The Informational Role of Individual Investors in Stock Pricing: Evidence from Large Individual and Small Retail Investors

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Abstract

Using a unique data set of complete trade records, we find that large individual investors are successful at picking stocks. Large individual investors' correlated trades not only can move synchronous stock prices but also can positively predict future returns. More importantly, large individual investors tend to trade before major earnings announcements and large price changes, suggesting that they are able to exploit value-relevant information. In contrast to large individual investors, small retail investors' correlated trades are inversely associated with synchronous and future stock returns, indicating that small retail investors are uninformed and naïve. The differential information content between large individual and small retail investors highlights the need to classify individual investors according to their investment amount when examining their role in stock pricing.

Keywords: Herding; individual investors; institutional investors; stock pricing.

JEL Classification: G10; G11; G14

1. Introduction

This paper examines the informational role of individual investors in stock pricing. Past literature has documented that institutional investors tend to trade the same stocks on the same side during a short-term period and that their correlated trades not only can move stock prices but also can predict future returns.[1] In contrast to institutional investors, despite a growing body of literature devoted to examining the trading of individual investors, questions on whether individual investors herd and how their trading affects synchronous and future stock returns are still being debated.[2] In this paper, we explore these issues by analyzing the transactions of all investors in an emerging market.

Our unique dataset consists of the complete historical order, trade records, and the identities of the investors in the Taiwan stock market from January 2001 to December 2006, allowing us to perform a detailed analysis of investors' trading behavior and its impact on stock prices. According to their identity, we group all investors as individuals, local institutions, or foreigners.[3] We then further categorize the investors in each group

[1] Please refer to Lakonishok, Shleifer, and Vishny (1992), Nofsinger and Sias (1999), and Wermers (1999).

[2] Existing studies have different views on the informational role of individual investors. The noise trader theory argues that individual investors are uninformed investors (see Black, 1986; Barber, Lee, Liu, and Odean, 2009; Seasholes and Zhu, 2010). This strand of literature asserts that individual investors with little investment knowledge may trade on noise, thus resulting in pushing stock prices away from their fundamental value (Hvidkjaer, 2008; Dorn, Huberman, and Sengmueller, 2008; Barber, Odean, and Zhu, 2009). Moreover, naïve individual investors provide immediacy to informed traders and are compensated for price reversals, which are caused by the price pressure of heavily informed trades (Kaniel, Saar, and Titman, 2008). Another strand of literature, called the informed trader hypothesis, argues that some groups of individual investors can exploit private information and trade for profit. The informed trades by individuals are helpful to speed up the process of incorporating private information into stock prices, thus improving market efficiency (Kaniel, Liu, Saar and Titman, 2012; Kelley and Tetlock, 2013). In addition to rational models, behavioral finance literature demonstrates that individual investors tend to suffer from behavioral biases and thus have lower investment returns than the benchmark (Odean, 1998; Barber and Odean, 2000, 2001).

[3] Several studies examining U.S. data separate investors and stocks into locals and non-locals (e.g., Coval and Moskowitz, 2001; Bail, Kang, and Kim, 2010; Seasholes and Zhu, 2010) using geographic distance or state identifiers. In comparison to the 50 states, the area of Taiwan is 13,974 square miles and is smaller than West Virginia (24,231 square miles, the 41st largest state in the U.S. by area) but larger than Maryland (12,407 square miles, the 42nd largest state). If we use a similar standard as a measure of geographic

into large-size and small-size traders based on their annual trading dollar value. We are particularly interested in examining whether the effect of stock trading on synchronous and future stock returns is different among large individual and small retail investors.[4] We hypothesize that large individual investors have more precise information regarding the fundamental value of stocks than smaller retail investors. The rationale of our hypothesis is based on the assumption that large individual investors are in a better position to access private information or they can better interpret a firm's public information.[5] To test our hypothesis, we examine the relationship between investors' correlated trades and concurrent and future stock returns. The relationship of a concurrent return with the herds in a group of investors is related to whether the investors' trades can move stock prices, while the future return predictability is the measure that is most likely to reflect differential information among investors. The empirical results confirm our hypothesis that the correlated trades of large individual investors move concurrent stock prices and positively predict the cross-section of stock returns over the subsequent 20-day period, while the trades of small retail investors are oppositely related to synchronous and future stock returns. This finding is crucial in understanding and interpreting the mixed results of literature on the informational role of individual investors.

We begin our analyses by investigating whether individual and institutional investors

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proximity, it is suitable to regard domestic investors as local investors while foreigners as non-local investors.

[4] We also conduct empirical analyses for local institutions and foreigners and present the results as a reference.

[5] Large individual investors are better at developing close relationships with corporate insiders and employees than small retail investors. Furthermore, large individual investors can buy financial analysts' reports, hire financial analysts as investment advisors, or mandate their investments to professional managers. Therefore, large individual investors have advantages in analyzing the market competitiveness of products and the information regarding future cash flows. This is not surprising because the benefits from higher returns on large amount of investments can offset the costs that individual investors spend on gathering information.

herd. Using the Lakonishok, Shleifer, and Vishy (1992) herding measure, we find a mean herding level of 4.64 percent when at least five large individual investors trade one stock during any given day. The measure increases monotonically to 5.68 percent if at least 20 investors trade. For local institutions and foreigners, the mean herding levels are 4.16 percent and 5.14 percent, respectively, when at least five institutions trade. These results show that our average levels of investors' herding are larger than that reported by Lakonishok et al. (1992) for their sample of pension funds (2.0 percent) and by Wermers (1999) for his sample of mutual funds (3.61 percent).[6] We also examine the association between prior abnormal returns and the level of herding. Consistent with Nofsinger and Sias (1999), we find that large individual investors follow a contrarian investment strategy and both local institutions and foreigners follow a positive-feedback strategy.

Given the finding regarding the existence of herding by large individual investors and institutions, we next examine the association between herding levels and stock returns. For each group of investors (large individual investors, local institutions, and foreigners), we separately form quintile buy-herding portfolios and quintile sell-herding portfolios according to the stocks' herding measure. The contemporaneous daily abnormal return for the portfolio of intense buy-herding (intense sell-herding) by large individual investors is 1.09 percent (0.18 percent), as compared to 1.15 percent (-0.69 percent) for the intense buy-herding (intense selling-herding) portfolio by local institutions and 0.73 percent (-0.69 percent) for the intense buy-herding (intense selling-herding) portfolio by foreigners. Moreover, for large individual and local institutional investors, the intense buy-herding portfolios subsequently outperform the

[6] We note that our herding measures are calculated using the daily transaction data rather than the changes of quarterly holding data used by Lakonishok et al. (1992) and Wermers (1999).

intense sell-herding portfolios over the 20 days after the portfolio formation (herding) day. The finding of a positive relationship between investors' herding and contemporaneous and subsequent abnormal returns is consistent with the view that large individual investors' herding is helpful in incorporating new information into stock prices. In contrast to large individual investors, the stocks bought mostly by small retail investors significantly underperform the stocks mostly sold on the portfolio formation and subsequent days, suggesting that small retail investors are more likely to be uninformed traders.

To further address the informational role of individual investors, we implement a series of different robustness tests. First, we investigate the aggressiveness of the executed orders for each group of investors. Recent literature suggests that informed individual traders tend to use market orders (e.g., Kelley and Tetlock, 2013). Our result demonstrates that large individual investors are more aggressive than small retail investors. Furthermore, when herds occur, the orders of small retail investors are picked off by their counterparts. Our findings are consistent with the idea that large individual investors are more likely to be informed traders, while small retail investors are liquidity providers who are not being compensated. Second, we regress the future returns on the herding measures of large individual investors and on the buy-sell imbalance of small retail investors. After controlling for momentum and firm characteristic variables, we document a positive relationship between large individual investors' trades and future returns but a negative association between small retail investors' trades and future returns. Third, we investigate the investors' trades prior to the semi-annual and annual earnings announcements. Our result shows that large individual investors and local institutions can successfully predict an earnings surprise, while small retail investors tend to trade on the

other side of earning announcements. Overall, the robust evidence supports our hypothesis that large individual investors are informed traders, while small retail investors are uninformed and naïve traders.

This study contributes to the existing literature on the role of individual investors in stock pricing. Our empirical results showing different information content between large individual and small retail investors can reconcile the contradictory findings on the informational role of individual investors. More specifically, the comprehensiveness of our dataset gives us an advantage in being able to classify individual investors as large individual and small retail investors. In contrast, the limitation of the data prevented previous studies from distinguishing the information content between large individual and small retail investors. For example, the findings documented in Hvidkjaer (2008), Barber, Lee, Liu, and Odean (2009), Barber, Odean, and Zhu (2009), and Seasholes and Zhu (2010) show that individual investors are uninformed traders. In contrast to our study, Hvidkjaer (2008) and Barber, Odean, and Zhu (2009) infer which trades are individuals based on trade size. Their empirical results might suffer due to accidently excluding trades by individual investors and accidently including trades by small institutional investors in the analyses. Seasholes and Zhu (2010) obtain their data, which has been used in a number of studies, from a single discount broker. The data is a small subset of the market and could be dominated by smaller and less sophisticated investors. Although using the same dataset as us, Barber, Lee, Liu, and Odean (2009) examine the investment performance of individuals and institutions during the period from 1995 to 1999, yet they do not distinguish the investment performance between large individual and small retail investors.

Although several studies have found that specific types of individual investors'

orders can predict future stock returns, their datasets are also criticized. Dorn, Huberman, and Sengmueller (2008) examine the trading of clients at a large German discount broker. Their data is biased toward investors who were younger, were better educated, and had a higher personal income than the typical investor. Kaniel, Saar and Titman (2008), Kaniel, Liu, Saar and Titman (2012), and Kelley and Tetlock (2013) examine the relationship of individuals' trades and stock returns. Their retail orders data is obtained from the New York Stock Exchange Consolidated Equity Audit Trial Data (NYSE's CAUD) and two market centers that provide execution services for retail broker-dealers. There are two potential pitfalls for the retail orders used in these papers: one is the internalization problem that retail brokers tend to internalize the small and naïve retail orders, and the other is that brokers have economic incentives to execute their retail orders – thought to have been placed by uninformed investors trading for liquidity reasons – away from the NYSE, as documented by Battalio and Loughran (2008).

In addition to the literature on the role of individual investors in stock pricing, we also contribute to the literature on investors' herding. Several early studies demonstrate a moderate level of institutional herding (see Lakonishok et al., 1992; Grinblatt, Titman, and Wermers, 1995; Nofsinger and Sias, 1999; Wermers, 1999). However, because these studies use publicly available quarterly (or annual) institutional holdings data, they are neither able to examine the short-term price impact of herding nor able to detect the intra-quarter trades of investors, as documented by Puckett and Yan (2011). Using trade records, we find that not only do local institutions and foreign institutional investors herd, individual investors also herd. More importantly, our robust evidence shows that herding by local institutions and large individual investors can be considered information-based correlated trading.

We are not the first to examine the informational contribution of large investors on stock pricing. In examining the initial public offerings made on the Singapore Stock Exchange, Lee, Taylor, and Walter (1999) find that investors who apply for larger quantities of new shares are more likely to be better informed than small investors. We contribute to this literature by providing evidence of the advantages that individual investors have in an emerging stock market.

The remainder of this paper is organized as follows. Section 2 describes the Taiwan market and the data used in this study. Section 3 describes the investors' herding and presents the main empirical results and findings. A series of robustness checks are reported in Section 4. Section 5 provides our conclusions.

