Hedge Funds and Quasi-Indexers: Where do Alphas Come from?

Xinyu Cui, Olga Kolokolova, Jiaguo (George) Wang *

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*Xinyu Cui (xinyu.cui@manchester.ac.uk) and Olga Kolokolova (olga.kolokolova@manchester.ac.uk) are at the University of Manchester, Alliance Manchester Business School, Booth Street West, Room 5.020, Manchester, M15 6PB, UK, tel: +44 (0)161 306 2081; Jiaguo (George) Wang (george.wang@lancaster.ac.uk) is at the Lancaster University Management School, Lancaster, UK, tel: +44 (0) 152 459 2577. We thank Michael Brennan, Alex Kostakis, Marc Goergen, Adam Reed, Guillaume Monarcha, Dalia Marciukaityte, Ingmar Nolte, Stefan Petry, Winfried Pohlmeier and the participants of the research seminar at Aston Business School, the University of Manchester, Univeristy of Reading, University of Sussex 5th Young Finance Scholars Conference (2018), the Konstanz and Lancaster joint annual KoLa workshop (2018), the 11th Annual Hedge Fund and Private Equity Research Conference in Paris (2019), and the 2019 FMA Annual Meeting for helpful comments. All errors remain our own.

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Abstract

Hedge funds earn positive ex-post abnormal returns and avoid negative abnormal returns when trading against highly-diversified low-turnover institutional investors (quasi-indexers). This pattern is pronounced for short- and long-term holding periods, as well as if trading is conditional on return predictability associated with well-known market anomalies. It seems to be driven by the preference of quasi-indexers for liquid, high-market beta stocks, which tend to exhibit low future abnormal returns. Trading against other institutional investors or non-institutions does not result in abnormal performance for hedge funds.

Keywords: Institutional Trading, Alpha, Market Beta, Market Anomalies, Quasi-Indexers, Hedge Funds.

JEL Classification: G12, G14, G23.

1. Introduction

> *If you are making money more often than not, what is motivating others to trade the other way, and will they continue to do so in the future? Remember that for every buyer, there is a seller, so someone is always taking the other side of your trades, and if you do not understand the economics of the trade, they may.*
>
> Lasse Pedersen, "Efficiently Inefficient", 2015

Institutional investors held 78% ($21.7 trillion) of the market value of the US broad-market Russell 3000 index, and 80% ($18 trillion) of the large cap S&P 500 index in 2017 according to Bloomberg. On average, their portfolios have a market beta close to one and earn a zero abnormal return (alpha) before fees, which turns negative after fees (French; 2008; Lewellen; 2011). Institutions only marginally outperform individual investors, not taking transaction and other costs into account (Cohen et al.; 2002). At the same time, hedge funds (HFs) are often found to be more skilful and more informed than other institutional investors and to deliver positive abnormal returns to their clients. The outperformance cannot be explained by pure luck, and may be associated with their private information, stock picking and market timing skills (Brunnermeier and Nagel; 2004; Kosowski et al.; 2007; Aragon and Martin; 2012; Agarwal et al.; 2013; Sias et al.; 2016; Jiao et al.; 2016).[1] HF trading often reduces stock mispricing, whereas mutual funds and other types of institutional investors either do not have any significant effect on mispricing or even exacerbate it (Jiao and Ye; 2014; Akbas et al.; 2015; Kokkonen and Suominen; 2015; Cao et al.; 2017; Ha and Hu; 2018).

Hence, if HFs often deliver positive abnormal returns, and institutions on aggregate, similar to individuals, exhibit zero abnormal returns on their investments, there aught to be some institutional investors that take the opposite side of HF trades and allow HFs to earn the alpha. By focusing on the trading behavior of HFs and non-HF investors, our study provides a new perspec-

[1] Nevertheless, some studies suggest that HFs are not more skilful than other institutional investors. For instance, Griffin and Xu (2009) document that, controlling for past quarterly returns, neither HF trading nor mutual fund trading can significantly predict future returns.

tive on who is on the other sides of HF trades.[2] One possibility would be that other institutional investors make random errors in their judgements of stock profitability, and HFs exploit these errors. In this case, there should not be any specific type of institutions which as a group consistently exhibit "negative skill" when trading against HFs. Alternatively, there may be groups of investors that do not have an alpha-maximizing onjective functions. For such investors, forgoing an alpha may be a natural consequence of their optimal trades. Such investors would constitute a permanent trading partner for HFs, facilitating their abnormal gains. In this paper, we set to establish if any type of institutional investors consistently provides HFs with profitable trading opportunities, and if yes, what are the reasons behind such behavior.

The group of institutional investors is heterogeneous. Passive and active mutual funds, index funds and ETFs, pension funds and insurance companies all have different objective functions, investment horizons, compensation schemes, and trading strategies. Their trading has been extensively studies in the literature,[3] and all of them can be potential counterparts for HF trades. However, even within the same nominal type, the investment behavior of institutions can be substantially different (Bushee; 2001). In his pioneering work, Bushee (2001) suggests to classify institutions according to their actual trading behavior, and not according to nominal labelling. Such "revealed" classification provides more insights into preferences and investment goals of the institutions. In particular, Bushee (2001) subdivides institutions into three big categories, (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) dedicated holders (DEDs). A quasi-indexer is defined as an institutional investor exhibiting high portfolio diversification and low turnover, and also pursuing index-based buy-and-hold strategies. A transient institution also holds a highly-diversified portfolio but has a high turnover, and follows predominantly short-term trading strategies. A dedicated holder invests in concentrated portfolios and has low turnover,

[2]Ben-David et al. (2012) examine the trading behavior of HFs and other institutional investors during the crisis period 2007-2009. They document that other non-mutual fund institutional investors and non-institutional investors took the other side of HF trades during this period.

[3]From the trading skill perspective, active mutual funds are often found to underperform index-tracking funds (Blake et al.; 1993; Malkiel; 1995; Elton et al.; 1996; French; 2008; Guercio and Reuter; 2014; Crane and Crotty; 2018). In terms or market impact, institutional trading may play a positive role in price discovery and mitigate market anomalies (Gompers and Metrick; 2001; Nagel; 2005; Israel and Moskowitz; 2013), but it can also destabilize stock prices (Frazzini and Lamont; 2008; Dasgupta et al.; 2011).

focusing on long-term trading strategies with low sensitivity to current firm earnings.

We find empirical evidence that QIXs trade in the alpha for the market beta when trading against HFs. They consistently buy stocks with higher market betas and sell stocks with lower ones. QIXs usually have limited potential to lock in alpha due to leverage and short-selling restrictions. They are often also constrained by the need of containing the tracking error within certain bounds, and their performance is benchmarked with respect to that of market indices. In order to achieve higher expected returns and beat the index, they optimally choose stocks with higher market betas, and thus depart from alpha-maximising portfolios. Such reasoning is supported by Christoffersen and Simutin (2017), who document that mutual fund managers tend to increase their exposure to high-beta stocks to increase expected returns while maintaining tracking errors around the benchmark.

HFs act as liquidity providers for QIXs, and exploit the earning opportunities from their beta-over-alpha preferences. On average, stocks sold by HFs and simultaneously purchased by QIXs exhibit a significantly negative alpha of -0.27% per month relative to the Carhart 4-factor model, whereas stocks purchased by HFs and sold by QIXs earn a significantly positive alpha +0.64% per month over the following quarter. The average market beta of stocks sold by HFs to QIXs is 1.17, whereas the average beta of stocks purchased by HFs from QIXs is 0.98, with the difference being highly statistically significant and persistent over time as well as for longer holding periods.

We further extend the analysis to show that HFs keep exploiting earning opportunities by providing liquidity to QIXs even when trading can be linked to return predictability based on well documented market anomalies. We use five well-established groups of market anomalies, including profitability, financial distress, investment, operating accrual, and equity issuance. We relate institutional trading during the second quarter of a year (when the complete firm-specific accounting information for the previous fiscal year becomes publicly available) to portfolio performance during the following four quarters. For all of the market anomalies considered, HFs buy low-beta stock from QIXs, and sell high-beta stocks, which often results in positive alpha for HFs. These results contribute to the extensive literature on the relation between institutional ownership and market

anomalies.[4] They also complement the analysis of Edelen et al. (2016), who find the negative relation between the change in institutional holding and the stocks' ex-post abnormal returns. Our paper shows that it is mainly driven by QIXs, which often take the "wrong" side of an anomaly trade due to the general beta-over-alpha preferences. Our results are consistent with Chen et al. (2018), who find that HFs earn positive abnormal returns by trading on anomaly stocks, and Ha and Hu (2018) who report that the HF daily order flow is positively correlated with previous daily market anomalies.

The total asset size of QIXs is far larger than that of other types of institutional investors and HFs together; hence, the vast amount of capital is invested in strategies that are not risk-adjusted return maximizing. Proactive arbitrageurs, such as HFs, have plentiful opportunities of delivering alpha to their investors, exploiting trading preferences of other institutions. This pattern is not likely to be reversed soon, since large investment firms keep launching low-cost index-tracking vehicles.[5]

2. Research Design

Key "suspects" in our investigation of the other side of HF trades are QIXs, as these institutions are less likely to have alpha-maximizing objective functions. Instead, they may be more concerned with minimizing the tracking error with respect to their benchmark index, while still trying to beat it. Harris and Gurel (1986) show that when indices adjust their company lists, large index funds frequently buy stocks that are newly added to indices and sell stocks deleted from the indices, leading to substantial demand shifts. Even in the absence of any index adjustments,

[4]Institutional demand for large stocks smoothes the size premium Gompers and Metrick (2001). The value anomaly is persistent due to short-sales constraints of institutional investors (Nagel; 2005) and it is reinforced by strong flows into growth-stock-based mutual funds (Frazzini and Lamont; 2008). However,Israel and Moskowitz (2013) find little evidence that institutional trading impacts the size, value, and momentum anomalies. The dissipation of the accrual anomaly is due to HFs' investment (Green et al.; 2011). Anomaly returns decrease after related academic publications (McLean and Pontiff; 2016) due to more intensive trading of high turnover institution (Calluzzo et al.; 2019).

[5]Fidelity, for example, launched the first index-tracking stock fund without any fees for investors on 3 August 2018. See "Asset managers shares dive after no-fee fund launch", Financial Times, August 2, 2018.

an important feature of the trading of institutions that face benchmarking is that they tilt their portfolios to high-beta stocks, in order to beat the benchmark. Buffa et al. (2019) develop an equilibrium framework in which choosing higher-beta investments is optimal for a benchmarking manager. Christoffersen and Simutin (2017) empirically show that those mutual funds that have a large share of investment from pension funds and, thus, are more likely to be benchmarked, invest disproportionally into high-beta stocks, and stocks with high market betas tend to have low alphas (Frazzini and Pedersen; 2014). Additionally, QIXs do not seem to closely monitor firms they invest into. They do not have any effect on innovation in firms they hold, while other types of institutional investors have positive association with innovation (Aghion et al.; 2013). We formulate our our key "beta-for-alpha swap" hypothesis as follows:

β-for-α hypothesis: *HFs earn positive abnormal returns when trading against QIXs by selling high-beta stocks to and buying low-beta stocks from them.*

To test our hypothesis, we first identify different types of traders. We split all institutions into HFs and non-HF investors, and then, following Bushee (2001), we subdivide non-HF investors into QIXs, TRAs, and DEDs.[6]

Second, for each type of traders we compute quarterly change in their holding of each stock i, expressed as a fraction of the total common shares outstanding by the company at the end of the previous quarter (q-1).

