Herding Behavior in the Indonesian Stock Exchange: The Roles and Contributions of Foreign Investors During the Period 2006 to 2011

(Gelagat "herding" dalam Bursa Saham Indonesia: Peranan dan Sumbangan Pelabur Asing dalam Tempoh 2006 hingga 2011)

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ABSTRACT

Domestic investors in the Indonesian capital market (IDX) tend to be very dependent on the behavior of foreign investors. It is assumed that most of the domestic investors in the IDX are like this, caused by an axiom that the bargaining position of foreign investors is stronger than that of the domestic investors and those of other emerging markets. This study tries to investigate whether the herding behavior exists and whether the assumption that foreign investors have caused instability is true or just a myth during the period 2006-2011.There are three objectives of the study: 1) To prove whether the conduct of domestic investors' herding behavior in the IDX exists, 2) To prove whether the trading of foreign investors causes the herding behavior and 3) To prove whether the interaction between foreign and domestic investors affect the stock volatility. Using the data from 2006 to 2011, it is found that herding behavior in the IDX exists; moreover, by using VAR analysis, it also indicates that the occurrence of herding behavior is caused by negative feedback trading from foreign investors. The volatility analysis using Parkinson and Garman-Klass methods found the stock volatilities in the IDX increased, caused by the interaction of foreign and domestic investors.

Keywords: Herding behavior; foreign investors; domestic investors; market volatility; IDX (Indonesian Stock Exchange)

ABSTRAK

Pelabur tempatan dalam pasaran modal Indonesia (IDX) adalah sangat bergantung dengan gelagat pelabur asing. Adalah diandaikan, kebanyakan pelabur tempatan dalam Bursa Saham Indonesia (IDX) bersikap begini disebabkan kepercayaan bahawa kedudukan tawar-menawar pelabur asing adalah lebih kuat berbanding pelabur tempatan terutamanya di pasaran yang sedang membangun. Kajian ini cuba menyiasat sama ada gelagat "herding" wujud dan sama ada andaian bahawa gelagat pelabur asing menimbulkan ketidakstabilan adalah benar atau hanya anggapan dalam tempoh 2006 – 2011. Kajian ini mempunyai tiga objektif: 1) Untuk membuktikan bahawa gelagat "herding" di kalangan pelabur tempatan dalam IDX benar-benar wujud; 2)Untuk membuktikan sama ada urus niaga melibatkan pelabur asing menyebabkan gelagat "herding" dan 3) untuk mengenal pasti sama ada interaksi pelabur tempatan dan pelabur asing menyebabkan volatility pasaran saham. Menggunakan data dari tahun 2001 hingga 2011, adalah didapati gelagat "herding" wujud. Tambahan pula berdasarkan analisis VAR, berlakunya gelagat "herding" ini disebabkan oleh tindak balas negatif terhadap urus niaga pelabur asing. Analisis volatility menggunakan kaedah Parkinson dan Garman-Klass mendapati naik turun nilai saham dalam IDX meningkat disebabkan interaksi di antara pelabur asing dan pelabur tempatan.

Kata kunci: Gelagat "herding; pelabur asing; pelabur tempatan; volatiliti pasaran; IDX (Bursa Saham Indonesia)

INTRODUCTION

The growing market characteristic of the IDX is interesting to be documented. What has happened in the IDX is unique. All participants could see whether the stock transactions in the IDX are conducted by domestics or foreign investors (Panggabean 2006; Bowe & Domuta 2004) and this is published in various reports. These transparent transactions could help in making institutions easier to herd than individuals (Sias 2004). Furthermore, domestic participants in the stock market usually depend on foreign investors (Panggabean 2006; Chen 2001; Wei et al. 2009). Domestic investors assume that foreign investors have stronger bargaining positions than local players.

Firstly foreign investors have greater capital than domestic investors and secondly, foreign investors have much more knowledge and experience than domestic investors (Iihara et al. 2001; Surjawan 2007). Foreign investors are often considered to have the extra ability to move the index significantly, or the movement of the foreigners significantly affected the stock index, as reported in a study in the period of 2006 (Panggabean 2006). It was concluded that foreigners caused the market instability in the capital market during the crisis (Neal, Jones, Linnan & Neal 2002; Wang 2000).

Currently, there are two pieces of evidence regarding herding behavior that have been documented in empirical research for the IDX, i.e., Setiyono (2012) and Gunawan,

Wijayanto, Achsani & Abdul Rahman (2011). Setiyono (2012) documented that herding behavior in the stock market actually resembles mass behavior. It is the role of rational social learning and the level of market efficiency that could increase the intensity of the herding. During that time, there were also those who believed that herding behavior was irrational, and dubious decisions are optimality pricing generated by herding. However, in addition to the externalities and reputation payoff, rational parties recognize herding as it could provide informational externalities for market participants and improve market efficiency. The level of market efficiency will decrease when the market volatility increases, and the increase of the market efficiency could also depend on the market efficiency level of the previous phases. Setiyono (2012) justifies the rationality of the institutional herding behavior as caused by reasons of informational externalities. While using quintile regression and Cross Sectional Absolute Deviation (CSAD) as a proxy for herding, Gunawan et al. (2011) reported that herding behavior exists in the LQ 45 stocks and sector indices in the IDX related to the situation of stock markets in the Asia Pacific. There are three conditions or situations in the markets that might influence the domestic investors to herd the foreign investors in stock transactions: stressed, normal and very bullish. In the stressed market conditions, they herd the foreign investors in the LQ 45 and sector indices. When the yield increase is lower than the increase in the market portfolio yield, it makes the market participants more frantic. They will act irrationally to secure their short-term investments from negative results without considering the impacts on the long-term outcomes. A higher CSAD and negative sign at quintile regression correspond to a greater potential for herding (Gunawan et al. 2011).

