sector-specific (read technology) equity hedge funds. The high incidence of death in managed futures and fixed income arbitrage strategies (notably mortgage-backed securities) following the Russian debt and Long-Term Capital Management (LTCM) crises in late 1998 have contributed to a large survivorship bias in those sectors. Equity arbitrage, distressed security and directional fixed income strategies on the other hand had significantly lower rates of death and survivorship bias. Prior estimates of instant history bias, on the other hand, are exaggerated by the methodology used, which removes a large volume of returns for recently established funds (mainly long-biased equity hedge) that have generally outperformed other style groups.

We find substantial differences in returns across various categories of defunct funds. Funds identified as having been liquidated had negative return, higher volatility and greater skew on average than other funds. Other defunct funds reported to have *merged/matured* or to have *stopped reporting* for other reasons had risk/return properties more in line with the broader All-Fund universe, suggesting many of these funds are in fact still in operation. Funds reportedly *closed* to new investors had very poor returns, suggesting many of these funds may, in fact, have died. However, this is not consistent with the much lower volatility, skew and kurtosis observed for such funds. We believe many of these funds actually closed themselves down because their net asset value drifted well below the previous high watermark for the payment of incentive fees, providing little motivation for managers to continuing trading. This is consistent with their lower volatility, skew and kurtosis since managers in such situations tend to wind down trading activities well before closure.

With respect to liquidated funds, our results suggest that *short-term* underperformance is more likely to lead to fund termination than poor returns or high volatility per se. More specifically, investors tend to

respond unfavourably to any sudden deterioration in performance, but tend to be more tolerant of a slow and less conspicuous erosion of NAV over time. We also find little evidence to support the popular notion that death in hedge funds is related to higher levels of leverage, the extent of investment style discretion or opportunism, or whether or not managers are personally invested. We do however find a significantly higher incidence of death among funds that use a technical/trend-following investment process (common for managed futures).

Finally, returns to genuinely diversified fund-of-hedge-funds (FOHF) have a relatively low survivorship bias of around 0.6% p.a. (0.8% p.a. for equity-based FOHF strategies). For all FOHFs however, this bias was quite high at 2.1% p.a., attributable to higher attrition rates among less well diversified fixed income based FOHFs, including single strategy FOHFs (mainly managed futures and emerging markets).

References

Ackermann C., McEnally R. and Ravenscraft D. (1999), The Performance of Hedge Funds: Risk Return and Incentive, *Journal of Finance*, 54, 833-874

Pares P. A., Gibson R. and Gyger S. (2001), Style Consistency and Survival Probability in the Hedge Funds' Industry, Federal Institute of Technology at Lausanne, Working Paper

Brown S. J. and Goetzmann W. N. (1995), Survivorship, *Journal of Finance*, Vol L, 3, 853-73

Brown S. J. and Goetzmann W. N. (1997), Mutual Fund Styles, *Journal of Financial Economics*, 43, 373-399.

Brown S. J. and Goetzmann W. N. (2001), Hedge Funds with Style, *Yale International Center for Finance* Working Paper No. 00-29.

Brown S. J., Goetzmann W. and Ibbotson R. (1999), Offshore Hedge Funds: Survival and Performance 1989-95, *Journal of Business*, 72, 91-118.

Edwards F R and Caglayan M O (2001), Hedge Fund Performance and Manager Skill, *Journal of Futures Markets* (forthcoming)

Fung W. and Hseih D. A. (2000), Performance Characteristics of Hedge Funds and Commodity Funds: Natural vs. Spurious Biases, *Journal of Financial and Quantitative Analysis*, 35, 3, 291-307.

Fung W and Hsieh D.A. (2001) Benchmark s of Hedge Fund Performance: Information Content and Measurement, *Financial Analysts Journal* (forthcoming).

Liang B. (2000), Hedge Funds: The Living and the Dead, *Journal of Financial and Quantitative Analysis*, 35, 309-336

Liang B (2001), Hedge Fund Performance: 1990-1999, *Journal of Finance* Vol. 57, No.1, 18

Malkiel B.G. (1995), Returns from Investing in Equity Mutual Funds, 1971 to 1991, *Journal of Finance*, 50, 549-572.

Park J. (1995), Managed Futures as an Investment Set, Columbia University (Doctoral dissertation)

MAFC Research Papers

Paper Number

1. Conference on Inflation, Edited by Bill Norton, October 1991

2. Conference on Monetary and Financial Supervision Edited by Bill Norton, August 1992

3. Asian Financial Markets, Paper at Australasian Finance and Banking Conference, December 1992

4. Australian Financial Markets, Paper at Australian Institute of Bankers Conference, July 1993

5. Alternative Measures of Financial Development, Paper at Conference of Economists, September 1993

6. Saving, Investment and Government Saving: Asian Evidence, Paper at Conference of Economists, September 1993

7. Conference on Financial Stability, Edited by Bill Norton, October/November 1993

8. Money, Budget Deficits, Economic Activity and Prices: Asian Evidence, paper at Australian Finance and Banking Conference, by Edward Nelson, December 1993

9. Derivatives: Growth, Benefits and Dangers, Invited Paper at the Asia-Pacific Forex Assembly, Singapore, by Bill Norton, November 1994

10. Economic Growth and Financial Sector Development, Paper at Conference of Economists, by David Lynch, 1994

11. Equity Markets in Asia-Pacific Economic Development, Paper at Australian Institute of Bankers Conference, by David Lynch, July 1995

12. Conference on Monetary Policy, Edited by Bill Norton, October 1995

13. Evaluating the Performance of Portfolios with Options, by Elizabeth A. Sheedy & Robert G. Trevor, February 1996

14. Asia-Pacific Money Markets in Financial Sector Development, by David Lynch, October 1996

15. Asset Allocation Decisions in a World With Changing Risk, by Elizabeth Sheedy, Robert Trevor & Justin Wood, October 1996

16. Asia-Pacific Bond Markets, by David Lynch, November 1996

17. Correlation in International Equity and Currency Markets: A Risk Adjusted Perspective, by Elizabeth Sheedy, June 1997

18. Limit Moves as Censored Observations of Equilibrium Futures Price in GARCH Processes, by I.G. Morgan & R.G. Trevor, August 1997

19. Pricing Options Under Generalised GARCH and Stochastic Volatility Processes, by Peter Ritchken & Rob Trevor, September 1997

20. Further Analysis of Portfolios with Options, by Elizabeth A. Sheedy & Robert G. Trevor, January 1999

21. Risk-shifting Behaviour in Australian Banks 1992-1997, by Anne Bigg, June 1999

22. Applying an Agency Framework to Operational Risk Management, by Elizabeth Sheedy, August 1999

23. Corporate Use of Derivatives in Hong Kong and Singapore: A Survey, by Elizabeth Sheedy, July 2001

24. Is ARCH useful in High Frequency Foreign Exchange Applications? By Brad Jones, January 2003

MAFC Issues Papers

1. Two talks: Ethics and Managing Bank Capital, by Jeffrey Carmichael, March 2001

Applied Finance Centre
Macquarie University
NORTH RYDE NSW 2109 AUSTRALIA