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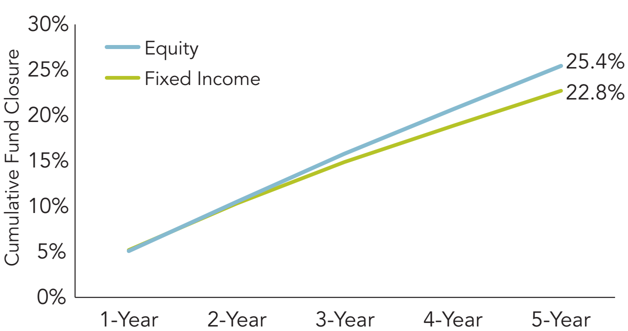
Disappearing Act of Mutual Funds

The mutual fund industry has expanded considerably over the past two decades. In particular, the number of US equity funds listed in CRSP[1] has climbed from about 550 in 1990 to more than 3,500 by the end of 2013. However, this growth obscures a high attrition rate within the industry; on average, more than 5% of the CRSP-listed US equity and fixed income funds are liquidated or merged each year. **Exhibit 1** illustrates the cumulative effect of this attrition—within five years, about 1 in 4 equity funds and 1 in 5 fixed income funds cease to be available.

Exhibit 1
Fund Attrition Rates, *2000–2013*



Cumulative fund closures are measured over rolling five-year periods for US equity and fixed income funds. The chart reports the average cumulative percentages at each time horizon. Data provided by the CRSP Survivor-Bias-Free US Mutual Fund Database, University of Chicago.

This purpose of this paper is to analyze the performance of non-surviving funds and understand the implications for mutual fund ratings. The results suggest that poor performance is a precursor to fund closure and that investors should be cautious in interpreting performance statistics computed without the non-surviving funds.

DATA AND METHODOLOGY

The sample for our study includes US-domiciled domestic equity, international equity, and fixed income funds listed in the CRSP Survivor-Bias-Free US Mutual Fund Database over the period January 2000–December 2013. We aggregate fund share classes to the strategy level using the CRSP identifiers for share class groups and portfolio holdings.[2] All returns are net of fees and expenses. Funds are identified using their Lipper investment objective codes and matched to benchmarks at the beginning of each evaluation period based on investment category.[3] A fund is considered closed as of the last date for which CRSP has returns; non-survivors include funds that are either merged or liquidated.[4]

OVERWHELMING UNDERPERFORMANCE OF NON-SURVIVING FUNDS

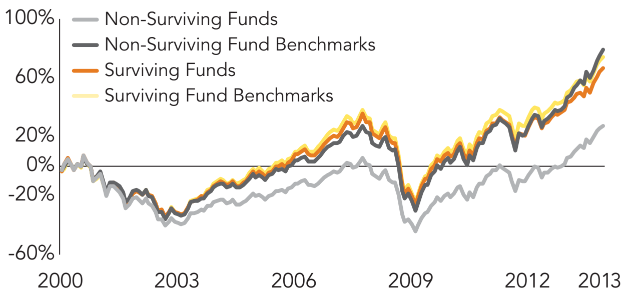
Mutual funds may close for many reasons, but a frequent cause is poor performance.[5] The cumulative returns in **Exhibit 2** compare the performance of surviving funds to that of non-surviving funds in their final years of existence. The non-surviving return in each month includes funds that cease operation within the subsequent five years; in other words, the non-surviving fund return in January 2000 is the average return for all funds that close by December 2004. The surviving and non-surviving groups on average contain 2,965 and 707 funds, respectively.

Non-surviving funds lagged the performance of their benchmarks, growing wealth by 27.4% after 14 years vs. 79.2% for the benchmarks. In contrast, funds that were still in operation as of December 2013 tracked the performance of their benchmarks much more closely, with a cumulative return of 66.7% compared to the benchmarks' 74.3%. In short, non-surviving funds performed markedly worse than their surviving counterparts.

See "Appendix: Standardized Performance Data and Disclosures" for how to obtain complete information on performance, investment objectives, risks, advisory fees, and expenses of Dimensional's funds.

Exhibit 2

Performance Prior to Closure, *January 2000–December 2013*



Each month, all funds in the sample are categorized into surviving and non-surviving groups based on whether the fund ceases to exist within the next five years. The asset-weighted average return is computed for each group. The figure reports the cumulative returns for surviving and non-surviving funds as well as the asset-weighted composite of their benchmarks. Sample includes 8,126 funds. Data provided by the CRSP Survivor-Bias-Free US Mutual Fund Database, University of Chicago.

