Taking Sides on Return Predictability

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Abstract

We study how nine different market participants, including retail investors, short sellers, firms, and 6 types of institutions, trade with respect to 131 stock return anomalies, and how each participant's trades predict returns. Retail investors do the worst. They accumulate anomaly-shorts and sell anomaly-longs. Short sellers build positions in anomaly-shorts, and begin to exit these positions soon after the portfolio-formation date. Firms are net share issuers across all types of stocks, but firms that are anomaly-shorts issue more shares. Institutional investors generally weight their portfolios towards anomaly-shorts, and then reduce these positions after the portfolio-formation date. Retail and bank trades predict stock returns in the wrong direction, other institutional trades do not consistently predict returns, firms' and short sellers' trades predict returns in the intended direction. Overall, firms and short sellers are the smart money, institutions are neutral, while retail investors perform the worst.

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We study how nine different market participants, retail investors, short sellers, firms, and 6 types of institutions, trade with respect to 131 different variables that have been shown to predict the cross-section of stock return returns (anomalies) and how each participant's trades forecast returns. A vast literature shows that simple cross-sectional sorts on easy-to-observe characteristics such as earnings surprises (Foster, Olsen, and Shevlin, 1984) and recent past returns (Jegadeesh and Titman, 1993) forecast stock returns. McLean and Pontiff (2016) find that post-publication, anomaly returns decay, but continue to persist. Lewellen (2011), Edelen, Ince, and Kadlec (2016), and Calluzzo, Moneta, and Topaloglu (2019) provide some mixed evidence on how institutions trade with respect to some popular anomalies. Drake, Rees, and Swanson (2011) and McLean and Pontiff (2016) find that short sellers target anomaly-shorts. We build on these studies and report several findings that are novel to this literature. To the best of our knowledge, this study provides the broadest investigation of market participation to date.

Using a comprehensive index based on 131 anomaly variables, we find that retail investors accumulate stocks that end up being anomaly-shorts, and reduce holdings in stocks that end up being anomaly-longs. Long and shorts are defined as stocks that fall into the top and bottom quintiles of our comprehensive anomaly index. Banks trade like retail investors. Banks accumulate eventual anomaly-shorts and reduce holdings in eventual anomaly-longs. Mutual funds and wealth managers were net sellers across all types of stocks during our sample period, however both sold more eventual anomaly-longs than eventual anomaly-shorts. Insurance companies also reduce their ownership in all types of stocks, but do so more for anomaly-shorts than anomaly-longs. Hedge funds and other institutional investors were net buyers during our

sample period, and increased ownership across all types of stocks, however, both increased ownership more in anomaly-shorts than in anomaly-longs.

Firms and short sellers are the only two participants to build positions that end up being consistent with anomaly strategies. Short sellers increase short interest in eventual anomaly-shorts, and reduce short interest in eventual anomaly-longs. Firms are net issuers in all types of stocks, i.e., firms across the board tend to issue more shares than they repurchase. However, eventual anomaly-shorts issue the most shares, and eventual anomaly-longs issue the fewest.

In addition to observing trades, we also observe holdings for institutions and short sellers. Short sellers are well-positioned with respect to anomalies; short interest averages 6.5% in anomaly-shorts and 2.8% in anomaly-longs. Institutions' tend to have the opposite pattern. Banks own on average 6% of shares outstanding in anomaly-shorts and 3.1% in anomaly-longs. Mutual funds own on average 14.2% of anomaly-shorts, and 8.1% of anomaly-longs. Hedge funds on average own 17.3% and 13.4% of anomaly-shorts and anomaly-longs, respectively. "Other" or unclassified institutional investors own on average 35.7% of anomaly-shorts and 22.9% of anomaly-longs. Insurance companies and wealth managers also own significantly more anomaly-shorts than anomaly-longs. Overall, the holdings data show that long positions of institutions are on the wrong side of anomalies, while short sellers on the right side.

We then examine trading in anomalies over the 3-month period *subsequent* to time *t*, the time of anomaly portfolio assignment. During this period, retail investors continue to buy anomaly-shorts and sell anomaly-longs. Institutions now buy the longs and sell the shorts, unwinding the unfavorable positions that they had built previously. However, the magnitudes of

the trades over this 3-month period are small relative to the holdings measured at the beginning of the period.

Short sellers now increase short interest in anomaly-longs and reduce short interest in anomaly-shorts. This likely reflects the fact that short sellers are exiting the favorable positions that they had taken earlier. Here again, the magnitudes of the trades over this 3-month period are small relative to the short interest measured at the beginning of the period. Firms continue to be net issuers of shares in all types of stocks, but anomaly-shorts issue more shares than other firms do.

We then study how the trades of each market participant relate to future stock returns. Consistent with retail investors making poor decisions, retail net buying predicts lower stock returns. The effects are economically meaningful; a one standard deviation increase in retail trading leads to lower monthly returns of 10 to 20 basis points, depending on the horizon over which retail trades are measured. Like most earlier studies, we find that institutional trades tend to not predict returns, with the exception being banks, whose trades consistently predict returns in the wrong direction. The trades of both firms and short sellers predict returns in the intended direction. So overall, our results suggest that firms along with short sellers are the "smart money" traders.

Our paper contributes to several literatures. With respect to institutions and anomalies, Edelen, Ince, and Kadlec (2016) suggest that institutions may contribute to anomalies, as they find that in the year prior to portfolio formation, institutional demand is typically on the *wrong* side of 7 anomaly strategies. We broaden the analysis to 131 anomalies, and also find that institutions tend to trade on the wrong side of anomalies prior to portfolio formation. Calluzzo,

Moneta, and Topaloglu (2019) use a sample of 14 anomaly strategies and find that some institutions, mainly hedge funds, follow anomaly strategies post-portfolio formation in their long positions, but only after an anomaly is highlighted in an academic publication. This result helps explain McLean and Pontiff's (2016) post-publication decay in anomaly returns. In our post-portfolio formation tests, we also find that some institutions, namely hedge funds, banks, and insurance companies, tend to trade in the right direction with respect to an index of 131 anomalies, whereas mutual funds, wealth managers, and other institutional investors do not.

Earlier studies find that short sellers are on the profitable side of anomaly strategies. Drake, Rees, and Swanson (2011) find that short sellers target stocks that anomaly variables suggest should be shorted. McLean and Pontiff (2016) also find that short sellers target anomaly-shorts, and further find that anomaly-shorting increases after an anomaly has been highlighted in an academic publication. We add some new insights to this literature as well. We find that short sellers build positions during the 3-year period prior to anomaly-portfolio formation, and then going to exit soon after. Boehmer, Jones, and Zhang (2008) show that institutions account for about 75% of short-sales, while individuals account for less than 2%, so monthly changes in short interest largely reflects hedge funds. Interestingly, our results suggest that hedge funds do much better in their short positions than their long positions, both with respect to anomalies and future stock returns.

Our findings relating firm issuance activity to anomalies are consistent with the survey in Graham and Harvey (2002), where the majority of CFOs respond that they hesitate to issue equity if they feel their stock price is undervalued, and are more likely to issue equity if they believe their stock price to be high and if there has been a recent run-up in stock price. Our findings are

therefore consistent with the market timing or windows of opportunity framework proposed in Loughran and Ritter (1995) and Baker and Wurgler (2000 and 2002). Consistent with our findings, these papers note that firms with high past returns and market-to-book ratios issue more shares. In contrast, Baker and Wurgler (2002) find that more profitable firms issue fewer shares, while Pontiff and Woodgate (2008) find that smaller firms issue fewer shares, so in these two cases firms are trading in the opposite direction relative to the profitability and size anomalies. Our findings show that overall, firms tend to trade with anomalies.[1]

Our paper also contributes to the literature on retail investors. Barber and Odean (2013) provide a comprehensive review of this research. Studies in this literature tend to use weekly retail trade imbalances (buys – sells / buys + sells) as measures of retail trading. Barber and Odean (2013) point out that there is tension in the literature, as over short horizons (e.g., 1-week, up to 1-month) retail trades predict returns in the right direction (see Kaniel, Saar, and Titman (2008), Barber, Odean, and Zhu (2009a), Kaniel, Saar, Liu, and Titman (2012), Kelly and Tetlock (2013), Boehmer, Jones, and Zhang (2018)), whereas over longer horizons (e.g., 1-year) retail trades are predict returns opposite to the intended direction (see Odean (1999), Barber and Odean (2000), Grinblatt and Keloharju (2000), Hvidkjaer (2008), and Barber, Odean, and Zhu (2009a and 2009b)). Our retail variable is different from the retail trade imbalance variable used in most earlier studies, as our variable reflects *accumulated* trades over 1-year and 3-year horizons, scaled by shares outstanding. Our variable predicts lower returns over both horizons, all while controlling for the weekly trade imbalance.

[1] Greenwood and Hanson (2012) find that for several anomaly strategies, when the difference in net share issues between the anomaly-sells and anomaly-buys is greater (i.e., anomaly-sells' net issues – anomaly-buys' net issues), the anomaly's subsequent long-short return spread is greater.

