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The dynamics of institutional trading: Evidence from transaction data

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ABSTRACT

I examine the cross-sectional relationship between institutional trading activity and daily and intradaily stock returns for a sample of NYSE, Amex, and Nasdaq securities. An analysis of the prior day's return sort indicates that, institutional investors are 13.6 percent more likely to be net buyers of securities that are in the winner (top performing decile) decile than of those that are in the loser decile. There is a strong daily contemporaneous relation between institutional imbalances and returns, and institutional trades follow the previous day's returns. The intradaily analysis suggests that the contemporaneous relation is primarily driven by institutional trades following the intradaily prices. There is no evidence of institutional return predictability.

1. Introduction

The institutional ownership of U.S. equities has grown considerably in the past several decades. The rapid growth of institutional ownership and the sheer magnitude of their trading activity have induced numerous empirical and theoretical papers on the trading behavior of institutional investors. However, because institutions are required to disclose their portfolio holdings only on a quarterly basis, extant empirical studies rely on quarterly or annual data to examine the dynamic relation between institutional trading and same-period returns. The main findings of these studies can be summarized as follows: First, institutional investors are momentum traders (Bennett, Sias, & Starks, 2003; Grinblatt, Titman, & Wermers, 1995; Sias, 2007). Second, institutional investors often allegedly follow each other and engage in herding behavior (Wermers, 1999). Third, a strong positive contemporaneous relation exists between changes in institutional ownership and returns (Nofsinger & Sias, 1999; Wermers, 1999). Although the quarterly contemporaneous relation between changes in institutional ownership and returns is well documented in the literature, the economic mechanisms underlying this relation are not fully understood and have received less attention in the literature because their investigation requires a higher frequency of institutional ownership data. In this paper, I use detailed transaction data for a sample of U.S. institutional investors to investigate the sources of this contemporaneous relation found at quarterly and yearly intervals. In particular, I examine the daily and intradaily cross-sectional relationship between the trading activity of institutional investors and stock returns.

The contemporaneous relation between changes in institutional ownership and same-period returns is consistent with three main hypotheses (Nofsinger and Sias (1999); Sias, Starks, and Titman (2006)): (1) the aggregate institutional buying and selling activities have a contemporaneous impact on prices (price pressure); (2) institutional investors are short-term momentum traders; and (3) institutional investors possess superior information that allow them to time their trades (i.e., institutions are able to forecast short-term returns). Unlike the previous studies, the institutional investors' transactional data allow us to examine these competing explanations on a daily and intradaily basis. For example, if the quarterly contemporaneous relation arises from institutional feedback trading (return predictability) during the quarter, we should observe institutional trades chasing (leading) the intraquarterly asset prices movements. Alternatively, if the contemporaneous relation at the quarterly intervals arises from the price impact of institutional trades, then a

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contemporaneous relation in the daily frequency should be observed. Understanding the sources of the contemporaneous relation between the changes in institutional ownership and same-period returns is important because each of the competing hypotheses has different interpretations; that is, whether the aggregate institutional buying and selling activity affects asset prices or whether asset prices can affect the aggregate institutional activity.

The main findings of the paper suggest that there is a strong positive contemporaneous relation between institutional trade imbalances and daily returns and that institutional investors follow previous day price movements. The difference between the returns in the high institutional imbalance decile and those in the low institutional imbalance decile is 0.884 percent and statistically significant on the day before portfolio formations, and it is 0.411 percent and statistically significant two days before portfolio formations. However, the results suggest a strong time variation in institutional momentum trading among loser and winner stocks. The results from a vector autoregression analysis suggest that a one standard deviation increase in daily returns leads to a 0.04 standard deviation increase in institutional imbalance on the subsequent day. Moreover, the institutional trading activity is highly autocorrelated at a one-day lag. The intradaily results suggest that the contemporaneous relation found at a daily frequency is primarily driven by institutional trades following the intradaily prices. Finally, there is no evidence of short-term institutional return predictability.

The contribution of this paper to existing literature is twofold. First, the paper provides empirical evidence that the source of the quarterly contemporaneous relation is primarily driven by the institutional investors' feedback trading at daily and intradaily levels. Second, the paper overcomes the limitations of quarterly institutional ownership data used in the previous studies and employs a proprietary database of institutional trades obtained from ANcerno Ltd. The ANcerno data provides a unique opportunity to examine the daily and intradaily relation between institutional trading activity and returns, since the dataset contains detailed information on institutional transactions that account for nearly 8 percent of the total trading volume of the Center for Research in Security Prices (CRSP) data in each of the years of our study.[1] The main advantage of ANcerno's data is that it allows us to distinguish between the trades of institutional and retail investors. It provides the following information: transaction-side information indicating whether the transaction is a buy or sell; the number of shares traded by each institution; date and time stamps for each trade; and a unique numerical identification that allow us to track the trades of each institution, both cross-sectionally and over time. It is important to note that our analysis for the relationship between institutional imbalances and returns is cross-sectional, as I remove market-wide effects from both variables.

The remainder of the paper proceeds as follow. Section 2 discusses the related literature. Section 3 presents the hypotheses, methodology, and describes the data used in our study. Section 4 provides the main empirical results. Section 5 discusses some robustness tests. Reversals analysis in Section 6. A brief results discussion and conclusion in Section 7.

2. Literature review

The relation between institutional trading activity and stock returns as well as on the interaction between institutional investors have been extensively studied in the finance literature. Theoretical models of investor behavior (e.g., DeLong, Shleifer, Summers, and Waldmann (1990); Hong and Stein (1999)) suggest that trading by one class of investors (rational speculators) can lead to momentum in stock prices. Other models show that fund managers may engage in herding behavior due to slow private information diffusion (e.g., Froot, Scharfstein, and Stein (1992); Hong and Stein (1999)), career concerns (Scharfstein and Stein (1990, pp. 465–479)), or because managers infer information from the trades of other investors (Bikhchandani, Hirshleifer, and Welch (1992)). Empirically, due to the lack of publicly available data on institutional transactions, previous studies rely on the changes in quarterly institutional holding data and find mixed evidence on the trading behavior of institutional investors. On the one hand, Lakonishok, Shleifer, and Vishny (1992) examine the quarterly holdings of a sample of pension funds and find a weak evidence of momentum investing or herding behavior. On the other hand, Grinblatt et al. (1995) analyze the trading behavior of 274 mutual funds and document a stronger evidence of momentum trading, while Badrinath and Wahal (2002) provide evidence that the tendency of momentum trading varies considerably across institutional types and is mainly driven by new equity positions. Using daily data, Choe, Kho, and Stulz (1999) document a herding behavior and feedback trading by Korean and foreign institutional investors. Conversely, Grinblatt and Keloharju (2000) document a contrarian investing strategiy by Finnish institutional investors.

Other studies examine the ability of institutional investors' trades to predict future returns. For instance, Chen, Jegadeesh, and Wermers (2000), after controlling for various stock characteristics, find that stocks that mutual funds buy outperform the stocks that mutual funds sell by 2 percent per year. In contrast, Griffin, Harris, and Topaloglu (2003) find no evidence of return predictability at a daily level. Their findings suggest that institutional trades precede stock price movements at an intradaily basis; however, this effect is economically small.

A number of other studies, conducting measurements over the same period (quarterly and yearly), investigate the drivers of the strong positive contemporaneous relationship between changes in institutional ownership and stock returns. For example, Sias et al. (2006) use the covariance decomposition methodology to estimate higher frequency correlations between unobservable monthly (weekly) changes in institutional holding and lead, lag, and contemporaneous monthly (weekly) returns. Their main findings suggest that the impact of institutional trades on prices is the primary explanation. However, Cai and Zheng (2004) find that stock returns Granger-cause quarterly changes of institutional ownership, but that ownership changes do not predict stock returns.

While these studies shed light on the quarterly and annual relation between changes in institutional ownership and stock returns, the

[1] ANcreno data have been used by academic scholars and produced various papers including Goldstein, Irvine, Kandel, and Wiener (2009), Chemmanur, He, and Hu (2009), Goldstein, Irvine, and Puckett (2011), Puckett and Yan (2011), Anand, Irvine, Puckett, and Venkataraman (2012).

exact nature of the intraperiod relation cannot be known without analyzing higher frequency data. In addition, using annual or quarterly institutional ownership data or any proxy for institutional trading activity may not fully capture the daily trading dynamic of institutional investors (Badrinath and Wahal (2002)). The implications of using low frequency holdings data to proxy for institutional trading activity are well illustrated by Elton, Gruber, Blake, Krasny, and Ozelge (2010). Using monthly holdings data instead of quarterly or semiannual holdings data, these authors reexamine some well-known hypotheses about investment manager behavior. They find changes in some of the previously documented results about the mangers' behavior and in some cases, they find that the results are reversed. This happens because monthly ownership data capture a large number of trades missed by quarterly data (18.5 percent of the trades). The high frequency institutional transaction data used in this study overcomes the limitations of the previous studies, and allow us to examine these competing hypotheses. In the process, they provide new evidence on the relation between daily and intradaily institutional trades and past stock returns, price pressure, and the short-term forecasting ability of institutional trading activity.

