Shorting Costs and Profitability of Long–Short Strategies

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Abstract:

We examine how profitability of long–short arbitrage strategies based on anomalies is affected after adjustment for two shorting costs: implicit cost due to unavailability of stocks in the short-leg to sell short and loan fee actually paid to stock lenders. The combined shorting cost amounts to almost 40 percent of gross long–short arbitrage raw returns over the sample period from January 2006 to December 2017. After adjustment for these shorting costs, long–short arbitrage profits are thus reduced by almost 40 percent. Even after adjustment for risk, the proportion of shorting costs is also substantial. If other trade-related transaction costs are considered, long–short arbitrage profits would be reduced further. Our results cast doubt on the profitability of long-short arbitrage strategies based on anomalies.

Keywords: Shorting costs; Long–short arbitrage strategies; Short sales constraints; Loan fee; Anomalies

JEL classification: G12; G14

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1. Introduction

According to the efficient market hypothesis, information should be reflected into stock prices immediately and accurately, and stock prices should not systematically deviate from fundamental firm value. Otherwise, arbitrageurs execute long–short arbitrage trades to exploit mispricing opportunities by buying long underpriced stocks and selling short overpriced stocks; thus, mispricing quickly disappears. Over the past several decades, however, many studies have documented empirical counter-evidence against the efficient market hypothesis. This counter-evidence is dubbed the market anomaly in the cross-section of stock returns.

The literature argues that long–short arbitrage strategies based on anomalies are profitable, even after adjustment for risk. This argument assumes that arbitrageurs can take long and short positions with no restrictions; that is, there are no limits to arbitrage. In the real world, however, arbitrage is limited because of market frictions, such as arbitrage risk, transaction costs, liquidity, information uncertainty, and short sale constraints (e.g., Shleifer and Vishny, 1997). Short sale constraints have a unilateral pricing effect on the short-leg side only, while other market frictions have a bilateral pricing effect on both the long-leg and short-leg. Researchers thus argue that short sale constraints are a main cause of overpricing of stocks in the short-leg. Among others, Miller (1977), Hong and Stein (2003), and Shleifer and Vishny (1997) argue that short sale constraints prevent negative information or opinions from being reflected in stock prices and limit the ability of arbitrageurs to exploit overpricing.[1] Jones and Lamont (2002) show that stocks that are expensive to short tend to be overpriced and have low subsequent returns.

[1] Diamond and Verrecchia (1987) argue that shorting restrictions affect the speed of adjustment to new information. Boehme, Danielsen, and Sorescu (2006) report that when investors hold different opinions about a stock, the presence of short-sale constraints can generate deviation from fundamental value. Other prominent studies that investigate the role of short-sale constraints on overpricing include Figlewski (1981), Chen, Hong, and Stein (2002), Diether, Malloy, and Sherbina (2002), Duffie, Garleanu, and Pedersen (2002), Scheinkman and Xiong (2003), Lamont and Stein (2004), Ofek, Richardson, and Whitelaw (2004), and Avramov, Chordia, Jostova, and Philipov (2013).

It is well documented in the literature that long–short arbitrage returns based on anomalies come more from the short-leg rather than the long-leg portfolio, since the degree of overpricing in the short-leg portfolio is more severe than the underpricing in the long-leg portfolio (e.g., Stambaugh, Yu, and Yuan, 2012, 2015).[2] Further, overpricing becomes more difficult to eliminate than underpricing due to short-sale constraints. We therefore focus on short sale constraints among the above-mentioned market frictions in investigating the effects of limits-to-arbitrage on profitability of long–short arbitrage strategies.

This study *explicitly* examines the effects of short sale constraints on profitability of long–short arbitrage strategies based on well-known market anomalies. As proxies for short sale constraints, we use loan fee and availability of stocks in the short-leg portfolio to sell short, which are obtained from the Markit dataset. These are more direct and complete proxies for short sale constraints than other proxies frequently used in the literature, such as institutional ownership (e.g., Chen, Hong, and Stein, 2002; Nagel, 2005; Kim, Lee, and Na, 2019), option status (Boehme, Danielsen, and Sorescu, 2006), and short interest (Figlewski and Webb, 1993; Danielsen and Sorescu, 2001). We select 14 anomalies on which long–short arbitrage strategies are based: return on assets (ROA), return on equity (ROE), momentum, net operating assets, investment-to-asset, abnormal capital investment, accruals, asset growth, net stock issuance, composite equity issues, O-score, failure probability, gross profit, and post-earnings-announcement drift (PEAD).

Profitability of long–short strategies is reported in the literature under the assumption that the stocks in the short-leg portfolio in each anomaly are available to sell short immediately and with no costs. However, stocks available to be borrowed are limited, and short sellers pay costs for borrowing stock. Some of these stocks are actually not available to sell short, because there is no supply for a new loan. Beneish, Lee, and Nichols (2015) show that shares are often least available to borrow when these stocks are most

[2] For example, Stambaugh, Yu, Yuan (2012) report that the benchmark-adjusted monthly abnormal return of the short-leg portfolios of the 11 anomalies selected in their study is -0.60 percent, while that of the long-leg portfolios is 0.28 percent.

attractive to short sellers. Therefore, long–short arbitrage returns should be computed after excluding these stocks in the short-leg portfolio. If long–short arbitrage returns decrease after exclusion of these stocks, then decreased profitability indicates an implicit shorting cost. Thus, arbitrageurs face two types of shorting cost for stocks in the short-leg unavailable to sell short and for those available to sell short. The first shorting cost is implicit cost, which equals the reduced long–short arbitrage return due to unavailability of stocks in the short-leg to sell short. The second shorting cost is loan fee actually paid to stock lenders for stocks available in the short-leg portfolio to sell short.[3] To our knowledge, this study is the first to *explicitly* adjust for the above-mentioned shorting costs in examining profitability of long–short arbitrage strategies. Note that we do not consider trade-related transaction costs necessary to take long and short positions, such as bid-ask spreads and brokerage fees, since we focus only on the effects of shorting costs on profitability of long–short strategies.

We find that the average implicit (first) shorting cost of the 14 anomalies is 0.029 percent per month, and the average explicit (second) shorting cost is 0.075 percent per month over the sample period from January 2006 to December 2017. Thus, the combined shorting cost is 0.104 percent per month, which corresponds on average to 39.7 percent of gross long–short arbitrage raw returns based on the 14 anomalies. This indicates that after adjustment for shorting costs, long-short arbitrage profits are reduced by almost 40 percent in raw return.[4] These results are robust to the degree of unavailability of stocks to sell short, from conservative to aggressive. Even after adjustment for risk, the proportion of shorting costs in long-short arbitrage profits is sizable. Our results indicate that the negative effect of shorting constraints on the profits

[3] Beneish, Lee, and Nichols (2015) find that lendable inventory is sensitive to borrowing costs and to firm characteristics associated with overvalued equity. These authors also find that supply is a key feature distinguishing constrained from unconstrained stocks, and that, among constrained stocks, those with the lowest supply have the strongest negative returns.

[4] These results are obtained from the value-weight scheme in forming portfolios and computing shorting costs in the short-leg portfolios. When the equal-weight scheme is used, the proportion of the shorting costs in long-short arbitrage returns becomes greater.

of long–short arbitrage strategies is substantial. If trade-related transaction costs, such as bid-ask spreads and brokerage fees, are considered, net long–short arbitrage profits would be reduced further. Therefore, our results cast doubt on the profitability of long-short arbitrage strategies based on anomalies.

We have also performed a simple test for the validity of the Stambaugh, Yu, and Yuan (2012) sentiment-related overpricing hypothesis that overpricing is more severe during high sentiment periods because of short sale impediments, and, thus, long–short arbitrage returns are greater during months following high sentiment periods than low sentiment periods. If this hypothesis is valid, short sale impediments should be more severe during high sentiment periods than low sentiment periods, since overpricing would induce high demand for selling short, and, as a result, short sale impediments would be tightened. However, we find no evidence that short sale impediments, proxied by shorting costs, are more severe during high sentiment periods than low sentiment periods.

Shorting is more difficult for investors than buying due to short sale constraints, and overpricing in the short-leg is more severe than underpricing in the long-leg portfolio. Thus, long–short arbitrage returns stem more from the short-leg rather than the long-leg portfolio. This is referred to as arbitrage asymmetry. We examine how much of arbitrage asymmetry can be explained by shorting constraints. We find that after adjustment for shorting costs, the extent of arbitrage asymmetry is substantially reduced. Our results thus support the assertion that short sale constraints are attributable to arbitrage asymmetry.

The remainder of this paper proceeds as follows. Section 2 describes the data, and Section 3 explains the 14 anomalies used in this study. Section 4 presents our empirical results, and Section 5 sets forth our conclusions.

2. **Data**

We obtain stock return, price, and market capitalization data for non-financial firms from the Center for

Research in Security Prices (CRSP) monthly data file and financial statement data from the Compustat database. Stock loan data are obtained from the Markit Securities Finance Analytics Database (formerly Data Explorers). The sample period is January 2006 to December 2017, as stock loan data are available in the Markit dataset mainly after 2005. We exclude stocks priced below $1 at the formation of the portfolios to mitigate biases subject to market microstructure.

To borrow stocks to sell short, borrowers pay a loan fee to stock lenders. The loan fee is determined based on the type of collateral used: cash collateral or non-cash collateral. If borrowers pledge cash as collateral (the dominant type of transaction in the United States), then the loan fee is defined as the difference between the risk-free interest rate and the rebate rate, which is the rate paid to the borrower for the cash collateral. Positive rebate rates indicate the amount the borrower receives from the lender, while negative rebate rates indicate the amount the borrower pays to the lender. Negative rebate rates thus indicate greater expense to borrow than do positive rebate rates. If borrowers pledge securities (such as US Treasuries) as collateral, the loan fee is directly negotiated between the borrower and the lender, and there is no rebate in this case.[5]

The Markit database contains stock loan data collected from a consortium of more than 100 institutional lenders, which covers more than 85 percent of the stock lending market and more than 90 percent of market capitalization of CRSP firms. For each stock, the database provides daily measures of total shares borrowed from lenders (a demand measure), total lendable inventory available from them (a supply measure), and the variables for stock borrowing cost. The key stock loan variables obtained from the Markit dataset are Indicative Fee as loan fee (FEE), Indicative Rebate Rate (REBATE), daily cost of borrowing score (DCBS), Active Available Quantity (AQ), and Active Utilization by Quantity (AU).

[5] There are two types of stock loan: open-term loans and fixed-term loans. Open-term loans can be renegotiated every day, while fixed-term loans have predefined clauses and maturities.

According to Markit, the Indicative Fee is the fee paid by the borrower for a new stock loan (a buy-side fee), based on both borrowing costs between agent lenders and prime brokers and rates from hedge funds to produce an indication of the current market rate. DCBS is an integer categorization ranging from 1 (low cost; easy to borrow) to 10 (high cost; difficult to borrow), computed by Markit for each stock based on the lending fees for the last seven days. AQ is the quantity of shares (in million) realistically available to borrow from the active beneficial owner. AU is the proportion of securities (in percent) in lending programs currently out on loan. Thus, variables AU and AQ measure the first (implicit) shorting costs related unavailability of stocks to sell short, and FEE, REBATE, and DCBS measure the second (explicit) shorting costs actually paid to stock lenders.

Table 1 presents basic statistics of the key stock loan variables (Panel A) and averages of these variables in the DCBS-sorted portfolios (Panel B) over the entire sample period (January 2006 to December 2017). FEE and REBATE are expressed in basis points (bps) per annum. These variables are observed on the last trading day of each month. The median value of FEE is 37.50 bps per annum. Panel B shows that higher DCBS-sorted portfolios exhibit greater AU and higher FEE. Conversely, the greater the utilization, the higher the borrowing costs. The average DCBS of the overall sample is 1.62. Note that 81.3 percent of the overall sample have DCBS of 1 (lowest cost), whose average utilization is 12.81 percent and average FEE is 42.26 bps per annum. For stocks with DCBS of 10 (highest cost) whose proportion is only 0.9 percent of the overall sample, the average FEE is 7,146.16 bps per annum, and average utilization is 96.34 percent. Thus, most stocks are available to be borrowed with relatively low cost, while some stocks barely available in the stock loan market is highly expensive to be borrowed. Beneish, Lee, and Nichols (2015) categorize stocks with DCBS of 1 and 2 as easy to borrow and stocks with DCBS of 3 or greater as difficult to borrow stocks.

3. Market Anomalies

This paper specifically examines the effect of shorting costs on the profitability of long–short strategies based on market anomalies. We consider 14 market anomalies well-documented in the literature. Detailed definitions of the anomalies and accounting variables are presented in Appendix Tables A1 and A2.

