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Hedge Funds: The Living and the Dead

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Hedge Funds: The Living and the Dead

Abstract

In this paper, we examine survivorship bias in hedge fund returns by comparing two large databases. We find that the survivorship bias exceeds 2% per year. Results of survivorship bias by investment styles indicate that the biases are different across styles. We reconcile the conflicting results about survivorship bias in previous studies by showing that the two major hedge fund databases contain different amounts of dissolved funds. Empirical results show that poor performance is the main reason for a fund's disappearance. Furthermore, we find that there are significant differences in fund returns, inception date, net assets value, incentive fee, management fee, and investment styles for the 465 common funds covered by both databases. Mismatching between reported returns and the percentage changes in NAVs can partially explain the differences in returns.

I. Introduction

Hedge funds are alternative investment vehicles. Due to flexible investment strategies, sophisticated investors, limited regulatory oversight, and reasonable fee structures, hedge funds have gained tremendous popularity. In addition, the recent debacle of Long-Term Capital Management LP demands more academic and practitioner studies in this area.

However, despite the popularity of hedge funds, there are very few academic studies in the hedge fund area. Fung and Hsieh (1997a) extend Sharpe's (1992) asset class factor model to include more diversified hedge fund strategies. Fung and Hsieh argue that the non-traditional and highly dynamic hedge fund investment strategy can provide an integrated framework for style analysis. In their study, they combine hedge fund data with commodity trading data. Brown, Goetzmann, and Ibbotson (1999) examine the performance of offshore hedge funds. They attribute offshore fund performance to the style effects rather than manager skills. Ackermann, McEnally, and Ravenscraft (1999) report that the comparison of hedge funds and market indexes yields mixed findings. They conclude that hedge funds outperform mutual funds. Liang (1999) documents that hedge funds dominate mutual funds in the mean-variance efficient world and hedge fund investment strategies are dramatically different from those of mutual funds.

The above papers all use different hedge fund data. For example, Fung and Hsieh (1997a) use combined data from Paradigm LDC and TASS Management Limited (hereafter TASS). Brown, Goetzmann, and Ibboston (1999) employ the hand-collected

data from the U.S. Offshore Funds Directory. Ackermann, McEnally, and Ravenscraft (1999) utilize combined data from Hedge Fund Research, Inc. (hereafter HFR) and Managed Account Reports, Inc. (hereafter MAR). Liang (1999) also uses data from HFR.

Hedge fund industry is one of the fastest growing sectors in finance. However, there are only a few data vendors to provide commercial hedge funds data to fund managers, consultants, and academics. In addition, hedge funds are basically not regulated. They report their fund information only on a voluntary basis. Therefore, the reliability of hedge fund data is an open question and is critical for hedge fund research and the investment community. It should not be surprising that different studies based on different databases draw conflicting conclusions. One example is that several studies have found different survivorship biases in hedge fund returns.

It is well known in mutual fund literature that survivorship bias can overstate mutual fund performance if the data contains only survived funds. For example, Grinblatt and Titman (1989), Brown, Goetzmann, Ibbotson, and Ross (1992), Brown and Goetzmann (1995), and Malkiel (1995) document that survivorship bias is in the range of 0.5-1.4% per year. Similarly, due to leverage-induced risk, use of derivatives, and the high growing nature of the hedge fund industry, we expect that survivorship bias of hedge funds should be higher than that of mutual funds.

Survivorship bias comes from the fact that data vendors collect only survived funds and an upward bias occurs when we evaluate performance of all funds based on survived funds only. As a matter of fact, Fung and Hsieh (1997b) find a survivorship bias as high as 3.54% per year for commodity trading advisors (CTAs hereafter). Fung and Hsieh (1998) document an annual survivorship bias of 1.5% for hedge funds. Brown,

Goetzmann, and Ibboston (1999) report an annual survivorship bias of 3% for offshore funds. However, Ackermann, McEnally, and Ravenscraft (1999) indicate that the survivor bias is small at an average magnitude of 0.013% per month, or 0.16% per year. The apparent conflicting results from the above studies necessitate further investigation of survivorship bias in hedge funds. This may require us to examine the accuracy of different databases.

In this paper, we evaluate survivorship bias for hedge fund returns by comparing two large databases from HFR and TASS. We further explore the other differences and investigate the accuracy of hedge fund data by comparing the two databases. These issues are important since survivorship bias is critical in comparing fund performance and data accuracy is essential for calculating fund returns, risk, assets, and fees. By far, this is the first paper to examine survivorship biases in hedge funds by comparing different databases and study survivorship biases by investment styles. By evaluating the data reliability for hedge funds, we test whether differences exist in the current databases and shed light on future studies in hedge funds.

We make two major contributions to the literature. First, by using a comprehensive database from TASS including substantial amounts of dissolved hedge funds, we document that the survivorship bias for hedge funds is over 2% per year. We reconcile the conflicting results about survivorship bias in previous studies by showing that several major hedge fund databases contain different amounts of dissolved funds and that major data vendors started to cover dissolved funds only from 1994 and on. We have also examined survivorship bias by investment styles and indicated that the biases are different across styles. Secondly, we document substantial differences in funds covered,

monthly returns, inception date, net asset value, management fee, incentive fee, and investment styles across the two databases. Further, we provide reasons why these differences exist. These contributions can add significantly to the understanding of the survivorship bias issue and to the understanding of the entire hedge fund industry.

The rest of the paper is organized as follows. Section II describes the data. Section III discusses survivorship bias and provides reasons why a fund may die. In section IV, we compare the two databases and report the differences. Section V summarizes the paper.

II. Data

We obtain hedge fund data from HFR and TASS. Descriptive statistics about the two databases are reported in Table 1. As of July 1997, HFR has a database that contains 1,162 hedge funds, including 1,052 survived funds and 110 (or 9.5%) dissolved funds. There are 16 investment styles according to HFR. For each investment style, there are three indexes: the composite, the offshore, and onshore indexes. This gives us 48 HFR indexes. They are included in the 1,052 survived funds. The total assets under management in the HFR data are about \$112 billion. In contrast, TASS hedge fund database contains 1,627 hedge funds, including 1,201 survived funds and 426 (or 26.2%) dissolved funds as of July 1998. The total assets under management are about \$158 billion. By far, these databases are probably the two largest hedge fund databases for academic research. Apparently, the two databases are different, especially in the number of disappeared funds. In fact, the HFR database contains a relatively lower number of dissolved funds than the TASS database.

