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High-Frequency Trading Activities and Brokerage Firms Effect: Empirical Evidence From the Indonesia Stock Exchange

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This research studies the trading activity of type of traders through their brokers. Order imbalance is believed to be a better proxy for explaining trading activity. This paper presents some empirical test that on brokerage level analysis exhibit information paradigm in Indonesia which market makers and specialist are not available. We divide imbalances into groups of samples (all stocks and most liquid stocks), trader type (foreign or domestic) and size of brokerage firm (small to big). Our results show that order imbalances generally have a positive serial correlation for all the traders and brokers analyzed. However, we find that the determinant of order imbalances is a particular phenomenon at the brokerage level, whose results differ from our market-wide analysis. We do not find that previous order imbalances can predict market returns across trader type and brokerage class. In contrast, for the inventory paradigm, the evidence from the brokerage level analysis indicates that information dissemination is induced order imbalance by brokerage house.

Keyword: *Order Imbalance; Brokerage Firm Effect; Market Liquidity; Trading Activity*

JEL Classification: G10, G82

Introduction

Many studies have been conducted on the relationship between trading activity and market returns. Most suggest that volume should be avoided as a proxy for trading activity. Compared to order imbalance, volume alone is guaranteed for conceal information toward price, because of its inability to judge its market sidedness. For example, Chordia and Subrahmanyam (2004) and Chordia, Roll and Subrahmanyam (2002) cite many studies that claim order imbalance is a better proxy for trading activity, and suggest that using it may shed light on the informational paradigm by assuring whether agents are able to predict the sign of impending announcements, which will help identify whether informed traders and liquidity traders in a more precise manner. They argue that order imbalance has two explaining powers for price and liquidity in the market compared to volume alone. First, order imbalance may contain private information, therefore provide signals to particular traders which may temporarily reduce liquidity and change prices permanently, which is in line with the well-known equilibrium price theory of Kyle (1985). Second, extreme order imbalance will mean market makers will struggle to readjust their inventories, and this problem will make them face consequences when

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revising price quotations.

In contrast, the developed countries there are different settings compared to emerging markets such as Indonesia, which implements a different market structure to NYSE or NASDAQ. In the Indonesia Stock Exchange (IDX), there are no designated market makers or specialists, and buyers and sellers meet directly through their own brokers as their representatives within the stock market system in order to conduct transactions. The most interesting aspect of IDX is that we can exploit its unique record of intraday data, which contains every transaction record, with information on whether the buyer and seller were domestic or foreign investors, and the names of the brokerage firms on both sides of the transaction. According to the intermediary paradigm, using this kind of data will allow us to explore more in-depth not only the type of investor, but also at broker level. Thus, our aim in this study is to shed further light on the tripartite association between trading activity, liquidity and stock market returns, using a set of high frequency data based on trader type and size of brokers in an emerging market context.

An explanation of order imbalance is given by the flow of information that spreads asymmetrically among traders. According to Kyle (1985), we can assume that there are three types of trader in the stock market. First, there are always traders who have unique access to private information on the ex post liquidation value of risky assets. Second, there are uninformed traders who trade randomly, and finally there are always opportunities to play the role of market makers, who can set prices efficiently according to information gained from the trading activity of others. Intuition suggests that trading activity will depend on the mechanism of the information-revealing process among agents. For this asymmetric condition, the price adjustment process will be affected directly by market structure and the characteristics of agents. According to Chordia and Swaminathan (2000), high volume stocks adjust rapidly to information. In addition, Admati and Pfleiderer (1988) theorize about the liquidity condition in intraday patterns as an extension of the work of Kyle (1985), because of the degree of revealing information across traders and its impact on market timing. Garfinkel and Nimalendran (2003) compared two different markets with different structures and found that there was a relationship between brokers and traders in dealing with private information. They focus on trading anonymity, which is in line with the idea of traders splitting orders in order to monopolize their position; as a consequence, this will affect market liquidity, volatility and informational efficiency. In addition, Battalio, Ellul and Jennings (2007) find that the type of relationship between broker and trader on the NYSE is associated with stock price. Thus, according to the information flow paradigm, it is very relevant that we include traders and brokers in our analysis in terms of their mutual relationship, which may explain order imbalance.

Previous studies on order imbalance have found a positive autocorrelation between daily returns and imbalances because of market makers' inventory problems, rather than asymmetric information discrepancies amongst agents. Chordia and Subrahmanyam (2004) theorize that order imbalance is intertemporally caused by the inventory problems faced by market makers. Confirming their theory, they find that persistent imbalances induce autocorrelated price pressures, which are consistent with equilibrium in the securities market. Chordia, Roll and Subrahmanyam (2002) and Chordia and Subrahmanyam (2004) found that order imbalance is significantly associated with daily changes in liquidity and with contemporaneous market returns, while Chan and Fong (2000) found that daily absolute return had a positive relationship with the number of trades in the medium sized category in different market structure settings. However, using Indonesian data, Ekaputra (2014) empirically confirms that absolute order imbalance fails to capture the arrival of informed traders.

Apart from the inventory problem explanation, another argument claims that asymmetric information causes order imbalance. Such information amongst traders is suspected to be due to the many brokerage houses which disclose trading recommendations. Many of them face research costs by hiring analysts and

building infrastructures to provide accurate and quick forecasts, which will lead to investors trading more frequently. Womack (1996) reports that information is costly to process, so in this sense market prices cannot perfectly reflect all the available information. Therefore, investors should be willing to pay for brokerage investment advice only if the expected benefit is at least equal to the cost of the advice. Kim, Lin and Slovin (1997) found that prices are affected by analysts' recommendations and that market efficiency depends on the structure of the market itself.

Other studies on asymmetric information amongst investors show that it has a relationship with their trading behavior. Lee et al. (2004) report that there are different types of persistent order imbalance among categories of investor. Asymmetric information among traders and trading size lead to continuations in price pressure, which is caused by herding and splitting orders. Choe, Kho and Stulz (2005) find that the degree of asymmetric information between domestic and foreign investors is related to their trading behavior. Another argument is developed by Agarwal et al. (2011), who claim that the degree of asymmetric conditions between informed and uninformed traders in the market will be related to herding behavior among them, including their relationship with brokerage firms. Brown, Walsh and Yuen (1997) find that bi-directional causality occurs between imbalance and returns, but that the pace of adjustment is not equal and not beyond a single day between the Australian market and the NYSE. They also find that there is no stabilization behavior, which is an indication that the explanation of a relationship between imbalance and returns is most likely to be informational. Dvořák (2005) documents that there are discrepancies between traders of local brokerages, which have a short-term information advantage, and those of global brokerages, who are better at picking long-terms winners. This indicates that at the level of brokerage there is homogeneous valuable information according to trader type. Ravi and Sha (2014) used a momentum type trading strategy and found that returns were positively related to investor sentiment, and therefore order imbalance was related to boom and bust conditions, which create discrepancies between buy-sell initiated.