1. Sample and Data

1.1 Retail Trading

We estimate retail trading via the methodology developed in Boehmer, Jones, and Zhang (2018), which identifies marketable orders originating from retail investors. Boehmer et. al. (2018) show that due to the modern characteristics of market structure and rules of Regulation NMS (National Market System), one can identify retail orders based on the sub-penny pricing of the execution. Retail marketable buy orders are likely to be internalized and receive sub-penny price improvement such that the trade price falls slightly below a whole cent. Conversely, retail marketable sell orders are likely to be internalized and receive sub-penny price improvement such that the trade price falls slightly above the whole cent. Thus, as outlined by Boehmer et. al. (2018), we calculate the fraction of the penny associated with the transaction price: $Z_{it} \equiv 100 * \text{mod}(P_{it}, 0.01)$ where P_{it} is the transaction price in the stock. Trades reported to FINRA TRF (exchange code 'D') with a Z_{it} in the range of (0.6, 1) are identified as buys by retail traders. Similarly, trades reported to FINRA TRF with a Z_{it} in the range of (0, 0.4) are identified as sells by retail traders. Consistent with Boehmer et. al. (2018), we do not identify trades with Z_{it} in the range of (0.4,0.6) as retail trades, since some advanced order types, such as pegged orders, can result in transaction prices that do not involve retail traders at or near half pennies. Boehmer et. al. (2018) validate this methodology with retail trade data used in Kelley and Tetlock (2013) and with retail trades obtained from NASDAQ.

We diverge from Boehmer et. al. (2018) in how we aggregate buys and sells from retail traders to form our retail trading measure. We calculate the daily percent of equity purchased

by retail traders as (buys by retail traders – sells by retail traders) / shares outstanding as reported by CRSP. We then aggregate this measure to periods ranging from 3 months to 3 years. We choose to scale the net retail buying volume by shares outstanding because we believe a measure of the percent of equity purchased by retailers will act as a better proxy for how much investors overweight or underweight stocks and thus their exposure to anomaly portfolios. Additionally, this scaling facilitates direct comparisons since our retail, institutional, and firm trading measures are all scaled by shares outstanding.

The identification of retail traders relies on a modern aspect of market structure, so we restrict our sample to period 2006:10 through 2017:12. We find the share of identified retail initiated trades rises beginning in 2006:10.

In order for us to construct our retail trading variable, we require that for every month during the relevant period, the stock must have at least one retail-initiated trade. This ensures that the stock was actively traded, and was not newly listed or temporarily delisted. We exclude stocks with prices under $1 as measured one month before the anomaly portfolios are constructed. These low-priced stocks are excluded from many anomaly portfolios and we seek to restrict to a sample with less tick-size heterogeneity. Lastly, we restrict our sample to common stock with share code 10 or 11 and listed on the NYSE, NYSE MKT (formerly the Amex), or NASDAQ.

Table 1 shows that our 1-year and 3-year lagged trading measures have mean values of 0.03% and 0.05%, respectively. This is sensible, as retail investors accumulate some stocks, and sell others, so on average retail trading is close to zero. Similarly, our 3-month trading measure has a mean of 0.00%.

1.2. Institutional Trading

We estimate mutual fund, bank, insurance, wealth management, hedge fund, and "other" (unclassified) institutional trading using changes in institutional holdings reported in 13F filings. We utilize 13F filings documented by Thomson Reuters and supplement them with SEC 13F filings in order to correct known issues with Thomson Reuters data in the later parts of our sample. We use the following methods to classify institutions into one of six types:

- In order to identify mutual fund institutions, we merge mutual fund holdings reported in S12 filings and documented by Thomson Reuters with 13F filings. We classify the number of shares reported by mutual funds as shares held by mutual fund institutions.
- The remaining shares for institutions that report more 13F shares than shares in S12 filings are classified as shares held by banks, shares held by insurance companies, or shares held by other institutions. We identify banks and insurance companies using Thomson Reuters institution type codes.
- If an institution is not a bank, insurance company, and does not have any mutual funds, we then classify them as either a wealth management or a hedge funds using text criteria based on institution names.[2]
- Any remaining institutions are classified as other institutions.

To estimate trading, for each firm we scale the aggregated shares held by each institution type by the number of shares outstanding, as reported by Thomson Reuters. We then calculate

[2] In order to identify wealth managements, we perform case insensitive searches for "Wealth Manag", "Wealth MGNT", "Private", "PRVT" and "advisor". We then perform case insensitive searches for the remaining institutions "LLC", "L.L.C." "L L C", "L. L. C.", "LP", "L.P", "L P", "L. P", or "Partner" to identify hedge funds.

the change in the percentage of shares outstanding held by each type of institution. We estimate these changes over periods of 3-months, 1-year and 3-years, the same horizons as our retail trading variables.

1.3. Firm Trading

Firm trading is measured as the real percentage change in the firm's shares outstanding. We follow the method in Pontiff and Woodgate (2008) and McLean, Pontiff, and Watanabe (2009). We scale the change in shares (share issues minus share repurchases) by shares outstanding, and sign this variable such that positive values of *Firm Trading* indicate negative changes in shares outstanding, i.e., a firm repurchasing or buying back its shares. We create this variable each month using the CRSP reported shares outstanding adjusted for splits and stock dividends. Similar to our institutional trading variables, shares outstanding data may only substantively update on a quarterly basis, when firms release financial reports regarding the completion of share repurchases. Table 1 shows that the mean of 3-month, 1-year and 3-year *Firm Trading* variables are -0.86%, -3.92% and -11.42% respectively. Thus, in our sample, the average firm issued more shares than it repurchased.

1.4. Trading Among the Market Participants

Some readers ask whether our measures of retail trading, institutional trading, short selling, and firm trading encompass virtually all trading. If this were the case, then an adding constraint yields one of the trading groups redundant. However, this is not the case for a few reasons. U.S. institutions that manage less than $100 million in 13F securities are not required to

file form 13F and are therefore not represented in our institutional trading variable. Foreign institutions are only required to file 13F if they both pass the $100 million threshold and "use any means or instrumentality of United States interstate commerce in the course of their business."[3] Ince, Kadlec, and McKeon (2018) report that in 2013, foreign institutions owned 22.5% of U.S. public equities, but only reported 7.8% in 13F. Non-profits who self-direct their portfolios also do not have file 13fs. One subset of the non-profits is universities, whose endowments, as of 2016, were worth over a half a trillion dollars [US Department of Education, 2019].

Panel B of Table 1 reports cross-correlations of the various trading variables. The trading variables are each measured over a 3-year period. The first column shows that the correlations between retail investors and the other investors are negative, telling us that retail investors tend to trade against the other market participants. These negative correlations are especially pronounced with firms and short sellers, as these correlations are -0.230 and -0.170, respectively. Our results in tables 7 and 8 show that the trades of firms and short sellers predict returns in the correct direction, whereas retail trades predict returns in the wrong direction.

Short sellers also trade against all of other market participants. The correlations are especially strong with mutual funds, banks, hedge funds, and other institutional investors, ranging from -0.113 to -0.196. The correlation between short sellers and firms is only -0.012, so these two participants do not really trade against each other. The trades between firms and institutions are weak, ranging from -0.009 to -0.045. This institutional-firm negative correlation

[3] See the rule here: www.sec.gov/divisions/investment/13ffaq.htm

is consistent with Ince, Kadlec, and McKeon (2018), who find that share issues and repurchases are an increasingly important counterparty to 13F institutions' trades.

1.5. Stock Return Anomalies

We use a sample of 131 stock return anomalies that are documented in published academic studies. This builds on the 97-anomaly sample used in McLean and Pontiff (2016) and Engelberg, McLean and Pontiff (2018a), and the 125-anomaly sample used in Engelberg, McLean and Pontiff (2018b). All of the anomaly variables we use can be constructed with data from CRSP, Compustat, and IBES. We exclude anomalies based on institutional investors, short sellers, and firms issues and repurchases.

To create the anomaly variables, stocks are sorted each month on each of the anomaly-characteristics. We define the long and short side of each anomaly strategy as the extreme quintiles produced by the sorts. Some of our anomalies are indicator variables (e.g, credit rating downgrades). For these cases, there is only a long or short side, based on the binary value of the indicator. We remake the anomaly portfolios each month.

Like Engelberg, McLean, Pontiff, (2018a and 2018b), we create an anomaly index *Net*, which is the difference between the number of long and short anomaly portfolios that a stock belongs to in a given month. As an example, a *Net* value of 10 in month *t* means that a stock belongs to 10 more anomaly-long portfolios than anomaly-short portfolios in month *t*. Table 1 shows that in our sample, *Net* has a mean value of -1.35, and a standard deviation of 8.94.

