# Liquidity Analysis And Information Component Of Frequently-Traded Stocks During Bullish And Bearish Market In Indonesia Stock Exchange (Idx)

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**Abstract**
This paper studies the liquidity pattern and information component cost of 10 stocks which are traded in Indonesia Stock Exchange during 2007 -2008. Liquidity analysis is particularly focused on net order imbalance between 2 tick sizes while the information component cost is calculated using the difference of buyers and sellers' valuation at various hypothetical trade size. During the bearish market, it is shown that the frequency of smaller order size is greater in as traders are more cautious in their order placement. Although, buyer-initiated trades seem to be slightly higher in the bullish market, there are more shares available to sell during this period. Except for large order size (>10,000 shares), the influence of net trading frequency at different order size on net order imbalance does not show convincing result. However, for large order size, it indicates that the same amount of net trading frequency will create higher order imbalance in bullish market rather than in bearish market which further imply that the degree of heterogeneous belief among traders are bigger in the bullish market. From information component cost, 3 stocks (ANTM, TLKM and UNTR) have consistent and small information component cost and 1 stock (AALI) appears to have the highest information component cost. In addition, there is evidence of significant difference in the mean of information component between these 2 periods of observation.

Keywords: *Liquidity, Information component, Bearish and Bullish market*

## 1. Introduction

As human beings are found to be risk adverse, it might be expected that the trading behaviour and trading strategy under bullish and bearish market condition will be different. The literature of behavioural finance suggests overconfidence and self-attribution are some human bias which can affect the trading activity. Since prices are up-trending in bullish market, it is believed that trading activity will be higher during this period as traders will easily overestimate their ability to interpret market movement. In addition, disposition effect might also give some influence for traders to exercise greater trading activity due to the propensity to sell winners is bigger than that of losers. Although sophisticated traders such institutional traders might not exhibit this bias as much as individual traders, different trading mechanism set up by market regulators for buying and selling assets under bearish and bullish market might limit 'rational" traders' activities to take advantage from this bias. For example, short-selling activities which are prohibited by the regulator of IDX during the second half year of 2009 to minimize the impact of price further down which set up. In addition, the risk and cost of trading and unknown time horizon of irrational traders can restrict arbitrageurs to take opportunity as often argued in the literature of behavioural finance theory. Due to unexpected condition is higher during bearish market, the level of fear is thus considerably higher and consequently, traders are more cautious in submitting and executing their orders. This study intends to identify trading activity, liquidity pattern and information component during bullish and bearish market, using tick by tick trading and quote data. The choice of the observation period to define bullish and bearish market is somewhat arbitrary. 86 trading days in 2007 and 2008 were chosen to indicate bull and bear market consecutively. In general, 2007 (2008) is a bull (bear) market where there is an upward (downward) price movement characterized by a series of higher (lower) intermediate highs (lows) which are interrupted by a series of higher (lower) intermediate lows (highs). There is no general consensus in finance literature about the number of series that a pattern should have to be called a bull (bear) market because every trader build his/her own pattern according to their investment horizon.

This paper will be arranged as follows. First, it will present the literature review for liquidity and information component followed by general description of IDX trading mechanism and performance. After that, the methodology and data used for this study will be portrayed. Finally, the result will be communicated. The first part of the result will provide descriptive statistics of trade price, spread, bid and ask size at different level market depth, proportion of trading frequency under different trade size, buyer-initiated and seller-initiated, net order imbalance and price duration. The second section will inform about OLS estimation of net order imbalance on frequency of different order size (500,501- 2500, 2501-10000 and >10000 shares) with the purpose to examine the impact of different order size on net order imbalance. Finally, the calculation of information component at six hypothetical trade size (2500,5000,7500,10000,12500 and 15000 shares) will be shown.

## 2. Literature Review

### 2.1 Liquidity

In a nutshell, liquidity is the ability to buy and sell a particular amount of an asset during the trading period without having significant impact on the asset price. It is an important issue in market microstructure theory and concerns issuers, market traders and regulators due to its close relationship with asset pricing and traders' behaviour. It is crucial for equity issuers because traders take account of the cost of trading when valuing financial assets. The rationale is straightforward; when traders want to sell their stocks at the same time, illiquid stocks cost them more so they discount their value. Amihud, Mendelson, & Pedersen (2005) show that a reduction in liquidity will result in price reduction. Thus the cost of capital for companies with illiquid stocks is higher than for companies with frequently-traded stocks. Market traders also prefer to participate in liquid markets since they have lower trading costs and subsequently achieve better actual returns for their portfolios. Liquidity is important for regulators because it can encourage the efficient flow of funds among capital suppliers and demanders, leading to higher trading activity and immediate price discovery.

Liquidity is certainly a subtle and complex concept which can be interpreted into different ways. For these reasons, there are various quantification methods which can usually be categorized into order-based and trading-based measurements (Aitken & Comerton-Forde, 2003). They argue that the latter does not signal future liquidity but only indicates past liquidity because it only employs measures of previous trading activity such as volume, value, frequency, and turnover. Therefore, it is not sufficient to assess incoming liquidity based solely on trading-based proxies. However, these proxies were popular among researchers in the 1990's because the data is readily available and easily observable over the long-run. Lhabitant & Gregoriou (2007) define liquidity as the change in the observed price corresponding to the change in the observed volume. In this context, liquidity is seen as a dynamic and elastic process which is influenced by trading activity. According to Harris (2003), liquidity presents in three dimensions, time, price and size. Time dimension (immediacy) is about the possibility of buying and selling whenever the traders are willing to do so. The less time needed to sell or to buy stocks, the more liquid the stocks are. Price dimension (spread) means the difference between bid and ask prices; liquid stocks will have narrow spread indicating that the trading cost for such stocks is relatively low. Spread is useful for measuring the immediate trading cost for a certain number of orders which are readily tradeable at best prices. It is usually relevant for small and medium orders as it can misrepresent trading cost for large orders if there is insufficient depth in the order book. Size dimension (depth) can be interpreted as the midpoint quantity of the best bid and ask price or the number of orders waiting to be executed for different trading prices and generally useful for predicting the price impact of trades. Liquid stocks will have a high volume of units available for trading at a given price, so a large block of trading does not have significant price impact. Thus the appropriate proxy for measurement of liquidity proxy has to include dimensions of immediacy, spread and depth.

Engle & Lange (2001) assessed liquidity in the stock market using VNet, a model of the dynamics of market depth. This model which measures the number of shares purchased minus the number of shares sold over a period when prices moved a certain increment, estimates the market reaction curve through the measurement of net trade volume and corresponding price change over a particular time interval. They found that the amount of one-sided volume (VNet) which can be sustained before price adjustment appears to vary over time and attributed this variability to the extent of information asymmetry among market participants. In addition, their model shows that traders with larger volume can greatly reduce transaction costs if they have time to spread their trades over a longer interval. Another intuitive approach which can be used to draw the slope of market reaction curve is to determine

the price change per share of excess demand over a fixed interval of time. However, as stated by Engle & Lange (2001), this approach should not be followed for these reasons: (1) excess volume of demand can be positive or negative, (2) the price discreteness problems arise at numerator, (3) the time internal should be long while using long intervals which will reduce the statistical ability to capture the short-run dynamics and (4) the possibility that demand change is zero is high.

2.2 Information Component

Rakowski & Beardsley (2008) have another approach to decompose information and non-information component in pure order driven market INET ECN. Their method of using spread and depth of limit order book enriches the existing decomposition model which is mainly designed for quote-driven market. Their work is motivated by illiquidity measurement model of Domowitz, Hansch, & Wang (2005) and the concept is as follows. Market liquidity is defined as the difference between seller's posted price and buyers' posted price or the order imbalance between supply and demand at particular time. In other words, they measure liquidity from the closeness of supply to demand, which is written as follow:

$l(Q) = \int_0^Q \frac{S(q) - D(q)dq}{Q}$ , where the smaller value indicates a tighter relationship between supply and demand, and thus the greater the liquidity.

