Volatile Markets and Institutional Trading

Marc Lipson
Darden Graduate School of Business Administration
Charlottesville, VA, 22906
Phone: 434-924-4837
Email: mlipson@virginia.edu

Andy Puckett
University of Missouri
Columbia, MO 65211
Phone: 573-884-5666
Email: puckettw@missouri.edu

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Abstract

We investigate the trading behavior of mutual funds and pension plan sponsors on days when the absolute value of the market's return is greater than two percent. Using a proprietary database of institutional trading activity from Abel Noser, we find that aggregate institutional imbalance on these days is negatively related to returns. In particular, we find that institutions are net sellers when markets are rising and net buyers when markets are falling. Further results suggest that the findings we document are due to implementation rather than position decisions. Specifically, it appears that institutions use large market movement days as an opportunity to rapidly execute pre-event trading decisions. In effect, they complete large buy (sell) decisions by buying (selling) against a falling (rising) market. We also show that positions established on these days significantly outperform a size-matched benchmark portfolio over the following six months. Taken together, these results suggest that institutions do not exacerbate market volatility during periods of market turmoil to the extent that prior literature suggests.

I. Introduction

Financial markets have experienced a dramatic increase in the institutional ownership of equities during the past two decades (Shiller, 1991; Gompers and Metrick, 2001). The resulting concentration of ownership and trading activity raises questions as to the impact of institutional trading, especially during periods of market turmoil. Numerous studies document positive feedback trading by institutions and such trading could contribute to excess volatility. In fact, Gabaix, Gopikrishnan, Plerou and Stanley (2006) present a theory of market volatility where institutional trades produce excessive price movements. As for direct evidence, Dennis and Strickland (2002) show that individual stocks that move the most during large market wide price movements are those that have relatively larger institutional holdings and that these stocks also experience subsequent price reversals. They conclude that institutions are herding together as they try to jump into rising markets or out of declining markets, thereby driving prices beyond fundamental values.

We re-evaluate the potential negative impact of institutional trading during volatile markets using proprietary institutional trading data provided by Abel Noser. Essential to the argument that institutional trades drive excessive market-wide price movements is that institutions are net buyers when markets are rising or sellers when markets are falling. Our data allow us to test this condition directly using realized trading activity rather than inferring that activity from ownership data as in Dennis and Strickland (2002). Furthermore, the Abel Noser trading data originates from pension plan sponsors and money managers, which are precisely the institutions Dennis and Strickland (2002) found to be most closely associated with the price movements they document. Finally, the data include sufficient information on the trading activity to allow us to provide some evidence on the nature of the trading decisions that generate the observed activity.

Following Dennis and Strickland (2002), we examine days when the absolute value of returns for the CRSP value- or equal-weighted market index are greater than two percent.[1] We find that, on average, institutions trade in the opposite direction of large market moves. Specifically, both pension plan sponsors and money mangers are net sellers (net buyers) on days when markets experience large price increases (decreases). Furthermore, while institutional trading activity is higher on these days, the institutions in our sample increase their trading levels along with overall market volume, and we find no evidence that they increase their trading as a proportion of aggregate market trading volume.

One possible explanation for our observed results is that rising or falling markets present opportunities for institutions to complete desired reductions or expansions (respectively) in their positions that result from trading decisions unrelated to current market movements. For example, an institution may have decided to increase its holding of a given stock as a result of some fundamental information. In response to the increased selling, on average, that accompanies a falling market, the institution is able to buy more shares than would otherwise be the case. This change in behavior need not be explicit or active. For example, this institution may have provided trading instructions that include limit prices (and these would be less binding) or may employ trading algorithms that acknowledge potential price impacts (and these would generate more extensive buying when counterparties are readily available). In either case, this institution will increase its buying during a declining market due to implementation rather than position decisions.

Our data allow us to explore the implementation explanation described above. In particular, we are able to distinguish between trading decisions initiated on volatile days and those that were initiated on prior days. Those initiated on prior days could not have been initiated in response to price changes on the volatile days. Thus, any unusual activity in these orders on volatile days would reflect implementation decisions rather than position decisions. We find that imbalances originating from trades initiated prior to the volatile day (pre-event initiations) are significantly negatively related to market movements. In fact, when we partition average trading into trading from pre-event initiations and all other trading, we find that the effects we document are derived from

[1] This definition of large market movements represents roughly a two standard deviation increase or decrease from the mean equal-weighted CRSP market index return during our sample period. We obtain similar results for days when the market return is three standard deviations above or below the 1999 to 2003 daily mean.

pre-event initiations. Finally, multivariate analyses show that trading activity at the firm level is characterized by an increase in buying (selling) from pre-event initiated buys (sells) when firm level returns are negative (positive). These results, taken together, suggest that on volatile days, some institutions are using the market movements as opportunities to complete prior investment decisions rather than viewing these movements as opportunities to enter the market and profit from excessive price changes.

Interestingly, our results for pre-event initiated trade orders are not symmetric. In the full sample of trades, the imbalances we document may arise from changes in either buying or selling or both, depending on the sub-sample. But for trading from pre-event initiations there is a striking pattern. For up markets, we observe a significant increase in selling but no change in buying. For down markets we observe the reverse. Were our results driven entirely by passive strategies, such as standing limit orders, we would expect a symmetric effect. It must therefore be the case that the implementation strategies are more complex. For example, it may be that when an order is not executed after a period of time, the order is resubmitted at a more aggressive price.

We also look at institutional trading patterns at the firm level in a manner similar to Griffin, Harris, and Topologlu (2003). We find that trading patterns during days with extreme price movements resemble trading patterns on other days. Specifically, that daily imbalances are positively related to past imbalances and both contemporaneous and past returns. However, we also find that the relation to contemporary returns is significantly attenuated on volatile days – the coefficient on contemporary returns is roughly half that on other days. This suggests a shift in trading behavior on these volatile days and that this shift results in a lower tendency to chase prices, rather than an increase as might be expected with herding. Of course, we do not observe a negative correlation at the firm level, which differs from results at the aggregate level. This is quite possible, of course, since the regression results are equally weighted across firms while actual trading volumes differ substantially. This difference implies relatively greater trading volumes in firms where institutions are trading against the market.

Finally, we investigate the performance of institutional positions established on large market movement days. Dennis and Strickland (2002) suggest that institutions act irrationally on large market movement days, and, as a result suffer post-event underperformance. However, we find that institutional positions established on large market movement days experience positive abnormal performance for a six month period following the event day. In other words, while our earlier results on trading show that *average* trading behavior is not consistent with herding, it may still be true that institutions are herding in the subset of stocks that experience extreme price reversals. These results suggest that this is not the case. These return results are consistent with our evidence that institutions are, on average, trading against price movements. In effect, they sell (buy) into the largest price jumps (declines) and profit from the subsequent reversal.

It is important to note that our results do not contradict the empirical evidence in Dennis and Strickland (2002). In fact, we show that their results are largely unchanged in the sample we examine. Our results simply narrow the set of possible explanations for the price behavior they document. They concluded that the link between price behavior and institutional ownership was likely due to trading. Our results suggest that is not the case. Identifying alternative explanations for that link is an area for future research. We also note that the economic magnitude of the imbalance in our sample is relatively small compared to market wide trading. Thus, while our evidence is inconsistent with an institutional trading explanation for excessive price movements, we do not suggest that institutional trading actually dampens or otherwise ameliorates the pressure from other traders. Clearly, since the institutional trades we examine are profitable, institutional trading does not completely eliminate excessive price movements. The actual impact of trading on prices is difficult to ascertain, of course, since we cannot observe prices in the absence of that trading. The central purpose of this paper is simply to document that institutional trading behavior, on average, during volatile markets is not consistent with herding.

The paper proceeds as follows. The next section reviews the relevant literature on institutional trading, institutional herding, and positive feedback trading. Section III discusses the data and our sample. Section IV replicates some of Dennis and Strickland’s findings in order to reconcile the samples. Section V presents our results using trading activity and section VI concludes.