Although the average fund assets, management fee, and incentive fee are similar across the two databases, the percentage of funds reporting assets, fees, and minimum

investment to the data vendors is higher for TASS than for HFR (the percentages are over 95% versus over 90%). In addition, both databases have more offshore funds than onshore funds. This is true because there are more offshore funds than onshore funds in existence. In general, offshore funds can enjoy minimum tax liabilities in offshore tax neutral jurisdictions and stay away from the strict US regulations.

III. Survivorship Bias

A. Fund Attrition Rate

Ackermann, McEnally, and Ravenscraft (1999) argue that the two counteracting biases, survivorship bias and self-selection bias, are cancelled out. Self-selection bias exists because well-performed funds have less incentive to report to data vendors in order to attract potential investors.¹ Therefore, the downward self-selection bias can offset the upward termination/survivor bias in fund returns. Ackermann, McEnally, and Ravenscraft use combined data from HFR and MAR. From the data description in the previous section, we can see that HFR collects a lower number of dissolved funds than TASS. Therefore, it is not surprising that a low survivorship bias exists in the combined HFR/MAR database. In Table 2, we compare the average annual attrition rates of hedge funds from HFR with those from TASS. It can be seen that the average attrition rate is only 2.72% from 1994 to 1997 in HFR's data, while it is 8.3% from 1994 to 1998 in TASS's data. It is important to indicate that both HFR and TASS started to collect data on the dissolved funds starting in 1994. In other words, funds died before 1994 were not included in these databases so fund attrition rates prior to 1994 should be zero. Therefore, studies about survivorship bias in hedge funds from 1994 can have a reasonable estimate

on the magnitude of the bias. However, Ackermann, McEnally, and Ravenscraft use data from 1988 to 1995 to estimate survivorship bias, which could underestimate both the fund attrition rate and survivorship bias. As a matter of fact, 1996 had the highest attrition rate (6.15% in HFR and 13.36% in TASS), but their study stopped in 1995.

In fact, Fung and Hsieh (1997b) document an annual attrition rate of 19% for CTAs. Brown, Goetzmann, and Ibboston (1999) report an annual attrition rate of 20% for CTAs and about 14% for offshore hedge funds. We expect that CTAs have higher attrition rates than hedge funds because CTAs invest fully in derivatives while hedge funds invest only partially in derivative securities.

B. Survivorship Bias

Following Malkiel (1995), Fung and Hsieh (1998), and Brown, Goetzmann, and Ibboston (1999), we calculate the survivorship bias as the performance difference between surviving funds and all funds. A low attrition rate will lead to a low survivorship bias if funds are dissolved for poor performance. In Panel A of Table 3, we report the low survivorship bias of 0.6% per year by using the HFR data, comparing with the 0.16% bias reported by Ackermann, McEnally, and Ravenscraft. The difference between 0.16% and 0.6% comes from the following: (1) Ackermann, McEnally, and Ravenscraft calculate survivorship bias by using average returns from the entire fund history during the period of 1988 to 1995 while we calculate biases on an annual basis from 1994 to 1997,² (2) they calculate survivorship bias as the performance difference between surviving funds and dissolved funds while we use the difference between surviving funds and all funds; in fact, if we use their definition of survivorship bias, we will find the bias is as high as

11.22% in our HFR sample,³ and (3) they use the combined HFR/MAR data while we use the HFR data only.

The extremely low survivorship of 0.16% using the HFR/MAR database is even below the range of 0.5-1.4% bias for mutual funds. This is inconsistent with the general impression that the hedge fund industry is riskier than the mutual fund industry.

However, in Panel B of Table 3 the annual survivorship bias is as high as 2.24% when we use the TASS database. This 2.24% bias is in between the 1.5% bias in Fung and Hsieh (1998) and 3% in Brown, Goetzmann, and Ibboston (1999). Remember that Brown, Goetzmann, and Ibboston study only offshore funds while we examine both offshore and onshore funds. Liang (1999) indicates that offshore funds are riskier than onshore funds due to global investment strategies and cross-border investments in the world financial markets. Because of this, our 2.24% bias is comparable to 3% for offshore funds. Comparing Panel A with Panel B, we conclude that the low survivorship bias in the HFR database is due to the relatively low number of dissolved funds.⁴ This problem could be amplified if one uses data prior to 1994 to calculate average returns when data vendors haven't started to cover dissolved funds yet.

One may argue that the low survivorship bias in HFR can be explained by the higher proportion of onshore funds and lower survivorship bias of onshore funds than offshore funds. We question this explanation by examining survivorship biases for both onshore and offshore funds in HFR. Table 4 shows that the average survivorship biases for onshore and offshore funds from 1994 to 1997 are 0.48% and 0.60%, respectively. Therefore, the low survivorship in HFR is unlikely caused by the difference in survivorship bias between onshore funds and offshore funds.⁵

Moreover, from 1994 to 1997, the average monthly returns for all funds calculated from the HFR data are consistently above those from the TASS data. These differences are all significant at the 1% significance level.⁶ This is consistent with the fact that HFR covers a lower number of dissolved funds than TASS.

C. Reasons Why Funds Disappear

The above results about survivorship bias indicate that poor performance is the main reason for a fund's disappearance since dissolved funds significantly underperform the survived funds. In Figure 1, we plot fund returns of the dissolved funds in the TASS data over the 24-month period before their exit dates. Figure 1 clearly shows a declining return pattern toward the date of exit, confirming that, on average, funds are dissolved due to inferior performance. Regardless of any previous track record, if a fund suffered consecutive losses in recent years, it is very likely for the manager to dissolve the fund, especially when the manager cannot meet the hurdle rate and the fund has a watermark provision. As a matter of fact, Figure 1 shows that the average fund return in the last month of fund existence is as low as -0.66% .

To further examine what determines the dissolution of a fund, we conduct a Probit regression using fund characteristics in the TASS data such as average monthly return, fund assets, manager's personal investment, incentive fee, management fee, fund age, and leverage ratio. We find that a young fund with poor performance, small asset amount, is more likely to be dissolved.⁷ This result is consistent with that poor performance is the main reason of a fund's dissolution.

IV. Other Differences between the TASS Data and the HFR Data

We have shown that the HFR data and the TASS data differ substantially in the dissolved funds covered. This is the main reason for the different estimates of survivorship bias obtained by previous studies. In this section, we want to further examine the other differences between the two databases, which can advance our understanding about the survivorship bias issue and the whole hedge fund industry.