Rakowski & Beardsley made several assumptions, i.e (1) the difference between buyer's and seller's valuation (information asymmetry component) is always positive (2) the difference in valuation is large at the top of the book and converges later, (3) the buyers always posted a price which is lower than their valuation and the sellers always posted a price which is higher than their valuation; the difference between sellers' (buyers') valuation and sellers' (buyers') posted price is called non-information component of sellers (buyers) and (4) the average net order processing cost for buyers and sellers is alike.

Using this model, they found that asymmetric information component of liquidity is large near the inside quotes and converges towards zero beyond it. This pattern is noticeable for low-volume and high-priced stocks. They also found that asymmetric information is dispersed throughout the order book for active stocks while for inactive stocks it is clustered which is the result of inability to "hide" orders amongst liquidity providers of inactive stocks since there is no sufficient number of orders present and result in the aggressively priced and marketable limit orders. For transaction cost per share, the most actively traded stocks experience rapid decrease until 1000 shares before it gradually decrease, and for the most inactive stocks, it also decrease rapidly until 600 shares but then it slowly increase before reaching a constant level about 4200 shares and higher.

The critical point of the article of Rakowski & Beardsley is the way they determine the expected valuation of sellers and buyers at time 0 is based on the order book information after 30 transactions for all data. They do not provide further justification/reasoning for this. Since stock characteristics and trading rules might affect the expected valuation of sellers and buyers at a particular time, this procedure can be misleading. Thus, it is necessary to examine the speed of adjustment to information for an individual stock. Husodo & Henker (2007) using the speed of adjustment model of Theobald & Yallup (2004) found that generally 50 most liquid stocks in Jakarta stock exchange during 2000 – 2004 adjust fairly to new information between 90 – 120 minutes. Theobald & Yallup extend the work of Amihud & Mendelson (1987) to determine the coefficient of speed of adjustment of price converging to the intrinsic value.

$$P_t - P_{t-1} = \pi(V_t - P_{t-1}) + u_t$$

If $\pi = 1$ ; this means price $P_t$ is fully adjusted to its intrinsic value $V_t$.

If $< 1$ ; this means that price underreact to new information.

If $\pi > 1$ ; this means that price overreact to new information.

Changing the above equation into:

$$P_t = \pi V_t + (1-\pi)P_{t-1} + u_t$$

Add $\Delta$ :

$$\Delta P_t = \pi \Delta V_t + (1-\pi)\Delta P_{t-1} + \Delta u_t$$

Since $\Delta P_t = R_t$, thus:

$$R_t = \pi \Delta V_t + (1-\pi)R_{t-1} + \Delta u_t$$

Given the assumption that $\Delta V_t = \mu + e_t$ ; where is $\mu$ the mean of expected rate of return plus $e_t$ the disturbance error, the following equation will be derived by Theobald & Yallup:

$$R_t = \pi\mu + (1-\pi)R_{t-1} + \pi e_t + u_t - u_{t-1}$$

This modelling structure are reflected as ARMA (1,1) process. When there is full adjustment, the process will be MA (1) process or the noise that derives the return process. The stationarity assumption will be satisfied if $|1-\pi| < 1, i.e. 0 < \pi < 2$ ; the condition which is also imposed by Amihud & Mendelson to ensure that prices were finite.

**3.Institutional Details**

3.1 IDX Trading Mechanism

Similar to many stock markets, the IDX trading rules require potential investors to be a member of a securities company before they can trade in the market. At present, the Indonesian government allows foreign and domestic investors to own up to 100% of shares with the exception for foreign investors who can only hold listed stocks in the banking industry to a maximum of 99%. After the administration process and submission of the initial deposit, an investor will obtain approval to make their first trade. The minimum unit for selling and buying in the regular and cash market is 1 lot which consists of 500 shares. Orders can be submitted by contacting brokers or online. After investors contact their brokers to give instruction to buy and sell shares, they need to inform their clients within 24 hours if the order has been fulfilled. In the regular market, every matched transaction should be settled within 3 days, a process which is known as T+3. In the cash market, the settlement is conducted on the same day while for the negotiated market, the settlement process depends on the agreement between brokers and the transaction will not be guaranteed by the Indonesian Clearing and Guarantee Corporation (KPEI in Indonesian acronym). In regular and cash markets, KPEI ensures that all trades have a proper settlement process. IDX also has a custodian agency which is called the Indonesian Central Securities Depository (KSEI in Indonesian acronym). The transaction cost for buying orders varies from 0.25% to 0.35% depending on the facilities provided by the securities companies. The cost of a selling order is higher because the government applies 0.1% of income taxation which is deducted directly from the seller account.

Following the Circular Letter No. SE-001/BEJ/06-2007, the minimum price for stock traded in the regular board of IDX has increased from IDR-25 on January 3, 2005 to IDR-50 per share on 18 June 2007. In regard to block trading, IDX applies the following rules from December 22, 2006; the maximum quantity for order submission for both regular and cash market is limited to maximum 5,000,000 shares (10,000 lots) or 5% of shares outstanding for particular stocks. Similar to odd lot orders, traders who submit orders exceeding these size limits have to use a negotiated market with a non-continuous auction execution system.

The IDX, a pure order-driven market, has five trading days (Monday to Friday) and for regular market, each trading day is divided into two trading sessions. The morning session is held between 9.30 and 12.00 and the afternoon session is held between 13.30 and 16.00 from Monday to Thursday. On Friday, the first session ends 30 minutes earlier and the second session starts 30 minutes late due to the Muslim Friday prayer session. The cash market is concurrent with the first session of the regular market. Since February 3, 2004, IDX has conducted a preopening market from 09:10 am to 09:25 am when all purchase and sell orders are submitted. These dictate the pre-opening price through the accumulation of total highest bids and asks matched by the Jakarta Automated Trading System (JATS). The system, which replaced the manual trading on May 22, 1995, allocates all transactions from 09:25:01 to 09:29:59.

The pre-opening price will be the opening price at the beginning of the trading session for the regular and the cash markets. The pre-opening system began on February 3, 2004 for LQ 45 stocks and by February 1, 2008 there are already 81 stocks included. The auto rejections limit which is applied in the pre-opening session and the percentage is based on the previous price or the offering price (Table 1). For the stocks without a pre-opening price, the following options exist: a previous, a theoretical, an initial or a fair price based on valuations by independent stock market experts. All unmatched bids and asks orders will be kept in the order book for first session trading provided they do not reach the auto rejection limit and the auto rejection for the first and second sessions of the regular market is based on the opening price.

**Table 1. Auto rejections limit**

| Previous Price of Regular Market Share Price (P) - IDR | Auto Rejection Percentage |
|---|---|
| P <= 100 | 50 % |
| 100< P < = 500 | 35 % |
| 500 < P < = 2500 | 30 % |
| 2500 < P <= 5000 | 25 % |
| P > 5000 | 20 % |

The order book records the number of market orders in descending prices for bids and in ascending prices for asks. JATS will continue to process all bids and asks orders based on price priority which means that higher bids and lower asks will be given priority. Moreover, if there is more than one bid or ask at the same price, the one that was submitted first will be given priority because of the time precedence rule. Tick size and maximum price step for trading in the regular market is shown in Table 2 below.