In Table 2, we sort stocks each month on Net into quintiles. We report the average *Net* values for each quintile at time *t*, and for each of the three years before and after time *t*. One

takeaway from Table 2 is that all of the action happens in the extreme quintiles. Moving from the low to high *Net* quintiles, the average *Net* values are -10.4, -1.0, 0.9, 2.0, and 8.5. So, there is not much difference between quintiles 2, 3, and 4, but a large difference of 18.9, between quintiles 1 and 5.

Table 2 also shows that *Net* is highly persistent in all of the quintiles. In the low *Net* quintiles, the average *Net* values are -8.6, -9.0, -9.3, and -10.4, for times *t-3*, *t-2*, *t-1*, and *t*, and then -9.4, -9.0, and -8.7, for times *t+1*, *t+2*, and *t+3*. For the high *Net* quintiles, the average *Net* values are 6.6, 7.0, 7.3, and 8.5, for times *t-3*, *t-2*, *t-1*, and *t*, and then 7.4, 7.0, and 6.7, for times *t+1*, *t+2*, and *t+3*. The three middle quintiles show persistence as well.

2. Main Findings

2.1 Trading Prior to Anomaly Portfolio Formation

In this section of the paper we ask how each market participant trades prior to stocks being assigned to anomaly portfolios. If a stock is an anomaly-buy (or anomaly-sell) at time *t*, which participants increase or decrease their ownership of the stock prior to time *t*? We answer this question in Table 3. Panel A studies trading 1 year prior to time *t*, the time of portfolio formation, whereas Panel B studies trading 3 years prior to time *t*. As we explain in the previous section, the trading variables are changes in ownership scaled by shares outstanding, i.e., buys minus sells scaled by shares outstanding.

Panel A shows that, in the year prior to anomaly portfolio formation, retail investors accumulate anomaly-shorts and reduce their holdings in anomaly-longs. The value in the anomaly-short portfolio is 0.105%, whereas the value in the anomaly-long portfolio is -0.018%.

The difference between these two values is statistically significant. Like retail investors, banks also sell anomaly-longs and buy anomaly-shorts. Other institutional investors accumulate both anomaly-longs and anomaly-shorts, but they accumulate more of the shorts. The trading values for other institutional investors are 0.329% and 0.759% for the anomaly-longs and anomaly-shorts, respectively. Mutual funds reduce their holdings in both anomaly-longs and anomaly-shorts, however they sell the longs more. The values in the anomaly-long and anomaly-short portfolios for mutual funds are -0.215% and -0.125%, respectively. Wealth managers exhibit the same pattern as do mutual funds, they sell both the longs and shorts, but sell the longs more.

Insurance companies buy anomaly-longs and sell anomaly-shorts. The values for the long and short portfolios are 0.001% and -0.067%, respectively. Hedge funds accumulate all types of stocks during this period, but accumulate more anomaly-longs. The values are 0.718% and 0.781% in the 4^{th} and 5^{th} (anomaly-long) quintiles, while the value is 0.585% in the anomaly-short portfolio.

Short sellers increase short interest in anomaly-shorts and reduce short interest in anomaly-longs. The values are -0.520% and 0.140% in the anomaly-short and anomaly-long portfolios, respectively. Firms are net issuers of shares in all five of the portfolios, however firms that are anomaly-shorts issue more shares than do firms that are anomaly-longs. Net share issuers are equal to 4.695% for anomaly-shorts and 3.420% for anomaly-longs.

Panel B examines the 3-year trading measures. The same patterns emerge as in Panel A. The differences in Panel B are in most cases larger than the differences in Panel A, showing that the associated trading patterns persisted for more than one year. If the patterns were of the same magnitude as in Panel A, then we could attribute all of the trading to trading in the final

year before portfolio formation. However, when we observe stronger patterns in Panel B, it suggests consistent trading for more than one year.

In Panel B, both retail investors and banks buy anomaly-shorts and sell-anomaly-longs. The short and long values are 0.217% and -0.041% for retail investors, and 0.323 and -0.227 for the banks. Mutual funds sell all stocks in all five quintiles, however they sell four times as much shorts as longs. The mutual fund trading values are -0.201% and -0.801% for the anomaly-shorts and anomaly-longs, respectively. Other institutional investors accumulate stocks in all 5 quintiles, however they accumulate far more anomaly-longs than anomaly-shorts, as the values are 2.875% and 0.408% for the long and short portfolios, respectively.

Wealth managers exhibit a different pattern, as they now sell more shorts than longs, whereas in Panel A they did the opposite. The values are -0.016% and -0.019% for the anomaly-short and anomaly-long portfolios. Taken together with the results in Panel A, this shows that wealth managers' trading patterns in Panel A, where they sold more longs than shorts, are a phenomenon that happens entirely during the year prior to portfolio formation.

Hedge funds also show a different pattern than in Panel A. In Panel B, hedge funds buy both anomaly-shorts and anomaly-longs, however they buy more shorts than longs. The patterns are 2.782% and 2.136% in the in the short and long portfolios, respectively. Taken together with the results in Panel A, this shows that hedge funds buy more shorts than longs in years t-3 and t-2, but then buy more longs than shorts in year t-1, perhaps because they sense the mispricing.

Insurance companies sell all types of stocks, but sell more anomaly-shorts than anomaly-longs. Short sellers increase short interest in shorts and reduce it in longs. The values are 0.340% and -1.337% for the longs and shorts respectively. Firms are net issuers across all five of the

quintiles, however firms that are anomaly-shorts issue more shares than do firms that are longs. Firms that are shorts issue shares equal to 13.918% of shares outstanding, while firms that are longs issue 9.894%. For both firms and short sellers, the magnitudes are large in Panel B than in Panel A, suggesting that these trading patterns were persistent over the entire 3-year period.

Taken together, the findings show that retail investors tend to do the worst with resepct to anomalies, as they build positions in eventual anomaly-shorts and reduce holdings in eventual anomaly-longs. Short sellers do the best; they increase short interest in the eventual anomaly-shorts and build positions in eventual anomaly-longs. Firms are net issuers of all types of stock, however firms that are anomaly-shorts issue the most shares. Note that firms are not like the other trading groups, as they may need to raise capital to operate. Institutions are a mixed bag. None of them consistently get things right. Banks consistently get things wrong. Insurance companies do the best. Overall, the results here suggest that firms and short sellers are the smart money.

2.3 Portfolio Holdings

In this section of the paper we study the holdings of the various market participants. We can observe holdings for institutions and short sellers, but not for firms and retail investors. To perform our holdings analyses, we sort forms into quintiles based on *Net*, and then tabulate the percentage of shares outstanding held by each market participant.

The first row of Table 4 shows that mutual funds own on average 14.2% of shares in anomaly-shorts and 8.1% of shares in anomaly-longs. These positions show that mutual funds;' holdings contradict anomaly strategies. Similarly, banks own 6% of shares outstanding in the

shorts and 3.1% in the longs, hedge funds own 17.3% of the shorts and 13.4% of the longs respectively, while "other" or unclassified institutional investors own 35.7% of the shorts and 22.9% of the longs. Insurance companies and wealth managers have smaller holdings, but both own significantly less shorts than longs. Overall, the results here are consistent with what we saw in the earlier tables, in that institutional investors tend to be on the wrong side of anomaly strategies.

Short sellers are well-positioned with respect to anomalies; short interest averages 6.5% in anomaly-shorts and 2.8% in anomaly-longs. This is also consistent with the findings in the earlier tables, where short sellers are shown to sell anomaly-shorts and buy anomaly-longs. Hence, short sellers position themselves to take advantage of anomaly strategies, whereas institutions do the opposite. As we mention in the Introduction, it is likely that most short positions are held by hedge funds. Interestingly, we see here that hedge funds do not position themselves correctly with respect to anomalies on the long-side.

2.4 Trading After Anomaly Portfolio Formation

In Table 3, we examined trading during the 1-year and 3-years prior to anomaly portfolio assignment. In table 4 we looked at holdings at the time of portfolio assignment. In Table 5, we study trading over the 3-months *subsequent* to portfolio assignment. That is, we study how the various market participants trade with respect to anomaly variables, e.g., do retail investor buy anomaly-longs and sell anomaly-shorts?

Most anomaly strategies are shown to predict returns from periods ranging from 1 month to 12 months. Our *Net* variable is designed to predict returns over the subsequent month, but it

does predict returns over the next 12 months (not reported in tables). Hence, it makes sense to buy high *Net* stocks and sell low *Net* stocks over the measurement period that we study here, which is the 3 months subsequent to portfolio assignment.

Table 5 shows that after the time of portfolio formation, retail investors continue their tendency to buy anomaly-shorts and sell anomaly-longs. The values for retail trading are 0.003% and -0.008% for the anomaly-long and anomaly-short portfolios, respectively.

Institutional investors do better now. Banks now buy anomaly-longs and sell anomaly-shorts. Mutual funds sell stocks in all 5 quintiles, but sell the shorts more than the longs; the values are -0.151% and -0.038% in the short and long portfolios, respectively. Insurance companies exhibit a similar pattern. Hedge funds and other institutional investors buy in all five quintiles, however both types of investors buy more anomaly-longs than shorts.