Anomalies 1 and 2: *Return on Assets (ROA) and Return on Equity (ROE)*. Fama and French (2006) and Chen, Novy-Marx, and Zhang (2011) show that more profitable firms earn higher subsequent returns on average than do less profitable firms. ROA (ROE) is measured as the ratio of quarterly earnings to one-quarter-lagged total assets (equities).

Anomaly 3: *Momentum*. Jegadeesh and Titman (1993) document the momentum phenomenon that firms with higher past returns earn higher subsequent returns (price continuation). In other words, past winners (losers) tend to become future winners (losers).

Anomaly 4: *Net Operating Assets*. Hirshleifer, Hou, Teoh and Zhang (2004) find that there is a negative relation between net operating assets and future stock returns. Net operating assets are defined as the difference between operating assets and operating liabilities scaled by one-year-lagged total assets. These authors argue that net operating assets indicate the level of investor optimism about the sustainability of recent earnings performance. Thus, firms with high net operating assets tend to be overvalued relative to those with low net operating assets and earn lower returns in the subsequent period.

Anomaly 5: *Investment to Assets*. Titman, Wei, and Xie (2004), Lyandres, Sun, and Zhang (2007), and Xing (2008) report that past investment is a strong negative predictor of stock returns in the cross-section.

Anomaly 6: *Abnormal Capital Investment*. Titman, Wei, and Xie (2004) find that firms with substantially increased capital investments (i.e., overinvestment) earn negative future benchmark-adjusted returns; that is, there is a negative relation between abnormal capital investment and future stock returns in the cross-section. Abnormal capital investment is measured as the ratio of capital expenditures (CAPX) to

the average of the past three years' capital expenditures minus one. All capital expenditures are scaled by sales in the corresponding period.

Anomaly 7: *Accruals*. Sloan (1996) finds that firms with high accruals achieve lower subsequent returns than those with low accruals. This implies that stock prices fail to fully reflect information contained in the accrual and cash flow components of current earnings.

Anomaly 8: *Asset Growth*. Cooper, Gulen, and Schill (2008) report that firms with higher growth rate of assets earn lower future stock returns. This implies that investors overreact to changes in future business prospects implied by asset expansions. Asset growth is measured as the ratio of change in total assets to one-year-lagged total assets.

Anomalies 9 and 10: *Composite Equity Issues* and *Net Stock Issues*. Daniel and Titman (2006) find that composite equity issuance is a negative predictor of stock returns in the cross-section. According to these authors, composite equity issuance measures the amount of equity a firm issues (or retires) in exchange for cash or services. Composite equity issues are measured as five-year log-change in the market value of equity minus the log return on the stock without dividends over the same five-year period. Loughran and Ritter (1995), Fama and French (2008), and Pontiff and Woodgate (2008) find that net stock issuance is a negative predictor of stock returns in the cross-section. This implies that firms issue stocks when they are overvalued and retire stocks when they are undervalued. Net stock issuance is measured as the log ratio of split-adjusted shares outstanding at year y-1 to split-adjusted shares outstanding at year y.

Anomalies 11 and 12*: Ohlson's O-score* and *Failure Probability*. Ohlson (1980), Dichev (1998), and Campbell, Hilscher, and Szilagyi (2008) document that financial distress negatively predicts stock returns; that is, highly distressed firms tend to earn lower subsequent returns in the cross-section. As a measure of financial distress, we use Ohlson (1980) O-score and failure probability from Campbell, Hilscher, and Szilagyi (2008).

Anomaly 13: *Gross Profitability*. Novy-marx (2013) reports that gross profitability is a positive predictor of stock returns in the cross-section; more profitable firms earn higher future stock returns than less profitable firms. Gross profitability is measured as the ratio of the difference between revenue and cost of goods sold to total assets.

Anomaly 14: *Post-Earnings-Announcement-Drift*. Ball and Brown (1968), Foster, Olsen, and Shevlin (1984), and Bernard and Thomas (1989) show that firms with positive (negative) unexpected earnings earn positive (negative) returns for an extended period from the earnings announcement date. As a measure of unexpected earnings, we use standardized unexpected earnings (SUE), computed as the ratio of the difference between actual quarterly earnings and expected earnings to the standard deviation of the differences over the past 20 quarters.

4. Empirical Results

To investigate the effect of shorting costs on profitability of long–short strategies based on market anomalies, we first form portfolios with value weight by sorting all stocks on the firm characteristic variables of the anomalies on an annual or monthly rebalancing basis. Specifically, we sort all stocks each year on the annual firm characteristic variable at year y-1 into one of ten deciles and hold the portfolios from July of year y to June of year y+1. The firm characteristic variables used in forming the annually-rebalanced portfolios are: net operating assets (NOA), investment to assets (IA), abnormal capital investment (ACI), accruals, asset growth, composite equity issuance, net stock issuance, O-score, and growth profitability. We also construct portfolios by sorting all stocks every month on the quarterly firm characteristic variable most recently available prior to month t into one of ten deciles and hold the portfolios with value weight for the next month. The quarterly firm characteristic variables used in forming the monthly-rebalanced portfolios are ROA, ROE, and PEAD. Portfolios sorted on failure probability are

rebalanced monthly, as in Campbell, Hilscher, and Szilagyi (2008). Following Jegadeesh and Titman (1993), momentum portfolios are constructed by sorting stocks on past 6-month returns (t-7, t-2) into one of ten deciles and holding the portfolios with value weight for the next 6-month period (t, t+5), after skipping one month (t-1) to eliminate the short-term reversal effect. Note that insofar as their sorting variables are available, all stocks are used in forming portfolios, regardless of availability of shorting constraint variables.

4.1. Shorting Constraints in the Short-Leg Portfolios

Short sales are constrained, since stocks available to be borrowed are limited, and short sellers should pay costs to lenders for stocks available to be borrowed. We refer to unavailability of stocks to sell short and costs explicitly paid to stock lenders as shorting constraints. In this subsection, we examine the extent of the shorting constraints in the portfolios of each anomaly, especially in the short-leg portfolios.

Table 2 presents simple averages of the shorting constraint variables across the portfolios in each anomaly (14 panels plus a panel for the combined anomalies). As expected, shorting constraints are most severe in the short-legs in all anomalies. For example, unavailability of stocks to sell short (the first shorting constraint) is most severe in the short-legs. Table 2 presents two measures of unavailability of stocks to sell short in each portfolio. The first measure is %(AU=100 percent), which indicates the percentage of stocks in a portfolio whose AU equals 100 percent,[6] and the other is %(AQ<1), which indicates the percentage of stocks in a portfolio whose AQ is less than 1 share. These two measures indicate the percentage of stocks in a portfolio that are virtually unavailable for stock loans. These two measures also exhibit a U-shape across portfolios. The short-leg portfolios have the largest values of %(AQ<1) and %(AU=100 percent), and the long-leg portfolios have the second largest values of these measures. Panel O presents averages of

[6] There are some cases where active utilization by quantity (AU) is greater than 100 percent in the Markit database. We treat these cases as AU equal to 100 percent.

these two measures for all 14 anomalies in each portfolio. The short-leg portfolios have 14.93 of %(AQ<1) and 13.91 of %(AU=100 percent) on average. This means that 14.93 percent of stocks in the short-leg portfolio have less than 1 share available to sell short, and 13.91 percent of stocks in the short-leg portfolio have 100 percent utilization (i.e., no stocks available to short sellers). The percentages of stocks measured by these two measures differ because the Markit database includes stocks whose AQ is a decimal number (i.e., less than 1 share). Although both measure virtual unavailability of stocks to sell short, we use %(AU=100 percent) as a measure of the first shorting constraint hereafter.

The costs paid to stock lenders (i.e., stock borrowing costs, such as FEE and DCBS), the second shorting constraint, are highest in the short-legs among the 10 decile portfolios for all 14 anomalies. However, these shorting costs are not monotonic across portfolios. Rather, they generally exhibit a U-shape across portfolios. These shorting costs are second highest in the long-legs. The last panel (Panel O) summarizes the averages of all 14 anomalies of the shorting constraint variables. Average FEEs in the short-leg (Portfolio 1), Portfolios 3, 5, 8, and the long-leg (Portfolio 10) of all 14 anomalies are 368, 131, 107, 121, and 173 bps per annum, respectively. Average DCBSs in these portfolios are 2.07, 1.34, 1.25, 1.30, and 1.48, respectively. Average percentages of stocks that have DCBS of 3 or greater (difficult to borrow) are 19.54 percent, 7.07 percent, 5.43 percent, 5.93 percent, and 9.52 percent, respectively. We use FEE as a measure of the second shorting constraint hereafter.

Before investigating how profitability of the long–short strategy in each anomaly is affected after adjustment for the shorting constraints in the short-leg portfolio, we need to clarify the process of adjustment for unavailability of stocks to sell short. To be consistent with the literature, portfolios are formed by sorting all stocks, regardless of availability of stock borrowing cost data (FEE) in the Markit database. Thus, stocks whose FEE data is missing in the database are included in the portfolio. Since the Markit database does not cover all stocks in the stock lending market, it is uncertain whether these stocks

are available to sell short. To be more conservative, however, we assume these stocks are available to sell short. Let us examine why this assumption leads to a conservative conclusion about the negative effect of the first shorting constraint on profitability of the long-short strategies.

Table 3 shows average number of stocks and average monthly returns of the groups including all stocks, stocks with AU equal to 100 percent, and stocks with FEE missing, respectively, in the short-leg portfolio in each anomaly. For the group including all stocks, average number of stocks and average raw return in excess of risk-fee return (or raw excess return) in the short-leg portfolios of all 14 anomalies are 322 and 0.661 percent per month, respectively. For the group including only stocks with AU=100 percent, these figures are 45 and -0.593 percent, respectively, and for the group including only stocks with FEE missing, these figures are 38 and -0.284 percent, respectively. Thus, 13.9 percent of stocks sorted into the short-leg portfolios have AU equal to 100 percent and are realistically unavailable to sell short. After excluding stocks with AU=100 percent, average raw excess return in the short-leg portfolios of all 14 anomalies is 0.690 percent. Long-short arbitrage return is therefore reduced by 0.029 percent per month (=0.690–0.661) after adjustment for unavailability of stocks to sell short. If stocks with FEE missing are assumed unavailable to sell short and are excluded together with stocks with AU=100 percent in computing the long-short arbitrage return, average raw excess return in the short-leg portfolios is 0.752 percent. Thus, it appears that long-short arbitrage return is reduced by 0.091 percent per month (=0.752–0.661). To be conservative, we assume only stocks whose AU equals 100 percent are realistically unavailable to sell short.[7]

[7] For the equally-weighted portfolio formation scheme, if only stocks with AU=100 percent are treated as unavailable to sell short, long-short arbitrage return is reduced by 0.085 percent per month. If both stocks with FEE missing and stocks with AU=100 percent are assumed unavailable to sell short and are excluded in computing the long-short arbitrage return, long-short arbitrage return is reduced by 0.340 percent per month. Detailed results are available upon request.

4.2. Profitability of Long–Short Strategy after Adjustment for Shorting Costs

In this subsection, we investigate how profitability of the long–short strategy in each anomaly is affected after adjustment for shorting constraints in the short-leg portfolio. We first show arbitrage returns of the long–short strategies for all 14 anomalies, assuming there are no shorting constraints; that is, short sellers can borrow stock with no limit and no borrowing costs. We also compute long–short arbitrage returns after adjustment for two shorting costs due to the first and second shorting constraints, respectively: implicit costs due to unavailability of stocks for stock loans and explicit costs actually paid to stock lenders for stocks available to sell short. Then, we compare these two arbitrage returns to measure the effect of shorting constraints on profitability of the long–short strategies.

Table 4 presents monthly arbitrage returns of the long–short strategies for all 14 anomalies: raw excess returns (Panel A), CAPM-adjusted returns (Panel B), Fama-French three-factor (FF3) adjusted returns (Panel C), and Hou, Xue, and Zhang (2015) four-factor (HXZ4) adjusted returns (Panel D). Column A of Table 4 shows gross long–short arbitrage returns before adjustment for shorting costs. Gross long–short raw arbitrage return of the 14 anomalies is 0.262 percent per month on average. Although statistical significance of the arbitrage raw returns is weak (probably due to the shorter sample period), the economic significance of the arbitrage returns is sizable. Gross long-short arbitrage benchmark-adjusted returns are also sizable. After adjusting for CAPM, FF3, and HXZ4, average gross long–short abnormal returns of the 14 anomalies are 0.473 percent, 0.431 percent, and 0.127 percent per month, respectively.

