Institutional Trading During Extreme Market Movements

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Abstract

We investigate the trading of mutual funds and pension plan sponsors on days of extreme market-wide price movements. We find that the institutions in our sample are net buyers (sellers) during extreme market declines (increases) and that these positions generate positive returns. Results are driven by institutions that were recently trading in the same direction as they are observed trading during extreme movements. We find no evidence that the institutions experience negative returns from their trades. This suggests that the effects we document arise due to implementation decisions (taking advantage of interest on the opposite side of a desired trade) rather than opportunistic market making (profiting by providing liquidity) or trading against an over-reaction (profiting from a trading strategy). Clearly, we find no evidence of herding at the aggregate level that might contribute to the overreaction that accompanies extreme market movements.

I. Introduction

The 2010 market "flash crash," in which the Dow Industrials dropped close to 7% in value in about 15 minutes and rebounded almost as quickly, focused attention once again on the effects of institutional trading on financial markets and price efficiency. Clearly, institutional trading moves prices. To the extent these trades are motivated by private information, price efficiency would be enhanced. On the other hand, the magnitude of institutional trading and the possibility that such trading is correlated across institutions raises concerns that aggregate institutional trading may drive markets too far, resulting in excessive price movements and degraded efficiency.

Empirical evidence is mixed. While institutional trading has been shown to be informative, it has also been shown to be positively correlated with prior period returns (positive feedback trading) and the prior period trading of other institutions (herding).[1] Positive feedback trading and herding are trading strategies that can potentially destabilize prices. Similarly, whereas Boehmer and Kelly (2007) and Sias and Starks (1997) show that the level of institutional ownership is positively related to some measures of price efficiency, Dennis and Strickland (2002) show that stocks with relatively greater institutional ownership move more during large market-wide price movements, experience a disproportionate increase in volume, and experience subsequent price reversals. Dennis and Strickland conclude from their results that institutions, on average, may herd together during extreme market-wide movements by buying during a market rise or selling during a market decline to a degree that drives prices beyond fundamental values. Dasgupta, Prat and Verardo (2010) find similar effects over the long term – persistently sold stocks, for example, outperform persistently bought stocks. We provide new evidence on the link between institutional trading and price efficiency by examining institutional trading activity on days with extreme market-wide price

[1] Evidence of positive feedback trading can be found in Hvidkjaer (2005), Cai and Zheng (2004), Griffin Harris and Topologlu (2003), Burch and Swaminathan (2003) and Nofsinger and Sias (1999). Evidence of herding can be found in Sias (2004). Prior studies, such as Lakonishok, Shleifer and Vishy (1992) and Wermers (1999) found mixed evidence regarding herding and positive feedback trading.

movements.[2] We use proprietary institutional trading data provided by ANcerno, which includes pension plan sponsors and money managers that Dennis and Strickland (2002) find to be most closely associated with the price distortions they document.

We find that institutions trade, on average, in the opposite direction of large market moves. Specifically, both pension plan sponsors and money managers are net sellers (net buyers) on days when markets experience large price increases (decreases). In addition, while institutional trading activity is higher on these days, the institutions in our sample increase their trading levels along with overall market volume and therefore remain at a typical proportion of aggregate volume. We also find no evidence of price reversals associated with institutional trading on these days. In fact, we find some evidence that the trades are profitable – that institutions are effectively buying the stocks that subsequently rise in price and selling those that subsequently fall in price. These results suggest that during periods of market turmoil, rather than herding together, trading aggressively, and destabilizing prices in order to participate in a broad market movement, institutions are providing some measure of price stability by trading against the market.

Large position changes are often executed over time. While we do have substantial information on the orders that gave rise to executions, we do not know for certain which trades arise from a single decision. However, since we can track the trading of particular institutions, we can examine trading around extreme market movements in light of trading prior to those movements. In particular, we can distinguish trades where the institution was trading the same stock in the same direction on prior days. We refer to these trades as position-continuing trades.[3] We observe the negative relation between trading imbalance and market-wide movements almost exclusively in the positioning-continuing trades. This suggests that the effects we document arise from *implementation* decisions rather than *position* decisions – that the patterns we document arise because institutions who already wished to sell decide to sell more actively as markets are rising

[2] Our event days are those where absolute return on the CRSP equal- or value-weighted market index is greater than 2.0%. We also provide results for alternate cutoffs of 1.5% and 2.5%, which are generally similar.

[3] The ANcerno data do include orders that lead to executions over time. However, though some institutions accurately report this data, in some cases executions are assigned to orders algorithmically. Thus, the data may not always be accurate. We note that were we to examine trades that were indicated as to having been initiated by an order on a prior day, the results are comparable to what we find looking at position-continuing trades.

and those who already wished to buy decide to buy more actively as markets are falling. This behavior is consistent trading strategies based on long term price expectations but also seek to minimize implementation costs by selling (buying) when there is increased demand (supply).[4] Clearly, not all institutions are not trading as though they need to jump into the market to participate in a rise or avoid a fall.

We also explore trading behavior during event days using firm level regressions in a manner similar to Griffin, Harris, and Topologlu (2003). Similar to their analysis, we find that daily imbalances are positively related to past imbalances and both contemporaneous and past returns for our entire sample. However, the relation to contemporary returns is significantly attenuated on event days – the coefficient on contemporary returns is less than half that on other non-event days.[5] This suggests a reduced tendency to chase prices (relative to prior behavior), rather than the increase that would be expected with herding. More importantly, we find that for position-continuing trades, there is a negative correlation with contemporaneous returns, consistent with our univariate findings for aggregate trading. In effect, we find that while institutions clearly alter their trading behavior on days with extreme market-wide movements, they do so in a manner that benefits rather than attenuates price efficiency.

Our results suggest that institutional trading does not contribute to the previously documented distortion of prices during periods of extreme market movements and may even provide a modest stabilizing influence. Furthermore, the behavior we document results from implementation decisions, such as those that emphasize long run investment strategies and seek to minimize implementation costs. Our analysis is the first to document this stabilizing influence and a potential reason for it.[6] While our results

[4] Rather than simply responding to counterparty order flow, trading decisions can also be influenced by organizational structure and incentives. Edelen and Kaldec (2007) model the behavior of trading desk that is evaluated by comparing execution prices to the volume weighted average price (VWAP) during the day. As markets rise, for example, a trading desk that is selling will sell more aggressively since they will be executing favorably against their benchmark. The predictions of this model are also consistent with our observed results.

