Estimating Order Imbalance Using Low Frequency Data

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ABSTRACT

We propose to estimate net order imbalance of individual stocks using daily CRSP data based on well-known illiquidity proxies. The estimated low frequency order imbalance (LFOI) has close relations with aggregate order imbalance estimated using high frequency data (HFOI). The LFOI positively predicts the price changes on the following day and the subsequent price reversal does not fully eliminate the positive price impact, suggesting that LFOI captures both transitory price pressure and permanent information flow in the trading process, as HFOI does. The predictive ability of LFOI is even stronger than HFOI in the cross section of stocks. Subsample analysis shows that the price impact of LFOI is robust and the return predictability is stronger for stocks with lower market capitalization and larger bid-ask spreads and for NASDAQ stocks. We also find that LFOI increases significantly around corporate events such as earnings announcements, and contains valuable information regarding the announcement returns. The evidence suggests that the proposed LFOI is sufficient to serve as an information indicator for empirical studies that employ order flow variables at daily or longer horizons.

JEL classification: C18; C58; C81; D82; G12; G14.

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I. Introduction

A large body of the market microstructure literature examines the relation between investors' orders and asset prices. In the seminal study of Kyle (1985), the relation can be represented as $\Delta P = \lambda x$, where the price change ΔP is a result of both the net order flow x and the price sensitivity λ termed as "market depth" by Kyle. The Kyle λ is determined by the relative amount of expected informed trading and essentially measures illiquidity of an asset. [1] The pricing relation can be rewritten as $x = \Delta P/\lambda$. Since the price change is directly observable, in this article, we propose to use established low-frequency illiquidity measures of λ to estimate the net order flow x for individual stocks at the daily level. Specifically, we consider three illiquidity measures that can be calculated every day without using intraday data, the inverse share volume turnover ratio, closing percentage bid-ask spread as in Amihud and Mendelson (1986), and the high-low spread as in Corwin and Shultz (2012). By dividing stock returns and illiquidity proxies on the same day, we arrive at three proxies of net daily order imbalance in the cross section of stocks. There are several other well-known low-frequency measures of illiquidity in the literature. We do not use the serial correlation of returns as in Roll (1984) and the effective spread based on zero return days as in Lesmond, Ogden, and Trzcinka (1999) because we want to update the illiquidity measure every day to calculate daily order imbalance. We do not use the effective bid-ask spreads developed by Holden (2009) and Goyenko, Holden, and Trzcinka (2009) because we want to avoid using tick data. The famous Amihud (2002) illiquidity measure can also be calculated every day using only the dollar trading volumes and stock returns. Indeed, Pastor and Stambough (2003) estimate individual stock's illiquidity as the price sensitivity to return-signed dollar volume on the previous day. Although the underlying rationale is not discussed in details by Pastor and Stambough (PS hereafter), the return-signed dollar volume is related to the LFOI we propose using the turnover ratio. The PS order imbalance is consistent with Amihud's illiquidity proxy in our framework but uses only the sign of contemporaneous return not the whole return. We believe our turnover-based LFOI (TLFOI) can outperform the PS measure

in the cross section mainly for two reasons. First, the turnover ratio adjusts for the market capitalization and standardizes trading intensity across stocks. Therefore, the turnover ratio can better describe how liquid an asset is than the original dollar volume traded used by PS in the cross section. Second, the sign of return in PS calculation takes binary values and ignores the magnitude of the price impact caused. This treatment can overstate order imbalance when the resulting stock return is marginal and understate order imbalance when the stock return is large. Nevertheless, we include PS order imbalance in our analysis as a benchmark for low frequency order imbalance in prior research.

The proposed low-frequency order imbalance (LFOI) has a significant advantage over order flow estimation methods by using tick data such as those developed by Lee and Ready (1991), Ellis, O'Hara, and Michaely (2000), Odders-White (2000), Chakrabarty, et al. (2007), and Easley, Lopes de Prado, and O'Hara (2013). Because the estimation requires only daily after-market data, it is easy to use and therefore suitable for order imbalance calculation in large-sample empirical analysis such as a cross-sectional asset pricing study. This feature is particularly desirable in today's markets with exploding size of intraday data due to high-frequency trading. The underlying assumption of positive contemporaneous price impact from order flow is also generic and intuitive. The method can therefore be applied to various markets under different market structures. Although the proposed LFOI focuses on daily intervals, this method can potentially be applied to shorter intervals by interacting high-frequency liquidity proxies and returns.

There may be concerns that the LFOI is not as accurate as the high-frequency estimates because the low-frequency illiquidity measures are noisy proxies. However, the high-frequency estimates are also imperfect and face growing challenges in financial markets. These estimates such as the Lee and Ready (1991) algorithm typically need to match transactions and quotes to sign trade directions and the accuracy largely depends on the matching. With increasing speed of trading, new trading techniques such as quote stuffing and quote spoofing, and emerging marketplaces such as electronic communication networks and

dark pools, this matching process becomes more and more difficult and the resulting high-frequency order imbalance contains considerable noise inevitably. Therefore, which order flow estimate works better is an empirical question.

We begin our empirical analysis by investigating the association of LFOI with the traditional high-frequency order imbalance (HFOI), the Lee and Ready (1991) estimate using correlation tests.We use two measures of stock returns in LFOI calculation. Theoretically, the contemporaneous price impact of order flow is limited to the price movement during the trading hours and should be free from the bid-ask bounce. Therefore, the mid quote return from market open to close should be the right return in calculating LFOI. Given the purpose of avoiding intraday data completely, we also use the daily stock return based on closing prices recorded by CRSP to calculate another set of LFOI. Together with the PS order imbalance, we end up with seven low-frequency measures of net order imbalance. We find the average contemporaneous correlation between HFOI and LFOI ranges from 0.12 to 0.25 with strong statistical significance. In comparison, the correlation between PS order imbalance and HFOI is lower at 0.1. Therefore, the proposed LFOI outperforms the PS order imbalance in representing the traditional order imbalance in the cross section. Surprisingly, we also find that LFOI using close-to-close returns slightly outperform the corresponding LFOI using open-to-close mid quote returns. Since it is also much easier to compute LFOI using closing price returns, we carry out the remaining analysis using this method.

We turn to two applications of low frequency order imbalance next. The first application is cross-sectional return prediction. Both the inventory and information models suggest that net order flow can affect subsequent stock returns. The prediction of contemporaneous price impact is positive in both models. However, the inventory model predicts an ultimate price reversal because the fundamental value does not change, while the information model predicts a permanent price impact. We find that our proposed LFOI shows positive and significant predictive power for future stock returns at daily frequency, consistent with the findings by Chordia and Subrahmanyam (2004) using the Lee and Ready (1991) order imbalance.

Although a reversal exists beyond one day, the stock price does not fully revert to the level before the order flow occurs, suggesting that the LFOI captures both liquidity effect and information content. Moreover the LFOI has even larger statistical and economic significance than HFOI in the regressions. The prediction power of LFOI for future returns is robust in several subsamples based on size, liquidity, exchange market, and time. Consistent with the effect of opaqueness and transactions cost on informed trading, the LFOI has stronger return predictability for small and illiquid stocks, NASDAQ stocks, and the predictability weakens in the recent period while staying statistically and economically significant. We also confirm that the return predictability is not biased due to the long bull market during our sample period because both buy and sell order imbalances are able to predict returns in the right directions. Investment strategies that are long in stocks of the highest LFOI decile and short in stocks of the lowest LFOI decile with daily rebalancing from 1983 generate statistically significant annualized alpha between 18.8% and 25.6%.

The second application concerns the fundamental information flow around corporate events. Specifically, we investigate earnings announcements, extreme price movements, analyst recommendation changes, value related 8-K filings, and schedule 13-D filings. We find the magnitude of LFOI increases significantly in the right direction approaching these events, consistent with informed trading ahead of the announcement. The LFOI is also significantly informative about abnormal announcement returns, suggesting this simple measure can be sufficient to detect the valuable information flow in such event studies. Finally, we find the price sensitivity to LFOI strengthens before price jumps and analyst recommendation changes, possibly due to the unscheduled nature of such events.

The main contribution of the study is to systematically test the effectiveness of low frequency order imbalance measures that can be easily computed and used in empirical finance studies on different topics. We show that the interactions of stock returns and low-frequency liquidity measures are good proxies for stock order imbalance and contain significant information about future stock returns. For researchers not concerned with high

frequency dynamics of price formation, these low frequency proxies can well serve the purpose of detecting price pressure and private information flow at least at the daily frequency.

Our methods are in the nature of the tick test on time bulks by Easley, Lopez de Prado, and O'Hara (2012). However, their method still relies on the intraday tick data as the tick test is performed on volume-weighted transaction price. Compared to their method, our low frequency order signing algorithm uses the end-of-day prices only. As a result, our method computes daily stock order imbalance at a much faster speed with the cost of introducing price noise due to illiquidity and being silence on the high frequency order flow. Nonetheless, in the cross-sectional pricing test, the low frequency order imbalances we propose have even stronger return predictability than the order imbalance based on the bulk tick test. Campbell, Grossman, and Wang (1993) also interact returns and turnover to predict subsequent returns at the market level. But they do not interpret the interaction as order imbalance. Rather, the turnover is used as a conditional variable in the same way as volatility to study the market return reversal. Unlike Campbell, Grossman, and Wang (1993), our focus is to propose an order flow measure at the individual stock level.

The rest of the paper is organized as follows. Section II describes the sample selection and how to construct our empirical measures of order flow. Section III reports empirical test results. In the first part, we report how well low frequency order flow reflect high frequency order flow. The second part includes three applications of low frequency order imbalance on stock return prediction at the stock level, at the market level, and around earnings announcements. Section IV concludes.

II. Data and variable construction

A. Sample selection

We employ mainly two data sets, Trades and Automated Quotes (hereafter, TAQ) and Center of Research in Security Prices (hereafter, CRSP) in the study. From TAQ, we extract

all trade and quote messages between 9 AM to 4 PM EST with positive trading price and trading volume in New York Stock Exchange (NYSE) market, American Stock Exchange (AMEX) market, and National Association of Securities Dealers Automated Quotations (NASDAQ) exchange market. From CRSP, we extract information on common stock characteristics in NYSE, AMEX, and NASDAQ including daily stock return, daily stock price, close bid and ask prices, shares outstanding, and daily trading volume. We exclude observations from CRSP if they have a price lower than five dollars or if their percentage bid-ask spread, defined as bid-ask spread scaled by the average of bid and ask prices, is outside the interval between zero and one half. The sample period of both data sets is from 1 January 1993 to 31 December 2013. We limit our analysis to common stocks only with CRSP code of 10 and 11.

B. Variable definition

We construct six low-frequency order imbalances (LFOIs) by using daily CRSP data based on well-established illiquidity measures. In our framework motivated by the Kyle's (1985) model, net order flow is described as price change over illiquidity measure. This paper employs three different illiquidity measures including share volume turnover ratio (TURN), percentage bid-ask spread (BASPRD), and high-low spread (HLSPRD). TURN is a standard liquidity measure because low TURN implies that traders are hard to encounter potential trading partners and therefore transaction cost becomes high. (Karpoff (1986)) Hence, securities with low TURN are likely to be illiquid. BASPRD is a natural measure of illiquidity because it works as transaction costs come from immediate execution. (Amihud and Mendelson (1986)) Lastly, HLSPRD is one of spread estimators from daily high and low prices, developed by Corwin and Schultz (2012). We simply utilize an SAS code they provide on Corwin's personal site (https://www3.nd.edu/ scorwin/). In addition to illiquidity measures, we also utilize two types of stock returns; the open-to-close mid-quote return for theoretical reason and the close-to-close transaction return for calculation convenience.

Theoretically, the returns are supposed to be free from bid-ask bounce and reflect intraday price change only, since we deal with net order flow within a given day. For that reason, the mid-quote return from market open to close is correct to use in our model. However it is cumbersome to compute open-to-close mid quote returns due to huge size of TAQ data. That is the reason why we take an advantage of transaction returns from market close to close which one can easily obtain from daily CRSP data. For comparison, we also add another LFOI proposed by Pastor and Stambough (2003). They presume return-signed dollar trading volume (PS hereafter) is a proxy for daily net order flow in order to estimate daily illiquidity of individual stock. We take their order imbalance as one of our LFOIs not only because PS is a well-known order imbalance proxy but also because, in our framework, PS is consistent with Amihud (2002) illiqudity measure. In other words, people may obtain PS by putting Amihud illiquidity into our model, price change over illiquidity. The LFOIs we dicussed above are formally defined for each stock-day as follows.

- TLFOI1: the interaction of daily close-to-close transaction return and daily share volume turnover ratio.
- TLFOI2: the interaction of daily open-to-close mid quote return and daily share volume turnover ratio.
- BALFOI1: close-to-close transaction return over daily percentage bid-ask spread.
- BALFOI2: open-to-close mid quote return over daily percentage bid-ask spread.
- HLLFOI1: close-to-close transaction return over daily percentage high-low spread.
- HLLFOI2: open-to-close mid quote return over daily percentage high-low spread.
- PS: sign of daily close-to-close transaction return multiplied by daily thousand dolloar trading volume.

Next we consider traditional order imbalance measure using high frequency data in order to compare LFOIs. We designate each transaction in TAQ data as either buyer-initiated or seller-initiated according to the Lee and Ready (1991) algorithm. It is basically the combination of a quote test and a tick test. The transaction is classifed as buyer-initiated

(seller-initiated) if its trading price is close to the national best bid (ask) price of the prevailing quote. To circumvent the concern on fast moving quotes in the recent sample period, we follow Holden and Jacobsen's (2014) quote adjustment on the monthly TAQ data to construct the NBBO prices after 2001. In the case the trading price is the middle of bid and ask prices, the transaction is classified as buyer-initated (seller-initiated) if price change prior to the transaction is positive (negative). After classifying buyer-initiated and seller-initated trades, we construct high frequency order flow (HFOI hereafter) for each stock-day.

- HFOI: the number of buyer-initiated shares less the number of seller-initiated shares from Lee-Ready algorithm, scaled by the number of shares outstanding for each stock-day.

In addition, we calculate share volume turnover ratio (TURN), percentage bid-ask spread (BASPRD), high-low spread (HLSPRD) and Amihud (2002) illiquidity (AMIHUD) for each stock-day in order to construct LFOIs as well as to obtain control variables for return prediction tests. The detailed definitions are following.

- TURN: daily trading volume over the number of shares outstanding.
- BASPRD: the difference of bid and ask prices scaled by the average of bid and ask prices for each stock-day.
- HLSPRD: the bid-ask spread from Corwin and Schutlz (2012) methodology.
- AMIHUD: the absolute value of daily transaction return divided by stock prices and its million dollar trading volume.

In this study, we mainly use turnover ratio, bid-ask spread and high-low spread as proxies for liquidity. Amihud illiquidity is only used in a correlation table to provide more information on order imbalances (OIs hereafter).

After variable construction, we control outliers in two ways. Firstly, we eliminate trading days with less than five percent of non-zero observations in HFOI and LFOIs. In the case of

trading days with few number of non-zero OIs, the sensitivity of OIs to daily stock return would be extraordinarily high. For instance, we observe that only three stocks out of about 5,300 stocks have non-zero value in HFOI and its Fama-MacBeth coefficient on daily stock return is higher than 240,000 on 1 December, 1993. In addition, we conduct time-series winsorization on HFOI, LFOIs, and liquidity factors at 1 and 99 percent to mitigate the effect of outliers in our sample.

C. Summary statistics

[Place Table I about here]

Table I documents the time-serial average of cross-sectional statistics for OIs and liquidity factors. Our sample period is from 01 January 1993 to 31 December 2013, so the number of dates is 5289, i.e., around twenty-one year. The average number of stocks per year is about 3,800 stocks. Due to lack of observations in high-low spread (HLSPRD), the number of observations in HLLFOI1 and HLLFOI2 are relaitvely small. Mid quote returns also have smaller number of observations than transaction returns, so LFOIs with transaction returns have more average number of stocks than LFOIs with mid quote returns. OIs except HLLFOI have positive mean and median which implies that thare are more days with large buying pressure over the market than with large selling pressure. Also All the OIs have higher mean than median and larger absolute value of maximum than absolute value of minimum. Those statistics indicate that they are positively skewed and have a fatter positive tail. Lastly the variance for BALFOIs and HLLFOIs is larger than the variance for HFOI and TLFOIs because their divisors, BASPRD and HLSPRD respectively, are close to zero.

[Place Table II about here]

Table II presents time-serial average of cross-sectional correlation for OIs, liquidity factors, and stock returns in order to demonstrate the strength of their monotonic relationships.

We document Pearson correlation coefficients in Panel A, Spearman correlation coefficients in Panel B, and rank correlation coefficients of quintile portfolios in Panel C. Pearson correlation is a common measure of association between two continuous variables. However, to obatin theoretically correct correlation coefficients, the target variables are supposed to follow bivariate normal distribution and to have a linear relationship without any outliers. Because it is impossible to satisfy the underlying assumptions Pearson correlation has, we also provide two more correlation coefficents, i.e., Spearman and rank correlation. Both rank-order correlation measures can apply to continous and discrete variables regardless with linear or non-linear relationship as well as their distributions. Moreover, because outliers belong to one of ranks, both measures are free from the concern on outliers.

Our proposed LFOIs are well associated with HFOI with reasonably high correlation. The correlation coefficients range from 0.12 to 0.24 in terms of Pearson correlation, and from 0.18 to 0.24 in terms of Spearman and Rank correlation. TLFOI1 has the highest correlation coefficient and PS has the lowest regardless with the correlation measures. In addition, LFOIs with close-to-close transaction return have stronger monotonic relationships with HFOI than LFOIs with open-to-close mid quote return. We conduct empirical tests with transaction return-based LFOIs, taking this empirical findings and calculation convenience into consideration. Table II provides evidence that LFOIs are little related to liquidity factors. The correlation coefficient of all the LFOIs with TURN, BASPRD, HLSPRD, and AMIHUD is close to zero. Although Panel A reports that TLFOI1 has the correlation coefficient of 0.12 with turnover ratio in terms of Pearson correlation, non-normal distribution, non-linear relationship or outliers may cause Pearson correlation to mis-estimate their monotonic relationship as we discussed above. Furthermore, the relatively high correlation coefficient of TLFOI1 with turnover ratio disappers in the rank-based correlation measures. When it comes to the correlation of OIs with stock returns, LFOIs show very stong contemporaneous price impact. This finding is consistent with large literature on how order flow influences the price setting process. The inventory model tells us that risk averse market makers with

inventory concern adjust price quotes to return back to optimal position when order flow sets their position away from optimal portfolio (Stoll (1978), Ho and Stoll (1981, 1983), and Cohen, Maier, Schwartz and Whitecomb (1981)). The information model also has the same prediction in terms of contemporaneous price impact of order flow because the market makers adjust price quotes as well as their belief about the terminal value along with the amount of net order flow (Kyle (1985), Glosten and Milgrom (1985), and Easley and O'Hara (1987)).

III. Applications

This section documents two applications of low frequency order imbalances (LFOIs). The first applications is cross-sectional return prediction.

To argue our proposed LFOI is an effective proxy for net order flow, we apply LFOIs to return prediction tests in Section III.A. The next application is fundamental information flow around corporate events. We analyze the temporal evolution of LFOIs around corporate events to examine whether LFOIs incorporate informed order flow on the fundamental value of stocks. Specfically, we study earnings announcements, extreme price movements, analyst recommendation changes, value related 8-K filings, and scheduled 13-D filings in Section **??**.

A. Cross-sectional Return prediction

This paper employs Fama-MacBeth (1973) two-stage regression models to estimate coefficients in all the regression models. The first stage is a cross-sectional regression of stock returns on LFOI, HFOI, and other control variables. The second stage is time-serial average of coefficients estimated in the first stage. Although we do not report estimated coefficients from the cross-sectional average of time-serial regression models and pooled regression models, those models also show by and large similar implications on the effectiveness of LFOIs. We choose the Fama-MacBeth regression model because it is less sensitive to common sources

of variation between residuals and independent variables. For potential concern about autocorrelation of estimated coefficients, we report t-statistics based on Newey-West (1987) standard errors with eight lags.

A.1. Main result

[Place Table III about here]

Table III presents estimated coefficients from the following regression models to measure daily predictive power of LFOIs for stock return.

$$\begin{aligned} \mathrm{RET}_{i,t} = \alpha_t \quad &+ \quad \sum_{i=1}^{5} \beta_{t-i} \mathrm{OI}_{i,t-i} + \sum_{i=1}^{5} \beta_{t-i} \mathrm{HFOI}_{i,t-i} + \mathrm{BASPRD\ (or\ HLSPRD)}_{i,t-1} \\ &+ \quad \mathrm{TURN}_{i,t-1} + \sum_{i=1}^{5} \gamma_{t-i} \mathrm{RET}_{i,t-i} + \sum_{i=1}^{5} \theta_{t-i} \mathrm{RET}^2_{i,t-i} + \epsilon_t \end{aligned}$$

, where OI stands for order imbalances, BASPRD is bid-ask spread, TURN is turnover ratio, and RET is stock return. The first lagged term of OIs should be positively correlated with current stock return because of positive autocorrelation in OIs, if OIs contain information on future return. Panel A in Table III shows us consistent test results with Chordia and Shubrahmanyam (2004). The first lagged terms for HFOIs and LFOIs have positive signs, and the other lagged terms are negative because of return reversal. Interestingly, the prediction power of LFOIs is better than that of HFOI. Moreover, we report the result of the same return predictability test using mid-quote stock returns instead of raw stock returns to remove a concern on bid-ask bounce within a trading day. The result of mid-quote stock returns is almost same as that of raw stock returns, which implies that bid-ask bounce has little influence on our test results.

We also add more control variables, bid-ask spread (BASPRD), turnover ratio (TURN), lagged returns (RET), and lagged squared returns (RET^2), which Chordia and Subrah-

manyam (2004) do not include. We put those control variables to isolate the effect of lagged OIs on current stock returns. Bid-ask spread has a positive sign, which is consistent with Amihud and Mendelson (1986, 1989). This is because, according to the model in Amihud and Mendelson (1986), market participants expect higher returns when they put their money into stocks with wider bid-ask spread. In addition, all of the lagged returns are negative because of stock return reversal. The lagged squared returns represent volatility of returns, so it is natural that higher lagged squared returns lead higher current returns. Turnover ratio also have desirable signs in all the regression models. Gervais, Kaniel, and Mingelgrin (2001) prove that there is the high-volume return premium resulted from stock's visibility. The positive sign of estimated coefficients on turnover ratio indicates the high-volume return premium.

Panel B in Table III presents the weekly-based test results of return predictability. We cumulate daily returns, LFOIs, turnover, and HFOI from Monday to Friday to construct weekly variables. Panel B shows us that LFOIs can predict weekly stock returns as Panel A implies. Then the next natural question is on how long the price impact of LFOIs last. The following figures answer the question.

[Place Figure 1 about here]

Figure 1 describes k estimated coefficients of the first lagged LFOIs from the following Fama-MacBeth regression model in order to gauge long-term return predictability of four different LFOIs,

$$CR_{i,t,t+k} = \alpha_t + \beta_t LFOI_{i,t-1} + \beta_t^T TURN_{i,t-1} + \beta_t^B BASPRD_{i,t-1} + \beta_t^R RET_{i,t-1} + \beta_t^{RSQ} RET_{i,t-1}^2 + \epsilon_{i,t}$$

, where $CR_{i,t,t+k}$ is raw cumulative return of stock i from day t to $t+k$

Figure 1 shows some evidence that LFOIs contain contemporaneous price presure as well as permanent price impact. $TLFOI$ in particular has sharp price reversal within five days, but the price reversal does not fully occur. The remaining part of price impact last for at

least twenty-one days, which may indicate permanent price impact. $BALFOI$ also shows both price pressure and permanent price impact while it has faded out more quickly than $TLFOI$. $HLLFOI$ does not show clear price reversal but it does not also have full price reversal. PS looks like that it only contain contemporaneous price pressure. According to Figure 1, we may say that our proposed LFOIs can capture information on fundamental value change in a stock.

[Place Table VIII about here]

Table VIII presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four asymmetric LFOIs,

$$R_{i,t} = \alpha_t + \beta_t^{1+} OI_{+i,t-1} + \beta_t^{1-} OI_{-i,t-1} + \beta_t^{2+} OI_{+i,t-2} + \beta_t^{2-} OI_{-i,t-2} + \beta_t^{3+} OI_{+i,t-3} + \beta_t^{3-} OI_{-i,t-3} + \beta_t^{4+} OI_{+i,t-4} + \beta_t^{4-} OI_{-i,t-4} + \beta_t^{5+} OI_{+i,t-5} + \beta_t^{5-} OI_{-i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw or mid-quote return of stock i on day t, mid-quote return is calculated close bid and offer price at a given day, and $OI+_{i,t}$ ($OI-_{i,t}$) is negative $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t.

Table VIII gives us some evidence on whether the effectiveness of LFOIs comes from one direction of order flow or both directions of order flow. This table tells us that both directions of order flow contributes the predictive power of LFOIs for future returns. Basically buying pressure is stronger than selling pressure in all the LFOIs including PS. However, PS is less obvious in the difference between buying and selling pressure.

A.2. Subsample tests

In this subsection, we conduct subsample tests with different criteria including size, liquidity, exchange market, and period in order to clarify robustness in the effectiveness of LFOI. All of the subsample tests support that the first lagged terms of LFOIs have positive and significant estimated coefficents regardless with any subsamples.

[Place Table IV about here]

Table IV presents the predictive power of order imbalances in size subsamples. We separate whole sample dataset into five subsamples based on market capitalization. In this table, we report Fama-MacBeth coefficients in three subsample regression. Panel A is for the smallest-size stocks, Panel B is for middle-sized stocks, and Panel C is for the largest-size stocks.

Generally speaking, small size stocks are naturally illiquid and information asymmetric because of their low price and little attention from market participants. Therefore small size stocks should be vulnerable to price pressure from OIs. Table IV shows the tendency; all of LFOIs have the strongest prediction power for current stock returns in a small size subsample. This result is consistent with Chordia and Subrahmanyam (2004).

[Place Table V about here]

Table V reports return predictability of order imbalances in liquidity subsamples. We separate whole sample dataset into five subsamples based on relative bid-ask spread ($BASPRD$). In this table, we report Fama-MacBeth coefficients in three subsample regression. Panel A is for stocks with the narrowest $BASPRD$, Panel B is for stocks with medium $BASPRD$, and Panel C is for stocks with the widest $BASPRD$.

By definition, liquidity is the amount of trading volume without any price change, and OI makes price pressure. Therefore liquid stocks do not easily react to OI, while illiquid stocks react more to OI than liquid stocks. In Table V all type of OIs have higher t-statistics in an illiquid subsample than in a liquid subsample.

[Place Table VI about here]

Table VI documents the prediction power of order imbalances in different exchange markets, NYSE and AMEX versus Nasdaq. OIs have return prediction power either in NYSE and AMEX in Panel A or in NASDAQ in Panel B. Since NASDAQ is holding smaller size stocks

comparing with NYSE and AMEX, the effect of order imbalance is stronger on NASDAQ than on NYSE and AMEX. Table VI reports such tendency.

[Place Table VII about here]

Table VII reports return predictability of OIs during each subperiod. We separate whole sample dataset into three subperiods. Panel A is for early subperiod from 1993 to 2000, Panel B is for middle subperiod from 2001 to 2006, and Panel C is for late subperiod from 2007 to 2013.

Trading behavior has changed over time. Exchange markets are getting more and more efficient and trading frequency is getting faster. Therefore the period for volume-return reversal should be getting shorter and weaker over time. In early period from 1993 to 2000, the fifth lagged term of LFOIs have negative sign, which implies volume-return reversal occurs at least for five days.

A.3. Investment strategy

[Place Table IX about here]

Table IX documents the profitability of investment strategies based on one-trading-day lagged LFOIs. We rank all the stocks in our sample by one-trading-day lagged LFOIs for each day, and classify them into decile portfolios. Stocks with the lowest (highest) LFOI belong to *Low (High)* portfolio. We take short positions for stocks in the *Low* portfolio and long position for stocks in the *High* portfolio at day t.

Raw LFOIs including $TLFOI$, $BALFOI$, $HLLFOI$, and PS are not profitable at all. First of all, the performance of decile portfolios is not monotonically increasing, and therefore High minus Low investment strategy does not produce positive and significant profits. This results are inconsistent with return predictive power of LFOIs in the previous tables.

We have a conjecture that the unprofitability may come from contaminated LFOIs which include the information not only on order imbalances but also returns or illiquidity. To

remove the information contents of returns and illiquidity, we utilize residual terms of LFOIs in the regression models of a given LFOI on stock return and its illiquidity factor, denoting it as residual LFOI. Except $HLLFOI$, LFOIs display strong profitability in our investment strategy. For example, High minus Low portfolio by Residual $TLFOI$ generates high daily returns of 0.768%, its Daily Sharpe Ratio is 105.76%. Even after controling Fama-French three factors, the profitability does not disappear in terms of positive and significant alpha with t-statistics of 77.85.

We make another sample data by using daily CRSP data only from 01 January 1983 to 31 December 2013, reporting in Table IX Panel B. The investment strategy creates very similar results as Panel A shows. Therefore we can say that our investment strategy does not only belong to our dataset but general daily CRSP dataset.

B. Fundamental information flow around corporate events

Section III.B studies five different events including earnings announcements, extreme price movements, analyst recommendation changes, value related 8-K filings, and scheduled 13-D filings. We define event days as follows. For earnings announcements, we take an advantage of I/B/E/S data. For extreme price movements, we choose event days satisfies with two criteria; 1) the days have abnormal returns above two standard deviation measured over the past twenty trading days, and 2) the abnormal returns are not fully reversed during ten days after the event day. Abnormal returns are the residual terms of the Fama-French three factor model over whole sample period. For analysts recommendation changes, we exploit I/B/E/S data matching CRSP data via symbol. For value related 8-K filings and scheduled 13-D filings, we employ WRDS SEC Analytics Suite data. To circumvent a concern about overlapping effect of near 8-K filings, the days between 8-K filings should be longer than five days in our event study for value related 8-K filings.

B.1. LFOI dynamic around corporate events

[Place Table 2 about here]

Figure 2 presents the time evolution of LFOIs near earnings announcement. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after positive or negative earnings announcements. We classify earnings announcements into positive (negative) ones when scaled earnings surprise ($SURS$) is positive (negative). We define $SURS$ as the difference between actual earnings and the average of earnings forecasts in analysts from the Institutional Brokers' Estimate System (IBES), scaling by stock price. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI.

We can visually observe that LFOIs capture information flow around earnings announcement dates. The LFOIs react to earnings announcement dates at least one day before the date, and the reaction direction is consistent with information contents of earnings; LFOIs start to rise in the case of good earnings news in terms of $SURS$, while they fall in the case of bad earnings news.

[Place Table 3 about here]

Figure 3 presents the time evolution of LFOIs near extreme price movement. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after positive or negative extreme price movement. We choose event days satisfies with two criteria; 1) the days have abnormal returns above two standard deviation measured over the past twenty trading days, and 2) the abnormal returns are not fully reversed during ten days after the event day. Abnormal returns are the residual terms of the Fama-French three factor model over whole sample period. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI.