The relationship between persistent order imbalances and market returns among different agents is also related to certain trading behavior. With regards to the asymmetric information paradigm, this relationship will therefore cause different imbalances amongst brokerage firms. In practice, it is well known that brokerage firms do not merely handle orders and trades for their clients; they also provide investment advice to their clients. Consequently, there are homogeneous sets of information amongst agents at brokerage level, which could make them trade in the same direction (Agarwal, et al. 2011). In addition, brokerage firms are able to conduct research better than non-institutional traders, not only because they can pay reputable analysts, but also because of their ability to learn from the arrival of informed traders. This may facilitate interaction between traders because of their domestic communion privilege, and therefore some degree of commonality amongst agents is possibly affected by the order imbalances of winner stocks due to institutional herding (Bailey, Cai, Cheung, & Wang, 2009). Nonetheless, in-house analysts are not free from stock mispricing, and as a consequence this will lead to heterogeneous price prediction amongst brokers at the market level. Sadka and Scherbina (2007) document that asset pricing anomalies are more pronounced among firms with high information uncertainty, and that mispricing may be predicted by liquidity. They suggest that microstructure considerations have important implications for asset pricing. Doukas, Kim and Pantzalis (2006) argue that differences of opinion amongst analysts have a significant impact on stock prices. However, at the market level, Chiyachantana et al. (2004) report that underlying market conditions are a major determinant of price impact and, more importantly, of the asymmetry between the price impacts of institutional buy and sell orders. Busse, Green and Jegadeesh (2012) also document that there are discrepancies in analysts' performance according to sell-side and buy-side recommendations, which are largely concentrated on the day of the

trade.

Most studies on order imbalance in developed countries do not use accurate data because the available transaction databases often do not identify buyers and sellers. Most researchers need to generate predictions on buyer or seller initiation using Lee and Ready's (1995) algorithm. In contrast, our available unique data include the order identification numbers initiated by both sellers and buyers, which are serially sorted according to their executed trading from all orders on the IDX, which will certainly help avoid errors. The accompanying information is also disclosed, from which brokers and traders (foreign or domestic) submit their orders. To retain confidentiality, we classify brokers into five groups according to their firm size.

In this article, we use a unique data set to shed further light on the issue of whether order imbalances differ between domestic and foreign traders. To differentiate our work from previous studies, we use a unique dataset from the Indonesia Stock Exchange (IDX), which contains all the orders and traders handled by individual brokerage firms, in order to investigate order imbalance due to asymmetric information-induced liquidity amongst traders from particular sized brokerage firms, as well as the type of trader. In IDX, there are no officially designated market maker or specialist. Following the study of Agarwal, et al. (2011), they report that some brokerage firms handle orders in different composition regarding their type of traders, that usually particular global brokerage firms have more foreign clients than domestic clients.

Our approach is close to the study of Lee, Liu, Roll, & Subrahmanyam (2004), and we analyze further using the brokerage firm effect which follows Agarwal, et al. (2011) approach. We incorporate those two study in order to test whether order imbalance is a marketwide phenomenon or is displayed just among a particular group of traders, particularly those associated with their brokerage firms. Our approach here will provide insight into issues surrounding order imbalance, which (i) differentiates the properties and determinants of daily order imbalances between domestic traders and foreign traders; (ii) investigates how daily order imbalances determines in each category; and (iii) investigates the return performance of each trader type by brokerage firm class according to an impact of order imbalances.

Our study contributes empirically to the examination of marketwide imbalances, returns, and liquidity in relation to the specific traders under the group size of brokerage firms. With regard to practical problems in the capital market, it also makes descriptive recommendations to the regulators in order to create stock market efficiency, which order imbalances occur particularly as a response to valuable information distributed among the association of traders and brokerage firms. From our investigation of agents, we present several findings. First, there are statistically significant positive serial correlations of order imbalance for marketwide level and trader-brokerage firm level. Second, order imbalances are determined differently at the trader level and trader-brokerage firm level, which involve trading activity, market returns movement and liquidity. Third, we find that there are no consistent patterns that confirm each group of trader-brokerage firm holds information equally. We also find that traders use a short term contrarian strategy among brokerage classes. Finally, we are unable to reject our hypothesis that order imbalances create price pressures at the market as well as unable to generalize at brokerage firm level.

The remainder of the paper is organized as follows. Research methods in section 2 and section 3 report our findings. Finally, In the last section we conclude our study and provide recommendations for further research.

Research Methods

The IDX trading system is built on a centralized limit order book. Buyers and sellers meet directly through their own brokers as their representatives within the stock market system. Traders submit limit orders which match the prevailing quotes for execution. The IDX is unlike other well-known limit orders markets, such as the Tokyo Stock Exchange and the Toronto Stock Exchange, no market orders allowed to enter the system (Agarwal, Chiu, Liu,

& Rhee, 2011). The IDX does not have designated market makers, indicating that agents have a privilege to allow themselves in de facto market making activity to absorb the imbalances of traders that demand immediacy (Glosten, 1994).

Data and Sample

The primary data in our study consist of the intraday trading records from the Indonesian Capital Market Directory (TICMI). A typical transaction record consists of unique identification information. As stated on the table of our data, we recognize several following fields, which are respectively [1] transaction code, [2] transaction date, [3] transaction time, [4] stock code, [5] transaction type, [6] stock volume, [7] stock price, [8] stock value, [9] brokerage firm code as order initiated, [10] type of investors as order initiated, [11] brokerage firm code as opposite order initiated, [12] type of investors as opposite order initiated, [13] buy/sell position code, and [14] order number. Our sample period spans August 1st, 2011 to December 30th, 2011 inclusive (a total of five months), a period outside the Indonesian financial crises (1998 and 2008). The sample consists of the entire population of stocks contained on the IDX Composite for 389 firms in total. The data on brokerage firms were gathered from the Indonesian Capital Market Electronic Library (ICAMEL) for 104 firms in total, which varied in size. Those were used in our study here.

In order to achieve our research objectives, the sample needed to meet several criteria, following Chordia, et al. (2002). A trade was excluded if it was out of sequence, recorded outside the regular market or a part of special transactions inside the negotiation market or other markets. We also excluded from our sample stocks which were not traded during a day (intraday). From the transactions retained, we need at first to define who initiate order and in which position (buy or sell) a trader submitted it. Most studies on order imbalance in developed countries do not use accurate data because the available transaction databases often do not identify buyers and sellers, therefore they need to generate predictions using Lee and Ready's (1995) algorithm. In contrast, our available unique data include the order identification numbers initiated by both sellers and buyers.

