Does Industry Timing Ability of Hedge Funds Predict Their Future Performance, Survival, and Fund Flows?

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Online Appendix

To save space in the paper, we present some of our findings in the Online Appendix. Section 1 describes the TASS hedge fund database and provides summary statistics on hedge fund returns, assets under management (AUM), and key fund characteristics. Section 2 explains how we handle data bias issues, including survivorship bias, backfill bias, and multi-period sampling bias in this study. Section 3 explains the risk factors utilized in estimating the risk-adjusted returns of hedge fund portfolios generated by sorting hedge funds based on their manufacturing industry timing coefficients. Section 4 discusses results from replicating the key empirical tests on manufacturing industry timing ability and its predictive power on future returns for the mutual fund sample.

Table I provides summary statistics on hedge fund numbers, returns, assets under management (AUM), and certain fund characteristics for the sample of 11,987 hedge funds during the sample period January 1994 – September 2018. Table II lists the names, abbreviations, and details of the 12-industry classifications and provides descriptive statistics on the value-weighted industry returns. Table III reports average fund characteristics of hedge funds for each of the ten timing deciles generated based on funds' manufacturing industry-timing coefficients. Table IV reports the average monthly raw return and nine-factor alpha differences between best manufacturing industry-timing funds and worst manufacturing industry-timing funds during the two subsample periods before and after the 2008 world financial crisis. Table V reports results from univariate portfolio tests as well as univariate and multivariate Fama-MacBeth regressions using manufacturing industry timing coefficients generated from Eq. (2) while controlling for Fung-Hsieh risk factors at the same time. Table VI shows results from univariate portfolio tests as well as univariate and multivariate Fama-MacBeth regressions using manufacturing industry timing coefficients generated from Henriksson-Merton timing model. Table VII presents results from univariate portfolios of hedge funds sorted by manufacturing industry timing coefficients generated by utilizing unsmoothed hedge fund returns. Table VIII reports results from the persistency analysis of manufacturing industry-timing betas with a portfolio transition matrix. Table IX shows results from tests that analyze the relationship between manufacturing industry-timing coefficients, future fund flows, and future fund survival. Table X presents results from the univariate portfolios of mutual funds sorted into deciles based on their manufacturing industry timing coefficients and reports, for each decile, mutual funds' average return sensitivity (beta) to the absolute value of the earnings surprises in the manufacturing industry as well as those deciles' next-month raw and risk-adjusted returns.

1. Hedge Fund Database

This study uses monthly hedge fund data from the Lipper Trading Advisor Selection System (TASS) database. In the database, we initially have information on 22,406 defunct and live hedge funds. However, among these 22,406 funds, many are listed multiple times since funds tend to report returns in different currencies, such as the US dollar, euro, British pound, Japanese yen, and Swiss franc. Many of these funds are essentially not separate funds but a single fund with returns reported on a currency-converted basis. However, the TASS database assigns a separate fund reference number to each of these funds reporting in different currencies, treating these funds as separate individual funds. In order to avoid duplicate funds, we first omit all non-US dollar-based hedge funds from our sample. After removing all non-US dollar-based hedge funds from the database, we end up with 11,987 distinct hedge funds.

Table I of this Online Appendix provides summary statistics on hedge fund numbers, returns, assets under management (AUM), and certain fund characteristics for this sample of 11,987 hedge funds during the sample period January 1994 – September 2018. For each year, Panel A of Table I reports the number of funds entering the database, the number of funds dissolved, total AUM at the end of each year (in billions of dollars), and the mean, median, standard deviation, minimum, and maximum monthly percentage returns on the equal-weighted hedge fund portfolio. A closer look at Panel A of Table I reveals a sharp reversal in the growth of hedge funds both in numbers and AUM since the end of 2007, the starting point of the last worldwide financial crisis. The AUM in our database increased exponentially from a small $54 billion in 1994 to $976 billion in 2007 and the number of operating hedge funds increased more than eight times to 5,345 in December 2007, from 635 in January 1994. However, both these figures reversed course beginning in 2008, the start of the worldwide financial crisis; the number of operating hedge funds fell sharply below 2,000, while total AUM dropped dramatically to $378 billion by September 2018. Furthermore, the yearly attrition rates in Panel A of Table I (ratio of the number of dissolved funds to the total number of funds at the beginning of the year) paints a similar picture: From 1994 to 2007, on average, the annual attrition rate in the database was only 8.8%; however, this annual figure more than doubled to 19.9% between 2008 and 2018. These statistics simply reflect the severity of the financial crisis for hedge funds during the past decade. In 2008, 2011, and 2018 alone, for example, hedge funds, on average, lost 1.57%, 0.40%, and 0.44% (return) per month, respectively.

The TASS database, in addition to reporting monthly returns (net of fees) and monthly assets under management (AUM), provides information on certain fund characteristics, including management fees, incentive fees, redemption periods, minimum investment amounts, and lockup and leverage provisions. Panel B of Table I of this Online Appendix reports the cross-sectional

mean, median, standard deviation, minimum, and maximum values for these hedge fund characteristics for the period January 1994 to September 2018. One interesting point evident in Panel B is the short lifespan of hedge funds. The median age (number of months in existence since inception) is only 61 months (or about five years). This short lifespan is mostly due to the fact that hedge fund managers must first cover all losses from previous years before getting paid in the current year. This forces hedge fund managers to dissolve quickly and form new hedge funds after a bad year instead of trying to cover losses in subsequent years. Another noteworthy observation that can be detected from this panel is the large size disparity among hedge funds. When we measure fund size as average monthly AUM over the life of the fund, we see that the average hedge fund size is $90.4 million, while the median hedge fund size is only $40.0 million. This indicates that only a few hedge funds have very large AUM in our database, which reflects true hedge fund industry standards.