3. Hypotheses and methodology

Empirical studies usually use quarterly data to evaluate the relationship between institutional trading activity and stock returns. In this section, I develop the main hypotheses for the potential drivers of the strong positive contemporaneous relation between returns and changes in institutional ownership, provide a data description, and present the methodology used to examine this relation.

3.1. Hypotheses

The contemporaneous relation between the changes in quarterly institutional ownership and quarterly returns is consistent with the institutional price pressure hypothesis. There are two possible explanations for why institutional trades may have a direct impact on asset prices. First, institutional investors are better informed than other investors are; thus, their trades reveal valuable information and consequently have a permanent effect on prices (Easley and Ohara' (1987)). Second, it is possible that aggregate institutional trading requires price concessions and therefore drives the liquidity suppliers away from their optimal inventory positions, resulting in a temporary effect on prices (Grossman & Miller, 1988; Stoll, 1978). The empirical studies on institutional price pressure show that institutional trading activities have both a permanent and a short-lived impact on prices (e.g., Chan & Lakonishok, 1993, 1995; Keim & Madhavan, 1997; Lakonishok et al., 1992). Moreover, Edelen and Warner (2001) show that both the aggregate flow into U.S. equity funds and institutional trading activities affect security prices. In addition, they find that the price impact of aggregate institutional trades is similar in magnitude to that of individual institutional trades. Since the price impact of institutional trading is well documented in the literature the current study investigates the other two possible explanations for the strong positive contemporaneous relation found at the quarterly level, between returns and changes in institutional ownership; that is, short-term momentum trading and returns predictability.

It is possible that the contemporaneous relation between quarterly returns and changes in institutional ownership is driven by institutional investors following short-term (intraquarter) positive feedback trading strategies. This explanation is consistent with the theoretical models of the investors' overreaction and/or the investors' underreaction. These models suggest that sophisticated investors such as hedge funds and mutual funds may rationally engage in momentum trading strategies to exploit this overreaction and/or underreaction by other investors (DeLong et al., 1990; Hong & Stein, 1999). Furthermore, institutional feedback trading could also arise because institutional investors provide liquidity to other market participants who follow contrarian investment strategies (Barber, Odean, & Zhu, 2009). Consistent with this reasoning, the first hypothesis captures the idea that institutional investors tend to buy stocks that have performed well and to sell the stocks that have performed poorly in the recent past implying that returns will lead institutional trading activity.

Hypothesis 1. ***There is a positive relation between institutional trade imbalances and prior day returns.***

The second potential explanation for the positive contemporaneous relation between changes in institutional holding and same-quarter returns is also consistent with the hypothesis that institutional trading activity has no impact on prices; however, institutional investors possess superior information and can predict intraquarter short-term returns. Therefore, the stocks that institutional investors buy would outperform the stocks that they sell. The empirical evidence indicates that there is a weak positive relationship between aggregate institutional demand and future returns (Bennett et al., 2003; Wermers, 1999, 2000). These findings suggest that, at least in part, the quarterly contemporaneous relation between changes in institutional ownership and returns can be explained by the ability of institutional investors to predict short-term intraquarter returns. Thus, the second hypothesis captures the idea that institutional trade imbalances are positively associated with daily future returns. This hypothesis implies that the daily institutional imbalances would lead the returns.

Hypothesis 2. ***There is a positive relation between institutional trade imbalances and the following day returns.***

3.2. Variable definition

The primary measure of stock-level institutional trading activity is calculated based on the daily institutional trading imbalance. In particular, for each firm *i*, I compute the institutional buy-sell imbalance by subtracting the total daily volume of shares sold by institutions from the total daily volume of shares bought by institutions and dividing the resulting amount by the number of shares outstanding:

Table 1
Ancerno DataDescriptive statistics for ANcerno institutional trading data.

	Full Sample	99	00	01	02	03	04	05	06	07	08	09	10	11
No. Instit	1142	379	370	398	424	401	404	376	399	377	333	322	308	259
No. Stocks	7800	4855	4761	4176	3942	3993	4202	4050	4062	4114	3817	3693	3468	3331
No. Tr. (mill)	205.7	4.00	5.42	6.82	9.17	7.92	16.39	14.75	24.63	31.02	26.20	21.00	22.19	16.18
Volume (bill)	1110	34.90	52.20	75.30	100.00	70.50	117.00	94.40	103.00	103.00	122.00	102.00	84.90	50.80
Volume $ (bill)	32950	1550	2320	2270	2390	1750	3320	2930	3270	3590	3450	2230	2310	1570
Avg. Vol per Tr.	5395.7	8739	9612	11052	10905	8907	7113	6399	4185	3323	4672	4839	3826	3142
Avg. $ Vol per Tr. (1000)	1601.7	3884.8	4279.8	3326.6	2608.0	2206.4	2023.5	1983.7	1326.5	1156.1	1318.0	1063.1	1042.6	969.4

Note: Institutional transaction data are collected from ANcerno Ltd. The sample includes the transactions of 1142 institutions covering a period from January 1, 1999 through September 30, 2011. The Table presents the full sample statistics as well as the descriptive statistics disaggregated by year.

$$Imbal_{i,t} = \frac{InstitBuy_{i,t} - InstitSell_{i,t}}{Shareoutstand_{i,t}} \quad (1)$$

where $Imbal_{i,t}$ is the institutional imbalance for stock i in day t, $InstitBuy_{i,t}$ is the total institutional buy volume for stock i in day t, $InstitSell_{i,t}$ is the total institutional sell volume for stock i in day t, and $Shareoutstand_{i,t}$ is the total number of shares outstanding of stock i on day t.

For each stock in the sample, I subtract from both the daily stock returns and the institutional imbalances an equally weighted average return and institutional imbalance, respectively, to minimize market wide-effects.

3.3. Data

The primary data source for this study consists of institutional investors transaction data from ANcerno Limited for the period from January 1, 1999 to September 30, 2011. ANcerno is a leading transaction cost analysis provider that mainly works with institutional investors and brokers. ANcerno data cover trade-by-trade transactions for a large number of institutional investors including pension plan sponsors, institutional money managers as well as (less frequently) brokers. The crucial attribute of the data set in examining the relation between institutional trading activity and returns is that each observation includes information, such as the following: each institution's unique numerical identification code, namely, *clientcode* which enables the tracking of the institutions' trade both in a cross-section and through time; the type of the institution, that is, whether it is pension plan sponsor (*clienttype* = *1*), a money manager (*clienttype* = *2*) or a broker (*clienttype* = *3*); a unique stock identification variable *stockkey*; *cusip*; a ticker; the transaction price; date and time stamps for an order; the execution price; the number of shares traded; and transaction-side information indicating whether it is a buy or a sell. As per ANcerno's specialists, the dataset contains the history of all transactions of ANcerno's clients as long as they remain in the sample. Since ANcerno is a proprietary database, selection and survivorship biases are main concerns. Puckett and Yan (2011) provide a detailed analysis on the integrity of the ANcerno database and conclude that the data may suffer selection bias but that the survivorship bias is not a concern.

Table 1 reports the full sample descriptive statistics for Ancerno's trade data as well as the disaggregated statistics by year. The total number of institutions in our sample is 1142: these institutions are responsible for almost 205 million transactions involving about $33 trillion in trading volume. The trading activity of ANcerno's institutions, on average, accounts for nearly 8 percent of the value of the CRSP's trading volume from 1999 through 2011.[2] Since the fraction of institutional trading activity accounts for approximately 80 percent of CRSP's trading volume, I estimate that ANcerno's trading data represent 10 percent of all institutional trading volume. Table 1 also presents several remarkable time series variations in the trading activity of institutional investors included in our sample. In 1999, the sample includes 379 institutions. This number declined to 259 in 2011, and the number of ANcerno's clients peaked in 2002 with a total of 424 institutions. There are more stocks traded by institutional investors at the beginning of the sample than in the later period. For instance, the number of stocks in the sample decreases from 4855 in 1999 to 3331 in 2011. The average value of the trading volume varies between a maximum of $427,977 in 2000 and a minimum of $96,935 in 2011.

