Assessing the Cost of Accounting-Based Long-Short Trades: Should You Invest a Billion Dollars in an Academic Strategy?

William H. Beaver
Stanford University

Maureen F. McNichols
Stanford University

Richard A. Price
Rice University

September 2011

ABSTRACT: We examine the profitability of long-short accounting-based trading strategies relative to alternative investments. Several of our findings raise questions about their profitability relative to risk. Specifically, short portfolio raw returns are generally positive (not negative as would ensure a profitable strategy), Sharpe ratios for long-short strategies are generally lower than for long-only strategies, and long-short strategy returns are negative at least once every five years. Moreover, we argue that zero net-investment portfolios are not implementable as implied by the long-short strategy. Furthermore, the common practice of adding the cost of the short position to test long-short strategy profitability produces abnormal returns that approximate raw returns. Overall, when these issues are considered, we find the abnormal returns to long-short accounting-based strategies substantially decline and are typically not significantly different from zero.

Keywords: *accounting-based anomalies; transaction costs of long-short strategies; accruals; book-to-market*

Data Availability: *Data used in this study are available from public sources identified in the study.*

We thank Steve Crawford, Jim Chanos, Wes Gray, Charles Lee, Franklin Parlamis, Scott Richardson, Eric So, workshop participants at Brigham Young University, and the 2010 European Accounting Association Annual Meeting for helpful comments.

I. INTRODUCTION

> [F]inding that stock prices do not fully reflect all publicly available information does not necessarily imply investor irrationality or the existence of unexploited profit opportunities. The information acquisition costs and processing costs associated with implementing the strategy … are non-trivial. (Sloan 1996, p. 314)

If you had one billion dollars to invest, would you choose one of the investing strategies suggested by the accounting literature? The literature contains many examples of strategies exploiting apparent inefficiencies in how information is reflected in stock prices. In general, these strategies involve creating portfolios of long and short positions of firms with extreme values of market- and accounting-based fundamental variables such as earnings, cash flow, accruals, and the book-to-market ratio among others. But how attractive are these strategies relative to alternative investment strategies such as raw returns to short positions or long-only portfolios?

We examine the assumption made by many accounting researchers that short sale proceeds can be used to construct zero-net investment portfolios (i.e. no capital is required from the investor) and characterize the implications this has for the profitability of long-short strategies. We compare the profitability relative to risk of long-short academic strategies with alternative investments including long-only investments in anomaly portfolios or the market. We investigate short selling costs by examining the raw returns to short portfolios. We also study the effect of short interest rebates on profitability, incorporating transaction costs and portfolio turnover in the analysis.

A critical issue in interpreting the findings of accounting anomaly studies is the realism of their assumptions about strategy implementation and transaction costs. Recent research (Ng et al. 2008; Richardson et al. 2010, Mashruwala et al. 2006; Lesmond et al. 2004; Asquith et al. 2005; Hanna and Ready 2005) demonstrates reductions to trading

strategy profitability when incorporating transaction costs, most frequently the bid-ask spread. Our study extends prior literature by examining the costs of holding the short position in a long-short strategy, potential benefits in the form of short interest rebates, and the implementability of zero net-investment portfolios. When we introduce more realistic considerations with respect to short selling, implementation and transaction costs, we find that the abnormal returns to long-short strategies are substantially reduced, typically statistically insignificant and are generally dominated by long-only strategies.

The motivation for shorting a stock is concisely stated by Dechow et al. (2001) as "the most direct way for an investor to bet that a stock's price will decrease." By examining raw returns to the short strategy, we provide evidence on the frequency with which the investor's expectation is fulfilled. Although we find future returns are on average lower for the short position, consistent with prior research, we also find that raw returns across the portfolios of the fundamental variables are generally positive, including the extreme short portfolios. The finding that short portfolio returns are positive implies that the short portfolio on average loses money. Even though there are other potentially significant problems and unrealistic assumptions (i.e., shares of any firm can be borrowed for extended and indefinite periods of time, further reducing the profitability of short sales), the positive short returns call into question the desirability of taking the short positions assumed in the literature.

Under specific circumstances, an investor might knowingly take short positions that on average lose money. Having a security or portfolio with a negative beta can be an effective risk management tool. For example, if the short portfolio acts as a hedge for a long portfolio, it can result in reduced risk and improvements in Sharpe ratios. However,

if it is not an effective hedge, the investment strategy can perform worse than if the short position is not taken (i.e., worse than a long-only position).

Our paper has four main contributions. First, we document that the costs of taking short positions in the literature are greater than generally assumed for two reasons; one, the generally positive raw short position returns are a significant cost of shorting (even ignoring transaction costs and other frictions); and two, the long-short strategy returns are negative (sometimes severely negative) often enough to question their value as hedges. The intra-year drawdown (worst performance within a year) reveals that the academic strategies experience significant volatility that is masked by using annual returns. In particular, the worst intra-year drawdown for the generally significant cash flow strategy is over 200%. Although this extreme negative performance is averaged out over the time horizon, it adds significantly to the implementation risk.

Second, we characterize the implications of not being able to use short sale proceeds as a source of funds. Using short sale proceeds to fund a portfolio, which is commonly assumed by accounting researchers, is expressly forbidden in Regulation T (Dechow et al. 2001; D'Avolio 2002). It ignores the economic reality that investors would be unwilling to lend their shares of stock without collateral or compensation. Typical tests of long-short strategy profitability subtract abnormal short returns ($R_S–C_S$) from abnormal long returns ($R_L–C_L$). This typical test *adds* the short risk adjustment to the strategy return ($R_L–C_L–R_S+C_S$). Although short positions undoubtedly involve additional risk, if we assume the only cost to the long-short strategy comes from the long side, the resulting long-short strategy returns are dramatically lower.

Third, we examine the effects of short interest rebates on profitability and suggest using the risk-free rate as a proxy for the maximum rebate possibly received by investors. We investigate the sensitivity of strategy returns to the inclusion of a short interest rebate equal to the risk-free rate. Results show that even if a full rebate is received, long-short strategies still do not generally outperform a long investment in the market.

Finally, we document several empirical issues related to bid-ask spreads. First, we find that CRSP and NYSE TAQ spreads are comparable and suggest a novel approach to incorporate spreads directly using CRSP bid and ask prices. Two advantages to this approach are computational efficiency and reduced measurement error in spread-adjusted returns. We also document a number of empirical issues related to bid-ask spreads using both NYSE TAQ and CRSP data that can lead to sample selection bias and errors in computing spreads.

Our findings have significant implications for the interpretation of typical tests of market inefficiency. Our findings show that when the long-short strategy implied by the typical test of market efficiency is actually implemented, it generally does not outperform the market. A consistent finding in the literature is that the long portfolios of trading strategies often do not generate significant abnormal returns (see Korajczyk and Sadka 2004). Thus a finding of market inefficiency based on long-short tests may not correspond with actual inefficiency when the frictions related to implementing the strategy are considered.

To illustrate further, the long-short cash flow strategy is generally the best performing strategy, with hedge returns as typically measured in the literature that are generally significant. However, the average monthly raw returns, and the Sharpe ratios

of the long-short cash flow strategy are dominated by the long-only cash flow strategy. In this case, the results are, in fact, consistent with the existence of inefficiency. However, the direct implementation of the long-short strategy is itself unprofitable.

In addition to the anomalies we examine, there are many others, such as refinements of accruals-based strategies (Hafzalla et al. 2011, Richardson et al. 2005, Hirshleifer et al. 2004, Fairfield et al. 2003, Desai et al. 2004). Our findings relate to a broad literature which commonly uses long-short tests of market efficiency to identify mispricing. Our results suggest that the actual implementation of such strategies would likely not generate returns that outperform the market.

The paper proceeds as follows. Section 2 discusses the data. Section 3 discusses short selling. Section 4 discusses costs of implementation. Section 5 presents the analysis of raw returns. Section 6 presents the abnormal returns tests. Section 7 presents other analysis including robustness checks and Section 8 concludes.

II. DATA

Our primary analysis is conducted with a sample of firms including all non-ADR firms in Compustat that are listed on the NYSE, AMEX and Nasdaq for fiscal years 1992-2006, which is when bid-ask spread data become available in CRSP. Because the returns are measured in year *t+1,* the return time period is 1993-2007. We maximize the sample size in each set of analysis, so the sample size varies.

From Compustat, we select the following variables: book-to-market (BM, common equity, ceq in Compustat, divided by the CRSP market value at beginning of the return period), earnings (EARN, ib in Compustat), operating cash flow from the statement of cash flows excluding extraordinary items (CF, oancf-xidoc in Compustat)

and accruals (AC, EARN–CF); these are deflated by average assets (at), except for the book-to-market ratio.

Annual size-adjusted returns are computed with the accumulation period beginning four months after the fiscal year-end. For the analysis using monthly returns, portfolios are created at the end of each April using accounting data from the most recent fiscal year. Portfolios are held for twelve months. We use bid and ask prices from CRSP to incorporate transaction costs into returns. When CRSP spreads are missing, we use the end-of-day inside quote computed using TAQ data. Delistings are included following Shumway (1997) and Beaver et al. (2007). Other data sources used include: institutional holdings data from Thompson Financial; short interest data from Nasdaq; and intra-day trade and quote data from the NYSE TAQ database.

III. SHORT SELLING

Short selling has existed for many years. In 1609, Isaac Le Maire, a Dutch investor, sold short the shares of the Dutch East India Company causing a significant drop in the stock price. This action resulted in the Dutch government outlawing short selling. When the price recovered, Le Maire was financially ruined (Fell 2010). Despite the important role short selling plays in price discovery, short selling is despised and widely perceived as un-American (Lamont 2005). Consequently, a "wronged" short seller is unlikely to be successful in litigation; shorted companies may take actions to increase the stock price such as repurchasing shares to harm short sellers.

The research on short interest suggests that it is a bearish signal (Desai et al. 2002). Short sellers target firms with low fundamentals (Dechow et al. 2001) and anticipate earnings restatements (Desai et al. 2006). Short sale constraints are more

likely to bind with mispriced stocks (Jones and Lamont 2002; Asquith et al. 2005; Nagel 2005). However, aggregate short interest decreases with aggregate mispricing (Lamont and Stein 2003) due to uncertainty in the timing of the price correction.

Untabulated descriptive statistics show that the average level of short interest is very low relative to shares outstanding (the median level of short interest for Nasdaq firms is generally less than 1% of shares outstanding). This may indicate that either the strategies investigated by academics are not frequently implemented, consistent with the findings in Richardson (2003) that investors do not appear to follow accruals-based strategies, or that they are implemented through the use of derivative securities.[1]

Taking a short position introduces additional risks, costs, and frictions that are absent in a long position. The minimum return to a long position is –100% while the maximum return is unbounded. With a short position, the maximum return is 100%, but the minimum return is unbounded. In addition, because shares are borrowed, short sellers must provide collateral. Additional collateral is required when prices increase or the position will be liquidated. Lenders may request delivery of the shares at any time, forcing short sellers to close positions early.