[5] We do not observe a negative correlation, which differs from results at the aggregate level. This is not an artifact of using multiple regressions. Instead, the difference is a result of the implicit weighting of the regressions (one observation per firm) rather than the aggregation of trading volumes which differ across firms. However, the results for pre-event initiated trades are consistent with the aggregate results.

[6] Prior studies have not done so since institutional trading is typically informed and therefore positively correlated, on average, with contemporary prices. Our analysis of extreme market-wide movements provides a context in which these results could be observed.

suggest different conclusions on the behavior of pension funds and mutual funds than those reached by Dennis and Strickland (2002) in their analysis using institutional ownership, our results using order and trade data do not contradict their actual empirical findings. In fact, in unreported analysis we show that even for the sample period we examine, the empirical regularities they document are largely unchanged. 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 institutional trading. Our results suggest that this is not the case.[7] Identifying alternative explanations for the link between ownership and excessive price movements is an area for future research.

The paper proceeds as follows. The next section reviews the relevant literature on institutional 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

Institutional investors clearly gather and generate value-relevant price information. As such, their activities will increase the informativeness of prices (see Holden and Subramanyam, 1992; Sias and Starks, 1997). It is not surprising; therefore, that institutional trading is positively correlated, on average, with contemporaneous price changes (Grinblatt and Titman (1993), Grinblatt, Titman, Wermers (1995), Wermers, (1999), Nofsinger and Sias (1999), Sias, Starks and Titman (2002), among others). At the same time, it is possible that institutional investors may drive prices too far and this could lead to temporary price distortions. In this section, we discuss the conditions that would give rise to such distortions and the existing empirical evidence.

Price distortions may occur as a result of specific trading patterns that would lead to large temporary price pressures from institutional trading. These trading patterns include chasing past returns (positive feedback trading) and following other institutions into or out of equity positions (herding). A number of models establish that these trading

[7] Furthermore, the Ancerno 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.

patterns, even when they distort prices, can exist in equilibrium. Froot, et. al. (1992) present a model of herding 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. Such trading strategies 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 (also see Scharfstein and Stein, 1990; and Lakonishok, Shleifer and Vishny, 1992). 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.

One set of empirical studies has explored these issues using quarterly or annual institutional holdings. In the case of herding, Lakonishok, Shliefer, and Vishney (1992) find evidence of herding by institutions in small stocks. Wermers (1999) also finds evidence of herding by mutual funds in smaller stocks, but extremely low levels of herding in large stocks. Most recently, Sias (2004) provides quite strong evidence of herding by institutions. As for positive feedback trading, Cai and Zheng (2004) find that returns Granger-cause institutional trading, but that institutional trading does not Granger-cause returns. Similarly, Burch and Swaminathan (2003) 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 and conclude that institutions rationally engage in positive feedback trading since stocks that institutions purchase subsequently outperform those they sell. Sias, Starks and Titman (2006), on the other hand, 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.

Even if institutions engage in positive feedback trading and herding, this does not necessarily imply any price inefficiency. Some studies of price behavior, such as

Nofsinger and Sias (1999), Wermers (1999), and Sias (2004), suggest that herding moves stock prices toward (rather than away from) their fundamental values. [8] Boehmer and Kelly (2007) find that stocks with greater institutional ownership are priced more efficiently in the sense that their prices more closely follow a random walk. On the other hand, Griffin, Harris, and Topaloglu (2003) look at daily trading data for institutions and find that it is correlated with past daily returns (positive feedback trading), past trading decisions (herding), and also with contemporaneous returns (consistent with price pressure). A central problem, of course, is that whether institutions are informed and driving prices to their correct values or are trading irrationally and driving prices too far, we will observe a positive correlation between trading and contemporaneous returns. Distinguishing between the two possibilities is empirically challenging. Furthermore, even if institutional trading does not distort prices on average, it may be true that they distort prices in some circumstances.

Dennis and Strickland (2002) examine the relation between quarterly institutional ownership levels and the cross sectional volatility of stock returns and turnover. They focus on days when the absolute value of returns for the equal- or value-weighted CRSP market index is greater than 2%. These extreme market movements are potentially periods when institutions may act similarly (herding) in response to common market movements and drive prices too far. Consistent with this possibility, 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.

The results in Dennis and Strickland (2002) are quite striking. In conjunction with the daily trading results in Griffin, Harris and Topalaglu (2003), which suggests herding at the daily level, the Dennis and Strickland results provide a strong indication that institutional trading can distort prices. However, their study, though it focuses on specific events where trading by institutions *might* be concentrated, uses ownership data rather than trading data. Furthermore, ownership levels and trading activities need not be related. In fact, Boehmer and Kelly (2007) provide evidence that quarterly changes in

[8] This is consistent with very early work by Friedman (1953), who suggests that traders who earn positive profits do so by trading against less rational investors who move prices away from fundamental values, and Fama (1965), who 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.

ownership do not provide a clear picture of the actually trading patterns of institutions during the quarter. Using actual trade data, we reach different conclusions than Dennis and Strickland.

Our analysis provides an interesting contrast to studies using changes in quarterly holdings by institutions. For example, Sias (2004) provides compelling evidence of herding looking at these changes, which must result from cumulative (relatively long term) trading decisions whereas we find no evidence of such herding looking at daily trading activity. This suggests that studies of institutional position decisions need to distinguish between short term and long term activities. It may very well be the case that at longer time frames, institutions exhibit herding but that it may not be true at shorter intervals, and we show it is clearly not true during extreme market-wide movements. This distinction is of importance because institutional trading is most likely to distort prices when it is concentrated into short intervals.