The implication of Figure 3 is virtually same as Figure 2. We can visually observe that LFOIs capture information flow around extreme price movements. The LFOIs react to

extreme price movements at least one day before the date even though the advanced reaction in Figure 3 is smaller than that in Figure 2, and the reaction direction is consistent with information contents of price movements.

[Place Table 4 about here]

Figure 4 presents the time evolution of LFOIs near recommendation updates. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after recommendation upgrade or degrade. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI.

The implication of Figure 4 is virtually same as the previous igures. We can visually observe that LFOIs capture information flow around recommendation updates. The LFOIs react to recommendation updates at least one day before the date, and the reaction direction is consistent with information contents of recommendation update.

[Place Table 5 about here]

Figure 5 presents the time evolution of LFOIs near value related 8K filing. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after positive or negative 8K filing. We classify 8K filings into positive (negative) ones when abnormal return at the 8K filing date is positive (negative). Abnormal return is a residual term from Fama-French three factor model for sixty-one trading days starting from thirty days before 8K filing date. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI.

The implication of Figure 5 is virtually same as the previous figures. We can visually observe that LFOIs capture information flow around 8-K filing dates. The LFOIs react to 8-K filing dates at least one day before the date even though the advanced reaction in Figure 5 is smaller than that in Figure 2 of Figure 4, and the reaction direction is consistent with information contents of 8-K filings.

[Place Table 6 about here]

Figure 6 presents the time evolution of LFOIs near scheduled 13D filing. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after 13D filing. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI. We cannot find any predictive power of LFOIs on 13-D filings. That is, according to Figure 6, LFOIs cannot predict 13-D filings dates in advance.

B.2. Return predictability in corporate events

[Place Table X about here]

Table X presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four different LFOIs around corporate events,

$$CAR_{i,t,t+k} = \alpha_t + \beta_t^1 OI_{i,t-1} + \beta_t^2 OI_{i,t-2} + \beta_t^3 OI_{i,t-3} + \beta_t^4 OI_{i,t-4} + \beta_t^5 OI_{i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $CAR_{i,t,t+k}$ is raw cumulative return of stock i from a day t to $t+k$, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t.

Return predictive power regarding earnings announcements is reported in Panel A. All the LFOIs including $TLFOI$, $BALFOI$, $HLLFOI$, and PS predict earnings announcement dates and its contents at least one day before the announcement dates. This result is consistent with Figure 2. The other control variables have similar patterns to Table III. Likewise, Panel B is for extreme price movement, Panel C for recommendation update, Panel D for 8-K filings, and Panel E for 13-D filings. All the event corporate studies support our argument that LFOIs are able to capture fundamental information flow. Especially $TLFOI$ can capture information on the above corporate events at the event day. In the case 13-D filings, no LFOIs can detect 13-D filing information, but after putting control variables in the regression model, LFOIs become predictive for 13-D filings in Table X Panel E.

[Place Table XI about here]

This table presents estimated coefficients from Fama-MacBeth (1973) regression with corporate event dummies to measure returns predictability of four different LFOIs around corporate events,

$$R_{i,t} = \alpha_t + \beta_t \text{EventDummy}_{i,t} + \sum_{k=1}^{5} \beta_t^k \text{EventDummy}_{i,t} \times OI_{i,t-k} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw return of stock i in a day t, EventDummy is a dummy variable, one for a corporate event day and zero for other days, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t.

Table XI is different from Table X in sample data. By utilizing full sample, Table XI provide us evidence on fundamental information capture of LFOIs. Inconsistent with Table X, $TLFOI$ in Panel A does not show predictive power for every event but only for extreme price movments and recommendation update. $BALFOI$ in Panel B also has similar predictive power for corporate events. It can notice extreme price movement and recommendation update one day before it happens. However, $HLLFOI$ and PS do not show any predictive power for corporate events in full sample tests. Therefore, in terms of corporate event prediction, our proposed LFOI, $TLFOI$ and $BALFOI$, outperform PS.

IV. Conclusion

In this paper, we propose to estimate low frequency order flow based on illiquidity measures using daily CRSP data. The empirical analysis shows that the correlation of LFOI and HFOI is reasonably high. We also find that the estimated coefficient in the regression of HFOI on LFOI is positive and significant in different subsamples. For the sake of computation convenience, out of all the LFOI measures we consider close-to-close transaction return-based LFOIs. Then we show that LFOIs have return predictive power at daily and

weekly frequency in the first application, and we find that LFOIs can capture the fundamental information flow around corporate events in the second application.

Our proposed LFOI is practically useful. LFOI can be calculated in very short time while HFOI can take much longer and greater computing power to calculate due to the increasing size of data sets. Also the easy-to-compute order flow are even more informative in terms of return prediction power. Its predictive power for stock returns still holds in a variety of subsamples including size, liquidity, exchange market, and period subsamples. The empirical results in this paper suggests that the proposed LFOI is a good proxy for the information in order flow and it can be applied in empirical studies that utilize order flow at low frequency.

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Notes

[1]The asserted price impact from order flow is a generic result in microstructure theories although the exact forms of price impact can vary across studies. Indeed, in sequential trade models such as Glosten and Milgrom (1985) and Easley and O'Hara (1992), the asset price set by the market maker is updated after order arrival to reflect the probability of new information in the order flow. Motivated by inventory cost rather than asymmetric information, the dynamic inventory models such as Ho and Stoll (1983) and Spiegel and Subrahmanyam (1995) also investigate the price changes following transactions as a result of the price pressure faced by market makers.

Figure 1
Cumulative return predictability

This figure describes k estimated coefficients of the first lagged LFOIs from the following Fama-MacBeth regression model in order to gauge long-term return predictability of four different LFOIs,

$$CR_{i,t,t+k} = \alpha_t + \beta_t LFOI_{i,t-1} + \beta_t^T TURN_{i,t-1} + \beta_t^B BASPRD_{i,t-1} + \beta_t^R RET_{i,t-1} + \beta_t^{RSQ} RET_{i,t-1}^2 + \epsilon_{i,t}$$

, where $CR_{i,t,t+k}$ is raw cumulative return of stock i from day t to $t+k$, and $LFOI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t, $TURN$ is daily turnover defined as trading volume over the number of shares outstanding, $BASPRD$ is daily relative bid-ask spread measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint, RET is daily stock return, and RET^2 is daily squared stock return. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). The horizontal axis represents how many days return is cumlated for, and the vertical axis represents time-serial average of cross-sectionally estimated coefficients of the first lagged LFOIs. We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by $BASPRD$. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. We use $HLSPRD$ for $HLLFOI$ in the above Fama-MacBeth regression model, instead of $BASPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003).

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Figure 1 – *Continued*

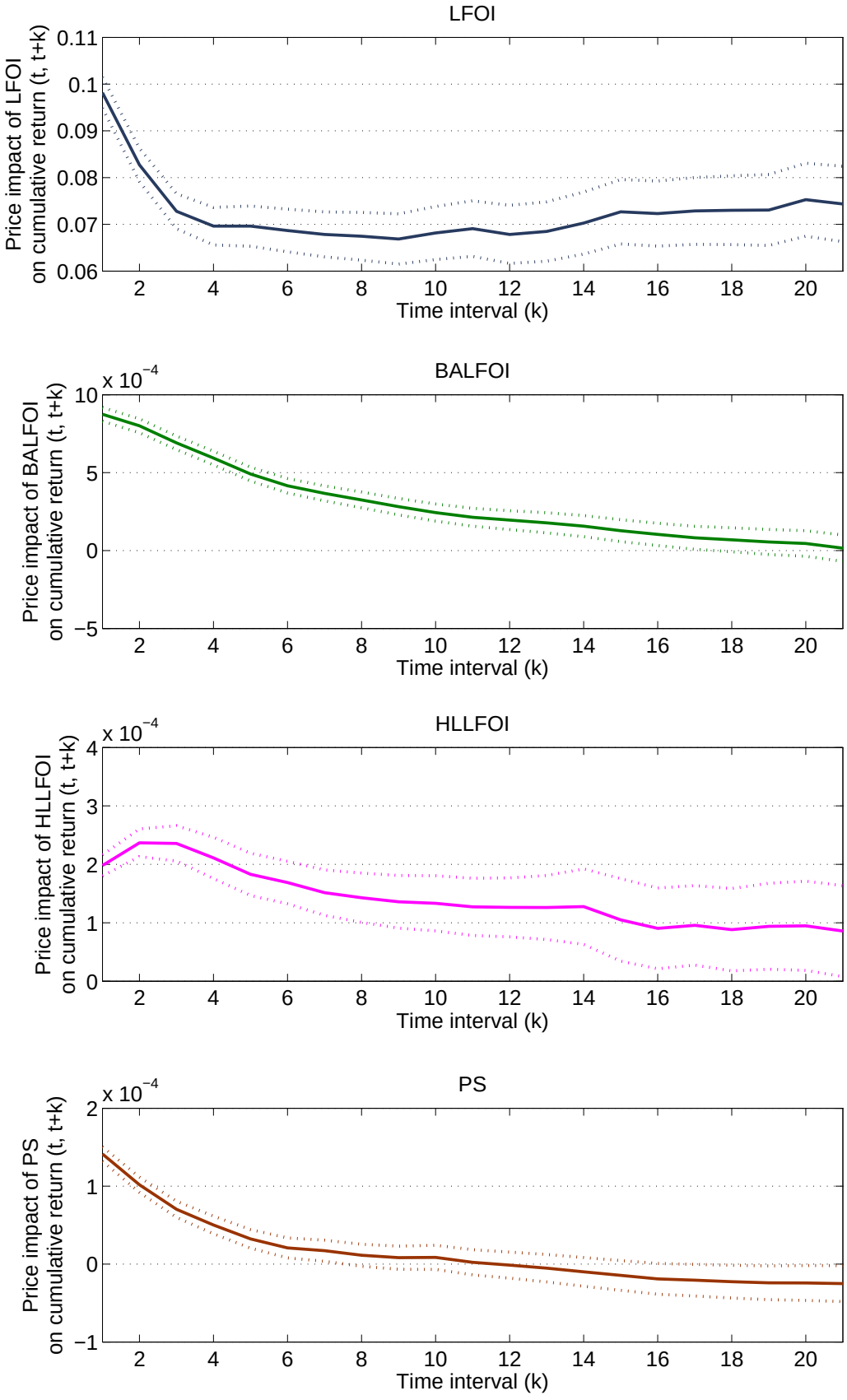

Figure 2
The dynamic of LFOI around earnings announcements

This figure presents the time evolution of LFOIs near earnings announcement. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after positive or negative earnings announcements. We classify earnings announcements into positive (negative) ones when scaled earnings surprise ($SURS$) is positive (negative). We define $SURS$ as the difference between actual earnings and the average of earnings forecasts in analysts from the Institutional Brokers' Estimate System (IBES), scaling by stock price. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003).

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Figure 2 – *Continued*

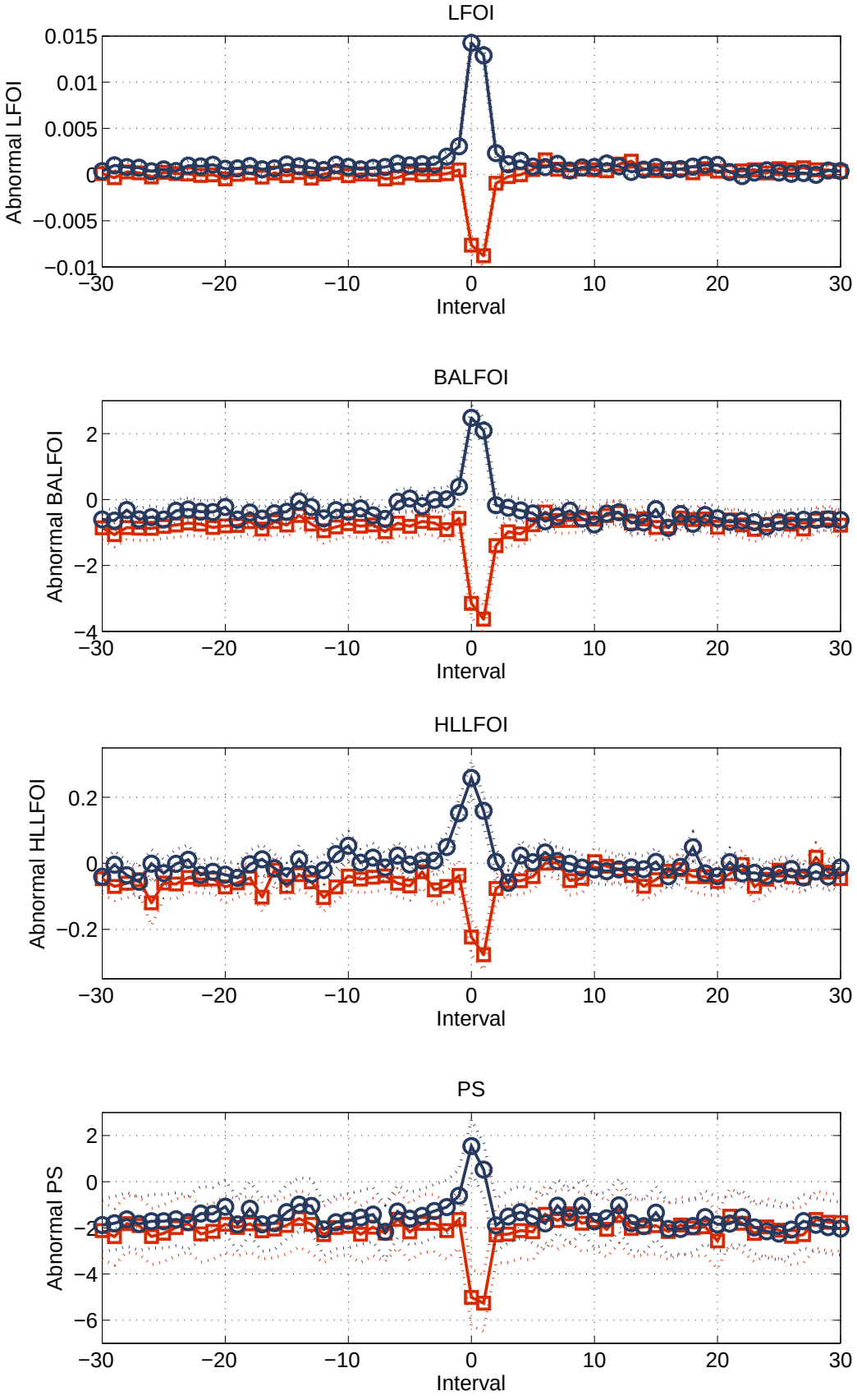

Figure 3
The dynamic of LFOI around extreme price movement

This figure presents the time evolution of LFOIs near extreme price movement. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after positive or negative extreme price movement. We choose event days satisfies with two criteria; 1) the days have abnormal returns above two standard deviation measured over the past twenty trading days, and 2) the abnormal returns are not fully reversed during ten days after the event day. Abnormal returns are the residual terms of the Fama-French three factor model over whole sample period. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003).

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Figure 3 – *Continued*

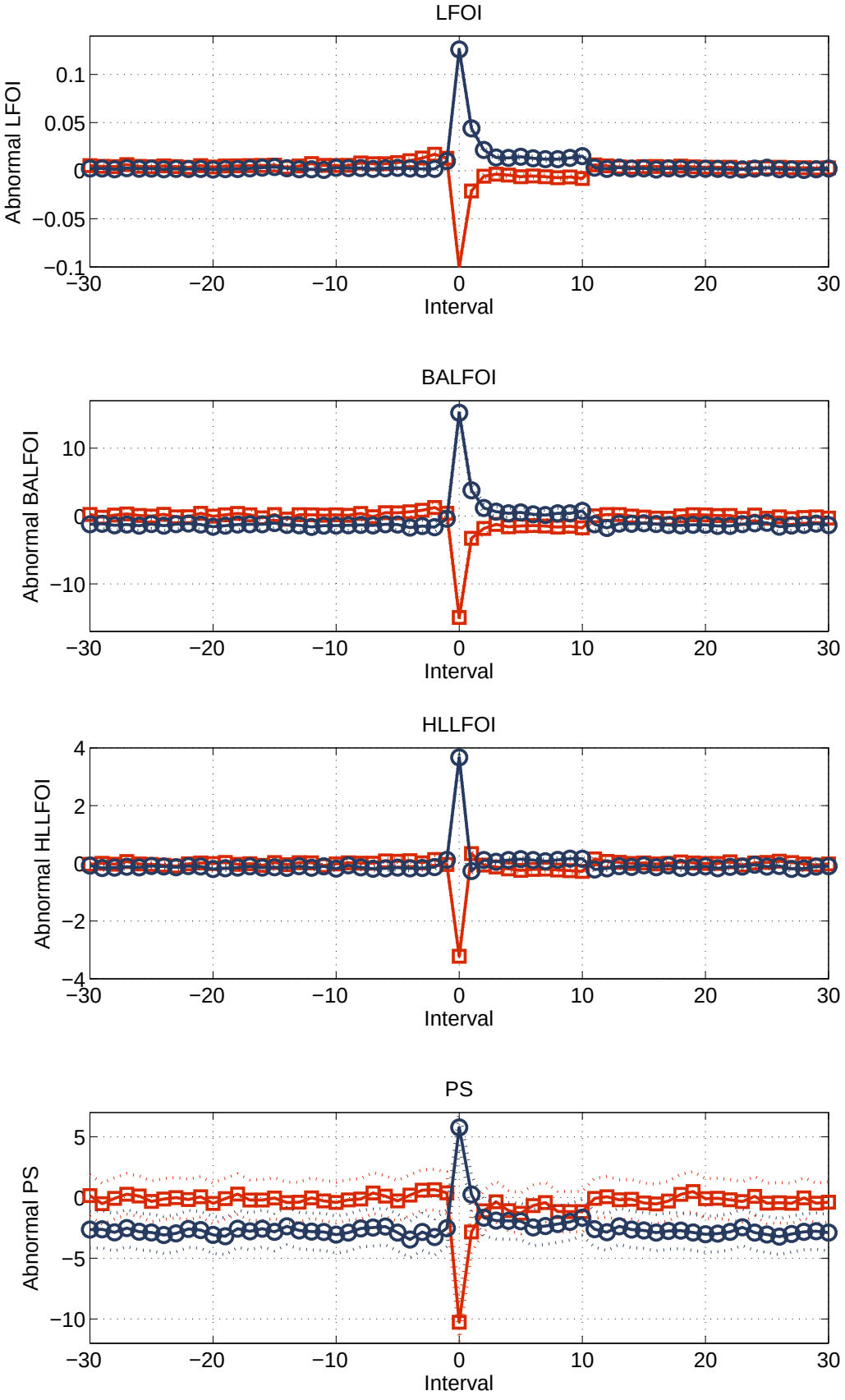

Figure 4
The dynamic of LFOI around recommendation updates

This figure presents the time evolution of LFOIs near recommendation updates. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after recommendation upgrade or degrade. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003).

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Figure 4 – *Continued*

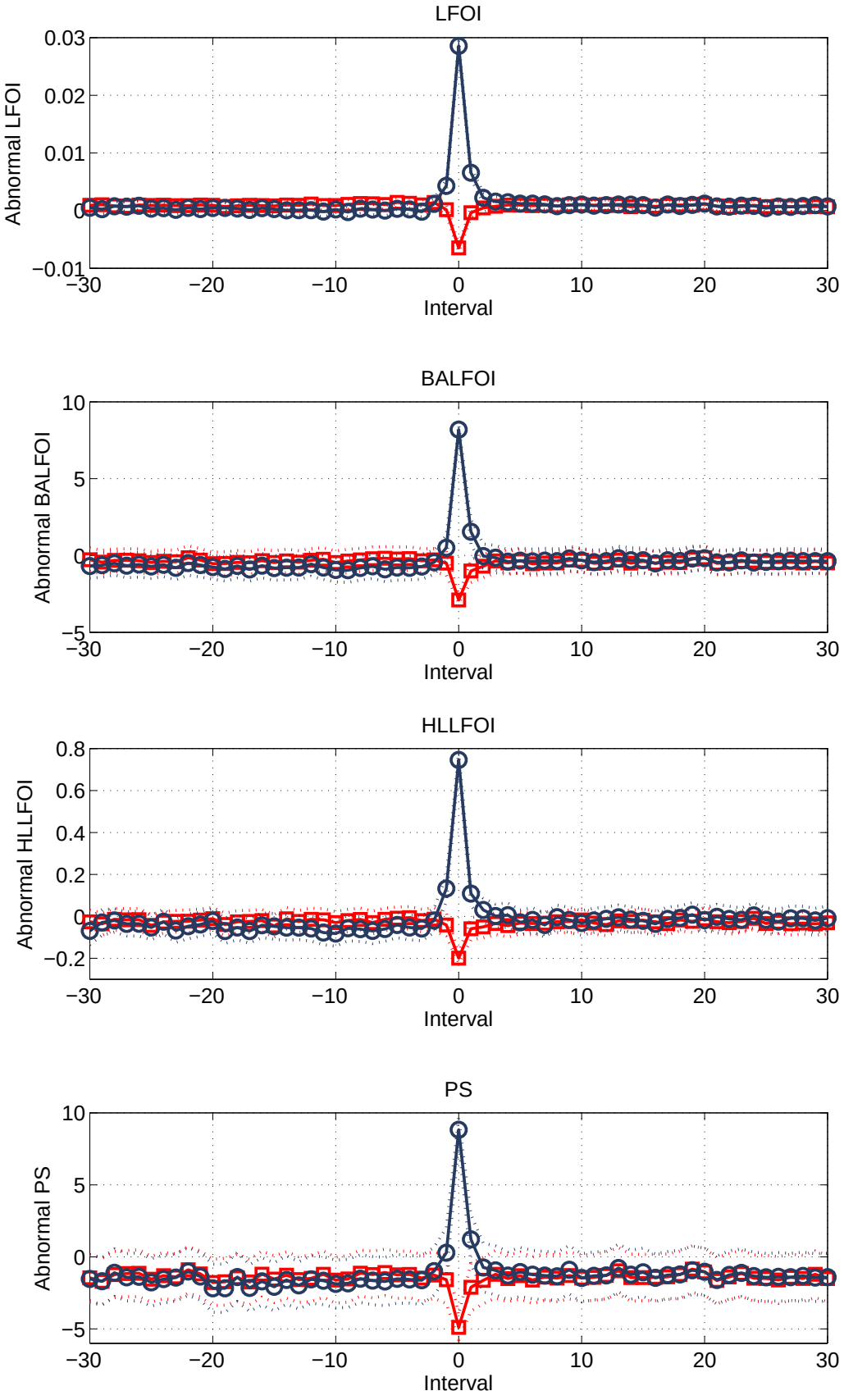

Figure 5
The dynamic of LFOI around value related 8K filing dates

This figure presents the time evolution of LFOIs near value related 8K filing. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after positive or negative 8K filing. We classify 8K filings into positive (negative) ones when abnormal return at the 8K filing date is positive (negative). Abnormal return is a residual term from Fama-French three factor model for sixty-one trading days starting from thirty days before 8K filing date. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003).

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Figure 5 – *Continued*

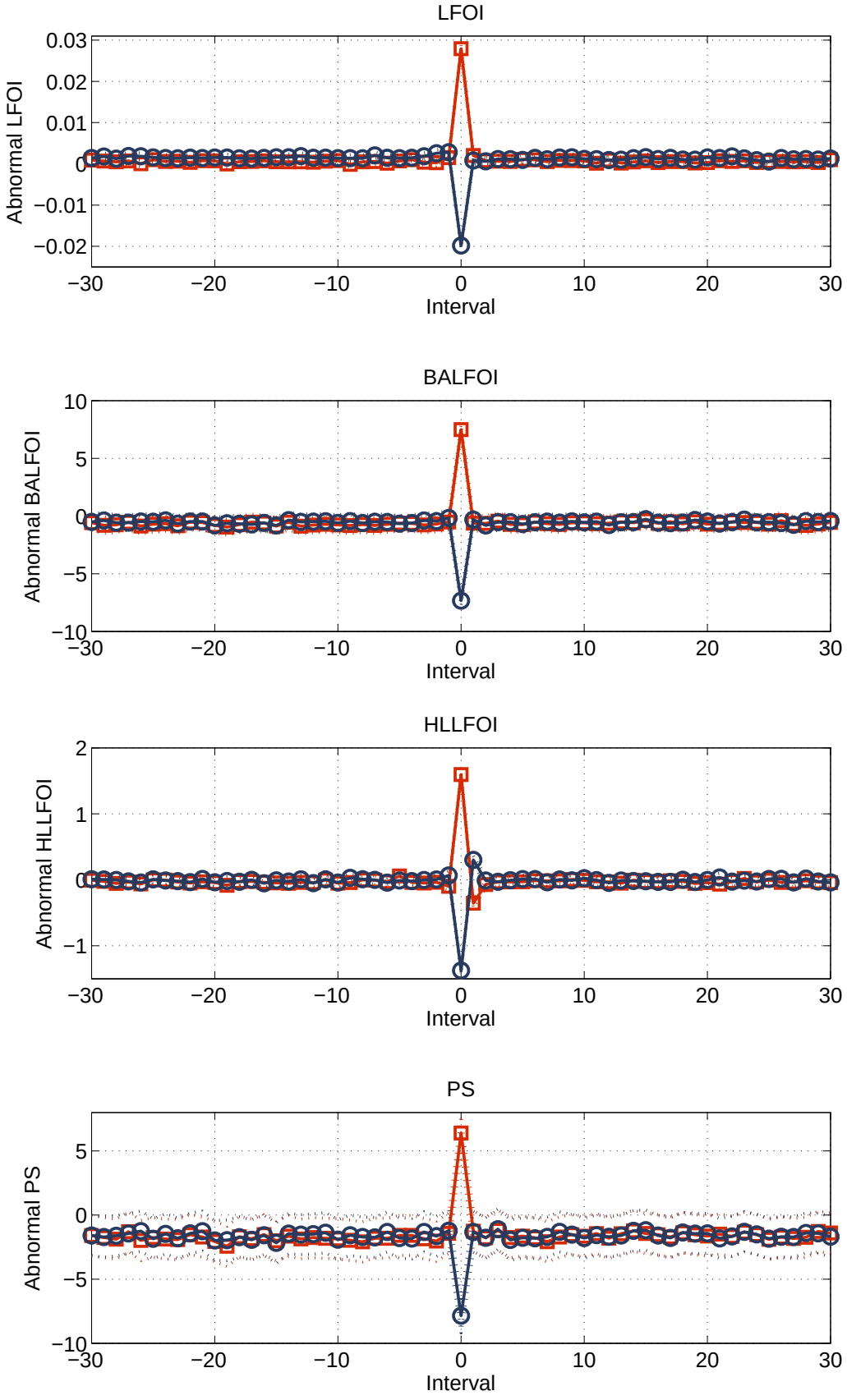

Figure 6
The dynamic of LFOI around scheduled 13D filing dates

This figure presents the time evolution of LFOIs near scheduled 13D filing. We plot time-serial average of abnormal LFOIs from thirty days before to thirty days after 13D filing. We measure an *Abnormal LFOI* as the difference of an LFOI from market-wide average of the LFOI. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003).

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Figure 6 – *Continued*

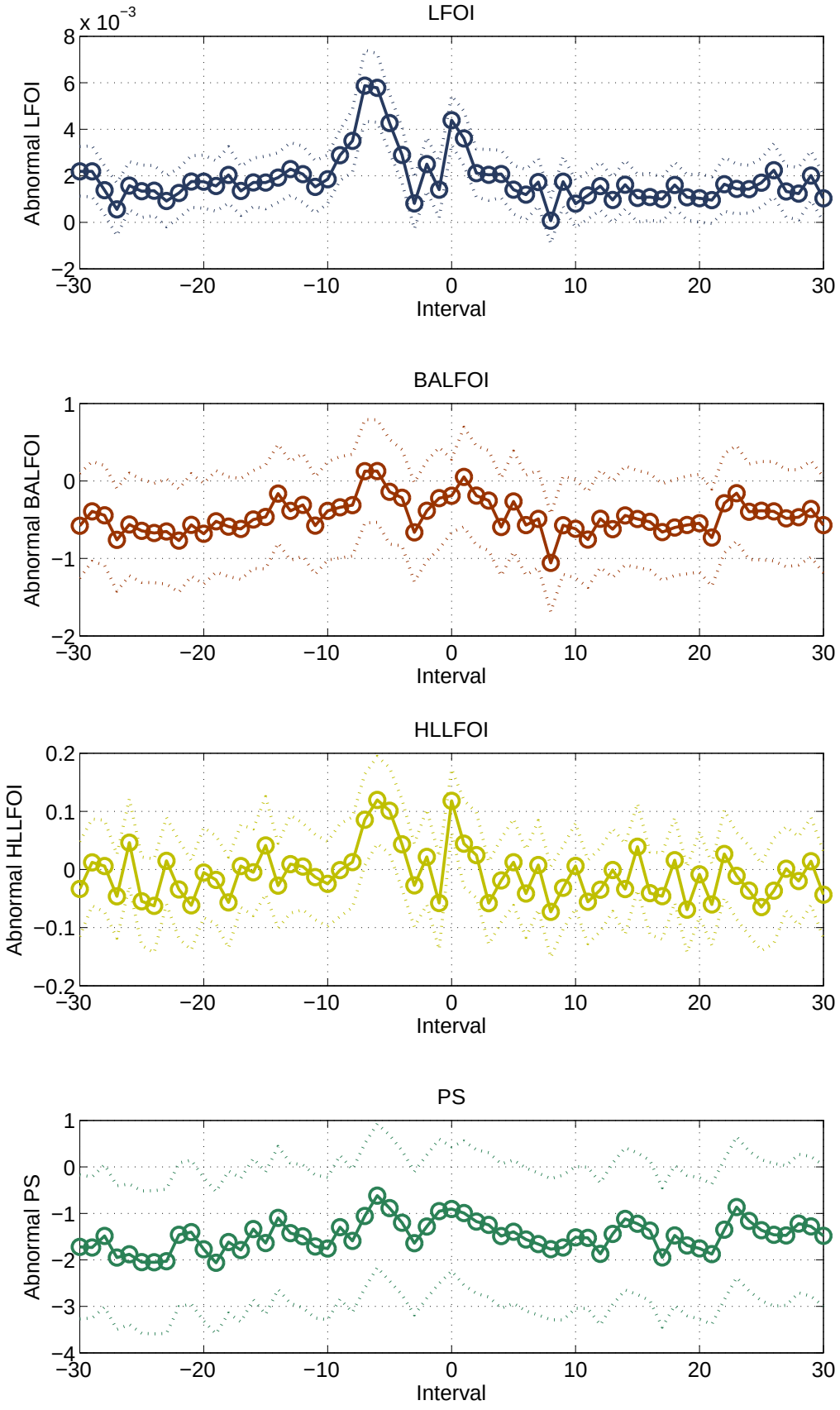

Table I
Summary statistics

This table shows the time-series averages of the cross-sectional statistics for the sample during the 1993 to 2013 sample period. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). *Number of Dates* stands for the number of working days during sample period. *Average Number of Stocks* is the average number of firms for each date. Moreover, this table reports mean, standard deviation, minimum, median and maximum of each variable. High frequency order imbalance (HFOI) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. We define four different low frequency order imbalances (LFOIs). $TLFOI1$ ($TLFOI2$) is the interaction of daily raw (mid-quote) returns and daily turnover ratio. $BALFOI1$ ($BALFOI2$) is daily raw (mid-quote) returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI1$ ($HLLFOI2$) is daily raw (mid-quote) returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. $AMIHUD$ is the absolute value of daily returns divided by trading millian dollar volume, following Amihud (2002). RET is daily stock return.