The phenomenon of herding behavior by domestic participants following that of foreign investors could make the stock price not real because the foreign investors dictate the price. The existence of herding behavior was indicated by the increasing magnitude of the CSAD, the error term in the quintile regression between market indices and sector indices (Gunawan et al. 2011). While using the major components of the interaction from stock trading in both sell and purchase orders, a measure of the herding behavior model measured by Lakonishok, Shleifer and Vishny (1992) and Neal et al. (2002) could detect the existence of herding behavior from the intensity of the herding (Setiyono 2012). The increase in the trade interactions among the financial market participants would increase the potential of herding behavior. Therefore, the herding behavior measure of Setiyono (2012) must be used and tested by considering the presence of foreign investors according to the study of Gunawan et al. (2011). It is important to explain why the herding behavior occurs and what will be the potential impact of the herding behavior for a stock exchange. Why herding behavior occurs would justify the opinion of Neal et al. (2002) for the IDX. It is easy for foreign investors to conduct trading actions that will be made a reference point by the domestic

investors. While the potential impact of herding behavior was tested by Wang (2000) that showed transactions in the IDX became increasingly volatile as foreign investors begin to trade.

Based on the explanation above, this study was intended to verify three issues:

1. Whether domestic investors herd foreign investors in the IDX.
2. Whether herding is due more to foreign investors' trading behavior in the IDX.
3. Whether the foreign and domestic investors affect the volatility of stocks in the IDX.

LITERATURE REVIEW

HERDING BEHAVIOR CONCEPT

Herding in its most common meaning is the interconnected patterns of behavior among individuals. However, in the case of many investors buying leading stocks, it is not a herding behavior because it is caused by the existence of related information that makes investors behave independently (Davenow & Welsch 2004; Panggabean 2006). Herding requires a coordination mechanism, i.e., depending on a signal (price movements) or being able to directly observe other decision makers (e.g., co-workers who observed investment decisions or choices of superior products used).

There are two opposing views of herding, which can be roughly divided into rational herding and non-rational herding. Non-rational herding focuses on investor psychology (Hwang & Salmon 2004); market participants behave like a lemming, a small animal similar to a mouse, living in cold northern countries. Lemmings travel in large groups that are sometimes found to follow their leaders over cliffs and into the sea (Oxford Advanced Learners Dictionary). Rational herding focuses on external factors, i.e., optimal decision making that is distorted by the difficulty of the information or incentive problems. Herding in this paper focuses the form of herding that produces decisions that result in the smallest or minimal systematic errors. (Hwang & Salmon 2004; Alemanni & Onelas 2009). The assumption of the adherents of rational herding is similar to that of Efficient Market Hypothesis adherents, which assumes that economic participants are rational. Rational sense is characterized as follows (Davenow & Welsch 2004); (i) When a person receives new information, he will integrate the information into the "belief" system that is true as described in Bayes's Law, (ii) Based on the person's "belief" system, he will make a decision normatively acceptable, in accordance with the opinion of Savage in Subjective Expected Utility.

Between these two extremes, there is a considered view that is in the middle of the two; decision makers are semi-rational (Davenow & Welsch 2004). This view draws on the heuristic method of giving economic value to the process of collecting and processing information

and that a rational activity by third parties is not able to eliminate the semi-rational action. Herding behavior should be further investigated and analyzed based on the level of rational thinking of different categories, such as (a) The nature of non-rational and semi or quasi-rational (Davenow & Welsch 2004; or (Hwang & Salmon 2004) and (b) The level of the object. The level of the object is divided into three categories; (i) the aggregate level that is seen as herding behavior that affects the stock market as a whole with no account of who did the herding, (ii) the institutional level in which to see the herding behavior by institutions, both domestic and foreign institutions, affecting the stock market and (iii) the individual level to see herding behavior caused by individuals who are involved in the stock trading (Wei et al. 2009).

In addition to the categories above, herding behavior can also be indicated from the types of the transactions. There will be herding behavior when it occurs after the action of herding sales or purchase of shares. The selection of these phenomena indicates the presence of feedback trading. Koutmos and Saidi (2002) found that feedback trading could be both positive and negative, depending not only on herding behavior where it occurs but also on the time of bullish and bearish stock markets, which would indicate investors should buy or sell, respectively. When buying is bullish and selling is bearish, then it is called positive feedback trading, which is in contrast to negative feedback trading.

EARLIER STUDIES

Nofsinger and Sias (1999) found that herding behavior and positive-feedback trading of institutional investors influenced stock prices more than did individual investors. The study is a continuation of Nofsinger (1996). The study of Wang (2000) on the Indonesian stock market from 1996 to 2000 found that a) transactions between foreign investors did not lead to capital market volatility in the Indonesian capital market; b) the Indonesian stock market was very sensitive to foreign selling, which was the only source of volatility throughout the study for the period from January 1, 1996 - June 30, 2000; c) there was a significant impact, either positively or negatively, from foreign investors, particularly institutional investors, influencing the liquidity and volatility of the Indonesian capital market; and d) different types of transactions affected the market liquidity and volatility differently. At the time the study was conducted, the trading composition shows foreign investors were net buyers of Indonesian stocks, the value of the sale of shares by foreigners was only 13% of the average daily transactions, and transactions between foreign investors were 26% of daily transactions in that market.

While Neal et al. (2002), who conducted research on the topic of the effects of herding and feedback trading during the financial crisis in Indonesia found strong evidence of herding, and the herding had increased before the crisis period. There was also positive feedback trading by foreign investors, however before the crisis, the positive feedback trading was manifested in the form of sale of the losers' shares (losers). In the aftermath of the crisis, foreign investors concentrated on buying leading shares (winners). Foreign portfolio managers were also found not to perform herding out of the IDX before or during the crisis, although there was a perception of weakening Rupiahs in the future.