III. Data

We investigate institutional trading on days with extreme market movements using proprietary institutional trading data from the Ancerno Corporation. Ancerno is a widely recognized consulting firm that works with institutional investors to monitor their equity trading costs. Ancerno 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 Ancerno data include Goldstein, Irvine, Kandel and Wiener (2006) and Chemanur and Hu (2007). The Ancerno sample of institutional trade executions covers the period from January 1, 1999 until December 31, 2005.[9]

Summary statistics for Ancerno trade data are presented in Table 1. The Ancerno trading database contains a total of 1,001 different institutions responsible for approximately 155 million execution reports. Please note that an execution report is not

[9] Ancerno 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 (2007). The authors are happy to provide details of Ancerno data upon request.

necessarily a trade – multiple trades may be combined into one execution report and occasionally a trade may be split among execution reports. Summary statistics on executions is provided to compare this study with other studies using similar data. The analysis conducted in this study uses daily aggregate trading measures.

For each execution, the data include the date of the execution, a code for the institution responsible for 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 the brokerage firm executing the trade. The Ancerno trading 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. [10] The majority of institutions are pension plan sponsors, who account for 692 of the institutions. Pension plan sponsors are responsible for approximately 30 million executions during the sample period with a mean execution size of 6,117 shares. Although money managers represent only 314 institutions, they account for most of the executions in the sample (approximately 126 million). The mean execution size of money managers is about the same as pension plan sponsors at 6,140 shares.

The institutions in our sample, on average, are responsible for 7.97% of total CRSP daily dollar volume during the 1999 to 2008 sample period.[11] Thus, while our data represents the activities of a subset of pension funds and money managers, it represents a significant portion of total institutional trading volume. Finally, as noted in the introduction, Dennis and Strickland (2002) find that it is precisely ownership by pension funds and money managers that is associated with abnormal price movements and volume on days with extreme market movements.

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[10] The Ancerno 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 single day by a single Ancerno 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.

[11] We calculate the ratio of Ancerno trading volume to CRSP trading volume during each day of the sample period. We include only stocks with sharecode equal to 10 or 11 in our calculation. In addition, we divide all Ancerno trading volume by two, since each individual Ancerno client constitutes only one side of a trade. We believe this estimate represents an approximate lower bound for the size of the Ancerno database.

We initially follow Dennis and Strickland (2002) and define extreme market movements as a 2% or more increase or decrease in the CRSP equal- or value-weighted market index.[12] We also examine 1.5% and 2.5% cutoff samples. Results are generally similar and we tabulate only the central results for these alternate cutoffs. In order to benchmark normal trading activity, we require Ancerno trading data for the 60 days before and after each event day. This additional requirement limits our window of analysis to the March 31, 1999 to September 30, 2008 period.

Table 2 contains summary statistics for our event days. We find 159, 82, and 44 days when the value-weighted CRSP index return is greater than 1.5%, 2.0%, and 2.5% respectively. Similarly, we find 189, 96, and 45 days when the value-weighted CRSP index return is less than -1.5%, -2.0%, and -2.5% respectively. Results suggest that, on average, the value-weighted CRSP index moves by at least 2% about once every eleven trading days. Extreme equal-weighted return days are less frequent. On average, the equal-weighed market index moves by at least 2% about once every thirty-one trading days. We find 96, 37, and 18 days when the equal-weighted CRSP index return is greater than 1.5%, 2.0%, and 2.5% respectively. Similarly, we find 99, 39, and 10 days when the equal-weighted CRSP index return is less than -1.5%, -2.0%, and -2.5% respectively.

Conditioning on value-weighted return days will tend to pick days when large stocks move more than small ones. Because institutional ownership is correlated with size, conditioning on the value-weighted index could induce a sample-selection bias (Gompers and Metrick, 2001). 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 for the 2.0% cutoff sample. On average, 60.9% of firms experience positive returns on 2.0% value-weighted up days, while 29.2% of firms experience negative returns. For 2.0% value-weighted down days, on average, 26.5% of firms experience positive returns, while 63.5% of firms experience negative returns.

[12] This cutoff is roughly two standard deviations from the mean CRSP equal-weighted market return during our sample period. 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.

There is a notable time variation in extreme movements. There is a cluster in the 2000 to 2002 time period and another cluster in the 2007 and 2008 time period. These represent prolonged periods of market and economic uncertainty that were kicked off by economic recessions.

IV. Trading Analysis

We begin by looking at aggregate trading measures for all executions in our sample. We then focus on position-continuing trades. We then look at institutional trading at the individual firm level and conclude by looking at the trading profits of positions established on extreme market movement days.

Volumes and Imbalances

In this section we examine the aggregate trading activity of institutions. Table 3 presents mean aggregate trading statistics for both volume and imbalance (buys minus sells). These measures are presented four ways: shares traded, shares traded divided by market-wide trading volume, turnover (shares traded divided by CRSP reported shares outstanding), and excess turnover (turnover minus the mean turnover over the benchmark period which spans days [-60, -20] and [20, 60]).[13] We normalize turnover and imbalance measures by shares outstanding to prevent results from being entirely driven by large firms and to minimize cross sectional variation driven by firm size. We examine excess turnover to determine whether 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. Thus, excess volume and imbalance are the meaningful measures we examine and are the only ones for which we provide tests of significance.

To determine the significance of excess volume and imbalance, 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

[13] Our measures of trading volume and imbalance is similar to those of Dennis and Strickland (2002), Griffin, Harris, and Topaloglu (2003), and Irvine, Lipson and Puckett (2007).

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, we are identifying days in which trading activity exceeds normal (see Bamber, Barron, and Stober, 1997).[14]

Table 3 presents all volume and imbalance statistics for the 2.0% cutoff sample. In addition, excess imbalance is presented for the 1.5% and 2.5% cutoff samples.[15] When investigating institutional trading volume, we find that mean trading volume on the event day is significantly higher than mean trading volume during the benchmark period for both value- and equal-weighted up days. For the 2.0% cutoff sample, aggregate institutional turnover is 7.33 basis points (BPs) and 7.46 BPs for value- and equal-weighted up days respectively. Event day turnover exceeds normal turnover by 0.66 BPs on value-weighted up days, and 0.87 BPs on equal-weighted up days. Results are similar for down days except that volumes are a bit lower for value-weighted down days. In every case, we see no significant difference for pension funds. Thus, all the results on volume are driven by money managers.