Although non-surviving funds underperform in aggregate, this finding belies the range of outcomes for closed funds. As the charts show in **Exhibit 3**, while the incidence and magnitude of underperformance are higher for the non-survivors than survivors, there are many cases of funds that closed even after beating their benchmarks. This result is consistent with evidence that mutual funds can be merged or liquidated for reasons other than poor performance.[6]

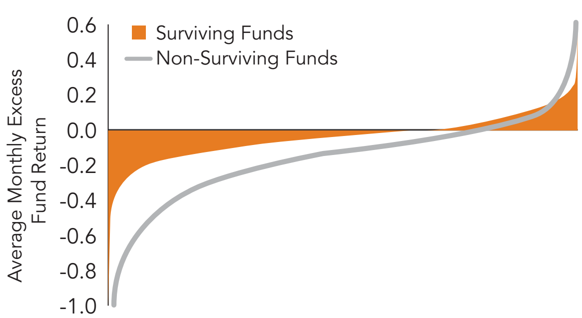
IMPACT OF SURVIVOR BIAS

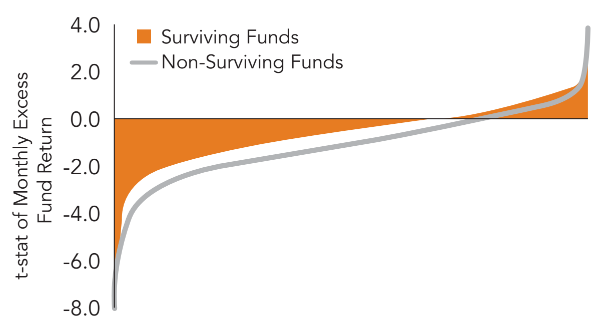
Investors should be cautious of survivorship bias when evaluating performance using a sample of surviving funds. For example, mutual fund analysis often consists of past performance rankings with respect to peers currently available within the same investment objective. However, by excluding funds existing at the start of the evaluation period that are no longer available, such performance tests are susceptible to survivor bias.

The chart in **Exhibit 4** reports outperformance rates for the industry of funds with and without non-survivors over various time intervals. Survivor bias is manifest as a boost in the portion of funds that beat their category benchmarks, and the magnitude of this bias increases as the evaluation period lengthens. Over a one-year horizon, the difference in outperformance rates between all funds and only the survivors is small, at 46.7% vs. 47.5%, respectively. However, over 10 years, the gap in outperformance rates grows to 5.5 percentage points (26.7% vs. 32.2%).

Exhibit 3

10-Year Fund Return Outcomes, *January 2004–December 2013*



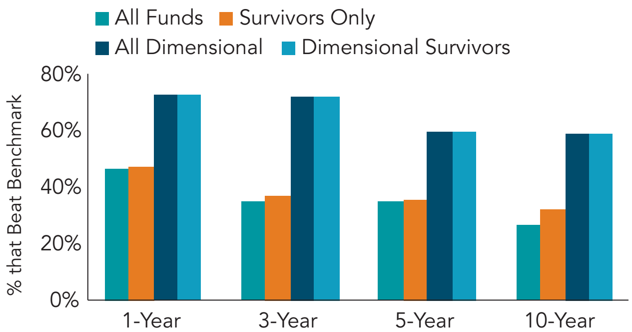


All funds available in January 2004 are categorized into surviving and non-surviving groups based on whether the fund existed through December 2013. The chart on the left reports each fund's average monthly return in excess of its respective benchmark in percent terms. The chart on the right reports the corresponding t-statistics for the monthly averages. Data provided by the CRSP Survivor-Bias-Free US Mutual Fund Database, University of Chicago.

Compared to the industry, outperformance rates for Dimensional's funds are markedly higher over each horizon. Over one year, more than 70% of funds outperform the indices; after 10 years, this rate is still close to 60%, more than double the industry average when closed funds are included. Identical results are obtained for the Dimensional survivors; the Dimensional funds in this sample are still available today.

Exhibit 4

Fund Outperformance Rates, *Periods Ending December 2013*



Cumulative returns over 1-, 3-, 5-, and 10-year horizons are computed for each fund and its benchmark. The exhibit reports the percentage of funds that outperformed their respective benchmark. "All Funds" outperformance rate is the number of funds for the industry with a higher cumulative return than the benchmark divided by the total number available at the start of the period. "Survivors Only" outperformance rate is the number of funds for the industry that survive the full period and have a higher return than the benchmark divided by the total number of survivors. Dimensional outperformance computed relative to indices matched in sample and includes all Dimensional funds available at the beginning of each period. The number of funds for the 1-, 3-, 5-, and 10-year evaluation periods for "All Funds" are 4,589, 4,737, 4,835, and 3,065, respectively. The corresponding fund counts for "Survivors Only" are 4,380, 4,022, 3,588, and 1,742. Each of the Dimensional samples contains 55, 47, 45, and 17 funds, respectively, managed by Dimensional Fund Advisors LP. Past performance is no guarantee of future results. It is not possible to invest directly in an index. Data provided by the CRSP Survivor-Bias-Free US Mutual Fund Database, University of Chicago.