The study concludes that the foreign players were not involved in over-speculation before the crisis or that they did not prevent market recovery after the crisis was over. During the crisis period, foreign investors were involved in positive feedback trading both in the liquid and non-liquid stocks, but the behavior did not destabilize the market. Thus, foreign investors were not the cause of the high volatility of the JCI during the 1997-1998 crises. The study indicated that domestic investors performed contra strategy or negative feedback trading, buying past losers' shares and selling present winners' shares.

Other studies on market participants' herding behavior were conducted by Chen (2001) in Taiwan. Chen's research (2001) concluded that before the Asian economic crisis, foreign trading could affect the index return, and vice versa whereby foreign trading was influenced by stock index returns. However, there was no strong evidence that after the crisis, foreign trade was affecting index return. The study also found that domestic investors took two days to react to foreign trades and foreign investors were positive feedback traders who were buying stock when their stock prices increased and sold their shares when the stock prices decreased. However, this happened within the time lag. Before the crisis, the category of the stocks had been characterized by large capitalization, higher returns, higher volatility and a higher proportion of foreign ownership. The proportion of the companies' ownership had a close relationship to both the influence of return on foreign trades and the influence of foreign trading on returns.

RESEARCH METHODS

ALTERNATIVE HYPOTHESIS

Evidence of Herding Behavior in the Indonesian Stock Market A remarkable process of increases in the market indices involving other sub-market index data is categorized as an indication of herding. This is because the co-movement literature, the motion effect from sector sub-indices, will indeed require more powerful triggers, i.e., the market index. The process of improving the sector indices and the market index proved the existence of herding in the IDX (Gunawan et al. 2011).The herding behavior was measured in the form of the CSAD through the quintile regression model between market indices and sector indices. The CSAD scale was increasing rapidly during 2006-2011, when it was incorporated into the global indexes, such as the DJGI, Nikkei, and Hang Seng.

CSAD improvement when including global indices data proved that the evidence of herding behavior of domestic investors to foreign investors did exist, although it was not in a direct manner. Setiyono (2012) also found herding phenomenon measured by the Lakonishok model. The herding phenomenon has been proved by Setiyono (2012) with an intensity herding index value H range above 0.3. Lakonishok et al. (1992) and Neal et al. (2002) suggested that herding behavior was indicated when the index value H range was from 0-1. Zero indicates no herding (0), and 1 (one) indicates inevitable herding. Alternative hypotheses:

H$_1$ There is evidence of herding in the IDX.

Foreign Investors and Herding Behavior in the IDX   Trading actions of foreign market participants increasingly affecting herding behavior by the local stock market as an institution since the year 2006 of the top-20 brokers; foreign institutional investors have mastered 47% of the total value of the trading and finally, even close to 70%. This condition has occurred due to the policy of the IDX, which is increasingly opening up to foreign investors to limit the purchase of domestic shares by foreigners to up to near 100% (Surjawan 2007). This then made the foreign investors became increasingly aggressive with their capital investment to buy blue chip stocks, particularly mining, telecommunication, and banking sectors.

They chartered shares in three sectors for value and growth. The value relates to the potential cash flow that can be achieved in the future. Doing the IPOs, it is believed that the three stocks in the sectors have the potential of providing great dividend yields because they are supported by a group of business owners who are very strong financially. Thus, they will be able to conduct investment activities in a variety of giant projects both inside and outside the country. While the growth is associated with the ability to choose projects that provide large benefits in the event of intense industry competition, they still survive.

By knowing value and growth involved in the shares of the three sectors, it was not easy for foreign investors to get it right. Therefore, in the IDX, they still required local brokers who are certainly more aware of the current situation in the three sector stocks. It is a local broker who also has the motivation to maintain their liquidity so that they will also offer the shares of the three sectors of information to prospective domestic investors. Thus the authors propose an alternative hypothesis as follows:

H$_2$ Behavior of foreign investors allegedly causes herding.

Behavior of Foreign and Domestic Investors on IDX   The only source of volatility in the Indonesian stock market is selling by foreign investors. Since it usually happens, after they sell, the JCI movement is downward. What is unique in Indonesia is that domestic investors are really followers of foreign investors in the hunt for certain stocks for resale. However, unfortunately, this movement is not so great when they sell the shares back in future periods, as reported in the study of Wang (2000). Of course, the findings of Wang (2000) need to be explored. Foreign investors will chase leading shares on the Stock Exchange on the three sectors, namely banking, telecommunications and mining with the motive to maximize value and growth. Value maximization and growth are important for foreign investors because they will be very interested in maximizing their portfolio.

They should pay close attention to the potential performance of the portfolio in a variety of markets, which are still categorized outperforming (in the performance of the market index) and which are underperforming (below the performance of the market index). When capital markets are underperforming, the foreign investors must perform rebalancing. Economic data from the IMF shows that the capital market in Europe is still categorized as capital markets underperforming because it is still in the process of recovery from the economic crisis in Greece. Capital markets in Asia exhibit performance that is actually outperforming. The positive trend of Asian capital markets (particularly Indonesia) encourages foreign investors to invest more of their funds in the related market. The greater is the flow of funds, the better it is because it has the potential to increase the market index and shows the implementation of the role of foreign investors as drivers of liquidity. According to Neal et al. (2002), there is a cyclical phase in the flow of foreign capital that could potentially increase volatility. If foreign investors push sales of capital flows generally, domestic investors will also imitate, although not greatly. Thus, the alternative hypothesis is:

H$_3$ Foreign and domestic investors' behavior contributes to high volatility of the index.