Following Ekaputra (2014) extraction buyer/seller-initiated procedures, data are already serially sorted according to their executed trading from all orders on the IDX, which will certainly help avoid errors. At first, the transaction data always show a pair of orders with different order number [14] but the same transaction number [1]. An order submitted later is assigned a higher-order number in the system. Second, we observe at field [13], which are "B" ("S") stands for buy (sell). A trade is buy-initiated (sell-initiated) if field [13] of the higher-order number [14] is "B" ("S"). Third, a trade is initiated by foreign (domestic) investors if field [10] is "A" ("I"). The earlier order with lower-order number is not a trade classification deciding factor because it enters the system as a limit order and is held until later order is entered to initiate the trade. At last, the accompanying information is also disclosed, from which brokerage firm at field [11] as a trader submit their orders. To retain confidentiality, we classify brokers into five groups according to their firm size.

Proxy and Calculation

In order to calculate order imbalances, we performed respectively several procedures, which are: (i) we calculated the number of order imbalances $(OIBNUM_t)$ defined as the number of buyer-initiated trades less seller-initiated trades on day-*t*; (ii) Then, we calculated order imbalance in shares ($OIBSH_t$), defined as buyer-initiated shares purchased less seller-initiated shares sold on day t; (iii) as well as transforming the order imbalance measures, we also computed the following measures of trading activity: total number of transactions on day-*t* scaled by total number of trades, and total number of shares traded on day-*t* scaled by total volume on that day. We used these to calculate the proportion of order imbalance on a particular day, which is to increase our statistical power as well as to eliminate the impact of total trading activity (Chordia & Subrahmanyam, 2004).

Table 1 Order Imbalances Descriptive Statistics

Daily marketable limit order imbalances on the Indonesian Stock Exchange were computed from August 2011 through December 2011 inclusive, for all stocks traded. Order imbalance was defined as buy orders less sell orders divide by total imbalances during the day (using marketable limit orders). Imbalances were tabulated separately for domestic and foreign traders. In addition, traders were classified by tracing their size of brokerage firms during the entire sample period. The size of broker are scaled from the smallest (1) to the biggest (5) using log of total assets on that period.

	Total			*Domestic (D) OIB*					*Foreign (F) OIB*				
	Buy	Sell	OIB	1	2	3	4	5	1	2	3	4	5
Observations	103	103	103	103	103	103	103	103	103	103	96	97	93
Shares													
Mean	1027045117	1018888092	8157024	4285864	23836286	-5569490	487757	-1375495	-3738869	-7950044	70047	-1625005	79758
Std. dev.	470774248	571752241	312987090	95919548	134635501	81219096	20163589	12790542	20055571	43554253	2896049	8909975	3835940
Proportion on Shares													
Mean			0.0322	0.0099	0.0260	-0.0037	0.0011	0.0000	-0.0017	-0.0059	0.0001	-0.0010	0.0002
Std. dev.			0.1534	0.0463	0.0675	0.0402	0.0099	0.0058	0.0124	0.0229	0.0010	0.0047	0.0020
Number of Orders													
Mean	30531	33634	-3103	-1159	196	-806	-167	-118	-183	-826	5	-61	28
Std. dev.	11321	16270	12256	3976	5219	3116	645	360	764	2395	41	273	165
Proportion on Number of Orders													
Mean			-0.0237	-0.0104	0.0128	-0.0068	-0.0014	-0.0012	-0.0029	-0.0133	0.0001	-0.0010	0.0007
Std. dev.			0.1674	0.0520	0.0776	0.0413	0.0086	0.0041	0.0136	0.0337	0.0007	0.0048	0.0035

Instead of using the $OIBNUM_t$, we utilize proportions of $OIBSH_t$ to all of our tests. It is because $OIBSH_t$ includes volume to provide an additional measure of market sidedness which has more valuable information than only signed frequency. Following Lee, at al. (2004), all our data are marketable limit orders, which are orders demand immediacy. We put effort into explaining the impact of such traders through their broker on the price formation process. In the fourth procedure, we grouped the imbalances by trader type on aggregate and also by brokerage level and by size; we define broker size as the log of total assets in the previous period of our test.

Results and Discussions

This study performs an empirical test to answer whether order imbalance is a marketwide phenomenon or is displayed just among a particular group of traders, particularly those associated with their brokerage firms. Table 1 summarizes descriptive statistics for average order imbalances. At marketwide level, the order imbalance measure for all the stock samples shows positive means for shares (OIBSH) and shows negative mean for number of orders (OIBNUM). Looking deeper into traders and brokerage level, the table demonstrates descriptively that not all trader types have homogeneous preferences. It is apparent that when the market is in a bust cycle, both foreign traders and domestic traders tend to execute sell order, but do not occur for all classes of brokerage firms. According to values at proportion on shares, the evidence suggests foreign traders more attempt to take a short position than domestic traders throughout all brokerage classes.

Properties and Determinants of Daily Order Imbalances

The very first research question in this article is whether the properties and determinants of daily order imbalances differ between domestic traders and foreign traders in the association with their brokerage firms. In order to answer the abovementioned question, we need to prove that there are order imbalances in IDX first. According to the theory, order imbalances are substantially and positively autocorrelated, even though daily returns shows either very small or none autocorrelation (Chordia, Roll, & Subrahmanyam, 2002). Following Lee, et al. (2004), research issue presents here is by looking at autocorrelations in imbalances when trades by the same agent are included, we can address the role played by brokerage firms information-induced imbalances.

Table 2 Serial Correlation of Number of Order Imbalances

Serial correlations (up to six lags) were computed for order imbalances. Daily order imbalances on Indonesia Stock Exchange were computed from August 2011 through December 2011 inclusive, for all stocks traded. Order imbalance was defined as buy orders less sell orders divided by total imbalances during the day (using marketable limit orders). Imbalances were tabulated separately for domestic and foreign traders. In addition, traders were classified by tracing their size of brokerage firms during the entire sample period. The size of broker are scaled from the smallest (1) to the biggest (5) using log of total assets on that period. *, **, and *** indicate significance levels of 10%, 5% and 1%, respectively. The Ljung and Box (1978) Q test is for the null hypothesis that all six coefficients are zero.

Lag (Days)	Total	Domestic					Foreign				
		1	2	3	4	5	1	2	3	4	5
1	0.3480***	0.4640***	0.3690***	0.5530***	0.3810***	0.5040***	0.2720***	0.1890*	-0.0860	0.2060**	0.0770
2	0.3230***	0.3670***	0.3020***	0.4140***	0.3100***	0.4410***	-0.0920**	0.2170**	-0.0630	0.2340***	-0.0400
3	0.1170***	0.1680***	0.0980***	0.2290***	0.2660***	0.3270***	0.0430**	0.0520**	0.1600	0.0560***	-0.1260
4	0.1240***	0.1150***	0.0610***	0.1840***	0.1190***	0.2660***	0.1470**	0.0250*	0.0690	-0.1830***	0.0490
5	0.2020***	0.1840***	0.1580***	0.2250***	0.1020***	0.3370***	0.1810**	-0.0340*	0.0290	-0.0230***	0.0090
6	0.1270***	0.1760***	0.1160***	0.1560***	0.0780***	0.2410***	0.0860**	-0.0630	-0.0370	0.0550**	0.1070
Q test	33.54***	48.97***	29.88***	68.57***	36.68***	86.11***	15.75**	9.77	4.72	14.74**	4.06
p-val	<.0001***	<.0001***	<.0001***	<.0001***	<.0001***	<.0001***	0.0152**	0.1346	0.5796	0.0224**	0.6688