To complement ANcerno's trade data, I obtain stock market data, such as returns, stock prices, total trading volume, and number of outstanding shares, from the Center for Research in Security Prices (CRSP). To select the information to be included in the sample, I choose these filtering criteria: (1) Only common shares with sharecodes 10 and 11 for companies that are members of the NYSE, Amex and Nasdaq are included; (2) I delete the trades where the order volume in the ANcerno dataset is greater than the stock trading volume as reported by CRSP; (3) I exclude stocks trading less than $1 or more than $999 to minimize market microstructure induced biases; (4) I require a minimum of 245 observations per year because in some years, the maximum number of trading days in the sample is 248 days. This leaves us with a total of 2483 firms. Table 2 reports the average stock characteristics across the ten portfolios sorted by their daily institutional buy-sell imbalance. The characteristics are as follows: stock volatility, which is computed as the standard deviation of daily returns during a quarter; firm size, representing the market capitalization; turnover, denoting the total daily trading volume divided by the number of shares outstanding; the daily price level; the daily raw returns; and the daily institutional buy-sell imbalance. Each statistic is computed as the average of the daily cross-sectional mean for the stock characteristic in each decile. The analysis starts by examining price levels across the ten portfolios because big differences in prices may have a crucial influence on result inferences (Badrinath & Wahal, 2002). Table 2 shows some differences in price levels across institutional buy-sell portfolios, the average prices are higher for extreme groups ranging from $30.59-$33.64. However, the variation in price levels across the ten groups is quite small, suggesting that giving equal weights to each stock is unlikely to bias the results in decile formation. The typical stock size traded by ANcerno's clients is approximately $4.5 billions and includes stocks with relatively higher volatility (smaller firms), suggesting that the largest fraction of institutional trading is not observed among the firms with the largest capitalization. This is in accordance with Bennett et al. (2003), who find that institutional investors increased their preferences for smaller and riskier securities. Moreover, institutional buying and selling activity is observed among stocks with high turnover. Finally, while stocks that institutions tend to sell experience negative returns, the stocks institutions tend to buy experience positive returns.

[2] I follow Puckett and Yan (2011) to compute the fraction of institutional trading volume to CRSP trading volume for each day in the sample period. Since ANcerno' clients constitutes one side of the transaction, I divide the total institutional trading volume by two. Only common stocks, those with code equal to 10 or 11, are include.

Table 2
Stock characteristics by institutional buy-sell imbalance.

	Return	Price	Turnover	Volatility	Cap	Inst.Imbal
D 1	−0.5581	33.23	0.0192	0.0297	4.670	−0.3328
D 2	−0.2849	33.03	0.0119	0.0266	8.250	−0.0792
D 3	−0.1521	33.51	0.0101	0.0255	11.81	−0.0319
D 4	−0.0639	32.63	0.0089	0.0249	13.34	−0.0109
D 5	+0.0038	30.59	0.0080	0.0251	10.64	−0.0015
D 6	+0.0645	31.14	0.0082	0.0250	10.76	+0.0044
D 7	+0.1271	32.52	0.0091	0.0251	12.11	+0.0148
D 8	+0.2343	32.87	0.0102	0.0258	10.27	+0.0369
D 9	+0.3967	32.37	0.0120	0.0270	7.240	+0.0856
D 10	+0.6967	33.64	0.0193	0.0301	4.200	+0.3340

Note: This table reports average security characteristics across 10 portfolios sorted by their daily institutional buy-sell imbalances. Stock returns are expressed in percentage per day; market capitalization is reported in billions of dollars; volatility is the standard deviation of daily return in a quarter; turnover is the total daily volume divided by the number of shares outstanding (in percentage); institutional imbalance is the difference between daily institutional buy and sell divided by the number of shares outstanding and (in percentage); price is the daily market price.

3.4. Methodology

3.4.1. Portfolio sort

To investigate the daily relation between the trading activity of institutional investors and returns, I start the analysis by using a sorting method similar to that used by Nofsinger and Sias (1999) and Griffin et al. (2003) and based on the intensity of the daily institutional buy-sell imbalances, assign stocks each day into one of the ten portfolios: the stocks assigned to the first decile are those experiencing the largest institutional selling activity, and the stocks in the top decile are those experiencing the largest institutional buying activity. Moreover, to investigate whether institutional investors trade on the prior day's returns, I follow Griffin et al. (2003) and sort firms into ten portfolios according to their daily return performance and then examine the institutional buy-sell imbalances on the subsequent day. For each day-decile, for a given stock, I compute the fraction of institutions that are net buyers based on its previous day return.

3.4.2. Vector autoregression

The primary objective of the paper is to investigate the relation between returns and institutional trading activity. Inferences about this relationship are potentially influenced by the time-series properties of each variable. Specifically, institutional imbalances are strongly related to past institutional imbalances (Griffin et al., 2003; Sias & Starks, 1997), and institutional trading is dependent on past returns (Griffin et al., 2003; Grinblatt et al., 1995; Wermers, 1999). Therefore, to examine whether institutional trades lead returns or returns lead institutional trades, I follow Griffin et al. (2003) and use vector autoregression to investigate at daily level the time-series behavior of institutional trading activity and returns. For each stock in the sample, I compute the daily institutional imbalances and returns and then deduct from both variables an equally weighted average institutional imbalance or return, respectively, to minimize the market wide-effects. To simplify the interpretation of the results, the two variables are standardized (to have a zero mean and standard deviation of one) by using their time series moments. For the baseline analysis, I estimate for each stock the following system of equation:

$$R_t = \alpha + \sum_{j=1}^{5} \beta_j R_{t-j} + \sum_{j=1}^{5} \gamma_j Iimbal_{t-j} + \varepsilon_{t,R} \tag{2}$$

$$Iimbal_t = \alpha + \sum_{j=1}^{5} \beta_j R_{t-j} + \sum_{j=1}^{5} \gamma_j Iimbal_{t-j} + \varepsilon_{t,Iimbal} \tag{3}$$

where R_t is the adjusted stock return on day t and $Iimbal_t$ is the adjusted institutional trading imbalance on day t.

Momentum trading strategy is based on buying past winners and selling past losers. In the context of this study, an equally important question is whether institutional investors' trading activity differs between loser and winner portfolios. To answer this question, as described in the following, I perform for each stock a piecewise linear regression with the median return as a knot.

$$Iimbal_t = \alpha + \sum_{j=0}^{5} \beta_j R_{L,t-j} + \sum_{j=0}^{5} \gamma_j R_{W,t-j} + \sum_{j=1}^{5} \lambda_j Iimbal_{t-j} + \varepsilon_{t,Iimbal} \tag{4}$$

where $R_{L,t} = min(R_t, \tilde{R}_t)$ is the return on loser stocks on day t, $R_{W,t} = max(R_t - \tilde{R}_t, 0)$ is the return on winner stocks, R_t is the daily stock return, $\tilde{R}_t$ is the daily cross-sectional median returns, and $Iimbal_t$ is the adjusted institutional trading imbalance on day t. The piecewise linear regression that has been widely used in the flow-performance literature (Sirri & Tufano, 1998) allows us to compute two different regression loads for the return variable. One of the estimated coefficients refers to the slope of the segment above the cross-sectional median return (winner stocks), whereas the other estimated coefficient refers to the slope of the segment below the cross-sectional

median (loser stocks). A positive relation between institutional imbalances and returns above (below) the median indicates that institutional investors tend on average to buy winners (sell losers).

3.4.3. Intradaily analysis

To understand the relation between institutional trading activity and returns at a high frequency level, I also conduct an intradaily analysis to investigate the relation between returns and institutional imbalances. More specifically, I study the relation between institutional trade imbalances and intradaily jumps in prices.

To capture both positive and negative jumps in the intradaily prices, I define two dummy variables. The dummy variable *pjump* (*njump*) captures the positive (negative) jump and equals one if the change in the stock price is at least one standard deviation higher (lower) than the quarterly average change in stock price and equals zero otherwise. I also examine the relation of larger jumps by considering 1.5 and a 2 standard deviation jumps. To limit our sample and obtain the necessary data, I require at least five observations for each stock in each day. For the jump events, I require the time difference between the two consecutive price observations to be a maximum of 60 min. I compute institutional buy-sell imbalances after a jump event by considering two time intervals, namely, a one-hour as well as a two-hours interval, after the jump occurs. Then, I estimate the following regression:

$$Imbal_{i,t} = \alpha + \beta_p Pjump_{i,t-1} + \beta_n Njump_{i,t-1} + \gamma Controls + \varepsilon_{i,t} \quad (5)$$

where *Pjump* and *Njump* are dummy variables capturing the positive and negative jumps, respectively; *Imbal* denotes the institutional imbalances. I also control for other stock characteristics, such as prior hour return, stock turnover, absolute return to proxy for stock volatility, firm size, bid-ask spread, and the previous day return.

A positive (negative) relationship between institutional imbalances and *Pjump* (*Njump*) implies that institutional investors follow intradaily stock prices and that this in turn may induce the positive contemporaneous relation between returns and institutional imbalances at the daily level.

Next, I examine the intradaily returns' predictability of institutional imbalances. While the jump events are defined as previously, the institutional imbalances are computed in one-hour and two-hour interval before the jump takes palace. A positive (negative) relation between lagged institutional imbalances and *pjump* (*njump*) indicates the ability of institutional investors to predict the intradaily price movements. To examine this hypothesis, I estimate the following two equations:

$$Pjump_{i,t} = \alpha + \beta_p Imbal_{i,t-1} + \gamma Controls + \varepsilon_{i,t} \quad (6)$$

$$Njump_{i,t} = \alpha + \beta_n Imbal_{i,t-1} + \gamma Controls + \varepsilon_{i,t} \quad (7)$$

Table 3
Returns and institutional buy-sell imbalances for portfolios classified by institutional buy-sell imbalance.