For example, the change in holding of stock i by HFs during quarter q ($\Delta\text{StockHold}^{\text{HF}}_{\text{i,q}}$, in%) is given by:

$$\Delta\text{StockHold}^{\text{HF}}_{\text{i,q}} = \frac{\text{StockHold}^{\text{HF}}_{\text{i,q}} - \text{StockHold}^{\text{HF}}_{\text{i,q-1}}}{\text{TSO}_{\text{i,q-1}}}, \tag{1}$$

where $\text{StockHold}^{\text{HF}}_{\text{i,q}}$ is the holding of stock i by all HFs at the end of quarter q, i.e.

$$\text{StockHold}^{\text{HF}}_{\text{i,q}} = \sum_{\text{j}} \text{StockHold}^{\text{HF}_{\text{j}}}_{\text{i,q}}, \tag{2}$$

[6]More details are provided in Section 3.

and $TSO_{i,q-1}$ is the total number of outstanding shares of firm i at the end of quarter q-1. $\Delta StockHold^{HF}_{i,q}$ is considered to be a missing value if any of $StockHold^{HF}_{i,q}$, $StockHold^{HF}_{i,q-1}$, or $TSO_{i,q-1}$ is missing. All holding and numbers of shares outstanding are adjusted for stock splits.

We also compute the holding and change in holding of non-institutional investors (NIIs) following Ben-David et al. (2012) as the difference between 100% and the percentage holding of all other reporting institutional investors.[7]

Third, we construct a set of swap portfolios, which include stocks heavily traded by HFs and simultaneously traded in the opposite direction by QIXs, TRAs, DEDs, or NIIs. We rank stocks based on the change in holding during each quarter in year t within stocks of two size groups – above or below the NYSE size median at the end of year t-1 – following Fama and French (1993). We consider stocks with the change in holding below the 20^{th} percentile as those that investors significantly sell, and those above the 80^{th} percentile as those that investors significantly buy. The swapped stocks are those which belong to the intensively traded stocks for two types of investors, but in different directions. We form a set of swap portfolios as an equal-weighted average across different size groups of the value-weighted average returns of the chosen swapped stocks.[8] The portfolios are then held for one quarter until the end of the following quarter and then rebalanced. To capture the longer term performance of swapped stocks we also consider annual holding periods. We form swap portfolios every quarter and hold them for the following year. Every month we compute the average return of the previously formed portfolios which are still being hed at that month to obtain the time series of long-term holding portfolio returns.

Last but not least, we evaluate the performance of these portfolios. We compute monthly average excess returns over the risk-free rate (measures is the 3-month T-bill rate) as well as the abnormal returns (α-s) and market factor loadings (β-s) relative to several benchmark models. We use the CAPM, the Fama-French (hereafter FF) 3-factor, and the Carhart 4-factor models. We

[7]Note that this measure is not a perfect proxy for non-institutional holdings. It may contain small holdings of large institutions which are below the reporting threshold, holdings of small institutions, which are not required to report to 13f, and holdings for which confidential treatment was requested by reporting institutions.

[8]As a robustness check, we also used 10% and 30% cutoffs. The results remain qualitatively the same and are reported in Online Appendix.

also consider two additional risk factors, which might explain stock picking skills (if any) of HFs: the betting against beta factor (hereafter BAB) of Frazzini and Pedersen (2014) and the traded liquidity factor (hereafter LIQ) of Pástor and Stambaugh (2003). The BAB factor[9] is introduced by Frazzini and Pedersen (2014), who find that high-beta assets earn low alphas due to funding constraints. As for the LIQ factor, we use the traded liquidity factor introduced by Pástor and Stambaugh (2003), who show that liquidity risk is an important determinant of HF returns.[10] We include these additional two factors into the Carhart 4-factor model, making a final 6-factor model specification.

To assess the stability of the results during different market conditions, we estimate alphas and betas before, during, and after the financial crisis of 2007-2008, and also run a rolling window regressions using a three-year window and quarterly steps. We also assess the long-term performance of the swapped stocks and use an annual holding period instead of a quarterly one, as described above.

Our "beta-for-alpha swap" hypothesis would imply that the alpha of stock bought by HFs from QIXs should be larger than that of stocks sold by HFs to QIXs, while the relation in their market betas is expected to be the opposite.

Another important feature of institutional investors is that they tend to prefer more liquid stocks (Gompers and Metrick; 2001), whereas HFs are known for earning high returns by trading less liquid assets and providing market liquidity (Teo; 2011; Jylhä et al.; 2014). We check if HFs swap liquid to illiquid stocks with QIXs. For each of the portfolios we compute the average Amihud (2002) illiquidity measure. We expect stocks bought by HFs from QIXs to be less liquid than stocks sold by HFs to QIXs.

[9]The time series values of the factor are obtained from the authors web-page https://www.aqr.com/Insights/Datasets/Betting-Against-Beta-Equity-Factors-Monthly.

[10]The time series values of the factor are obtained from the authors' web-page http://finance.wharton.upenn.edu/~stambaug/.

3. Data Sources and Sample Construction

Stock returns are from the Center for Research in Security Prices (CRSP) Monthly Stock File. We consider the monthly returns of common stocks (those with CRSP share codes of 10 or 11) traded on the NYSE, AMEX or NASDAQ (those with CRSP exchange codes of 1, 2 or 3) from April 1994 to December 2018. Stock returns are adjusted for split and delisting. We only consider the stocks with monthly prices above \$5 at the beginning of each quarter, in order to purge the estimation noise from the minimum tick effect (Harris; 1994; Amihud; 2002) and to make sure that all institutional investors can trade them. We exclude the stocks of utility firms (those with standard industrial classification (SIC) codes from 6000 to 6999) and financial firms (those with SIC codes from 4900 to 4999). Panel A of Table 1 reports the descriptive statistics of all of the stocks in our sample. We also collect the data for the standard market factors from Ken French's data library.[11]

Our data on institutional holding are from the Thomson Reuters Institutional (13f) Holding database (CDA/Spectrum s34). The 13f mandatory reports of institutional holding are filed with the Securities and Exchange Commission (SEC) and are compiled by Thomson Reuters. According to the 1978 amendment to the Securities and Exchange Act of 1934, institutions with aggregate fair market values over \$100 million must file their forms within 45 days after the end of a calendar quarter. The managers are allowed to omit their "small" holding (if they hold fewer than 10,000 shares and less than \$200,000 in terms of their market values). Thus, most of the disclosed holding data come from relatively large positions of large firms.

To identify HFs, we use a union of three major HF databases – EurekaHedge, TASS Lipper, and Morningstar – for the period from 1994 to 2017.[12] We merge the databases following the procedure described in Joenväärä et al. (2016). We then create a list of HFs' 13f identifiers, i.e. manager numbers (hereafter MGRNOs), by matching the HF company name and the names of the institution reporting to the 13f database. We manually check that the identified companies

[11] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[12] Starting from 1994, most databases keep the information on defunct HFs: a potential survivorship bias in the data is thereby ameliorated.

do not have any other business (e.g., a mutual fund, insurance, banking etc.), ensuring that we obtain a list of pure HF companies. Altogether, we identify 734 HF companies that report to the 13f databases. Next, we use the Brian Bushee's database[13] to identify 2,906 QIXs, 1,448 TRAs and 190 DEDs in our sample. We consider only those institutions which have a unique identifier of permanent classification provided in the Bushee's database. We remove institutions without a permanent classification or those with several permanent classifications. Overall, the 5,278 institutions in our final sample cover 74.92% of all institutions from the database existing between 1994 and 2017.

Panel B of Table 1 reports the descriptive statistics of the institutional portfolios. The largest group of institutions are QIXs, with on overage 1,352 institutions reporting holding per quarter compared to 319 HFs. The smallest group is DEDs with only 69 institutions reporting per quarter, on average. QIXs are also the most diversified institutions, holding on average 170 different stocks in a quarter, followed by TRAs with 166 stocks per quarter, compared to 118 of HFs and only 52 of DEDs. QIXs have the smallest turnover, on average 6.62% per quarter, compared to over 22.10% per quarter for HFs and 23.80% for TRAs. Turnover for quarter q is calculated as the minimum of purchases and sales during quarter q, divided by the average market value of the portfolio at the end of quarter q and the previous quarter.

Panel C of Table 1 reports the descriptive statistics of the holding (from 1994q1 to 2018q1) and the change in holding (from 1994q2 to 2018q1) of all types of institutions and non-institutions, winsorized at the 1% and 99% quantiles.[14] QIXs hold on average 32.98% of shares in listed non-financial and non-utility companies, which is substantially larger than other institutions. On average, HFs hold 7.61% of these firms, 11.17% is held by TRAs, and only 1.75% by DEDs. QIXs also have the largest change in the position of 0.68% per quarter on average, compared to 0.23% for HFs, 0.26% for TRAs, and 0.01% for DEDs. Given how few DEDs exist per quarter, the small share of their holding, and a particular investment style of long-term holding of concentrated

[13] http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html

[14] We exclude from the sample those quarter-stock data points for which the sum of the reported institutional holding exceeds 100%.

portfolios, we exclude these institutions from the analysis.

The average change in holding of NIIs over our sample period is negative of -0.03% reflecting the overall trend towards institutional holding.

[Place Table 1 about here]

4. Empirical Results

4.1. Institutional trading swap: β-for-α

Panel A of Table 2 reports the excess returns over the risk-free rate and alphas relative to various benchmark models for stocks swapped between HFs and other types of investors. Regardless of the benchmark model, the stocks sold by HFs to QIXs exhibit negative future alphas ranging from -0.24% to -0.35% per month depending on the benchmark, all being statistically significant. The alphas tend to decrease in absolute value when more factors are included in the benchmark model. But even after controlling for the BAB and LIQ factors in the 6-factor model, the alpha of the stocks sold by HFs to QIXs is still negative (-0.24%) and significant at the 10% level. Stocks bought by HFs from QIXs earn positive alphas irrespective of the benchmark model, ranging from 0.53% to 0.64% per month. They remain large in absolute values and highly statistically significant even for more comprehensive benchmark models.

In contrast, stocks swapped between HFs and TRAs do not exhibit any statically significant alphas for swaps going in either direction. Remarkably stocks sold by HFs to NIIs exhibit significantly negative alpha only with respect to CAPM and FF 3-factor model. Once we control for the momentum factor and further for the BAB and LIQ factors, the alpha substantially reduces in absolute value and loses significance.

Persistently negative abnormal returns of stocks purchased by QIXs from HFs can either indicate negative stock-picking skills of QIXs or that their portfolio optimization approach is not alpha-maximizing. Our hypothesis suggests that trying to beat the benchmark while remaining within

admissible tracking error bounds, QIXs are likely to tilt their portfolios to high-beta stocks, which tend to be associated with low alphas. The results reported in Panel B of Table 2 support this intuition. For all the benchmark models considered, HFs sell high-beta stocks to QIXs and buy low-beta stocks from them. The difference in betas ranges from -0.24 for CAPM to -0.19 for the 6-factor model, and it is always highly statistically significant. The difference in market betas for swapped stocks between HFs and NIIs is much smaller in magnitude and is significant only when FF 3-factor model is used as a benchmark.

Combined together, the results suggest that QIXs trade in the alpha for the market beta. HFs exploit this opportunity and provide liquidity for such trades, thus, earning positive alphas for their investors.[15]

[Place Table 2 around here]

To assess the stability of our results across different market conditions, we repeat the analysis for three sample periods separately: pre-crisis (1994q1-2007q2), crisis (2007q3-2009q2), and post-crisis (2009q3-2017) periods (Ben-David et al.; 2012). The performance difference between stocks sold by HFs to QIXs and those bought by HFs from QIXs is persistent across all three periods (Tables 3). Remarkably, in the pre-crisis and crisis periods, HFs were gaining significantly by buying future winners from QIXs. The effect is especially strong during the crisis period, where the ex-post alpha of stocks bought by HFs from QIXs relative to the CAPM reaches 1.92% per month. During the post crisis period, the performance differences are generated predominantly by HFs selling future losers to QIXs.

As for market betas (Tables 4), QIXs have been buying high-beta stocks from HFs during the pre- and post-crisis periods, but not during the crisis. This result is consistent with the intuition that QIXs tilt their portfolios towards high-beta stocks when trying to beat the benchmark. This strategy works, however, only as long as the benchmark has a positive expected return. During the crisis period the market returns were negative, and retreating from high-beta stocks was optimal

[15] As a robustness check, we evaluate alphas and betas of stocks intensively traded by different types of investors independently, and find similar results (reported in the Online Appendix). QIXs earn negative alphas on purchased stocks and forgo positive alphas on sold stocks, while buying high-beta and selling low-beta stocks.

for those institutions that are benchmarked.