	Number of Dates	Average Number of Stocks	Mean	Standard Deviation	Minimum	Median	Maximum
$HFOI$	5289	3778.98	0.008	0.174	-0.665	0.002	0.737
$TLFOI1$	5289	3785.82	0.002	0.032	-0.119	0.000	0.163
$TLFOI2$	5289	3296.39	0.000	0.030	-0.123	0.000	0.142
$BALFOI1$	5289	3785.82	0.500	12.588	-24.514	0.067	27.833
$BALFOI2$	5289	3296.39	0.091	12.659	-26.210	-0.133	27.619
$HLLFOI1$	5289	2562.00	0.022	2.418	-5.408	-0.010	5.680
$HLLFOI2$	5289	2153.22	-0.040	2.606	-6.125	-0.042	6.103
PS	5289	3785.82	0.479	20.137	-44.628	0.020	48.239
$TURN$	5289	3787.03	0.573	0.725	0.000	0.350	4.368
$BASPRD$	5289	3787.03	0.014	0.012	0.002	0.009	0.047
$HLSPRD$	5289	2562.02	0.017	0.013	0.001	0.013	0.050
$AMIHUD$	5289	3609.21	0.790	16.084	0.000	0.007	741.482
RET	5289	3785.82	0.001	0.031	-0.264	0.000	0.448

Table II
Correation table

This table reports correlation tables between OIs and other variables. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). Correlation coefficients are the time-serial average of cross-sectional correlation coefficient over our sample period. High frequency order imbalance (HFOI) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. We define four different low frequency order imbalances (LFOIs). $TLFOI1$ ($TLFOI2$) is the interaction of daily raw (mid-quote) returns and daily turnover ratio. $BALFOI1$ ($BALFOI2$) is daily raw (mid-quote) returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI1$ ($HLLFOI2$) is daily raw (mid-quote) returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. $AMIHUD$ is the absolute value of daily returns divided by trading millian dollar volume, following Amihud (2002). RET is daily stock return. Panel A is for Pearson correlation, Panel B is for Spearman correlation, and Panel C is for rank correlation.

Panel A. Pearson Correlation

	$HFOI$	$TLFOI1$	$TLFOI2$	BA $LFOI1$	BA $LFOI2$	HL $LFOI1$	HL $LFOI2$	PS
$HFOI$	1.00							
$TLFOI1$	0.25	1.00						
$TLFOI2$	0.23	0.83	1.00					
$BALFOI1$	0.17	0.59	0.51	1.00				
$BALFOI2$	0.16	0.50	0.60	0.83	1.00			
$HLLFOI1$	0.13	0.39	0.33	0.54	0.44	1.00		
$HLLFOI2$	0.12	0.32	0.41	0.43	0.56	0.67	1.00	
PS	0.10	0.40	0.33	0.56	0.46	0.30	0.24	1.00
$TURN$	0.10	0.12	0.06	0.05	0.03	0.03	0.02	0.04
$BASPRD$	-0.05	-0.01	0.00	-0.02	0.00	0.00	0.00	-0.02
$HLSPRD$	0.01	0.00	-0.01	0.00	-0.01	-0.01	0.00	-0.01
$AMIHUD$	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RET	0.21	0.69	0.69	0.64	0.53	0.62	0.45	0.29

(Continued)

Table II – *Continued*

Panel B. Spaerman Correlation

	$HFOI$	$LFOI1$	$LFOI2$	BA $LFOI1$	BA $LFOI2$	HL $LFOI1$	HL $LFOI2$	PS
$HFOI$	1.00							
$LFOI1$	0.24	1.00						
$LFOI2$	0.23	0.79	1.00					
$BALFOI1$	0.22	0.91	0.73	1.00				
$BALFOI2$	0.21	0.73	0.92	0.79	1.00			
$HLLFOI1$	0.19	0.83	0.61	0.84	0.62	1.00		
$HLLFOI2$	0.19	0.61	0.84	0.62	0.85	0.67	1.00	
PS	0.19	0.88	0.66	0.87	0.67	0.74	0.54	1.00
$TURN$	0.08	0.03	0.00	0.03	0.01	0.02	0.01	0.03
$BASPRD$	-0.07	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01
$HLSPRD$	0.00	-0.01	-0.02	-0.01	-0.01	0.00	0.01	-0.01
$AMIHUD$	-0.08	0.00	0.01	-0.01	0.01	-0.02	0.00	-0.01
RET	0.24	0.90	0.73	0.88	0.71	0.88	0.62	0.72

Panel C. Rank Correlation

	$HFOI$	$LFOI1$	$LFOI2$	BA $LFOI1$	BA $LFOI2$	HL $LFOI1$	HL $LFOI2$	PS
$HFOI$	1.00							
$LFOI1$	0.23	1.00						
$LFOI2$	0.22	0.75	1.00					
$BALFOI1$	0.21	0.89	0.70	1.00				
$BALFOI2$	0.20	0.70	0.89	0.76	1.00			
$HLLFOI1$	0.18	0.79	0.59	0.81	0.60	1.00		
$HLLFOI2$	0.18	0.59	0.81	0.60	0.82	0.65	1.00	
PS	0.18	0.86	0.64	0.85	0.65	0.72	0.52	1.00
$TURN$	0.08	0.03	0.00	0.03	0.01	0.02	0.01	0.02
$BASPRD$	-0.07	-0.01	0.00	0.00	0.01	0.00	0.00	-0.01
$HLSPRD$	0.00	-0.01	-0.02	-0.01	-0.01	0.00	0.01	-0.01
$AMIHUD$	-0.08	-0.01	0.01	-0.01	0.01	-0.02	0.00	-0.01
RET	0.22	0.88	0.70	0.86	0.68	0.85	0.60	0.71

Table III
Return predictability

This table presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four different LFOIs,

$$R_{i,t} = \alpha_t + \beta_t^1 OI_{i,t-1} + \beta_t^2 OI_{i,t-2} + \beta_t^3 OI_{i,t-3} + \beta_t^4 OI_{i,t-4} + \beta_t^5 OI_{i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw or mid-quote return of stock i on day t, mid-quote return is calculated close bid and offer price at a given day, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). The first row shows which LFOI is utilized in the above Fama-MacBeth regression model, and the second row explains which return we employ in the regression model. We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). High frequency order imbalance (HFOI) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. RET is daily stock return, and RET^2 is daily squared stock return. Panel A shows estimated coefficients from daily-based Fama-MacBeth regression, and Panel B shows coefficients from weekly-based Fama-MacBeth regression. In parentheses, we report t-statistics of the average coefficient over sample period based on New-West (1987) standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent lavel, respectively.

Panel A. Daily-based regression								
	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	0.021	0.031**	0.027*	0.046***	0.035***	0.016**	0.023	0.043***
	(1.41)	(2.39)	(1.93)	(3.56)	(3.70)	(2.06)	(1.57)	(3.28)
OI_{t-1}	9.502***	2.885***	0.082***	0.041***	0.032***	0.047***	0.015***	0.000
	(26.26)	(23.16)	(15.05)	(16.08)	(16.28)	(38.75)	(13.40)	(0.31)
OI_{t-2}	-0.256**	-1.145***	0.006***	0.003***	0.003*	0.013***	-0.002***	-0.003***
	(-2.55)	(-12.31)	(5.49)	(4.76)	(1.91)	(13.41)	(-6.38)	(-10.80)
OI_{t-3}	-0.458***	-0.257***	-0.007***	0.000	-0.000	0.006***	-0.002***	-0.001***
	(-5.11)	(-3.60)	(-7.07)	(0.63)	(-0.25)	(6.17)	(-6.91)	(-4.64)

(Continued)

Panel A in Table III – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
OI_{t-4}	-0.195**	0.205***	-0.008***	-0.001*	-0.005***	0.004***	-0.001***	-0.001***
	(-2.39)	(3.10)	(-8.21)	(-1.90)	(-3.66)	(4.04)	(-6.14)	(-3.21)
OI_{t-5}	-0.101	0.307***	-0.009***	-0.002***	-0.002**	0.003***	-0.001***	-0.001***
	(-1.21)	(4.63)	(-8.81)	(-3.24)	(-2.11)	(3.38)	(-5.46)	(-3.27)
$HFOI_{t-1}$	0.110***	0.133***	0.204***	0.147***	0.316***	0.267***	0.220***	0.158***
	(7.38)	(12.71)	(11.61)	(15.01)	(10.73)	(15.05)	(11.74)	(14.86)
$HFOI_{t-2}$	-0.038***	-0.046***	-0.055***	-0.062***	-0.041**	-0.025	-0.054***	-0.065***
	(-5.39)	(-7.73)	(-7.44)	(-10.30)	(-2.32)	(-1.63)	(-7.36)	(-10.87)
$HFOI_{t-3}$	-0.041***	-0.036***	-0.057***	-0.040***	-0.073***	-0.056***	-0.058***	-0.040***
	(-6.57)	(-6.57)	(-9.03)	(-7.40)	(-3.83)	(-3.82)	(-9.19)	(-7.25)
$HFOI_{t-4}$	-0.042***	-0.032***	-0.046***	-0.027***	-0.094***	-0.071***	-0.048***	-0.027***
	(-6.37)	(-5.40)	(-6.98)	(-4.75)	(-5.69)	(-4.93)	(-7.26)	(-4.73)
$HFOI_{t-5}$	-0.038***	-0.029***	-0.042***	-0.025***	-0.036**	-0.024*	-0.045***	-0.025***
	(-5.71)	(-4.87)	(-6.30)	(-4.29)	(-2.19)	(-1.79)	(-6.60)	(-4.18)
$BASPRD_{t-1}$	4.214***	1.051***	3.857***	0.550*			4.059***	0.751**
	(12.86)	(3.57)	(12.09)	(1.84)			(12.21)	(2.46)
$HLSPRD_{t-1}$					0.148	0.570***		
					(0.66)	(3.19)		
$TURN_{t-1}$	0.083***	0.085***	0.107***	0.076***	0.177***	0.137***	0.113***	0.080***
	(13.64)	(14.11)	(14.58)	(13.31)	(12.54)	(12.45)	(14.40)	(13.13)
RET_{t-1}	-11.074***	-1.901***	-9.805***	-2.012***	-19.207***	-5.861***	-6.948***	-0.017
	(-35.38)	(-9.66)	(-29.11)	(-14.46)	(-43.27)	(-17.17)	(-27.46)	(-0.11)
RET_{t-2}	-2.096***	-0.929***	-2.032***	-1.482***	-6.466***	-2.045***	-1.717***	-1.174***
	(-18.11)	(-9.43)	(-18.58)	(-16.15)	(-23.65)	(-10.04)	(-17.35)	(-13.07)
RET_{t-3}	-0.846***	-1.002***	-0.714***	-1.113***	-1.841***	-0.716***	-0.852***	-1.035***
	(-9.07)	(-10.86)	(-8.22)	(-12.97)	(-8.96)	(-3.97)	(-10.47)	(-12.25)
RET_{t-4}	-0.575***	-1.030***	-0.225***	-0.761***	0.003	-0.403**	-0.537***	-0.838***
	(-6.49)	(-11.77)	(-2.68)	(-9.48)	(0.01)	(-2.36)	(-6.84)	(-10.54)
RET_{t-5}	-0.414***	-0.848***	-0.064	-0.532***	0.361**	-0.211	-0.363***	-0.634***
	(-4.79)	(-10.25)	(-0.78)	(-7.00)	(2.09)	(-1.36)	(-4.87)	(-8.48)

(Continued)

Panel A in Table III – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-1}	19.699***	21.927***	22.999***	27.021***	62.849***	42.471***	20.247***	23.945***
	(21.54)	(18.50)	(22.58)	(22.38)	(17.47)	(11.21)	(21.00)	(20.34)
RET^2_{t-2}	4.762***	6.234***	3.978***	4.157***	17.563***	2.296	3.534***	3.380***
	(8.40)	(6.65)	(7.11)	(4.60)	(5.41)	(0.70)	(6.37)	(3.76)
RET^2_{t-3}	4.922***	7.696***	3.959***	6.390***	7.776***	8.544***	3.978***	6.234***
	(8.39)	(8.15)	(6.66)	(6.87)	(2.79)	(2.95)	(6.69)	(6.75)
RET^2_{t-4}	5.339***	7.769***	4.418***	6.427***	7.005***	4.538	4.697***	6.602***
	(9.85)	(8.30)	(8.20)	(7.01)	(2.82)	(1.51)	(8.75)	(7.20)
RET^2_{t-5}	5.323***	7.481***	4.569***	6.741***	8.705***	4.778	4.649***	6.791***
	(9.33)	(7.49)	(7.93)	(6.81)	(3.52)	(1.62)	(8.13)	(6.89)
Adjusted R^2	0.054***	0.051***	0.052***	0.050***	0.087***	0.071***	0.051***	0.050***
	(48.11)	(39.37)	(46.38)	(39.28)	(59.07)	(48.46)	(45.20)	(38.92)
Observation	19,764,044	19,094,070	19,764,044	19,094,070	3,648,074	3,555,477	19,764,044	19,094,070

Panel B. Weekly-based regression

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	2.691***	2.659***	2.522***	2.539***	2.495***	2.322***	2.548***	2.561***
	(3.82)	(3.85)	(3.63)	(3.70)	(4.23)	(4.00)	(3.64)	(3.71)
OI_{t-1}	28.597***	17.087***	0.112***	0.010	-0.003**	0.006***	0.004**	-0.006***
	(15.02)	(13.68)	(5.68)	(0.81)	(-2.23)	(4.15)	(2.25)	(-3.50)
OI_{t-2}	10.262***	9.895***	0.036***	0.037***	0.002	0.002**	0.001	0.001
	(7.57)	(7.31)	(3.56)	(3.71)	(1.57)	(2.03)	(0.46)	(0.50)
OI_{t-3}	6.816***	7.453***	0.024**	0.031***	0.001	0.001	0.000	0.001
	(6.27)	(6.83)	(2.24)	(2.97)	(1.29)	(1.28)	(0.03)	(0.44)
OI_{t-4}	3.563***	3.520***	0.010	0.013	-0.000	0.000	-0.001	-0.001
	(3.78)	(3.79)	(1.03)	(1.41)	(-0.29)	(0.22)	(-0.84)	(-0.62)
$HFOI_{t-1}$	-0.205	-0.163	0.096	0.029	0.284*	0.149	0.141	0.049
	(-1.57)	(-1.35)	(0.70)	(0.24)	(1.74)	(1.06)	(0.99)	(0.39)
$HFOI_{t-2}$	-0.357***	-0.328***	-0.311***	-0.274**	-0.401***	-0.336**	-0.289***	-0.244**
	(-3.21)	(-2.97)	(-2.85)	(-2.52)	(-2.88)	(-2.41)	(-2.64)	(-2.24)

(Continued)

Panel B in Table III – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$HFOI_{t-3}$	-0.263**	-0.250**	-0.215**	-0.186*	-0.291**	-0.260**	-0.204*	-0.169
	(-2.38)	(-2.25)	(-1.97)	(-1.69)	(-2.27)	(-2.02)	(-1.86)	(-1.52)
$HFOI_{t-4}$	-0.313***	-0.312***	-0.294***	-0.282**	-0.305**	-0.297**	-0.273**	-0.255**
	(-2.80)	(-2.81)	(-2.60)	(-2.50)	(-2.50)	(-2.43)	(-2.39)	(-2.25)
$BASPRD_{t-1}$	6.218	0.932	8.714	2.838			9.366	3.538
	(0.79)	(0.12)	(1.13)	(0.36)			(1.18)	(0.44)
$HLSPRD_{t-1}$					10.039	14.293*		
					(1.36)	(1.94)		
$TURN_{t-1}$	0.109	0.132*	0.290***	0.276***	0.317***	0.294***	0.317***	0.291***
	(1.56)	(1.83)	(3.59)	(3.46)	(3.24)	(3.09)	(3.77)	(3.54)
RET_{t-1}	-72.746***	-47.138***	-57.092***	-32.929***	-54.879***	-32.735***	-50.334***	-31.301***
	(-22.29)	(-18.65)	(-17.70)	(-13.26)	(-17.54)	(-13.00)	(-17.65)	(-13.49)
RET_{t-2}	-21.703***	-19.855***	-16.164***	-14.908***	-15.060***	-13.355***	-13.280***	-12.110***
	(-8.74)	(-7.91)	(-7.41)	(-6.72)	(-6.69)	(-5.91)	(-6.31)	(-5.67)
RET_{t-3}	-14.036***	-14.226***	-9.744***	-9.989***	-10.190***	-10.104***	-7.968***	-7.884***
	(-6.36)	(-6.34)	(-5.01)	(-5.07)	(-5.06)	(-4.95)	(-4.12)	(-4.03)
RET_{t-4}	-5.964***	-5.819***	-4.509***	-4.356***	-3.599**	-3.523**	-3.319*	-3.225*
	(-3.34)	(-3.23)	(-2.69)	(-2.58)	(-2.03)	(-2.00)	(-1.91)	(-1.85)
RET^2_{t-1}	23.738***	19.461***	28.872***	22.286***	38.496***	29.684***	25.766***	20.191***
	(3.77)	(3.11)	(4.59)	(3.58)	(3.88)	(2.92)	(4.15)	(3.27)
RET^2_{t-2}	2.057	4.596	4.322	6.926	3.813	5.794	3.328	5.931
	(0.31)	(0.68)	(0.65)	(1.04)	(0.53)	(0.81)	(0.51)	(0.89)
RET^2_{t-3}	7.943	9.673	9.884	11.799*	4.666	9.085	10.015	11.800*
	(1.29)	(1.55)	(1.61)	(1.91)	(0.67)	(1.24)	(1.62)	(1.89)
RET^2_{t-4}	9.825***	10.106***	10.562***	10.644***	6.764*	6.989*	10.710***	10.786***
	(2.64)	(2.74)	(2.86)	(2.91)	(1.78)	(1.81)	(2.87)	(2.92)
Adjusted R^2	0.044***	0.043***	0.043***	0.042***	0.039***	0.039***	0.042***	0.041***
	(20.70)	(19.63)	(20.19)	(19.35)	(19.58)	(18.71)	(19.90)	(19.13)
Observation	4,226,990	4,226,990	4,226,990	4,226,990	2,885,128	2,885,128	4,226,990	4,226,990

Table IV
Return predictability in size subsamples

This table presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four different LFOIs within each size subsample,

$$R_{i,t} = \alpha_t + \beta_t^1 OI_{i,t-1} + \beta_t^2 OI_{i,t-2} + \beta_t^3 OI_{i,t-3} + \beta_t^4 OI_{i,t-4} + \beta_t^5 OI_{i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw or mid-quote return of stock i on day t, mid-quote return is calculated close bid and offer price at a given day, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We separate whole sample dataset into five subsamples based on market capitalization. In this table, we report Fama-MacBeth coefficients in three subsample regression. Panel A is for the smallest-size stocks, Panel B is for middle-sized stocks, and Panel C is for the largest-size stocks. The first row shows which LFOI is utilized in the above Fama-MacBeth regression model, and the second row explains which return we employ in the regression model. We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). High frequency order imbalance ($HFOI$) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. RET is daily stock return, and RET^2 is daily squared stock return. In parentheses, we report t-statistics of the average coefficient over sample period based on New-West (1987) standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent lavel, respectively.

Panel A. Small-sized stock								
	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	-0.015	0.016	0.010	0.041***	0.027***	0.007	-0.020	0.019
	(-0.92)	(1.15)	(0.69)	(3.18)	(2.79)	(0.89)	(-1.27)	(1.43)
OI_{t-1}	13.667***	4.505***	0.140***	0.078***	0.024***	0.053***	0.155***	0.037***
	(32.67)	(26.93)	(16.79)	(17.73)	(11.19)	(34.03)	(19.04)	(12.84)
OI_{t-2}	0.105	-1.461***	0.028***	0.025***	0.004**	0.019***	-0.001	-0.018***
	(0.65)	(-11.09)	(11.48)	(12.99)	(2.08)	(13.89)	(-0.33)	(-8.10)
OI_{t-3}	-0.828***	-0.627***	-0.005***	0.012***	-0.003	0.008***	-0.011***	-0.004**
	(-6.11)	(-5.71)	(-3.15)	(8.95)	(-1.52)	(6.14)	(-4.42)	(-2.10)

(Continued)

Panel A in Table IV – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
OI_{t-4}	-0.485***	0.093	-0.012***	0.006***	-0.005***	0.006***	-0.006***	0.001
	(-3.93)	(0.95)	(-6.52)	(5.34)	(-2.67)	(5.47)	(-2.62)	(0.53)
OI_{t-5}	-0.323***	0.243**	-0.014***	0.003***	-0.002	0.004***	-0.005***	0.002
	(-2.68)	(2.47)	(-7.46)	(3.26)	(-1.05)	(4.09)	(-2.67)	(1.47)
$HFOI_{t-1}$	0.117***	0.206***	0.273***	0.233***	0.309***	0.329***	0.270***	0.261***
	(6.01)	(15.33)	(12.35)	(19.55)	(8.65)	(14.34)	(12.30)	(20.17)
$HFOI_{t-2}$	-0.060***	-0.059***	-0.074***	-0.081***	-0.028	-0.005	-0.061***	-0.076***
	(-5.44)	(-6.66)	(-6.48)	(-9.02)	(-1.17)	(-0.24)	(-5.38)	(-8.35)
$HFOI_{t-3}$	-0.058***	-0.047***	-0.082***	-0.056***	-0.083***	-0.065***	-0.076***	-0.055***
	(-5.67)	(-5.58)	(-8.03)	(-6.76)	(-2.95)	(-2.94)	(-7.38)	(-6.53)
$HFOI_{t-4}$	-0.048***	-0.032***	-0.052***	-0.028***	-0.096***	-0.072***	-0.051***	-0.026***
	(-4.76)	(-3.87)	(-5.28)	(-3.45)	(-4.17)	(-3.57)	(-5.14)	(-3.21)
$HFOI_{t-5}$	-0.057***	-0.037***	-0.059***	-0.034***	-0.039*	-0.043**	-0.058***	-0.033***
	(-5.61)	(-4.37)	(-5.82)	(-3.99)	(-1.70)	(-2.20)	(-5.75)	(-3.89)
$BASPRD_{t-1}$	4.850***	1.185***	3.787***	0.168			4.755***	1.028***
	(12.86)	(3.61)	(10.93)	(0.53)			(12.77)	(3.11)
$HLSPRD_{t-1}$					-0.069	0.501***		
					(-0.27)	(2.60)		
$TURN_{t-1}$	0.097***	0.095***	0.137***	0.081***	0.235***	0.170***	0.178***	0.122***
	(12.07)	(12.52)	(14.19)	(11.38)	(12.78)	(11.95)	(17.87)	(15.59)
RET_{t-1}	-14.571***	-2.982***	-14.316***	-3.963***	-21.982***	-7.640***	-10.797***	-1.281***
	(-42.14)	(-12.87)	(-35.95)	(-21.80)	(-49.27)	(-19.37)	(-35.60)	(-6.66)
RET_{t-2}	-2.871***	-0.823***	-3.290***	-2.216***	-7.654***	-2.629***	-2.467***	-1.121***
	(-21.12)	(-7.77)	(-24.11)	(-21.94)	(-23.88)	(-11.13)	(-21.73)	(-12.31)
RET_{t-3}	-0.918***	-0.948***	-1.016***	-1.587***	-2.042***	-0.846***	-1.054***	-1.158***
	(-9.12)	(-9.89)	(-9.66)	(-16.69)	(-8.26)	(-3.87)	(-11.96)	(-13.31)
RET_{t-4}	-0.444***	-0.942***	-0.233**	-1.029***	0.183	-0.412**	-0.577***	-0.890***
	(-4.48)	(-10.17)	(-2.29)	(-11.56)	(0.74)	(-2.08)	(-6.63)	(-10.57)
RET_{t-5}	-0.309***	-0.820***	-0.078	-0.795***	0.357*	-0.295	-0.402***	-0.752***
	(-3.30)	(-9.51)	(-0.78)	(-9.47)	(1.71)	(-1.64)	(-4.79)	(-9.34)

(Continued)

Panel A in Table IV – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-1}	27.149***	29.778***	32.948***	37.468***	71.510***	52.591***	28.833***	32.008***
	(23.28)	(21.52)	(25.70)	(25.76)	(17.16)	(11.35)	(23.36)	(22.21)
RET^2_{t-2}	6.494***	7.013***	5.777***	5.061***	21.848***	4.256	4.694***	2.896***
	(8.27)	(6.14)	(7.41)	(4.62)	(5.43)	(0.98)	(6.05)	(2.64)
RET^2_{t-3}	5.820***	8.072***	5.136***	7.009***	10.686***	10.312**	4.886***	6.280***
	(7.81)	(7.33)	(6.83)	(6.49)	(2.96)	(2.49)	(6.52)	(5.76)
RET^2_{t-3}	5.820***	8.072***	5.136***	7.009***	10.686***	10.312**	4.886***	6.280***
	(7.81)	(7.33)	(6.83)	(6.49)	(2.96)	(2.49)	(6.52)	(5.76)
RET^2_{t-4}	6.233***	8.401***	5.321***	7.666***	8.241**	3.930	5.495***	7.149***
	(8.78)	(8.03)	(7.69)	(7.56)	(2.48)	(1.05)	(7.84)	(7.00)
RET^2_{t-5}	5.541***	7.552***	4.915***	7.425***	7.285**	2.907	4.964***	7.011***
	(7.72)	(6.98)	(6.82)	(6.97)	(2.46)	(0.83)	(7.00)	(6.55)
Adjusted R^2	0.062***	0.051***	0.059***	0.050***	0.100***	0.081***	0.059***	0.050***
	(51.68)	(41.73)	(49.85)	(41.50)	(61.59)	(47.53)	(49.34)	(41.57)
Observation	10,451,530	10,159,598	10,451,530	10,159,598	2,663,946	2,611,219	10,451,530	10,159,598

Panel B. Middle-sized stock

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	0.019	0.009	0.042***	0.031**	0.040**	0.029	0.002	-0.010
	(1.33)	(0.63)	(3.08)	(2.31)	(2.00)	(1.52)	(0.11)	(-0.73)
OI_{t-1}	2.086***	1.696***	0.028***	0.052***	0.016**	0.024***	0.009***	0.010***
	(8.80)	(7.65)	(10.42)	(13.75)	(2.49)	(3.80)	(11.01)	(12.19)
OI_{t-2}	-0.464**	-0.571***	0.005**	0.007***	0.002	0.010*	0.000	-0.000
	(-2.21)	(-2.88)	(2.57)	(4.66)	(0.32)	(1.73)	(0.21)	(-0.67)
OI_{t-3}	0.168	0.017	-0.004**	-0.003**	0.010*	0.008	-0.001	-0.001
	(0.85)	(0.10)	(-2.54)	(-1.97)	(1.69)	(1.58)	(-0.90)	(-1.08)
OI_{t-4}	0.431**	0.414**	-0.001	-0.001	-0.005	-0.003	0.001	0.001
	(2.32)	(2.45)	(-0.90)	(-0.90)	(-0.86)	(-0.52)	(1.45)	(1.54)
OI_{t-5}	0.534***	0.475***	-0.004**	-0.002	-0.004	-0.007	0.001	0.001
	(3.09)	(2.76)	(-2.33)	(-1.64)	(-0.76)	(-1.33)	(1.36)	(0.98)

(Continued)

Panel B in Table IV – *Continued*

	$TLFOI$		$BALFOI$		$HLLFOI$		PS	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$HFOI_{t-1}$	-0.004	-0.013	-0.003	-0.028	0.419***	0.252***	-0.001	-0.026
	(-0.25)	(-0.76)	(-0.18)	(-1.42)	(5.43)	(3.45)	(-0.07)	(-1.50)
$HFOI_{t-2}$	-0.054***	-0.056***	-0.062***	-0.067***	-0.079	-0.049	-0.045***	-0.042***
	(-3.21)	(-3.93)	(-3.61)	(-4.54)	(-1.12)	(-0.66)	(-3.07)	(-2.70)
$HFOI_{t-3}$	-0.041***	-0.046***	-0.032**	-0.041**	-0.129*	-0.214***	-0.015	-0.021
	(-2.86)	(-2.89)	(-2.16)	(-2.45)	(-1.83)	(-3.01)	(-1.05)	(-1.45)
$HFOI_{t-4}$	-0.067***	-0.061***	-0.072***	-0.062***	-0.155**	-0.184**	-0.058***	-0.054***
	(-4.84)	(-4.32)	(-4.57)	(-4.41)	(-2.24)	(-2.54)	(-3.78)	(-3.31)
$HFOI_{t-5}$	-0.035**	-0.039***	-0.013	-0.032**	0.106	0.119	-0.014	-0.012
	(-2.29)	(-2.69)	(-0.70)	(-2.38)	(1.44)	(1.64)	(-0.93)	(-0.88)
$BASPRD_{t-1}$	9.176***	8.670***	6.044***	6.581***			7.635***	7.718***
	(6.69)	(7.05)	(4.18)	(5.15)			(5.54)	(6.24)
$HLSPRD_{t-1}$					0.213	1.463		
					(0.17)	(1.28)		
$TURN_{t-1}$	0.078***	0.079***	0.072***	0.074***	0.093***	0.076**	0.192***	0.187***
	(9.47)	(9.15)	(9.76)	(9.57)	(2.76)	(2.37)	(19.51)	(19.48)
RET_{t-1}	-1.681***	0.123	-1.948***	-1.533***	-7.221***	-0.537	-1.565***	-0.139
	(-6.65)	(0.47)	(-7.84)	(-6.59)	(-5.88)	(-0.45)	(-7.11)	(-0.66)
RET_{t-2}	-1.010***	-1.058***	-1.367***	-1.697***	-1.870	0.060	-1.110***	-1.263***
	(-4.69)	(-4.97)	(-6.22)	(-7.81)	(-1.64)	(0.05)	(-5.75)	(-6.46)
RET_{t-3}	-0.858***	-0.803***	-0.638***	-0.680***	-0.322	1.600	-0.763***	-0.691***
	(-4.22)	(-4.14)	(-3.20)	(-3.64)	(-0.26)	(1.45)	(-4.43)	(-3.97)
RET_{t-4}	-1.145***	-1.113***	-0.443**	-0.503***	-0.806	-2.542**	-0.863***	-0.882***
	(-6.06)	(-5.94)	(-2.33)	(-2.75)	(-0.75)	(-2.34)	(-4.90)	(-5.19)
RET_{t-5}	-0.842***	-0.776***	-0.193	-0.251	0.868	0.777	-0.794***	-0.692***
	(-4.30)	(-4.17)	(-0.93)	(-1.28)	(0.94)	(0.81)	(-4.53)	(-3.46)
RET_{t-1}^2	7.570***	4.305	11.476***	7.573**	99.770***	64.186*	-3.871	-10.803***
	(2.62)	(1.29)	(3.82)	(2.26)	(2.82)	(1.78)	(-1.27)	(-2.96)
RET_{t-2}^2	8.439***	6.995**	5.991**	6.876**	-7.479	-20.801	1.538	-1.081
	(2.83)	(2.43)	(2.02)	(2.05)	(-0.20)	(-0.51)	(0.57)	(-0.39)
RET_{t-3}^2	9.255***	8.990***	6.388**	9.253***	32.136	83.837**	4.860*	7.623***
	(2.94)	(3.24)	(2.50)	(3.28)	(0.92)	(2.20)	(1.92)	(2.69)