2. Institutional Background, Data, and Sample

2.1 Institutional background

The Taiwan Stock Exchange (TWSE) began operations in 1962. Although only 18 companies were listed in 1962, this figure increases to 584 in 2001 and to 688 in 2006. The total market capitalization also grows to NT$ 10.2 trillion (US$ 295 billion) in 2001 and to NT$ 19.4 trillion (US$ 596 billion) in 2006.[7] According to the 2006 annual statistics report of the *World Federal Exchange*, the TWSE ranks 20th globally in value of market capitalization at the end of 2006. These figures suggest that the Taiwan stock market is an important emerging market.

Taiwan opened its stock market in 1983 by allowing its domestic investment trust companies to raise offshore funds for investments in the local market. In 1991, Qualified

[7] The exchange rate during our sample period is in the range of NT$ 35.11 (February 2002) to NT$ 30.86 (March 2005) per US$ 1.00.

Foreign Institutional Investors (QFIIs) were allowed to invest directly in the Taiwan stock market. These foreign institutional investors include banks, insurance companies, securities firms, mutual funds, pension funds, and other investment institutions. Furthermore, direct investments by foreign individual investors have been allowed since 1996. Similar to other emerging markets, Taiwan has also set several restrictions, such as an investment quota and an ownership ceiling, on equity investment by foreign investors. The investment quota for foreigners has increased over time, standing at US$ 2 billion for QFIIs and US$ 50 million for foreign individual investors at the end of 2000. Because the QFII scheme was abolished in July 2003, the investment quota for offshore investors was subsequently removed and the quota for onshore foreign institutional investors was increased to US$ 3 billion. There were also ceilings for each foreign investor's holdings in individual firms as well as for the total foreign holdings in individual firms. The ownership restrictions have declined steadily over time, and by the end of 2000, foreigners were permitted to own 100 percent of domestic firms with few exceptions.[8]

The TWSE is a consolidated order-driven market where only limit orders are accepted. Orders can be submitted starting at 8:30 am. During the regular session from 9:00 am to 1:30 pm, buy and sell orders interact to determine the executed price subject to applicable auto-matching rules. Orders are matched two to three times every minute throughout the trading period and are executed in strict price and time priority. A price limit of 7 percent is imposed on the daily stock price movement. Naked short selling is prohibited. However, domestic individual investors have been able to engage in securities

[8] Foreign investors are not allowed to own shares of TV firms. Thus, the stock with TWSE code 9928 has been removed from our empirical analysis. Furthermore, the ceiling of foreign ownership of firms in the transportation industry (13 stocks in our sample) and in the telecom industry (4 stocks in our sample) is 49 percent. These firms remain part of our empirical analyses because the limits of foreign ownership were never breached during our sample period.

margin trading since 1980. In June 2003, the TWSE launched a centralized Securities Borrowing and Lending (SBL) system, which can provide qualified institutional investors an efficient way to borrow and lend securities. More importantly, it is easier for institutional investors, particularly for foreign institutions, to engage in short selling.

2.2 Data

We restrict our analysis to ordinary common stocks. The data for this study comes from two sources. We acquire the complete trade-by-trade records of all traders on the TWSE from January 1, 2001 to December 31, 2006. The dataset comprises the details of the trade, including the transaction date and time, stock code, buy or sell, transaction price, number of shares, trader type (domestic institutional investor, foreign institutional investor, domestic individual investor, or foreign individual investor), and identity of the traders.[9] The identity of the traders allows us to trace all the historical trade-by-trade data for every trader in our sample period.[10] Our sample consists of 1.9 billion trades, resulting in a NT$ 254.1 trillion trading dollar volume (double-counting the buy and sell transactions). In addition, we obtain the stock return, trading volume, and shares outstanding from the Taiwan Economic Journal (TEJ) Equity database, and the financial variables and financial analysts' earnings forecasts from the TEJ Finance database.

Panel A of Table 1 provides the descriptive statistics for the TWSE. In our sample period, the Taiwan stock market enjoys a bull market except for a loss of 19.8 percent in 2002. The annual turnover is in a range from 124 percent (in 2005) to 197 percent (in 2002). Although the average turnover in our sample is higher than many developed

[9] The dataset has been studied by Barber, Lee, Liu, and Odean (2009). They examined the investment performance of individual and institutional investors from 1995 to 1999.

[10] If an investor has accounts in several brokerage houses, the dataset allows us to trace all of the investor's transaction records in different accounts.

markets, it is dramatically lower than what it was in the 1990s.[11]

<Table 1 is inserted here>

Similar to other emerging East Asian markets, individual investors dominate the Taiwan stock market in terms of the number of investors, ownership, and trading volume.[12] In each of the sample years, more than two million individual investors have trade records on the TWSE. This accounts for at least 12 percent of the total population on the island. Although the ownership of individual investors has declined from 51.2 percent (in 2001) to 42.8 percent (in 2006), this proportion is still larger than any other type of investor. Moreover, the trading dollar volume of individual investors accounts for 66.1 percent (in 2005) to 83.0 percent (in 2001) of the total trading dollar volume in the Taiwan stock market. The disproportion between ownership and trading volume suggests that individual investors trade more frequently than other types of investors in Taiwan.

Despite the individual investors' dominant position in this emerging market, institutional investors' importance increases over time in the sample period. The number of institutional investors trading on the TWSE increases from 10,364 (including 7,999 domestic and 2,365 foreign institutions) in 2001 to 12,390 (8,641 domestic and 3,749 foreign institutions) in 2006. While foreign ownership expands rapidly from 8.2 percent to 22.2 percent, domestic ownership declines slightly from the 31.1 percent to 29.7 percent. The trading volume of institutional investors also increases over time; the trades by institutional investors account for 17.0 percent of the total trading dollar volume in the market in 2001, and the ratio increases to 32.3 percent in 2006. Interestingly, foreign

[11] For example, Barber, Lee, Liu, and Odean (2009) report a mean annual turnover rate of 294 percent in their sample period from 1995 to 1999.

[12] The summary statistic in this section is consistent with the general findings of individual investors dominating the Taiwan stock market (Barber et al., 2009; Huang and Shiu, 2009).

investors play a more important role than domestic institutional investors in recent years. The ratio of the trades in dollar volume by foreign investors to the total trading dollar volume is 18.0 percent and 18.5 percent in 2005 and 2006, exceeding the 15.9 percent and 13.8 percent by domestic institutional investors in the corresponding period.

Panel B of Table 1 provides descriptive statistics on the firm characteristics and ownership of our sample stocks. The mean market capitalization is NT$ 19.4 billion (median NT$ 4.0 billion), which is approximately equal to US$ 607 million (median US$ 126 million). The sample stocks have an average price of NT$ 25.60 (median NT$ 16.70), a weekly return of 0.36 percent (median 0.40 percent), and a return volatility of 6.86 percent (median 6.39 percent). The mean weekly turnover is 4.40 percent (median 3.63 percent) and the mean trading dollar volume is NT$ 630 million (median NT$ 203 million).

2.3 Sample

We hypothesize that individual investors have more information regarding the fundamental value of stocks than smaller retail investors. To distinguish the informational role on stock pricing between large individual investors and small retail investors, a cut-off point needs to be set in order to separate investors into large and small investors. Furthermore, in examining the relationship between investors' collective actions and stock returns, literatures employ either a herding level or a buy-sell imbalance as a measure. The herding measure, which will be discussed later, is related to the number of investors whereas the buy-sell imbalance is related to the number of shares bought and sold. Therefore, a specific investor's collective action might yield contrasting results for the herding measure and the buy-sell imbalance.[13] Separating traders into large and small

[13] To illustrate, assume that there are five individuals buying one share and one individual selling 10 shares

investors can harmonize the conflicting results. We therefore set a cut-off point of an annual trading dollar volume of NT$ 1 billion to separate all individual and institutional investors into large and small investors.[14] Throughout the paper, individual investors, domestic institutional investors, and foreign institutional investors whose annual trading dollar volume is more than the cut-off point are called "large individual investors," "local institutional investors," and "foreign investors," respectively, differentiated from "small retail investors," "small local institutions," and "small foreigners."

Panels C and D of Table 1 present the summary statistics for the sample of large investors and the sample of small investors, respectively. Although the number of large investors is small, the trading dollar volume of large investors has a significant stake in the market. As an illustration, the number of large individual investors only accounts for 0.1 percent of the population of small retail investors but the trading dollar volume of large investors accounts for one-sixth of the total market and is approximately equal to one quarter of the trading volume of small retail investors. The extreme disproportion between the number of investors and the trading dollar volume is also shown for local institutions and foreign investors.

The distinctive features between large and small investors are also reflected in the mean number of different stocks and the mean dollar volume traded per investor. For example, in 2001, the mean number of different stocks traded per large individual investor is 4.88 and the mean dollar volume was NT$ 13.37 million per day, which is

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of a stock. In this case, the individual investor is regarded as a buy-herding group but is classified as a net selling group.

[14] We also use several cut-off points, such as an annual trading dollar volume of NT$ 100 million and NT$ 500 million, to separate our sample. The results are qualitatively similar. The number of large investors increases materially if we set a lower criterion.

significantly higher than the 1.92 different stocks and NT$ 0.44 million trading dollar volume for small retail investors. Local and foreign institutional investors have similar findings. These statistics indicate that large investors are characterized as being active traders or wealthy investors, while small investors either trade less frequently, trade a smaller number, or both.

Interestingly, we find that the average large institutional investor trades a broader spectrum of stocks and a higher trading dollar volume over time, but individual investors as a group do not reveal such a pattern. As shown in Panel C of Table 1, along with the increases in the number of institutions and in the number of listed companies from 2001 to 2006, the average local institutional investor (foreign investor) traded 4.97 (5.39) different stocks and NT$ 44.20 million (NT$ 65.60 million) per day in 2001, increasing to 8.07 (6.39) different stocks and NT$ 65.40 million (NT$ 91.63 million) per day in 2006. On average, foreign investors trade fewer different stocks but have a larger trading dollar volume than local institutional investors, which is consistent with the findings in six Asian emerging markets as documented by Richards (2005).

3. Investors' Correlated Trading and Abnormal Stock Returns

In this section, we investigate large investors' correlated trading and its relationship with abnormal stock returns. We first introduce and present evidence of the herding measure, which is used in our study as a proxy for the correlated trading by large individual investors. We also examine the relationship between the herding level and abnormal stock returns, including the prior return, contemporaneous abnormal returns, and subsequent returns. This relationship helps us to understand the informational roles of these investors in stock pricing.

The analyses on small investors are followed. Not surprisingly, the number of small investors that trade a stock during any given day is possibly thousands of times more than the number of large investors; and the number of small investors can vary greatly from one stock to another. Thus, it is not appropriate to estimate the herding measures for small investors because the calculation of the herding measure not only requires a number of investors but also being very sensitive to the number of investors. So, we use the buy-sell imbalance to proxy for the correlated trading by small investors. We will explore the relationship between the buy-sell imbalance of small investors and stocks returns.

3.1 Herding measure

Herding is defined as a group of investors who trade the same securities in the same direction over a defined time period. In order to test for the cross-sectional temporal dependence of institutional traders, Lakonishok et al. (1992) develop the herding measure (hereafter referred to as the LSV herding measure) as:

$$HM_{i,t} = \left|p_{i,t} - \overline{p}_{i,t}\right| - E\left|p_{i,t} - \overline{p}_{i,t}\right| \quad (1)$$

where $HM_{i,t}$ is a measure of the herding for stock i during time t, $p_{i,t}$ is the proportion of the specific investors trading stock i during time t who are buyers, $\overline{p}_{i,t}$ is the average of $p_{i,t}$ for all stocks that the specific investors traded during time t, and $E\left|p_{i,t} - \overline{p}_{i,t}\right|$ is the adjustment factor that accounts for the expected value of $\left|p_{i,t} - \overline{p}_{i,t}\right|$ under the null hypothesis of no herding.