II. Related Literature

The concentration of institutional ownership and trading activity raises important questions concerning how institutions trade, and whether institutions are a stabilizing or destabilizing force on security prices. Recent literature proposes theories of herding and positive feedback trading by institutions. Herding arises when a group of institutions trade in the same direction over a period of time, whereas positive feedback trading involves a correlation between institutional trading and lagged returns. Central to the investigation of herding and positive feedback trading, is whether such trading strategies are rational for value maximizing institutions, and whether such trading patterns are exacerbated during periods of market turmoil.

Froot, et. al. (1992) present a model in which institutions rationally choose to focus on short horizons and ignore valuable information that may take a long time to be impounded in stock prices. This focus on short horizons may be rational since institutions are evaluated against each other, and therefore have incentives to trade the same stocks to avoid falling behind their peer group (Scharfstein and Stein, 1990). In such environments, institutions may find it optimal to mimic the trading patterns of other institutions (herd). Empirical studies using quarterly or annual institutional holdings data find moderate support for the existence of institutional herding. Lakonishok, Shliefer, and Vishney (1992) use quarterly holdings from 769 pension funds from 1985 to 1990 and find modest amounts of herding by institutions in small stocks. Using a similar methodology, Wermers (1999) finds extremely low levels of herding by mutual funds in large stocks, but does suggest that higher levels of herding are present when examining smaller stocks. Wylie (2005) finds that herding metrics used by Lakonishok, et. al (1992) and Wermers (1999) are positively biased due to the existence of short sale constraints. After adjusting the measure, he finds no significant evidence of herding in U.K. stocks. Alternatively, Sias (2004) finds significant evidence of herding by institutions using a different metric.

Concerning positive feedback trading: DeLong, et. al. (1990) propose a model where institutions may rationally choose to follow positive feedback trading strategies in order to earn abnormal profits. In this model, rational speculators may earn abnormal profits by trading ahead of other positive feedback traders; however, these actions can cause asset prices to deviate from their fundamental values. Klemkosky (1977) studies quarterly trading imbalances for mutual funds from 1963 to 1972 and finds evidence of positive feedback trading. His findings suggest that large buy imbalances are preceded by at least two months of abnormally positive stock returns, and large sell imbalances are preceded by at least one month of abnormal negative stock returns. Cai and Zheng (2004) use quarterly institutional holdings data and find that returns Granger-cause institutional trading, but that institutional trading does not Granger-cause returns. Similarly, Burch and Swaminathan (2003) use quarterly institutional holdings data from 1982 to 1996 and find significant evidence of momentum trading in response to past returns, but not with respect to past earnings news. Using annual changes in institutional ownership, Nofsinger and Sias (1999) document a strong positive correlation between changes in institutional ownership and lag returns. They conclude that institutions rationally engage in positive feedback trading since stocks that institutions purchase subsequently outperform those they sell.

Empirical studies that fail to find evidence of herding or positive feedback trading include Kraus and Stoll (1972) who study herding in 229 bank trust departments, mutual funds, and closed end companies from 1968 to 1969. Using monthly institutional transaction data, their findings suggest that any observed herding can simply be attributed to chance. Lakonishok, Shleifer, and Vishny (1992) fail to find evidence of positive feedback trading by institutions. Using annual institutional holdings data, Cohen, Gompers, and Vuolteenaho (2002) find that institutions do not follow momentum strategies; rather, they sell shares to individuals when stock prices increase in the absence of any news about underlying cash flows. Similarly, Cohen (1999) finds that individuals tend to reduce their exposure to equities by selling stocks to institutions in troughs of business cycles, and buying stocks from institutions after market increases.

The research question that is central to our paper concerns the contemporaneous relationship between aggregate market movements and institutional trading during volatile markets. Specifically, are institutional tendencies to herd and chase returns (positive feedback trade) altered during periods of market turmoil. If asset prices deviate from fundamental values on days when markets are extremely volatile, efficient market proponents would suggest that institutions (i.e. informed investors) arbitrage irrationalities in individual investors' responses to information and provide a stabilizing influence on stock prices.

Early theoretical literature by Fama (1965) proposes a rational market view where agents may trade irrationally, but that such trading does not substantially affect prices since sophisticated traders quickly trade against these agents to eliminate deviations from true economic values. Furthermore, Friedman (1953) suggests that traders who earn positive profits do so by trading against less rational investors who move prices away from fundamental values.

Studies that investigate institutional trading with aggregate annual or quarterly institutional ownership data often find a significantly positive contemporaneous correlation between stock returns and institutional ownership changes (Wermers, 1999; Nofsinger and Sias, 1999; Cai and Zheng, 2004). In contrast, Sias, Starks and Titman (2001) distinguish between the hypothesis that institutions buy stocks and then their prices increase (informed institutions), and the hypothesis that a stock's price increases and then institutions buy it (positive feedback trading). They reject the positive feedback trading hypothesis in favor of the hypothesis that institutions trade because they possess superior information. They further suggest that the price impact of institutional trading is primarily responsible for the previously documented positive contemporaneous correlation between quarterly changes in institutional ownership and quarterly returns.

Studies using quarterly or annual institutional holdings data have limited power when investigating institutional trading patterns that occur over shorter time intervals. Several studies attempt to circumvent this problem using more frequent data. Dennis and Strickland (2002) examine the relation between quarterly institutional ownership levels and the cross sectional volatility of stock returns and turnover. During the period from 1988 until 1996, Dennis and Strickland investigate days when the absolute value of returns for the equal- or value-weighted CRSP market index is greater than 2%. They find that stocks with high levels of institutional ownership experience more extreme returns and abnormal volume than stocks with low levels of institutional ownership. They argue that institutional investors are herding together and buying (selling) stocks on large up (down) movement days, and conclude that this herding drives stock prices away from fundamental values. Although Dennis and Strickland (2002) make progress in investigating the daily trading patterns of institutions, their study is subject to data limitations imposed by the availability of institutional ownership data.

Griffin, Harris, and Topaloglu (2003) investigate institutional trading patterns using actual trade executions. The study uses a proprietary Nasdaq database that identifies the brokerage house handling each order. Griffin, et. al. classify investors by order flow (institutional or individual) based on the brokerage house that handles the order, and study institutional versus individual investor trading in Nasdaq 100 stocks. They suggest that institutions are net buyers (net sellers) on days following large market up (down) moves. They also find that institutional trading is strongly negatively correlated with contemporaneous five minute market moves, but that institutional trading is positively correlated with daily contemporaneous returns.

Our study contributes to prior research investigating institutional trading at a daily frequency. We use actual trade executions to investigate institutional trading patterns on volatile market days. The following section provides details of the institutional trading data we use in our empirical tests.

III. Data

We obtain daily institutional trading data from the Abel Noser Corporation. Abel Noser is a widely recognized consulting firm that works with institutional investors to monitor their equity trading costs. Abel Noser clients include pension plan sponsors such as CALPERS, the Commonwealth of Virginia, and the YMCA retirement fund, as well as money managers such as MFS (Massachusetts Financial Services), Putman Investments, Lazard Asset Management, and Vanguard. Previous academic studies that have used Abel Noser data include Goldstein, Irvine, Kandel and Wiener (2006) and Hu (2004). The Abel Noser sample of institutional trade executions covers the period from January 1, 1999 until December 31, 2003.[2]

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[2] Abel Noser provides consulting services for equity trading costs in a manner similar to the Plexus Group. Plexus data has been used extensively in academic empirical studies by Keim and Madhavan (1995), Jones and Lipson (1999), Conrad, Johnson and Wahal (2001), and Irvine, Lipson and Puckett (2006). Data from Abel Noser exhibit significant differences from Plexus trading data. The authors are happy to provide details of Abel Noser data upon request.

Summary statistics for Abel Noser trade data are presented in Table 1. The Abel Noser trading database contains a total of 716 different institutions and approximately 44 million execution reports origninating from about 16 million orders sent to a brokerage or ECN.[3] Clearly, an order may generate more than one execution. An order may also generate executions over multiple days. Orders for the entire sample span an average of 1.70 days, and are executed for an average of 24,063 shares.

