Trade Size Clusters and the Relation to Momentum Returns

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Abstract

This paper uses trade clusters, centered around 100-share (and increments of 100 shares), 500-share, and 1000-share categories, to analyze the relationship between trade size clusters and the cross-section of future stock returns across momentum portfolios. We find that winner-loser momentum portfolios that have a high concentration of 500 or 1000-share trade size clusters earn an alpha of 0.78% per month which is almost double the performance of the momentum strategy not predicated on these trade size clusters. The performance of the 500 and 1000-share trade size clusters is not matched by any other trade size clusters. This ability of the 500 and 1000-share trade clusters in better predicting momentum returns persists regardless of the decimalization in stock quotes and is more resilient to momentum crashes that plague the conventional momentum strategy. We also find that the 500 and 1000-share trades tend to be concentrated in firms with high idiosyncratic volatility, which suggests that they are more likely persistent noise trades.

Keywords: Trade size, Intra-Day trades, Returns
Caveats: Do not distribute, cite, or circulate to any parties

1 Introduction

Jegadeesh and Titman's (1993) seminal article documents a momentum effect where stocks with good (bad) recent performance continue to outperform (underperform) for up to a one-year horizon. A vast literature has emerged relating momentum profits to a behavioral perspective [1] that lends itself to focusing on the impact of small, retail trades on momentum profits (Hvidkjaer, 2006), relying on the importance of noise trading (Long, Shleifer, Summers, and Waldmann, 1990) in markets. But little attention has been focused on whether large trades, and, in particular, large trade size clusters, are associated with noise trading within the momentum anomaly. The momentum anomaly provides the ideal basis for examining the implications of noise trading because only prior returns are necessary to implement the strategy. This paper investigates a relatively unexplored area of whether noise trading induced trade size clusters interact with past momentum returns in the prediction of future returns. Trade size and stock returns are jointly determined by theory, yet trade size is invariably treated separately from returns.

We find that investors trading in 500 or 1000-share clusters trade in a manner consistent with the momentum strategy with greatly enhanced momentum performance, while investors trading round-lots or non-clustered trades exhibit a contrarian trading behavior with reduced momentum performance. Consistent with a noise trading argument (Long et al., 1990) as a source for abnormal profits, we document that 500 and 1000-share trade size clusters are positively associated with idiosyncratic volatility, while 100-share trade size clusters are negatively associated with idiosyncratic volatility. The importance of the 500 and 1000-share noise trading clusters is exemplified in that they do not evidence a seasonality in momentum returns (Jegadeesh and Titman, 1993), they continue to earn significant momentum profits even when the base momentum strategy crashes

[1] Momentum returns are higher for stocks that are small and have low analyst coverage (Hong, Lim, and Stein, 2000), high analyst forecast dispersion (Zhang, 2006; Verardo, 2009), low return (Hou, Xiong, and Peng, 2006), and high market-to-book and for the momentum strategy, where we find that portfolios exhibiting a high concentration of 100-share trades underperform relative to the base momentum strategy while portfolios that are dominated by 500 and 1000-share trade clusters significantly outperform the base momentum strategy. We further find that portfolios dominated by 500 a ratios (Daniel and Titman, 1999). Lee and Swaminathan (2000) find an interaction between momentum and share turnover and suggest that turnover provides information on the extent to which investor sentiment favors a stock at a particular point in time. Since these characteristics are commonly used to proxy for information uncertainty and limits to arbitrage, these findings are often interpreted as evidence in support of behavioral explanations of momentum.

(Daniel and Moskowitz, 2013), and consistently earns abnormal profits among NYSE/Amex listed stocks wherein the base momentum strategy is largely insignificant. These results persist regardless of how the momentum portfolios are formed or when we form the trade size portfolios.

We examine trade size clusters, rather than a continuous measure of trade size, because Barclay and Warner (1993); Hasbrouck (1995); Chakravarty (2001) document that specific "medium" sized trades have the most cumulative price impact which they interpret as having more value relevant information. This is further exemplified by Alexander and Peterson (2007) who note investor clienteles that cluster at 100, 500 and 1000-shares per trade with 500 and 1000-share size trades exhibiting higher execution costs than 100-share trades. Given the differential price impact of 100, 500, and 1000-share trade clusters, it is an empirical question whether 500 and 1000-share size trade clusters, as opposed to one round-lot and non-clustered trades, better predict momentum returns.

Existing studies on trade size are often predicated on inferring trade direction [2] to allow inferences to be drawn from the order imbalance (Lee, 1992; Battalio and Mendenhall, 2005; Hvidkjaer, 2006) or by using trade volume to identify different investor clienteles in the market (Lee and Swaminathan, 2000), in conjunction with earnings or momentum tests. However, inferring trade direction is exceptionally difficult in the period after the decimalization of stock quotes because of the proliferation of quotes that makes relating the trade price to the relevant quote or the National Best-Bid and Offer (hereafter, NBBO) reference quote [3] challenging. Additionally, the evidence is mixed on the usefulness of this classification in predicting future returns. Our approach is decidedly different in that we do not require the bid and ask quotes to play a role in our measure of trade size making our trade size measure easily estimable in both the pre and post-decimalization [4] periods, nor do we attach any significance to dollar volume.

[2] Kaniel, Saar, and Titman (2008) employ a similar procedure in obtaining a net individual investor trading by subtracting the value of the shares sold by individuals from the value of shares bought and standardized by the average daily dollar volume yielding a Net Individual Trading measure.

[3] This is extensively studied by Holden and Jacobsen (2014) who find that severe distortions in the quote can occur when using the more common monthly quote file on the Trade and Quote (hereafter, TAQ) database. They argue that using the daily TAQ can lead to very different empirical outcomes from the research using the monthly TAQ. However, they also note the difficulty in using the daily TAQ file whereby millions of quotes are noted on a daily basis making the identification of the NBBO difficult and its association to the price file impractical in large time-series datasets.

[4] It should be noted that Battalio and Mendenhall (2005) only study NASDAQ firms from 1993 through 1996 and Hvidkjaer (2006, 2008) restricts his sample to the period before the decimalization of stock quotes in 2001.

Long et al. (1990) formalize the role of noise traders in financial markets. They show that noise traders can create mispricing and excess volatility if the trading horizon of risk-averse arbitrageurs is short. However, there is an ongoing debate regarding whether noise traders can survive in the long-run and continue to affect asset prices (Kogan, Ross, Wang, and Westerfield, 2006, 2009). While much of the literature is focused on the relation of small trades [5] and potential noise trading, we argue that large trades clustered at 500 and 1000-shares exhibits noise trading characteristics, is persistent in its predictive power, and better predicts momentum returns than other non-clustered trades or round-lot trades.

The conventional wisdom is that focusing on segments [6] of investor trading is useful in predicting future returns. We further rely on the findings of Alexander and Peterson (2007) who note that trades cluster at 100, 500, and 1000-shares. We sum all 100-share, 500-share, and 1000-share trades [7] for each firm and day over the month and then divide by the total number of trades each day. This daily ratio is then averaged over the month for each firm to determine an average daily trade size cluster. We next sort portfolios into past winner and loser momentum portfolios and then within each momentum portfolio we further sort on each trade size cluster. Conditional on momentum, we perform sort tests spanning the period 1983 to 2012 using raw returns and characteristic-adjusted returns (Daniel, Grinblatt, Titman, and Wermers, 1997; Wermers, 2003) to show the differential predictability of future returns for the large trade size and small trade size cluster portfolios.

Illustrating the differential return behavior of the separate trade size clusters, we show that the hedged portfolios *dominated* by 500 or 1000-share trades yields a significant characteristic-adjusted return of 0.78% per month, significantly outperforming the base momentum strategy that earns 0.45% per month, while portfolios *avoided* by the 500 and 1000-share trades earn an

[5] Lee (1992) and Battalio and Mendenhall (2005) note the importance of small trades in predicting future returns in a post-earnings drift environment. Hvidkjaer (2006) argues large traders show no evidence of underreaction and large trade imbalances have little impact on subsequent returns, concluding that the results suggest that momentum could partly be driven by the behavior of small traders.

[6] There is long-standing empirical evidence of systematic trading behavior among various investor groups. For instance, small and large investors respond differently to exogenous information events such as earnings releases (Lee, 1992), seasoned equity offerings (Huh and Subrahmanyam, 2005), and analyst recommendations (Malmendier and Shanthikumar, 2014).

[7] We also analyze trade size increments between 100 and 500 shares, and between 500 and 1000 shares, between 1000 and 5000, and 5000-share trades. Our results point to only two trade size categories, namely 500-share and 1000-share trade sizes, that are associated with significant improvements in momentum profits.

average characteristic-adjusted return of only 0.20% per month, significantly under performing the base momentum strategy. The hedged portfolios that are *avoided* by 100-share (and other non-clustered) traders earns an abnormal monthly return of 0.61% outperforming the base momentum strategy by approximately 50%.

These results are robust to decile or tercile portfolios or whether we focus on NYSE/Amex or NASDAQ firms separately. We further find that large trade size portfolios formed *before* the momentum portfolio formation period also better predict future returns than does the base momentum strategy mitigating concerns about endogeneity bias (or feedback effects) on our results.

We find that 500 and 1000-share traders act strategically before and after the decimalization[8] in stock quotes. Before decimalization, 500 and 1000-share traders concentrate on smaller market capitalization firms, but after decimalization these large traders tend to concentrate on larger market capitalization firms. Surprisingly, the returns predicated on large trade size clusters persist in the post-decimalization period when the bid-ask spread declines precipitously. Interestingly, Frazzini, Israel, and Moskowitz (2013) show that actual institutional trading costs are less than a tenth as large as the quote bid-ask spread, and therefore the potential profitability of these trade cluster-based strategies is more than an double that suggested using the bid-ask spread as the relevant cost of trade.

The results also show that these two trade cluster portfolios maintain pricing ability that is remarkably consistent over specific time periods when the base momentum strategy crashes. We are able to show that the 500-share trade clusters experience a characteristic-adjusted six-month return of 0.75% per month from 2001 to 2010, while the base momentum strategy earns an insignificant 0.30% per month. This level of return is remarkably consistent with that earned in the 1983 to 2000 period. We also find that portfolios dominated by 500-share, and to a lesser extent 1000-

[8]The NYSE Fact book reports statistics showing average trade sizes falling dramatically after stock decimalization. The average trade size in 1999 for NYSE-listed firms was 1,205 shares per trade. After decimalization in 2004, the average trade size was significantly reduced to just over 390 shares per trade. In 2010, the average trade size had dwindled to 220 shares per trade and in 2014 the average trade size was approximately 140 shares per trade. The post-decimalization period also affected volume measures as investors significantly increased trade volume in reflection of reduced trading costs. We find that turnover (Lee and Swaminathan, 2000) fails to predict future returns after the decimalization of stock quotes in 2001: a period that coincides with momentum crashes noted by Daniel and Moskowitz (2013) leading to robustness issues with volume as a viable predictor of momentum profits.

share, portfolios are more resilient to the seasonality of momentum returns outlined by Jegadeesh and Titman (1993). Portfolios dominated by 500-share trades experience the same risk-adjusted momentum return in January as they do from February to December.

We advance the notion that 500 and 1000-share trade portfolios evidence noise trading characteristics with distinct behavioral biases, a domain which previously been dedicated to small, retail traders. Overall, our results could be construed as supportive of the conservatism bias as argued by Barberis, Shleifer, and Vishny (1998) or the self-attribution bias proposed by Daniel, Hirshleifer, and Subrahmanyam (1998). Barberis et al. (1998) discuss how a "conservatism bias" might lead investors to underreact to information, giving rise to momentum profits. The conservatism bias suggests that investors tend to underweight new information when they update their priors. If investors act in this way, prices will slowly adjust to information, but once the information is fully incorporated in prices there is no further predictability about stock returns. Conversely, Daniel et al. (1998) propose a "self-attribution" bias that is consistent with price momentum and return reversals. Daniel et al. (1998) argue that investors observe positive signals about a set of stocks, some of which perform well after the signal is received. Because of their cognitive biases, the investors attribute the performance of ex-post winners to their stock selection skills and that of the ex-post losers to bad luck. As a result, these investors become overconfident about their ability to pick winners and thereby overestimate the precision of their signals for these stocks. Based on their increased confidence in their signals, they push up the prices of the winners above their fundamental values. The delayed overreaction in this model leads to momentum profits that are eventually reversed as prices revert to their fundamentals.

Our evidence confirms that portfolios concentrating on trades clustered at 500 shares are more consistent with a self-attribution bias in that they "break" after one year, but trades clustered at 1000 shares show evidence of a conservatism bias whereby these traders drive the price to its intrinsic value over a six-month period with no evidence of a "break" in the returns subsequent to this period. Given that these two trade size clusters account for more than 45% of all large trades, the results appear to point to a distinct set of behavioral biases for traders engaged in each trade size cluster. A cause for concern for the behavioral perspective is that the 500 and 1000-share trade

cluster returns exceed the underlying bid-ask spread violating the limits to arbitrage constraint. This is most in evidence during the period after decimalization where liquidity cost are known to have fallen dramatically. Taken as a whole, the evidence is not fully consistent with any particular behavioral perspective, and given that the strategy earns an after-transaction cost return, the limits to arbitrage may not be as binding a constraint as the behavioral perspective would require.

This study is important for the following reasons. We extend the line of research into trade size, but in a very different direction. By obviating the necessity of identifying trade direction and focusing on unidirectional trade size, we show that an easily estimable trade size portfolio can enhance the profitability of momentum based trading strategies. Rather than focusing on trade imbalances that are institutionally based (Kaniel, Liu, Saar, and Titman, 2012) or utilizing intraday dollar-volume based small trades (Lee, 1992), we would contend that large trade cluster portfolios are related to a vast array of anomalies (Hou, Xue, and Zhang, 2015), Novy-Marx and Velikov (2016). We also show that noise trading is in evidence in trade size, but our emphasis on large trade clusters is decidedly different than the prior literatures focus on the importance on small trades or a related focus on retail trades.

The paper is organized as follows. Section 2 outlines the estimation of the trade size portfolios and the various control variables. Section 3 presents the double sorts of momentum and trade size deciles and terciles, Fama-French factor tests to identify the sources of the momentum profits for each trade size cluster, Fama-Macbeth predictive return regression tests, and tests for trade size cluster determinants. We also examine seasonality in momentum profits with trade size clusters. Section 4 presents results for the pre and post-decimalization in stock quotes that are known to have a large influence on trade size. Section 5 presents robustness checks on our results using trade size deciles in the sort tests and splits the results into NYSE/Amex and NASDAQ listed firms. We also control for endogeneity and feedback in our trade size results by using trade size portfolios formed before the formation of the momentum portfolios. Section 6 concludes.

2 Trade Size and Firm Attribute Controls

The sample includes all ordinary common stocks listed on the NYSE and the American Stock Exchange (AMEX) in the period January 1983 through December 2012. Transactions data on NASDAQ stocks became available in January 1987, hence those stocks are included in the sample from that time on. Real estate investment trusts, 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. We employ characteristic-adjusted returns as developed by Daniel et al. (1997) and Wermers (2003). [9]

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 trades for stocks listed on NYSE/AMEX from 1983 to 1992 and on NASDAQ from 1987 to 1992, while TAQ covers 1993 to present for all exchanges. Trades with irregular terms are excluded and trades are run through a simple price-based error filter to exclude likely erroneous prices. We only focus on the trades database for both ISSM and TAQ negating the need to match the trade with the prevailing quote due to our focus on trade size. We do utilize the quote database to calculate the bid-ask spread applicable to the closing price to estimate the costs of implementing the trade.

The trade size ratios are the sum of intraday 100-share, 500-share, and 1000-share trades over a month divided by the total number of trades that month to derive monthly firm-level ratios within each trade size category. We also analyze trade size increments between 100 and 500 shares, and between 500 and 1000 shares, between 1000 and 5000, 5000-share trades, and greater than 5000 share trades.

To be included in our sample we require a stock to have available information on past returns, trading volume, market capitalization, and stock price. Turnover is calculated as the monthly trading volume divided by the number of shares outstanding at the beginning of the month.

At the beginning of each month, from January 1983 to December 2010 we sort stocks by past

[9] Russ Wermer's website: http://www.smith.umd.edu/faculty/rwermers/ftpsite/Dgtw/coverpage.htm contains the characteristic-adjusted returns.

returns and past trade size. The stocks are assigned to one of three portfolios based on past returns over the previous J months, where J ranges from one to 12-months, and one of ten portfolios based on each of our three trade size measures. We focus our attention on the monthly returns of extreme winner and loser tercile momentum portfolios over the next K months, where K equals 6 and 12. We also examine K=13 to 24 months after the portfolio formation period and this is replicated for various momentum quintiles and trade size terciles. In all of these tests, we skip the month immediately after the portfolio formation period to avoid any microstructure issues in our K performance periods. Consequently, we use the (J,1,K) nomenclature when describing the separate formation and performance periods.

Similar to Jegadeesh and Titman (1993), the monthly return for the K-month holding period is based on an equally-weighted average of portfolio returns from strategies implemented in the current month and the previous K-1 months. Thus, the monthly return for a six month holding period, averages the portfolio returns from this month's strategy, and then from the prior five months, all on an equally-weighted basis. This allows for a distribution to determine significance for monthly returns.

Finally, we delete all stocks with a price less than $5 and greater than $1,000 during the last month of the portfolio formation period. The $5 price threshold that we impose on our firms mitigates any microstructure issues or regulatory concerns due to price that may impede investability by institutions.

3 Initial Trade Size Predictive Sort Results

We discuss the empirical results for trade size-based momentum strategies. In Section 3.1, we present our three trade size ratios across each momentum portfolio and illustrate the association with respect to price and market capitalization. In Section 3.2, we introduce trade size-based price momentum portfolios, where trade size and momentum are broken down into deciles and terciles, respectively. We then examine the predictive power of trade size over six-months, one-year, and from one-to-two years from the momentum formation period. Section 3.3 examines the sources of

the momentum profits for the price momentum trade size portfolios from a Fama-French factor perspective. Here, we attempt to identify the factor loadings that are associated with each trade size portfolio as well as to confirm our characteristic-adjusted return results. Section 3.6 examines seasonality and price momentum

3.1 Price Momentum Summary

Table 1 summarizes results from several price momentum portfolio strategies. We present decile and tercile portfolio assignments for the momentum portfolios with these shown in Panels A and B, respectively. Each month, stocks are ranked and grouped into decile (Panel A) or tercile (Panel B) portfolios on the basis of their returns over the previous three, six, nine, and 12 months. We report results for the extreme decile portfolio of losers (R1) and winners (R10), and one intermediate portfolio (R5). For brevity we do not present the remaining portfolios, but the results are consistent with both Jegadeesh and Titman (1993) and Lee and Swaminathan (2000).

For each portfolio, Panel A of Table 1 reports decile momentum portfolios with associated mean returns, the monthly average of the 100-share, 500-share, and 1000-share trade size portfolios. We also present the median size decile of the portfolio based on NYSE/AMEX cutoffs (SzRnk), and the stock price at the end of the portfolio formation period (Price). At the portfolio formation date, stocks in the winner portfolio are larger and have higher price than stocks in the loser portfolio, although firms in either of these portfolios are smaller and of lower price than those of the intermediate portfolio. For instance, J=6 formation period's R1 price is \$13.99 and the R10 price is \$33.42. The lower price registered for the R1 portfolio coincides with negative return, shown as -7.20% per month, earned by the loser portfolio, while the higher price given for the R10 portfolio is consistent with the positive return, shown as 10.57% per month, earned by the winner portfolio.

However, trade size exhibits some dispersion between the extreme and intermediate momentum portfolios. The extreme momentum portfolios exhibit higher percentages of 500-share and 1000-share trades than are noted for the intermediate portfolios. As shown for J=6, approximately 12%

of all trades are for exactly 1000-shares in the extreme momentum R1 and R10 portfolios, compared to 9% for the intermediate portfolios. Similar evidence, although more muted, is shown for the 500-share trades. This differentiation between the extreme momentum portfolios does not extend to the 100-share trades. For small trade sizes, it appears that they are more concentrated in the intermediate portfolios than the extreme R1 or R10 portfolios. For example, the J=6 formation period shows that approximately 34% of all trades are for exactly 100 shares for the intermediate portfolio and 32% for the extreme momentum portfolios. Overall, it appears that larger trades are more prevalent in the extreme momentum portfolios than are smaller trades.

Turning to the average monthly returns where we report the return followed by its t-statistic in parentheses. These results are segregated by four separate holdings period, i.e., K= 3, 6, 9, and 12 months. In unreported results, we show that consistent with prior research that the return breaks after one-year. The extreme momentum portfolios earn highly significant abnormal returns across the spectrum of holdings periods, although the levels are reduced from that reported by Lee and Swaminathan (2000). Regardless, the returns earned by momentum portfolios are robust to the 1983 to 2010 time period and they are economically significant. The J=6 formation period appears to produce the most consistent momentum returns as evidenced by the increased abnormal performance across the four holdings periods relative to the remaining formation periods. For this reason our subsequent tests will focus only on the J=6 formation period.