Short sellers now reduce short interest in the shorts. They increase short interest in all of the other groups, but reduce it with the anomaly-shorts. Taken together with the results in Tables 2 and 3, the results here show that short sellers begin to exit their anomaly positions, perhaps too quickly, as anomaly-shorts do have low returns over this period. Finally, firms are net issuers across all 5 quintiles, but especially with the anomaly-shorts.

2.6 Predicting Stock Returns

In this section of the paper we study how retail, institutional, short seller, and firm trading predicts stock returns. Earlier studies show that firm trading (repurchases minus issues) predicts higher returns (e.g., Pontiff and Woodgate (2006) and McLean, Pontiff, and Watanabe (2009)). Earlier studies also show that over long-horizons, increases in institutional ownership forecast

lower returns (see Gutierrez and Kelly (2009), Dasgupta, Prat, and Verado (2011), and Edelen, Ince, and Kadlec (2016)). Dechow et al. (2001) and Duan, Hu, and McLean (2009) show that high levels of short interest portend low returns. As we mention in the Introduction, several papers show that weekly retail-trade imbalances, which are measured as buys minus sells scaled by buys plus sells, predict returns in the intended direction over short horizons (e.g., 1-month or less). We therefore control for weekly trade imbalances in our regressions.

Table 6 reports our findings for the 1-year trading variables. The trading variables are measured over months *t-11* through *t*, while price and size (used a controls) are measured at time *t*. The weekly trade imbalance is measured during the last week of month *t*. The dependent variable is the monthly stock return in month *t+1* and is expressed in basis points.

The results show that the effects of each variable on stock returns are fairly independent of one another, as the coefficients are mostly similar in the univariate and multivariate specifications. The first 11 regressions are univariate regressions, with *Net*, and each trading variable tested independently. Consistent with earlier studies, the coefficients for *Net*, the weekly trade imbalance, firm trading, and short seller trading are all positive and significant. New to the literature, the coefficient for bank trading is negative and significant. The coefficients for the other institutions are insignificant.

The regressions reported in the last two columns include all of the variables, with the regression in the final column also controlling for size and price. In both of these regressions, the coefficients for *Net*, the weekly trade imbalance, firm trading, and short seller trading are all positive and significant, while the coefficient for banks is negative and significant. In the final specification, the coefficient for retail trading is also negative and significant.

With respect to economic significance, in the regression reported in the final column, the coefficient on retail trading is -1019.11 (*t*-statistic = -1.72). The 1-year retail trading variable has a standard deviation of 1.01%, so a one standard deviation increase in retail trading leads to a decrease in monthly returns of 10 basis points, which is a meaningful effect. The coefficient for the firm trading variable is 174.02 (*t*-statistic = 3.36), so a one standard deviation increase in the firm trading variable implies a monthly return that is higher by 24 basis points.

The coefficient for the weekly trade imbalance is 119.51, so a one standard deviation increase in this variable implies a monthly return that is higher by 27 basis points. The short selling coefficient show an increase in monthly return of 11.43 basis points, per standard deviation increase. A one standard deviation increase in *Net* yields an increase in monthly return of 24 basis points. Note that most of the variables used in *Net* are post-publication (our sample begins in October of 2006), and McLean and Pontiff (2016) find that anomaly predictability is about half as large post-publication.

The coefficient for bank trading in the final specification is -430.81. A one standard deviation increase in bank trading therefore yields a decrease in subsequent monthly return of about 10 basis points. As we mention above, banks are the only institution to predict returns in our sample, and to the best of our knowledge such return-predictability has not been previously linked to bank trades.

Table 7 studies return-predictability with the 3-year trading variables, and produces stronger findings for several of the measures. As in Table 7, *Net*, the weekly order imbalance, short seller trading, and firm trading all predict returns in the intended direction. The trades of banks are also negative and significant in each specification. The retail trading coefficient is

negative and significant in all specifications. Measuring retail trades over a longer horizon therefore appears to be important, as the retail trading coefficient is not significant in Table 6, where trading is measured over one year.

The trades of mutual funds, insurance companies, and other institutions are negative and significant in the univariate regressions, but not in the more complete regressions reported in the final two columns. In these regressions, insurance companies have a positive and significant coefficient, while the coefficient mutual funds and other institutions are insignificant. The coefficient for wealth managers is positive and significant in one of the specifications. Overall, the findings suggest that institutions' trades do not robustly predict returns, the exception being banks, whose trades predict returns in the wrong direction in almost all of the specifications.

In the most complete specification reported in the final column, a one standard deviation increase in retail trading reflects a 20-basis point decrease in returns. Similar to Table 7, the effects for *Net* and the weekly trade imbalance each reflect 24-basis point increases in monthly returns for one standard deviation increases in the variables.

2.7 Explaining Trading Return-Predictability with Anomalies

In this last table we examine whether anomaly return-predictability can explain the negative relation between investor trading and future stock returns. In the earlier tables, we control for anomaly predictability with the composite anomaly variable *Net*. In this table, we take the 131 anomaly variables used to create *Net*, and regress stock returns on the entire 131. We then take the residual from that regression, and regress the residual on the variables used in Tables 6 and 7.

Table 8 shows that retail trading, which was found to be a strong predictor in Table 7, is a much weaker predictor if anomaly returns are more completely controlled for. In Panel A, the 1-year retail trading coefficients are insignificant. In Panel B, the 3-year retail trading coefficients are less significant as compared to those reported in Table 8. In the most complete specification, reported in the final column, the retail trading coefficient has a t-statistic of -1.90 in Table 8. In contrast, in Table 7, which estimates the same specification using raw stock returns, the t-statistic for the 3-year retail trading variable is -3.89.

The weekly order imbalance variable remains highly significant in these specifications. Hence, whatever information is reflected in these trade spikes is largely orthogonal to the information reflected in the anomaly variables. The findings here therefore suggest that when retail investors accumulate (reduce) positions in stocks over long horizons, they do so in stocks that are overvalued (undervalued) according to anomaly variables. However, when retail investors trade aggressively in the short run, they tend to buy (sell) stocks in which the current price is too low (high), and such information is not reflected in anomalies. It may very well be that different populations of retail investors create these two very different findings.

The firm trading variable remains significant in all specifications, but less so when measured over a 3-year period. The trades of short sellers are insignificant, as are the trades of banks. Hence, the predictability stemming from these two market participants is explained by each group's tendency to trade with or against anomaly variables.

3. Conclusions

We study how the trades of virtually all major market participants—retail investors, institutional investors, short sellers, and firms—relate to stock return anomalies and future stock returns. To the best of our knowledge, this is the broadest study of market participation to date. We find that during the three years prior to portfolio assignment, retail investors and institutions increase their portfolio weights in anomaly-shorts, and reduce their weights in anomaly-longs. At the time of portfolio formation, institutional investors' holdings are heavily weighted towards anomaly-shorts, and away from anomaly-longs. Once a stock is in the anomaly portfolio, retail investors continue to buy the shorts and sell the longs, whereas institutional investors switch, and buy the longs and sell the shorts.

Short sellers buy stocks that become anomaly-shorts and sell stocks that become anomaly-longs. At the time of portfolio formation, short interest is significantly higher for the anomaly-shorts and for the anomaly-longs. After the time of portfolio formation, short sellers switch, and buy the shorts and sell the longs, i.e., they begin to exit their positions, albeit slowly.

Firms are net issuers of shares across all types of stocks. However, firms that become anomaly-shorts issue significantly more shares, and this continues after the portfolio formation date.

We also study the return-predictability of each investors' trades. The trades for firms and short sellers strongly predict returns in the intended direction. Institutional trades do not consistently predict returns, with the exception of banks, whose trades predict returns in the wrong direction.

Retail trades predict returns in the wrong direction. This is in contrast to weekly retail trade imbalances, which are shown in earlier studies and in our paper to predict higher returns over the next month. Taken together, these results show that temporary spikes in retail trading are informative about future stock returns, whereas retail trading aggregated over long horizons predicts returns in the wrong direction. It may be that different populations of retail investors create these two different findings.

All in all, it our results show that firms and short sellers are the smart money. Retail investors do the worst. Institutions can be described as neutral, although among the 6 types that we study, banks consistently do the worst.

