Small trades and the cross-section of stock returns

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Abstract

This paper uses volume arising from small trades to analyze the effect of retail investor trading behavior on the cross-section of stock returns. The central finding is that stocks with intense sell-initiated small-trade volume, measured over the past several months, outperform stocks with intense buy-initiated small-trade volume. This return difference accrues from the first month after the portfolio formation up to three years later. The results suggest that stocks favored by retail investors become overvalued and subsequently experience prolonged underperformance relative to stocks out of favor with retail investors.

A literature has emerged which finds systematic trading behavior among various investor groups. For instance, individual investors are found to quickly realize gains, but refrain from realizing losses; mutual funds and other institutional investors tend to follow momentum strategies, while individuals tend to be short-term contrarians, but longer-term momentum traders; a strong seasonal component exists to individuals' trading behavior; trading frequency by individuals depends on gender; small and large investors respond differently to events such as earnings releases, seasoned equity offerings, and analysts' recommendations.[1] Such systematic behavior is central to the line of reasoning espoused by the behavioral finance literature, which argues that sub-rational investors affect prices in financial markets. Otherwise, as Bagehot (1971) notes, even if investors are sub-rational, their trades will tend to cancel out, and any price effects will be minimal.

Even if behavior is systematic, the fundamental question remains to which extent such behavior impacts prices in financial markets? This paper addresses the effect of retail investor trading behavior on the cross-section of stock returns by studying the future returns to portfolios with small-trade buying or selling pressures. The central finding is that stocks with strong small-trade selling pressure, measured over the past several months, outperform stocks with strong small-trade buying pressure. In other words, stocks favored by retail investors tend to experience underperformance in the future. This return difference accrues from the first month after the portfolio formation up to three years later.

Entirely rational motives, of course, can also lead to systematic investor behavior. For instance, tax considerations might predict seasonal components to individual's trades. Moreover, return predictability of such trading can be understood in entirely rational frameworks by appealing either to the limits to liquidity or to informational asymmetry. For instance, Campbell, Grossman, and Wang (1993) suggest that selling pressures lead to temporarily higher expected rates of return in order to induce liquidity providers to enter the market. Also, if prices are not fully revealing, privately informed investors will necessarily capture higher returns than uninformed investors. The key difference between these fully rational and the sub-rational models lies in the *horizon* of the return predictabil-

[1] See, for instance, Lee (1992), Grinblatt, Titman, and Wermers (1995), Odean (1998, 1999), Nofsinger and Sias (1999), Wermers (1999), Grinblatt and Keloharju (2000, 2001), Barber and Odean (2001, 2005), Goetzmann and Massa (2002), Hvidkjaer (2005), Huh and Subrahmanyam (2004), Kaniel, Saar, and Titman (2004), and Malmendier and Shanthikumar (2005).

ity. Liquidity effects would be expected to be relatively short-run, such as days or perhaps weeks. Likewise, if privately informed investors experience higher returns over some time interval, the private information would generally have to be private at the beginning of that interval. Yet this paper finds significant return differences both in the second and third year after the portfolio formation. Private information, presumably, does not generally attain such longevity.

The measure of trading pressures is constructed from the volume of buy- and sell-initiated transactions of small sizes (based on firm-size dependent cut-off points) in stocks listed on the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX) or Nasdaq in the 1983–2004 period. For each stock, sell-initiated volume is subtracted from buy-initiated volume, and the difference is divided by the number of shares outstanding. The result is the *signed small-trade turnover* (SSTT), and it is measured over periods of one to 24 months. Stocks with high SSTT (i.e., strong buying pressures) tend to have low book-to-market (BM) ratios and high past long-term returns, while low SSTT stocks have high BM and low past long-term returns. Also, SSTT is negatively correlated with contemporaneous changes in institutional holdings, though this relationship disappears in the last couple of years in the sample. A large concurrent increase in small-trade turnover suggests that this disappearance is driven by increased splitting of institutional orders. Both the low and high SSTT stocks are somewhat smaller and have higher share turnover than the intermediate stocks.

Portfolios are formed on the basis of SSTT, and the returns of those portfolios are measured up to three years in the future. The results show that stocks with low SSTT outperform stocks with high SSTT. For instance, using value-weighted returns and a six-month formation period, the average monthly return difference between the two portfolios is 0.73% in the first year (t-statistic = 3.41) and 0.56% in the second year (t-statistic = 3.14). The third-year value-weighted return difference is an insignificant 0.27%, but the corresponding equal-weighted return difference is 0.47% per month (t-statistic = 2.97). In addition, returns are characteristics-adjusted based on size, BM, and momentum. This adjustment tends to lower the monthly return differences by 10–20 basis points, but have less impact on the statistical significance. For instance, the third-year equal-weighted return difference decreases to 0.38%, but the t-statistic increases to 3.64. These return differences appear in a variety of subsamples based on size, BM, momentum, and long-term past returns; they hold for the set of NYSE/AMEX stocks only; and they appear in both the first and second half of the sample period. They are, however, absent among low-turnover stocks and strong among high-turnover stocks.

These results suggest that SSTT is a proxy for retail investor sentiment, in the sense that retail investor expectations about future stock returns, as manifested in their trading behavior, are not warranted by fundamentals. Moreover, the evidence is consistent with the hypothesis that stocks favored by retail investors become overvalued and subsequently experience prolonged underperformance relative to stocks out of favor with retail investors.

Little evidence exists to suggest that the return differences are caused by differences in risk. First, in addition to the characteristics-adjustment of returns, cross-sectional and time series regression controls do not substantially decrease the profitability of the zero-investment portfolio, which is long the low SSTT stocks and short the high SSTT stocks. Secondly, across SSTT portfolios, the high SSTT portfolio has the highest beta with respect to market returns, yielding a negative beta of -0.38 for the zero-investment portfolio. Thirdly, the zero-investment strategy experiences several calendar years with large positive returns, but no years with more than 5% loss.

Hvidkjaer (2005) constructs a related measure of small-trade imbalance, defined as the percentage difference between buy- and sell-initiated small-trade volume in a given stock. In comparison, the current paper scales signed volume by shares outstanding instead of by volume. While both approaches would seem to be reasonable measures of retail investor trading behavior, the scaling in the current paper follows the approach in Breen, Hodrick, and Korajczyk (2002), who argue that the relationship between signed turnover and returns is an accurate measure of price impact. Therefore, one might expect any price effects to be stronger when scaling by shares outstanding instead of volume.

Hvidkjaer (2005) analyzes the trading behavior of small (and large) investors in Jegadeesh and Titman (1993) momentum portfolios, and whether this contributes to the profitability of momentum strategies. Indeed, Hvidkjaer (2005) finds that momentum stocks with small-trade selling pressures outperform those with small-trade buying pressures.

Given that result, it is not surprising that SSTT has explanatory power for future returns. The surprise lies in the magnitude, persistence, and wide scope of the explanatory power.

In a paper developed contemporaneously and independently of the current paper, Barber, Odean, and Zhu (2005) also use transactions data to study the relationship between signed volume and future returns. As Hvidkjaer (2005), they scale the difference between buy- and sell-initiated small-trade (large-trade) volume by the total small-trade (large-trade) volume. Using a one-year formation period and a one-year holding period they find, as does the current study, that stocks with strong retail investor buying over the prior year underperform those with strong retail investor selling. Also, they detect that stocks bought by retail investors at the weekly level actually perform well over the following couple of weeks. The short-term results in Barber, Odean, and Zhu (2005) are consistent with the findings of Kaniel, Saar, and Titman (2004), who have access to NYSE order-level data originating from individuals during a four-year period. Kaniel, Saar, and Titman (2004) note that the short-term profitability of retail trades is consistent with risk-averse individuals being compensated for providing liquidity to institutional investors.

Several other studies link trading by individuals to future returns. Using brokerage account data, Coval, Hirshleifer, and Shumway (2005) find persistence in the trading performance of individual investors, and that some individuals are consistently able to outperform the market. In other markets, Grinblatt and Keloharju (2000) and Barber, Lee, Liu, and Odean (2005) find that the trades of individual investors in Finland and Taiwan, respectively, have significantly lower returns than those of institutional investors.

A paper also similar in spirit is Frazzini and Lamont (2005), who study the effect of mutual fund flows on stock return. Like the current study, they find that stocks favored by retail investors tend to underperform in subsequent years. Their argument is that mutual funds are constrained in their holdings, so that currently popular funds with strong inflows of money might have to invest in stocks that they already view as overvalued. This provides an alternative and indirect channel through which retail investors affect stock prices.

The remainder of the paper is organized as follows. Section 1 details the sample and the construction of the SSTT variable. Section 2 presents various characteristics of the SSTT-sorted portfolios and the time variation in some of the key characteristics. Section 3 contains the main results of the paper, namely the explanatory power of SSTT for the cross-section of future returns. Section 4 concludes the paper.

1. Data sample and construction of variables

The sample in the current study includes all ordinary common stocks listed on the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX) in the period January 1983 through December 2004. Transactions data on Nasdaq stocks became available in January 1993, hence those stocks are included in the sample from that time on. REITS, stocks of companies incorporated outside the U.S., and closed-end funds are eliminated from the sample. Return data and unsigned share volume data are from the Center for Research in Security Prices (CRSP) files. Data on book value of equity are from Compustat, and book value is defined as in Fama and French (1992). Institutional ownership data are from the 13f transactions files compiled by CDA/Spectrum. Returns from factor-mimicking portfolios, used in time series regressions, are available from two sources. First, the Fama-French and momentum factor returns were obtained from http://mba.tuck.dartmouth.edu/pages/-faculty/ken.french/, which also details the procedure used to create the portfolio returns. Secondly, the PIN (probability of informed trading) factor returns constructed in Easley, Hvidkjaer, and O'Hara (2005) are available from the current author's webpage.

Transactions data are obtained from the Institute for the Study of Security Markets (ISSM) and the Trade And Quote (TAQ) data sets. The ISSM data set includes all transactions and quotes in all stocks listed on NYSE/AMEX in 1983–1992, while TAQ also includes Nasdaq firms and covers 1993 to present.[2] Trades and quotes with irregular terms are excluded, and trades and quotes are run through a simple price-based error filter to exclude likely erroneous prices.[3]

The ISSM and TAQ data sets do not contain any information on whether a trade was initiated by the buyer or the seller. The classification of trades as buys or sells is therefore done according to the Lee and Ready (1991) algorithm. This is standard in the market microstructure literature, and primarily uses trade placement relative to the current bid/ask quotes to determine trade direction. If a trade is executed at a price above (below) the

[2] ISSM also covers Nasdaq stocks in 1987–1992, but that data was not available for the current study.

[3] See the appendix in Hvidkjaer (2005) for a description of the trade and quote filters.

quote midpoint, it is classified as a buy (sell). Trades at the quote midpoint are classified using the "tick test", which determines the direction by comparing the trade price to the price of preceding trades. All eligible trades are thus classified as either buys or sells.

Furthermore, all trades are classified by size using a variation of the Lee (1992) firm-specific dollar-based trade-size proxy. Lee (1992) notes that while a dollar-based size proxy is conceptually superior to one based on the number of shares traded, the dollar-based proxy is sensitive to small price changes. Therefore, he suggests obtaining a closing price during the sample period, comparing that price to, say, $10,000, and determine the largest number of round lot shares that is less than or equal to $10,000. Trades at this number of shares or less are deemed small trades. Moreover, using the TORQ data, Lee and Radhakrishna (2000) provide support for the use of trade size as a proxy for individual versus institutional trading. They also find that the classification accuracy can be enhanced by conditioning the cut-off point on firm size.