Panel B of Table 1, reporting momentum terciles, shows similar although less differentiated results across the momentum portfolios than is evident in the decile splits of Panel A. However, the quantitative nature of price, firm size, and trade size appear robust to this split of the momentum portfolios.

3.2 Trade Size Based Price Momentum

We first sort the portfolios at the beginning of each month based on their returns over the past J= 6 months, divide them into three portfolios spanning losers (L) and winners (W), and then sort the firms within each of the three momentum portfolios into deciles by the trade size categories.

We measure trade size as of the last month prior to the performance period. We report the trade size decile as well as the number of firms compromising that portfolio. We also report the average price, firms size, bid-ask spread, and price impact measure. We complete the table by reporting the monthly holding returns for month 1-6, 1-12, and then from months 13-24. For each of these holding periods, the characteristic adjusted returns are reported based on firm size, book-to-market, and momentum. For comparison, the base momentum strategy in addition to our trade size portfolios is also displayed.

Our initial sort results use a filter [10] that eliminates any overlapping firms in the extreme 100-share, 500-share, and 1000-share trade size cluster portfolios for the winner and loser momentum portfolios. This occurs when a firm is assigned to the lowest (or highest) decile for the 100-share trade size portfolio and simultaneously assigned to the highest (or lowest) decile for the 500 and/or 1000-share trade size portfolio(s). Having the same firm in either portfolio may cloud the inferences as to the return predictability specific to each trade size cluster. The resulting samples are unbalanced and necessarily have a smaller number of firms in the 100-share portfolios than are evident in the 500 or 1000-share portfolios.

For each of these tables, Panel 1 shows the clustered trade size portfolios that contain the 100-share trade size ratio, the 500-share trade size ratio, and the 1000-share trade size ratio. Panel 2 shows the non-clustered trade size portfolios greater than 500 shares and Panel 3 shows the non-clustered trade size portfolio for trades less than 500 shares but greater than 100 shares. Within each trade size category, decile 1 represents the lowest trade size ratio, while decile 10 represents the highest trade size ratio. We will term the return earned by a hedged momentum portfolio as W-L, and the return earned by that hedged momentum portfolio for each trade size decile as W-L (Decile 10) or W-L (Decile 1) to reflect either the highest or lowest trade size ratio portfolios, respectively.

As shown in Panel A of Table 2, across the 1983 to 2010 time period, the momentum portfolio earns a 0.53% return that is matched by a 0.45% characteristic-adjusted return for a six month

[10] We obtain substantively similar results for the sample without any filter on overlapping firms in the extreme deciles. For this sample we have 105 firms per decile across each trade size cluster decile.

holding period. The return declines to 0.40% and the characteristic-adjusted return declines to 0.26% over a one-year period. A break in the return is observed in months 13-24. The bid-ask spreads and the price impact measures are all lower for the winner than for the loser portfolios, although they do eclipse the returns across each of the winner-loser portfolios.

In Panel B of Table 2, the 100-share trade size portfolios show some stylized facts. First, decile 10 trade size portfolios are composed of smaller firms than are decile 1 trade size portfolios, but regardless of the smaller size, decile 10 trade size portfolios (i.e. more dominated by 100-share trade sizes) are more liquid, with both lower bid-ask spreads and lower price impact costs being registered, than are the shown by decile 1 trade size portfolios. This supports the conventional wisdom that small traders are liquidity providers for the market and this is shown despite the inverse relation with firm size.

Turning to returns, we see that conditional on past returns, portfolios dominated by a large percentage of 100-share trades earn higher returns than do portfolios dominated by low percentages of 100-share trades. This is seen for the K=1-6 period where the winner (W) trade size decile 10 portfolio earns 1.47% and the loser (L) trade size decile 10 portfolio earns 0.97% with the winner-loser portfolio (W-L) earning 0.51%. The relatively large return for the loser portfolio appears to indicate that 100-share traders are bidding up the value of loser firms, exactly opposite to a momentum strategy.

The portfolios that experience much smaller concentrations of 100-share trades, shown by decile 1 results, indicate the winner trade size decile 1 portfolio earns 1.25% and the loser decile 1 trade size portfolio earns 0.56%, with the W-L portfolio earning 0.69% per month. Momentum returns are more in evidence for stocks that are avoided by 100-share traders, rather than stocks that have concentrated 100-share trades.

Across both the Decile 1 and Decile 10 results, Panel B of Table 2 shows that the characteristic-adjusted returns are substantially less than the unadjusted returns, but the winner-loser (W-L) portfolios are generally of the same level and of the same significance. This is seen in the W-L (Decile 10) characteristic-adjusted return portfolio earning 0.44% per month and the W-L (Decile

1) portfolio earning 0.61% per month.

Overall segregating by small trades produces no return improvement when compared to the base momentum strategy. This is shown by the W-L (Decile 10) - W-L (Base) and the W-L (Decile 1) - W-L (Base) where we report statistics to directly compare profits earned in excess of the base momentum strategy. As is shown, none of the 100 trade size portfolios earn a return in excess of the base momentum strategy with the W-L (Decile 10 - Base) portfolio returning -0.03% per month and the W-L (Decile 1 - Base) returning a slightly positive premium of 0.16% per month. These results closely match those of based on the characteristic-adjusted returns. None of these return differences are statistically significant.

Turning to the 500-share trade size portfolios for the K=1-6 month period, shown in Panel C of Table 2, we see that the momentum winner decile 10 portfolio earns 1.47% per month, while the momentum loser decile 10 portfolio earns 0.66%. Larger traders appear to better predict those loser stocks that will be bid down in the future as well as predict those winner stocks that will increase in value. This effect is noted nicely in the characteristic-adjusted returns whereby the winner decile 10 portfolio earns a significant 0.27% return, while the loser decile 10 portfolio earns a significant -0.50% return. Portfolios dominated by 500-share traders do indeed earn a return in excess of risk and it should be noted that both the long side and the short side of the trade are significant in the relation to momentum returns. These decile 10 portfolios are coincident with lower levels of price impact costs than are experienced by decile 1 portfolios. The decreased level of price impact costs is consistent with more noise trading.

Portfolios that are most concentrated (decile 10) in 500-share trades also show better subsequent return performance than do portfolios that are less concentrated (decile 1) in 500-share trades. This is noted in the W-L Decile 10 return that is shown as 0.81% per month with a highly significant characteristic-adjusted return of 0.78% per month, while the W-L Decile 1 return is only 0.17% per month with an insignificant characteristic-adjusted return of 0.11%. Comparing these returns to the base momentum strategy, we clearly see that portfolios dominated by 500-share trade clusters produce a significant return improvement. This is shown by the W-L (Decile 10 - Base) and the W-L (Decile 1 - Base) where we report statistics to directly compare profits earned in excess of the

base momentum strategy. As is shown, the decile 10 portfolios earn a 0.28% return (characteristic-adjusted return of 0.33%) more than the base momentum strategy, while the portfolio avoided by 500-share traders, decile 1, earns a -0.36% return (characteristic-adjusted return of -0.33%) less than the base momentum strategy. The evidence suggests that conditional on past returns, portfolios that are dominated by 500-share traders earn a far higher level of risk-adjusted (and raw) return than is earned by those portfolios avoided by these traders.

In addition, the portfolios dominated by 500-share trades see persistence in the abnormal returns for up to one-year after the formation period. As shown in Panel C of Table 2, over one-year the W-L decile 10 portfolio return is 0.57% (characteristic return of 0.45%) per month, and this portfolio earns a significant 0.16% (characteristic return of 0.19%) per month return in excess of the base momentum strategy as shown by the W-L (decile 10 - Base) strategy. The persistence in the return "breaks" in month 13-24 yielding an insignificant negative return. This return pattern is more consistent with the self-attribution bias of Daniel et al. (1998) in that the 500-share traders are driving the price past its equilibrium level with negative return reaction ("break") after one year.

The one-year W-L decile 1 portfolios yield monthly returns of only 0.21% (characteristic-adjusted returns of 0.11%), which significantly underperforms relative to the base momentum strategy, given by W-L (Decile 1 - Base) as -0.19% per month (characteristic-adjusted return of -0.15%).

Examining the 1000-share trades with results, shown in Panel D of Table 2, it is noted that the 1000-share trade dominated portfolios (i.e. decile 10) are slanted toward much larger firms than the 500-share trade size portfolios. This is also met with a vastly reduced trading cost, compared to the 500-share trade size portfolios, as evidenced by either the bid-ask spread or the price impact measure. But, as is shown, the returns and characteristic-adjusted results are substantively similar to those obtained by focusing only on 500-share trades. Over the first six months, the W-L Decile 10 portfolios earn returns of 0.79% per month with characteristic-adjusted returns of 0.74% per month. Comparing these returns to the base momentum strategy, the W-L (Decile 10- Base) earns a 0.26% return in excess of the base momentum strategy, while the W-L (Decile 1 - Base) portfolio earns -0.15% per month less than the base momentum strategy. The characteristic-adjusted returns report

virtually identical findings. Extending the analysis to the first twelve months, shows a significant return of continuation with returns of 0.63% (characteristic-adjusted returns of 0.37%) per month. Interestingly, the return over months 13-24 is slightly negative, but it demonstrates no break in the return sequence. Portfolios dominated by 1000-share trades appear to drive returns to their intrinsic value with no further return predictability. This is most consistent with the conservatism bias expounded upon by Barberis et al. (1998).

This is reinforced by a comparison to the base momentum strategy where we see no significant improvement in holding the 1000-share portfolios over twelve months. The W-L (Decile 10 - Base) returns are 0.13% per month (characteristic-adjusted returns of 0.11%) in excess of the base momentum strategy up to twelve months are 0.11% per month. The decile 1 performance over the base momentum strategy is also insignificant.

In sum, the results indicate momentum returns over the 12 months subsequent to the portfolio formation are more pronounced for portfolios that are favored by 500 and 1000-share traders than for 100-share traders. We find that portfolios dominated by 500 or 1000-share traders earn abnormal returns that are nearly double that earned by the base momentum strategy. This out-performance does not extend to the 100-share trade size portfolios.

We now examine the performance of the non-clustered large and small trade portfolios which are shown in Panels 2 and 3 of Table 2, respectively. For all the non-clustered large trade portfolios, shown in Panels E through G, we see that enhanced momentum performance is observed for the decile 1 portfolios rather than the decile 10 portfolios. For instance, for trade sizes between 500 shares and 1000 shares, shown in Panel E, we see six-month W-L decile 10 portfolio characteristic-adjusted returns of 0.21%, but the decile 1 characteristic-adjusted returns of 0.48%. However, none of these portfolios out-performs the base momentum return as shown by either the W-L (Decile 10 - Base) or the W-L (Decile 1 - Base) returns. These results indicate that focusing on non-clustered trades greater than 500 shares yields no significant enhancement in return predictability.

Exemplifying the importance of the 500-share trade categories on the large trade portfolio, we see that the portfolio that combines all large trades into one portfolio, shown in Panel H of Table 2,

shows returns quite similar to the 500-share portfolio, but with greatly reduced liquidity costs. While this portfolio reduces return predictability, it does support the importance of the 500 and 1000-share trade sizes in return predictability.

Finally, Panel 3 of Table 2 reports non-clustered small trade portfolios, comprised of trades greater than 100 but less then 500 shares. As is shown, there is little return predictability over that contained in the base winner-loser momentum portfolios. None of the W-L (Decile 10 or 1) portfolios are significantly different from the base momentum strategy.

3.3 Fama-French Regressions with Price Momentum and Trade Size Based Portfolios

Table 3 provides additional evidence on the source of abnormal returns for the various price momentum-trade size strategies. In this table, we report the results from time-series regressions based on the Fama and French (1993) three-factor model where we run the following time-series regression using monthly portfolio returns:

$$r_i - r_f = a_i + b_i(r_m - r_f) + s_i SMB + h_i HML + \epsilon_i$$

where $r_m - r_f$ is the excess return on the one-month value-weighted return on the market, HML is the high-minus-low book-to-market (value) factor, and SMB is the small-minus-big size factor. The term a_i represents the abnormal performance for each portfolio. All returns and market return are stated on a percentage basis. The coefficients, b_i, s_i, and h_i are the corresponding factor loadings and they are stated on a percentage basis. We report the portfolio formation and holding periods for the J = 6, K = 6 frequency. We skip one-month after the J = 6 portfolio formation period and separate our findings with respect to the portfolios that concentrate on trade size = 100 shares (Panel A), trade size = 500 shares (Panel B), and trade size = 1000 shares (Panel C). The subsequent results only focus on the 500-share and the 1000-share large trade portfolios because the prior results showed significance for only these two trade sizes. We retain the 100-share portfolio because it is the largest (by number of trades) trade size in the market as well as to provide a

comparison to the large trade size portfolio results. Within each of these categories, we present the lowest decile (D1), the middle decile (D5), and highest decile (D10) trade size ratios. For each trade size portfolio, we first present the estimated intercept coefficient followed by the estimated coefficients for b_i, s_i, and h_i, respectively. We also report the goodness-of-fit with the adjusted-R^2 for each regression. The estimated intercept coefficients from these regressions (a_i) are the risk-adjusted return of the portfolio relative to the three-factor model.

As is shown in Table 3, the abnormal performance measures embodied in the intercept estimates confirm that our prior results are not dependent on the use of characteristic-adjusted returns and they cannot be explained by the standard Fama-French factors. For the 100-share trade size category, shown in Panel A, we note that while the winner-loser portfolios are all positive and significant for each of the trade size deciles, there is no differential in abnormal returns between deciles 10 and 1. This is seen more clearly by the W-L D10 - D1 portfolio that shows an aggregate momentum return [11] earned by investing across the high and low deciles of 100-share trades to be -0.01%. This alludes to the fact that sorting on the 100-share trade size does not yield any abnormal returns over and above the base momentum strategy. This reinforces our average return and characteristic-adjusted return results that shows that small trades do little to differentiate performance in momentum portfolios.

The loadings on the SMB factor show that across all the momentum portfolios, the D10 portfolios are more slanted to small stocks than are the D1 portfolios. The loadings on the HML factor show no differential between value/glamor except for the winner momentum portfolio where we see a clear value stock preference for the D1 portfolio.

These results are in marked departure from those of the larger trade size clusters. As shown in Panels B and C, we now find significant dispersion in abnormal performance across the decile 1 and decile 10 trade size portfolios for the winner-loser (W-L) momentum strategy. In Panel B, the 500-trade share portfolio based W-L decile 10 portfolio yields abnormal returns of 0.91% while the decile 1 portfolio yields abnormal returns of 0.24% per month, respectively, with a significant return differential of 0.67% per month. Substantively similar results are found for the 1000-share

[11] By observation, it is apparent that the base monthly momentum returns are approximately 0.75%.

trade size portfolio. As shown in Panel C, the 1000-share based W-L decile 10 portfolio yields abnormal returns of 0.92% while the decile 1 portfolio yields abnormal returns of 0.45% per month, respectively, with a significant return differential of 0.47% per month.

The SMB loadings for the 500 and 1000-share trade portfolios, shown in Panels B and C, demonstrate the the D10 deciles are more concentrated in smaller firms across the winner-Loser momentum portfolios than are the D1 decile portfolios. Given that most of the abnormal returns from the momentum strategy accrue to the D10 decile, it appears that the 500 and 1000-share traders are concentrating on somewhat smaller firms to derive larger abnormal profits. It is surprising that even the 1000-share trades, shown in Panel C, are also concentrating on smaller firms. The distinction in firm size across the D10 and D1 trade size deciles is made evident by the monotonic trend across the trade size deciles that exhibits robust significance for the decile 10 - decile 1 portfolios, but with no significance across the winner - loser portfolios. The results indicate that decile 10 portfolios, or those portfolios dominated by large trades, earn more of the improvement in performance as noted by the abnormal returns do so by focusing on smaller firms.

Turning now to the HML loadings, we see for both the 500-share and 1000-share trade size portfolios that the D1 portfolio is more weighted to value firms than is the D10 portfolio. In essence, the decile 1 portfolios are comprised of more value stocks, or ones with higher book-to-market valuations. Conversely, the decile 10 portfolios demonstrate much lower loadings on book-to-market indicating they are slanted more towards glamour stocks, or ones with lower book-to-market valuations. This is reinforced by the negative coefficients for the decile 10 - decile 1 portfolios.

3.4 Fama-MacBeth Predictive Regressions

Table 4 provides a predictive monthly return regression where we test whether the trade clusters are associated with the future monthly returns. We include control variables that are known to be associated with future monthly returns. We use the contemporaneously determined systematic Fama-French risk factors, the lagged idiosyncratic volatility (Ang, Hodrick, Xing, and Zhang, 2006),

the prior period return (reversal effect) (Jegadeesh, 1990), the natural log scaled firm size, book-to-market (to represent value versus growth characteristics) and share turnover (Lee and Swaminathan, 2000), Amihud's price impact measure (Amihud, 2002), and the direct effect of the prior period 6-month momentum along with each trade size cluster. We interact momentum with each trade size cluster. The specification is as follows:

$$\begin{aligned}\text{Return}_{i,t} = {} & \alpha_0 + \alpha_1 \text{Ln(1+Institutional Holdings)}_{i,q} + \alpha_2 \beta_{mkt,t} + \alpha_3 \beta_{smb,t} + \alpha_4 \beta_{hml,t} \\ & + \alpha_5 \text{Idiosyncratic Volatility}_{i,t-1} + \alpha_6 \text{Lagged Return}_{i,t-6} + \alpha_7 \text{Ln(Firm Size)}_{i,t-2} \\ & + \alpha_8 \text{Ln(Book–to–Market)}_{i,t-1} + \alpha_9 \text{Share Turnover} + \alpha_{10} \text{Amihud} \\ & + \alpha_{11} \text{Ln(Number of Analysts)}_{i,t-1} + \alpha_{12} \text{Share Clusters}_{i,t-1} \\ & + \alpha_{13} \text{Momentum Return}_{i,t-1} + \alpha_{14} \text{Share Clusters*Momentum Return}_{i,t-1} + \epsilon_{i,t},\end{aligned} \tag{1}$$

Our hypothesized relation is that the interaction term should be positive if the trade size cluster enhances the monthly return accruing to the momentum portfolios.

The first prominent result in Table 4 is that only 500 and 1000-share trade size cluster interaction term is significantly and positively associated with the future monthly return. This indicates that only the 500 and 100o-share trade size clusters enhance the momentum profits, while the 100-share clusters do not enhance the momentum portfolio returns. Also telling in the results is that full regression shows no significance for the direct momentum effect for the 500 or 1000-share-share trade cluster. This would indicate that controlling for the effect of 500 share trades on the momentum anomaly is sufficient at removing the direct effect of momentum on future returns. These results are supportive of the prior sort results indicating the importance of 500 and 1000-share trade cluster in the prediction of future returns conditional on the momentum anomaly.

These results persist even after controlling for the significance in the return reversal effect, idiosyncratic volatility, turnover, and the liquidity effect. Firm size is significantly and negatively associated with future returns but this does not affect the significance in the interaction terms effect on the momentum profits on a monthly basis. This extends to the book-to-market effect or the number of analysts following the firm.

3.5 Trade-Size Cluster Determinants

We test for drivers of 100, 500, and 1000-share trade size clusters with a primary focus on separating noise from more informed trading characteristics. Models of noise trading such as Long et al. (1990), Campbell and Kyle (1993), Campbell, Grossman, and Wang (1993), or Llorente, Michaely, Saar, and Wang (2002) predict that noise trading contributes to idiosyncratic volatility above and beyond cash flow news. In particular, Long et al. (1990), in formalizing a model of noise trade risk, argues that noise traders create risk that is separate from fundamental risk. We operationalize the existence of noise trading risk by employing an estimate of idiosyncratic volatility, σ_{IV} relative to a three-factor Fama-French pricing model. We view the systematic estimates of the model as measures of fundamental risk and the estimate of idiosyncratic volatility as a measure of noise trader risk.

We control for other variables that have been shown to be associated with noise trading (Brennan and Subrahmanyam, 1998). To fix and separate these effects from our primary noise trading risk hypothesis embodied in idiosyncratic volatility, we lag each of the variables by one-month. Institutional investors are expected to be less risk-averse than individual investors and we hence control for the proportion of the security that is held by institutional investors. To capture different trading cost components that may impact trade size, we model the variable cost of trade with the Amihud measure and the fixed costs of trade with share turnover. Share turnover also reflects sensitivity to value or glamour stock characteristics as shown in Lee and Swaminathan (2000). Firm size is included as an additional proxy for the standard deviation of noise trading.

In addition to these variables, we also include the standardized unexpected earnings measured according to a random walk model or deviation from the median analyst forecast (Battalio and Mendenhall, 2005). We control for persistence in trade size with the lagged trade size. We specify three trade size ranging from 100-shares, 500-shares, and then to 1000-shares. The Fama-MacBeth cross-sectional regressions are run from 1983 to 2010 for a total of 336 months. We specify the

regression as follows:

$$\begin{aligned}\text{Trade Size Cluster}_{i,t} = {} & \alpha_0 + \alpha_1 \sigma_{IV} + \alpha_2 \beta_{rm} + \alpha_3 \beta_{hml} + \alpha_4 \beta_{smb} + \alpha_5 \text{Institutional Holdings}_{i,q-1} \\ & + \alpha_6 \text{Share Turnover}_{i,t-1} + \alpha_7 \text{Amihud}_{i,t-1} + \alpha_8 \text{Ln(Firm Size)}_{i,t-1} \\ & + \alpha_{10} \text{SUE-SRW}_{i,q-1} + \alpha_{11} \text{SUE-AF}_{i,q-1} \\ & + \alpha_{12} \text{Trade Size Cluster}_{i,t-1} + \epsilon_{i,t},\end{aligned} \tag{2}$$

where the subscript t represents the month for each variable and q represents the quarter for the institutional holdings or standardize unexpected earnings as estimate by a seasonal random walk (SRW) model or in relation to the median analyst forecast (AF) reflecting the frequency of observation.