Table 3 Serial Correlation of Order Imbalances in Shares

Serial correlations (up to six lags) were computed for proportion of order imbalances. Daily order imbalances on Indonesia Stock Exchange were computed from August 2011 through December 2011 inclusive, for all stocks traded. Proportion of order imbalance on shares (OIBSH) was defined as total shares of buy orders less total shares of sell orders divided by total shares traded during the day (using marketable limit orders). Imbalances were tabulated separately for domestic and foreign traders. In addition, traders were classified by tracing their size of brokerage firms during the entire sample period. The size of broker are scaled from the smallest (1) to the biggest (5) using log of total assets on that period. F-F represents foreign buy order less foreign sell order, and D-D represents domestic buy orders less domestic sell orders. *, **, and *** indicate significance levels of 10%, 5% and 1%, respectively. The Ljung and Box (1978) Q test is for the null hypothesis that all six coefficients are zero.

Lag (Days)	Total	Domestic (D)					Foreign (F)					F-F	D-D
		1	2	3	4	5	1	2	3	4	5		
1	0.1040	0.2230**	0.1540	0.3230*	0.1060	0.0250	0.1690*	0.1080	-0.0670	0.1640*	0.0140	0.0530	0.2120**
2	0.1020	0.0170*	0.1870**	0.2560*	0.2480**	-0.0370	0.1530*	0.0320	0.0560	0.1310*	0.0700	0.0220	0.1600**
3	0.0000	-0.1120*	0.0550*	0.1910*	0.1730**	0.1930	-0.0080	0.1690	-0.0930	0.1770**	0.0520	0.0990	0.0690**
4	-0.0450	-0.0850	0.0460	0.0220*	-0.0110**	0.0960	0.2270**	0.1560	0.1460	-0.0130*	0.0630	0.1960	-0.0070*
5	0.0780	0.0360	0.1750*	0.0900*	0.1270**	0.1880	0.2120*	0.0390	-0.1280	0.1340**	-0.1300	0.0750	0.1210*
6	0.1370	0.1550	0.2210**	0.0440*	-0.0360**	-0.0220	-0.0780*	0.1280	0.0440	0.1350**	-0.1870	-0.0330	0.1560*
Q test	5.25	10.25	15.60**	23.19***	12.94**	9.21	16.83***	9.08	6.10	12.09*	7.07	6.33	12.40*
p-val	0.5127	0.1146	0.0161**	0.0007***	0.0440**	0.1623	0.0099***	0.1692	0.4122	0.0600*	0.3149	0.3871	0.0536*

Table 2 shows autocorrelations for the order imbalances of the sample stocks. Most of these are positive and many are statistically significant. By the trader type, foreign traders consistently exhibit less positive value than domestic traders. However, all broker classes and types of trader show many positive and significant results. Our findings are consistent with previous research, which also reports positive serial correlation order imbalances.

Our objectives here will accommodate volume as additional information on market sidedness, and from this point forward we only report results for imbalance in shares which are computed as proportion. Table 3 presents the autocorrelation of order imbalances in shares, which represents the combination of imbalances and trading volume as a market sidedness measure for each type of investor across brokerage classes. The table shows that order imbalances in shares give virtually identical results to the number of order imbalances. Although it was less statistically significant, the serial correlation was virtually similar across trader type and broker. Statistically significant positive results are found more for domestic rather than foreign traders in both sample groups. Order imbalances also particularly happen across trader type, especially for transactions that involve domestic traders. According to our findings, it can be interpreted that there is asymmetric information between trader types and that domestic traders are likely to create order imbalances in each brokerage classes on the IDX. On aggregate, order imbalances occur through domestic traders than foreign traders. It also confirms previous studies by Chordia, Roll, and Subrahmanyam (2002) and Chordia and

Subrahmanyam (2004), which suggest breaking down order imbalances in order to provide a better understanding of agents and their trading activity. Overall, our findings indicate that order imbalances are a particular issue rather than a marketwide phenomenon.

Predictors of Order Imbalances

The next issue we attempt to examine how daily order imbalance determines in each category. We continue to scrutiny what can predict order imbalances across different trader types and brokerage firm classes. Here, we put an effort to ascertain the extent to which traders follow strategies based on information distributed by their brokers. Our method follows the study of Lee et al. (2004), with some modifications derived from the study of Agarwal et al. (2011). Table 4 shows a marketwide level regression using day-of-the-week indicator variables, past market return performances and lagged order imbalances. We found that in marketwide level order imbalances in shares are to some extent determined by the trading activity on a particular day, but are not defined by both past market return performances and lagged imbalances. The aggregate order imbalances are caused merely by the behavior of domestic traders. Domestic traders tend to be more active on Mondays and Thursdays, while foreign traders are more active on Wednesdays. The particular trading day has an impact on daily market imbalances.

There is no evidence that traders use a strategy that naively extrapolates from past price performances at marketwide level. However, we find that lagged imbalances determine particular recent imbalances. Prior foreign trading activity is responsible to define its daily imbalances, as our test reports statistically significant negative serial correlation only for foreign traders. The lagged order imbalance is responsible for increasing the bulk of explanatory power, which reaches 20%. This finding confirms with the results of Chordia, et al. (2002) that order imbalances are not driven by weekly seasonal. Nevertheless, the overall negative serial correlation is inconsistent with our aforementioned test, which is debatable in light of order imbalances should be positively correlated.

We examine these issues further in a more descriptive manner and with the same method, incorporating brokerage firm size to explore more deeply the particular order imbalances in relation to trader types. Table 5 exhibits a time-series regression which examines determinant of order imbalances in shares by breaking down into specific trader types and brokerage classes. We found that at the brokerage level, the determination of order imbalances varied across broker size for both samples used and that there were no consistent imbalance patterns amongst the classes. The weekly seasonal are also change that on a small to medium broker, with domestic traders more likely to trade on Wednesdays, and foreign traders to trade on Mondays and Thursdays through big brokers. This evidence is different from our findings around the trading day on a marketwide level previously mentioned. However, the contrarian strategy is also captured consistently only in a few brokerage classes in both domestic and foreign traders, as well as a very small number of momentum strategy. Traders tend to trade at an opposite direction according to market returns past performance after three days after up-market moves and a day after down-market moves. This evidence of contrarian trading confirms a part of finding in Lee, et al. (2004), but our test shows inconsistency among different brokerage classes. Our interpretation according to this trading activity is that a brokerage firm provides recommendations to traders in a particular market situation (e.g. profit taking when the market is upward-moving and buy-on-value when the market is downward-moving).