RESEARCH MODEL AND MEASUREMENT

HERDING BEHAVIOR MEASUREMENT FOR TESTING HYPOTHESIS 1

Herding behavior is an investor action to follow the decisions made by other investors. Operationally, it can be measured by the herding formula of Lakonishok et al. (1992), Nofsinger (1996) and Neal et al. (2002). This herding size has a major component, i.e., interaction purchase and sale of shares between foreign investors and domestic investors. H$_{it}$ can be formulated:

$$HI_{it} = 1/N_{i=1}\sum_{j=1}^{n}\sum^{m} ABS\ [B_{it}/ (B_{it} + S_{it}) - p_{it}] - AF_{it} \quad (1)$$

where:

HI$_{it}$ = herding measure from investor group i on day t
B$_{it}$ = number of buy trades from investors group i on day t

S_{it} = number of sell trades from investors group i on day t

P_{it} = the proportion of trades by group i; across all stocks; on day t that is buying (B_{it}) and selling (S_{it}) [the average of $B_{it}/(B_{it}+S_{it})$ over group i]

AF_{it} = adjustment factors that are related to expected value of the absolute value of $[B_{it}/(B_{it}+S_{it})-p_{it})]$ assuming B_{it} follows a binomial distribution with the probability p_{it} of success

The higher H_{it} means there is an indication of herding behavior. The high value of H_{it} is driven more by the value of B_{it} than the value of S_{it} from foreign investors. Growing B_{it} of foreign investors often followed the enlargement of B_{it} of domestic investors. When the value of H_{it} is near zero, there will be no indication of herding. When the value of AF_{it} is difficult to be estimated, then AF_{it} is equal to zero. ABS is the absolute value when minus $B_{it}/(B_{it}+S_{it})-p_{it})$ is equated with positive results. The formula of H_{it} in Equation 1 above is used by Setiyono (2012). To test Hypothesis 1, we used the formula of H_i, as mentioned in Equation 1. If the value of H_i is not equal to zero, then there will be an indication of herding behavior on the Stock Exchange, which means Hyphothesis 1 is accepted. The focus of attention here is that if the value of H_i is greater than zero when the market is bullish, it will mean that investors buy more overall than they sell, and vice versa; for a bearish market conditions, investors will sell more overall than they buy.

VECTOR AUTO REGRESSION (VAR) FOR TESTING HYPOTHESIS 2

To test Hyphotesis 2, we used Vector Autoregressive Regression (VAR). The reason for using VAR is to obtain justification of the previous research hypotheses such as those of Neal et al. (2002) and Chen (2001), and it is not building model from theory. To date, in the finance literature, it has not been unanimously accepted that feedback trading will affect herding behavior (Kallinterakis & Ferreira 2006). In general, for the VAR model, the backward time (lag) used is minimum 2. Chen (2001) used lag 2 while Neal et al. (2002) used lag 4. This study will use lag 2 from the study of Chen (2001) with consideration of aspects of parsimony in the VAR model. In order for the VAR model to be used effectively, there should have an indication of herding and feedback trading on the Stock Exchange first. This indication can be seen in the descriptive statistics for herding and feedback trading. The econometric model by Hiemstra and Jones (1994) looks as follows:

$$HI_{it} = \beta_0 + \beta_1 HI_{i(t-1)} + \beta_2 HI_{i(t-2)} + \beta_3 TI_{i(t-1)} + \beta_4 TI_{i(t-2)} + \varepsilon_{it} \quad (2)$$

$$TI_{it} = \delta_0 + \delta_1 HI_{i(t-1)} + \delta_2 H_{i(t-2)} + \delta_3 TI_{i(t-1)} + \delta_4 TI_{i(t-2)} + \varepsilon_{it} \quad (3)$$

Another assumption is variables H_i and TI_{it} must be stationary. Hypothesis 2 is accepted if the coefficient ($\beta 3$) of $TI_{i(t-1)}$ and ($\beta 4$) of $TI_{i(t-2)}$ significantly affects H_i. H_{it} refers to herding behavior as explained before, while TI_{it} is feedback trading. According to Neal et al. (2002), feedback trading is an act of foreign investors buying and selling shares on the stock exchange. If they are buying when a winner (bullish) situation occurs and selling when a loser (bearish) situation occurs, it is called positive feedback trading, and vice versa; if they buy when a loser situation occurs and sell when a winner situation occurs, that will be referred to as negative feedback trading. The signal of the occurrence of positive feedback trading is when the value of TI is positive. TI can be formulated as follows:

$$TI = 1/NT \sum \sum (B_{it} - S_{it}) / (B_{it} + S_{it}) \quad (4)$$

where:

T_{it} = feedback trading measure from investor group i on day t

B_{it} = number of buy trades from investors group i on day t

S_{it} = number of sell trades from investors group i on day t

Time-Lag Regression for Testing Hypothesis 3 Then, to test hypotheses 3, we use a time-lag regression model. We will replicate Wang's research (2001) with the consideration of the sample similarity in the IDX. Econometric time-lag regression models will appear as follows:

$$Ln (V_t) = \beta_0 + \sum \beta_j \ln (V)_{(t-j)} + \sum \gamma_j D_{t \neq j} + \sum \lambda_k A^e_{t,k} + \sum \delta A^u_{t,k} + \varepsilon_{it} \quad (5)$$

Note:
$Ln (V)_{(tj)}$ is the lagged volatility that serves to anticipate the effect of volatility clustering in the daily data stock trading on the Stock Exchange. $D_{t \neq j}$ is a four-day of the week dummy, which serves to anticipate the possible effects of the day of the week together with the constants. In the above equation, it appears that the coefficient of A_e (expected trading component) and A_u (unexpected trading component), particularly for k = FS (foreign investor selling to domestic investor), has significant influence on V_t (Hypothesis 3 is accepted). Volatility proxies are used such as by Parkinson (1980) with the symbol of V_p, and Garman-Klass Volatility (1980) with the symbol of V_{gk} used by Wang (2000).