To explore the relation between institutional trading volume and aggregate market volume, we calculate the ratio of Ancerno turnover to total market turnover. If institutions increase their trading relative to other market participants on event days (Dennis and Strickland, 2002), we expect this ratio to increase significantly. 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 (although not statistically significant) in every category except for one.

Looking at imbalances, which are of central interest to this study, we find that institutions are actually net sellers when market indexes experience large increases and net buyers on extreme down movement days. For the 2.0% cutoff sample, mean institutional share imbalance is -16.5 million (-13.2 million) shares for value- (equal-) weighted up days. When investigating large down movement days, we find mean

[14] This methodology is identical to Corwin and Lipson (2004) and Irvine, Lipson, and Puckett (2007).
[15] Inference obtained from all three cutoff samples is similar in both magnitude and significance. Tabulated results are limited for the sake of brevity.

institutional share imbalance on value-weighted down days is 15.3 million shares, and on equal-weighted down days is 17.2 million shares.[16]

Excess imbalance measures presented in Table 3 provide even stronger evidence of this relationship. We find significant mean excess imbalances of -0.62, -0.57, and -0.72 basis points when value-weighted CRSP index returns are greater than 1.5%, 2.0%, and 2.5% respectively. For value-weighted down days we find significant mean excess imbalances of 0.33, 0.32, and 0.38 basis points for the 1.5%, 2.0%, and 2.5% cutoff samples. Significance tests reveal that imbalances on these days are significantly more negative (positive) than benchmark levels on extreme market-wide up (down) movement days. Results are similar in both magnitude and significance when investigating the equal-weighted samples. Furthermore, the results are qualitatively similar for pension funds and money managers, though the magnitude is generally smaller for the pension funds.

Our results are quite apparent when illustrated graphically as in Figure 1. This figure graphs the daily mean imbalance for all institutions during the [-20, +20] trading day window around value-weighted large movement days for the 2.0% cutoff sample.[17] The effects we document for event days are clearly unusual and striking.

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 3). When investigating the 1.5% cutoff sample for equal-weighted up days, we find that on average, 46.1% of institutions are net buyers and 53.9% of institutions are net sellers. For equal-weighted down days, on average, 54.6% of institutions are net buyers and 45.4% 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, 44.3% of institutions are net buyers and 55.7% of

[16] 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.

[17] Figures illustrating institutional imbalance surrounding equal-weighted large movement days and for other sample cutoff levels reveal a similar picture, but are not included for the sake of brevity.

institutions are net sellers. For value-weighted down days we find that 55.7% of all institutions are net buyers and 44.3% are net sellers.[18]

Taken together, our results thus far suggest that aggregate trading by institutions in our sample is certainly not positively correlated with extreme market returns and, in fact, is typically negatively correlated.[19] In order to flesh out the nature of trading decisions driving this relationship, we first divide all trading by institutions into buys and sells. Consistent with empirical tests presented in Table 3, we test whether buy and sell activities on event days are significantly different from benchmark levels.

Table 4 presents buy and sell volume and imbalance statistics for the 2.0% cutoff sample, and excess imbalance statistics for the 1.5% and 2.5% cutoff samples. Selling activity increases (i.e. imbalance is more negative) significantly on up movement days. Specifically, excess selling increases by 0.64, 0.52, and 0.76 basis points on value-weighted up days for the 1.5%, 2.0%, and 2.5% cutoff samples respectively but there is no corresponding change in excess buying imbalances. For value-weighted down days, we find an increase in buying. Results are similar for equal-weighted large movement days except that there is some increase in buying as well as selling on up days and for down days at the 2.5% cutoff, some increase in selling. Taken together, these results suggest that the effects we document arise from increased selling on up days and buying on down days.

Table 5 also investigates buy and sell volume as a percentage of overall market turnover for the 2.0% cutoff sample. On up days, we find that selling (buying) volume increases (decreases) as a percentage of aggregate market turnover. For value-weighted days the ratio of selling volume to total market volume increases by 0.37%, while the ratio for buy volume decreases by 0.53%. When investigating down markets, we find that selling volume decreases as a percentage of market volume and modest evidence of an increase in the buying.

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

[18] We use daily dollar imbalance for each institution to calculate net buyers and sellers. When using share imbalances and when investigating the 2.0% and 2.5% cutoff samples, results are quantitatively similar.
[19] 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.

movement on those days. These results do suggest that institutional trading is the result of trading strategies that are contingent on price movements. The exact nature of those strategies is not clear from Table 4. 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.

Position-Continuing Executions

As described in the introduction, one plausible explanation for the observed institutional trading behavior 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, portfolio managers (or possibly the institutional trading desk – see Edelen and Kadlec (2007)) who 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.

We test this possibility by partitioning our sample as follows. We identify those executions where the execution is in the same direction as a trade by the same institution in the prior five days, what we describe as "position-continuing executions." Execution results for these executions are more likely to be driven by trading strategies (implementation) rather than market positioning. Results are presented in Table 5. 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 table, partition, we see that the negative contemporaneous relationship between institutional imbalance and large market movements documented in table 3 is largely explained by position-continuing executions. For the 2.0% cutoff sample, the position-continuing excess imbalance is -0.50 basis points for the value-weighted up market sample and 0.30 for the value-weighted down market sample. Results are similar for the equal-weighted sample. Only for value-weighted up markets is

there any significant change for the executions that are not position-continuing, and the magnitudes are much smaller in magnitude than for position-continuing executions.

Stock Level Trading Patterns

In this section we examine the determinants of institutional trading patterns at the institution and firm level. Prior literature suggests that trading decisions are motivated by price changes, and work by Griffin, Harris, and Topaloglu (2003) further suggests that aggregate institutional trading imbalance is related to the prior day aggregate institutional imbalance. In this section we assess 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 first take the imbalance turnover (imbalance divided by shares outstanding) for each institution and stock during each day of 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 positively correlated with both contemporaneous and lagged daily firm 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. Specifically, we pool all days during our sample period that are not included in our sample of extreme movements (1727 days). From this sample, we randomly select 187 trading days (about 10%) as control days. Results for this regression are presented in Table 6 along with the

results for value-weighted and equal-weighted event days for the 2.0% cutoff sample. In addition, $Return_t$ is presented for the 1.5% and 2.5% cutoff samples.