There is a potential benefit to the short seller, which comes in the form of interest received from the proceeds of the short sale. Lenders invest short sale proceeds in low-risk investments and negotiate a rebate rate with the short seller. Market forces related to the demand and supply in the securities lending market determine how interest is divided. The rebate received by short sellers is the risk-free rate (typically LIBOR) minus a

[1] However, options are most commonly available for large securities. The lack of availability of option contracts for small and illiquid securities calls into question whether strategies could be implemented through the use of derivative securities.

brokerage fee. We use the risk-free rate as a proxy for the short interest rebate. This represents the maximum amount a short seller could receive.

Because short interest rebate data are proprietary, most researchers ignore rebates in evaluating the profitability of trading strategies. Geczy et al. (2002) use a proprietary database of securities lending and show that the fees are typically between 4 and 38 basis points per year (for large and small firms respectively), a relatively small amount. They find that the median loan period is three days, much shorter than assumed by academic strategies. In addition, most loans are subject to renegotiation daily. For additional fees, term loans are available.With hard-to-borrow stocks (such as low-priced stocks in extreme anomaly deciles with low institutional holdings) the fee paid can exceed the risk-free rate leading to additional costs to short selling.

Low-Priced Stocks and Portfolio Turnover

Table 1, Panel A shows the percentage of each anomaly decile that has a stock price less than $5 and $1.[2] The higher this percentage, the more difficult and costly it would be to short the stocks in the portfolio. For the book-to-market ratio, cash flows, and earnings, the percentage of the short portfolios, decile 1, with stock price less than $5 ($1) is 35%, 65.4% and 70% (9%, 17.9%, and 20.8%) respectively. For accruals, the percentage in the short portfolio, decile 10, with stock price less than $5 ($1) is 34.1% (5%). There are significant implications of these findings. First, these low-priced stocks are less likely to be held by institutions, increasing the difficulty of borrowing and shorting the shares. Second, the cost of shorting these shares, especially the shares priced

[2] Stocks trading for less than $5 are generally illiquid, and have very low institutional investing, if any. These stocks have the highest probability of being delisted.

under $1, can be as high as 100% per year.[3] The short portfolios would be especially difficult to construct for cash flows and earnings, given their abnormally high concentration of low-priced stocks.

Table 1, Panel B presents the portfolio turnover for each anomaly decile. In general, portfolio turnover is the lowest in the extreme portfolios (between 47% and 57% for BM, CF, EARN; 76% for AC), but still high. Because portfolio turnover generates costs of implementing the strategies, we also explore the effect of turnover-based transaction costs (i.e., bid-ask spreads) in robustness tests.

Short Interest and Institutional Holdings

We also present descriptive statistics in Table 1, Panel C that show significant differences in the strategies followed by institutions vs. short sellers. Short Interest is a direct measure of the fulfilled demand for short selling. Institutional Investing is a proxy for the lendable supply of shares that could be shorted, and has been used as a proxy for short interest (Nagel 2005).

Due to data availability, the sample in Table 1, Panel C consists of Nasdaq stocks for fiscal years 1992-2006. For the extreme deciles of each anomaly variable for firms with high short interest or institutional holdings (i.e., they are in the highest tercile), we present the portfolio tilt, which shows whether the number of observations in the portfolio is higher or lower than would be expected under a uniform distribution. It is computed as the number of observations in the portfolio divided by the average number of observations in the ten deciles, minus 1. Portfolio tilt equals zero when the number of

[3] A 30% annual shorting fee is not uncommon and interest is often grossed up to $1. This means that for a stock that trades at $0.33 with a 33% fee, the short seller would have to pay a 100% annual fee to hold the short position. We thank Franklin Parlamis, Head of US Convertible Arbitrage at Pine River Capital, for bringing this to our attention

observations is uniformly distributed. A value of 1 (-0.5) indicates that the number of observations is twice the size (half the size) expected with a uniform distribution.

The results in Table 1, Panel C suggest that short sellers avoid high book-to-market stocks (tilt = -0.52 in BM Decile 10) in favor of low book-to-market stocks (tilt = 0.46 in BM Decile 1). Short sellers also appear to favor shorting firms with extreme earnings (tilt = 0.24 in EARN Decile 1, tilt = 0.39 in EARN Decile 10),cash flows, and to some sense accruals (tilt = 0.19 in CF Decile 1, tilt = 0.14 in CF Decile 10; tilt = 0.06 in AC Decile 1, tilt = 0.07 in AC Decile 10).

Institutional investors exhibit different behavior, with a preference for high cash flow and earnings (tilt = -0.67 in CF Decile 1, tilt = 0.30 in CF Decile 10; tilt = -0.64 in EARN Decile 1, tilt = 0.39 in EARN Decile 10). Institutional investors avoid stocks in extreme deciles of the book-to-market ratio and accruals (tilt = -0.28 in BM Decile 1, tilt = -0.27 in BM Decile 10; tilt = -0.47 in AC Decile 1, tilt = -0.27 in AC Decile 10). We provide these results as descriptive evidence of differences in the strategies followed by institutions and short sellers. These differences influence the profitability of the strategies.

Zero Net Investment Portfolios

The primary measure used to gauge inefficiency in the literature is the difference between the abnormal returns of extreme portfolios formed on the level of a fundamental variable. Researchers generally do not specify the source of funding for the proposed trading strategies with this research design, and explicitly or implicitly assume that zero net investment portfolios can be constructed. A zero net investment portfolio is formed when the proceeds from selling borrowed securities in the short portfolio are used to

purchase the securities in the long portfolio. In addition, this research design ignores frictions in the securities lending market and assumes that all desired shares can be borrowed for an indefinite period of time to take the necessary short positions.

As we have noted, restrictions on short selling make forming a zero net investment portfolio impossible. A broker must first locate shares available for borrowing, generally from institutional investors. To protect the lender of the security, the Federal Reserve Board requires in Regulation T that short sellers provide collateral equal to 50% of the amount of the short position when the lender is a U.S. broker-dealer (D'Avolio 2002), and must maintain a minimum equity position of 25%,[4] which may be increased depending on the price or risk of the stock being shorted. Securities in a long portfolio can serve as collateral. When institutions borrow shares, they return 102% of the share's value to the lender of the security (D'Avolio 2002; Geczy et al. 2002). When securities decrease in value, the institution will return money to the short seller; however, when the securities increase in value, additional cash must be provided to the institution, representing an additional cost.

The inability of short sellers to use short sale proceeds is confirmed in testimony by James Chanos, President of Kynikos Associates, a hedge fund specializing in short selling, to a SEC panel discussion. Chanos states that the collateral requirements provide a control on short selling, and that "proceeds are used to collateralize borrowed securities and they are not available to leverage the portfolio and enable additional short sales" (Chanos 2003).

[4] Regulation T, which was passed in 1934 and has been amended several times, allows the Federal Reserve Board to change the margin requirements. Because the proceeds of a short sale are held in escrow, and the initial margin requirement is 50%, when a short position is initiated, the margin account must have a balance equal to 150% of the value of the shorted securities.

Comparing Trading Strategy Returns to Alternative Investment Returns

If the trading strategies in the literature could be implemented with zero net investment portfolios, any positive trading strategy return represents an infinite return on investment and the relevant benchmark for a zero net investment portfolio is zero. Consequently, returns to a zero net investment portfolio cannot be meaningfully compared with returns to a long position. However, because zero net investment portfolios are not implementable, statistically significant trading strategy returns could persist because frictions prevent their exploitation (Shleifer and Vishny 1997).

We compare the returns of implementable long-short trading strategies with alternative investment choices. With a long-short strategy, the investor provides funds for the long position, and then uses the long portfolio as collateral for the securities in the short position. Thus the initial long and short portfolio sizes are equal.[5] With this perspective, it is meaningful to compare long-short trading strategy returns with investment alternatives. We compare long-short strategy returns with the returns to the long position (ignoring the short position) and the value-weighted market return.

IV. COSTS OF IMPLEMENTATION

Costs of implementation include most importantly the cost of capital and in addition transaction costs (which are directly influenced by portfolio turnover). Returns that do not incorporate these costs adequately are likely to be overstated.

Cost of Capital

Consider an investment in a portfolio P, with raw long returns R_L (net of transaction costs) and cost of capital C_L, and thus after-cost returns (i.e., abnormal

[5] With the collateral requirement of 50%, the investor could have a short portfolio that is twice the size of the long portfolio. The typical assumption in the literature is that the long and short portfolios are of equal size. This is within the collateral requirements.

returns) of $R_L - C_L$. Because there is some risk in the long position, one would expect $C_L > rf$, where *rf* is the risk-free rate. Common benchmarks used empirically include market returns, the Capital Asset Pricing Model (CAPM), and size- or factor- based adjustments.

Next consider a strategy with a long investment in portfolio P1 and a short investment in P2. The raw strategy returns are $R1_L - R2_S$. Using C_{LS} as the cost of capital and assuming the short seller receives a rebate of *rf*, the after-cost return of the long-short strategy is:

$$R1_L - R2_S - C_{LS} + rf \quad (1)$$

In practice, investors following a long-short strategy must provide funds for the long position.[6] We assume that the investor funds the long position, and provides is not required to provide additional funds for the short position.

Within the CAPM framework the cost of capital is $rf+\beta(E[R_M]-rf)$, where β is the portfolio beta and $E[R_M]$ is the expected return of the market. With long-short strategies, the betas of the long and short portfolios are often similar in magnitude, creating a near zero beta portfolio. Under CAPM with a zero-beta portfolio, the after-cost returns are $R1_L - R2_S - rf$ if no rebate is received, or $R1_L - R2_S$ with a full rebate. CAPM ignores the potentially significant idiosyncratic risk to which the strategy is exposed.

Common Tests in the Literature

Typical tests of long-short strategy profitability in the literature are computed as:

$$(R1_L - C1_L) - (R2_S - C2_S) \quad (2)$$

or

$$R1_L - C1_L - R2_S + C2_S$$

[6] Although it is possible to use significant amounts of leverage, most hedge funds are unlevered. This was communicated to us by Pankaj Patel, a Director and Quantitative Strategist for Equity Research at Credit Suisse.

Note that the cost of the short position is added back in the test of strategy profitability. Although the portfolio return is potentially uncorrelated with the market, there is still significant risk and variation that remains. The risk adjustments to the long and short positions are often similar in magnitude resulting in an after-cost strategy return that approximates raw strategy returns; there is essentially zero cost assigned to the hedge portfolio in the tests typically conducted in the literature.

Assessing the Cost of the Long-Short Strategy

Because the investor in a long-short strategy provides funds for the long position, one could argue that the contribution of the long position to the cost of capital of the long-short strategy is $C1_L$. Since the investor provides no funds for the short position and may receive a rebate,[7] the lower bound for the cost of the short portfolio in a long-short strategy is $-rf$, the maximum possible rebate. The resulting lower bound for the cost of capital to the long-short strategy is:

$$C1_L - rf < C_{LS}$$

The after-cost strategy returns using the lower bound as a proxy for C_{LS} is:

$$R1_L - R2_S - C1_L + rf \qquad (3)$$

Relative to the common test presented in equation 2, our proposed measure of after-cost returns, equation 3, is lower by $C2_S - rf$ (or $C2_S$ if no rebate is received). This is applied to annual size-adjusted returns by subtracting the size adjustment for the long portfolio from raw long-short returns and adding back the risk-free rate. This is applied to monthly returns by subtracting raw short position returns from the long position alpha (the after-cost return to the long position) and adding back the risk-free rate ($\alpha_L - R_S + rf$).