(Continued)

Panel B in Table IV – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-4}	6.486***	9.683***	6.134**	10.405***	34.631	-18.159	6.252**	10.440***
	(2.64)	(3.19)	(2.52)	(3.69)	(1.10)	(-0.56)	(2.49)	(3.54)
RET^2_{t-5}	7.619***	11.286***	7.511***	10.382***	-44.797	-25.638	8.317***	11.156***
	(2.90)	(4.04)	(3.12)	(3.72)	(-1.45)	(-0.76)	(3.42)	(3.96)
Adjusted R^2	0.097***	0.097***	0.090***	0.090***	0.212***	0.223***	0.093***	0.093***
	(41.46)	(45.73)	(38.74)	(42.43)	(43.58)	(44.55)	(41.77)	(45.99)
Observation	2,321,096	2,230,617	2,321,096	2,230,617	234,956	225,572	2,321,096	2,230,617

Panel C. Large-sized stock

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	0.022*	0.016	0.032**	0.020	0.048	0.038	0.049***	0.039***
	(1.68)	(1.27)	(2.53)	(1.59)	(1.53)	(1.04)	(3.21)	(2.78)
OI_{t-1}	2.912***	3.578***	0.006***	0.018***	0.008	0.026**	0.002***	0.003***
	(4.55)	(6.35)	(3.99)	(10.48)	(0.76)	(2.48)	(7.08)	(11.84)
OI_{t-2}	0.849	0.443	-0.006***	-0.004***	0.007	-0.003	-0.001***	-0.001***
	(1.64)	(1.15)	(-4.11)	(-3.48)	(0.82)	(-0.35)	(-3.56)	(-3.04)
OI_{t-3}	0.853**	0.871***	-0.005***	-0.004***	-0.013	-0.010	-0.001***	-0.001***
	(2.11)	(2.66)	(-3.54)	(-2.64)	(-1.47)	(-1.02)	(-4.74)	(-4.39)
OI_{t-4}	0.784**	0.808***	-0.003**	-0.004***	-0.009	-0.003	-0.001***	-0.001***
	(2.31)	(2.84)	(-2.28)	(-3.54)	(-1.03)	(-0.33)	(-2.95)	(-3.02)
OI_{t-5}	0.697**	0.450*	-0.003**	-0.003**	-0.002	-0.013	-0.000	-0.000**
	(2.14)	(1.67)	(-2.09)	(-2.49)	(-0.19)	(-1.43)	(-1.48)	(-2.06)
$HFOI_{t-1}$	0.017	0.039	0.061	0.037	0.470***	0.332	0.062	0.052
	(0.43)	(1.07)	(1.64)	(0.72)	(2.58)	(1.58)	(1.59)	(1.57)
$HFOI_{t-2}$	-0.068**	-0.083***	-0.084**	-0.092**	-0.333*	-0.304	-0.030	-0.092***
	(-2.13)	(-3.24)	(-2.25)	(-2.57)	(-1.78)	(-1.53)	(-1.02)	(-2.81)
$HFOI_{t-3}$	0.006	0.014	0.010	0.001	0.110	0.026	-0.006	0.012
	(0.23)	(0.48)	(0.38)	(0.04)	(0.58)	(0.14)	(-0.20)	(0.47)
$HFOI_{t-4}$	-0.001	-0.028	-0.002	0.000	-0.097	-0.198	0.007	-0.002
	(-0.01)	(-0.90)	(-0.06)	(0.00)	(-0.57)	(-1.14)	(0.24)	(-0.08)

(Continued)

Panel C in Table IV – *Continued*

	$TLFOI$		$BALFOI$		$HLLFOI$		PS	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$HFOI_{t-5}$	0.011	-0.004	0.030	0.016	-0.098	0.115	-0.031	0.015
	(0.34)	(-0.10)	(0.80)	(0.38)	(-0.55)	(0.65)	(-0.91)	(0.32)
$BASPRD_{t-1}$	12.549***	12.111***	12.857***	13.679***			11.260***	11.469***
	(3.60)	(3.53)	(3.06)	(3.31)			(3.20)	(3.30)
$HLSPRD_{t-1}$					-0.469	-1.247		
					(-0.23)	(-0.56)		
$TURN_{t-1}$	0.112***	0.102***	0.088***	0.091***	0.068	0.078	0.090***	0.101***
	(7.78)	(8.37)	(7.99)	(7.22)	(1.02)	(1.11)	(7.72)	(6.96)
RET_{t-1}	-2.352***	-2.348***	-1.381***	-2.024***	-3.066	-6.380***	-1.591***	-1.749***
	(-7.44)	(-7.15)	(-4.86)	(-6.70)	(-1.42)	(-2.78)	(-6.37)	(-6.87)
RET_{t-2}	-2.391***	-2.368***	-1.221***	-1.344***	-8.650***	-8.236***	-1.571***	-1.714***
	(-7.76)	(-8.10)	(-4.77)	(-5.29)	(-4.08)	(-3.47)	(-5.99)	(-6.81)
RET_{t-3}	-1.682***	-1.709***	-0.306	-0.458*	-1.625	0.307	-0.682***	-0.866***
	(-6.69)	(-6.58)	(-1.18)	(-1.75)	(-0.73)	(0.13)	(-3.00)	(-3.65)
RET_{t-4}	-1.499***	-1.587***	-0.336	-0.207	2.444	3.746*	-0.469*	-0.549**
	(-6.28)	(-6.76)	(-1.32)	(-0.85)	(1.17)	(1.65)	(-1.92)	(-2.47)
RET_{t-5}	-1.232***	-1.153***	-0.643***	-0.604**	1.219	1.534	-0.892***	-0.798***
	(-4.87)	(-5.04)	(-2.59)	(-2.53)	(0.67)	(0.76)	(-4.13)	(-3.77)
RET^2_{t-1}	-19.316***	-23.499***	-15.024***	-20.935***	-48.252	-40.041	-15.064***	-22.866***
	(-3.77)	(-4.03)	(-3.00)	(-4.03)	(-0.52)	(-0.40)	(-2.87)	(-4.18)
RET^2_{t-2}	0.935	1.825	-3.858	-1.713	74.489	92.424	-5.129	-5.480
	(0.18)	(0.37)	(-0.88)	(-0.35)	(0.78)	(0.84)	(-1.08)	(-1.17)
RET^2_{t-3}	3.196	2.740	5.591	4.231	23.589	-0.783	3.793	2.811
	(0.65)	(0.58)	(1.31)	(0.91)	(0.29)	(-0.01)	(0.87)	(0.60)
RET^2_{t-4}	-0.484	0.596	-3.069	0.829	-99.758	-215.21**	-1.433	1.360
	(-0.10)	(0.13)	(-0.73)	(0.19)	(-1.20)	(-2.26)	(-0.33)	(0.28)
RET^2_{t-5}	0.596	-1.503	0.937	-1.916	-25.707	57.691	-0.769	-6.946
	(0.13)	(-0.32)	(0.20)	(-0.42)	(-0.35)	(0.71)	(-0.17)	(-1.46)
Adjusted R^2	0.145***	0.147***	0.133***	0.136***	0.251***	0.242***	0.130***	0.133***
	(53.28)	(53.02)	(50.11)	(49.54)	(32.06)	(27.92)	(50.72)	(50.50)
Observation	1,704,521	1,627,215	1,704,521	1,627,215	136,527	129,916	1,704,521	1,627,215

Table V
Return predictability in liquidity subsamples

This table presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four different LFOIs within each liquidity subsample,

$$R_{i,t} = \alpha_t + \beta_t^1 OI_{i,t-1} + \beta_t^2 OI_{i,t-2} + \beta_t^3 OI_{i,t-3} + \beta_t^4 OI_{i,t-4} + \beta_t^5 OI_{i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw or mid-quote return of stock i on day t, mid-quote return is calculated close bid and offer price at a given day, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We separate whole sample dataset into five subsamples based on relative bid-ask spread ($BASPRD$). In this table, we report Fama-MacBeth coefficients in three subsample regression. Panel A is for stocks with the narrowest $BASPRD$, Panel B is for stocks with medium $BASPRD$, and Panel C is for stocks with the widest $BASPRD$. The first row shows which LFOI is utilized in the above Fama-MacBeth regression model, and the second row explains which return we employ in the regression model. We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). High frequency order imbalance ($HFOI$) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. RET is daily stock return, and RET^2 is daily squared stock return. In parentheses, we report t-statistics of the average coefficient over sample period based on New-West (1987) standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent lavel, respectively.

Panel A. Liquid stock								
	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	-0.020*	-0.014	0.002	0.008	0.007	-0.004	-0.000	0.006
	(-1.70)	(-1.23)	(0.16)	(0.67)	(0.55)	(-0.33)	(-0.03)	(0.54)
OI_{t-1}	1.264***	0.901***	0.008***	0.022***	0.001	0.018***	-0.001***	-0.001***
	(6.94)	(5.40)	(5.34)	(12.59)	(0.17)	(4.84)	(-3.71)	(-3.96)
OI_{t-2}	-1.066***	-0.945***	-0.002*	-0.001	-0.003	0.001	-0.002***	-0.002***
	(-6.38)	(-6.30)	(-1.94)	(-1.56)	(-0.80)	(0.40)	(-8.01)	(-8.64)
OI_{t-3}	-0.381**	-0.238*	-0.004***	-0.003***	0.000	-0.002	-0.001***	-0.001***
	(-2.57)	(-1.66)	(-3.53)	(-3.12)	(0.01)	(-0.70)	(-6.08)	(-5.68)

(Continued)

Panel A in Table V – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
OI_{t-4}	0.431***	0.504***	-0.005***	-0.003***	-0.001	-0.002	-0.001***	-0.001***
	(3.02)	(3.73)	(-4.67)	(-3.70)	(-0.19)	(-0.47)	(-3.99)	(-3.46)
OI_{t-5}	0.234*	0.267**	-0.004***	-0.003***	-0.002	-0.001	-0.001***	-0.001***
	(1.67)	(2.09)	(-3.43)	(-3.23)	(-0.64)	(-0.31)	(-3.65)	(-3.51)
$HFOI_{t-1}$	0.036***	0.042***	0.046***	0.046***	0.105**	0.078*	0.043***	0.046***
	(2.72)	(3.45)	(3.47)	(3.78)	(2.18)	(1.73)	(3.19)	(3.67)
$HFOI_{t-2}$	-0.032***	-0.031***	-0.046***	-0.041***	-0.070	-0.053	-0.044***	-0.040***
	(-3.09)	(-3.23)	(-4.48)	(-4.33)	(-1.49)	(-1.15)	(-4.35)	(-4.26)
$HFOI_{t-3}$	-0.034***	-0.035***	-0.035***	-0.037***	-0.071	-0.075*	-0.035***	-0.035***
	(-3.17)	(-3.53)	(-3.31)	(-3.75)	(-1.50)	(-1.79)	(-3.29)	(-3.56)
$HFOI_{t-4}$	-0.038***	-0.040***	-0.034***	-0.035***	-0.058	-0.058	-0.032***	-0.035***
	(-3.62)	(-4.05)	(-3.27)	(-3.63)	(-1.32)	(-1.31)	(-3.13)	(-3.61)
$HFOI_{t-5}$	-0.032***	-0.026***	-0.029***	-0.023**	0.004	0.031	-0.027**	-0.019*
	(-3.02)	(-2.63)	(-2.75)	(-2.29)	(0.09)	(0.80)	(-2.55)	(-1.94)
$BASPRD_{t-1}$	19.560***	15.793***	14.989***	12.171***			16.751***	13.339***
	(7.21)	(6.86)	(5.09)	(4.93)			(6.57)	(6.29)
$HLSPRD_{t-1}$					4.456***	3.559***		
					(5.10)	(4.41)		
$TURN_{t-1}$	0.084***	0.083***	0.078***	0.075***	0.079***	0.076***	0.080***	0.078***
	(10.93)	(12.12)	(11.02)	(12.15)	(3.75)	(4.15)	(10.85)	(11.99)
RET_{t-1}	0.053	1.504***	0.496**	0.781***	-0.201	2.255***	1.228***	2.462***
	(0.22)	(6.41)	(2.36)	(4.18)	(-0.26)	(3.09)	(6.62)	(13.08)
RET_{t-2}	-0.489**	-0.629***	-0.875***	-0.946***	-0.378	-0.385	-0.795***	-0.803***
	(-2.53)	(-3.42)	(-4.81)	(-5.44)	(-0.46)	(-0.51)	(-5.15)	(-5.22)
RET_{t-3}	-0.521***	-0.811***	-0.483***	-0.624***	-0.495	-0.790	-0.603***	-0.730***
	(-2.97)	(-4.81)	(-2.75)	(-3.78)	(-0.62)	(-1.01)	(-4.12)	(-5.05)
RET_{t-4}	-1.131***	-1.209***	-0.381**	-0.478***	-0.510	-0.564	-0.720***	-0.757***
	(-6.64)	(-7.37)	(-2.25)	(-2.98)	(-0.63)	(-0.74)	(-5.06)	(-5.53)
RET_{t-5}	-0.564***	-0.714***	-0.183	-0.361**	0.837	0.852	-0.356***	-0.484***
	(-3.57)	(-4.69)	(-1.16)	(-2.42)	(1.13)	(1.26)	(-2.71)	(-3.75)
RET^2_{t-1}	4.331*	-1.213	4.892*	1.949	88.351***	57.345**	4.191	-1.087
	(1.65)	(-0.42)	(1.88)	(0.68)	(3.90)	(2.26)	(1.59)	(-0.38)

(Continued)

Panel A in Table V – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-2}	6.047***	5.218**	4.149**	2.001	-18.418	-28.181	3.670*	1.073
	(2.93)	(2.29)	(2.06)	(0.91)	(-0.73)	(-1.04)	(1.85)	(0.49)
RET^2_{t-3}	2.551	3.966*	1.382	3.056	27.221	46.278*	1.691	2.983
	(1.25)	(1.79)	(0.68)	(1.42)	(1.13)	(1.72)	(0.85)	(1.40)
RET^2_{t-4}	7.963***	8.997***	5.488***	6.406***	31.857	-1.175	5.942***	6.687***
	(3.76)	(4.02)	(2.75)	(3.04)	(1.33)	(-0.04)	(2.97)	(3.16)
RET^2_{t-5}	5.029**	6.503***	4.175**	5.845***	-3.788	-2.442	3.955**	5.429**
	(2.57)	(2.97)	(2.05)	(2.64)	(-0.19)	(-0.11)	(1.97)	(2.48)
Adjusted R^2	0.087***	0.088***	0.082***	0.083***	0.191***	0.199***	0.082***	0.083***
	(58.19)	(59.90)	(55.86)	(57.31)	(55.87)	(59.86)	(55.22)	(56.72)
Observation	3,980,381	3,836,380	3,980,381	3,836,380	421,272	406,482	3,980,381	3,836,380

Panel B. Less liquid stock

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	-0.075***	-0.058***	-0.051***	-0.033**	0.006	0.000	-0.064***	-0.042***
	(-5.12)	(-4.32)	(-3.57)	(-2.44)	(0.42)	(0.02)	(-4.38)	(-3.10)
OI_{t-1}	4.297***	1.418***	0.029***	0.061***	0.006	0.033***	0.010***	-0.000
	(15.11)	(7.98)	(9.49)	(14.46)	(1.62)	(9.85)	(9.59)	(-0.31)
OI_{t-2}	-1.418***	-1.439***	0.000	0.017***	0.005	0.016***	-0.004***	-0.004***
	(-8.07)	(-9.30)	(0.19)	(8.09)	(1.40)	(5.15)	(-6.42)	(-7.16)
OI_{t-3}	-0.444***	-0.438***	-0.003*	0.007***	0.008**	0.013***	-0.002***	-0.001***
	(-2.74)	(-3.25)	(-1.65)	(4.30)	(2.27)	(4.20)	(-3.66)	(-2.86)
OI_{t-4}	0.061	0.066	-0.005***	0.002	-0.003	0.001	-0.001*	-0.001
	(0.43)	(0.50)	(-2.78)	(1.13)	(-0.81)	(0.42)	(-1.92)	(-1.53)
OI_{t-5}	0.101	0.213	-0.007***	-0.002	-0.003	-0.001	-0.000	-0.000
	(0.70)	(1.62)	(-3.55)	(-1.37)	(-0.82)	(-0.55)	(-0.55)	(-0.48)
$HFOI_{t-1}$	0.098***	0.116***	0.142***	0.110***	0.200***	0.201***	0.142***	0.127***
	(5.65)	(7.71)	(7.51)	(7.53)	(4.37)	(4.98)	(7.59)	(8.33)
$HFOI_{t-2}$	-0.034***	-0.035***	-0.052***	-0.049***	-0.055	0.018	-0.052***	-0.051***
	(-2.74)	(-3.24)	(-4.08)	(-4.50)	(-1.34)	(0.44)	(-4.06)	(-4.72)

(Continued)

Panel B in Table V – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$HFOI_{t-3}$	-0.026**	-0.031***	-0.035***	-0.035***	-0.041	-0.040	-0.032***	-0.034***
	(-2.21)	(-2.89)	(-2.93)	(-3.37)	(-1.02)	(-1.11)	(-2.73)	(-3.25)
$HFOI_{t-4}$	-0.023*	-0.005	-0.024**	-0.004	-0.043	-0.036	-0.020*	-0.001
	(-1.92)	(-0.48)	(-1.98)	(-0.35)	(-1.14)	(-0.99)	(-1.66)	(-0.13)
$HFOI_{t-5}$	-0.053***	-0.041***	-0.048***	-0.036***	-0.086*	-0.038	-0.045***	-0.033***
	(-4.54)	(-3.85)	(-4.16)	(-3.37)	(-1.94)	(-0.99)	(-3.87)	(-3.10)
$BASPRD_{t-1}$	17.469***	11.982***	15.266***	10.232***			16.805***	11.441***
	(14.62)	(13.38)	(12.88)	(11.52)			(14.11)	(12.84)
$HLSPRD_{t-1}$					2.625***	2.762***		
					(3.81)	(4.71)		
$TURN_{t-1}$	0.090***	0.097***	0.091***	0.075***	0.170***	0.160***	0.097***	0.088***
	(11.03)	(12.82)	(11.48)	(11.20)	(7.42)	(7.78)	(11.98)	(12.41)
RET_{t-1}	-4.266***	0.552***	-3.419***	-0.708***	-6.865***	0.912	-2.371***	1.599***
	(-16.42)	(2.71)	(-13.03)	(-3.84)	(-9.20)	(1.50)	(-11.73)	(9.66)
RET_{t-2}	-0.400**	-0.210	-0.900***	-1.397***	-2.795***	-0.728	-0.785***	-0.724***
	(-2.55)	(-1.45)	(-5.10)	(-8.55)	(-4.35)	(-1.22)	(-5.99)	(-5.80)
RET_{t-3}	-0.524***	-0.518***	-0.584***	-0.923***	-1.114*	-0.261	-0.714***	-0.765***
	(-3.55)	(-3.63)	(-3.67)	(-6.31)	(-1.87)	(-0.48)	(-5.93)	(-6.37)
RET_{t-4}	-0.874***	-0.900***	-0.439***	-0.727***	0.103	-0.265	-0.729***	-0.793***
	(-6.45)	(-6.77)	(-2.85)	(-5.18)	(0.18)	(-0.50)	(-6.35)	(-6.99)
RET_{t-5}	-0.686***	-0.795***	-0.422***	-0.555***	0.809	0.885*	-0.618***	-0.652***
	(-4.66)	(-6.02)	(-2.63)	(-4.31)	(1.49)	(1.96)	(-5.29)	(-6.01)
RET^2_{t-1}	18.717***	15.834***	22.075***	20.404***	47.721***	30.729**	20.176***	16.413***
	(9.92)	(7.33)	(11.37)	(9.16)	(2.91)	(1.99)	(10.55)	(7.52)
RET^2_{t-2}	8.013***	6.035***	6.260***	4.707***	4.870	3.706	5.541***	2.441
	(5.41)	(3.31)	(4.42)	(2.64)	(0.29)	(0.22)	(3.96)	(1.38)
RET^2_{t-3}	6.342***	7.147***	5.462***	6.360***	4.505	0.624	5.053***	5.261***
	(4.75)	(4.31)	(4.16)	(3.95)	(0.30)	(0.04)	(3.90)	(3.28)
RET^2_{t-4}	4.623***	8.498***	2.983**	5.970***	1.999	-4.174	2.910**	5.993***
	(3.73)	(5.37)	(2.36)	(3.83)	(0.13)	(-0.27)	(2.35)	(3.85)

(Continued)

Panel B in Table V – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-5}	3.837***	5.054***	3.440***	4.140***	15.006	-7.655	2.891**	3.958**
	(2.96)	(3.09)	(2.72)	(2.63)	(1.10)	(-0.56)	(2.29)	(2.49)
Adjusted R^2	0.068***	0.065***	0.063***	0.061***	0.150***	0.157***	0.061***	0.060***
	(55.67)	(54.00)	(52.73)	(51.87)	(44.67)	(46.16)	(51.09)	(50.76)
Observation	3,973,614	3,842,685	3,973,614	3,842,685	670,844	654,390	3,973,614	3,842,685

Panel C. Illiquid stock

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	-0.141***	-0.043***	-0.114***	-0.023	0.015	-0.011	-0.142***	-0.040**
	(-6.66)	(-2.66)	(-6.02)	(-1.49)	(1.32)	(-1.25)	(-6.88)	(-2.49)
OI_{t-1}	21.866***	8.600***	0.231***	0.101***	0.023***	0.060***	0.190***	0.042***
	(41.18)	(27.99)	(15.33)	(16.82)	(7.66)	(26.78)	(14.44)	(12.76)
OI_{t-2}	2.842***	-1.204***	0.059***	0.043***	-0.001	0.024***	0.032***	-0.014***
	(8.97)	(-5.58)	(8.70)	(11.35)	(-0.23)	(12.29)	(6.27)	(-3.86)
OI_{t-3}	-0.559**	-0.580***	-0.015***	0.026***	-0.007**	0.011***	-0.006	-0.000
	(-2.30)	(-2.93)	(-2.63)	(8.32)	(-2.31)	(5.30)	(-1.38)	(-0.04)
OI_{t-4}	-0.903***	-0.044	-0.035***	0.016***	-0.006**	0.008***	-0.015***	0.001
	(-3.55)	(-0.23)	(-6.11)	(5.95)	(-1.98)	(4.32)	(-3.81)	(0.28)
OI_{t-5}	-0.993***	0.093	-0.043***	0.008***	-0.001	0.008***	-0.022***	-0.004
	(-3.86)	(0.48)	(-7.74)	(4.19)	(-0.21)	(4.16)	(-4.49)	(-1.51)
$HFOI_{t-1}$	0.085**	0.376***	0.431***	0.473***	0.252***	0.590***	0.442***	0.522***
	(2.53)	(17.94)	(12.11)	(23.35)	(3.77)	(13.45)	(12.57)	(24.90)
$HFOI_{t-2}$	-0.015	-0.030*	0.003	-0.063***	-0.064	-0.022	-0.001	-0.073***
	(-0.60)	(-1.76)	(0.14)	(-3.67)	(-1.21)	(-0.52)	(-0.04)	(-4.28)
$HFOI_{t-3}$	-0.100***	-0.104***	-0.138***	-0.120***	-0.137**	-0.073	-0.138***	-0.120***
	(-4.72)	(-6.07)	(-6.57)	(-7.14)	(-2.19)	(-1.63)	(-6.57)	(-7.15)
$HFOI_{t-4}$	-0.086***	-0.074***	-0.101***	-0.073***	-0.203***	-0.140***	-0.113***	-0.076***
	(-3.74)	(-4.31)	(-4.54)	(-4.25)	(-4.12)	(-3.44)	(-5.03)	(-4.48)

(Continued)

Panel C in Table V – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$HFOI_{t-5}$	-0.061***	-0.059***	-0.086***	-0.064***	-0.094*	-0.057	-0.090***	-0.061***
	(-2.84)	(-3.58)	(-4.10)	(-3.89)	(-1.88)	(-1.40)	(-4.24)	(-3.70)
$BASPRD_{t-1}$	5.074***	1.108***	4.377***	0.473			5.012***	1.047***
	(13.07)	(3.56)	(12.37)	(1.60)			(13.12)	(3.38)
$HLSPRD_{t-1}$					-1.209***	0.038		
					(-3.70)	(0.15)		
$TURN_{t-1}$	0.145***	0.102***	0.197***	0.094***	0.353***	0.283***	0.223***	0.113***
	(10.52)	(9.14)	(12.95)	(8.67)	(9.95)	(9.98)	(14.27)	(10.14)
RET_{t-1}	-23.352***	-7.309***	-23.601***	-7.710***	-30.840***	-13.755***	-19.030***	-5.191***
	(-57.36)	(-23.78)	(-46.07)	(-29.40)	(-65.55)	(-26.32)	(-49.27)	(-19.48)
RET_{t-2}	-6.575***	-1.922***	-6.582***	-2.959***	-12.235***	-5.027***	-5.477***	-1.982***
	(-34.78)	(-14.51)	(-30.24)	(-24.44)	(-29.10)	(-15.41)	(-33.80)	(-16.69)
RET_{t-3}	-2.379***	-1.571***	-1.923***	-2.055***	-4.492***	-2.214***	-2.197***	-1.677***
	(-18.79)	(-13.08)	(-12.29)	(-17.01)	(-12.67)	(-7.19)	(-18.85)	(-14.96)
RET_{t-4}	-0.876***	-1.336***	-0.317**	-1.511***	-1.046***	-1.210***	-0.912***	-1.290***
	(-6.52)	(-11.33)	(-2.03)	(-12.92)	(-3.08)	(-4.56)	(-7.83)	(-12.04)
RET_{t-5}	-0.280**	-0.980***	0.296*	-1.007***	0.036	-0.463*	-0.376***	-0.922***
	(-2.21)	(-8.61)	(1.89)	(-8.95)	(0.13)	(-1.94)	(-3.42)	(-8.85)
RET^2_{t-1}	46.715***	38.567***	54.567***	45.925***	92.932***	67.709***	51.982***	45.126***
	(26.00)	(18.67)	(29.06)	(21.01)	(15.83)	(10.09)	(27.89)	(20.67)
RET^2_{t-2}	12.738***	8.201***	11.188***	4.842***	27.243***	10.509*	10.660***	4.317***
	(9.85)	(4.84)	(8.83)	(3.00)	(4.94)	(1.69)	(8.14)	(2.64)
RET^2_{t-3}	7.001***	4.325***	5.728***	2.438	4.450	-9.532	5.862***	2.375
	(5.58)	(2.68)	(4.69)	(1.55)	(0.80)	(-1.36)	(4.77)	(1.53)
RET^2_{t-4}	8.927***	7.094***	7.035***	6.007***	14.227***	2.587	7.428***	5.998***
	(7.44)	(4.49)	(5.86)	(3.95)	(2.92)	(0.44)	(6.08)	(3.89)
RET^2_{t-5}	5.948***	5.239***	5.198***	4.809***	6.939*	2.798	5.132***	4.536***
	(5.33)	(3.50)	(4.76)	(3.29)	(1.68)	(0.54)	(4.70)	(3.08)
Adjusted R^2	0.102***	0.072***	0.095***	0.067***	0.154***	0.123***	0.092***	0.066***
	(67.02)	(57.50)	(64.61)	(55.58)	(80.95)	(61.39)	(60.20)	(53.82)
Observation	3,871,425	3,718,042	3,871,425	3,718,042	1,175,074	1,144,471	3,871,425	3,718,042

Table VI
Return predictability in different exchange markets

This table presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four different LFOIs within each exchange market subsample,

$$R_{i,t} = \alpha_t + \beta_t^1 OI_{i,t-1} + \beta_t^2 OI_{i,t-2} + \beta_t^3 OI_{i,t-3} + \beta_t^4 OI_{i,t-4} + \beta_t^5 OI_{i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw or mid-quote return of stock i on day t, mid-quote return is calculated close bid and offer price at a given day, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We separate whole sample dataset into two subsamples based on an exchange market. Panel A is for NYSE and AMEX, and Panel B is for Nasdaq.The first row shows which LFOI is utilized in the above Fama-MacBeth regression model, and the second row explains which return we employ in the regression model. We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). High frequency order imbalance ($HFOI$) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. RET is daily stock return, and RET^2 is daily squared stock return. In parentheses, we report t-statistics of the average coefficient over sample period based on New-West (1987) standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent lavel, respectively.