The Abel Noser data is provided without institution names, but does identify institutions by a unique numeric code. In addition, the data include codes categorizing the institution as a pension plan sponsor or money managers.[4] The majority of institutions are pension plan sponsors, who make up 626 out of the 716 institutions. Pension plan sponsors account for approximately 16 million executions during the sample period with a mean execution size of 6,561 shares. Although money managers represent only 90 of the 716 total institutions in the sample, they account for most of the executions in the sample (approximately 28 million). The mean execution size of money managers is also the largest in the sample with 11,140 shares.

While our data only represent the activities of pension funds and other money managers, the data are not subject to the same measurement error as those studies that attempt to classify institutional trades according to trade size (Lee and Radhakrishna, 2000), or the broker/dealer with whom the trade is placed (Griffin, Harris, and Topaloglu, 2003). In addition, our data represent a substantial portion of total institutional trades. Abel Noser clients, on average, are responsible for 7.98% of total CRSP daily share volume and 7.92% of total CRSP daily dollar volume during the 1999 to 2003 sample period.[5] Finally, as noted in the introduction, Dennis and Strickland (2002) find that it is

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[3] For each execution, the data includes the date of the execution, a code for the institution initiating the execution, the stock traded, the number of shares executed, the execution price, whether the execution is a buy or sell, the commissions paid, and an indicator as to the corresponding order that each execution resulted from.

[4] The Abel Noser data contain trades for two institutions classified as "brokers". These institutions are excluded from our analysis since we are unable to discern whether these trades represent market-making activities by the brokerage firm, or trades for the brokerage firm's own account. Furthermore, we eliminate all trades where more than 5% of totals shares outstanding are traded on a singe day by a single Abel Noser client. We attribute these to misstatements of available shares outstanding by CRSP, or to trading in very small firms. This filter eliminates less than 0.01% of the sample and does not materially affect our results.

[5] We calculate the ratio of Abel Noser trading volume to CRSP trading volume during each day of the sample period. CRSP volume in Nasdaq stocks is divided by two because of the double counting of trades (see Atkins and Dyl, 1997).

precisely ownership by pension funds and money managers that is associated with abnormal price movements and volume on volatile days.

We examine days when the absolute value of the market return is large. Our window of analysis is limited to March 31, 1999 through September 30, 2003 by the availability of Abel Noser data. Note that we not only require data for days when market movements are large, but also for the 60 trading days before and after those days in order to benchmark normal trading activity. We follow Dennis and Strickland (2002) and define large as a 2% or more increase or decrease in the CRSP equal- or value-weighted market index. This cutoff is roughly two standard deviations from the mean CRSP equal-weighted market return during our sample period.[6]

Table 2 contains summary statistics for our extreme movement days. We find 71 days when the value-weighted CRSP index return is greater than two percent, and 76 days when it is less then negative two percent. Mean (median) returns for value-weighted up days are 2.9% (2.7%), while mean (median) returns for value-weighted down days are -2.6% (-2.4%). Extreme equal-weighted return days are less frequent. There are 29 days when the equal-weighted CRSP index return is greater than two percent, and 23 days when it is less than negative two percent. The mean (median) return for equal-weighted up days is 2.7% (2.5%), while the mean (median) return for equal-weighted down days is -2.8% (-2.4%).[7]

Conditioning on value-weighted returns will tend to pick days when large stocks move more than small ones. Because institutional ownership is highly correlated with size, conditioning on the value weighted index could induce a sample-selection bias. To ensure that value-weighted up (down) days in the sample are representative of days when the majority of stocks experience increases (decreases) in value, we calculate the percentage of CRSP firms with positive and negative returns. On average, 60.9% of firms experience positive returns on value-weighted up days, while 29.2% of firms experience negative returns. For value-weighted down days, on average, 26.5% of firms experience

[6] The 2% cutoff represents approximately three standard deviations from the mean return during the 1988 to 1996 sample period used by Dennis and Strickland (2002). However, they state that their results hold for days when the return is two standard deviations above or below the 1988 to 1996 daily mean.
[7] In robustness tests, we repeat all tests using a 3% (three standard deviation) cutoff for large movement days. All results hold for the three standard deviation cutoff.

positive returns, while 63.5% of firms experience negative returns. In the next section we replicate the results of Dennis and Strickland (2002) during our sample period.

IV. Replication of Dennis and Strickland

The Securities Act Amendment of 1975 requires that institutional investors managing more than $100 million report their portfolio holdings to the SEC on a quarterly basis (13(f) filings). We obtain institutional ownership data from Thompson Financial. Dennis and Strickland (2002) predict that if institutions herd together and buy (sell) stocks on large market up (down) movement days, then stocks with higher aggregate institutional ownership levels will experience more extreme returns. We replicate their analysis and partition all stocks in our sample as above or below median institutional ownership levels.[8] We then compare returns and trading activity across the partition.

Table 3 presents our results. Our findings are similar to those reported by Dennis and Strickland when looking at the returns of the high institutional ownership portfolio versus the low institutional ownership portfolio. On value-weighted up days we find that the mean (median) return for the high institutional ownership portfolio is 2.39% (1.65%) compared to the low institutional ownership portfolio which is 1.44% (0.36%). For value-weighted down days, mean (median) returns for the high institutional ownership portfolio are -2.13% (-1.67%) versus the low institutional ownership portfolio where returns are -1.28% (-0.59%). For both up and down days, univariate tests reject the equality of means and medians between the high and low institutional ownership portfolios at the one percent level.[9]

Dennis and Strickland (2002) also test whether levels of abnormal turnover and normalized abnormal turnover differ between high and low institutional ownership portfolios. They hypothesize that if institutional investors herd together on event days, this will lead to higher abnormal turnover for the high institutional ownership portfolio compared to the low institutional ownership portfolio. Event day abnormal turnover is

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[8] We also replicate Dennis and Strickland (2002) by separating sample firms into above and below mean institutional ownership levels. In this sample, cross-sectional return results are consistent with the medians sample, however, cross-sectional turnover results are not.

[9] Findings are similar when investigating the difference between high and low institutional ownership portfolio returns on equal-weighted days. All results are presented in Table 3.

defined as the event-day turnover (shares traded divided by shares outstanding) minus the median turnover for days [-250, -50]. We find that on value-weighted days mean (median) abnormal turnover for the high institutional ownership portfolio is 0.219 (0.016) percent, and for the low institutional ownership portfolio abnormal turnover is 0.213 (0.001) percent. Consistent with Dennis and Strickland's results, we are able to reject the equality of medians between the two samples; however, univariate tests in our sample are unable to reject the equality of means.[10] We also calculate relative abnormal turnover, which controls for the fact that high institutional ownership firms may already have high turnover. This measure is defined as abnormal turnover divided by median turnover for days [-250, -50]. We repeat this analysis and find that relative abnormal turnover is 7.36% for the high institutional ownership portfolio and -6.9% for the low institutional ownership portfolio. These results are also consistent with findings by Dennis and Strickland.[11]

Our findings are similar to Dennis and Strickland for returns and abnormal turnover on large up and down movement days. Dennis and Strickland also partition institutional ownership by type of institution. We are not able to replicate this section of Dennis and Strickland's paper due to a classification error in institutional ownership data that begins in 1998.[12] As noted by Dennis and Strickland, if institutional ownership and trading are related, these results suggest that institutions may be herding together to drive asset prices.

V. Trading Analysis

Our central contribution relative to other studies is to examine actual institutional trading activity on days with extreme market movements. We begin by looking at aggregate trading measures for all executions in our sample. We then focus on executions that result from orders originating prior to the events we examine (pre-event initiations). These orders allow us to asses the relation between market movements and trading

[10] We repeat this analyses for equal-weighted up and down days and find similar results.

[11] Dennis and Strickland do not report normalized abnormal turnover for equal-weighted days, but do say that results are similar to those reported for value-weighted days.

[12] In 1998 Thompson Financial announced a coding problem with their classification of institutional shareholders into one of five different categories. In the second quarter of 1998, Thompson Financial reclassified approximately 1,000 institutions from Mutual Funds and Brokers to the "Other" institutional shareholder category.

strategies where the decision to buy or sell is not contingent on the market movement. We then look at institutional trading at the individual firm level and conclude by looking at the trading profits implied by the trading activity of institutions in our sample.