**Table 2. Tick Size and Maximum Tick Size**

| Group | Share Price (P) - IDR | Tick Size | Maximum Tick Size |
|---|---|---|---|
| 1 | P < 200 | IDR 1 | IDR 10 |
| 2 | 200 < P < 500 | IDR 5 | IDR 50 |
| 3 | 500 < P < 2000 | IDR 10 | IDR 100 |
| 4 | 2000 < P < 5000 | IDR 25 | IDR 250 |
| 5 | P ≥ 5000 | IDR 50 | IDR 500 |

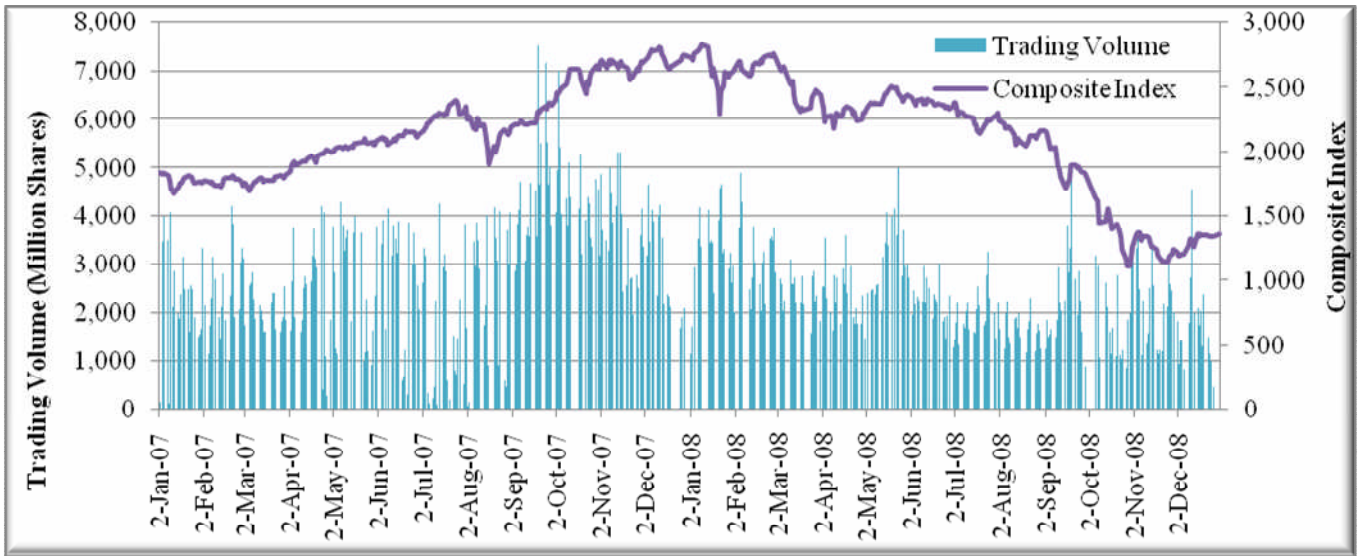
3.2 IDX Performance in 2007- 2008

Based on the Minister of Law Decree Number C-04552 HT TH 2007, Indonesia has one stock exchange arising from a merger between the Jakarta Stock Exchange (JSX) and Surabaya Stock Exchange (SSX). JSX was established in colonial times and was reactivated in 1977 to serve customers for equities market while SSX was formed in 1989 mostly for bonds and derivative products. SSX ceased to exist by November 30, 2007 and all the activities were moved to the JSX. The merger was concluded on December 3, 2007 and the name changed to Indonesia Stock Exchange on January 1, 2008. Although originally proposed during trading declines in the Asian crisis, the main purpose of the merger as indicated in the 2006 Financial Sector Policy Package was to create more synergy and efficiency in the Indonesian capital market.

The Indonesia composite market index grew significantly from 2002 – 2007, when according to the 2007 annual report of Indonesian capital market supervisory agency (BAPEPAM) - *Streamlining Process and Procedures*, IDX had the third best performance among Asian Pacific stock markets after Shanghai and Shenzhen stock market. The composite index of the IDX improved significantly by 52.08% in 2007 with the lowest of 1678.07 in January 12 to the highest of 2810.96 in December 11. 2,830.26, continue to reach its peak on January 9, 2008 with 2830.26 before declining sharply to the level of 1,111.39 on October 28, 2008 due to the global financial crisis. IDX regulators halted trading for several days in October 2008 and short-selling has been suspended till the market recovers. The composite Index was somewhat slightly recovered at the level of 1,1355.41 at Dec 30, 2008, but still significantly lower than that of its closing for Dec 28, 2007 at 2,745.83 and Dec 29, 2006 at 1,805.52. Figure 1.

shows the changes of closing composite index at IDX during period 2007 – 2008 which picture the bullish market for 2007 and bearish market for 2008.

**Figure 1. Closing Composite Index 2007 - 2008**




During 2008, there were 6 delisted companies, 13 new listing companies and 1 relisting company with total market capitalization of IDR 1,076,491 billion for 398 listed companies with 1,374,412 million shares (Figure 2). By the end of 2008, there have been 383 active stocks and 121 active brokerage houses. Figure 3 illustrates that the IDX share index ended 2008 is much lower than in 2006 and 2007. The top 20 losing stocks in 2008 lost more than 80% of their price, ranging from 82.86% to 96.48% and the increase range for top 20 gaining stocks was 34% to 197.38%.

**Figure 2. Share Price Index on IDX 1995 - 2008**

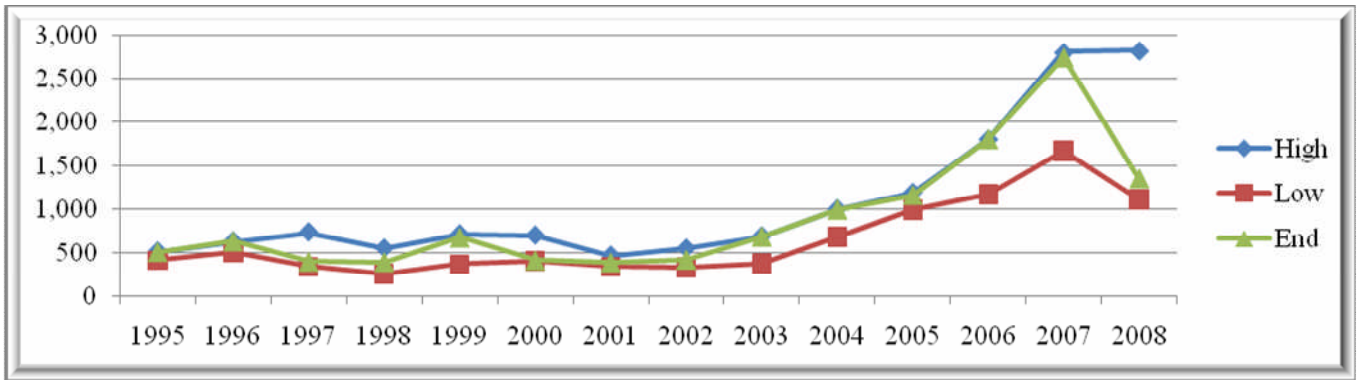
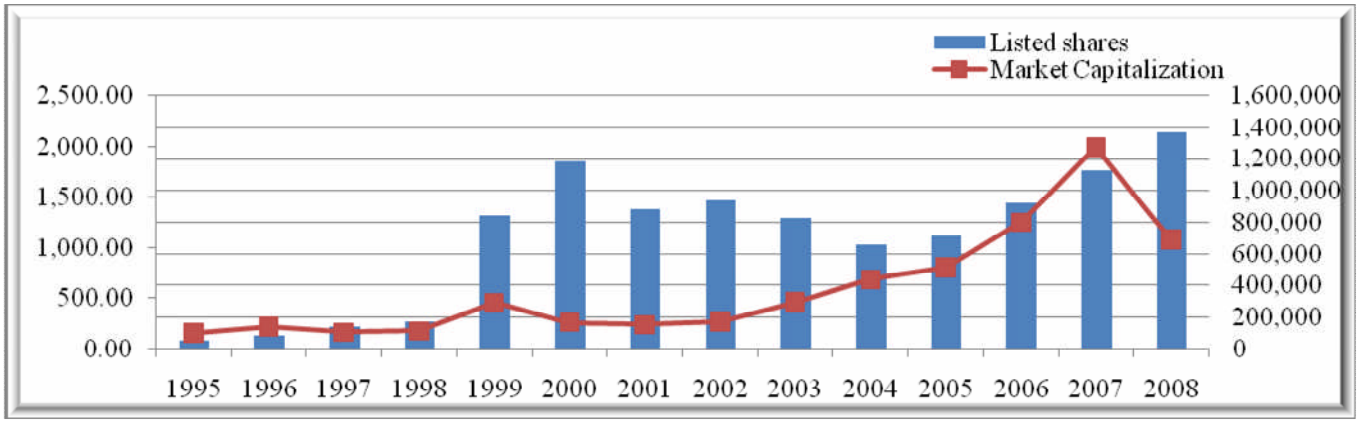