A. The Number of Common Funds

As of July 1997, HFR database contains 1,162 hedge funds, comparing to 1,627 funds in the TASS database as of July 1998. Note that TASS has one more year data coverage than HFR data.⁸ Overall, there are 465 funds that are the same for both databases. Detailed information about these 465 funds can be found in Table 5. In Table 5, there are 381 funds being classified as live funds by both data vendors, but only 34 funds being classified as dead funds by both. On the other hand, there are 49 funds that are dead funds in the TASS data but live funds in the HFR data. This is possible because TASS has one extra year of data and funds may die during this one-year period from August 1997 to July 1998. In fact, there are 18 funds dead after July 1997, one dead in July 1997. The remaining 30 funds died before July 1997. Careful examination reveals that the returns of these funds stopped before July 1997 according to both HFR and TASS data. Therefore, it is likely that these 30 funds are dead funds instead of live ones as classified by HFR. In addition, there is one live fund in the TASS data that is classified as a dead fund by HFR.

However, the TASS data shows that the fund has returns up to July 1998, hence it is more likely a live fund than a dead one.

The 465 common funds are only a relatively small proportion of each database. For example, 622 live funds (59% of 1,052 live funds) and 75 dead funds (68% of 110 dead funds) in the HFR data are not in the TASS data. On the other hand, 819 live funds (68% of live 1,201 funds) and 343 dead funds (81% of 426 dead funds) in the TASS data are not covered in the HFR data. Therefore, the majority of funds in the two databases are not overlapping. It seems that the two companies have different clients and only a small amount of hedge funds report their information to multiple data vendors.

The above difference may come from the different ways that data vendors approach hedge funds. TASS often solicits data from hedge funds especially from the newborn funds. This is true for about 50% of the funds they tracked. The other 50% of funds voluntarily report to TASS. As for HFR, hedge funds report to the data vendor in a vast majority of cases. HFR seldom solicits data from hedge funds. Normally, a hedge fund voluntarily reports to a data vendor so that its information can be distributed to potential investors. This is an important distribution channel, as hedge funds are not allowed to advertise publicly. There is another reason why hedge funds want to report to HFR: they want to be included in the HFR indexes. Although some funds may not want to distribute their information, they still want to be included in the index composition because a solid hedge fund index is important for them.

B. Returns and Inception Date

A majority of hedge funds report their monthly returns on an after fee basis. After deleting 40 funds that report returns with incentive fee, management fee, and other fees and report returns on a quarterly basis, we have 425 common funds left for both databases. We then compare these fund returns across the two databases on an equal basis.

First of all, HFR has 55,654 return observations from 1,052 live funds and 110 dead funds as of July 1997 (47.9 observations per fund). In contrast, TASS has 81,768 return observations (plus 23 missing observations) from 1,201 live funds and 426 dead funds as of July 1998 (50.3 observations per fund). To compare the two databases on a common time horizon, we delete the return observations from TASS after July 1997. This reduces the return observations from 81,768 to 67,678 (plus 23 missing observations). Therefore, TASS has 12,024 more return observations than HFR, not mentioning that the 48 HFR indexes contribute 4,305 return observations. Although TASS has more live funds than HFR, TASS has more dead funds than HFR as well. Dead funds may have shorter history and hence less return observations than live funds. Therefore, we need to examine the return history and inception date for each fund to see whether the same funds have the same return history across the two databases.

In Table 6, we report the important date discrepancy in the two databases. We are especially interested in the fund inception date and the date when a fund reports its first return. For the 465 common funds, there are only 154 (33.1%) funds having their first returns reported on the same date across the two databases. There are 197 funds that the TASS data has earlier returns (hence longer history) than HFR while HFR has only 76

funds that have longer history than TASS (among which 52 funds have only one-month longer history than TASS). Therefore, TASS has not only more funds but also longer return history than HFR according to the data examined.

For the TASS data, 332 (71.4%) funds have their inception months the same as the months of the first reported returns. 74 funds report their first returns one month after the inception. 46 funds report returns at least two months after the inception. Surprisingly, there are 11 funds that have the inception dates later than the month of the first return. This is either due to a coding error or related to returns from the fund's predecessor.⁹ As for the HFR data, there are only 174 (37.4%) funds that have the inception months the same as the month of the first return, 11 funds report returns one month after the inception, 206 funds report returns at least two months after the inception. However, there are 53 funds that have the inception dates later than the month of the first return.

There are 322 (69.25%) funds that have the same inception dates across the two databases. Considering a one-month error range, we increase this number to 388 (83.4%).¹⁰ There are still 68 funds (14.6%) that differ in inception dates across the two databases.

Table 7 reports the distribution of return discrepancy between the two data vendors. The discrepancy is calculated based on absolute values. There are only 9,099 (or 47%) return observations that are exactly the same for the same funds covered by both databases. There are 18,791 (or 97.1%) return observations that differ by 1% or less in absolute values. Note that differences may result from rounding errors. For example, when we move the return difference from 0 to 0.5%, the cumulative percentage increases from 47% to 95.2%. Therefore, rounding errors play an important role in return

discrepancy. However, there are about 556 (3%) observations, which differ over 1% across the two databases. These differences can be due to mismatching between the reported returns and the percentage change in NAV. For example, In the HFR data, there are 135 return observations from 48 funds that differ from the NAV calculation by 1% or more.¹¹ These 48 funds are all offshore funds. In contrast, there are only 3 return observations in the TASS data that are not consistent with their NAVs. Detailed examination reveals that they are typos.

In summary, for the 425 common funds with monthly returns net of fees, about 5% of these returns differ by 0.5% or more. Relatively speaking, TASS has more return observations than HFR. This is due to the fact that TASS has more funds covered and longer return history than HFR. In addition, monthly returns from TASS are consistent with NAVs.

C. Net Assets Value (NAV)

It is important to point out a major structural difference between onshore funds and offshore funds. The majority of onshore funds are organized as private partnerships while most offshore funds are corporations such as investment companies. As a result, offshore funds (as corporations) must calculate NAV per share in order to accept new subscriptions and keep current investors apprised of their performance. In contrast, onshore funds (as partnerships) can only calculate returns. Therefore, onshore funds (as partnerships) reports only returns to data vendors while offshore funds provide either NAV, or returns, or both. For the TASS data, out of 1,627 funds, there are 498 onshore funds, 1,127 offshore funds, and 2 funds remain unclassified. For onshore funds, there are

461 (92.6%) reporting returns and only 37 (7.4%) reporting NAVs. For offshore funds, there are 414 (36.7%) reporting returns and 713 (63.3%) reporting NAVs.¹² Although onshore funds generally do not have NAVs, TASS assigns some hypothetical initial NAVs for onshore funds so that each fund has its own “index” to start with. Next, TASS back fills the missing NAVs from the initial NAV and return numbers.¹³ Therefore, it appears that every fund in the TASS data has NAVs. However, only offshore funds organized as corporations have meaningful NAVs.