Rank	−5	−4	−3	−2	−1	0	−5	−4	−3	−2	−1	0
	Return-EW Return		Instit.Buy-Instit.Sell									
D1	− 0.090[a]	− 0.116[a]	− 0.166[a]	− 0.266[a]	− 0.506[a]	− 0.611[a]	− 0.045[a]	− 0.053[a]	− 0.066[a]	− 0.086[a]	− 0.135[a]	− 0.320[a]
D2	− 0.019	− 0.037	− 0.058[a]	− 0.118[a]	− 0.248[a]	− 0.373[a]	− 0.015[a]	− 0.017[a]	− 0.021[a]	− 0.026[a]	− 0.038[a]	− 0.074[a]
D3	− 0.003	− 0.003	− 0.015	− 0.059[a]	− 0.129[a]	− 0.240[a]	− 0.006[a]	− 0.008[a]	− 0.009[a]	− 0.012[a]	− 0.016[a]	− 0.030[a]
D4	+ 0.006	− 0.002	− 0.001	− 0.017	− 0.063[a]	− 0.135[a]	− 0.002[a]	− 0.003[a]	− 0.004[a]	− 0.004[a]	− 0.006[a]	− 0.010[a]
D5	+ 0.004	+ 0.002	+ 0.000	− 0.002	− 0.023	− 0.052[a]	− 0.000[a]	− 0.000[a]	− 0.000[a]	− 0.001[a]	− 0.001[a]	− 0.001[a]
D6	+ 0.004	− 0.010	+ 0.009	+ 0.001	+ 0.028[b]	+ 0.012[a]	+ 0.001	+ 0.001[a]	+ 0.002	+ 0.002	+ 0.003[b]	+ 0.004[a]
D7	− 0.001	+ 0.007	+ 0.009	+ 0.037[a]	+ 0.075[a]	+ 0.088[a]	+ 0.005[a]	+ 0.006[a]	+ 0.006[a]	+ 0.007[a]	+ 0.009[a]	+ 0.014[a]
D8	− 0.002	+ 0.019	+ 0.024[b]	+ 0.055[a]	+ 0.139[a]	+ 0.209[a]	+ 0.010[a]	+ 0.011[a]	+ 0.013[a]	+ 0.016[a]	+ 0.021[a]	+ 0.035[a]
D9	+ 0.001	+ 0.024[b]	+ 0.048[a]	+ 0.109[a]	+ 0.239[a]	+ 0.363[a]	+ 0.020[a]	+ 0.024[a]	+ 0.027[a]	+ 0.032[a]	+ 0.045[a]	+ 0.080[a]
D10	− 0.021	+ 0.001	+ 0.036[b]	+ 0.144[a]	+ 0.378[a]	+ 0.626[a]	+ 0.053[a]	+ 0.058[a]	+ 0.070[a]	+ 0.091[a]	+ 0.138[a]	+ 0.324[a]
H-L	+ 0.069[a]	+ 0.117[a]	+ 0.202[a]	+ 0.411[a]	+ 0.884[a]	+ 1.237[a]	+ 0.098[a]	+ 0.111[a]	+ 0.136[a]	+ 0.177[a]	+ 0.273[a]	+ 0.644[a]

Note: This table reports the time-series averages of lagged and contemporaneous institutional trade imbalances and return differential (Return-EW Return), both expressed in percent. The last row reports the mean difference between the high and low portfolios (H-L) for each variable. The statistical significance reported in the last row is computed from a paired *t*-test estimated from the time series of the difference between the high and the low portfolios. The statistical significance reported in the first 10 rows are computed from a paired *t*-test estimated from the time series of the difference between the corresponding portfolio return and the mean across all 10 portfolios. For statistical significance, a at 1 and b at 5 percent.

where variables in equations (6) and (7) are defined in the same way as in equation (5).

4. Empirical results

Most of the existing empirical studies evaluate institutional trading behavior by examining the quarterly changes in institutional ownership. However, except for the study by Griffin et al. (2003) and a short analysis in Nofsinger and Sias (1999), little is known about the short-term relation between institutional trading and returns in the U.S. market. This section provides the empirical results on the daily relation between institutional investors' trading and returns.

4.1. The contemporaneous relationship

Table 3 reports the time series average of the daily cross-sectional mean abnormal returns and institutional trading imbalances for firms within each institutional trading imbalance decile. In the formation day, stocks in the decile experiencing the largest institutional buying activity exhibit an average excess return (relative to an equally-weighted market return) of 0.626 percent, which is significantly different from zero at the one percent level. Alternatively, the stocks in the decile experiencing the largest institutional selling activity exhibit an average excess return of −0.611 percent, which is again different from zero at a one percent level. The stocks experiencing strong institutional buying activity outperform the ones experiencing strong institutional selling activity by 1.24 percent per day: the difference is statistically significant at the one percent level. Griffin et al. (2003) report a difference of 7.98 percent for Nasdaq 100 securities, while Nofsinger and Sias (1999), for three-month period, report a difference of 2.68 percent for 114 NYSE firms. Our finding is smaller in magnitude in comparison to the findings of both studies, likely because our sample covers a longer time period, is a larger sample that includes firms listed on NYSE, Amex, and Nasdaq, and contains smaller and less liquid firms. In unreported results, I find a considerable time variation in the returns differentials between stocks experiencing large institutional buying activity and stocks experiencing large institutional selling activity. While the return difference between the top and bottom decile peaks in 2008 reaching 2 percent per day, the return differential is only 0.86 percent per day in 2004. I also estimate a daily cross-sectional regression of returns on institutional trading, firm size, turnover, and stock volatility and find that the strong contemporaneous relation between returns and institutional trading imbalances is not affected by controlling for these firm characteristics.

4.2. Institutional trading and return sort

For each stock, Fig. 1 shows the fraction of institutions that are net buyers based on the previous day returns. Stocks in the decile experiencing the highest daily returns exhibit net buying by institutions more than they exhibit net selling on the next day 59.8 percent of the time. On the other hand, stocks in the decile experiencing the lowest daily stock returns are bought by institutions on the following day only 46.2 percent of the time. Fig. 1 shows that institutional investors are 13.6 percent $(59.8 - 46.2)$ more likely to be net buyers of stocks experiencing large prior day returns than of those with low prior day returns. These findings are smaller than those documented by Griffin et al. (2003) who find that institutional investors are 23.9 percent more likely to be net buyers of Nasdaq 100 stocks that have experienced a large prior day performance than of those that have experienced a low prior day performance. In unreported results, a sub-sample analysis show that the fraction of institutions that are net buyers of top decile stocks rather than of bottom decile stocks does not change over time or in sub-samples based on firm characteristics such as size or liquidity. These findings suggest that the short-term institutional momentum trading is weaker than that documented in Griffin et al. (2003), again likely because the current study uses a more comprehensive sample.

In momentum profits, prior studies document a considerable time variation due to either market state, investor sentiment, or the realized volatility of the market (e.g., Chordia & Shivakumar, 2002; Cooper, Gutierrez, & Hameed, 2004; Wang & Xu, 2010). Therefore, I also examine how institutional trading following the prior day's returns develops over time for both winner and loser portfolios. Fig. 2

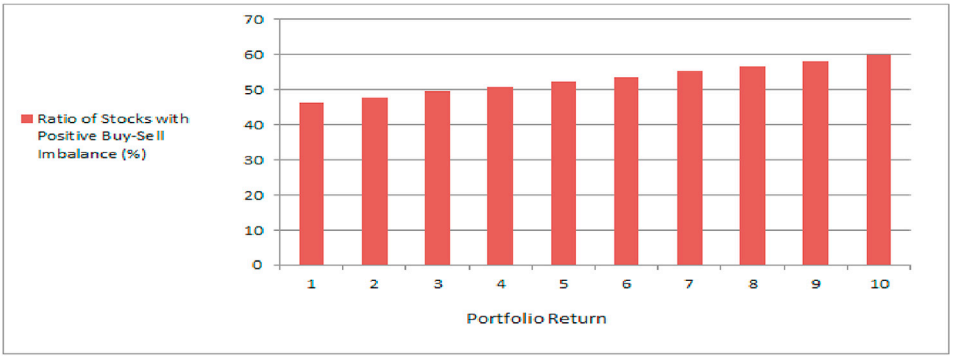

Fig. 1. Institutional trading activity following ranking by daily returns. On each day, the sample of stocks are sorted by the prior day's return and assigned to one of ten deciles. For each decile, the proportion of stocks for which institutions are net buyers the following day is calculated. The time series average of these proportions is computed for each decile on the day following the ranking day.