**Figure3. Market Capitalization (in Millions) and Listed Shares (in Thousands) 1995 - 2008**




## 4. Methodology

Engle's model of net order imbalance is formally written as: $V - Net = \log\left|\sum_i (d_i vol_i)\right|$, the summation of $d_i$ (the direction of trade indicator) and $vol_i$ (the number of shares traded) within a given price duration. This study will use the amount of net order imbalances measured in volume and frequency over the changes of midpoint as much as 2 tick sizes as the measurement of price increment. For example, the initial midpoint is IDR 4925 and the tick size for price ranging from IDR 2000 – 5000 is IDR 25, thus if next midpoint is IDR 4975, the volume bought minus sold from the initial of IDR 4925 to IDR 4975 is calculated as VNet. If the continuing midpoint is IDR 5000 and the tick size for price is greater or equal to IDR 5000 is IDR 50, the tick size that will take into account now is IDR 50. Thus, VNet will be calculated if next midpoint is IDR 4900 or IDR 5100. Beside VNet, the duration between the changes of 2 tick size (PDUR) and standard deviation of trade price over the changes of 2 tick size midpoint (PSDEV) is also calculated. Since trading hours in Indonesia stock exchange is divided into morning and afternoon session and the trading hours is different on Friday, we exclude data if the price duration (PDUR) is greater or equal to 1.5 hours (5400 seconds). The purpose of having the value of VNet, Price Duration and Standard deviation of trade price is to further examine whether informed traders prefer particular trading size to "hide" their information.

For measuring information component during bearish and bullish market, this paper employs the method of Rakowski & Beardsley with $l(Q)$ is the liquidity measurement, $c_q$ as the non-information component, $\alpha_q$ is the information component, and $Q$ is the hypothetical size is intended to measure, k and k" are the last step at the ask side and the bid side up to when hypothetical size Q accumulated, A (B) is the ask (bid) price up to step k (k"), the model can be written as:

$$l(Q) = 2c_1 q - \alpha_1 q = \left(\Sigma_1 (i=1)^{\dagger} k \left[A_1(i,t)\, Q_1(i,t)^{\dagger} A\right] - \Sigma_1 (i=1)^{\dagger} k'' B_1(i,t)\, Q_1(i,t)^{\dagger} B\right)/Q$$

$$\alpha_q = \left[E\left(WP_{t+\Delta t} \middle| H_t^B\right) - E\left(WP_{t+\Delta t} \middle| H_t^A\right)\right]$$

## 5. Data

This study uses 10 companies which can be seen in table 3 to represent the liquid and well-performed stocks in Indonesia Stock Exchange. These companies are included in LQ 45 Index 8 of 10 times from August 1997 to January 2010. LQ 45 Index is an important tool to show relative performance of Indonesian stock market because it consists of 45 stocks which are chosen for their trading liquidity and market capitalization and cover a minimum of 70% of IDX total market capitalization and transaction values. The base value is July 13, 1994 and the stocks which are included in this index are evaluated half yearly. Indeed, there are 16 companies that met this criterion but we eliminate 4 of them. GGRM – Gudang Garam, Tbk, INTP – Indocement Tunggal Prakarsa, Tbk, PNBN – Bank PAN Indonesia, Tbk and TINS – Timah, Tbk for the reason that they are not always included in LQ 45 Index

during the period of analysis (January 2007 – December 2008). Eventually, we also eliminate 2 other companies for relatively insufficient trading activities and corporate action, i.e KLBF – Kalbe Farma, Tbk and BLTA – Berlian Laju Tanker, Tbk.

**Table 3. Brief summary of the sample company**

| No. | Ticker Symbol | Stock Name | Industry Classification | Listing Date |
|---|---|---|---|---|
| 1 | AALI | Astra Agro Lestari, Tbk | Agriculture/ Plantation | Dec 9, 1997 |
| 2 | ANTM | Aneka Tambang, Tbk | Mining/ Metal & Mineral Mining | Nov 27, 1997 |
| 3 | ASII | Astra International, Tbk | Machinery & Heavy Equipment/ Automotive and Components. | April 4, 1990 |
| 4 | INDF | Indofood Sukses Makmur, Tbk | Consumer Goods/ Food & Beverages | July 14, 1994 |
| 5 | INKP | Indah Kiat Pulp & Paper Corp, Tbk | Basic Industry & Chemicals/ Pulp & Paper | July 16, 1990 |
| 6 | ISAT | Indosat, Tbk | Infrastructure, Utilities & Transportation/ Telecommunication | Oct 19, 1994 |
| 7 | MEDC | Medco Energi International, Tbk | Mining/ Crude Petroleum & Natural Gas Production | Oct 12, 1994 |
| 8 | SMCB | Holcim Indonesia, Tbk | Basic Industry & Chemicals/ Cement | Aug 10, 1997 |
| 9 | TLKM | Telekomunikasi Indonesia, Tbk | Infrastructure, Utilities & Transportation/ Telecommunication | Nov 14, 1995 |
| 10 | UNTR | United Tractors, Tbk | Trade, Services & Investment/ Wholesale (Durable & Non-Durable Goods) | Sept 19, 1989 |

The data from this paper is obtained from Reuters Database Tickscope History (RDTH). For trading details, RDTH provides with ticker symbol of share, date and time of trading, bid size and price, ask size and price, trade price, trade volume and volume weighted average price (VWAP). Meanwhile, for market depth, RDTH gives ticker symbol of a share, date and time of each new quote, bid size and price for up to 5 levels and ask size and price for up to 5 levels.

Period of observation**: 86** trading days

Time of observation : **9.30 – 16.00** local time

The price movement for all stocks included in LQ 45 Index during bullish and bearish market can be seen in Figure 4 and 5.

**Figure 4. LQ 45 Index in Bullish Market (20 August -19 December 2007)**

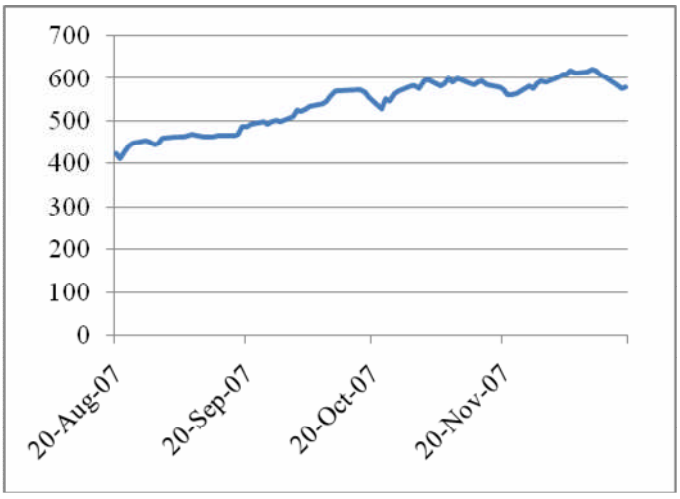
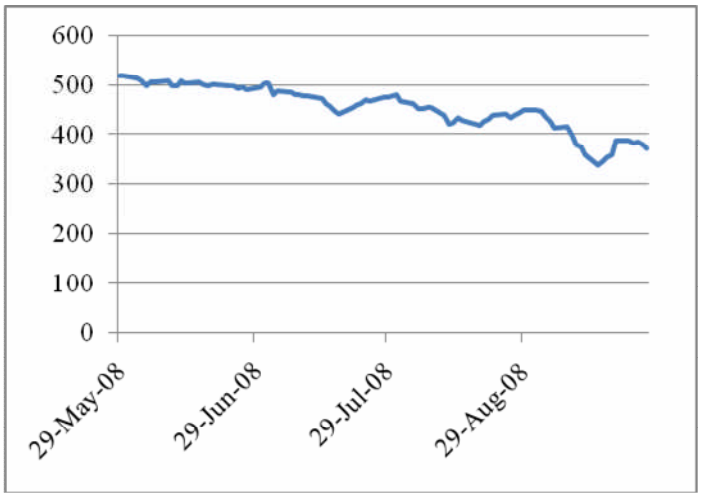