Hvidkjaer (2005) suggests sorting stocks into quintiles based on NYSE/AMEX firm-size cut-off points and using the following small-trade cut-off points within firm-size quintiles: $3,400 for the smallest firms, $4,800, $7,300, $10,300, and $16,400 for the largest firms. The cut-off points in number of shares are updated monthly based on the share price at the end of the prior month. I slightly modify the approach in Hvidkjaer (2005), as the share cut-off points are obtained as the ratio of the dollar cut-off point to the share price *rounded up* to the nearest round-lot. This ensures that small trades exist in all stocks.

The small-trade buy-volume is summed up monthly, and the small-trade buy-initiated turnover is computed as the total number of shares of small buy-initiated trades in that month, divided by the number of shares outstanding. The small-trade sell-initiated turnover is computed similarly. At the end of each month, the small-trade buy- and sell-initiated turnover are then summed over the prior J months, where $J = 1, 3, 6, 12$, and 24. The *signed small-trade turnover* (SSTT) is then simply the summed small-trade buy-initiated turnover minus the summed small-trade sell-initiated turnover.[4] SSTT is the main conditioning variable used in the asset pricing tests in section 3, where portfolios are formed monthly based on

[4]Reported trading volume of Nasdaq-listed stocks is inflated relative to that of stocks on NYSE/AMEX (Gould and Kleidon, 1994). However, Appendix A shows that no systematic differences across exchanges appear to exist with respect to small-trade turnover. Therefore, no attempts were made to deflate Nasdaq trading volume.

the J-month SSTT.

Tests were initially run including all stocks with a price of at least \$1. However, it turned out that small-trade turnover constitutes a very large fraction of overall turnover for the lowest priced stocks. Consequently, those stocks tended to be overrepresented in the extreme SSTT portfolios. Therefore, in the monthly portfolio formation, only stocks with a current price of at least \$5 are included. This also tends to ensure investability and that the return results below are not influenced by bid-ask bounces.

2. The characteristics of SSTT-sorted portfolios

In Table 1, stocks are sorted into deciles each month, according to past six-month SSTT. Value-weighted characteristics of the stocks in the sample are computed monthly, and the time series averages in each of the portfolios are reported along with the difference between the low and high SSTT portfolio and the corresponding autocorrelation-adjusted t-statistics. However, these portfolios might not have stable characteristics, since different styles might vary in popularity through time. Hence, figures 1–4 show the time series patterns of some key characteristics.

The first line in Table 1 presents the mean percentage size ranks based on NYSE cut-off points. SSTT does not appear to be strongly correlated with firm size, though stocks in the extreme SSTT portfolios tend to be somewhat smaller than those in the intermediate portfolios. Still, the value-weighted mean ranks of 69.4% and 72.1% of the low and the high SSTT portfolios, respectively, are well above the median NYSE stock. Figure 1 plots the rank size each month for the SSTT portfolios. The figure reveals that the average difference in size between the two portfolios is driven by a preference for larger stocks in the 1998–2001 period. The figure also shows a drop in 1993, which is simply caused by the inclusion of Nasdaq stocks in the sample.

If one group of investors are net-buyers of a stock, another group of investors are necessarily net-sellers. In the current context, if in fact high SSTT indicates that retail investors are net-buyers of a stock, we would expect institutional investors to be net-sellers. The relationship, though, is complicated by effects such as the constraints that mutual fund flows place on mutual fund holdings, as discussed by Frazzini and Lamont (2005). Nevertheless, the change in institutional holdings during the contemporaneous six-month period is negatively correlated with SSTT. Table 1 shows that the portfolio with the strongest small-trade selling pressure has the highest change in institutional holdings with 3.86% increase in institutional holdings as a percentage of shares outstanding. The change in institutional holdings decreases monotonically across SSTT portfolios to -0.78% for the high SSTT portfolio. Figure 3 depicts the time series pattern of the rank institutional trading. In the figure, the percentage rank change in institutional holdings is computed within NYSE size quintiles, and the value-weighted mean of the ranks in each portfolio is computed. The figure shows that a large difference in institutional trading exists during most of the sample period. For instance, the stocks in the low (high) SSTT portfolio on the first formation date in June 1983 have an average institutional change rank of 83% (32%). For comparison, a perfect negative correlation would imply that the stocks in the low SSTT decile would have an average rank of 95% (ignoring value-weighting) and those in the high SSTT decile would have an average rank of 5%. However, the difference in the institutional change rank disappears in the final years of the sample period. This could possibly be caused by the concurrent combination of increased automated trading, decreased trading costs, and increased order splitting by institutional traders. If correct, then we would expect an increase in small-trade turnover in those years, as more investors now trade smaller sizes. Figure 4 shows the annualized small-trade turnover in the two extreme SSTT portfolios. The pattern is clear: while the small-trade turnover is fairly stable throughout most of the sample period at around 10%, a virtual explosion in small-trade turnover appears in the later years. It is particularly large for the stocks in the high SSTT portfolio with the average small-trade turnover spiking at more than 140% in 2003. While some of the increase surely is driven by actual increase in trading by retail investors, in particular the early increases around 1999 during the bubble period, the bulk of the increase is likely to come from institutional trading. This suggests that the proxy for retail investor behavior suggested in this paper might be a poor one in the future.[5]

Both overall turnover and small-trade turnover are large in the extreme SSTT portfolios. Overall turnover in Table 1 is ranked within NYSE/AMEX and Nasdaq separately, and the

[5] Campbell, Ramadorai, and Vuolteenaho (2004) present a thorough analysis of the ability of the transactions data to predict the quarterly changes in institutional holdings in the 1993–2000 period.

table reports the value-weighted percentage ranks for each portfolio. The low SSTT portfolio has a high average turnover rank of 70.80%, but the high SSTT is even higher at 81.90%. The turnover statistics suggest that both the high and low SSTT portfolios consist of relatively liquid stocks.

Table 1 suggests that the low-SSTT stocks tend to be high book-to-market, or value, stocks. By contrast, while the stocks in the highest SSTT portfolio do have a relatively low book-to-market ratio on average, the ratio is not lower than that of any of the four other upper half SSTT portfolios.

Table 1 shows that SSTT is highly correlated with the prior three-year returns. Figure 2 shows the rank three-year return for the low and high SSTT portfolios over the sample period. While the high SSTT stocks clearly have higher past returns throughout most of the sample, the relationship does vary over time. For instance, the spread appears to be very wide just prior to the October 1987 crash, after which it disappears for a short period. The return spread disappears again in 2002, but this might be related to the increased institutional presence among small trades.

In sum, SSTT appears to be most highly correlated with past long-term returns and the contemporaneous change in institutional holdings.

3. Effects on the cross-section of returns

The main question addressed in this paper is whether SSTT, the measure of retail investor trading behavior, has explanatory power for the cross-section of future stocks returns. This section shows that portfolios of stocks with low SSTT outperform portfolios of stocks with high SSTT, using a number of methodologies and within a number of subsamples.

Each month, stocks are sorted into portfolios according to SSTT measured over the prior J months, where J is equal to 1, 3, 6, 12, and 24. Future returns earned by these portfolios are computed over horizons of K months, where K is equal to 1, 2–7, 1–12, 13–24, and 25–36 months. Both raw and characteristics-adjusted returns are reported. Returns are characteristics-adjusted based on size, BM and momentum in a manner similar to the technique suggested by Daniel, Grinblatt, Titman, and Wermers (1997) and Wermers (2004). Specifically, each month, stocks are sorted into size quintiles based on NYSE cut-off points, and within each size quintile, stocks are sorted into quintiles based on industry-adjusted BM ratios.[6] Within each of the size-BM portfolios, stocks are sorted into quintiles according to their past 12 months return. Each stock is now uniquely identified with one of the resulting 125 portfolios, and the size-, BM-, and momentum-adjusted return for stock i in month t is then its return minus the average returns of the other stocks in the portfolio. For value-weighted portfolios, the benchmark-portfolio return is also value-weighted, while equal-weighted portfolios use equal-weighted benchmark-portfolios. If expected returns only depend on these characteristics, then the expected characteristics-adjusted return of a given stock would be zero.

Similar to Jegadeesh and Titman (1993), holding-period portfolio returns are calculated as the equal-weighted average of the current period's return on the previous K months' portfolios. For K equal to 1–12, for example, the portfolio return is the average of this month's return for the portfolios constructed in each of the prior twelve months. By averaging across prior strategies rather than prior returns, the overlap problem is avoided and t-statistics can be computed in the normal manner. Still, to remove any effect of heteroskedasticity and autocorrelation of returns in calendar time, all t-statistics are computed using the Newey-West correction with 6 lags.

Table 2 shows the average monthly returns for the stocks in SSTT deciles 1, 2, 9, and 10, and for a portfolio consisting of the stocks in the intermediate six deciles. Results are reported for both the value- and equal-weighted returns, and show that low SSTT stocks (decile 1) tend to outperform high SSTT stocks (decile 10) up to three years after the formation date. For instance, using a six-month formation period and value-weighting returns, low SSTT stocks outperform high SSTT stocks by 0.84% in the first month after the portfolio formation (t-statistic = 3.27) and by 0.73% per month over the following six months (t-statistic = 3.20). In year two, the monthly return difference is still a highly significant 0.56% (t-statistic = 3.14). The year three difference is an insignificant 0.27% for the value-weighted strategy. However, the corresponding equal-weighted strategy yields 0.47% per month (t-statistic = 2.97). In general, the equal-weighted strategy appears to yield simi-

[6] The industry-adjustment is based on the Fama-French 17-industry classification and is performed as in Wermers (2004), who normalizes log(BM) within industry by subtracting the industry mean and dividing by the standard deviation.

lar return differences, but the standard deviations of the strategies are smaller, yielding larger t-statistics. Also, return differences in year three are generally significant for the equal-weighted strategies, but not for the value-weighted strategies, suggesting that any mispricing might take longer time to correct among smaller stocks.

To the extent that characteristics-adjusting returns captures differences in risk or that SSTT measures small-trader sentiment towards particular styles as opposed to individual stocks, we would expect the characteristics-adjusted return differences to be smaller than those of the raw returns. Indeed, the differences of the characteristics-adjusted returns presented in Table 3 are somewhat lower than those of the raw returns. For instance, for $J = 6$, $K =$ 2–7, the difference of the value-weighted returns is now 0.54%, a reduction of 0.19 percentage points from the raw returns. However, the corresponding t-statistic is only reduced slightly from 3.20 to 3.05. Generally, the t-statistics in Table 3 are as large as those of the raw return differences, so the statistical significance of the results is unaffected by the characteristics-adjustment.

The adjusted returns also allow one to analyze the extent to which high versus low SSTT stocks contribute to the return differences. In fact, for the value-weighted portfolios, both sides seem to contribute about equally. Again, for the $J = 6$, $K =$ 2–7 strategy, low SSTT stocks outperform their benchmark by 0.25%, while high SSTT stocks underperform their benchmark by 0.30%. Both returns are marginally significant with t-statistics of 1.72 and -1.76, respectively. For the equal-weighted strategies, on the other hand, the evidence suggests that the return difference for low Ks are driven by underperformance of the high SSTT stocks: for $J = 6$, $K =$ 2–7, low SSTT stocks outperform by only 0.03%, while high SSTT stocks underperform by 0.43% (t-statistic = -3.68). At $K =$ 25–36, however, both sides seem to contribute equally also for the equal-weighted portfolios.