For both the control and event day samples, coefficient estimates confirm that an institution's trading behavior with regard to a stock is highly significantly correlated with the previous five days of trading activity for that institution. For the control days sample, the coefficient on $Imbalance_{t-1}$ is 0.032, suggesting that a one standard deviation increase in an institution's trading imbalance on day t-1 results in an increase of 0.06 basis points in event day imbalance. The regression also shows that both contemporaneous returns on day *t* and prior day returns 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 0.42 and significant at the 1% level. The coefficient indicates that as a stock's price increases by 1 standard deviation, this results in an increase of 0.41 basis points in event day imbalance.

If institutions are even more prone to follow stock returns on days with extreme price movements, driving stock prices past fundamental values, then one would expect the coefficient on contemporaneous returns to increase for a sample of event days. Looking at regression results for both value- and equal-weighted event days, we find that the coefficient estimates for $Return_t$ decrease from 0.42 on control days to 0.151 on value-weighted event days, and 0.076 on equal-weighted event days. Results suggest that institutional imbalances become less sensitive to firm returns on these event days.[20]

Although the reduction in sensitivity to contemporaneous returns on extreme movement days suggests that firms reduce, rather than increase, their trading sensitivity to market movements, 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

[20] 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.

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).

However, there is no conflict between the regression and aggregate results when we look only at position-continuing executions. These results are shown in table 7. 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.[21] This is consistent with trading strategies where institutions implement position decisions over multiple days.

Table 7 uses the same regression specification presented in Table 6. Similar to previous results, we present these regressions for non-event days and event days separately. Of central importance, we now find that the contemporaneous relationship between imbalance and returns is negative for the event day samples. The result is consistent for both equal- and value-weighted days and exists for all cutoff subsamples. Thus far our evidence confirms that institutions use extreme market movements as opportunities to complete previously initiated trade orders.

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 directly test the profitability of institutional trading on event days by using the actual trades of institutions in our sample. 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

[21] This analysis is conditioned on an institution trading a stock on the event day.

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 performance of institutional trading 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 Ancerno clients for each stock traded on our event day (day t) using actual execution prices. We track the principal-weighted raw and abnormal portfolio return for 1 week, 1 month, and 3 months following the event day 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. Abnormal portfolio returns are the raw return minus DGTW benchmark returns (Daniel, Grinblatt, Titman, and Wermers, 1997). DGTW benchmark returns are the value-weighted returns to portfolios of stocks sorted into quintiles by size, book-to-market, and past 12 month return.

Results for our return analysis following event days are presented in Table 8. We find no evidence of negative abnormal performance for institutional positions established on event days. In fact, we find some evidence that trades are profitable. For the 1.5% cutoff sample, three month (60 trading day) post-event DGTW abnormal returns are 0.89% for institutional positions established on equal-weighted up days, and 0.78% for positions established on equal-weighted down days. Returns are also significantly positive for down days at the 2% and 2.5% cutoffs for equal-weighted days. As for value-weighted days, there are positive returns for the 2.5% cutoff down days. Abnormal returns are significantly positive at the 5% level.

Post-event performance measures provide some evidence that positions established on event days are marginally profitable. This seems to be particularly true for equal-weighted days where the movements are more broadly observed rather than concentrated in a few larger firms. Most important, we find no evidence that positions established on these days experience negative abnormal returns as would be expected if these trades were driving prices past fundamental values.

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 1.5%, 2.0% or 2.5%. Using a proprietary database of institutional trades from the Ancerno 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 mechanism driving this pattern in trading, we find that this aggregate behavior is driven by trades in the same direction as recent trades. 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. 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, we find some evidence that positions established by institutions on event days earn abnormal profits as institutions buy (sell) more when market demand is excessively negative (positive).

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Table 1- Summary Statistics for ANcerno Data

Table 1 presents summary information for the institutional trading sample provided by the Ancerno Corporation. The trades in the sample are placed by 1,001 different institutions during the time period from January 1, 1999 to June 30, 2008. Daily volume summary statistics aggregate all institutional trading volume by firm and trading day. We then present separate statistics for orders (instructions to trade initiated by a client's trading desk and given to brokerage firms for execution) and executions. Summary statistics are also broken down by pension plan sponsor and money manager.

	All Years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
All Institutions											
Number of Institutions	1,001	380	372	400	425	402	406	376	398	377	304
Number of Stocks	9,017	6,173	5,900	5,051	4,675	4,711	4,916	4,760	4,726	4,766	4,264
Number of Executions (millions)	155.34	5.22	6.93	8.30	11.14	11.07	18.96	16.62	27.26	34.24	15.61
Total Share Volume (billions)	953.15	46.11	64.58	85.32	117.66	98.08	135.06	108.51	117.66	118.87	61.29
Total Dollar Volume ($trillion)	30.18	2.07	2.88	2.60	2.89	2.46	3.89	3.39	3.79	4.20	2.01
Mean Share Vol /execution	6,136	8,838	9,325	10,282	10,516	8,861	7,123	6,528	4,316	3,471	3,926
Median Dollar Vol / execution	194,271	397,248	415,760	313,270	259,019	222,355	205,156	203,808	138,908	122,740	128,972
Pension Plan Sponsors											
Number of Institutions	692	343	329	335	344	317	290	246	240	221	175
Number of Stocks	8,669	5,876	5,649	4,604	4,388	4,524	4,858	4,276	4,338	4,401	3,620
Number of Executions (millions)	29.50	1.85	2.30	2.55	3.04	2.40	7.87	1.57	2.35	3.55	2.03
Total Share Volume (billions)	180.46	9.80	12.12	16.26	21.55	15.48	50.46	10.25	15.54	20.83	8.19
Total Dollar Volume ($trillion)	5.56	0.39	0.49	0.49	0.53	0.38	1.45	0.31	0.50	0.76	0.27
Mean Share Vol /execution	6,117	5,299	5,280	6,374	7,082	6,447	6,413	6,535	6,622	5,862	4,037
Median Dollar Vol / execution	188,386	210,119	213,043	190,673	174,307	159,146	184,378	195,092	213,592	213,592	131,223
Money Managers											
Number of Institutions	314	37	43	65	81	85	116	130	158	156	129
Number of Stocks	8,493	5,331	5,114	4,696	4,315	4,331	4,607	4,628	4,664	4,668	4,222
Number of Executions (millions)	125.84	3.37	4.63	5.57	8.10	8.67	11.09	15.06	24.91	30.68	13.58
Total Share Volume (billions)	772.68	36.31	52.46	69.06	96.12	82.60	84.60	98.27	102.13	98.04	53.10
Total Dollar Volume ($trillion)	24.62	1.68	2.39	2.11	2.36	2.08	2.44	3.08	3.29	3.44	1.75
Mean Share Vol /execution	6,140	10,780	11,331	12,017	11,868	9,530	7,626	6,527	4,100	3,195	3,909
Median Dollar Vol / execution	195,651	499,938	516,274	367,692	290,844	239,866	219,893	204,716	131,929	112,218	128,637