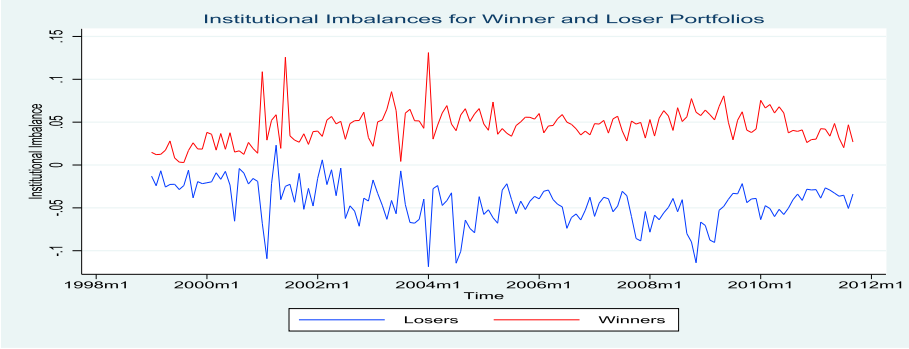

Fig. 2. Institutional trading activity for winner and loser portfolios. On each day, the sample of stocks are sorted by the prior day's return and assigned to one of ten deciles. The Figure displays the cross-sectional average of institutional imbalances for both winner and loser portfolios.

depicts the cross-sectional average of institutional imbalances for both winner and loser portfolios in the day following the portfolios' formation. As seen, there is a notable time variation in institutional trading for both loser and winner portfolios; however, after 2004, the time variation in the loser stocks is stronger than that in the winner stocks. In unreported results, I also compute the difference in institutional demand between winner and loser stocks over the sample period and find a notable time variation in the degree of momentum trading by institutions, such that the difference is positive during the whole sample period. I don't observe any considerable contrarian trading by institutions; the institutional momentum trading has increased rapidly in the first half of the sample.

To further examine the relationship between institutional buy-sell imbalances and the previous day's returns, the extreme winner and loser portfolios (based on the prior day's return) are ranked into quintiles based on the subsequent day's institutional buy-sell imbalance. Panel A in Table 4 reports the time-series mean of the cross-sectional averages of the subsequent day's institutional imbalances and abnormal returns for the stocks in the top daily return decile (winners). The results show a strong relationship between institutional imbalances and returns in the day following portfolio formation. The quintile of winners experiencing the largest next day institutional net selling activity exhibits strong return reversals and an abnormal returns average −0.525 percent in the day following portfolio formation, showing a result that is statistically significant at a one percent level. Alternatively, the quintile of winners experiencing the largest subsequent day institutional net buying exhibits strong momentum and an abnormal returns average 0.733 percent in the day following the portfolio formation, again showing a result that is statistically significant at the one percent level. Panel B presents similar results for the decile of losers divided into the institutional buy-sell imbalances quintile. In sum, these results suggest that institutions are short-term momentum traders and that there is a strong positive relation between institutional trading activity and the level of return momentum.

4.3. Vector autoregression results

Cross-sectional averages of the estimated loadings from equations (2) and (3), the percentage of securities with positive and negative estimates that are significant at the conventional level, and the adjusted R-squares are reported in Table 5. Panel A of Table 5 reveals several interesting patterns. First, in equation (3), the cross-sectional average of the estimated coefficients of the prior day's return is 0.04, suggesting that a one standard deviation increase in the day $t-1$ return leads to a 0.04 standard deviation increase in the net buying activity of institutions in day *t*. Moreover, 27 percent of the stocks have positive and significant coefficients at a five percent level. However, the effect disappears, with the 2-through 5-day lagged coefficients being either small or slightly negative. Griffin et al. (2003) use vector autoregression for 82 stocks that are members of the Nasdaq 100 and find that a one standard deviation increase in the daily return leads to a 0.12 increase in the following day's institutional net buying and that 34 percent of stocks have positive and significant coefficients. Second, abnormal institutional trading activity is highly autocorrelated with prior day institutional activity. The cross-sectional average coefficient on the previous day institutional buy-sell imbalance is 0.27, and more than 89 percent of the loadings are positive and significantly different from zero at a five percent level. The lagged 2- through 5-day institutional buy-sell imbalance estimates are positive as well. These daily findings are in line with those found in Sias and Starks (1997) and Griffin et al. (2003), who find that there is strong persistence in the U.S. institutional investors' trading activity. However, these results reveal a stronger persistence in institutional buy-sell imbalances compared to those documented in Griffin et al. (2003), likely because our measure of institutional trading variable is a better proxy. Third, there is no evidence that institutional trades predict the next day returns. In the return equation of Panel A in Table 5, the cross-sectional average coefficients for past institutional imbalances are close to zero, and approximately four percent of the stocks have positive coefficients that are significantly different from zero at a five percent confidence level.

Table 5, Panel B, reports the results obtained from estimating a structural vector autoregression by including the contemporaneous returns in the institutional trading equation.[3] The results show a strong contemporaneous relationship between institutional buy-sell

[3] I add the contemporaneous return to measure the contemporaneous effect on institutional imbalances relative to the impact of prior day's return. I obtain similar strong relationship by including the contemporaneous institutional imbalances in the return equation.

Table 4
Institutional buy-sell imbalances and return sort.

	Subsequent Selling	2	3	4	Subsequent Buying	*F*-statistic
	Panel A: Winners Ranked by Subsequent Institutional Imbalance					
Subsequent Abnormal Returns	− 0.525	− 0.328	− 0.149	0.189	0.733	2055***
	(− 17.69)−17.69)***	(−13.59)***	(−6.43)***	(7.62)***	(24.62)***	
Institutional Imbalance	− 0.205	− 0.015	0.010	0.058	0.333	2059***
	Panel B: Losers Ranked by Subsequent Institutional imbalances					
Subsequent Abnormal Returns	− 0.702	− 0.143	0.187	0.397	0.637	1748***
	(−21.17)***	(−5.41)***	(7.12)***	(13.88)***	(18.09)***	
Institutional Imbalance	− 0.344	− 0.050	− 0.005	0.025	0.260	1759***

Note: Each day a sample of NASDAQ-AMEX-NYSE stocks are sorted into ten portfolios based on daily raw return. Panel A presents the time-series average of cross-sectional mean subsequent day institutional buy-sell imbalance and abnormal returns for stocks in the top daily return decile (winners) ranked into subsequent day institutional buy-sell imbalance quintiles. Similarly, Panel B presents the data losers decile ranked into subsequent day institutional buy-sell imbalance quintile. *F − statistic* is based on the null hypothesis that the time-series averages of cross-sectional means do not differs across the portfolios. *t − statistic* between paracenteses.

Table 5
Daily VAR estimates for individual stocks.

	Return			Panel A			Panel B		
				Iimbal			Iimbal		
	Coeff	% pos.sig.	% neg.sig.	Coeff	% pos.sig.	% neg.sig.	Coeff	% pos.sig.	% neg.sig.
α	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Return									
β_0							0.12	56.54	0.68
β_1	− 0.02	3.75	12.32	0.04	27.18	0.85	0.04	28.84	0.64
β_2	− 0.02	2.50	8.30	0.01	5.80	2.30	0.01	6.32	2.05
β_3	− 0.01	2.58	4.07	0.00	3.34	2.94	0.00	3.75	2.74
β_4	− 0.01	1.57	3.66	0.00	2.58	3.42	0.00	2.74	3.22
β_5	− 0.01	1.41	4.43	0.00	2.22	3.58	0.04	2.54	3.54
Iimbal									
γ_1	0.00	3.71	3.46	0.27	89.65	0.00	0.27	89.93	0.00
γ_2	0.00	3.50	3.02	0.07	38.66	0.56	0.07	39.23	0.52
γ_3	0.00	3.26	3.66	0.05	24.45	0.44	0.05	24.73	0.56
γ_4	0.00	3.58	4.03	0.03	14.78	0.77	0.03	14.78	0.85
γ_5	0.00	3.75	3.34	0.04	18.45	0.48	0.04	19.13	0.40
Adj.R^2	0.008			0.13			0.160		

Note: Results from equations (2) and (3) are reported in Panel A. Panel B reports results for a structural VAR with contemporaneous excess returns in the institutional imbalance equation. The table reports the cross-sectional averages of the coefficient estimates and adjusted R^2s, the percentage of stocks with positive and negative coefficients that are significant at the 5 percent confidence level (% pos.sig. and % neg.sig.).

imbalances and returns; the cross-sectional average coefficients for the contemporaneous return is 0.12, indicating that a one standard deviation increase in the day *t* return is associated with a 0.12 standard deviation increase in the day *t* institutional net buying activity. More than 56 percent of stocks have significant positive coefficients at the five percent level, and the average adjusted R^2 for the imbalance equation has increased from 0.13 to 0.16. Note that the average coefficient of the past day's return is unchanged and that the percentage of positive significant coefficients increases from 27.18 percent to 28.84 percent.[4] The strong positive relation between daily institutional imbalances and daily returns is consistent with the institutional investors' ability to predict intradaily price movements, to follow intradaily prices, or is consistent with the institutional price pressure hypothesis. To distinguish between these competing hypotheses, in section 4.5, I examine the relation between institutional imbalances and returns at the intradaily level.