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Table 1: Descriptive Statistics of Variables

Panel A of this table provides descriptive statistics for the variables used in the study. Panel B reports average cross-sectional correlations of our main variables of interest. We construct the *Retail Trading* variables by summing the daily percentage of common equity purchased by retail traders for the relevant period. Daily percentage of equity purchased by retail traders is calculated as (retail buyer initiated - retail seller initiated) / shares outstanding. Retail buyer and seller-initiated trades are identified by sub-penny pricing as described by Boehmer et al. (2018). *Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading,* and *Other Institutional Trading* are calculated as the changes in categorized 13F reported holdings. *Short Seller Trading* is calculated as the negative change in short interest / shares outstanding. Thus, a positive value of *Short Seller Trading* indicates a decrease in the short interest and vice versa. *Firm Trading* is calculated as the negative change in shares outstanding / beginning of period shares outstanding. Thus, a positive value of *Firm Trading* indicates a decrease in the shares outstanding and vice versa. All trading variables are winsorized at the 1% level. Weekly order imbalance is calculated as the average of (retail buyer initiated - retail seller initiated) / (retail buyer initiated + retail seller initiated) for the last five trading days of the month. We use the 131 cross-sectional anomalies studied in McLean and Pontiff (2018b). At the end of each month, stocks are sorted on each anomaly characteristic (e.g., size, book-to-market, accruals). We use the extreme quintiles to define the long side and short side of each anomaly strategy. Some anomalies are indicator variables (e.g., credit rating downgrades); for these anomalies, there is only a long or short side, based on the binary value of the indicator. We exclude anomalies based on 13F data, short interest and share issuances since they are used for the construction of our institutional trading, *Short seller Trading* and *Firm Trading* measures. For each firm-month observation, we sum the number of long-side and short-side anomaly portfolios that the firm belongs to and calculate net as the total long - short indicators. We also subdivide these anomalies into the following categories: fundamental, event, market, valuation and opinion. Price and size are reported as of the time of the anomaly stock sorts. Size is the CRSP reported market capitalization of common equity. *Net Residual* is the residuals from monthly returns regressed on the 131 anomaly indicator variables. These residuals represent the monthly return not explained by which anomaly portfolios an equity belongs to at the beginning of the month.

Panel A: Descriptive Statistics of Firm-Month Observations								
Variable	**Obs.**	**Mean**	**Std. Dev.**	**1st %ile**	**25th %ile**	**Median**	**75th %ile**	**99th %ile**
Retail Trading$_{t-11,t}$	435,613	0.03%	1.01%	-2.09%	-0.34%	-0.07%	0.19%	4.33%
Retail Trading$_{t-35,t}$	306,881	0.05%	2.14%	-4.01%	-0.82%	-0.22%	0.36%	10.21%
Retail Trading$_{t,t+3}$	496,288	0.00%	0.36%	-1.03%	-0.12%	-0.02%	0.07%	1.46%
Mutual Fund Trading$_{t-11,t}$	461,078	-0.11%	6.44%	-21.28%	-1.82%	0.01%	1.74%	19.49%
Mutual Fund Trading$_{t-35,t}$	415,695	-0.49%	9.06%	-26.81%	-3.99%	0.00%	3.23%	24.27%
Mutual Fund Trading$_{t,t+3}$	483,610	-0.08%	4.23%	-15.62%	-0.56%	0.00%	0.58%	14.46%
Bank Trading$_{t-11,t}$	461,078	0.08%	2.32%	-7.49%	-0.60%	0.00%	0.86%	7.43%
Bank Trading$_{t-35,t}$	415,695	0.08%	3.33%	-10.18%	-1.21%	0.00%	1.51%	9.91%
Bank Trading$_{t-35,t+3}$	483,610	0.01%	1.31%	-4.56%	-0.22%	0.00%	0.29%	4.13%
Insurance Company Trading$_{t-11,t}$	461,078	-0.03%	1.03%	-3.90%	-0.13%	0.00%	0.12%	3.41%
Insurance Company Trading$_{t-35,t}$	415,695	-0.10%	1.53%	-5.54%	-0.33%	0.00%	0.23%	4.62%
Insurance Company Trading$_{t,t+3}$	483,610	-0.01%	0.47%	-1.87%	-0.03%	0.00%	0.03%	1.59%
Wealth Management Trading$_{t-11,t}$	461,078	-0.01%	0.18%	-0.49%	0.00%	0.00%	0.00%	0.34%
Wealth Management Trading$_{t-35,t}$	415,695	-0.03%	0.45%	-1.47%	0.00%	0.00%	0.00%	0.71%
Wealth Management Trading$_{t,t+3}$	483,610	0.00%	0.06%	-0.15%	0.00%	0.00%	0.00%	0.11%
Hedge fund Trading$_{t-11,t}$	461,078	0.70%	7.39%	-20.71%	-2.21%	0.20%	3.39%	24.12%
Hedge fund Trading$_{t-35,t}$	415,695	2.50%	10.24%	-25.78%	-2.17%	1.52%	7.09%	33.32%
Hedge fund Trading$_{t,t+3}$	483,610	0.14%	4.40%	-13.65%	-1.09%	0.00%	1.23%	15.08%
Other Institutional Trading$_{t-11,t}$	461,078	0.64%	9.26%	-27.60%	-3.07%	0.23%	4.20%	29.27%
Other Institutional Trading$_{t-35,t}$	415,695	1.83%	13.14%	-38.27%	-4.26%	1.37%	8.06%	39.28%
Other Institutional Trading$_{t,t+3}$	483,610	0.10%	5.23%	-17.00%	-1.42%	0.01%	1.64%	16.48%
Short Seller Trading$_{t-11,t}$	467,687	-0.18%	3.83%	-13.39%	-1.23%	-0.01%	0.99%	11.84%
Short Seller Trading$_{t-35,t}$	417,115	-0.49%	5.41%	-18.47%	-2.10%	-0.03%	1.37%	15.81%
Short Seller Trading$_{t,t+3}$	488,170	-0.03%	2.02%	-7.02%	-0.52%	0.00%	0.53%	6.55%
Firm Trading$_{t-11,t}$	481,681	-3.92%	13.59%	-71.94%	-2.74%	-0.60%	0.42%	14.49%
Firm Trading$_{t-35,t}$	434,768	-11.42%	30.83%	-158.67%	-14.17%	-2.53%	2.29%	31.36%
Firm Trading$_{t,t+3}$	500,805	-0.86%	4.38%	-24.34%	-0.44%	-0.06%	0.00%	5.30%
Weekly Order Imbalance$_t$	508,654	-3.34%	22.96%	-63.76%	-16.80%	-1.85%	9.77%	56.20%
Net$_t$	509,281	-1.35	8.94	-23	-7	-1	5	20
Net Fundamental$_t$	509,281	0.06	3.54	-9	-2	0	2	8
Net Event$_t$	509,281	-0.33	3.07	-8	-2	0	2	7

Net Market$_t$	509,281	-0.37	4.00	-10	-3	0	2	9
Net Valuation$_t$	509,281	0.12	2.59	-6	-2	0	2	7
Net Opinion$_t$	509,281	-0.83	2.26	-6	-2	-1	1	4
Price$_t$	509,194	$69.18	$2,685.58	$1.07	$6.65	$16.09	$33.75	$164.34
Size$_t$	509,194	$4,585,057	$20,300,000	$8,609	$119,413	$480,514	$2,051,912	$80,900,000
Return$_{t+1}$	508,767	64bp	1535bp	-3810bp	-597bp	36bp	656bp	4613bp
Net Residual$_{t+1}$	502,984	0bp	15bp	-39bp	-7bp	-1bp	6bp	45bp

Panel B: Average Cross-Sectional Correlations

Variable	*Retail Trading$_{t-35,t}$*	*Mutual Fund Trading$_{t-35,t}$*	*Bank Trading$_{t-35,t}$*	*Insurance Company Trading$_{t-35,t}$*	*Wealth Management Trading$_{t-35,t}$*	*Hedge fund Trading$_{t-35,t}$*	*Other Institutional Trading$_{t-35,t}$*	*Short Seller Trading$_{t-35,t}$*	*Firm Trading$_{t-35,t}$*
Mutual Fund Trading$_{t-35,t}$	-0.042								
Bank Trading$_{t-35,t}$	-0.001	0.084							
Insurance Company Trading$_{t-35,t}$	-0.020	0.056	0.075						
Wealth Management Trading$_{t-35,t}$	0.018	0.006	0.011	-0.012					
Hedge fund Trading$_{t-35,t}$	-0.053	-0.036	0.052	0.010	0.002				
Other Institutional Trading$_{t-35,t}$	-0.053	0.111	0.105	0.068	0.011	0.015			
Short Seller Trading$_{t-35,t}$	-0.170	-0.113	-0.120	-0.030	-0.003	-0.123	-0.196		
Firm Trading$_{t-35,t}$	-0.230	-0.045	-0.031	-0.009	-0.022	-0.060	-0.043	-0.012	
Net$_t$	-0.075	-0.007	-0.018	0.034	0.000	0.005	-0.017	0.075	0.055

Panel C: Quarterly Time-Series Correlations

Retail Trading	*Mutual Fund Trading*	*Bank Trading*	*Insurance Company Trading*	*Wealth Management Trading*	*Hedgefund Trading*	*Other Institutional Trading*	*Short Seller Trading*	*Firm Trading*
0.246	-0.310	-0.167	-0.013	0.079	-0.177	-0.134	-0.101	0.146

Table 2: Net Time Series by Net Anomaly Quintiles

This table reports average time series *Net* indicators for quintile sorts of *Net* anomaly indicators. For each month, quintiles are formed by sorting observations by *Net*. Due to the discrete nature of *Net*, this forms five quintiles of differing size. To create the *Net* anomaly variable, we use the 131 cross-sectional anomalies studied in McLean and Pontiff (2018b). We exclude anomalies based on 13F data and share issuances since they are used for the construction of our *Institutional Trading* and *Firm Trading* measures. For each stock-month observation, we sum up the number of long-side and short-side anomaly portfolios that the stock belongs to and calculate *Net* as equal to the number of long portfolios minus number of short portfolios.