[Place Tables 3 and 4 around here]

Figure 1 further plots the time series of alphas and market betas relative to the Carhart 4-factor model for stocks swapped between HFs and other investors estimated using three-year rolling windows. The alphas of stocks bought by HFs from QIXs are almost always positive and above those sold by HFs to QIXs, which are in most cases negative. The betas of the stocks purchased by HFs, on the contrary, are almost always smaller than those of sold stocks, apart from the crisis period, consistent with the previous discussion. As for the swaps between HFs and other investors, no persistent differences can be seen for either alphas or market betas over time.

[Place Figure 1 about here]

As for stock illiquidity, we cannot find any significant differences in liquidity for stocks swapped between HFs and TRAs or HFs and NIIs (Panel B of Table 2). However, the difference is highly statistically significant for HF/QIX swap. Here, HFs tend to sell more liquid stocks to QIXs and buy less liquid stocks from them, supporting liquidity preference of QIXs.

Long-term performance of the swapped stocks (Table 5) reveals that the alpha losses of QIXs that buy stocks from HFs are predominantly associated with the short term performance over the first quarter, and the losses are not statistically significant over the annual horizon. At the same time, the gains which HFs make by purchasing stocks from HFs remain positive and highly statistically significant even on the annual horizon. The difference in market betas is also persistently statistically significant with HFs selling to QIXs high-beta stocks and buying from QIXs low-beta stocks. No statistical difference can be found for other counterparts of HFs.

An alternative explanation for the significant ex-post alphas associated with HF/QIX swaps may be position reversals. QIXs may, during the following quarter, sell a substantial amount of the stocks that they previously bought from HFs, thereby exerting selling pressure on stock prices, reducing the abnormal returns. To check is such a mechanism is supported by the data, we compute the average change in holding of different types of investors during each quarter for the swapped stocks, and then the change in holding of these stocks during the subsequent quarter

(Table 6). During trading quarter, the change in holding of HFs are always smaller than the corresponding change in holding of all other traders. HFs do not seem to fully exploit potential arbitrage opportunities, which may be due to relatively small total size of the HF industry as compared to the overall market value. At the same time, we find no evidence of substantial trade reversals for any type of institutional swaps. QIXs, moreover, tend to keep buying during quarter q+1 the stocks they purchased from HFs during the previous quarter. Thus, we cannot find empirical support that trade reversals can lead to observed negative abnormal returns of stocks bought by QIXs.

[Place Table 6 about here]

4.2. Implications for market anomalies

Over the past decades, an increasing number of firm's characteristics that predict future stock returns have been discovered (so-called market anomalies). The trading behaviour of institutional investors associated with these anomalies has attracted a great deal of scholarly attention (see Fama and French; 2008; Campbell et al.; 2009; Israel and Moskowitz; 2013; Hou et al.; 2015; Edelen et al.; 2016, among others).

Calluzzo et al. (2019) show that HFs and other high turnover institutions do trade on market anomalies and exploit return predictability especially over short-term. Edelen et al. (2016), however, show that on aggregate institutional investors trade against market anomalies. They incur abnormal losses when wrongly purchasing "anomaly" stocks that theoretically should belong to the short-side of the anomaly trade. Thus, similar to our main findings, these equilibrium results suggest that HFs may be profiting by trading against other investors even if the trades are related to known features of return predictability. Our previous empirical results indicate that QIXs seem to have a different objective function from other institutional investors, and swap portfolio alphas for portfolio betas – the strategy being exploited by HFs. We now extend this analysis to portfolios of "anomaly" stocks.

We consider eleven well-known market anomalies discussed in Stambaugh et al. (2012), assigned

to six categories (following Edelen et al.; 2016): stock issuance (net stock issues and composite equity issues), earnings quality (accruals and net operating assets), corporate investment (asset growth and investment-to-assets), financial distress (failure probability and O-Score), momentum and profitability (gross profitability and return on assets). Within each category we choose a single anomaly with the strongest statistical support for a positive alpha (the highest t-statistic) of the underpriced-minus-overpriced portfolio during the complete sample period from July 1994 to June 2018. We focus on fundamental-based trading signals and exclude price momentum anomaly.[16] Altogether, we use five market anomalies: gross profitability (GP), the O-Score, investment-to-assets (IVA), net operating assets (NOA) and net stock issues (NSI) anomalies.[17]

To guarantee that all of the firm specific information related to the market anomalies is available to all institutional investors, we consider the institutional trading during the second quarter of year t. This ensures that the annual reports for the fiscal year ending in calendar year t-1 are readily available.[18] The portfolio holding period is the following four quarters starting from the third quarter of year t. The anomaly portfolios constructed during the institutional trading window of year t are held until the end of the next trading window of year t+1.

Similar to our main analysis and following Fama and French (1993), we construct six portfolios from the intersection of two size groups (above or below the NYSE size median at the end of calendar year t-1) and three anomaly groups (stocks with the anomaly characteristic being below the 30% quantile, stocks with the anomaly characteristic between the 30% and 70% quantiles and stocks with the anomaly characteristic above the 70% quantile using NYSE breakpoints). To reduce the dominance of micro-cap stock returns (Edelen et al.; 2016), we compute the monthly value-weighted returns for each portfolio and calculate the equal-weighted returns of portfolios in different size groups but the same anomaly group. The resulting portfolios characterize the average

[16]We still use the Carhart four-factor model as one of the benchmark model to control for the momentum effect when analysing the abnormal returns associated with the chosen anomalies.

[17]The anomalies are described in detail in the supplementary Online Appendix.

[18]Edelen et al. (2016) consider trading over six quarters preceding quarter the third quarter, that is, the trading is based not only on publicly available information, but also private information and estimates of institutional investors. As a robustness check, we consider trading over longer period of the previous four quarters. The results reported in the supplementary Online Appendix are qualitatively similar to those discussed in the paper.

performance of the anomaly-related stocks in our sample. We call portfolios "underpriced" if they contains top 30% of stocks according to the gross profitability, or bottom 30% of stocks according to other anomalies. The underpriced portfolios are expected to have positive abnormal returns, and they belong to the long-leg of a trade. We call portfolios "overpriced" if they contain bottom 30% of stocks according to the gross profitability, or top 30% stocks according to other anomalies. The overpriced portfolios are expected to have negative abnormal returns and they belong to the short-leg of a trade.

We then construct a set of institutional swap on market anomalies portfolios. During the institutional trading window (the second quarter of year t), we conduct independent triple sorts of all stocks based on (1) stock sizes at the end of calendar year t-1 using the NYSE median, (2) each of the five market anomalies evaluated for the fiscal year ending in calendar year t-1 using the 30% and 70% NYSE breakpoints, and (3) the change in holding during the second quarter of calendar year t using the 20^{th} and 80^{th} percentiles. We then compute the monthly value-weighted returns for each portfolio and calculate the equal-weighted returns of portfolios in different size groups but the same anomaly group, ranking variables and the change in holding. Thus, we end up with four swap portfolios for each of the five anomalies and each pair of investors. For example, if HFs exploit market anomalies and QIXs make "wrong-side" trades, we would expect to find significantly negative abnormal returns for stocks in the short-leg of the anomaly that are sold by HFs and bought by QIXs.

We collect the accounting information from the CRSP/Compustat Merged Database Fundamentals Annually from 1993 to 2016.[19] We only use firms with the minimum of two years of data available, starting from their second reporting year.

Panel A of Table 7 reports the descriptive statistics of the firm performance measures, related to the five market anomalies in our sample. All of the anomaly measures are winsorized at the 1% and 99% levels. Panel B of Table 7 reports the Carhart four-factor alphas for portfolios sorted on

[19]The accounting information we used is this study is related to year t-1. Thus, our last calendar year for the accounting data is 2016; based on this information our last holding period is from July 2017 to June 2018, that is, until the end of our return sample.

each of the five anomalies under study. The results substantiate the existence of these anomalies in our sample, with the GP and NOA anomalies being the most pronounced. By investing in the corresponding long-short portfolios investors can obtain abnormal returns reaching 0.57% per month, signifiant at 1% level (the GP anomaly).

[Place Table 7 about here]

Table 8 reports the monthly Carhart 4-factor alphas for swapped stocks related to each of the market anomalies under consideration during entire holding period. Swaps in which HFs sell overpriced stocks to QIXs deliver significantly negative future alphas for four of five anomalies, with the exception of only the O-score anomaly. They range from -0.38% per month for the NSI anomaly to -0.55% per month for the IVA anomaly. In these cases, the differences in alphas of stocks bought by HFs from QIXs and sold by HFs to QIXs are all positive and statistically significant. For the remaining O-Score anomaly, HFs seem to profit by purchasing underpriced stocks from QIXs. Such swapped stocks earn a significantly positive ex-post alpha of 0.75% per month.

Considering the swaps between HFs and other counterparts, we cannot see any consistent pattern in alphas. The difference in alphas between bought and sold stocks for each type of stocks is never statistically significant.

[Place Table 8 about here]

We further look at the market betas of anomaly stocks swapped between HFs and other investors. The results in Table 9 corroborate our previous findings of the preference for high-beta stocks by QIXs. In each of the sub-groups of stocks (overpriced/underpriced relative to each of the market anomalies), QIXs buy stocks from HFs with higher market betas than those of stocks they sell to HFs. The differences are in most cases statistically significant. Swaps between HFs and other types of investors do not exhibit such patterns.

[Place Table 9 about here]

Overall, the results suggest that HFs are able to exploit return predictability associated with

different market anomalies because they are able to find a willing counterpart – QIXs – investors that tilt their portfolios towards high-beta stocks and do not seem to be directly motivated to exploit return predictability.

The QIXs are the dominant group of institutional investors in our sample according to their asset size. As of the end of 2017, the overall portfolio size of QIXs was \$9.72 trillion, whereas it was \$2.83 trillion for TRAs, \$0.29 trillion for DEDs, and \$1.59 trillion for HFs. Thus, as QIXs do not exploit the profitable opportunities arising from the market anomalies due to the peculiar objective function of these traders, and the total portfolio size of other institutions is not sufficient to offset the impact of the trading of QIXs, the market anomalies are still strongly pronounced nowadays, despite the availability of theoretical research explaining their nature and accounting information underlying the corresponding portfolio choice.

5. Conclusion

Hedge funds earn positive abnormal returns and avoid negative abnormal returns when they trade against quasi-indexers – highly-diversified and low turnover institutions. Stocks bought by hedge funds and simultaneously sold by quasi-indexers exhibit significantly positive future alphas relative to various benchmark models, while stocks sold by hedge funds and bought by quasi-indexers exhibit negative future alphas. The seemingly negative stock-picking skills of quasi-indexers are likely to be related to their trading strategy, which is not explicitly alpha-maximizing. Being motivated by benchmarking relative to the market index, these institutions tend to purchase stocks with higher market betas, and sell stocks with low market betas, hence, trading in alpha. Hedge funds provide liquidity for such trades, earning abnormal returns for their own investors. Other types of institutions and even non-institutional investors do not exhibit such patterns. Hedge funds do not earn significant abnormal returns when trading against them.

The beta-over-alpha preferences seem to hold quasi-indexers off trading against well-established market anomalies, too. Even conditional on the anomaly related accounting information being

publicly available, quasi-indexers still invest into high-beta and low-alpha stocks. They do not exploit return predictability and allow hedge funds that trade against them to earn abnormal returns. This finding echoes Giannetti and Kahraman (2017), who show that open-end investment structures may hamper the trading against mispricing. It also extends the work of Edelen et al. (2016) by showing that the negative relation between change in institutional holding and ex-post abnormal returns for anomaly stocks is mainly driven by quasi-indexers, trading in the alpha for the market beta.

Our paper suggests that, as long as the largest amount of investible capital is allocated to traders that are not explicitly motivated to deliver high risk-adjusted expected returns, various profit-making opportunities (including market anomalies) will persist in the market. More active and properly-motivated investors, such as hedge funds, will exploit these opportunities at the expense of individuals who delegate their money management to quasi-indexers.