V.i. Volumes and Imbalances

In this section we examine the trading activity of institutions in our sample. Mean daily trading statistics are presented in table 4 for our sample of days with extreme market movements. Included in that table are measures of both volume and imbalance (buys minus sells). These measures are presented three ways: shares traded, turnover (shares traded divided by CRSP reported shares outstanding), and adjusted turnover (turnover minus the mean turnover over the benchmark period which spans days [-60, -20] and [20, 60]).[13] We present turnover variables to prevent the results from being entirely driven by large firms and to minimize cross sectional variation driven by firm size. We present adjusted turnover to illustrate how trading differs from typical trading. This is clearly important in the case of volume. It is also important in the case of imbalances since institutions are typically net buyers and comparisons to zero are not appropriate.

To determine the significance of trading measures, we use a t-test based on the standard deviation of the daily means during the benchmark period. Since we are using the time series standard deviation of daily means, we are only assuming independence across event time daily means – clustering in calendar time, which would lead to cross sectional correlation, will not affect our inferences. Since we are testing for a difference between a specific daily mean and the benchmark (as opposed to testing whether the daily mean is different from zero), we are identifying days in which trading activity exceeds normal (see Bamber, Barron, and Stober, 1997).[14] We present these tests for shares and adjusted turnover (results for unadjusted turnover will be, of course, the same as those for adjusted turnover).

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[13] Our measures of trading volume and imbalance is similar to those of Dennis and Strickland (2002) and Griffin, Harris, and Topaloglu (2003).

[14] This methodology is identical to Corwin and Lipson (2004) and Irvine, Lipson, and Puckett (2006). Of course, in the case of adjusted turnover, which is already presented as the difference between the event day mean and the benchmark mean, this test is equivalent to testing whether the mean is different from zero using the standard deviation of benchmark means.

Looking at trading volume, for both value- and equal-weighted up days we find that mean institutional trading volume on the event day is significantly higher than mean trading volume during the benchmark estimation window. Aggregate institutional turnover is 0.0627% and 0.061% for value- and equal-weighted up days respectively. Turnover on these days exceeds normal turnover by 0.0059% on value-weighted up days, and 0.0078% on equal-weighted up days. When investigating volatile down days, we find that institutional turnover is not significantly different from the benchmark levels with the exception of pension funds on equal-weighted down days. Results for up days are consistent with findings by Dennis and Strickland (2002), while results for down days are not. Thus, institutions in our sample do not appear to increase trading on down days along with the market.

To explore the relation between institutional trading volume and aggregate market volume, we calculate the ratio of Abel Noser turnover to total market turnover. If institutions increase their trading relative to other market participants on volatile days (Dennis and Strickland, 2002), we would expect this ratio to increase on these day when compared to benchmark levels. We find no evidence to support the hypothesis that institutions increase their trading activity when compared to other market participants. In fact, the ratio actually decreases for all extreme day sub-samples. The ratio decreases by 0.201% for value-weighted up days, and by 0.252% for value-weighted down days; however, this decrease is only statistically significant on value-weighted down days.

Our central contribution relative to other studies is to examine the net trading imbalance of institutions. We find that institutions are net sellers on large up movement days. For value-weighted up days the mean institutional share imbalance is -8.6 million shares. Similarly, on equal-weighted up days, we find that the mean institutional share imbalance is -7.7 million shares. On large down movement days we find that institutions are, on average, net buyers. The mean institutional share imbalance on value-weighted down days is 5.5 million shares, and on equal-weighted down days is 7.4 million shares.[15] Table 4 shows that imbalance turnover measures (imbalance divided by shares outstanding) are consistently negative for pension funds and money managers on both

[15] Results are consistent when analyzing institutional dollar imbalances on large movement days. Only median dollar imbalances on equal-weighted down days suggest a possible positive correlation between large market returns and institutional imbalance.

value- and equal-weighted up days. On value-weighted up days, mean institutional imbalance is -0.0021%, while on equal-weighted up days it is -0.0022%. Significance tests reveal that imbalances on these days are significantly more negative than benchmark levels (at the 1% level). These findings suggest that institutions are selling, in aggregate, when market indexes experience large increases. For value- and equal-weighted down days, mean measures of imbalance turnover are consistently positive for all types of institutions. Mean institutional imbalance turnover is 0.0036% for value-weighted down days and 0.0032% for equal-weighted down days. Significance tests reveal that institutions exhibit abnormal levels of buying on value-weighted down days. Only pension funds exhibit significant abnormal buying on equally-weighted down days, however, results suggest that money managers continue with their positive buying levels even when markets experience large declines.

To confirm that aggregate imbalance results are not driven by a small number of active institutions, we also investigate the number of institutions who are buyers and sellers (not reported in Table 4). For equal-weighted up days we find that on average, 46.3% of institutions are net buyers and 53.7% of institutions are net sellers. For equal-weighted down days we find that, on average, 53.5% of institutions are net buyers and 46.5% of institutions are net sellers. These results are slightly stronger when investigating value-weighted movements. On value-weighted up days we find that, on average, 44.6% of institutions are net buyers and 55.4% of institutions are net sellers. For value-weighted down days we find that, on average, 55.7% of all institutions are net buyers and 44.4% are net sellers.[16]

Our results are most easily understood when illustrated graphically as in Figure 1. This figure graphs the daily mean imbalance turnover for all institutions during the [-20, +20] trading day window around value-weighted large movement days. The first graph shows institutional imbalance turnover around value-weighed up days, where day zero represents the event day. We observe a sharp decline in institutional imbalance turnover on large value-weighted up days, where the negative imbalance is more than ten times as large as any other day in the 41 day window. The second graph shows institutional

[16] We use daily dollar imbalance for each institution to calculate net buyers and sellers. When using share imbalances, results are quantitatively similar.

imbalance turnover around value-weighted down days, where we find a sharp increase in imbalance. The mean positive imbalance turnover on these days is almost twice as large as any other day in the [-20, +20] window.[17]

Taken together, our results thus far suggest that trading by institutions in our sample is certainly not positively correlated with market returns and, in fact, is typically negatively correlated.[18] In order to investigate the nature of the trading decisions that contribute to this negative correlation between institutional imbalance and aggregate market movements, we first divide all volatile day trading into buys and sells. Results are presented in Table 5. We find that on volatile up days institutions significantly increase their selling activity. For value-weighted up days, selling activity increased by 0.0047%, while on equal-weighted up days it increased by 0.0057%. Test results do not suggest a symmetric decrease in buying activity. Buying activity for both value- and equal-weighted up days is not significantly different from benchmark buying activity. Our investigation of down days presents a different picture. For value-weighted down days, selling activity significantly decreases by 0.0016%, with no resulting change in buying activity. We find no statistically significant results for equal-weighted down days.

Table 5 also investigates buy and sell turnover as a percentage of overall market turnover. On volatile up days, we find that selling (buying) volume increases (decreases) as a percentage of market turnover. For value-weighted days the ratio of selling volume to total market volume increases by 0.3571%, while the ratio for buy volume decreases by 0.558%. When investigating down markets, we find that selling volume decreases as a percentage of market volume; however, we do not find a symmetric increase in the buying volume ratio.

Clearly, our results are inconsistent with the notion that institutions are jumping into rising or falling markets in a manner that would contribute to the excess price movement on those days. These results do suggest, though weakly, that institutional trading is the result of trading strategies that are contingent on price movements. The

[17] Figures illustrating institutional imbalance surrounding equal-weighted large movement days reveal a similar picture, but are not included for the sake of brevity.
[18] Results using medians, in particular comparing median trading levels on event days to median levels during benchmark periods, are quantitatively and statistically similar to those reported in table 4.

exact nature of those strategies is not clear from Table 5. In the next section we will look at a subset of trading activity for which the trading strategies and implications for market volatility are much clearer.