[7] Assuming that all securities in the short portfolio receive a full rebate equal to the risk-free rate is unlikely; in fact in some cases extra fees for hard-to-borrow stocks can introduce additional costs to shorting (D'Avolio 2002).

An alternative would be to use a simple market adjustment, subtracting the value-weighted market return from raw long-short strategies.

One potential concern with using the cost of the long position as a proxy for the cost of the long-short strategy is that it is the cost for systematic as opposed to idiosyncratic risk. The objective of long-short investing is often to eliminate exposure to the market and create a zero beta portfolio. CAPM only assigns a cost of *rf* for a zero beta portfolio and ignores the potentially significant idiosyncratic risk of the portfolio. While the proposed measure of after-cost monthly returns ($\alpha_L - R_S + rf$) is not consistent with the assumptions of CAPM, the cost of the long portfolio (or alternatively the market return) represents the opportunity cost of investing the capital in the long-short strategy.

Another potential concern is that equation 3 assumes that there is no hedge benefit to the short position. We believe that this is plausible given discussion with hedge fund managers. In addition, since short selling involves borrowing shares, long-short strategies inherently involve leverage; leverage generally results in increased risk, not a reduction in risk. However, to address this concern, we use the risk-free rate as the cost of capital. This assumes that the short portfolio completely hedges the long portfolio, which is a very generous assumption; the risk-free rate is the absolute lower bound. The resulting after-cost returns are $R1_L - R2_S - rf$ without rebates, or $R1_L - R2_S$ with rebates. Of course, hedge fund investors will use a much higher cost of capital in their investing decisions. Overall, we believe our assumptions about the cost of capital are likely to be conservative in many cases (i.e., the cost of capital likely exceeds our assumed costs).

Finally, a well-known alternative approach to comparing the risk-to-reward tradeoff is to examine the Sharpe Ratios of the strategies. Because it is possible that

long-short strategies reduce variation in returns and result in improvements in the Sharpe ratio, we present Sharpe ratio results for the strategies. The Sharpe ratio measures portfolio returns relative to risk and is computed as the average of the excess annual return (raw portfolio return less the risk-free rate) divided by the standard deviation. No separate adjustment is made for risk. A hedge benefit to the short position should be observable through improved volatility and Sharpe ratios.

Transaction Costs

Transaction costs are the costs incurred in the process of buying and selling a security. A number of transaction costs including direct costs (broker commissions and taxes) and indirect costs (bid-ask spreads, price impact, opportunity costs, and holding costs) are borne by investors (Keim and Madhavan 1998; Pontiff 2006). Indirect costs are reflected in transaction prices, whereas direct costs are paid separately. It has long been known that transaction costs reduce the returns to trading strategies (Stoll and Whaley 1983, Schultz 1983, Ball et al. 1995).

Recent research also documents significantly decreased returns to trading strategies after incorporating transaction costs, most commonly bid-ask spreads (Ng et al. 2008, Richardson et al. 2010, Mashruwala et al. 2006, Lesmond et al. 2004, Asquith et al. 2005, Hanna and Ready 2005, Korajczyk and Sadka 2004). Over time, transaction costs have decreased dramatically.[8]

Methodology for Incorporating Spreads

[8] Untabulated results show dramatic decreases over time in bid-ask spreads. In the smallest (largest) size decile, spreads decrease from 18.3% in 1993 to 2.6% in 2007 (1.1% to 0.07%).

The bid-ask spread, which is the transaction cost we use, is the most easily observed and accurately measured transaction cost. The typical methodology in the literature for computing spreads computes average spreads using intra-day data following Lee and Ready (1991). This computationally intensive algorithm matches intraday trade and quote data over extended periods of time. We introduce a simple approach to incorporating transaction costs using bid and ask prices readily available in CRSP to directly compute returns. Specifically, we compute returns in long portfolios as $(bid_{t+1}-ask_t)/ask_t$ and in short portfolios as $(ask_{t+1}-bid_t)/bid_t$. We only incorporate spreads when rebalancing is necessary according to actual portfolio turnover.

There are two advantages to using CRSP spreads. First, because this method is much less computationally intensive, it would encourage researchers to incorporate spreads. Second, directly using quoted bid and ask prices to compute returns can reduce measurement error in transaction-cost adjusted returns.[9] In untabulated analysis we document that CRSP spreads are comparable to spreads from TAQ.

We document three issues with CRSP and TAQ data that can result in sample selection bias and erroneous spreads. First, we identify more than 750,000 daily observations in CRSP with missing bid-ask spreads.[10] Second, because CRSP sets the closing price equal to the average of the bid and ask prices when there is no trading volume, CRSP effective spreads (calculated as the price less the midpoint of the bid and ask price) are incorrectly measured, primarily for small firms, as zero when there is no

[9] The typical methodology subtracts spreads from returns. This ignores the fact that quoted prices often equal bid or ask prices. Untabulated analysis suggests that this does not appear to bias returns, but does introduce measurement error. It is unlikely to affect inferences in a portfolio setting, but in a regression setting, this measurement error could result in increased standard errors of coefficient estimates.

[10] For these observations we compute the end-of-day national best bid and offer (NBBO) using TAQ data. These datasets are available upon request.

trading volume. Third, the data requirements of the Lee and Ready (1991) algorithm often produces missing spreads using TAQ data in early years for small firms due to missing trade data. Using the union of both datasets increases the number of usable observations and reduces the potential for sample selection bias.

V. ANALYSIS OF RAW RETURNS

We begin by analyzing raw returns. First, we examine the raw returns to the short portfolios, or the actual returns to the investment without a risk adjustment that forces the average sample return to equal zero, to assess the cost of the short position in the long-short strategy. Second, we compare the Sharpe ratios of long-short strategies with long-only alternatives to compare returns relative to risk.

Raw Returns to Short Portfolios

Raw returns allow us to analyze the two motivations for short selling: first, as a bet that the price will decrease; and second, as a hedge against the long portfolio. Table 2, Panel A presents equal-weighted and value-weighted pooled raw returns for the short portfolios of the anomaly variables for 1993-2007. The average equal-weighted returns are uniformly positive. Ignoring transaction costs due to turnover (No Turnover), the returns are 0.056 for BM, 0.055 for CF, 0.085 for AC, and 0.079 for EARN. The average value-weighted returns, ranging from -2.4% to 2.8%, are lower but insignificantly different from zero. The generally positive (or marginally negative) short portfolio returns indicate that the academic strategies are not effective at identifying stocks that decrease in value. However, if the short portfolio acts as a hedge for the long portfolio, constructing the short portfolio may be desirable.

Table 2, Panel B presents the percentage of years with positive short returns (% Short > 0) and the percentage where short returns exceed long returns (% Hedge < 0). The results in Panel B are computed using annual returns aligned in event time (i.e., by fiscal year) as is typically done in the accounting literature, and incorporate bid-ask spreads according to actual turnover. The percentage of years with positive short equal-weighted returns is 53% for BM, 40% for CF, 67% for AC, and 60% for EARN. The percentage of years with negative equal-weighted hedge returns is 27% for BM, 20% for CF, 87% for AC and 27% for EARN. The long-short portfolios do not generally reduce the percentage of years with negative returns relative to the long position, or the market. Results with value-weighted buy-and-hold returns are similar.

Table 2, Panel C presents information on the drawdown for each of the strategies. Drawdown is the worst performance of the long-short strategy. We present the drawdown both for intra-year performance, and for end-of-year performance. We use monthly returns aligned in calendar time to compute both intra-year and end-of-year drawdown. In general, drawdown is larger for equal-weighted returns. The worst drawdown for Cash flow and Earnings strategies is –2.005, and –2.064 respectively. This occurred in February of 2000 when the short portfolios ballooned to over 300% return, significantly higher than the long portfolio return. The end-of-year drawdown masks the severity of the performance of the strategies, with drawdowns of –0.839 for cash flow and –0.845 for earnings. Clearly a drawdown of this magnitude is an impediment to implementation.

As further evidence, we present in Figures 1 and 2 the cumulative and yearly returns to long-short book-to-market and cash flow strategies relative to the returns of the

long portfolio and the value-weighted market return for 1970-2007. Figure 1, Panel A excludes short interest rebates and shows that the long position returns significantly outperform the trading strategy returns. In Panel B, rebates are included in the trading strategy returns (i.e., strategy returns are increased by the risk-free rate), resulting in improvements to strategy returns. The cash flow strategy returns are at a level similar to the long cash flow returns, and the book-to-market strategy returns are actually higher than the long book-to-market returns. Thus rebates have a significant effect on strategy performance.

The results in Panel B should be interpreted carefully. First, we are completely ignoring transaction costs, which related to short selling could be very high. Second, we are ignoring frictions in the short-selling market, assuming that all shares in short portfolios can be borrowed indefinitely. When we conduct similar analysis with transaction-cost adjusted returns from 1993-2007, long-only returns significantly outperform long-short strategy returns even with rebates.

Figure 2 provides additional insight by presenting yearly returns. In the extended time period (1970-2007 for CF) there are 5 years with negative cash flow strategy returns, however the returns in 1999 and 2003 are extremely negative. These extreme returns are attributable to short portfolios that increase in value more than the long portfolios. Although the long-only cash flow returns are negative in seven years, returns have never been lower than -20%, and in the last 30 years, returns have not been lower than -10%.

Sharpe Ratios

In addition to examining the raw returns and frequency of negative returns to the short positions and the long-short strategies, we examine their Sharpe ratios. The Sharpe ratio is one of the most common measures used to evaluate the performance of mutual funds. It measures portfolio returns relative to volatility and is computed as the average of the excess annual return (raw portfolio return less the risk-free rate) divided by the standard deviation. No separate adjustment is made for risk. It is possible that the long-short strategies reduce variation in returns and result in improvements in the Sharpe ratio.

The Sharpe ratios of long-short strategies are compared with those of the long positions in each of the anomaly variables and of the value-weighted market return (MKT). Results are presented using both equal-weighted and value-weighted returns. Sharpe ratios are also presented for the long-short strategies with and without a rebate equal to the risk-free rate.

Including the bid-ask spread adjustment for actual turnover (1993-2007), the results generally show that even when assuming that the full rebate is received, the Sharpe ratios are generally lower for the long-short strategies compared with the long portfolio. The Sharpe ratio of the value-weighted market return (0.48) is higher than any of the long-short Sharpe ratios with actual turnover: 0.44 for BM; 0.28 for Cash Flow; -0.44 for AC; 0.06 for EARN. The only portfolios that show improvement (including actual turnover) relative to the market are the long positions in CF and EARN: 0.80 for CF porfolio, 0.63 for EARN.

The value-weighted results are very similar. It is interesting that while the long-short book-to-market results are lower (Sharpe ratio of 0.17) than the equal-weighted results, the long-short cash-flow, accruals, and earnings results all improve (0.33 for CF,

0.45 for for AC, and 0.41 for Earn). However, none of these is larger than the Sharpe ratio of the value-weighted market return. Overall the results are striking in that the long-short strategy returns do not result in improvements in the Sharpe ratio relative to a simple buy-and-hold investment in the market.