Investment categories with high attrition rates can be the most susceptible to survivor bias. For instance, out of 476 small cap-tilted US equity funds available in January 2004, nearly 40% failed to survive 10 years. Accordingly, the gap between the biased and unbiased portions that beat their benchmark is over 12 percentage points, 54.5% vs. 42.0%.

Exhibit 5 repeats the 10-year outperformance tests for the 10 investment categories with the most survivor bias. The average gap in outperformance between all funds and the survivors for these categories is nearly 12 percentage points, more than double the size of the difference measured for all investment objectives over the same length of time. The implication is that investors should be especially wary of survivor bias when analyzing funds for which attrition rates are high, as is the case for long-term performance evaluation and for certain categories such as small caps and value.

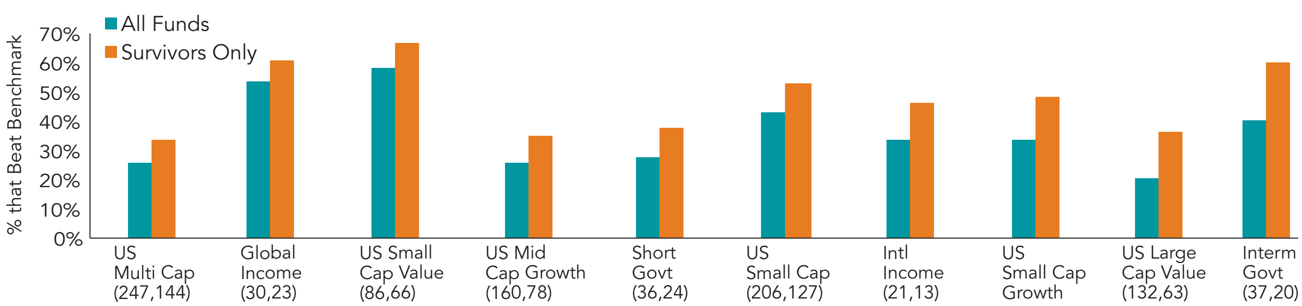
FAMILY TREE OF BIAS

Fund families are sometimes evaluated based on their full body of work, a collective performance rating of all current fund offerings. Families with a high percentage of funds that beat their benchmarks might appear more skilled, as opposed to families with isolated fund outperformance, which could be construed as luck.

Exhibit 6 reports 10-year fund outperformance rates in the industry at the family level, with and without survivor bias. As with the fund-level analysis, outperformance rates are considered survivor-biased when only currently available funds are included. The height of the bars represents the portion of fund families with outperformance rates at the level indicated by the horizontal axis.

Exhibit 5

Fund Outperformance Rates for Categories with Most Survivor Bias, *January 2004– December 2013*

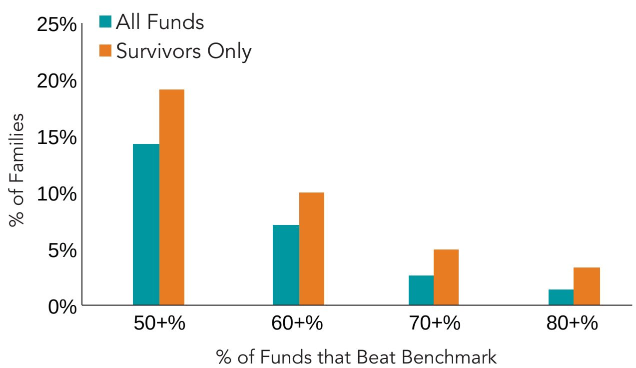


Cumulative 10-year returns are computed for each fund and its benchmark. "All Funds" outperformance rate is the number of funds with a higher cumulative return than the benchmark divided by the total number available at the start of the period. "Survivors Only" outperformance rate is the number of funds that survive the full period and have a higher return than the benchmark divided by the total number of survivors. The exhibit reports the percentage of funds that outperform their respective benchmarks for the investment objective categories with the largest difference between "All Funds" and "Survivors Only." The category labels report the number of funds for "All Funds" and "Survivors Only", respectively. Past performance is no guarantee of future results. It is not possible to invest directly in an index. Data provided by the CRSP Survivor-Bias-Free US Mutual Fund Database, University of Chicago.

See "Appendix: Standardized Performance Data and Disclosures" for how to obtain complete information on performance, investment objectives, risks, advisory fees, and expenses of Dimensional's funds.