To examine the effect of shorting constraints on profitability of the long–short strategies, we carry out a two-step adjustment for shorting constraints. The first-step adjustment is to exclude stocks in the short-leg portfolio that are unavailable to sell short (i.e., AU=100 percent) in computing long–short arbitrage returns, and the second-step adjustment is to deduct stock borrowing costs of stocks in the short-leg portfolio available to sell short from the long–short arbitrage returns. Column B of Table 4 shows the

long–short arbitrage returns in each anomaly after the first-step adjustment. This column shows that average long–short raw arbitrage return of the 14 anomalies decreases to 0.233 percent from 0.262 percent per month. The third column shows the difference in the long–short arbitrage return before (Column A) and after (Column B) the first-step adjustment for each anomaly. This difference (=Column A−Column B) indicates *implicit* shorting costs due to unavailability of stocks in the short-leg portfolio to sell short. These differences are positive for 12 of the 14 anomalies. The decreased long–short raw arbitrage return is 0.029 percent, or 2.9 bps, per month on average after excluding such stocks in the short-legs. This is the first (implicit) shorting cost. As mentioned in subsection 4.1 (Table 2), the proportion of such stocks in the short-leg portfolio is 13.91 percent on average. Note that if %(AQ<1) were used in the first-step adjustment instead of %(AU=100 percent), the reduction in the long–short arbitrage return would be greater, since more stocks are virtually unavailable to sell short (i.e., %(AQ<1) is 14.93 percent).

The second-step adjustment is to deduct the stock loan fee, FEE, from the long–short arbitrage return obtained after the first-step adjustment. Column D of Table 4 shows average stock loan fees actually paid to stock lenders for stocks in the short-legs available to sell short.[8] The average loan fee for the 14 anomalies is 0.075 percent, or 7.5 bps, per month. This is the second (explicit) shorting cost. Note that the loan fee in the short-leg portfolio is also calculated with value weight. Column E shows total shorting costs, which are the sum of the first and second shorting costs (= Column C + Column D). Average total shorting cost of the 14 anomalies is 0.104 percent or 10.4 bps per month. After adjustment for the total shorting costs, net long–short arbitrage return is 0.158 percent, which is reduced by 0.104 percent from the gross long-short arbitrage return of 0.262 percent.

Benchmark-adjusted returns show a similar pattern in long–short arbitrage returns. After

[8] About 0.1% of the entire sample have an extremely large FEE value of 10,000 bps per annum or greater. Since 96 percent of these sample have AU=100 percent, most of extremely large FEE values are excluded in computing average Fee value.

adjustment for the two shorting costs, the CAPM-adjusted, FF3-adjusted, and HXZ4-adjusted long–short arbitrage returns are reduced by 0.107 percent, 0.107 percent, and 0.102 percent, respectively, similar to the case of raw excess returns.

In summary, due to unavailability of stocks in the short-leg portfolios to sell short and loan fee actually paid to stock lenders, total shorting costs have a negative impact of 0.104 percent per month in raw return. This amount corresponds to 39.7 percent of the gross long–short arbitrage raw return of 0.262 percent. Even after adjustment for risk, the proportion of shorting costs in long-short arbitrage profits is significant. That is, after adjustment for CAPM, FF3, and HXZ4, total shorting costs correspond to 22.6 percent (=0.107/0.473), 24.8 percent (=0.107/0.431), and 80.3 percent (=0.102/0.127 of the gross long–short arbitrage return, respectively. These results indicate that the negative effect of shorting constraints on the profits of long–short arbitrage strategies is substantial. When portfolios are formed with equal weight, the negative impact of shorting constraints is more substantial. Results with equally-weighted portfolios are presented in Appendix Table A3.[9]

4.3. Robustness Check

As a measure of unavailability of stocks in the short-legs to sell short, we previously used AU=100 percent. That is, we excluded stocks in the short-legs in computing the long–short arbitrage returns whose AU equals 100 percent. This restriction means that stocks with AU equal to 99 percent or 98 percent are assumed

[9] For the equally-weighted portfolio formation scheme, average gross long–short arbitrage raw return of the 14 anomalies is 0.366 percent per month, and combined total shorting cost is 0.226 percent. Thus, net long-short arbitrage raw return is 0.140 percent. Total shorting cost corresponds to 61.7 percent of the gross long–short arbitrage raw return of 0.366 percent. After adjusting for CAPM, FF3, and HXZ4, average gross long–short arbitrage returns are 0.519 percent, 0.514 percent, and 0.224 percent per month, respectively. Since total shorting costs are 0.217 percent, 0.225 percent, and 0.212 percent, respectively, net long-short arbitrage returns are 0.302 percent, 0.289 percent, and 0.012 percent, respectively. Total shorting costs correspond to 41.8 percent (=0.217/0.519), 43.8 percent (=0.225/0.514), and 94.6 percent (=0.212/0.224) of gross long–short arbitrage return, respectively.

available to sell short. In this case, however, these stocks may actually hardly be available to sell short. Thus, the unavailability restriction of AU=100 percent is too conservative in the first-step adjustment. It would be interesting, therefore, to examine how profits of the long–short strategy would be affected by relaxing the unavailability restriction.

As a robustness check, we consider three more aggressive degrees of unavailability of stocks in the short-leg portfolio to sell short: $AU \geq 90$ percent, $AU \geq 80$ percent, and $DCBS \geq 3$. Table 5 presents the first (implicit) shorting costs due to unavailability of stocks to sell short, stock loan fee (the second shorting cost), and total shorting cost for each unavailability restriction. All shorting costs are computed with value weight. As the unavailability restriction is relaxed, the first shorting cost becomes greater, while the second shorting cost becomes smaller than in the case of the unavailability restriction of AU=100 percent. However, the combined total shorting cost is similar: 0.112 percent, 0.117 percent, and 0.105 percent per month for $AU \geq 90$ percent, $AU \geq 80$ percent, and $DCBS \geq 3$, respectively. These results show that the negative effect of the shorting constraints on profits of the long–short strategies are somewhat robust to the degree of unavailability of stocks to sell short, from conservative to aggressive.

4.4. Arbitrage Asymmetry and Shorting Costs

It is well documented in the literature that long–short arbitrage returns come more from short-leg rather than long-leg portfolios. Overpricing in the short-legs is more severe than underpricing in the long-legs, since shorting is more difficult for investors than buying, due to short sale constraints. Thus, there is an arbitrage asymmetry. In this subsection, we specifically examine how much of arbitrage asymmetry can be explained by shorting constraints.

Table 6 presents FF3-adjusted monthly abnormal returns on the long- and short-leg portfolios in each anomaly before (gross) and after (net) adjustment for total shorting costs. Average FF3-adjusted

returns on the long- and short-leg portfolios of the 14 anomalies are 0.172 percent and -0.259 percent, respectively. That is, a greater portion of the long-short arbitrage return comes from the short-leg portfolio. The extent of arbitrage asymmetry is 1.51 $(= |-0.259|/0.172)$. After adjustment for total (average) shorting cost of 0.107 percent to the short-leg, the profit from the short-leg is reduced to 0.152 percent, and thus, the extent of arbitrage asymmetry is reduced to 0.88 $(= |-0.152|/0.172)$. This is much closer to the extent of no arbitrage asymmetry, which is equal to 1.0. Thus, these results show that a substantial portion of arbitrage asymmetry can be explained by shorting costs.[10]

4.5. Is Short Selling More Difficult When Investor Sentiment is High?

Stambaugh, Yu, and Yuan (2012) suggest a sentiment-related overpricing hypothesis in which overpricing of stocks in the short-leg is more severe and persistent when investor sentiment is high than when investor sentiment is low; thus, long–short arbitrage returns are greater during months following high sentiment periods than low sentiment periods. Note that investor sentiment has relatively little effect on long-leg returns. These authors conjecture that persistence of overpricing is due to short sale impediments. Thus, if their hypothesis is valid, short sale impediments should be more severe during high sentiment periods than low sentiment periods, since overpricing would induce high demand for selling short and, as a result, short sale impediments would be tightened. We therefore perform a simple test for the validity of their hypothesis by examining whether short sale impediments, proxied by shorting costs, are more severe during high sentiment periods than low sentiment periods. As in Stambaugh et al. (2012), we classify months as high- or low-sentiment periods based on the median level of the Baker and Wurgler (2006) (BW) investor sentiment index.

Table 7 presents the percentages of stocks in the short-leg portfolio unavailable to sell short

[10] Using the CAPM-adjusted abnormal returns, we obtain similar results.

(i.e., %(AU=100 percent)), shorting costs due to unavailability of stocks to sell short, loan fees, and total shorting costs during high and low investor sentiment periods, respectively. Due to availability of the BW sentiment index, we analyze the sample period from January 2006 to October 2015. Among all 118 months, 54 (64) months are classified as high (low) sentiment months. %(AU=100 percent) is slightly higher during high sentiment months than low sentiment months: 13.9 percent vs. 12.1 percent, on average. As a result, the implicit shorting cost due to unavailability of stocks to sell short is slightly higher during high-sentiment months than low-sentiment months: 0.04 percent vs. 0.03 percent per month on average, respectively. However, there is virtually no difference in implicit shorting cost between these two periods. Further, the explicit shorting costs (loan fee) are almost the same during high- and low- sentiment months: 0.07 percent vs. 0.08 percent per month on average, respectively. Consequently, combined shorting costs are equal to 0.11 percent during both sentiment periods. All shorting costs are computed with value-weight.[11]

Stambaugh, Yu, and Yuan (2012) report in their Table 2 that long–short arbitrage returns are 1.23 percent and 0.31 percent per month during high- and low-sentiment periods, respectively. Thus, the difference in the long–short arbitrage return between high- and low-sentiment periods is 0.93 percent per month. Most of this difference stems from a large negative return of the short-leg portfolio during months following high sentiment periods. These authors argue that the large negative return of the short-leg portfolio is due to severe short sale impediments during high sentiment periods. However, we find no evidence that short sale impediments, proxied by shorting costs, are more severe during high sentiment periods than low sentiment periods. Our results therefore lend little support for these authors' sentiment-related overpricing hypothesis. In other words, it would be difficult to argue that a large proportion of the long–short arbitrage return during months following high sentiment periods is due to short sale

[11] When all shorting costs are computed with equal weight, the difference in total shorting cost between high and low sentiment periods is only 0.04 percent per month. Detailed results are available upon request.

impediments.[12]

5. Conclusion

Profitability of long–short arbitrage strategies is reported in the literature by assuming that arbitrageurs can sell short stocks in the short-leg immediately and with no costs. However, stocks available to be borrowed are limited, and short sellers should pay costs for stock borrowing. Therefore, there are two types of shorting constraint. The first is due to unavailability of stocks to sell short, and the second is loan fees actually paid to stock lenders for stocks in the short-leg portfolio available to sell short. This study examines how profitability of long–short arbitrage strategies based on 14 anomalies are affected after shorting costs related to these two shorting constraints are explicitly adjusted. These two shorting constraints are more direct and complete proxies for short sale constraints than are other proxies frequently used in the literature, such as institutional ownership, option status, and short interest.

We find that after adjustment for two shorting costs related to the first and second shorting constraints, long–short arbitrage returns are substantially reduced. Specifically, total shorting cost corresponds to 39.7 percent of gross long–short arbitrage raw return over our sample period. This means that after adjustment for shorting costs, long–short arbitrage raw returns are reduced by 39.7 percent. Even after adjustment for risk by CAPM, FF3, and HXZ4, the proportion of shorting costs in long-short arbitrage profits is significant. These results indicate that the negative effect of shorting constraints is substantial on the profits of long–short arbitrage strategies. If trade-related transaction costs, such as bid-ask spreads and brokerage fees, are considered, net long–short arbitrage profits would be further reduced. Therefore, our

[12] Kim and Na (2018) report that results consistent with the sentiment-related overpricing story suggested by Stambaugh, Yu, and Yuan (2012) disappear after adjusting for the effect of macroeconomic conditions. These authors argue that the Stambaugh, Yu, and Yuan (2012) results may be a consequence of the use of an inadequately constructed sentiment index.

results cast doubt on the profitability of long-short arbitrage strategies based on anomalies.

Stambaugh, Yu, and Yuan (2012) suggest a sentiment-related overpricing hypothesis that overpricing is more severe during high sentiment periods because of short sale impediments; thus, long–short arbitrage returns are greater during months following high sentiment periods than low sentiment periods. Therefore, if their hypothesis is valid, short sale impediments should be more severe during high sentiment periods than low sentiment periods. However, we find no evidence that short sale impediments, proxied by shorting costs, are more severe during high sentiment periods than low sentiment periods. Our results therefore lend little support for these authors' sentiment-related overpricing hypothesis. We also find that after adjustment for shorting costs, the extent of arbitrage asymmetry is substantially reduced. This result supports the assertion that short sale constraints are attributable to arbitrage asymmetry.