Table 2- Summary Statistics for Large Market Movement Days

Table 2 presents summary information for days during the March 31, 1999 to March 31, 2008 sample period where the absolute value of the CRSP equal- or value-weighted market index return is large. We initially define large as a 2.0% or larger movement in either the equal- or value-weighted market index. However, we also present results for alternate cutoffs of 1.5% and 2.5%. The table presents the number and annual distribution of large market movement days for each cutoff level. The table also presents mean returns for each cutoff level.

	All Days	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Value-Weighted - Up											
# of days (1.5% cutoff)	159	17	31	23	35	20	3	3	6	13	8
# of days (2.0% cutoff)	82	5	21	14	23	9	0	0	2	5	3
# of days (2.5% cutoff)	44	2	15	6	13	3	0	0	0	3	2
Mean Return (1.5% cutoff)	2.32%	1.97%	2.60%	2.48%	2.56%	2.06%	1.62%	1.66%	1.98%	2.05%	2.29%
Mean Return (2.0% cutoff)	2.89%	2.57%	3.04%	2.94%	3.02%	2.48%	n/a	n/a	2.37%	2.66%	3.23%
Mean Return (2.5% cutoff)	3.48%	3.01%	3.38%	3.88%	3.64%	3.17%	n/a	n/a	n/a	2.89%	3.78%
Value-Weighted - Down											
# of days (1.5% cutoff)	189	12	42	38	43	11	6	2	4	20	11
# of days (2.0% cutoff)	96	6	20	16	29	5	0	0	0	12	8
# of days (2.5% cutoff)	45	1	11	8	12	2	0	0	0	6	5
Mean Return (1.5% cutoff)	-2.16%	-2.00%	-2.26%	-2.17%	-2.25%	-2.01%	-1.56%	-1.63%	-1.68%	-2.16%	-2.31%
Mean Return (2.0% cutoff)	-2.60%	-2.23%	-2.81%	-2.80%	-2.52%	-2.48%	n/a	n/a	n/a	-2.48%	-2.54%
Mean Return (2.5% cutoff)	-3.06%	-2.57%	-3.26%	-3.42%	-2.97%	-2.95%	n/a	n/a	n/a	-2.75%	-2.73%
Equal-Weighted - Up											
# of days (1.5% cutoff)	96	1	22	20	21	11	1	0	4	10	6
# of days (2.0% cutoff)	37	0	12	10	7	0	0	0	2	3	3
# of days (2.5% cutoff)	18	0	6	6	4	0	0	0	0	0	2
Mean Return (1.5% cutoff)	2.06%	1.68%	2.22%	2.31%	1.98%	1.65%	1.63%	n/a	2.02%	2.02%	2.11%
Mean Return (2.0% cutoff)	2.64%	n/a	2.63%	2.85%	2.61%	n/a	n/a	n/a	2.34%	2.34%	2.57%
Mean Return (2.5% cutoff)	3.10%	n/a	3.08%	3.33%	2.94%	n/a	n/a	n/a	n/a	n/a	2.77%
Equal-Weighted - Down											
# of days (1.5% cutoff)	99	0	26	14	17	2	7	1	4	17	10
# of days (2.0% cutoff)	39	0	9	7	7	0	1	0	0	8	7
# of days (2.5% cutoff)	10	0	4	4	1	0	0	0	0	1	0
Mean Return (1.5% cutoff)	-2.04%	n/a	-2.15%	-2.30%	-2.02%	-1.79%	-1.71%	-1.63%	-1.66%	-2.00%	-2.02%
Mean Return (2.0% cutoff)	-2.55%	n/a	-2.97%	-2.94%	-2.36%	n/a	-2.12%	n/a	n/a	-2.30%	-2.13%
Mean Return (2.5% cutoff)	-3.59%	n/a	-3.90%	-3.51%	-3.11%	n/a	n/a	n/a	n/a	-3.12%	n/a

Table 3 - Trading Activity

Table 3 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 March 31, 2008 sample period when the absolute value of the CRSP equal- or value-weighted market index return is large. We initially define large as a 2% or greater move in the index, however, we also include excess imbalance statistics for alternate cutoffs of 1.5% and 2.5%. Volume and imbalance (buy volume minus sell volume) are presented in three ways: shares traded, turnover (shares traded divided by shares outstanding), and excess turnover (turnover less the mean turnover over the benchmark period spanning days [-60, -20] and [20, 60]). Turnover statistics (both volume and imbalance) are presented in basis points (BP). 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 pension plan sponsor and money manager.