2. Hedge Fund Data Biases

Hedge fund studies can be subject to potential data bias issues. Brown, Goetzmann, Ibbotson, and Ross (1992), Fung and Hsieh (2000), and Liang (2000) cover these well-known data bias problems extensively in the hedge fund literature. The first potential data bias in a hedge fund study is the survivorship bias if the database does not include the returns of non-surviving hedge funds. In our study, for the period January 1994 to September 2018, we have the monthly return histories of 2,001 funds in the live funds (survivor) database and 9,986 funds in the graveyard (defunct) database. We estimate that if the returns of non-surviving hedge funds (graveyard database) had been excluded from the analyses, there would have been a survivorship bias of 1.02% in average annual hedge fund returns. This is the difference between the annualized average return of only surviving funds in the sample and the annualized average return of all surviving and non-surviving funds in the sample. However, the fact that we also use the returns of defunct funds in our analyses removes any potential concerns about the effect of survivorship bias on our main findings.

Another important data bias in hedge fund studies is called the backfill bias. Once a hedge fund is included in a database, that fund's previous returns are automatically added to that database as well (a process called "back-filling"). This practice, however, in the hedge fund industry is problematic, because it generates an incentive only for successful hedge funds to report their initial returns to the database vendor and, as a result, it can generate an upward bias in the returns of newly reporting hedge funds during their early histories. In the TASS database we have information on when a hedge fund is added to the database as well as the fund's first reported performance date. In our sample, the median gap between the first performance date and the date

the fund is added to the database is 18 months, with the latter coming 18 months after the former. We check whether this 18-month gap generates a difference in returns between funds' first 18-month performance vs. the rest of period performance (the rest of period performance starts from the 19th month until either the fund is deceased or until the end of our sample September 2018). We find that the cross-sectional average of the funds' time-series monthly return average during the first 18 months of existence is 1.41% per month higher than the cross-sectional average of the funds' time-series monthly return average in the subsequent period. Thus, in order to avoid backfill bias in our analyses, we delete the first 18-month return histories of all individual hedge funds in our database.[1] Correcting for backfill bias results in an average 2.33% per annum lower returns for hedge funds during our sample period January 1994 – September 2018.[2]

The last possible data bias in a hedge fund study is called the multi-period sampling bias (look-ahead bias). Investors generally ask for a minimum of 24 months of return history before making a decision whether to invest in a hedge fund or not. Therefore, in a hedge fund study, the inclusion of hedge funds with return histories shorter than 24 months would be misleading to those investors who seek past performance data to make future investment decisions. In addition, a minimum 24-month return history requirement makes sense from a statistical perspective to be able to run regressions and obtain sensible estimates of alphas and hedge fund timing coefficients. Thus, we require all hedge funds in the sample to have at least 24 months of return history. This 24-month minimum return history requirement, however, decreases our sample size from 10,556 to 7,902 funds (i.e., 2,654 funds in the sample have return histories of less than 24 months). There is a slight chance of introducing a new survivorship bias into our database due to the deletion of these 2,654 hedge funds (funds that had return histories of less than 24 months most probably dissolved due to bad performance). In an effort to find the impact of these deleted 2,654 hedge funds on total hedge fund performance, we compare the performance of hedge funds *before* and *after* the 24-month return history requirement. We find that the annual average return of hedge funds after the 24-month return history requirement (7,902 funds) is only 0.36% higher than the annual average return of hedge funds before the return history requirement (10,556 funds). This

[1] Deleting the first 18-month returns results in deleting 1,431 funds from our sample because they have return histories less than 18 months, bringing the total number of hedge funds in our database to 10,556 from 11,987.

[2] To control for the effect of backfill bias on our main results, we also consider an alternative approach by deleting all the returns of hedge funds prior to their listing dates in TASS (i.e., the date the fund is added to the TASS database). We find that correcting for the backfill bias in this format does not alter our main finding of a significant positive relation between manufacturing industry-timing coefficients and future fund returns. This suggests that our results are not sensitive to how we correct the backfill bias in our sample.

difference between the two samples is a small, insignificant percentage in terms of survivorship bias considerations.[3,4]

3. Risk Factors

We rely on the widely accepted standard nine hedge fund risk factors when computing the risk-adjusted returns of hedge fund portfolios generated by sorting hedge funds based on their manufacturing industry timing coefficients. In other words, we use the market, size, book-to-market, and momentum factors of Fama and French (1993) and Carhart (1997), two bond factors of Fama and French (1993), and three trend-following factors of Fung and Hsieh (2001) in estimating nine-factor alphas of hedge fund portfolios. Specifically, the nine risk factors include: 1) MKT: Excess return on the value-weighted NYSE/AMEX/NASDAQ (CRSP) equity market index over the risk-free rate (one-month T-bill rate); 2) SMB: Fama-French (1993) size factor defined as the return of a zero-cost long-short size-based portfolio that is long stocks with low market capitalization and short stocks with high market capitalization; 3) HML: Fama-French (1993) book-to-market factor defined as the return of a zero-cost long-short book-to-market ratio-based portfolio that is long stocks with high book-to-market ratios and short stocks with low book-to-market ratios; 4) MOM: Carhart (1997) momentum factor defined as the return of a portfolio that is long stocks with high momentum and short stocks with low momentum; 5) DEF: Fama and French (1993) default risk factor defined as the spread between long term corporate bond returns and long-term government bond returns; 6) TERM: Fama and French (1993) term premium risk factor defined as the spread between long-term government bond returns and the risk-free rate; 7) BDTF: Fung-Hsieh (2001) bond trend-following factor measured as the return of PTFS (Primitive Trend-Following Strategy) Bond Lookback Straddle; 8) FXTF: Fung-Hsieh (2001) currency trend-following factor measured as the return of PTFS Currency Lookback Straddle; and 9) CMTF: Fung-Hsieh (2001) commodity trend-following factor measured as the return of PTFS Commodity Lookback Straddle.[5]

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[3] This figure is similar to estimates from earlier studies. Fung and Hsieh (2000), for example, impose a 36-month return history requirement and find a survivorship bias estimate of 0.60%.