	Net_t Quintile				
Reported Variable:	**Lo**	**2**	**3**	**4**	**Hi**
Net_{t-3}	-8.6	-0.9	0.7	1.4	6.6
Net_{t-2}	-9.0	-0.9	0.7	1.5	7.0
Net_{t-1}	-9.3	-0.9	0.7	1.6	7.3
Net_t	-10.4	-1.0	0.9	2.0	8.5
Net_{t+1}	-9.4	-0.9	0.7	1.6	7.4
Net_{t+2}	-9.0	-0.9	0.7	1.5	7.0
Net_{t+3}	-8.7	-0.9	0.7	1.4	6.7

Table 3: Net Anomaly Indicators on Past Trading

This table reports average trading by various trader types over 1 (3) year(s) prior to quintile sorts of *Net* anomaly indicators. The *Retail Trading* is expressed as the percentage of common equity net purchased by retail traders during the relevant time period (.01 = 1% of common equity). We construct the retail net buying variables by summing the daily percentage of common equity purchased by retail traders for the relevant period. Daily percentage of equity purchased by retail traders is calculated as (retail buyer initiated - retail seller initiated) / shares outstanding. Retail buyer and seller-initiated trades are identified by sub-penny pricing as described by Boehmer et al. (2018). *Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading,* and *Other Institutional Trading* are calculated as the changes in categorized 13F reported holdings between the most recent filing and the filing 1 (3) years prior to the most recent filing. *Short Seller Trading* is calculated as the negative change in short interest / shares outstanding. Thus, a positive value of *Short Seller Trading* indicates a decrease in the short interest and vice versa. *Firm Trading* is calculated as the negative change in shares outstanding / beginning of period shares outstanding. Thus, a positive value of *Firm Trading* indicates a decrease in the shares outstanding and vice versa. All trading variables are winsorized at the 1% level. We use the 131 cross-sectional anomalies studied in McLean and Pontiff (2018b). At the end of each month, stocks are sorted on each anomaly characteristic (e.g., size, book-to-market, accruals). We use the extreme quintiles to define the long side and short side of each anomaly strategy. Some anomalies are indicator variables (e.g., credit rating downgrades); for these anomalies, there is only a long or short side, based on the binary value of the indicator. We exclude anomalies based on 13F data, short interest and share issuances since they are used for the construction of our institutional trading, *Shortseller Trading* and *Firm Trading* measures. For each stock-month observation, we sum up the number of long-side and short-side anomaly portfolios that the stock belongs to and calculate *Net* as equal to the number of long portfolios minus number of short portfolios. Newey-West standard errors are utilized for the t-statistics in parentheses. The sample period is from 2006:10 to 2017:12. *, **, and *** indicate significance at the 10%, 5% and 1% respectively.

Table 3 (Continued)

Panel A: Prior 1 Year Trading

	Net_t Quintile						
Reported Variable:	**Lo**	**2**	**3**	**4**	**Hi**	**Hi - Lo**	**t-stat**
Retail Trading$_{t-11,t}$	0.105%	-0.002%	-0.020%	-0.023%	-0.018%	-0.124%	-5.5
Mutual Fund Trading$_{t-11,t}$	-0.125%	-0.036%	-0.004%	0.004%	-0.215%	-0.089%	-0.3
Bank Trading$_{t-11,t}$	0.130%	0.104%	0.080%	-0.036%	-0.017%	-0.146%	-2.7
Insurance Company Trading$_{t-11,t}$	-0.067%	-0.019%	-0.003%	-0.007%	0.001%	0.068%	3.3
Wealth Management Trading$_{t-11,t}$	-0.002%	0.003%	0.015%	0.014%	-0.004%	-0.002%	-0.9
Hedgefund Trading$_{t-11,t}$	0.585%	0.382%	0.523%	0.718%	0.781%	0.196%	1.4
Other Institutional Trading$_{t-11,t}$	0.795%	0.395%	0.043%	-0.060%	0.329%	-0.466%	-1.7
Short Seller Trading$_{t-11,t}$	-0.520%	-0.029%	0.144%	0.086%	0.140%	0.660%	4.8
Firm Trading$_{t-11,t}$	-4.695%	-3.576%	-3.463%	-3.271%	-3.420%	1.275%	5.1

Panel B: Prior 3 Year Trading

	Net_t Quintile						
Reported Variable:	**Lo**	**2**	**3**	**4**	**Hi**	**Hi - Lo**	**t-stat**
Retail Trading$_{t-35,t}$	0.217%	-0.049%	-0.085%	-0.069%	-0.041%	-0.259%	-4.2
Mutual Fund Trading$_{t-35,t}$	-0.201%	-0.234%	-0.056%	-0.278%	-0.801%	-0.600%	-1.3
Bank Trading$_{t-35,t}$	0.323%	0.165%	0.176%	-0.126%	-0.227%	-0.550%	-3.9
Insurance Company Trading$_{t-35,t}$	-0.137%	-0.054%	-0.011%	-0.064%	-0.069%	0.068%	1.2
Wealth Management Trading$_{t-35,t}$	-0.019%	-0.007%	0.012%	0.001%	-0.016%	0.003%	0.5
Hedgefund Trading$_{t-35,t}$	2.782%	1.737%	1.652%	1.987%	2.136%	-0.646%	-1.1
Other Institutional Trading$_{t-35,t}$	2.875%	1.457%	0.909%	0.596%	0.408%	-2.466%	-9.1
Short Seller Trading$_{t-35,t}$	-1.337%	-0.176%	0.288%	0.144%	0.340%	1.677%	5.5
Firm Trading$_{t-35,t}$	-13.918%	-9.895%	-9.812%	-9.409%	-9.894%	4.024%	3.5

Table 4: Ownership by Net Anomaly Quintiles

This table reports average monthly ownership level for quintile sorts of *Net* anomaly indicators. For each month, quintiles are formed by sorting observations by *Net*. Due to the discrete nature of *Net*, this forms five quintiles of differing size. Newey-West standard errors with 12 lags are utilized for the t-statistics reported for Hi-Lo averages. Institutional ownerships reported are from 13F filings. We categorize these institutions as described in the data section. *Short Seller Ownership* is calculated as short interest divided by shares outstanding. *Short Seller Ownership* is signed to make interpretation consistent with other ownership variables. All ownership measures are winsorized at the 1% level. To create the *Net* anomaly variable, we use the 131 cross-sectional anomalies studied in McLean and Pontiff (2018b). We exclude anomalies based on 13F data and share issuances since they are used for the construction of our *Institutional Trading* and *Firm Trading* measures. For each stock-month observation, we sum up the number of long-side and short-side anomaly portfolios that the stock belongs to and calculate *Net* as equal to the number of long portfolios minus number of short portfolios.

	Net_t Quintile						
Reported Variable:	**Lo**	**2**	**3**	**4**	**Hi**	**Hi - Lo**	**t-stat**
Mutual Fund Ownership$_t$	14.2%	7.3%	2.5%	5.2%	8.1%	-6.0%	-12.6
Bank Ownership$_t$	6.0%	4.4%	3.9%	4.1%	3.1%	-2.9%	-26.5
Insurance Ownership$_t$	0.9%	0.6%	0.3%	0.4%	0.6%	-0.3%	-10.6
Wealth Management Ownership$_t$	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	-2.8
Hedge fund Ownership$_t$	17.3%	12.2%	9.1%	12.2%	13.4%	-3.9%	-17.7
Other Institutional Ownership$_t$	35.7%	25.4%	19.3%	23.8%	22.9%	-12.8%	-35.2
Short Seller Ownership$_t$	-6.5%	-4.2%	-2.0%	-2.6%	-2.8%	3.8%	21.1

Table 5: Future Trading on Net Anomaly Indicators

This table reports average trading by various trader types over 3 months after quintile sorts of *Net* anomaly indicators. We construct the retail net buying variables by summing the daily percentage of common equity purchased by retail traders for the relevant period. Daily percentage of equity purchased by retail traders is calculated as (retail buyer initiated - retail seller initiated) / shares outstanding. Retail buyer and seller-initiated trades are identified by sub-penny pricing as described by Boehmer et al. (2018). *Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading,* and *Other Institutional Trading* are calculated as the changes in categorized 13F reported holdings between the most recent filing and the filing 3 months after the most recent filing. *Short Seller Trading* is calculated as the negative change in short interest / shares outstanding. Thus, a positive value of *Short Seller Trading* indicates a decrease in the short interest and vice versa. *Firm Trading* is calculated as the negative change in shares outstanding / beginning of period shares outstanding. Thus, a positive value of *Firm Trading* indicates a decrease in the shares outstanding and vice versa. All trading variables are winsorized at the 1% level. We use the 131 cross-sectional anomalies studied in McLean and Pontiff (2018b). At the end of each month, stocks are sorted on each anomaly characteristic (e.g., size, book-to-market, accruals). We use the extreme quintiles to define the long side and short side of each anomaly strategy. Some anomalies are indicator variables (e.g., credit rating downgrades); for these anomalies, there is only a long or short side, based on the binary value of the indicator. We exclude anomalies based on 13F data, short interest and share issuances since they are used for the construction of our institutional trading, *Shortseller Trading* and *Firm Trading* measures. For each stock-month observation, we sum up the number of long-side and short-side anomaly portfolios that the stock belongs to and calculate *Net* as equal to the number of long portfolios minus number of short portfolios. Newey-West standard errors are utilized for the t-statistics in parentheses. The sample period is from 2006:10 to 2017:12. *, **, and *** indicate significance at the 10%, 5% and 1% respectively.