As a robustness check, one can examine the difference in returns between deciles 2 and 9. Indeed, for the strategies in Table 2 which yield significantly positive return differences between decile 1 and 10, the corresponding difference between deciles 2 and 9 is also positive in every case. Moreover, in Table 3, for the value-weighted strategies in which the decile spreads are significant, all decile 2 returns are positive and all decile 9 returns are negative. In the equal-weighted portfolios, deciles 2 and 9 are consistently positive and negative, respectively, only for the strategies with holding periods beyond one month ($K = 1$). However, the shorter-term strategies also do not have consistently positive returns in decile 1, reflecting the observation above that low SSTT stocks do not reliably outperform when equal-weighting. In sum, the relationship between SSTT and future returns also seems to appear outside the two extreme SSTT deciles.

3.1. Interaction effects with firm characteristics

The results in Tables 2 and 3 are remarkably robust to different choices of J, the length of the formation period. Tables 4 and 5 examines the effect of SSTT on future returns within portfolios based on several firm characteristics. Stocks are now sorted into SSTT deciles within quintiles based on NYSE size cut-off points, book-to-market ratio, contemporaneous returns, prior three-year returns, or turnover. The tables report the value- and equal-weighted return difference between the low and high SSTT portfolio using both raw and characteristics-adjusted returns for the $J = 6$, $K = 2$–7 strategy. In addition, the tables show the difference in SSTT between the two portfolios. In Table 4, Panel A shows that SSTT has explanatory power for returns across all NYSE size quintiles. The effect, though, is only marginally statistically significant for the stocks in the largest NYSE quintile, with only the equal-weighted/characteristics-adjusted returns significant at the 5% level. However, the table also shows that, across size quintiles, the difference in SSTT is smallest for the largest firms. For instance, the value-weighted difference in SSTT is 2.47% of shares outstanding among the smallest firms, but only 1.25% among the largest firms. So while the overall effect of SSTT appears to be smaller for the largest firms, it is not clear whether this is caused by a tighter distribution of SSTT or whether a given level of SSTT has a smaller effect on returns for large stocks. In an attempt to break the correlation between size and SSTT differences, I performed independent sorts on NYSE size quintiles and SSTT quintiles. The results are presented in Panel B of Table 4. While the independent sort does not entirely break the correlation, the results show that the return difference between low and high SSTT portfolios is almost constant across size quintiles. Moreover, it is significant at the 5% level for all the 20 strategies considered in Panel B.[7]

[7] Note that SSTT *deciles* are formed in the sequential sorts, in order to facilitate comparison with the univariate sorts, but the independent sorts uses SSTT *quintiles*, in order to achieve a sufficient number of stocks in each

In Table 5, the evidence in Panels A–C suggests that no strong interaction effect for returns exists between SSTT and either book-to-market ratio, contemporaneous returns, or prior three-year returns. Panel D, however, shows that the effect of SSTT is muted among low-turnover stocks, but very strong among high-turnover stocks. For instance, the value-weighted difference of the raw returns is 1.19% (t-statistic = 3.98). This is consistent with Hvidkjaer (2005), who finds a similar relationship among momentum stocks.[8]

3.2. Robustness of results

One might suspect that the results could be driven by abnormal behavior among Nasdaq stocks in the late 1990s and early 2000s, which saw both the advent of small day traders and rather spectacular volatility. However, while the sub-sample results in this section do suggest that an SSTT-based strategy was profitable during that period, the explanatory power of SSTT for returns is not confined to that sub-sample.

Table 6 shows the results based on the six-month formation period when excluding Nasdaq stocks from the sample. Return differences are generally smaller than those reported in Tables 2 and 3, but significant nonetheless. In other words, while results appear to be stronger among Nasdaq stocks, they are not confined to those stocks.

In Table 7, the sample is split into two periods, 1983–1993 and 1994–2004. The return differences are significant in both periods. For the value-weighted strategy, the second half of the sample appears to have slightly higher returns for holding periods in the first year after the portfolio formation. However, the return differences appear to be more persistent in first half of the sample (which only includes NYSE/AMEX stocks until mid-1993). Specifically, for $K = 25$–36, value-weighted returns are insignificant in the second half (as in the overall sample), but strongly significant in the first half.

Stocks with prices below $5 are excluded from the analysis, as noted in section 1. However, retail investor trading is likely to have a larger effect on prices among low-priced stocks relative to higher-priced stocks. Therefore, it is of interest to check the explanatory power of SSTT among the low-priced stocks not in the main sample. Indeed, analysis

portfolio. Therefore, the difference in SSTT is generally lower for the independent sorts.

[8]Additional analysis shows that the longer-term return differences within the high-turnover portfolio are also large, with average monthly returns in years one, two, and three at 1.22%, 0.89%, and 0.61% (t-statistics 4.77, 3.57, and 1.95), respectively (not reported in table), for the value-weighted strategy.

shows that relatively high return differences exist among those stocks. For instance, the $J = 6$, $K = 2$–7 zero-investment strategy based only on stocks with prices between \$1 and \$5 yields 0.88% (t-statistic = 2.16) and 1.01% (t-statistic = 3.67) for the value- and equal-weighted returns, respectively (not reported in table).

Figure 5 depicts the year-to-year value-weighted returns of the $J = 6$, $K = 2$–7 strategy. If the return differences are caused by risk differences, such risk does not appear to have materialized during the sample period. The top panel using raw returns shows that the strategy yields negative returns in five of the 22 years, but the maximum loss in any year is 4.6% (in 1991), while profits are 10% or more in nine of the sample years. The characteristics-adjusted returns in the bottom panel shows a similar pattern, though the returns are lower and less volatile. The main difference between the raw and characteristics-adjusted returns seems to appear in the 1998–2002 period: the adjustment reduces the high profitability in 2000–2002, but increases the 1998–1999 returns.

An alternative return-adjustment for the effect of other characteristics is the Fama and MacBeth (1973) regression. This also provides a way of gauging the relative explanatory power of different characteristics for returns. Table 8 investigates the explanatory power of different characteristics over varying horizons. Regressions are performed monthly based on log(BM), log(size), $ret_{-5:0}$ (i.e., prior six-month returns), $ret_{-41:-6}$, and prior six-month SSTT. All explanatory variables are normalized each month by subtracting the cross-sectional mean and dividing by the standard deviation, such that the coefficient can be interpreted as the effect of a one standard deviation move in the explanatory variable. The dependent variable is the percentage monthly return in month K, where $K = 1, 2, 13, 25, 37$, and 49, i.e., up to four years after the measurement of the explanatory variables. The effect of SSTT is again strong and persists for at least two years, e.g., when dependent returns are measured in the 25th month after SSTT, the coefficient is -0.12 with a t-statistic of -3.12. The effect of SSTT becomes marginally significant after three years ($K = 37$) and disappears after four years ($K = 49$). The prior long-term returns are included in the regressions, as one might suspect that, because SSTT is highly correlated with past three-year returns, the effect of SSTT is simply a restatement of the De Bondt and Thaler (1985) long-term reversal finding. However, the Fama-MacBeth evidence does not indicate that the effect of SSTT is explained by long-term prior returns, as $ret_{-41:-6}$ is insignificant for all K.[9]

Across months $K = 1$ to 37, SSTT remains the variable with the strongest statistical significance. However, for $K = 2$, both log(BM) and $ret_{-5:0}$ have higher coefficients, but the variability of the effect of those variables reduces the statistical significance. This suggests again that an SSTT-based strategy is relatively low-risk, at least when compared to BM and momentum. Moreover, the persistence of SSTT shows that a lower portfolio turnover is required for such a strategy.

In sum, the return differences for SSTT-portfolios seem to be quite robust across different sub-samples, and the effect of SSTT is equally strong in the Fama-MacBeth regressions.[10]

3.3. *Time series regressions*

As an alternative to the characteristics-adjustment of returns based on benchmark portfolio returns, it is of interest to investigate the ability of factor models to capture the returns of SSTT portfolios. Fama and French (1993) find that the returns on three factor-mimicking portfolios, constructed as the overall stock market portfolio (r_m), a portfolio long small firms and short large firms (SMB), and a portfolio long firms with high book-to-market equity and short low BM firms (HML), seem to explain average returns on stock portfolios.

Table 9 performs time series regressions, similar to Fama and French (1993). First, the portfolio returns of the $J = 6$, $K = 2$–7 value-weighted strategy are regressed against r_m, the CRSP value-weighted NYSE/AMEX/Nasdaq index returns. The β_{r_m} coefficients do not indicate that beta risk can account for the return differential between the low and high SSTT portfolios. On the contrary, the high SSTT portfolio has by far the highest beta coefficient at 1.52, but since the strategy is short in that portfolio, the zero-investment portfolio has a negative beta of -0.38. Correspondingly, the intercept of the regression with the zero-investment portfolio is, at 0.97 (t-statistic = 4.87), higher than the average raw return of 0.73

[9] Moreover, additional analysis shows that exclusion of $ret_{-41:-6}$ from the regression have little effect on the coefficient on SSTT, except for $K = 37$, in which the coefficient on SSTT is -0.11 (t-statistic = -2.71) when $ret_{-41:-6}$ is excluded (not reported in table).

[10] In addition, the seasonality of the results was investigated (not reported in table). Return differences for short holding and formation periods appear to be stronger in January. For instance, the value-weighted $J = 1$, $K = 1$ strategy yields 3.44% in January (t-statistic = 2.26), consistent with temporary price pressure from tax-loss selling. However, for $J = 6$, $K = 2$–7, returns were 0.97% in January, not materially different from the full period return differences of 0.73% in Table 2.

reported in Table 2. Secondly, the portfolio returns are regressed against the three Fama-French factors. This does reduce the intercept to 0.66, but it remains highly significant with a t-statistic of 3.53. Interestingly, both the low and the high SSTT portfolio seem to have a stronger covariation with growth firms than suggested by their BM ratios in Table 1. Concretely, the coefficient on HML is insignificant for the low SSTT portfolio, even though Table 1 shows a high BM ratio for that portfolio. Likewise, even though the high SSTT portfolio does not have a particularly low BM, that portfolio has a strong negative loading on HML.

The loadings on the SMB returns exhibit a marked U-pattern across SSTT portfolios. That is, the low and high SSTT portfolios have strongly positive loadings, while intermediate portfolios have negative loadings. In other words, the extreme SSTT stocks tend to have high covariation with small firms, even though the value-weighting ensures that the returns of those portfolios are mainly driven by large stocks.[11] It is worth noting that because both the low and high SSTT portfolios have high levels of small-trade turnover, and therefore are likely to have a high degree of retail investor participation, the results are consistent with the hypothesis that excess comovements exist among stocks with high retail investor participation (see Lee, Shleifer, and Thaler, 1991; Kumar and Lee, 2005).

In terms of R^2, both models appear to have less success in capturing the of variation in the extreme SSTT portfolio, relative to the intermediate portfolios. Compared to the one-factor model, the three-factor model does produce the largest increases in R^2s in the extreme SSTT portfolios, but the R^2s of those portfolios remain the two lowest across the 10 portfolios.