In contrast, HFR has 315 onshore funds, 523 offshore funds, 179 onshore funds with offshore equivalent, and 145 funds which are unclassified. Among the 315 onshore funds, there are 310 (98.4%) funds with return information including 4 funds with NAV information. For the 523 offshore funds, there are 511 (97.7%) funds with return information including 388 (74.2%) funds with NAV information. HFR does not assign an initial NAV to onshore funds so HFR does not back fill the missing NAVs. Therefore, the number of NAV observations in the HFR data appears much smaller than TASS. For example, as of July 1997, HFR has 19,053 non-missing NAV observations (including 331 observations from the 48 HFR indexes) and 36,602 missing observations. In contrast, TASS has 81,768 non-missing NAV observations and 23 missing observations as of July 1998. This may not be a fair comparison because TASS has one extra year of coverage and back filled NAVs for onshore funds. After deleting the onshore funds and NAV numbers after July 1997, we have 30,065 NAV observations (plus 3 missing observations) left for offshore funds in the TASS data. Therefore, TASS still has 11,012 more NAV observations than HFR. This compares to 12,024 more return observations from TASS than HFR in the early section.

Table 8 reports the distribution of the NAV discrepancy between the two databases. Note that the discrepancy can come from the way in which a data vendor/fund enters a wrong unit for the NAV. For example, a fund with a NAV of \$1,001 can be mistakenly coded as \$10.01. We find that this kind of coding error is consistent for a fund over its history. In this case, the error does not affect the return calculations.

There are 5,542 NAV observations (94.9%) that differ by \$1 or less between the two databases. For the 760 NAV observations that differ by more than \$100, we find that 383 (50.4%) observations from 20 funds are due to unit difference while 377 (49.6%) are due to data discrepancy.

D. Incentive Fees and Management Fees

We have reported in Table 1 that TASS has fee information available for all funds but HFR has incentive fees and management fees missing for some of the funds they covered. Now we compare the fee information for the 465 common funds from the two databases.

Panels A and B of Table 9 show the incentive fee discrepancy and management fee discrepancy across the two databases. Among the 465 common funds, there are 392 funds (88.1%) that have the same incentive fees and 370 funds (81.9%) that have the same management fees. Note that there are 20 funds with missing incentive fees and 13 funds with missing management fees, all from the HFR data. On average, HFR's incentive fee is 0.8% higher ($t=1.57$) than TASS and HFR's management fee is 0.06% higher ($t=1.61$) than TASS, although the differences are not significant. Note that the fee numbers for HFR is as of July 1997 while the fee numbers for TASS is as of July 1998.¹⁴

One may argue that the fee difference between the two databases is due to changing fees from 1997 to 1998. We test this hypothesis by examining two snapshot fee numbers from the July 1998 version of the TASS data and July 1999 version of the TASS data.¹⁵ The result shows that hedge funds seldom change fee structures. From July 1998 to July 1999, the TASS database shows that 98.8% of funds have the same incentive fee and about the same amount of funds have the same management fee. Only about 1% of funds change fee structures over this time period. Therefore, the fee discrepancy between the two databases is due to data differences rather than changing fees.

E. Investment Styles and Survivorship Bias

By far, all studies about survivorship bias are based on all funds rather than individual investment styles. It is quite possible that different investment styles have different survivorship biases because of differences in performance, risk, financial instruments, and leverage employed. We extend the literature by examining survivorship bias according to investment styles. As far as we know, this is the first paper to explore survivorship bias by investment styles.

Style distributions for both databases can be found in Table 10. There are 17 investment styles defined by HFR. These styles are: composite, convertible arbitrage, distressed securities, emerging markets, fixed income, foreign exchange, fund of funds, growth, macro, market neutral, market timing, merger arbitrage, multi-strategy, opportunistic, sector, short selling, and value styles.

In contrast, TASS follows different definitions for investment styles. The 15 styles defined by TASS are: Top down macro, bottom up, short selling, long bias, market

neutral, opportunities, relative value, arbitrage, discretionary, trend follower, technical, fundamental, systematic, diverse, and other. Note that these styles are not mutually exclusive.¹⁶ Table 11 shows the survivorship bias by investment styles from the HFR data. As we can see, the biases are fairly small and none of them is statistically significant. The average bias across all styles is 0.02% per month or 0.31% per year, slightly different from 0.39% in Panel A of Table 3. Remember that the numbers in Table 3 are calculated from the period of 1993 to 1997 while the numbers in Table 11 are calculated for the entire fund history.

Table 12 shows the survivorship bias by investment styles from the TASS data. The survivorship biases are greater than or equal to 0.1% per month for 10 out of 15 styles. The biases are significant at the conventional significance levels for 10 out of 15 styles.¹⁷ Among them, technical, discretionary, trend follower, systematic, and short selling styles have relatively higher biases than the other styles. The average bias across all 15 styles is 0.12% per month or 1.49% per year. Again, 1.49% is slightly different from 2.24% in Panel B of Table 3 due to different time periods covered.

V. Conclusion

In this paper, using two large hedge fund databases from HFR and TASS, we study the survivorship bias issue in the hedge fund industry. We extend the literature by studying survivorship bias according to investment styles. Further, we compare the two databases and examine the accuracy of hedge fund data.

We find that the average survivorship bias of hedge funds is over 2% per year, consistent with studies of Fung and Hsieh (1998) and Brown, Goetzmann, and Ibboston (1999). The small bias in Ackermann, McEnally, and Ravenscraft (1999) seems due to

the relatively low number of dissolved funds in the HFR/MAR database and due to the fact that they use data before 1994 to calculate survivorship bias when HFR hasn't started to cover dissolved funds yet. Interestingly, funds display declining returns toward the date of liquidation. This finding, together with the large positive survivorship bias, indicates that the reason for the fund disappearance is mainly poor performance.

Except for the differences in dissolved funds tracked, there are other differences between the two databases. The two databases cover a small proportion of common funds. For these 465 common funds, we find that there are significant differences in returns, inception date, net assets value, incentive fee, management fee, and investment styles across the two databases. TASS has more return observations and NAV observations due to more funds covered and longer return history than HFR. TASS has more funds with incentive fee and management fee information than HFR. Across the two databases, at least 5% of return numbers and 5% of NAV numbers differ dramatically. Mismatching between the reported returns and the percentage changes in NAVs can partially explain the difference. The return numbers in TASS are consistent with the NAV numbers. In addition, the two databases have different style classifications. The survivorship biases are different across styles. They are significant for 10 out of 15 styles in TASS but none is significant for HFR.