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Table 1. Basic Statistics for Stock Loan Variables

This table presents basic statistics for stock loan variables obtained from the Markit database. Fee is the indicative fee observed on the last trading day of each month, paid by the borrower for a new stock loan. Rebate is the indicative rebate rate observed on the last trading day of each month, which is the cash interest on collateral received by the borrower. Active available quantity (AQ) is the quantity of shares (in millions) realistically available for borrowing from the active beneficial owner. Active utilization by quantity (AU) is the share of securities (in %) in lending programs currently out on loan. DCBS is a daily measure of the relative cost of borrowing, ranging from 1 (cheapest, easiest to borrow) to 10 (most expensive, most difficult to borrow). Portfolios are formed by sorting all stocks on DCBS at the last trading day of each month. "Obs." is the number of firm-months. The sample period is January 2006 to December 2017.

Panel A: Descriptive statistics

Variable	Mean	Std.	Min	1%	25%	50%	75%	99%	Max
Fee (bp per annum)	223.52	790.66	25.00	25.00	37.50	37.50	50.00	3,500.00	22,000.00
Rebate (bp per annum)	-94.70	820.78	-21,894.00	-3,481.00	-32.50	-22.50	53.50	493.75	662.50
Active available quantity (AQ) (million share)	23.67	90.71	-2.78	0.00	0.73	4.85	15.04	345.66	2137.79
Active utilization (AU) (%)	25.32	32.14	0.00	0.00	2.73	10.60	33.39	100.00	100.00
DCBS	1.62	1.63	1.00	1.00	1.00	1.00	1.00	9.00	10.00

Panel B: Portfolios sorted on DCBS

DCBS	Obs. (%)	Fee (bp per annum)		Rebate (bp per annum)		AQ (M shares)		AU (%)	
		Mean	Median	Mean	Median	Mean	Median	Mean	Median
1	427,534(81.3)	42.26	37.50	103.46	2.50	25.66	5.79	12.81	6.56
2	30,949 (5.9)	162.76	162.50	-69.05	-97.50	2.26	0.25	47.15	46.06
3	18,746 (3.6)	353.31	350.00	-221.28	-244.00	0.55	0.00	77.59	100.00
4	15,005 (2.9)	632.60	600.00	-430.96	-479.00	0.38	0.00	82.17	100.00
5	10,205 (1.9)	851.22	800.00	-671.19	-779.00	0.31	0.00	86.81	100.00
6	7,052 (1.3)	1121.95	1100.00	-982.77	-994.00	0.35	0.00	88.45	100.00
7	5,966 (1.1)	1527.06	1500.00	-1415.04	-1393.00	0.35	0.00	90.15	100.00
8	2,850 (0.5)	2236.04	2500.00	-2143.54	-2025.28	0.40	0.00	92.02	100.00
9	2,848 (0.5)	3015.98	3000.00	-2948.09	-2983.00	0.26	0.00	93.96	100.00
10	4,589 (0.9)	7146.16	6500.00	-7083.72	-6392.00	0.16	0.00	96.34	100.00
Total	525,744 (100.0)								

Table 2. Shorting Constraints in Portfolios of Each Anomaly

This table presents simple averages of the shorting constraint variables in the portfolios formed with value weight by sorting stocks into one of 10 deciles on each anomaly variable. "Short" is the short-leg portfolio (Portfolio 1), "Long" is the long-leg portfolio (Portfolio 10), and "L-S" is the long-minus-short arbitrage portfolio. "Fee" is the indicative fee (in basis point per annum) observed on the last trading day of each month, paid by the borrower for a new stock loan. "Rebate" is the indicative rebate rate (in basis point per annum) observed on the last trading day of each month, which is the cash interest on collateral received by the borrower. AQ (active available quantity) is the quantity of shares realistically available for borrowing from the active beneficial owner. Active utilization by quantity (AU) is the share of securities (in %) in lending programs currently out on loan. DCBS is a daily measure of the relative cost of borrowing, ranging from 1 (cheapest, easiest to borrow) to 10 (most expensive, most difficult to borrow). "%(AQ≤1)" means the percentage of stocks in the portfolio whose AQ is less than 1 share. "%(AU=100)" means the percentage of stocks in the portfolio whose AU equals 100 percent. "%(DCBS≥3)" means the percentage of stocks in the portfolio whose DCBS is greater than or equal to 3.

Port-folios	Sorting variable	Fee (bps)	Rebate (bps)	AQ (in M)	%(AQ<1)	AU	%(AU =100)	DCBS	%(DCBS ≥3)	ME ($M)	Obs.
Panel A : Sorted on return on asset (ROA)											
Short	-0.19	600	-477	4.69	24.15	49.17	23.11	2.80	31.51	483	259
3	-0.01	172	-49	13.90	7.77	24.90	7.18	1.49	9.89	1743	260
5	0.01	98	25	29.75	3.78	17.42	3.41	1.22	4.56	4700	260
8	0.02	92	31	37.05	3.26	15.73	2.89	1.20	3.97	8522	260
Long	0.07	179	-56	38.34	6.08	23.75	5.55	1.48	9.69	10618	260
L-S	0.26	-421	421	33.65	-18.08	-25.42	-17.55	-1.32	-21.82		
Panel B : Sorted on return on equity (ROE)											
Short	-0.66	565	-442	6.36	22.86	47.72	21.81	2.70	30.01	734	259
3	-0.02	184	-61	12.76	8.00	24.77	7.37	1.51	10.16	1541	260
5	0.01	106	17	21.60	4.50	17.76	4.04	1.25	5.21	3338	260
8	0.04	83	40	43.03	2.79	15.77	2.49	1.17	3.65	9494	260
Long	0.47	178	-55	41.91	6.06	22.77	5.55	1.47	9.36	11177	260
L-S	1.13	-388	388	35.55	-16.80	-24.95	-16.25	-1.23	-20.66		
Panel C : Sorted on momentum											
Short	-0.44	524	-401	7.78	18.81	41.87	18.02	2.41	24.25	768	294
3	-0.14	178	-55	23.45	7.80	24.03	7.23	1.50	9.93	4010	294
5	0.00	128	-5	33.41	5.77	19.55	5.15	1.34	6.98	6904	294
8	0.21	119	4	32.03	4.76	18.38	4.30	1.29	6.00	6956	295
Long	0.86	260	-137	12.60	9.65	27.91	9.11	1.70	13.11	2451	296
L−S	1.30	-264	264	4.81	-9.16	-13.96	-8.91	-0.70	-11.14		
Panel D : Sorted on net operating assets											
Short	-3.80	235	-103	14.46	9.53	30.11	8.39	1.65	12.33	3011	267
3	-0.75	118	14	24.41	6.15	19.71	5.07	1.30	6.62	4997	204
5	-0.65	105	26	29.77	4.45	17.56	3.70	1.24	5.41	6668	191
8	-0.49	117	14	32.61	5.11	18.61	4.21	1.30	6.44	6649	228
Long	0.03	252	-121	19.19	11.58	30.06	10.81	1.76	14.97	3395	553
L−S	3.83	18	-18	4.73	2.05	-0.05	2.42	0.11	2.64		
Panel E : Sorted on investment-to-assets											
Short	-1.66	297	-165	15.82	10.52	34.04	9.52	1.83	15.39	3704	263
3	-0.08	128	4	25.06	5.10	21.31	4.52	1.33	6.74	6117	225
5	-0.04	122	9	30.06	5.98	20.75	5.35	1.32	6.72	7159	228
8	0.00	164	-33	32.81	7.32	21.51	6.67	1.44	8.91	5943	269
Long	0.12	186	-54	18.58	9.93	22.69	8.66	1.53	10.45	2421	254
L−S	1.79	-111	111	2.76	-0.59	-11.35	-0.86	-0.30	-4.94		

Port-Folios	Sorting variable	Fee (bp)	Rebate (bp)	AQ (in M)	%(AQ<1)	AU	%(AU =100)	DCBS	%(DCBS ≥3)	ME ($M)	Obs.
Panel F : Sorted on abnormal capital investment											
Short	-3.61	194	-62	12.76	9.51	26.48	8.39	1.57	11.41	2443	321
3	-0.25	97	35	36.11	3.95	18.65	3.49	1.23	5.03	7631	183
5	-0.04	88	44	43.07	3.18	17.09	2.69	1.20	4.24	9876	175
8	0.20	115	16	33.75	3.61	18.07	3.01	1.25	4.88	6305	200
Long	0.64	233	-102	11.66	11.86	28.27	10.65	1.68	13.48	1728	430
L−S	4.25	40	-40	-1.10	2.35	1.79	2.26	0.11	2.07		
Panel G : Sorted on total accruals											
Short	-0.22	273	-142	10.23	11.42	30.34	10.30	1.77	14.77	1895	399
3	0.01	119	12	30.17	4.95	18.81	4.44	1.28	5.47	6375	210
5	0.03	116	16	37.26	4.33	18.77	3.95	1.28	6.05	8527	187
8	0.07	115	17	35.66	5.37	19.49	4.73	1.31	6.36	7414	219
Long	0.41	235	-103	13.20	11.38	29.30	10.21	1.70	13.86	2509	361
L−S	0.63	-38	38	2.98	-0.04	-1.04	-0.09	-0.07	-0.91		
Panel H : Sorted on asset growth											
Short	-4.35	306	-175	15.41	11.68	36.04	10.63	1.90	17.17	3906	414
3	-0.14	90	42	30.73	4.12	18.38	3.45	1.22	4.74	6799	234
5	-0.06	103	28	33.60	4.55	17.22	3.80	1.23	5.02	7472	196
8	0.02	106	26	34.74	4.38	18.19	3.85	1.25	4.67	6520	206
Long	0.21	260	-128	17.56	12.94	28.10	11.82	1.78	15.12	2108	352
L−S	4.56	-46	46	2.15	1.26	-7.94	1.19	-0.12	-2.05		
Panel I : Sorted on composite equity issues											
Short	-0.73	228	-97	19.90	10.77	31.10	10.14	1.70	14.29	2662	268
3	-0.06	79	53	18.29	4.60	15.86	3.58	1.17	3.42	3655	188
5	0.05	67	65	27.06	3.70	14.66	2.73	1.13	3.22	5529	151
8	0.18	64	68	79.82	2.80	13.86	1.94	1.12	2.49	17805	118
Long	0.52	80	51	56.83	2.74	17.69	1.88	1.17	4.25	11693	120
L−S	1.25	-148	148	36.93	-8.03	-13.41	-8.25	-0.52	-10.04		
Panel J : Sorted on O-Score											
Short	-0.49	392	-261	5.09	19.17	39.00	17.44	2.23	23.31	655	514
3	2.78	121	10	15.48	5.83	20.63	5.10	1.32	6.58	2517	200
5	3.56	91	40	20.25	3.51	18.29	3.08	1.21	4.64	3893	191
8	4.72	77	55	36.75	2.27	15.01	1.90	1.14	2.84	7586	204
Long	6.84	121	11	55.77	4.01	21.07	3.46	1.30	5.93	13711	323
L−S	7.33	-271	271	50.68	-15.16	-17.93	-13.98	-0.93	-17.38		
Panel K : Sorted on failure probability											
Short	-0.25	465	-342	6.15	20.43	39.54	19.27	2.35	24.48	427	446
3	-0.06	135	-12	18.91	5.54	22.62	5.21	1.38	7.91	2523	233
5	-0.04	94	29	28.09	3.17	18.62	2.93	1.22	4.53	5108	199
8	-0.02	71	52	36.87	2.01	15.32	1.79	1.13	2.92	9003	201
Long	-0.02	75	48	55.60	2.38	13.99	2.08	1.15	3.24	12815	293
L−S	0.24	-390	390	49.45	-18.06	-25.54	-17.19	-1.20	-21.25		
Panel L : Sorted on growth profitability											
Short	-0.11	402	-270	14.38	16.35	39.19	15.35	2.21	22.77	2275	325
3	0.17	139	-7	29.44	5.72	21.55	5.03	1.37	7.55	5593	188
5	0.26	132	-1	29.63	6.16	20.40	5.35	1.33	7.06	6151	206
8	0.43	106	25	27.70	4.69	18.39	4.11	1.25	5.15	6260	291
Long	0.85	146	-14	16.34	7.92	24.23	6.82	1.43	8.91	3688	322
L−S	0.96	-256	256	1.97	-8.43	-14.96	-8.53	-0.78	-13.86		