Table 9 also shows the loadings on the momentum factor (UMD). Both the low and the high SSTT portfolios load negatively on UMD, and the loading of 0.08 for the zero-investment portfolio, while positive, is economically small. Finally, Table 9 includes results from adding the PINF factor, suggested by Easley, Hvidkjaer, and O'Hara (2005). PINF is based on an estimate of the probability that a given trade is motivated by private information (see Easley, Hvidkjaer, and O'Hara, 2002). Because small and large trades are likely

[11]Table 1 showed that the stocks in the extreme SSTT portfolios are somewhat smaller than those in the intermediate portfolios, which makes inference about the relative loadings more difficult. However, additional analysis using double sorts on size and SSTT shows that the U-shape is present in all size quintiles.

to have different information content, the profitability of SSTT could be related to PINF. In fact, both the low and the high SSTT portfolios have large negative loadings on PINF, while the intermediate portfolios tend to have low loadings. This is consistent with the observation in Table 1 that both the low and high SSTT portfolios have high levels of small-trade volume, which presumably is less informed than larger trades. Moreover, the loadings of the two portfolios are almost identical, leaving PINF unable to explain the returns to the zero-investment portfolio.

3.4. Are the portfolio strategies implementable?

Given the conditioning information, it would seem that a profitable trading strategy could have been implemented over the period studied, even when considering implementation costs. First, this paper has focused on monthly returns averaged over prior strategies, because of the well-known inference problems with long-term buy-and-hold strategies (see Fama, 1998). However, an actual implementation would allow investors to buy and hold up to three years, since the return differences persist up to three years. In other words, a low portfolio turnover is required. Secondly, as noted earlier, share turnover is high in the stocks in the extreme SSTT portfolios, suggesting that these stocks are relatively liquid. These factors would argue for relatively low implementation costs.

If the return difference is unattributable to risk differences and with no easily identifiable limits to arbitrage, then why do these returns persist? Of course, without the necessary conditioning information, it is not possible to construct the portfolio, and it appears that no single stock characteristic could serve as a useful proxy. For instance, the prior three-year return does not reliably predict future returns. As such, arbitrageurs might not have had access to the necessary conditioning information, at least early in the sample period before the transactions data became easily available. Even with the data widely available, arbitrageurs, as well as researchers, face the non-trivial task of constructing an accurate measure of retail investor trading behavior. Thus, there might simply be a period of learning involved.

4. Conclusion

The results in this paper shows that small-trade volume contains information about the cross-section of future stock returns. Concretely, stocks with a high level of sell-initiated small-trade volume, measured over the prior several months, outperform stocks with a high level of buy-initiated small-trade volume. The return difference is economically large and statistically significant up to three years in the future. In other words, stocks favored by retail investors tend to experience large and prolonged underperformance in the future, relative to stocks out of favor with retail investors. As such, the results link the systematic component of retail investor behavior to future returns, and suggest that such behavior can lead to over- or undervaluation of stocks, which take years to correct.

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Appendix A.
1993 Turnover by exchange

It is well-known that reported trading volume on Nasdaq is inflated relative to NYSE (and AMEX) due to the double-counting of trades in multiple dealer markets. Signed volume measures would be expected to be inflated by a similar amount. However, it is less obvious that small-trade volume would be inflated on Nasdaq to a similar degree. For instance, inter-dealer trading, which creates much of the double-counting, is presumably concentrated in larger trade sizes. Moreover, the specialist on NYSE is probably more likely to act as a dealer in smaller trades than in overall volume, in part because the specialist only acts a broker in the upstairs market for block-trades, which constitutes a large proportion of NYSE volume over the sample period. To assess whether small-trade volume is inflated on Nasdaq, I compared the relative volume of Nasdaq versus NYSE/AMEX in 1993, which is the first year Nasdaq trade data are available. In the table below, stocks were sorted into size deciles and then grouped by exchange. The table reports the average turnover and small-trade turnover for each group. The double-counting of volume is clear when comparing turnover based on all trades, with Nasdaq turnover being approximately twice as large as NYSE/AMEX turnover within all size deciles. However, when comparing small-trade turnover, no systematic difference across exchanges seems to exist.

	All (%)		Small-trade (%)	
Size	NYSE/AMEX	Nasdaq	NYSE/AMEX	Nasdaq
Small	32.7	48.3	4.07	1.90
2	38.2	72.1	3.45	2.90
3	33.1	77.5	3.73	3.38
4	49.0	98.4	3.71	3.48
5	50.1	110.0	4.11	3.10
6	57.5	116.4	3.68	3.40
7	61.3	122.1	2.93	2.81
8	61.4	138.3	2.80	3.27
9	64.5	103.6	2.88	3.43
Large	57.4	125.6	2.43	3.04

Table 1: Characteristics of SSTT portfolios

Portfolios are formed monthly based on prior six-month SSTT deciles ($J = 6$). All characteristics are value-weighted within each decile, and the table presents averages across formation dates. $ret_{-5:0}$ is the return during the six-month formation period. $ret_{-41:-6}$ is the prior three-year return. The six-month share turnover is ranked within NYSE/AMEX and Nasdaq separately, and the average rank of the stocks in each portfolio is reported. *Small-trade turnover* is the sum of the small-trade buy- and sell-initiated turnover. BM is the book-to-market ratio of equity. *Age* is the time since the first entry in the CRSP files. Changes in institutional holdings (Δ *inst. hold.*), as a percentage of shares outstanding, during the six-month formation period are computed every third month. The sample covers 1983–2004, and consists of all NYSE/AMEX and (beginning 1993) Nasdaq stocks with a price $\geq$ \$5.

	Low	2	3	4	5	6	7	8	9	High	Low-High	t(Low-High)
NYSE size rank (%)	69.41	79.51	84.80	86.75	87.14	86.79	85.30	82.65	79.29	72.10	−2.69	−1.95
Δ inst. hold. (%)	3.86	2.19	1.39	0.99	0.79	0.73	0.66	0.53	0.15	−0.78	4.64	8.91
$ret_{-5:0}$ (%)	19.11	13.37	11.21	11.04	10.28	9.73	10.82	10.58	12.91	16.52	2.59	0.89
$ret_{-41:-6}$ (%)	41.30	42.33	57.28	66.12	76.35	95.91	111.36	127.90	158.52	197.56	−156.3	−7.04
Rank turnover (%)	70.80	61.47	53.61	51.79	53.36	54.73	58.08	63.89	70.29	81.90	−11.10	−10.96
Small-trade turnover (%)	6.97	3.37	2.02	1.66	1.95	2.45	3.16	4.18	6.05	13.48	−6.51	−4.28
SSTT (%)	−0.76	−0.28	−0.14	−0.06	0.01	0.08	0.16	0.28	0.50	1.30	−2.05	−24.34
Price (\$)	28.70	37.72	47.35	86.27	75.95	112.92	54.73	45.91	40.56	32.61	−3.92	−2.13
BM	0.80	0.70	0.62	0.56	0.52	0.47	0.44	0.45	0.44	0.48	0.32	16.13
Age (years)	23.87	26.69	27.42	28.77	29.11	28.34	27.43	26.25	24.20	20.45	3.42	5.85
#stocks	313.41	314.19	314.29	314.29	314.27	314.79	314.77	314.61	314.71	314.23		

Table 2: Returns of SSTT portfolios

Deciles are formed monthly based on prior J-month SSTT. Stocks with low (high) SSTT are in decile 1 (10). The table presents the average monthly returns computed over holding periods K. For instance, $K = 1$–12 represents average monthly returns from months one to 12 after the portfolio formation, computed by averaging the current month's return of the strategies initiated over the prior 12 months. The difference in returns between the low and the high SSTT portfolios are also reported. Newey-West-adjusted t-statistics are in parentheses. The sample covers 1983–2004, and consists of all NYSE/AMEX and (beginning 1993) Nasdaq stocks with a price $\geq$ \$5.

		Value-weighted % returns, $K =$					Equal-weighted % returns, $K =$				
	Portfolio	1	2–7	1–12	13–24	25–36	1	2–7	1-12	13–24	25–36
$J = 1$	1	1.35	1.31	1.38	1.46	1.49	1.04	1.05	1.07	1.21	1.41
	2	1.34	1.33	1.38	1.32	1.38	1.14	1.25	1.26	1.27	1.36
	3 to 8	1.14	1.13	1.12	1.14	1.21	1.29	1.28	1.27	1.23	1.27
	9	1.07	1.12	1.09	1.12	1.32	1.26	1.06	1.08	1.04	1.23
	10	0.58	0.75	0.74	1.01	1.24	0.83	0.68	0.70	0.83	1.10
	$1-10$	0.78	0.57	0.64	0.45	0.25	0.20	0.37	0.36	0.37	0.31
		(2.82)	(3.35)	(3.95)	(3.07)	(1.37)	(1.09)	(3.42)	(3.84)	(5.06)	(3.14)
$J = 3$	1	1.39	1.39	1.45	1.53	1.50	1.08	1.08	1.14	1.30	1.47
	2	1.39	1.31	1.35	1.32	1.36	1.26	1.29	1.30	1.32	1.35
	3 to 8	1.10	1.10	1.11	1.16	1.22	1.28	1.24	1.25	1.26	1.28
	9	1.17	1.02	1.02	1.12	1.30	1.14	1.00	1.02	1.05	1.17
	10	0.51	0.70	0.73	1.03	1.26	0.58	0.57	0.60	0.82	1.09
	$1-10$	0.88	0.69	0.72	0.50	0.24	0.50	0.51	0.54	0.49	0.38
		(3.49)	(3.31)	(3.68)	(3.09)	(1.07)	(2.81)	(3.69)	(4.57)	(5.00)	(2.88)
$J = 6$	1	1.40	1.45	1.46	1.57	1.53	1.15	1.14	1.18	1.34	1.53
	2	1.27	1.37	1.35	1.31	1.29	1.19	1.30	1.29	1.39	1.33
	3 to 8	1.07	1.10	1.07	1.19	1.21	1.25	1.22	1.20	1.30	1.27
	9	1.10	1.00	0.98	1.16	1.26	1.06	0.97	0.93	1.09	1.17
	10	0.56	0.72	0.73	1.01	1.26	0.41	0.52	0.50	0.82	1.06
	$1-10$	0.84	0.73	0.73	0.56	0.27	0.74	0.62	0.68	0.52	0.47
		(3.27)	(3.20)	(3.41)	(3.14)	(1.06)	(4.27)	(3.82)	(4.97)	(4.20)	(2.97)
$J = 12$	1	1.54	1.59	1.57	1.53	1.45	1.27	1.35	1.33	1.42	1.43
	2	1.36	1.41	1.38	1.32	1.20	1.36	1.39	1.38	1.42	1.34
	3 to 8	1.09	1.10	1.10	1.18	1.20	1.28	1.26	1.25	1.30	1.26
	9	1.04	1.10	1.10	1.18	1.27	0.97	0.98	1.00	1.13	1.18
	10	0.68	0.87	0.81	0.93	1.21	0.53	0.63	0.58	0.82	1.04
	$1-10$	0.85	0.73	0.76	0.60	0.23	0.74	0.73	0.76	0.60	0.39
		(3.39)	(2.92)	(3.23)	(2.58)	(0.76)	(3.75)	(4.54)	(4.98)	(3.64)	(2.01)
$J = 24$	1	1.54	1.51	1.52	1.47	1.36	1.54	1.49	1.47	1.41	1.47
	2	1.41	1.42	1.33	1.17	1.24	1.55	1.50	1.48	1.33	1.29
	3 to 8	1.13	1.13	1.17	1.14	1.16	1.33	1.29	1.33	1.26	1.26
	9	1.11	1.09	1.12	1.17	1.35	1.13	1.07	1.09	1.07	1.19
	10	0.83	0.79	0.79	0.88	1.18	0.64	0.68	0.68	0.76	1.10
	$1-10$	0.71	0.72	0.73	0.59	0.18	0.90	0.82	0.79	0.65	0.37
		(2.80)	(2.83)	(2.94)	(1.83)	(0.47)	(4.90)	(5.21)	(4.96)	(3.41)	(1.43)

Table 3: Characteristics-adjusted returns of SSTT portfolios

Deciles are formed monthly based on prior J-month SSTT. Stocks with low (high) SSTT are in decile 1 (10). The table presents the average monthly characteristics-adjusted returns computed over holding periods K. For instance, $K = 1$–12 represents average monthly returns from months one to 12 after the portfolio formation, computed by averaging the current month's return of the strategies initiated over the prior 12 months. Returns are adjusted by subtracting the returns of a matched portfolio based on size, industry-adjusted BM ratios, and momentum quintiles from the monthly returns of each individual stock. The difference in returns between the low and the high SSTT portfolios are also reported, along with the Newey-West-adjusted t-statistics in parentheses. The sample covers 1983–2004, and consists of all NYSE/AMEX and (beginning 1993) Nasdaq stocks with a price $\geq$ \$5.