The concern here is the estimation of A_e and A_u as well as the possible effects of days of the week. To estimate the A_e and A_u, the authors decided to use the database calculation H_i. In the database of H_i, the trade component between foreign and domestic investors (symbol: FS to DB) will be found as well as the trade component among foreign investors (symbol: FS to FB). A_e can be calculated

by using the ratio of FS to DB per day compared with the FS to DB each month. That way, it will be found in decimal value of A_e, which is expected to be strongly correlated with V_p and V_{gk}, whereas A_u is calculated by dividing the ratio of FS to FB per day and FS to FB each month as well. Associated with the estimation of possible effects of days of the week, we will just use four observations for each period.

RESULTS AND DISCUSSION

HERDING IN THE IDX

Figure 1 shows the herding behavior pattern that appeared before the global financial crisis. It was dominated by stationary patterns between 0.4 and 0.6. The highest intensity of herding behavior occurred on November 28, 2008. The highest intensity was 0.8668, while the lowest was 0.1943, which occurred on June 21, 2006. The lowest level of the intensity was achieved when the transactions caused complications for domestic investors, who were mimicking the shares trading of foreigners. All of the targeted shares were bought by foreigners. The high or low intensity of herding behavior was due to the large or small number of shares purchased (B_{it}) by foreign investors and their total trade. This is according to the formula of H_{it} outlined in Equation 1.

The highest intensity of herding behavior was on November 28, 2008. It was due to the large number of purchases and small number of sales of shares by foreign investors. The large number of foreign investors' transactions caused domestic investors to imitate the foreign investors by searching for the leading shares in the LQ 45 index. The shares in the LQ45 index are the shares that the foreign investors targeted in their shares investment. The lowest intensity of herding behavior was on June 21, 2006. It was due to the low level of transactions of purchases and sales of shares by foreign investors. The lowest intensity suggests different behavior from the highest intensity transaction levels. The high intensity level of transactions of foreigners' trades provided a reference point for domestic investors.

After the global financial crisis, a slightly different pattern of herding behavior was found. There were some peaks or high point intensities of herding behavior, which exceeded 0.75. It was in 2010 and 2011. Based on descriptive statistics data, the average intensity of herding behavior was 0.4980 with a standard deviation of 0.0526. Preliminary conclusions obtained suggested that the distribution of herding behavior data was categorized normal with small variance, and the skewness of the coefficient of variation was very small. Thus, the variable intensity of herding behavior data can be used for subsequent analysis of herding behavior such as identification of its reciprocal relationship with feedback trading.

Just before the global financial crisis in 2008, the highest and lowest intensity levels of herding behavior were identified. This is important in order to understand whether herding behavior also occurred due to the effects of the trade interactions between foreign and domestic investors. Based on observations tabulation (not shown), the highest value of herding behavior was 0.9018. It occurred on April 8, 2011, and the lowest value was 0.32, which occurred on July 1, 2009.

Before the global financial crisis, the timing differences on herding behavior were characterized by the lowest intensities coming before the highest ones. On the contrary, after the global financial crisis period, they were characterized by the highest intensities coming before the lowest intensities. The first research objective was thus reached; the existence of herding behavior on the Indonesian Stock Exchange was detected. During the observation period 2006-2011, the intensity of herding behavior had an average of 0.5024, which is greater than zero. Based on the herding behavior formula in Equation 1, Hypothesis 1 is accepted, and this supports Panggabean (2006). The acceptance of the first hypothesis then brings a consequence of the impact of herding behavior in the capital markets, and furthermore, it was the alleged offender that made the herding behavior. Graphically, the herding behavior pattern in the IDX for the period 2006-2011 is shown in Figure 3, as follows:
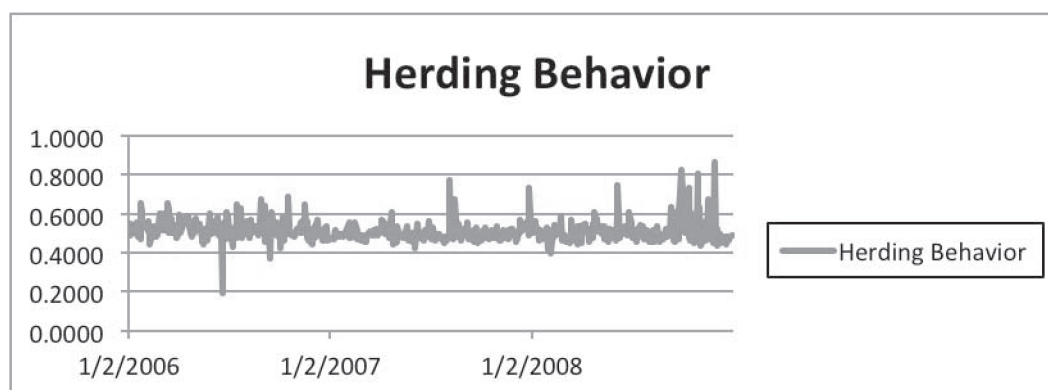