	Following Quarter Trading						
	Net_t Quintile						
Reported Variable:	**Lo**	**2**	**3**	**4**	**Hi**	**Hi - Lo**	**t-stat**
Retail Trading$_{t,t+3}$	0.003%	-0.006%	-0.007%	-0.008%	-0.008%	-0.011%	-1.9
Mutual Fund Trading$_{t,t+3}$	-0.151%	-0.039%	-0.019%	-0.008%	-0.038%	0.113%	1.2
Bank Trading$_{t,t+3}$	-0.016%	0.007%	0.042%	0.022%	0.021%	0.037%	2.5
Insurance Company Trading$_{t,t+3}$	-0.017%	-0.007%	-0.001%	-0.002%	-0.004%	0.013%	2.2
Wealth Management Trading$_{t,t+3}$	0.000%	0.001%	0.004%	0.002%	-0.001%	-0.001%	-0.6
Hedgefund Trading$_{t,t+3}$	0.087%	0.090%	0.112%	0.155%	0.182%	0.095%	2.7
Other Institutional Trading$_{t.t+3}$	0.017%	0.082%	0.003%	-0.151%	0.121%	0.104%	1.1
Short Seller Trading$_{t,t+3}$	0.020%	-0.011%	0.005%	-0.043%	-0.041%	-0.061%	-1.7
Firm Trading$_{t.t+3}$	-0.931%	-0.863%	-0.824%	-0.846%	-0.838%	0.093%	1.4

Table 6: Returns on One Year Trading and Anomalies

This table reports results from a Fama-Macbeth regression of monthly *Returns* on *Net* anomaly indicators, *Retail Trading, Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading, Other Institutional Trading*, *Short Seller Trading* and *Firm Trading* aggregated through the 1 year prior to the month of the anomaly stock sorts, *log(Price)* at the month of the anomaly stock sorts, and *log(Size)* as measured by the log of the CRSP reported market capitalization of common equity at the month of the anomaly stock sorts. Monthly Returns are reported by CRSP and denoted as basis points. The *Retail Trading* is expressed as the percentage of common equity net purchased by retail traders during the relevant time period (.01 = 1% of common equity). We construct the retail net buying variables by summing the daily percentage of common equity purchased by retail traders for the relevant period. Daily percentage of equity purchased by retail traders is calculated as (retail buyer initiated - retail seller initiated) / shares outstanding. Retail buyer and seller-initiated trades are identified by sub-penny pricing as described by Boehmer et al. (2018). *Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading,* and *Other Institutional Trading* are calculated as the changes in categorized 13F reported holdings between the most recent filing and the filing 1 year prior to the most recent filing. *Short Seller Trading* is calculated as the negative change in short interest / shares outstanding. Thus, a positive value of *Short Seller Trading* indicates a decrease in the short interest and vice versa. *Firm Trading* is calculated as the negative change in shares outstanding / beginning of period shares outstanding. Thus, a positive value of *Firm Trading* indicates a decrease in the shares outstanding and vice versa. All trading variables are winsorized at the 1% level. Weekly order imbalance is calculated as the average of (retail buyer initiated - retail seller initiated) / (retail buyer initiated + retail seller initiated) for the last five trading days of the month. To create the *Net* anomaly variable, we use the 131 cross-sectional anomalies studied in McLean and Pontiff (2018b). We exclude anomalies based on 13F data, short interest and share issuances since they are used for the construction of our institutional trading, *Short Seller Trading* and *Firm Trading* measures. For each stock-month observation, we sum up the number of long-side and short-side anomaly portfolios that the stock belongs to and calculate *Net* as equal to the number of long portfolios minus number of short portfolios. Newey-West standard errors are utilized for the t-statistics in parentheses. The sample period is from 2006:10 to 2017:12. *, **, and *** indicate significance at the 10%, 5% and 1% respectively.

Table 6 (Continued)

	Dependent Variable: $Return_{t+1}$												
Net_t	1.92***											2.11***	2.73***
	(3.13)											(3.33)	(3.28)
$Retail\ Trading_{t-11,t}$		-1649.33										-855.40	-1019.11*
		(-1.55)										(-1.15)	(-1.72)
$Mutual\ Fund\ Trading_{t-11,t}$			-108.96									-30.31	-5.07
			(-1.20)									(-0.37)	(-0.07)
$Bank\ Trading_{t-11,t}$				-607.69**								-434.03*	-430.81**
				(-2.10)								(-1.80)	(-2.32)
$Insurance\ Company\ Trading_{t-11,t}$					-495.72							-466.23	-407.00
					(-1.23)							(-1.26)	(-1.24)
$Wealth\ Management\ Trading_{t-11,t}$						3114.66						3599.54	3523.87
						(1.27)						(1.41)	(1.43)
$Hedge\ fund\ Trading_{t-11,t}$							23.67					20.32	51.77
							(0.22)					(0.17)	(0.60)
$Other\ Institutional\ Trading_{t-11,t}$								-141.74				-78.40	-71.62
								(-1.59)				(-1.00)	(-1.16)
$Short\ Seller\ Trading_{t-11,t}$									506.17***			294.12**	298.34***
									(3.54)			(2.48)	(2.69)
$Firm\ Trading_{t-11,t}$										224.49***		181.63***	174.02***
										(3.99)		(3.18)	(3.36)
$Weekly\ Order\ Imbalance_t$											116.45***	119.01***	119.51***
											(8.52)	(8.33)	(8.13)
$log(Size_t)$													10.65*
													(1.91)
$log(Price_t)$													-9.95
													(-0.43)
Constant	76.26	81.37	76.59	82.96	81.36	82.25	76.90	80.50	80.96	87.10	78.93	88.59	-28.87
	(1.36)	(1.36)	(1.38)	(1.48)	(1.46)	(1.48)	(1.39)	(1.46)	(1.49)	(1.59)	(1.54)	(1.55)	(-0.38)
Lags for Newey-West SE's	12	12	12	12	12	12	12	12	12	12	1	12	12
No. Time Periods	134	124	135	135	135	135	135	135	135	135	135	123	123
N	508,767	438,535	463,723	463,723	463,723	463,723	463,723	463,723	470,511	484,526	511,723	401,173	401,161

Table 7: Returns on Three Year Trading and Anomalies

This table reports results from a Fama-Macbeth regression of monthly *Returns* on *Net* anomaly indicators, *Retail Trading, Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading, Other Institutional Trading, Short Seller Trading,* and *Firm Trading* aggregated through the 3 years prior to the month of the anomaly stock sorts, *log(Price)* at the month of the anomaly stock sorts, and *log(Size)* as measured by the log of the CRSP reported market capitalization of common equity at the month of the anomaly stock sorts. Monthly Returns are reported by CRSP and denoted as basis points. The *Retail Trading* is expressed as the percentage of common equity net purchased by retail traders during the relevant time period (.01 = 1% of common equity). We construct the retail net buying variables by summing the daily percentage of common equity purchased by retail traders for the relevant period. Daily percentage of equity purchased by retail traders is calculated as (retail buyer initiated - retail seller initiated) / shares outstanding. Retail buyer and seller initiated trades are identified by sub-penny pricing as described by Boehmer et al. (2018 *Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading,* and *Other Institutional Trading* are calculated as the changes in categorized 13F reported holdings between the most recent filing and the filing 3 years prior to the most recent filing. *Short Seller Trading* is calculated as the negative change in short interest / shares outstanding. Thus, a positive value of *Short Seller Trading* indicates a decrease in the short interest and vice versa. *Firm Trading* is calculated as the negative change in shares outstanding / beginning of period shares outstanding. Thus, a positive value of *Firm Trading* indicates a decrease in the shares outstanding and vice versa. All trading variables are winsorized at the 1% level. Weekly order imbalance is calculated as the average of (retail buyer initiated - retail seller initiated) / (retail buyer initiated + retail seller initiated) for the last five trading days of the month. To create the *Net* anomaly variable, we use the 131 cross-sectional anomalies studied in McLean and Pontiff (2018b). We exclude anomalies based on 13F data, short interest and share issuances since they are used for the construction of our institutional trading, *Short Seller Trading* and *Firm Trading* measures. For each stock-month observation, we sum up the number of long-side and short-side anomaly portfolios that the stock belongs to and calculate *Net* as equal to the number of long portfolios minus number of short portfolios. Newey-West standard errors are utilized for the t-statistics in parentheses. The sample period is from 2006:10 to 2017:12. *, **, and *** indicate significance at the 10%, 5% and 1% respectively.