		Value-weighted % returns, $K =$					Equal-weighted % returns, $K =$				
	Portfolio	1	2–7	1–12	13–24	25–36	1	2–7	1-12	13–24	25–36
$J = 1$	1	0.17	0.12	0.20	0.22	0.10	−0.07	−0.04	−0.02	0.03	0.11
		(1.05)	(0.77)	(1.41)	(1.28)	(0.77)	(−0.64)	(−0.36)	(−0.21)	(0.22)	(1.11)
	2	0.13	0.14	0.17	0.07	0.06	−0.04	0.06	0.07	0.05	0.06
		(1.25)	(1.63)	(2.42)	(0.90)	(0.74)	(−0.74)	(1.48)	(2.00)	(1.47)	(2.06)
	9	−0.14	−0.06	−0.05	−0.01	0.05	0.08	−0.05	−0.04	−0.05	−0.00
		(−1.24)	(−1.02)	(−1.03)	(−0.16)	(0.68)	(1.19)	(−1.63)	(−1.50)	(−1.72)	(−0.07)
	10	−0.55	−0.30	−0.31	−0.11	−0.00	−0.40	−0.35	−0.33	−0.19	−0.12
		(−3.29)	(−1.99)	(−2.30)	(−0.79)	(−0.03)	(−3.08)	(−3.55)	(−3.45)	(−1.93)	(−1.10)
	1 − 10	0.72	0.41	0.51	0.32	0.11	0.33	0.31	0.31	0.21	0.24
		(3.52)	(2.77)	(3.88)	(2.46)	(0.74)	(2.65)	(3.36)	(4.61)	(2.90)	(3.13)
$J = 3$	1	0.20	0.21	0.26	0.26	0.11	−0.07	−0.01	0.02	0.07	0.16
		(1.24)	(1.36)	(1.75)	(1.65)	(0.91)	(−0.68)	(−0.11)	(0.23)	(0.56)	(1.61)
	2	0.24	0.09	0.12	0.07	0.05	0.08	0.09	0.09	0.07	0.06
		(2.16)	(0.94)	(1.29)	(0.77)	(0.62)	(1.28)	(2.33)	(2.24)	(1.96)	(2.10)
	9	−0.05	−0.11	−0.11	−0.06	0.02	0.03	−0.06	−0.06	−0.08	−0.07
		(−0.60)	(−1.75)	(−1.96)	(−0.73)	(0.16)	(0.58)	(−1.52)	(−1.73)	(−2.07)	(−1.39)
	10	−0.51	−0.30	−0.28	−0.10	0.02	−0.51	−0.40	−0.39	−0.22	−0.13
		(−2.69)	(−1.87)	(−1.96)	(−0.68)	(0.08)	(−4.14)	(−3.72)	(−3.75)	(−2.11)	(−1.02)
	1 − 10	0.71	0.51	0.55	0.36	0.10	0.44	0.39	0.41	0.29	0.29
		(3.51)	(3.05)	(3.62)	(2.60)	(0.61)	(3.62)	(3.77)	(5.07)	(3.39)	(3.25)
$J = 6$	1	0.15	0.25	0.27	0.28	0.17	−0.01	0.03	0.07	0.06	0.22
		(1.01)	(1.72)	(1.84)	(1.95)	(1.38)	(−0.07)	(0.33)	(0.69)	(0.50)	(2.15)
	2	0.09	0.14	0.15	0.05	0.01	0.02	0.10	0.10	0.09	0.04
		(0.92)	(1.29)	(1.59)	(0.52)	(0.12)	(0.44)	(2.32)	(2.30)	(2.67)	(1.13)
	9	−0.04	−0.13	−0.10	−0.04	0.02	0.01	−0.06	−0.08	−0.08	−0.05
		(−0.44)	(−1.98)	(−1.81)	(−0.50)	(0.18)	(0.15)	(−1.34)	(−2.18)	(−1.85)	(−1.02)
	10	−0.39	−0.30	−0.24	−0.13	0.02	−0.54	−0.43	−0.41	−0.25	−0.16
		(−2.28)	(−1.76)	(−1.60)	(−0.87)	(0.11)	(−4.37)	(−3.68)	(−3.79)	(−2.14)	(−1.23)
	1 − 10	0.54	0.54	0.51	0.41	0.15	0.53	0.47	0.49	0.31	0.38
		(2.83)	(3.05)	(3.20)	(3.07)	(0.80)	(4.51)	(4.37)	(5.48)	(3.35)	(3.64)

(Table 3 continued)

		Value-weighted % returns, $K =$					Equal-weighted % returns, $K =$				
	Portfolio	1	2–7	1–12	13–24	25–36	1	2–7	1-12	13–24	25–36
$J = 12$	1	0.24	0.29	0.31	0.25	0.13	0.01	0.12	0.11	0.12	0.15
		(1.74)	(1.97)	(1.99)	(1.92)	(1.17)	(0.14)	(1.04)	(0.96)	(1.12)	(1.46)
	2	0.20	0.14	0.15	0.06	−0.10	0.10	0.12	0.13	0.08	0.07
		(1.52)	(1.36)	(1.70)	(0.74)	(−1.13)	(1.94)	(3.02)	(3.42)	(2.27)	(1.48)
	9	−0.10	−0.06	−0.01	−0.02	0.08	−0.10	−0.11	−0.08	−0.06	−0.06
		(−1.02)	(−0.84)	(−0.18)	(−0.16)	(0.70)	(−1.65)	(−2.45)	(−2.07)	(−1.24)	(−0.74)
	10	−0.40	−0.19	−0.20	−0.15	0.01	−0.54	−0.36	−0.38	−0.27	−0.16
		(−2.30)	(−1.15)	(−1.30)	(−0.85)	(0.04)	(−3.93)	(−3.06)	(−3.33)	(−2.03)	(−1.10)
	$1 - 10$	0.64	0.48	0.51	0.40	0.12	0.55	0.48	0.49	0.40	0.31
		(3.27)	(2.44)	(2.78)	(2.33)	(0.52)	(4.35)	(4.17)	(4.50)	(3.58)	(2.39)
$J = 24$	1	0.14	0.20	0.18	0.22	0.10	0.10	0.15	0.13	0.15	0.19
		(1.03)	(1.54)	(1.46)	(1.87)	(0.86)	(0.98)	(1.45)	(1.22)	(1.53)	(2.05)
	2	0.22	0.17	0.09	−0.03	−0.05	0.19	0.18	0.14	0.08	0.00
		(1.62)	(1.55)	(0.94)	(−0.35)	(−0.41)	(3.75)	(3.44)	(3.13)	(1.81)	(0.03)
	9	−0.08	−0.09	−0.06	0.01	0.13	−0.07	−0.05	−0.07	−0.09	−0.03
		(−0.75)	(−0.92)	(−0.60)	(0.06)	(1.01)	(−1.13)	(−0.99)	(−1.64)	(−1.30)	(−0.30)
	10	−0.34	−0.26	−0.26	−0.13	−0.07	−0.44	−0.30	−0.33	−0.29	−0.14
		(−2.05)	(−1.51)	(−1.56)	(−0.61)	(−0.26)	(−3.28)	(−2.42)	(−2.69)	(−2.10)	(−0.80)
	$1 - 10$	0.48	0.45	0.44	0.35	0.17	0.54	0.45	0.46	0.45	0.34
		(2.52)	(2.41)	(2.55)	(1.47)	(0.59)	(4.39)	(4.16)	(4.35)	(3.65)	(1.86)

Table 4: Interaction with size

Quintiles are formed monthly based on NYSE size cut-off points. In panel A, deciles based on prior six-month SSTT ($J = 6$) are formed within each size quintile. In panel B, quintile based on prior six-month SSTT are formed independently. The table presents the average difference between the monthly returns of low and high SSTT portfolios using a six-month holding period in months 2–7. Four sets of return results are presented based on either value-weighting (*vw*) or equal-weighting (*vw*) individual stock returns in the portfolio, and based on either raw or adjusted returns. The return adjustment is performed by subtracting the returns of a matched portfolio based on size, industry-adjusted BM ratios, and momentum quintiles from the monthly returns of each individual stock. Newey-West-adjusted t-statistics are in parentheses. The average difference between the SSTT of the portfolios are also reported. The sample covers 1983–2004, and consists of all NYSE/AMEX and (beginning 1993) Nasdaq stocks with a price $\geq$ \$5.

Panel A: Sorts by size, then SSTT

	Small	2	3	4	Large
Return difference, %:					
vw, raw	0.51	0.78	0.68	0.58	0.42
	(2.81)	(3.15)	(2.93)	(2.03)	(1.45)
vw, adj	0.47	0.64	0.48	0.34	0.36
	(2.92)	(3.15)	(2.53)	(1.82)	(1.67)
ew, raw	0.30	0.78	0.73	0.56	0.51
	(1.91)	(3.25)	(3.17)	(2.06)	(1.78)
ew, adj	0.34	0.61	0.56	0.35	0.40
	(2.54)	(3.17)	(2.92)	(1.92)	(1.99)
SSTT difference, %:					
vw	−2.47	−2.48	−2.14	−1.90	−1.25
ew	−2.57	−2.48	−2.15	−1.89	−1.35

Panel B: Independent sorts by size and SSTT

	Small	2	3	4	Large
Return difference, %:					
vw, raw	0.44	0.50	0.42	0.54	0.49
	(3.09)	(2.99)	(2.83)	(3.11)	(1.97)
vw, adj	0.37	0.38	0.29	0.32	0.44
	(3.30)	(2.84)	(2.29)	(2.29)	(2.06)
ew, raw	0.28	0.50	0.47	0.53	0.47
	(2.05)	(3.05)	(3.14)	(3.18)	(2.21)
ew, adj	0.26	0.38	0.36	0.33	0.38
	(2.61)	(2.89)	(2.79)	(2.39)	(2.18)
SSTT difference, %:					
vw	−1.61	−1.59	−1.47	−1.38	−1.14
ew	−1.67	−1.60	−1.48	−1.38	−1.25

Table 5: Interaction with other firm characteristics

Quintiles are formed monthly based on a stock characteristic (as indicated in the panel headings), and within each characteristic-quintile, deciles are formed based on prior six-month SSTT ($J = 6$). The table presents the average difference between the monthly returns of low and high SSTT portfolios using a six-month holding period in months 2–7. Four sets of return results are presented based on either value-weighting (*vw*) or equal-weighting (*vw*) individual stock returns in the portfolio, and based on either raw or adjusted returns. The return adjustment is performed by subtracting the returns of a matched portfolio based on size, industry-adjusted BM ratios, and momentum quintiles from the monthly returns of each individual stock. Newey-West-adjusted t-statistics are in parentheses. The average difference between the SSTT of the portfolios are also reported. The sample covers 1983–2004, and consists of all NYSE/AMEX and (beginning 1993) Nasdaq stocks with a price $\geq$ \$5.