[4] In order to analyze the impact of look-ahead bias on our main findings, in a separate analysis, we adjust hedge fund returns to correct for the look-ahead bias by employing the methodology utilized in Baquero, ter Horst, and Verbeek (2005) and Chen and Liang (2007). Using the look-ahead bias adjusted hedge fund returns, we generate manufacturing industry-timing coefficients on a 24-month rolling window basis and test the predictive power of these new set of manufacturing industry-timing coefficients over future hedge fund returns. Both univariate portfolio and multivariate Fama-MacBeth regression results indicate that the positive and significant cross-sectional relation between manufacturing industry-timing betas and future hedge fund returns remains intact (with almost no change from original results) after correcting for the look-ahead bias.

[5] The four equity factors MKT, SMB, HML, and MOM are obtained from the online data library of Kenneth French: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. The three trend-following factors BDTF, FXTF, and CMTF are provided by David Hsieh at http://faculty.fuqua.duke.edu/~dah7/HFRFData.htm. The two bond factors DEF and TERM are provided by Amit Goyal at http://www.hec.unil.ch/agoyal/.

4. Testing Manufacturing Industry Timing Ability of Mutual Funds

In this section, we test whether the positive and significant link between manufacturing industry timing coefficients and future performance holds for the sample of mutual funds as well. Although hedge funds differ from mutual funds significantly in terms of their trading strategies including their usage of leverage, derivatives and short-selling, their flexibility in taking concentrated positions, their much faster turnover statistics, and their incentive fee structures, a specific characteristic of the manufacturing industry that hedge funds capitalize on might be known to some mutual funds as well. This in turn might enable those mutual funds to time the manufacturing industry specific returns and generate superior returns in the future. For this, we replicate our key empirical tests for the mutual funds sample. Specifically, we investigate if mutual fund managers also pay particular attention to earnings news in the manufacturing industry and whether mutual funds' timing ability of manufacturing industry specific news results in superior future mutual fund performance. For these tests, we use monthly returns of mutual funds from the CRSP Survivor-Bias-Free US Mutual Fund Database. We include in our sample only domestic equity mutual funds with investment objectives of aggressive growth, growth, growth-and-income, and income. For funds with multiple share classes, we aggregate the total net assets (TNAs) of individual share classes and calculate the fund-level returns as the TNA-weighted average across different share classes of the same fund.

We first generate the monthly time-series estimates of the manufacturing industry timing coefficients of mutual funds during the sample period January 1996 – September 2018 and replicate our main analysis in Tables 2 and 6 of the main manuscript for the mutual fund sample. Table X of this Online Appendix presents results from the univariate portfolios of mutual funds sorted into deciles based on their manufacturing industry timing coefficients and reports, for each decile, mutual funds' average return sensitivity (beta) to the absolute value of the earnings surprises in the manufacturing industry as well as those deciles' next-month raw and risk-adjusted returns. Table X of this Online Appendix shows that among best-timing and worst-timing mutual funds, there is no statistical difference in mutual funds' return sensitivity to the absolute value of the earnings surprises in the manufacturing industry. Moreover, the average return and Fama-French-Carhart four-factor alpha spreads provide no evidence of a significant link between mutual funds' manufacturing industry timing coefficients and their future performance.[6] We believe these results are due to mutual funds' inability to capitalize on the information disseminated by earnings surprises due to the concentration limitations and/or short-selling restrictions that mutual funds face in their portfolio holdings. In fact, when we analyze portfolio holdings data of hedge funds

[6] Similarly, there is no significant relation between mutual funds' industry timing coefficients and their future fund flows and survival.

against all other institutions in the 13F database, we find that the magnitudes of the average buy and sell trades of non-hedge funds are half the size of hedge funds' average buy and sell trades (relative to their respective equity portfolio sizes). These significantly smaller concentrated positions of non-hedge funds in the manufacturing industry compared to hedge funds could perhaps explain to some extent our finding why mutual funds are unable to time the manufacturing industry returns as well as hedge funds. Overall, the results highlight stronger industry-timing ability for hedge fund managers compared to mutual fund managers.

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Table I. Descriptive Statistics of Hedge Funds

There are total of 11,987 USD denominated hedge funds that reported monthly returns to TASS during the sample period January 1994 – September 2018. Panel A reports the number of hedge funds, total assets under management (AUM) at the end of each year by all hedge funds (in billion $s), and the mean, median, standard deviation, minimum, and maximum monthly returns on the equal-weighted hedge fund portfolio. Panel B reports the cross-sectional mean, median, standard deviation, minimum, and maximum statistics for hedge fund characteristics including returns, size, age, management fee, incentive fee, redemption period, and minimum investment amount.

Panel A: Summary Statistics Year by Year

						Equal-Weighted Hedge Fund Portfolio Monthly Returns (%)				
Year	Year Start	Entries	Dissolved	Year End	Total AUM (billion $s)	Mean	Median	Std. Dev.	Minimum	Maximum
1994	635	245	20	860	54.4	0.02	0.18	1.22	-1.82	1.90
1995	860	291	40	1,111	67.3	1.41	1.72	1.04	-0.74	2.36
1996	1,111	345	81	1,375	90.2	1.68	1.87	1.32	-1.74	3.48
1997	1,375	381	89	1,667	133.9	1.49	1.38	1.97	-1.45	4.54
1998	1,667	417	146	1,938	142.3	0.59	0.73	2.71	-6.41	3.76
1999	1,938	474	154	2,258	178.9	3.63	2.30	5.34	-0.58	8.14
2000	2,258	500	209	2,549	199.7	0.94	0.60	2.60	-2.11	6.36
2001	2,549	658	233	2,974	251.8	0.67	0.96	1.48	-2.05	3.20
2002	2,974	760	294	3,440	295.6	0.35	0.54	1.03	-1.60	1.97
2003	3,440	821	274	3,987	421.0	1.71	1.63	0.92	0.15	3.28
2004	3,987	951	336	4,602	587.4	1.37	1.44	1.42	-0.78	4.03
2005	4,602	1,027	562	5,067	661.7	1.25	1.44	1.91	-1.44	4.31
2006	5,067	891	635	5,323	803.4	1.26	1.42	1.62	-1.73	4.07
2007	5,323	850	828	5,345	975.5	1.17	1.07	1.68	-1.58	4.26
2008	5,345	699	1,307	4,737	654.3	-1.57	-1.76	2.98	-6.85	3.42
2009	4,737	651	906	4,482	572.1	2.10	1.48	2.01	-0.98	5.97
2010	4,482	488	766	4,204	538.2	0.78	0.93	1.73	-2.97	3.11
2011	4,204	434	820	3,818	513.9	-0.40	-0.21	1.84	-3.76	2.48
2012	3,818	389	815	3,392	501.5	0.66	0.68	1.39	-2.52	2.62
2013	3,392	372	737	3,027	488.6	0.97	1.21	1.09	-1.54	2.75
2014	3,027	301	568	2,760	481.4	0.21	-0.26	0.81	-0.66	1.61
2015	2,760	261	554	2,467	422.1	0.07	0.16	1.29	-2.21	1.92
2016	2,467	307	435	2,339	402.9	0.42	0.52	1.22	-2.68	2.04
2017	2,339	251	462	2,128	406.2	0.77	0.69	0.34	0.23	1.25
2018	2,128	219	413	1,934	377.8	-0.44	-0.48	1.30	-2.84	2.27