FIGURE 1. Herding behavior in the IDX before the Global Financial Crisis in 2008
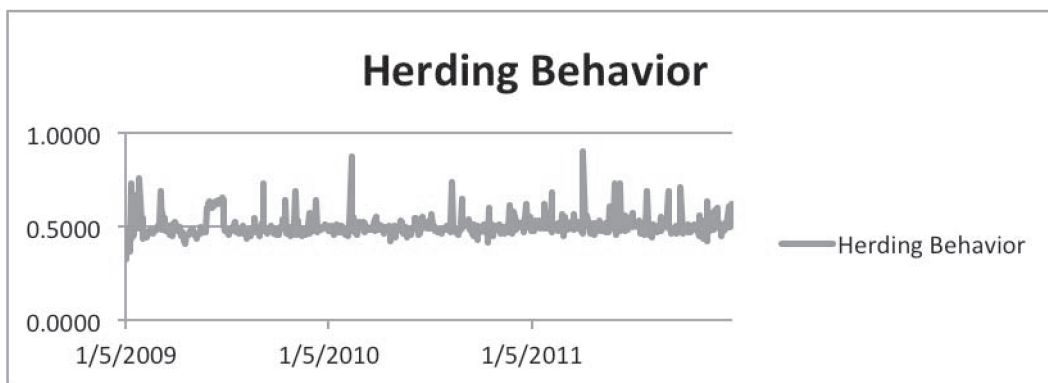
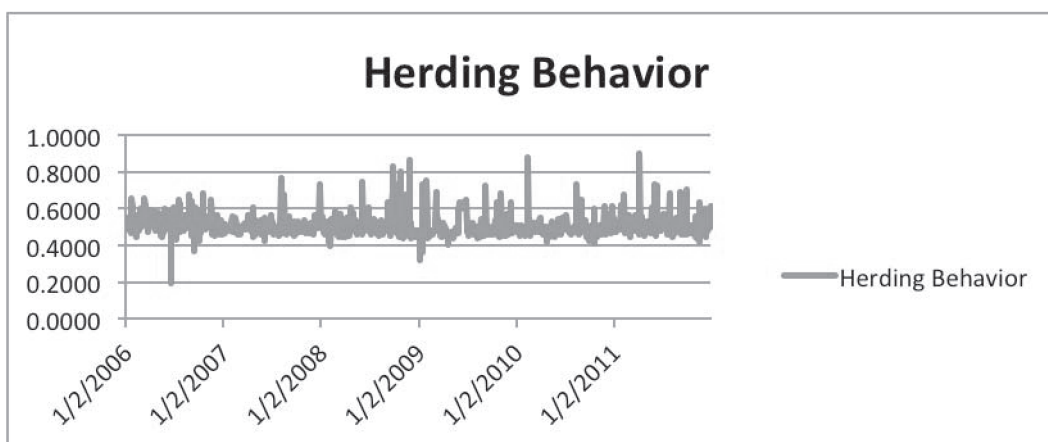FIGURE 2. Herding behavior in IDX after the Global Financial Crisis in 2008

FIGURE 3. Herding behavior in IDX period 2006-2011

Polarization of herding behavior is indicated in the graph in Figure 3. It is characterized by approximately 80% of the observations. They are stationary in the range of 0.4 to 0.6. Meanwhile, there are some extreme herding behavior patterns. There are some above 0.75 and below 0.2 for a certain time. However, these are only 20% of the observations. These findings indicate that there were strong tendencies for balanced transactions between the amount of shares foreign investors purchased and sold. The more balanced are the purchases and sales of shares traded by the foreign investors, the more slightly reduced are the frequency of both transactions. This is due to the foreign investors' confidence in the illiquid capital markets. They tend to discourage purchasing shares and cause domestic investors to be less able to imitate the foreign investors.

HERDING BEHAVIOR AND THE TRADING PATTERN OF FOREIGN INVESTORS

OBSERVATIONS ON 2006-2011 DATA, INCLUDING 2008

Table 1 shows that the Granger causality test results were significant. The two main variables HI and TI have a reciprocal relationship. The significance of the F-statistic on the two in the model of the relationship accommodates Granger causality assumptions. Then, it will also be eligible to test HI and TI with the basic VAR (Vector Auto Regression) model.

TABLE 1. Pairwise Granger Causality tests 2006-2011
(2008 data included)

Null Hypothesis:	Obs	F-Statistic	Probability
TI does not Granger Cause HI.	1435	24.4422	3.4E-11
HI does not Granger Cause TI.		29.5432	2.4E-13

Note: Lags: 2

Basic VAR test results in Table 2 show that all variable components HI (-1), HI (-2), TI (-1) and (TI-2) are significant to the HI and TI. What is interesting in the study is the positive as well as negative direct relationship of HI and TI on each model, linked to one another. This confirmed the existence of herding behavior in the Indonesian Stock Exchange (IDX), and the herding behavior was a result of foreign investors' negative feedback trading. This finding supports Hypothesis 2 that herding on the IDX exists due to foreign investors' feedback trading. It supports Surjawan (2007) as well.

TABLE 2. Testing of VAR model 2006-2011
(2008 data included)

	HI	TI
HI(-1)	0.261008	-0.186574
	(0.02374)	(0.04148)
	(10.9949)	(-4.49796)
HI(-2)	0.173270	-0.184463
	(0.02393)	(0.04181)
	(7.24176)	(-4.41223)
TI(-1)	-0.033444	0.281095
	(0.01338)	(0.02338)
	(-2.49941)	(12.0228)
TI(-2)	-0.066104	0.254151
	(0.01329)	(0.02322)
	(-4.97396)	(10.9445)
C	0.280165	0.141089
	(0.01396)	(0.02440)
	(20.0624)	(5.78213)
Adj. R-squared	0.180520	0.266823
F-statistic	94.84186	156.0329

Note: Standard errors & t-statistics in parentheses

OBSERVATIONS ON 2006-2011 DATA, EXCLUDING 2008

Excluding the 2008 data, we found the Granger causality test between HI and TI using the 2006-2011 data was significant. We found that the results of the tests did not have much different F-statistics with or without 2008 data. Therefore, it can be concluded that the financial crisis of 2008 did not affect the significant HI and TI's relationship.