Table 7 (Continued)

	Dependent Variable: $Return_{t+1}$												
Net_t	1.92***											2.34***	2.67***
	(3.13)											(3.97)	(4.42)
$Retail\ Trading_{t-35,t}$		-1648.98***										-974.92***	-952.55***
		(-4.39)										(-3.61)	(-3.89)
$Mutual\ Fund\ Trading_{t-35,t}$			-59.18**									-12.06	-0.74
			(-2.24)									(-0.42)	(-0.03)
$Bank\ Trading_{t-35,t}$				-316.20**								-116.74	-123.21*
				(-2.24)								(-1.47)	(-1.68)
$Insurance\ Company\ Trading_{t-35,t}$					-253.65*							132.95*	157.60**
					(-1.67)							(1.73)	(2.14)
$Wealth\ Management\ Trading_{t-35,t}$						377.65						1087.46*	993.19
						(0.65)						(1.89)	(1.64)
$Hedge\ fund\ Trading_{t-35,t}$							-37.13					46.51	53.55
							(-0.64)					(0.97)	(1.17)
$Other\ Institutional\ Trading_{t-35,t}$								-112.43**				-28.94	-27.95
								(-2.51)				(-0.83)	(-0.83)
$Short\ Seller\ Trading_{t-35,t}$									452.46***			282.71***	287.30***
									(8.43)			(5.04)	(5.55)
$Firm\ Trading_{t-35,t}$										94.75***		27.32**	29.42**
										(5.62)		(2.17)	(2.18)
$Weekly\ Order\ Imbalance_t$											116.45***	105.15***	104.77***
											(8.52)	(12.05)	(15.02)
$log(Size_t)$													4.97
													(1.47)
$log(Price_t)$													-3.61
													(-0.53)
Constant	76.26	126.50***	80.11*	85.52*	86.50*	86.37*	86.18*	89.70**	88.86**	93.56**	78.93	134.14***	78.74**
	(1.36)	(5.73)	(1.83)	(1.91)	(1.93)	(1.93)	(1.96)	(2.01)	(2.07)	(2.16)	(1.54)	(6.71)	(2.34)
Lags for Newey-West SE's	12	36	36	36	36	36	36	36	36	36	1	36	36
No. Time Periods	134	100	135	135	135	135	135	135	135	135	135	99	99
N	508,767	309,607	418,024	418,024	418,024	418,024	418,024	418,024	419,641	437,326	511,723	281,352	281,349

Table 8: Anomaly Residual Regressions

This table reports results from a Fama-Macbeth regression of monthly *Net Residuals* on *Retail Trading, Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading, Other Institutional Trading,* and *Firm Trading* aggregated through the 1 (3) year(s) prior to the month of the anomaly stock sorts, *log(Price)* at the month of the anomaly stock sorts, and *log(Size)* as measured by the log of the CRSP reported market capitalization of common equity at the month of the anomaly stock sorts. *Net Residual* is the residuals from monthly returns, expressed in basis points, regressed on the 131 anomaly indicator variables. These residuals represent the monthly return not explained by which anomaly portfolios an equity belongs to at the beginning of the month. The *Retail Net Buying* is expressed as the percentage of common equity net purchased by retail traders during the relevant time period (.01 = 1% of common equity). We construct the retail net buying variables by summing the daily percentage of common equity purchased by retail traders for the relevant period. Daily percentage of equity purchased by retail traders is calculated as (retail buyer initiated - retail seller initiated) / shares outstanding. Retail buyer and seller-initiated trades are identified by sub-penny pricing as described by Boehmer et al. (2018). *Mutual Fund Trading, Bank Trading, Insurance Company Trading, Wealth Management Trading, Hedge fund Trading,* and *Other Institutional Trading* are calculated as the changes in categorized 13F reported holdings between the most recent filing and the filing 1 (3) years prior to the most recent filing. *Short Seller Trading* is calculated as the negative change in short interest / shares outstanding. Thus, a positive value of *Short Seller Trading* indicates a decrease in the short interest and vice versa. *Firm Trading* is calculated as the negative change in shares outstanding / beginning of period shares outstanding. Thus, a positive value of *Firm Trading* indicates a decrease in the shares outstanding and vice versa. All trading variables are winsorized at the 1% level. Weekly order imbalance is calculated as the average of (retail buyer initiated - retail seller initiated) / (retail buyer initiated + retail seller initiated) for the last five trading days of the month. Newey-West standard errors are utilized for the t-statistics in parentheses. The sample period is from 2006:10 to 2017:12. *, **, and *** indicate significance at the 10%, 5% and 1% respectively.

Table 8 (Continued)

	Dependent Variable: Return Residual$_{t+1}$									
	Panel A: Prior 1 Year Trading									
Retail Trading$_{t-11,t}$	-0.69									2.42
	(-0.06)									(0.36)
Mutual Fund Trading$_{t-11,t}$		-0.14								0.35
		(-0.14)								(0.44)
Bank Trading$_{t-11,t}$			-3.21							-3.54*
			(-1.03)							(-1.76)
Insurance Company Trading$_{t-11,t}$				-4.81						-4.83
				(-1.12)						(-1.26)
Wealth Management Trading$_{t-11,t}$					38.80					35.89
					(1.53)					(1.38)
Hedge fund Trading$_{t-11,t}$						0.34				0.36
						(0.31)				(0.40)
Other Institutional Trading$_{t-11,t}$							-0.68			-0.54
							(-0.72)			(-0.78)
Short Seller Trading$_{t-11,t}$								0.67		0.10
								(0.42)		(0.09)
Firm Trading$_{t-11,t}$									1.47**	0.97**
									(2.55)	(2.00)
Weekly Order Imbalance$_{t}$										1.09***
										(7.57)
log(Size$_{t}$*)*										0.07
										(1.01)
log(Price$_{t}$*)*										0.03
										(0.15)
Constant	-0.27	-0.33	-0.27	-0.29	-0.28	-0.33	-0.30	-0.29	-0.24	-1.32*
	(-0.58)	(-0.60)	(-0.48)	(-0.51)	(-0.49)	(-0.60)	(-0.54)	(-0.53)	(-0.44)	(-1.68)
Number of Lags for Newey-West Standard Errors	12	12	12	12	12	12	12	12	12	12
No. Time Periods	122	133	133	133	133	133	133	133	133	122
N	429,951	455,997	455,997	455,997	455,997	455,997	455,997	462,230	475,661	396,497

Table 8 (Continued)

	Dependent Variable: Return Residual$_{t+1}$									
	Panel B: Prior 3 Year Trading									
Retail Trading$_{t-35,t}$	-10.04**									-5.27*
	(-2.14)									(-1.90)
Mutual Fund Trading$_{t-35,t}$		-0.05								0.04
		(-0.15)								(0.15)
Bank Trading$_{t-35,t}$			-0.23							-0.31
			(-0.22)							(-0.51)
Insurance Company Trading$_{t-35,t}$				-0.91						2.55**
				(-0.47)						(2.12)
Wealth Management Trading$_{t-35,t}$					2.94					5.85
					(0.51)					(1.01)
Hedge fund Trading$_{t-35,t}$						0.03				0.60
						(0.06)				(1.38)
Other Institutional Trading$_{t-35,t}$							-0.42			-0.25
							(-1.01)			(-0.71)
Short Seller Trading$_{t-35,t}$								0.16		-0.21
								(0.27)		(-0.30)
Firm Trading$_{t-35,t}$									0.60***	-0.13
									(2.93)	(-1.05)
Weekly Order Imbalance$_t$										0.95***
										(13.70)
log(Size$_t$)										0.01
										(0.26)
log(Price$_t$)										0.13*
										(1.74)
Constant	0.11	-0.36	-0.31	-0.29	-0.30	-0.31	-0.28	-0.29	-0.25	-0.34
	(0.47)	(-0.81)	(-0.67)	(-0.64)	(-0.66)	(-0.69)	(-0.61)	(-0.64)	(-0.58)	(-1.07)
Number of Lags for Newey-West Standard Errors	12	12	12	12	12	12	12	12	12	12
No. Time Periods	98	133	133	133	133	133	133	133	98	98
N	302,344	411,104	411,104	411,104	411,104	411,104	411,104	412,220	429,444	277,573