VI. ABNORMAL STRATEGY RETURNS

The preceding results provide evidence that the benefits of long-short strategies over long-only alternatives are questionable. We now turn to risk-adjusted annual returns to examine the profitability of long-short academic strategies. We employ both annual and monthly return methodologies to examine the effect of our proposed measure of abnormal returns on inferences of profitability.

Annual Portfolio Returns Tests

We construct portfolios by ranking firms by fiscal year on the four anomaly variables being studied. We compute annual raw returns and size-adjusted returns as the difference between the size-adjusted returns of the long and short portfolios, similar to Lakonishok, et al. (1994) and Sloan (1996). We also present returns using the risk-free rate as the cost of capital. Finally, we compute long-short portfolio returns using equation 3, $R1_L - R2_S - C1_L + rf$, using the size adjustment for the long portfolio as the estimate of $C1_L$ and the risk-free rate is the one-month Treasury bill rate. We incorporate transaction costs in a later section.

Table 4, Panel A presents pooled raw returns for the four anomaly variables. Standard errors are clustered by year. Equal-weighted returns are presented on the left and value-weighted returns on the right. We discuss equal-weighted returns first. In general, the long-short raw strategy returns are significant; 0.16 (t=5.83) for BM, 0.142

(t=3.78) for CF, 0.033 (t=1.88) for AC, and 0.075 (t=1.93) for EARN. If a rebate equal to the risk-free rate is received, these returns are higher by 3.97% and are all significant. By way of comparison, the average value-weighted return for the entire sample is 0.085 for this time period.

Table 4, Panel B presents the results of the typical test of strategy profitability, which size-adjusts both the long and short portfolios. The results are as follows: 0.105 (t=3.99) for BM, 0.16 (t=5.17) for CF, 0.035 (t=1.92) for AC, and 0.096 (t=3.12) for EARN. It is interesting to note that these are very similar to the raw returns; they are lower than BM raw returns, but higher than CF, AC and EARN raw returns.

Table 4, Panel C presents the results using the risk-free rate as the cost of the long-short strategy. Compared to Panel A, the returns are reduced by the risk-free rate. The first row of results presents raw strategy returns less the risk-free rate (L-S-*rf*). This assumes no rebates are received. If rebates are not received, then only the book-to-market returns and the cash flow returns are significant. If rebates are received, accruals and earnings become marginally significant. Of course if rebates are assumed to be received, the after-cost returns equal the raw returns presented in Panel A.

Finally, Panel D presents returns using our proposed adjustment to compute abnormal strategy returns, where the cost of the long position is used as the cost of the strategy. The results show that none of the strategies has significantly positive returns.

The value-weighted results also presented in the table show that the book-to-market strategy returns are reduced and become insignificant. However, the cash flow strategy remains strong, and the returns to accruals and earnings strategies improve compared with the equal-weighted results. The abnormal strategy returns in Panel D

using our proposed adjustment show that as long as rebates are received, Cash Flow (0.097), Accruals (0.105), and Earnings (0.091) have significantly positive returns. However, excluding the rebate, the returns for cash flow and accruals are marginally significant (0.06, t=1.88 for CF; 0.068, t=1.90 for AC). Earnings remains significantly positive without rebates (0.054, t=2.08). The improvement in the accrual strategy is with value-weighted returns is attributable to the reduced influence of delisted firms (Beaver et al. 2007), which tend to be smaller.

The results generally show reduced profitability to the trading strategies when using our proposed cost of capital adjustment. One concern with the annual return methodology is that it ignores intra-year fluctuations in strategy performance. The monthly return analysis, which we examine next, does consider intra-year variation.

Monthly Portfolio Returns Tests

In addition to conducting analysis with annual returns, we conduct analysis using monthly returns to compute alphas.[11] A major difference between the methodologies is that annual returns align firms by fiscal year in event time while monthly returns align firms in calendar time. Another significant difference is that monthly returns analysis takes into consideration the variation in returns over the holding period. The results in Table 2, Panel C show that the intra-year variation is significant and can be masked by simply using annual returns.

Profitability with monthly returns is typically measured as the difference between the long and short alphas and assumes that a rebate equal to the risk-free rate is received.

[11] We use the three Fama and French (1993) factors to compute alphas for cash flow, accruals, and earnings tests. For book-to-market tests we include only the market factor because the inclusion of the book-to-market factor, especially in value-weighted analysis, significantly reduces the profitability of the book-to-market alphas. However, overall inferences are generally unchanged if it is included.

Significance is tested by regressing the difference in excess returns, *(RL–rf)–(RS–rf) = RL–RS* (raw returns) on the factors. If a rebate equal to the risk-free rate is received, raw strategy returns equal *RL–RS+rf* and excess returns equal *RL–RS*. If a rebate is not received, then excess strategy returns are *RL–RS–rf* and the alpha will be lower by the risk-free rate.

The assumption that rebates are received is not by itself problematic. However, coupled with the assumption that zero net investment portfolios can be formed, it is problematic. Assuming not only that the lender of the short securities will allow the short seller to use the short sale proceeds to fund the strategy, but also that the short seller will receive a rebate allows the short seller to have his cake and eat it too.

Portfolios are formed each April using the most recently reported annual data. We compute the average monthly portfolio buy-and-hold raw return and the alpha from the regression of this return on the factors. We include the typical test of strategy profitability, which is the test of the difference between the long and short alphas. As with the annual returns analysis, we present returns using the risk-free rate as the cost of capital and compute abnormal long-short portfolio returns using the long portfolio risk adjustment as the estimate of the cost of the strategy, which equates to $\alpha_L - R_S + rf$ assuming rebates are received or $\alpha_L - R_S$ if rebates are not received.[12]

Table 5, Panel A presents average monthly raw returns for the four anomaly variables. We first discuss equal-weighted returns. The raw strategy returns are significant for BM and CF; 0.0104 (t=2.94) and 0.0110 (t=2.06) respectively. However, for AC and EARN, they are insignificant; 0.0005 (t=0.21) and 0.0069 (t=1.29)

[12] We bootstrap the standard error of this measure by creating 1,000 bootstrapped samples where monthly portfolio returns are sampled with replacement. The standard deviation of the bootstrapped measure is used as the estimated standard error to determine significance.

respectively. If a rebate equal to the risk-free rate is received, these returns are higher by 0.0031, and the earnings returns become marginally significant, 0.0101 (t=1.89).

Table 5, Panel B presents the results of the typical test of strategy profitability, which is the difference between the long and short alphas. The difference between alphas is significant for all strategies except for the accruals strategy: 0.0139 (t=4.60) for BM, 0.0116 (t=2.97) for CF, -0.0007 (t=-0.33) for AC, and 0.0081 (t=2.06) for EARN. It is interesting to note that the difference between alphas is very similar to raw strategy returns; BM (0.0139 alpha difference vs. 0.0104 raw returns), CF (0.0116 vs. 0.0110) and EARN (0.0081 vs. 0.0069) have a difference that exceeds raw returns while AC (-0.0007 vs. 0.0005) has a difference that is lower. As seen with these results, the typical test uses measures that often exceed raw returns to infer profitability.

Table 5, Panel C presents the results using the risk-free rate as the cost of the long-short strategy. Compared to Panel A, the strategy returns are reduced by the risk-free rate. Excluding the rebate, only the book-to-market returns are significant (0.0072, t=2.04). Including the rebate, the returns to the book-to-market and cash flow strategies are both significant (and equal to raw strategy returns).Finally, Panel D presents returns using our proposed measure of abnormal portfolio returns, using the cost of the long position as the cost of the strategy. Even if a rebate is received, none of the strategies generates significant returns.

Value weighted returns are presented on the right side of the table. As was seen with the annual returns tests, the returns to the book-to-market strategy are weaker and generally insignificant, while the returns to the accruals and earnings strategies strengthen, but are still generally insignificant. It is interesting to note that the cash flow

strategy is significant (0.0117, t=3.40) in Panel B, with the typical test of profitability (difference in alphas). However, none of the other return measures are significant, including the raw returns with the rebate (0.0109, t=1.92). It is striking that the typical test of profitability produces a return measure that exceeds raw returns plus the rebate.

Although the other value-weighted strategies are generally insignificant, even with the typical test of strategy profitability in Panel B, when compared to our proposed measures of abnormal strategy returns, the Panel B returns are higher by between 0.0066 and 0.0073. The differences seen with equal-weighted strategies are even larger.

By using both annual and monthly returns, we can compare the profitability of the trading strategies using different methodologies. In general, the inferences are similar with both measures. Using the cost of the long position as the cost of capital as we propose, there is a significant reduction in the profitability of the strategies. The annual return methodology shows that cash flow, accruals, and earnings strategies are profitable, even with our proposed risk adjustment. However, our proposed risk adjustment with the monthly return methodology shows that none of the strategies generate abnormal returns. Because the monthly return methodology takes intra-year variation into consideration, we consider this methodology to be better.

VII. OTHER ANALYSIS

Transaction Costs

We conduct the main analysis presented in Tables 4 and 5 including our proposed adjustment for transaction costs, reducing strategy returns for the actual turnover in the portfolios. Because spreads are higher for small firms, the impact of transaction costs on equal-weighted returns will be much larger than on value-weighted returns.

Table 6 presents the annual returns net of transaction costs, with the same format as Table 4. In general, there is a significant reduction (roughly between 6% and 8%) to equal-weighted raw annual strategy returns. Panel B shows that only the cash flow strategy remains significant in the typical test conducted in the literature. However, the results in Table 4, Panel D presented earlier already showed that even ignoring transaction costs, none of the strategies generated abnormal profits after using our proposed risk adjustment. The value-weighted returns show a much lower effect of transaction costs on returns (generally around a 1% reduction in raw annual strategy returns), and no inferences change as a result of incorporating transaction costs.

Table 7 presents the monthly returns net of transaction costs, with the same format as Table 5. The equal weighted monthly returns are significantly reduced (roughly between 0.004 and 0.006). Although some returns become insignificant after incorporating transaction costs in Panels A-C, the returns in Table 5, Panel B presented earlier ignoring transaction costs were already insignificant.

Overall, our findings are generally consistent with other research that documents reductions in performance when transaction costs are considered. However, in many specifications, our proposed measure of abnormal long-short strategy returns was already insignificant even prior to adjusting for transaction costs.

Other Anomalies

Although we present results for the book-to-market ratio, cash flow, accruals, and earnings, there are numerous other anomalies that have been examined. In addition to the four anomalies presented above, we conduct similar untabulated analysis with net operating assets (Richardson et al. 2005) and momentum (Jegadeesh and Titman 1993)

and generally make the same inferences. Our findings relate to a broad literature which commonly uses long-short tests of market efficiency to identify mispricing. Our results suggest that the actual implementation of such strategies would likely not outperform long-only strategies.

Regression Analysis

We also conduct regressions of future returns on the anomaly variables to explore how the magnitude of returns relates to the magnitude of the anomaly variable and how this changes with transaction costs. As the dependent variable, we use future raw returns assuming no transaction costs are incurred, according to actual turnover. The sample is limited to firms in extreme deciles because no positions are taken in the other deciles. We winsorize the independent variables at the top and bottom one percent of the distribution and present OLS standard errors and standard errors clustered by year. To infer significance we use clustered standard errors.