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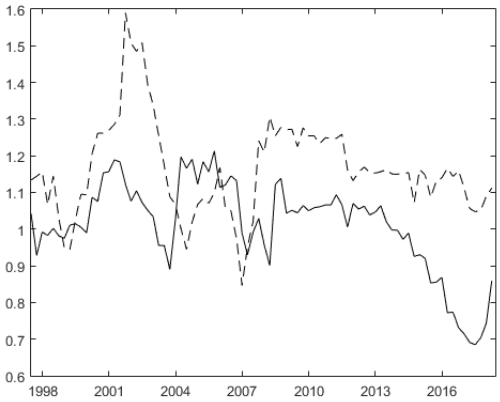
Figure 1: Time series of alphas and market betas for trading swaps

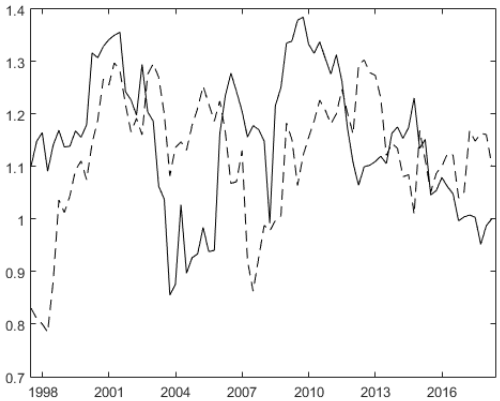
The figure plots the time series of alphas and market betas from the Carhart four-factor model of stocks bought (solid line) by HFs from different groups of non-HF investors and sold (dashed line) by HFs to different groups of non-HF investors. Non-HF investors include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). The estimation is performed over three-year rolling windows.

(i) HF/QIX Swap: α

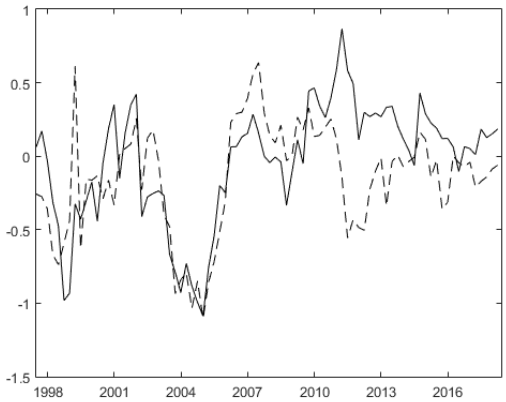


(ii) HF/QIX Swap: β

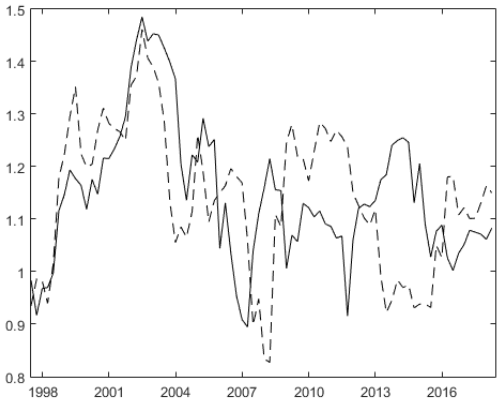
(iii) HF/TRA Swap: α



(iv) HF/TRA Swap: β



(v) HF/NII Swap: α



(vi) HF/NII Swap: β

Table 1: Descriptive statistics

This table reports the summary statistics of characteristics of stocks traded and different groups of investors. Panel A reports the monthly returns, prices, and Amihud illiquidity (Amihud; 2002) from 1994q2 to 2018q4. We only consider common stocks (those with CRSP share codes of 10 or 11) traded on the NYSE, AMEX or NASDAQ (those with CRSP exchange codes of 1, 2 or 3) with monthly prices above \$5 at the end of previous quarter. We exclude the stocks of utility firms (those with standard industrial classification (SIC) codes from 6000 to 6999) and financial firms (those with SIC codes from 4900 to 4999). Panel B reports the portfolio characteristics of HF and non-HF institutional investors, including portfolio assets (PortAssets, in \$million), numbers of stock held per quarter (No.StockHold) from 1994q1 to 2018q1, and the turnover (Turnover, in % per quarter) computed from 1994q2 to 2018q1. Non-HF institutional investors are classified following Bushee (2001) into (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) dedicated holders (DEDs). Panel C reports the stock holding (StockHold, in %) and change in holding (ΔStockHold, in % per quarter) of HFs, non-HF institutional investors, and non-institutional investors (NIIs). NIIs is calculated following Ben-David et al. (2012).

Panel A: Characteristics of Stocks Traded

	Mean	Std.Dev	P5	P25	Median	P75	P95
Adjusted Return (% per month)	0.94	15.44	-21.64	-6.40	0.50	7.56	24.23
Price or Bid/Ask Average (\$)	28.22	55.88	5.00	10.25	18.76	34.05	72.95
Amihud Illiquidity ($\times 10^{-6}$)	4.19	19.10	0.00	0.04	0.16	0.94	18.77

Panel B: Portfolio Charactistics of Different Groups of Institutional Investors

	Mean	Std.Dev	P5	P25	Median	P75	P95	No.Investors (per quarter)
$\text{PortAssets}^{\text{HF}}$ (\$m)	2347	11087	12	91	310	1231	8293	319
$\text{PortAssets}^{\text{QIX}}$ (\$m)	3390	23866	20	90	218	799	10544	1352
$\text{PortAssets}^{\text{TRA}}$ (\$m)	2545	23743	7	72	236	945	7676	489
$\text{PortAssets}^{\text{DED}}$ (\$m)	3445	17807	12	98	328	1287	11532	69
$\text{No.StockHold}^{\text{HF}}$	118	227	3	15	36	105	516	319
$\text{No.StockHold}^{\text{QIX}}$	170	326	8	37	67	137	735	1352
$\text{No.StockHold}^{\text{TRA}}$	166	295	3	24	62	160	706	489
$\text{No.StockHold}^{\text{DED}}$	52	174	1	4	10	33	186	69
$\text{Turnover}^{\text{HF}}$ (% per quarter)	22.30	18.02	0.31	8.52	17.55	32.64	58.00	306
$\text{Turnover}^{\text{QIX}}$ (% per quarter)	6.63	7.01	0.17	2.12	4.73	8.93	18.88	1293
$\text{Turnover}^{\text{TRA}}$ (% per quarter)	24.03	17.78	0.72	10.95	20.06	33.87	59.17	462
$\text{Turnover}^{\text{DED}}$ (% per quarter)	7.45	11.27	0.00	0.01	3.17	9.85	30.01	62

Panel C: Stock Holding and Trading of Different Groups of Investors

	Mean	Std.Dev	P5	P25	Median	P75	P95
$\text{StockHold}^{\text{HF}}$ (%)	7.61	7.23	0.00	1.73	6.01	11.48	21.35
$\text{StockHold}^{\text{QIX}}$ (%)	32.98	19.14	2.77	16.72	33.57	48.20	63.32
$\text{StockHold}^{\text{TRA}}$ (%)	11.17	8.90	0.00	3.92	9.79	16.66	27.46
$\text{StockHold}^{\text{DED}}$ (%)	1.75	4.88	0.00	0.00	0.00	0.79	9.91
$\text{StockHold}^{\text{NII}}$ (%)	45.70	27.95	5.78	21.72	42.44	68.65	93.78
$\Delta\text{StockHold}^{\text{HF}}$ (% per quarter)	0.23	2.34	-3.32	-0.70	0.06	1.02	4.28
$\Delta\text{StockHold}^{\text{QIX}}$ (% per quarter)	0.68	4.10	-5.58	-1.19	0.31	2.36	7.83
$\Delta\text{StockHold}^{\text{TRA}}$ (% per quarter)	0.26	3.44	-5.17	-1.10	0.05	1.44	6.26
$\Delta\text{StockHold}^{\text{DED}}$ (% per quarter)	0.01	1.40	-1.89	-0.08	0.00	0.09	1.97
$\Delta\text{StockHold}^{\text{NII}}$ (% per quarter)	-0.03	5.98	-9.12	-2.49	-0.16	1.98	9.51

Table 2: Trading swaps

This table reports monthly ex-post excess returns, Amihud illiquidity (Amihud; 2002), ex-post alphas and market betas for the short-term portfolios of quarterly trading swaps between HFs and non-HF investors from 1994q2 to 2017q4. Non-HF investors include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed at the end of each quarter and held for the following quarter. Stocks with the change in holding below (above) the bottom (top) 20^{th} percentile are considered as those that investors significantly sell (buy). Alphas and market betas are estimated using CAPM, Fama-French 3-factor, Carhart 4-factor, and 6-factor (Carhart 4 factors plus betting-against-beta (Frazzini and Pedersen; 2014) and liquidity (Pástor and Stambaugh; 2003) factors) models respectively. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 6 lags. t-statistics are reported in brackets.

Panel A: Excess Return & Alpha

	Excess Return (% per month)			Alpha (% per month)											
				CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	0.78**	1.09***	0.82**	-0.35**	0.02	-0.33*	-0.33***	0.04	-0.29**	-0.27**	0.01	-0.13	-0.24*	0.04	-0.04
	(1.99)	(3.06)	(2.24)	(-2.29)	(0.15)	(-1.80)	(-3.15)	(0.30)	(-1.99)	(-2.30)	(0.08)	(-0.91)	(-1.88)	(0.29)	(-0.28)
B/S	1.53***	1.17***	1.24***	0.57***	0.07	0.13	0.53***	0.06	0.17	0.64***	0.19	0.13	0.62***	0.14	0.2
	(5.06)	(3.27)	(3.25)	(2.89)	(0.42)	(0.68)	(3.48)	(0.39)	(1.37)	(4.28)	(1.41)	(1.00)	(4.46)	(1.07)	(1.51)
B/S−S/B	0.75***	0.08	0.42**	0.92***	0.05	0.46**	0.86***	0.02	0.47**	0.91***	0.18	0.25	0.86***	0.11	0.24
	(3.77)	(0.56)	(2.29)	(5.05)	(0.34)	(2.51)	(4.95)	(0.11)	(2.44)	(5.03)	(1.24)	(1.36)	(4.48)	(0.71)	(1.25)

Panel B: Amihud Illiquidity & Market Beta

	Amihud Illiquidity ($\times 10^{-6}$)			Market Beta											
				CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	0.70***	0.59***	1.09***	1.34***	1.24***	1.37***	1.20***	1.12***	1.27***	1.17***	1.14***	1.18***	1.14***	1.11***	1.13***
	(7.03)	(7.98)	(9.30)	(26.38)	(29.47)	(20.57)	(37.01)	(36.91)	(26.63)	(39.34)	(38.38)	(23.57)	(40.14)	(40.48)	(25.13)
B/S	1.10***	0.74***	1.13***	1.10***	1.29***	1.30***	1.03***	1.21***	1.15***	0.98***	1.14***	1.18***	0.95***	1.13***	1.16***
	(6.53)	(6.59)	(9.46)	(29.73)	(32.55)	(26.51)	(30.86)	(33.97)	(33.56)	(28.39)	(31.00)	(31.07)	(27.89)	(33.11)	(28.40)
B/S−S/B	0.40***	0.15	0.04	-0.24***	0.05	-0.07	-0.17***	0.09**	-0.11**	-0.19***	0.01	-0.01	-0.19***	0.02	0.02
	(3.09)	(1.58)	(0.35)	(-4.06)	(1.20)	(-1.51)	(-3.90)	(2.26)	(-2.15)	(-4.54)	(0.16)	(-0.12)	(-4.33)	(0.67)	(0.38)

Table 3: Impact of financial crisis on trading swaps: excess return & alpha

This table reports monthly ex-post excess returns, and ex-post alphas for the short-term portfolios of quarterly trading swaps between HFs and non-HF investors in pre-crisis (1994q2-2007q2), crisis (2007q3-2009q1), and post-crisis (2009q2-2017q4) periods (Ben-David et al.; 2012). Non-HF investors include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed at the end of each quarter and held for the following quarter. Stocks with the change in holding below (above) the bottom (top) 20^{th} percentile are considered as those that investors significantly sell (buy). Alphas and market betas are estimated using CAPM, Fama-French 3-factor, Carhart 4-factor, and 6-factor (Carhart 4 factors plus betting-against-beta (Frazzini and Pedersen; 2014) and liquidity (Pástor and Stambaugh; 2003) factors) models respectively. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 6 lags. t-statistics are reported in brackets.