In comparison to the marketwide level test, our results show that at the brokerage level there are some differences in the nature of the order imbalances between trader types. Nevertheless, we still found negative serial correlations for foreign traders, which appears in small-to-medium size brokerage firm class. These negative serial correlation findings are consistent with our prior findings in a marketwide level analysis. The explanation that has been proposed for these negative autocorrelation can be approached following Chordia and

Table 4 Determinants of Marketwide Order Imbalances

Daily order imbalances (OIBSH) by trader category and their size of broker, as describes in Tables 1 and 2, are regressed on day-of-the week dummies, lagged imbalances of the same trader and size of broker category, and their past positive and negative market returns. Since IDX trades on only five days a week, then five lags and dummies span one week are used. Friday is the base case in day-of-the-week dummies. The order imbalance is in shares (OIBSH) and is equally-weighted across samples, which OIBSH is proportion of daily order imbalance in shares from all stocks traded. Total of observations is 103. F-F represents foreign buy orders less foreign sell orders, D-D represents domestic buy orders less domestic sell orders. maxr_lagt = max(0,Rt) and minr_lagt = min(0,Rt) where Rt is the market returns t days prior to the observation date. *, **, and *** indicate significance levels of 10%, 5% and 1%, respectively.

	Total	D-D	F-F
Intercept	-0.0672	-0.0634	-0.0038
	(-1.63)	(-1.60)	(-0.62)
Monday	0.1037	0.0969	0.0068
	(2.33)**	(2.28)**	(1.05)
Tuesday	0.0289	0.0309	-0.0020
	(0.68)	(0.75)	(-0.31)
Wednesday	0.0153	0.0261	-0.0108
	(0.35)	(0.63)	(-1.72)*
Thursday	0.0863	0.0857	0.0006
	(1.97)**	(2.05)**	(0.09)
$maxr_{\_lag1}$	-0.3522	-0.1720	-0.1802
	(-0.17)	(-0.09)	(-0.61)
$maxr_{\_lag2}$	-2.7608	-2.4671	-0.2937
	(-1.36)	(-1.27)	(-0.99)
$maxr_{\_lag3}$	1.2013	1.3767	-0.1754
	(0.75)	(0.89)	(-0.75)
$maxr_{\_lag4}$	0.9789	0.7410	0.2379
	(0.54)	(0.43)	(0.91)
$maxr_{\_lag5}$	2.2921	1.9909	0.3012
	(1.23)	(1.12)	(1.11)
$minr_{\_lag1}$	0.6106	0.3342	0.2764
	(0.44)	(0.25)	(1.38)
$minr_{\_lag2}$	0.8221	0.8423	-0.0203
	(0.64)	(0.69)	(-0.11)
$minr_{\_lag3}$	0.6058	0.8101	-0.2043
	(0.47)	(0.66)	(-1.09)
$minr_{\_lag4}$	-0.3933	-0.2638	-0.1295
	(-0.29)	(-0.20)	(-0.66)
$minr_{\_lag5}$	-1.6548	-1.6834	0.0286
	(-1.23)	(-1.31)	(0.15)
lag1	-0.0315	0.0249	-0.0564
	(-0.17)	(0.14)	(-2.12)**
lag2	0.1238	0.1547	-0.0309
	(0.71)	(0.93)	(-1.21)
lag3	0.1384	0.1789	-0.0405
	(0.83)	(1.12)	(-1.67)*
lag4	-0.0468	-0.0357	-0.0111
	(-0.28)	(-0.22)	(-0.45)
lag5	0.0465	0.0626	-0.0162
	(0.27)	(0.38)	(-0.65)
Adj. R^2	-0.0177	-0.0161	0.2002

Swaminathan (2000). They report that trading volume is a significant determinant of the cross-autocorrelation. Intuition suggests that in our model there are lagged market returns and order imbalance in shares, therefore it is possible that negative serial correlation is produced by cross-autocorrelation between market returns and volume loaded in our proxies here.

Another explanation we may propose here that since in IDX agents have a privilege to allow themselves in de facto market making activity to absorb the imbalances, foreign traders in association with their brokerage firms do not act to follow order imbalances strategy as well as take a role as market makers. The non-existences of designated market makers make

Table 5 Determinant of Order Imbalances within Trader type According to Broker Size

Daily order imbalances (OIBSH) by trader category and their size of broker are regressed on day-of-the week dummies, lagged imbalances of the same trader and size of broker category, and their past positive and negative market returns. Since IDX trades on only five days a week, then five lags and dummies span one week are used. Friday is the base case in day-of-the-week dummies. The order imbalance is in shares (OIBSH) and is equally-weighted across samples.. Total of observations is 103. F-F represents foreign buy orders less foreign sell orders, and D-D represents domestic buy orders less domestic sell orders. maxr_lagt = max(0,Rt) and minr_lagt = min(0,Rt) where Rt is the market returns t days prior to the observation date. *, **, and *** indicate significance levels of 10%, 5% and 1%, respectively.