V.ii Pre-Event Initiated Executions

As described in the introduction, one plausible explanation for our observed results is that rising or falling markets allow institutions to complete desired reductions or expansions (respectively) in their positions that result from trading decisions unrelated to current market movements. According to this explanation, institutions that were buying in the pre-event period will increase their buying on days when markets move downward. Of course, these extreme market movements may also make it more difficult for institutions to complete desired position changes. Thus, institutions that were selling in the pre-event period might decrease their selling when the market moves downward.

Approximately half of all trade executions in our database are part of orders which take more than one day to execute. We test our theory by partitioning trade executions into two catagories: 1) executions that are part of trade orders originating prior to the volatile event day, and 2) executions where the decision to trade is made on the volatile day . In particular, execution results for pre-event initiated orders are clearly a function of trading strategies rather than position decisions. Results are presented in Table 6. Variables are calculated as before, where adjusted values are the difference between event day means and benchmark period means. Statistical tests are also identical to those presented earlier. In this partition, we see that the negative contemporaneous relationship between institutional imbalance and large market movements documented in table 4 is entirely explained by pre-event initiated executions. For value- (equal-) weighted up days the pre-event initiated imbalance is -0.0031% (-0.0034%), while the event day initiated imbalance is positive. The pattern is similar for value- (equal-) weighed down days, with pre-event initiated imbalances of 0.0023% (0.0024%). Imbalance measures for all pre-event initiated executions are significantly different from benchmark levels at the 1% level.

The adjusted measures calculated in Table 6 for pre-event initiated executions show how realized execution levels differ from typical trading periods. It does not reflect the degree to which the pre-event initiated execution levels differ from what would have been expected *for those orders* had price movements been typical. To accomplish this, we first need to infer the expected execution level for the pre-event initiated orders. In particular, we need to predict the execution levels based on typical execution patterns. We proceed as follows:

We take all trade orders of length n, where n is the number of days over which the order is executed, and determine the average number of shares executed each day as a percentage of the total shares in the trade order. For example, for all orders that execute over three days, on average, 42.18% of the total order volume is executed on the first day. Over the next two trading days, 16.69% and 39.12% of the total order volume is executed each day, respectively.[19] This method allows us to quantify measures of expected trading that are consistent with multiple-day trade executions for institutions in the Abel Noser database. Using the predicted levels of trading, we are able to calculate unexpected execution volume for volatile market days.[20] Since trading strategies may vary over time, expected execution levels are based on realized multiple-day trade order results for the prior three month calendar period. We calculate a daily aggregate unexpected execution level by summing across all institutions and all open multiple-day orders. In the absence of any other effect, unexpected execution levels should be zero, and our tests use the variance of unexpected execution levels over the benchmark periods to tests of significance.

Results are presented in Table 7 for pre-initiation buy and sell orders separately. We present only unexpected shares traded, though inferences using unexpected turnover are similar. We find that during each value-weighted (equal-weighted) down day, institutions purchase an average of 4,502,410 (3,073,323) more shares than would be expected in a normal trading environment. This unexpected buying is statistically significant at the 1% level. For value-weighted (equal-weighted) up days, institutions sell

[19] These percentages represent average expectations over the entire sample period. Since trading strategies may vary over time, actual expectations exhibit time varying properties.

[20] For example, if the typical execution level for the second day of an order executed over three days is 16.69%, we calculate the expected execution level for a three day order where the second day is our event day as 0.1669 times the total shares executed in the order. Thus, for a 400,000 share buy order (that spans three trading days) initiated the day before our event day, we would expect 66,760 shares to be executed on our event day. If the institution actually buys 125,000 shares, the unexpected execution level is 125,000-66,760 = 58,240.

11,226,428 (11,608,430) more shares than would be expected in a normal trading environment. This abnormal selling is also statistically significant at the 1% level. Results are generally the same for both pension funds and money managers. These results suggest that institutions are using market wide demand (either to buy or sell depending on market movements) as an opportunity to complete more of an order than would typically be the case.

Also notable in Table 7 is that the results are not symmetric. We find no evidence that on down days, institutions that were selling before the event day sell any less than expected. Analogous conclusions apply to up days. This suggests there is more to execution strategies than simply the use of limit prices. In particular, our results suggest that when the market moves in favor of execution, executions increase, but that when markets move against execution, the execution strategy is reconsidered. For example, if a limit price was given for a buy order, and markets move down, the buy order is more likely to execute. On the other hand, if the market moves up, the limit price must have been raised so that the order will execute with a probability no different from other days.

V.iii. Firm Level Trading Patterns

In this section we examine the determinants of institutional trading patterns at the firm level. Prior literature suggests that trading decisions are motivated by price changes and recent work by Griffin, Harris, and Topaloglu (2003) suggests further that aggregate institutional trading imbalance is related to the prior day aggregate institutional imbalance. In this section we asses the degree to which these trading patterns differ on days of extreme market movements and if these changes are consistent with our aggregate trading results.

We aggregate imbalances measured using adjusted turnovers by institution and by stock for each day in the sample period. We model these institution/firm level imbalances as a function of independent variables that prior literature suggests may affect trading behavior. We estimate the following pooled regression:

$$Imbalance_{j,i,t} = \alpha_0 + \sum_{i=1}^{5} \alpha_i \sum_{r=1}^{5} Imbalance_{j,i,t-r} + \sum_{i=6}^{11} \alpha_i \sum_{r=0}^{5} Return_{j,i,t-r} + \varepsilon_i$$

Where *j* refers to the institution trading, *i* is the i^{th} firm, and *t* refers to the event day. The dependent variable, *Imbalance*, is measured for each institution and firm. We include five days of lagged institutional trading imbalance to test whether institutional trading on large movement days is related to pre-event trading. In order to test findings by Dennis and Strickland (2002) and Griffin, Harris, and Topaloglu (2003) that institutional imbalance is both contemporaneously correlated with daily firm returns, and is positively correlated with lagged returns, we include variables $Return_t$, $Return_{t-1}$, $Return_{t-2}$, $Return_{t-3}$, $Return_{t-4}$, and $Return_{t-5}$. $Return_t$ is the firm's return on the event day, while other return variables represent five days of lagged firm returns.

We run this regression for non-event days and event days separately. Specfically, we pool all days during our sample period that are not included in our sample of extreme movements (975 days). From this sample, we randomly select 97 trading days (10%) as control days. Results for this regression are presented in Table 8 along with the results for value-weighted and equal-weighted event days.

For control days, coefficient estimates confirm that an institutions trading behavior with regard to a stock is highly significantly correlated with the previous five days of trading activity for that institution. Prior institution imbalances are responsible for more than 99% of the total explanatory power of the regression. The coefficient on $Imbalance_{t-1}$ is 0.341 suggesting that a one standard deviation increase in an institution's trading imbalance on day t-1 results in an increase of 0.0052% in event day imbalance. The regression also shows that both contemporaneous returns on day *t* and prior returns on day *t-1* are significantly related to an institution's trading imbalance. This result confirms findings by Griffin, Harris, and Topaloglu (2003). The coefficient on contemporaneous returns is 0.218 and significant at the 1% level. The coefficient indicates that as a stock's price increases by 3.79% (1 standard deviation), this results in an increase of 0.0008% in event day imbalance.

If institutions are even more prone to follow stock returns on very volatile days, driving stock prices past fundamental values, then one would expect the coefficient on contemporaneous returns to increase for a sample of volatile days. Looking at regression results for both value- and equal-weighted volatile days, we find that the coefficient estimates for $Return_t$ decrease from 0.218 on control days to 0.084 on value-weighted volatile days, and 0.071 on equal-weighted volatile days. Results suggest that institutional imbalances become less sensitive to firm returns on these volatile days.[21]

To test formally for the equality of coefficients on contemporaneous returns for control days versus volatile days, we pool control and volatile days. We introduce the variable *Event* which equals one if the observation occurs on an event day, and zero if it occurs on a control day. We then interact the *Event* variable with $Return_t$. This variable, therefore, captures the marginal effect on the coefficient on returns for volatile days, assuming all other coefficients are unchanged. For both the value- and equal-weighted volatile day samples, the coefficient on this interaction term is negative and significant.