Port-Folios	Sorting variable	Fee (bp)	Rebate (bp)	AQ (in M)	%(AQ<1)	AU	%(AU =100)	DCBS	%(DCBS ≥3)	ME ($M)	Obs.
Panel M : Sorted on net stock issues											
Short	-0.57	520	-397	12.24	17.90	42.25	16.95	2.41	24.21	1756	246
3	-0.03	151	-28	13.73	6.29	23.43	5.87	1.41	8.22	2282	246
5	-0.01	118	5	18.25	5.09	18.81	4.74	1.30	6.13	3570	246
8	0.00	345	-222	8.61	20.70	28.31	18.14	2.04	18.60	1705	67
Long	0.10	80	43	54.65	2.09	15.95	1.82	1.17	3.63	11656	349
L−S	0.68	-440	440	42.41	-15.81	-26.30	-15.14	-1.24	-20.57		
Panel N : Sorted on standardized unexpected earnings (SUE)											
Short	-3.32	152	-29	30.04	5.89	21.91	5.48	1.38	7.72	6451	196
3	-0.47	124	-1	30.45	5.64	19.86	5.22	1.33	6.76	5878	196
5	-0.07	125	-2	31.60	5.41	18.58	4.97	1.31	6.18	5590	196
8	0.44	121	2	32.82	5.36	18.47	4.90	1.30	6.17	6727	196
Long	2.46	142	-19	31.93	6.04	19.60	5.47	1.36	7.27	7229	197
L−S	5.77	-10	10	1.90	0.15	-2.31	-0.01	-0.02	-0.46		
Panel O : Combined all 14 anomalies											
Short	-1.46	368	-240	12.52	14.93	36.34	13.91	2.07	19.54	2226	
3	0.07	131	-3	23.06	5.82	21.04	5.20	1.34	7.07	4404	
5	0.22	107	21	29.53	4.54	18.25	3.99	1.25	5.43	6035	
8	0.41	121	7	36.02	5.32	18.22	4.64	1.30	5.93	7635	
Long	0.97	173	-45	31.73	7.48	23.24	6.71	1.48	9.52	6943	
L−S	2.43	-195	195	19.20	-7.45	-13.10	-7.21	-0.59	-10.03		

Table 3. Average Number of Stocks and Average Returns of the Short-Leg Portfolios

This table presents average number of stocks (Obs.) and average monthly raw excess returns (Ret) of the value-weighted short-leg portfolio in each anomaly. "All stocks" indicates including all stocks in the short-leg portfolio before excluding the stocks. "Stocks with AU=100" and "Stocks with FEE missing" indicate including only stocks in the short-leg portfolio whose AU equals 100 percent and whose indicative fee (FEE) data is missing in the Markit database, respectively. Numbers in parentheses indicate t-statistics of the average returns, and numbers in bracket indicate the proportion (in %) of the stocks among all stocks included in the short-leg portfolio.

Anomaly	All stocks (before excl. stocks)		Stocks with AU=100%		Stocks with FEE missing		After excl. stocks with AU=100%		After excl. stocks with AU=100% and FEE missing	
	Obs.	Ret (t-stat)	Obs.[%]	Ret (t-stat)	Obs.[%]	Ret (t-stat)	Obs.[%]	Ret (t-stat)	Obs.[%]	Ret (t-stat)
Return-on-assets	259	0.30 (0.47)	60 [23.1]	-0.74 (-0.97)	40 [15.5]	-2.47 (-2.59)	199 [76.9]	0.40 (0.63)	159 [61.4]	0.63 (0.97)
Return-on-equity	259	0.40 (0.67)	57 [21.8]	-0.53 (-0.69)	39 [15.2]	-1.84 (-2.39)	203 [78.2]	0.46 (0.78)	163 [63.0]	0.63 (1.03)
Momentum	294	0.74 (1.13)	53 [18.0]	-1.18 (-1.44)	41 [14.1]	-0.66 (-0.89)	241 [82.0]	0.80 (1.23)	200 [67.9]	0.91 (1.39)
Net operating asset	267	0.59 (1.46)	22 [8.4]	-0.88 (-1.17)	25 [9.4]	0.12 (0.21)	244 [91.6]	0.60 (1.48)	219 [82.2]	0.62 (1.56)
Invest-to-assets	263	0.76 (1.55)	25 [9.5]	-0.95 (-1.10)	24 [8.9]	-0.16 (-0.22)	238 [90.5]	0.77 (1.58)	215 [81.5]	0.81 (1.68)
Abnor capitl invest	321	0.64 (1.34)	27 [8.4]	-0.53 (-0.75)	26 [8.2]	0.44 (0.66)	294 [91.6]	0.64 (1.34)	268 [83.4]	0.60 (1.22)
Accruals	399	0.84 (2.01)	41 [10.3]	-0.59 (-0.95)	33 [8.4]	0.49 (0.85)	358 [89.7]	0.85 (2.04)	324 [81.3]	0.87 (2.10)
Asset growth	414	0.84 (1.99)	44 [10.6]	-0.68 (-0.89)	40 [9.7]	0.64 (1.01)	370 [89.4]	0.85 (2.01)	330 [79.6]	0.81 (1.99)
Comp equity issues	268	0.67 (1.63)	27 [10.1]	-0.41 (-0.61)	27 [10.2]	-0.02 (-0.03)	241 [89.9]	0.68 (1.65)	214 [79.7]	0.71 (1.74)
O-score	514	0.85 (1.59)	90 [17.4]	-0.74 (-1.08)	67 [13.0]	-0.01 (-0.01)	424 [82.6]	0.90 (1.69)	357 [69.5]	0.98 (1.80)
Failure probability	446	0.97 (1.12)	86 [19.3]	0.15 (0.12)	61 [13.7]	-1.37 (-1.37)	360 [80.7]	1.02 (1.20)	299 [67.0]	1.26 (1.49)
Gross profit	325	0.71 (2.09)	50 [15.3]	-0.48 (-0.60)	44 [13.6]	0.14 (0.17)	276 [84.7]	0.73 (2.14)	231 [71.1]	0.77 (2.28)
Net stock issues	246	0.35 (0.78)	42 [17.0]	-0.73 (-0.95)	34 [13.8]	0.67 (0.78)	204 [83.0]	0.36 (0.81)	170 [69.2]	0.30 (0.67)
PEAD	196	0.61 (1.53)	11 [5.5]	-0.03 (-0.02)	13 [6.8]	0.06 (0.09)	185 [94.5]	0.61 (1.53)	172 [87.7]	0.63 (1.58)
Average	322	0.661	45 [14.1]	-0.593	38 [11.7]	-0.284	274 [85.1]	0.690	239 [74.2]	0.752

Table 4. Average Returns of Each Anomaly After Adjustment for Shorting Constraints

This table presents monthly raw excess returns (Panel A), CAPM-adjusted (Panel B), FF3-adjusted (Panel C), and HXZ4-adjusted abnormal returns (Panel D) of the value-weighted long–short portfolio in each anomaly before and after adjustment for shorting constraints. "Long–short (Gross)" and "Long–short (Net)" represent long–short portfolio returns before and after adjustment for shorting constraints. The first shorting constraint is unavailability of stocks in the short-leg portfolio to sell short, which is determined by 100 percent active utilization (i.e., AU=100%). The second shorting constraint is fee explicitly paid to stock lenders for stocks in the short-leg portfolio used to sell short. All costs and returns are in percent per month and are computed with value weight.

Anomaly	Long–short (Gross) (A)	After excl. stocks unavail-able to short (B)	Costs due to unavailability to short (C) [=(A) – (B)]	Fee (costs paid to lenders) (D)	Total shorting costs (E) [=(C)+(D)]	Long–short (Net) (F) [=(A) – (E)]
Panel A : Raw excess return						
Return-on-assets	0.64 (1.32)	0.54 (1.10)	0.10 (2.54)	0.16 (15.70)	0.26 (6.44)	0.37 (0.77)
Return-on-equity	0.66 (1.61)	0.60 (1.45)	0.06 (2.49)	0.13 (18.83)	0.19 (7.57)	0.47 (1.13)
Momentum	0.19 (0.39)	0.13 (0.27)	0.06 (2.93)	0.11 (28.27)	0.16 (8.17)	0.03 (0.06)
Net operating asset	0.55 (2.41)	0.54 (2.37)	0.01 (2.80)	0.05 (44.81)	0.06 (19.41)	0.49 (2.16)
Invest-to-assets	0.17 (0.59)	0.16 (0.56)	0.01 (3.02)	0.05 (55.28)	0.06 (17.18)	0.11 (0.38)
Abnor capitl invest	0.39 (1.57)	0.39 (1.55)	0.00 (0.94)	0.04 (78.37)	0.045 (12.20)	0.35 (1.38)
Accruals	0.01 (0.06)	0.00 (0.01)	0.01 (3.50)	0.05 (67.95)	0.06 (18.16)	-0.05 (-0.23)
Asset growth	0.02 (0.08)	0.01 (0.05)	0.01 (2.65)	0.05 (53.57)	0.06 (19.10)	-0.04 (-0.15)
Comp equity issues	0.29 (1.14)	0.28 (1.13)	0.010 (1.86)	0.05 (56.88)	0.065 (20.92)	0.23 (0.93)
O-score	-0.02 (-0.08)	-0.07 (-0.23)	0.05 (4.34)	0.08 (44.37)	0.13 (11.26)	-0.16 (-0.49)
Failure probability	-0.07 (-0.09)	-0.12 (-0.17)	0.05 (1.57)	0.13 (22.95)	0.18 (5.18)	-0.25 (-0.35)
Gross profit	0.02 (0.09)	0.00 (0.03)	0.02 (2.36)	0.05 (72.38)	0.07 (10.19)	-0.04 (-0.18)
Net stock issues	0.42 (1.69)	0.41 (1.64)	0.01 (1.60)	0.07 (31.92)	0.08 (9.83)	0.35 (1.38)
PEAD	0.39 (1.72)	0.39 (1.75)	0.00 (-0.40)	0.04 (59.90)	0.04 (7.91)	0.35 (1.58)
Average	0.262	0.233	0.029	0.075	0.104	0.158
Panel B : CAPM-adjusted return						
Return-on-assets	1.01 (2.20)	0.91 (1.96)	0.10 (2.47)	0.16 (15.70)	0.26 (6.31)	0.74 (1.61)
Return-on-equity	1.09 (3.02)	1.03 (2.83)	0.06 (2.37)	0.13 (18.83)	0.19 (7.38)	0.90 (2.47)
Momentum	0.43 (0.87)	0.36 (0.73)	0.07 (3.53)	0.11 (28.27)	0.18 (8.86)	0.25 (0.51)
Net operating asset	0.50 (2.15)	0.49 (2.11)	0.01 (3.48)	0.05 (44.81)	0.06 (20.38)	0.44 (1.90)
Invest-to-assets	0.31 (1.10)	0.30 (1.05)	0.01 (3.63)	0.05 (55.28)	0.06 (18.32)	0.25 (0.87)
Abnor capitl invest	0.54 (2.23)	0.54 (2.21)	0.00 (0.71)	0.04 (78.37)	0.05 (11.84)	0.50 (2.03)
Accruals	-0.05 (-0.23)	-0.06 (-0.29)	0.01 (4.15)	0.05 (67.95)	0.06 (19.29)	-0.11 (-0.52)
Asset growth	0.04 (0.14)	0.03 (0.10)	0.01 (3.54)	0.05 (53.57)	0.06 (20.92)	-0.02 (-0.10)
Comp equity issues	0.53 (2.32)	0.52 (2.30)	0.01 (2.08)	0.05 (56.88)	0.05 (20.86)	0.48 (2.09)
O-score	0.31 (1.07)	0.26 (0.88)	0.05 (4.53)	0.08 (44.37)	0.14 (11.30)	0.17 (0.60)
Failure probability	0.82 (1.38)	0.75 (1.28)	0.07 (2.03)	0.13 (22.95)	0.20 (5.61)	0.62 (1.07)
Gross profit	-0.01 (-0.03)	-0.03 (-0.11)	0.02 (3.42)	0.05 (72.38)	0.07 (11.78)	-0.08 (-0.32)
Net stock issues	0.60 (2.46)	0.58 (2.40)	0.02 (1.91)	0.07 (31.92)	0.08 (10.06)	0.51 (2.12)
PEAD	0.52 (2.33)	0.52 (2.35)	0.00 (-0.06)	0.04 (59.90)	0.04 (8.35)	0.48 (0.87)
Average	0.473	0.441	0.032	0.075	0.107	0.366