	D-D					F-F				
	1	2	3	4	5	1	2	3	4	5
Intercept	0.0048	0.0320	-0.0124	0.0011	-0.0032	-0.0051	0.0022	0.0006	-0.0011	0.0004
	(0.40)	(1.89)*	(-1.30)	(0.44)	(-1.97)*	(-1.88)*	(0.48)	(1.70)*	(-1.19)	(0.67)
Monday	-0.0029	0.0130	-0.0024	0.0019	0.0015	-0.0002	0.0047	0.0001	0.0019	-0.0001
	(-0.23)	(0.72)	(-0.24)	(0.70)	(0.88)	(-0.07)	(0.95)	(0.15)	(1.92)*	(-0.22)
Tuesday	-0.0125	-0.0236	-0.0167	-0.0025	0.0005	-0.0029	-0.0004	0.0003	0.0016	-0.0004
	(-0.95)	(-1.26)	(-1.59)	(-0.90)	(0.26)	(-0.97)	(-0.08)	(0.68)	(1.49)	(-0.72)
Wednesday	-0.0269	-0.0276	-0.0238	-0.0049	-0.0025	0.0014	-0.0036	-0.0001	0.0012	0.0005
	(-2.08)**	(-1.50)	(-2.30)**	(-1.80)*	(-1.40)	(0.47)	(-0.72)	(-0.22)	(1.18)	(0.88)
Thursday	-0.0208	-0.0243	-0.0141	-0.0014	0.0009	-0.0040	-0.0088	-0.0001	0.0019	0.0000
	(-1.61)	(-1.33)	(-1.36)	(-0.53)	(0.50)	(-1.37)	(-1.74)*	(-0.14)	(1.88)*	(-0.07)
$maxr_{lag1}$	-0.3046	-0.2939	0.2204	0.1464	0.0597	0.1490	-0.3299	-0.0233	-0.0077	0.0030
	(-0.50)	(-0.34)	(0.46)	(1.17)	(0.72)	(1.08)	(-1.40)	(-1.34)	(-0.16)	(0.11)
$maxr_{lag2}$	-0.5990	-1.4981	-0.2087	-0.0789	-0.0823	-0.0191	-0.3163	-0.0138	0.0726	-0.0125
	(-1.00)	(-1.76)*	(-0.43)	(-0.63)	(-1.00)	(-0.14)	(-1.35)	(-0.80)	(1.52)	(-0.46)
$maxr_{lag3}$	0.2653	0.1777	0.8028	0.0356	0.0953	0.1826	-0.3878	-0.0167	-0.0011	0.0261
	(0.56)	(0.26)	(2.11)*	(0.36)	(1.46)	(1.68)*	(-2.08)**	(-1.22)	(-0.03)	(1.23)
$maxr_{lag4}$	0.3355	-0.1499	0.4763	0.0380	0.0410	-0.0320	0.2502	-0.0091	0.0014	0.0277
	(0.63)	(-0.20)	(1.12)	(0.34)	(0.56)	(-0.26)	(1.20)	(-0.59)	(0.03)	(1.16)
$maxr_{lag5}$	0.8859	0.6467	0.3304	0.0677	0.0602	0.0600	0.3282	0.0141	-0.1074	0.0037
	(1.61)	(0.83)	(0.75)	(0.59)	(0.80)	(0.48)	(1.52)	(0.89)	(-2.44)**	(0.15)
$minr_{lag1}$	0.0057	0.4194	-0.0537	-0.0374	0.0002	-0.0077	0.2741	-0.0016	0.0187	0.0023
	(0.01)	(0.73)	(-0.17)	(-0.44)	(0.00)	(-0.08)	(1.73)*	(-0.14)	(0.59)	(0.12)
$minr_{lag2}$	0.3289	0.4889	-0.0828	0.0843	0.0230	-0.0435	0.0197	0.0008	-0.0013	0.0051
	(0.87)	(0.91)	(-0.27)	(1.07)	(0.44)	(-0.50)	(0.13)	(0.08)	(-0.05)	(0.29)
$minr_{lag3}$	0.3833	0.5279	-0.1206	0.0812	-0.0616	-0.0477	-0.1428	0.0010	-0.0072	-0.0028
	(1.01)	(0.98)	(-0.40)	(1.03)	(-1.19)	(-0.55)	(-0.96)	(0.09)	(-0.24)	(-0.16)
$minr_{lag4}$	-0.0606	-0.0646	-0.1338	-0.0167	0.0119	-0.0275	-0.1356	-0.0018	-0.0088	0.0183
	(-0.15)	(-0.11)	(-0.42)	(-0.20)	(0.22)	(-0.30)	(-0.87)	(-0.15)	(-0.27)	(1.02)
$minr_{lag5}$	-0.5003	-1.0038	-0.0566	-0.0859	-0.0367	-0.0362	0.0032	-0.0012	0.0515	0.0104
	(-1.25)	(-1.77)*	(-0.18)	(-1.04)	(-0.67)	(-0.40)	(0.02)	(-0.11)	(1.65)	(0.58)
lag1	-0.0226	0.0096	0.0302	0.0074	0.0002	-0.0045	-0.0518	-0.0005	0.0002	-0.0003
	(-0.42)	(0.13)	(0.70)	(0.66)	(0.03)	(-0.37)	(-2.45)**	(-0.32)	(0.06)	(-0.10)
lag2	0.0440	0.0409	0.0497	0.0179	0.0022	-0.0036	-0.0288	-0.0003	0.0004	0.0009
	(0.85)	(0.56)	(1.20)	(1.66)*	(0.31)	(-0.31)	(-1.42)	(-0.21)	(0.09)	(0.41)
lag3	0.0450	0.0795	0.0426	0.0093	0.0024	-0.0036	-0.0343	-0.0006	-0.0037	0.0014
	(0.91)	(1.14)	(1.08)	(0.91)	(0.36)	(-0.32)	(-1.78)*	(-0.40)	(-0.96)	(0.63)
lag4	0.0098	-0.0126	-0.0234	-0.0076	-0.0019	-0.0114	-0.0021	0.0014	-0.0007	0.0017
	(0.20)	(-0.18)	(-0.59)	(-0.73)	(-0.28)	(-1.00)	(-0.11)	(0.98)	(-0.19)	(0.78)
lag5	0.0245	0.0123	0.0235	0.0021	0.0003	-0.0040	-0.0088	0.0015	-0.0082	0.0020
	(0.48)	(0.17)	(0.58)	(0.20)	(0.04)	(-0.35)	(-0.45)	(1.05)	(-2.04)**	(0.86)
Adj. R^2	-0.0387	-0.0036	0.0393	0.0172	-0.0178	-0.0310	0.2260	-0.1016	0.0208	-0.1120

inventory paradigm is not relevant to explain our findings. Our evidence exhibit that the negative correlation of imbalances is either inconsistent or cannot show a pattern. This problem arises when one breaks down imbalances into the smaller level of unit analysis. Thus, this particularity prompt that brokerage firms may provide foreign traders with valuable information, which is distributed only for their clients. This negative correlation of order imbalances is consistent with the work of Su and Huang (2008), which reports asymmetric information on return-order imbalance relation. In addition, the work of Chordia and Subrahmanyam (2004) shows that negative coefficients on lagged imbalances arise because conditioning on total

Table 6 Determinants of Market Returns

The dependent variable is the daily market returns on the Indonesia Stock Exchange. Explanatory variables include day-of-the week dummies, lagged imbalances and their past positive and negative market returns. Since IDX trades on only five days a week, then five lags and dummies span one week are used. Friday is the base case in day-of-the-week dummies. The order imbalance is in shares (OIBSH) and is equally-weighted across samples, which OIBSH is proportion of daily order imbalance in shares from all of stocks traded. Total of observations is 103. F-F represents foreign buy orders less foreign sell orders, and D-D represents domestic buy orders less domestic sell orders. maxr_lagt = max(0,Rt) and minr_lagt = min(0,Rt) where Rt is the market returns t days prior to the observation date. Similarly, EBO_lag1 = max(0,OIBt) and ESO_lag1 = -min(0,OIBt). *, **, and *** indicate significance levels of 10%, 5% and 1%, respectively.