		Volume					**Imbalance**			**Imbalance Alternate Cutoffs**	
										1.5%	**2.5%**
		Volume (1,000s)	Turnover (BP)	Excess Turnover (BP)	Vol/Mkt (%)	Excess Vol/Mkt (%)	Net Shares (1,000s)	Imbalance (BP)	Excess Imbalance (BP)	Excess Imbalance (BP)	Excess Imbalance (BP)
Value Weighted											
Up	*All*	421,388	7.33	0.66***	8.65	-0.15	-16,477	-0.48	-0.62***	-0.57***	-0.72***
	Pension Funds	72,013	1.52	0.08	2.01	-0.10	-5,620	-0.15	-0.14***	-0.12***	-0.16***
	Money Mangers	349,347	5.80	0.57***	6.63	-0.06	-10,857	-0.33	-0.48***	-0.45***	-0.56***
Down	*All*	424,103	7.23	0.35**	8.69	-0.11	15,332	0.45	0.33***	0.32***	0.38***
	Pension Funds	76,688	1.46	0.00	1.98	-0.09	8,475	0.10	0.11***	0.09***	0.13***
	Money Mangers	347,415	5.78	0.36***	6.71	-0.02	6,857	0.35	0.22***	0.23***	0.25**
Equal Weighted											
Up	*All*	433,866	7.46	0.87***	8.24	-0.12	-13,190	-0.56	-0.71***	-0.50***	-0.63***
	Pension Funds	72,289	1.53	0.12	1.80	-0.17	-4,633	-0.13	-0.12***	-0.11***	-0.11**
	Money Mangers	361,576	5.93	0.75***	6.44	0.05	-8,556	-0.43	-0.60***	-0.39***	-0.52***
Down	*All*	480,637	8.26	0.90***	8.58	-0.21	17,243	0.58	0.46***	0.36***	0.49**
	Pension Funds	83,099	1.62	0.15	1.93	-0.02	6,370	0.13	0.15***	0.12***	0.20***
	Money Mangers	397,537	6.64	0.74***	6.66	-0.18	10,873	0.45	0.31**	0.23**	0.28*

Table 4 – Buy and Sell Volume Separately

Table 4 presents mean statistics for buy and sell trading volume separately on days during the March 31, 1999 to March 31, 2008 sample period when the absolute value of the CRSP equal- or value-weighted market index return is large. We initially define large as a 2% or greater move in the index, however, we also include excess imbalance statistics for alternate cutoffs of 1.5% and 2.5%. The table presents results for buy and sell turnover divided by aggregate market turnover and buy and sell imbalance turnover. Imbalance turnover is measured as signed trading volume divided by shares outstanding, and excess imbalance is turnover less the mean turnover over the benchmark period spanning days [-60, -20] and [20, 60]. Imbalance turnover and excess imbalance statistics are presented in basis points (BP). 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/Mkt		**Imbalance**		**Imbalance Alternate Cutoffs**	
						1.5%	**2.5%**
		Volume/ Market (%)	Excess Vol./Mkt (%)	Imbalance (BP)	Excess Imbalance (BP)	Excess Imbalance (BP)	Excess Imbalance (BP)
Value Weighted							
Up	*Buys*	4.09	-0.53***	3.43	0.02	-0.04	0.03
	Sells	4.55	0.37***	-3.90	-0.64***	-0.52***	-0.76***
Down	*Buys*	4.81	0.20*	3.84	0.34***	0.23***	0.60***
	Sells	3.87	-0.32***	-3.39	-0.01	0.09	-0.21
Equal Weighted							
Up	*Buys*	3.89	-0.54***	3.45	0.08	0.26**	0.53**
	Sells	4.35	0.41***	-4.01	-0.79***	-0.76***	-1.16***
Down	*Buys*	4.84	0.23	4.42	0.67***	0.41***	1.05***
	Sells	3.75	-0.43***	-3.84	-0.22	-0.06	-0.57**

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

Table 5 – Position-Continuing Executions

Table 5 presents mean statistics for position continuing and remaining execution separately on event days during the March 31, 1999 to March 31, 2008 sample period when the absolute value of the CRSP equal- or value-weighted market index return is large. We initially define large as a 2% or greater move in the index, however, we also include imbalance statistics for alternate cutoffs of 1.5% and 2.5%. Position-continuing executions are those in which an institution had traded in the same direction over the prior five days. Turnover is measured as volume or imbalance (buy volume minus sell volume) divided by shares outstanding, and excess turnover (both volume and imbalance) is turnover less the mean turnover over the benchmark period spanning days [-60, -20] and [20, 60]. Turnover statistics (both volume and imbalance) are presented in basis points (BP). 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**		**Imbalance Alternate Cutoffs**	
						1.5%	**2.5%**
		Turnover (BP)	Excess Turnover (BP)	Imbalance (BP)	Excess Imbalance (BP)	Excess Imbalance (BP)	Excess Imbalance (BP)
Value Weighted							
Up	*Continuing*	3.78	0.31***	-0.393	-0.496***	-0.456***	-0.554***
	Other	3.58	0.36***	-0.088	-0.130**	-0.110***	-0.176**
Down	*Continuing*	3.73	0.14*	0.385	0.296***	0.308***	0.300***
	Other	3.53	0.21*	0.065	0.034	0.015	0.081
Equal Weighted							
Up	*Continuing*	3.85	0.41***	-0.505	-0.617***	-0.502***	-0.530***
	Other	3.64	0.47***	-0.061	-0.103	-0.081*	-0.113
Down	*Continuing*	4.31	0.44**	0.511	0.425***	0.364***	0.509***
	Other	3.98	0.46**	0.063	0.026	0.017	-0.034

Table 6 - Regression Analysis of All Orders

Table7 presents pooled cross-sectional regressions where trade imbalance (shares bought minus shares sold divided by shares outstanding) 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 $return_{t-1}$, $return_{t-2}$, $return_{t-3}$, $return_{t-4}$, and $return_{t-5}$ represent five days of lagged firm returns. The variable *Prior* is the absolute value of the mean of the previous five days imbalance turnover in a stock times $Return_t$. The table presents regression results for a randomly selected sample of non-event control days and for days when the value-or equal-weighted CRSP index moves by greater than 2%. The table also presents results for selected coefficients $Return_t$ and *Prior* for the alternate 1.5% and 2.5% cutoff samples.