Table I (continued)

Panel B: Cross-Sectional Statistics of Hedge Fund Characteristics: January 1994 – September 2018

	N	Mean	Median	Std. Dev.	Minimum	Maximum
Average Monthly Return over the life of the Fund (%)	11,987	0.52	0.47	1.63	-19.57	25.82
Average Monthly AUM over the life of the Fund (million $)	11,987	90.4	40.0	265.5	0.5	11,677.3
Age of the Fund (# of months in existence)	11,987	77.3	61.0	60.3	1.0	297.0
Management Fee (%)	11,987	1.29	1.50	0.70	0.00	10.00
Incentive Fee (%)	11,987	13.27	20.00	8.80	0.00	50.00
Redemption Period (# of days)	11,987	33.8	30.0	33.6	0.0	365.0
Minimum Investment Amount (million $)	11,987	1.38	0.25	15.06	0.00	1,000.00

Table II. Definitions and Descriptive Statistics of Fama-French 12 Industries

Panel A lists names, abbreviations, and definitions of the 12 Fama-French industries utilized in this study. Generated on a 24-month rolling window basis, Panel B provides average values of the mean, standard deviation, minimum, and maximum statistics of the value-weighted monthly industry returns. In Panel C the average correlations between the value-weighted monthly industry returns generated on a 24-month rolling window basis are reported to the left of the diagonal in the correlation matrix and the average correlations between the industry residual returns generated on a 24-month rolling window basis are reported to the right of the diagonal in the correlation matrix.

Panel A: Industry definitions

Ind1 - NDRB	Consumer Non-Durables -- Food, Tobacco, Textiles	Ind7 - TLC	Telecom -- Telephone and Television Transmission
Ind2 - DRB	Consumer Durables -- TV's, Furniture, Appliances	Ind8 - UTIL	Utilities
Ind3 - MNF	Manufacturing -- Machinery, Trucks, Planes, Cars	Ind9 - SHP	Shops -- Wholesale and Retail Shops
Ind4 - ENRG	Energy -- Oil, Gas, and Coal Extraction and Products	Ind10 - HLTH	Healthcare -- Medical Equipment and Drugs
Ind5 - CHE	Chemicals	Ind11 - FIN	Finance
Ind6 - TECH	Business Equipment -- Computers, Software, Elect. Equip.	Ind12 - OTH	Other -- Mines, Construction, Transportation, Entertainment

Panel B: Descriptive statistics for value-weighted industry returns: January 1994 – September 2018

	Mkt	NDRB	DRB	MNF	ENRG	CHE	TECH	TLC	UTIL	SHP	HLTH	FIN	OTH
Mean	0.86%	0.95%	0.76%	1.08%	0.94%	0.89%	1.13%	0.71%	0.85%	0.95%	1.02%	0.93%	0.67%
Std. Dev.	4.07%	3.43%	6.52%	5.08%	5.55%	3.99%	6.53%	4.79%	3.92%	4.25%	4.03%	5.17%	4.60%
Min	-8.18%	-6.67%	-13.42%	-10.09%	-9.95%	-7.61%	-11.71%	-9.20%	-7.56%	-8.47%	-7.61%	-10.39%	-9.71%
Max	7.52%	6.78%	14.68%	10.63%	12.06%	8.47%	12.48%	10.17%	7.55%	8.87%	8.16%	10.65%	9.25%

Panel C: Correlations between value-weighted industry returns and industry residual returns: January 1994 – September 2018

	Mkt	NDRB	DRB	MNF	ENRG	CHE	TECH	TLC	UTIL	SHP	HLTH	FIN	OTH
Mkt	**1.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NDRB	0.67	**1.00**	-0.19	-0.13	-0.07	0.34	-0.34	0.15	0.35	0.12	0.23	0.00	-0.12
DRB	0.78	0.48	**1.00**	0.42	-0.01	0.08	-0.11	-0.11	-0.18	0.18	-0.26	0.15	0.23
MNF	0.90	0.60	0.82	**1.00**	0.26	0.33	-0.17	-0.17	-0.11	0.02	-0.33	-0.07	0.31
ENRG	0.59	0.41	0.49	0.63	**1.00**	0.12	-0.25	-0.10	0.30	-0.27	-0.24	-0.16	0.01
CHE	0.78	0.71	0.67	0.80	0.55	**1.00**	-0.30	-0.13	0.07	0.01	0.04	0.01	0.11
TECH	0.87	0.48	0.65	0.75	0.42	0.59	**1.00**	-0.14	-0.32	-0.11	-0.21	-0.44	-0.17
TLC	0.79	0.62	0.59	0.66	0.42	0.56	0.63	**1.00**	0.13	-0.02	0.04	-0.13	0.00
UTIL	0.39	0.54	0.25	0.32	0.47	0.39	0.21	0.39	**1.00**	-0.15	0.15	-0.11	-0.09
SHP	0.82	0.62	0.71	0.76	0.39	0.67	0.69	0.65	0.26	**1.00**	-0.10	0.01	0.13
HLTH	0.69	0.62	0.46	0.54	0.33	0.60	0.53	0.57	0.40	0.53	**1.00**	-0.06	-0.20
FIN	0.83	0.61	0.72	0.75	0.46	0.69	0.61	0.63	0.33	0.71	0.59	**1.00**	0.02
OTH	0.91	0.59	0.78	0.88	0.56	0.74	0.77	0.72	0.33	0.79	0.58	0.77	**1.00**