	Total	Total of D-D	D-D 1	D-D 2	D-D 3	D-D 4	D-D 5	Total of F-F	F-F 1	F-F 2	F-F 3	F-F 4	F-F 5
Intercept	-0.0031	0.0048	-0.0051	-0.0034	-0.0020	-0.0033	-0.0057	0.0067	-0.0006	-0.0027	-0.0036	-0.0045	-0.0041
	(-0.57)	(0.94)	(-0.90)	(-0.66)	(-0.36)	(-0.65)	(-1.05)	(1.13)	(-0.12)	(-0.45)	(-0.71)	(-0.77)	(-0.82)
Monday	-0.0014	-0.0099	-0.0009	-0.0012	-0.0013	-0.0018	-0.0023	-0.0113	-0.0014	-0.0028	-0.0027	-0.0019	-0.0028
	(-0.22)	(-1.55)	(-0.14)	(-0.19)	(-0.20)	(-0.29)	(-0.36)	(-1.74)*	(-0.21)	(-0.43)	(-0.42)	(-0.29)	(-0.44)
Tuesday	0.0025	-0.0061	0.0020	0.0031	0.0018	0.0015	0.0006	-0.0085	0.0018	-0.0001	0.0006	0.0016	0.0005
	(0.40)	(-0.97)	(0.31)	(0.50)	(0.28)	(0.24)	(0.09)	(-1.34)	(0.29)	(-0.01)	(0.10)	(0.24)	(0.08)
Wednesday	0.0087	-0.0077	0.0092	0.0086	0.0079	0.0086	0.0086	-0.0086	0.0095	0.0083	0.0087	0.0077	0.0068
	(1.40)	(-1.22)	(1.46)	(1.39)	(1.27)	(1.38)	(1.37)	(-1.36)	(1.51)	(1.31)	(1.39)	(1.15)	(1.06)
Thursday	0.0014	-0.0087	0.0010	0.0011	0.0006	0.0006	0.0000	-0.0083	0.0005	0.0001	0.0004	0.0013	-0.0007
	(0.23)	(-1.40)	(0.16)	(0.17)	(0.09)	(0.09)	(0.00)	(-1.32)	(0.08)	(0.01)	(0.07)	(0.20)	(-0.11)
$maxr_{\_lag1}$	-0.1066	-0.1604	-0.1101	-0.2302	-0.0544	-0.0867	-0.0158	0.0182	-0.0370	0.0289	-0.0388	0.0159	0.0108
	(-0.41)	(-0.62)	(-0.44)	(-0.90)	(-0.24)	(-0.35)	(-0.07)	(0.08)	(-0.17)	(0.13)	(-0.17)	(0.07)	(0.05)
$minr_{\_lag1}$	-0.2832	-0.2738	-0.1127	-0.2303	-0.3932	-0.2112	-0.0681	-0.0773	-0.0544	-0.0864	-0.0978	-0.1064	-0.0403
	(-1.32)	(-1.26)	(-0.63)	(-1.17)	(-1.73)*	(-0.95)	(-0.37)	(-0.51)	(-0.36)	(-0.57)	(-0.65)	(-0.69)	(-0.26)
$EBO_{\_lag1}$	-0.0488	-0.0425	0.0064	-0.0776	-0.3886	-0.3819	0.7057	0.0249	-0.8664	0.1006	0.2667	0.4309	2.4101
	(-1.14)	(-0.96)	(0.05)	(-0.94)	(-1.69)*	(-0.65)	(0.68)	(0.09)	(-1.08)	(0.35)	(0.08)	(0.33)	(1.03)
$ESO_{\_lag1}$	0.0136	0.0335	0.1020	0.1270	-0.0040	0.3700	0.7296	-0.1120	-0.3143	-0.1067	2.9293	0.2797	0.5357
	(0.34)	(0.78)	(0.81)	(1.15)	(-0.03)	(0.50)	(1.01)	(-0.68)	(-0.99)	(-0.48)	(0.95)	(0.23)	(0.25)
Adj. R^2	-0.0246	-0.0206	-0.0356	-0.0101	-0.0099	-0.0331	-0.0303	-0.0362	-0.0254	-0.0362	-0.0331	-0.0554	-0.0455

current imbalance overweights the impact of current trades that the autocorrelated with past trades. Since the negative imbalances appear only at the foreign traders, it is possible that they exploit valuable information through their own brokerage firms. This might overweight the impact of current imbalances. Overall, we conclude that both marketwide level and brokerage firms level, traders do not exhibit compelling evidence of strategies which are the results of using past price trends as well as exploiting imbalances as a trading strategy.

Order Imbalance as Predictor of Market Return

Since the existence of imbalance will make a price pressure on the market, we examine further the market returns performance in relation to extreme imbalances on each trader and brokerage firm classes. Empirical studies of relationships between order imbalances and market returns date back to Lee, et al. (2004), Chordia, et al. (2002), and Su and Huang (2008) which argue that that imbalance could cause continuing price pressures in the direction of an imbalance shock. We examine this kind of relationship between imbalances and future market returns further by estimating the directional impact according to the imbalances generated by different traders and brokerage firm size categories. We split the imbalances into positive and negative and included them as separate regressors, which are defined as *Excess Buy Order*, and formally stated as $EBO \equiv max[0,OIB_t]$ and *Excess Sell Order*, formally stated as $ESO \equiv -min[0,OIB_t]$, where OIB_t is the buy less sell order imbalance at t days prior to the observation date, $(t=0,1)$. Ideally, one would use market returns calculated from a market index unaffected by nonsynchronous trading, but in the IDX nonsynchronous trading occurs nevertheless. We warn readers about this problem.

Table 6 exhibits a prediction regression model following the test of Lee, et al. (2004), which examines a relationship of market returns on prior imbalances. In terms of explanatory power, the forecasting ability of prior imbalances is weak to nonexistent, among marketwide level, trader level, and brokerage firm level. Most of all our result in Table 6 exhibit non significant imbalances (both *EBO* and *ESO*). Nonetheless,

we still find that there is only a group which reports a previous negative significant imbalance. At a group of medium-sized brokerage firm classes within domestic traders, lagged EBO exhibits negative value and significant. Surprisingly, the signed is different from our expectation, which ought to be positive as reported in Lee, et al. (2004) but it should not be significant.

To infer this evidence, we consistently follow Chordia and Subrahmanyam (2004) theoretical framework, which is the relation between market returns and imbalances are built upon inventory and asymmetric information consideration. Since in IDX there is no designated market maker, the inventory problem will consequently embed to each agent if and only if they take a market-making position. If an inventory balancing act produces autocorrelation, then it might not fulfill in IDX. Under this theoretical framework, the following explanation may answer our finding that non-informed traders herd together to response specific information otherwise informed traders split their orders over time, which their actions may responsible to cause imbalances. Our findings suggest that in different market structure setting asymmetric information may explain better than inventory regarding the market-making activity. Thus, by intuition, the information paradigm may complement particularly the explanation of an inventory problem in marketwide imbalances.

Conclusions

There is a consensus among financial academics and practitioners about domestic traders have an advantage in trading stocks over foreign traders. We test order imbalances under the consideration between two types of traders in association with their brokerage house, which create a particular quality of information. We follow the suggestion of Chordia and Subrahmanyam (2004) and Chordia, Roll and Subrahmanyam (2002) that by using order imbalance may shed light on the informational paradigm by ascertaining whether agents are able to predict the signs of impending announcements, which will help identify whether informed traders and liquidity traders in a more precise manner. Our study is an extension for the following research issues, which are examines properties and determinants of daily order imbalances between domestic traders and foreign traders, investigates how daily order imbalances determines in each category, and examines the market return performance in relation to order imbalances of each trader type in their association with their brokerage firms. Our study provides also an explanation of order imbalances in a market, which does not have either designated market makers or specialists, indicating that agents have a privilege to allow themselves in de facto market making activity to absorb the imbalances of traders that demand immediacy.