**Figure 5. LQ 45 Index in Bearish Market (29 May – 26 September 2008)**



## 6. Result

During period of observation, each of stocks has different price movement. Generally, all stocks show the strong pattern of upward price movement during bullish market except for INKP and TLKM. Meanwhile the pattern for downward price movement is obvious for AALI and ANTM, while most of stocks indicated moderate downward of price movement with the exception of ISAT and TLKM. Descriptive statistics of trade price during the period of observation can be seen in the table 4.

**Table 4. Descriptive statistics of trade price**

| | | Number of observation | Min | Max | Average | Standard Deviation |
|---|---|---|---|---|---|---|
| AALI | Bullish | 23,344 | 13,000.00 | 27,500.00 | 20,759.52 | 4,094.38 |
| | Bearish | 93,650 | 10,000.00 | 31,050.00 | 20,406.66 | 5,302.72 |
| ANTM | Bullish | 334,121 | 2,000.00 | 5,300.00 | 3,720.33 | 888.69 |
| | Bearish | 190,865 | 900.00 | 3,425.00 | 2,152.00 | 775.58 |
| ASII | Bullish | 38,096 | 15,900.00 | 28,800.00 | 22,787.93 | 3,618.90 |
| | Bearish | 67,548 | 14,150.00 | 23,050.00 | 19,719.68 | 1,671.99 |
| INDF | Bullish | 57,203 | 1,700.00 | 2,850.00 | 2,196.27 | 313.75 |
| | Bearish | 58,644 | 1,750.00 | 2,925.00 | 2,178.82 | 201.94 |
| INKP | Bullish | 11,058 | 820.00 | 1,020.00 | 915.77 | 40.73 |
| | Bearish | 145,244 | 990.00 | 3,325.00 | 2,164.40 | 618.18 |
| ISAT | Bullish | 33,530 | 6,850.00 | 10,000.00 | 8,242.44 | 704.25 |
| | Bearish | 42,642 | 5,300.00 | 6,950.00 | 6,291.47 | 400.62 |
| MEDC | Bullish | 84,142 | 3,500.00 | 6,400.00 | 4,943.84 | 648.75 |
| | Bearish | 42,645 | 3,075.00 | 5,650.00 | 4,641.69 | 513.82 |
| SMCB | Bullish | 31,568 | 860.00 | 2,040.00 | 1,527.74 | 289.50 |
| | Bearish | 30,429 | 620.00 | 1,220.00 | 1,032.88 | 143.30 |
| TLKM | Bullish | 112,228 | 9,800.00 | 12,750.00 | 10,890.01 | 623.40 |
| | Bearish | 96,159 | 5,900.00 | 8,300.00 | 7,487.27 | 411.39 |
| UNTR | Bullish | 34,588 | 6,850.00 | 11,700.00 | 9,634.56 | 1,332.51 |
| | Bearish | 75,932 | 7,300.00 | 14,500.00 | 11,185.43 | 1,444.13 |

Spread seems to be low during bearish market because the average stock price is lower and thus the allowable difference between bid and ask price (tick size) is also small. However, when the spread is compared to the trade price, it is found that the proportion is higher during bearish market for 5 stocks (ANTM, INDF, ISAT, SMCB and TLKM), similar for 2 stocks (ASII and AALI) and smaller for 3 stocks (INKP, MEDC, UNTR) which is shown in Table 6. INDF and INKP seems to be the most expensive stocks to trade frequently as the proportion is about 1% followed by ANTM, ISAT, MEDC, and SMCB. While UNTR and TLKM are traded at relatively low cost, ASII and AALI have the lowest trading cost among these 10 companies.

**Table 5. Percentage of spread to trade price**

| % of spread to trade price | AALI | ANTM | ASII | INDF | INKP | ISAT | MEDC | SMCB | TLKM | UNTR |
|---|---|---|---|---|---|---|---|---|---|---|
| Bullish | 0.35% | 0.69% | 0.29% | 0.90% | 1.13% | 0.63% | 0.75% | 0.68% | 0.46% | 0.55% |
| Bearish | 0.30% | 0.81% | 0.30% | 1.03% | 0.88% | 0.81% | 0.73% | 0.99% | 0.68% | 0.47% |

The average of ask size and bid size are compared during bullish and bearish market for each level of market depth and the result is shown in Table 6.

**Table 6. Comparison of ask size and bid size at different level of market depth**

| Stock Ticker | Bullish Market | Bearish Market |
|---|---|---|

| | | |
|---|---|---|
| AALI | Ask size > bid size for all levels | Bid size > ask size for all levels |
| ANTM | Ask size > bid size for all levels | Bid size > ask size, except for level 1,2, and 5 |
| ASII | Ask size > bid size for all levels | Bid size > ask size, except for level 4 and 5 |
| INDF | Ask size > bid size for all levels | Bid size > ask size for level 1 only |
| INKP | Ask size > bid size for level 5 only | Bid size > ask size for level 1, 2 only |
| ISAT | Ask size > bid size for all levels | Bid size > ask size for level 1 only |
| MEDC | Ask size > bid size for all levels | Ask size > bid size for all levels |
| SMCB | Ask size > bid size except for level 1 | Ask size > bid size for all levels |
| TLKM | Ask size < bid size for all levels | Ask size > bid size for all levels |
| UNTR | Ask size > bid size for all levels | Bid size > ask size for level 1 only |

Given more shares available to sell during bullish market might indicate two things. First, traders believe that true price of these stocks is already overvalued during bullish market. Therefore, traders who have these stocks are willing to offer their shares to sell. Similarly, traders who do not have these stocks but expect their price to decrease will do short sell as it is allowed. Second, this profit-taking activity might be caused by the disposition effect where traders are willing to sell their stocks as long as they already make some profit out of it. During bearish market, the condition is not as convincing as the bullish market. In general, bid size is bigger than ask size for lower level of depth for 7 companies while for the rests show the opposite.

When the bid size during bullish market is compared to that of bearish market, most shares show that the bid size in the former is bigger than the later, as shown in Table 7. The result is fairly similar when ask size of bullish market is compared to that of bearish market. As the result, shares which are traded in bigger size are more frequent in bullish market rather than bearish market, as shown in Figure 6 and 7. This fact can also be interpreted as the caution as traders are relatively vigilant during bearish market because lack of confidence about future price of shares and the placement of large order size might create bigger market sentiment in bearish market condition.