Although the reduction in sensitivity to contemporaneous returns on extreme movement days suggests that firms reduce, rather than increase, their trading in response to the market movement, the results are not entirely consistent with our aggregate results. In particular, at the aggregate level imbalances are negatively correlated with returns while at the firm/institution level they are still positively correlated. This difference in inferences, of course, results from the fact that the regressions weight each firm/institution equally whereas trading activity will not be equal across all observations. Thus, it must be that trading volumes are relatively higher for firms/institutions that are trading against the market (e.g. buying in a down market) than for those that are trading with the market (e.g. selling in a down market). This is shown to be true in the aggregate volume results.

The regression framework also allows us to provide further evidence that trading patterns on event days are related to prior trading decisions. We note, first, that in cases where an institution is buying a stock during the five day pre-period, 83% of institutions continue to buy that stock on the event day, regardless of whether the market moves up or down. In cases where an institution is selling a stock during the five day pre-period, 79% of institutions continue to sell that stock on the event day, regardless of the market movement. This is consistent with the trading strategies with executions over multiple days.

[21] All results hold for pension funds and money managers separately. All standard errors are Rogers/clustered to control for any within institution correlated trading patterns.

To formally test for a link between event day trading and prior trading activity, we include the term *Prior*, which is the sum of the previous five days imbalance turnover in a stock times $Return_t$. If institutions use volatile market days as an opportunity to rapidly execute previously determined trade orders, we should expect a negative coefficient on the term *Prior*. For example, if an institution is a net buyer of a stock in the period before a volatile market day, and the stock decreases in value on day *t*, we would expect the institution to increase their level of buying in order to take advantage of the opportunity to complete their trading decision at lower prices. Consistent with our prior results, we find negative and significant coefficients for the term *Prior* in both value- and equal-weighted day regressions.

V.iv. Profits

A notable conclusion in Dennis and Strickland (2002) is that institutions are behaving irrationally since their trading is driving prices too far. This conclusion follows from their analysis since the stocks with the largest institutional ownership are those that experience subsequent reversals and they assume ownership is positively related to trading. We test directly for the rationality of institutional trading in our sample by calculating trading profits implied by actual trades and subsequent returns. The results in this section are not necessarily implied by our earlier results, since even if aggregate trading is negatively related to market-wide returns, individual firm trading activity may not be negatively correlated with those individual firm returns that are subsequently reversed. This analysis also provides further evidence on whether institutional trading is driven by market demand (e.g. that institutional buying is driven by market selling). Specifically, if institutions are responding to market demand, when market demand is extreme and likely to have driven prices past fundamentals, institutions are all the more likely to have been on the other side.

In calculating the post-event return performance of institutional trading positions we proceed as follows. We assume that the initial endowment for all institutions is zero on day t-1. We then calculate the net position established by all Abel Noser clients for each stock traded on our event day (day t). Net position is the number of shares purchased minus the number of shares sold for each stock on the event day. We then calculate the position value by marking the position to the closing CRSP price on the event day. Thus, if Abel Noser clients purchase 15,000 shares of IBM and sell 10,000 shares of IBM on day t, the net position for IBM is (15,000-10,000)=5,000 shares. If the closing price of IBM is $80 on day t, then the position value equals (5,000 x $80) = $400,000. In cases where institutions are net sellers of a particular stock, we treat the position as a short. For purposes of return calculations, and to avoid zero-investment hedge portfolios, we require capital allocation from the institutions equal to the absolute value of the short position (i.e. we are assuming 100% margin requirements).[22] We then acknowledge any gains/losses over the subsequent six-month (120 trading day) holding period by applying CRSP returns to the net position value at the end of the event day. By using CRSP returns we acknowledge cash received in the form of dividends.

We obtain aggregate post-event institutional returns by taking the value-weighted average of institutional returns, weighting the return of each institutional position by the position value at the end of day t. Institutional returns following volatile event days are presented in Table 9. We find that the six month (120 trading days) post-event cumulative return is 0.785% for institutional positions established on value-weighted up days, and 1.368% for institutional positions established on value-weighted down days.

Next we calculate post-event abnormal performance for each institutional position by subtracting the mean return for all stocks in the same size quintile. Size quintiles are determined at the beginning of each calendar year in the sample period. We obtain the value-weighted average of post-event cumulative abnormal returns and report these in table 9. Our findings suggest that the six-month post-event abnormal returns are 1.06% for institutional positions established on value-weighted up days, and 1.128% for positions established on value-weighted down days. Significance tests reveal that positive six-month abnormal returns following large value-weighted up and down days are significant at the 1% level.

Post-event performance measures suggest that institutions trade rationally on large movement days. Specifically, institutional positions established on large market

[22] We acknowledge that assuming 100% margin requirements may not be a realistic assumption for institutional traders. However, such an assumption biases the test against finding positive abnormal returns in the post-event period.

movement days exhibit positive abnormal performance for six months after the event day.

VI. Conclusion

This paper investigates the trading behavior of money managers and pension plan sponsors on days when markets experience large increases or decreases in value. Large increases (decreases) occur when the absolute value of returns for the CRSP equal- or value-weighted market index is greater than two percent. Using a proprietary database of institutional trades from the Abel Noser Corporation, we find strong evidence that both money managers and pension plan sponsors are net sellers on days when the market experiences large increases and net buyers on days when the market experiences large decreases.

Exploring the reason for this pattern in trading, we find that this aggregate behavior is driven by orders that were placed in days prior to the large market movements. This suggests the trading patterns result from implementation strategies rather than decisions about positions. In effect, institutions view rising markets as opportunities to execute previously determined decreases in ownership. The reverse holds for falling markets. Interestingly, the relationship is not symmetric: while a rising market implies a significant increase in selling, it does not imply a notable change in buying. Again, an analogous pattern holds for falling markets. Results suggest a fairly sophisticated trading strategy. However, what is abundantly clear is that institutions do not appear to chase price changes and jump into markets to buy shares when markets are rising or sell shares when markets are falling. Instead, institutions appear to have a long-term perspective on their holdings and respond to market movements as opportunities to execute previously determined position changes, rather than motivators for new position changes. Consistent with this view, positions established by institutions in our sample earn abnormal profits as institutions buy (sell) more when market demand is excessively negative (positive).

Our conclusions are very different from those of Dennis and Strickland (2002) who link extreme price movements to institutional ownership. A possible way to reconcile our results with those of Dennis and Strickland is to consider the effects of float. For firms with higher institutional ownership, fewer shares are available for individuals to trade. When individuals trade in stocks with smaller float, stock prices are more sensitive to individual trade orders, which may cause a more pronounced stock price reaction than would be in stocks with a larger float. Identifying and supporting explanations that reconcile our result with those of Dennis and Strickland is an area of future research that may substantially improve our understanding of the impact of institutions on markets.

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Table 1 – Summary Statistics for Abel Noser Data

Table 1 presents summary information on the institutional trading sample from the Abel Noser Corporation. The trades in the sample are placed by 716 different institutional Abel Noser clients during the time period from January 1, 1999 to December 31, 2003. We distinguish between orders (instructions to trade initiated by a client's trading desk and given to brokerage firms for execution) and executions (aggregated at the daily level). Summary statistics are also broken down by money manager and pension plan sponsor.

	Daily Volume Characteristics		**Order Characteristics**		**Execution Characteristics**	
	Shares	*Dollars*	*Shares*	*Dollars*	*Shares*	*Dollars*
Total Sample (716 Institutions)						
Mean	27,228	881,194	24,063	766,084	9,466	306,355
Median	2,700	75,480	2,500	75,790	1,300	37,100
Observations	15,476,728		15,694,509		44,516,952	
Average Duration			1.70 days			
Pension Plan Sponsors (626 Institutions)						
Mean	11,095	320,549	14,244	411,507	6,561	189,553
Median	2,000	57,350	2,527	74,750	1,220	34,737
Observations	9,625,686		7,497,973		16,277,719	
Average Duration			1.76 days			
Money Managers (90 Institutions)						
Mean	53,768	1,803,525	33,045	1,090,442	11,140	373,682
Median	5,100	142,208	2,500	76,875	1,300	38,681
Observations	5,851,042		8,196,536		28,239,233	
Average Duration			1.64 days			

Table 2- Summary Statistics for Large Market Movement Days

Table 2 presents summary information for days during the March 31, 1999 to September 30, 2003 sample period where the absolute value of the CRSP equal- or value-weighted market index return was greater than 2%. Mean and median returns for large market movement days are presented. Mean percent positive statistics represent the average number of firms that experience positive returns on large market movement days. Similarly, mean percent negative and mean percent zero represent the average number of firms that experience negative or zero returns, respectively. The table also presents summary statistics by sample year.