Table III. Fund Characteristics of Hedge Funds sorted on Manufacturing Industry Timing Coefficients

Decile portfolios are formed every month from January 1996 to September 2018 by sorting hedge funds based on their manufacturing industry timing coefficients. Decile 1 is the portfolio of hedge funds with the lowest industry timing coefficients (worst-timing funds) and decile 10 is the portfolio of hedge funds with the highest industry timing coefficients (best-timing funds). This table reports the average fund characteristics of hedge funds for each of the ten deciles. ALPHA is the 9-factor alpha estimated over the past 24 months, LAG_RET is the one-month lagged hedge fund returns; STDEV is the standard deviation of monthly hedge fund returns over the past 24 months; SIZE is measured as the average monthly assets under management (AUM) in millions of dollars; AGE is measured as the number of months in existence since inception; MGMTFEE is a fixed percentage fee of assets under management; INCENTFEE is a fixed percentage fee of the fund's annual net profits above a designated hurdle rate; REDEMP is the minimum number of days an investor needs to notify a hedge fund before the investor can redeem the invested amount from the fund; MIN_INVEST is the minimum initial investment amount (measured in millions of dollars in the regression) that the fund requires from its investors to invest in a fund; D_LOCKUP is the dummy variable for lockup provisions (1 if the fund requires investors not to withdraw initial investments for a pre-specified term, 0 otherwise); D_LEVER is the dummy variable for leverage (1 if the fund uses leverage, 0 otherwise).

Decile	MNF Tmg Beta	Alpha	Lag_Ret	Stdev	Size	Age	Mgmt Fee	Incent Fee	Redemp	Min_Invest	D_Lockup	D_Lever	# of HFs
1	-0.428	0.08	0.19	5.64	135.4	95.8	1.43	16.79	34.60	0.85	0.24	0.58	182.0
2	-0.185	0.14	0.41	3.40	153.4	97.7	1.43	15.49	37.75	1.21	0.23	0.57	182.9
3	-0.112	0.16	0.41	2.57	170.9	100.0	1.39	14.08	41.33	1.26	0.23	0.55	183.1
4	-0.069	0.18	0.50	2.23	174.6	100.1	1.38	13.14	43.24	1.42	0.23	0.52	183.0
5	-0.038	0.20	0.52	2.08	176.9	100.4	1.36	12.72	44.01	1.42	0.22	0.51	183.2
6	-0.011	0.22	0.52	2.10	172.6	101.1	1.37	12.90	44.15	1.41	0.22	0.51	183.3
7	0.020	0.27	0.58	2.28	163.6	98.8	1.37	13.66	43.35	1.40	0.23	0.53	183.3
8	0.060	0.28	0.66	2.69	161.0	100.8	1.37	15.03	42.33	1.20	0.24	0.55	183.2
9	0.126	0.29	0.83	3.56	142.0	99.0	1.37	16.00	39.05	0.98	0.26	0.56	183.3
10	0.342	0.33	1.12	5.92	124.7	97.9	1.39	17.25	37.12	0.85	0.26	0.61	182.8

Table IV. Subsample Portfolio Amalysis

Decile portfolios are formed every month from January 1996 to September 2018 by sorting hedge funds based on their manufacturing industry timing coefficients. Decile 1 is the portfolio of hedge funds with the lowest industry timing coefficients (worst-timing funds) and decile 10 is the portfolio of hedge funds with the highest industry timing coefficients (best-timing funds). The table reports the one-month-ahead average raw returns and 9-factor alphas for each decile in two different subsamples. The full sample is divided into half using world financial crisis of 2008 as the cut-off point in between the two samples. The last row shows the average monthly raw return and 9-factor alpha differences between Decile 10 and Decile 1 for both of the subsamples. Average returns and alphas are defined in monthly percentage terms. Newey-West adjusted *t*-statistics are given in parentheses. Numbers in bold denote statistical significance of the return and alpha differences between Decile 10 and Decile 1.

	Panel A: 1996:01 – 2008:12		*Panel B: 2009:01 – 2018:09*	
	Next-month Raw Returns (%)	Next-month 9-factor Alphas (%)	Next-month Raw Returns (%)	Next-month 9-factor Alphas (%)
Low	0.40 (1.05)	-0.21 (-0.78)	0.23 (0.90)	-0.30 (-1.62)
2	0.49 (1.90)	-0.06 (-0.35)	0.33 (2.07)	-0.18 (-1.36)
3	0.59 (2.86)	0.09 (0.78)	0.32 (2.40)	-0.10 (-1.03)
4	0.59 (3.32)	0.12 (1.20)	0.35 (3.01)	0.01 (0.18)
5	0.63 (3.69)	0.14 (1.47)	0.37 (3.48)	0.07 (1.11)
6	0.64 (4.01)	0.19 (2.25)	0.41 (3.80)	0.11 (1.78)
7	0.62 (3.65)	0.18 (1.90)	0.48 (4.17)	0.17 (2.81)
8	0.64 (3.54)	0.22 (2.20)	0.57 (4.07)	0.25 (3.25)
9	0.83 (3.54)	0.35 (2.70)	0.68 (3.38)	0.25 (2.09)
10	1.01 (3.14)	0.52 (2.33)	0.88 (3.06)	0.55 (2.20)
High – Low	**0.62** **(2.05)**	**0.72** **(2.16)**	**0.65** **(2.37)**	**0.85** **(2.63)**

Table V. Manufacturing Industry-timing Coefficients generated by controlling Fung-Hsieh Risk Factors

In Panel A, decile portfolios are formed every month from January 1996 to September 2018 by sorting hedge funds based on their manufacturing industry-timing coefficients generated by controlling Fung and Hsieh (2001), (2004) risk factors. Decile 1 (10) is the portfolio of hedge funds with the lowest (highest) industry-timing coefficients. The table reports the one-month-ahead average raw returns and 9-factor alphas for each decile. The last row shows the average monthly raw return and 9-factor alpha differences between Decile 10 and Decile 1. Average returns and alphas are defined in monthly percentage terms. Panel B reports average slope coefficients from multivariate Fama-MacBeth regressions where all timing coefficients in the regression are generated from 24-month rolling window multivariate regressions controlling for Fung-Hsieh risk factors. Newey-West adjusted *t*-statistics are given in parentheses. Numbers in bold denote statistical significance.