Panel A: Sorts by Book-to-market, then SSTT

	Growth	2	3	4	Value
Return difference, %:					
vw, raw	0.82	0.42	0.62	0.71	0.57
	(2.46)	(1.46)	(2.30)	(2.59)	(1.81)
vw, adj	0.60	0.28	0.53	0.58	0.51
	(1.92)	(1.04)	(2.28)	(2.42)	(1.99)
ew, raw	0.47	0.50	0.61	0.52	0.31
	(2.16)	(2.61)	(3.79)	(3.06)	(1.60)
ew, adj	0.38	0.47	0.63	0.50	0.27
	(1.90)	(2.76)	(3.95)	(3.20)	(1.57)
SSTT difference, %:					
vw	−2.34	−1.85	−1.80	−1.78	−2.21
ew	−2.65	−2.14	−2.00	−1.97	−2.44

Panel B: Sorts by $ret_{-5:0}$, then SSTT

	Losers	2	3	4	Winners
Return difference, %:					
vw, raw	0.70	0.63	0.61	0.59	0.43
	(2.45)	(2.81)	(2.77)	(2.65)	(1.27)
vw, adj	0.61	0.40	0.51	0.49	0.39
	(2.31)	(2.03)	(2.81)	(2.66)	(1.26)
ew, raw	0.62	0.56	0.60	0.71	0.58
	(2.79)	(3.71)	(4.22)	(5.39)	(2.48)
ew, adj	0.48	0.41	0.41	0.54	0.46
	(2.48)	(3.16)	(3.76)	(4.87)	(2.28)
SSTT difference, %:					
vw	−2.61	−1.68	−1.55	−1.67	−2.79
ew	−2.69	−1.80	−1.68	−1.84	−3.26

Panel C: Sorts by $ret_{-41:-6}$, then SSTT

	Losers	2	3	4	Winners
Return difference, %:					
vw, raw	0.78	0.75	0.76	−0.05	0.48
	(2.61)	(3.10)	(3.39)	(−0.22)	(1.60)
vw, adj	0.67	0.56	0.60	−0.08	0.38
	(2.60)	(2.56)	(2.93)	(−0.44)	(1.41)
ew, raw	0.77	0.58	0.52	0.32	0.66
	(4.06)	(3.77)	(3.78)	(2.31)	(3.40)
ew, adj	0.66	0.46	0.33	0.14	0.44
	(3.74)	(3.46)	(2.90)	(1.18)	(2.67)
SSTT difference, %:					
vw	−2.87	−1.82	−1.53	−1.50	−2.11
ew	−3.13	−1.98	−1.72	−1.71	−2.30

Panel D: Sorts by exchange-ranked turnover, then SSTT

	Low	2	3	4	High
Return difference, %:					
vw, raw	0.05	0.18	0.61	0.63	1.19
	(0.28)	(0.87)	(2.30)	(2.43)	(3.98)
vw, adj	−0.03	0.23	0.45	0.41	1.13
	(−0.16)	(1.26)	(2.04)	(1.54)	(3.93)
ew, raw	−0.12	0.25	0.44	0.41	0.81
	(−0.89)	(1.88)	(3.08)	(2.25)	(3.32)
ew, adj	−0.06	0.28	0.32	0.24	0.72
	(−0.43)	(2.41)	(2.35)	(1.32)	(3.20)
SSTT difference, %:					
vw	−0.74	−1.18	−1.56	−2.04	−3.64
ew	−0.81	−1.32	−1.75	−2.30	−4.18

Table 6: Returns of SSTT portfolios: NYSE/AMEX only

Deciles are formed monthly in 1983–2004 from all NYSE/AMEX stocks (with a price of at least \$5) based on prior six-month SSTT ($J = 6$). Stocks with low (high) SSTT are in decile 1 (10). The table presents the average monthly returns computed over holding periods K. Four sets of return results are presented based on either value-weighting (*vw*) or equal-weighting (*vw*) individual stock returns in the portfolio, and based on either raw or adjusted returns. The return adjustment is performed by subtracting the returns of a matched portfolio based on size, industry-adjusted BM ratios, and momentum quintiles from the monthly returns of each individual stock. Newey-West-adjusted t-statistics are in parentheses.

	Value-weighted % returns, $K =$					Equal-weighted % returns, $K =$				
Portfolio	1	2–7	1–12	13–24	25–36	1	2–7	1-12	13–24	25–36
Raw returns:										
1	1.20	1.32	1.30	1.36	1.40	1.20	1.17	1.17	1.19	1.31
2	1.08	1.26	1.23	1.35	1.16	1.10	1.26	1.21	1.25	1.19
3 to 8	1.10	1.12	1.10	1.19	1.20	1.21	1.19	1.17	1.24	1.18
9	1.17	1.13	1.11	1.11	1.15	1.13	1.07	1.02	1.04	1.04
10	0.67	0.86	0.88	1.02	1.08	0.54	0.60	0.59	0.79	0.95
1 − 10	0.53	0.46	0.42	0.34	0.33	0.66	0.58	0.58	0.40	0.36
	(2.40)	(2.01)	(2.05)	(1.83)	(1.49)	(4.20)	(3.71)	(4.10)	(2.98)	(2.55)
Characteristics-adjusted returns:										
1	0.10	0.15	0.14	0.07	0.14	0.02	−0.00	−0.00	−0.09	0.06
	(1.07)	(1.36)	(1.48)	(0.66)	(1.52)	(0.24)	(−0.02)	(−0.03)	(−1.29)	(0.76)
2	−0.02	0.08	0.06	0.09	−0.07	−0.07	0.03	0.00	−0.03	−0.04
	(−0.25)	(0.89)	(0.80)	(1.33)	(−0.84)	(−0.92)	(0.52)	(0.03)	(−0.46)	(−0.60)
9	0.01	−0.10	−0.10	−0.17	−0.09	0.03	−0.06	−0.09	−0.18	−0.17
	(0.06)	(−1.33)	(−1.43)	(−2.10)	(−0.99)	(0.33)	(−0.82)	(−1.35)	(−2.78)	(−2.83)
10	−0.44	−0.32	−0.28	−0.21	−0.20	−0.48	−0.46	−0.44	−0.35	−0.27
	(−3.20)	(−2.45)	(−2.43)	(−1.80)	(−1.67)	(−4.81)	(−4.97)	(−5.08)	(−3.78)	(−3.10)
1 − 10	0.54	0.47	0.42	0.28	0.34	0.50	0.46	0.44	0.26	0.32
	(3.11)	(2.52)	(2.62)	(1.67)	(2.15)	(4.14)	(4.04)	(4.20)	(2.32)	(3.15)

Table 7: Returns of SSTT portfolios: Subperiods

Deciles are formed monthly in 1983–1993 (Panel A) and 1994–2004 (Panel B) from all NYSE/AMEX and (beginning 1993) Nasdaq stocks based on prior six-month SSTT ($J = 6$). Stocks with low (high) SSTT are in decile 1 (10). The table presents the average monthly returns computed over holding periods K. Four sets of return results are presented based on either value-weighting (*vw*) or equal-weighting (*vw*) individual stock returns in the portfolio, and based on either raw or adjusted returns. The return adjustment is performed by subtracting the returns of a matched portfolio based on size, industry-adjusted BM ratios, and momentum quintiles from the monthly returns of each individual stock. Newey-West-adjusted t-statistics are in parentheses.

	Value-weighted % returns, $K =$					Equal-weighted % returns, $K =$				
Portfolio	1	2–7	1–12	13–24	25–36	1	2–7	1–12	13–24	25–36
Panel A: 1983–1993:										
Raw returns:										
1	1.27	1.42	1.36	1.58	1.52	1.06	1.02	1.03	1.09	1.33
2	1.42	1.51	1.48	1.49	1.22	1.08	1.20	1.15	1.25	1.11
3 to 8	1.20	1.22	1.18	1.33	1.24	1.20	1.18	1.14	1.27	1.14
9	1.17	1.11	1.09	1.27	1.23	1.06	1.02	0.95	1.06	0.97
10	0.66	0.76	0.79	1.05	1.01	0.32	0.47	0.46	0.74	0.84
1 − 10	0.61	0.67	0.57	0.53	0.51	0.74	0.55	0.57	0.35	0.49
	(2.37)	(2.50)	(2.55)	(3.10)	(3.06)	(3.47)	(2.83)	(3.36)	(2.17)	(2.84)
Characteristics-adjusted returns:										
1	0.05	0.15	0.13	0.20	0.27	0.00	−0.02	0.02	−0.05	0.26
	(0.34)	(0.93)	(0.92)	(1.69)	(2.51)	(0.05)	(−0.19)	(0.21)	(−0.55)	(2.56)
2	0.17	0.19	0.18	0.10	−0.05	−0.00	0.09	0.06	0.07	0.04
	(1.29)	(1.72)	(1.91)	(1.03)	(−0.49)	(−0.02)	(1.30)	(1.06)	(1.31)	(0.76)
9	−0.01	−0.08	−0.06	−0.06	−0.01	0.02	−0.02	−0.05	−0.08	−0.14
	(−0.10)	(−0.88)	(−0.93)	(−0.86)	(−0.09)	(0.22)	(−0.33)	(−1.03)	(−1.37)	(−2.21)
10	−0.38	−0.34	−0.31	−0.23	−0.22	−0.57	−0.48	−0.47	−0.30	−0.25
	(−2.90)	(−2.48)	(−2.86)	(−2.39)	(−1.87)	(−4.82)	(−4.09)	(−4.43)	(−2.56)	(−2.14)
1 − 10	0.43	0.49	0.44	0.43	0.49	0.57	0.47	0.48	0.26	0.51
	(1.94)	(2.16)	(2.35)	(2.85)	(3.50)	(3.31)	(3.04)	(3.62)	(1.72)	(3.24)

(Table 7 continued)