TABLE 3. Pairwise Granger Causality tests 2006-2011
(2008 data excluded)

Null Hypothesis:	Obs	F-Statistic	Probability
TI does not Granger Cause HI.	1215	24.5375	3.3E-11
HI does not Granger Cause TI.		28.9491	4.7E-13

Lags: 2

The basic VAR analysis in Table 4 is consistent with the test in the previous section. All component variables HI (-1), HI (-2), TI (-1) and TI (-2) had a significant influence on the HI and TI. The positive direct relationship of HI and TI remains the same even when they were modeled internally. There was a different result when HI and TI associated externally. This confirms the existence of herding behavior in the IDX and that the herding behavior was influenced by foreign investors' negative feedback trading. It supports Hypothesis 2 that the existence of herding in the IDX is due to foreign investors' feedback trading. It supports Surjawan (2007).

TABLE 4. Testing of VAR Model 2006-2011
(2008 data excluded)

	HI	TI
HI(-1)	0.269902	-0.198358
	(0.02552)	(0.04644)
	(10.5746)	(-4.27151)
HI(-2)	0.189150	-0.205111
	(0.02574)	(0.04684)
	(7.34763)	(-4.37932)
TI(-1)	-0.031951	0.279929
	(0.01384)	(0.02518)
	(-2.30855)	(11.1168)
TI(-2)	-0.069748	0.261920
	(0.01374)	(0.02500)
	(-5.07682)	(10.4786)
C	0.267804	0.158212
	(0.01478)	(0.02690)
	(18.1146)	(5.88204)
Adj. R-squared	0.203653	0.278156
F-statistic	94.59837	142.0348

Standard errors & t-statistics in parentheses

STOCK VOLATILITY DUE TO THE INTERACTION OF
FOREIGN & DOMESTIC INVESTORS

Using Garman-Klass Volatility   The main difference between the Garman-Klass and Parkinson Volatilities is that there is a price adjustment factor above the opening and closing of a market index in the Garman-Klass Volatility. Therefore, the Garman-Klass volatility will be greater than that of Parkinson.

TABLE 5. Testing Stock Volatility by Garman-Klass
(2006-2011) using GARCH (1,1)

	Coefficient	Std. Error	z-Statistic	Prob.
VG-1	0.157310	0.001762	89.26818	0.0000
VG-2	0.175482	0.003271	53.64147	0.0000
VG-3	0.100613	0.001695	59.35277	0.0000
VG-4	0.022082	0.000657	33.59007	0.0000
D1	-1.36E-05	5.86E-06	-2.312053	0.0208
D2	-1.42E-05	5.85E-06	-2.419201	0.0156
D3	3.65E-05	5.78E-06	6.319000	0.0000
D4	2.34E-05	6.11E-06	3.831954	0.0001
AE	0.000849	7.33E-05	11.58903	0.0000
AU	3.11E-05	5.93E-05	0.524076	0.6002
C	-1.83E-05	5.87E-06	-3.124595	0.0018
	Variance Equation			
C	8.55E-10	6.10E-10	1.401678	0.1610
ARCH(1)	2.962943	0.107527	27.55538	0.0000
GARCH(1)	0.202741	0.005702	35.55318	0.0000
R-squared	0.056049	Mean dependent var		0.000519
Adjusted R-squared	0.047414	S.D. dependent var		0.001705
Log likelihood	9153.422	F-statistic		6.490421
Durbin-Watson stat	1.946584	Prob (F-statistic)		0.000000

Convergence achieved after 105 iterations

The combined analysis of the best model to predict the Garman-Klass volatility is the GARCH (1,1). All components of the variables VG_{t-1}, Dummy and AE unless AU have a significant effect to Garman-Klass Volatility. This indicates the interaction between foreign and domestic investors is likely to increase the volatility of the JCI movement. Thus, Hypothesis 3 is accepted, and these findings support the studies of Wang (2000) and Choe et.al. (1998). Although the GARCH (1.1) model for the Garman-Klass volatility has many significant variables, it also contains flaws. The Adj-R^2 is very small, below 5%. This implies the necessity to explore the other variables to fit the model.

Using Parkinson Volatility   It is important to note that when aggregate data are used to lag 4 on VP_{t-1} and D_{t-1}, they could be identified with either. This is because when partial data are used, the maximum lag order is only at order 3. However, when lag 4 is used, the command will appear near singular matrix. This confirms that the sample used for analysis is still insufficient.

TABLE 6. Testing stock volatility by Parkinson Formula (2006-2011) using GARCH (1,1)

	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	1989.249	134.6687	14.77143	0.0000
VP-1	0.248416	0.006643	37.39568	0.0000
VP-2	0.193392	0.007497	25.79534	0.0000
VP-3	0.081696	0.007700	10.60972	0.0000
VP-4	0.003943	0.009282	0.424783	0.6710
D1	2.65E-05	5.79E-06	4.577718	0.0000
D2	2.50E-05	5.79E-06	4.310545	0.0000
D3	2.37E-05	5.08E-06	4.665068	0.0000
D4	1.92E-05	5.11E-06	3.745646	0.0002
AE	0.001551	0.000122	12.73700	0.0000
AU	4.23E-05	9.08E-05	0.466046	0.6412
C	-8.92E-05	7.41E-06	-12.04171	0.0000
	Variance Equation			
C	1.07E-09	3.91E-10	2.736644	0.0062
ARCH(1)	0.380237	0.029412	12.92801	0.0000
GARCH(1)	0.277390	0.023122	11.99704	0.0000
Adjusted R-squared	0.171167	S.D. dependent var		0.000125
Log likelihood	11748.84	F-statistic		22.15304
Durbin-Watson stat	2.181088	Prob(F-statistic)		0.000000

Convergence achieved after five iterations

Table 6 shows that all V_p group's determinant variables VP_{t-1}, D_{t-1} and AE are significant. These results indicate the acceptance of Hypothesis 3 (H₃). This is in line with the Garman-Klass volatility test in section "Time-Lag Regression for Testing Hypothesis 3" above. The categories of models, GARCH (1,1), were econometrically feasible and noteworthy. First, the Adj-R^2 values are still above 15%, and second, the Durbin Watson (DW) is close to 2. These both indicate that the feasibility of the model GARCH (1,1) of Parkinson volatility is very well supported by VP_{t-1}, D_{t-1} and AE, and those variables could be used as the determinant variables of the volatility. The DW indicates that there were no indications of an autocorrelation problem.