In this paper, we use the LSV herding measure to examine the existence and extent of correlated trading by large investors on a daily frequency. We average the LSV herding measure (denoted as $\overline{HM}$) across all stock-days for each type of investor (large

individual investors, local institutional investors, and foreign investors, respectively). A higher herding measure indicates that a higher proportion of a type of investor herds into or out of a specific stock in the same direction during any given day. However, to analyze the impact of herding on stock price, it requires the segregation of investors' herding by trade direction (i.e., buy or sell). We classify stocks as buy-herding stocks (sell-herding stocks) if they have had a higher (lower) proportion of buyers than the average stock during the same day. The LSV herding measures are called "buy herding measures" (*BHM*) for buy-herding stocks and "sell herding measures" (*SHM*) for sell-herding stocks:

$$BHM_{i,t} = HM_{i,t} \left| p_{i,t} > \overline{p}_{i,t} \right. \tag{2}$$

and

$$SHM_{i,t} = HM_{i,t} \left| p_{i,t} < \overline{p}_{i,t} \right. \tag{3}$$

In order to account for the buy or sell direction, we define the signed LSV herding measure, *LSV_HM*, which is dependent on being buy-herding or sell-herding, as follows:

$$LSV\_HM_{i,t} = \begin{cases} 1 \times HM_{i,t}, \text{ if } BHM \\ -1 \times HM_{i,t}, \text{ if } SHM \end{cases} \tag{4}$$

3.2 Evidence for large investors' herds

The mean LSV herding measures for all stocks, where at least 5, 10, or 20 investors in a group trade on any given day, are represented in Panel A of Table 2. For stocks with at least 10 institutional investors trading, as an example, the average LSV herding measure is 4.67 percent. This average herding measure indicates that if 100 institutional investors trade a stock on a given day, there are 4.67 more institutional investors who trade on the same side of this stock than would be expected if each investor randomly and

independently makes the trading decision.

If the sample institutional investors are split into local institutional investors and foreign investors, foreign investors have a higher level of herding than local institutional investors. For example, the average LSV herding measure for stocks with at least 10 foreign investors is 6.22 percent, higher than the average herding measure of 4.78 percent for local institutional investors. Overall, our average levels of institutional herding are larger than that reported by Lakonishok et al. (1992) for their sample of pension funds (2.0 percent) and by Wermers (1999) for his sample of mutual funds (3.61 percent).[15] This is probably attributed to the limitation of quarterly holding data, which is used in most of the previous studies, that the changes in quarterly holdings do not capture investors' intra-quarter transactions (Puckett and Yan (2011)).

<Table 2 is inserted here>

Surprisingly, we uncover that our sample of large individual investors also herd to a great extent. As shown in Panel A of Table 2, the average LSV herding measure is 5.24 percent for stocks with at least 10 large individual investors who trade on any given day, suggesting that large individual investors also often pile into or out of the same stocks at the same time. We provide clear evidence that not only institutional investors but also individual investors herd, which is not well documented in earlier studies.

We find that the mean LSV herding measure increases when we require large numbers of investors to trade a specific stock on any given day. For all institutional investors in a group, the measure increases monotonically from 4.09 percent (when there are at least 5 institutions) to 5.27 percent when at least 20 institutions are required to trade

[15] Both studies by Lakonishok et al. (1992) and Wermers (1999) used quarterly ownership data to estimate the LSV herding measures.

on any given day. For large individual investors, the measure also increases from 4.64 percent (when there are at least 5 large individual investors) to 5.68 percent (when there are at least 20 large individual investors). This pattern is contrary to the results presented by Wermers (1999) who find that the quarterly herding measure decreases from 3.40 percent (when there are at least 5 mutual funds traded in a given quarter) to 3.17 percent when at least 50 mutual funds need to be traded in a given quarter.

We further examine whether the herding level differs between large stocks and small stocks. If herding is motivated by private information, we would observe a higher level of herding occurring in smaller-sized firms where the information asymmetry is more severe than larger-sized firms. To investigate the relationship, we divide all stocks equally into two subsamples based on their market capitalization. Panels B and C of Table 2 present the average LSV herding measures for large stocks and small stocks, respectively.

We find that, for overall results from the mean LSV herding measures of large individual investors and institutional investors, the herding level of small stocks is higher than the herding level of large stocks. For example, for large individual investors, the average LSV herding measure for small stocks with at least five investors is 5.71 percent, higher than the average herding measure of 3.55 percent for large stocks. This pattern is also found in the herding of local and foreign institutions. However, we are cautious in interpreting results for small stocks since the sample size of local institutions as well as the sample size of foreign institutional investors become very small as we increase the trading hurdle.[16]

Overall, our evidence demonstrates that large individual investors display a greater

[16] This shows that local institutions and foreign investors disfavor small stocks in Taiwan and is consistent with the findings documented in Huang and Shiu (2009).

tendency of herding than local institutional investors but a lesser tendency than foreign investors. The private information hypothesis argues that herding is more likely to occur among the information-disadvantaged investors because these investors may obtain private information from the prior trades of better-informed investors and trade in the same direction. Based on the private information hypothesis, foreign investors have an information disadvantage relative to local institutional and large individual investors.

3.3 Large investors' herding and stock returns

We investigate the short-term relationship between herding and stock returns for three reasons. First, earlier studies (e.g., Lakonishok et al., 1992; Grinblatt, et al., 1995; Nofsinger and Sias, 1999; Wermers, 1999) use the changes of quarterly or annual holding data to examine the relationship between investors' herding and stock returns. The short-term lead-lag relationship between herding and stock returns is not detected by these studies. Second, Griffin, Harris, and Topaloglu (2003) document that U.S. institutions are momentum investors and individuals are contrarian investors. Similarly, Choe, Kho, and Stulz (1999) also find strong evidence of momentum investing by Korean and foreign institutional investors and contrarian investment by individual investors. However, Grinblatt and Keloharju (2000) report that Finnish individuals and institutions are contrarian traders while foreigners tend to be momentum traders. The inconclusive findings on investors' trading behavior may be attributable to the differences in the nature of institutional and individual trading activities across countries and markets. Third, Black (1986) and others assert that individual investors may trade on "noise". This view, however, has been challenged by recent studies. For example, Kaniel, Liu, Saar, and Titman (2012) and Kelley and Tetlock (2013) find that the order imbalance of individual investors can predict future returns or an earnings surprise, alluding that individual

investors posses valuable private information. We partition individuals into large individual and small retail investors and we expect that the return predictability of trades by large individual investors will be better than the trades by small retail investors.

We begin by creating herding portfolios. This procedure is conducted independently for herding of large individual investors, domestic institutional investors, and foreign investors. On each day, stocks traded by at least 10 investors are divided into two groups: buy-herding (those having a greater proportion of buyers than the average stock on that day) and sell-herding stocks. Quartile portfolios of buy-herding (sell-herding) stocks are formed by their LSV measures; Portfolio B1 (Portfolio S1) is the quartile of stocks having the highest buy-herding (sell-herding) measures, and Portfolio B4 (Portfolio S4) is the quartile of stocks with only a slightly greater than average proportion of buyers (sellers). We then calculate the daily abnormal return as the stock's raw return minus the market return. We also form equal-weighted portfolios and calculate the abnormal returns in the period from 20 days before to 20 days after the formation day (i.e., period [-20, 20], where day 0 denotes the portfolio formation day). We use the Newey and West (1987) correction in computing the standard error of abnormal returns due to the potential autocorrelation of the errors.

Table 3 illustrates the abnormal returns of the quartile buy-herding and sell-herding portfolios around the portfolio formation day for large individual investors, local institutional investors, and foreign investors. To compare our results with past literature, we first discuss the results for institutions. As shown in Panels B and C, the positive prior returns in the intense buy-herding portfolios and negative prior returns in the intense sell-herding portfolios suggest that both local institutional and foreign investors display a positive-feedback investment strategy. This finding is consistent with earlier literature on

mutual funds (e.g., Grinblatt et al., 1995; Wermer, 1999), institutional investors (Nofsinger and Sias, 1999), and foreign investors (Froot, O'Connell, and Seasholes, 2001; Richards, 2005).

Moreover, for both local institutional and foreign investors, we find a strong monotonic relationship between the contemporaneous abnormal return and the herding level. For example, the stocks in the intense buy-herding portfolio of local institutions (foreign investors) have average daily abnormal returns of 1.15 percent (0.73 percent) on the herding day, while stocks in the intense sell-herding portfolio have average abnormal returns of -0.69 percent (-0.69 percent). The difference in the abnormal return between the intense buy-herding and intense sell-herding portfolios is 1.84 percent (1.42 percent), which is economically and statistically significant. This demonstrates that institutional investors' herd can move equity prices.

<Table 3 is inserted here>

Given the finding of a positive relationship between the herding level and the contemporaneous abnormal return, we next address the issue about whether these institutional investors destabilize the stock market. If the herding of these institutional investors drives stock prices away from their fundamental value and destabilizes the market, we would observe subsequent price reversals in the post-herding period. Instead, either the continuity of the outperformance of the buy-herding stocks and the underperformance of the sell-herding stocks, or the lack of subsequent price reversals is consistent with the hypothesis that herding is attributable to information. Looking at Panels B and C of Table 3, we find that local institutional investors have slightly different post-herding abnormal returns than foreign investors. For local institutional investors, the intense buy-herding portfolio of stocks significantly outperforms the intense sell-herding

portfolio of stocks over the period [1, 20]. However, despite the abnormal returns for the intense sell-herding portfolio of stocks by foreign investors remaining negative over the 20-day period, the abnormal returns for the intense buy-herding portfolio of stocks reverse to become negative, beginning three days after the portfolio formation. This means that the outperformance of the intense buy-herding portfolio relative to the intense sell-herding portfolio is only significant on the first two days following the portfolio formation. In addition, the subsequent price reversal of stocks heavily bought by foreign investors indicates that foreign investors tend to slightly destabilize the emerging market when they herd in, which is consistent with the findings documented by Richards (2005).

We next turn to large individual investors. Empirical evidence on large individual investors differs from that on institutional investors in many respects. First, as shown in Panel A of Table 3, the prior returns of both intense buy-herding and intense sell-herding portfolios are significantly positive. Our result is not consistent with Kelley and Tetlock (2013), who documented a negative correlation between individual investors' order flow and past stock returns. The positive prior returns on stocks in the intense buy-herding portfolio suggest that large individual investors tend to chase stocks with good news, which is similar to institutional investors. On the other hand, two possible explanations are offered to interpret the positive prior returns on stocks in the intense sell-herding portfolio. One is the stock-picking ability that large individual investors have to detect over-valued stocks. The other is related to the disposition effects by large individual investors (Shefrin and Statman, 1985).

Second, although the positive relationship between the contemporaneous abnormal return and the herding level is also revealed in individual investors' herding portfolios, the returns do not become negative for the stocks in the intense sell-herding portfolio. As

shown, the stocks in the highest buy-herding portfolio significantly outperform the stocks in the highest sell-herding portfolio by 0.91 percent (with a standard error of 0.049 percent). In contrast to the negative returns in the intense sell-herding portfolios by local institutional and foreign investors, the non-negative return of stocks in the intense sell-herding portfolios by large individual investors is a manifestation that individual investors are more constrained by market regulations on short sales than institutional investors in Taiwan.[17]

Finally, we find significantly positive subsequent returns on stocks in the intense buy-herding portfolio and negative subsequent returns on stocks in the intense sell-herding portfolio. If we establish an investment strategy by buying stocks in the intense buy-herding portfolio and shorting stocks in the intense sell-herding portfolio, the outperformance of the long/short strategy persists over the 20-day period following the portfolio formation. The negative subsequent return on the intense sell-herding portfolio is more related to the view that large individual investors have value-relevant information rather than the disposition effect.