Table 8, Panel A presents the results using the book-to-market ratio as the independent variable. When the return variable is measured without the spread adjustment, the coefficient 0.031 (t= 1.97), suggesting a significant relation between the magnitude of the realized returns and BM. When returns include spreads, the coefficient falls and becomes insignificant 0.013 (t=0.92).

Similarly, Panel B shows that in a regression of returns on cash flow, the coefficient of cash flow falls from 0.225 (t=2.32) to 0.169 (t=1.70). Panel C shows an insignificant relation between returns and the magnitude of accruals with no turnover, with the coefficient being of the wrong sign (positive) for the strategy to be profitable.

Finally, Panel D shows a reduction in the earnings coefficient from 0.160 (t=1.85) to 0.114 (t=1.28).

These results are largely consistent with the preceding results. In particular, the relation between returns and the magnitude of the anomaly variable becomes weaker when transaction costs (bid-ask spreads) are incorporated in the return measure.

VIII. Conclusion

We study the profitability of accounting-based trading strategies previously identified in the literature as being evidence of market inefficiency. We argue that due to frictions related to short selling, the long-short strategies suggested in the literature would be costly to implement. We show that short portfolio raw returns are significantly positive, representing a significant cost of implementation. In addition, short position returns exceed long position returns often enough to question their effectiveness as a hedge. Also, we show that the Sharpe ratio of the market generally exceeds Sharpe ratios of long-short strategies after transaction costs.

We argue that the typical tests of long-short strategy profitability, which implicitly assume that zero net investment portfolios can be constructed, are problematic. The common practice of computing strategy profitability as the difference between the abnormal returns of the long and short portfolios generates a measure that approximates raw strategy returns, and is implicitly tested against a benchmark of zero. We suggest using the long portfolio risk adjustment as an estimate of the cost of implementing a strategy. Using this measure, we show that long-short strategies generally do not beat the long portfolio benchmark. These inferences are consistent with those obtained by comparing Sharpe ratios of long-short strategies with long only alternatives.

We also investigate implications of short interest rebates on the profitability of long-short strategies. While rebates increase the returns to long-short strategies, they do not result in returns that are superior to long-only alternatives. We show that cash flow trading strategies perform the best of those we examine. However, the Sharpe ratios of a long-only cash flow strategy are notably higher than the Sharpe ratios of the long-short cash flow strategy.

Overall, we argue that the direct implementation of the long-short strategies implied by the mispricing tests frequently used in the literature do not generate better returns than simple long investments in the anomaly-based strategies or the market. The generally superior returns of the long anomaly-based strategies indicate that there is still evidence of market inefficiency. We do not conclude that all long-short strategies are unprofitable, or that market efficiency does not exist. In fact, many hedge funds employ long-short strategies effectively over a sustained period of time (Lee 2001). Our analysis can be interpreted as evidence on whether the implementation of the long-short strategies used to identify mispricing generates abnormal returns.

We add to an existing body of research that has documented reductions to other anomalies and provide additional insight into the methods used to estimate trading strategy profitability. The use of multiple methodologies and return measures, including raw returns, provide information on the level of market inefficiency and the implementability of the strategies proposed in the literature.

References

Asquith, P., P. Pathak, and J. Ritter. 2005. Short interest, institutional ownership, and stock returns. *Journal of Financial Economics* 78: 243–276.

Ball, R., S.P. Kothari, and J. Shanken. 1995. Problems in measuring portfolio performance: An application to contrarian investment strategies. *Journal of Financial Economics* 38: 79–107.

Beaver, W., M. McNichols, and R. Price. 2007. Delisting returns and their effect on accounting-based market anomalies. *Journal of Accounting and Economics* 43: 341–368.

Chanos, J. 2003. Hedge fund strategies and market participation. SEC Roundtable on Hedge Funds, May 15, 2003. http://www.sec.gov/spotlight/hedgefunds/hedge-chanos.htm

D'Avolio, G. 2002. The market for borrowing stock. *Journal of Financial Economics* 66: 271–306.

Dechow, P., A. Hutton, L. Muelbroek, and R. Sloan. 2001. Short-sellers, fundamental analysis, and stock returns. *Journal of Financial Economics* 61: 77–106.

Desai, H., S. Krishnamurthy, and K. Venkataraman. 2006. Do short sellers target firms with poor earnings quality? Evidence from earnings restatements. *Review of Accounting Studies* 11: 71–90.

Desai, H., S. Rajgopal, and M. Venkatachalam. 2004. Value-glamour and accruals mispricing: One anomaly or two? *The Accounting Review* 79 (2): 297–339.

Desai, H., K. Ramesh, S.R. Thiagarajan, and B. Balachandran. 2002. An investigation of the informational role of short interest in the Nasdaq market. *The Journal of Finance* 57: 2263–2287.

Fairfield, P., S. Whisenant, and T. Yohn. 2003. Accrued earnings and growth: Implications for future profitability and market mispricing. *The Accounting Review* 78 (1): 353–371.

Fama, E. and K. French. 1993. Common risk factors in the returns of stocks and bonds. *Journal of Financial Economics* 33: 3–56.

Fell, C. 2010. Germans wrong to shoot the short selling messenger. Irish Times May 28, 2010. http://www.irishtimes.com/newspaper/finance/2010/0528/1224271295027.html

Geczy, C., D. Musto, and A. Reed. 2002. Stocks are special too: An analysis of the equity lending market. *Journal of Financial Economics* 66: 241–269.

Hafzalla, N., R. Lundholm, and M. Van Winkle. 2011. Percent Accruals. *The Accounting Review* 86 (1): 209–236.

Hanna, J.D., and M. Ready. 2005. Profitable predictability in the cross section of stock returns. *Journal of Financial Economics* 78: 463–505.

Hirshleifer, D., K. Hou, S. Teoh, and Y. Zhang. 2004. Do investors overvalue firms with bloated balance sheets? *Journal of Accounting and Economics* 38 (1–3): 297–331.

Keim, D., and A. Madhavan. 1998. The cost of institutional equity trades. *Financial Analysts Journal* 54: 50–69.

Korajczyk, R., and R. Sadka. 2004. Are momentum profits robust to trading costs? *Journal of Finance* 59: 1039–1082.

Jegadeesh, N., and S. Titman. 1993. Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of Finance* 48: 65–91.

Jegadeesh, N., and S. Titman. 2001. Profitability of momentum strategies: An evaluation of alternative explanations. *The Journal of Finance* 56: 699–720.

Jones, C., and O. Lamont. 2002. Short sale constraints and stock returns. *Journal of Financial Economics* 66: 207–239.

Lakonishok, J., A. Shleifer, and R. Vishny. 1994. Contrarian investment, extrapolation, and risk. *The Journal of Finance* 49: 1541–1578.

Lamont, O. 2005. Short sale constraints and overpricing. Working paper, Yale University.

Lamont, O., and J. Stein. 2003. Aggregate short interest and market valuations. Working paper, Harvard University.

Lee, C. 2001. Market efficiency and accounting research: A discussion of 'capital market research in accounting' by S.P. Kothari. *Journal of Accounting and Economics* 31 (1–3): 233–253.

Lee, C. and M. Ready. 1991. Inferring trade direction from intraday data. *The Journal of Finance* 46: 733–746.

Lesmond, D., M. Schill, and C. Zhou. 2004. The illusory nature of momentum profits. *Journal of Financial Economics* 71: 349–380.

Mashruwala, C., S. Rajgopal, and T. Shevlin. 2006. Why is the accrual anomaly not arbitraged away? The role of idiosyncratic risk and transaction costs. *Journal of Accounting and Economics* 42 (1–2): 3–33.

Nagel, S. 2005. Short sales, institutional investors and the cross-section of stock returns. *Journal of Financial Economics* 78: 277–309.

Ng, J., T. Rusticus, and R. Verdi. 2008. Implications of transaction costs for post-earnings announcement drift. *Journal of Accounting Research* 46: 661–696.

Pontiff, J. 2006. Costly arbitrage and the myth of idiosyncratic risk. *Journal of Accounting and Economics* 42: 35–52.

Richardson, S. 2003. Earnings quality and short sellers. *Accounting Horizons* 5: 49–61.

Richardson, S., R. Sloan, M. Soliman, and I. Tuna. 2005. Accrual Reliability, earnings persistence and stock prices. *Journal of Accounting and Economics* 39 (3): 437–485.

Richardson, S., I. Tuna, and P. Wysocki. 2010. Accounting anomalies and fundamental analysis: A review of recent research advances. *Journal of Accounting and Economics* 50: 410–454.

Roll, R. 1984. A simple implicit measure of the effective bid-ask spread in an efficient market. *The Journal of Finance* 39: 1127–1139.

Schultz, P. 1983. Transactions costs and the small firm effect: A comment. *Journal of Financial Economics* 12: 81–88.

Shleifer, A., and R. Vishny. 1997. The Limits of Arbitrage. *The Journal of Finance* 52 (1) 35-55.

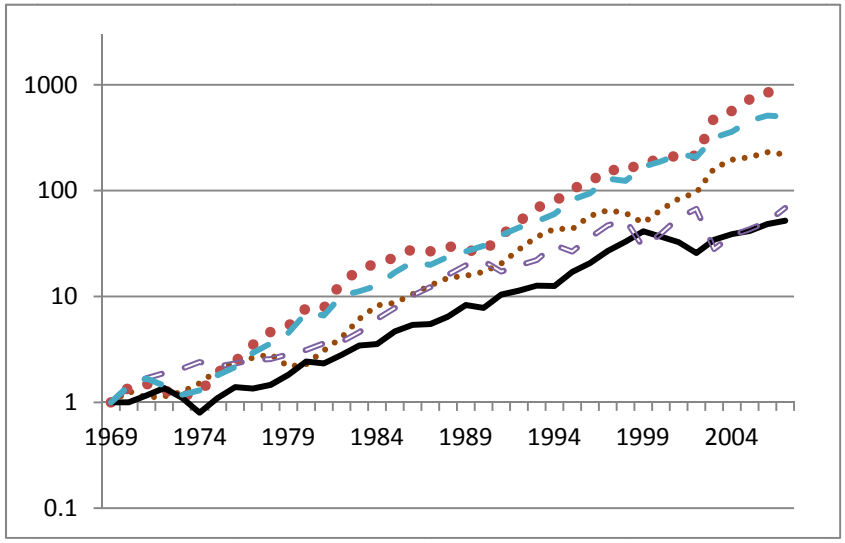
Shumway, T. 1997. The delisting bias in CRSP data. *The Journal of Finance* 52: 327–340.

Smith, B. A. Turnbull, and R. White. 2001. Upstairs market for principal and agency trades: Analysis of adverse information and price Effects. *The Journal of Finance* 56: 1723–1746.