4.4. Buying winners or selling losers

The results of equation (4) are presented in Table 6. For brevity, the coefficients of the variable *Iimbal* are not reported. The results of the full sample analysis reveal notable differences between loser and winner stocks in the trading patterns of institutional investors. An examination of the contemporaneous relation show that, the estimated coefficient of the loser portfolio is 0.15 and that 60 percent of the securities have positive and significant coefficients at a five percent level, whereas the cross-sectional average estimates of the winner portfolio is 0.09 and 51 percent of the stocks have positive and significant estimates at a five percent level. On the other hand,

[4] Griffin et al. (2003) document average coefficient for the contemporaneous return for 82 stock of Nasdaq 100 of 0.52 and all stocks have significant positive coefficients.

Table 6
Differences in institutional trading among winners and losers.

Dep.Var	α	β_0	Losers		β_3	β_4	β_5	γ_0	γ_1	Winners		γ_4	γ_5	
			β_1	β_2						γ_2	γ_3			$Adj.R^2$
Iimbal	0.00	0.15	0.03	0.00	0.00	0.00	0.00	0.09	0.05	0.01	0.01	0.00	0.00	0.17
pos.sig.	7.3%	60.6%	22.1%	7.4%	6.4%	5.2%	4.5%	51.6%	28.4%	8.7%	5.0%	4.7%	4.3%	
neg.sig.	6.2%	5.3%	7.5%	8.7%	7.0%	6.2%	6.0%	6.6%	2.6%	4.0%	3.4%	4.1%	3.8%	

Note: This table reports the results of equation (4), the cross-sectional averages of the coefficient estimates and adjusted R^2s, the percentage of stocks with positive and negative coefficients that are significant at the 5 percent confidence level (% pos.sig. and % neg.sig.).

institutions are momentum traders in both winner and loser stocks; however, they tend to buy the prior day's winners more often than they sell the prior day's losers. The cross-sectional average coefficients of the winners is 0.05, and 28 percent of the stocks have positive and significant estimates at a five percent level, whereas the cross-sectional coefficients on the losers is 0.03 and only 22 percent of the coefficients are positive and significant at a five percent level.

In unreported results, the subperiod analysis shows similar trading patterns by our sample of institutional investors. On the same day in all subperiods except for the most recent one, institutions tend to sell stocks experiencing poor performance (below the cross-sectional median) more often than they buy stocks experiencing strong performance. Moreover, in most of the subsmaples, institutions tend to buy the prior day's winners more often than they sell prior day's losers.

4.5. Intradaily analysis results

The strong daily contemporaneous relation between institutional imbalances and returns is consistent with institutional investors following intradaily prices, the institutional price pressure hypothesis, and the institutional investors' ability to predict intradaily price movements. To better understand which of these competing explanations is the main driver of the daily contemporaneous relation between institutional trading activity and returns, this section provides the results of the intradaily analysis between institutional trade imbalances and intradaily jumps in prices.

Table 7 reports the regression results of equation (5) for each of the years in our sample. The regressions include firm fixed effects and monthly time dummies. In the left part of Table 7, institutional imbalances are computed in one-hour intervals after the jump event, while in the right part, institutional trades are computed in two-hours intervals. The empirical results reveal a strong positive relation between institutional imbalances and positive jumps, particularly for the most recent years; the relation holds for all jump sizes and whether the institutional trades are computed in one hour or two hours intervals. For example, the coefficients on *pjump* are positive and significant at conventional levels for all sub-samples after 2002, suggesting that institutions increase their net buying activity after a large increase in prices at intradaily level. However, except for some subsamples of the very recent years, the relation between institutional imbalances and negative jumps is insignificant. While the coefficient of *njump* is negative and significant at conventional levels only for 2009 when computing the institutional imbalances in a one-hour interval, it is negative and significant at conventional levels for 1σ from 2009 to 2011, for 1.5σ from 2009 to 2010, and for 2σ only in 2009 when calculating institutional imbalances in a two-hour interval after the jump event.

These findings provide some evidence in favor of institutional trend chasing at the intradaily frequency. Institutions react faster and more often to positive jumps than to negative ones, and consequently, they increase their stock holding after a positive jump and less often decrease their stock holding after the negative ones. These results are similar to that obtained by Griffin et al. (2003), who, investigate the intradaily relationship between institutional imbalances and returns measured at 5-min intervals using vector autoregression analysis as well as by examining both institutional imbalances and returns around extreme institutional trading and return events. Their main findings suggest that institutional imbalances follow past prices at the intradaily level and that the impact of institutional trading on prices is minimal.

The estimation results of equations (6) and (7) are presented in Table 8. The left part of Table 8 presents the results of yearly subsamples for the negative jumps, whereas the right part presents the results for the positive jumps. These regressions include both firm fixed effects and monthly time dummies. The empirical results suggest that there is no evidence on the intradaily institutional returns' predictability. The relationship between the lagged institutional imbalances and negative jumps is positive and significant at conventional levels in most of the yearly subsamples, whereas the relation between positive jumps and lagged institutional imbalances is mixed. These findings are in contrast to those obtained in Griffin et al. (2003) who find an economically small but statistically significant intradaily return predictability for lagged institutional imbalances.

In sum, the intradaily analysis suggests that the daily contemporaneous relation between institutional imbalances and returns is mainly driven by institutions following intradaily prices. There are two possible explanations for these intradaily results. First, prices may move in the same direction as institutional trades either because institutions trade on common information or simply because institutions follow past prices. Alternatively, institutions may submit their buy orders, and then in an attempt to accumulate the required number of shares, the market makers bid up the prices before executing the trade. Finally, I do not find any evidence on institutional return predictability.

Table 7
The intradaily analysis for institutional momentum trading.

	1 σ		One Hour						Two Hours			
			1.5 σ		2 σ		1 σ		1.5 σ		2 σ	
	Pjump	Njump	Pjump	Njump	Pjump	Njump	Pjump	Njump	Pjump	Njump	Pjump	Njump
1999	0.000014	0.000017	− 0.000001	0.000011	− 0.000132	− 0.000009	0.000007	0.000004	− 0.000085	− 0.000069	− 0.000132	− 0.000009
	(0.34)	(0.44)	(− 0.01)	(0.17)	(− 1.75)	(− 0.11)	(0.18)	(0.09)	(− 1.24)	(− 1.01)	(− 1.75)	(− 0.11)
2000	0.000095	−0.000030	0.000196	−0.000053	0.000320	−0.000146	0.000105	−0.000079	0.000179	−0.000161	0.000320	−0.000146
	(1.68)	(-0.51)	(2.29)	(-0.61)	(2.56)	(-1.15)	(1.42)	(-1.05)	(1.65)	(-1.47)	(2.56)	(-1.15)
2001	0.000058	0.000070	−0.000041	−0.000020	0.000001	−0.000032	0.000163	0.000291	−0.000050	0.000117	0.000001	−0.000032
	(0.33)	(0.39)	(-0.92)	(-0.46)	(0.01)	(-0.60)	(0.69)	(1.22)	(-0.6)	(1.4)	(0.01)	(-0.6)
2002	0.000036	0.000025	0.000010	0.000047	0.000044	0.000050	0.000054	0.000017	0.000086	0.000057	0.000044	0.000050
	(1.89)	(1.31)	(0.39)	(1.86)	(1.29)	(1.48)	(2.13)	(0.65)	(2.38)	(1.59)	(1.29)	(1.48)
2003	0.000033	0.000013	0.000036	−0.000002	0.000035	−0.000003	0.000032	0.000000	0.000055	−0.000007	0.000035	−0.000003
	(3.38)	(1.31)	(2.80)	(-0.18)	(2.06)	(-0.2)	(2.58)	(0.02)	(3.43)	(-0.42)	(2.06)	(-0.2)
2004	0.000041	0.000021	0.000054	0.000049	0.000052	0.000018	0.000073	0.000009	0.000064	0.000058	0.000052	0.000018
	(2.09)	(1.05)	(2.03)	(1.82)	(1.47)	(0.52)	(2.71)	(0.34)	(1.67)	(1.49)	(1.47)	(0.52)
2005	0.000026	0.000010	0.000038	0.000015	0.000038	0.000000	0.000043	0.000018	0.000072	0.000027	0.000038	0.000000
	(3.41)	(1.28)	(3.65)	(1.44)	(3.09)	(-0.04)	(3.92)	(1.7)	(4.72)	(1.76)	(3.09)	(-0.04)
2006	0.000028	0.000004	0.000038	0.000010	0.000035	0.000018	0.000031	0.000002	0.000049	0.000009	0.000035	0.000018
	(4.37)	(0.60)	(4.31)	(1.13)	(2.99)	(1.53)	(3.51)	(0.2)	(5.01)	(0.94)	(2.99)	(1.53)
2007	0.000055	0.000000	0.000066	−0.000003	0.000067	0.000000	0.000061	0.000006	0.000091	0.000016	0.000067	0.000000
	(5.29)	(0.00)	(4.90)	(-0.19)	(3.77)	(-0.03)	(4.6)	(0.47)	(5.97)	(1.07)	(3.77)	(-0.03)
2008	0.000022	0.000002	0.000033	0.000011	0.000037	0.000015	0.000030	−0.000005	0.000055	0.000008	0.000037	0.000015
	(3.02)	(0.25)	(3.34)	(1.12)	(2.82)	(1.11)	(3.02)	(-0.52)	(3.95)	(0.6)	(2.82)	(1.11)
2009	0.000032	−0.000013	0.000041	−0.000015	0.000047	−0.000016	0.000035	−0.000025	0.000056	−0.000028	0.000047	−0.000016
	(8.78)	(-3.66)	(8.90)	(-3.19)	(7.89)	(-2.64)	(7.17)	(-5.12)	(8.76)	(-4.43)	(7.89)	(-2.64)
2010	0.000039	−0.000002	0.000051	−0.000006	0.000061	0.000002	0.000046	−0.000017	0.000062	−0.000033	0.000061	0.000002
	(10.48)	(-0.66)	(10.39)	(-1.18)	(9.29)	(0.29)	(9.27)	(-3.4)	(9.08)	(-4.86)	(9.29)	(0.29)
2011	0.000031	−0.000002	0.000041	0.000002	0.000058	−0.000003	0.000034	−0.000017	0.000049	−0.000009	0.000058	−0.000003
	(8.53)	(-0.65)	(8.70)	(0.47)	(9.03)	(-0.44)	(7.02)	(-3.48)	(7.58)	(-1.45)	(9.03)	(-0.44)