The results are shown in Table 5 with each trade separated into two columns with each column reflecting the change in sample size due to the inclusion of the IBES analyst forecast variables. We first observe that each regression is well-specified with a goodness of fit that ranges from 25.5% for the 500-share trade size cluster to 75.2% for either the 100 or 1000-share size trade clusters. Also along these lines, we show that trade size is persistent with highly significant coefficients noted for the lagged trade size clusters regardless of 100, 500, or 1000-share trade size classifications.

The immediate distinction in the results is shown in the loadings on idiosyncratic volatility. The 100-share trade size cluster is negatively associated with idiosyncratic volatility, while the 500 and 1000-share trade size clusters are positively associated with idiosyncratic volatility indicating the 500 and 1000-share traders are "bearing" increased risk, while the 100-share traders are reducing their exposure to such risk.

This is in addition to the loadings on the fundamental risk factors that again are distinctly different between the 100 and 500 (or 1000) share trade size clusters. As shown in Table 5, only the small-minus-big systematic risk factor is significant and positively associated with the 100-share cluster. The positive sign is indicative of an increased loading on the risk associated with smaller firms. These results contrast with those experienced by the 500 and 1000-share trade size clusters

where we can clearly see significance across all the systematic risk factors representing fundamental risk. For the 500 and 1000-share clusters, the loadings are of the same signs with a positive association for the market index, a negative association with the high-minus-low book-to-market (value versus glamour) effect, and a negative relation for the risk associated with small-minus-big firm size. Given our prior predictive return results shown in Table 4, we could argue that the 500 and 1000-share trade size clusters earn abnormal profits due to significant loadings on fundamental risk as well as higher idiosyncratic (noise) risk.

Across all trade size clusters, lower levels of institutional holdings are associated with higher levels of trading in each trade size cluster. For the 100-share size clusters this indicates that more retail traders are trading in stocks not widely held by institutions, while for the 500 and 1000-share trade size clusters the results indicate that these traders seek out those stocks that are not widely held by institutions.

The lagged share turnover is negatively associated with 100-share trade clusters and positively associated with 500 and 1000-share trade size clusters indicating that smaller trade size clusters bear the fixed costs of trades by trading into less deep markets, while larger trade size cluster traders seek deeper markets to reduce the fixed costs of trade. The lagged Amihud measure is indicative of lower price impact (adverse selection costs) for 100-share traders who may act as liquidity providers and higher price impact costs for larger trade size cluster traders. The latter result is to be expected given price pressure from increased demand due to these large trade sizes. The negative significance for firm size (except for the 1000-share specification with analyst forecast variables), indicates that smaller firms with potentially a larger variation in noise trading are associated with all trade size clusters.

Finally, consistent with Battalio and Mendenhall (2005), the earnings surprise based on the seasonal random walk is more associated, albeit insignificantly, with 100-share trades than is the earnings surprise based on the analyst forecast, while the earnings surprise based on the analyst forecast is significantly related to the 500-share trades.

3.6 Seasonality and Price Momentum

Jegadeesh and Titman (1993) find a striking seasonality in momentum profits, a result that is substantiated in Jegadeesh and Titman (2001). They document that the losers significantly outperform the winners in January, while the winners outperform losers in all months except January. By extension, they also document that momentum profits are not in evidence in January, but are robust from February to December. We examine the out-of-sample momentum performance whereby we interact trade size with that of the momentum anomaly in January versus the rest of the year. We first sort the portfolios at the beginning of each month based on their returns over the past J=6 months, dividing them into three portfolios spanning losers (L) and winners (W), and then sort the firms within each of the three momentum portfolios into deciles by the trade size categories. We measure trade size as of the last month prior to the performance period. We then separate the performance exclusively in January and then from February to December.

The results are presented in Table 6. As shown in Panel A of Table 6, the January momentum average return underperforms relative to the rest of the year, a result consistent with the prior literature. The January returns are -0.96% per month, while the February to December returns are 0.66% per month. This underperformance extends to the characteristic-adjusted returns that shows returns in January of only 0.01% per month compared to 0.49% per month across the rest of the year. This general results is consistent with the original findings of Jegadeesh and Titman (1993).

Focusing on 100-share trades, shown in Panel B of Table 6, we see that in January, the W-L decile 10 portfolios demonstrate a -0.95% return per month (0.19% characteristic-adjusted return), while the W-L Decile 1 portfolios show a -0.15% return per month (0.62% characteristic-adjusted return). This level of return is not statistically different from the base momentum strategy on a characteristic-adjusted return basis as evidenced by either the W-L (Decile 10 or Decile 1) - W-L (Base). However as found for the base momentum strategy, the February to December period shows momentum profits are more in evidenced in the portfolios that are avoided by the 100-share trades. The Decile 10 risk adjusted returns are 0.32% while the Decile 1 risk-adjusted returns are

0.71%. These results mirror the monthly average returns. The Decile 1 portfolios earn 0.21% more than the base momentum portfolio, while the decile 10 portfolios earn -0.17% less than the base momentum portfolio. The returns demonstrate the contrarian nature of the one round lot trades.

The 500-share trades, shown in Panel C of Table 6, demonstrates a distinctly different return behavior. In January, the W-L decile 10 portfolios demonstrate a -0.37% return per month (0.70% characteristic-adjusted return), and the W-L Decile 1 portfolios show a -0.97% return per month (-0.03% characteristic-adjusted return). While the risk-adjusted return for the Decile 10 portfolio is insignificant, this most probably results from a low power test. Relative to the Base momentum strategy, the W-L (Decile 10) portfolio represents a substantial improvement in the momentum performance. The W-L (Decile 10) - W-L (Base) is 0.69% (significant at the 5% level), while the W-L (Decile 1) - W-L (Base) is -0.04%.

The performance is improved in the February to December period, but on a risk-adjusted basis the overall return is surprisingly similar. The risk-adjusted return is 0.77% and significant at the 1% level. Comparing this to the 0.70% risk-adjusted return found in January, it can be easily argued that portfolios dominated by 500-share trades do not experience a significant fall-off in performance in January as found in the base momentum strategy. As expected, the Decile 10 portfolios perform much better than the Decile 1 portfolios relative to the base momentum strategies as evidenced in the W-L Decile 10, 1) - W-L (Base) portfolios where the Decile 10 portfolios earn 0.28% more than the Base momentum strategy and the Decile 1 portfolios earn -0.32% less than the base momentum strategy.

The 1000-share trades, shown in Panel D of Table 6, shows a return behavior that is similar to that exhibited by the 500-share trades. In January, the W-L decile 10 portfolios demonstrate a -0.50% return per month (0.50% characteristic-adjusted return), while the W-L Decile 1 portfolios show a -0.98% return per month (0.07% characteristic-adjusted return). Relative to the Base momentum strategy, the W-L (Decile 10) - W-L (Base) is 0.49% (significant at the 10% level), and the W-L (Decile 1) - W-L (Base) is 0.06%.

As found previously, over the February to December period the Decile 10 portfolio shows a

risk-adjusted return of 0.74% and significant at the 1% level, while the Decile 1 portfolio shows a risk-adjusted return of 0.30% per month. These returns as closely aligned to those noted for the 500-share trades. As found for the 500-share trades, the Decile 10 portfolios perform much better than the Decile 1 portfolios relative to the base momentum strategies. The W-L Decile 10) - W-L (Base) portfolio earns 0.25% more than the Base momentum strategy and the W-L Decile 1) - W-L (Base) portfolio earns -0.20% less than the Base momentum strategy.

The results indicate that the 500 and 1000-share trade dominated portfolios trade with the momentum anomaly, and do so with vastly improved performance relative to the contrarian 100-share trade size portfolios. The results also indicate that the seasonality in risk-adjusted returns is muted for the 500 share portfolios with January risk-adjusted returns mirroring those obtained from February to December. The performance of the portfolio dominated by 500-share, and to a lesser extent the 1000-share, trades does not appear to exhibit the severity in the seasonality.

4 Decimalization Effects

In this section we examine the effect of momentum crashes on the relation between trade size and price momentum. Daniel and Moskowitz (2013) argue that momentum crashes have become more frequent after the year 2000. This coincides with the crash in NASDAQ stocks in 2000 and the Great Recession in 2007 and 2008. The crashes in momentum coincide with the decimalization in stock quotes, although the two are not explicitly tied together. We note that decimalization has significantly affected trade size. The NYSE Fact book reports statistics that show an average trade sizes falling dramatically after stock decimalization. The average trade size in 1999 for NYSE-listed firms was 1,205 shares per trade. In 2004, the average trade size was significantly reduced to just over 390 shares per trade, while in 2010 the average trade size had dwindled to 220 shares per trade and in 2014 the average trade size was approximately 140 shares per trade. To control for the drop in average trade size and to incorporate the cases of momentum crashes, we separate our sample into two periods with the first based on the period 1983 to 2000 and the second based on the period 2001 to 2010.

4.1 Pre-Decimalization Period

Panel 1 of Table 7 shows that the base momentum return strategy during the 1983 to 2000 is very profitable yielding characteristic-adjusted returns of 0.62% per month and 0.39% per month for the six and twelve-month periods, respectively. The return then breaks after one year and experiences a -0.16% per month decline.

The small trade size category, Panel B of Table 7 shows that W-L Decile 10, 100-share portfolios are principally composed of much larger stocks. The winner stocks have average market valuations of $2.757 billion while the loser portfolio has a market valuation of $1.721 billion. The W-L decile 10 portfolios yield significant characteristic-adjusted returns of 0.66% and 0.45% over six months and one year, respectively. The Decile 1 T100 portfolio, composed of much smaller stocks, experiences higher characteristic-adjusted returns recorded at 0.83% and 0.47% per month over the first six and twelve months, respectively. However, the W-L (Decile 10 - Base) or the W-L (Decile 1 - Base) do not earn a robust return improvement over the base momentum strategy.

The larger trade categories, i.e. the 500 and the 1000-share trade size portfolios given in Panels C and D, respectively, show that the Decile 10 portfolios are composed of much smaller stocks with the 500-share portfolios dominated by very small stocks. Regardless, the W-L (decile 10) portfolios earn a significant return of 0.87% per month over the first six months and the significance in the characteristic-adjusted return measured at 0.52% per month, persists for up to one-year. On the one hand, the Decile 10, 500-share portfolio returns, shown in Panel C of Table 7, break to a negative and significant 0.26% monthly return over the 13-24 month period. This behavior is consistent with the self-attribution behavioral bias. On the other hand, the 1000-share trade size portfolio earns a significant characteristic-adjusted return of 0.85% for six months and 0.43% per month for 12 months after the portfolio formation period. But the subsequent break in the return is negative but insignificant. This behavior is consistent with the conservatism behavioral bias.

Panels C and D show that the enhanced performance is restricted to those portfolios dominated by 500 and 1000-share trades, or decile 10 portfolios, but only for the first six months. The W-L (decile 10 - Base) 500-share and 1000-share strategies earn monthly returns of 0.25% and 0.23%,

respectively, more than the base momentum strategy over six months. The W-L (decile 10 - Base) characteristic-adjusted returns fall to insignificance over the full twelve month period earning 0.13% and 0.04% for the 500 and 1000-share portfolios, respectively. This behavior is distinctly different than that seen for the Decile 1 portfolios. The W-L (decile 1 - Base) earn characteristic-adjusted returns that are -0.35% and -0.23% for 500 and 1000-share portfolios, respectively. This underperformance persists up to one year.

4.2 Post-Decimalization Period

Turning to the post decimalization period from 2001 to 2010 that is shown in Panel 2 of Table 7, we can clearly see that the base momentum strategy is now insignificant evidencing the crashes found in Daniel and Moskowitz (2013). The insignificance in the characteristic-adjusted returns are found regardless of holding period. Indeed, this is replicated with the 100-share size portfolios that also experience no significant performance over any holding period. This is found regardless of examining the Decile 10 or the Decile 1 portfolios. Also, we note that the average firm size that makes up these 100-share portfolios is now slanted to extremely small firm with market valuations of $547 million for the Loser portfolio and $670 million for the Winner portfolio.

The 500-share portfolio, shown in Panel G of Table 7, continues to earn a significant characteristic-adjusted return over the first year with a 0.75% per month return earned over the first six months and a 0.47% per month return earned over the year. An insignificant break in the return is noted after one-year. Interestingly, the average firm size of these extreme 500-share portfolios is now increased to over a billion dollars. It appears that traders concentrating in this trade size portfolio are focusing on larger market capitalization firms and only these larger firms outperform the base momentum strategy as evidenced by the W-L (Decile 10- Base) results that shows a 0.45% per month return improvement over six months and a smaller 0.25% return improvement over one-year. The Decile 1, 500-share portfolio significantly underperforms the base momentum strategy indicating that only those portfolios that experienced higher concentrations of 500-share trade sizes earn a significant momentum return.

Finally, the Decile 10, 1000-share size cluster portfolio, illustrated in Panel H of Table 7, also earn significant monthly returns of 0.68% over six months, but they fall to insignificance over one year. The larger trade size portfolios appear to price momentum more quickly with significance only observed in the first six months after the momentum portfolio formation. The decile 10 portfolios for both the winner and loser side of the trade, shows clustering around much larger firms with the Winner portfolio composed of firms with a market capitalization of $1.529 billion and the Loser portfolio composed of firms with a market capitalization of $3.211 billion. Additionally, the 1000-share trade portfolio out-perform the base momentum strategy by 0.38% which is significant at the 5% level. This does not persist over the one-year period.

5 Robustness Tests

We employ robustness checks on our results by splitting trade size into quintiles as opposed to deciles, but keeping momentum separated into terciles. This is done in order to increase the cross-sectional coverage of firms as well as reduce the associated liquidity costs of each trade size portfolio. We also split firms by listing exchange separating the results by NYSE/Amex and then NASDAQ listed firms. Finally to minimize a potential endogeneity bias in our results, we form the trade size deciles prior to the 6-month momentum portfolio to eliminate any causality between the trade size and the prior-period returns. We again focus on the original momentum tercile and trade size decile sorts that formed the basis of our prior tests. Also, as with all of our tests we eliminate any firm that is in both the decile (quintile) one and/or decile 10 (quintile 5) of both the 100 and 500-share (and 1000-share) trade size portfolios. We concentrate only on the characteristic-adjusted returns.

5.1 Trade Size Quintiles

Table 8 reports results on the basis of a two-way sort between momentum and trade size. In this test, we sort momentum into terciles and trade size into quintiles in order to increase the span of firms in the sample as well as reducing the associated liquidity costs of the traded sample. As

previously described, we first sort the portfolios at the beginning of each month based on their returns over the past J=6 months and then divide them into three portfolios, spanning losers (L) and winners (W). We then sort the firms within each of the three momentum portfolios into quintiles by either the 100-share trade size ratio, the 500-share trade size ratio, or the 1000-share trade size ratio. Within each trade size category, quintile 1 represents the lowest trade size ratio, while quintile 5 represents the highest trade size ratio. We will term the return earned by a hedged momentum portfolio as W-L, and the return earned by that hedged momentum portfolio for each trade size quintile as W-L (Quintile 5) or W-L (Quintile 1) to reflect either the highest or lowest trade size ratio portfolios, respectively. To avoid repeated sampling, we eliminate any firm that is in the extreme trade size portfolios for both the 100-share, 500, and 1000-share trade size portfolios. This is accomplished after our initial sort on trade size, hence our final sample will have unbalanced numbers of firms within each momentum/trade size portfolio. This filter results in a steep falloff in the number of firms but the restricted sample is of much higher liquidity. We report the trade size quintile as well as the number of firms compromising that portfolio. We also report the average price, firms size, bid-ask spread, and price impact measure.

As shown in Panel A of Table 8, across the 1983 to 2010 time period, the momentum portfolio remains priced earning a monthly 0.46% characteristic-adjusted return for a six month holding period. The characteristic-adjusted monthly return declines to 0.27% over a one-year period. A break in the return is observed in months 13-24. The bid-ask spreads and the price impact measures are all lower for the winner and loser portfolios, although they now do not eclipse the returns across each of the winner-loser portfolios.

In Panel B of Table 8 we review the findings for the 100-share size portfolios. As shown, we see a concentration of momentum profits for the Quintile 5 portfolios where the winner momentum portfolio earns 0.33% per month and the loser momentum portfolio earns -0.19% per month. This translates to a W-L momentum return across the Quintile 5 portfolios of 0.53%. The Quintile 1 portfolios earn less than the Quintile 5 portfolios yielding a W-L Quintile 1 characteristic-adjusted return of 0.34%. However, compared to the base momentum strategy, these returns are not statistically different from those earned by the base strategy as shown by the insignificant W-L (Quintile

5 or 1) - W-L (Base) portfolio returns. The evidence shows that concentrated trades by 100-share traders have no incremental impact on the subsequent price performance of momentum strategies.

However, 500-share trade clusters exhibit a far different behavior. Panel C of Table 8 shows that the W-L (Quintile 5) portfolio earns a significant characteristic-adjusted return of 0.87% per month over six months and a significant 0.53% per month over twelve months. This is 0.42% more than that earned by the base momentum strategy over six months and 0.26% more than that earned by the base strategy over twelve months. The portfolios avoided by large traders do not perform as well. The quintile 1 portfolios earn an insignificant characteristic-adjusted return of 0.18% over six months and an slightly larger characteristic-adjusted return of 0.19% over 12 months.

The outperformance of the Quintile 5 portfolios lies mainly in the short position. The winner quintile 5 portfolio earns 0.30% per month, while the loser quintile 5 portfolio earns -0.57% per month. The 500-share traders appear to better predict those stocks that will decline in value for the loser momentum portfolio.

Finally, Panel D of Table 8 shows the 1000-share portfolios exhibit similar behavior to that reported by the 500-share trade portfolios, except that the performance over the base momentum strategy is not as robust past the first six months. As shown in Panel D of Table 8, the momentum characteristic-adjusted return earned by the portfolios dominated by 1000-share trades, W-L (Quintile 5), is significant at 0.81% per month, as is the twelve month return of 0.40% per month. Over the first six months, the quintile 5 performance is 0.35% more than that earned by the base momentum strategy and over the twelve month period, the quintile 5 performance is 0.13% more than that earned by the base momentum strategy. Conversely, the quintile 1 portfolio earns significantly less than the base strategy over the six month period, shown as W-L (Quintile 1) - W-L (Base) = -0.25%.

5.2 NYSE/Amex listed Firms: Trade Size and Price Momentum

We examine NYSE/Amex and NASDAQ separately in order to assess the effects of exchange listing on our results. This test will ensure that a few small stocks are not driving the results. As

implemented previously, we delete any firm with a price less than $5.00 as determined at the end of the portfolio formation period. We again focus on the original momentum tercile and trade size decile sorts that formed the basis of our prior tests. This will ensure sufficient power for the tests. Also, as with all of our tests we eliminate any firm that is in both the decile one and/or decile 10 of both the T100 and T500-share trade size portfolio. Panel 1 of Table 9 outlines the results for NYSE/Amex listed firms and Panel 2 of Table 9 outlines the results for only NASDAQ listed firms.

Panel 1 of Table 9 shows that the base momentum return strategy declines considerably when examining only NYSE/Amex firms. The characteristic-adjusted return falls to 0.27% per month over months 1-6 and the characteristic-adjusted return is insignificant over the 12-month trading horizon falling to just 0.18% per month. The characteristic-adjusted return in months 13-24 is negative, but insignificant, and recorded at -0.07%.

The small trade size category, Panel B of Table 9 again shows that portfolios that are dominated by 100-share trade sizes underperform the base momentum strategy. Indeed, the Decile 10 portfolio earns a characteristic-adjusted return of 0.09% less than the base momentum strategy, while the decile 1 small trade size portfolio earns a characteristic-adjusted return of 0.12% per month more than the base momentum strategy. The profitably of momentum strategies, even at the NYSE/Amex level is not dependent on the trade behavior of small traders. Rather, the performance appears to be concentrated in the portfolio shunned by small traders.

Examining the performance of the larger trade size portfolios reveals results consistent with the prior findings. Namely, portfolios dominated by 500 and 1000-share trades exhibit very consistent significant characteristic-adjusted returns for up to one-year after the portfolio formation period. In panel C of Table 9, we see that the 500-share trade size portfolios earn significant monthly risk-adjusted returns of 0.72% over six months and 0.34% over 12 months. These results extend to the 1000-share trade size portfolios that also show robust performance up to one-year after the portfolio formation period. The break in the return after one-year is insignificant, and it demonstrates the same behavior for either the 500 or 1000-share trade size portfolios.