			By Year				
		All Days	*1999*	*2000*	*2001*	*2002*	*2003*
Value Weighted							
Up	*N*	71	5	21	14	23	8
	Mean return	2.90%	2.60%	3.00%	2.90%	3.00%	2.50%
	Median return	2.70%	2.40%	2.90%	2.30%	2.70%	2.30%
	Mean % positive	60.90%	54.00%	56.30%	62.40%	64.70%	66.30%
	Mean % negative	29.20%	30.30%	29.90%	28.90%	28.70%	28.00%
	Mean % zero	9.90%	15.70%	13.70%	8.60%	6.60%	5.80%
Down	*N*	76	6	20	16	29	5
	Mean return	-2.60%	-2.20%	-2.80%	-2.80%	-2.50%	-2.50%
	Median return	-2.40%	-2.20%	-2.60%	-2.50%	-2.30%	-2.30%
	Mean % positive	26.50%	28.50%	25.90%	26.50%	26.70%	25.20%
	Mean % negative	63.50%	56.80%	60.70%	63.20%	66.60%	69.00%
	Mean % zero	10.00%	14.60%	13.40%	10.20%	6.70%	5.90%
Equal Weighted							
Up	*N*	29	-	12	10	7	-
	Mean return	2.70%		2.60%	2.80%	2.60%	
	Median return	2.50%		2.40%	2.60%	2.60%	
	Mean % positive	63.10%		59.70%	62.90%	70.20%	
	Mean % negative	26.00%		26.40%	27.20%	23.50%	
	Mean % zero	10.80%		13.90%	9.90%	6.40%	
Down	*N*	23	-	9	7	7	-
	Mean return	-2.80%		-3.00%	-2.90%	-2.40%	
	Median return	-2.40%		-2.40%	-3.10%	-2.20%	
	Mean % positive	22.80%		23.80%	22.30%	21.90%	
	Mean % negative	68.00%		63.90%	70.00%	71.90%	
	Mean % zero	9.20%		12.20%	7.70%	6.20%	

Table 3-Replication of Dennis and Strickland

Table 3 presents a replication of Dennis and Strickland (2002) results during the sample period from March 31, 1999 until September 30, 2003. On each large movement day, all stocks are divided into portfolios depending on whether the aggregate institutional ownership (IO) level for the stock is above or below the median level of institutional ownership for all stocks in the previous quarter. Significance levels presented in the table reflect a standard t-test, testing the equality of means (medians) between the high IO and low IO portfolios.

		Dennis and Strickland Sample (Jan. 1, 1988 – Dec. 31, 1996)			Study Sample (March 31, 1999 – Sept. 30, 2003)		
		All Stocks	High IO	Low IO	All Stocks	High IO	Low IO
Value Weighted							
Returns							
Up	*mean*	1.7%	2.1%***	1.3%	1.86%	2.39%***	1.44%
	median	0.007%	1.6%***	0.0%	0.94%	1.65%***	0.36%
Down	*mean*	-2.1%	-2.5%***	-1.6%	-1.65%	-2.13%***	-1.28%
	median	-1.6%	-2.2%***	0.0%	-1.11%	-1.67%***	-0.59%
Abnormal Turnover							
	mean	0.1447%	0.181%***	0.107%	0.217%	0.219%	0.213%
	median	0.009%	0.024%***	0.000%	0.003%	0.016%***	0.00%
Relative Abnormal Turnover							
	mean	16%	22%	6%	3.53%	7.36%	-6.9%
Equal Weighted							
Returns							
Up	*mean*	2.5%	2.8%***	2.2%	2.70%	3.16%***	2.34%
	median	1.6%	2.1%***	0.0%	1.32%	2.07%***	0.70%
Down	*mean*	-2.4%	-2.8%***	-2.1%	-2.76%	-2.98%***	-2.59%
	median	-1.9%	-2.3%***	-1.1%	-1.80%	-2.24%***	-1.37%

* denotes significance at the 10% level
** denotes significance at the 5% level
*** denotes significance at the 1% level

Table 4 - Trading Activity

Table 4 presents mean statistics for institutional trading volume, trading volume divided by aggregate market trading volume, and imbalance on days during the March 31, 1999 to September 30, 2003 sample period when the absolute value of the CRSP equal- or value-weighted market index return was greater than 2%. Volume and imbalance (buy volume minus sell volume) are presented in three ways: shares traded, turnover (shares traded divided by shares outstanding), and adjusted turnover (turnover less the mean turnover over the benchmark period spanning days [-60, -20] and [20, 60]). The significance of trading measures is evaluated using a t-test comparing the event day means to the means over benchmark level using the standard deviation of the daily averages during the benchmark period. The table also presents measures partitioned by client type.

		Volume			Volume/Market		Imbalance		
		Shares (1,000s)	Turnover (%)	Adjusted Turnover (%)	Ratio	Adjusted	Shares (1,000s)	Turnover (%)	Adjusted Turnover (%)
Value Weighted									
Up	All	395,280	0.0627	0.0059***	9.861	-0.201	-8,606**	-0.0021	-0.0036***
	Pension Funds	96,094	0.0199	0.0017**	3.504	-0.087	-5,403***	-0.0013	-0.0017***
	Money Managers	299,185	0.0536	0.0051***	8.038	-0.153	-3,203	-0.0011	-0.0028***
Down	All	369,517	0.0558	-0.0010	9.780	-0.252*	5,568	0.0036	0.0022***
	Pension Funds	95,721	0.0179	-0.0006	3.482	-0.147	5,058**	0.0010	0.0010***
	Money Managers	273,796	0.0474	-0.0008	7.973	-0.147	509	0.0031	0.0014***
Equal Weighted									
Up	All	433,636	0.0610	0.0078***	9.218	-0.191	-7,797	-0.0022	-0.0036***
	Pension Funds	122,960	0.0197	0.0023**	3.144	-0.177	-10,017*	-0.0013	-0.0011**
	Money Managers	310,676	0.0523	0.0069**	7.679	-0.007	2,219	-0.0010	-0.0029***
Down	All	402,399	0.0606	0.0047	9.306	-0.514	7,379	0.0032	0.0014
	Pension Funds	105,903	0.0199	0.0020*	3.421	-0.090	8,609**	0.0010	0.0010**
	Money Managers	296,495	0.0507	0.0032	7.470	-0.479	-1,229	0.0025	0.0003

* denotes significance at the 10% level
** denotes significance at the 5% level
*** denotes significance at the 1% level

Table 5 – Buy and Sell Volume Separately

Table 5 presents mean statistics for buy and sell trading volume separately on days during the March 31, 1999 to September 30, 2003 sample period when the absolute value of the CRSP equal- or value-weighted market index return was greater than 2%. Imbalance turnover is measured as signed trading volume divided by shares outstanding, and adjusted turnover is turnover less the mean turnover over the benchmark period spanning days [-60, -20] and [20, 60]. Results for buy and sell turnover divided by aggregate market turnover are also presented. The significance of trading measures is evaluated using a t-test comparing the event day means to the means over benchmark level using the standard deviation of the daily averages during the benchmark period.