**Table 7. Comparison of bid size ( and ask size) at different level during bullish and bearish market**

| Stock Ticker | Bid Size | Ask Size |
|---|---|---|
| AALI | Bid size at bullish > bid size at bearish for level 1,2 and 3. | Ask size at bullish > ask size at bearish for all levels |
| ANTM | Bid size at bullish > bid size at bearish for all levels | Ask size at bullish > ask size at bearish for all levels |
| ASII | Bid size at bullish > bid size at bearish for all levels | Ask size at bullish > ask size at bearish for all levels |
| INDF | Bid size at bullish > bid size at bearish for all levels | Ask size at bullish > ask size at bearish for all levels |
| INKP | Bid size at bullish > bid size at bearish for level 1 and 2 | Ask size at bullish > ask size at bearish except for level 1 |
| ISAT | Bid size at bullish > bid size at bearish for level 2 and 3 | Ask size at bullish > ask size at bearish except for level 1 |
| MEDC | Bid size at bullish > bid size at bearish for all levels | Ask size at bullish > ask size at bearish for all levels |
| SMCB | Bid size at bullish > bid size at bearish for all levels | Ask size at bullish > ask size at bearish except for level 1 |
| TLKM | Bid size at bullish > bid size at bearish for all levels | Ask size at bullish > ask size at bearish for all levels |
| UNTR | Bid size at bullish > bid size at bearish except for level 3 | Ask size at bullish > ask size at bearish for all levels |

**Figure 6. Proportion of trade frequency under different trade size in bullish market**

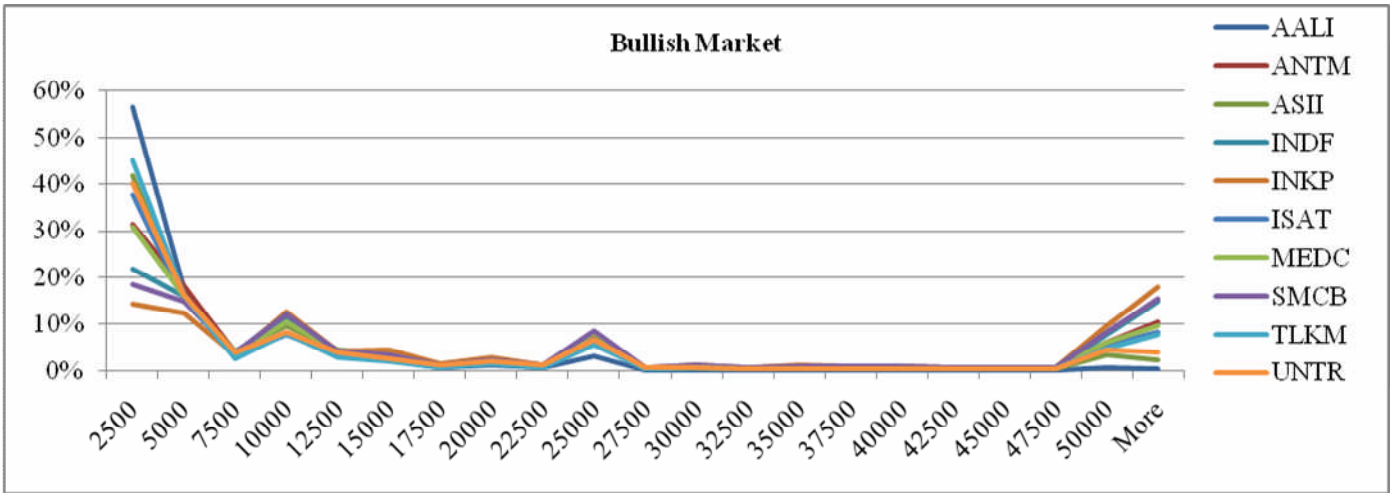
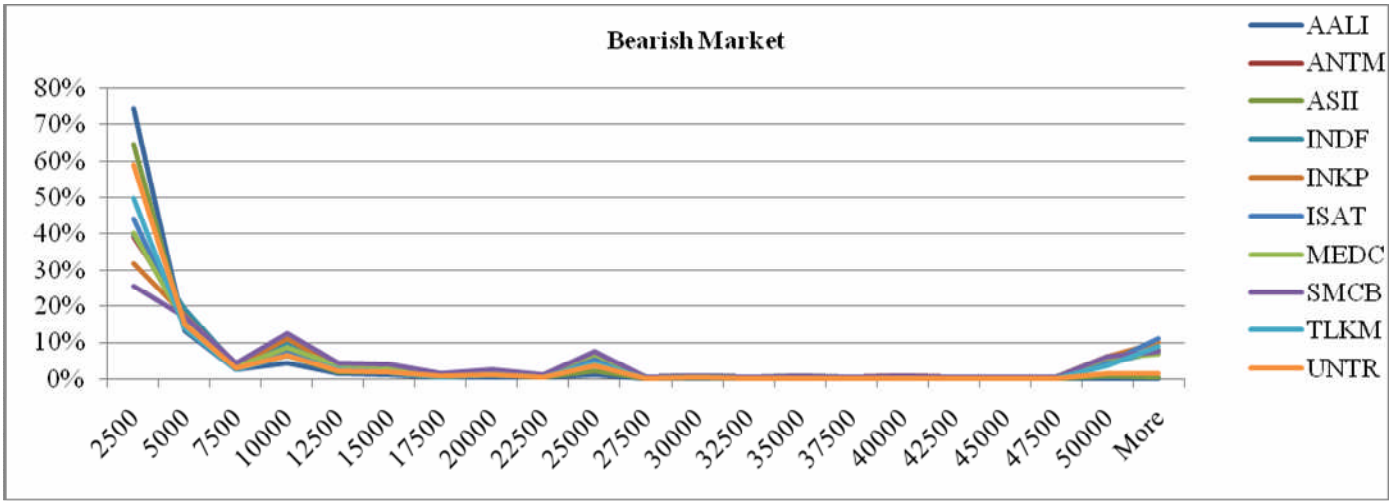



**Figure 7. Proportion of trade frequency under different trade size in bearish market**




Since, we use order imbalance and no initiated-trades for buying and selling in our data, we need to set up the identity of buyer and seller-initiated trades using particular rules. If trade price is at or higher than ask quote, the trade is classified as buyer initiated trades (+1) and if trade price is at or lower than bid quote, the trade is categorized as seller initiated trades (-1). However, if the trade price is at the current midpoint quote, then this price will be compared to the closest previous midpoint quote which has different value from the current midpoint quote. If the closest is small than the current trade price, it is a buyer-initiated and vice versa. Figure 8 and 9 illustrate the buyer initiated and seller initiated trades during bullish and bearish market, consecutively. Generally, the proportion of buyer initiated and seller initiated trades are alike for both markets. However, the buyer-initiated trades seem to have slightly higher percentage in bullish market as 8 or 10 stocks indicate this evidence.