The returns earned by either large trade size portfolio indicates an economic and statistical

improvement over the base strategy as evidenced by the W-L (decile 10 - base) return. The 500-share portfolios, shown in Panel C of Table 9, demonstrates a per month characteristic-adjusted return improvement of 0.46% and 0.16% over six and 12-months, respectively. Also, the decile 1 500-share portfolio clearly under-performs relative to the decile 10 500-share portfolio with regard to the base momentum strategy. The decile 1 500-share portfolio earns 0.19% per month less than the base momentum portfolio with insignificance found at 12 months.

The 1000-share portfolio, presented in Panel D of Table 9, shows that only the W-L (Decile 10 - Base) has any improvement in performance over the base momentum strategy. The six month return, recorded at 0.31% per month, is significantly above that earned by the base momentum strategy. The out-performance is robust to a 12 month trading horizon with insignificant monthly characteristic-returns of 0.17%. The performance of the 1000-share trade size portfolios mimics that of the 500-share trade size portfolio indicating that for NYSE/Amex firms, focusing on either trade size will out-perform that base momentum strategy. Focusing on 500 and 1000-share trade size clusters is a viable avenue to better exploit the momentum profits.

5.3 NASDAQ listed Firms: Trade Size and Price Momentum

Panel 2 of Table 9 shows that the base momentum strategy strengthens by focusing only on NASDAQ firms. Persistence of the momentum profits is now evident up to a 12-month trading horizon regardless of raw or characteristic-adjusted returns. The characteristic-adjusted return is highly significant at 0.68% over six months, but falls to 0.37% over the whole 12-month trading horizon period. However, the break in the one-year performance is marginally significant indicating that NASDAQ firms exhibit characteristics consistent with the self-attribution behavioral bias (Daniel et al., 1998).

As was found with the NYSE/Amex firms, the small trade size portfolios, shown in Panel F of Table 9, do not exhibit any meaningful difference from that earned by the base momentum strategy. As shown by the W-L (Decile 10 - Base) or the W-L (Decile 1 - Base), the abnormal returns are essentially zero with the maximum recorded at at 0.18% per month (over the twelve-month holding

period). Small one-round lot based trade portfolios do not substantially improve the performance of NASDAQ-based momentum portfolios.

The performance of the larger trade portfolios is distinctly improved relative to the small trade portfolios. As shown in Panel G of Table 9, the 500-share trade size portfolio earns 0.96% characteristic-adjusted return per month in the first six months and 0.56% per month over a one-year holding period. The W-L (Decile 10 - Base) characteristic-adjusted return is significant at 0.28% per month over six months and 0.19% per month over one-year. However, the negative break experienced one year after the portfolio formation is insignificant indicating that the initial underreaction is not matched by a subsequent overreaction. Rather, the results appear to indicate that for NASDAQ firms, 500-share traders price momentum to its intrinsic level and do so over one-year.

These results are matched by the Decile 10, 1000-share trade size portfolio that experiences a significant characteristic-adjusted return of 0.87% and 0.50% per month over the six and twelve month trading horizons after the portfolio formation period, respectively. The W-L (Decile 10 - Base) strategy yields a significant return improvement with the six month characteristic-adjusted return seen as significant at 0.19% per month, but falls to insignificance over the twelve month period. It again appears that portfolios dominated by much larger trade sizes price momentum more quickly with returns over the base momentum strategy only significant up to six months and these portfolios experience some return continuation as evidenced by the positive, although insignificant, return in months 13-24 after the portfolio formation period.

5.4 Trade Size Portfolios Formed Before Momentum Portfolios

We examine the effect of forming trade size portfolios prior to the price momentum portfolio formation. The measurement of trade size prior to the momentum portfolio formation will address any concern that momentum itself may cause trade size portfolios to develop. We measure trade size and assign them into portfolios in the month prior to the J=6 price momentum portfolios. As implemented previously, we delete any firm with a price less than $5.00 as determined at the end

of the portfolio formation period and we form momentum tercile and trade size decile portfolios in our sort tests.

Due to our data filter for non-overlapping firms, we reexamine the base momentum strategy. Panel A of Table 10 shows that the base momentum return strategy continues to produce significant characteristic-adjusted, 0.41%, returns over the six month holding period. The significance of the base momentum strategy extends to the 12-month holding period with characteristic-adjusted returns of 0.26% per month.

Panel B of Table 10 shows 100-share trade size portfolio performance. Interestingly, the Decile 10, 100-share portfolio evidences a significant characteristic-adjusted return of 0.34%, but this is lower than the return earned ay the Decile 1 portfolio recored at 0.46% per month over six months. But neither of these returns are statistically distinguishable from the base price momentum strategy. This is represented by an insignificant W-L (Decile 10 - Base) six month portfolio return that is shown as -0.07% for the decile 10 and 0.05% for the decile 1 portfolio. Overall then results indicate that forming trade size portfolios prior to the momentum portfolio formation affects the subsequent performance of the 100-share trade size portfolios, but again there is no significant enhancement over the base momentum strategy, i.e. the 100-share trade size portfolios simply replicate the performance of the base momentum strategy.

Panels B and C of Table 10 show the 500 and 1000-share trade size portfolios. As demonstrated in Panels B and C, for both the 500 or 1000-share trade portfolios, the characteristic-adjusted returns remain significant for up to one-year after the momentum portfolio formation period. Neither portfolio experiences a significant break in subsequent one-year holding period. For instance the W-L Decile 10, 500-share portfolio earns a characteristic-adjusted return of 0.76% per month and a 0.42% per month of the six and twelve month periods, respectively. The W-L Decile 1 portfolios earn substantially less than the Decile 10 portfolios. It is notable that the Decile 10 portfolios, for both the 500-share and the 1000-share trade size categories, see a consistent return improvement over the base momentum strategy. The 500-share W-L (Decile 10 - Base) shows a characteristic-adjusted return improvement of 0.35% for six months and a return improvement of 0.17% for twelve months over the base momentum strategy. This is substantively similar to that

earned by the 1000-share trade size portfolio, except that the W-L Decile 10 - base 1000-share portfolios are insignificantly different after the first six months.

In conclusion, the results indicate that focusing on larger trade portfolios shows continued improvement in the momentum profits even if they are formed before the start of the momentum portfolio formation. This result does not imply that large trades cause momentum, but rather that large trades are not exhibiting any feedback effect from momentum whereupon large trade could be concentrating their trades on the previously disclosed momentum. Portfolios dominated by 500 (and 1000)-share trades appear to demonstrate persistent improvement in the momentum profits that are maintained for up to one-year. Importantly, the results do not evidence any support for an endogeneity or feedback bias that may cloud the inferences concerning the return predictability of large trade portfolios.

6 Conclusions

We show that past trade size clusters are an important determinant in price-based momentum. We consider the effect of trade size clusters within a momentum strategy and show that trade size clusters of 500 and 1000-shares are important in the expectation of future returns. However, we further show that this pricing ability is not shared by any other trade size cluster. It appears that noise traders use these distinct 500 and 1000-share size when splitting up larger orders. We show conclusively momentum profits can be significantly increased by focusing on 500 and 1000-share trade size clusters rather than any other trade size cluster.

The large trade cluster results are robust to the portfolio formation techniques that would focus on deciles, quintiles, or terciles for portfolio formations alleviating concerns about sample size or portfolio composition. Additionally, these large trade size cluster portfolios produces significantly improved returns if we also condition on much larger dollar trade volumes in addition to price filters. Finally, the large trade size cluster portfolios do not experience "momentum crashes" that is typical of the base momentum strategy in the post-decimalization period. Large trade portfolios continue to earn significant returns in both the pre and post decimalization period. Traders concentrating

in these portfolios appear to act strategically by focusing on larger market capitalization firms and avoiding the issues with falling trade size as a result of the decimalization of quotes that drove average trade size down significantly.

This paper attempts to expand upon the research that explores trade size, but we are distinctive in that we combine two separate strains of literature that have been previously explored separately. This includes the retail trade literature that requires separate buy and sell volume and is behaviorally based and an older literature that explores the pricing of noise trades. We combine these two separate literature streams into one picture showing the importance of both categories when using trade size clusters, but we obviate the necessity of determining separate buys and sells for small trades by focusing exclusively on the trades clusters into pre-identified categories.

The main features of this path of research is the potential identification of a set of trades embodied in trade size clusters that may evidence noise trading. More study on trade size and its relation to noise trading is necessary, but the ease in identification of noise trading segments of the market and the sheer significance of the results should foster more empirical research as well as theoretical investigation. We view these results as fundamental to better understanding the source of momentum profits through the actions of noise traders and our results strongly support the noise trading hypothesis. Noise trading is important in understanding the source of anomalies, that now number nearly 80 (Hou et al., 2015), and why they persist.

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Table 1: Momentum Portfolio Returns

We present average monthly returns in percentage for price momentum portfolio strategies involving NYSE/Amex/NASDAQ stocks for the time period 1983 to 2010. The sample consists of all NYSE/AMEX and beginning in 1987 NASDAQ stocks with a price > \$5. At the beginning of each month starting in 1983, all stocks in the NYSE/Amex/NASDAQ exchanges are sorted based on their previous J months' cumulative returns and divided into 10 equally-weighted portfolios (shown in Panel A) or into three equally-weighted portfolios (shown in Panel B). R1 represents the portfolio with the lowest returns (loser), and R10 (or R3 for the tercile portfolios) represents the portfolio with the highest returns (winner) during the previous J months. The monthly holding period is represented by K, where K = three, six, nine, or 12 months. Monthly holding period returns are computed as an equal-weighted average of returns from strategies initiated at the beginning of the month and the past J months. Returns are the average return across the monthly returns and are expressed in percentages. T100 represents the proportion of all 100 share daily trades divided by the total number of trades averaged over the month. T500 represents the proportion of all 500 share daily trades divided by the total number of trades averaged over the month. T1000 represents all 1000 share daily trades divided by the total number of trades averaged on the month. *SzRnk* is the time-series average of the median size decile of the portfolio of NYSE/Amex stocks in the sample. Price represents the time-series average dollar stock price of the portfolio on the portfolio formation date. Newey-West robust estimators with four lags specifying the t-statistics are presented in the parentheses. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Panel A: Momentum Portfolio Deciles

								Monthly Returns							
J	Portfolio	Return	T100	T500	T1000	SzRnk	Price	K=3		K=6		K=9		K=12	
3	R1 (Loser)	-10.31	0.33	0.09	0.11	2.99	15.53	0.73*	(1.77)	0.61	(1.50)	0.57	(1.41)	0.58	(1.42)
	R5	0.34	0.34	0.09	0.09	4.09	51.17	1.13***	(4.17)	1.14***	(4.28)	1.09***	(4.05)	1.11***	(4.12)
	R10 (Winner)	15.04	0.32	0.10	0.12	3.42	27.28	1.26***	(3.17)	1.28***	(3.26)	1.21***	(3.11)	1.15***	(2.93)
	R10-R1							0.53**	(1.98)	0.67***	(2.87)	0.63***	(2.99)	0.57***	(2.92)
6	R1 (Loser)	-7.20	0.32	0.09	0.11	2.91	13.99	0.52	(1.22)	0.49	(1.15)	0.45	(1.05)	0.54	(1.27)
	R5	0.49	0.34	0.09	0.09	4.12	45.44	1.13***	(4.22)	1.13***	(4.26)	1.08***	(4.04)	1.09***	(4.05)
	R10 (Winner)	10.57	0.33	0.10	0.12	3.44	33.42	1.58***	(3.90)	1.53***	(3.81)	1.35***	(3.34)	1.23***	(3.07)
	R10-R1							1.06***	(3.40)	1.04***	(3.57)	0.90***	(3.32)	0.70***	(2.76)
9	R1 (Loser)	-5.76	0.32	0.09	0.11	2.81	13.18	0.47	(1.05)	0.46	(1.04)	0.49	(1.12)	0.6	(1.39)
	R5	0.56	0.34	0.09	0.08	4.23	50.88	1.09***	(4.06)	1.12***	(4.23)	1.09***	(4.08)	1.10***	(4.13)
	R10 (Winner)	8.75	0.33	0.10	0.12	3.53	33.15	1.64***	(3.89)	1.50***	(3.58)	1.29***	(3.07)	1.14***	(2.79)
	R10-R1							1.17***	(3.41)	1.05***	(3.15)	0.79**	(2.53)	0.54*	(1.87)
12	R1 (Loser)	-4.89	0.32	0.09	0.11	2.75	12.58	0.43	(0.96)	0.5	(1.12)	0.56	(1.27)	0.67	(1.51)
	R5	0.59	0.34	0.09	0.08	4.24	58.08	1.09***	(4.14)	1.12***	(4.30)	1.10***	(4.21)	1.10***	(4.20)
	R10 (Winner)	7.66	0.33	0.10	0.12	3.61	28.35	1.48***	(3.38)	1.35***	(3.13)	1.13***	(2.66)	1.04**	(2.50)
	R10-R1							1.06***	(2.87)	0.85**	(2.42)	0.57*	(1.74)	0.37	(1.23)

Panel B: Momentum Portfolio Terciles

J	Portfolio	Return	T100	T500	T1000	SzRnk	Price	Monthly Returns K=3		K=6		K=9		K=12	
3	R1 (Loser)	-5.41	0.34	0.09	0.10	3.43	29.74	0.99***	(2.92)	0.92***	(2.77)	0.85**	(2.55)	0.85**	(2.55)
	R2	0.98	0.34	0.09	0.09	4.14	46.12	1.13***	(4.21)	1.15***	(4.33)	1.10***	(4.12)	1.12***	(4.18)
	R3 (Winner)	8.46	0.33	0.09	0.10	3.85	39.32	1.13***	(3.60)	1.18***	(3.75)	1.15***	(3.67)	1.15***	(3.64)
	R3-R1							0.15	(0.91)	0.26*	(1.90)	0.30**	(2.43)	0.30**	(2.59)
6	R1 (Loser)	-3.65	0.33	0.09	0.10	3.38	28.38	0.84**	(2.44)	0.79**	(2.32)	0.75**	(2.19)	0.81**	(2.35)
	R2	0.94	0.34	0.09	0.09	4.19	48.55	1.12***	(4.14)	1.13***	(4.25)	1.11***	(4.15)	1.10***	(4.13)
	R3 (Winner)	6.12	0.34	0.09	0.10	3.92	38.24	1.30***	(4.06)	1.33***	(4.22)	1.25***	(3.97)	1.20***	(3.83)
	R3-R1							0.46**	(2.37)	0.53***	(3.04)	0.50***	(2.99)	0.40**	(2.53)
9	R1 (Loser)	-2.85	0.33	0.09	0.10	3.33	26.39	0.74**	(2.11)	0.75**	(2.16)	0.76**	(2.18)	0.84**	(2.39)
	R2	0.94	0.34	0.09	0.09	4.27	50.26	1.12***	(4.23)	1.14***	(4.34)	1.10***	(4.21)	1.11***	(4.21)
	R3 (Winner)	5.16	0.34	0.09	0.10	3.91	38.53	1.40***	(4.36)	1.36***	(4.26)	1.24***	(3.88)	1.17***	(3.67)
	R3-R1							0.65***	(3.11)	0.61***	(3.01)	0.48**	(2.45)	0.34*	(1.87)
12	R1 (Loser)	-2.38	0.33	0.09	0.10	3.27	25.85	0.76**	(2.15)	0.81**	(2.29)	0.83**	(2.34)	0.89**	(2.52)
	R2	0.92	0.34	0.09	0.09	4.30	49.64	1.13***	(4.33)	1.14***	(4.40)	1.11***	(4.29)	1.11***	(4.26)
	R3 (Winner)	4.58	0.34	0.09	0.10	3.97	39.69	1.37***	(4.18)	1.31***	(4.03)	1.17***	(3.61)	1.11***	(3.46)
	R3-R1							0.61***	(2.69)	0.50**	(2.30)	0.35*	(1.69)	0.23	(1.20)

Table 2: Monthly and Characteristic-Adjusted Returns: Trade Size and Price Momentum

This table presents average monthly and characteristic-adjusted returns from portfolios strategies formed on the basis of two-way sorts based on past trade size and price momentum for the period 1983 to 2010. We delete any firm that is in both the decile 1 (Decile 10) 100-share portfolio and the decile 1 (decile 10) 500 and 1000-share portfolios to eliminate overlapping firms. We also delete any firm with a share price < $5.00. At the beginning of each month all available stocks listed on the NYSE/Amex/NASDAQ markets are first sorted based on the past 6 months returns, and divided into three portfolios. The loser portfolio represents the worst prior price performance and the winner portfolio represents the best prior price performance. Within each momentum portfolio, the stocks are then sorted into deciles based on the average trade size over the month just prior to the monthly evaluation period. We skip one month between the portfolio formation period and the performance period. We analyze performance of three separate holding periods using a six-month period (1-6), a twelve-month period (1-12), and a holding period that spans months 13 to 24 from the formation period. Monthly returns are computed based on the portfolio rebalancing strategy described in Table 1 and characteristic-adjusted returns are based on firm size, book-to-market, and momentum using the portfolios derived from Daniel et al. (1997) and Wermers (2003). We report the base winner-loser portfolios for the base momentum strategy (W-L Base), the extreme Winner-Loser trade size deciles (W-L Deciles 1 or 10), and then we finally compare winner-loser trade portfolio returns to the base momentum strategy (W-L Decile 1 or 10 - Base). We report the average bid-ask spread and the price impact measure of Amihud, firm size expressed in millions of dollars, and the average price of the portfolio of stocks at the end of the month prior to the performance period. Panel 1 presents the primary trade size cluster results, Panel 2 presents the larger non-trade cluster size results, and Panel 3 presents the smaller non-trade cluster size results. Newey-West robust estimators with four lags specifying the t-statistics are presented in the parentheses. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Panel 1: Clustered Trades