Panel A: Pre-Crisis (1994q2-2007q2)

	Excess Return (% per month)			Alpha (% per month)											
				CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	0.97**	1.24***	0.81*	-0.34	0.06	-0.54**	-0.25	0.09	-0.43**	-0.12	-0.02	-0.15	-0.06	0.07	-0.12
	(2.01)	(2.84)	(1.74)	(-1.42)	(0.23)	(-2.48)	(-1.57)	(0.46)	(-2.02)	(-0.73)	(-0.08)	(-0.71)	(-0.39)	(0.35)	(-0.55)
B/S	1.76***	1.25***	1.31**	0.68**	0.04	0.03	0.50**	-0.06	0.15	0.72***	0.18	0.03	0.77***	0.19	0.16
	(4.65)	(2.94)	(2.51)	(2.15)	(0.13)	(0.11)	(2.23)	(-0.30)	(0.68)	(3.31)	(0.92)	(0.15)	(3.63)	(0.94)	(0.77)
B/S−S/B	0.79**	0.00	0.49*	1.02***	-0.03	0.58*	0.75***	-0.15	0.58*	0.85***	0.19	0.18	0.84***	0.13	0.27
	(2.50)	(0.01)	(1.68)	(3.49)	(-0.12)	(1.95)	(2.95)	(-0.62)	(1.66)	(2.99)	(0.85)	(0.53)	(2.92)	(0.57)	(0.84)

Panel B: Crisis (2007q3-2009q1)

	Excess Return (% per month)			Alpha (% per month)											
				CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	-2.40	-1.56	-0.56	-0.06	0.71*	1.95**	-0.44	0.02	1.41*	-0.47	-0.27	1.00**	-0.44	-0.63	0.69*
	(-1.03)	(-0.74)	(-0.23)	(-0.15)	(1.90)	(2.37)	(-0.70)	(0.04)	(1.97)	(-0.66)	(-0.34)	(2.56)	(-1.26)	(-0.92)	(1.97)
B/S	-0.28	-1.12	-0.89	1.92***	1.54***	1.41***	1.57***	1.27***	0.95***	1.43***	1.12**	0.90**	1.28**	1.14	0.69
	(-0.15)	(-0.46)	(-0.44)	(6.35)	(4.02)	(3.78)	(5.54)	(3.40)	(2.99)	(3.51)	(2.18)	(2.34)	(2.36)	(1.74)	(1.54)
B/S−S/B	2.12***	0.43	-0.33	1.98***	0.83**	-0.54	2.01***	1.26**	-0.46	1.89***	1.39**	-0.1	1.72***	1.77***	0.01
	(3.55)	(1.01)	(-0.50)	(4.25)	(2.85)	(-0.86)	(2.99)	(2.78)	(-0.68)	(2.96)	(2.18)	(-0.24)	(4.00)	(3.30)	(0.01)

Panel C: Post-Crisis (2009q2-2017q4)

	Excess Return (% per month)			Alpha (% per month)											
				CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	1.13**	1.37***	1.10***	-0.44**	-0.24	-0.45***	-0.32**	-0.15	-0.36***	-0.30**	-0.13	-0.33**	-0.15	0.05	-0.05
	(2.52)	(3.21)	(2.66)	(-2.05)	(-1.39)	(-3.02)	(-2.47)	(-1.07)	(-2.77)	(-2.40)	(-0.91)	(-2.56)	(-0.93)	(0.27)	(-0.40)
B/S	1.55***	1.51***	1.55***	0.14	-0.08	-0.03	0.24*	0.03	0.05	0.27*	0.08	0.05	0.27*	0.29	0.06
	(4.09)	(3.66)	(3.62)	(0.83)	(-0.39)	(-0.15)	(1.74)	(0.18)	(0.37)	(1.92)	(0.56)	(0.34)	(1.88)	(1.60)	(0.31)
B/S−S/B	0.43***	0.14	0.45***	0.58***	0.16	0.41**	0.56***	0.17	0.41**	0.57***	0.21	0.38*	0.42**	0.24	0.11
	(3.03)	(0.84)	(2.71)	(3.62)	(0.92)	(2.03)	(3.75)	(0.92)	(2.08)	(3.81)	(1.16)	(1.87)	(2.07)	(0.96)	(0.52)

Table 4: Impact of financial crisis on trading swaps: market beta

This table reports monthly ex-post market betas for the short-term portfolios of quarterly trading swaps between HFs and non-HF investors in pre-crisis (1994q2-2007q2), crisis (2007q3-2009q1), and post-crisis (2009q2-2017q4) periods (Ben-David et al.; 2012). Non-HF investors include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed at the end of each quarter and held for the following quarter. Stocks with the change in holding below (above) the bottom (top) 20^{th} percentile are considered as those that investors significantly sell (buy). Alphas and market betas are estimated using CAPM, Fama-French 3-factor, Carhart 4-factor, and 6-factor (Carhart 4 factors plus betting-against-beta (Frazzini and Pedersen; 2014) and liquidity (Pástor and Stambaugh; 2003) factors) models respectively. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 6 lags. t-statistics are reported in brackets.

Panel A: Pre-Crisis (1994q2-2007q2)

	Market Beta											
	CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	1.43***	1.25***	1.50***	1.25***	1.12***	1.35***	1.21***	1.16***	1.27***	1.17***	1.12***	1.21***
	(17.05)	(18.08)	(15.72)	(21.85)	(23.38)	(21.49)	(21.36)	(22.51)	(16.16)	(22.53)	(22.54)	(16.36)
B/S	1.09***	1.29***	1.38***	1.12***	1.26***	1.18***	1.04***	1.18***	1.22***	1.01***	1.18***	1.20***
	(18.07)	(19.80)	(20.93)	(20.93)	(22.29)	(23.37)	(20.88)	(18.91)	(19.78)	(17.63)	(18.10)	(17.71)
B/S−S/B	-0.33***	0.04	-0.12*	-0.13**	0.14**	-0.18**	-0.17***	0.02	-0.05	-0.16**	0.06	-0.01
	(-3.41)	(0.65)	(-1.76)	(-2.13)	(2.57)	(-2.33)	(-2.92)	(0.33)	(-0.45)	(-2.48)	(0.95)	(-0.10)

Panel B: Crisis (2007q3-2009q1)

	Market Beta											
	CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	1.24***	1.21***	1.33***	1.23***	1.16***	1.29***	1.22***	1.09***	1.18***	0.94***	0.98***	1.22***
	(29.77)	(24.08)	(24.31)	(30.72)	(24.77)	(25.66)	(25.46)	(10.50)	(19.15)	(12.42)	(9.60)	(17.36)
B/S	1.17***	1.41***	1.22***	1.15***	1.45***	1.21***	1.11***	1.41***	1.20***	1.08***	1.42***	1.23***
	(41.40)	(31.24)	(45.77)	(30.93)	(21.52)	(24.91)	(22.66)	(15.21)	(16.82)	(17.25)	(15.30)	(14.67)
B/S−S/B	-0.07	0.20***	-0.11*	-0.08	0.28***	-0.08	-0.11*	0.32**	0.02	0.14*	0.43***	0.01
	(-1.31)	(2.89)	(-2.05)	(-1.50)	(3.26)	(-1.08)	(-2.02)	(2.70)	(0.20)	(1.96)	(3.70)	(0.16)

Panel C: Post-Crisis (2009q2-2017q4)

	Market Beta											
	CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	1.24***	1.27***	1.22***	1.10***	1.16***	1.12***	1.09***	1.16***	1.11***	1.08***	1.14***	1.09***
	(20.36)	(23.11)	(23.11)	(31.77)	(25.82)	(24.49)	(34.97)	(25.03)	(22.07)	(34.66)	(26.09)	(23.66)
B/S	1.12***	1.26***	1.25***	1.00***	1.13***	1.15***	0.99***	1.12***	1.15***	0.99***	1.10***	1.15***
	(19.67)	(19.20)	(15.97)	(22.53)	(23.83)	(16.28)	(21.37)	(27.66)	(16.31)	(23.57)	(28.65)	(15.45)
B/S−S/B	-0.13**	-0.02	0.03	-0.10**	-0.03	0.03	-0.10**	-0.04	0.04	-0.09*	-0.04	0.06
	(-2.47)	(-0.34)	(0.45)	(-2.08)	(-0.48)	(0.35)	(-2.11)	(-0.70)	(0.42)	(-1.70)	(-0.76)	(0.68)

Table 5: Trading swaps: long-term

This table reports monthly ex-post excess returns, Amihud illiquidity (Amihud; 2002), ex-post alphas and market betas for the long-term portfolios of quarterly trading swaps between HFs and non-HF investors from 1994q2 to 2017q4. Non-HF investors include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed at the end of each quarter and held for the following four quarters. Stocks with the change in holding below (above) the bottom (top) 20$^{\text{th}}$ percentile are considered as those that investors significantly sell (buy). Alphas and market betas are estimated using CAPM, Fama-French 3-factor, Carhart 4-factor, and 6-factor (Carhart 4 factors plus betting-against-beta (Frazzini and Pedersen; 2014) and liquidity (Pástor and Stambaugh; 2003) factors) models respectively. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 6 lags. t-statistics are reported in brackets.

Panel A: Excess Return & Alpha

	Excess Return (% per month)			Alpha (% per month)											
				CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	0.88**	0.92**	0.84**	-0.19	-0.11	-0.24*	-0.17**	-0.09	-0.21**	-0.10	-0.10	-0.09	-0.08	-0.12	-0.05
	(2.41)	(2.50)	(2.29)	(-1.38)	(-0.75)	(-1.66)	(-2.20)	(-1.08)	(-2.55)	(-1.36)	(-1.09)	(-1.19)	(-0.96)	(-1.21)	(-0.65)
B/S	1.25***	1.12***	1.05***	0.30**	0.10	-0.01	0.27***	0.09	0.03	0.30***	0.17*	0.00	0.25***	0.12	0.03
	(3.96)	(3.29)	(2.75)	(1.99)	(0.70)	(-0.06)	(3.01)	(0.98)	(0.30)	(3.53)	(1.88)	(-0.04)	(3.16)	(1.30)	(0.34)
B/S−S/B	0.37***	0.20**	0.21**	0.48***	0.21**	0.23**	0.44***	0.19**	0.24**	0.40***	0.26***	0.09	0.33***	0.23***	0.08
	(3.84)	(2.05)	(2.04)	(4.81)	(2.06)	(2.26)	(5.94)	(2.02)	(2.30)	(5.12)	(3.20)	(0.86)	(4.06)	(2.81)	(0.74)

Panel B: Market Beta

	Market Beta											
	CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	1.32***	1.26***	1.34***	1.20***	1.15***	1.23***	1.17***	1.15***	1.16***	1.14***	1.14***	1.13***
	(35.09)	(39.37)	(26.05)	(42.64)	(48.43)	(32.24)	(48.38)	(44.92)	(37.18)	(45.58)	(40.68)	(40.89)
B/S	1.15***	1.25***	1.31***	1.07***	1.16***	1.17***	1.06***	1.12***	1.18***	1.04***	1.11***	1.16***
	(32.65)	(40.52)	(33.65)	(41.89)	(51.74)	(50.25)	(42.76)	(49.90)	(41.37)	(50.61)	(56.31)	(38.95)
B/S−S/B	-0.17***	-0.01	-0.03	-0.13***	0.01	-0.06	-0.11***	-0.03	0.02	-0.11***	-0.03	0.03
	(-3.57)	(-0.24)	(-0.94)	(-3.43)	(0.50)	(-1.59)	(-3.51)	(-1.41)	(0.70)	(-3.70)	(-1.23)	(1.02)

Table 6: Average change in holding of trading-swap stocks

This table reports the average quarterly change in holding (ΔStockHold, in % per quarter) of trading-swap stocks in trading quarters (q) and quarters following trading (q+1) from 1994q1 to 2017q4. Trading swaps are between HFs and Non-HF investors, which include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012).