	Control Days	Value-Weighted Days	Equal-Weighted Days
Intercept	0.001	0.001	0.001
$Imbalance_{t-1}$	0.032***	0.315***	0.322***
$Imbalance_{t-2}$	0.068***	0.108***	0.106***
$Imbalance_{t-3}$	0.039***	0.061***	0.062***
$Imbalance_{t-4}$	0.017***	0.048***	0.050***
$Imbalance_{t-5}$	0.023***	0.046***	0.047***
$Return_t$	0.420***	0.076***	0.060***
$Return_{t-1}$	0.247***	0.058***	0.053***
$Return_{t-2}$	0.159***	0.015**	0.025 **
$Return_{t-3}$	0.012	0.005	-0.008
$Return_{t-4}$	0.079***	0.005	-0.005
$Return_{t-5}$	0.025**	0.004	-0.003
Prior			
R-squared	2.88%	16.61%	16.64%
Alternate Cutoffs – Selected Coefficients			
1.5% Movement	$Return_t$	0.090***	0.078***
2.5% Movement	$Return_t$	0.064***	0.062***

Table 7 – Regression Analysis of Position-Continuing Orders

Table 8 presents pooled cross-sectional regressions for multiple-day trade orders where the decision to trade is made prior to the event day (i.e. pre-event initiated trading volume). The dependent variable is event day trade imbalance (shares bought minus shares sold divided by shares outstanding), 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 $return_{t-1}$, $return_{t-2}$, $return_{t-3}$, $return_{t-4}$, and $return_{t-5}$ represent five days of lagged firm returns. The table presents regression results for a randomly selected sample of non-event control days, and for days when the absolute value of the CRSP equal- or value-weighted market index is large. We define large as greater than a 1.5%, 2.0%, or 2.5% move in the index.

	Control Days	Value-Weighted Days			Equal-Weighted Days		
		1.5% cutoff	**2.0% cutoff**	**2.5% cutoff**	**1.5% cutoff**	**2.0% cutoff**	**2.5% cutoff**
Intercept	0.001	0.001	0.000	0.000	0.001	0.000	-0.0003
$Imbalance_{t-1}$	0.022***	0.039***	0.029***	0.126***	0.028***	0.102***	0.109***
$Imbalance_{t-2}$	0.049***	0.003***	0.026***	0.019***	0.011***	0.026***	0.017***
$Imbalance_{t-3}$	0.023***	0.014***	0.011***	0.028***	0.025***	0.036***	0.043***
$Imbalance_{t-4}$	0.012***	0.010***	0.022***	0.013***	0.006***	0.019***	0.014***
$Imbalance_{t-5}$	0.015***	0.020***	0.026***	0.023***	0.006***	0.005***	0.017***
$Return_t$	0.014***	-0.032***	-0.034***	-0.035***	-0.036***	-0.049***	-0.058***
$Return_{t-1}$	0.246***	0.161***	0.158***	0.128***	0.147***	0.112***	0.100***
$Return_{t-2}$	0.136***	0.098***	0.087***	0.066***	0.085***	0.066***	0.062***
$Return_{t-3}$	0.006	0.054***	0.045***	0.028***	0.041***	0.010**	0.021***
$Return_{t-4}$	0.079***	0.053***	0.042***	0.041***	0.037***	0.021***	0.022***
$Return_{t-5}$	0.027**	0.024***	0.025***	0.024***	0.033***	0.023***	0.006
R-squared	4.61%	3.43%	3.80%	9.39%	2.98%	8.19%	8.38%

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

Table 8 – Post-Event Abnormal Returns

Table 10 presents the performance of trading positions established by institutions on event days. Raw returns presented in Panel A represent the value-weighted portfolio return of institutional positions established on the event day, where each position is weighted by the dollar value of the actual position cost (i.e. the transaction price times the number of shares traded). Panel B presents abnormal returns based on the approach by Dainiel, Grinblatt, Titman, and Wermers (1997). Specifically, DGTW benchmark returns are the value-weighted returns to portfolios of stocks that are sorted into quintiles by size, book-to-market, and past 12-month returns, yielding 125 portfolios. The DGTW-abnormal return is the raw return minus the characteristic-matched DGTW benchmark return. The table presents mean portfolio returns for 1 week, 1 month, and 3 months following the event day. The table also includes results for the 1.5%,. 2.0% and 2.5% cutoff samples.

Panel A: Raw Returns

		1 week	1 month	3 months
Value-Weighted				
1.50%	*Up*	0.20%**	0.09%	0.13%
	Down	0.13%	0.53%**	0.13%
2.00%	*Up*	0.22%*	0.11%	0.37%
	Down	0.09%	0.73%*	0.53%
2.50%	*Up*	-0.34%	-0.14%	-0.34%
	Down	0.14%	1.13%**	1.44%***
Equal-Weighted				
1.50%	*Up*	0.37%*	0.43%*	0.63%*
	Down	0.13%	0.95%**	0.64%*
2.00%	*Up*	0.45%	0.32%	-0.14%
	Down	0.29%	1.54%	1.53%**
2.50%	*Up*	-0.90%	-0.51%	0.58%
	Down	1.12%	3.20%	3.86%**

Panel B: DGTW Returns

		1 week	1 month	3 months
Value-Weighted				
1.50%	*Up*	0.12%**	0.11%	0.07%
	Down	0.11%	0.38%**	-0.06%
2.00%	*Up*	0.16%**	0.23%	0.30%
	Down	0.10%	0.49%	0.12%
2.50%	*Up*	-0.24%	-0.38%*	-0.26%
	Down	0.13%	0.64%**	0.90%**
Equal-Weighted				
1.50%	*Up*	0.14%	0.88%*	0.89%**
	Down	0.43%*	0.46%	0.78%**
2.00%	*Up*	0.56%	0.66%	0.13%
	Down	0.42%	1.50%	1.56%**
2.50%	*Up*	-1.17%	-1.15%	0.01%
	Down	1.33%	3.08%	3.85%**

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

Figure 1 - Imbalance for all institutions

Figure 1 presents the daily mean trading imbalance for all institutions (pension plan sponsors and money managers) during the [-20, +20] day period surrounding days when the absolute value of the CRSP equal- or value-weighted market index is greater than 2.0%.