Note: This table reports the regression results of intradaily institutional imbalances on jumps in stock prices, equation (5). The regressions include firm fixed effects and monthly time dummies. t − statistic in parenthesis.

Table 8
An intradaily analysis for institutional return predictability.

	One Hours			Two Hours			One Hours			Two Hours		
							Pjump					
	1 σ	1.5 σ	2 σ	1 σ	1.5 σ	2 σ	1 σ	1.5 σ	2 σ	1 σ	1.5 σ	2 σ
1999	−5.052	−0.470	−0.021	−0.153	0.084	0.326	−7.280	−3.668	−3.462	−0.301	−0.336	−0.275
	(-1.6)	(-0.28)	(-0.01)	(-0.18)	(0.12)	(0.53)	(-1.72)	(-1.74)	(-2.05)	(-0.37)	(-0.46)	(-0.45)
2000	0.501	1.630	0.955	1.094	0.580	0.301	−0.617	0.714	0.324	−0.220	0.022	0.014
	(0.43)	(2.33)	(1.64)	(2.67)	(1.36)	(0.83)	(-0.51)	(1.16)	(0.63)	(-0.65)	(0.07)	(0.05)
2001	0.025	0.036	0.028	0.043	0.047	0.032	0.203	0.039	0.031	0.083	0.059	0.040
	(0.31)	(0.63)	(0.61)	(0.62)	(0.78)	(0.65)	(0.43)	(0.68)	(0.69)	(1.16)	(0.98)	(0.81)
2002	0.635	0.661	0.730	0.885	0.982	0.994	0.594	0.544	0.670	0.639	0.570	0.637
	(1.09)	(2.25)	(2.97)	(2.63)	(3.34)	(3.93)	(1.14)	(1.8)	(2.65)	(1.92)	(1.93)	(2.48)
2003	0.760	0.635	0.774	0.744	0.681	0.836	0.279	0.484	0.608	0.227	0.468	0.698
	(1.51)	(2.18)	(3.21)	(2.1)	(2.1)	(3.03)	(0.56)	(1.63)	(2.54)	(0.64)	(1.44)	(2.53)
2004	−0.070	0.084	0.132	0.104	0.195	0.236	0.412	0.326	0.283	0.133	0.099	0.052
	(-0.43)	(0.83)	(1.61)	(0.86)	(1.81)	(2.61)	(2.71)	(3.27)	(3.49)	(1.12)	(0.94)	(0.58)
2005	0.774	0.571	0.644	0.298	0.202	0.601	1.019	0.420	0.454	0.504	0.386	0.338
	(1.65)	(2.26)	(3.14)	(1.99)	(1.53)	(2.97)	(2.41)	(1.7)	(2.03)	(1.78)	(1.53)	(1.49)
2006	0.572	0.682	0.770	0.451	0.751	0.824	0.108	0.261	0.248	0.037	0.136	0.242
	(1.83)	(3.49)	(4.86)	(2.03)	(3.36)	(4.3)	(0.34)	(1.31)	(1.54)	(0.16)	(0.66)	(1.38)
2007	0.768	0.563	0.459	0.687	0.687	0.602	−0.025	0.132	0.042	−0.056	0.099	0.063
	(3.3)	(3.59)	(3.62)	(3.99)	(4)	(4.08)	(-0.11)	(0.85)	(0.34)	(-0.32)	(0.6)	(0.44)
2008	1.665	1.170	0.909	1.461	1.469	1.212	−0.066	0.197	0.242	−0.148	0.238	0.444
	(7.33)	(7.95)	(7.59)	(7.79)	(8.66)	(8.29)	(-0.31)	(1.29)	(1.94)	(-0.88)	(1.43)	(3.05)
2009	3.908	2.245	1.761	2.460	2.088	1.614	−2.473	−1.092	−0.720	−2.148	−1.423	−0.934
	(7.2)	(7.19)	(6.99)	(7.5)	(7.02)	(6.35)	(-4.48)	(-3.54)	(-2.88)	(-6.79)	(-4.88)	(-3.7)
2010	3.881	2.773	2.409	3.419	3.016	2.807	−1.313	−0.213	−0.231	−2.290	−1.488	−1.133
	(6.86)	(7.54)	(8.07)	(7.81)	(7.59)	(8.14)	(-2.36)	(-0.58)	(-0.78)	(-5.25)	(-3.73)	(-3.32)
2011	4.452	4.127	3.204	4.799	5.185	4.233	−1.130	−0.301	−0.146	−1.627	−0.900	−0.159
	(5.47)	(8.07)	(7.7)	(7.45)	(8.95)	(8.49)	(-1.41)	(-0.59)	(-0.35)	(-2.61)	(-1.55)	(-0.32)

Note: This Table reports the intradaily regression results of positive (negative) jumps on institutional imbalances, equations (6) and (7). The regressions include firm fixed effects and monthly time dummies. $t-$ statistic in parenthesis.

5. Robustness analysis

In this section, I investigate alternative explanations on what might be driving institutional trading activity in the same direction of the previous day's returns. It is possible that institutional investors split the large orders and work them over several trading days to minimize the market impact of these trades. To examine this alternative view, I follow Griffin et al. (2003) and test it in three different ways.

First, Griffin et al. (2003) argue that if institutional investors work orders over several days, then one would expect these trades to be the result of large block orders. Hence, I use their strategy and investigate whether our results survive for medium-size institutional trades, that is, I consider transactions where the number of shares is greater than or equal to 500 and less than 10,000 shares. Panel A of Table 9 shows that the medium − size institutional trades follow the prior day's return, although not with the same magnitude as shown previously in Panel B of Table 5. A one standard deviation increase in the past day return leads to a 0.03 standard deviation increase in the daily net buying activity of institutional investors.

Second, it is possible that institutions submit large orders near the closing hour; therefore, it is more likely that these orders will not be fully filled the same day but rather in the morning of the next day (Griffin et al., 2003). To examine this alternative explanation, I use institutional transactions executed between 12:00 and the closing hour. The results presented in Panel B of Table 9 suggest that our findings are not driven by large institutional orders taking a long time to be filled but rather from institutional trades following past returns. A one standard deviation increase in the past day's return is associated with a 0.04 standard deviation increase in today's institutional net buying activity.

Finally, it is reasonable to think that institutional trend chasing may arise form the price impact of their trades. Therefore, if our findings are driven by institutional trades moving prices and by the trades taking a long time to clear, then one should expect these patterns to be less severe in the most active stocks, as they are extremely liquid stocks. Panel C reveals that a one standard deviation increase in previous day return for the most liquid stocks leads to a 0.04 standard deviation increase in institutional imbalances and 27.78 percent of firms have positive and significant coefficients at the five percent level.

While it is not possible to rule out all potential explanations on what might be driving institutional trades in the same direction as that of the previous day's returns, our daily evidence indicates that these patterns are in large part the consequence of institutional orders that are placed in the same direction of the price movements.

6. Post ranking returns and price reversal

DeLong et al. (1990) note that as trading activity by the feedback traders can push prices beyond fundamentals, it may thereby

Table 9
A Closer Examination of the Daily relation between Returns and Institutional Trading Activity.