Anomaly	Long–short (Gross) (A)	After excl. stocks unavail-able to short (B)	Costs due to unavailability to short (C) [=(A) – (B)]	Fee (costs paid to lenders) (D)	Total shorting costs (E) [=(C)+(D)]	Long–short (Net) (F) [=(A) – (E)
Panel C: FF3-adjusted return						
Return-on-assets	0.91 (2.25)	0.81 (1.98)	0.10 (2.51)	0.16 (15.70)	0.27 (6.32)	0.64 (1.58)
Return-on-equity	0.99 (3.11)	0.93 (2.89)	0.06 (2.39)	0.13 (18.83)	0.19 (7.37)	0.80 (2.48)
Momentum	0.26 (0.55)	0.19 (0.41)	0.07 (3.44)	0.11 (28.27)	0.17 (8.74)	0.08 (0.18)
Net operating asset	0.44 (1.96)	0.43 (1.92)	0.01 (3.39)	0.05 (44.81)	0.06 (20.40)	0.38 (1.70)
Invest-to-assets	0.39 (1.46)	0.38 (1.41)	0.01 (3.74)	0.05 (55.28)	0.06 (19.06)	0.33 (1.22)
Abnor capitl invest	0.57 (2.37)	0.57 (2.34)	0.00 (0.65)	0.04 (78.37)	0.05 (11.96)	0.52 (2.16)
Accruals	-0.08 (-0.38)	-0.09 (-0.44)	0.01 (4.12)	0.05 (67.95)	0.06 (19.44)	-0.14 (-0.67)
Asset growth	0.16 (0.75)	0.15 (0.71)	0.01 (3.61)	0.05 (53.57)	0.06 (22.33)	0.11 (0.48)
Comp equity issues	0.55 (2.68)	0.54 (2.65)	0.00 (1.97)	0.05 (56.88)	0.05 (20.90)	0.49 (2.41)
O-score	0.23 (1.05)	0.18 (0.79)	0.05 (4.78)	0.08 (44.37)	0.14 (11.82)	0.09 (0.41)
Failure probability	0.53 (1.09)	0.46 (0.97)	0.07 (2.03)	0.13 (22.95)	0.20 (5.58)	0.33 (0.70)
Gross profit	-0.01 (-0.05)	-0.03 (-0.13)	0.02 (3.62)	0.05 (72.38)	0.07 (12.50)	-0.08 (-0.33)
Net stock issues	0.60 (2.55)	0.59 (2.48)	0.01 (1.90)	0.07 (31.92)	0.08 (10.42)	0.51 (2.19)
PEAD	0.51 (2.28)	0.51 (2.30)	0.00 (-0.23)	0.04 (59.90)	0.04 (8.24)	0.47 (2.13)
Average	0.431	0.399	0.032	0.075	0.107	0.324
Panel D : HXZ4-adjusted return						
Return-on-assets	0.32 (0.91)	0.23 (0.63)	0.09 (2.24)	0.16 (15.70)	0.25 (5.92)	0.06 (0.18)
Return-on-equity	0.49 (1.83)	0.43 (1.58)	0.06 (2.29)	0.13 (18.83)	0.19 (7.12)	0.30 (1.10)
Momentum	-0.30 (-0.77)	-0.37 (-0.93)	0.07 (3.33)	0.11 (28.27)	0.17 (8.47)	-0.48 (-1.20)
Net operating asset	0.35 (1.53)	0.34 (1.50)	0.01 (3.01)	0.05 (44.81)	0.06 (19.97)	0.29 (1.28)
Invest-to-assets	0.00 (0.00)	-0.01 (-0.06)	0.01 (3.42)	0.05 (55.28)	0.06 (18.46)	-0.06 (-0.30)
Abnor capitl invest	0.34 (1.54)	0.34 (1.51)	0.00 (0.79)	0.04 (78.37)	0.05 (11.94)	0.29 (1.32)
Accruals	0.09 (0.47)	0.08 (0.41)	0.01 (3.64)	0.05 (67.95)	0.06 (18.85)	0.03 (0.16)
Asset growth	-0.05 (-0.27)	-0.06 (-0.32)	0.01 (3.02)	0.05 (53.57)	0.06 (21.99)	-0.11 (-0.59)
Comp equity issues	0.33 (1.78)	0.33 (1.75)	0.00 (1.53)	0.05 (56.88)	0.05 (20.73)	0.28 (1.50)
O-score	-0.08 (-0.39)	-0.13 (-0.65)	0.05 (4.39)	0.08 (44.37)	0.13 (11.14)	-0.21 (-1.07)
Failure probability	-0.23 (-0.68)	-0.27 (-0.81)	0.04 (1.19)	0.13 (22.95)	0.17 (4.85)	-0.39 (-1.20)
Gross profit	-0.12 (-0.48)	-0.14 (-0.54)	0.02 (2.90)	0.05 (72.38)	0.07 (12.22)	-0.19 (-0.74)
Net stock issues	0.31 (1.48)	0.30 (1.42)	0.01 (1.25)	0.07 (31.92)	0.08 (9.86)	0.24 (1.11)
PEAD	0.31 (1.47)	0.32 (1.50)	-0.01 (-1.27)	0.04 (59.90)	0.03 (7.84)	0.28 (1.32)
Average	0.127	0.100	0.027	0.075	0.102	0.025

Table 5. Robustness Test

This table presents (i) cost due to unavailability of stocks in the short-leg portfolio to sell short, (ii) fee explicitly paid to stock lenders, and (iii) total shorting costs [=(i)+(ii)] according to the degree of unavailability of stocks in the short-leg portfolio to sell short. Three different degrees of unavailability of stocks in the short-leg portfolio to sell short are considered: AU ≥ 90 percent, AU ≥ 80 percent, and DCBS ≥ 3. All costs are in percent per month and are computed with value weight.

Anomaly	Cost due to unavailability to short			Fee (costs paid to lenders)			Total shorting costs		
	AU ≥ 90%	AU ≥ 80%	DCBS ≥ 3	AU ≥ 90%	AU ≥ 80%	DCBS ≥ 3	AU ≥ 90%	AU ≥ 80%	DCBS ≥ 3
Return-on-assets	0.16 (1.97)	0.21 (2.08)	0.16 (1.65)	0.11 (24.04)	0.08 (26.91)	0.05 (23.94)	0.27 (3.30)	0.28 (2.87)	0.22 (2.19)
Return-on-equity	0.15 (3.42)	0.20 (3.60)	0.21 (3.78)	0.09 (23.03)	0.06 (31.63)	0.05 (30.79)	0.23 (5.48)	0.27 (4.73)	0.26 (4.66)
Momentum	0.12 (2.94)	0.17 (3.37)	0.16 (3.14)	0.08 (28.06)	0.06 (33.41)	0.04 (76.13)	0.20 (4.78)	0.22 (4.52)	0.20 (3.95)
Net operating asset	0.00 (-0.27)	0.00 (-0.07)	-0.01 (-0.42)	0.04 (50.14)	0.04 (78.11)	0.04 (177.89)	0.04 (3.27)	0.04 (1.74)	0.03 (1.87)
Invest-to-assets	0.01 (0.85)	0.00 (0.04)	0.00 (0.15)	0.04 (80.29)	0.04 (95.03)	0.04 (191.13)	0.05 (4.76)	0.04 (1.86)	0.04 (2.12)
Abnor capitl invest	0.00 (0.27)	0.01 (0.39)	0.00 (0.38)	0.04 (73.44)	0.04 (83.87)	0.03 (158.21)	0.04 (5.01)	0.05 (2.22)	0.04 (3.42)
Accruals	0.01 (1.50)	0.02 (1.70)	0.04 (3.31)	0.04 (72.31)	0.04 (87.85)	0.04 (138.37)	0.06 (6.10)	0.06 (4.68)	0.08 (5.98)
Asset growth	0.01 (1.70)	0.02 (1.09)	0.01 (0.91)	0.04 (55.62)	0.04 (69.47)	0.04 (132.10)	0.06 (7.08)	0.06 (3.85)	0.05 (3.49)
Comp equity issues	0.01 (0.89)	0.01 (1.17)	0.01 (0.73)	0.04 (54.18)	0.04 (78.67)	0.03 (196.82)	0.05 (4.83)	0.05 (4.20)	0.05 (3.04)
O-score	0.05 (2.29)	0.07 (1.46)	0.07 (1.76)	0.07 (50.33)	0.05 (70.03)	0.04 (125.83)	0.12 (5.02)	0.12 (2.59)	0.11 (2.86)
Failure probability	0.17 (2.76)	0.18 (2.44)	0.20 (2.72)	0.08 (27.59)	0.06 (38.55)	0.05 (76.00)	0.25 (4.14)	0.24 (3.25)	0.24 (3.34)
Gross profit	0.02 (1.99)	0.04 (2.04)	0.04 (1.78)	0.04 (76.53)	0.04 (128.91)	0.04 (181.13)	0.06 (6.28)	0.08 (3.87)	0.07 (3.46)
Net stock issues	0.04 (2.63)	0.04 (1.40)	0.01 (0.48)	0.06 (32.53)	0.05 (44.68)	0.04 (94.47)	0.10 (6.02)	0.08 (3.00)	0.05 (1.72)
PEAD	0.00 (-0.58)	0.01 (0.46)	0.01 (0.56)	0.04 (85.88)	0.03 (138.36)	0.03 (154.82)	0.03 (3.46)	0.04 (3.41)	0.04 (3.46)
Average	0.054	0.070	0.066	0.058	0.047	0.039	0.112	0.117	0.105

Table 6. Asymmetric Pricing Effects of Shorting Costs

This table presents Fama-French three-factor-adjusted monthly returns on the value-weighted long-leg and short-leg portfolios in each anomaly before (gross) and after (net) adjustment for total shorting costs. Total shorting costs are the sum of implicit shorting costs due to unavailability of stocks in the short-leg portfolio to sell short and fee explicitly paid to stock lenders for stocks in the short-leg portfolio used to sell short. All returns and costs are in percent per month.

	Before adjustment for total shorting costs				After adjustment for total shorting costs		
	Long-leg (Gross)	Short-leg (Gross)	Long–short (Gross)	Total shorting costs	Long-leg (Net)	Short-leg (Net)	Long–short (Net)
Return-on-assets	0.20 (1.64)	-0.71 (-1.95)	0.91 (2.25)	0.27 (6.32)	0.20 (1.64)	-0.44 (-1.21)	0.64 (1.58)
Return-on-equity	0.36 (3.61)	-0.63 (-2.27)	0.99 (3.11)	0.19 (7.37)	0.36 (3.61)	-0.44 (-1.56)	0.80 (2.48)
Momentum	-0.07 (-0.29)	-0.33 (-0.96)	0.26 (0.55)	0.17 (8.74)	-0.07 (-0.29)	-0.15 (-0.44)	0.08 (0.18)
Net operating asset	0.25 (1.85)	-0.19 (-1.11)	0.44 (1.96)	0.06 (20.40)	0.25 (1.85)	-0.13 (-0.77)	0.38 (1.70)
Invest-to-assets	0.21 (1.55)	-0.19 (-0.78)	0.39 (1.46)	0.06 (19.06)	0.21 (1.55)	-0.12 (-0.51)	0.33 (1.22)
Abnor capitl invest	0.25 (2.00)	-0.31 (-1.60)	0.57 (2.37)	0.05 (11.96)	0.25 (2.00)	-0.27 (-1.35)	0.52 (2.16)
Accruals	-0.09 (-0.50)	-0.01 (-0.06)	-0.08 (-0.38)	0.06 (19.44)	-0.09 (-0.50)	0.05 (0.38)	-0.14 (-0.67)
Asset growth	0.12 (0.83)	-0.04 (-0.26)	0.16 (0.75)	0.06 (22.33)	0.12 (0.83)	0.02 (0.11)	0.11 (0.48)
Comp equity issues	0.38 (2.74)	-0.17 (-1.17)	0.55 (2.68)	0.05 (20.90)	0.38 (2.74)	-0.12 (-0.80)	0.49 (2.41)
O-score	0.08 (0.91)	-0.14 (-0.83)	0.23 (1.05)	0.14 (11.82)	0.08 (0.91)	-0.01 (-0.04)	0.09 (0.41)
Failure probability	0.23 (1.93)	-0.30 (-0.71)	0.53 (1.09)	0.20 (5.58)	0.23 (1.93)	-0.10 (-0.25)	0.33 (0.70)
Gross profit	0.08 (0.53)	0.09 (0.50)	-0.01 (-0.05)	0.07 (12.50)	0.08 (0.53)	0.16 (0.89)	-0.08 (-0.33)
Net stock issues	0.10 (1.30)	-0.50 (-2.48)	0.60 (2.55)	0.08 (10.42)	0.10 (1.30)	-0.42 (-2.07)	0.51 (2.19)
PEAD	0.33 (2.40)	-0.19 (-1.16)	0.51 (2.28)	0.04 (8.24)	0.33 (2.40)	-0.15 (-0.93)	0.47 (2.13)
Average	0.172	-0.259	0.431	0.107	0.172	-0.152	0.324

Table 7. Shorting Costs in High and Low Investor Sentiment Periods

This table presents percentages of stocks with AU=100% in the short-leg portfolios, costs due to unavailability of stocks in the short-leg portfolio to sell short, fee actually paid to stock lenders for stocks in the short-leg portfolio used to sell short, and combined total shorting costs during months of high and low investor sentiment. High- and low-sentiment months are classified based on the median level of the Baker and Wurgler (2006) (BW) investor sentiment index. All costs are in percent per month and are computed with value-weight. Due to availability of the BW sentiment index, the sample period is January 2006 to October 2015. Among all 118 months, 54 (64) months are classified as high (low) sentiment months. All costs are in percent per month.