In summary, the two databases differ not only in the number of dissolved funds covered, but also in some other aspects. All these differences can explain the different estimates of survivorship bias documented in the previous studies.

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Footnotes

1. Hedge funds report to data vendors voluntarily. Because hedge funds are not allowed to advertise to the public, hedge funds view this voluntary reporting as a way to distribute their fund information and attract investors for more assets.
2. Remember that HFR started to cover dissolved funds only from 1994. The bias calculated in our study is based on data from 1994 to 1997 when funds died during all these years, while Ackermann et al. use data from 1988 to 1995 with 6 out of 8 years having no fund died. In addition, we calculate returns on an annual basis for each year from 1994 to 1997 while Ackermann et al. calculate returns over the entire fund history. If dissolved funds show declining returns toward the date of exit as shown in Figure 1, then our annual return method will be more likely to pick up this downward trend while their method could average this downward trend out due to long-term average over the entire fund history.
3. According to previous literature, survivorship bias is defined as the performance difference between a fund sample without dissolved funds and a one with dissolved funds.
4. One may argue that the HFR database is different from the TASS database in the sense that the dissolved funds in the HFR are both poorly performed funds and voluntarily closed funds. If this were the case, we would expect that the positive and negative biases could cancel each other out, leaving a very small bias as shown in the HFR database. However, based on the 110 dissolved funds in the HFR data, we find that the average monthly return for all dissolved funds from 1994 to 1997 is -0.04% per month, much lower than the 1.22% for the survived funds.

5. We thank David Hsieh for this point. Using the TASS data from 1994 to 1998, we find that the annual survivorship biases are 1.52% and 2.34% for onshore and offshore funds, respectively. The bias for offshore funds is indeed higher than onshore funds but the 1.52% bias of onshore funds is still much higher than 0.16% in Ackermann, McEnally, and Ravenscraft (1999).
6. The t -statistics for the return differences in years 1994 through 1997 are 2.73, 3.67, 2.86, and 4.66, respectively.
7. All variables except for management fee are significant at the conventional significance level, indicating that the probability of fund dissolution is significantly related to fund characteristics. Particularly, the probability is negatively correlated with fund performance (p -value=0.0001), fund assets (p -value=0.0001), managers' personal investments (p -value=0.0002), incentive fee (p -value=0.0198), and fund age (p -value=0.0057) while it is positively related to the leverage ratio (p -value=0.0001).

To mitigate a potential collinearity problem, we re-run the Probit regression with the average return variable only. Results from this single variable regression are similar to those from the multi-variable Probit regression. The return variable is significant at the 1% level and negatively related to the probability of a fund's dissolution. Hence, collinearity shouldn't be a major concern.

Further, we run the Probit regression using the HFR database without the variable Personal since HFR does not have this information. Results using the HFR data are similar to those using the TASS data, although they are slightly weaker. The performance variable and the asset variable are significant at the 1% level, the incentive fee is significant at the 10% level but with a wrong sign. The results show

that poor performance is the main reason for a fund's dissolution, regardless of whether we use the TASS data or the HFR data. We attribute the weaker result from HFR to the relative low number of dissolved funds they covered. In fact, when we don't have a sufficient number of dissolved funds, any test on performance difference between extant funds and dissolved funds will not have enough testing power. This may be one of the reasons why Ackermann et al. didn't find significant return differences in their study.

8. Both data vendors overwrite their historical data stored electronically so we are unable to get a July 1997 version of TASS data at the time of purchase. Although the extra year may give TASS more newborn funds, funds also died during the one-year period from August 1997 to July 1998. In fact, there are 120 newborn funds and 103 dead funds during this time period. The birth effect and death effect may roughly cancel each other out.
9. For example, one fund has an inception date of November 1994 and the first reported return in March 1992. From March 1992 to October 1994 it was organized as a proprietary trading company. From November 1994, it was organized as an offshore fund with the same trading strategy and fee structures as its predecessor.
10. Sometimes the inception date of a fund is determined from the month when its first return is reported. A fund can either report its first return in the inception month or the month after. This could give us a one-month error.
11. One may expect that these 48 funds be not audited by outside auditors. Surprisingly, there is only one non-audited fund. Therefore, coding errors should be a major reason for the discrepancy.

12. There is an indicator variable in the TASS data that shows whether a fund reports returns or NAVs to the data vendor. However, there is no indicator variable in the TASS data to specify “offshore” or “onshore”. We define a fund as onshore if it domiciles in the US and offshore if it domiciles outside the US.
13. There are only 2 funds with missing initial NAVs out of 1,627 funds in the TASS data. The initial NAVs are usually set at \$1,000 (47.9%), \$100 (26.8%), or \$10 (11.3%) for convenience.
14. If there is any fee changes over time, it more likely occurs at the year-end. Hence the fees in July 1997 should be the same as the end of 1996 and the fees in July 1998 should be the same as the end of 1997.
15. We have purchased data twice from TASS in 1998 and 1999, respectively.
16. There is another set of style definitions: US equity hedge (14), European equity hedge (2), Asian equity hedge (1), global equity hedge (2), dedicated short seller (36), fixed income directional (1), convertible fund (1), event driven (3), non directional/relative value (9), global macro (1), global opportunity (1), natural resources (1), pure leveraged currency (3), pure managed future (34), pure emerging market (12), pure property (0), fund of funds (20). The numbers in parentheses are the numbers of dead funds. This may be a better style definition because they are mutually exclusive. However, there are only 141 out of 426 (33%) dead funds that are classified by this style definition. The other 285 (67%) dead funds are unclassified. To fully utilize the rich information of dead funds in order to analyze survivorship bias by styles, we choose to use the other set of style definitions.

17. The biases are significant at the 1% level for 5 styles, at 5% for 3 styles, and at 10% for 2 styles.

TABLE 1
Descriptive Statistics: TASS versus HFR

Variable	TASS				HFR			
	<u>N</u>	<u>Percent</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>N</u>	<u>Percent</u>	<u>Mean</u>	<u>Std. Dev.</u>
Assets	1,576	96.9%	\$97.7mm	\$601mm	1,037	93.1% ^a	\$96.2mm	\$314mm
Management fee	1,627	100.0%	1.57%	1.04%	1,026	92.1%	1.30%	0.77%
Incentive fee	1,627	100.0%	15.63%	8.39%	1,000	89.8%	16.41%	7.76%
Minimum invest	1,548	95.1%	\$570,996	\$3.6mm	1,023	91.8%	\$858,926	\$3.2mm
Live fund	1,201	73.8%			1,052	90.5%		
Dead fund	426	26.2%			110	9.5%		
Onshore fund	498	30.6%			315	27.1%		
Offshore fund	1,127	69.3%			523 ^b	45.0%		

Data is from TASS Management Limited (TASS). There are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998. Data is from Hedge Fund Research Inc. (HFR). There are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997.