	Value-weighted % returns, $K =$					Equal-weighted % returns, $K =$				
Portfolio	1	2–7	1–12	13–24	25–36	1	2–7	1–12	13–24	25–36
Panel B: 1994–2004:										
Raw returns:										
1	1.52	1.48	1.55	1.57	1.54	1.24	1.26	1.33	1.56	1.68
2	1.11	1.24	1.23	1.15	1.35	1.28	1.40	1.42	1.50	1.49
3 to 8	0.95	0.99	0.98	1.07	1.19	1.29	1.27	1.27	1.33	1.37
9	1.02	0.90	0.89	1.07	1.28	1.05	0.92	0.91	1.12	1.34
10	0.47	0.69	0.67	0.98	1.45	0.49	0.57	0.54	0.89	1.22
1 − 10	1.05	0.79	0.88	0.59	0.09	0.75	0.69	0.79	0.67	0.46
	(2.43)	(2.16)	(2.46)	(1.97)	(0.21)	(2.74)	(2.68)	(3.72)	(3.75)	(1.85)
Characteristics-adjusted returns:										
1	0.24	0.34	0.40	0.35	0.10	−0.02	0.08	0.13	0.15	0.19
	(0.97)	(1.45)	(1.61)	(1.42)	(0.49)	(−0.10)	(0.44)	(0.66)	(0.73)	(1.17)
2	0.02	0.10	0.13	0.00	0.06	0.04	0.12	0.14	0.10	0.04
	(0.13)	(0.55)	(0.76)	(0.01)	(0.44)	(0.71)	(1.99)	(2.13)	(2.75)	(0.83)
9	−0.07	−0.18	−0.14	−0.02	0.04	0.00	−0.09	−0.11	−0.08	0.01
	(−0.48)	(−1.91)	(−1.57)	(−0.17)	(0.24)	(0.01)	(−1.54)	(−2.00)	(−1.29)	(0.11)
10	−0.41	−0.26	−0.18	−0.05	0.21	−0.52	−0.38	−0.36	−0.20	−0.09
	(−1.30)	(−0.86)	(−0.64)	(−0.18)	(0.60)	(−2.41)	(−1.92)	(−1.93)	(−1.06)	(−0.42)
1 − 10	0.65	0.60	0.58	0.40	−0.11	0.50	0.46	0.49	0.35	0.28
	(2.11)	(2.19)	(2.26)	(1.86)	(−0.37)	(3.09)	(3.12)	(4.14)	(3.20)	(2.05)

Table 8: Fama-MacBeth regressions

Cross-sectional regressions are performed each month in 1983–2004 using the sample of all NYSE/AMEX and (beginning 1993) Nasdaq stocks with a price above \$5. The explanatory variables are standardized each month by the cross-sectional mean and standard deviation. SSTT is measured over the prior six-months. $ret_{-5:0}$ is the prior six-month return, and $ret_{-41:-6}$ is the three-year return before the six-month period. The dependent variable is the percentage stock return K months ahead. The table contains the average coefficient estimates with the corresponding t-statistics in parentheses.

	$K =$					
	1	2	13	25	37	49
log(BM)	0.23	0.21	0.15	0.07	0.03	−0.04
	(2.83)	(2.77)	(1.66)	(0.75)	(0.30)	(−0.37)
log(size)	0.04	0.02	0.07	0.05	0.04	−0.01
	(0.49)	(0.32)	(0.88)	(0.51)	(0.42)	(−0.08)
$ret_{-5:0}$	0.09	0.26	−0.14	−0.21	−0.12	−0.03
	(0.70)	(2.28)	(−1.67)	(−2.96)	(−1.71)	(−0.51)
$ret_{-41:-6}$	0.06	0.05	0.03	0.03	−0.01	−0.09
	(0.84)	(0.79)	(0.42)	(0.51)	(−0.28)	(−1.76)
SSTT	−0.18	−0.15	−0.10	−0.12	−0.08	0.00
	(−4.34)	(−3.87)	(−2.80)	(−3.12)	(−1.83)	(0.04)

Table 9: Time-series regressions

Deciles are formed monthly based on prior six-month SSTT ($J = 6$), and value-weighted portfolio returns are computed using a six-month holding period. The table presents selected statistics from regressing the portfolio returns on the Fama-French factors: market excess return (r_m), small stock returns minus large stock returns (SMB), high book-to-market stock returns minus low book-to-market stock returns (HML), past 1-year winner stock returns minus past loser stock returns (UMD). In addition, regressions are performed including PINF, which is the difference between the monthly returns of a high and a low PIN portfolio, where PIN is a measure of the probability of information-based trading in a stock. The estimation of PIN and the PINF portfolio construction are detailed in Easley, Hvidkjaer, and O'Hara (2005). The sample covers 1983–2004, and consists of all NYSE/AMEX and (beginning 1993) Nasdaq stocks with a price $\geq$ \$5, except the regressions with PINF, for which data are available only in 1984–2002. T-statistics are in parentheses.

	Low	2	3	4	5	6	7	8	9	High	Low-High
Market factor:											
α	0.32	0.32	0.20	0.13	0.18	0.08	0.11	0.02	−0.16	−0.65	0.97
	(1.70)	(2.71)	(2.34)	(1.59)	(1.98)	(0.81)	(1.22)	(0.24)	(−1.49)	(−2.80)	(4.87)
β_{r_m}	1.13	1.00	0.93	0.86	0.87	0.93	1.00	1.09	1.18	1.52	−0.38
	(27.39)	(38.49)	(48.86)	(45.71)	(42.51)	(43.86)	(50.24)	(54.80)	(49.03)	(29.27)	(−8.66)
Adj. R^2	0.75	0.85	0.90	0.89	0.88	0.88	0.91	0.92	0.90	0.77	0.23
Fama-French 3-factor:											
α	0.34	0.25	0.09	0.01	0.03	−0.04	0.09	0.03	−0.04	−0.32	0.66
	(2.12)	(2.14)	(1.16)	(0.09)	(0.45)	(−0.43)	(1.07)	(0.34)	(−0.41)	(−1.68)	(3.53)
β_{r_m}	1.07	1.03	0.99	0.94	0.97	1.01	1.03	1.09	1.11	1.29	−0.22
	(26.78)	(35.26)	(48.30)	(53.53)	(50.57)	(48.22)	(47.98)	(48.07)	(42.14)	(26.65)	(−4.63)
β_{SMB}	0.49	0.16	−0.03	−0.12	−0.12	−0.15	−0.16	−0.08	0.05	0.38	0.11
	(9.77)	(4.43)	(−1.05)	(−5.49)	(−4.97)	(−5.57)	(−5.86)	(−2.92)	(1.38)	(6.25)	(1.89)
β_{HML}	0.02	0.13	0.16	0.18	0.22	0.16	0.01	−0.02	−0.18	−0.47	0.49
	(0.41)	(2.90)	(5.24)	(7.02)	(7.62)	(5.10)	(0.29)	(−0.72)	(−4.56)	(−6.47)	(7.01)
Adj. R^2	0.82	0.86	0.92	0.93	0.92	0.91	0.92	0.92	0.91	0.85	0.35
Fama-French 3-factor + UMD:											
β_{UMD}	−0.18	−0.10	−0.03	−0.00	−0.03	−0.12	−0.08	−0.11	−0.07	−0.26	0.08
	(−5.32)	(−3.88)	(−1.66)	(−0.03)	(−1.95)	(−6.95)	(−4.55)	(−5.94)	(−3.28)	(−6.64)	(2.03)
Fama-French 3-factor + PINF:											
β_{PIN}	−0.70	−0.51	−0.15	0.00	0.03	−0.06	−0.01	−0.13	−0.10	−0.68	−0.02
	(−6.00)	(−6.13)	(−2.43)	(0.05)	(0.45)	(−1.00)	(−0.08)	(−1.91)	(−1.22)	(−4.74)	(−0.15)

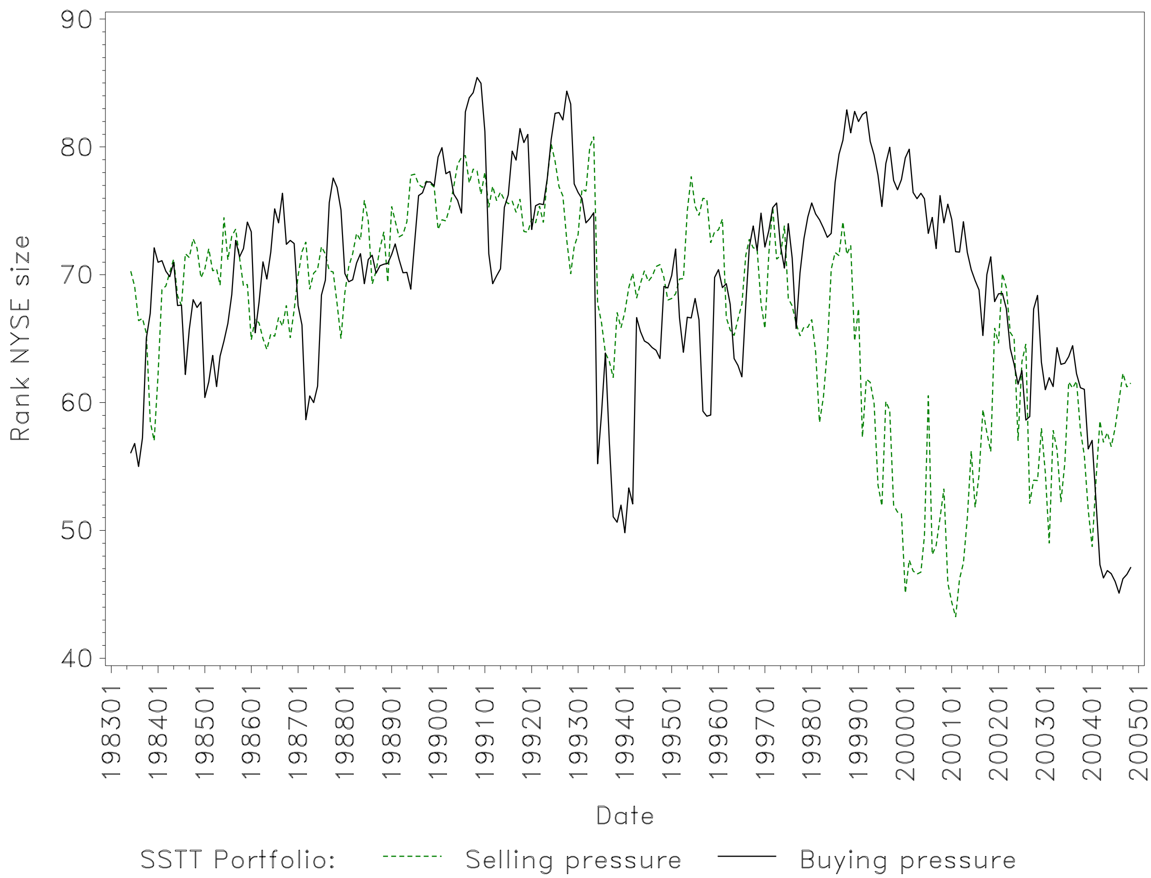

Figure 1: NYSE size ranks of SSTT portfolios

Deciles are formed monthly in 1983–2004 based on past six-month SSTT. The figure contains the monthly value-weighted mean of the size ranks for the stocks in the low and high SSTT portfolio. Ranks are in percentages and computed based on NYSE cut-off points.