Anomaly	%(AU =100)	Cost due to unavail to short	Fee	Total shorting costs	%(AU =100)	Cost due to unavail to short	Fee	Total shorting costs	%(AU =100)	Cost due to unavail to short	Fee	Total shorting costs
	High investor sentiment				Low investor sentiment				High−Low			
Return-on-assets	24.4	0.13	0.14	0.28 (3.13)	18.3	0.08	0.15	0.24 (4.94)	6.1	0.05	-0.01	0.04 (0.40)
Return-on-equity	23.0	0.09	0.11	0.20 (4.25)	17.3	0.04	0.12	0.16 (4.21)	5.7	0.05	-0.01	0.04 (0.76)
Momentum	18.7	0.05	0.08	0.13 (5.22)	13.4	0.08	0.11	0.19 (4.92)	5.3	-0.03	-0.03	-0.06 (-1.34)
Net operating asset	8.5	0.01	0.05	0.06 (12.96)	8.4	0.01	0.05	0.06 (11.36)	0.1	0.00	0.00	0.00 (0.42)
Invest-to-assets	9.2	0.02	0.05	0.07 (9.69)	9.9	0.02	0.05	0.06 (11.38)	-0.7	0.00	0.00	0.00 (0.15)
Abnor capitl invest	8.2	0.01	0.04	0.05 (6.68)	8.0	0.00	0.04	0.04 (8.18)	0.2	0.01	0.00	0.01 (1.70)
Accruals	9.3	0.02	0.05	0.07 (10.79)	9.7	0.01	0.05	0.06 (10.92)	-0.4	0.01	0.00	0.01 (1.08)
Asset growth	10.2	0.01	0.05	0.06 (11.62)	10.4	0.01	0.05	0.06 (11.47)	-0.2	0.00	0.00	0.00 (1.16)
Comp equity issues	10.6	0.01	0.05	0.06 (14.21)	8.9	0.00	0.05	0.05 (11.28)	1.7	0.01	0.00	0.01 (1.88)
O-score	16.8	0.06	0.08	0.14 (6.56)	16.1	0.06	0.09	0.15 (7.60)	0.7	0.00	-0.01	-0.01 (-0.24)
Failure probability	19.5	0.08	0.11	0.19 (5.13)	15.3	0.06	0.13	0.19 (2.66)	4.2	0.02	-0.02	0.00 (-0.06)
Gross profit	14.5	0.03	0.05	0.08 (7.82)	14.5	0.01	0.05	0.06 (5.74)	0.0	0.02	0.00	0.02 (1.06)
Net stock issues	16.0	0.02	0.06	0.08 (6.68)	14.9	0.00	0.07	0.07 (5.41)	1.1	0.02	-0.01	0.01 (0.53)
PEAD	5.8	0.01	0.04	0.05 (7.50)	4.2	-0.01	0.04	0.03 (3.23)	1.6	0.02	0.00	0.02 (1.50)
Average	13.9	0.04	0.07	0.11	12.1	0.03	0.08	0.11	1.8	0.01	-0.01	0.00

APPENDIX A1. Market Anomalies and Portfolio Construction

Anomalies 1 & 2 (Return-on-assets, ROA; Return-on-equity, ROE): ROA is computed as income before extraordinary items (Compustat quarterly item IBQ) divided by one-quarter-lagged total assets (item ATQ). ROE is computed as income before extraordinary items divided by one-quarter-lagged book value of equity. As book value of equity, we use common equity (item CEQQ) plus the carrying value of preferred stock (item PSTKQ), or total assets (item ATQ) minus total liabilities (item LTQ), in that order. For book value of preferred stock, if the carrying value of preferred stock (item PSTKQ) is unavailable, we use redemption value (item PSTKRQ) when available. At the end of each month t, portfolios are formed with value weight by sorting all stocks on ROA (or ROE) into one of ten deciles using the most recently available quarterly earnings.

Anomaly 3 (Momentum): As in Jegadeesh and Titman (1993), we form ten decile portfolios with value weight by sorting stocks on past 6-month returns $(t-7,\ t-2)$ and holding the stocks for next 6 months $(t,\ t+5)$. We skip one month $(t-1)$ after sorting the stocks to eliminate the short-run reversal effect.

Anomaly 4 (Net Operating Assets, NOA): Following Hirshleifer et al. (2004), net operating assets (NOA) is defined as operating assets minus operating liabilities scaled by one-year-lagged total assets. Operating assets are total assets (Compustat annual item AT) minus cash and short-term investment (item CHE), and operating liabilities are total assets minus debt included in current liabilities (item DLC, zero if missing), minus long-term debt (item DLTT, zero if missing), minus minority interest (item MIB, zero if missing), minus preferred stocks (item PSTK, zero if missing), and minus common equity (item CEQ). Portfolios are formed with value weight by sorting stocks on NOA based on the NYSE break-points at the end of year y and holding the stocks during the period from July of year y+1 to June of year y+2.

Anomaly 5 (Investment to Assets, ITA): Following Lyandres, Sun, and Zhang (2007) and Chen, Novy-

Marx, and Zhang (2010), investment-to-asset (ITA) is defined as changes in gross property, plant, and equipment (Compustat annual item PPEGT) plus changes in inventory (item INVT) scaled by lagged total assets (item AT). Portfolios are formed as in forming the portfolios sorted on NOA.

Anomaly 6 (Abnormal Capital Investment, ACI): Following Titman, Wei, and Xie(2004), abnormal capital investment (ACI) is measured as $CE_{t-1}/[(CE_{t-2}+CE_{t-3}+CE_{t-4})/3]-1$, where CE_{t-j} is capital expenditure (Compustat annual item CAPX) scaled by sales(item SALE) at year $t-j$. Portfolios are formed as in forming the portfolios sorted on NOA.

Anomaly 7 (Total Accruals, ACC): Following Sloan (1996), total accruals is measured as $(\Delta CA-\Delta CASH)-(\Delta CL-\Delta STD-\Delta TD)-DP$, where ΔCA is change in current assets (Compustat annual item ACT), $\Delta CASH$ is change in cash or cash equivalents (item CHE), ΔCL is change in current liabilities (item LCT), ΔSTD is change in debt included in current liabilities (item DLC), ΔTP is change in income taxes payable (item TXP), and DP is depreciation and amortization expense (item DP). Total accruals are scaled by one-year-lagged total assets. Portfolios are formed as in forming the portfolios sorted on NOA.

Anomaly 8 (Asset Growth, AG): Following Cooper, Gulen, and Schill (2008), we compute asset growth at year y as changes in total assets (total assets at year y minus total assets at year y-1) divided by total assets at year y-1. Portfolios are formed as in forming the portfolios sorted on NOA.

Anomaly 9 (Composite Equity Issues, CEI): Following Daniel and Titman (2006), we measure composite equity issues (CEI) as $\log(ME_t/ME_{t-5})-r(t-5,t)$, where ME_t is market capitalization at the end of year t and $r(t-5,t)$ is cumulative log return on the stock from the last trading day of fiscal $t-5$ to the last trading day of year t. Seasoned issues and share-based acquisitions increase the issuance measure, while repurchases, dividends, and other actions that take cash out of the firm reduce this issuance measure. Portfolios are formed as in forming the portfolios sorted on NOA.

Anomaly 10 (Ohlson's score, O-score): Following Ohlson (1980), O-score is computed as

$$-1.32 - 0.407\log(TAGNP) + 6.03\text{TLTA} - 1.43\text{WCTA} + 0.076\text{CLCA} - 1.72\text{ENEG} - 2.37\text{NITA} - 1.83\text{FUTL} + .0285\text{INTWO} - 0.521\text{CHIN},$$

where TAGNP is total assets (Compustat annual item AT) divided by GNP price-level index; TLTA is leverage ratio defined as book value of debt (item DLC plus item DLTT) divided by total assets; WCTA is working capital divided by total assets, (item ACT minus item LCT)/item AT; CLCA is current liabilities (item LCT) divided by current assets (item ACT); OENEG is 1 if total liabilities (item LT) exceed total assets (item AT), and zero otherwise; NITA is net income (item NI) divided by total assets; FUTL is funds provided by operations (PI) divided by total liabilities (item LT); INTWO is equal to 1 if net income (item NI) is negative for the past 2 years, and zero otherwise; and CHIN is $(NI_t - NI_{t-1})/(|NI_t| + |NI_{t-1}|)$, where NI_t is net income (item NI). Portfolios are formed as in forming the portfolios sorted on NOA.

Anomaly 11 (Failure Probability, FP): Following Campbell, Hilscher, and Szilagyi (2008), we compute failure probability (FP) as

$$FP_t = -9.164 - 20.264NIMTAAVG_t + 1.416TLMTA_t - 7.129EXRETAVG_t + 1.411SIGMA_t - 0.045RSIZE_t - 2.132CASHMTA_t + 0.075MB_t - 0.058PRICE_t,$$

where $NIMTAAVG_{t-1,t-12} \equiv \frac{1-\phi^3}{1-\phi^{12}}\left(NIMTA_{t-1,t-3} + \cdots + \phi^9 NIMTA_{t-10,t-12}\right)$, $EXRETAVG_{t-1,t-12} \equiv \frac{1-\phi}{1-\phi^{12}}(EXRET_{t-1} + \cdots + \phi^{11}EXRET_{t-12})$, $\phi = 2^{-1/3}$. $NIMTA$ is net income (Compustat quarterly item NIQ) divided by the sum of market equity (share price times the number of shares outstanding from CRSP) and total liabilities (item LTQ); $EXRET \equiv \log(1 + R_{it}) - \log(1 + R_{S\&P500,t})$ is monthly log excess return on each firm's equity relative to the S&P500 Index; $TLMTA$ is the ratio of total liabilities divided by the sum of market equity and total liabilities; $SIGMA$ is the annualized 3-month rolling sample standard deviation: $\sqrt{\frac{252}{N-1}\sum_{k\in\{t-1,t-2,t-3\}} r_k^2}$, where k is the index of trading days in months $t-1$, $t-2$, and $t-3$, r_k is firm-level daily return, and N is total number of trading days in

the 3-month period. $RSIZE$ is the relative size of each firm measured as the log ratio of its market equity to that of the S&P500 Index. $CASHMTA$ is the ratio of cash and short-term investments (Compustat quarterly item CHEQ) divided by the sum of market equity and total liabilities (item LTQ). MB is market-to-book equity. $PRICE$ is each firm's log price per share. FP portfolios are formed by sorting stocks every month based on NYSE breakpoints.

Anomaly 12 (Gross Profitability, GP): Following Novy-Marx (2013), gross profitability (GP) is measured as total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS) divided by total assets (item AT: current total assets, not lagged). Portfolios are formed as in forming the portfolios sorted on NOA.

Anomaly 13 (Net Stock Issues, NSI): Following Fama and French (2008), net stock issues (NSI) are measured as natural log of the ratio of split-adjusted shares outstanding at the end of year t to split-adjusted shares outstanding at the end of year t-1. Split-adjusted shares outstanding is computed as shares outstanding (Compustat annual item CSHO) times the adjustment factor (item AJEX). Portfolios are formed by sorting stocks on NSI at the end of year y and holding the stocks during the period from July of year y+1 to June of year y+2. Because a disproportionately large number of stocks have zero and negative NSI, we assign stocks with zero NSI into the 8th portfolio and assign equally stocks with negative NSI into the 9th and 10th portfolios. Stocks with positive NSI are equally assigned into the first seven portfolios.

Anomaly 14 (Post Earnings Announcement Drift, PEAD): Following Foster, Olsen, and Shevlin (1984), we use standardized unexpected earnings (SUE) as a measure of earnings surprise. Standardized unexpected earnings (SUE) is computed as the ratio of the difference between actual quarterly earnings and expected earnings divided by the standard deviation of the differences over the last 20 quarters. SUE portfolios are formed by sorting stocks every month based on most recently available SUE.