^aExclude the 48 HFR indexes.

^bThere are 179 funds that are onshore funds with offshore equivalent. There are 145 funds that are unclassified as onshore or offshore funds.

TABLE 2

Attrition Rates of Hedge Funds: HFR versus TASS

<u>Year</u>	<u>Year Start</u>	<u>Entry</u>	<u>Dissolution</u>	<u>Year End</u>	<u>Attrition rate</u>
<u>Panel A: HFR^a</u>					
1993				631	
1994	631	197	9	819	1.43
1995	819	172	15	976	1.83
1996	976	107	60	1023	6.15
1997 ^b	1023	7	15	1015	1.47
Average					2.72
<u>Panel B: TASS^c</u>					
1993				728	
1994	728	220	34	914	4.71
1995	914	220	77	1,057	8.38
1996	1,057	217	141	1,133	13.36
1997	1,133	189	122	1,200	10.84
1998 ^d	1,200	51	50	1,201	4.19
Average					8.30

Data is from Hedge Fund Research Inc. (HFR) and TASS Management Limited (TASS). There are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997 in HFR data. There are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998 in TASS data. Attrition rate is calculated as the ratio of the number of dissolved funds to the number that existed at the start of the year. Panel A represents for the attrition rate from the HFR data while Panel B represents for the attrition rate from TASS data.

^a38 funds with missing birth data and 11 funds with missing dead date. 631 funds at the end of 1993 include those 38 funds.

^bThrough June 1997

^cTwo funds have missing information on entry dates and exit dates.

^dThrough July 1998

TABLE 3
Survivorship Bias in Hedge Funds: HFR versus TASS

<u>Year End</u>	<u>All Funds</u>			<u>Surviving Funds</u>			<u>Dissolved Funds</u>		
	<u>Return</u>	<u>Std. Dev</u>	<u>Obs.</u>	<u>Return</u>	<u>Std. Dev</u>	<u>Obs.</u>	<u>Return</u>	<u>Std. Dev</u>	<u>Obs.</u>
<u>Panel A: HFR</u>									
1994	0.14	4.50	5,220	0.20	4.42	4,668	-0.31	5.08	552
1995	1.46	5.46	7,839	1.52	4.99	7,077	0.85	8.67	762
1996	1.46	5.64	12,387	1.51	4.82	11,660	0.78	13.04	727
1997 ^a	1.61	5.28	6,304	1.64	5.27	6,240	-1.49	5.24	64
Average	1.17			1.22			-0.04		
Bias	0.05	(0.60 per year)							
<u>Panel B: TASS</u>									
1994	-0.08	5.07	9,917	0.02	5.00	6,678	-0.27	5.18	3,239
1995	1.15	6.30	11,945	1.46	5.27	8,567	0.34	8.31	3,378
1996	1.26	5.57	13,419	1.52	5.26	10,621	0.25	6.52	2,798
1997	1.22	6.03	14,160	1.33	5.90	12,771	0.16	7.06	1,389
1998 ^b	0.37	5.94	8,156	0.41	5.91	7,979	-1.33	6.84	177
Average	0.78			0.95			-0.17		
Bias	0.17	(2.24 per year)							

Data is from Hedge Fund Research Inc. (HFR) and TASS Management Limited (TASS). There are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997 in HFR data. 48 HFR indexes are not included in calculation. There are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998 in TASS data. Survivorship bias is calculated as the performance difference between surviving funds and all funds. All returns are net of fees and on a monthly basis.

^aThrough July 1997

^bThrough July 1998

TABLE 4

**Survivorship Bias in Hedge Funds (the HFR Database (1994-1997)):
Onshore versus Offshore**

<u>Year End</u>	<u>All Funds</u>			<u>Surviving Funds</u>			<u>Dissolved Funds</u>		
	<u>Return</u>	<u>Std. Dev</u>	<u>Obs.</u>	<u>Return</u>	<u>Std. Dev</u>	<u>Obs.</u>	<u>Return</u>	<u>Std. Dev</u>	<u>Obs.</u>
<u>Panel A: Onshore</u>									
1994	0.24	3.90	1,414	0.27	3.91	1,261	0.02	3.82	153
1995	1.47	3.83	1,974	1.56	3.69	1,809	0.54	5.09	165
1996	1.44	4.32	3,026	1.46	4.17	2,888	1.14	6.62	138
1997*	1.42	4.27	1,496	1.42	4.28	1,493	-0.71	2.03	3
Average	1.14			1.18			0.25		
Bias	0.04	(0.48per year)							
<u>Panel B: Offshore</u>									
1994	0.01	5.00	2,598	0.08	4.90	2,291	-0.55	5.67	307
1995	1.33	6.31	4,175	1.36	5.59	3,701	1.08	10.34	474
1996	1.39	6.39	6,776	1.44	5.04	6,308	0.70	15.76	468
1997*	1.66	5.80	3,466	1.71	5.79	3,413	-1.49	5.52	53
Average	1.10			1.15			-0.07		
Bias	0.05	(0.60 per year)							

Data is from Hedge Fund Research Inc. (HFR). There are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997. There are 315 onshore funds, 523 offshore funds, and 179 onshore funds with offshore equivalent. Survivorship bias is calculated as the performance difference between surviving funds and all funds. All returns are net of fees and on a monthly basis. 48 HFR indexes are not included in calculation. Panel A represents for onshore funds while Panel B represents for offshore funds.

*Through July 1997

TABLE 5
Comparison of HFR and TASS Databases

		TASS			
		<u>Live</u>	<u>Dead</u>	<u>Not in TASS</u>	<u>Total (HFR)</u>
H	Live	381	49	622	1,052*
F	Dead	1	34	75	110
R	Not in HFR	819	343		
	Total (TASS)	1,201	426		

Data is from Hedge Fund Research Inc. (HFR) and TASS Management Limited (TASS). In HFR, there are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997. In TASS, there are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998.

*Including 48 HFR indexes.