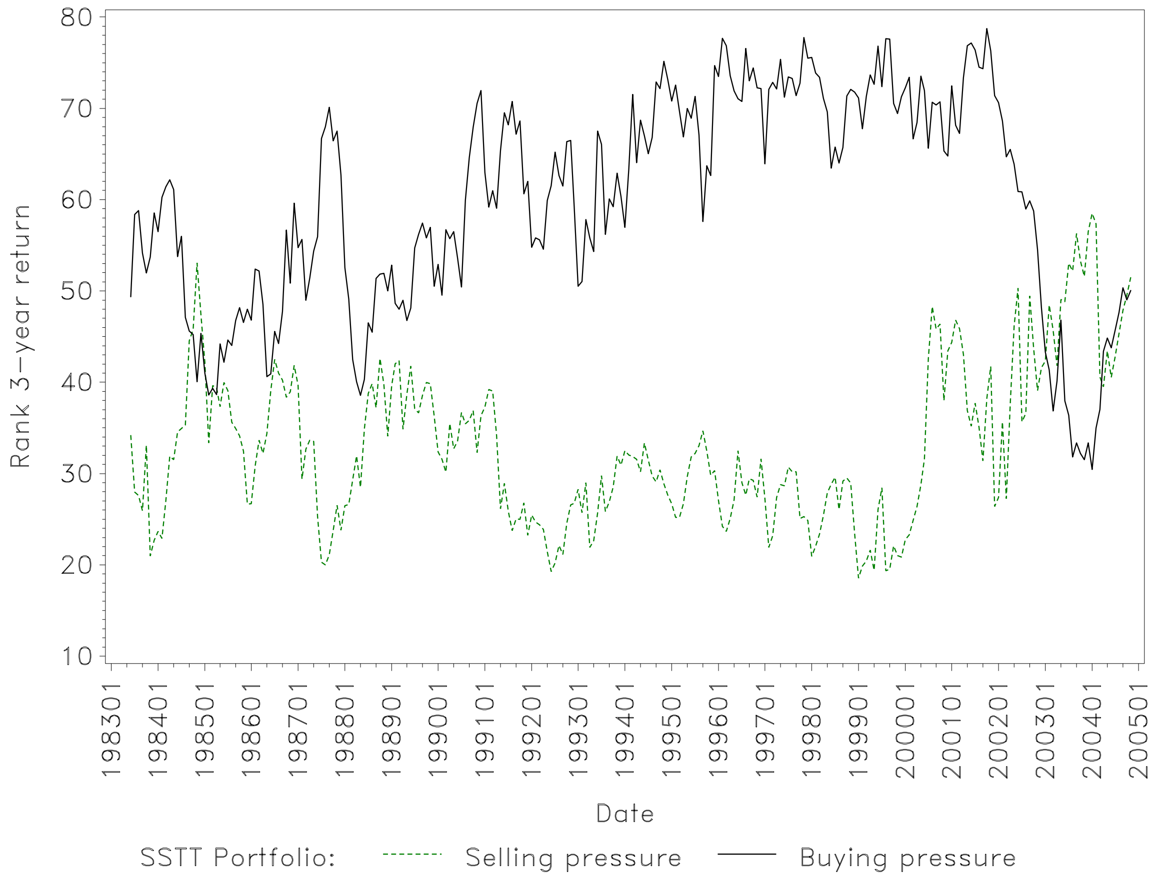

Figure 2: 3-year past return rank of SSTT portfolios

Deciles are formed monthly in 1983–2004 based on past six-month SSTT. Also, all stocks are ranked each month based on $ret_{-41:-6}$, the three-year return prior the six-month period. The figure contains the monthly value-weighted mean of the ranks for the stocks in the low and high SSTT portfolio. Ranks are in percentages, such that 100 represents the stock with the highest three-year return.

Figure 3: Rank Δ of institutional holding of SSTT portfolios

Deciles are formed every third month in 1983–2004 based on past six-month SSTT. Also, the change in institutional holdings over the six-month period is computed as the change in the number of shares held by institutions divided by the number of shares outstanding. Then, within NYSE size quintiles, stocks are ranked each month based on the institutional holdings change. The figure contains the monthly value-weighted mean of the ranks for the stocks in the low and high SSTT portfolio. Ranks are in percentages, such that 100 represents the stock with the highest increase in institutional holding.

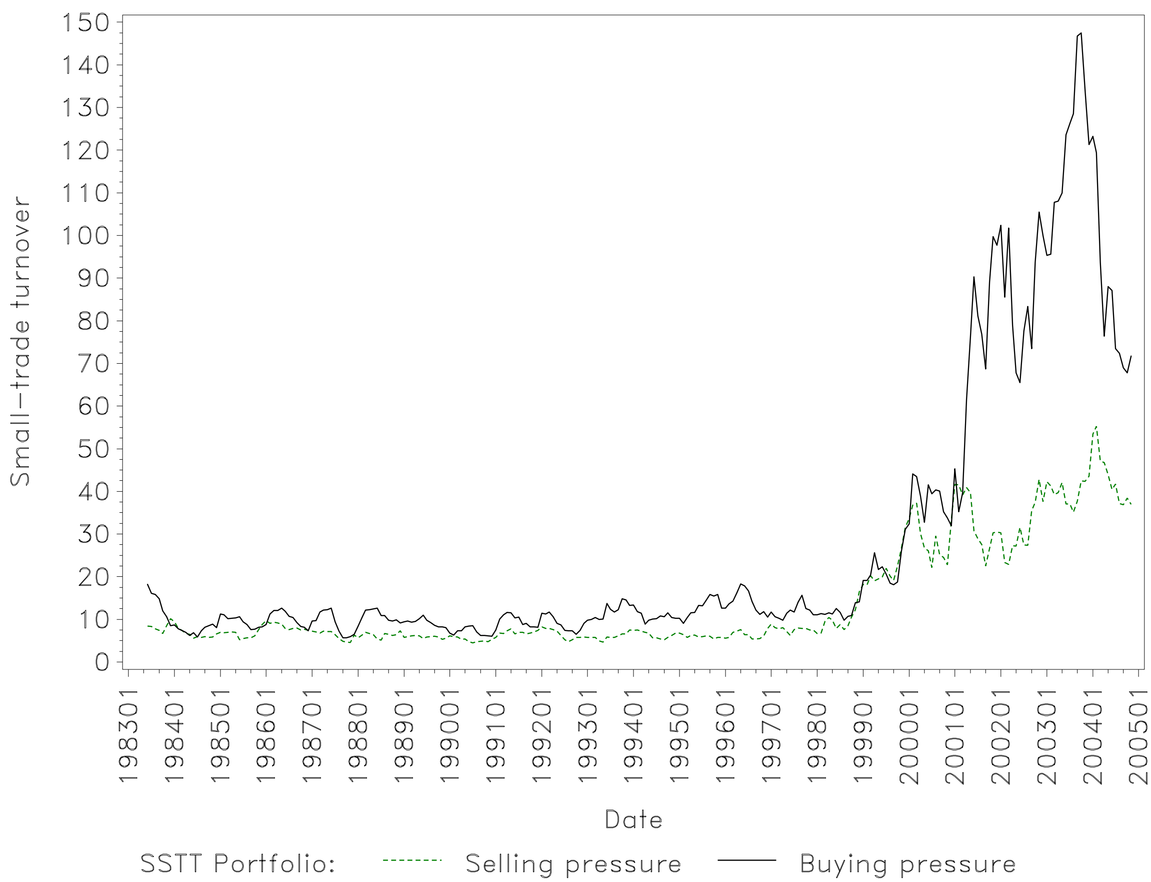

Figure 4: Small-trade turnover in SSTT portfolios

Deciles are formed monthly in 1983–2004 based on past six-month SSTT. Also, the annualized percentage small-trade turnover over the six-month period is computed for each stock. The figure contains the monthly value-weighted mean of the small-trade turnover for the stocks in the low and high SSTT portfolio.

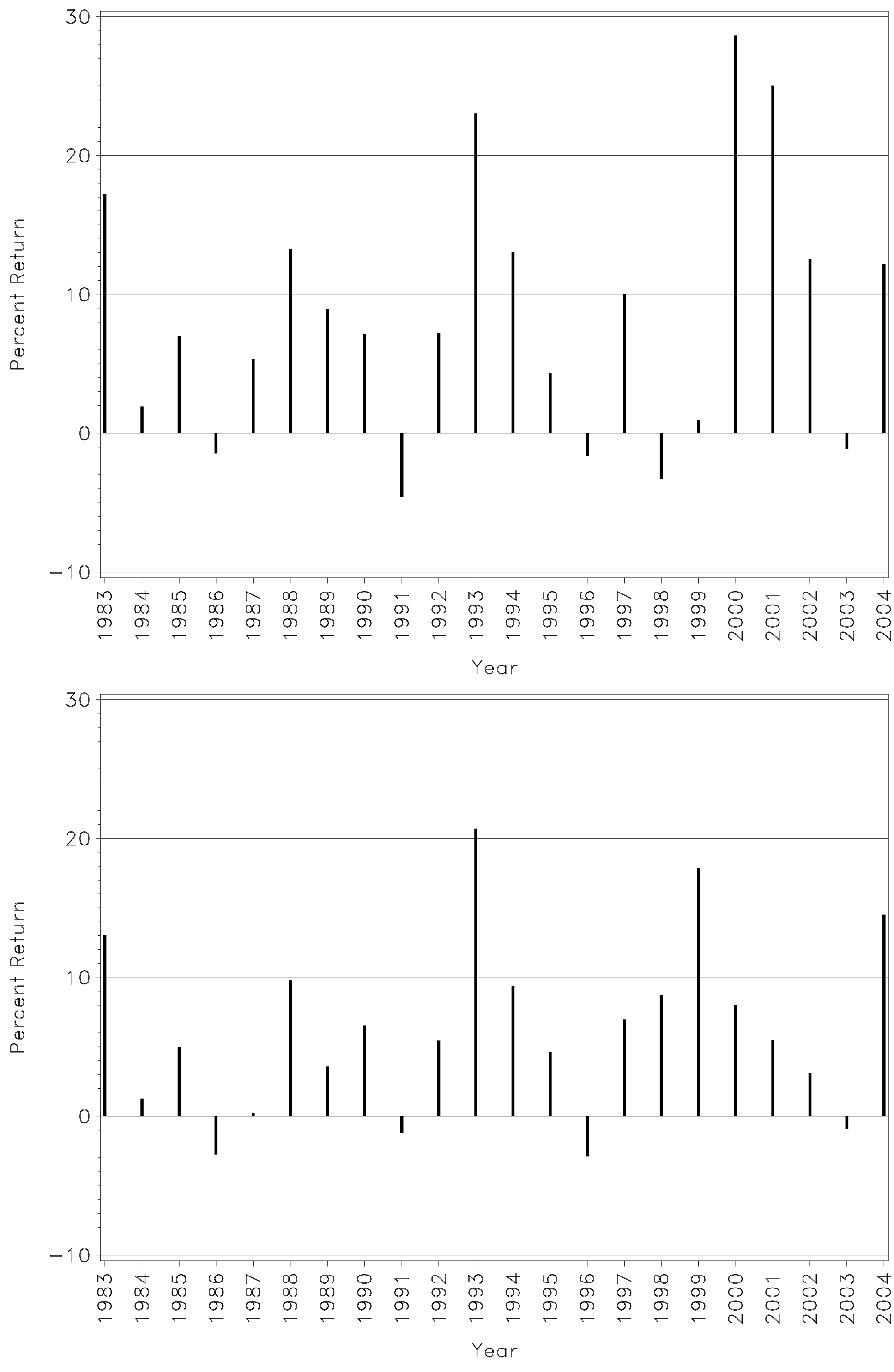

Figure 5: Yearly returns

Deciles are formed monthly in 1983–2004 based on past six-month SSTT. The figures present the yearly difference between the returns of low and high SSTT portfolios using a six-month holding period in months 2–7. The first formation month is July 1983, so that year only contains the returns from the last five months. The top panel presents the difference in the raw returns, and the bottom panel presents the difference in the characteristics-adjusted returns (based on size, BM, and momentum).