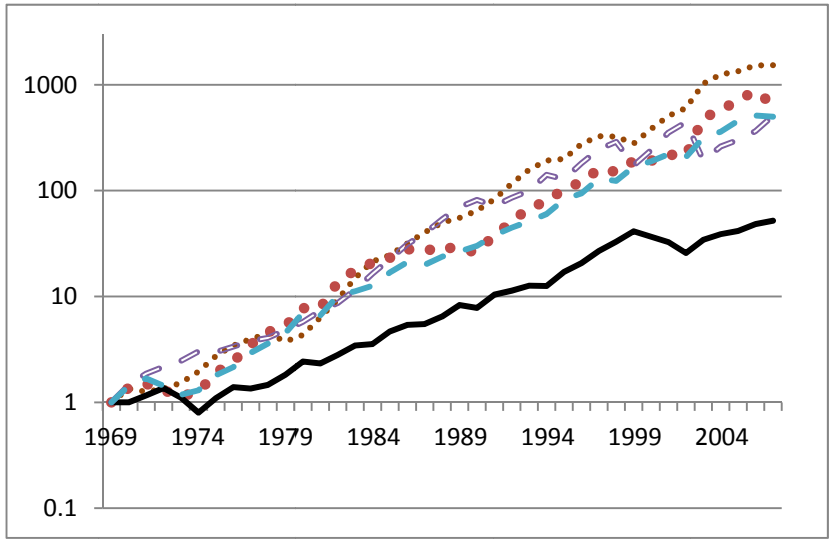
Sloan, R. 1996. Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review* 71: 289–315.

Stoll, H., and R. Whaley. 1983. Transactions costs and the small firm effect. *Journal of Financial Economics* 12: 57–80.

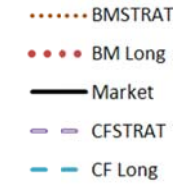
FIGURE 1
Cumulative Long Position Returns vs. Trading Strategy Returns, 1970-2007



Panel A: No Rebate

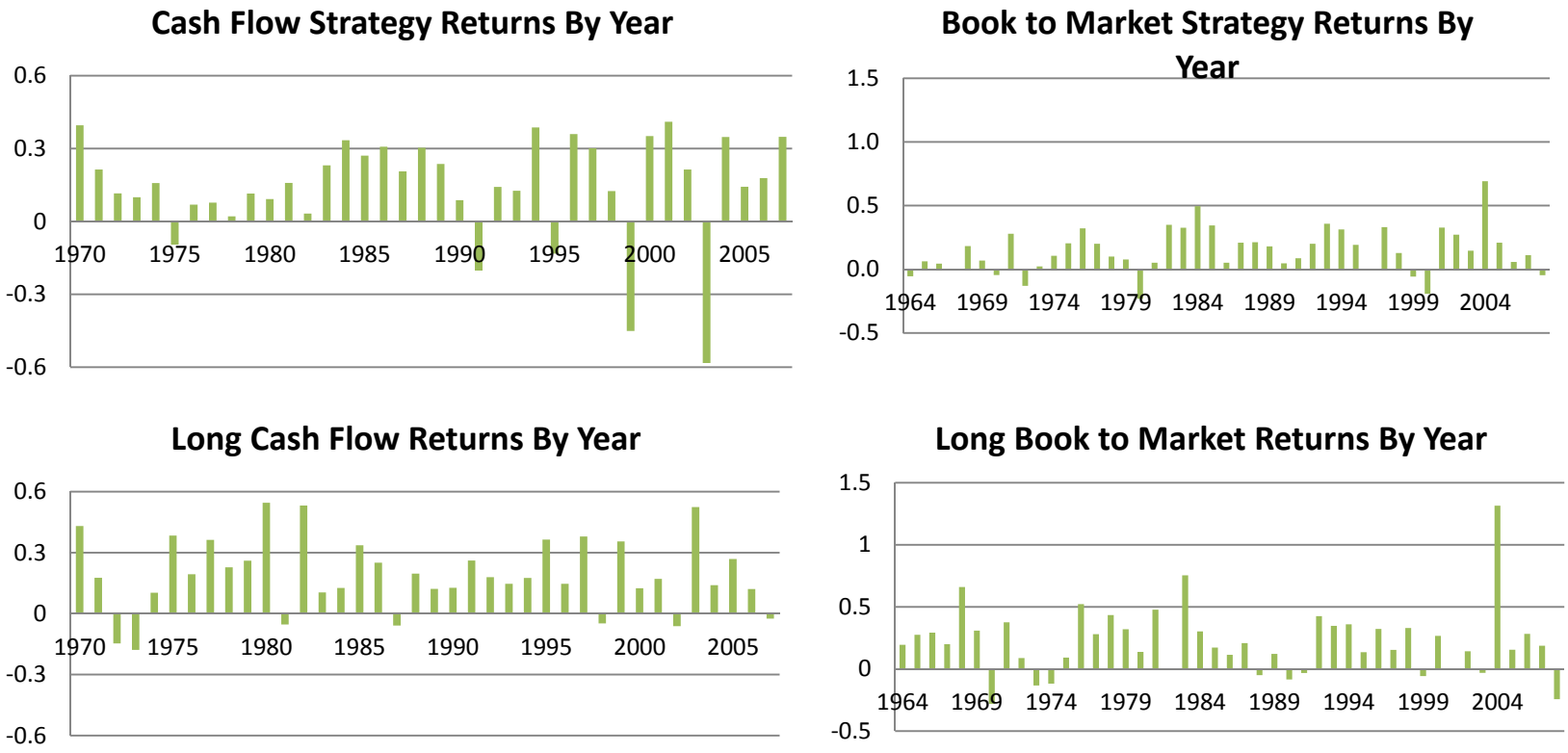


Panel B: Rebate



This figure plots cumulative raw equal-weighted returns to the long position vs. long-short trading strategy for cash flow (CF) and book-to-market (BM). Panel A excludes short interest rebates, while Panel B assumes the short position earns a rebate equal to the risk-free rate. Transaction costs are excluded. The time period is 1970-2007 (the index value is 1 in 1969, the first year on the graph). The ending index value is shown on the chart for each series. The scale of the y-axis is logarithmic.

FIGURE 2
Yearly Long Position Returns vs. Trading Strategy Returns



This figure plots yearly raw equal-weighted returns to the long position vs. long-short trading strategy for cash flow (CF) and book-to-market (BM). Short interest rebates are excluded. Transaction costs are excluded. The time period is 1970-2007 for Cash Flows and 1963-2007 for Book-to-Market.

TABLE 1
Descriptive Statistics

Panel A. Low Priced Stocks in Anomaly Variable Portfolios

	Fraction of Stocks in Anomaly Variable Deciles with Low Stock Prices							
	Book-to-Market		Cash Flow		Accruals		Earnings	
Decile	< $5	< $1	< $5	< $1	< $5	< $1	< $5	< $1
1	0.350	0.090	0.654	0.179	0.602	0.178	0.700	0.208
2	0.201	0.029	0.526	0.114	0.375	0.077	0.588	0.127
3	0.180	0.025	0.383	0.070	0.277	0.044	0.410	0.065
4	0.164	0.024	0.291	0.044	0.224	0.034	0.182	0.021
5	0.170	0.024	0.212	0.028	0.194	0.026	0.128	0.014
6	0.179	0.023	0.171	0.019	0.174	0.024	0.146	0.013
7	0.196	0.026	0.152	0.017	0.174	0.020	0.129	0.008
8	0.239	0.033	0.143	0.014	0.192	0.026	0.114	0.009
9	0.334	0.050	0.122	0.012	0.243	0.035	0.097	0.007
10	0.556	0.133	0.142	0.017	0.340	0.051	0.107	0.008

Panel B. Turnover of Anomaly Portfolios, and Percentage of Incorporated Spread

Decile	Book-to-Market	Cash Flow	Accruals	Earnings
1	0.518	0.495	0.756	0.521
2	0.691	0.745	0.822	0.728
3	0.760	0.785	0.843	0.768
4	0.792	0.772	0.853	0.639
5	0.806	0.791	0.848	0.649
6	0.801	0.785	0.841	0.720
7	0.787	0.800	0.832	0.716
8	0.772	0.783	0.802	0.705
9	0.718	0.736	0.832	0.631
10	0.537	0.569	0.757	0.474

Panel C. Portfolio Tilt of Stocks with High Short Interest and Institutional Holdings

	Stocks with High Short Interest				Stocks with High Institutional Holdings			
Decile	Book-to-Market	Cash Flow	Accruals	Earnings	Book-to-Market	Cash Flow	Accruals	Earnings
1	0.457	0.186	0.057	0.242	-0.279	-0.669	-0.473	-0.645
10	-0.52	0.143	0.069	0.394	-0.272	0.296	-0.270	0.388

This table presents descriptive statistics for the deciles of the book-to-market ratio, cash flows from operating activities, accruals (computed as the difference between earnings and cash flows), and earnings. Cash flow, accruals, and earnings are deflated by average assets. The sample period is fiscal years 1992-2006. Panel A shows the fraction of the deciles of anomaly variables with stock price less than $5 and $1. Panel B presents turnover in each decile, measured as the fraction of the portfolio that was not in the portfolio in year t-1. Panel C reports the portfolio tilt of extreme deciles for stocks with high short interest, and high institutional holdings. Portfolio tilt is computed as the number of observations in the decile divided by the average number of observations in each decile minus one. A value of zero indicates that the number of observations equals what would be expected under a uniform distribution.

TABLE 2
Short Portfolio Descriptive Statistics

Panel A. Raw Short Portfolio Returns

	No Turnover	Actual Turnover
Equal Weighted		
Book-to-Market	0.056	0.082
Cash Flow	0.055	0.092
Accruals	0.085	0.117
Earnings	0.079	0.126
Value Weighted		
Book-to-Market	0.028	0.030
Cash Flow	–0.024	–0.016
Accruals	0.000	0.004
Earnings	–0.021	–0.013

Panel B. Percentage of Years with Negative Investment Returns

	Market	Book-to-Market	Cash Flow	Accruals	Earnings
Equal Weighted					
% Short > 0		0.53	0.40	0.67	0.60
% Long < 0	0.27	0.27	0.20	0.53	0.13
% Hedge < 0		0.27	0.20	0.87	0.27
Value Weighted					
% Short > 0		0.67	0.33	0.60	0.60
% Long < 0	0.27	0.27	0.20	0.33	0.20
% Hedge < 0		0.40	0.27	0.47	0.33

Panel C. Drawdown

	Worst Intra-Year Performance				Worst End-of-Year Performance			
	Book-to-Market	Cash Flow	Accruals	Earnings	Book-to-Market	Cash Flow	Accruals	Earnings
Equal Weighted								
Min	–0.773	–2.005	–0.192	–2.064	–0.327	–0.839	–0.191	–0.845
P10	–0.220	–1.137	–0.191	–1.235	–0.220	–0.626	–0.181	–0.689
Q1	–0.138	–0.137	–0.166	–0.214	–0.053	–0.028	–0.166	–0.043
Value Weighted								
Min	–0.572	–1.187	–0.309	–1.069	–0.454	–0.734	–0.236	–1.069
P10	–0.248	–0.889	–0.236	–1.019	–0.196	–0.254	–0.180	–0.332
Q1	–0.123	–0.206	–0.145	–0.287	–0.121	–0.127	–0.123	–0.231

This table presents pooled short portfolio raw returns in Panel A, and the frequency of years with unprofitable strategy returns in Panel B for the following strategies: book-to-market, BM; cash flow, CF; accruals, AC; and earnings, EARN. Panel B presents the frequency of years with positive short returns (Short > 0), negative long returns (Long < 0), and the frequency of years with short returns exceeding long returns (Hedge < 0). Results are presented for 1993-2007. Panel A presents results with no turnover, and actual turnover (i.e., transaction costs). Panel B presents results including actual turnover. Results are presented using equal- and value-weighted methodologies. Panel C reports the worst intra-year and year-end returns (drawdown).