Momentum Tercile	Trade Size Decile	Number of Firms	Average Price	Firm Size ($ millions)	Bid-Ask Spreads (%)	Amihud's measure	% Monthly Holding Period Returns 1-6 Return	T	1-12 Return	T	13-24 Return	T	% Monthly Characteristic-Adjusted Returns 1-6 Return	T	1-12 Return	T	13-24 Return	T
Panel A: Base Six Month Momentum Strategy, Single-Sort by previous six-month returns																		
Losers (L)		933	19	1740	2.06	0.13	0.81**	(2.31)	0.82**	(2.34)	1.14***	(3.23)	-0.26***	(-2.74)	-0.17*	(-1.96)	0.08	(1.07)
2		932	26	2733	1.77	0.13	1.14***	(4.27)	1.11***	(4.13)	1.11***	(4.04)	-0.02	(-0.29)	-0.01	(-0.14)	0.02	(0.27)
Winners (W)		932	27	2194	1.75	0.09	1.34***	(4.17)	1.22***	(3.83)	1.00***	(3.15)	0.18***	(3.43)	0.09**	(2.35)	-0.04	(-0.57)
W-L (Base)							0.53***	(2.94)	0.40**	(2.58)	-0.13	(-1.23)	0.45***	(3.22)	0.26**	(2.45)	-0.12	(-1.34)
Panel B: Double Sort by previous six-month returns, then previous one-month trade size = 100 shares																		
Losers (L)	1	48	18	3751	3.23	0.48	0.56*	(1.76)	0.61*	(1.90)	1.06***	(3.25)	-0.42***	(-3.40)	-0.29**	(-2.54)	0.02	(0.20)
	10	43	23	1304	2.07	0.12	0.97***	(3.09)	0.95***	(2.9)	1.16***	(3.58)	-0.13	(-1.25)	-0.07	(-0.70)	0.09	(1.00)
2	1	46	23	4256	3.11	0.54	0.89***	(3.26)	0.91***	(3.34)	1.13***	(4.20)	-0.2	(-1.56)	-0.15	(-1.25)	0.02	(0.15)
	10	45	31	2352	1.65	0.09	1.14***	(4.5)	1.12***	(4.47)	1.06***	(4.1)	-0.03	(-0.29)	-0.02	(-0.25)	-0.02	(-0.17)
Winners (W)	1	48	21	3296	2.79	0.32	1.25***	(4.04)	1.13***	(3.7)	0.98***	(2.96)	0.19*	(1.71)	0.07	(0.78)	-0.05	(-0.47)
	10	42	34	2015	1.69	0.08	1.47***	(4.32)	1.37***	(4.21)	1.01***	(3.35)	0.31**	(2.46)	0.24**	(2.29)	0.02	(0.16)
W-L (Decile 10)							0.51**	(2.26)	0.42*	(1.95)	-0.15	(-1.04)	0.44**	(2.54)	0.30**	(2.00)	-0.08	(-0.66)
W-L (Decile 1)							0.69***	(4.38)	0.52***	(3.57)	-0.08	(-0.55)	0.61***	(4.16)	0.36***	(3.24)	-0.07	(-0.56)
W-L (Decile 10) - W-L (Base)							-0.03	(-0.17)	0.01	(0.15)	-0.02	(-0.26)	-0.01	(-0.03)	0.04	(0.44)	0.04	(0.57)
W-L (Decile 1) - W-L (Base)							0.16	(1.45)	0.11	(1.16)	0.06	(0.52)	0.16	(1.39)	0.10	(1.05)	0.04	(0.35)
Panel C: Double Sort by previous six-month returns, then previous one-month trade size = 500 shares																		
Losers (L)	1	63	21	817	3.09	0.38	1.05***	(3.7)	1.01***	(3.52)	1.07***	(3.83)	-0.08	(-0.71)	-0.05	(-0.48)	-0.03	(-0.32)
	10	72	13	1018	2.96	0.29	0.66*	(1.8)	0.63*	(1.77)	0.91***	(2.63)	-0.50***	(-3.66)	-0.43***	(-3.85)	-0.16*	(-1.77)
2	1	63	27	850	2.88	0.36	1.13***	(4.62)	1.12***	(4.66)	1.08***	(4.57)	-0.09	(-0.69)	-0.04	(-0.35)	-0.04	(-0.34)
	10	71	17	1421	2.74	0.26	1.25***	(4.34)	1.15***	(3.98)	0.94***	(3.15)	0.01	(0.07)	-0.06	(-0.53)	-0.19*	(-1.77)
Winners (W)	1	63	31	1616	2.32	0.25	1.22***	(4.7)	1.22***	(4.77)	1.15***	(4.35)	0.03	(0.28)	0.06	(0.59)	0.12	(1.21)
	10	71	18	637	2.57	0.18	1.47***	(4.03)	1.20***	(3.3)	0.74**	(2.08)	0.27**	(2.45)	0.02	(0.19)	-0.35**	(-2.56)
W-L (Decile 10)							0.81***	(3.95)	0.57***	(3.61)	-0.18	(-1.49)	0.78***	(4.5)	0.45***	(3.97)	-0.18*	(-1.68)
W-L (Decile 1)							0.17	(1.45)	0.21*	(1.92)	0.08	(0.87)	0.11	(1.1)	0.11	(1.39)	0.14*	(1.86)
W-L (Decile 10) - W-L (Base)							0.28***	(2.65)	0.16**	(2.2)	-0.04	(-0.51)	0.33***	(3.13)	0.19**	(2.49)	-0.06	(-0.79)
W-L (Decile 1) - W-L (Base)							-0.36***	(-3.51)	-0.19**	(-2.38)	0.21***	(2.6)	-0.33***	(-3.70)	-0.15**	(-2.17)	0.26***	(3.2)
Panel D: Double Sort by previous six-month returns, then previous one-month trade size = 1000 shares																		
Losers (L)	1	59	23	648	2.79	0.41	0.89***	(3.26)	0.91***	(3.29)	1.06***	(3.91)	-0.27**	(-2.05)	-0.18	(-1.53)	-0.06	(-0.58)
	10	63	12	1335	2.56	0.21	0.6	(1.52)	0.62	(1.59)	1.01**	(2.47)	-0.49***	(-3.37)	-0.35***	(-2.84)	-0.01	(-0.08)
2	1	60	28	549	2.76	0.39	1.12***	(4.96)	1.11***	(4.92)	1.09***	(4.71)	-0.13	(-0.83)	-0.08	(-0.54)	-0.05	(-0.33)
	10	62	16	1526	2.41	0.22	1.22***	(3.88)	1.16***	(3.63)	1.08***	(3.23)	0.02	(0.17)	0	(-0.04)	0	(0.05)
Winners (W)	1	57	32	996	2.25	0.24	1.27***	(5.13)	1.21***	(4.93)	1.06***	(4.22)	0.04	(0.33)	0.04	(0.31)	0	(-0.04)
	10	63	18	1002	2.07	0.14	1.39***	(3.47)	1.15***	(2.94)	0.99**	(2.53)	0.25*	(1.85)	0.02	(0.14)	-0.06	(-0.45)
W-L (Decile 10)							0.79***	(3.74)	0.53***	(3.21)	-0.02	(-0.13)	0.74***	(4.15)	0.37***	(2.87)	-0.05	(-0.37)
W-L (Decile 1)							0.38***	(3.06)	0.30***	(2.78)	0.01	(0.08)	0.31***	(2.81)	0.21***	(2.65)	0.06	(0.82)
W-L (Decile 10) - W-L (Base)							0.26**	(2.44)	0.13	(1.45)	0.12	(1.05)	0.29***	(2.77)	0.11	(1.21)	0.07	(0.69)
W-L (Decile 1) - W-L (Base)							-0.15	(-1.29)	-0.1	(-1.10)	0.14*	(1.88)	-0.14	(-1.35)	-0.05	(-0.60)	0.18**	(2.58)

Panel 2: Non-Clustered Large Trades

Momentum Tercile	Trade Size Decile	Number of Firms	Average Price	Firm Size ($ millions)	Bid-Ask Spreads (%)	Amihud's measure	% Monthly Holding Period Returns 1-6 Return	T	1-12 Return	T	13-24 Return	T	% Monthly Characteristic-Adjusted Returns 1-6 Return	T	1-12 Return	T	13-24 Return	T
Panel E: Double Sort by previous six-month returns, then previous one-month trade size > 500 and < 1000 shares																		
Losers (L)	1	70	20	439	3.46	0.38	0.85***	(2.81)	0.86***	(2.83)	1.11***	(3.71)	-0.34***	(-2.61)	-0.25**	(-2.16)	-0.01	(-0.11)
	10	82	17	2947	2.73	0.29	0.84***	(2.63)	0.84***	(2.66)	1.04***	(3.41)	-0.21*	(-1.72)	-0.14	(-1.20)	-0.04	(-0.42)
2	1	70	25	498	3.23	0.35	1.26***	(4.96)	1.20***	(4.74)	1.13***	(4.41)	-0.02	(-0.17)	-0.04	(-0.28)	-0.04	(-0.32)
	10	83	23	4007	2.48	0.30	1.08***	(4.26)	1.05***	(4.13)	1.06***	(4.07)	-0.06	(-0.49)	-0.04	(-0.37)	-0.04	(-0.37)
Winners (W)	1	69	28	759	2.78	0.25	1.39***	(4.82)	1.27***	(4.34)	0.97***	(3.3)	0.14	(1.36)	0.05	(0.56)	-0.11	(-0.91)
	10	82	23	2939	2.33	0.19	1.13***	(3.89)	1.11***	(3.86)	1.02***	(3.33)	-0.01	(-0.06)	0	0	-0.03	(-0.31)
W-L (Decile 10)							0.28**	(1.97)	0.27**	(2.41)	-0.02	(-0.20)	0.21*	(1.77)	0.14*	(1.75)	0.01	(0.09)
W-L (Decile 1)							0.55***	(3.56)	0.41***	(2.87)	-0.13	(-1.17)	0.48***	(3.57)	0.30***	(2.89)	-0.1	(-0.98)
W-L (Decile 10) - W-L (Base)							-0.25***	(-2.98)	-0.14*	(-1.82)	0.11	(1.41)	-0.24***	(-3.31)	-0.13*	(-1.78)	0.13*	(1.69)
W-L (Decile 1) - W-L (Base)							0.02	(0.16)	0	(0.04)	0	(-0.01)	0.03	(0.32)	0.04	(0.55)	0.02	(0.34)
Panel F: Double Sort by previous six-month returns, then previous one-month trade size > 1000 and < 5000 shares																		
Losers (L)	1	72	22	722	3.05	0.37	0.77**	(2.53)	0.82***	(2.69)	1.12***	(3.73)	-0.36***	(-2.76)	-0.23*	(-1.87)	0.03	(0.29)
	10	78	16	4061	2.72	0.24	0.66*	(1.94)	0.67**	(1.98)	1.03***	(3.01)	-0.36***	(-3.32)	-0.25**	(-2.40)	0.01	(0.07)
2	1	72	27	732	2.83	0.31	1.17***	(4.97)	1.16***	(4.93)	1.07***	(4.45)	-0.08	(-0.57)	-0.04	(-0.31)	-0.05	(-0.38)
	10	79	22	5550	2.47	0.23	0.98***	(3.57)	0.96***	(3.48)	1.08***	(3.76)	-0.12	(-1.36)	-0.09	(-0.98)	0	(0.02)
Winners (W)	1	72	32	1311	2.55	0.24	1.47***	(4.75)	1.34***	(4.34)	0.97***	(3.29)	0.25**	(2.33)	0.16*	(1.76)	-0.04	(-0.31)
	10	78	21	3145	2.35	0.15	1.12***	(3.41)	1.02***	(3.13)	0.89**	(2.57)	0.08	(0.8)	-0.03	(-0.32)	-0.15	(-1.43)
W-L (Decile 10)							0.46***	(2.85)	0.34***	(2.61)	-0.14	(-1.36)	0.44***	(3.37)	0.22**	(2.37)	-0.15	(-1.53)
W-L (Decile 1)							0.70***	(3.75)	0.52***	(2.95)	-0.15	(-1.08)	0.62***	(3.95)	0.39***	(2.92)	-0.07	(-0.59)
W-L (Decile 10) - W-L (Base)							-0.07	(-0.79)	-0.06	(-0.75)	-0.01	(-0.10)	-0.01	(-0.13)	-0.04	(-0.49)	-0.03	(-0.45)
W-L (Decile 1) - W-L (Base)							0.17*	(1.71)	0.12	(1.38)	-0.02	(-0.21)	0.17*	(1.79)	0.13	(1.61)	0.05	(0.73)
Panel G: Double Sort by previous six-month returns, then previous one-month trade size = 5000 shares																		
Losers (L)	1	139	14	118	4.35	0.38	1.02***	(3.06)	1.19***	(3.53)	1.11***	(3.72)	-0.61***	(-2.99)	-0.34*	(-1.93)	-0.2	(-1.33)
	10	86	16	2139	2.19	0.09	0.78**	(2.07)	0.70*	(1.89)	1.07***	(2.92)	-0.32***	(-2.73)	-0.31***	(-2.91)	-0.02	(-0.20)
2	1	176	20	135	4.11	0.28	1.18***	(4.09)	1.03***	(3.16)	0.99***	(2.94)	0.03	(0.1)	0.05	(0.21)	-0.2	(-0.91)
	10	85	20	2577	1.95	0.10	1.17***	(3.83)	1.10***	(3.55)	1.12***	(3.58)	-0.01	(-0.09)	-0.04	(-0.47)	-0.03	(-0.41)
Winners (W)	1	131	20	171	3.56	0.30	1.50***	(5.36)	1.36***	(4.95)	0.99***	(2.94)	0.2	(1.34)	0.05	(0.37)	-0.02	(-0.12)
	10	85	21	1348	1.87	0.07	1.29***	(3.75)	1.16***	(3.31)	1.04***	(2.87)	0.16*	(1.7)	0.04	(0.5)	-0.07	(-0.74)
W-L (Decile 10)							0.52***	(2.84)	0.46***	(3.14)	-0.03	(-0.26)	0.48***	(3.24)	0.34***	(3.48)	-0.05	(-0.53)
W-L (Decile 1)							0.74***	(5.34)	0.45***	(3.42)	0.09	(0.77)	0.72***	(5.68)	0.38***	(3.58)	0.15	(1.58)
W-L (Decile 10) - W-L (Base)							-0.01	(-0.15)	0.06	(0.96)	0.1	(1.28)	0.03	(0.46)	0.08	(1.52)	0.07	(0.97)
W-L (Decile 1) - W-L (Base)							0.06	(0.34)	0.04	(0.38)	0.27***	(2.96)	0.08	(0.56)	0.07	(0.76)	0.28***	(3.16)
Panel H: Double Sort by previous six-month returns, then previous one-month trade size ≥ 500 shares																		
Losers (L)	1	57	26	1027	2.35	0.23	0.85***	(2.92)	0.85***	(2.92)	1.09***	(3.78)	-0.28**	(-2.08)	-0.19	(-1.60)	0	(0.03)
	10	62	15	3755	2.59	0.25	0.51	(1.43)	0.54	(1.55)	1.06***	(2.88)	-0.52***	(-4.46)	-0.40***	(-3.71)	0.02	(0.14)
2	1	59	33	1185	2.06	0.20	1.09***	(4.86)	1.07***	(4.75)	1.06***	(4.58)	-0.09	(-0.67)	-0.07	(-0.55)	-0.03	(-0.20)
	10	61	19	4531	2.44	0.27	1.00***	(3.47)	0.98***	(3.38)	1.12***	(3.6)	-0.12	(-1.23)	-0.1	(-1.11)	0	(0.05)
Winners (W)	1	55	36	1279	2.00	0.16	1.25***	(4.34)	1.20***	(4.23)	0.96***	(3.41)	0.07	(0.69)	0.07	(0.7)	-0.03	(-0.29)
	10	61	19	2332	2.20	0.15	1.24***	(3.4)	1.09***	(3.04)	0.90**	(2.39)	0.16	(1.24)	-0.01	(-0.05)	-0.19*	(-1.70)
W-L (Decile 10)							0.73***	(3.73)	0.55***	(3.64)	-0.15	(-1.28)	0.67***	(4.23)	0.40***	(3.65)	-0.21*	(-1.84)
W-L (Decile 1)							0.40**	(2.25)	0.36**	(2.21)	-0.13	(-1.05)	0.35**	(2.43)	0.26**	(2.21)	-0.04	(-0.40)
W-L (Decile 10) - W-L (Base)							0.20*	(1.92)	0.15*	(1.72)	-0.02	(-0.21)	0.22**	(2.18)	0.13	(1.48)	-0.09	(-1.00)
W-L (Decile 1) - W-L (Base)							-0.13	(-1.41)	-0.05	(-0.65)	0.01	(0.1)	-0.1	(-1.19)	0	(-0.05)	0.08	(1.28)

Panel 3: Non-Clustered Small Trades

Momentum Tercile	Trade Size Decile	Number of Firms	Average Price	Firm Size ($ millions)	Bid-Ask Spreads (%)	Amihud's measure	% Monthly Holding Period Returns 1-6 Return	1-6 T	1-12 Return	1-12 T	13-24 Return	13-24 T	% Monthly Characteristic-Adjusted Returns 1-6 Return	1-6 T	1-12 Return	1-12 T	13-24 Return	13-24 T
Panel I: Double Sort by previous six-month returns, then previous one-month trade size > 100 and < 500 shares																		
Losers (L)	1	71	17	504	2.71	0.23	0.78**	(2.36)	0.82**	(2.39)	1.20***	(3.43)	-0.38***	(-3.69)	-0.24***	(-2.70)	0.09	(1.18)
	10	82	19	1910	2.77	0.34	0.82***	(2.7)	0.80***	(2.64)	1.05***	(3.47)	-0.28**	(-2.16)	-0.22*	(-1.83)	-0.03	(-0.34)
2	1	70	24	877	2.45	0.20	1.12***	(3.98)	1.13***	(4.03)	1.18***	(4.09)	-0.13	(-1.44)	-0.08	(-0.95)	0	(-0.01)
	10	84	24	2398	2.55	0.32	1.09***	(4.58)	1.08***	(4.5)	1.04***	(4.28)	-0.06	(-0.41)	-0.05	(-0.39)	-0.07	(-0.50)
Winners (W)	1	70	25	822	2.16	0.15	1.40***	(4.19)	1.31***	(3.93)	1.08***	(3.22)	0.17*	(1.9)	0.1	(1.25)	-0.04	(-0.43)
	10	83	25	2266	2.37	0.21	1.33***	(4.97)	1.26***	(4.69)	1.01***	(3.52)	0.16	(1.54)	0.12	(1.24)	-0.05	(-0.36)
W-L (Decile 10)							0.52***	(3.77)	0.45***	(3.7)	-0.03	(-0.34)	0.44***	(3.98)	0.34***	(3.92)	-0.01	(-0.12)
W-L (Decile 1)							0.62***	(3.43)	0.49***	(2.94)	-0.12	(-0.98)	0.55***	(3.73)	0.34***	(2.9)	-0.13	(-1.26)
W-L (Decile 10) - W-L (Base)							-0.01	(-0.12)	0.05	(0.73)	0.10*	(1.79)	-0.01	(-0.06)	0.08	(1.18)	0.11**	(2.05)
W-L (Decile 1) - W-L (Base)							0.09	(0.99)	0.09	(1.14)	0.02	(0.27)	0.1	(1.09)	0.08	(1.15)	-0.01	(-0.14)

Table 3: Fama-French Three-Factor Regressions of Monthly Excess Returns on Price-Momentum-Trade Size Portfolios

This table presents regressions of monthly returns on price momentum and trade size for J=6 (formation period) and K=6 (months after the formation period) portfolios. We also skip one-month between each of these periods. We repeat the regressions for each of the three trade size portfolios, i.e. 100-share, 500-share, and 1000-shares. Each of the regression results are presented in separate panels. We delete any firms with a share price < \$5.00. At the beginning of each month all available stocks are sorted based on the past 6 months returns, and divided into 3 portfolios. The loser portfolio represents the worst prior return performance and the winner portfolio represents the best prior return performance. The stocks are then sorted based on the average trade size over the last month of the momentum portfolio formation period. We divide the trade size portfolios into 10 portfolios. The three-factor regression model is given as:

$$r_i - r_f = a_i + b_i(r_m - r_f) + s_i SMB + h_i HML + \epsilon_i$$

where $r_m - r_f$ is the excess return on the one-month value-weighted return on the NYSE/Amex/NASDAQ market, HML is the High-minus-low book-to-market (value) factor, and SMB is the small-minus-big size factor. The term a_i represents the abnormal performance for each portfolio. All returns and market return are stated on a percentage basis, hence the estimated slope coefficients are stated on a percentage basis. We report the winner-loser portfolios for each of the three trade size portfolios. The sample period spans January 1983 to December 2010. Newey-West robust estimators with four lags specifying the t-statistics are presented in the parentheses. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Panel A: Trade Size = 100 Shares

	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1
Portfolio			a				b				s	
Losers (L)	-0.51***	-0.48***	-0.18*	0.34*	0.95***	1.20***	1.03***	0.07	0.42***	0.67***	0.66***	0.25***
	(-2.85)	(-3.32)	(-1.67)	(1.82)	(13.83)	(26.91)	(16.68)	(0.79)	(3.03)	(4.35)	(6.69)	(2.73)
2	-0.07	0.05	0.1	0.17	0.76***	0.95***	0.84***	0.08	0.34***	0.40***	0.49***	0.15
	(-0.41)	(0.57)	(1.24)	(0.99)	(11.56)	(31.21)	(27.21)	(0.98)	(3.36)	(5.54)	(8.75)	(1.63)
Winners (W)	0.21	0.28***	0.54***	0.33	0.87***	1.00***	0.90***	0.02	0.64***	0.74***	0.84***	0.22
	(1.57)	(3.56)	(3.24)	(1.43)	(14.38)	(26.22)	(21.86)	(0.27)	(7.53)	(21.62)	(7.37)	(1.19)
W-L	0.72***	0.76***	0.71***	-0.01	-0.08	-0.20***	-0.13*	-0.05	0.23***	0.08	0.19	-0.03
	(4.63)	(4.27)	(3.24)	(-0.03)	(-1.38)	(-2.77)	(-1.69)	(-0.93)	(2.86)	(0.54)	(0.94)	(-0.19)

	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1
Portfolio			h				Adj-Rsqr	
Losers (L)	0.26**	0.26**	0.26**	0	0.70	0.82	0.81	0.07
	(2.38)	(2.14)	(2.18)	(0.02)				
2	0.26**	0.38***	0.30***	0.04	0.69	0.91	0.87	0.04
	(2.55)	(6.01)	(4.44)	(0.33)				
Winners (W)	0.19*	0.1	-0.17*	-0.36**	0.77	0.91	0.85	0.16
	(1.87)	(1.22)	(-1.94)	(-2.35)				
W-L	-0.07	-0.16	-0.43***	-0.36***	0.06	0.05	0.13	0.10
	(-0.68)	(-0.89)	(-2.65)	(-3.75)				

Panel B: Trade Size = 500 Shares

	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1
Portfolio			a				b				s	
Losers (L)	-0.05	-0.41***	-0.48***	-0.43***	0.86***	1.18***	0.99***	0.12**	0.43***	0.63***	0.75***	0.33***
	(-0.36)	(-3.04)	(-3.74)	(-3.59)	(20.16)	(26.68)	(16.48)	(2.21)	(3.13)	(4.5)	(8.01)	(4.22)
2	0.18	0.01	0.27*	0.09	0.70***	0.97***	0.76***	0.07**	0.34***	0.40***	0.52***	0.19***
	(1.31)	(0.08)	(1.95)	(0.97)	(13.87)	(42.56)	(14.7)	(2.23)	(4.46)	(5.36)	(7.61)	(6.59)
Winners (W)	0.20*	0.26***	0.43***	0.24	0.82***	1.01***	0.92***	0.10**	0.41***	0.77***	0.85***	0.46***
	(1.80)	(3.07)	(2.96)	(1.46)	(16.92)	(32.84)	(18.37)	(2.11)	(4.47)	(15.79)	(19.05)	(4.49)
W-L	0.24**	0.67***	0.91***	0.67***	-0.04	-0.17**	-0.07	-0.02	-0.01	0.15	0.12	0.13**
	(2.21)	(3.50)	(5.65)	(5.27)	(-0.84)	(-2.53)	(-0.76)	(-0.44)	(-0.11)	(0.82)	(1.1)	(2.29)