$\Delta\text{StockHold}^{\text{HF}}/\Delta\text{StockHold}^{\text{QIX}}$		$\Delta\text{StockHold}^{\text{HF}}/\Delta\text{StockHold}^{\text{TRA}}$		$\Delta\text{StockHold}^{\text{HF}}/\Delta\text{StockHold}^{\text{NII}}$	
q	q+1	q	q+1	q	q+1
-2.88/5.80	0.04/0.86	-2.81/4.37	0.08/0.10	-3.09/7.25	0.21/-0.59
3.43/-4.65	0.33/0.11	3.39/-4.06	0.23/0.10	3.73/-7.64	0.26/0.50

Table 7: Market anomalies: descriptive statistics and portfolio performance

This table reports the descriptive statistics and portfolio alphas from 1994q3 to 2018q2 for five market anomalies, including the GP (Gross profitability), O-Score, IVA (investment-to-assets), NOA (net operating assets) and NSI (net stock issues) anomalies. Portfolios are constructed in the second quarter of year t using anomaly information for the fiscal year ending in calendar year t-1 and are held for the following one year. Short (Long) leg is defined as portfolios that expect to have negative (positive) ex-post alphas, which comprise stocks at the bottom (top) 30% of GP anomaly and those at the top (bottom) 30% of O-Score, IVA, NOA, or NSI anomaly. Alphas are estimated using Carhart 4-factor model. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 12 lags. t-statistics are reported in brackets.

Panel A: Descriptive Statistics of Market Anomalies

	Mean	Std.Dev	P5	P25	Median	P75	P95
GP	0.37	0.27	0.00	0.20	0.34	0.51	0.86
O-Score	-3.14	2.57	-6.63	-4.68	-3.41	-1.99	1.16
IVA	0.10	0.21	-0.07	0.01	0.05	0.13	0.45
NOA	0.67	0.44	0.06	0.45	0.64	0.81	1.33
NSI	0.08	0.26	-0.07	0.00	0.01	0.04	0.45

Panel B: Alphas of Anomaly Portfolios

	GP	O-Score	IVA	NOA	NSI
Short Leg	-0.29***	-0.15	-0.10	-0.23***	-0.01
	(-2.61)	(-1.47)	(-1.23)	(-2.81)	(-0.19)
Long Leg	0.28***	0.15**	0.08	0.19**	0.22***
	(4.25)	(2.11)	(1.18)	(2.47)	(2.80)
Long−Short	0.57***	0.30**	0.18	0.42***	0.23**
	(3.76)	(2.11)	(1.46)	(3.21)	(2.11)

Table 8: Trading swaps for market anomalies: alpha

This table reports the trading-swap portfolio alphas from 1994q3 to 2018q2 for five market anomalies, including the GP (Gross profitability), O-Score, IVA (investment-to-assets), NOA (net operating assets) and NSI (net stock issues) anomalies. Trading swaps are between HFs and Non-HF investors, which include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed in the second quarter of year t using the change in holding information in the same quarter and the anomaly information for the fiscal year ending in calendar year t-1, and are held for the following one year. Stocks with the change in holding below (above) the bottom (top) 20^{th} percentile are considered as those that investors significantly sell (buy). Short (Long) leg is defined as portfolios that expect to have negative (positive) ex-post alphas, which comprise stocks at the bottom (top) 30% of GP anomaly and those at the top (bottom) 30% of O-Score, IVA, NOA, or NSI anomaly. Alphas are estimated using Carhart 4-factor model. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 12 lags. t-statistics are reported in brackets.

Panel A: HF/QIX Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	-0.54*	0.14	0.68*	0.12	0.37	0.25	-0.55**	0.33	0.88*	-0.41**	0.41	0.82**	-0.38*	0.52	0.90***
	(-1.94)	(0.44)	(1.80)	(0.34)	(1.22)	(0.53)	(-2.56)	(0.73)	(1.93)	(-2.21)	(1.23)	(2.46)	(-1.86)	(1.51)	(2.63)
Long Leg	0.01	0.36	0.35	-0.08	0.75***	0.83**	0.08	0.19	0.11	0.10	0.17	0.07	0.09	0.23	0.14
	(0.04)	(1.54)	(1.02)	(-0.31)	(2.97)	(2.25)	(0.28)	(0.95)	(0.30)	(0.44)	(0.96)	(0.27)	(0.29)	(1.12)	(0.37)
Long−Short	0.55	0.22	-0.33	-0.20	0.38	0.58	0.63*	-0.14	-0.77	0.51*	-0.24	-0.75	0.47*	-0.29	-0.76
	(1.49)	(0.45)	(-0.55)	(-0.40)	(0.90)	(0.79)	(1.96)	(-0.27)	(-1.34)	(1.75)	(-0.57)	(-1.57)	(1.81)	(-0.63)	(-1.27)

Panel B: HF/TRA Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	-0.49*	-0.43	0.06	-0.43*	0.02	0.45	-0.11	0.11	0.22	-0.47*	-0.29	0.18	0.03	0.13	0.10
	(-1.89)	(-1.18)	(0.19)	(-1.88)	(0.07)	(1.60)	(-0.39)	(0.40)	(0.56)	(-1.82)	(-1.64)	(0.53)	(0.11)	(0.58)	(0.36)
Long Leg	0.57***	0.64**	0.07	0.36*	0.19	-0.17	-0.05	0.21	0.26	0.09	0.88**	0.79**	0.12	0.37	0.25
	(2.80)	(2.47)	(0.28)	(1.69)	(1.01)	(-0.62)	(-0.24)	(0.77)	(0.86)	(0.32)	(2.50)	(2.37)	(0.50)	(1.57)	(0.70)
Long−Short	1.06**	1.07**	0.02	0.79***	0.17	-0.62	0.06	0.09	0.03	0.55	1.17***	0.62	0.09	0.24	0.15
	(2.53)	(2.26)	(0.04)	(2.69)	(0.65)	(-1.37)	(0.21)	(0.24)	(0.08)	(1.59)	(3.18)	(1.31)	(0.32)	(0.67)	(0.30)

Panel C: HF/NII Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	-0.07	-0.10	-0.03	-0.08	-0.27	-0.19	-0.31	-0.22	0.09	-0.27	-0.25	0.02	-0.02	0.19	0.21
	(-0.31)	(-0.42)	(-0.11)	(-0.27)	(-1.37)	(-0.57)	(-1.32)	(-0.97)	(0.26)	(-1.01)	(-0.93)	(0.06)	(-0.11)	(0.86)	(0.70)
Long Leg	0.29	0.52**	0.22	-0.08	0.05	0.13	0.02	0.02	0.00	0.09	0.35*	0.26	-0.29	0.16	0.45
	(1.46)	(2.34)	(0.73)	(-0.48)	(0.28)	(0.49)	(0.09)	(0.11)	0.00	(0.27)	(1.67)	(0.77)	(-1.08)	(0.70)	(1.15)
Long−Short	0.36	0.62	0.26	0.00	0.33	0.33	0.33	0.25	-0.08	0.36	0.60	0.24	-0.27	-0.03	0.24
	(1.24)	(1.56)	(0.57)	0.00	(1.38)	(0.80)	(1.00)	(0.75)	(-0.22)	(0.68)	(1.54)	(0.41)	(-0.88)	(-0.09)	(0.54)

Table 9: Trading swaps for market anomalies: market beta

This table reports the trading-swap portfolio market betas from 1994q3 to 2018q2 for five market anomalies, including the GP (Gross profitability), O-Score, IVA (investment-to-assets), NOA (net operating assets) and NSI (net stock issues) anomalies. Trading swaps are between HFs and Non-HF investors, which include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed in the second quarter of year t using the change in holding information in the same quarter and the anomaly information for the fiscal year ending in calendar year t-1, and are held for the following one year. Stocks with the change in holding below (above) the bottom (top) 20^{th} percentile are considered as those that investors significantly sell (buy). Short (Long) leg is defined as portfolios that expect to have negative (positive) ex-post alphas, which comprise stocks at the bottom (top) 30% of GP anomaly and those at the top (bottom) 30% of O-Score, IVA, NOA, or NSI anomaly. Alphas are estimated using Carhart 4-factor model. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 12 lags. t-statistics are reported in brackets.

Panel A: HF/QIX Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	1.39***	1.07***	-0.33***	1.26***	0.97***	-0.30**	1.37***	1.17***	-0.20*	1.33***	1.01***	-0.32***	1.32***	1.03***	-0.29**
	(15.62)	(15.57)	(-2.89)	(11.23)	(14.84)	(-2.04)	(14.49)	(14.49)	(-1.71)	(14.80)	(15.07)	(-3.04)	(17.78)	(10.40)	(-2.22)
Long Leg	1.14***	0.92***	-0.22***	1.21***	0.99***	-0.22***	1.21***	1.03***	-0.18	1.29***	1.16***	-0.13	0.98***	0.98***	0.00
	(13.71)	(18.77)	(-2.95)	(18.82)	(28.82)	(-3.22)	(13.70)	(17.14)	(-1.52)	(19.52)	(20.15)	(-1.32)	(13.14)	(15.53)	(0.05)
Long−Short	-0.26**	-0.15*	0.11	-0.05	0.03	0.08	-0.16	-0.14**	0.02	-0.04	0.15**	0.19	-0.34***	-0.05	0.29
	(-2.17)	(-1.70)	(0.76)	(-0.35)	(0.39)	(0.47)	(-1.44)	(-2.32)	(0.13)	(-0.31)	(2.22)	(1.27)	(-3.22)	(-0.34)	(1.35)

Panel B: HF/TRA Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	1.48***	1.42***	-0.05	1.32***	1.21***	-0.11	1.33***	1.23***	-0.11	1.33***	1.20***	-0.13	1.26***	1.29***	0.03
	(17.42)	(15.53)	(-0.66)	(15.18)	(18.18)	(-0.89)	(16.34)	(13.56)	(-0.84)	(16.46)	(19.69)	(-1.29)	(21.98)	(20.66)	(0.35)
Long Leg	1.02***	0.91***	-0.11	1.14***	1.14***	0.00	1.16***	1.12***	-0.04	1.28***	1.03***	-0.25***	1.04***	1.02***	-0.02
	(16.11)	(10.67)	(-1.09)	(14.36)	(11.37)	0.00	(27.24)	(18.09)	(-0.52)	(16.75)	(18.21)	(-2.89)	(12.53)	(12.11)	(-0.25)
Long−Short	-0.45***	-0.51***	-0.06	-0.18	-0.07	0.11	-0.17*	-0.10	0.07	-0.05	-0.16*	-0.11	-0.22*	-0.26**	-0.05
	(-3.62)	(-3.49)	(-0.53)	(-1.56)	(-0.57)	(0.56)	(-1.86)	(-0.96)	(0.47)	(-0.48)	(-1.79)	(-1.00)	(-1.82)	(-2.44)	(-0.55)

Panel C: HF/NII Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	1.30***	1.40***	0.10	1.28***	1.43***	0.14	1.39***	1.40***	0.02	1.16***	1.37***	0.20*	1.24***	1.31***	0.07
	(15.34)	(19.79)	(0.81)	(11.04)	(23.70)	(1.01)	(17.04)	(16.57)	(0.16)	(21.00)	(13.84)	(1.97)	(17.18)	(23.93)	(0.69)
Long Leg	1.08***	1.08***	0.00	1.12***	1.20***	0.08	0.92***	1.23***	0.31**	1.18***	1.14***	-0.04	1.04***	1.06***	0.02
	(11.69)	(17.87)	(-0.00)	(15.65)	(24.99)	(0.86)	(8.56)	(14.21)	(2.27)	(8.01)	(19.80)	(-0.21)	(16.65)	(15.27)	(0.16)
Long−Short	-0.21**	-0.32***	-0.10	-0.16	-0.22***	-0.07	-0.47***	-0.18	0.30***	0.01	-0.23*	-0.24	-0.20***	-0.26***	-0.06
	(-2.36)	(-3.09)	(-0.64)	(-1.30)	(-3.30)	(-0.50)	(-4.65)	(-1.36)	(3.15)	(0.08)	(-1.75)	(-1.19)	(-2.88)	(-3.10)	(-0.56)

Hedge Funds and Quasi-Indexers: Cui Bono?