TABLE 3
Sharpe Ratios

		Equal Weighted			Value Weighted		
		Long	Long-Short		Long	Long-Short	
Strategy	**Turnover**	Only	No Rebate	Rebate	Only	No Rebate	Rebate
Market	None				0.48		
Book-to-Market	None	0.52	0.57	0.78	0.48	0.09	0.23
	Actual	0.39	0.24	0.44	0.43	0.03	0.17
Cash Flow	None	0.90	0.35	0.48	0.62	0.26	0.38
	Actual	0.80	0.15	0.28	0.61	0.21	0.33
Accruals	None	0.23	-0.08	0.23	0.41	0.36	0.51
	Actual	0.10	-0.77	-0.44	0.38	0.29	0.45
Earnings	None	0.70	0.13	0.26	0.62	0.33	0.47
	Actual	0.63	-0.06	0.06	0.61	0.27	0.41

This table presents average annual Sharpe ratios (annual return less the risk-free rate divided by the standard deviation of excess annual returns) for long-only and long-short returns to the following strategies: book-to-market, cash flow, accruals, and earnings, EARN. Equal-weighted Sharpe Ratios value-weighted Sharpe ratios are presented. For comparison purposes, the Sharpe ratio of the value-weighted market return is also presented. Results are presented for 1993-2007 with no turnover (ignoring transaction costs) and actual turnover (i.e., incorporating bid-ask spreads for the actual portfolio turnover). Results for long-short strategies are are presented assuming no short interest rebate is received (No Rebate), and assuming a rebate equal to the risk-free rate is received (Rebate).

TABLE 4
Annual Returns

		Equal Weighted				Value Weighted			
	Rebate	Book-to-Market n = 94,858	Cash Flow n=77,966	Accruals n=77,964	Earnings n=85,682	Book-to-Market n = 94,858	Cash Flow n=77,966	Accruals n=77,964	Earnings n=85,682
Panel A. Raw Returns									
1		0.056	0.055	0.118	0.079	0.028	-0.024	0.158	-0.021
		(t=0.81)	*(t=0.49)*	*(t=1.36)*	*(t=0.70)*	*(t=0.33)*	*(t=-0.28)*	*(t=1.80)*	*(t=-0.23)*
10		0.216	0.198	0.085	0.155	0.094	0.107	0.000	0.101
		(t=2.66)	*(t=4.38)*	*(t=1.31)*	*(t=3.54)*	*(t=1.23)*	*(t=1.75)*	*(t=-0.00)*	*(t=1.89)*
L-S	0	0.160	0.142	0.033	0.075	0.066	0.131	0.158	0.123
		(t=5.83)	*(t=3.78)*	*(t=1.88)*	*(t=1.93)*	*(t=0.85)*	*(t=2.27)*	*(t=3.27)*	*(t=2.49)*
L-S+rf	*rf*	0.200	0.181	0.072	0.115	0.108	0.168	0.194	0.159
		(t=7.32)	*(t=4.57)*	*(t=3.39)*	*(t=2.77)*	*(t=1.37)*	*(t=2.92)*	*(t=4.15)*	*(t=3.24)*
Panel B. Size-Adjust Both Portfolios, Typical Test in Literature									
1		-0.075	-0.102	-0.035	-0.078	-0.025	-0.120	0.068	-0.103
		(t=-2.22)	*(t=-1.67)*	*(t=-0.94)*	*(t=-1.23)*	*(t=-0.63)*	*(t=-2.09)*	*(t=1.03)*	*(t=-1.67)*
10		0.030	0.057	-0.070	0.018	-0.003	0.036	-0.055	0.033
		(t=0.95)	*(t=3.55)*	*(t=-4.01)*	*(t=1.05)*	*(t=-0.07)*	*(t=1.06)*	*(t=-1.56)*	*(t=1.19)*
L-S		0.105	0.160	0.035	0.096	0.022	0.156	0.124	0.136
		(t=3.99)	*(t=5.17)*	*(t=1.92)*	*(t=3.12)*	*(t=0.58)*	*(t=4.90)*	*(t=3.61)*	*(t=5.28)*
Panel C. Strategy Returns with *rf* as cost of capital									
L-S-rf	0	0.120	0.103	-0.007	0.036	0.023	0.094	0.122	0.086
		(t=4.38)	*(t=2.73)*	*(t=-0.38)*	*(t=0.91)*	*(t=0.30)*	*(t=1.63)*	*(t=2.52)*	*(t=1.75)*
L-S	*rf*	0.160	0.142	0.033	0.075	0.066	0.131	0.158	0.123
		(t=5.83)	*(t=3.78)*	*(t=1.88)*	*(t=1.93)*	*(t=0.85)*	*(t=2.27)*	*(t=3.27)*	*(t=2.49)*
Panel D. Strategy Returns with Cost of Long Position as cost of capital									
L-E(L)-S	0	-0.026	0.002	-0.120	-0.061	-0.031	0.060	0.068	0.054
		(t=-0.70)	*(t=0.03)*	*(t=-2.95)*	*(t=-1.07)*	*(t=-0.39)*	*(t=1.88)*	*(t=1.90)*	*(t=2.08)*
L-E(L)-S+rf	*rf*	0.014	0.041	-0.081	-0.022	0.011	0.097	0.105	0.091
		(t=0.34)	*(t=0.69)*	*(t=-1.79)*	*(t=-0.36)*	*(t=0.14)*	*(t=3.05)*	*(t=2.99)*	*(t=3.51)*

This table presents equal-weighted and value-weighted annual pooled raw and abnormal returns for extreme deciles of the book-to-market ratio, cash flow, accruals, and earnings. Standard errors are clustered by year. The sample consists of all non-ADR NYSE, AMEX and Nasdaq firms with the necessary data to compute returns and to rank the data for fiscal years 1992-2006. Returns are computed starting four months after the fiscal year-end and continue for twelve months. Panel A presents raw returns with and without rebates. Panel B presents the typical test of profitability in the literature. Panel C uses the risk-free rate as the assumed cost of capital, with and without rebates. Finally, Panel D uses the cost of the long position as the cost of capital, with and without rebates.

TABLE 5
Monthly Returns

		Equal Weighted				Value Weighted			
	Rebate	Book-to-Market	Cash Flow	Accruals	Earnings	Book-to-Market	Cash Flow	Accruals	Earnings
Panel A. Raw Returns									
1		.0053	.0035	.0089	.0050	.0070	.0035	.0107	.0073
		(t=0.90)	*(t=0.43)*	*(t=1.37)*	*(t=0.61)*	*(t=1.64)*	*(t=0.45)*	*(t=1.59)*	*(t=0.87)*
10		.0157	.0144	.0084	.0119	.0129	.0112	.0063	.0113
		(t=3.77)	*(t=3.83)*	*(t=1.72)*	*(t=3.09)*	*(t=3.26)*	*(t=3.00)*	*(t=1.32)*	*(t=3.08)*
L-S	0	.0104	.0110	.0005	.0069	.0059	.0077	.0044	.0039
		(t=2.94)	*(t=2.06)*	*(t=0.21)*	*(t=1.29)*	*(t=1.44)*	*(t=1.36)*	*(t=1.08)*	*(t=0.61)*
L-S+rf	*rf*	.0135	.0141	.0037	.0101	.0091	.0109	.0076	.0071
		(t=3.83)	*(t=2.66)*	*(t=1.55)*	*(t=1.89)*	*(t=2.21)*	*(t=1.92)*	*(t=1.84)*	*(t=1.11)*
Panel B. Difference in Alphas, Typical Test in Literature									
1		-.0064	-.0074	-.0030	-.0061	-.0033	-.0070	.0008	-.0024
		(t=-1.64)	*(t=-1.86)*	*(t=-1.03)*	*(t=-1.53)*	*(t=-1.62)*	*(t=-2.33)*	*(t=0.22)*	*(t=-0.56)*
10		.0075	.0042	-.0024	.0020	.0040	.0047	-.0035	.0048
		(t=1.93)	*(t=3.67)*	*(t=-1.28)*	*(t=1.80)*	*(t=1.96)*	*(t=3.61)*	*(t=-1.91)*	*(t=3.73)*
L-S		.0139	.0116	-.0007	.0081	.0073	.0117	.0043	.0072
		(t=4.60)	*(t=2.97)*	*(t=-0.33)*	*(t=2.06)*	*(t=1.78)*	*(t=3.40)*	*(t=1.07)*	*(t=1.52)*
Panel C. Strategy Returns with *rf* as cost of capital									
L-S-rf	0	.0072	.0078	-.0027	.0037	.0028	.0045	.0013	.0008
		(t=2.04)	*(t=1.47)*	*(t=-1.14)*	*(t=0.70)*	*(t=0.67)*	*(t=0.80)*	*(t=0.31)*	*(t=0.12)*
L-S	*rf*	.0104	.0110	.0005	.0069	.0059	.0077	.0044	.0039
		(t=2.94)	*(t=2.06)*	*(t=0.21)*	*(t=1.29)*	*(t=1.44)*	*(t=1.36)*	*(t=1.08)*	*(t=0.61)*
Panel D. Strategy Returns with Cost of Long Position as cost of capital									
L-E(L)-S	0	.0022	.0008	-.0114	-.0030	-.0030	.0013	-.0055	-.0025
		(t=0.35)	*(t=0.10)*	*(t=-2.30)*	*(t=-0.38)*	*(t=-0.61)*	*(t=0.17)*	*(t=-0.95)*	*(t=-0.30)*
L-E(L)-S+rf	*rf*	.0053	.0039	-.0083	.0002	.0002	.0044	-.0023	.0006
		(t=0.87)	*(t=0.51)*	*(t=-1.66)*	*(t=0.03)*	*(t=0.04)*	*(t=0.58)*	*(t=-0.40)*	*(t=0.07)*

This table presents equal-weighted and value-weighted annual pooled raw and abnormal returns for extreme deciles of the book-to-market ratio, cash flow, accruals, and earnings. Standard errors are clustered by year. The sample consists of all non-ADR NYSE, AMEX and Nasdaq firms with the necessary data to compute returns and to rank the data for fiscal years 1992-2006. Returns are computed starting four months after the fiscal year-end and continue for twelve months. Panel A presents raw returns with and without rebates. Panel B presents the typical test of profitability in the literature. Panel C uses the risk-free rate as the assumed cost of capital, with and without rebates. Finally, Panel D uses the cost of the long position as the cost of capital, with and without rebates.