	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1
Portfolio			h				Adj-Rsqr	
Losers (L)	0.46***	0.26**	0.31**	-0.14	0.77	0.84	0.76	0.25
	(5.15)	(2.44)	(2.52)	(-1.32)				
2	0.38***	0.36***	0.31***	-0.07*	0.76	0.93	0.79	0.21
	(5.13)	(6.37)	(4.18)	(-1.77)				
Winners (W)	0.33***	0.02	0.09	-0.24***	0.81	0.84	0.93	0.35
	(4.09)	(0.23)	(1.25)	(-2.88)				
W-L	-0.13	-0.25	-0.22	-0.1	0.02	0.07	0.05	0.04
	(-1.47)	(-1.50)	(-1.30)	(-0.96)				

Panel C: Trade Size = 1000 Shares

	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1
Portfolio			a				b				s	
Losers (L)	-0.16	-0.39***	-0.56***	-0.41***	0.80***	1.15***	1.12***	0.32***	0.40***	0.62***	0.79***	0.40***
	(-1.37)	(-2.80)	(-3.72)	(-2.75)	(23.23)	(26.6)	(19.02)	(5.8)	(4.31)	(4.22)	(6.85)	(6.27)
2	0.22*	0.04	0.22*	0	0.62***	0.95***	0.89***	0.27***	0.32***	0.35***	0.63***	0.33***
	(1.71)	(0.42)	(1.66)	(0.03)	(13.16)	(34.69)	(18.63)	(7.58)	(5.29)	(4.24)	(9.17)	(7.29)
Winners (W)	0.29***	0.29***	0.35**	0.06	0.77***	0.98***	1.03***	0.25***	0.45***	0.74***	0.92***	0.48***
	(2.60)	(3.93)	(2.16)	(0.28)	(16.81)	(31.52)	(19.63)	(5.54)	(7)	(25.42)	(16.21)	(5.24)
W-L	0.45***	0.69***	0.92***	0.47***	-0.04	-0.17***	-0.1	-0.07	0.06	0.14	0.14	0.09
	(3.94)	(3.75)	(4.79)	(2.61)	(-0.69)	(-2.63)	(-1.08)	(-1.06)	(0.9)	(0.85)	(1.09)	(0.97)

	D1	D5	D10	D10 - D1	D1	D5	D10	D10 - D1
Portfolio			h				Adj-Rsqr	
Losers (L)	0.43***	0.35***	0.11	-0.32***	0.78	0.83	0.79	0.49
	(5.05)	(3.09)	(1.06)	(-4.15)				
2	0.37***	0.39***	0.1	-0.27***	0.75	0.91	0.84	0.56
	(6.05)	(6.28)	(1.28)	(-5.17)				
Winners (W)	0.27***	0.1	-0.12	-0.39***	0.86	0.93	0.85	0.48
	(4.15)	(1.62)	(-1.30)	(-4.52)				
W-L	-0.16	-0.24	-0.23	-0.07	0.04	0.07	0.05	0.01
	(-1.54)	(-1.53)	(-1.40)	(-0.75)				

Table 4: Cross-Sectional Fama-MacBeth Predictive Monthly Return Regressions

This table presents cross-sectional Fama-BacBeth predictive monthly return regressions using trade size clusters of 100, 500, and 1000-shares. We interact the six-month momentum return with the trade size cluster to test whether each trade size cluster is enhancing the momentum return on a monthly return basis. We control for the direct momentum effect as well as various controls that are noted to be associated with future monthly returns. These include the prior monthly return (reversal), idiosyncratic volatility, share turnover, the Amihud liquidity measure, and book-to-market. We also include the percentage of stock held by institutions and the number of analysts following firm. These two variables are natural log scaled. All of the control variables are lagged by one-month. Finally, we include the contemporaneous Fama-French factors. T-statistics are presented in the parentheses and these are Newey-West corrected with four lags. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Variable	100-Share Cluster		500-Share Cluster		1000-Share Cluster	
6-Month Momentum Return	1.2761***	1.4083***	0.1385	-0.0996	0.3900	0.4311
	(3.94)	(3.43)	(0.39)	(-0.26)	(1.36)	(1.33)
100-Share Cluster	-1.7250***	-2.6974***				
	(-5.20)	(-4.82)				
Momentum*100-Share	-0.9321	-1.0388				
	(-1.25)	(-0.86)				
500-Share Cluster			2.9072***	7.1062**		
			(2.80)	(2.27)		
Momentum*500-Share			8.3840***	11.3203***		
			(2.92)	(3.13)		
1000-Share Cluster					6.4559***	19.3880**
					(5.48)	(2.28)
Momentum*1000-Share					9.4912**	15.0339**
					(1.98)	(1.96)
β_{rm}	0.2668**	0.2593**	0.2617**	0.2504**	0.2506**	0.2449**
	(2.28)	(2.08)	(2.22)	(2.00)	(2.16)	(1.98)
β_{hml}	-0.0584	-0.0634	-0.0508	-0.0553	-0.0499	-0.0524
	(-0.93)	(-1.06)	(-0.81)	(-0.93)	(-0.80)	(-0.88)
β_{smb}	-0.0043	-0.0218	-0.0070	-0.0211	-0.0074	-0.0241
	(-0.10)	(-0.48)	(-0.16)	(-0.46)	(-0.17)	(-0.54)
Idiosyncratic Volatility	-0.0597	-0.0885**	-0.0504	-0.0808*	-0.0712*	-0.1047***
	(-1.45)	(-2.08)	(-1.23)	(-1.88)	(-1.81)	(-2.68)
Prior Month's Return	-0.0356***	-0.0438***	-0.0351***	-0.0434***	-0.0356***	-0.0436***
	(-9.36)	(-10.41)	(-9.27)	(-10.39)	(-9.42)	(-10.51)
Turnover	-0.4896	0.5416	-0.3667	0.5875	-0.5870	0.4856
	(-1.00)	(1.08)	(-0.75)	(1.19)	(-1.21)	(0.96)
Amihud Measure	0.3983*	-0.3439	0.3575*	-0.2180	0.4127**	-0.2510
	(1.94)	(-0.68)	(1.73)	(-0.40)	(2.06)	(-0.49)
Ln(Firm Size)	-0.1865***	-0.2141***	-0.1801***	-0.2029***	-0.1643***	-0.1744***
	(-5.47)	(-3.67)	(-5.54)	(-3.70)	(-4.99)	(-3.25)
Ln(1+Institutional Holdings)		-1.0950***		-0.9838***		-0.9442***
		(-3.55)		(-3.25)		(-3.13)
Book-to-Market		0.2918**		0.3330***		0.3236***
		(2.54)		(2.81)		(2.77)
Ln(Number of Analysts)		0.1353*		0.1609**		0.1270
		(1.73)		(2.03)		(1.63)
Observations	336	336	336	336	336	336
Adjusted R^2	0.069	0.078	0.068	0.078	0.069	0.079

Table 5: Trade Size Cluster Determinants

We present cross-sectional Fama-MacBeth determinant regressions using 100, 500, and 1000-share trade size clusters. We test variables that would typify informed versus noise trading characteristics. We include the contemporaneously measured Fama-French systematic risk measures and the resulting idiosyncratic volatility "risk" measure. Higher levels of idiosyncratic volatility should be associated with higher levels of noise trading. All are estimated using one-month of daily data. We include institutional holdings and the unexpected earnings estimated from a seasonal random walk model and relative to the median analyst forecast error. Both of these estimates are available quarterly and we project all of these estimates over the three months from their announcement. As control variables we, include Amihud's liquidity measure and firm size as general information environment variables under the premise that smaller more illiquid firms are more associated with a more opaque information environment. All of the control variables are lagged by one-month. Finally, we include the lagged trade-size clusters to model trade size persistence. T-statistics are presented in the parentheses and these are Newey-West corrected with four lags. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Variable	100-Share Cluster		500-Share Cluster		1000-Share Cluster	
Idiosyncratic Volatility	-0.0050***	-0.0070***	0.0015***	0.0020***	0.0043***	0.0044***
	(-9.47)	(-14.69)	(6.06)	(8.23)	(12.23)	(12.77)
β_{rm}	0.0001	-0.0001	0.0008***	0.0008***	0.0016***	0.0014***
	(0.26)	(-0.43)	(3.27)	(5.24)	(5.73)	(6.20)
β_{hml}	0.0001	-0.0000	-0.0003***	-0.0003***	-0.0007***	-0.0006***
	(0.36)	(-0.28)	(-4.31)	(-4.17)	(-5.99)	(-5.33)
β_{smb}	0.0008***	0.0003**	-0.0005***	-0.0002**	-0.0003***	-0.0002**
	(4.47)	(2.06)	(-6.14)	(-2.06)	(-3.26)	(-2.08)
Ln(1+Institutional Holdings)	-0.0163***	-0.0219***	-0.0122***	-0.0036***	-0.0025**	-0.0021**
	(-4.61)	(-9.44)	(-10.80)	(-3.69)	(-2.25)	(-2.18)
Lagged Share Turnover	-0.0178***	0.0072**	0.0057**	0.0080**	0.0436***	0.0278***
	(-4.53)	(2.49)	(2.07)	(2.36)	(8.53)	(5.29)
Lagged Amihud Measure	-0.0228***	-0.1345***	0.0037***	0.0349**	0.0011*	0.0544***
	(-8.00)	(-3.22)	(3.15)	(2.27)	(1.67)	(3.63)
Lagged Ln(Firm Size)	-0.0008	-0.0018***	-0.0027***	-0.0007***	-0.0013***	0.0003*
	(-1.59)	(-4.19)	(-9.35)	(-3.20)	(-5.22)	(1.82)
Earnings Surprise (Seasonal Random Walk)		0.0110		0.0004		-0.0015
		(1.34)		(0.29)		(-0.88)
Earnings Surprise (Analyst Forecast-based)		0.0070		0.0146**		-0.0001
		(0.25)		(2.01)		(-0.01)
Lagged 100-Share Cluster	0.6805***	0.8138***				
	(44.41)	(65.04)				
Lagged 500-Share Cluster			0.4067***	0.6629***		
			(30.51)	(37.08)		
Lagged 1000-Share Cluster					0.5402***	0.7776***
					(43.99)	(52.34)
Observations	336	336	336	336	336	336
Adjusted R^2	0.538	0.752	0.258	0.546	0.417	0.750

Table 6: Seasonality in Momentum Return and Trade Size

This table presents average monthly and characteristic-adjusted returns from portfolios strategies separated into January and then February to December. All portfolios are formed on the basis of two-way sorts based on past trade size and price momentum for the period 1983 to 2010. We delete any firm that is in both the extreme 100-share and the 500 (or the 100 share and the 1000) share trade cluster portfolios to eliminate overlapping firms. We also delete any firm with a share price $<$ \$5.00. At the beginning of each month all available stocks listed on the NYSE/Amex/NASDAQ markets are sorted based on the past 6 months returns, and divided into three portfolios. The loser portfolio represents the worst prior return performance and the winner portfolio represents the best prior return performance. The stocks are then sorted based on the average trade size over the month just prior to the monthly evaluation period. We divide the trade size portfolios into decile portfolios. Monthly returns are computed based on the portfolio rebalancing strategy described in Table 1 and characteristic-adjusted returns are based on firm size, book-to-market, and momentum using the portfolios derived from Daniel et al. (1997) and Wermers (2003). We report the winner-loser (W-L) portfolios for the base momentum strategy (W-L Base), then based on the extreme trade size quintiles (W-L quintiles 1 or 10), and finally relative to the base momentum strategy (W-L quintile 1 or 10 minus the base momentum strategy). T-statistics are presented in the parentheses and these are Newey-West corrected with four lags. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Period	Portfolio	Average Monthly Return		Characteristic-Adjusted Return	
Panel A: Base Strategy Momentum Portfolios Returns					
Jan.	W-L	-0.96	(-1.52)	0.01	(0.02)
Feb.-Dec.	W-L	0.66***	(3.03)	0.49***	(3.03)
Panel B: Double Sort on Momentum and 100-Share Trade Size					
Jan.	W-L (Decile 10)	-0.95*	(-1.86)	0.19	(0.40)
Jan.	W-L (Decile 1)	-0.15	(-0.20)	0.62	(0.87)
Jan.	W-L (Decile 10) - W-L (Base)	0.01	(0.03)	0.18	(0.41)
Jan.	W-L (Decile 1) - W-L (Base)	0.81*	(1.81)	0.61	(1.47)
Feb.-Dec.	W-L (Decile 10)	0.47**	(2.02)	0.32*	(1.66)
Feb.-Dec.	W-L (Decile 1)	0.86***	(4.32)	0.71***	(4.43)
Feb.-Dec.	W-L (Decile 10) - W-L (Base)	-0.19**	(-2.21)	-0.17*	(-1.88)
Feb.-Dec.	W-L (Decile 1) - W-L (Base)	0.19*	(1.85)	0.21**	(2.00)
Panel C: Double Sort on Momentum and 500 Share Trade Size					
Jan.	W-L (Decile 10)	-0.37	(-0.59)	0.7	(1.29)
Jan.	W-L (Decile 1)	-0.97**	(-2.13)	-0.03	(-0.05)
Jan.	W-L (Decile 10) - W-L (Base)	0.58*	(2.04)	0.69**	(2.45)
Jan.	W-L (Decile 1) - W-L (Base)	-0.02	(-0.04)	-0.04	(-0.12)
Feb.-Dec.	W-L (Decile 10)	0.92***	(4.99)	0.77***	(5.16)
Feb.-Dec.	W-L (Decile 1)	0.30**	(2.00)	0.17	(1.54)
Feb.-Dec.	W-L (Decile 10) - W-L (Base)	0.26**	(2.38)	0.28***	(2.64)
Feb.-Dec.	W-L (Decile 1) - W-L (Base)	-0.37***	(-3.50)	-0.32***	(-3.51)
Panel D: Double Sort on Momentum and 1000 Share Trade Size					
Jan.	W-L (Decile 10)	-0.5	(-0.77)	0.5	(0.89)
Jan.	W-L (Decile 1)	-0.98*	(-1.90)	0.07	(0.13)
Jan.	W-L (Decile 10) - W-L (Base)	0.46	(1.54)	0.49*	(1.75)
Jan.	W-L (Decile 1) - W-L (Base)	-0.02	(-0.06)	0.06	(0.18)
Feb.-Dec.	W-L (Decile 10)	0.92***	(4.05)	0.74***	(4.17)
Feb.-Dec.	W-L (Decile 1)	0.42**	(2.53)	0.30**	(2.21)
Feb.-Dec.	W-L (Decile 10) - W-L (Base)	0.25***	(2.67)	0.25***	(2.82)
Feb.-Dec.	W-L (Decile 1) - W-L (Base)	-0.24**	(-2.36)	-0.20**	(-2.14)

Table 7: Decimalization Effect on Trade Size and Price Momentum

This table presents average monthly and characteristic-adjusted returns from portfolios strategies formed on the basis of two-way sorts based on past trade size and price momentum for the period 1983 to 2010. We split the sample into the pre-decimalization time period from 1983 to 2000, shown in Panel 1, and into the post-decimalization period from 2001 to 2010, shown in Panel 2. We delete any firm that is in both the extreme 100-share and the 500 share trade portfolios to eliminate overlapping firms. We also delete firms with a price < \$5.00 in the month prior to the performance period. At the beginning of each month all available stocks listed on the NYSE/Amex/NASDAQ markets are sorted based on the past 6 months returns, and divided into 3 portfolios. The loser portfolio represents the worst prior return performance and the winner portfolio represents the best prior return performance. The stocks are then sorted based on the average trade size over the month just prior to the monthly evaluation period. We divide the trade size portfolios into 10 portfolios. We analyze performance of three separate holding periods using a six-month period (1-6), a twelve-month period (1-12), and a holding period that spans months 13 to 24 from the formation period. Monthly returns are computed based on the portfolio rebalancing strategy described in Table 1 and characteristic-adjusted returns are based on firm size, book-to-market, and momentum characteristics. We report the winner-loser portfolios for the base momentum strategy (W-L Base), then based on the extreme trade size deciles (W-L Deciles 1 or 10), and finally relative to the base momentum strategy (W-L Decile 1 or 10 minus the base momentum strategy). For each extreme portfolio, we report the average bid-ask spread and the price impact measure of Amihud. We also present firm size expressed in millions of dollars and the average price of the portfolio of stocks at the end of the month prior to the performance period. Newey-West robust estimators with four lags specifying the t-statistics are presented in the parentheses Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Panel 1: Pre-Decimalization Period - 1983 to 2000

Momentum Tercile	Trade Size Decile	Number of Firms	Average Price	Firm Size ($ millions)	Bid-Ask Spread (%)	Amihud's measure	% Monthly Characteristic-Adjusted Returns, Pre-2001 1-6 Return	T	1-12 Return	T	13-24 Return	T
Panel A: Base Six Month Momentum Strategy, Single-Sort by previous six-month returns												
Losers (L)		940	18	951	2.80	0.12	-0.37***	(-3.39)	-0.28***	(-3.09)	0.01	(0.21)
2		937	25	1784	2.34	0.10	-0.03	(-0.34)	-0.04	(-0.50)	-0.04	(-0.54)
Winners (W)		942	26	1617	2.34	0.09	0.25***	(4.94)	0.11**	(2.53)	-0.15*	(-1.87)
W-L (Base)							0.62***	(4.17)	0.39***	(3.63)	-0.16	(-1.58)
Panel B: Double Sort by previous six-month returns, then previous one-month trade size = 100 shares												
Losers (L)	1	55	13	431	3.87	0.23	-0.52***	(-3.65)	-0.40***	(-2.97)	0.06	(0.51)
	10	46	22	1721	2.96	0.18	-0.11	(-0.88)	-0.08	(-0.65)	0.05	(0.49)
2	1	51	18	541	3.66	0.23	-0.16	(-1.02)	-0.17	(-1.12)	0.01	(0.07)
	10	46	32	3254	2.34	0.13	0.04	(0.3)	-0.03	(-0.20)	-0.03	(-0.21)
Winners (W)	1	57	17	512	3.40	0.17	0.31**	(2.42)	0.07	(0.6)	-0.19	(-1.62)
	10	46	36	2757	2.40	0.12	0.55***	(3.31)	0.37***	(2.96)	-0.07	(-0.45)
W-L (Decile 10)							0.66***	(2.76)	0.45**	(2.23)	-0.12	(-0.94)
W-L (Decile 1)							0.83***	(4.47)	0.47***	(3.13)	-0.26	(-1.57)
W-L (Decile 10) - W-L (Base)							0.04	(0.24)	0.07	(0.5)	0.04	(0.42)
W-L (Decile 1) - W-L (Base)							0.20*	(1.69)	0.08	(0.84)	-0.09	(-0.71)
Panel C: Double Sort by previous six-month returns, then previous one-month trade size = 500 shares												
Losers (L)	1	71	18	771	3.87	0.31	-0.08	(-0.59)	-0.08	(-0.55)	0.04	(0.34)
	10	80	13	122	3.80	0.26	-0.56***	(-3.76)	-0.46***	(-3.36)	-0.22*	(-1.97)
2	1	69	24	878	3.48	0.27	0.01	(0.06)	0	(0.03)	-0.01	(-0.08)
	10	78	18	194	3.38	0.22	0	(-0.03)	-0.07	(-0.48)	-0.23	(-1.56)
Winners (W)	1	72	28	1886	2.82	0.18	0.19	(1.41)	0.13	(1.17)	0.11	(0.82)
	10	81	19	201	3.22	0.20	0.31***	(2.91)	0.05	(0.52)	-0.48***	(-2.83)
W-L (Decile 10)							0.87***	(5.33)	0.52***	(3.97)	-0.26**	(-2.03)
W-L (Decile 1)							0.27**	(2.48)	0.21**	(2.56)	0.07	(0.72)
W-L (Decile 10) - W-L (Base)							0.25**	(2.11)	0.13	(1.4)	-0.1	(-1.01)
W-L (Decile 1) - W-L (Base)							-0.35***	(-3.20)	-0.18**	(-2.54)	0.23***	(2.68)
Panel D: Double Sort by previous six-month returns, then previous one-month trade size = 1000 shares												
Losers (L)	1	58	21	639	3.33	0.29	-0.26	(-1.56)	-0.16	(-1.00)	-0.01	(-0.09)
	10	70	13	301	3.26	0.17	-0.54***	(-3.34)	-0.34**	(-2.34)	0.14	(0.72)
2	1	58	26	489	3.17	0.26	-0.05	(-0.26)	-0.04	(-0.19)	-0.02	(-0.13)
	10	68	18	773	2.89	0.16	-0.02	(-0.18)	0.01	(0.17)	0.05	(0.59)
Winners (W)	1	57	29	960	2.65	0.18	0.14	(0.86)	0.08	(0.61)	-0.06	(-0.39)
	10	72	22	712	2.49	0.12	0.31*	(1.95)	0.09	(0.65)	0	(0.03)
W-L (Decile 10)							0.85***	(4.36)	0.43***	(3.1)	-0.14	(-0.83)
W-L (Decile 1)							0.40***	(3.35)	0.24***	(2.76)	-0.05	(-0.60)
W-L (Decile 10) - W-L (Base)							0.23*	(1.93)	0.04	(0.41)	0.03	(0.23)
W-L (Decile 1) - W-L (Base)							-0.23*	(-1.80)	-0.14*	(-1.68)	0.11	(1.56)