	Panel A						Panel B			Panel C		
	Return			Iimbal			Iimbal			Iimbal		
	Coeff	%pos.sig.	%neg.sig.	Coeff	%pos.sig.	%neg.sig.	Coeff	%pos.sig.	%neg.sig.	Coeff	%pos.sig.	%neg.sig.
α	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89	− 0.01	1.00	2.08
β_0				0.09	46.59	1.16						
β_1	− 0.02	3.75	9.48	0.03	19.44	1.02	0.04	27.88	0.67	0.04	27.78	1.04
β_2	− 0.02	2.39	8.53	0.00	4.02	3.14	0.01	6.85	2.23	0.00	3.82	3.99
β_3	− 0.01	1.64	5.32	0.00	2.80	4.23	0.00	3.45	3.07	0.00	3.13	3.30
β_4	− 0.01	1.64	4.64	0.00	3.21	4.37	0.00	3.07	2.94	0.00	2.26	5.38
β_5	− 0.01	1.64	5.32	0.00	2.11	4.09	0.00	2.52	3.78	−0.01	2.08	5.73
γ_1	0.01	6.75	2.11	0.32	95.29	0.00	0.27	89.15	0.00	0.25	87.85	0.00
γ_2	0.00	2.80	3.62	0.08	37.79	0.14	0.07	37.97	0.42	0.06	37.50	0.52
γ_3	0.00	2.18	2.73	0.05	20.40	0.82	0.05	22.71	0.88	0.04	22.40	0.35
γ_4	0.00	2.46	2.80	0.03	13.85	0.75	0.03	13.41	0.84	0.03	15.97	0.69
γ_5	0.00	3.27	3.14	0.03	14.67	0.68	0.04	18.21	0.55	0.03	16.67	1.22
Adj.R^2	0.01			0.20			0.13			0.12		

Note: Panel A of this table reports the results of medium−size trades analysis (1466 firms). In Panel B the daily adjusted institutional trade imbalance is computed from 12:00 p.m. to 4:00 p.m. (2378 firms). Panel C reports results for the 576 most active stocks with average trading volume per year more or equal to 75^{th} percentile across all stocks. The table reports the cross−sectional averages of the coefficient estimates and adjusted R^2s, the percentage of stocks with positive and negative coefficients that are significantly different from 0 at the 5 percent confidence level (% pos.sig. and % neg.sig.).

destabilize prices and threaten the efficiency of financial markets. However, although herding and feedback trading could drive prices away from fundamentals, it may also drive prices towards fundamentals if the information inferred from the trade of others is valuable (Bikhchandani et al., 1992; Hirshleifer, Subrahmanyam, & Titman, 1994; Hong & Stein, 1999).

Examining the deviation of prices from fundamental values is not an easy task. However, we can test whether institutional trading has a destabilizing effect by investigating post−formation returns (Griffin et al., 2003). If institutional orders move prices away from their fundamental values, then return reversal will be observed. Alternatively, the absence of subsequent price reversals is consistent with the information hypothesis. However, return continuations in the days following the portfolio formation may reflect institutional investors continuing to move prices away from fundamental values. In either case, whether return reversals or continuations indicate destabilizing behavior depends on the time period considered (Nofsinger & Sias, 1999).

For each decile, Table 10 reports the time − series average of the cross−sectional mean abnormal return created based on institutional imbalances in the ten days following the formation day. I find that in the two days following portfolio formation, the decile experiencing the largest institutional selling activity exhibits small negative and insignificant returns, while the decile experiencing the largest institutional buying activity exhibits small positive and insignificant returns. Although the results suggest a return reversal of the correct sign in the third day after portfolio formation, the return differential between the high and low institutional buy − sell imbalance deciles are insignificant. Therefore, these findings do not support the reversal hypothesis, and it could be that a longer time horizon is necessary to make a clear inference here.

7. Conclusion−Discussion

In this study, the author investigates the sources of the contemporaneous relation found at quarterly and yearly intervals between the changes in institutional ownership and stock returns. These sources cannot be accurately identified without having a higher frequency of institutional trade data. The paper uses a unique proprietary dataset on institutional transactions to study the underlying sources of this

Table 10
Price reversal and post ranking returns.

Rank	0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
D1	− 0.611	− 0.005	− 0.004	0.002	0.007	− 0.010	− 0.016	0.004	− 0.001	− 0.010	− 0.009
D2	− 0.373	− 0.045	− 0.016	− 0.014	− 0.023	− 0.028	− 0.012	− 0.014	− 0.015	− 0.014	− 0.007
D3	− 0.240	− 0.037	− 0.025	− 0.024	− 0.021	− 0.014	− 0.018	− 0.016	− 0.015	− 0.014	− 0.016
D4	− 0.135	− 0.041	− 0.026	− 0.016	− 0.016	− 0.007	− 0.011	− 0.021	− 0.001	− 0.007	− 0.020
D5	− 0.052	− 0.017	− 0.023	− 0.016	0.000	− 0.004	0.000	− 0.004	− 0.010	− 0.009	0.003
D6	0.012	− 0.009	− 0.005	− 0.006	− 0.008	0.003	− 0.012	− 0.008	− 0.013	− 0.004	− 0.011
D7	0.088	− 0.001	− 0.014	− 0.014	− 0.015	− 0.016	− 0.011	− 0.004	− 0.009	− 0.005	− 0.016
D8	0.209	0.004	− 0.003	− 0.007	− 0.005	− 0.016	− 0.012	− 0.020	− 0.018	− 0.011	− 0.005
D9	0.363	0.018	0.001	− 0.013	− 0.015	− 0.006	− 0.014	− 0.016	− 0.008	− 0.013	− 0.003
D10	0.626	0.020	0.002	− 0.006	− 0.016	− 0.013	− 0.010	− 0.013	− 0.021	− 0.021	− 0.028
H-L	1.237[a]	0.024	0.006	− 0.008	− 0.022	− 0.003	0.006	− 0.017	− 0.020	− 0.011	− 0.020

Note: This table reports the contemporaneous and post ranking returns. Returns are expressed in percent per day. The last row reports the mean difference between the high and low institutional trade imbalance deciles for each variable. The statistical significance reported in the last row is computed from a paired t − test estimated from the time series of the difference between the high and the low portfolios. a Significance at 1 percent and b Significance at 5 percent.

quarterly contemporaneous relationship and provides empirical evidence on the cross − sectional relation between institutional trading activity and contemporaneous as well as prior day's returns and on the institutional investors' ability to predict future returns both at daily and intradaily intervals. The inference is that all the findings above are useful to better understand the dynamic relation between institutional trading and stock returns.

The empirical analysis suggests that there is a strong evidence of institutional trades following prior day price movements; the results are economically and statistically significant. On the day following an extreme return performance, institutional investors are 13.6 percent more likely to be net buyers in stocks that are in the top decile of return performance than those that are in the bottom decile. Moreover, the vector autoregression results indicate that a one standard deviation increase in the previous day returns leads to a 0.04 standard deviation increase in the net buying activity of institutional investors. Additionally, there is no evidence of the institutional investors' ability to predict future returns. These results suggest that the main source of the quarterly contemporaneous relation between returns and changes in institutional holding is that institutional investors follow intraquarter asset price movements. However, the analysis also shows that there is a strong positive contemporaneous relationship between the trading activity of institutional investors and daily returns that requires a further analysis at the intradaily level.

The intradaily analysis suggests that the contemporaneous relation found on a daily basis is primarily driven by institutional investors following the intradaily prices but not by the institutional investors' ability to predict intradaily price movements. More specifically, institutions tend to increase their net buying (selling less often) activity after a positive (negative) shock in prices, and there is no evidence of institutional imbalances predicting intradaily returns. Moreover, there is considerable time variation in the institutional trading among loser and winner stocks. This result of daily institutional trades following past returns and the persistence of institutional trades are robust to different trade−size classifications and methodologies. A possible explanation for these patterns is that institutions observe return movements or a firm's related information and trade accordingly or due to institutional price pressure. Similarly, the results indicate that the afternoon institutional trades strongly follow past return movements at a daily level, even for most active stocks. This suggests that our findings are not specific to institutional order splitting. While there are likely several explanations for our results, it appears that institutions view recent positive return movements or the information related to them as a buying signal. Although the fact that institutional investors following past returns may have a destabilizing influence, I find no evidence that institutional activity leads to price reversals.

To sum up, the paper contributes to our understanding of the dynamic relation between institutional investors' trading activity and stock returns both at daily and intradaily horizons. In particular, the paper answers the questions of whether institutional trades follow the recent price movements or whether institutional investors can predict short − term future returns. The main findings imply that institutional investors actively follow short−term momentum trading strategies and that they lack the ability to predict future returns. Therefore, the main source of the quarterly contemporaneous relation between changes in institutional ownership and returns is institutional investors following intraquarter returns.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jeca.2018.e00112.

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