3.4 Buy-sell imbalance of small investors and abnormal stock returns

We use the buy-sell imbalance to proxy for the correlated trading by small retail investors, small local institutions, and small foreigners. To construct a series of daily buy-sell imbalances of small investors for a stock, we subtract the dollar volume sold in

[17] In the analyses of 46 equity markets for the effect of short sales restrictions on efficiency, Bris, Goetzmann, and Zhu (2007) classified Taiwan as a market in which short sales are allowed but not practiced. Their information about short sales regulations and practices was collected before December 2001. During our sample period, local institutional investors could borrow securities from other institutions and foreign investors could borrow securities offshore. As stated in an earlier section, the TWSE launched a centralized SBL system in June 2003. Its aim was to facilitate the efficiency of borrowing securities. In contrast, individual investors are not allowed to borrow securities. Individual investors who meet certain qualifications of age, trading experience, and financial integrity can apply for a margin account. The maximum amount of a short position in a margin account for an individual is NT$ 20 million.

each investor category from the dollar volume bought and divide it by the average daily dollar volume in the calendar year. Specifically, the buy-sell imbalance of stock *i* for each investor category *k* on day *t*, $IMB_{i,t}^{k}$, is calculated as:

$$IMB_{i,t}^{k} = \frac{Buy_{i,t}^{k} - Sell_{i,t}^{k}}{\overline{V}_i} \tag{5}$$

where $Buy_{i,t}^{k}$ ($Sell_{i,t}^{k}$) denotes the stock *i* dollar volume of buy (sell) trades by investors in group *k* on day *t* and $\overline{V}_i$ is the average dollar volume of stock *i* in the calendar year.

For each investor category, we form quartile buy portfolios and quartile sell portfolios of stocks based on their buy-sell imbalances. We also compute the daily mean abnormal returns over the period [-20, 20] for each portfolio. The abnormal stock returns of buy-sell imbalance portfolios by small investors are presented in Table 4.

<Table 4 is inserted here>

Panel A in Table 4 shows the abnormal returns for small retail investors. We first investigate the abnormal returns prior to the portfolio formation. Interestingly, the most negative prior returns are found on the portfolios of the stocks with light buy ratings (AR[-20, -6] = -2.19 percent; AR[-5, -1] = -0.98 percent) and the stocks with light sell ratings (AR[-20, -6] = -1.89 percent; AR[-5, -1] = -0.88 percent). In contrast, the past stock returns are strongly positive for the portfolios of the stocks with the most intense sell ratings (AR[-20, -1] = 3.07 percent) and the stocks with the most intense buy ratings (AR[-20, -6] = 1.00 percent). This is similar to the finding with large individual investors.

We next look at the abnormal returns on the portfolio formation day. The most striking result is that the abnormal return is reversely associated with the buy-sell imbalance of small retail investors. The portfolio of stocks heavily bought by small retail

investors underperforms the portfolio of stocks heavily sold by 2.70 percent, which is highly economically and statistically significant. Moreover, the negative relationship is monotonic, indicating that the results are not driven by the two extremities.

The negative abnormal return on the portfolio of stocks heavily bought by small retail investors persists over the period [1, 20]. The portfolio of stocks heavily sold, however, has a positive abnormal return on the first day following the portfolio formation but then has a slightly negative abnormal return. The long/short investment strategy yields significantly negative abnormal returns on day 1 and over the period [6, 20] following the portfolio formation. The negative association between the trades and contemporaneous and subsequent abnormal returns does not support the idea that aggregate small retail investors have value-relevant information.

In Panels B and C of Table 4, we also show the buy-sell imbalance and abnormal returns for portfolios sorted by small institutional investors and small foreigners. As compared to the local institutions and foreign institutional investors (shown in Panels B and C of Table 3), we find that the contemporaneous relationship between trades and returns as well as the relationship between trades and subsequent abnormal returns are episodic. Although small institutions are not the focus of this study, we will conduct further analyses to explore the role of these small institutions on stock pricing.

4. Robustness Tests

Our results of contemporaneous and subsequent positive (negative) abnormal returns associated with intense buy (sell) of large individual investors are consistent with the hypothesis that large individual investors have private information about the fundamental value of stocks. However, other potential hypotheses can also explain our results. We

conduct three different robustness tests, as explained below, to examine the validity of the competing hypotheses.

4.1 Controlling for firm characteristics and past returns

Our findings on the positive (negative) subsequent abnormal return associated with the buy-herding (sell-herding) portfolio of stocks could also be explained by a variation of firm characteristics (Daniel and Titman, 1997) or momentum effects (Jegadeesh and Titman, 1993; Grinblatt et al., 1995). In order to control for firm characteristics and past returns, we conduct daily Fama and MacBeth (1973) regressions of future abnormal returns on several independent variables.[18] The dependent variable of the regression is the future abnormal returns in two non-overlapping periods: AR[1, 5] and AR[6, 20]. The independent variables are as follows: seven herding-portfolio dummies (*Dummy_B1*, *Dummy_B2*, *Dummy_B3*, and *Dummy_B4* for respective stocks in buy-herding portfolios B1, B2, B3, and B4, and Portfolio B1 is the heavy buy-herding portfolio; *Dummy_S4*, *Dummy_S3*, and *Dummy_S2* for respective stocks in sell-herding portfolios S4, S3, and S2, and Portfolio S4 is the light sell-herding portfolio), the market capitalization of the stock (*Ln_cap*; the logarithm of the market cap), and the book-to-market ratio (*Book-to-market*). Table 5 presents the regression results for the three types of large investors.

<Table 5 is inserted here>

The first two regressions in Table 5 examine the future returns for large individual investors. All of the coefficients of the seven herding portfolio dummies are positive, and the coefficients of *Dummy_B1*, *Dummy_B2*, *Dummy_B3*, and *Dummy_S4* are

[18] We use the Newey and West (1987) method to correct for the autocorrelation in the time-series of the regression coefficients. If the number of observations in the daily cross-section regression is less than 30, we exclude it from our analysis.

significantly different from zero in both regressions (*Dummy_B4* is significant only in the AR[1, 5] regression), suggesting that the buy-herding portfolios and light sell-herding portfolios significantly outperform the intense sell-herding portfolios at horizons up to 20 days. The sum of the coefficients of *Dummy_B1* in the first and second regressions (i.e., the cumulative abnormal return in the period [1, 20]) is 106 basis points, which is economically and statistically significant. This states that, after controlling for firm characteristic variables, the investment strategy of buying stocks in the intense buy-herding portfolio by large individual investors and shorting stocks in the intense sell-herding portfolio can deliver an implied annual abnormal return of 13.29 percent.[19] The result suggests that the trades by large individual investors positively predict the stock's future returns.

The third and fourth regressions in Table 5 examine the future returns for local institutional investors. The economic magnitude and statistical significance of the coefficients of the herding portfolio dummies are higher than those for large individual investors and foreign investors, implying that the local institutional investors' long/short investment strategy can deliver the highest yield (annual abnormal return of 28.17 percent) among all types of investors. Finally, the fifth and sixth regressions show the regression results for foreign investors. The coefficients of the herding portfolio dummies are significantly positive only in the fifth regression. All of the dummy coefficients become negative in the sixth regression (only Dummy_S4 is significant), indicating that the positive predictability of foreign investors' trade is up to five days after herding.

In Tables 6 and 7, we perform additional tests on the association between investors'

[19] Multiply the sum, 1.06353 percent, by (250 / 20).

correlated trading and future abnormal returns. For the independent variables of the regressions in Table 6, we directly use the signed LSV herding measure (*LSV_HM*, which is positive for buy-herding and negative for sell-herding). In addition, we add synchronous and past abnormal return variables (*AR[0]*, *AR[-5, -1]*, and *AR[-20, -6]*) as the independent variables. By considering these three abnormal return variables in the regression, we are able to isolate the effect of investors' correlated trading on future returns while controlling for momentum and contrarian effects. The regression results are presented in Table 6.

<Table 6 is inserted here>

After controlling for past returns, in the regressions for the large individual investors and local institutional investors, both coefficients of *LSV_HM* are significantly positive, suggesting that their correlated trading can positively predict future abnormal returns. In the regression for foreign investors, both coefficients of *LSV_HM* are positive and the coefficient in the regression of *AR[1, 5]* is significant, which are different from the earlier results. This difference is probably attributable to the control of past returns.

We next turn to small investors. We repeat the analyses in Table 6 except we replace the LSV_HM with the buy-sell imbalance of small investors, *BS_imbalance*. The regression results are presented in Table 7.

<Table 7 is inserted here>

The first two regressions examine the future returns for small retail investors. As shown in Table 7, the coefficient of *BS_imbalance* is significantly negative in the regression of AR[1, 5] and is insignificantly positive in the regression of AR[6, 20]. This indicates that the correlated trading by small retail investors does not positively predict future returns. Surprisingly, in the regressions for small local institutions and small

foreigners, all of the coefficients of *BS_imbalance* are positive and most of them are statistically different from zero. The predictability of correlated trading by small institutional investors is similar to large institutional investors, and the regression results contrast the findings in the statistical analysis of daily abnormal returns, which are shown in Table 4.

4.2 Trade aggressiveness

In our second robust test, we examine the trade aggressiveness when a group of investors trade the same stocks on the same side during a short-term period. In a related study, Kelley and Tetlock (2013) asserted that the market orders of individual investors have information content regarding the firms' cash flows, while the aggregated limit orders do not. Therefore, if large individual investors are informed, their orders would be more aggressive than other groups of investors when they herd.

Since market orders are not permitted in Taiwan, we do not directly classify all trades into market or limit orders. We follow Barber, Lee, Liu, and Odean's (2009) approach to categorize trades as aggressive or passive. An aggressive trade is defined as a purchase (selling) price of a limit order that is equal to or higher (lower) than the best asked (bid) price. Using this algorithm, we successfully classify 94.8 percent of all trades as passive or aggressive. In our sample from 2001 to 2006, large individual investors are the most aggressive group of traders (71.8 percent of the trades come from aggressive orders), while local institutions are the most passive group (62.5 percent of the trades are aggressive). Moreover, foreign investors show more aggressiveness than small retail investors (69.0 percent versus 64.3 percent of the trades are aggressive).

Having identified the aggressiveness of trades, we turn to investigate the relationship between the aggressiveness of trades and buy-sell imbalances. We look at the relationship

in the intense buying and selling portfolios. Table 8 presents the empirical results. We are particularly interested in comparing the aggressiveness of trades in the portfolios of stocks intensively bought or sold by large individual investors with the aggressiveness of stocks bought or sold by small retail investors.

The first two rows of Table 8 show the buy-sell imbalances and trade aggressiveness for stocks of the intense buy-herding and sell-herding portfolios. Not surprisingly, the aggregated large individual investors have 7.32 percent (7.15 percent) more dollar volume on the buy (sell) side than the sell (buy) side in the highest buy-herding (sell-herding) portfolio. The counterparts of large individual investors' are foreign investors and local institutions. Interestingly, the aggregated trades by small retail investors are in the same direction with the trades by large individual investors (the buy-sell imbalance is 4.99 percent on the buy-herding portfolio and is -5.72 percent on the sell-herding portfolio).