Panel A: Univariate Portfolios sorted on Manufacturing Industry-timing Coefficients generated by controlling Fung-Hsieh Risk Factors

	Next-month Raw Returns (%)	Next-month 9-factor Alphas (%)
Low	0.42	-0.16
	(2.23)	(-1.01)
2	0.51	0.02
	(4.03)	(0.23)
3	0.53	0.11
	(5.13)	(1.51)
4	0.47	0.09
	(5.24)	(1.30)
5	0.43	0.05
	(4.93)	(0.74)
6	0.50	0.13
	(5.75)	(2.09)
7	0.51	0.15
	(5.82)	(2.62)
8	0.57	0.18
	(5.66)	(2.89)
9	0.67	0.27
	(5.21)	(3.20)
High	0.94	0.47
	(4.58)	(3.03)
High – Low	**0.52**	**0.63**
	(2.51)	**(2.63)**

Panel B: Univariate & Multivariate Fama-MacBeth Regressions using Manufacturing Industry-timing Coefficients generated by controlling Fung-Hsieh Risk Factors

Model	MNF Tmg Beta	Alpha	Stdev	Size	Age	Mgmt Fee	Incent Fee	Redemp	Min_ Invest	D_Lockup	D_Lever	MKT Tmg	LIQ Tmg	VOL Tmg
(1)	**0.149**													
	(2.38)													
(2)	**0.178**	**0.192**	**0.046**	0.024	-0.022	0.011	**0.004**	**0.002**	**0.005**	**0.067**	-0.011	0.002	**0.014**	**-0.020**
	(2.83)	**(5.08)**	**(1.76)**	(1.63)	(-0.74)	(0.46)	**(2.06)**	**(3.48)**	**(4.34)**	**(2.04)**	(-0.50)	(0.22)	**(1.76)**	**(-2.07)**

Table VI. Manufacturing Industry-timing Coefficients generated from Henriksson-Merton Model

In Panel A, decile portfolios are formed every month from January 1996 to September 2018 by sorting hedge funds based on their manufacturing industry-timing coefficients generated from Henriksson-Merton (1981) timing model. Decile 1 (Decile 10) is the portfolio of hedge funds with the lowest (highest) industry-timing coefficients. The table reports the one-month-ahead average raw returns and 9-factor alphas for each decile. The last row shows the average monthly raw return and 9-factor alpha differences between Decile 10 and Decile 1. Average returns and alphas are defined in monthly percentage terms. Panel B reports average slope coefficients from multivariate Fama-MacBeth regressions using manufacturing industry-timing coefficients generated from Henriksson-Merton model where all timing coefficients in the regression are generated separately from 24-month rolling window univariate regressions.Newey-West adjusted *t*-statistics are given in parentheses. Numbers in bold denote statistical significance.

Panel A: Univariate Portfolios sorted on Manufacturing Industry-timing Coefficients generated from Henriksson-Merton Model

	Next-month Raw Returns (%)	Next-month 9-factor Alphas (%)
Low	0.41	-0.14
	(1.77)	(-0.68)
2	0.42	-0.05
	(2.60)	(-0.42)
3	0.47	0.05
	(3.53)	(0.46)
4	0.54	0.15
	(4.70)	(1.81)
5	0.52	0.13
	(4.74)	(1.71)
6	0.50	0.11
	(4.66)	(1.50)
7	0.57	0.18
	(5.06)	(2.55)
8	0.59	0.20
	(4.85)	(2.72)
9	0.71	0.25
	(4.59)	(2.64)
High	0.93	0.44
	(4.09)	(2.41)
High – Low	**0.52**	**0.58**
	(2.24)	**(2.13)**

Panel B: Univariate & Multivariate Fama-MacBeth Regressions using Manufacturing Industry-timing Coefficients generated from Henriksson-Merton Model

Model	MNF Tmg Beta	Alpha	Stdev	Size	Age	Mgmt Fee	Incent Fee	Redemp	Min_ Invest	D_Lockup	D_Lever	MKT Tmg	LIQ Tmg	VOL Tmg
(1)	**0.154**													
	(2.21)													
(2)	**0.193**	**0.204**	**0.043**	0.020	0.001	0.015	**0.004**	**0.002**	**0.004**	**0.061**	0.006	0.004	**0.016**	**-0.019**
	(2.51)	**(5.91)**	**(1.77)**	(1.42)	(0.02)	(0.63)	**(2.24)**	**(3.42)**	**(4.23)**	**(1.99)**	(0.30)	(0.27)	**(1.82)**	**(-1.91)**

Table VII. Univariate Portfolios of Hedge Funds sorted on Manufacturing Industry-timing Coefficients generated from Unsmoothed Hedge Fund Returns

Decile portfolios are formed every month from January 1996 to September 2018 by sorting hedge funds based on their manufacturing industry timing coefficients. Manufacturing industry timing betas are generated from unsmoothed hedge fund returns as in Getmansky, Lo, and Makarov (2004). Decile 1 is the portfolio of hedge funds with the lowest industry timing coefficients (worst-timing funds) and decile 10 is the portfolio of hedge funds with the highest industry timing coefficients (best-timing funds). The table reports the one-month-ahead average raw returns and 9-factor alphas for each decile. The last row shows the average monthly raw return difference and the 9-factor alpha difference between Decile 10 (best-timing funds) and Decile 1 (worst-timing funds). Average returns and alphas are defined in monthly percentage terms. Newey-West adjusted *t*-statistics are given in parentheses. Numbers in bold denote statistical significance of the return and alpha spreads.