Including all funds, the distribution of families is shifted downward: Fewer families attain majority outperformance when the survivor bias is removed. Whereas about 1 in 5 families has an outperformance rate greater than 50% for its surviving funds, that portion falls to 1 in 7 when non-surviving funds are included. The disparity is even higher at larger winning percentages; of the four fund families that can claim over 80% of their surviving funds beat their benchmarks, only two, comprising 34 of the 2,370 funds in the sample, can still make that claim on a survivorship bias-free basis.

Exhibit 6
Family Outperformance Rates, *January 2004–December 2013*



Cumulative returns over a 10-year horizon are computed for each fund and its benchmark. The percentage of funds outperforming their benchmarks is computed for each fund family, and the vertical axis in the exhibit reports the portion of families with outperformance rates at each level indicated on the horizontal axis. "All Funds" outperformance rate is the number of a family's funds with a higher cumulative return than the benchmark divided by the total number in the family at the start of the period. "Survivors Only" outperformance rate is the number of a family's funds that survived the full period and have a higher return than the benchmark divided by the number in the family that survived. Families with fewer than five funds are excluded. Only funds with a valid CRSP identifier for management company are included. Sample includes 154 families and 2,370 funds. Past performance is no guarantee of future results. It is not possible to invest directly in an index. Data provided by the CRSP Survivor-Bias-Free US Mutual Fund Database, University of Chicago.

LESSONS LEARNED

There are a few key points investors can take from this analysis. The first is that, despite vast industry growth, a significant number of mutual funds are closed every year. In addition, these non-surviving funds are often poor performers, and neglecting their underperformance imparts bias in fund rankings. Consequently, investors should take caution in interpreting mutual fund performance metrics that consist only of funds currently available.

Juxtaposed with industrywide attrition, nearly all mutual funds launched by Dimensional remain available today. This longevity reflects well on Dimensional's goal to provide clients with a better investment experience. Our relationships with clients enable us to understand their needs and provide solutions designed to help them achieve their investment goals. By focusing on the tradeoffs that matter for returns, Dimensional has delivered benchmark-beating returns in a wide variety of asset classes. Of the 27 funds with 15 or more years of live performance history as of September 2014, 23 have beaten their benchmarks in cumulative returns since the first full month following inception.

Past performance is no guarantee of future results.

Exhibit 7
Dimensional Portfolios with 15+ Years of Performance
Annualized returns for the first full month[7] through 9/30/2014

US Equity	Fund(%)	Benchmark(%)
US Micro Cap, since 1/82	12.11	10.40
Small Cap, since 4/92	10.78	9.29
US Large Cap Value, since 3/93	10.45	9.88
US Small Cap Value, since 4/93	12.35	10.23
Non-US Equity	**Fund(%)**	**Benchmark(%)**
Intl Small Company, since 10/96	7.14	4.04
Intl Small Cap Value, since 1/95	7.90	3.90
Intl Value, since 3/94	6.84	5.30
Emerging Mkts. Small Cap, since 4/98	12.62	8.00
Emerging Mkts. Value, since 5/98	12.03	8.12
Emerging Mkts., since 5/94	7.59	6.32
Fixed Income	**Fund(%)**	**Benchmark(%)**
One-Year Fixed, since 8/83	5.05	4.97
Intermediate Govt., since 11/90	6.66	6.19
Five-Year Global, since 12/90	5.71	5.07

Performance data shown represents past performance and is no guarantee of future results. Current performance may be higher or lower than the performance shown. The investment return and principal value of an investment will fluctuate so that an investor's shares, when redeemed, may be worth more or less than their original cost. To obtain the most current month-end performance data, visit www.dimensional.com.

REFERENCES

1. Center for Research in Security Prices, University of Chicago.

2. The CRSP variables for class group and portfolio are crsp_cl_grp and crsp_portno, respectively.

3. Certain funds that are difficult to match to appropriate benchmarks are excluded. Equity funds with a narrow investment objective, such as sectors and real estate, are excluded. For fixed income, money market funds and funds invested primarily in municipal bonds or asset-backed securities are excluded. In addition, funds are excluded prior to reaching $5 million USD in assets.

4. This could include funds that fail to report to the database.

5. Brown, S. J., and W. N. Goetzmann. 1995. "Performance persistence." *Journal of Finance* 50: 679-698.

6. Evans, R. B. 2004. "Does alpha really matter? Evidence from mutual fund incubation, termination, and manager change." Working paper, University of Pennsylvania.

7. Returns are annualized from the first full month and reflect compound returns and assume reinvestment of dividends and other earnings. Benchmark information available in the appendix. See "Track Record Portfolios and Benchmarks" and "Standardized Performance Data and Disclosures" pages in the Appendix.

See "Appendix: Standardized Performance Data and Disclosures" for how to obtain complete information on performance, investment objectives, risks, advisory fees, and expenses of Dimensional's funds.