<Table 8 is inserted here>

Looking at the "Aggressive trades" column in Table 8, we find that when large individual investors herd, they tend to trade more aggressively than their counterparts. For example, in the intense buy-herding portfolio of large individual investors, 71.2 percent of the total buy trades by large individual investors are aggressive. This proportion is higher than their counterparts (60.8 percent of the buy trades by small retail investors, 69.9 percent of the sell trades by foreign investors, and 61.0 percent of the sell trades by local institutions are aggressive). The intense sell-herding portfolio also displays similar patterns. The analyses on the buy-sell imbalance and trade aggressiveness suggest that large individual investors are more likely to aggressively trade with their counterparts, rather than passively place orders picked off by them.

In contrast, small retail investors are more inclined to passively trade with their counterparts, no matter the portfolio of stocks that they heavily buy or sell. As the last two rows of Table 8 show, the trade counterparts of the small retail investors include foreign investors (-7.5 percent of the sell imbalance by foreign investors is on the intense buy portfolio of small retail investors, and 9.6 percent of the buy imbalance is on the intense buy portfolio), local institutions (-7.0 percent and 5.8 percent, respectively), and large individual investors (-4.3 percent and 4.0 percent, respectively). More importantly, we find that the trades by small retail investors are less aggressive than the trades by their counterparts. For a heavy buying portfolio of stocks, the percentage of aggressive buy trades to total trades by small retail investors is 60.3 percent, lower than the 71.4 percent of sell trades by foreign investors, 68.1 percent of sell trades by local institutions, and 73.9 percent of sell trades by large and aggressive individual investors. For a heavy selling portfolio of stocks, the percentage of aggressive sell trades by small retail investors is also lower than the other three types of investors. The evidence suggests that the correlated trade by small retail investors is merely a manifestation of providing liquidity to the other types of investors, as in the findings discussed by Kaniel et al. (2008). In other words, the other types of investors tend to pick off the trades by small retail investors.

Overall, the more aggressive trades by large individual investors in our study are consistent with retail market orders, while passive trades by small retail investors are consistent with the retail limit orders, as documented by Kelley and Tetlock (2013).

4.3 Investors trading before earnings announcements

If large individual investors have private information, we would observe that large individual investors tend to buy more shares before relevant information is disclosed.

Since earnings are unknown to the public until they are disclosed, we use the earnings announcement day as an information-event day. We collect information regarding the announcement day for semi-annual and annual earnings. There are 6,904 events in our sample period. In the third robustness check, we investigate the buy-sell imbalance of investors before the earnings announcement day.

Ideally, since financial analysts immediately revise their earnings forecasts if they have updated information, we should measure the earnings surprise using the difference between the actual earnings and the earnings forecast. However, the sell-side financial analysts' earnings forecasts derive from the TEJ Finance database and, unfortunately, only annual earnings forecasts are available. To overcome the problem, we calculate the stock's cumulative abnormal returns from the earnings announcement day to 20 days after the announcement (i.e., AR[0, 20], where day 0 is the earnings announcement day) and use AR[0, 20] as a proxy for the earnings surprise.[20] For each semi-annual and annual earnings, we divide all of the stocks into eight portfolios according to their AR[0, 20]. We then calculate the buy-sell imbalance of investors over the period [-10, -1] for the stocks in the eight portfolios. Table 9 presents the mean buy-sell imbalance of investors of four groups in these eight portfolios.[21]

[20] The rationale is that the cumulative abnormal returns are expected to be higher if firms have a higher earnings surprise.

[21] To justify the validity of AR[0, 20] as a proxy for earnings surprise, we calculate the annual earnings surprise using the difference between the actual earnings and the earnings forecast. We collect the sell-side financial analysts' earnings forecasts from the TEJ Finance database and this yields a sample of 2,623 observations. We define the normalized earnings surprise as actual annual earnings before interest and taxes (EBIT) minus the EBIT forecast and divided by the total assets (book value). The EBIT forecast is the median of the analysts' forecasts made two months prior to the earnings announcement. We then calculate the industry-adjusted normalized earnings surprise by subtracting the median normalized earnings surprise of all firms that are in the same industry from the normalized earnings surprise of the firm. For Portfolios 1 to 8 in Table 9 ranked by AR[0, 20], the respective median industry-adjusted normalized earnings surprise is 0.37 percent, 0.33 percent, 0.04 percent, 0.02 percent, 0 percent, -0.04 percent, -0.55 percent, and -0.78 percent. Stocks with higher AR[0, 20] have more earnings surprise, suggesting that AR[0, 20] is a valid proxy for earnings surprise.

<Table 9 is inserted here>

As shown in Table 9, Portfolio 1 (Portfolio 8) is composed of the stocks with the highest (poorest) cumulative abnormal returns following the earnings announcements. Obviously, large individual investors and local institutional investors stand on the buy (sell) side before the good (or bad) news is released, while small retail investors are on the opposite side. The difference of the buy-sell imbalance between Portfolio 1 and Portfolio 8 is significantly positive for large individual investors (5.11 percent, t-statistic = 1.93) and local institutional investors (8.52 percent, t-statistic = 1.67). However, the difference is significantly negative for small retail investors (-20.16 percent, t-statistic = -2.21), indicating that small retail investors tend to buy shares immediately before bad news and sell shares before an earnings surprise. An interesting finding is that foreign investors tend to buy shares in the 10-day period prior to the earnings announcement day.

The finding on large individual and small retail investors' buy-sell imbalance before the earnings announcement is consistent with the view that large individual investors possess value-relevant information, while small retail investors are uninformed and naïve traders. At least our results show that the aggregate trading by large individual investors (small retail investors) can positively (reversely) predict future earnings surprise.

5. Conclusion

In this paper, we examine the correlated trading of investors in the Taiwan stock market. Using a unique database, we divide all investors into six groups: large individual investors, local institutional investors, foreign institutional investors, small retail investors, small local institutions, and small foreigners.

In the empirical analyses, we show that not only can institutional investors herd, but

individual investors can also herd. The correlated trading of large individual investors can move stock prices. Equity prices tend to go up if large individual investors herd-in and tend to go down if they herd-out. The correlated trading of large individual investors can also positively predict future abnormal returns. We conduct additional robustness tests. We find that large individual investors trade more aggressively when they herd, indicating that the herding is not caused by the "pick-off" effect. Furthermore, we find that large individual investors stand on the buy side if the earnings announcement is good news and on the sell side if the earnings announcement is bad news. Overall, the trading behavior of large individual investors is very similar to the behavior of local institutions. The outperformance and predictability of future returns indicate that large individual investors are informed traders or skillful investors. At least the aggregated trades by large individual investors are informative.

The empirical analyses on small retail investors, however, are complete opposites. The correlated trades by small retail investors are negatively related to concurrent abnormal stock returns. Their trades cannot predict future returns. Moreover, we find that small retail investors are more passive than the other types of investors when small retail investors herd. In contrast to large individual investors, small retail investors tend to sell shares prior to the release of good news and buy shares prior to bad news. This evidence is consistent with the view that small retail investors are naïve and uninformed traders. Their correlated trades are picked off by their counterparts. That is, small retail investors provide immediacy to the other types of investors without being compensated.

Current literature debates about the informational role of individual investors on stock pricing. Our different findings on large individual investors and small retail investors can provide more insight to this line of research and reconcile the contradicting

findings in the literature. Moreover, the findings of this study highlight the need for the classification of individual investors according to their investment amount when examining the informational role of individual investors.

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Table 1

Summary Statistics

This table presents the descriptive statistics for the transaction data and the firm characteristics of the stocks traded on the TWSE in the sample period between January 1, 2001 and December 31, 2006. Panel A provides the summary statistics of the TWSE. *Total market capitalization* and the *ownership* by various classes of investors are measured using the data at the end of the preceding year. Panel B provides the summary statistics of the firm characteristics. *Assets (book value)*, *market capitalization*, and *book-to-market* value are measured at the end of the preceding year. The variables *return*, *return volatility*, *turnover*, *trading volume*, and *trading dollar volume* are measured weekly throughout our sample period. We calculate the time-series average of firm characteristic variables for every sample firm and provide the cross-sectional summary statistics. Panels C and D provide the summary statistics for large investors and small investors, respectively. Large investors are defined as traders with an annual trading value of NT$ 1 billion or more. All investors are classified into three large investor groups ("large individual investor," "local institutional investor," and "foreign institutional investor") and three small investor groups ("small retail investor," "small local institutions," and "small foreigners").

Panel A: Summary Statistics for the TWSE

	2001	2002	2003	2004	2005	2006
Total number of listed firms	584	638	669	697	691	688
Total market capitalization (NT$ billion)	10,248	9,094	12,869	13,989	15,634	19,377
Market return (%)	17.14	-19.79	32.30	4.23	6.66	19.48
Turnover (%)	149.82	197.40	196.76	196.46	123.60	133.58
Ownership (%)						
State	7.62	6.73	6.23	5.02	4.73	3.86
Domestic institutions	31.13	30.51	30.90	30.07	30.58	29.70
Foreign institutions	8.15	10.81	10.52	15.41	17.36	22.19
Domestic individuals	51.96	50.70	50.17	48.01	45.94	42.78
Foreign individuals	0.67	0.52	0.70	0.38	0.64	0.60
Buy-back	0.47	0.73	1.48	1.11	0.75	0.87
Number of individual investors	2,379,515	2,718,392	2,591,187	2,985,918	2,472,863	2,743,267
Domestic	2,378,702	2,717,393	2,590,068	2,984,366	2,471,221	2,741,214
Foreign	813	999	1,119	1,552	1,642	2,053
Number of institutional investors	10,364	10,422	10,905	11,825	11,581	12,390
Domestic	7,999	7,765	8,049	8,851	8,254	8,641
Foreign	2,365	2,657	2,856	2,974	3,327	3,749
Ratio of trading dollar volume to total market (%)						
Individual investors	83.03	80.90	76.20	74.08	66.13	67.75
- Domestic individuals	83.02	80.89	76.19	74.06	66.11	67.72
- Foreign individuals	0.01	0.01	0.01	0.02	0.02	0.03
Institutional investors	16.97	19.09	23.8	25.93	33.87	32.25
- Domestic institutions	9.94	11.39	13.01	13.36	15.89	13.76
- Foreign institutions	7.03	7.70	10.79	12.57	17.98	18.49

Table 1 (Cont'd.)

Panel B: Summary Statistics of Firm Characteristics

	Mean	Median	Std. Dev.	Max.	Min.
Market capitalization (NT$ billion)	19.43	4.02	65.88	1,229.65	0.09
Assets (book value) (NT$ billion)	54.29	5.67	207.06	2,424.26	0.55
Price (NT$)	25.64	16.72	32.71	339.90	0.19
Book-to-market	1.23	1.00	1.09	11.11	0.08
Weekly return (%)	0.36	0.40	0.97	17.81	-8.18
Weekly return volatility (%)	6.86	6.39	2.60	24.95	1.50
Weekly turnover (%)	4.40	3.63	3.15	16.77	0.03
Weekly dollar volume (NT$ million)	629.79	202.75	1,272.16	13,223.61	0.08

Panel C: Summary Statistics for Large Individual and Institutional Investors

	2001	2002	2003	2004	2005	2006
Number of large individuals	2,933	3,440	3,005	3,238	2,236	2,998
Number of institutions	867	1,008	1,087	1,306	1,427	1,561
Local	465	519	533	617	599	594
Foreign	402	489	554	689	828	967
Ratio of trading dollar volume to total market (%)						
Large individual investors	17.67	18.27	17.12	15.56	13.17	14.55
Institutional investors	14.81	17.04	21.37	23.61	31.1	29.75
- Local	8.78	10.27	11.76	12.08	14.50	12.59
- Foreign	6.03	6.77	9.61	11.53	16.60	17.16
Daily mean number of stocks traded per investor						
Large individual investors	4.883	5.246	5.362	5.107	5.212	5.321
Local institutional investors	4.970	5.737	6.611	6.803	7.522	8.070
Foreign institutional investors	5.389	5.797	6.080	6.461	6.057	6.387
Daily mean dollar volume per investor (NT$ million)						
Large individual investors	13.37	13.18	12.81	13.17	11.95	12.41
Local institutional investors	44.20	52.68	54.62	62.68	58.99	65.40
Foreign institutional investors	65.60	72.00	79.24	87.31	79.77	91.63

Table 1 (Cont'd.)