Panel A. NYSE and AMEX								
	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	0.010	0.008	0.019	0.017	0.010	-0.000	0.020*	0.019
	(0.90)	(0.73)	(1.57)	(1.42)	(1.05)	(-0.03)	(1.66)	(1.57)
OI_{t-1}	2.106***	2.762***	0.011***	0.039***	0.014***	0.043***	0.001***	0.001
	(13.47)	(13.12)	(7.58)	(13.11)	(6.42)	(18.75)	(4.18)	(1.32)
OI_{t-2}	-0.871***	-1.540***	-0.003***	-0.003***	-0.001	0.005***	-0.002***	-0.001
	(-6.81)	(-2.87)	(-2.71)	(-3.08)	(-0.47)	(2.73)	(-8.98)	(-0.71)
OI_{t-3}	-0.150	0.091	-0.003***	-0.001	0.006**	0.001	-0.001***	0.000
	(-1.42)	(0.50)	(-2.62)	(-0.72)	(2.49)	(0.49)	(-5.06)	(0.02)

(Continued)

Panel A in Table VI – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
OI_{t-4}	0.277**	0.152	-0.003***	-0.003**	-0.002	-0.003	-0.000***	0.003
	(2.51)	(1.03)	(-2.98)	(-2.28)	(-1.11)	(-1.34)	(-2.63)	(0.84)
OI_{t-5}	0.387***	0.511***	-0.003***	-0.001	-0.001	-0.001	-0.001***	-0.003
	(3.49)	(3.87)	(-3.16)	(-1.04)	(-0.42)	(-0.52)	(-3.23)	(-1.21)
$HFOI_{t-1}$	0.021**	0.046***	0.041***	0.074***	0.025	0.122***	0.041***	0.081***
	(1.96)	(3.61)	(3.87)	(5.78)	(0.51)	(4.01)	(3.70)	(5.67)
$HFOI_{t-2}$	-0.045***	-0.055***	-0.063***	-0.078***	-0.015	-0.016	-0.060***	-0.083***
	(-4.56)	(-5.01)	(-6.48)	(-5.95)	(-0.41)	(-0.57)	(-6.24)	(-5.94)
$HFOI_{t-3}$	-0.036***	-0.039***	-0.042***	-0.040***	-0.077**	-0.070**	-0.040***	-0.040***
	(-4.04)	(-4.01)	(-4.86)	(-4.13)	(-2.27)	(-2.48)	(-4.69)	(-3.83)
$HFOI_{t-4}$	-0.052***	-0.054***	-0.048***	-0.054***	-0.189**	-0.037	-0.046***	-0.054***
	(-5.55)	(-5.33)	(-5.14)	(-5.07)	(-2.05)	(-1.39)	(-4.89)	(-5.00)
$HFOI_{t-5}$	-0.021**	-0.011	-0.019**	-0.014	0.012	0.001	-0.015*	-0.005
	(-2.37)	(-0.96)	(-2.18)	(-1.53)	(0.26)	(0.05)	(-1.68)	(-0.50)
$BASPRD_{t-1}$	3.868***	2.245***	3.340***	1.777***			3.456***	1.886***
	(11.15)	(7.24)	(9.46)	(5.52)			(9.86)	(5.92)
$HLSPRD_{t-1}$					1.599***	1.040***		
					(3.73)	(2.65)		
$TURN_{t-1}$	0.089***	0.084***	0.087***	0.081***	0.136***	0.116***	0.088***	0.083***
	(14.35)	(13.77)	(14.59)	(13.55)	(7.47)	(9.19)	(14.65)	(13.14)
RET_{t-1}	-1.755***	-0.836***	-0.889***	-0.942***	-6.008***	-6.410***	-0.495***	0.555***
	(-9.85)	(-4.80)	(-5.60)	(-5.23)	(-13.76)	(-16.10)	(-3.55)	(3.98)
RET_{t-2}	-0.476***	-0.324**	-0.563***	-0.493***	-1.424***	-1.587***	-0.537***	-0.434***
	(-3.57)	(-2.31)	(-4.35)	(-3.62)	(-3.35)	(-4.03)	(-4.66)	(-3.71)
RET_{t-3}	-0.646***	-0.737***	-0.533***	-0.663***	-0.931**	-0.306	-0.540***	-0.580***
	(-5.11)	(-5.62)	(-4.15)	(-5.04)	(-2.18)	(-0.77)	(-4.81)	(-5.23)
RET_{t-4}	-0.783***	-0.801***	-0.363***	-0.404***	-0.263	-0.291	-0.545***	-0.591***
	(-6.51)	(-6.33)	(-3.05)	(-3.36)	(-0.67)	(-0.81)	(-5.05)	(-5.20)
RET_{t-5}	-0.562***	-0.665***	-0.178	-0.306***	0.365	0.041	-0.273***	-0.318***
	(-4.84)	(-5.70)	(-1.57)	(-2.65)	(1.02)	(0.13)	(-2.80)	(-3.22)

(Continued)

Panel A in Table VI – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-1}	14.074***	13.833***	15.747***	18.470***	68.645***	65.831***	14.963***	17.257***
	(8.48)	(7.13)	(9.43)	(9.22)	(6.59)	(7.34)	(9.16)	(8.76)
RET^2_{t-2}	4.257***	5.395***	2.941**	3.112*	4.450	-4.172	2.722**	2.279
	(3.56)	(3.04)	(2.54)	(1.69)	(0.47)	(-0.45)	(2.35)	(1.21)
RET^2_{t-3}	3.893***	4.003**	3.017**	3.364*	2.535	7.611	2.991**	3.181*
	(3.19)	(2.27)	(2.37)	(1.92)	(0.29)	(0.87)	(2.35)	(1.83)
RET^2_{t-4}	4.026***	5.236***	3.352***	3.721**	4.612	-0.210	3.473***	3.405**
	(3.53)	(3.46)	(2.99)	(2.58)	(0.51)	(-0.02)	(3.13)	(2.27)
RET^2_{t-5}	4.274***	4.419***	3.532***	3.931**	7.213	-6.405	3.647***	3.517**
	(4.16)	(2.72)	(3.39)	(2.42)	(0.86)	(-0.79)	(3.55)	(2.19)
Adjusted R^2	0.065***	0.064***	0.062***	0.062***	0.135***	0.134***	0.062***	0.063***
	(37.62)	(35.44)	(36.96)	(34.94)	(44.55)	(47.42)	(37.22)	(35.25)
Observation	8,371,990	8,037,054	8,371,990	8,037,054	863,950	817,573	8,371,990	8,037,054

Panel B. Nasdaq

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	0.025	0.046***	0.036**	0.065***	0.043***	0.022**	0.024	0.057***
	(1.39)	(2.94)	(2.16)	(4.30)	(3.80)	(2.44)	(1.38)	(3.68)
OI_{t-1}	11.859***	2.695***	0.103***	0.041***	0.025***	0.049***	0.033***	0.000
	(28.40)	(19.77)	(14.66)	(14.76)	(11.70)	(34.32)	(13.38)	(1.04)
OI_{t-2}	0.358***	-1.013***	0.010***	0.007***	0.005***	0.018***	-0.002***	-0.006***
	(2.97)	(-10.28)	(6.26)	(6.79)	(2.90)	(15.53)	(-4.69)	(-10.29)
OI_{t-3}	-0.516***	-0.312***	-0.010***	0.002***	-0.000	0.009***	-0.004***	-0.002***
	(-4.94)	(-3.84)	(-7.40)	(2.84)	(-0.27)	(8.14)	(-6.31)	(-4.41)
OI_{t-4}	-0.334***	0.176**	-0.014***	-0.001	-0.005***	0.006***	-0.003***	-0.002***
	(-3.57)	(2.49)	(-8.53)	(-0.84)	(-3.41)	(5.83)	(-6.45)	(-3.94)
OI_{t-5}	-0.248***	0.205***	-0.015***	-0.002***	-0.003**	0.003***	-0.003***	-0.001***
	(-2.62)	(2.86)	(-9.07)	(-3.15)	(-2.23)	(3.53)	(-5.87)	(-3.15)
$HFOI_{t-1}$	0.108***	0.153***	0.228***	0.165***	0.319***	0.281***	0.245***	0.182***
	(5.58)	(11.35)	(10.04)	(13.63)	(8.88)	(13.33)	(10.52)	(13.82)

(Continued)

Panel B in Table VI – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$HFOI_{t-2}$	-0.033***	-0.040***	-0.045***	-0.058***	-0.057**	-0.037*	-0.042***	-0.057***
	(-3.53)	(-5.61)	(-4.63)	(-7.88)	(-2.52)	(-1.95)	(-4.27)	(-7.81)
$HFOI_{t-3}$	-0.041***	-0.034***	-0.056***	-0.038***	-0.075***	-0.064***	-0.058***	-0.038***
	(-5.02)	(-4.99)	(-6.92)	(-5.58)	(-3.06)	(-3.37)	(-7.06)	(-5.55)
$HFOI_{t-4}$	-0.042***	-0.028***	-0.044***	-0.022***	-0.096***	-0.074***	-0.046***	-0.020***
	(-4.91)	(-3.84)	(-5.16)	(-3.08)	(-4.63)	(-4.21)	(-5.32)	(-2.86)
$HFOI_{t-5}$	-0.044***	-0.029***	-0.046***	-0.026***	-0.038*	-0.035*	-0.051***	-0.026***
	(-5.26)	(-4.07)	(-5.45)	(-3.56)	(-1.78)	(-1.93)	(-6.02)	(-3.61)
$BASPRD_{t-1}$	4.437***	0.602*	3.934***	-0.028			4.365***	0.346
	(10.93)	(1.70)	(10.23)	(-0.08)			(10.90)	(0.97)
$HLSPRD_{t-1}$					-0.405*	0.256		
					(-1.67)	(1.44)		
$TURN_{t-1}$	0.084***	0.088***	0.122***	0.074***	0.199***	0.144***	0.129***	0.081***
	(11.23)	(11.84)	(13.42)	(11.21)	(11.41)	(10.98)	(13.46)	(11.36)
RET_{t-1}	-14.413***	-2.540***	-13.070***	-2.728***	-21.506***	-6.464***	-9.536***	-0.606***
	(-40.75)	(-9.52)	(-33.88)	(-14.76)	(-47.36)	(-15.41)	(-31.79)	(-2.97)
RET_{t-2}	-3.051***	-1.312***	-2.767***	-1.929***	-7.801***	-2.691***	-2.314***	-1.462***
	(-21.87)	(-12.14)	(-21.42)	(-19.31)	(-26.20)	(-11.75)	(-20.09)	(-15.30)
RET_{t-3}	-1.040***	-1.094***	-0.836***	-1.288***	-2.151***	-0.991***	-1.010***	-1.151***
	(-10.12)	(-11.09)	(-8.94)	(-14.41)	(-9.32)	(-4.99)	(-11.65)	(-13.02)
RET_{t-4}	-0.560***	-1.126***	-0.148	-0.899***	-0.009	-0.592***	-0.550***	-0.943***
	(-5.54)	(-11.44)	(-1.55)	(-10.06)	(-0.04)	(-3.19)	(-6.46)	(-10.84)
RET_{t-5}	-0.399***	-0.919***	0.006	-0.637***	0.362*	-0.360**	-0.368***	-0.747***
	(-4.10)	(-10.15)	(0.07)	(-7.72)	(1.93)	(-2.15)	(-4.48)	(-9.13)
RET_{t-1}^2	22.047***	24.043***	26.003***	28.898***	67.385***	44.159***	22.686***	25.827***
	(21.66)	(18.30)	(23.15)	(21.95)	(16.70)	(10.32)	(21.14)	(19.82)
RET_{t-2}^2	6.310***	6.785***	5.374***	4.659***	20.553***	4.284	4.836***	3.880***
	(9.35)	(6.51)	(8.22)	(4.56)	(5.65)	(1.12)	(7.37)	(3.81)
RET_{t-3}^2	6.361***	8.819***	5.265***	7.478***	15.008***	10.677***	5.363***	7.383***
	(9.73)	(8.35)	(7.98)	(7.23)	(4.76)	(3.14)	(8.15)	(7.14)

(Continued)

Panel B in Table VI – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-4}	6.544***	9.317***	5.570***	8.014***	6.382**	6.727**	5.834***	8.062***
	(10.47)	(9.23)	(9.04)	(8.11)	(2.26)	(2.05)	(9.48)	(8.16)
RET^2_{t-5}	6.064***	7.743***	5.127***	6.993***	8.222***	5.246*	5.269***	7.193***
	(8.95)	(7.07)	(7.66)	(6.42)	(3.12)	(1.71)	(7.86)	(6.64)
Adjusted R^2	0.063***	0.056***	0.060***	0.054***	0.098***	0.078***	0.057***	0.053***
	(52.97)	(42.98)	(50.93)	(42.52)	(57.67)	(48.33)	(49.25)	(42.15)
Observation	11,392,054	11,057,016	11,392,054	11,057,016	2,784,124	2,737,904	11,392,054	11,057,016

Table VII
Return predictability in period subsamples

This table presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four different LFOIs within each period subsample,

$$R_{i,t} = \alpha_t + \beta_t^1 OI_{i,t-1} + \beta_t^2 OI_{i,t-2} + \beta_t^3 OI_{i,t-3} + \beta_t^4 OI_{i,t-4} + \beta_t^5 OI_{i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw or mid-quote return of stock i on day t, mid-quote return is calculated close bid and offer price at a given day, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). We separate whole sample dataset into three subperiods. Panel A is for early subperiod from 1993 to 2000, Panel B is for middle subperiod from 2001 to 2006, and Panel C is for late subperiod from 2007 to 2013. The first row shows which LFOI is utilized in the above Fama-MacBeth regression model, and the second row explains which return we employ in the regression model. We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). High frequency order imbalance ($HFOI$) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. RET is daily stock return, and RET^2 is daily squared stock return. In parentheses, we report t-statistics of the average coefficient over sample period based on New-West (1987) standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent lavel, respectively.

Panel A. Early period from 1993 to 2000

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	-0.033	-0.001	-0.043**	0.008	-0.005	-0.014	-0.045**	0.009
	(-1.48)	(-0.06)	(-2.30)	(0.44)	(-0.34)	(-1.20)	(-2.08)	(0.49)
OI_{t-1}	16.489***	2.927***	0.207***	0.105***	0.065***	0.064***	0.036***	-0.000
	(25.05)	(11.24)	(22.96)	(28.46)	(21.25)	(41.43)	(17.24)	(-0.34)
OI_{t-2}	-0.842***	-2.713***	0.016***	0.009***	0.001	0.023***	-0.004***	-0.007***
	(-4.03)	(-17.57)	(5.86)	(5.28)	(0.57)	(13.96)	(-6.20)	(-12.19)
OI_{t-3}	-1.293***	-0.722***	-0.019***	0.001	-0.004*	0.012***	-0.005***	-0.002***
	(-7.29)	(-5.23)	(-7.96)	(0.35)	(-1.73)	(8.03)	(-7.29)	(-4.66)

(Continued)

Panel A in Table VII – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
OI_{t-4}	-0.706***	0.198	-0.021***	-0.003*	-0.008***	0.007***	-0.003***	-0.002***
	(-4.30)	(1.46)	(-8.91)	(-1.82)	(-3.87)	(4.67)	(-6.29)	(-3.15)
OI_{t-5}	-0.536***	0.462***	-0.024***	-0.005***	-0.006***	0.005***	-0.003***	-0.002***
	(-3.13)	(3.65)	(-9.87)	(-3.08)	(-3.08)	(4.23)	(-6.20)	(-3.41)
$HFOI_{t-1}$	0.428***	0.353***	0.590***	0.348***	0.898***	0.535***	0.640***	0.387***
	(18.82)	(24.36)	(21.97)	(26.24)	(21.11)	(23.49)	(22.76)	(27.13)
$HFOI_{t-2}$	0.000	-0.025***	-0.029**	-0.052***	0.036	0.013	-0.024*	-0.057***
	(0.02)	(-2.66)	(-2.32)	(-5.36)	(1.39)	(0.61)	(-1.93)	(-6.00)
$HFOI_{t-3}$	-0.041***	-0.026***	-0.067***	-0.032***	-0.066**	-0.045**	-0.072***	-0.033***
	(-4.42)	(-3.44)	(-7.27)	(-4.31)	(-2.50)	(-2.18)	(-7.94)	(-4.40)
$HFOI_{t-4}$	-0.061***	-0.041***	-0.068***	-0.031***	-0.068***	-0.016	-0.075***	-0.033***
	(-5.63)	(-4.36)	(-6.41)	(-3.42)	(-3.08)	(-0.87)	(-7.24)	(-3.66)
$HFOI_{t-5}$	-0.062***	-0.039***	-0.067***	-0.028***	-0.050**	-0.013	-0.077***	-0.030***
	(-5.88)	(-4.26)	(-6.24)	(-3.11)	(-2.16)	(-0.69)	(-7.21)	(-3.40)
$BASPRD_{t-1}$	3.353***	0.895***	3.393***	0.699***			3.459***	0.743***
	(13.22)	(3.90)	(16.26)	(3.43)			(14.14)	(3.26)
$HLSPRD_{t-1}$					0.448*	0.715***		
					(1.81)	(3.35)		
$TURN_{t-1}$	0.159***	0.167***	0.227***	0.156***	0.379***	0.262***	0.239***	0.166***
	(13.80)	(15.24)	(17.38)	(15.48)	(15.42)	(13.82)	(16.79)	(15.04)
RET_{t-1}	-15.645***	1.814***	-16.195***	-1.232***	-26.465***	0.238	-10.818***	2.888***
	(-25.80)	(7.94)	(-27.11)	(-5.79)	(-36.36)	(0.49)	(-22.27)	(15.09)
RET_{t-2}	-3.078***	-0.818***	-3.395***	-2.339***	-8.395***	-0.216	-2.827***	-1.678***
	(-17.51)	(-6.94)	(-21.16)	(-21.55)	(-20.59)	(-0.86)	(-21.51)	(-15.66)
RET_{t-3}	-0.823***	-1.123***	-0.647***	-1.473***	-1.845***	-0.124	-1.076***	-1.362***
	(-6.71)	(-9.42)	(-5.24)	(-12.75)	(-6.48)	(-0.53)	(-10.26)	(-12.63)
RET_{t-4}	-0.435***	-1.169***	-0.013	-0.934***	0.728***	0.003	-0.616***	-1.017***
	(-3.74)	(-10.99)	(-0.10)	(-9.09)	(2.67)	(0.01)	(-6.06)	(-10.86)
RET_{t-5}	-0.263**	-1.179***	0.338***	-0.741***	1.167***	-0.104	-0.316***	-0.891***
	(-2.29)	(-11.26)	(2.92)	(-7.28)	(4.99)	(-0.49)	(-3.36)	(-9.34)

(Continued)

Panel A in Table VII – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-1}	25.601***	23.024***	33.731***	31.472***	84.318***	51.003***	29.095***	25.604***
	(17.93)	(15.30)	(20.40)	(20.34)	(20.50)	(9.94)	(18.83)	(17.16)
RET^2_{t-2}	3.708***	3.718***	2.482***	0.569	13.295***	5.854	1.809**	-0.824
	(4.33)	(3.18)	(2.93)	(0.52)	(3.52)	(1.39)	(2.18)	(-0.75)
RET^2_{t-3}	2.335***	1.830	0.618	0.153	6.301	2.143	0.831	-0.126
	(2.68)	(1.46)	(0.71)	(0.12)	(1.57)	(0.54)	(0.93)	(-0.10)
RET^2_{t-4}	2.441***	2.138*	0.842	1.092	1.158	-0.963	1.394*	1.344
	(3.17)	(1.67)	(1.10)	(0.86)	(0.35)	(-0.23)	(1.81)	(1.04)
RET^2_{t-5}	2.808***	1.428	1.483*	1.075	4.150	0.688	1.841**	0.980
	(3.74)	(1.05)	(1.90)	(0.79)	(1.17)	(0.15)	(2.41)	(0.72)
Adjusted R^2	0.048***	0.039***	0.046***	0.040***	0.078***	0.051***	0.043***	0.039***
	(35.13)	(23.97)	(33.52)	(24.09)	(49.85)	(33.79)	(32.30)	(23.68)
Observation	9,089,791	8,862,779	9,089,791	8,862,779	2,121,154	2,085,647	9,089,791	8,862,779

Panel B. Middle period from 2001 to 2006

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	0.053**	0.048**	0.063***	0.062***	0.069***	0.047***	0.059**	0.057***
	(2.21)	(2.31)	(2.80)	(2.96)	(5.24)	(4.41)	(2.48)	(2.68)
OI_{t-1}	6.027***	2.773***	0.006***	0.000	0.003*	0.028***	0.002***	0.000
	(22.94)	(14.60)	(8.57)	(0.55)	(1.79)	(19.86)	(7.72)	(0.33)
OI_{t-2}	-0.235*	-0.564***	-0.001*	-0.001**	0.004**	0.007***	-0.000**	-0.001***
	(-1.85)	(-4.24)	(-1.75)	(-2.45)	(2.11)	(5.77)	(-2.43)	(-2.99)
OI_{t-3}	-0.015	-0.020	0.000	0.001*	0.002	0.002	-0.000**	-0.000
	(-0.13)	(-0.17)	(1.04)	(1.96)	(1.28)	(1.43)	(-2.02)	(-1.25)
OI_{t-4}	0.186	0.282***	-0.001*	-0.000	0.001	0.004***	-0.000	-0.000
	(1.52)	(2.64)	(-1.81)	(-0.01)	(0.76)	(3.01)	(-1.14)	(-0.60)
OI_{t-5}	0.237*	0.297**	-0.001*	-0.000*	0.001	0.003**	0.000	-0.000
	(1.87)	(2.49)	(-1.94)	(-1.81)	(0.37)	(2.33)	(0.72)	(-0.53)
$HFOI_{t-1}$	-0.068***	0.002	0.013	0.039***	0.107***	0.175***	0.016	0.038***
	(-5.21)	(0.13)	(1.00)	(3.26)	(3.32)	(6.17)	(1.22)	(3.16)

(Continued)

Panel B in Table VII – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$HFOI_{t-2}$	-0.103***	-0.091***	-0.123***	-0.111***	-0.140***	-0.099***	-0.124***	-0.109***
	(-9.64)	(-8.83)	(-11.06)	(-10.64)	(-4.62)	(-3.53)	(-11.30)	(-10.69)
$HFOI_{t-3}$	-0.055***	-0.056***	-0.068***	-0.061***	-0.078***	-0.052**	-0.066***	-0.058***
	(-4.50)	(-5.00)	(-5.62)	(-5.47)	(-2.75)	(-1.96)	(-5.40)	(-5.22)
$HFOI_{t-4}$	-0.026**	-0.030***	-0.029**	-0.029**	-0.129***	-0.117***	-0.029**	-0.028**
	(-2.20)	(-2.59)	(-2.44)	(-2.53)	(-4.17)	(-4.30)	(-2.37)	(-2.41)
$HFOI_{t-5}$	-0.021*	-0.018	-0.025**	-0.015	-0.072***	-0.066***	-0.025*	-0.014
	(-1.70)	(-1.47)	(-2.03)	(-1.30)	(-2.65)	(-2.79)	(-1.92)	(-1.15)
$BASPRD_{t-1}$	4.359***	1.987***	3.955***	1.442***			4.181***	1.734***
	(7.93)	(4.05)	(7.59)	(2.98)			(7.45)	(3.40)
$HLSPRD_{t-1}$					-0.378	0.341		
					(-0.99)	(1.07)		
$TURN_{t-1}$	0.048***	0.051***	0.048***	0.044***	0.080***	0.090***	0.051***	0.045***
	(4.85)	(5.02)	(4.50)	(4.70)	(3.13)	(4.11)	(4.53)	(4.66)
RET_{t-1}	-7.924***	-2.790***	-5.212***	-0.921***	-13.590***	-6.911***	-4.464***	-0.921***
	(-31.52)	(-11.36)	(-24.82)	(-4.72)	(-28.55)	(-19.38)	(-22.19)	(-4.68)
RET_{t-2}	-1.494***	-1.050***	-1.289***	-1.167***	-4.923***	-2.389***	-1.311***	-1.209***
	(-8.16)	(-5.42)	(-8.35)	(-7.38)	(-13.23)	(-7.12)	(-8.02)	(-6.99)
RET_{t-3}	-0.851***	-1.032***	-0.814***	-1.086***	-1.502***	-0.317	-0.749***	-0.972***
	(-5.47)	(-6.23)	(-5.89)	(-7.47)	(-4.46)	(-0.97)	(-5.37)	(-6.40)
RET_{t-4}	-0.806***	-1.168***	-0.514***	-0.916***	-0.459	-0.581**	-0.612***	-0.930***
	(-4.79)	(-7.01)	(-3.72)	(-6.30)	(-1.34)	(-1.98)	(-4.34)	(-6.24)
RET_{t-5}	-0.651***	-0.825***	-0.339***	-0.504***	-0.328	-0.406	-0.495***	-0.624***
	(-4.46)	(-5.53)	(-2.65)	(-3.77)	(-1.11)	(-1.46)	(-3.89)	(-4.50)
RET_{t-1}^2	17.082***	28.065***	17.095***	29.895***	51.752***	33.710***	16.156***	29.270***
	(11.58)	(12.94)	(11.54)	(13.58)	(8.82)	(5.09)	(11.07)	(13.37)
RET_{t-2}^2	5.750***	7.303***	5.130***	5.684***	17.238***	4.927	5.009***	5.438***
	(5.96)	(4.48)	(5.44)	(3.67)	(2.87)	(0.85)	(5.32)	(3.51)
RET_{t-3}^2	6.960***	11.582***	6.710***	10.742***	8.413**	12.029**	6.395***	10.181***
	(7.25)	(6.51)	(6.99)	(6.27)	(1.99)	(2.29)	(6.74)	(6.06)
RET_{t-4}^2	7.397***	10.331***	7.131***	9.664***	10.871***	9.985**	7.155***	9.440***
	(7.40)	(5.74)	(7.20)	(5.45)	(2.62)	(1.99)	(7.21)	(5.35)

(Continued)

Panel B in Table VII – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET^2_{t-5}	6.642***	9.308***	6.330***	9.152***	10.685***	12.852**	6.331***	9.113***
	(5.68)	(4.69)	(5.39)	(4.62)	(2.74)	(2.49)	(5.40)	(4.69)
Adjusted R^2	0.049***	0.052***	0.047***	0.050***	0.075***	0.072***	0.047***	0.050***
	(29.28)	(26.81)	(27.82)	(25.78)	(36.51)	(36.61)	(28.24)	(26.29)
Observation	5,360,031	4,979,251	5,360,031	4,979,251	833,404	783,328	5,360,031	4,979,251

Panel C. Late period from 2007 to 2013

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	0.055*	0.054**	0.075***	0.074***	0.051***	0.024	0.069**	0.070**
	(1.86)	(1.97)	(2.64)	(2.75)	(2.63)	(1.43)	(2.41)	(2.57)
OI_{t-1}	4.491***	2.932***	0.004***	0.003***	0.019***	0.043***	0.001***	0.000***
	(26.38)	(22.09)	(17.17)	(14.36)	(6.42)	(19.27)	(9.03)	(4.30)
OI_{t-2}	0.395***	0.149	0.000***	0.000*	0.003	0.008***	-0.000	-0.000
	(3.11)	(1.56)	(3.12)	(1.69)	(1.19)	(4.29)	(-0.67)	(-1.52)
OI_{t-3}	0.117	0.072	0.000	0.000	0.001	0.002	0.000	0.000
	(1.02)	(0.77)	(1.00)	(0.75)	(0.59)	(1.23)	(0.72)	(0.14)
OI_{t-4}	0.062	0.147*	-0.000*	-0.000	-0.006**	-0.000	-0.000	-0.000
	(0.60)	(1.70)	(-1.95)	(-1.64)	(-2.25)	(-0.11)	(-0.63)	(-0.54)
OI_{t-5}	0.105	0.139	-0.000	-0.000	-0.001	-0.000	0.000	0.000
	(1.01)	(1.55)	(-0.46)	(-0.43)	(-0.28)	(-0.21)	(1.30)	(1.41)
$HFOI_{t-1}$	-0.101***	-0.007	-0.075***	0.009	-0.169***	0.040	-0.086***	-0.001
	(-7.86)	(-0.63)	(-5.69)	(0.76)	(-4.99)	(1.38)	(-6.43)	(-0.09)
$HFOI_{t-2}$	-0.026**	-0.032***	-0.025**	-0.034***	-0.044	-0.004	-0.029**	-0.036***
	(-2.12)	(-3.04)	(-2.03)	(-3.17)	(-1.30)	(-0.14)	(-2.34)	(-3.43)
$HFOI_{t-3}$	-0.029***	-0.031***	-0.034***	-0.033***	-0.076*	-0.073**	-0.034***	-0.032***
	(-2.62)	(-3.06)	(-3.05)	(-3.26)	(-1.85)	(-2.48)	(-2.97)	(-3.15)
$HFOI_{t-4}$	-0.035***	-0.023**	-0.035***	-0.022**	-0.093***	-0.095***	-0.033***	-0.020**
	(-3.03)	(-2.37)	(-3.08)	(-2.26)	(-2.82)	(-3.26)	(-2.87)	(-2.11)
$HFOI_{t-5}$	-0.024**	-0.027***	-0.027**	-0.030***	0.012	-0.000	-0.025**	-0.028***
	(-2.13)	(-2.72)	(-2.42)	(-3.04)	(0.36)	(-0.01)	(-2.19)	(-2.77)

(Continued)

Panel C in Table VII – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$BASPRD_{t-1}$	5.074***	0.430	4.302***	-0.383			4.639***	-0.082
	(6.20)	(0.58)	(5.25)	(-0.50)			(5.55)	(-0.11)
$HLSPRD_{t-1}$					0.254	0.599		
					(0.50)	(1.54)		
$TURN_{t-1}$	0.025***	0.020***	0.021***	0.011**	0.029***	0.033***	0.023***	0.012**
	(4.76)	(4.01)	(3.34)	(2.02)	(2.69)	(3.48)	(3.47)	(2.08)
RET_{t-1}	-8.547***	-5.386***	-6.431***	-3.835***	-15.719***	-11.931***	-4.650***	-2.563***
	(-28.03)	(-18.95)	(-23.77)	(-16.52)	(-28.01)	(-26.34)	(-19.41)	(-11.56)
RET_{t-2}	-1.490***	-0.953***	-1.109***	-0.771***	-5.581***	-3.840***	-0.796***	-0.569***
	(-7.15)	(-4.69)	(-5.78)	(-4.17)	(-10.17)	(-9.29)	(-4.41)	(-3.19)
RET_{t-3}	-0.867***	-0.839***	-0.706***	-0.724***	-2.127***	-1.734***	-0.683***	-0.715***
	(-4.30)	(-4.32)	(-3.86)	(-4.09)	(-4.94)	(-4.69)	(-3.91)	(-4.07)
RET_{t-4}	-0.537***	-0.752***	-0.220	-0.430***	-0.432	-0.713**	-0.383**	-0.556***
	(-3.01)	(-4.15)	(-1.29)	(-2.60)	(-1.02)	(-2.07)	(-2.32)	(-3.33)
RET_{t-5}	-0.385**	-0.491***	-0.289*	-0.316**	0.029	-0.167	-0.304*	-0.349**
	(-2.11)	(-2.86)	(-1.68)	(-2.01)	(0.08)	(-0.52)	(-1.89)	(-2.28)
RET^2_{t-1}	15.194***	15.425***	15.789***	19.477***	47.813***	40.216***	13.637***	17.494***
	(9.12)	(6.54)	(9.41)	(8.18)	(6.01)	(5.10)	(8.24)	(7.51)
RET^2_{t-2}	5.122***	8.195***	4.700***	6.951***	22.718***	-4.019	4.244***	6.423***
	(4.66)	(4.09)	(4.33)	(3.55)	(3.26)	(-0.59)	(3.94)	(3.33)
RET^2_{t-3}	6.136***	11.075***	5.423***	9.793***	8.917	12.875**	5.507***	10.124***
	(5.32)	(6.14)	(4.65)	(5.46)	(1.51)	(2.17)	(4.74)	(5.73)
RET^2_{t-4}	6.891***	12.010***	6.182***	9.754***	10.379*	6.165	6.368***	10.181***
	(6.71)	(6.93)	(6.16)	(5.78)	(1.95)	(1.00)	(6.39)	(6.09)
RET^2_{t-5}	7.069***	12.834***	6.588***	11.151***	12.214**	2.546	6.420***	11.443***
	(6.67)	(7.09)	(6.34)	(6.29)	(2.35)	(0.45)	(6.16)	(6.45)
Adjusted R^2	0.065***	0.064***	0.063***	0.062***	0.107***	0.092***	0.062***	0.062***
	(28.83)	(25.92)	(28.22)	(25.79)	(35.44)	(33.82)	(27.57)	(25.53)
Observation	5,314,222	5,252,040	5,314,222	5,252,040	693,516	686,502	5,314,222	5,252,040

Table VIII
Return predictability of asymmetric order imbalance

This table presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four asymmetric LFOIs,

$$R_{i,t} = \alpha_t + \beta_t^{1+} OI_{+i,t-1} + \beta_t^{1-} OI_{-i,t-1} + \beta_t^{2+} OI_{+i,t-2} + \beta_t^{2-} OI_{-i,t-2} + \beta_t^{3+} OI_{+i,t-3} + \beta_t^{3-} OI_{-i,t-3} + \beta_t^{4+} OI_{+i,t-4} + \beta_t^{4-} OI_{-i,t-4} + \beta_t^{5+} OI_{+i,t-5} + \beta_t^{5-} OI_{-i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw or mid-quote return of stock i on day t, mid-quote return is calculated close bid and offer price at a given day, and $OI+_{i,t}$ ($OI-_{i,t}$) is negative $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). The first row shows which LFOI is utilized in the above Fama-MacBeth regression model, and the second row explains which return we employ in the regression model. We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). High frequency order imbalance (HFOI) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. RET is daily stock return, and RET^2 is daily squared stock return. In parentheses, we report t-statistics of the average coefficient over sample period based on New-West (1987) standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent lavel, respectively.