Appendix A2. Summary of Market Anomalies

Anomaly	Sorting variable	Reference	Rebalancing Frequency
Return-on-assets (ROA)	Earnings / Total assets	Fama and French (2006)	monthly
Return-on-equity (ROE)	Earnings / Book equity	Chen, Novy-Marx, and Zhang (2010)	monthly
Momentum	Prior 6-month stock performance excluding the most recent month	Jegadeesh and Titman (1993)	monthly
Net operating assets	Net operating assets	Hirshleifer, Hou, Teoh, and Zhang (2004)	annual
Investment-to-assets	Investment-to-asset	Lyandres, Sun, and Zhang (2007)	annual
Abnormal capital investment	Investment growth based on capital expenditure	Titman, Wei, and Xie (2004)	annual
Accruals	Total accruals	Sloan (1996)	annual
Asset growth	Growth in total assets	Cooper, Gulen, and Schill (2008)	annual
Composite equity issues	Growth rate in the ME not attributable to stock returns	Daniel and Titman (2006)	annual
O-score	Ohlson's O-score	Ohlson (1980)	annual
Failure probability	Failure probability	Campbell, Hilscher, and Szilagyi (2008)	monthly
Gross profit	(Revenues−Costs of goods sold) / Total assets	Novy-Marx (2013)	annual
Net stock issues	Log growth rate in split-adjusted shares outstanding	Pontiff and Woodgate (2008)	annual
Post-earnings-announcement drift (PEAD)	Standardized unexpected earnings (SUE)	Foster, Olsen, and Shevlin (1984)	monthly

Table A3. Average Returns of Each Anomaly After Adjustment for Shorting Constraints

This table is the same as Table 4 except that portfolios are formed with equal weight. That is, this table presents monthly raw returns (Panel A), CAPM-adjusted (Panel B), FF3-adjusted (Panel C), and HXZ4-adjusted abnormal returns (Panel D) of the equal-weighted long–short portfolio in each anomaly before and after adjustment for shorting constraints. "Long–short (Gross)" and "Long–short (Net)" represent long–short portfolio returns before and after adjustment for shorting constraints. The first shorting constraint is unavailability of stocks in the short-leg portfolio to sell short, which is determined by 100 percent active utilization (i.e., AU=100 percent). The second shorting constraint is the fee explicitly paid to the stock lenders. All costs and returns are in percent per month.

Anomaly	Long–short (Gross) (A)	After excl. stocks unavail-able to short (B)	Costs due to unavailability to short (C) [=(A) – (B)]	Fee (costs paid to lenders) (D)	Total shorting costs (E) [=(C)+(D)]	Long–short (Net) (F) [=(A) – (E)
Panel A : Raw return						
Return-on-assets	0.59 (1.52)	0.47 (1.22)	0.12 (1.37)	0.22 (26.30)	0.34 (3.95)	0.25 (0.64)
Return-on-equity	0.78 (2.23)	0.64 (1.79)	0.14 (1.95)	0.21 (26.97)	0.36 (4.82)	0.42 (1.19)
Momentum	0.06 (0.14)	0.05 (0.10)	0.01 (0.20)	0.18 (28.79)	0.19 (2.64)	-0.13 (-0.33)
Net operating asset	0.48 (2.20)	0.38 (1.70)	0.10 (2.63)	0.10 (37.55)	0.20 (5.16)	0.29 (1.27)
Invest-to-assets	0.68 (3.28)	0.55 (2.58)	0.13 (3.39)	0.12 (40.98)	0.25 (6.62)	0.42 (2.00)
Abnor capitl invest	0.08 (0.69)	0.04 (0.32)	0.04 (1.14)	0.09 (46.54)	0.13 (3.68)	-0.05 (-0.40)
Accruals	0.11 (0.73)	0.00 (0.00)	0.11 (3.20)	0.11 (39.90)	0.23 (6.48)	-0.11 (-0.73)
Asset growth	0.31 (1.38)	0.24 (1.07)	0.07 (1.64)	0.13 (33.81)	0.20 (4.68)	0.11 (0.48)
Comp equity issues	0.48 (1.90)	0.44 (1.79)	0.04 (0.91)	0.10 (37.87)	0.14 (3.30)	0.34 (1.39)
O-score	0.06 (0.23)	-0.05 (-0.19)	0.11 (2.06)	0.15 (32.67)	0.26 (4.71)	-0.20 (-0.74)
Failure probability	-0.17 (-0.31)	-0.30 (-0.52)	0.13 (2.08)	0.16 (27.09)	0.29 (4.73)	-0.46 (-0.81)
Gross profit	0.29 (0.94)	0.25 (0.89)	0.04 (0.53)	0.15 (30.34)	0.19 (2.71)	0.10 (0.36)
Net stock issues	1.00 (3.53)	0.90 (3.14)	0.10 (1.58)	0.17 (29.27)	0.27 (4.41)	0.73 (2.55)
PEAD	0.38 (1.73)	0.33 (1.56)	0.05 (1.51)	0.07 (40.37)	0.12 (3.52)	0.25 (1.22)
Average	0.366	0.281	0.085	0.141	0.226	0.140
Panel B : CAPM-adjusted return						
Return-on-assets	0.83 (2.18)	0.72 (1.89)	0.11 (1.27)	0.22 (26.30)	0.34 (3.80)	0.50 (1.31)
Return-on-equity	1.04 (3.13)	0.92 (2.75)	0.12 (1.66)	0.21 (26.97)	0.34 (4.49)	0.70 (2.12)
Momentum	0.27 (0.65)	0.26 (0.64)	0.01 (0.11)	0.18 (28.79)	0.18 (2.50)	0.08 (0.21)
Net operating asset	0.53 (2.36)	0.44 (1.89)	0.09 (2.42)	0.10 (37.55)	0.19 (4.91)	0.34 (1.47)
Invest-to-assets	0.72 (3.40)	0.60 (2.75)	0.12 (3.14)	0.12 (40.98)	0.25 (6.33)	0.47 (2.18)
Abnor capitl invest	0.10 (0.84)	0.07 (0.58)	0.03 (0.75)	0.09 (46.54)	0.11 (3.29)	-0.02 (-0.14)
Accruals	0.07 (0.44)	-0.04 (-0.25)	0.11 (3.03)	0.11 (39.90)	0.22 (6.25)	-0.15 (-0.98)
Asset growth	0.27 (1.18)	0.20 (0.88)	0.07 (1.54)	0.13 (33.81)	0.20 (4.52)	0.07 (0.31)
Comp equity issues	0.59 (2.37)	0.57 (2.35)	0.02 (0.48)	0.10 (37.87)	0.12 (2.86)	0.47 (1.95)
O-score	0.31 (1.24)	0.22 (0.90)	0.09 (1.69)	0.15 (32.67)	0.24 (4.33)	0.07 (0.29)
Failure probability	0.48 (1.04)	0.39 (0.82)	0.09 (1.54)	0.16 (27.09)	0.26 (4.24)	0.23 (0.47)
Gross profit	0.43 (1.41)	0.37 (1.32)	0.06 (0.79)	0.15 (30.34)	0.21 (2.94)	0.22 (0.79)
Net stock issues	1.20 (4.43)	1.11 (4.06)	0.09 (1.40)	0.17 (29.27)	0.26 (4.17)	0.94 (3.45)
PEAD	0.45 (2.04)	0.39 (1.85)	0.06 (1.68)	0.07 (40.37)	0.13 (3.67)	0.32 (2.18)
Average	0.519	0.443	0.076	0.141	0.217	0.302

Anomaly	Long–short (Gross) (A)	After excl. stocks unavail-able to short (B)	Costs due to unavailability to short (C) [=(A) – (B)]	Fee (costs paid to lenders) (D)	Total shorting costs (E) [=(C)+(D)]	Long–short (Net) (F) [=(A) – (E)
Panel C: FF3-adjusted return						
Return-on-assets	0.81 (2.25)	0.69 (1.94)	0.12 (1.40)	0.22 (26.30)	0.35 (3.95)	0.46 (1.31)
Return-on-equity	1.00 (3.24)	0.87 (2.82)	0.13 (1.73)	0.21 (26.97)	0.34 (4.55)	0.66 (2.14)
Momentum	0.16 (0.40)	0.14 (0.36)	0.02 (0.25)	0.18 (28.79)	0.19 (2.63)	-0.03 (-0.09)
Net operating asset	0.47 (2.24)	0.38 (1.75)	0.09 (2.44)	0.10 (37.55)	0.19 (4.92)	0.28 (1.30)
Invest-to-assets	0.77 (3.82)	0.64 (3.09)	0.13 (3.23)	0.12 (40.98)	0.25 (6.43)	0.52 (2.51)
Abnor capitl invest	0.10 (0.91)	0.07 (0.59)	0.03 (0.94)	0.09 (46.54)	0.12 (3.50)	-0.01 (-0.12)
Accruals	0.08 (0.49)	-0.03 (-0.22)	0.11 (3.15)	0.11 (39.90)	0.23 (6.35)	-0.15 (-0.94)
Asset growth	0.38 (1.90)	0.31 (1.50)	0.07 (1.68)	0.13 (33.81)	0.20 (4.66)	0.17 (0.85)
Comp equity issues	0.67 (2.98)	0.64 (2.95)	0.03 (0.62)	0.10 (37.87)	0.12 (3.00)	0.54 (2.50)
O-score	0.28 (1.16)	0.17 (0.75)	0.11 (2.03)	0.15 (32.67)	0.26 (4.75)	0.02 (0.11)
Failure probability	0.32 (0.74)	0.21 (0.48)	0.11 (1.95)	0.16 (27.09)	0.28 (4.79)	0.05 (0.11)
Gross profit	0.50 (1.70)	0.43 (1.57)	0.07 (0.97)	0.15 (30.34)	0.22 (3.13)	0.28 (1.02)
Net stock issues	1.24 (5.08)	1.15 (4.67)	0.09 (1.44)	0.17 (29.27)	0.26 (4.19)	0.98 (3.98)
PEAD	0.41 (1.90)	0.35 (1.70)	0.06 (1.66)	0.07 (40.37)	0.13 (3.62)	0.28 (1.37)
Average	0.514	0.430	0.084	0.141	0.225	0.289
Panel D : HXZ4-adjusted return						
Return-on-assets	0.18 (0.62)	0.05 (0.18)	0.13 (1.44)	0.22 (26.30)	0.35 (3.89)	-0.17 (-0.61)
Return-on-equity	0.43 (1.85)	0.27 (1.24)	0.16 (2.04)	0.21 (26.97)	0.37 (4.75)	0.06 (0.29)
Momentum	-0.43 (-1.40)	-0.44 (-1.48)	0.01 (0.14)	0.18 (28.79)	0.18 (2.44)	-0.61 (-2.06)
Net operating asset	0.52 (2.31)	0.45 (1.94)	0.07 (1.87)	0.10 (37.55)	0.17 (4.36)	0.35 (1.52)
Invest-to-assets	0.64 (3.50)	0.52 (2.72)	0.12 (2.97)	0.12 (40.98)	0.24 (6.08)	0.40 (2.08)
Abnor capitl invest	0.07 (0.59)	0.05 (0.34)	0.02 (0.71)	0.09 (46.54)	0.11 (3.18)	-0.04 (-0.35)
Accruals	0.18 (1.25)	0.09 (0.62)	0.09 (2.57)	0.11 (39.90)	0.20 (5.75)	-0.02 (-0.14)
Asset growth	0.31 (1.82)	0.27 (1.58)	0.04 (0.89)	0.13 (33.81)	0.17 (3.87)	0.14 (0.82)
Comp equity issues	0.50 (2.15)	0.48 (2.15)	0.02 (0.42)	0.10 (37.87)	0.12 (2.73)	0.38 (1.71)
O-score	-0.07 (-0.34)	-0.16 (-0.81)	0.08 (1.51)	0.15 (32.67)	0.23 (4.11)	-0.30 (-1.58)
Failure probability	-0.39 (-1.29)	-0.50 (-1.67)	0.11 (1.91)	0.16 (27.09)	0.27 (4.58)	-0.66 (-2.21)
Gross profit	0.13 (0.45)	0.11 (0.40)	0.02 (0.28)	0.15 (30.34)	0.17 (2.43)	-0.04 (-0.15)
Net stock issues	0.92 (3.87)	0.86 (3.48)	0.07 (1.07)	0.17 (29.27)	0.24 (3.78)	0.69 (2.80)
PEAD	0.13 (0.71)	0.08 (0.49)	0.05 (1.29)	0.07 (40.37)	0.12 (3.22)	0.02 (0.10)
Average	0.224	0.153	0.071	0.141	0.212	0.012