Panel 2: Post-Decimalization Period - 2001 to 2010

	Trade		Average	Firm	Bid-Ask	Amihud's	% Monthly Characteristic-Adjusted Returns, Post-2001					
Momentum	Size	Number	Price	Size	Spread	measure	1-6		1-12		13-24	
Tercile	Decile	of Firms		($ millions)	(%)		Return	T	Return	T	Return	T
Panel E: Base Six Month Momentum Strategy, Single-Sort by previous six-month returns												
Losers (L)		919	20	3174	0.71	0.15	-0.19	(-0.93)	-0.12	(-0.60)	0.05	(0.25)
2		924	27	4456	0.74	0.17	0.01	(0.19)	0.06	(0.78)	0.08	(1.05)
Winners (W)		914	27	3243	0.69	0.10	0.1	(0.87)	0.1	(1.18)	0.18*	(1.73)
W-L (Base)							0.3	(0.97)	0.22	(0.85)	0.13	(0.69)
Panel F: Double Sort by previous six-month returns, then previous one-month trade size = 100 shares												
Losers (L)	1	35	25	9778	2.06	0.92	-0.33	(-1.53)	-0.18	(-0.93)	-0.08	(-0.34)
	10	39	23	547	0.46	0.02	-0.19	(-0.92)	-0.12	(-0.61)	0.03	(0.15)
2	1	35	31	11001	2.13	1.10	-0.31	(-1.37)	-0.17	(-0.74)	0.04	(0.15)
	10	43	30	715	0.41	0.02	-0.11	(-0.84)	0.01	(0.07)	-0.01	(-0.07)
Winners (W)	1	31	28	8350	1.69	0.60	0.01	(0.06)	0.11	(0.6)	0.18	(0.91)
	10	35	31	670	0.41	0.02	-0.03	(-0.21)	0.12	(0.78)	0.29***	(3.24)
W-L (Decile 10)							0.16	(0.6)	0.23	(0.86)	0.27	(1.34)
W-L (Decile 1)							0.34	(1.53)	0.29	(1.56)	0.27	(1.22)
W-L (Decile 10) - W-L (Base)							-0.14	(-0.80)	0.01	(0.09)	0.14	(1.22)
W-L (Decile 1) - W-L (Base)							0.04	(0.19)	0.07	(0.32)	0.14	(0.56)
Panel G: Double Sort by previous six-month returns, then previous one-month trade size = 500 shares												
Losers (L)	1	49	26	899	1.68	0.51	-0.11	(-0.52)	-0.02	(-0.12)	-0.19	(-1.11)
	10	59	12	2644	1.45	0.36	-0.49*	(-1.71)	-0.49**	(-2.36)	-0.13	(-0.72)
2	1	52	33	800	1.79	0.53	-0.22	(-0.94)	-0.1	(-0.41)	-0.12	(-0.52)
	10	58	16	3650	1.58	0.32	0.04	(0.21)	-0.01	(-0.08)	-0.08	(-0.45)
Winners (W)	1	46	36	1126	1.43	0.37	-0.19	(-0.92)	-0.01	(-0.05)	0.15	(0.9)
	10	54	15	1428	1.41	0.16	0.25	(1.02)	-0.02	(-0.08)	-0.06	(-0.25)
W-L (Decile 10)							0.75*	(1.9)	0.47**	(1.98)	0.07	(0.29)
W-L (Decile 1)							-0.09	(-0.41)	0.01	(0.07)	0.33**	(2.58)
W-L (Decile 10) - W-L (Base)							0.45**	(2.1)	0.25*	(1.81)	-0.06	(-0.43)
W-L (Decile 1) - W-L (Base)							-0.39**	(-2.22)	-0.21	(-1.33)	0.2	(1.01)
Panel H: Double Sort by previous six-month returns, then previous one-month trade size = 1000 shares												
Losers (L)	1	61	27	666	1.81	0.61	-0.3	(-1.42)	-0.24	(-1.33)	-0.18	(-1.13)
	10	50	11	3211	1.31	0.29	-0.52*	(-1.72)	-0.52**	(-2.09)	-0.4	(-1.65)
2	1	65	32	657	2.01	0.63	-0.2	(-0.82)	-0.1	(-0.41)	-0.05	(-0.23)
	10	52	13	2892	1.55	0.34	0.1	(0.51)	0	0	-0.12	(-0.75)
Winners (W)	1	57	36	1063	1.52	0.33	-0.08	(-0.39)	-0.01	(-0.03)	0.12	(0.73)
	10	47	12	1529	1.32	0.17	0.16	(0.62)	-0.1	(-0.45)	-0.1	(-0.41)
W-L (Decile 10)							0.68*	(1.82)	0.43	(1.46)	0.31	(1.2)
W-L (Decile 1)							0.22	(1)	0.24	(1.34)	0.30**	(2.11)
W-L (Decile 10) - W-L (Base)							0.38**	(1.86)	0.2	(1.21)	0.18	(0.87)
W-L (Decile 1) - W-L (Base)							-0.08	(-0.42)	0.01	(0.09)	0.17	(1.14)

Table 8: Portfolios Formed on Trade Size Quintiles and Price Momentum Terciles

This table presents average monthly and characteristic-adjusted returns from portfolios strategies formed on the basis of two-way sorts based on past trade size and price momentum for the period 1983 to 2010. We delete any firm that is in both the extreme 100-share and the 500 (or the 100 share and the 1000) share trade cluster portfolios to eliminate overlapping firms. We also delete any firm with a share price < $5.00. At the beginning of each month all available stocks listed on the NYSE/Amex/NASDAQ markets are sorted based on the past 6 months returns, and divided into 3 portfolios. The loser portfolio represents the worst prior return performance and the winner portfolio represents the best prior return performance. The stocks are then sorted based on the average trade size over the month just prior to the monthly evaluation period. We divide the trade size portfolios into quintile portfolios. We analyze performance of three separate holding periods using a six-month period (1-6), a twelve-month period (1-12), and a holding period that spans months 13 to 24 from the formation period. Monthly returns are computed based on the portfolio rebalancing strategy described in Table 1 and characteristic-adjusted returns are based on firm size, book-to-market, and momentum using the portfolios derived from Daniel et al. (1997) and Wermers (2003). We report the winner-loser (W-L) portfolios for the base momentum strategy (W-L Base), then based on the extreme trade size quintiles (W-L quintiles 1 or 5), and finally relative to the base momentum strategy (W-L quintile 1 or 5 minus the base momentum strategy). For each extreme portfolio, we report the average bid-ask spread and the price impact measure of Amihud. We also present firm size expressed in millions of dollars and the average price of the portfolio of stocks at the end of the month prior to the performance period. T-statistics are presented in the parentheses and these are Newey-West corrected with four lags. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Momentum Tercile	Trade Size Quintile	Number of Firms	Average Price	Firm Size ($ millions)	Bid-Ask Spreads (%)	Amihud's measure	% Monthly Characteristic-Adjusted Returns 1-6 Return	T	1-12 Return	T	13-24 Return	T
Panel A: Base Six Month Momentum Strategy, Single-Sort by previous six-month returns												
Losers (L)		761	18	1519	2.10	0.14	-0.26***	(-2.68)	-0.17*	(-1.85)	0.09	(1.1)
2		759	26	2475	1.80	0.13	-0.01	(-0.26)	0	(-0.06)	0.02	(0.4)
Winners (W)		759	26	2070	1.78	0.10	0.19***	(3.59)	0.10**	(2.55)	-0.04	(-0.53)
W-L (Base)							0.46***	(3.24)	0.27**	(2.43)	-0.12	(-1.36)
Panel B: Double Sort by Previous six-month returns, then previous one-month trade size = 100 shares												
Losers (L)	1	67	19	2650	2.80	0.37	-0.23**	(-2.06)	-0.19*	(-1.86)	0.09	(1)
	5	63	19	844	2.08	0.11	-0.19*	(-1.80)	-0.15	(-1.56)	0.05	(0.51)
2	1	63	25	3091	2.63	0.36	-0.14	(-1.31)	-0.09	(-0.86)	0.01	(0.09)
	5	65	27	1888	1.65	0.08	0.02	(0.25)	0.03	(0.38)	-0.03	(-0.32)
Winners (W)	1	66	24	2654	2.40	0.23	0.11	(1.2)	0.08	(0.89)	-0.1	(-0.89)
	5	62	29	1561	1.71	0.08	0.33***	(2.89)	0.20**	(2.19)	0	(0.01)
W-L (Quintile 5)							0.53***	(2.93)	0.35**	(2.38)	-0.05	(-0.43)
W-L (Quintile 1)							0.34**	(2.58)	0.27***	(2.62)	-0.19*	(-1.68)
W-L (Quintile 5) - W-L (Base)							0.07	(0.71)	0.08	(1.05)	0.07	(1.11)
W-L (Quintile 1) - W-L (Base)							-0.12	(-1.22)	0	(0.02)	-0.07	(-0.86)
Panel C: Double Sort by Previous six-month returns, then previous one-month trade size = 500 shares												
Losers (L)	1	103	21	1507	2.48	0.25	-0.07	(-0.69)	-0.07	(-0.79)	0.01	(0.19)
	5	120	14	901	2.51	0.17	-0.57***	(-4.44)	-0.46***	(-3.94)	-0.07	(-0.63)
2	1	101	29	2136	2.24	0.25	-0.06	(-0.62)	-0.01	(-0.05)	0.02	(0.19)
	5	116	19	1810	2.26	0.15	0	(-0.04)	-0.03	(-0.41)	-0.13	(-1.36)
Winners (W)	1	101	31	2291	1.90	0.16	0.11	(1.17)	0.12	(1.43)	0.08	(1.08)
	5	117	19	1230	2.22	0.12	0.30***	(3.69)	0.07	(0.92)	-0.27**	(-2.34)
W-L (Quintile 5)							0.87***	(5.6)	0.53***	(4.64)	-0.21*	(-1.87)
W-L (Quintile 1)							0.18	(1.62)	0.19**	(2.23)	0.07	(0.9)
W-L (Quintile 5) - W-L (Base)							0.42***	(5.73)	0.26***	(4.43)	-0.09	(-1.52)
W-L (Quintile 1) - W-L (Base)							-0.27***	(-3.40)	-0.08	(-1.27)	0.19***	(2.78)
Panel : Double Sort by Previous six-month returns, then previous one-month trade size = 1000 shares												
Losers (L)	1	92	24	1217	2.15	0.25	-0.13	(-1.24)	-0.1	(-1.08)	-0.03	(-0.37)
	5	100	13	875	2.35	0.14	-0.51***	(-3.49)	-0.31**	(-2.44)	0.06	(0.44)
2	1	95	30	1279	2.06	0.24	-0.11	(-0.93)	-0.05	(-0.46)	-0.01	(-0.10)
	5	96	18	1659	2.18	0.13	0	(0.04)	0	(-0.06)	0.04	(0.58)
Winners (W)	1	91	33	1895	1.74	0.15	0.07	(0.68)	0.06	(0.59)	0.03	(0.39)
	5	98	19	1323	1.91	0.09	0.30**	(2.55)	0.09	(0.83)	-0.08	(-0.72)
W-L (Quintile 5)							0.81***	(4.6)	0.40***	(3.22)	-0.14	(-1.23)
W-L (Quintile 1)							0.20*	(1.81)	0.16*	(1.82)	0.07	(0.97)
W-L (Quintile 5) - W-L (Base)							0.35***	(4.86)	0.13**	(2)	-0.02	(-0.29)
W-L (Quintile 1) - W-L (Base)							-0.25***	(-2.93)	-0.11*	(-1.69)	0.19***	(2.99)

Table 9: Trade Size and Price Momentum: NYSE/Amex and NASDAQ Listed Firms Separately

This table presents average monthly and characteristic-adjusted returns from portfolios strategies formed on the basis of two-way sorts based on past trade size and price momentum for the period 1983 to 2010. We delete any firm that is in both the extreme 100-share and the 500 (or greater then 500) share trade portfolios to eliminate overlapping firms. We also delete any firm with a share price $<$ \$5.00. Panel 1 contains only NYSE/Amex listed firms and Panel 2 contains only NASDAQ listed firms. At the beginning of each month all available stocks listed on the NYSE/Amex (Panel 1) or NASDAQ (Panel 2) markets are sorted based on the past 6 months returns, and divided into 3 portfolios. The loser portfolio represents the worst prior return performance and the winner portfolio represents the best prior return performance. The stocks are then sorted based on the average trade size over the month just prior to the monthly evaluation period. We divide the trade size portfolios into decile portfolios. We analyze performance of three separate holding periods using a six-month period (1-6), a twelve-month period (1-12), and a holding period that spans months 13 to 24 from the formation period. Monthly returns are computed based on the portfolio rebalancing strategy described in Table 1 and characteristic-adjusted returns using the characteristics of firm size, book-to-market, and momentum. We report the winner-loser (W-L) portfolios for the base momentum strategy (W-L Base), then based on the extreme trade size deciles (W-L deciles 1 or 10), and finally relative to the base momentum strategy (W-L deciles 1 or 10 minus the base momentum strategy). For each extreme portfolio, we report the average bid-ask spread and the price impact measure of Amihud. We also present firm size expressed in millions of dollars and the average price of the portfolio of stocks at the end of the month prior to the performance period. Newey-West robust estimators with four lags specifying the t-statistics are presented in the parentheses. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Panel 1: NYSE/Amex Listed Firms

Momentum Tercile	Trade Size Decile	Number of Firms	Average Price	Firm Size ($ millions)	Bid-ask Spreads (%)	Amihud's measure	% Monthly Characteristic-Adjusted Returns 1-6 Return	T	1-12 Return	T	13-24 Return	T
Panel A: Base Six Month Momentum Strategy, Single-Sort by previous six-month returns												
Losers (L)		420	23	3384	1.38	0.03	-0.17	(-1.51)	-0.11	(-0.97)	0.06	(0.53)
2		474	32	4916	1.07	0.02	0	(0.01)	-0.01	(-0.13)	-0.01	(-0.11)
Winners (W)		404	32	4078	1.15	0.02	0.1	(1.24)	0.08	(1.16)	-0.01	(-0.17)
W-L (Base)							0.27*	(1.88)	0.18	(1.6)	-0.07	(-0.76)
Panel B: Double Sort by Previous six-month returns, then previous one-month trade size =100 shares												
Losers (L)	1	18	22	5883	1.79	0.07	-0.27*	(-1.69)	-0.18	(-1.13)	0.14	(1.04)
	10	17	25	2618	1.36	0.04	0.03	(0.24)	0.07	(0.57)	0.02	(0.24)
2	1	19	33	7790	1.45	0.05	-0.02	(-0.15)	-0.12	(-1.15)	-0.1	(-0.89)
	10	20	33	3696	1.05	0.03	0.01	(0.09)	-0.01	(-0.13)	-0.04	(-0.40)
Winners (W)	1	16	27	5652	1.60	0.06	0.12	(0.95)	0.02	(0.18)	-0.18	(-1.26)
	10	16	38	4616	1.05	0.03	0.21*	(1.7)	0.19*	(1.91)	0.11	(1.14)
W-L (Decile 10)							0.18	(1.21)	0.13	(0.91)	0.09	(0.81)
W-L (Decile 1)							0.39*	(1.92)	0.2	(1.08)	-0.32*	(-1.92)
W-L (Decile 10) - W-L (Base)							-0.09	(-0.64)	-0.06	(-0.51)	0.16	(1.42)
W-L (Decile 1) - W-L (Base)							0.12	(0.81)	0.02	(0.14)	-0.25*	(-1.85)
Panel C: Double Sort by Previous six-month returns, then previous one-month trade size =500 shares												
Losers (L)	1	26	29	2196	1.45	0.08	-0.1	(-0.83)	-0.09	(-0.81)	0.01	(0.11)
	10	30	15	2401	2.12	0.10	-0.52***	(-2.94)	-0.38***	(-2.66)	-0.05	(-0.49)
2	1	29	39	3668	1.16	0.05	-0.13	(-1.30)	-0.12	(-1.31)	-0.01	(-0.12)
	10	34	20	2889	1.78	0.08	-0.01	(-0.06)	-0.06	(-0.59)	-0.24**	(-2.24)
Winners (W)	1	25	40	3929	1.11	0.05	-0.02	(-0.15)	0.04	(0.44)	-0.01	(-0.11)
	10	29	19	1006	1.84	0.08	0.2	(1.35)	-0.04	(-0.29)	-0.17	(-1.15)
W-L (Decile 10)							0.72***	(3.52)	0.34***	(2.68)	-0.12	(-0.93)
W-L (Decile 1)							0.08	(0.57)	0.14	(1.12)	-0.02	(-0.22)
W-L (Decile 10) - W-L (Base)							0.46***	(3.46)	0.16	(1.54)	-0.05	(-0.40)
W-L (Decile 1) - W-L (Base)							-0.19**	(-1.97)	-0.05	(-0.69)	0.05	(0.7)
Panel D: Double Sort by Previous six-month returns, then previous one-month trade size =1000 shares												
Losers (L)	1	25	28	878	1.61	0.11	-0.21	(-1.58)	-0.13	(-1.08)	-0.07	(-0.60)
	10	26	11	3337	2.25	0.07	-0.43**	(-2.31)	-0.33**	(-2.17)	-0.13	(-1.07)
2	1	28	35	995	1.35	0.08	-0.07	(-0.51)	-0.07	(-0.58)	-0.05	(-0.39)
	10	27	16	4666	1.98	0.06	0.05	(0.46)	-0.07	(-0.79)	-0.32***	(-2.85)
Winners (W)	1	23	37	1199	1.29	0.07	0.07	(0.57)	0.05	(0.47)	0.02	(0.21)
	10	22	15	1552	2.15	0.06	0.16	(1.2)	0.03	(0.24)	-0.31**	(-2.31)
W-L (Decile 10)							0.58***	(2.73)	0.36**	(2.35)	-0.18	(-1.30)
W-L (Decile 1)							0.28**	(2.01)	0.18*	(1.68)	0.09	(1)
W-L (Decile 10) - W-L (Base)							0.31**	(2.07)	0.17	(1.64)	-0.11	(-0.82)
W-L (Decile 1) - W-L (Base)							0.01	(0.11)	0	(-0.04)	0.16**	(2.16)