	$TLFOI$		$BALFOI$		$HLLFOI$		PS	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
Intercept	0.020	0.030**	0.010	0.038***	-0.010	-0.003	0.041***	0.056***
	(1.40)	(2.39)	(0.80)	(3.25)	(-1.06)	(-0.28)	(2.82)	(4.19)
$OI+_{t-1}$	11.537***	4.257***	0.104***	0.059***	0.040***	0.065***	0.032***	0.009***
	(29.13)	(20.99)	(17.39)	(19.12)	(14.01)	(29.01)	(11.65)	(6.13)
$OI-_{t-1}$	8.775***	2.120***	0.060***	0.038***	-0.008***	0.034***	0.029***	0.007***
	(19.69)	(9.24)	(13.13)	(14.32)	(-2.96)	(19.37)	(13.94)	(9.11)
$OI+_{t-2}$	0.276*	-1.204***	0.011***	0.010***	0.004**	0.013***	-0.001	-0.004***
	(1.81)	(-7.90)	(7.66)	(8.39)	(2.20)	(8.94)	(-1.12)	(-2.77)
$OI-_{t-2}$	-1.392***	-1.988***	0.007***	0.004***	-0.011***	0.006***	0.002***	-0.003***
	(-5.36)	(-9.87)	(4.38)	(3.15)	(-6.35)	(3.68)	(3.41)	(-4.54)

(Continued)

Panel A in Table VIII – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
$OI+_{t-3}$	-0.286*	-0.238*	-0.008***	0.002*	0.009***	0.010***	-0.003***	-0.000
	(-1.96)	(-1.85)	(-5.48)	(1.69)	(4.60)	(6.18)	(-3.44)	(-0.20)
$OI-_{t-3}$	-1.003***	-0.481***	-0.004***	0.002	-0.008***	-0.001	0.001	0.000
	(-5.32)	(-2.92)	(-2.60)	(1.50)	(-4.75)	(-0.56)	(1.48)	(0.42)
$OI+_{t-4}$	-0.078	0.178	-0.011***	-0.002*	0.008***	0.007***	-0.002***	-0.001
	(-0.52)	(1.31)	(-6.80)	(-1.65)	(4.00)	(5.68)	(-2.87)	(-1.16)
$OI-_{t-4}$	-0.515***	0.152	-0.004***	0.002*	-0.004**	-0.001	0.001	0.000
	(-2.86)	(0.95)	(-2.60)	(1.65)	(-2.57)	(-0.75)	(0.91)	(0.52)
$OI+_{t-5}$	-0.072	0.198	-0.013***	-0.003***	0.006***	0.006***	-0.003***	-0.001
	(-0.50)	(1.45)	(-7.19)	(-2.88)	(3.70)	(4.96)	(-4.99)	(-1.24)
$OI-_{t-5}$	0.039	0.678***	-0.003*	0.003**	-0.002	0.000	0.002***	0.001**
	(0.21)	(4.09)	(-1.75)	(2.36)	(-1.50)	(0.41)	(2.97)	(2.30)
$HFOI_{t-1}$	0.105***	0.130***	0.198***	0.144***	0.257***	0.169***	0.212***	0.156***
	(7.05)	(12.40)	(11.29)	(14.75)	(11.73)	(14.22)	(11.45)	(14.64)
$HFOI_{t-2}$	-0.036***	-0.044***	-0.053***	-0.061***	-0.084***	-0.056***	-0.051***	-0.062***
	(-5.15)	(-7.37)	(-7.25)	(-10.17)	(-10.20)	(-7.93)	(-7.03)	(-10.51)
$HFOI_{t-3}$	-0.040***	-0.035***	-0.055***	-0.038***	-0.052***	-0.040***	-0.054***	-0.037***
	(-6.43)	(-6.30)	(-8.78)	(-7.10)	(-6.72)	(-5.98)	(-8.77)	(-6.97)
$HFOI_{t-4}$	-0.042***	-0.030***	-0.045***	-0.026***	-0.056***	-0.033***	-0.043***	-0.024***
	(-6.43)	(-5.29)	(-6.76)	(-4.59)	(-7.24)	(-4.83)	(-6.60)	(-4.24)
$HFOI_{t-5}$	-0.038***	-0.028***	-0.041***	-0.025***	-0.058***	-0.033***	-0.039***	-0.021***
	(-5.94)	(-4.90)	(-6.18)	(-4.27)	(-7.48)	(-4.89)	(-5.91)	(-3.69)
$BASPRD_{t-1}$	4.215***	1.028***	4.122***	0.515*			3.519***	0.357
	(13.38)	(3.73)	(13.69)	(1.87)			(10.44)	(1.16)
$HLSPRD_{t-1}$					2.330***	1.483***		
					(10.08)	(7.86)		
$TURN_{t-1}$	0.052***	0.071***	0.102***	0.075***	0.097***	0.086***	0.125***	0.090***
	(10.02)	(14.85)	(15.53)	(14.37)	(10.72)	(11.76)	(14.53)	(13.68)

(Continued)

Panel A in Table VIII – *Continued*

	TLFOI		*BALFOI*		*HLLFOI*		*PS*	
	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q	RAW	MID-Q
RET_{t-1}	-11.225***	-2.013***	-10.090***	-2.415***	-10.996***	-3.100***	-7.251***	-0.239
	(-35.53)	(-9.89)	(-30.58)	(-16.50)	(-29.87)	(-13.99)	(-28.29)	(-1.54)
RET_{t-2}	-2.057***	-0.809***	-2.150***	-1.612***	-3.367***	-1.534***	-1.816***	-1.223***
	(-16.95)	(-7.61)	(-18.79)	(-16.40)	(-23.56)	(-15.35)	(-18.10)	(-13.46)
RET_{t-3}	-0.800***	-0.968***	-0.743***	-1.172***	-1.178***	-1.080***	-0.911***	-1.089***
	(-8.13)	(-9.75)	(-8.15)	(-12.87)	(-12.34)	(-11.40)	(-11.11)	(-12.73)
RET_{t-4}	-0.544***	-1.041***	-0.238***	-0.836***	-0.679***	-0.887***	-0.571***	-0.884***
	(-5.68)	(-10.56)	(-2.67)	(-9.64)	(-7.48)	(-9.70)	(-7.22)	(-10.94)
RET_{t-5}	-0.443***	-0.908***	-0.128	-0.650***	-0.376***	-0.685***	-0.412***	-0.687***
	(-4.82)	(-9.74)	(-1.48)	(-7.96)	(-4.24)	(-7.97)	(-5.47)	(-8.98)
RET^2_{t-1}	18.652***	19.236***	21.868***	25.764***	32.899***	23.566***	20.158***	23.326***
	(18.97)	(14.38)	(21.50)	(20.41)	(19.59)	(13.97)	(20.79)	(19.84)
RET^2_{t-2}	3.792***	6.042***	3.693***	3.185***	5.980***	3.188***	3.591***	3.412***
	(6.25)	(5.67)	(6.42)	(3.48)	(7.99)	(2.98)	(6.44)	(3.73)
RET^2_{t-3}	4.264***	8.272***	3.838***	5.992***	4.190***	5.492***	4.074***	6.207***
	(7.16)	(8.51)	(6.35)	(6.56)	(6.33)	(5.49)	(6.82)	(6.76)
RET^2_{t-4}	4.698***	8.525***	4.562***	6.784***	4.165***	5.056***	4.763***	6.753***
	(8.24)	(8.93)	(8.58)	(7.71)	(6.53)	(5.05)	(8.90)	(7.52)
RET^2_{t-5}	5.760***	9.955***	4.906***	7.243***	3.470***	3.565***	4.845***	7.037***
	(10.19)	(10.32)	(8.63)	(7.79)	(5.35)	(3.45)	(8.57)	(7.36)
Adjusted R^2	0.059***	0.055***	0.055***	0.053***	0.054***	0.049***	0.052***	0.052***
	(49.88)	(40.81)	(47.27)	(39.98)	(47.99)	(39.59)	(46.16)	(39.81)
Observation	19,764,027	19,094,828	19,764,027	19,094,828	13,347,095	12,911,689	19,764,027	19,094,828

Table IX
Investment simulation

This table documents the profitability of investment strategies based on one-trading-day lagged LFOIs. We rank all the stocks in our sample by one-trading-day lagged LFOIs for each day, and classify them into decile portfolios. Stocks with the lowest (highest) LFOI belong to *Low (High)* portfolio. We take short positions for stocks in the *Low* portfolio and long position for stocks in the *High* portfolio at day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). The first row indicates the type of LFOI which we utilize in our investment strategy. $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). In addition to LFOIs, we define residual LFOIs, regressing an LFOI on return and a control variable. Residual $TLFOI$ is the residual term in the regression model of return on $TLFOI$ and $TURN$ for every stock in every trading day. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. Residual $BALFOI$ is the residual term in the regression model of return on $BALFOI$ and $BASPRD$ for every stock in every trading day. $BASPRD$ is daily relative bid-ask spread measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. Residual $HLLFOI$ is the residual term in the regression model of return on $HLLFOI$ and $HLSPRD$ for every stock in every trading day. We compute daily high-low spread, $HLSPRD$, following Cowin and Schultz (2012). Residual PS is the residual term in the regression model of return on PS and $TURN$ for every stock in every trading day. The first to tenth rows (*Low* to *High*) report portfolio return in each decile LFOI portfolio. The eleventh row, HML, reports the performance and t-statistics of our investment strategies, short *Low* and long *High*. The thirteenth and fourteenth row, *Daily SR* and *FF3 Alpha*, report Daily Sharpe Ratio and Fama-French three factor alpha of our investment strategy, respectively. In Panel A, we document the performance of investment strategy using our sample and, in Panel B, using daily CRSP from 01 January 1983 to 31 December 2013. In parentheses, we report t-statistics of *HML* and *FF3 Alpha*.

(Continued)

Table IX – *Continued*

Panel A. Investment strategy from 1993

	TLFOI	*BALFOI*	*HLLFOI*	*PS*	Residual *TLFOI*	Residual *BALFOI*	Residual *HLLFOI*	Residual *PS*
Low (%)	0.240	0.143	0.361	0.072	-0.155	-0.024	0.148	0.081
2	0.196	0.264	0.270	0.114	-0.016	-0.002	0.071	-0.053
3	0.196	0.241	0.229	0.219	0.065	0.044	0.069	-0.033
4	0.194	0.171	0.146	0.344	0.083	0.068	0.076	0.023
5	0.098	0.109	0.083	0.203	0.077	0.063	0.059	0.050
6	-0.001	0.049	0.066	0.007	0.069	0.083	0.068	0.062
7	-0.058	-0.006	0.016	-0.050	0.063	0.102	0.094	0.095
8	-0.034	-0.021	-0.033	0.052	0.079	0.149	0.124	0.244
9	0.036	0.003	-0.054	0.110	0.201	0.268	0.172	0.424
High	0.223	0.119	-0.066	0.079	0.613	0.327	0.141	0.187
HML (%)	-0.017	-0.024	-0.427	0.008	0.768	0.351	-0.007	0.105
	(-1.28)	(-2.07)	(-49.13)	(0.86)	(77.70)	(42.60)	(-1.16)	(13.47)
Daily SR (%)	-2.9	-4.17	-69.25	-0.52	105.76	56.92	-4.19	16.61
FF3 Alpha	-0.134	-0.211	-4.254	0.095	7.682	3.523	-0.057	1.054
	(-1.03)	(-1.88)	(-49.39)	(1.09)	(77.85)	(43.47)	(-0.97)	(13.57)

Panel B. Investment strategy from 1983

	TLFOI	BALFOI	HLLFOI	PS	Residual TLFOI	Residual BALFOI	Residual HLLFOI	Residual PS
Low (%)	0.305	0.181	0.334	0.072	-0.256	-0.174	-0.248	-0.061
2	0.269	0.402	0.357	0.200	-0.107	-0.063	-0.129	-0.032
3	0.262	0.327	0.363	0.340	0.001	0.002	-0.029	0.021
4	0.237	0.164	0.190	0.391	0.043	0.034	0.013	0.061
5	0.114	0.081	0.102	0.195	0.057	0.038	0.033	0.063
6	-0.048	-0.016	0.040	-0.102	0.063	0.057	0.067	0.071
7	-0.163	-0.125	-0.057	-0.246	0.075	0.094	0.093	0.095
8	-0.154	-0.139	-0.162	-0.115	0.127	0.155	0.154	0.144
9	-0.078	-0.133	-0.206	0.035	0.273	0.275	0.285	0.244
High	0.180	0.129	-0.112	0.126	0.696	0.554	0.640	0.368
HML (%)	-0.125	-0.052	-0.446	0.054	0.952	0.728	0.888	0.429
	(-11.56)	(-5.32)	(-56.39)	(6.78)	(71.47)	(80.72)	(72.54)	(33.25)
Daily SR (%)	-14.78	-7.91	-66.23	5.41	81.43	89.76	75.77	34.36
FF3 Alpha	-1.255	-0.535	-4.446	0.517	9.047	6.853	7.740	3.473
	(-11.90)	(-5.67)	(-56.52)	(6.72)	(73.34)	(80.66)	(67.96)	(31.64)

Table X
Return predictability in corporate events

This table presents estimated coefficients from Fama-MacBeth (1973) regression to measure returns predictability of four different LFOIs around corporate events,

$$CAR_{i,t,t+k} = \alpha_t + \beta_t^1 OI_{i,t-1} + \beta_t^2 OI_{i,t-2} + \beta_t^3 OI_{i,t-3} + \beta_t^4 OI_{i,t-4} + \beta_t^5 OI_{i,t-5} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $CAR_{i,t,t+k}$ is raw cumulative return of stock i from a day t to $t+k$, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). The first row shows which LFOI is utilized in the above Fama-MacBeth regression model, and the second row explains which return we employ in the regression model. We define four different low frequency order imbalances (LFOIs). $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). High frequency order imbalance ($HFOI$) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. RET is daily stock return, and RET^2 is daily squared stock return. We study five corporate events; earnings announcements in Panel A, extreme price movement in Panel B, recommendation updates in Panel C, value related 8K filings in Panel D, and scheduled 13D filings in Panel E. We define extreme price movement as daily unreversed abnormal return above two standard deviations for abnormal return in the last twenty trading days. Abnormal return is a residual term of Fama-French three factor regression model. In parentheses, we report t-statistics of the average coefficient over sample period based on New-West (1987) standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent lavel, respectively.

Panel A. Earnings announcement

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
Intercept	0.122***	0.213***	0.201***	0.115***	0.203***	0.190***	0.214***	0.294***	0.267***	0.116***	0.206***	0.194***
	(7.18)	(8.55)	(7.49)	(6.76)	(8.15)	(7.08)	(5.57)	(5.30)	(4.50)	(6.83)	(8.28)	(7.22)
OI_{t-1}	2.315***	2.150***	1.909***	0.002***	0.004***	0.005***	0.019	0.017	0.028	0.001**	0.001	0.001
	(7.10)	(4.49)	(3.69)	(4.04)	(4.43)	(4.90)	(1.60)	(1.00)	(1.55)	(2.13)	(1.15)	(1.17)
OI_{t-2}	-0.711**	-0.166	-0.083	0.000	0.001	0.001	-0.012	-0.015	-0.020	-0.000	0.000	0.000
	(-1.97)	(-0.31)	(-0.14)	(0.68)	(1.14)	(1.57)	(-1.00)	(-0.83)	(-1.08)	(-0.65)	(0.05)	(0.37)
OI_{t-3}	-0.500	-0.462	-0.321	-0.000	-0.000	-0.000	-0.003	0.036**	0.029	0.000	-0.000	0.000
	(-1.40)	(-0.88)	(-0.57)	(-0.49)	(-0.06)	(-0.08)	(-0.21)	(2.02)	(1.55)	(0.36)	(-0.13)	(0.22)
OI_{t-4}	0.567	1.111**	1.730***	0.000	0.002***	0.003***	-0.015	-0.022	-0.025	-0.000	0.000	0.001
	(1.60)	(2.14)	(3.08)	(0.09)	(2.81)	(3.53)	(-1.18)	(-1.21)	(-1.29)	(-0.28)	(0.80)	(1.42)
OI_{t-5}	0.077	-0.000	0.063	0.001*	0.002**	0.002***	-0.010	0.007	-0.001	0.000	0.001	0.001*
	(0.22)	(-0.00)	(0.11)	(1.74)	(2.53)	(2.66)	(-0.84)	(0.44)	(-0.03)	(0.29)	(1.48)	(1.75)
$HFOI_{t-1}$	0.200***	0.136	0.123	0.251***	0.186**	0.170*	0.707***	0.825***	1.102***	0.246***	0.177**	0.159*
	(3.35)	(1.55)	(1.29)	(4.22)	(2.13)	(1.80)	(4.20)	(3.40)	(4.25)	(4.13)	(2.03)	(1.68)
$HFOI_{t-2}$	-0.162**	-0.040	-0.119	-0.178***	-0.046	-0.122	0.141	0.463*	0.220	-0.180***	-0.048	-0.126
	(-2.55)	(-0.43)	(-1.18)	(-2.81)	(-0.49)	(-1.22)	(0.78)	(1.77)	(0.78)	(-2.85)	(-0.52)	(-1.25)
$HFOI_{t-3}$	-0.221***	-0.132	-0.011	-0.235***	-0.147	-0.024	-0.559***	-0.266	-0.152	-0.232***	-0.144	-0.020
	(-3.49)	(-1.42)	(-0.11)	(-3.74)	(-1.59)	(-0.24)	(-3.11)	(-1.03)	(-0.55)	(-3.69)	(-1.56)	(-0.20)

(Continued)

Panel A in Table X – *Continued*

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
$HFOI_{t-4}$	-0.179***	-0.104	-0.116	-0.172***	-0.083	-0.083	-0.127	-0.802***	-0.595**	-0.171***	-0.084	-0.084
	(-2.91)	(-1.15)	(-1.19)	(-2.81)	(-0.92)	(-0.85)	(-0.73)	(-3.20)	(-2.22)	(-2.79)	(-0.93)	(-0.87)
$HFOI_{t-5}$	-0.250***	-0.416***	-0.415***	-0.248***	-0.412***	-0.409***	-0.046	0.346	0.269	-0.249***	-0.414***	-0.410***
	(-4.02)	(-4.54)	(-4.20)	(-4.01)	(-4.53)	(-4.16)	(-0.26)	(1.39)	(1.01)	(-4.03)	(-4.55)	(-4.18)
$BASPRD_{t-1}$	9.306***	6.272***	5.246***	9.465***	6.552***	5.573***				9.409***	6.402***	5.399***
	(14.37)	(6.59)	(5.11)	(14.61)	(6.88)	(5.42)				(14.53)	(6.73)	(5.26)
$HLSPRD_{t-1}$							3.389**	1.097	-0.165			
							(2.34)	(0.53)	(-0.07)			
$TURN_{t-1}$	0.039***	-0.059***	-0.072***	0.047***	-0.052***	-0.065***	-0.071*	-0.062	-0.083	0.047***	-0.050***	-0.063***
	(2.91)	(-3.02)	(-3.41)	(3.55)	(-2.68)	(-3.12)	(-1.76)	(-1.07)	(-1.34)	(3.57)	(-2.59)	(-3.02)
RET_{t-1}	-10.45***	-15.44***	-16.51***	-9.213***	-14.72***	-16.20***	-16.28***	-21.20***	-22.94***	-8.737***	-13.81***	-15.10***
	(-25.02)	(-25.16)	(-24.95)	(-25.73)	(-27.98)	(-28.54)	(-14.23)	(-12.86)	(-13.01)	(-26.44)	(-28.45)	(-28.83)
RET_{t-2}	-5.235***	-8.548***	-9.749***	-5.787***	-8.846***	-10.13***	-4.393***	-8.097***	-9.112***	-5.613***	-8.564***	-9.752***
	(-11.80)	(-13.11)	(-13.86)	(-15.04)	(-15.65)	(-16.61)	(-3.39)	(-4.33)	(-4.56)	(-15.85)	(-16.46)	(-17.37)
RET_{t-3}	-2.839***	-5.046***	-6.528***	-3.161***	-5.362***	-6.706***	-0.558	-6.379***	-8.426***	-3.279***	-5.353***	-6.749***
	(-6.47)	(-7.82)	(-9.38)	(-8.32)	(-9.60)	(-11.13)	(-0.43)	(-3.43)	(-4.24)	(-9.37)	(-10.42)	(-12.17)
RET_{t-4}	-2.505***	-4.198***	-6.168***	-2.110***	-4.063***	-5.786***	2.305*	0.205	-1.529	-2.072***	-3.463***	-5.035***
	(-5.75)	(-6.55)	(-8.92)	(-5.60)	(-7.33)	(-9.68)	(1.83)	(0.11)	(-0.79)	(-5.96)	(-6.78)	(-9.13)
RET_{t-5}	-1.855***	-2.949***	-3.891***	-2.054***	-3.521***	-4.460***	3.438***	1.375	1.007	-1.781***	-3.069***	-3.978***
	(-4.27)	(-4.62)	(-5.65)	(-5.49)	(-6.40)	(-7.52)	(2.97)	(0.82)	(0.56)	(-5.17)	(-6.07)	(-7.29)
RET^2_{t-1}	3.232***	4.245***	4.057***	2.965***	4.123***	4.049***	4.381***	5.377***	5.412***	2.823***	3.853***	3.722***
	(9.10)	(8.13)	(7.20)	(8.42)	(7.97)	(7.25)	(10.03)	(8.54)	(8.04)	(8.07)	(7.50)	(6.71)
RET^2_{t-2}	9.574***	6.132**	2.047	9.837***	6.468**	2.528	65.436***	76.924***	56.508***	9.620***	6.145**	2.099
	(5.45)	(2.38)	(0.74)	(5.57)	(2.49)	(0.90)	(7.22)	(5.89)	(4.05)	(5.47)	(2.38)	(0.75)
RET^2_{t-3}	-1.396	-0.493	-0.318	-1.144	-0.224	-0.104	18.320**	8.771	21.583**	-1.072	-0.244	-0.096
	(-1.40)	(-0.34)	(-0.20)	(-1.14)	(-0.15)	(-0.07)	(2.57)	(0.85)	(1.96)	(-1.08)	(-0.17)	(-0.06)
RET^2_{t-4}	4.915***	-1.450	-2.585	4.972***	-0.884	-1.908	-0.957	-9.903	-4.413	4.936***	-1.369	-2.507
	(3.97)	(-0.80)	(-1.32)	(3.99)	(-0.48)	(-0.97)	(-0.18)	(-1.27)	(-0.53)	(3.98)	(-0.75)	(-1.28)
RET^2_{t-5}	2.217***	0.172	2.908**	2.479***	0.734	3.539***	14.072*	-13.597	7.947	2.285***	0.407	3.188**
	(2.73)	(0.14)	(2.26)	(3.05)	(0.61)	(2.74)	(1.77)	(-1.19)	(0.65)	(2.83)	(0.34)	(2.49)
Adjusted R^2	0.006	0.006	0.006	0.006	0.006	0.007	0.009	0.006	0.006	0.006	0.006	0.006
Observation	250,013	250,013	250,013	250,013	250,013	250,013	41,374	41,374	41,374	250,013	250,013	250,013

Panel B. Extreme price movement

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
Intercept	0.336***	0.424***	0.467***	0.334***	0.423***	0.467***	0.299***	0.499***	0.602***	0.333***	0.422***	0.466***
	(17.71)	(17.77)	(17.56)	(17.58)	(17.76)	(17.55)	(6.66)	(8.74)	(9.58)	(17.51)	(17.71)	(17.49)
OI_{t-1}	10.947***	8.618***	10.108***	0.006***	0.004***	0.004***	0.177***	0.179***	0.212***	0.003***	0.002***	0.002***
	(30.45)	(19.10)	(20.05)	(9.37)	(4.39)	(4.28)	(13.86)	(11.03)	(11.87)	(7.00)	(2.93)	(2.91)
OI_{t-2}	-1.213***	-2.611***	-3.033***	0.001	-0.000	-0.000	0.051***	0.047***	0.051***	0.000	-0.001	-0.001
	(-2.88)	(-4.94)	(-5.13)	(1.53)	(-0.29)	(-0.26)	(3.63)	(2.61)	(2.59)	(0.51)	(-0.91)	(-1.09)

(Continued)

Panel B in Table X – *Continued*

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
OI_{t-3}	2.556***	2.375***	2.833***	-0.001	-0.002*	-0.002*	-0.007	-0.015	-0.011	0.001	0.001	0.001
	(5.62)	(4.16)	(4.44)	(-1.08)	(-1.66)	(-1.72)	(-0.49)	(-0.80)	(-0.54)	(1.58)	(1.01)	(1.22)
OI_{t-4}	3.363***	4.566***	4.879***	-0.000	-0.000	-0.000	-0.004	-0.006	-0.001	0.000	0.000	0.000
	(7.20)	(7.78)	(7.45)	(-0.02)	(-0.51)	(-0.39)	(-0.29)	(-0.34)	(-0.06)	(0.57)	(0.12)	(0.22)
OI_{t-5}	2.857***	3.195***	3.618***	0.002**	0.002*	0.001	0.010	0.003	0.004	0.001**	0.001**	0.001**
	(5.92)	(5.28)	(5.35)	(2.06)	(1.82)	(1.15)	(0.69)	(0.16)	(0.18)	(2.51)	(2.48)	(2.06)
$HFOI_{t-1}$	1.049***	1.195***	1.315***	1.232***	1.336***	1.480***	2.351***	2.498***	2.694***	1.221***	1.329***	1.472***
	(17.04)	(15.46)	(15.23)	(20.06)	(17.34)	(17.19)	(13.87)	(11.60)	(11.36)	(19.87)	(17.25)	(17.10)
$HFOI_{t-2}$	-0.377***	-0.407***	-0.512***	-0.407***	-0.458***	-0.571***	-0.239	-0.387	-0.123	-0.410***	-0.458***	-0.571***
	(-5.57)	(-4.80)	(-5.40)	(-6.03)	(-5.40)	(-6.03)	(-1.27)	(-1.61)	(-0.47)	(-6.08)	(-5.40)	(-6.03)
$HFOI_{t-3}$	-0.401***	-0.395***	-0.386***	-0.383***	-0.383***	-0.370***	-0.497***	-0.475**	-0.417	-0.378***	-0.376***	-0.362***
	(-5.82)	(-4.57)	(-4.00)	(-5.58)	(-4.44)	(-3.84)	(-2.69)	(-2.02)	(-1.61)	(-5.51)	(-4.36)	(-3.76)
$HFOI_{t-4}$	-0.285***	-0.239***	-0.206**	-0.257***	-0.193**	-0.158	-0.499***	-0.329	-0.226	-0.255***	-0.191**	-0.155
	(-4.12)	(-2.75)	(-2.12)	(-3.72)	(-2.23)	(-1.63)	(-2.62)	(-1.36)	(-0.84)	(-3.68)	(-2.20)	(-1.60)
$HFOI_{t-5}$	-0.399***	-0.555***	-0.548***	-0.372***	-0.518***	-0.509***	-0.085	-0.076	0.161	-0.372***	-0.520***	-0.510***
	(-5.81)	(-6.43)	(-5.70)	(-5.43)	(-6.03)	(-5.31)	(-0.47)	(-0.34)	(0.64)	(-5.44)	(-6.05)	(-5.31)
$BASPRD_{t-1}$	18.749***	29.829***	32.950***	19.261***	30.264***	33.450***				19.289***	30.278***	33.464***
	(25.82)	(32.73)	(32.36)	(26.51)	(33.20)	(32.85)				(26.54)	(33.22)	(32.86)
$HLSPRD_{t-1}$							6.351***	14.678***	14.122***			
							(3.48)	(6.33)	(5.53)			
$TURN_{t-1}$	0.177***	0.225***	0.265***	0.185***	0.229***	0.270***	0.270***	0.203***	0.246***	0.186***	0.231***	0.271***
	(12.31)	(12.45)	(13.10)	(12.83)	(12.69)	(13.37)	(6.15)	(3.63)	(4.00)	(12.93)	(12.75)	(13.43)
RET_{t-1}	-6.581***	0.280	-1.060	0.967**	6.522***	6.341***	-30.532***	-19.084***	-23.359***	1.949***	7.143***	7.011***
	(-14.16)	(0.48)	(-1.63)	(2.45)	(13.19)	(11.48)	(-23.15)	(-11.39)	(-12.65)	(5.33)	(15.58)	(13.69)
RET_{t-2}	-2.320***	0.023	-0.063	-3.009***	-1.590***	-1.945***	-4.533***	4.976**	4.822**	-2.769***	-1.554***	-1.864***
	(-4.29)	(0.03)	(-0.08)	(-6.48)	(-2.73)	(-2.99)	(-2.77)	(2.39)	(2.10)	(-6.49)	(-2.90)	(-3.12)
RET_{t-3}	-4.105***	-3.722***	-4.285***	-1.640***	-1.281**	-1.401**	12.189***	20.581***	21.682***	-2.078***	-1.902***	-2.148***
	(-7.23)	(-5.22)	(-5.38)	(-3.36)	(-2.09)	(-2.05)	(6.95)	(9.24)	(8.84)	(-4.64)	(-3.39)	(-3.42)
RET_{t-4}	-7.193***	-8.108***	-9.200***	-4.064***	-3.948***	-4.756***	12.416***	16.911***	17.233***	-4.167***	-4.129***	-4.936***
	(-12.36)	(-11.10)	(-11.28)	(-8.11)	(-6.28)	(-6.77)	(7.05)	(7.56)	(6.99)	(-9.08)	(-7.17)	(-7.67)
RET_{t-5}	-6.780***	-7.524***	-7.995***	-4.570***	-5.098***	-5.030***	5.590***	7.259***	8.609***	-4.417***	-4.944***	-5.008***
	(-11.50)	(-10.17)	(-9.67)	(-9.04)	(-8.04)	(-7.10)	(3.44)	(3.52)	(3.78)	(-9.54)	(-8.51)	(-7.72)
RET^2_{t-1}	13.197***	14.091***	14.375***	10.926***	12.193***	12.118***	106.426***	114.057***	96.712***	10.552***	11.954***	11.860***
	(18.84)	(16.03)	(14.63)	(15.65)	(13.93)	(12.39)	(20.82)	(17.56)	(13.51)	(15.16)	(13.70)	(12.16)
RET^2_{t-2}	107.699***	130.160***	136.868***	109.351***	131.333***	138.268***	147.449***	152.765***	209.008***	109.346***	131.372***	138.268***
	(35.47)	(34.15)	(32.15)	(35.95)	(34.42)	(32.44)	(10.53)	(8.59)	(10.66)	(35.97)	(34.45)	(32.45)
RET^2_{t-3}	7.112***	6.494***	7.202***	6.512***	5.856***	6.448***	158.773***	153.699***	165.737***	6.653***	6.050***	6.683***
	(11.97)	(8.71)	(8.65)	(11.02)	(7.90)	(7.78)	(9.34)	(7.12)	(6.97)	(11.32)	(8.20)	(8.11)
RET^2_{t-4}	43.885***	51.294***	51.772***	43.611***	50.486***	50.991***	184.880***	336.415***	349.771***	43.689***	50.601***	51.101***
	(22.03)	(20.52)	(18.53)	(21.85)	(20.16)	(18.23)	(11.27)	(16.15)	(15.24)	(21.93)	(20.25)	(18.31)
RET^2_{t-5}	164.410***	230.294***	263.845***	166.722***	232.672***	266.321***	126.716***	142.483***	176.905***	166.583***	232.532***	266.303***
	(45.72)	(51.03)	(52.33)	(46.24)	(51.45)	(52.71)	(7.66)	(6.78)	(7.64)	(46.26)	(51.48)	(52.77)
Adjusted R^2	0.018	0.019	0.018	0.016	0.018	0.017	0.025	0.022	0.021	0.016	0.018	0.017
Observation	479,103	479,103	479,103	479,103	479,103	479,103	76,794	76,794	76,794	479,103	479,103	479,103