SUPPLEMENTARY RESULTS

Xinyu Cui, Olga Kolokolova, Jiaguo (George) Wang

January 13, 2020

Table A1: Institutional trading

This table reports monthly ex-post excess returns, ex-post alphas, and market betas for the short-term portfolios of quarterly HFs and non-HF trading from 1994q1 to 2017q4. Non-HF investors include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed at the end of each quarter and held for the following quarter. Stocks with the change in holding below (above) the bottom (top) 20^{th} percentile are considered as those that investors significantly sell (buy). Alphas and market betas are estimated using CAPM, Fama-French 3-factor, Carhart 4-factor, and 6-factor (Carhart 4 factors plus betting-against-beta (Frazzini & Pedersen 2014) and liquidity (Pástor & Stambaugh 2003) factors) models respectively. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 6 lags. t-statistics are reported in brackets.

Panel A: Excess Return & Alpha

	Excess Return (% per month)				Alpha (% per month)															
					CAPM				FF 3-factor				Carhart 4-factor				6-factor			
	HF	QIX	TRA	NII	HF	QIX	TRA	NII	HF	QIX	TRA	NII	HF	QIX	TRA	NII	HF	QIX	TRA	NII
Sell	0.89**	1.14***	0.94***	0.96***	-0.19*	0.20*	-0.17	-0.08	-0.18***	0.17**	-0.17*	-0.06	-0.10	0.25***	-0.01	-0.11	-0.10	0.20***	-0.03	-0.07
	(2.53)	(3.90)	(2.65)	(2.77)	(-1.76)	(1.82)	(-1.39)	(-0.59)	(-2.60)	(2.46)	(-1.78)	(-0.75)	(-1.45)	(4.14)	(-0.07)	(-1.35)	(-1.24)	(3.48)	(-0.29)	(-0.77)
Buy	1.22***	0.85**	1.16***	0.85**	0.16	-0.26*	0.11	-0.23*	0.17**	-0.23***	0.14	-0.20*	0.17**	-0.22***	0.06	-0.06	0.19**	-0.20***	0.11	-0.08
	(3.55)	(2.30)	(3.21)	(2.40)	(1.06)	(-1.81)	(0.67)	(-1.72)	(2.05)	(-3.26)	(1.42)	(-1.88)	(2.21)	(-3.05)	(0.70)	(-0.69)	(2.57)	(-2.63)	(1.20)	(-0.97)
Buy−Sell	0.34***	-0.29**	0.22	-0.12	0.34***	-0.45***	0.28*	-0.15	0.35***	-0.40***	0.32**	-0.14	0.27***	-0.47***	0.07	0.05	0.29***	-0.41***	0.14	-0.02
	(3.23)	(-2.21)	(1.36)	(-0.81)	(3.37)	(-3.85)	(1.92)	(-1.08)	(3.64)	(-4.00)	(2.19)	(-0.99)	(2.85)	(-4.92)	(0.58)	(0.43)	(2.85)	(-4.13)	(1.12)	(-0.18)

Panel B: Market Beta

	Market Beta															
	CAPM				FF 3-factor				Carhart 4-factor				6-factor			
	HF	QIX	TRA	NII	HF	QIX	TRA	NII	HF	QIX	TRA	NII	HF	QIX	TRA	NII
Sell	1.26***	1.07***	1.31***	1.21***	1.16***	1.01***	1.23***	1.09***	1.12***	0.97***	1.15***	1.11***	1.10***	0.96***	1.13***	1.10***
	(37.88)	(38.92)	(32.46)	(38.26)	(55.27)	(57.47)	(40.40)	(59.01)	(63.82)	(46.12)	(43.64)	(51.78)	(63.84)	(50.47)	(48.47)	(47.78)
Buy	1.24***	1.31***	1.23***	1.26***	1.13***	1.17***	1.09***	1.17***	1.13***	1.17***	1.14***	1.10***	1.11***	1.15***	1.11***	1.08***
	(34.85)	(29.69)	(30.20)	(29.39)	(57.39)	(49.05)	(51.74)	(40.42)	(49.74)	(43.24)	(53.92)	(39.05)	(50.77)	(43.96)	(53.22)	(40.52)
Buy−Sell	-0.01	0.23***	-0.08	0.05	-0.03	0.16***	-0.14***	0.08**	0.01	0.20***	-0.01	-0.02	0.01	0.19***	-0.02	-0.02
	(-0.40)	(4.65)	(-1.54)	(1.16)	(-1.34)	(5.13)	(-3.72)	(2.35)	(0.42)	(5.20)	(-0.40)	(-0.44)	(0.42)	(5.17)	(-0.67)	(-0.59)

Table A2: Trading swaps: 10% cutoffs

This table reports monthly ex-post excess returns, ex-post alphas, and market betas for the short-term portfolios of quarterly trading swaps between HFs and non-HF investors from 1994q1 to 2017q4. Non-HF investors include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed at the end of each quarter and held for the following quarter. Stocks with the change in holding below (above) the bottom (top) 10^{th} percentile are considered as those that investors significantly sell (buy). Alphas and market betas are estimated using CAPM, Fama-French 3-factor, Carhart 4-factor, and 6-factor (Carhart 4 factors plus betting-against-beta (Frazzini & Pedersen 2014) and liquidity (Pástor & Stambaugh 2003) factors) models respectively. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 6 lags. t-statistics are reported in brackets.

Panel A: Excess Return & Alpha

	Excess Return (% per month)			Alpha (% per month)											
				CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	0.60	0.90**	0.77	-0.58**	-0.15	-0.46	-0.53***	-0.14	-0.41	-0.49**	-0.19	-0.18	-0.38	-0.13	-0.11
	(1.28)	(2.15)	(1.62)	(-2.31)	(-0.59)	(-1.42)	(-2.61)	(-0.60)	(-1.56)	(-2.48)	(-0.89)	(-0.67)	(-1.59)	(-0.65)	(-0.40)
B/S	1.27***	1.07**	1.22***	0.30	-0.10	0.04	0.26	-0.13	0.10	0.41**	0.09	0.02	0.42**	0.07	0.15
	(3.85)	(2.54)	(2.66)	(1.59)	(-0.45)	(0.16)	(1.57)	(-0.62)	(0.45)	(2.58)	(0.50)	(0.11)	(2.59)	(0.42)	(0.63)
B/S−S/B	0.67***	0.17	0.44	0.88***	0.05	0.51	0.79***	0.01	0.51	0.90***	0.28	0.2	0.81***	0.21	0.26
	(2.71)	(0.63)	(1.24)	(4.04)	(0.19)	(1.41)	(3.58)	(0.03)	(1.35)	(4.11)	(1.10)	(0.56)	(3.46)	(0.83)	(0.68)

Panel B: Market Beta

	Market Beta											
	CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	1.41***	1.22***	1.49***	1.21***	1.09***	1.35***	1.19***	1.12***	1.23***	1.15***	1.07***	1.18***
	(21.90)	(17.62)	(17.66)	(27.37)	(17.47)	(20.47)	(25.22)	(20.95)	(16.34)	(21.40)	(22.68)	(17.57)
B/S	1.11***	1.39***	1.40***	1.04***	1.32***	1.24***	0.97***	1.21***	1.28***	0.95***	1.20***	1.24***
	(24.48)	(19.82)	(18.83)	(24.32)	(20.39)	(24.25)	(28.05)	(18.39)	(18.57)	(26.12)	(19.12)	(16.85)
B/S−S/B	-0.30***	0.17*	-0.09	-0.17***	0.22**	-0.10	-0.22***	0.09	0.05	-0.21***	0.13*	0.07
	(-4.20)	(1.90)	(-1.36)	(-2.84)	(2.52)	(-1.54)	(-3.55)	(1.07)	(0.54)	(-3.04)	(1.70)	(0.78)

Table A3: Trading swaps: 30% cutoffs

This table reports monthly ex-post excess returns, ex-post alphas, and market betas for the short-term portfolios of quarterly trading swaps between HFs and non-HF investors from 1994q1 to 2017q4. Non-HF investors include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed at the end of each quarter and held for the following quarter. Stocks with the change in holding below (above) the bottom (top) 30^{th} percentile are considered as those that investors significantly sell (buy). Alphas and market betas are estimated using CAPM, Fama-French 3-factor, Carhart 4-factor, and 6-factor (Carhart 4 factors plus betting-against-beta (Frazzini & Pedersen 2014) and liquidity (Pástor & Stambaugh 2003) factors) models respectively. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 6 lags. t-statistics are reported in brackets.

Panel A: Excess Return & Alpha

	Excess Return (% per month)			Alpha (% per month)											
				CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	0.86**	1.04***	0.76**	-0.23*	0.01	-0.33***	-0.21***	0.01	-0.33***	-0.16*	-0.03	-0.21**	-0.13	-0.03	-0.20**
	(2.44)	(3.09)	(2.16)	(-1.71)	(0.09)	(-2.64)	(-2.64)	(0.10)	(-3.21)	(-1.90)	(-0.36)	(-2.43)	(-1.50)	(-0.35)	(-2.23)
B/S	1.39***	1.22***	1.22***	0.43***	0.17	0.14	0.39***	0.15	0.16	0.47***	0.26**	0.15	0.43***	0.19*	0.17*
	(4.63)	(3.61)	(3.33)	(2.60)	(1.07)	(0.92)	(3.14)	(1.17)	(1.59)	(4.02)	(2.43)	(1.47)	(3.79)	(1.84)	(1.65)
B/S−S/B	0.53***	0.18	0.45***	0.66***	0.15	0.48***	0.61***	0.14	0.49***	0.63***	0.29**	0.36***	0.56***	0.22*	0.37***
	(3.57)	(1.33)	(3.34)	(4.61)	(1.17)	(3.54)	(4.74)	(0.97)	(3.63)	(4.87)	(2.39)	(2.83)	(4.11)	(1.79)	(2.73)

Panel B: Market Beta

	Market Beta											
	CAPM			FF 3-factor			Carhart 4-factor			6-factor		
	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII	HF/QIX	HF/TRA	HF/NII
S/B	1.28***	1.18***	1.29***	1.16***	1.08***	1.20***	1.13***	1.11***	1.14***	1.11***	1.09***	1.11***
	(32.01)	(31.56)	(30.96)	(52.57)	(41.67)	(39.17)	(57.65)	(44.06)	(37.34)	(58.86)	(46.83)	(37.87)
B/S	1.09***	1.22***	1.25***	1.03***	1.15***	1.14***	0.99***	1.09***	1.14***	0.98***	1.09***	1.13***
	(31.72)	(37.79)	(34.25)	(39.58)	(43.49)	(36.91)	(38.93)	(40.90)	(39.51)	(41.71)	(48.81)	(38.33)
B/S−S/B	-0.19***	0.04	-0.04	-0.13***	0.06*	-0.06	-0.14***	-0.02	0.00	-0.13***	0.00	0.02
	(-3.89)	(0.95)	(-0.88)	(-4.02)	(1.81)	(-1.54)	(-4.79)	(-0.55)	(-0.02)	(-4.85)	(-0.09)	(0.43)

Table A4: Market anomalies: description

This table describes the market anomalies used in this study. "Positive" predictability means that stocks with high value of the anomaly-related characteristic are expected to have positive future abnormal returns, whereas "negative" predictably means that the expected abnormal returns are negative. The variable names (items) are as used in COMPUSTAT.