Panel D: Summary Statistics for Small Retail and Institutional Investors

	2001	2002	2003	2004	2005	2006
Number of small investors						
Retail investors	2,375,769	2,713,953	2,587,063	2,981,128	2,468,985	2,738,216
Foreign individuals	813	999	1,119	1,552	1,642	2,053
Small local institutions	7,534	7,246	7,516	8,234	7,655	8,052
Small foreign institutions	1,963	2,168	2,302	2,285	2,499	2,777
Ratio of trading dollar volume to total market (%)						
Retail investors	65.35	62.63	59.07	58.50	52.94	53.17
Foreign individuals	0.01	0.01	0.01	0.02	0.02	0.03
Small local institutions	1.16	1.12	1.25	1.27	1.39	1.17
Small foreign institutions	1.00	0.94	1.17	1.04	1.38	1.34
Daily mean number of stocks traded per investor						
Retail investors	1.92	1.92	1.94	1.90	1.83	1.84
Foreign individuals	1.45	1.45	1.53	1.54	1.43	1.48
Small local institutions	1.69	1.75	1.77	1.79	1.71	1.82
Small foreign institutions	1.94	1.93	2.01	1.92	1.82	1.87
Daily mean dollar volume per investor (NT$ million)						
Retail investors	0.44	0.42	0.40	0.42	0.41	0.44
Foreign individuals	0.46	0.46	0.44	0.47	0.51	0.57
Small local institutions	2.79	2.94	2.86	3.20	3.02	3.05
Small foreign institutions	8.46	8.97	9.29	9.46	8.74	9.94

Table 2

Herding by Large Investors: LSV (1992) Measure

This table presents the means and the test statistics of the LSV (1992) herding measures. The sample covers the trading of institutional and large individual investors in the period from January 2001 to December 2006. Institutional and individual investors with an annual trading value of NT$ 1 billion or more are included in our sample. The LSV herding measure, $HM_{i,t}$, for any given stock-day equals $\left|p_{i,t}-\overline{p}_{i,t}\right|-E\left|p_{i,t}-\overline{p}_{i,t}\right|$, where $p_{i,t}$ is the proportion of the specific investors trading stock i during day t who are buyers, $\overline{p}_{i,t}$ is the average of $p_{i,t}$ for all stocks during day t, and $E\left|p_{i,t}-\overline{p}_{i,t}\right|$ is the adjustment factor. We calculate the LSV herding measures separately for institutional investors (local and foreign investors) and large individual investors. Panel A presents the values of $\overline{HM}$, which is $HM_{i,t}$ averaged across all stock-days traded by at least 5, 10, or 20 specific investors on any given day. Panels B and C, respectively, present the values of $\overline{HM}$ for large and small stocks, where stocks are equally divided into large and small stocks based on their market capitalization at the beginning of each week. The t-statistics are shown in the parentheses below the mean herding measures, and the number of herding measures is shown in the brackets.

Investor Type		Number of Investors Trading		
		N≧5	N≧10	N≧20
Panel A: All Stocks				
Large individual investors	Mean	4.635	5.237	5.680
	(t-stat.)	(280.01)	(280.28)	(244.97)
	[N]	[308,571]	[193,256]	[102,482]
Institutional investors	Mean	4.085	4.669	5.267
	(t-stat.)	(170.17)	(153.24)	(106.73)
	[N]	[174,636]	[89,735]	[28,756]
Local institutions	Mean	4.161	4.779	4.622
	(t-stat.)	(128.40)	(101.54)	(50.34)
	[N]	[110,110]	[41,414]	[8,089]
Foreign institutions	Mean	5.144	6.220	6.861
	(t-stat.)	(121.46)	(98.34)	(52.46)
	[N]	[79,791]	[30,626]	[5,496]

Table 2 (Cont'd.)

Investor Type		Number of Investors Trading		
		N≧5	N≧10	N≧20
Panel B: Large Stocks				
Large individual investors	Mean	3.554	3.953	4.304
	(t-stat.)	(198.66)	(203.83)	(185.08)
	[N]	[219,062]	[149,826]	[86,355]
Institutional investors	Mean	2.671	3.283	3.967
	(t-stat.)	(121.13)	(121.10)	(91.65)
	[N]	[162,204]	[86,844]	[28,201]
Local institutions	Mean	2.431	3.346	4.466
	(t-stat.)	(82.39)	(79.90)	(51.68)
	[N]	[101,696]	[39,881]	[7,853]
Foreign institutions	Mean	4.304	5.688	6.785
	(t-stat.)	(107.01)	(94.71)	(53.41)
	[N]	[77,701]	[30,127]	[5,448]
Panel C: Small Stocks				
Large individual investors	Mean	5.708	6.727	7.317
	(t-stat.)	(153.68)	(139.24)	(98.72)
	[N]	[81,082]	[38,601]	[13,768]
Institutional investors	Mean	3.583	4.273	NA
	(t-stat.)	(26.78)	(11.86)	-
	[N]	[7,039]	[694]	-
Local institutions	Mean	4.032	3.648	NA
	(t-stat.)	(24.58)	(9.07)	-
	[N]	[5,039]	[507]	-
Foreign institutions	Mean	NA	NA	NA
	(t-stat.)	-	-	-
	[N]	-	-	-

Table 3

Herding and Abnormal Stock Returns: Large Investors

This table presents the abnormal returns for the portfolios of stocks sorted by the LSV herding measure of large individual investors (in Panel A), local institutional investors (in Panel B), and foreign institutional investors (in Panel C). The sample covers all trade records in the TWSE during the period from January 2001 - December 2006. Institutions and individual investors with an annual trading value of NT$ 1 billion or more are included in our analyses. On each day, stocks traded by at least 10 specific investors are divided into two groups: buy-herding (those having a greater proportion of buyers than the average stock on that day) and sell-herding stocks. Quartile portfolios of buy-herding (sell-herding) stocks are formed by their LSV measures; Portfolio B1 (Portfolio S1) is the quartile of stocks having the highest buy-herding (sell-herding) measures, and Portfolio B4 (Portfolio S4) is the quartile of stocks with only a slightly greater than average proportion of buyers (sellers). The abnormal return is calculated as the stock's raw return minus the market return. We form equal-weighted portfolios and calculate the daily abnormal returns in the period [-20, 20], where day 0 denotes the portfolio formation day. AR[*x*] is the abnormal return on day x and AR[*x*, *y*] is the cumulative abnormal return measured from day *x* through day *y*. The time-series average abnormal returns for each portfolio and the differences in the abnormal returns between Portfolio B1 and Portfolio S1 with Newey and West (1987) standard errors (in the parentheses) are shown. The statistics of the mean difference test with *p*-values of 0.10 or less are highlighted in bold-faced type.

Panel A: Equal-Weighted Abnormal Returns (in percent) of Herding Portfolios: Sorted by Large Individual Investors

	AR[-20, -6]	AR[-5, -1]	AR[0]	AR[1]	AR[2]	AR[3]	AR[4]	AR[5]	AR[6, 20]
Portfolio B1 (High BHM)	1.279	0.289	1.089	0.236	0.038	0.033	0.012	0.000	-0.420
Portfolio B2	1.614	0.854	0.520	0.068	-0.028	-0.020	-0.013	-0.008	-0.668
Portfolio B3	1.448	0.803	0.308	-0.038	-0.044	-0.032	-0.044	-0.015	-0.696
Portfolio B4 (Low BHM)	0.464	0.241	0.023	-0.043	-0.055	-0.008	-0.036	-0.013	-0.643
Portfolio S4 (Low SHM)	0.591	0.338	0.046	-0.023	-0.064	-0.046	-0.023	-0.056	-0.549
Portfolio S3	1.356	1.006	0.299	-0.074	-0.051	-0.060	-0.064	-0.054	-0.816
Portfolio S2	1.362	1.325	0.343	-0.089	-0.075	-0.078	-0.066	-0.056	-0.849
Portfolio S1 (High SHM)	0.877	1.540	0.178	-0.128	-0.101	-0.091	-0.095	-0.083	-0.875
B1 minus S1	**0.403**	**-1.251**	**0.910**	**0.364**	**0.139**	**0.124**	**0.107**	**0.083**	**0.456**
(s.e.)	(0.115)	(0.074)	(0.049)	(0.028)	(0.027)	(0.027)	(0.027)	(0.025)	(0.098)
(B1 to B4) minus (S1 to S4)	**0.155**	**-0.507**	**0.268**	**0.134**	**0.051**	**0.062**	**0.042**	**0.053**	**0.166**
(s.e.)	(0.052)	(0.032)	(0.018)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.047)

Table 3 (Cont'd.)

Panel B: Equal-Weighted Abnormal Returns (in percent) of Herding Portfolios: Sorted by Local Institutional Investors

	AR[-20, -6]	AR[-5, -1]	AR[0]	AR[1]	AR[2]	AR[3]	AR[4]	AR[5]	AR[6, 20]
Portfolio B1 (High BHM)	2.037	2.347	1.148	0.382	0.131	0.060	0.008	0.009	-0.103
Portfolio B2	1.595	1.596	0.713	0.206	0.083	0.003	-0.018	0.001	-0.255
Portfolio B3	1.472	1.130	0.462	0.091	0.012	0.011	-0.023	-0.038	-0.613
Portfolio B4 (Low BHM)	1.275	0.692	0.208	0.031	0.010	-0.012	-0.063	-0.034	-0.631
Portfolio S4 (Low SHM)	0.942	0.345	0.047	-0.059	-0.050	-0.037	-0.052	-0.026	-0.687
Portfolio S3	1.029	0.021	-0.076	-0.149	-0.075	-0.052	-0.037	-0.038	-0.802
Portfolio S2	0.792	-0.577	-0.379	-0.235	-0.104	-0.058	-0.063	-0.025	-0.990
Portfolio S1 (High SHM)	0.554	-1.206	-0.691	-0.350	-0.152	-0.078	-0.088	-0.076	-1.228
B1 minus S1	**1.483**	**3.553**	**1.838**	**0.732**	**0.283**	**0.138**	**0.097**	**0.085**	**1.125**
(s.e.)	(0.175)	(0.105)	(0.047)	(0.042)	(0.039)	(0.039)	(0.039)	(0.037)	(0.140)
(B1 to B4) minus (S1 to S4)	**0.765**	**1.795**	**0.907**	**0.376**	**0.155**	**0.072**	**0.036**	0.026	**0.526**
(s.e.)	(0.073)	(0.043)	(0.019)	(0.017)	(0.017)	(0.017)	(0.017)	(0.016)	(0.063)

Panel C: Equal-Weighted Abnormal Returns (in percent) of Herding Portfolios: Sorted by Foreign Institutional Investors