(Continued)

Table X – *Continued*

Panel C. Recommendation update

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
Intercept	-0.014	-0.013	-0.019	-0.012	-0.010	-0.017	-0.018	-0.003	0.039	-0.015	-0.013	-0.020
	(-0.77)	(-0.62)	(-0.82)	(-0.66)	(-0.46)	(-0.73)	(-0.30)	(-0.05)	(0.53)	(-0.84)	(-0.62)	(-0.85)
OI_{t-1}	0.768***	0.351	0.318	0.000	-0.000	-0.000	0.026	0.035*	0.034*	0.001**	0.000	0.000
	(3.59)	(1.43)	(1.18)	(0.24)	(-0.53)	(-0.59)	(1.61)	(1.90)	(1.66)	(2.28)	(1.28)	(1.10)
OI_{t-2}	-0.650**	-0.587**	-0.207	-0.001**	-0.001**	-0.001	-0.016	-0.037*	-0.040*	-0.000	-0.000*	-0.000
	(-2.54)	(-2.00)	(-0.64)	(-2.02)	(-1.97)	(-1.52)	(-0.90)	(-1.77)	(-1.75)	(-1.26)	(-1.66)	(-1.19)
OI_{t-3}	-0.819***	-0.659**	-0.665*	-0.001**	-0.001*	-0.001	-0.009	-0.012	-0.012	-0.000	-0.000	0.000
	(-2.99)	(-2.10)	(-1.93)	(-2.32)	(-1.91)	(-1.19)	(-0.52)	(-0.56)	(-0.54)	(-0.52)	(-0.20)	(0.54)
OI_{t-4}	-0.115	-0.580*	-0.595	-0.002***	-0.002***	-0.001**	-0.035**	-0.034*	-0.039*	-0.000	-0.000	-0.000
	(-0.39)	(-1.70)	(-1.59)	(-3.15)	(-3.07)	(-2.22)	(-2.06)	(-1.73)	(-1.85)	(-0.80)	(-0.97)	(-0.96)
OI_{t-5}	-0.059	0.081	-0.073	-0.000	0.000	-0.000	-0.028	-0.030	-0.047**	0.000	0.000	0.000
	(-0.21)	(0.25)	(-0.20)	(-0.60)	(0.20)	(-0.00)	(-1.52)	(-1.39)	(-2.03)	(0.39)	(1.32)	(0.86)
$HFOI_{t-1}$	0.057	-0.006	0.037	0.072	0.002	0.043	0.290	0.283	0.378*	0.071	0.000	0.042
	(1.21)	(-0.11)	(0.62)	(1.53)	(0.03)	(0.72)	(1.60)	(1.35)	(1.67)	(1.51)	(0.01)	(0.71)
$HFOI_{t-2}$	-0.236***	-0.238***	-0.247***	-0.248***	-0.249***	-0.252***	0.050	0.089	0.044	-0.246***	-0.248***	-0.250***
	(-4.32)	(-3.80)	(-3.59)	(-4.54)	(-3.98)	(-3.67)	(0.24)	(0.37)	(0.17)	(-4.52)	(-3.96)	(-3.65)
$HFOI_{t-3}$	-0.019	0.012	0.071	-0.034	-0.001	0.060	-0.295	-0.394	-0.147	-0.030	0.003	0.064
	(-0.33)	(0.18)	(1.01)	(-0.60)	(-0.02)	(0.85)	(-1.39)	(-1.61)	(-0.55)	(-0.54)	(0.05)	(0.90)
$HFOI_{t-4}$	-0.105*	-0.043	-0.072	-0.113*	-0.056	-0.083	-0.442**	-0.284	-0.331	-0.107*	-0.050	-0.079
	(-1.83)	(-0.66)	(-0.99)	(-1.96)	(-0.85)	(-1.15)	(-2.10)	(-1.17)	(-1.26)	(-1.86)	(-0.76)	(-1.10)
$HFOI_{t-5}$	-0.094*	-0.172***	-0.173**	-0.093	-0.168**	-0.172**	0.215	0.501**	0.568**	-0.093	-0.168**	-0.171**
	(-1.65)	(-2.63)	(-2.42)	(-1.64)	(-2.57)	(-2.40)	(1.08)	(2.18)	(2.27)	(-1.63)	(-2.57)	(-2.39)
$BASPRD_{t-1}$	-4.058***	-2.663**	-3.569***	-4.105***	-2.801**	-3.666***				-4.033***	-2.729**	-3.606***
	(-3.95)	(-2.26)	(-2.77)	(-4.01)	(-2.39)	(-2.85)				(-3.94)	(-2.32)	(-2.80)
$HLSPRD_{t-1}$							-3.849	-4.075	-7.930**			
							(-1.47)	(-1.35)	(-2.42)			
$TURN_{t-1}$	-0.025***	-0.031***	-0.032***	-0.024**	-0.031***	-0.031***	-0.061*	-0.103**	-0.113**	-0.024***	-0.032***	-0.032***
	(-2.66)	(-2.95)	(-2.72)	(-2.56)	(-2.97)	(-2.70)	(-1.72)	(-2.51)	(-2.55)	(-2.60)	(-3.01)	(-2.74)
RET_{t-1}	0.894***	0.057	-0.862**	1.634***	0.471*	-0.462	1.154	-0.060	-0.968	1.483***	0.293	-0.649**
	(2.88)	(0.16)	(-2.21)	(6.56)	(1.65)	(-1.48)	(0.94)	(-0.04)	(-0.63)	(6.25)	(1.08)	(-2.18)
RET_{t-2}	-0.975**	-2.089***	-3.153***	-1.352***	-2.378***	-3.063***	-2.031	-2.645	-4.313*	-1.533***	-2.525***	-3.198***
	(-2.34)	(-4.38)	(-6.03)	(-4.01)	(-6.16)	(-7.23)	(-1.14)	(-1.29)	(-1.94)	(-4.85)	(-6.97)	(-8.04)
RET_{t-3}	-0.227	-1.657***	-2.507***	-0.781**	-2.051***	-3.021***	3.881**	0.871	0.460	-1.131***	-2.413***	-3.372***
	(-0.50)	(-3.21)	(-4.42)	(-2.13)	(-4.88)	(-6.54)	(2.01)	(0.39)	(0.19)	(-3.30)	(-6.15)	(-7.83)
RET_{t-4}	-2.001***	-3.003***	-4.704***	-1.559***	-3.031***	-4.887***	5.189***	0.764	-0.276	-2.062***	-3.561***	-5.262***
	(-4.15)	(-5.44)	(-7.76)	(-4.02)	(-6.82)	(-10.02)	(2.62)	(0.33)	(-0.11)	(-5.72)	(-8.63)	(-11.62)
RET_{t-5}	-1.835***	-3.489***	-3.552***	-1.825***	-3.501***	-3.700***	3.396*	0.135	0.999	-1.990***	-3.655***	-3.843***
	(-3.79)	(-6.28)	(-5.83)	(-4.62)	(-7.74)	(-7.45)	(1.90)	(0.07)	(0.45)	(-5.43)	(-8.70)	(-8.34)
RET^2_{t-1}	-1.663***	-2.318***	-2.837***	-1.837***	-2.417***	-2.935***	8.433***	12.423***	7.352***	-1.794***	-2.366***	-2.881***
	(-4.61)	(-5.60)	(-6.25)	(-5.12)	(-5.88)	(-6.50)	(5.12)	(6.51)	(3.56)	(-5.01)	(-5.76)	(-6.40)
RET^2_{t-2}	-0.230	-0.293	-0.709	-0.219	-0.305	-0.783	7.469	10.701	13.595	-0.159	-0.259	-0.741
	(-0.35)	(-0.39)	(-0.85)	(-0.33)	(-0.40)	(-0.94)	(0.87)	(1.08)	(1.26)	(-0.24)	(-0.34)	(-0.89)

(Continued)

Panel C in Table X – *Continued*

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
RET^2_{t-3}	4.039***	7.419***	4.917***	4.034***	7.377***	4.955***	5.275	9.173	19.295	4.200***	7.552***	5.128***
	(3.53)	(5.65)	(3.41)	(3.52)	(5.62)	(3.44)	(0.47)	(0.70)	(1.37)	(3.67)	(5.76)	(3.56)
RET^2_{t-4}	1.694**	2.226***	5.523***	1.503**	2.193***	5.555***	-19.244**	-6.987	-5.594	1.709***	2.410***	5.708***
	(2.54)	(2.91)	(6.59)	(2.28)	(2.90)	(6.69)	(-2.05)	(-0.64)	(-0.47)	(2.60)	(3.20)	(6.90)
RET^2_{t-5}	0.203	0.610	0.636	0.189	0.608	0.665	-15.842	-21.013*	-23.092*	0.227	0.642	0.698
	(0.39)	(1.02)	(0.97)	(0.36)	(1.02)	(1.02)	(-1.64)	(-1.88)	(-1.91)	(0.44)	(1.08)	(1.07)
Adjusted R^2	0.001	0.002	0.002	0.001	0.002	0.002	0.002	0.003	0.002	0.001	0.002	0.002
Observation	287,037	287,037	287,037	287,037	287,037	287,037	27,013	27,013	27,013	287,037	287,037	287,037

Panel D. 8K filing

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
Intercept	0.211***	0.180***	0.164***	0.209***	0.179***	0.162***	0.121*	0.086	-0.007	0.209***	0.179***	0.162***
	(7.93)	(5.58)	(4.70)	(7.87)	(5.54)	(4.65)	(1.88)	(1.08)	(-0.08)	(7.86)	(5.53)	(4.66)
OI_{t-1}	1.006**	0.926	0.731	0.001	0.001	0.002	-0.011	-0.020	-0.008	0.001	0.001	0.000
	(2.13)	(1.61)	(1.18)	(1.00)	(0.65)	(1.07)	(-0.63)	(-0.89)	(-0.35)	(1.28)	(1.03)	(0.41)
OI_{t-2}	-0.888*	-0.503	-0.464	0.000	-0.001	0.001	0.009	0.028	0.042*	0.000	-0.001	-0.000
	(-1.79)	(-0.83)	(-0.71)	(0.22)	(-0.47)	(0.39)	(0.49)	(1.17)	(1.67)	(0.33)	(-0.67)	(-0.16)
OI_{t-3}	-0.114	-0.695	-0.521	0.001	-0.000	0.000	0.035*	0.035	0.042*	0.001	-0.000	-0.000
	(-0.22)	(-1.10)	(-0.77)	(0.91)	(-0.02)	(0.06)	(1.90)	(1.51)	(1.70)	(1.35)	(-0.14)	(-0.30)
OI_{t-4}	1.364**	0.719	0.096	-0.000	-0.000	0.000	0.008	-0.004	0.026	0.000	0.001	0.001
	(2.55)	(1.10)	(0.14)	(-0.36)	(-0.21)	(0.13)	(0.42)	(-0.17)	(1.00)	(0.54)	(0.76)	(0.61)
OI_{t-5}	-1.167**	-0.974	-0.025	-0.001	-0.001	-0.001	-0.012	-0.017	-0.018	-0.001	-0.000	-0.000
	(-2.19)	(-1.50)	(-0.04)	(-1.19)	(-0.38)	(-0.46)	(-0.63)	(-0.73)	(-0.69)	(-0.62)	(-0.21)	(-0.29)
$HFOI_{t-1}$	0.106	0.048	0.054	0.128	0.070	0.069	0.283	0.128	0.378	0.129	0.070	0.072
	(1.32)	(0.49)	(0.51)	(1.61)	(0.73)	(0.66)	(1.22)	(0.45)	(1.24)	(1.62)	(0.72)	(0.69)
$HFOI_{t-2}$	-0.062	0.046	0.020	-0.082	0.037	0.010	0.320	0.438	0.139	-0.082	0.038	0.011
	(-0.73)	(0.44)	(0.18)	(-0.97)	(0.36)	(0.09)	(1.39)	(1.54)	(0.46)	(-0.97)	(0.37)	(0.10)
$HFOI_{t-3}$	-0.085	-0.119	-0.108	-0.087	-0.134	-0.120	-0.545**	-0.476	-0.457	-0.089	-0.134	-0.120
	(-0.96)	(-1.11)	(-0.94)	(-0.99)	(-1.26)	(-1.05)	(-2.25)	(-1.58)	(-1.42)	(-1.02)	(-1.26)	(-1.04)
$HFOI_{t-4}$	-0.195**	-0.186*	-0.213*	-0.168*	-0.173	-0.213*	-0.302	-0.387	-0.468	-0.171*	-0.176	-0.216*
	(-2.20)	(-1.72)	(-1.83)	(-1.90)	(-1.61)	(-1.84)	(-1.24)	(-1.28)	(-1.45)	(-1.93)	(-1.64)	(-1.87)
$HFOI_{t-5}$	-0.156*	-0.234**	-0.160	-0.180**	-0.255**	-0.161	0.117	0.364	0.652**	-0.178**	-0.253**	-0.160
	(-1.76)	(-2.17)	(-1.38)	(-2.05)	(-2.39)	(-1.40)	(0.49)	(1.23)	(2.06)	(-2.03)	(-2.37)	(-1.39)
$BASPRD_{t-1}$	8.095***	6.961***	5.501***	8.122***	6.956***	5.554***				8.129***	6.964***	5.527***
	(5.92)	(4.19)	(3.07)	(5.95)	(4.19)	(3.10)				(5.95)	(4.19)	(3.09)
$HLSPRD_{t-1}$							12.664***	11.066***	12.280***			
							(4.41)	(3.10)	(3.24)			
$TURN_{t-1}$	0.021	-0.017	-0.039*	0.023	-0.015	-0.037	0.017	0.001	0.059	0.022	-0.016	-0.037
	(1.18)	(-0.80)	(-1.67)	(1.33)	(-0.73)	(-1.62)	(0.31)	(0.01)	(0.86)	(1.29)	(-0.76)	(-1.62)
RET_{t-1}	-1.019*	-2.227***	-2.290***	-0.421	-1.640***	-2.025***	-3.120*	-2.979	-3.320	-0.348	-1.611***	-1.757***
	(-1.74)	(-3.13)	(-2.99)	(-0.85)	(-2.73)	(-3.12)	(-1.65)	(-1.27)	(-1.33)	(-0.77)	(-2.94)	(-2.97)

(Continued)

Panel D in Table X – *Continued*

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
RET_{t-2}	-0.936	-2.526***	-3.328***	-1.750***	-2.781***	-3.862***	-2.173	-6.016**	-7.972***	-1.751***	-2.831***	-3.688***
	(-1.41)	(-3.13)	(-3.83)	(-3.07)	(-4.01)	(-5.17)	(-1.02)	(-2.26)	(-2.82)	(-3.41)	(-4.53)	(-5.48)
RET_{t-3}	-0.405	-0.441	-1.286	-0.790	-1.034	-1.775**	-5.047**	-5.076*	-7.925***	-0.726	-1.012	-1.694**
	(-0.59)	(-0.53)	(-1.43)	(-1.32)	(-1.42)	(-2.27)	(-2.24)	(-1.82)	(-2.66)	(-1.34)	(-1.54)	(-2.39)
RET_{t-4}	-2.380***	-1.864**	-1.548*	-1.102*	-1.212	-1.532*	-3.066	-5.193*	-8.120***	-1.302**	-1.430**	-1.601**
	(-3.38)	(-2.18)	(-1.68)	(-1.81)	(-1.64)	(-1.92)	(-1.35)	(-1.84)	(-2.71)	(-2.38)	(-2.15)	(-2.23)
RET_{t-5}	0.693	-0.903	-1.503	0.130	-1.570**	-1.314	-0.574	-1.739	-1.600	-0.168	-1.685**	-1.457**
	(0.96)	(-1.03)	(-1.59)	(0.21)	(-2.04)	(-1.59)	(-0.28)	(-0.69)	(-0.59)	(-0.30)	(-2.45)	(-1.97)
RET^2_{t-1}	-1.285***	-1.603***	-1.582***	-1.477***	-1.790***	-1.652***	2.974	3.993	-1.308	-1.502***	-1.799***	-1.749***
	(-3.42)	(-3.51)	(-3.22)	(-4.06)	(-4.04)	(-3.46)	(0.57)	(0.61)	(-0.19)	(-4.21)	(-4.15)	(-3.75)
RET^2_{t-2}	-0.588	1.271	3.745**	-0.217	1.287	4.022**	-0.646	4.706	10.750	-0.199	1.341	3.877**
	(-0.45)	(0.80)	(2.19)	(-0.16)	(0.80)	(2.33)	(-0.10)	(0.59)	(1.27)	(-0.15)	(0.85)	(2.28)
RET^2_{t-3}	-0.863	-1.346	-0.818	-0.614	-1.070	-0.578	4.863	1.799	1.796	-0.666	-1.082	-0.640
	(-0.59)	(-0.76)	(-0.43)	(-0.42)	(-0.60)	(-0.30)	(0.98)	(0.29)	(0.27)	(-0.46)	(-0.62)	(-0.34)
RET^2_{t-4}	1.953**	1.157	-0.320	1.390	0.888	-0.319	1.171	5.190	4.449	1.525	1.035	-0.270
	(1.96)	(0.96)	(-0.25)	(1.40)	(0.74)	(-0.25)	(0.20)	(0.72)	(0.58)	(1.56)	(0.87)	(-0.21)
RET^2_{t-5}	-4.159*	-5.529*	-9.150***	-4.201*	-5.436*	-9.404***	9.164	-10.479	2.400	-3.893	-5.325*	-9.258***
	(-1.67)	(-1.82)	(-2.80)	(-1.67)	(-1.78)	(-2.86)	(0.59)	(-0.54)	(0.12)	(-1.56)	(-1.75)	(-2.83)
Adjusted R^2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Observation	118,901	118,901	118,901	118,901	118,901	118,901	18,489	18,489	18,489	118,901	118,901	118,901

Panel E. 13D filing

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
Intercept	-0.027	-0.039	-0.056	-0.032	-0.041	-0.058	0.018	-0.054	-0.158	-0.030	-0.041	-0.057
	(-0.87)	(-0.96)	(-1.19)	(-1.05)	(-1.02)	(-1.23)	(0.18)	(-0.44)	(-1.21)	(-0.99)	(-1.00)	(-1.23)
OI_{t-1}	2.667***	1.980***	1.832**	0.005***	0.007***	0.009***	0.004	0.016	-0.010	0.003***	0.004***	0.005***
	(4.97)	(2.78)	(2.24)	(3.02)	(2.87)	(3.19)	(0.12)	(0.37)	(-0.21)	(2.61)	(2.92)	(2.90)
OI_{t-2}	-1.027*	-0.787	-0.519	0.001	-0.001	-0.004	0.028	0.012	0.014	-0.001	-0.000	-0.000
	(-1.90)	(-1.10)	(-0.63)	(0.74)	(-0.56)	(-1.32)	(0.82)	(0.28)	(0.32)	(-0.49)	(-0.25)	(-0.04)
OI_{t-3}	0.173	-0.772	0.422	-0.003*	-0.003	-0.001	-0.123***	-0.072*	-0.026	-0.002*	-0.002	-0.002
	(0.33)	(-1.10)	(0.52)	(-1.69)	(-1.13)	(-0.53)	(-3.55)	(-1.67)	(-0.56)	(-1.91)	(-1.52)	(-1.04)
OI_{t-4}	0.880*	1.561**	1.370*	-0.001	-0.001	-0.000	-0.031	-0.024	-0.016	-0.002*	-0.002	-0.003*
	(1.73)	(2.31)	(1.76)	(-0.39)	(-0.32)	(-0.08)	(-0.95)	(-0.59)	(-0.35)	(-1.88)	(-1.43)	(-1.69)
OI_{t-5}	-0.333	-0.354	-1.080	-0.000	0.001	0.000	0.014	0.018	0.008	-0.000	-0.000	-0.001
	(-0.71)	(-0.57)	(-1.50)	(-0.18)	(0.66)	(0.11)	(0.43)	(0.45)	(0.19)	(-0.39)	(-0.00)	(-0.51)
$HFOI_{t-1}$	0.239***	0.341***	0.379***	0.283***	0.373***	0.407***	0.462	0.439	0.459	0.279***	0.368***	0.403***
	(3.20)	(3.44)	(3.32)	(3.82)	(3.79)	(3.59)	(1.60)	(1.22)	(1.19)	(3.76)	(3.74)	(3.55)
$HFOI_{t-2}$	-0.232***	-0.245**	-0.175	-0.252***	-0.258***	-0.184	-0.852***	-0.620*	-0.282	-0.253***	-0.260***	-0.188*
	(-3.12)	(-2.48)	(-1.54)	(-3.42)	(-2.64)	(-1.63)	(-2.99)	(-1.75)	(-0.74)	(-3.44)	(-2.66)	(-1.67)
$HFOI_{t-3}$	0.120	0.086	0.066	0.123*	0.072	0.076	1.497***	0.938***	0.783**	0.126*	0.076	0.080
	(1.62)	(0.87)	(0.59)	(1.68)	(0.74)	(0.67)	(5.37)	(2.70)	(2.11)	(1.71)	(0.78)	(0.71)
$HFOI_{t-4}$	0.129*	0.233**	0.368***	0.145**	0.263***	0.395***	0.237	0.627*	0.664*	0.146**	0.264***	0.396***
	(1.77)	(2.40)	(3.30)	(2.00)	(2.74)	(3.57)	(0.87)	(1.84)	(1.83)	(2.02)	(2.75)	(3.58)

(Continued)

Panel E in Table X – *Continued*

	TLFOI			*BALFOI*			*HLLFOI*			*PS*		
	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)	CAR (t,t)	CAR (t,t+1)	CAR (t,t+2)
$HFOI_{t-5}$	0.057	0.031	0.067	0.050	0.025	0.047	-0.101	-0.148	0.135	0.050	0.026	0.049
	(0.80)	(0.33)	(0.62)	(0.71)	(0.27)	(0.44)	(-0.40)	(-0.46)	(0.39)	(0.72)	(0.28)	(0.46)
$BASPRD_{t-1}$	5.914***	5.610***	5.195***	6.083***	5.711***	5.293***				6.046***	5.704***	5.295***
	(5.26)	(3.76)	(3.02)	(5.41)	(3.83)	(3.08)				(5.38)	(3.83)	(3.08)
$HLSPRD_{t-1}$							6.188*	7.991*	10.562**			
							(1.70)	(1.77)	(2.19)			
$TURN_{t-1}$	0.072***	0.101***	0.103***	0.080***	0.106***	0.107***	-0.060	0.016	0.104	0.081***	0.107***	0.108***
	(3.46)	(3.69)	(3.25)	(3.92)	(3.91)	(3.43)	(-0.76)	(0.16)	(0.98)	(3.97)	(3.94)	(3.45)
RET_{t-1}	-3.854***	-5.184***	-7.519***	-2.411***	-4.518***	-7.237***	-10.111***	-11.332***	-9.924**	-1.993***	-4.080***	-6.607***
	(-5.65)	(-5.73)	(-7.21)	(-4.20)	(-5.94)	(-8.25)	(-3.39)	(-3.05)	(-2.50)	(-3.76)	(-5.80)	(-8.15)
RET_{t-2}	-2.636***	-3.940***	-5.240***	-3.528***	-4.330***	-5.018***	-8.578***	-8.452**	-8.886**	-3.271***	-4.482***	-5.547***
	(-3.85)	(-4.34)	(-5.01)	(-6.10)	(-5.64)	(-5.67)	(-2.81)	(-2.22)	(-2.19)	(-6.09)	(-6.29)	(-6.76)
RET_{t-3}	-0.615	-1.575*	-4.207***	0.011	-1.807**	-3.562***	9.298***	3.980	-3.062	-0.153	-1.913***	-3.555***
	(-0.90)	(-1.74)	(-4.04)	(0.02)	(-2.38)	(-4.08)	(2.94)	(1.01)	(-0.73)	(-0.29)	(-2.73)	(-4.40)
RET_{t-4}	-1.769***	-3.345***	-3.635***	-0.920*	-2.002***	-2.478***	6.623**	4.717	4.166	-0.744	-1.822***	-2.122***
	(-2.81)	(-4.01)	(-3.78)	(-1.73)	(-2.84)	(-3.05)	(2.36)	(1.35)	(1.11)	(-1.51)	(-2.79)	(-2.82)
RET_{t-5}	-0.686	-1.071	-0.352	-0.832*	-1.470**	-1.196	1.210	2.645	3.740	-0.809*	-1.256**	-1.031
	(-1.14)	(-1.35)	(-0.38)	(-1.65)	(-2.20)	(-1.55)	(0.57)	(1.00)	(1.33)	(-1.72)	(-2.01)	(-1.43)
RET^2_{t-1}	6.105***	2.882	5.037**	5.817***	3.006	5.420**	20.460***	13.067**	11.887*	5.393***	2.552	4.789**
	(3.86)	(1.37)	(2.08)	(3.67)	(1.43)	(2.23)	(3.85)	(1.98)	(1.68)	(3.43)	(1.22)	(1.99)
RET^2_{t-2}	10.033***	8.848***	5.609	10.334***	8.819***	5.145	9.216	6.427	7.061	10.024***	8.874***	5.541
	(4.42)	(2.94)	(1.61)	(4.52)	(2.91)	(1.47)	(1.33)	(0.75)	(0.77)	(4.41)	(2.94)	(1.59)
RET^2_{t-3}	5.134***	3.882	4.375	4.780***	3.902	4.072	102.812***	63.370***	45.298**	4.904***	3.976	4.039
	(2.79)	(1.59)	(1.55)	(2.59)	(1.59)	(1.44)	(7.71)	(3.82)	(2.55)	(2.67)	(1.63)	(1.44)
RET^2_{t-4}	0.995	1.188	2.159*	0.575	0.537	1.630	-11.821**	-9.278	-8.605	0.468	0.409	1.376
	(1.27)	(1.15)	(1.81)	(0.75)	(0.52)	(1.38)	(-2.06)	(-1.30)	(-1.13)	(0.61)	(0.41)	(1.18)
RET^2_{t-5}	0.124	0.154	-0.456	0.165	0.377	-0.020	-0.762	-9.020	-9.654	0.161	0.238	-0.106
	(0.13)	(0.12)	(-0.32)	(0.18)	(0.31)	(-0.01)	(-0.17)	(-1.58)	(-1.58)	(0.18)	(0.20)	(-0.08)
Adjusted R^2	0.003	0.003	0.003	0.003	0.003	0.003	0.021	0.006	0.003	0.003	0.003	0.003
Observation	51,526	51,526	51,526	51,526	51,526	51,526	8,626	8,626	8,626	51,526	51,526	51,526

Table XI
Return predictability with corporate event dummies

This table presents estimated coefficients from Fama-MacBeth (1973) regression with corporate event dummies to measure returns predictability of four different LFOIs around corporate events,

$$R_{i,t} = \alpha_t + \beta_t \text{EventDummy}_{i,t} + \sum_{k=1}^{5} \beta_t^k \text{EventDummy}_{i,t} \times OI_{i,t-k} + \text{ControlVariables} + \epsilon_{i,t}$$

, where $R_{i,t}$ is raw return of stock i in a day t, EventDummy is a dummy variable, one for a corporate event day and zero for other days, and $OI_{i,t}$ is $TLFOI$, $BALFOI$, $HLLFOI$, or PS of stock i on day t. The sample period is from 01 January 1993 to 31 December 2013. We combine Trades and Quotes (TAQ) dataset with the daily Center for Research in Security Prices (daily CRSP). The first row shows which event we take as an event dummy in the above Fama-MacBeth regression model. We study five corporate events; earnings announcements in the first column, *Earnings*, extreme price movement in the second column, *ExtPrcChg*, recommendation updates in the third column, *Recom*, value related 8K filings in the fourth column, *8K*, scheduled 13D filings in the fifth column, *13D*, and all the coporate events in the last column, *All*. We define extreme price movement as daily unreversed abnormal return above two standard deviations for abnormal return in the last twenty trading days. Abnormal return is a residual term of Fama-French three factor regression model. Moreover, we design four different low frequency order imbalances (LFOIs) as control variables. $TLFOI$ is the interaction of daily raw returns and daily turnover ratio. $BALFOI$ is daily raw returns divided by daily relative spreads (daily $BASPRD$). $BASPRD$ is measured as twice the distance between daily close offer and bid prices scaled by the quote midpoint. $HLLFOI$ is daily raw returns divided by daily high-low spreads (daily $HLSPRD$). Following Cowin and Schultz (2012), we compute $HLSPRD$. PS is a signed million dollar trading volume, following Paster and Stambaugh (2003). High frequency order imbalance ($HFOI$) is defined as order imbalances (OIs) divided by the number of shares outstanding. We estimate $HFOI$, following Lee-Ready (1991) algorithm. $TURN$ is daily turnover ratio, and turnover is defined as trading volume over the number of shares outstanding. RET is daily stock return, and RET^2 is daily squared stock return. We take $TLFOI$ as a control variable in Panel A, $BALFOI$ in Panel B, $HLLFOI$ in Panel C, PS in Panel D. In parentheses, we report t-statistics of the average coefficient over sample period based on New-West (1987) standard errors. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent lavel, respectively.