	Next-month Raw Returns (%)	Next-month 9-factor Alphas (%)
Low	0.26 (1.11)	-0.25 (-1.46)
2	0.35 (2.12)	-0.09 (-0.77)
3	0.39 (3.04)	-0.01 (-0.16)
4	0.48 (4.16)	0.10 (1.38)
5	0.49 (4.16)	0.12 (1.45)
6	0.54 (4.78)	0.17 (2.26)
7	0.59 (5.13)	0.23 (3.11)
8	0.71 (5.04)	0.31 (3.42)
9	0.70 (4.64)	0.25 (2.56)
High	1.03 (4.55)	0.51 (2.94)
High - Low	**0.77** **(3.14)**	**0.76** **(2.98)**

Table VIII. Cross-Sectional Persistence in Manufacturing Industry-timing Betas over 6-month, 12-month, and 24-month Periods

This table reports the portfolio transition matrix for the manufacturing industry timing coefficients in 6, 12, and 24 months ahead during the sample period January 1996 – September 2018. The table presents the average probability that a fund in decile *i* (defined by the rows) in one month will be in decile *j* (defined by the columns) in 6, 12, and 24 months after. In each panel, the diagonal elements from top left to bottom right are highlighted to indicate the degree of persistence in manufacturing industry timing coefficients.

Panel A: 6-month-ahead analysis

	Worst	2	3	4	5	6	7	8	9	Best
Worst	**52.39%**	15.74%	6.53%	4.01%	3.23%	2.95%	2.86%	2.97%	3.82%	5.50%
2	15.57%	**29.37%**	16.41%	9.29%	6.20%	5.26%	4.75%	4.48%	4.45%	4.22%
3	6.09%	17.42%	**23.28%**	15.77%	10.32%	7.87%	6.24%	5.16%	4.41%	3.44%
4	4.02%	9.03%	17.25%	**21.39%**	16.08%	10.68%	8.20%	6.00%	4.40%	2.96%
5	3.01%	6.29%	10.88%	17.79%	**20.61%**	15.88%	10.35%	7.08%	5.04%	3.07%
6	2.72%	4.94%	7.65%	11.47%	17.22%	**21.12%**	15.68%	9.42%	6.30%	3.49%
7	2.99%	4.34%	6.12%	7.94%	11.53%	17.04%	**21.67%**	15.57%	8.45%	4.35%
8	3.25%	4.20%	5.06%	5.79%	7.60%	10.40%	16.89%	**25.10%**	15.47%	6.26%
9	3.81%	4.33%	4.06%	4.21%	4.94%	6.06%	8.84%	17.55%	**30.62%**	15.58%
Best	5.83%	4.38%	3.12%	2.80%	2.81%	3.09%	3.89%	6.66%	16.80%	**50.63%**

Panel B: 12-month-ahead analysis

	Worst	2	3	4	5	6	7	8	9	Best
Worst	**34.27%**	13.78%	7.70%	5.44%	4.90%	4.76%	4.87%	5.50%	7.10%	11.68%
2	13.47%	**18.26%**	13.10%	9.49%	7.64%	7.21%	7.26%	7.61%	7.89%	8.08%
3	7.26%	13.63%	**15.23%**	12.77%	10.80%	9.52%	9.04%	8.43%	7.48%	5.85%
4	5.37%	9.59%	13.78%	**15.32%**	13.69%	11.76%	10.07%	8.67%	6.89%	4.87%
5	4.93%	7.78%	11.31%	14.72%	**15.88%**	14.00%	11.37%	8.56%	6.72%	4.75%
6	4.36%	6.90%	10.19%	12.60%	14.80%	**15.41%**	13.02%	10.23%	7.61%	4.89%
7	4.87%	7.22%	9.13%	10.43%	11.64%	13.92%	**14.65%**	12.73%	9.39%	6.02%
8	5.84%	7.18%	8.12%	8.62%	9.60%	10.99%	13.32%	**16.07%**	12.73%	7.54%
9	7.17%	7.85%	6.92%	6.84%	7.55%	8.13%	8.95%	13.77%	**19.17%**	13.65%
Best	12.15%	7.54%	5.46%	4.68%	4.52%	4.57%	5.58%	8.62%	14.67%	**32.22%**

Table VIII (continued)

Panel C: 24-month-ahead analysis

	Worst	2	3	4	5	6	7	8	9	Best
Worst	**20.77%**	11.16%	7.72%	7.63%	6.27%	6.59%	7.22%	8.17%	11.05%	13.42%
2	10.06%	**14.38%**	9.17%	8.61%	8.53%	8.62%	9.32%	9.95%	11.03%	10.33%
3	7.48%	9.42%	**13.08%**	9.69%	10.42%	10.17%	10.93%	10.22%	9.89%	8.69%
4	6.32%	8.67%	9.89%	**13.97%**	11.24%	11.61%	11.40%	10.93%	9.33%	6.65%
5	6.04%	8.47%	10.26%	11.73%	**13.34%**	13.00%	12.14%	10.75%	8.13%	6.13%
6	5.90%	8.88%	10.87%	12.57%	12.34%	**13.81%**	11.03%	10.18%	8.04%	6.38%
7	7.02%	9.31%	11.70%	11.39%	11.34%	10.46%	**13.24%**	9.58%	8.69%	7.26%
8	8.74%	10.59%	11.15%	10.54%	9.06%	9.85%	9.79%	**12.98%**	9.67%	7.62%
9	10.19%	10.73%	10.03%	9.69%	8.40%	8.18%	8.20%	10.22%	**14.14%**	10.23%
Best	12.51%	11.62%	7.84%	6.66%	5.98%	7.10%	7.66%	8.81%	11.75%	**20.07%**

Table IX. Manufacturing Industry-timing Coefficients and Future Fund Flows and Survival

Panel A reports during our sample period from January 1996 to September 2018 the magnitudes of six-month-ahead and 12-month-ahead cumulative flows for each hedge fund decile generated by sorting hedge funds based on their manufacturing industry-timing coefficients. Cumulative flows are defined in percentage terms. Newey-West adjusted *t*-statistics are provided in columns next to flows. Numbers in bold denote statistical significance of the 10-1 difference portfolio. Panel B reports average slope coefficients from Fama-MacBeth cross-sectional regressions of six-month-ahead and 12-month-ahead cumulative fund flows on manufacturing industry-timing coefficients with and without control variables. Panel C reports average slope coefficients from Fama-MacBeth cross-sectional logit regressions of six-month-ahead and 12-month-ahead fund survival (measured as a dummy variable taking the value of one if the fund is in existence, or zero if the fund is deceased) on manufacturing industry-timing coefficients with and without control variables. For each variable in Panel B and Panel C, the corresponding Newey-West *t*-statistics are reported in parentheses. Numbers in bold denote statistical significance.