TABLE 6
Annual Returns with Transaction Costs

		Equal Weighted				Value Weighted			
	Rebate	Book-to-Market n = 94,858	Cash Flow n=77,966	Accruals n=77,964	Earnings n=85,682	Book-to-Market n = 94,858	Cash Flow n=77,966	Accruals n=77,964	Earnings n=85,682
Panel A. Raw Returns									
1		0.082	0.092	0.070	0.126	0.030	-0.016	0.153	-0.013
		(t=1.15)	*(t=0.80)*	*(t=0.78)*	*(t=1.08)*	*(t=0.36)*	*(t=-0.18)*	*(t=1.73)*	*(t=-0.14)*
10		0.166	0.177	0.117	0.141	0.086	0.105	0.004	0.099
		(t=2.10)	*(t=4.02)*	*(t=1.82)*	*(t=3.29)*	*(t=1.14)*	*(t=1.72)*	*(t=0.05)*	*(t=1.85)*
L-S	0	0.084	0.085	-0.047	0.015	0.056	0.121	0.150	0.113
		(t=3.03)	*(t=2.17)*	*(t=-2.19)*	*(t=0.37)*	*(t=0.73)*	*(t=2.10)*	*(t=3.05)*	*(t=2.30)*
L-S+rf	*rf*	0.124	0.124	-0.008	0.055	0.098	0.158	0.186	0.149
		(t=4.54)	*(t=3.13)*	*(t=-0.35)*	*(t=1.32)*	*(t=1.24)*	*(t=2.74)*	*(t=3.96)*	*(t=3.04)*
Panel B. Size-Adjust Both Portfolios, Typical Test in Literature									
1		-0.050	-0.065	-0.083	-0.032	-0.023	-0.112	0.063	-0.095
		(t=-1.43)	*(t=-1.02)*	*(t=-2.05)*	*(t=-0.47)*	*(t=-0.57)*	*(t=-1.92)*	*(t=0.95)*	*(t=-1.52)*
10		-0.020	0.037	-0.038	0.005	-0.010	0.034	-0.052	0.031
		(t=-0.64)	*(t=2.32)*	*(t=-1.94)*	*(t=0.28)*	*(t=-0.25)*	*(t=1.01)*	*(t=-1.44)*	*(t=1.12)*
L-S		0.029	0.102	-0.044	0.036	0.013	0.146	0.115	0.126
		(t=1.08)	*(t=3.15)*	*(t=-2.02)*	*(t=1.11)*	*(t=0.33)*	*(t=4.61)*	*(t=3.31)*	*(t=4.92)*
Panel C. Strategy Returns with *rf* as cost of capital									
L-S-rf	0	0.045	0.046	-0.086	-0.024	0.014	0.084	0.114	0.076
		(t=1.60)	*(t=1.17)*	*(t=-4.03)*	*(t=-0.59)*	*(t=0.18)*	*(t=1.46)*	*(t=2.32)*	*(t=1.55)*
L-S	*rf*	0.084	0.085	-0.047	0.015	0.056	0.121	0.150	0.113
		(t=3.03)	*(t=2.17)*	*(t=-2.19)*	*(t=0.37)*	*(t=0.73)*	*(t=2.10)*	*(t=3.05)*	*(t=2.30)*
Panel D. Strategy Returns with Cost of Long Position as cost of capital									
L-E(L)-S	0	-0.102	-0.055	-0.200	-0.121	-0.041	0.050	0.060	0.044
		(t=-2.52)	*(t=-0.93)*	*(t=-4.44)*	*(t=-2.01)*	*(t=-0.52)*	*(t=1.58)*	*(t=1.62)*	*(t=1.72)*
L-E(L)-S+rf	*rf*	-0.062	-0.016	-0.160	-0.082	0.002	0.087	0.096	0.081
		(t=-1.53)	*(t=-0.27)*	*(t=-3.54)*	*(t=-1.34)*	*(t=0.02)*	*(t=2.74)*	*(t=2.74)*	*(t=3.13)*

This table presents equal-weighted and value-weighted annual pooled raw and abnormal returns adjusted for transaction costs (bid-ask spreads assuming actual turnover) for extreme deciles of the book-to-market ratio, cash flow, accruals, and earnings. Standard errors are clustered by year. The sample consists of all non-ADR NYSE, AMEX and Nasdaq firms with the necessary data to compute returns and to rank the data for fiscal years 1992-2006. Returns are computed starting four months after the fiscal year-end and continue for twelve months. Panel A presents raw returns with and without rebates. Panel B presents the typical test of profitability in the literature. Panel C uses the risk-free rate as the assumed cost of capital, with and without rebates. Finally, Panel D uses the cost of the long position as the cost of capital, with and without rebates.

TABLE 7
Monthly Returns with Transaction Costs

		Equal Weighted				Value Weighted			
	Rebate	Book-to-Market	Cash Flow	Accruals	Earnings	Book-to-Market	Cash Flow	Accruals	Earnings
Panel A. Raw Returns									
1		.0072	.0063	.0053	.0083	.0072	.0045	.0101	.0083
		(t=1.20)	*(t=0.78)*	*(t=0.82)*	*(t=1.02)*	*(t=1.70)*	*(t=0.58)*	*(t=1.50)*	*(t=0.99)*
10		.0124	.0130	.0109	.0109	.0119	.0110	.0070	.0111
		(t=3.03)	*(t=3.47)*	*(t=2.20)*	*(t=2.85)*	*(t=3.03)*	*(t=2.95)*	*(t=1.45)*	*(t=3.03)*
L-S	0	.0052	.0067	-.0056	.0026	.0047	.0065	.0031	.0027
		(t=1.46)	*(t=1.23)*	*(t=-2.17)*	*(t=0.47)*	*(t=1.15)*	*(t=1.15)*	*(t=0.76)*	*(t=0.43)*
L-S+rf	*rf*	.0084	.0098	-.0025	.0057	.0079	.0097	.0063	.0059
		(t=2.33)	*(t=1.81)*	*(t=-0.94)*	*(t=1.06)*	*(t=1.92)*	*(t=1.71)*	*(t=1.52)*	*(t=0.92)*
Panel B. Difference in Alphas, Typical Test in Literature									
1		-.0046	-.0047	-.0064	-.0029	-.0031	-.0061	.0002	-.0015
		(t=-1.18)	*(t=-1.15)*	*(t=-2.17)*	*(t=-0.71)*	*(t=-1.51)*	*(t=-2.02)*	*(t=0.05)*	*(t=-0.34)*
10		.0043	.0029	.0000	.0011	.0030	.0046	-.0029	.0046
		(t=1.33)	*(t=2.51)*	*(t=-0.01)*	*(t=0.99)*	*(t=1.18)*	*(t=3.47)*	*(t=-1.55)*	*(t=3.58)*
L-S		.0089	.0075	-.0064	.0040	.0061	.0106	.0031	.0061
		(t=2.93)	*(t=1.88)*	*(t=-2.70)*	*(t=0.99)*	*(t=1.50)*	*(t=3.08)*	*(t=0.76)*	*(t=1.29)*
Panel C. Strategy Returns with *rf* as cost of capital									
L-S-rf	0	.0020	.0035	-.0088	-.0006	.0015	.0033	.0000	-.0004
		(t=0.57)	*(t=0.64)*	*(t=-3.38)*	*(t=-0.11)*	*(t=0.37)*	*(t=0.59)*	*(t=-0.01)*	*(t=-0.07)*
L-S	*rf*	.0052	.0067	-.0056	.0026	.0047	.0065	.0031	.0027
		(t=1.46)	*(t=1.23)*	*(t=-2.17)*	*(t=0.47)*	*(t=1.15)*	*(t=1.15)*	*(t=0.76)*	*(t=0.43)*
Panel D. Strategy Returns with Cost of Long Position as cost of capital									
L-E(L)-S	0	-.0029	-.0035	-.0173	-.0072	-.0042	.0001	-.0068	-.0037
		(t=-0.47)	*(t=-0.45)*	*(t=-3.42)*	*(t=-0.92)*	*(t=-0.86)*	*(t=0.01)*	*(t=-1.16)*	*(t=-0.43)*
L-E(L)-S+rf	*rf*	.0003	-.0003	-.0141	-.0041	-.0010	.0033	-.0036	-.0006
		(t=0.04)	*(t=-0.04)*	*(t=-2.79)*	*(t=-0.52)*	*(t=-0.21)*	*(t=0.43)*	*(t=-0.62)*	*(t=-0.06)*

This table presents equal-weighted and value-weighted annual pooled raw and abnormal returns adjusted for transaction costs (bid-ask spreads assuming actual turnover) for extreme deciles of the book-to-market ratio, cash flow, accruals, and earnings. Standard errors are clustered by year. The sample consists of all non-ADR NYSE, AMEX and Nasdaq firms with the necessary data to compute returns and to rank the data for fiscal years 1992-2006. Returns are computed starting four months after the fiscal year-end and continue for twelve months. Panel A presents raw returns with and without rebates. Panel B presents the typical test of profitability in the literature. Panel C uses the risk-free rate as the assumed cost of capital, with and without rebates. Finally, Panel D uses the cost of the long position as the cost of capital, with and without rebates.

TABLE 8
Regressions of Returns on Anomaly Variables

Panel A: Book-to-Market Regressions (n= 17,526)

	No Turnover			Actual Turnover		
Coeff.	Est.	OLS T-Value	Clustered T-Value	Est.	OLS T-Value	Clustered T-Value
Intercept	0.067	9.82	1.11	0.073	10.82	1.19
BM	0.031	8.86	1.97	0.013	3.77	0.92
RSQ	0.005			0.001		

Panel B: Cash Flow Regressions (n= 14,440)

	No Turnover			Actual Turnover		
Coeff.	Est.	OLS T-Value	Clustered T-Value	Est.	OLS T-Value	Clustered T-Value
Intercept	0.101	15.68	1.54	0.103	15.86	1.56
CF	0.225	13.37	2.32	0.169	9.93	1.70
RSQ	0.012			0.007		

Panel C: Accruals Regressions (n= 14,400)

	No Turnover			Actual Turnover		
Coeff.	Est.	OLS T-Value	Clustered T-Value	Est.	OLS T-Value	Clustered T-Value
Intercept	0.061	8.95	0.96	0.068	9.91	1.05
AC	0.0004	0.02	0.01	0.113	5.04	1.38
RSQ	0.000			0.001		

Panel D: Earnings Regressions (n= 15,810)

	No Turnover			Actual Turnover		
Coeff.	Est.	OLS T-Value	Clustered T-Value	Est.	OLS T-Value	Clustered T-Value
Intercept	0.106	15.98	1.84	0.110	16.21	1.89
EARN	0.160	11.45	1.85	0.114	8.02	1.28
RSQ	0.008			0.004		

This table shows the results of regressions of returns on anomaly variables where returns incorporate actual turnover. Raw returns are regressed on the book-to-market ratio, operating cash flows, accruals, and earnings before extraordinary items. The sample consists of all non-ADR NYSE, AMEX and Nasdaq firms with nonmissing returns. Only observations in the extreme deciles (1 or 10) are included. In the short deciles (1 for BM, CF, EARN, 10 for AC), the adjustment for transaction costs increases the raw return (i.e., a reduction to the short position returns). In the long deciles (10 for BM, CF, EARN, 1 for AC) the adjustment for transaction costs decreases the raw returns. The sample period is fiscal years 1992-2006, with a corresponding return period of 1993-2007. Returns are computed starting four months after the fiscal year-end and continue for twelve months. Observations in the extreme 1% are excluded. Standard errors are clustered by year.