We find that order imbalances are a particular phenomenon regarding the level of analysis. It may affect a generalization of the impact of imbalances among levels. Our findings confirm the brokerage firm effect proposed by Agarwal et al. (2011) in order to shed further light on order imbalances analysis. In addition, we document several interesting findings:

- For all brokerage firm classes, both domestic traders and foreign traders exhibit much positive serial correlation and statistically significant results. Our findings are consistent with previous researches, which also report that there are positive serial correlation order imbalances. Although it is less significant, our calculation using order imbalance in shares (OIBSH) shows similar results. Contrasting two types of trader on brokerage firm level, our results show that order imbalances are caused by asymmetric information. Since there are no either designated market makers or specialist, inventory paradigm is not relevant to explain our results.
- The determinants of imbalances vary between domestic traders and foreign traders in relation to their brokerage firms, but we do not capture consistent imbalance patterns amongst the classes. Using the proportion of order imbalance in shares, we also document that both traders use contrarian trading strategy on the previous two days. In addition, we still find the weekly seasonal effect. Us-

ing brokerage firm categorization, we still found negative serial correlations for a group of foreign traders. Between domestic traders and foreign traders, there are also some differences in the nature of the trading activity inducing order imbalances depending on which brokerage firm they execute the trade. This indicates that information disseminated by brokerage houses leads to imbalance. There is no evidence that traders use a strategy that naively extrapolates from past price performances at a marketwide level. We find for both traders an only small number of contrarian strategy among brokerage firm class.

- The forecasting ability of previous imbalances is weak to nonexistence, both at the marketwide level and brokerage firm level. Although there is a negative correlation of order imbalance, this evidence which shows at the brokerage firms level proves that a close relationship between traders and brokerage firms affect their trading activity.

Our findings show evidence that is different to that of previous studies, which marketwide analysis confirms to the inventory paradigm; however, since the asymmetric information issue may arise at the brokerage firm level, the information paradigm may complement the explanation of order imbalances. Overall, we conclude that the relationship between traders and brokers creates specific order imbalances. The results indicate that order imbalances affect liquidity in a particular manner, but we are unaware of which information causes imbalances. Regarding the study limitations, other tests considering stock level information, public announcements and trading behavior, such as institutional and individual herding in the relationship with market-wide imbalances, may shed further light on this topic. These and other possible topics are left for future research.

References

Admati, A. R., & Pfleiderer, P. (1988). A Theory of Intraday Patterns: Volume and Price Variability. *The Review of Financial Studies, 1*(1), 3-40.

Agarwal, S., Chiu, I.-M., Liu, C., & Rhee, S. G. (2011, Fall). The Brokerage Firm Effect in Herding: Evidence from Indonesia. *Journal of Financial Research, 34*(3), 461-479.

Bailey, W., Cai, J., Cheung, Y. L., & Wang, F. (2009). Stock returns, order imbalances, and commonality: Evidence on individual, institutional, and proprietary investors in China. *Journal of Banking and FInance, 33*(1), 9-19.

Battalio, R., Ellul, A., & Jennings, R. (2007). Reputation Effects in Trading on the New York Stock Exchange. *Journal of Finance, 62*(3), 1243-1271.

Brown, P., Walsh, D., & Yuen, A. (1997). The Interaction between Order Imbalance and Stock Price. *Pacific-Basin Finance Journal, 5*, 539-557.

Busse, J. A., Green, T. C., & Jegadeesh, N. (2012). Buy-Side Trades and Sell-Side Recomendations: Interactions and Information Content. *Journal of Financial markets, 15*, 207-232.

Chan, K., & Fong, W.-M. (2000). Trade Size, Order Imbalance, and the Volatility-Volume Relation. *Journal of Financial Economics, 57*, 247-273.

Chiyachantana, C. N., Jain, P. K., Jiang, C., & Wood, R. A. (2004). International Evidence on Institutional Trading Behavior and Price Impact. *Journal of Finance, 59*(2), 869-898.

Choe, H., Kho, B.-C., & Stulz, R. M. (2005). Do Domestic Investors Have an Edge? The Trading Experience of Foreign Investors in Korea. *Review of Financial Studies, 18*(3), 795-829.

Chordia, T., & Subrahmanyam, A. (2004). Order Imbalance and Individual Stock Returns: Theory and Evidence. *Journal of Financial Economics, 72*, 485-518.

Chordia, T., & Swaminathan, B. (2000). Trading Volume and Cross-Autocorrelations in Stock Returns. *Journal of Finance, 55*(2), 913-935.

Chordia, T., Roll, R., & Subrahmanyam, A. (2002). Order Imbalance, Liquidity, and Market Returns. *Journal of Financial Economics, 65*, 111-130.

Doukas, J. A., Kim, C. (., & Pantzalis, C. (2006). Divergence of Opinion and Equity Returns. *Journal of Financial and Quantitative Analysis, 41*(3), 573-606.

Dvořák, T. (2005). Do Domestic Investors Have an Information Advantage? Evidence from Indonesia. *Journal of Finance, 60*(2), 817-839.

Ekaputra, I. A. (2014). Impact of Foreign and Domestic Order Imbalances on Return and Volatility Volume Relation. *Asian Academy of Management Journal of Accounting and Finance, 10*(1), 1-19.

Garfinkel, J. A., & Nimalendran, M. (2003). Market Structure and Trader Anonymity: An Analysis of Insider Trading. *Journal of Financial and Quantitative Analysis, 38*(3), 591-610.

Glosten, L. R. (1994). Is the Electronic Open Limit Order Book Inevitable? *Journal of Finance, XLIX*(4), 1127-1161.

Kim, S. T., Lin, J.-C., & Slovin, M. B. (1997). Market Structure, Informed Trading; and Analysts' Recommendations. *Journal of Financial and Quantitative Analysis, 32*(4), 307-524.

Lee, Y.-T., Liu, Y.-J., Roll, R., & Subrahmanyam, A. (2004). Order Imbalances and Market Efficiency: Evidence from Taiwan Stock Exchange. *Journal of Financial and Quantitative Analysis, 39*(2), 327-341.

Ravi, R., & Sha, Y. (2014). Autocorrelated Order-Imbalance and Price Momentum in the Stock Market. *International Journal of Economics and Finance, 6*(10), 39-54.

Sadka, R., & Scherbina, A. (2007). Analyst Disagreement, Mispricing, and Liquidity. *Journal of Finance, 62*(5), 2367-2403.

Su, Y. C., & Huang, H. C. (2008). Dynamic Causality between Intraday Return and Order Imbalance in NASDAQ Speculative Top Gainers. *Applied Financial Economics, 18*, 1489-1499.

Womack, K. L. (1996). Do Brokerage Analysts' Recommendations Have Investment Value? *Journal of Finance, 51*(1), 137-167.