TABLE 6
Inception Date Differences and the First Return Date Differences between the two Databases

Difference (month)	Month of 1 st return (TASS-HFR)	%	Inception date (TASS-HFR)	%	Inception-1 st month (HFR)	%	Inception-1 st month (TASS)	%
<-1	194	(41.72)	34	(7.31)	206	(44.30)	46	(9.89)
-1	3	(0.65)	41	(8.82)	11	(2.37)	74	(15.91)
0	154	(33.12)	322	(69.25)	174	(37.42)	332	(71.40)
1	52	(11.18)	25	(5.38)	42	(9.03)	6	(1.29)
>1	24	(5.16)	34	(7.31)	11	(2.37)	5	(1.08)
Missing	38	(8.17)	9	(1.94)	21	(4.52)	2	(0.43)
Total	465	(100.00)	465	(100.00)	465	(100.00)	465	(100.00)

Data is from TASS Management Limited (TASS). There are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998. Data is from Hedge Fund Research Inc. (HFR). There are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997. There are 465 funds common to both databases. Inception date is the date when a fund is organized while the first month means the month when fund reports its first return.

TABLE 7
Return Discrepancy between HFR and TASS

<u>Difference (%)</u>	<u>Frequency</u>	<u>Percentage (%)</u>	<u>Cumulative freq.</u>	<u>Cumulative %</u>
0.0	9,099	47.0	9,099	47.0
0.1	68	0.4	17,510	90.5
0.2	36	0.2	17,916	92.6
0.3	13	0.1	18,124	93.7
0.4	15	0.1	18,280	94.5
0.5	12	0.1	18,414	95.2
1.0	6	0.0	18,791	97.1
1.5	3	0.0	18,961	98.0
2.0	1	0.0	19,038	98.4
2.5	1	0.0	19,091	98.7
3.0	1	0.0	19,149	99.0
3.5	1	0.0	19,168	99.1
4.0	2	0.0	19,202	99.3
4.5	1	0.0	19,222	99.4
5.0	1	0.0	19,242	99.5
61.35	1	0.0	19,346*	100.0

Data is from Hedge Fund Research Inc. (HFR) and TASS Management Limited (TASS). In HFR, there are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997. There are 55,654 return observations. In TASS, there are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998. There are 81,768 return observations and 23 missing observations. There are 465 funds, which are common in both databases. After removing 40 funds that have returns with different fees and with non-monthly intervals, we have 425 common funds left. Return differences are calculated as the absolute differences from these 425 funds. To save space, the table does not report all differences.

*Missing observations=7,029.

TABLE 8
Net Asset Value (NAV) Discrepancy between HFR and TASS

<u>Difference (\$)</u>	<u>Frequency</u>	<u>Percentage (%)</u>	<u>Cumulative freq.</u>	<u>Cumulative %</u>
0.0	4,866	83.3	4,866	83.3
0.1	8	0.1	5,411	92.6
0.2	3	0.1	5,448	93.3
0.3	4	0.1	5,474	93.7
0.4	2	0.0	5,493	94.0
0.5	2	0.0	5,504	94.2
0.6	1	0.0	5,511	94.3
0.7	1	0.0	5,522	94.5
0.8	1	0.0	5,528	94.6
0.9	2	0.0	5,534	94.7
1.0	3	0.1	5,542	94.9
2.0	2	0.0	5,583	95.6
3.0	1	0.0	5,600	95.9
4.0	1	0.0	5,609	96.0
5.0	1	0.0	5,616	96.1
10.0	1	0.0	5,641	96.6
1,243.51	1	0.0	5,842*	100.0

Data is from Hedge Fund Research Inc. (HFR) and TASS Management Limited (TASS). In HFR, there are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997. There are 19,053 non-missing NAV observations and 36,602 missing NAV observations. In TASS, there are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998. There are 81,768 non-missing NAV observations and 23 missing observations. There are 465 funds, which are common in both databases. After removing 40 funds that have returns with different fees and with non-monthly intervals, we have 425 common funds left. NAV differences are calculated as the absolute differences from these 425 funds. To save space, the table does not report all differences.

*Missing observations=17,140.

TABLE 9
Incentive Fee and Management Fee Discrepancy between HFR and TASS

<u>Difference (%)</u>	<u>Frequency</u>	<u>Percentage (%)</u>	<u>Cumulative freq.</u>	<u>Cumulative %</u>
<u>Panel A: Incentive fee^a</u>				
-20	15	3.4	15	3.4
-15	3	0.7	18	4.0
-10	2	0.4	21	4.7
-5	6	1.3	28	6.3
0.0	392	88.1	424	95.3
5	8	1.8	435	97.8
10	3	0.7	439	98.7
20	5	1.1	444	99.8
22.5	1	0.2	445 ^b	100.0
<u>Panel B: Management fee^c</u>				
-3	1	0.2	1	0.2
-2	4	0.9	6	1.3
-1	14	3.1	24	5.3
-0.5	15	3.3	42	9.3
0.0	370	81.9	419	92.7
0.5	14	3.1	441	97.6
1.00	9	2.0	452 ^d	100.0

Data is from Hedge Fund Research Inc. (HFR) and TASS Management Limited (TASS). In HFR, there are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997. In TASS, there are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998. There are 465 funds, which are common in both databases. Note that the incentive fee information from HFR is as of July 1997 while those from TASS are as of July 1998. The fee difference is calculated as TASS minus HFR. Panel A represents the differences in incentive fees and Panel B represents the differences in management fees across the two databases. There are 20 funds with missing incentive fees and 13 funds with missing management fees, all from HFR.

^a $IFee_{TASS} - IFee_{HFR} = -0.8$ ($t = -1.57$)

^bMissing=20

^c $MFee_{TASS} - MFee_{HFR} = -0.06$ ($t = -1.61$)