**Figure 8. Proportion of buyer initiated and seller initiated trades in bullish market**

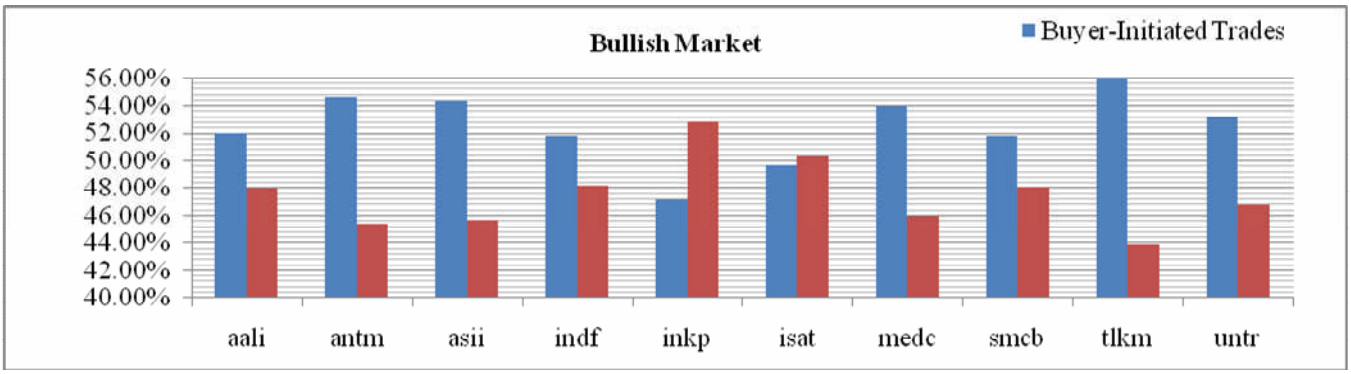
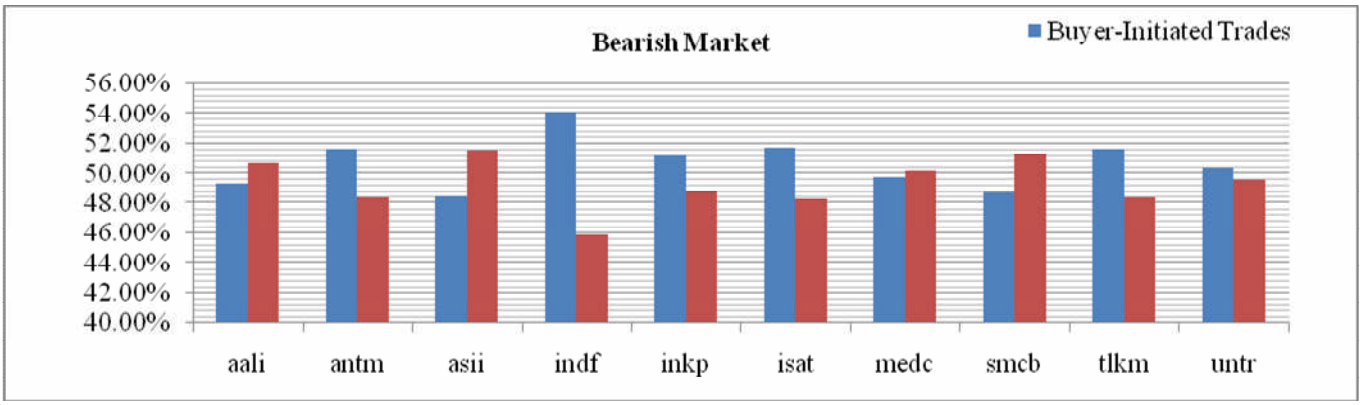



**Figure 9. Proportion of buyer initiated and seller initiated trades in bearish market**




The average VNET (net order imbalance in absolute value of volume over 2 tick size changes), average PDUR (price duration – in seconds) and average PSDEV (standard deviation of trade price over 2 tick size changes) for each stock can be seen in the table 8. ANTM, INDF, ISAT and MEDC have noticeable net order imbalance during bullish and bearish market and it is higher during bullish market for ANTM, INDF and MEDC. The duration that takes place for midpoint quote to change is from the lowest of 496 seconds for AALI to the highest of 1743 seconds for INKP with strong difference is visible for INKP. The standard deviation of trade price during the changes of midpoint quote of 2 tick sizes are half for ANTM and MEDC, while for other stocks are qualitatively similar.

**Table 8. Mean of VNET, PDUR and PSDEV**

| | | Number of observation | VNET | PDUR | PSDEV |
|---|---|---|---|---|---|
| AALI | Bullish | 1116 | **38,665** | 652 | 30.89 |
| | Bearish | 2119 | **44,354** | 496 | 31.96 |
| ANTM | Bullish | 367 | 5,495,015 | 1061 | **14.02** |
| | Bearish | 395 | 2,011,684 | 935 | **7.39** |
| ASII | Bullish | 1504 | 78,928 | **540** | 28.71 |
| | Bearish | 1286 | 71,895 | **616** | 29.88 |
| INDF | Bullish | 181 | 2,013,597 | 1383 | 9.11 |
| | Bearish | 226 | 605,157 | 1022 | 7.63 |
| INKP | Bullish | 53 | 1,117,311 | 1743 | **5.52** |
| | Bearish | 992 | 989,376 | 661 | **8.32** |
| ISAT | Bullish | 293 | **463,208** | **1196** | 27.94 |
| | Bearish | 149 | **1,260,154** | **1513** | 27.55 |
| MEDC | Bullish | 413 | 1,069,350 | 1014 | **19.6** |
| | Bearish | 839 | 298,819 | 708 | **10.83** |

| | | | | | |
|---|---|---|---|---|---|
| SMCB | Bullish | 407 | 662,913 | **976** | 5.76 |
| | Bearish | 160 | 596,338 | **1510** | 5.92 |
| TLKM | Bullish | 270 | **1,267,320** | **1400** | 27.91 |
| | Bearish | 211 | **1,499,820** | **1495** | 27.05 |
| UNTR | Bullish | 377 | 246,035 | 1318 | 28.60 |
| | Bearish | 721 | 166,310 | 877 | 30.39 |

To examine further whether the trading frequency at different order size can explain the VNET, PDUR, PSDEV. Trading frequency is classified into 4 categories of trade size (<=500, 501-2500, 2501- 10000 and more than 10000). Then, the value of each trading frequency during one interval of midpoint quote changes is regressed toward the value of VNET, PDUR and PSDEV. The result as shown in Table 9 suggests that trading frequency can only explain the VNET but not for PDUR and PSDEV and for this reason, we only show the regression coefficient of VNET. As shown in Table 10, the regression coefficient of net trading frequency of buy over sell is less during bearish market except for ISAT and TLKM (both are telecommunication companies). This indicates that the same amount of net trading frequency will create higher order imbalance in bullish market rather than in bearish market. This might indicate the degree of heterogeneous belief among traders seems to be bigger in the bullish market.

**Table 9. OLS Result of VNet on Different Net Trading Frequency**

| | | **Adj – R Squared** | **C** | **Net Trading Frequency of Buy – Sell** | | | |
|---|---|---|---|---|---|---|---|
| | | | | **<=500** | **501 - 2500** | **2501- 10000** | **>10000** |
| AALI | Bullish | 77.09% | | | 1287.41 (0.0256) | 7049.01 (0.0001) | 26529.3 (0.0001) |
| | Bearish | 91.8% | | 356.986 (0.0107) | 1551.78 (0.0001) | 5995.2 (0.0001) | 22526.2 (0.0001) |
| ANTM | Bullish | 92.02% | | -31479.4 (0.0905) | | -27961.2 (0.0001) | 112922 (0.0001) |
| | Bearish | 74.81% | | | | | 74394.4 (0.0001) |
| ASII | Bullish | 77.97% | 3281.43 (0.0416) | | 2273.3 (0.0133) | 3071. 46 (0.0109) | 32646.7 (0.0001) |
| | Bearish | 86.39% | | 1462.89 (0.0062) | | 5600.62 (0.0001) | 32197.2 (0.0001) |
| INDF | Bullish | 80.25 % | | | | -82.104 (0.0556) | 138900 (0.0001) |
| | Bearish | 71.66% | | | | | 47882 (0.0001) |
| INKP | Bullish | 58.27 | | -17778 (0.0963) | | | 76805.9 (0.0002) |
| | Bearish | 72.97% | | | | | 76417.2 (0.0001) |
| ISAT | Bullish | 77.23 % | | -36066.4 (0.073) | | | **74452.8 (0.0001)** |
| | Bearish | 75.95% | | | | -21289.8 (0.0339) | **103645 (0.0001)** |
| MEDC | Bullish | 80.46 % | | | -12914 (0.032) | | 63444.2 (0.0001) |
| | Bearish | 80.14% | | | | 6838.03 (0.078) | 55913.9 (0.0001) |
| SMCB | Bullish | 63.09% | | | | | 79338.6 (0.0001) |
| | Bearish | 74.69% | | | | | 57228.3 (0.0001) |
| TLKM | Bullish | 86.24% | | | | | **56640.4 (0.0001)** |
| | Bearish | 69.86% | | | | | **89530.2 (0.0001)** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| UNTR | Bullish | 78.61 % | | -8391. 73 (0.0055) | | | 45005.3 (0.0001) |
| | Bearish | 86.65% | | | | 5546.85 (0.0001) | 34598.6 (0.0001) |

When the value of VNET is regressed on different trading frequency of buy and sell, similar result is found, as shown in Table 11, that is trading frequency at higher order size can explain the net order imbalance better with consistent sign and relatively comparable coefficient between buy and sell side. In addition, the coefficient regression of trading frequency with order size more than 10,000 shares is generally lower under bearish market for most stocks except for ISAT and TLKM.