Market anomaly	Variable	Predictability	Construction	Reference
Gross profitability	GP	Positive	Total revenue (item REVT) minus the cost of goods sold (item COGS), divided by current total assets (item AT).	Novy-Marx (2013)
O-Score	O-Score	Negative	O-Score $= -0.407\text{SIZE} + 6.03\text{TLTA} - 1.43\text{WCTA} + 0.076\text{CLCA} - 1.72O\text{ENEG} - 2.37\text{NITA} - 1.83\text{FUTL} + 0.285\text{INTWO} - 0.521\text{CHIN} - 1.32$, where SIZE is the log of total assets (item AT), TLTA is the book value of debt (item DLC plus item DLTT) divided by total assets, WCTA is working capital (item ACT minus item LCT) divided by total assets, CLCA is current liabilities (item LCT) divided by current assets (item ACT), ONEEG is 1 if total liabilities (item LT) exceed total assets and is zero otherwise, NITA is net income (item NI) divided by total assets, FUTL is funds provided by operations (item PI) divided by total liabilities, INTWO is equal to 1 if net income (item NI) is negative for the last 2 years and zero otherwise, CHIN is $(\text{NI}_j - \text{NI}_{j-1})/(\lvert\text{NI}_j\rvert + \lvert\text{NI}_{j-1}\rvert)$, in which NI_j is the income (item NI) for year j.	Ohlson (1980)
Investment-to-assets	IVA	Negative	The changes in gross property, plant, and equipment (item PPEGT) plus changes in inventory (item INVT), divided by lagged total assets (item AT).	Titman et al. (2004)
Net operating assets	NOA	Negative	Debt included in current liabilities (item DLC), plus long-term debt (item DLTT), plus common equity (item CEQ), plus minority interests (item MIB), plus preferred stocks (item PSTK), minus cash and short-term investment (item CHE), divided by lagged total assets (item AT).	Hirshleifer et al. (2004)
Net stock issues	NSI	Negative	The annual log change in split-adjusted shares outstanding. Split-adjusted shares outstanding equals shares outstanding (item CSHO) times the adjustment factor (item ADJEX_C).	Fama & French (2008)

Table A5: Trading swaps for market anomalies: alphas (annual change in holding)

This table reports the trading-swap portfolio alphas from 1995q3 to 2018q2 for five market anomalies, including the GP (Gross profitability), O-Score, IVA (investment-to-assets), NOA (net operating assets) and NSI (net stock issues) anomalies. Trading swaps are between HFs and Non-HF investors, which include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed in the second quarter of year t using the change in holding information in past four quarters and the anomaly information for the fiscal year ending in calendar year t-1, and are held for the following one year. Stocks with the change in holding below (above) the bottom (top) 20^{th} percentile are considered as those that investors significantly sell (buy). Short (Long) leg is defined as portfolios that expect to have negative (positive) ex-post alphas, which comprise stocks at the bottom (top) 30% of GP anomaly and those at the top (bottom) 30% of O-Score, IVA, NOA, or NSI anomaly. Alphas are estimated using Carhart 4-factor model. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 12 lags. t-statistics are reported in brackets.

Panel A: HF/QIX Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	-0.45	0.30	0.74	-0.41	0.15	0.56	-0.72**	-0.12	0.60	-0.95***	0.08	1.04**	-0.50	0.41	0.91**
	(-0.97)	(1.05)	(1.43)	(-0.79)	(0.34)	(0.98)	(-2.52)	(-0.30)	(1.10)	(-3.06)	(0.31)	(2.47)	(-1.39)	(1.42)	(2.02)
Long Leg	0.02	0.65**	0.63	-0.29	0.11	0.40	-0.12	0.20	0.33	-0.34	0.46	0.80	-0.10	0.14	0.24
	(0.08)	(2.33)	(1.63)	(-1.39)	(0.49)	(1.19)	(-0.31)	(0.84)	(0.75)	(-1.58)	(1.33)	(1.60)	(-0.28)	(0.72)	(0.63)
Long−Short	0.47	0.36	-0.11	0.13	-0.04	-0.16	0.60**	0.32	-0.28	0.62*	0.38	-0.24	0.41	-0.27	-0.67
	(1.18)	(0.80)	(-0.25)	(0.24)	(-0.06)	(-0.23)	(2.01)	(0.67)	(-0.55)	(1.89)	(0.75)	(-0.35)	(0.89)	(-0.69)	(-1.35)

Panel B: HF/TRA Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	-0.55	-0.42	0.13	0.06	-0.32	-0.37	-0.33	-0.04	0.28	-0.62*	0.01	0.63*	-0.04	-0.17	-0.13
	(-1.44)	(-1.44)	(0.37)	(0.17)	(-1.14)	(-1.10)	(-0.93)	(-0.12)	(0.59)	(-1.81)	(0.02)	(1.78)	(-0.15)	(-0.63)	(-0.35)
Long Leg	0.32	-0.05	-0.37	-0.11	-0.07	0.04	-0.06	-0.38	-0.32	0.56	0.30	-0.26	-0.01	-0.33	-0.33
	(1.14)	(-0.17)	(-0.82)	(-0.40)	(-0.23)	(0.13)	(-0.18)	(-1.65)	(-0.79)	(1.58)	(1.53)	(-0.63)	(-0.02)	(-0.95)	(-0.69)
Long−Short	0.88	0.37	-0.51	-0.17	0.24	0.41	0.27	-0.33	-0.60	1.18**	0.29	-0.90**	0.04	-0.16	-0.20
	(1.57)	(1.03)	(-0.81)	(-0.45)	(0.74)	(0.91)	(0.54)	(-0.79)	(-1.14)	(1.99)	(0.68)	(-2.10)	(0.10)	(-0.42)	(-0.54)

Panel C: HF/NII Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	-0.79***	-0.38	0.41	-0.47	0.28	0.75*	-0.43*	-0.48	-0.05	-0.68**	-0.56	0.12	-0.27	-0.40	-0.13
	(-2.94)	(-0.99)	(1.27)	(-1.35)	(0.82)	(1.66)	(-1.72)	(-1.06)	(-0.15)	(-2.01)	(-1.49)	(0.36)	(-1.06)	(-1.31)	(-0.31)
Long Leg	0.20	0.14	-0.07	0.02	-0.02	-0.04	0.18	-0.26	-0.44**	0.20	0.23	0.03	0.14	0.13	-0.01
	(0.78)	(0.45)	(-0.19)	(0.09)	(-0.08)	(-0.12)	(1.16)	(-1.18)	(-2.33)	(0.83)	(0.83)	(0.12)	(0.40)	(0.51)	(-0.04)
Long−Short	0.99***	0.51	-0.48	0.49	-0.30	-0.79	0.61**	0.22	-0.39	0.87*	0.79	-0.08	0.41	0.53	0.12
	(3.34)	(0.86)	(-0.87)	(1.09)	(-0.76)	(-1.13)	(2.05)	(0.46)	(-1.00)	(1.83)	(1.59)	(-0.17)	(0.99)	(1.35)	(0.20)

Table A6: Trading swaps for market anomalies: market betas (annual change in holding)

This table reports the trading-swap portfolio market betas from 1995q3 to 2018q2 for five market anomalies, including the GP (Gross profitability), O-Score, IVA (investment-to-assets), NOA (net operating assets) and NSI (net stock issues) anomalies. Trading swaps are between HFs and Non-HF investors, which include (1) quasi-indexers (QIXs), (2) transient institutions (TRAs), and (3) non-institutional investors (NIIs), following Bushee (2001) and Ben-David et al. (2012). Portfolios are constructed in the second quarter of year t using the change in holding information in the past four quarters and the anomaly information for the fiscal year ending in calendar year t-1, and are held for the following one year. Stocks with the change in holding below (above) the bottom (top) 20^{th} percentile are considered as those that investors significantly sell (buy). Short (Long) leg is defined as portfolios that expect to have negative (positive) ex-post alphas, which comprise stocks at the bottom (top) 30% of GP anomaly and those at the top (bottom) 30% of O-Score, IVA, NOA, or NSI anomaly. Alphas are estimated using Carhart 4-factor model. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The standard errors are adjusted for heteroscedasticity and serial correlation using the Newey-West estimator with 12 lags. t-statistics are reported in brackets.

Panel A: HF/QIX Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	1.14***	1.18***	0.04	1.24***	1.21***	-0.03	1.35***	1.18***	-0.17**	1.35***	1.06***	-0.29**	1.30***	1.21***	-0.09
	(7.96)	(13.57)	(0.31)	(7.03)	(8.40)	(-0.17)	(17.85)	(21.23)	(-2.46)	(12.46)	(8.62)	(-2.43)	(9.85)	(10.47)	(-0.84)
Long Leg	1.20***	0.94***	-0.26**	1.32***	1.05***	-0.27***	1.17***	1.01***	-0.16	1.29***	1.02***	-0.26**	1.22***	0.93***	-0.30*
	(14.24)	(12.33)	(-1.98)	(20.75)	(17.20)	(-3.33)	(7.77)	(14.80)	(-0.96)	(13.07)	(18.45)	(-2.11)	(6.56)	(14.88)	(-1.77)
Long−Short	0.06	-0.24**	-0.30**	0.08	-0.16	-0.24	-0.19*	-0.18**	0.01	-0.06	-0.04	0.02	-0.08	-0.28**	-0.21
	(0.40)	(-2.57)	(-2.26)	(0.50)	(-0.95)	(-1.21)	(-1.69)	(-2.03)	(0.08)	(-0.64)	(-0.25)	(0.14)	(-0.41)	(-2.44)	(-0.99)

Panel B: HF/TRA Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	1.39***	1.28***	-0.11	1.41***	1.15***	-0.26*	1.46***	1.15***	-0.31***	1.19***	1.09***	-0.10	1.30***	1.00***	-0.30***
	(11.34)	(18.34)	(-0.81)	(10.65)	(18.30)	(-1.67)	(14.16)	(13.00)	(-2.86)	(12.88)	(13.39)	(-1.11)	(18.15)	(12.76)	(-3.04)
Long Leg	1.12***	1.02***	-0.11	1.25***	0.97***	-0.28*	1.25***	1.08***	-0.17	1.39***	1.01***	-0.39**	1.22***	1.14***	-0.08
	(14.49)	(16.78)	(-0.88)	(11.13)	(11.47)	(-1.93)	(10.03)	(20.15)	(-1.17)	(16.60)	(12.18)	(-2.54)	(9.39)	(16.05)	(-0.60)
Long−Short	-0.26	-0.27***	0.00	-0.16	-0.17	-0.01	-0.21	-0.07	0.14	0.20*	-0.09	-0.29*	-0.08	0.14	0.22
	(-1.53)	(-3.23)	(-0.01)	(-0.82)	(-1.49)	(-0.06)	(-1.18)	(-0.59)	(0.70)	(1.73)	(-0.85)	(-1.95)	(-0.51)	(1.14)	(1.35)

Panel C: HF/NII Swap

	GP			O-Score			IVA			NOA			NSI		
	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B	S/B	B/S	B/S−S/B
Short Leg	1.35***	1.36***	0.01	1.27***	1.37***	0.10	1.28***	1.39***	0.10	1.27***	1.29***	0.02	1.18***	1.36***	0.18
	(16.16)	(13.48)	(0.06)	(12.61)	(17.33)	(0.92)	(12.13)	(11.35)	(0.72)	(11.20)	(11.95)	(0.19)	(12.09)	(13.55)	(1.46)
Long Leg	1.03***	1.09***	0.06	1.12***	1.17***	0.05	1.17***	1.13***	-0.03	1.15***	1.21***	0.06	1.03***	0.97***	-0.06
	(16.84)	(17.50)	(0.84)	(12.83)	(17.95)	(0.52)	(19.03)	(19.59)	(-0.38)	(13.49)	(17.58)	(0.51)	(16.79)	(14.68)	(-0.95)
Long−Short	-0.32***	-0.27**	0.05	-0.15	-0.20**	-0.05	-0.12	-0.25**	-0.14	-0.12	-0.08	0.04	-0.15*	-0.39***	-0.24*
	(-3.54)	(-2.17)	(0.39)	(-1.05)	(-2.55)	(-0.32)	(-0.87)	(-1.99)	(-0.72)	(-1.05)	(-0.63)	(0.19)	(-1.68)	(-3.64)	(-1.73)

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