Panel A: 6-month and 12-month ahead Cumulative Flows of the Manufacturing Industry-timing Beta Deciles

Rank for MNF Tmg Betas	6-month-ahead Cumulative Flows (%)	*t*-statistics	12-month-ahead Cumulative Flows (%)	*t*-statistics
Low	-1.14	-2.91	0.37	0.49
2	-0.86	-2.29	1.06	1.46
3	-0.40	-0.98	1.64	1.98
4	0.19	0.46	2.51	3.08
5	0.69	1.54	3.03	3.66
6	1.22	2.55	3.36	3.75
7	0.84	2.02	3.48	4.41
8	1.19	3.03	3.91	5.43
9	0.41	1.19	2.31	3.71
High	1.82	5.47	6.13	9.61
High - Low	**2.96**	**6.69**	**5.76**	**6.89**

Panel B: Fama-MacBeth Regressions of 6-month and 12-month-ahead Cumulative Flows on Manufacturing Industry-timing Betas

	MNF Tmg Beta	Lag_Ret	Stdev	Size	Age	Mgmt Fee	Incent Fee	Redemp	Min_Invest	D_Lockup	D_Lever
6-month ahead analysis	**0.876**										
	(4.26)										
	0.531	**0.781**	**-0.187**	**-0.972**	**-4.823**	-0.549	0.046	**0.032**	**0.393**	0.013	**0.546**
	(3.28)	**(15.28)**	**(-2.06)**	**(-6.51)**	**(-11.13)**	(-1.54)	(1.54)	**(6.14)**	**(4.12)**	(0.04)	**(2.13)**
12-month ahead analysis	**1.532**										
	(3.81)										
	0.814	**1.486**	**-0.427**	**-3.172**	**-10.436**	-0.792	**0.128**	**0.078**	**1.090**	-0.250	**1.562**
	(2.54)	**(16.54)**	**(-2.35)**	**(-10.39)**	**(-13.08)**	(-1.49)	**(2.14)**	**(7.20)**	**(4.84)**	(-0.38)	**(3.09)**

Table IX (continued)

Panel C. Fama-MacBeth Regressions of 6-month and 12-month-ahead Fund Survival on Manufacturing Industry-timing Betas

	MNF Tmg Beta	Lag_Ret	Stdev	Size	Age	Mgmt Fee	Incent Fee	Redemp	Min_Invest	D_Lockup	D_Lever
6-month ahead analysis	**0.003 (3.07)**										
	0.003 (2.32)	**0.069 (5.48)**	**0.048 (5.10)**	**0.303 (12.56)**	**0.274 (6.18)**	**0.102 (3.29)**	**-0.026 (-4.34)**	**0.168 (3.75)**	**0.111 (2.31)**	**1.531 (4.84)**	0.005 (0.06)
12-month ahead analysis	**0.003 (3.88)**										
	0.002 (3.29)	**0.055 (14.17)**	**0.034 (6.57)**	**0.267 (22.75)**	**0.221 (7.15)**	**0.096 (4.30)**	**-0.021 (-9.24)**	**0.116 (3.37)**	**0.053 (6.29)**	**1.514 (4.96)**	-0.033 (-1.19)

Table X. Univariate Portfolios of Mutual Funds sorted into Manufacturing Industry-timing Beta Deciles and those Deciles' Return Sensitivity to the absolute value of Standardized Earnings Surprises (SUEs) in the Manufacturing Industry

Decile portfolios are formed each month from January 1996 to September 2018 by sorting mutual funds based on their manufacturing industry timing betas. Decile 1 is the portfolio of mutual funds with the lowest industry timing coefficients (worst-timing funds) and decile 10 is the portfolio of mutual funds with the highest industry timing coefficients (best-timing funds). The first column reports for each decile, mutual funds' average return sensitivity (beta) to the absolute value of the earnings surprises in the manufacturing industry. The second and third columns report the one-month-ahead average raw returns and 4-factor alphas of mutual funds for each decile. The last row shows the average SUE beta difference as well as the average monthly raw return and 4-factor alpha differences between Decile 10 and Decile 1. Average returns and alphas are defined in monthly percentage terms. Newey-West adjusted *t*-statistics are given in parentheses. Numbers in bold denote statistical significance.

	Mutual Funds' MNF Industry SUE Betas	Next-month Mutual Fund Raw Returns (%)	Next-month Mutual Fund 4-factor Alphas (%)
Low	0.493 (0.29)	0.88 (2.71)	-0.03 (-0.26)
2	0.719 (0.46)	0.90 (3.11)	0.03 (0.48)
3	0.632 (0.44)	0.93 (3.35)	0.07 (1.37)
4	0.603 (0.43)	0.89 (3.26)	0.04 (0.88)
5	0.600 (0.43)	0.86 (3.21)	0.03 (0.60)
6	0.651 (0.47)	0.87 (3.25)	0.05 (1.09)
7	0.642 (0.47)	0.83 (3.02)	-0.00 (-0.07)
8	0.704 (0.51)	0.81 (2.94)	-0.02 (-0.42)
9	0.755 (0.54)	0.83 (2.89)	-0.02 (-0.31)
High	0.876 (0.57)	0.86 (2.87)	0.00 (0.00)
High - Low	0.383 (0.84)	-0.02 (-0.13)	0.03 (0.19)