	AR[-20, -6]	AR[-5, -1]	AR[0]	AR[1]	AR[2]	AR[3]	AR[4]	AR[5]	AR[6, 20]
Portfolio B1 (High BHM)	-0.242	1.081	0.726	0.279	0.030	-0.049	-0.051	-0.048	-0.771
Portfolio B2	-0.054	0.403	0.356	0.132	-0.006	-0.112	-0.021	-0.115	-0.787
Portfolio B3	-0.283	0.171	0.192	-0.038	-0.055	-0.023	-0.060	-0.029	-0.887
Portfolio B4 (Low BHM)	-0.650	-0.092	0.022	-0.043	-0.067	-0.025	0.003	0.000	-0.834
Portfolio S4 (Low SHM)	-0.697	-0.240	-0.043	-0.073	-0.049	-0.073	-0.083	-0.086	-0.968
Portfolio S3	-0.570	-0.351	-0.213	-0.142	-0.013	-0.034	-0.061	-0.059	-0.893
Portfolio S2	-0.814	-0.623	-0.390	-0.188	-0.008	-0.046	-0.077	-0.019	-0.877
Portfolio S1 (High SHM)	-0.836	-1.331	-0.694	-0.346	-0.095	-0.055	-0.063	-0.035	-0.568
B1 minus S1	**0.576**	**2.414**	**1.423**	**0.625**	**0.124**	0.005	0.013	-0.014	-0.218
(s.e.)	(0.166)	(0.107)	(0.049)	(0.046)	(0.045)	(0.044)	(0.044)	(0.043)	(0.163)
(B1 to B4) minus (S1 to S4)	**0.428**	**1.052**	**0.673**	**0.276**	0.018	0.000	0.038	0.001	0.006
(s.e.)	(0.087)	(0.056)	(0.026)	(0.025)	(0.025)	(0.024)	(0.025)	(0.024)	(0.083)

Table 4

Buy-Sell Imbalance and Abnormal Stock Returns: Small Investors

The following table presents abnormal returns for the portfolios of buy-sell imbalance using different types of small investors: small retail investors (in Panel A), small local institutions (in Panel B), and small foreigners (in Panel C). Day 0 is the portfolio formation day. Individuals and institutions are classified as small investors if the annual trading dollar volume is less than NT$ 1 billion. The daily buy-sell imbalance of a stock is defined as the buy dollar volume minus the sell dollar volume in a particular investor category in the stock and scaled by the stock's average daily dollar volume in the year. In Panel A, all stocks are divided into two groups on each day: net buy (those that have a larger total buy dollar volume by small retail investors than total sell dollar volume) and net sell stocks. Quartile portfolios of net buy (net sell) stocks are formed by their buy-sell imbalance ranking; Portfolio B1 (Portfolio S1) is the quartile of stocks having the highest buy imbalance (sell imbalance), and Portfolio B4 (Portfolio S4) is the quartile of stocks with only a slightly buy imbalance (sell imbalance). In Panels B and C, procedures are conducted for small institutional investors and small foreigners, respectively. The abnormal return is calculated as the stock's raw return minus the market return. We form equal-weighted portfolios and calculate the daily abnormal returns in the period [-20, 20], where day 0 denotes the portfolio formation day. AR[*x*] is the abnormal return on day x and AR[*x*, *y*] is the cumulative abnormal return measured from day *x* through day *y*. The time-series average abnormal returns for each portfolio and the differences in the abnormal returns between Portfolio B1 and Portfolio S1 with Newey and West (1987) standard errors (in the parentheses) are shown. The statistics of the mean difference test with *p*-values of 0.10 or less are highlighted in bold-faced type.

Panel A: Equal-Weighted Abnormal Returns (in percent) of Portfolios: Sorted by Buy-Sell Imbalance of Small Retail Investors

B-S Imbalance Portfolio	AR[-20, -6]	AR[-5, -1]	AR[0]	AR[1]	AR[2]	AR[3]	AR[4]	AR[5]	AR[6, 20]
Portfolio B1 (Intense buy)	0.997	-0.006	-0.981	-0.315	-0.037	-0.018	-0.040	-0.037	-1.024
Portfolio B2	-0.421	-0.306	-0.555	-0.177	-0.062	-0.038	-0.030	-0.033	-0.716
Portfolio B3	-1.192	-0.572	-0.390	-0.101	-0.045	-0.039	-0.032	-0.033	-0.597
Portfolio B4	-2.193	-0.980	-0.302	-0.073	-0.030	-0.038	-0.028	-0.029	-0.358
Portfolio S4	-1.890	-0.880	-0.212	-0.029	-0.024	-0.035	-0.044	-0.028	-0.458
Portfolio S3	-0.905	-0.375	0.072	0.039	-0.009	-0.027	-0.022	-0.042	-0.585
Portfolio S2	0.040	0.341	0.554	0.102	-0.019	-0.035	-0.035	-0.056	-0.678
Portfolio S1 (Intense sell)	1.434	1.631	1.712	0.280	-0.071	-0.074	-0.080	-0.068	-0.760
B1 minus S1	**-0.437**	**-1.638**	**-2.693**	**-0.595**	**0.034**	**0.056**	**0.041**	**0.031**	**-0.265**
(s.e.)	(0.068)	(0.041)	(0.021)	(0.018)	(0.017)	(0.017)	(0.016)	(0.015)	(0.059)
(B1 to B4) minus (S1 to S4)	**-0.372**	**-0.645**	**-1.089**	**-0.265**	-0.013	0.010	0.013	0.015	-0.054
(s.e.)	(0.061)	(0.033)	(0.014)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.058)

Table 4 (Cont'd.)

Panel B: Equal-Weighted Abnormal Returns (in percent) of Portfolios: Sorted by Buy-Sell Imbalance of Small Local Institutions

	AR[-20, -6]	AR[-5, -1]	AR[0]	AR[1]	AR[2]	AR[3]	AR[4]	AR[5]	AR[6, 20]
Portfolio B1 (Intense buy)	0.577	0.408	-0.072	0.006	0.008	-0.004	-0.022	-0.026	-0.565
Portfolio B2	-0.237	-0.092	-0.264	-0.027	0.001	-0.014	-0.019	-0.032	-0.687
Portfolio B3	-0.556	-0.314	-0.330	-0.059	-0.003	-0.019	-0.033	-0.037	-0.563
Portfolio B4	-1.089	-0.579	-0.381	-0.083	-0.060	-0.037	-0.044	-0.045	-0.727
Portfolio S4	-1.467	-0.507	0.011	-0.032	-0.033	-0.026	-0.042	-0.052	-0.657
Portfolio S3	-0.513	-0.039	0.206	-0.050	-0.058	-0.069	-0.049	-0.051	-0.738
Portfolio S2	0.529	0.465	0.393	-0.059	-0.087	-0.062	-0.048	-0.062	-0.793
Portfolio S1 (Intense sell)	1.986	1.441	0.811	-0.003	-0.095	-0.079	-0.077	-0.065	-0.975
B1 minus S1	**-1.409**	**-1.033**	**-0.882**	0.009	**0.102**	**0.076**	**0.055**	**0.040**	**0.410**
(s.e.)	(0.077)	(0.043)	(0.020)	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.062)
(B1 to B4) minus (S1 to S4)	**-0.460**	**-0.484**	**-0.617**	-0.005	**0.054**	**0.041**	**0.025**	**0.023**	**0.155**
(s.e.)	(0.052)	(0.029)	(0.012)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.047)

Panel C: Equal-Weighted Abnormal Returns (in percent) of Portfolios: Sorted by Buy-Sell Imbalance of Small Foreigners

	AR[-20, -6]	AR[-5, -1]	AR[0]	AR[1]	AR[2]	AR[3]	AR[4]	AR[5]	AR[6, 20]
Portfolio B1 (Intense buy)	0.510	0.945	0.589	0.168	-0.047	-0.039	-0.040	-0.054	-0.610
Portfolio B2	0.230	0.600	0.250	0.056	-0.034	-0.060	-0.047	-0.054	-0.660
Portfolio B3	0.301	0.404	-0.002	-0.038	-0.023	-0.048	-0.052	-0.058	-1.000
Portfolio B4	0.016	0.311	-0.228	-0.141	-0.087	-0.087	-0.082	-0.045	-1.146
Portfolio S4	-0.075	0.122	0.219	-0.024	-0.038	-0.040	-0.028	-0.064	-0.985
Portfolio S3	0.136	0.216	0.123	-0.064	-0.061	-0.060	-0.057	-0.036	-1.000
Portfolio S2	-0.031	-0.119	-0.120	-0.132	-0.088	-0.075	-0.041	-0.037	-0.907
Portfolio S1 (Intense sell)	0.558	-0.347	-0.386	-0.181	-0.028	-0.026	-0.039	-0.025	-0.700
B1 minus S1	-0.048	**1.292**	**0.976**	**0.349**	-0.019	-0.014	-0.001	-0.029	0.090
(s.e.)	(0.102)	(0.063)	(0.027)	(0.024)	(0.024)	(0.024)	(0.024)	(0.023)	(0.091)
(B1 to B4) minus (S1 to S4)	**0.117**	**0.597**	**0.193**	**0.112**	0.006	-0.008	-0.014	-0.012	0.044
(s.e.)	(0.065)	(0.036)	(0.014)	(0.014)	(0.013)	(0.014)	(0.014)	(0.014)	(0.058)

Table 5
Regression Analysis of Future Returns on Herding Portfolios: Large Investors

This table presents the results from daily Fama and MacBeth (1973) regressions of future returns on the herding portfolios and firm characteristic variables. Institutions and individual investors with an annual trading value of NT$ 1 billion or more are included in our sample. On each day, stocks traded by at least 10 specific investors are included in the regression analysis. The dependent variable is the cumulative abnormal return over the periods [1, 5] and [6, 20], where day 0 denotes the portfolio formation day. Abnormal returns are computed by subtracting the value-weighted return of all firms in the TWSE from the return of the corresponding firm. *Dummy_B1*, *Dummy_B2*, *Dummy_B3*, *Dummy_B4*, *Dummy_S4*, *Dummy_S3*, and *Dummy_S2* are indicator variables that are equal to 1 if the stocks are assigned to portfolios B1, B2, B3, B4, S4, S3, and S2 on day 0, respectively. The portfolios are defined in Table 3. *Ln_cap* is the logarithm of the market value of shares outstanding, which is measured on day 0. *Book-to-market* is the book-to-market value, where the market value is measured on day 0 and the book value is measured at the end of the preceding year. Average coefficients and Newey and West (1987) standard errors (in the parentheses) are shown. Statistics with *p*-values of 0.10 or less are highlighted in bold-faced type.