		Imbalance		Volume / Market	
		Turnover (%)	Adjusted Turnover (%)	Turnover (%)	Adjusted Turnover (%)
Value Weighted					
Up	Buys	0.0303	0.0011	4.7833	-0.5580***
	Sells	-0.0324	-0.0047***	5.0773	0.3571***
Down	Buys	0.0297	0.0006	5.4555	0.1209
	Sells	-0.0261	0.0016**	4.3244	-0.3730***
Equal Weighted					
Up	Buys	0.0294	0.0021	4.5095	-0.5410***
	Sells	-0.0316	-0.0057***	4.7090	0.3511***
Down	Buys	0.0319	0.0030	5.1625	-0.1090
	Sells	-0.0287	-0.0017	4.1435	-0.4052*

* denotes significance at the 10% level
** denotes significance at the 5% level
*** denotes significance at the 1% level

Table 6 – Pre-Event Initiated Trading Volume

Table 6 presents mean statistics for pre-event initiated and event initiated trading volume separately on days during the March 31, 1999 to September 30, 2003 sample period when the absolute value of the CRSP equal- or value-weighted market index return was greater than 2%. Pre-event initiated trading includes executions that are part of trade orders originating prior to the volatile event day, and event day initiated trading includes executions where the decision to trade is made on the volatile day. Turnover is measured as volume or imbalance divided by shares outstanding, and adjusted turnover is turnover less the mean turnover over the benchmark period spanning days [-60, -20] and [20, 60]. The significance of trading measures is evaluated using a t-test comparing the event day means to the means over benchmark level using the standard deviation of the daily averages during the benchmark period.

		Volume		Imbalance	
		Turnover (%)	Adjusted Turnover (%)	Turnover (%)	Adjusted Turnover (%)
Value Weighted					
Up	Pre-Event Initiated	0.0226	0.0010 *	-0.0031	-0.0034 ***
	Event Day Initiated	0.0406	0.0048 ***	0.0009	-0.0003
Down	Pre-Event Initiated	0.0204	-0.0013 **	0.0023	0.0020 ***
	Event Day Initiated	0.0358	0.0002	0.0013	0.0002
Equal Weighted					
Up	Pre-Event Initiated	0.0226	0.0020	-0.0034	-0.0038 ***
	Event Day Initiated	0.0388	0.0058 ***	0.0012	0.0002
Down	Pre-Event Initiated	0.0190	-0.0028	0.0024	0.0019 ***
	Event Day Initiated	0.0419	0.0073 ***	0.0007	-0.0006

* denotes significance at the 10% level
** denotes significance at the 5% level
*** denotes significance at the 1% level

Table 7 – Unexpected Trading from Multiple-Day Orders

Table 7 presents mean statistics for unexpected trading volume for multiple-day trade orders where the decision to trade is made prior to volatile event days. Event days are those during our March 31, 1999 to September 30, 2003 sample period when the absolute value of the CRSP equal- or value-weighted market index return was greater than 2%. Significance tests use the variance of unexpected execution levels over the [-60, -20] and [20, 60] benchmark period. .

		Buy	Sell
Value Weighted			
Up	All	348,486	-11,226,428***
	Pension Funds	103,550	-3,594,677***
	Money Manager	244,935	-7,631,751***
Down	All	4,502,410***	1,863,271
	Pension Funds	1,487,782***	2,031,391
	Money Manager	3,014,627***	-168,119
Equal Weighted			
Up	All	513,223	-11,608,430***
	Pension Funds	-80,173	-2,566,879***
	Money Manager	593,396	-9,041,551***
Down	All	3,073,323***	3,627,309
	Pension Funds	2,245,732***	3,625,189
	Money Manager	827,591	2,120

* denotes significance at the 10% level
** denotes significance at the 5% level
*** denotes significance at the 1% level

Table 8 - Regression Analysis

Table 8 presents pooled cross-sectional regressions where trade imbalance on the event day is the dependent variable, and observations are aggregated at the institution and firm level. Independent variables include five days of lagged institutional trading imbalance. *Return*$_t$ is the firm's return on the event day, while variables *return*$_t$, *return*$_{t-1}$, *return*$_{t-2}$, *return*$_{t-3}$, *return*$_{t-4}$, and *return*$_{t-5}$ represent five days of lagged firm returns. *Event* is a dumy variable set to one if the observation occurs on a volatile event day, and zero if it occurs on a control day. The variable *Prior* is the sum of the previous five days imbalance turnover in a stock times *Return*$_{t.}$

		Value Weighted Volatile Days			Equal Weighted Volatile Days		
	Control	VW	VW	VW + Control	EW	EW	EW + Control
Intercept	0.000	0.000	0.000	0.001	0.000	0.000	0.001
Imbalance$_{t-1}$	0.341 ***	0.341 ***	0.341 ***	0.283 ***	0.380 ***	0.380 ***	0.293 ***
Imbalance$_{t-2}$	0.122 ***	0.135 ***	0.135 ***	0.101 ***	0.120 ***	0.120 ***	0.093 ***
Imbalance$_{t-3}$	0.074 ***	0.081 ***	0.081 ***	0.057 ***	0.080 ***	0.080 ***	0.055 ***
Imbalance$_{t-4}$	0.048 ***	0.056 ***	0.056 ***	0.036 ***	0.057 ***	0.057 ***	0.035 ***
Imbalance$_{t-5}$	0.048 ***	0.057 ***	0.057 ***	0.035 ***	0.060 ***	0.060 ***	0.034 ***
Return$_t$	0.218 ***	0.084 ***	0.110 ***	0.069 ***	0.071 ***	0.119 ***	0.057 ***
Return$_{t-1}$	0.104 ***	0.084 ***	0.085 ***	0.059 ***	0.081 ***	0.080 ***	0.057 ***
Return$_{t-2}$	0.012	0.020 **	0.020 **	0.013 ***	0.029 *	0.029 *	0.015 ***
Return$_{t-3}$	0.010	0.002	0.001	0.004	-0.023	-0.023	-0.001
Return$_{t-4}$	0.007	-0.008	-0.009	-0.002	-0.019	-0.021	-0.007
Return$_{t-5}$	0.007	0.001	-0.001	0.002	0.006	0.005	0.003
Event				0.000			0.001
*Event*Return*$_t$				0.082 ***			0.093 ***
Prior			-0.100 ***			-0.185 ***	
R-squared	13.52%	13.32%	14.51%	13.33%	12.89%	14.43%	12.94%

* denotes significance at the 10% level
** denotes significance at the 5% level
*** denotes significance at the 1% level

Table 9-Post-Event Abnormal Returns

Table 9 examines the abnormal performance of institutional trading positions established on volatile event days. Returns represent the value-weighted average of institutional position returns, weighting the return of each institutional position by the dollar value of the open position on day t. Post-event abnormal returns are calculated by subtracting the mean return for all stocks in the same size quintile from each institutional position return.

		1 Month		3 Months		6 Months	
		Raw	Abnormal	Raw	Abnormal	Raw	Abnormal
Value Weighted							
Up	All	0.059%	0.021%	0.199%	0.250%	0.785%	1.06%***
	Pension Funds	0.39%	0.17%	0.78%	0.47%*	1.76%	1.45%***
	Money Manager	-0.008%	0.029%	0.151%	0.295%	0.631%	1.01%***
Down	All	0.576%	0.462%*	0.727%	0.467%	1.368%	1.128%**
	Pension Funds	1.35%	0.85%*	1.29%	0.75%	2.40%	1.69%***
	Money Manager	0.255%	0.315%	0.596%	0.461%	0.982%	0.916%**
Equal Weighted							
Up	All	0.06%	-0.13%	1.79%	1.44%**	1.55%	1.72%***
	Pension Funds	0.41%	-0.01%	2.21%	1.46%*	2.68%	2.14%**
	Money Manager	0.28%	0.19%	1.26%	1.20%**	1.22%	1.60%***
Down	All	1.01%	1.02%	1.43%	1.28%**	0.48%	0.52%
	Pension Funds	2.73%	1.77%	3.28%	2.48%**	0.81%	0.13%
	Money Manager	0.25%	0.62%	0.81%	0.92%**	0.64%	0.89%

* denotes significance at the 10% level
** denotes significance at the 5% level
*** denotes significance at the 1% level

Figure 1 - Mean Imbalance Turnover for All Institutions on Value-Weighted Days

Figure 2 presents the daily mean trading imbalance for both pension plan sponsors and money managers during the [-20, +20] day period surrounding value-weighted up and down days.