(Continued)

Table XI – *Continued*

Panel A. $TLFOI$

	Earnings	ExtPrcChg	Recom	8K	13D	All
Intercept	0.021	0.005	0.023	0.021	0.023	-0.000
	(1.40)	(0.37)	(1.56)	(1.44)	(1.56)	(-0.00)
$Earning_t$	0.229					0.252
	(0.69)					(0.76)
$Earning_t xOI_{t-1}$	-18.690					-15.806
	(-0.11)					(-0.09)
$Earning_t xOI_{t-2}$	318.377					322.474
	(0.90)					(0.91)
$Earning_t xOI_{t-3}$	-193.57					-194.24
	(-0.90)					(-0.89)
$Earning_t xOI_{t-4}$	309.811					312.285
	(1.37)					(1.37)
$Earning_t xOI_{t-5}$	-182.53					-182.94
	(-1.30)					(-1.29)
$ExtPrcChg_t$		0.901***				0.902***
		(21.19)				(21.18)
$ExtPrcChg_t xOI_{t-1}$		18.836***				19.062***
		(12.94)				(13.06)
$ExtPrcChg_t xOI_{t-2}$		-0.273				-0.181
		(-0.21)				(-0.14)
$ExtPrcChg_t xOI_{t-3}$		-5.076***				-4.991***
		(-3.85)				(-3.78)
$ExtPrcChg_t xOI_{t-4}$		-3.996***				-3.985***
		(-2.66)				(-2.64)
$ExtPrcChg_t xOI_{t-5}$		-4.206***				-4.142***
		(-2.92)				(-2.87)
$Recom_t$			-0.253***			-0.226***
			(-7.83)			(-6.94)
$Recom_t xOI_{t-1}$			5.943***			6.235***
			(2.83)			(2.96)
$Recom_t xOI_{t-2}$			2.425			2.316
			(1.22)			(1.17)
$Recom_t xOI_{t-3}$			-7.889			-7.835
			(-1.08)			(-1.08)
$Recom_t xOI_{t-4}$			-10.258			-10.425
			(-0.80)			(-0.81)
$Recom_t xOI_{t-5}$			0.536			0.505
			(0.46)			(0.43)
$8K_t$				0.361**		0.381***
				(2.57)		(2.71)
$8KxOI_{t-1}$				-60.963		-69.351
				(-0.64)		(-0.73)
$8KxOI_{t-2}$				-90.068		-58.927
				(-0.60)		(-0.38)
$8KxOI_{t-3}$				32.727		33.882
				(0.53)		(0.54)
$8KxOI_{t-4}$				42.542		42.697
				(1.28)		(1.28)
$8KxOI_{t-5}$				31.997		31.128
				(1.16)		(1.12)
$13D_t$					0.328	0.355*
					(1.55)	(1.72)
$13D_t xOI_{t-1}$					618.066	575.488
					(0.93)	(0.94)
$13D_t xOI_{t-2}$					-2152.6	-1949.2
					(-0.90)	(-0.88)
$13D_t xOI_{t-3}$					-163.35	-134.69
					(-1.63)	(-1.42)
$13D_t xOI_{t-4}$					11.384	14.278
					(0.20)	(0.26)
$13D_t xOI_{t-5}$					9.301	10.108
					(0.44)	(0.47)

(Continued)

Panel A in Table XI – *Continued*

	Earnings	ExtPrcChg	Recom	8K	13D	All
OI_{t-1}	9.613***	9.241***	9.383***	9.549***	9.532***	9.189***
	(26.23)	(25.78)	(26.11)	(26.16)	(26.06)	(26.07)
OI_{t-2}	-0.163	-0.096	-0.278***	-0.188*	-0.195*	-0.143
	(-1.57)	(-0.96)	(-2.78)	(-1.80)	(-1.87)	(-1.50)
OI_{t-3}	-0.364***	-0.340***	-0.460***	-0.385***	-0.390***	-0.410***
	(-3.91)	(-3.86)	(-5.06)	(-4.15)	(-4.19)	(-4.85)
OI_{t-4}	-0.124	-0.106	-0.203**	-0.129	-0.130	-0.160**
	(-1.44)	(-1.27)	(-2.46)	(-1.50)	(-1.51)	(-2.00)
OI_{t-5}	-0.046	0.006	-0.103	-0.044	-0.048	-0.061
	(-0.52)	(0.07)	(-1.21)	(-0.50)	(-0.53)	(-0.75)
$HFOI_{t-1}$	0.105***	0.099***	0.114***	0.107***	0.106***	0.108***
	(6.73)	(6.49)	(7.50)	(6.93)	(6.84)	(7.22)
$HFOI_{t-2}$	-0.036***	-0.031***	-0.035***	-0.036***	-0.035***	-0.031***
	(-4.25)	(-3.84)	(-4.30)	(-4.33)	(-4.17)	(-3.95)
$HFOI_{t-3}$	-0.038***	-0.037***	-0.041***	-0.039***	-0.039***	-0.038***
	(-5.47)	(-5.29)	(-6.02)	(-5.61)	(-5.58)	(-5.71)
$HFOI_{t-4}$	-0.046***	-0.039***	-0.045***	-0.046***	-0.047***	-0.037***
	(-6.11)	(-5.42)	(-6.27)	(-6.03)	(-6.14)	(-5.38)
$HFOI_{t-5}$	-0.037***	-0.034***	-0.039***	-0.037***	-0.037***	-0.035***
	(-4.96)	(-4.71)	(-5.55)	(-4.99)	(-4.97)	(-5.17)
$BASPRD_{t-1}$	4.217***	4.084***	4.199***	4.141***	4.187***	4.090***
	(12.72)	(12.41)	(12.65)	(12.49)	(12.65)	(12.41)
$TURN_{t-1}$	0.069***	0.061***	0.082***	0.069***	0.069***	0.073***
	(10.99)	(10.29)	(13.09)	(10.95)	(10.94)	(12.43)
RET_{t-1}	-10.993***	-11.069***	-11.093***	-11.030***	-10.986***	-11.255***
	(-34.97)	(-35.54)	(-35.25)	(-35.11)	(-34.96)	(-36.10)
RET_{t-2}	-2.094***	-2.116***	-2.111***	-2.106***	-2.087***	-2.154***
	(-17.69)	(-18.07)	(-17.88)	(-17.85)	(-17.61)	(-18.72)
RET_{t-3}	-0.867***	-0.838***	-0.864***	-0.873***	-0.867***	-0.823***
	(-9.04)	(-8.91)	(-9.07)	(-9.13)	(-9.03)	(-8.94)
RET_{t-4}	-0.606***	-0.577***	-0.588***	-0.614***	-0.615***	-0.546***
	(-6.65)	(-6.47)	(-6.50)	(-6.75)	(-6.73)	(-6.21)
RET_{t-5}	-0.448***	-0.435***	-0.423***	-0.449***	-0.447***	-0.418***
	(-5.03)	(-4.94)	(-4.79)	(-5.02)	(-5.01)	(-4.81)
RET^2_{t-1}	19.599***	19.460***	20.359***	19.547***	19.560***	20.249***
	(21.38)	(21.71)	(22.05)	(21.42)	(21.30)	(22.62)
RET^2_{t-2}	4.887***	4.976***	4.857***	4.899***	4.943***	4.901***
	(8.41)	(8.72)	(8.41)	(8.43)	(8.45)	(8.73)
RET^2_{t-3}	5.179***	5.021***	4.992***	5.105***	5.132***	4.785***
	(8.65)	(8.63)	(8.37)	(8.57)	(8.56)	(8.25)
RET^2_{t-4}	5.599***	5.541***	5.476***	5.579***	5.603***	5.364***
	(10.03)	(10.09)	(9.93)	(9.96)	(9.96)	(9.95)
RET^2_{t-5}	5.622***	5.542***	5.352***	5.563***	5.585***	5.493***
	(9.76)	(9.71)	(9.28)	(9.68)	(9.66)	(9.53)
Adjusted R^2	0.059***	0.080***	0.068***	0.060***	0.055***	0.106***
	(52.24)	(70.80)	(56.04)	(50.66)	(49.40)	(73.59)
Observation	19,867,402	19,867,402	19,867,402	19,867,402	19,867,402	19,867,402

(Continued)

Table XI – *Continued*

Panel B. *BALFOI*

	Earnings	ExtPrcChg	Recom	8K	13D	All
Intercept	0.026*	0.005	0.030**	0.026*	0.029**	-0.000
	(1.89)	(0.39)	(2.18)	(1.89)	(2.07)	(-0.04)
$Earning_t$	0.938*					0.960*
.	(1.74)					(1.78)
$Earning_t xOI_{t-1}$	0.198					0.207
.	(0.44)					(0.46)
$Earning_t xOI_{t-2}$	-0.255					-0.254
.	(-0.97)					(-0.96)
$Earning_t xOI_{t-3}$	0.290					0.292
.	(0.86)					(0.86)
$Earning_t xOI_{t-4}$	-0.208					-0.210
.	(-1.46)					(-1.47)
$Earning_t xOI_{t-5}$	0.178					0.179
.	(0.76)					(0.76)
$ExtPrcChg_t$		1.110***				1.111***
.		(22.32)				(22.27)
$ExtPrcChg_t xOI_{t-1}$		0.122***				0.124***
.		(11.42)				(11.53)
$ExtPrcChg_t xOI_{t-2}$		-0.008				-0.007
.		(-0.97)				(-0.93)
$ExtPrcChg_t xOI_{t-3}$		-0.042***				-0.041***
.		(-5.74)				(-5.68)
$ExtPrcChg_t xOI_{t-4}$		-0.033***				-0.033***
.		(-4.08)				(-4.07)
$ExtPrcChg_t xOI_{t-5}$		-0.041***				-0.041***
.		(-5.36)				(-5.34)
$Recom_t$			-0.290***			-0.256***
.			(-5.01)			(-4.41)
$Recom_t xOI_{t-1}$			0.075***			0.077***
.			(9.35)			(9.54)
$Recom_t xOI_{t-2}$			0.008			0.006
.			(1.10)			(0.94)
$Recom_t xOI_{t-3}$			0.028*			0.027*
.			(1.74)			(1.66)
$Recom_t xOI_{t-4}$			-0.001			-0.003
.			(-0.13)			(-0.30)
$Recom_t xOI_{t-5}$			0.001			-0.000
.			(0.17)			(-0.01)
$8K_t$				1.561**		1.580**
.				(2.39)		(2.42)
$8KxOI_{t-1}$				0.449		0.451
.				(1.15)		(1.14)
$8KxOI_{t-2}$				-0.506**		-0.503**
.				(-2.27)		(-2.25)
$8KxOI_{t-3}$				-0.004		-0.003
.				(-0.01)		(-0.01)
$8KxOI_{t-4}$				-0.187**		-0.189**
.				(-2.00)		(-2.01)
$8KxOI_{t-5}$				-0.099		-0.100
.				(-0.56)		(-0.57)
$13D_t$					0.766	0.528
.					(0.78)	(0.52)
$13D_t xOI_{t-1}$					0.455	0.560
.					(0.85)	(1.03)
$13D_t xOI_{t-2}$					0.171	0.123
.					(0.68)	(0.50)
$13D_t xOI_{t-3}$					0.224	0.228
.					(1.35)	(1.38)
$13D_t xOI_{t-4}$					0.124	0.133
.					(0.76)	(0.83)
$13D_t xOI_{t-5}$					0.066	0.067
.					(0.94)	(0.96)

(Continued)

Panel B in Table XI – *Continued*

	Earnings	ExtPrcChg	Recom	8K	13D	All
OI_{t-1}	0.082***	0.079***	0.081***	0.081***	0.081***	0.078***
	(15.03)	(14.82)	(15.00)	(15.01)	(15.01)	(14.84)
OI_{t-2}	0.006***	0.007***	0.006***	0.006***	0.006***	0.007***
	(5.61)	(6.12)	(5.35)	(5.37)	(5.31)	(6.47)
OI_{t-3}	-0.007***	-0.005***	-0.007***	-0.007***	-0.007***	-0.006***
	(-6.65)	(-5.74)	(-7.25)	(-6.79)	(-6.76)	(-5.95)
OI_{t-4}	-0.008***	-0.007***	-0.009***	-0.008***	-0.008***	-0.007***
	(-7.94)	(-7.01)	(-8.38)	(-8.05)	(-8.06)	(-7.01)
OI_{t-5}	-0.009***	-0.008***	-0.009***	-0.009***	-0.009***	-0.008***
	(-8.57)	(-7.94)	(-8.81)	(-8.72)	(-8.75)	(-7.85)
$HFOI_{t-1}$	0.199***	0.195***	0.206***	0.201***	0.201***	0.202***
	(10.93)	(10.82)	(11.49)	(11.07)	(11.01)	(11.40)
$HFOI_{t-2}$	-0.052***	-0.049***	-0.052***	-0.053***	-0.052***	-0.050***
	(-6.00)	(-5.78)	(-6.16)	(-6.07)	(-5.93)	(-6.02)
$HFOI_{t-3}$	-0.054***	-0.054***	-0.055***	-0.054***	-0.054***	-0.055***
	(-7.57)	(-7.59)	(-8.03)	(-7.55)	(-7.64)	(-8.07)
$HFOI_{t-4}$	-0.049***	-0.045***	-0.048***	-0.048***	-0.050***	-0.043***
	(-6.56)	(-6.11)	(-6.64)	(-6.44)	(-6.59)	(-6.06)
$HFOI_{t-5}$	-0.040***	-0.039***	-0.041***	-0.041***	-0.040***	-0.039***
	(-5.36)	(-5.32)	(-5.62)	(-5.48)	(-5.39)	(-5.52)
$BASPRD_{t-1}$	3.880***	3.797***	3.813***	3.832***	3.848***	3.819***
	(11.98)	(11.75)	(11.79)	(11.81)	(11.88)	(11.84)
$TURN_{t-1}$	0.094***	0.087***	0.105***	0.094***	0.093***	0.099***
	(12.38)	(12.02)	(13.96)	(12.39)	(12.35)	(13.58)
RET_{t-1}	-9.664***	-9.686***	-9.799***	-9.687***	-9.658***	-9.887***
	(-28.69)	(-28.89)	(-29.02)	(-28.75)	(-28.68)	(-29.39)
RET_{t-2}	-1.996***	-2.009***	-2.040***	-2.004***	-1.989***	-2.068***
	(-17.83)	(-18.12)	(-18.21)	(-17.96)	(-17.77)	(-18.83)
RET_{t-3}	-0.700***	-0.713***	-0.709***	-0.703***	-0.703***	-0.728***
	(-7.79)	(-8.03)	(-7.95)	(-7.82)	(-7.80)	(-8.34)
RET_{t-4}	-0.210**	-0.229***	-0.233***	-0.219**	-0.215**	-0.257***
	(-2.41)	(-2.66)	(-2.69)	(-2.53)	(-2.47)	(-3.03)
RET_{t-5}	-0.055	-0.054	-0.059	-0.051	-0.051	-0.080
	(-0.64)	(-0.64)	(-0.70)	(-0.59)	(-0.60)	(-0.95)
RET^2_{t-1}	22.782***	22.735***	23.425***	22.796***	22.759***	23.508***
	(22.34)	(22.53)	(22.87)	(22.40)	(22.30)	(23.26)
RET^2_{t-2}	4.150***	4.386***	4.063***	4.100***	4.166***	4.324***
	(7.23)	(7.75)	(7.12)	(7.15)	(7.22)	(7.72)
RET^2_{t-3}	4.244***	4.435***	4.092***	4.146***	4.202***	4.235***
	(7.00)	(7.41)	(6.76)	(6.85)	(6.91)	(7.11)
RET^2_{t-4}	4.682***	4.909***	4.574***	4.662***	4.683***	4.797***
	(8.43)	(8.86)	(8.29)	(8.40)	(8.38)	(8.78)
RET^2_{t-5}	4.900***	5.118***	4.731***	4.845***	4.868***	5.124***
	(8.39)	(8.80)	(8.12)	(8.30)	(8.32)	(8.77)
Adjusted R^2	0.056***	0.070***	0.064***	0.057***	0.052***	0.091***
	(49.81)	(61.84)	(54.05)	(48.31)	(47.39)	(68.25)
Observation	19,867,402	19,867,402	19,867,402	19,867,402	19,867,402	19,867,402

(Continued)

Table XI – *Continued*

Panel C. *HLLFOI*

	Earnings	ExtPrcChg	Recom	8K	13D	All
Intercept	0.032***	0.022**	0.034***	0.033***	0.034***	0.019**
	(3.28)	(2.37)	(3.49)	(3.31)	(3.43)	(2.06)
$Earning_t$	-0.932					-0.904
.	(-1.46)					(-1.43)
$Earning_t xOI_{t-1}$	-0.178					-0.092
.	(-0.45)					(-0.22)
$Earning_t xOI_{t-2}$	-2.506					-2.403
.	(-1.13)					(-1.10)
$Earning_t xOI_{t-3}$	0.089					0.193
.	(0.25)					(0.52)
$Earning_t xOI_{t-4}$	0.206					0.187
.	(0.91)					(0.81)
$Earning_t xOI_{t-5}$	-0.144					-0.144
.	(-1.07)					(-1.06)
$ExtPrcChg_t$		2.157				2.146
.		(1.63)				(1.61)
$ExtPrcChg_t xOI_{t-1}$		-2.162				-2.156
.		(-1.00)				(-1.00)
$ExtPrcChg_t xOI_{t-2}$		0.473				0.486
.		(0.90)				(0.92)
$ExtPrcChg_t xOI_{t-3}$		-2.302				-2.328
.		(-0.93)				(-0.94)
$ExtPrcChg_t xOI_{t-4}$		-0.420				-0.456
.		(-0.64)				(-0.69)
$ExtPrcChg_t xOI_{t-5}$		-1.051				-1.057
.		(-1.01)				(-1.01)
$Recom_t$			-1.758			-1.351
.			(-1.24)			(-1.04)
$Recom_t xOI_{t-1}$			3.707**			2.983**
.			(2.02)			(2.22)
$Recom_t xOI_{t-2}$			-5.538			-3.127
.			(-1.12)			(-1.23)
$Recom_t xOI_{t-3}$			0.371			0.381
.			(0.41)			(0.42)
$Recom_t xOI_{t-4}$			0.540			0.582
.			(0.68)			(0.72)
$Recom_t xOI_{t-5}$			-0.450			-0.437
.			(-1.54)			(-1.49)
$8K_t$				-4.451		-3.406
.				(-1.09)		(-0.86)
$8KxOI_{t-1}$				4.961		4.652
.				(0.94)		(0.88)
$8KxOI_{t-2}$				-7.851		-7.856
.				(-1.14)		(-1.13)
$8KxOI_{t-3}$				-7.354		-7.387
.				(-1.05)		(-1.04)
$8KxOI_{t-4}$				-0.332		-0.331
.				(-1.18)		(-1.19)
$8KxOI_{t-5}$				-0.002		-0.010
.				(-0.01)		(-0.05)
$13D_t$					1.310	1.375
.					(1.38)	(1.40)
$13D_t xOI_{t-1}$					-2.089	-2.152
.					(-1.14)	(-1.14)
$13D_t xOI_{t-2}$					-0.125	-0.129
.					(-1.27)	(-1.29)
$13D_t xOI_{t-3}$					0.002	0.011
.					(0.08)	(0.38)
$13D_t xOI_{t-4}$					-0.011	-0.008
.					(-0.49)	(-0.35)
$13D_t xOI_{t-5}$					-0.019	-0.020
.					(-0.82)	(-0.83)

(Continued)

Panel C in Table XI – *Continued*

	Earnings	ExtPrcChg	Recom	8K	13D	All
OI_{t-1}	0.032***	0.031***	0.032***	0.032***	0.032***	0.031***
	(16.13)	(16.19)	(16.39)	(16.54)	(16.01)	(16.79)
OI_{t-2}	0.003*	0.002*	0.003**	0.002*	0.002*	0.003**
	(1.90)	(1.95)	(1.99)	(1.72)	(1.82)	(2.05)
OI_{t-3}	0.000	0.000	0.000	0.000	0.000	0.000
	(0.29)	(0.02)	(0.11)	(0.09)	(0.35)	(0.10)
OI_{t-4}	-0.005***	-0.006***	-0.005***	-0.005***	-0.005***	-0.005***
	(-3.97)	(-4.47)	(-3.85)	(-4.03)	(-4.00)	(-4.05)
OI_{t-5}	-0.003**	-0.003***	-0.003**	-0.003**	-0.003**	-0.003***
	(-2.50)	(-2.70)	(-2.49)	(-2.45)	(-2.44)	(-2.69)
$HFOI_{t-1}$	0.322***	0.313***	0.327***	0.327***	0.326***	0.312***
	(10.32)	(10.29)	(10.86)	(10.56)	(10.47)	(10.64)
$HFOI_{t-2}$	-0.041**	-0.032*	-0.037**	-0.041**	-0.038**	-0.028
	(-2.23)	(-1.75)	(-2.09)	(-2.20)	(-2.07)	(-1.64)
$HFOI_{t-3}$	-0.091***	-0.078***	-0.088***	-0.086***	-0.094***	-0.065***
	(-4.79)	(-4.35)	(-5.04)	(-4.65)	(-5.00)	(-3.99)
$HFOI_{t-4}$	-0.084***	-0.075***	-0.089***	-0.084***	-0.086***	-0.077***
	(-4.78)	(-4.48)	(-5.24)	(-4.83)	(-4.85)	(-4.89)
$HFOI_{t-5}$	-0.034**	-0.032**	-0.036**	-0.036**	-0.035**	-0.033**
	(-2.03)	(-2.02)	(-2.19)	(-2.19)	(-2.10)	(-2.22)
$HLSPRD_{t-1}$	0.282	0.152	0.221	0.186	0.299	-0.100
	(1.19)	(0.67)	(0.96)	(0.80)	(1.25)	(-0.48)
$TURN_{t-1}$	0.171***	0.155***	0.185***	0.172***	0.173***	0.169***
	(11.65)	(11.14)	(12.73)	(11.74)	(11.70)	(12.30)
RET_{t-1}	-19.179***	-19.233***	-19.422***	-19.239***	-19.151***	-19.631***
	(-41.75)	(-42.74)	(-42.98)	(-42.44)	(-41.64)	(-44.72)
RET_{t-2}	-6.426***	-6.503***	-6.479***	-6.457***	-6.415***	-6.584***
	(-22.94)	(-23.68)	(-23.46)	(-23.35)	(-22.93)	(-24.38)
RET_{t-3}	-1.745***	-1.809***	-1.786***	-1.762***	-1.750***	-1.890***
	(-8.18)	(-8.76)	(-8.52)	(-8.30)	(-8.19)	(-9.45)
RET_{t-4}	0.156	0.087	0.108	0.103	0.121	0.041
	(0.74)	(0.44)	(0.52)	(0.50)	(0.57)	(0.21)
RET_{t-5}	0.380**	0.368**	0.354**	0.367**	0.367**	0.348**
	(2.15)	(2.16)	(2.06)	(2.11)	(2.07)	(2.12)
RET^2_{t-1}	64.776***	62.774***	65.106***	64.211***	64.638***	62.525***
	(17.20)	(17.97)	(17.70)	(17.68)	(17.24)	(18.64)
RET^2_{t-2}	15.770***	16.017***	15.149***	15.522***	15.527***	16.121***
	(4.92)	(5.13)	(4.75)	(4.84)	(4.81)	(5.21)
RET^2_{t-3}	8.718***	7.659***	7.819***	8.714***	7.822***	6.613**
	(3.09)	(2.81)	(2.81)	(3.09)	(2.81)	(2.53)
RET^2_{t-4}	6.897***	6.872***	6.360**	7.176***	7.373***	6.142**
	(2.73)	(2.84)	(2.53)	(2.84)	(2.93)	(2.56)
RET^2_{t-5}	8.572***	7.541***	8.515***	8.574***	8.400***	7.510***
	(3.48)	(3.08)	(3.48)	(3.44)	(3.35)	(3.14)
Adjusted R^2	0.097***	0.151***	0.111***	0.098***	0.089***	0.196***
	(65.52)	(77.57)	(65.63)	(64.02)	(63.19)	(72.45)
Observation	3,641,970	3,641,970	3,641,970	3,641,970	3,641,970	3,641,970

(Continued)

Table III – *Continued*

Panel D. *PS*

	Earnings	ExtPrcChg	Recom	8K	13D	All
Intercept	0.023	0.001	0.027*	0.023	0.025*	-0.003
	(1.56)	(0.10)	(1.85)	(1.57)	(1.72)	(-0.19)
$Earning_t$	1.040*					1.065*
.	(1.85)					(1.89)
$Earning_t xOI_{t-1}$	-4.184					-4.177
.	(-0.68)					(-0.68)
$Earning_t xOI_{t-2}$	0.068					0.068
.	(0.03)					(0.03)
$Earning_t xOI_{t-3}$	4.222					4.234
.	(1.21)					(1.21)
$Earning_t xOI_{t-4}$	-1.246					-1.233
.	(-0.66)					(-0.66)
$Earning_t xOI_{t-5}$	1.285					1.287
.	(1.23)					(1.23)
$ExtPrcChg_t$		1.126***				1.126***
.		(23.30)				(23.26)
$ExtPrcChg_t xOI_{t-1}$		0.095				0.095
.		(1.52)				(1.53)
$ExtPrcChg_t xOI_{t-2}$		0.002				0.002
.		(0.14)				(0.15)
$ExtPrcChg_t xOI_{t-3}$		-0.009*				-0.009*
.		(-1.90)				(-1.89)
$ExtPrcChg_t xOI_{t-4}$		-0.010				-0.010
.		(-1.39)				(-1.39)
$ExtPrcChg_t xOI_{t-5}$		-0.027***				-0.027***
.		(-3.27)				(-3.26)
$Recom_t$			-0.380***			-0.348***
.			(-7.47)			(-6.82)
$Recom_t xOI_{t-1}$			0.014**			0.015**
.			(2.19)			(2.26)
$Recom_t xOI_{t-2}$			0.007			0.006
.			(1.06)			(0.99)
$Recom_t xOI_{t-3}$			0.006			0.006
.			(0.63)			(0.60)
$Recom_t xOI_{t-4}$			0.006			0.005
.			(1.19)			(1.10)
$Recom_t xOI_{t-5}$			-0.004			-0.004
.			(-0.63)			(-0.67)
$8K_t$				0.503***		0.526***
.				(4.16)		(4.35)
$8K xOI_{t-1}$				0.054		0.058
.				(0.07)		(0.08)
$8K xOI_{t-2}$				0.026		0.037
.				(0.03)		(0.05)
$8K xOI_{t-3}$				-0.008		-0.012
.				(-0.04)		(-0.07)
$8K xOI_{t-4}$				-0.034		-0.034
.				(-0.23)		(-0.23)
$8K xOI_{t-5}$				-0.031		-0.033
.				(-0.12)		(-0.13)
$13D_t$					0.491	0.474
.					(0.84)	(0.82)
$13D_t xOI_{t-1}$					4.850	3.396
.					(1.28)	(1.09)
$13D_t xOI_{t-2}$					4.058	1.796
.					(0.57)	(0.28)
$13D_t xOI_{t-3}$					-0.283	-0.155
.					(-0.09)	(-0.05)
$13D_t xOI_{t-4}$					5.871	5.860
.					(1.50)	(1.50)
$13D_t xOI_{t-5}$					-2.562	-2.552
.					(-1.00)	(-0.99)

(Continued)

Panel D in Table XI – *Continued*

	Earnings	ExtPrcChg	Recom	8K	13D	All
OI_{t-1}	0.015***	0.014***	0.014***	0.015***	0.015***	0.014***
	(13.45)	(13.32)	(13.20)	(13.42)	(13.41)	(13.11)
OI_{t-2}	-0.001***	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***
	(-5.33)	(-4.73)	(-6.69)	(-5.69)	(-5.66)	(-5.37)
OI_{t-3}	-0.002***	-0.001***	-0.002***	-0.002***	-0.002***	-0.001***
	(-6.29)	(-5.52)	(-7.01)	(-6.47)	(-6.38)	(-5.91)
OI_{t-4}	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(-5.64)	(-4.78)	(-6.23)	(-5.83)	(-5.78)	(-4.98)
OI_{t-5}	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(-4.92)	(-4.05)	(-5.50)	(-5.04)	(-5.02)	(-4.38)
$HFOI_{t-1}$	0.215***	0.212***	0.219***	0.217***	0.216***	0.216***
	(11.09)	(11.02)	(11.44)	(11.26)	(11.18)	(11.34)
$HFOI_{t-2}$	-0.052***	-0.050***	-0.051***	-0.052***	-0.051***	-0.050***
	(-5.96)	(-5.83)	(-6.01)	(-5.97)	(-5.85)	(-5.92)
$HFOI_{t-3}$	-0.055***	-0.055***	-0.056***	-0.055***	-0.056***	-0.056***
	(-7.65)	(-7.72)	(-8.09)	(-7.71)	(-7.82)	(-8.09)
$HFOI_{t-4}$	-0.051***	-0.049***	-0.051***	-0.051***	-0.052***	-0.048***
	(-6.77)	(-6.54)	(-6.91)	(-6.76)	(-6.79)	(-6.64)
$HFOI_{t-5}$	-0.043***	-0.042***	-0.045***	-0.043***	-0.043***	-0.043***
	(-5.69)	(-5.67)	(-6.05)	(-5.71)	(-5.70)	(-5.96)
$BASPRD_{t-1}$	4.059***	3.958***	4.020***	3.996***	4.031***	3.969***
	(12.08)	(11.81)	(11.92)	(11.88)	(12.00)	(11.82)
$TURN_{t-1}$	0.100***	0.094***	0.110***	0.100***	0.100***	0.104***
	(12.38)	(12.11)	(13.68)	(12.39)	(12.38)	(13.32)
RET_{t-1}	-6.837***	-6.877***	-6.921***	-6.852***	-6.842***	-6.988***
	(-26.93)	(-27.20)	(-27.22)	(-26.98)	(-26.96)	(-27.58)
RET_{t-2}	-1.680***	-1.669***	-1.709***	-1.683***	-1.676***	-1.702***
	(-16.52)	(-16.54)	(-16.85)	(-16.57)	(-16.48)	(-17.03)
RET_{t-3}	-0.828***	-0.820***	-0.850***	-0.836***	-0.834***	-0.840***
	(-9.86)	(-9.88)	(-10.17)	(-9.96)	(-9.92)	(-10.23)
RET_{t-4}	-0.524***	-0.519***	-0.540***	-0.529***	-0.530***	-0.530***
	(-6.46)	(-6.46)	(-6.68)	(-6.55)	(-6.52)	(-6.68)
RET_{t-5}	-0.354***	-0.338***	-0.359***	-0.354***	-0.356***	-0.352***
	(-4.61)	(-4.44)	(-4.68)	(-4.61)	(-4.64)	(-4.63)
RET^2_{t-1}	20.097***	20.150***	20.484***	20.132***	20.072***	20.656***
	(20.77)	(20.87)	(21.15)	(20.80)	(20.71)	(21.44)
RET^2_{t-2}	3.716***	3.990***	3.645***	3.678***	3.715***	3.966***
	(6.53)	(7.08)	(6.43)	(6.49)	(6.51)	(7.08)
RET^2_{t-3}	4.254***	4.554***	4.146***	4.190***	4.216***	4.410***
	(7.00)	(7.53)	(6.83)	(6.91)	(6.92)	(7.32)
RET^2_{t-4}	4.935***	5.245***	4.862***	4.928***	4.941***	5.187***
	(8.91)	(9.43)	(8.79)	(8.87)	(8.86)	(9.38)
RET^2_{t-5}	4.940***	5.228***	4.809***	4.930***	4.923***	5.258***
	(8.54)	(9.05)	(8.33)	(8.54)	(8.48)	(9.06)
Adjusted R^2	0.054***	0.064***	0.059***	0.055***	0.051***	0.081***
	(48.08)	(56.47)	(50.88)	(46.57)	(46.15)	(61.21)
Observation	19,867,402	19,867,402	19,867,402	19,867,402	19,867,402	19,867,402