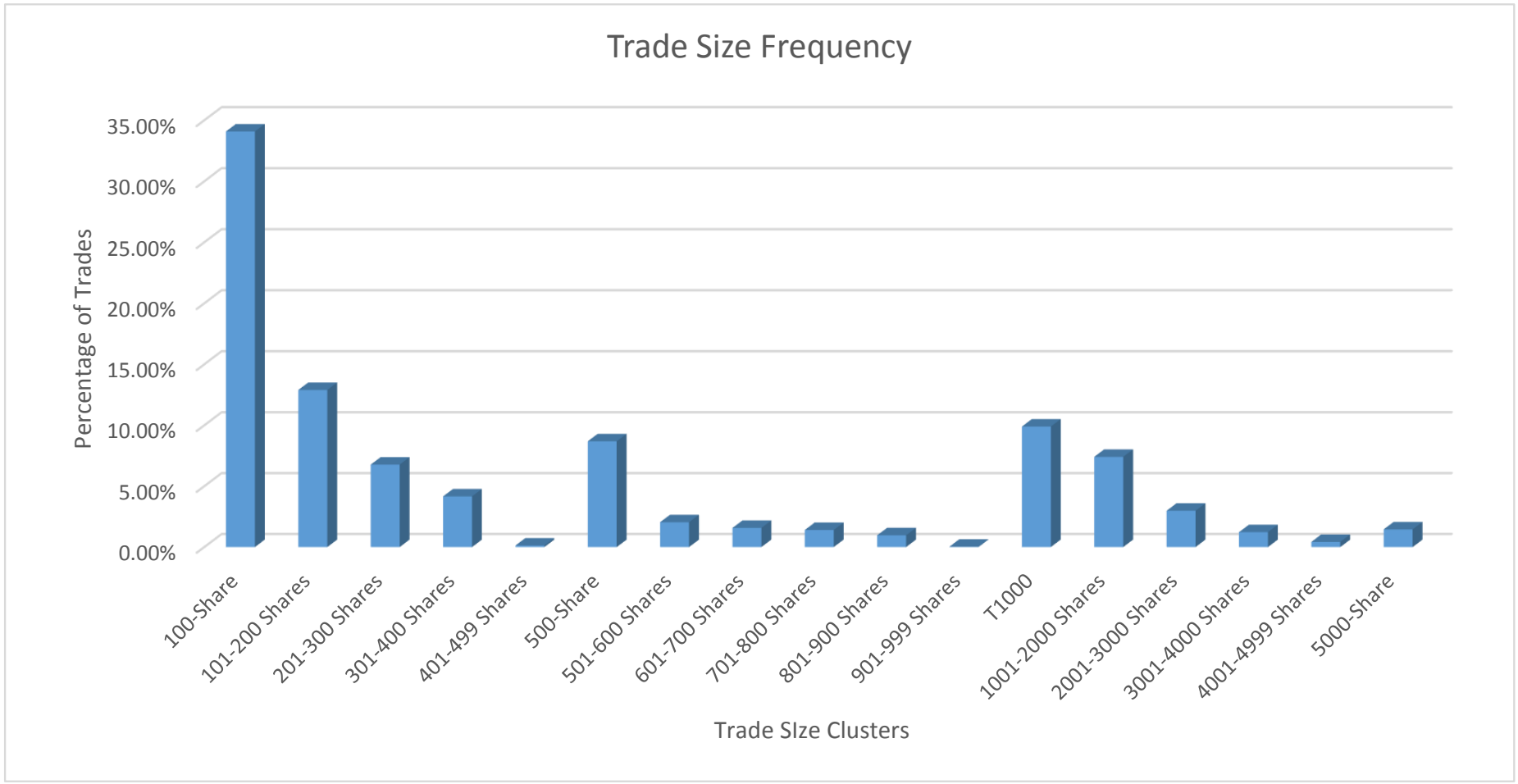
Panel 2: NASDAQ Listed Firms

Momentum Tercile	Trade Size Decile	Number of Firms	Average Price	Firm Size ($ millions)	Bid-ask Spreads (%)	Amihud's measure	% Monthly Characteristic-Adjusted Returns 1-6 Return	T	1-12 Return	T	13-24 Return	T
Panel E: Base Six Month Momentum Strategy, Single-Sort by previous six-month returns												
Losers (L)		614	15	649	2.69	0.22	-0.39***	(-3.21)	-0.25**	(-2.19)	0.17	(1.57)
2		551	20	777	2.58	0.24	-0.06	(-0.75)	-0.03	(-0.33)	0.05	(0.69)
Winners (W)		631	21	938	2.24	0.15	0.29***	(3.48)	0.13*	(1.87)	-0.05	(-0.54)
W-L (Base)							0.68***	(4.08)	0.37***	(2.79)	-0.21*	(-1.82)
Panel F: Double Sort by Previous six-month returns, then previous one-month trade size =100 shares												
Losers (L)	1	31	11	848	4.36	0.79	-0.67***	(-3.98)	-0.48***	(-2.95)	-0.08	(-0.56)
	10	30	21	438	2.91	0.20	-0.34**	(-2.26)	-0.22*	(-1.87)	0.19	(1.6)
2	1	29	14	606	4.39	0.86	-0.43**	(-2.23)	-0.33*	(-1.77)	-0.05	(-0.33)
	10	29	29	513	2.65	0.19	0	0	0.03	(0.26)	-0.01	(-0.04)
Winners (W)	1	33	13	737	3.67	0.54	0.14	(0.98)	-0.02	(-0.18)	-0.07	(-0.49)
	10	29	33	726	2.22	0.13	0.49***	(2.91)	0.33**	(2.33)	-0.05	(-0.36)
W-L (Decile 10)							0.82***	(3.53)	0.56***	(2.86)	-0.24	(-1.43)
W-L (Decile 1)							0.81***	(4.64)	0.46***	(2.85)	0.01	(0.06)
W-L (Decile 10) - W-L (Base)							0.14	(1.12)	0.18*	(1.76)	-0.03	(-0.25)
W-L (Decile 1) - W-L (Base)							0.13	(0.78)	0.08	(0.58)	0.22	(1.62)
Panel G: Double Sort by Previous six-month returns, then previous one-month trade size =500 shares												
Losers (L)	1	42	18	364	4.16	0.62	-0.22	(-1.41)	-0.14	(-1.00)	-0.07	(-0.60)
	10	44	12	371	4.08	0.54	-0.63***	(-3.79)	-0.54***	(-3.50)	-0.23*	(-1.70)
2	1	38	22	292	4.25	0.64	-0.17	(-0.94)	-0.13	(-0.72)	-0.13	(-0.80)
	10	40	15	641	3.92	0.49	-0.06	(-0.38)	-0.09	(-0.62)	-0.12	(-0.88)
Winners (W)	1	44	26	594	3.10	0.40	-0.05	(-0.37)	0.01	(0.04)	0.08	(0.62)
	10	46	16	296	3.37	0.32	0.33**	(2.14)	0.02	(0.17)	-0.35*	(-1.94)
W-L (Decile 10)							0.96***	(4.89)	0.56***	(3.57)	-0.12	(-0.74)
W-L (Decile 1)							0.17	(1.31)	0.15	(1.44)	0.15	(1.3)
W-L (Decile 10) - W-L (Base)							0.28**	(1.99)	0.19*	(1.67)	0.1	(0.81)
W-L (Decile 1) - W-L (Base)							-0.51***	(-4.33)	-0.22**	(-2.29)	0.36***	(3.58)
Panel H: Double Sort by Previous six-month returns, then previous one-month trade size =1000 shares												
Losers (L)	1	39	18	284	4.79	0.77	-0.43**	(-2.27)	-0.36**	(-2.13)	-0.13	(-0.83)
	10	43	12	461	2.79	0.35	-0.64***	(-3.67)	-0.45***	(-2.97)	0.03	(0.14)
2	1	38	22	163	4.85	0.75	-0.23	(-1.12)	-0.13	(-0.63)	-0.09	(-0.48)
	10	41	16	566	2.70	0.37	-0.19	(-1.39)	-0.06	(-0.49)	0.17	(1.5)
Winners (W)	1	38	25	448	3.95	0.47	-0.13	(-0.72)	-0.07	(-0.42)	-0.09	(-0.54)
	10	45	18	554	2.14	0.20	0.23	(1.28)	0.05	(0.31)	0.1	(0.57)
W-L (Decile 10)							0.87***	(4.17)	0.50***	(3.17)	0.07	(0.43)
W-L (Decile 1)							0.31**	(2.07)	0.29***	(2.77)	0.04	(0.39)
W-L (Decile 10) - W-L (Base)							0.19**	(1.96)	0.13	(1.1)	0.29**	(2.23)
W-L (Decile 1) - W-L (Base)							-0.37***	(-2.65)	-0.08	(-0.74)	0.26**	(2.51)

Table 10: Trade Size Portfolios Formed Before Momentum Portfolios

This table presents average monthly and characteristic-adjusted returns from trade size portfolios formed prior to the price momentum portfolio formation for the period 1983 to 2010. We delete any firm that is in both the extreme 100-share and the 500 share trade portfolios to eliminate overlapping firms. We also delete any firm with a share price < $5.00. At the beginning of each month all available stocks listed on the NYSE/Amex/NASDAQ markets are sorted independently based on the past 6 months returns, and divided into three portfolios. The stocks are first sorted based on the average trade size over the month just prior to the price momentum portfolio formation where the loser portfolio represents the worst prior price performance and the winner portfolio represents the best prior price performance. We divide the trade size portfolios into 10 portfolios. We skip one month between the momentum portfolio formation period and the performance period. We analyze the performance across three separate holding periods using a six-month period (1-6), a twelve-month period (1-12), and a holding period that spans months 13 to 24 from the formation period. Monthly returns are computed based on the portfolio rebalancing strategy described in Table 1 and characteristic-adjusted returns are based on firm size, book-to-market, and momentum characteristics. We report the winner-loser portfolios for the base momentum strategy (W-L Base), then based on the extreme trade size deciles (W-L Deciles 1 or 10), and finally relative to the base momentum strategy (W-L Decile 1 or 10 minus the base momentum strategy). For each extreme portfolio, we report the average bid-ask spread and the price impact measure of Amihud. We also present firm size expressed in millions of dollars and the average price of the portfolio of stocks at the end of the month prior to the performance period. Newey-West robust estimators with four lags specifying the t-statistics are presented in the parentheses. Significance is reported with an * (10% significance), an ** (5% significance), or an *** (1% significance).

Momentum Tercile	Trade Size Decile	Number of Firms	Average Price	Firm Size ($ millions)	Bid-ask Spreads (%)	Amihud's measure	% Monthly Characteristic-Adjusted Returns 1-6 Return	T	1-12 Return	T	13-24 Return	T
Panel A: Base Six Month Momentum Strategy, Single-Sort by previous six-month returns												
Losers (L)		856	19	1796	1.98	0.12	-0.26***	(-2.69)	-0.17*	(-1.90)	0.08	(1.16)
2		859	27	2894	1.67	0.11	-0.02	(-0.39)	-0.01	(-0.19)	0.02	(0.39)
Winners (W)		773	29	2541	1.53	0.07	0.15***	(2.65)	0.09**	(2.15)	0.01	(0.19)
W-L (Base)							0.41***	(2.93)	0.26**	(2.37)	-0.07	(-0.83)
Panel B: Double Sort by Previous six-month returns, then previous one-month trade size = 100 shares												
Losers (L)	1	44	18	3898	2.99	0.42	-0.37***	(-2.91)	-0.28**	(-2.27)	0.06	(0.64)
	10	39	22	1375	1.97	0.10	-0.15	(-1.34)	-0.11	(-1.04)	0.01	(0.08)
2	1	42	24	4483	2.77	0.40	-0.18	(-1.43)	-0.11	(-0.92)	-0.08	(-0.81)
	10	41	31	2618	1.57	0.08	0.01	(0.07)	-0.01	(-0.07)	-0.06	(-0.61)
Winners (W)	1	39	25	3826	2.35	0.24	0.09	(0.95)	0.01	(0.14)	-0.08	(-0.84)
	10	36	36	2942	1.52	0.06	0.18	(1.61)	0.15	(1.59)	0	(-0.02)
W-L (Decile 10)							0.34**	(2.1)	0.26**	(1.98)	-0.01	(-0.10)
W-L (Decile 1)							0.46***	(3.56)	0.30***	(2.79)	-0.15	(-1.17)
W-L (Decile 10) - W-L (Base)							-0.07	(-0.77)	0	(0.04)	0.06	(0.78)
W-L (Decile 1) - W-L (Base)							0.05	(0.42)	0.04	(0.39)	-0.08	(-0.78)
Panel B: Double Sort by Previous six-month returns, then previous one-month trade size = 500 shares												
Losers (L)	1	58	21	1249	2.84	0.38	-0.11	(-0.94)	-0.1	(-0.96)	-0.07	(-0.67)
	10	67	13	907	2.84	0.27	-0.63***	(-4.98)	-0.47***	(-3.82)	-0.19*	(-1.89)
2	1	58	28	1131	2.62	0.33	-0.04	(-0.31)	0	(-0.00)	-0.05	(-0.39)
	10	66	18	1574	2.60	0.25	-0.09	(-0.81)	-0.14	(-1.23)	-0.20*	(-1.74)
Winners (W)	1	52	32	1530	2.19	0.17	0.14	(1.26)	0.13	(1.24)	0.03	(0.34)
	10	59	21	1025	2.22	0.15	0.13	(1.32)	-0.04	(-0.46)	-0.26**	(-1.99)
W-L (Decile 10)							0.76***	(5.63)	0.42***	(3.66)	-0.08	(-0.78)
W-L (Decile 1)							0.25**	(2.4)	0.23***	(2.62)	0.1	(1.12)
W-L (Decile 10) - W-L (Base)							0.35***	(4.38)	0.17**	(2.36)	0	(-0.03)
W-L (Decile 1) - W-L (Base)							-0.16	(-1.64)	-0.03	(-0.37)	0.18**	(2.27)
Panel B: Double Sort by Previous six-month returns, then previous one-month trade size = 1000 shares												
Losers (L)	1	53	22	601	2.66	0.39	-0.21	(-1.58)	-0.18	(-1.47)	-0.08	(-0.64)
	10	58	13	1201	2.41	0.20	-0.45***	(-3.42)	-0.31**	(-2.58)	-0.03	(-0.21)
2	1	55	29	641	2.50	0.34	-0.07	(-0.50)	-0.04	(-0.25)	-0.09	(-0.63)
	10	57	17	2040	2.31	0.23	-0.09	(-0.95)	-0.1	(-1.09)	0.03	(0.38)
Winners (W)	1	49	33	1112	2.08	0.19	0.03	(0.22)	0.06	(0.55)	0.02	(0.19)
	10	52	21	1419	1.82	0.11	0.24**	(2.05)	0.06	(0.58)	-0.02	(-0.17)
W-L (Decile 10)							0.69***	(4.39)	0.37***	(3.1)	0.01	(0.04)
W-L (Decile 1)							0.24**	(2.16)	0.25***	(2.87)	0.1	(1.22)
W-L (Decile 10) - W-L (Base)							0.28***	(3.16)	0.12	(1.48)	0.08	(0.9)
W-L (Decile 1) - W-L (Base)							-0.17*	(-1.70)	-0.01	(-0.14)	0.17**	(2.23)


Trade Size Frequency
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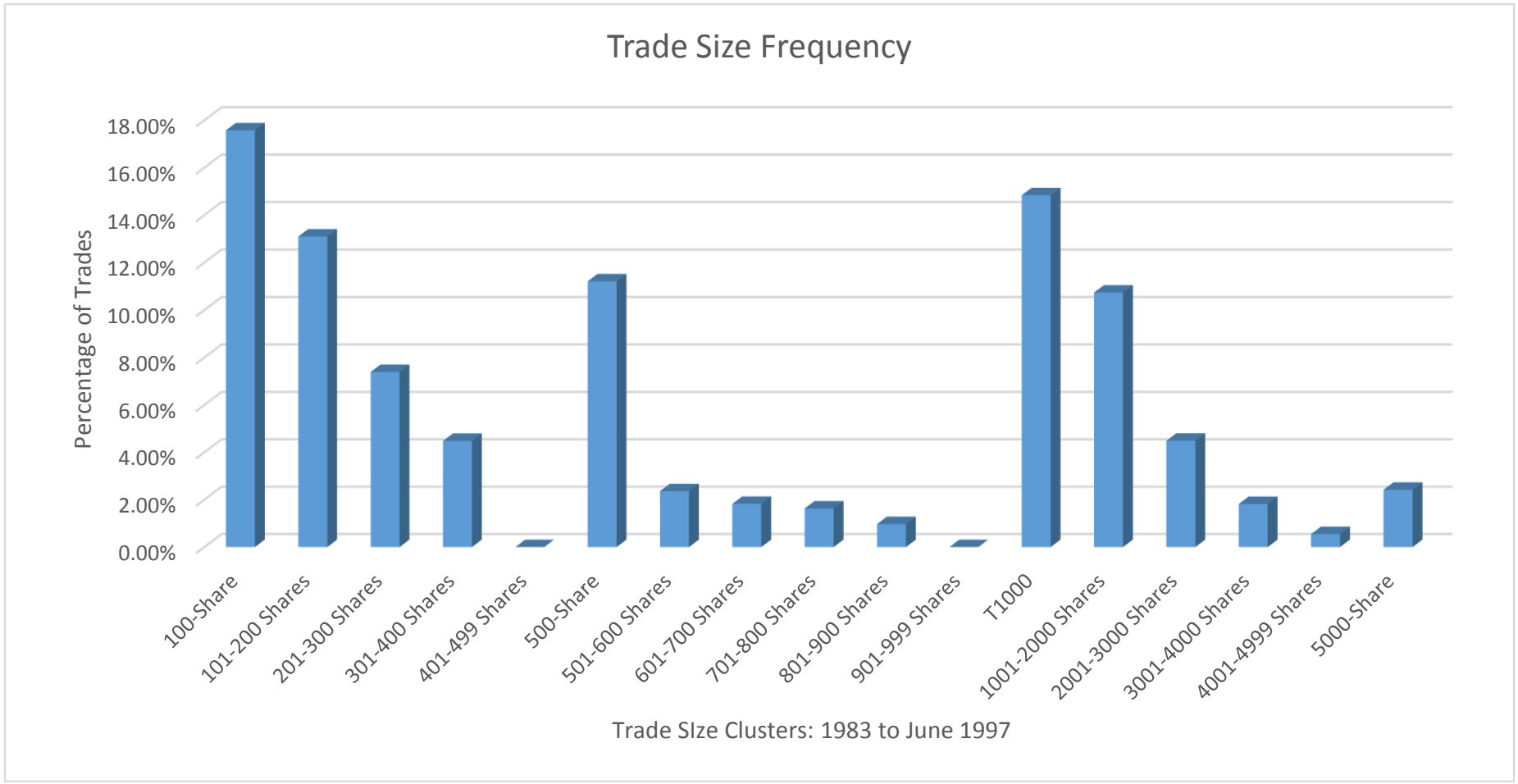
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Percentage of Trades
100-Share
101-200 Shares
201-300 Shares
301-400 Shares
401-499 Shares
500-Share
501-600 Shares
601-700 Shares
701-800 Shares
801-900 Shares
901-999 Shares
T1000
1001-2000 Shares
2001-3000 Shares
3001-4000 Shares
4001-4999 Shares
5000-Share
Trade SIze Clusters


Trade Size Frequency
Percentage of Trades
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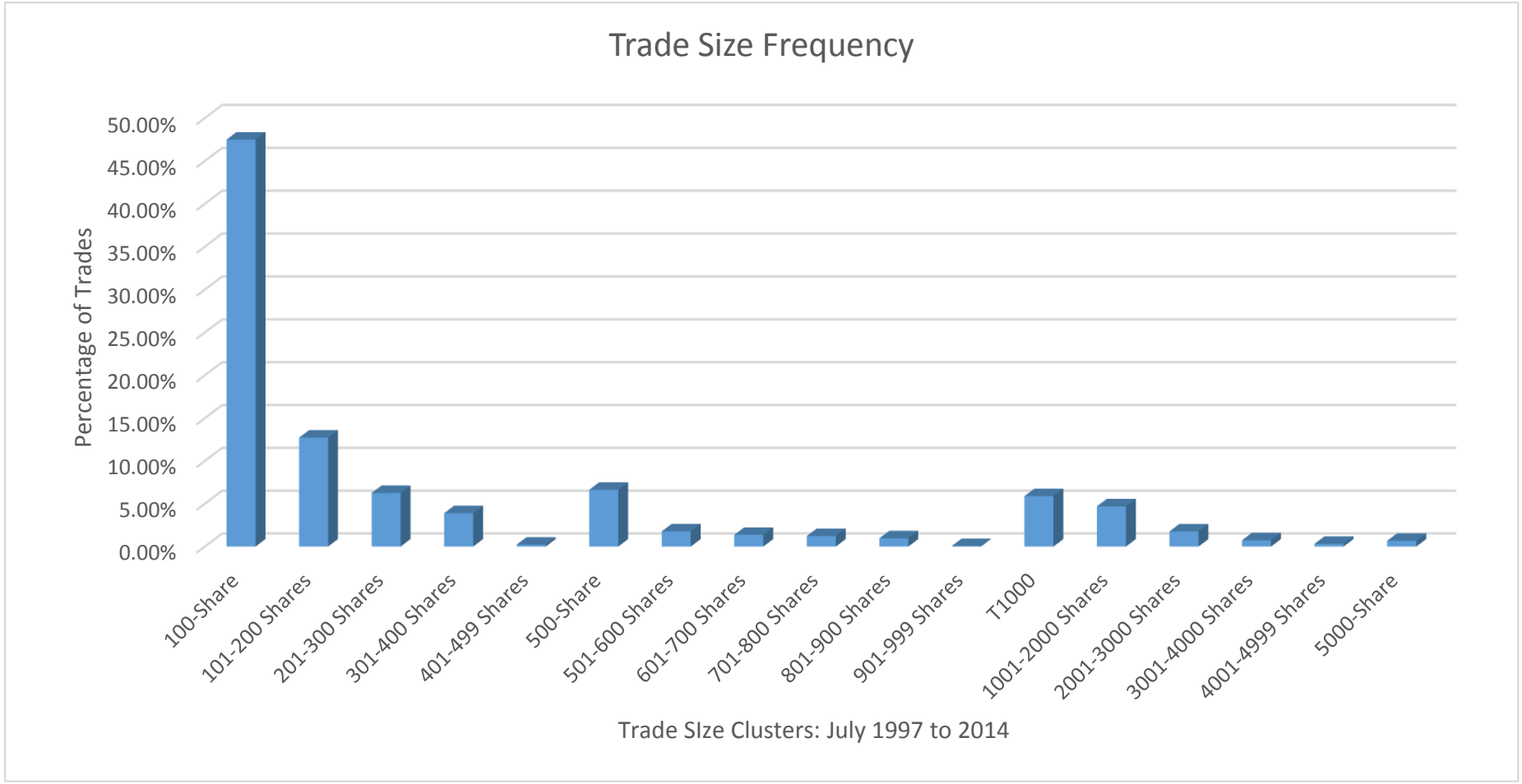
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
100-Share
101-200 Shares
201-300 Shares
301-400 Shares
401-499 Shares
500-Share
501-600 Shares
601-700 Shares
701-800 Shares
801-900 Shares
901-999 Shares
T1000
1001-2000 Shares
2001-3000 Shares
3001-4000 Shares
4001-4999 Shares
5000-Share
Trade SIze Clusters: 1983 to June 1997


Trade Size Frequency
Percentage of Trades
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45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
100-Share
101-200 Shares
201-300 Shares
301-400 Shares
401-499 Shares
500-Share
501-600 Shares
601-700 Shares
701-800 Shares
801-900 Shares
901-999 Shares
T1000
1001-2000 Shares
2001-3000 Shares
3001-4000 Shares
4001-4999 Shares
5000-Share
Trade SIze Clusters: July 1997 to 2014