	Large Individuals		Local Institutions		Foreign Institutions	
	AR[1, 5]	AR[6, 20]	AR[1, 5]	AR[6, 20]	AR[1, 5]	AR[6, 20]
Intercept	0.538	1.210	0.119	0.579	-0.614	-0.252
	(0.514)	(1.412)	(0.573)	(1.569)	(0.847)	(1.925)
Dummy_B1	**0.580**	**0.483**	**1.287**	**0.967**	**0.610**	-0.121
	(0.090)	(0.099)	(0.109)	(0.210)	(0.140)	(0.291)
Dummy_B2	**0.337**	**0.227**	**1.007**	**0.835**	**0.334**	-0.146
	(0.067)	(0.085)	(0.106)	(0.199)	(0.149)	(0.218)
Dummy_B3	**0.175**	**0.212**	**0.816**	**0.553**	**0.290**	-0.267
	(0.063)	(0.097)	(0.092)	(0.171)	(0.142)	(0.213)
Dummy_B4	**0.215**	0.151	**0.608**	**0.488**	**0.416**	-0.257
	(0.072)	(0.147)	(0.090)	(0.204)	(0.120)	(0.209)
Dummy_S4	**0.148**	**0.273**	**0.555**	**0.397**	0.153	**-0.383**
	(0.075)	(0.147)	(0.086)	(0.165)	(0.117)	(0.196)
Dummy_S3	0.098	0.043	**0.412**	**0.375**	**0.221**	-0.180
	(0.063)	(0.088)	(0.072)	(0.148)	(0.103)	(0.177)
Dummy_S2	0.032	0.074	**0.280**	**0.224**	**0.244**	-0.217
	(0.049)	(0.089)	(0.076)	(0.121)	(0.112)	(0.167)
Ln_cap	**-0.109**	**-0.249**	**-0.087**	-0.172	-0.005	-0.051
	(0.047)	(0.124)	(0.045)	(0.125)	(0.067)	(0.153)
Book-to-market	**0.290**	**0.781**	0.135	0.254	0.188	0.523
	(0.163)	(0.452)	(0.227)	(0.581)	(0.249)	(0.672)
Average Adj-R^2	7.2%	8.1%	9.1%	9.2%	5.6%	6.4%
Average N	172		69		48	

Table 6
Regression Analysis of Future Returns on LSV Herding Measure: Large Investors

This table presents the results from daily Fama and MacBeth (1973) regressions of future returns on the herding portfolios and firm characteristic variables. Institutions and individual investors with an annual trading value of NT$ 1 billion or more are included in our sample. On each day, stocks traded by at least 10 specific investors are included in the regression analysis. The dependent variable is the cumulative abnormal return over the periods [1, 5] and [6, 20], where day 0 denotes the portfolio formation day. Abnormal returns are computed by subtracting the value-weighted return of all firms in the TWSE from the return of the corresponding firm. *LSV_HM* is the signed LSV herding measure (is positive for buy-herding and negative for sell-herding). *AR[0]* is the abnormal return on the portfolio formation day. *AR[-5, -1]* and *AR[-20, -6]* is the cumulative abnormal return over the periods [-5, -1] and [-20, -6], respectively. *Ln_cap* is the logarithm of the market value of shares outstanding, which is measured on day 0. *Book-to-market* is the book-to-market value, where the market value is measured on day 0 and the book value is measured at the end of the preceding year. Average coefficients and Newey and West (1987) standard errors (in the parentheses) are shown. Statistics with *p*-values of 0.10 or less are highlighted in bold-faced type.

	Individual Investors		Local Institutions		Foreign Institutions	
	AR[1, 5]	AR[6, 20]	AR[1, 5]	AR[6, 20]	AR[1, 5]	AR[6, 20]
Intercept	0.308	0.250	0.831	0.460	-0.505	-0.493
	(0.462)	(1.187)	(0.553)	(1.394)	(0.748)	(1.848)
LSV_HM	**0.010**	**0.005**	**0.030**	**0.017**	**0.017**	0.005
	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.007)
AR[0]	**0.040**	**0.074**	**-0.022**	-0.006	**-0.036**	0.036
	(0.010)	(0.018)	(0.012)	(0.021)	(0.021)	(0.046)
AR[-5, -1]	**-0.018**	**0.062**	**-0.051**	**0.034**	**-0.081**	0.035
	(0.007)	(0.014)	(0.008)	(0.017)	(0.010)	(0.024)
AR[-20, -6]	**0.017**	0.013	0.006	0.009	0.013	0.026
	(0.005)	(0.011)	(0.006)	(0.013)	(0.010)	(0.019)
Ln_cap	-0.062	-0.143	-0.074	-0.115	0.015	-0.054
	(0.044)	(0.107)	(0.046)	(0.114)	(0.059)	(0.149)
Book-to-market	**0.255**	**0.748**	0.183	0.272	**0.519**	0.836
	(0.142)	(0.390)	(0.206)	(0.512)	(0.243)	(0.645)
Average R^2	12.6%	12.5%	15.5%	14.7%	15.0%	13.8%
Average N	172		69		48	

Table 7
Regression Analysis of Future Returns on Buy-Sell Imbalance: Small Investors

This table presents the results from daily Fama and MacBeth (1973) regressions of future returns on the buy-sell imbalance by a particular type of small investor and specific firm characteristic variables. Individuals and institutions are classified as small investors if their annual trading dollar volume is less than NT$ 1 billion. The dependent variable is the cumulative abnormal return over the periods [1, 5] and [6, 20], where day 0 denotes the portfolio formation day. Abnormal returns are computed by subtracting the value-weighted return of all firms in the TWSE from the return of the corresponding firm. *BS_imbalance* is the daily buy-sell imbalance of a stock, which is defined as the buy dollar volume minus the sell dollar volume by a particular investor category in the stock and scaled by the stock's average daily dollar volume in the year. *AR[0]* is the abnormal return on the portfolio formation day. *AR[-5, -1]* and *AR[-20, -6]* is the cumulative abnormal return over the periods [-5, -1] and [-20, -6], respectively. *Ln_cap* is the logarithm of the market value of shares outstanding, which is measured on day 0. *Book-to-market* is the book-to-market value, where the market value is measured on day 0 and the book value is measured at the end of the preceding year. Average coefficients and Newey and West (1987) standard errors (in the parentheses) are shown. Statistics with *p*-values of 0.10 or less are highlighted in bold-faced type.

	Individual Investors		Local Institutions		Foreign Institutions	
	AR[1, 5]	AR[6, 20]	AR[1, 5]	AR[6, 20]	AR[1, 5]	AR[6, 20]
Intercept	**-0.305**	**-0.915**	**-0.299**	**-0.903**	**-0.312**	**-0.988**
	(0.092)	(0.260)	(0.106)	(0.294)	(0.135)	(0.365)
BS_imbalance	**-0.055**	0.006	**0.290**	**0.448**	**0.241**	0.085
	(0.015)	(0.021)	(0.063)	(0.129)	(0.075)	(0.155)
AR[0]	**0.082**	**0.041**	**0.064**	**0.036**	**0.037**	0.024
	(0.010)	(0.014)	(0.009)	(0.014)	(0.010)	(0.019)
AR[-5, -1]	-0.002	**0.038**	**-0.014**	**0.040**	**-0.030**	**0.026**
	(0.006)	(0.012)	(0.006)	(0.012)	(0.007)	(0.015)
AR[-20, -6]	**0.011**	-0.002	**0.011**	-0.004	**0.009**	-0.003
	(0.004)	(0.011)	(0.004)	(0.010)	(0.005)	(0.012)
Ln_cap	-0.000	-0.000	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Book-to-market	0.094	0.266	0.101	0.213	0.063	0.081
	(0.085)	(0.233)	(0.092)	(0.248)	(0.119)	(0.315)
Average R^2	8.6%	9.7%	9.8%	10.4%	11.5%	12.6%
Average N	603		372		139	

Table 8
Buy-Sell Imbalances and Aggressive Trades in Herding Portfolios by Investor Group

This table presents the buy-sell imbalances and the percentage of aggressive orders by various types of investors in the highest herding (buy-sell imbalance) portfolios. The percentage of aggressive orders relative to total trades by a specific type of investor in the portfolio is also provided. On each day, the highest buy-herding (B1) and sell-herding (S1) portfolios of stocks by large individual investors are chosen. We calculate the buy-sell imbalances of each type of investor (including large individual investors, local institutional investors, foreign investors, and small retail investors; small institutions and small foreign investors are omitted due to their low proportions in the market) and the percentage of aggressive trades relative to total trades by each type of investor. Because market orders are not permitted in Taiwan, we classify each trade as aggressive or passive based on the order price underlying the trade. An aggressive order is defined as the price of a buy (sell) order that is equal to or higher (lower) than the best-asked (bid) price. The results for the highest buy-herding portfolio of stocks by large investors are averaged across all stocks and presented in the first row, and the results for the highest sell-herding portfolio are presented in the second row. We repeat the procedure for the highest herding portfolios for local institutional investors and foreign investors. We also conduct the procedure for the most intense buy and sell portfolios based on the buy-sell imbalances for small retail investors.

		Buy-sell imbalances (%)				Aggressive trades (%)							
Portfolios (herding/buy-sell)		Large Individuals	Local Institutions	Foreign Investors	Small Retail Investors	Large Individuals		Local Institutions		Foreign Investors		Small Retail Investors	
						Buy	Sell	Buy	Sell	Buy	Sell	Buy	Sell
Large individuals	B1	7.32	-4.56	-6.65	4.99	71.19	64.56	58.64	60.96	63.36	69.90	60.79	58.57
	S1	-7.15	3.18	8.90	-5.72	75.06	70.65	64.53	61.85	69.83	69.44	66.25	66.69
Local institutions	B1	-0.79	12.09	-2.08	-8.92	76.90	69.85	64.76	60.64	71.05	67.58	68.95	62.89
	S1	0.20	-13.21	6.47	6.15	72.79	72.80	60.14	65.16	67.70	70.90	61.85	68.17
Foreign investors	B1	-1.58	-2.77	16.65	-13.45	76.67	72.04	63.69	61.53	67.91	71.06	66.55	63.65
	S1	1.45	1.28	-12.54	10.71	74.76	72.63	61.92	64.42	70.41	68.40	62.92	67.67
Small retail investors	B1	-4.26	-6.99	-7.51	19.73	70.74	73.92	56.11	68.07	66.37	71.41	60.27	72.30
	S1	3.97	5.79	9.57	-20.09	77.04	65.45	66.55	56.15	69.80	65.12	70.43	58.47

Table 9
Buy-Sell Imbalances before Earnings Announcement and Surprises

This table presents the association between the cumulative abnormal returns following an earnings announcement and the buy-sell imbalance by different types of investors in the 10-day period prior to an earnings announcement. Stocks announcing semi-annual and annual earnings from January 2001 - December 2006 are included in our analyses. The abnormal return is calculated as the stock's raw return minus the market return. For each earnings announcement, we calculate the cumulative abnormal returns over the period [0, 20] (AR[0, 20]) for every stock, where 0 denotes the earnings announcement day, and divide all stocks equally into eight portfolios according to their AR[0, 20]. We also calculate the buy-sell imbalance over the period [-10, -1] by different types of investors. The daily buy-sell imbalance of a stock is defined as the buy dollar volume minus the sell dollar volume by a particular investor category in the stock and scaled by the stock's average daily dollar volume in the year. We form equal-weighted portfolios for AR[0, 10] and AR[0, 20] as well as the buy-sell imbalance over the period [-10, -1] for every type of investor. The difference in the buy-sell imbalances between Portfolio 1 and Portfolio 8 and the difference in the average buy-sell imbalances between Portfolios 1, 2, and 3 and Portfolios 6, 7, and 8, with the corresponding t-statistics (in the parentheses), are shown. The statistics of the mean difference test with *p*-values of 0.10 or less are highlighted in bold-faced type.

	Number of Observations	AR[0, 10] (%)	AR[0, 20] (%)	Buy-Sell Imbalance [-10, -1] (%)			
				Large Individuals	Local Institutions	Foreign Institutions	Small Retail Investors
Portfolio 1	858	11.90	19.95	2.573	2.163	7.284	-14.377
2	866	5.17	8.54	1.061	1.681	7.833	-11.173
3	863	2.67	4.18	-1.177	4.936	5.956	-17.032
4	867	0.78	0.82	0.006	2.143	5.687	-9.415
5	864	-1.43	-2.24	-2.557	-3.382	5.068	-11.454
6	863	-3.27	-5.47	-6.774	-6.707	5.312	-1.263
7	866	-5.88	-9.77	-1.032	-0.412	4.035	-11.777
Portfolio 8	857	-12.75	-20.93	-2.536	-6.354	7.706	5.783
Diff.: 1-8				**5.109**	**8.517**	-0.422	**-20.160**
(t-statistic)				(1.93)	(1.67)	(-0.10)	(-2.21)
Diff.: (1+2+3)-(6+7+8)				**4.263**	**7.418**	1.351	**-11.738**
(t-statistic)				(2.36)	(2.42)	(0.55)	(-2.25)