^dMissing=13

TABLE 10
Style Distribution: HFR versus TASS

Strategy	HFR ^a						TASS ^b					
	Live		Dead		All		Live		Dead		All	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Composite	15	1.50	0	0.00	15	1.35	313	26.06	70	16.43	383	23.54
Convertible arbitrage	22	2.20	6	5.45	28	2.52	561	46.71	96	22.54	657	40.38
Distressed securities	34	3.40	2	1.82	36	3.24	408	33.97	106	24.88	514	31.59
Emerging markets	90	9.00	10	9.09	100	9.01	387	32.22	89	20.89	476	29.26
Fixed income	59	5.90	10	9.09	69	6.22	257	21.40	58	13.62	315	19.36
Foreign exchange	30	3.00	1	0.91	31	2.79	429	35.72	91	21.36	520	31.96
Fund of funds	224	22.40	13	11.82	237	21.35	333	27.73	85	19.95	418	25.69
Growth	124	12.40	18	16.36	142	12.79	362	30.14	83	19.48	445	27.35
Macro	35	3.50	6	5.45	41	3.69	270	22.48	117	27.46	387	23.79
Market neutral	35	3.50	6	5.45	41	3.69	220	18.32	94	22.07	314	19.30
Market timing	14	1.40	5	4.55	19	1.71	397	33.06	199	46.71	596	36.63
Merger arbitrage	19	1.90	0	0.00	19	1.71	646	53.79	189	44.37	835	51.32
Multi-strategy	1	0.10	0	0.00	1	0.09	348	28.98	172	40.38	520	31.96
Opportunistic	100	10.00	17	15.45	117	10.54	357	29.73	86	20.19	443	27.23
Sector	57	5.70	3	2.73	60	5.41	161	13.41	57	13.38	218	13.40
Short selling	11	1.10	1	0.91	12	1.08						
Value	130	13.00	12	10.91	142	12.79						
Total	1,000	100.00	110	100.00	1,110	100.00	1,201	100.00	426	100.00	1,627	100.00

Data is from Hedge Fund Research Inc. (HFR) and TASS Management Limited (TASS). In HFR, there are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997. In TASS, there are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998. Styles in the TASS data are overlapping.

^aThere are 2 funds that are not classified. 2 funds are in a category called mutual funds. There are 48 HFR indexes.

^bStyles are overlapping

TABLE 11
Survivorship bias by Investment Styles (HFR)

Style	All Funds			Surviving Funds			Dissolved Funds			t-bias
	Return	Std. Dev	Obs.	Return	Std. Dev	Obs.	Return	Std. Dev	Obs.	
Composite	1.46	5.29	862	1.46	5.29	862	N/A	N/A	0	0
Convertible arbitrage	0.97	1.38	1,118	1.03	1.42	982	0.56	0.96	136	0.06
Distressed securities	1.33	2.53	1,491	1.34	2.54	1,458	0.73	2.13	33	0.01
Emerging markets	1.71	7.60	3,427	1.85	7.65	3,170	-0.01	6.68	257	0.14
Fixed income	1.04	2.74	2,282	1.11	2.80	2,048	0.44	2.04	234	0.07
Foreign exchange	1.18	8.00	1,466	1.20	8.07	1,431	0.11	4.71	35	0.02
Fund of funds	1.04	3.67	8,551	1.07	3.62	8,350	-0.24	5.28	201	0.03
Growth	1.51	5.92	5,187	1.58	5.73	4,694	0.92	7.47	493	0.07
Macro	1.57	5.73	1,919	1.54	5.67	1,836	2.36	6.92	83	-0.03
Market neutral	0.94	2.38	1,646	0.95	2.43	1,557	0.80	1.19	89	0.01
Market timing	1.01	3.58	971	1.03	3.11	778	0.95	5.06	193	0.02
Merger arbitrage	1.20	3.51	1,444	1.20	3.51	1,444	N/A	N/A	0	0
Opportunistic	1.36	5.25	4,538	1.50	5.46	3,816	0.64	3.88	722	0.14
Sector	2.06	11.26	1,693	1.87	6.65	1,604	5.48	40.27	89	-0.19
Short selling	0.20	6.88	463	0.18	7.18	395	0.32	4.84	68	-0.02
Value	1.59	4.94	4,747	1.62	4.87	4,085	1.44	5.35	662	0.03
Average	1.26			1.28			1.04			0.02
Bias	0.02	(0.31 per year)								

Data is from Hedge Fund Research Inc. (HFR). There are 1,162 hedge funds, including 1,052 survived funds (including 48 HFR indexes) and 110 dissolved funds as of July 1997. 48 HFR indexes are excluded from calculation. Returns are all net of fees and on a monthly basis. Survivorship bias is calculated as the performance difference between surviving funds and all funds. Multi-strategy style has no fund left after we restrict funds reporting returns on an after fee basis and on a quarterly basis.

TABLE 12
Survivorship Bias by Investment Styles (TASS)

Style	All Funds			Surviving Funds			Dissolved Funds			t-bias	
	Return	Std. Dev	Obs.	Return	Std. Dev	Obs.	Return	Std. Dev	Obs.		Bias
Top down macro	1.17	5.92	19,648	1.26	5.98	17,172	0.55	5.45	2,476	0.09	1.45
Bottom up	1.26	5.16	31,433	1.32	5.13	28,034	0.79	5.40	3,399	0.06	1.42
Short selling	1.21	5.14	24,433	1.35	4.91	20,034	0.54	6.04	4,399	0.14	2.93
Long bias	1.25	5.64	23,323	1.36	5.51	19,987	0.58	6.31	3,336	0.11	2.05
Market neutral	1.02	3.14	15,342	1.10	3.06	12,880	0.60	3.47	2,462	0.08	2.16
Opportunities	1.31	5.47	25,685	1.38	5.48	22,239	0.84	5.42	3,446	0.07	1.40
Relative value	1.10	5.50	19,705	1.20	4.57	16,332	0.62	8.70	3,373	0.10	1.89
Arbitrage	1.11	4.86	21,662	1.19	3.91	18,592	0.63	8.57	3,070	0.08	1.83
Discretionary	0.95	6.71	18,645	1.14	6.10	14,459	0.28	8.43	4,186	0.19	2.69
Trend Follower	1.06	7.18	18,732	1.23	7.29	14,380	0.49	6.79	4,352	0.17	2.12
Technical	0.98	6.88	33,757	1.19	7.02	24,907	0.40	6.42	8,850	0.21	3.61
Fundamental	1.11	6.41	41,942	1.23	6.02	34,081	0.56	7.87	7,861	0.12	2.65
Systematic	0.99	6.47	29,405	1.16	6.50	21,934	0.47	6.34	7,471	0.17	2.94
Diverse	1.10	5.57	23,377	1.18	5.58	20,094	0.66	5.53	3,283	0.08	1.49
Other	0.97	6.60	10,106	1.14	5.16	7,926	0.32	10.23	2,180	0.17	1.94
Average	1.11			1.23			0.56			0.12	
Bias	0.12	(1.49% per year)									

Data is from TASS Management Limited (TASS). There are 1,627 hedge funds, including 1,201 survived funds and 426 dissolved funds as of July 1998. Returns are net of fees and on a monthly basis. Survivorship bias is calculated as the performance difference between surviving funds and all funds. Note that investment styles overlap each other.

Figure 1. Monthly Returns for Dead Funds towards the Death Date