DISCUSSION OF THE RESULTS

ALTERNATIVE HYPOTHESIS 1

The graphical analyses from Figures 1, 2 and 3 indicate that herding behavior still exists in the Indonesian Stock Exchange (IDX); therefore, the graphical analyses were in line with Hypothesis 1 (H₁). The intensity of herding behavior for the period 2006 - 2011 ranged from 0.4 to 0.6. The rise and fall of the intensity of herding behavior accompanied the ups and downs of foreign investors' trading activities. The increases in the intensity of herding behavior were caused by more purchases of shares by foreign investors than that by domestic investors. Meanwhile, the reductions in the intensity of herding behavior were mainly in line with foreign investors' sales of shares that were generally bought by other foreign investors. The result of Hypothesis 1 (H₁) was consistent with the earlier studies by Panggabean (2006), Setiyono (2012) and Gunawan et al. (2011) that herding behavior still exists in the IDX despite the global financial crisis of 2008. The indication of herding behavior was signaled by the action of foreign investors who purchased shares followed by domestic investors.

ALTERNATIVE HYPOTHESIS 2

Based on the analysis of the VAR models for the period 2006-2011, with or without 2008 data, we found that there was a relationship between herding behavior and feedback trading. That supports Hypothesis 2 (H₂); foreign investors' trading behavior leads to herding. What made this study interesting is that we found that the behavior of the domestic participants in the period was such that the herding behavior was followed by negative feedback trading. The domestic investors' strategy switched from herding to being contrarian. The herding behavior and feedback trading relationship was negative. This indicates that the type of feedback trading that influenced the herding behavior was a negative feedback trading. This finding is less confirmed with the role of foreign investors in Surjawan (2007). The role of the foreign investors was not as a liquidity driver, nor a value creator. Otherwise, it asserts that domestic investors will not directly perform herding toward foreign investors. This type of herding will refer to the pseudo-herding that is called semi-rational herding according to Davenow and Welsch (2004).

ALTERNATIVE HYPOTHESIS 3

Testing the volatility of the market indices in the Indonesian Stock Exchange using Parkinson and Garman-Klass models, we found the interaction between

foreign and domestic investors increased the market index volatilities. That supports Hypothesis 3 (H_3) and Wang (2000); foreign investors' trading activities in the Indonesian Stock Exchange increased the market index volatilities, and their trading activities triggered the domestic investors' herding behavior.

CONCLUSIONS

The herding behavior analysis for the period 2006-2011 found the existence of herding behavior. It supported the earlier study of Panggabean (2006). By diversifying and combining the distribution of the data for the period to before and after the global financial crisis of 2008, we did not find negative figures of instances of herding behavior comply with the model by Lakonishok et al. (1992). The consistency of the intensity of herding (H_i) level from 0.4 to 0.6 indicates the existence of the herding behavior in the IDX by domestic investors following foreigners, despite the global crisis in 2008. The results of this study are not only in line with Panggabean (2006), but also support Neal, et al. (2002), Gunawan et al. (2011) and Setiyono (2012) on the persistence of the phenomenon of herding in the IDX over ten years.

Related to the purpose of the study, it was found that herding behavior occurs because of feedback trading. It is important to note that the type of feedback trading that occurs in the trading of shares is negative feedback trading. Referring to the test using the VAR model, TI, in general, will negatively affect HI. This finding emphasizes that domestic investors would not directly perform herding on foreign investors' trading behavior. However, foreign investors historically in terms of technology, capital, and market experience have superior knowledge compared to domestic investors. Being informed by the mastery of local information, it is supposed that domestic investors' pseudo-herding mimicking of foreign investors is the trading strategy.

The third objective of the study was also achieved in the presence of significant coefficients A_e against all forms of the volatility of Parkinson volatility (V_p) and Garman-Klass Volatility (V_{gk}). These findings indicate that the interaction between foreign and domestic investors' trading activities raised market index volatility. The increased market index volatility, despite a positive impact on the performance of the market, should be observed by the regulators because excessive market index volatility could cause market stress and a possible subsequent market crash.

SUGGESTION

We have not been able to measure the individual and institutional investors' case of herding behavior separately. This is because of the uneven individual and institutional foreign investors' trading activities data per share. Even

if the data were obtained, it would cause problems when testing Hypothesis 3 (H_3) for the volatility models of Parkinson and Garman-Klass. They are more widely used for market indices. It could be a solution for future research; the data could detect the individual shares transactions to see the type of herding behavior phenomenon that exists in the IDX and whether the market index volatility associated with the reuse of the traditional statistical volatility could be applied to individual shares.

It is important to consider the method to perform the modeling of herding behavior using Monte Carlo Simulation as advised by Lakonishok et al. (1992). As the authors have been working with the spreadsheet, it remains static for the foreign investors' trading activities. However, considering the dynamics of the volatility of the market index in the Indonesian Stock Exchange to date; the herding behavior simulations need to be demonstrated in the dynamics model of the rise and fall of foreign investors' trading activities to make them more concrete.

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