**Table 11. OLS Result of VNet on Different Types of Trading Frequency**

| | | C | Buy | | | | Sell | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | <=500 | 501 – 2500 | 2501-10000 | >10000 | <=500 | 501 - 2500 | 2501-10000 | >10000 |
| AALI | Bullish | 2128.6 (0.0983) | - | - | 7221.4 (0.0001) | ***25827.3 (0.0001)*** | - | - 1843.7 (0.0089) | -7146.1 (0.0001) | ***-27785.6 (0.0001)*** |
| | Bearish | - | 627.9 (0.0003) | 1378.1 (0.0001) | 6117.3 (0.0001) | ***21809.3 (0.0001)*** | - | -1715.8 (0.0001) | -5888.7 (0.0001) | ***-23263.8 (0.0001)*** |
| ANTM | Bullish | 436707 (0.0081) | - | - | -32152.9 (0.0003) | ***114291 (0.0001)*** | - | - | 25923.9 (0.0086) | ***-113711 (0.0001)*** |
| | Bearish | - | - | - | - | ***78193.4 (0.0001)*** | - | - | - | ***-68926.4 (0.0001)*** |
| ASII | Bullish | - | - | - | 3036.6 (0.052) | ***34353.2 (0.0001)*** | - | -3646.1 (0.0119) | -3323.9 (0.0299) | ***-30273 (0.0001)*** |
| | Bearish | - | 1729.2 (0.0163) | - | 5140.8 (0.0001) | ***33024.7 (0.0001)*** | -1159.7 (0.0231) | - | -6210.4 (0.0001) | ***-31219.5 (0.0001)*** |
| INDF | Bullish | -226517 (0.0489) | | | -68080.1 (0.0073) | ***139969 (0.0001)*** | -195243 (0.0114) | - | - | ***-97967.7 (0.0001)*** |
| | Bearish | - | - | - | - | ***46739.4 (0.0062)*** | - | - | - | ***-53992.4 (0.0001)*** |
| INKP | Bullish | 203262 (0.0751) | - | - | - | ***36044.2 (0.0705)*** | 473364 (0.0417) | - | - | ***-91655.2 (0.0113)*** |
| | Bearish | 101664 (0.0234) | - | - | - | ***65866.8 (0.0001)*** | - | - | 12186.2 (0.0463) | ***-86030.5 (0.0001)*** |
| ISAT | Bullish | - | -25299.9 (0.0566) | - | - | ***73955.2 (0.0001)*** | - | - | - | ***-72897.7 (0.0001)*** |
| | Bearish | - | - | - | -26574.1 (0.0442) | ***102328 (0.0001)*** | - | - | - | ***-86591.3 (0.0001)*** |
| MEDC | Bullish | - | - | -14531.4 (0.0666) | - | ***63915.8 (0.0001)*** | - | - | - | ***-62561.5 (0.0001)*** |
| | Bearish | - | - | - | 10606.6 (0.0853) | ***52710.3 (0.0001)*** | - | - | - | ***-60684.4 (0.0001)*** |
| SMCB | Bullish | 108213 (0.0358) | 31165 (0.0364) | - | -18786 (0.0707) | ***81249.4 (0.0001)*** | - | - | - | ***-77995.7 (0.0001)*** |
| | Bearish | - | 37818.7 (0.0675) | - | - | ***54750.3 (0.0001)*** | - | - | 16197 (0.0382) | ***-59033.2 (0.0001)*** |
| TLKM | Bullish | - | - | - | - | ***55866.9 (0.0001)*** | - | - | - | ***-64632.5 (0.0001)*** |
| | Bearish | - | -10412.3 (0.0424) | - | - | ***84951.7 (0.0001)*** | 62890 (0.0104) | -16539.4 (0.0705) | - | ***-97762.9 (0.0001)*** |
| UNTR | Bullish | -- | -10182.8 (0.0729) | - | - | ***47633.1 (0.0001)*** | - | - | - | ***-39957.6 (0.0001)*** |
| | Bearish | 11991.4 (0.0134) | - | - | 6465.8 (0.0001) | ***32631.3 (0.0001)*** | - | -2456.6 (0.0329) | -4396.1 (0.0006) | ***-34465.1 (0.0001)*** |

This paper use the speed of adjustment coefficients from Husodo & Henker (2007) for 8 of 10 companies and the rest (INKP and SMCB) is calculated using the data from the period of observation. The calculation of informational component for these companies will use 30 minutes and 60 minutes interval, as shown as Table 12.The choice of 30 and 60 minutes depend on the result of ARMA (1,1) estimation. Briefly, the speed of adjustment which is close to 1 and higher negative MA (1) coefficient is the benchmark. Stocks with higher trading activity seem to have shorter duration for compounding news into price.

**Table 12. ARMA (1,1) Coefficient**

| Ticker Symbol | Duration | The Speed of adjustment coefficient (1-AR (1)) estimated from ARMA (1,1) Return | MA (1) coefficient estimated from ARMA (1,1) Return |
|---|---|---|---|
| AALI | 60 minutes | 0.97 | -0.12 |
| ANTM | 60 minutes | 0.84 | -0.29 |
| **ASII** | **30 minutes** | **1.15** | **0.04** |
| INDF | 60 minutes | 0.96 | -0.37 |
| INKP | 60 minutes | 0.69 | -0.01 |
| **ISAT** | **30 minutes** | **1.02** | **-0.10** |
| **MEDC** | **30 minutes** | **0.66** | **-0.49** |
| SMCB | 60 minutes | 0.71 | - 0.31 |
| **TLKM** | **30 minutes** | **1.07** | **-0.05** |
| **UNTR** | **30 minutes** | **0.91** | **-0.25** |

This paper uses six hypothetical trading sizes, i.e 2500, 5000, 7500, 10000, 12500 and 15000 shares which approximately cover about 60-80% of all trade sizes occurred in the period of observation. As can be seen from Table 13. ANTM, TLKM and UNTR have consistent and small information component cost whilst AALI appears to have the highest information component cost. In addition, T-test of paired two sample means indicate that information component cost is significantly different between these 2 different periods of observation, as shown in Table 14.

**Table 13. Adjusted information component cost at 15,000 shares ***

| | AALI | ANTM | ASII | INDF | INKP | ISAT | MEDC | SMCB | TLKM | UNTR |
|---|---|---|---|---|---|---|---|---|---|---|
| Bearish | 1.273 | 1.027 | 1.091 | 1.101 | 1.124 | 1.106 | 1.089 | 1.157 | 1.026 | 1.076 |
| Bullish | 1.616 | 1.039 | 1.305 | 1.050 | 1.040 | 1.028 | 1.049 | 1.043 | 1.017 | 1.083 |

*) Information component cost at 2500 shares = 1

**Table 14. T-test for Mean Comparison of Information component cost**

| Description | Bullish | Bearish |
|---|---|---|
| Mean | 40.739 | 46.561 |
| Variance | 884.215 | 858.579 |
| Observations * | 60 | 60 |
| df | 59 | 59 |
| t Stat | -3.812065783 | |
| P(T<=t) one-tail | 0.000165783 | |
| t Critical one-tail | 1.671093033 | |
| P(T<=t) two-tail | 0.000331565 | |
| t Critical two-tail | 2.000995361 | |

*) 6 options of trade size (2500, 5000, 7500, 10000, 12500 and 15000 shares) for 10 companies.

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