HERDING MOMENTUM EFFECT AND FEEDBACK TRADING OF QUALIFIED FOREIGN INSTITUTIONAL INVESTORS IN THE TAIWAN STOCK MARKET

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ABSTRACT

This study extends the herding measures proposed by Warmers (1999), Lakonishok, Shleifer and Vishny (1992) and Borensztein and Gaston (2003) for stocks overbought and oversold by institutional investors as well as the information content related to institutional herding proposed by Nofsinger and Sias (1999). Our analysis further develops a herding measure related to the overbought herding measure, oversold herding measure, and overbought–oversold in dollar ratio for Qualified Foreign Institutional Investors (QFIIs) in the Taiwan stock market. Our results show that the short-term overbought herding measure and the mid-to-long-term oversold in dollar ratio by QFIIs are associated with herding effects resulting from positive feedback trading among QFIIs. The short-to mid-term overbought in dollar ratio by QFIIs is associated with clear herding effects, primarily resulting from the price-impact of herding. The results of this study contribute to the literature on herding measured by the buying number and dollar amounts of institutional investor. The results are also to be integrated with a series of research studies regarding reactions to information on securities markets.

JEL: G11, G14, G21, C21.

KEYWORDS: herding, feedback trading, cascading, momentum, QFIIs.

INTRODUCTION

Qualified Foreign Institutional Investors (QFIIs) have invested in the Taiwan securities market following its initial opening in 1991.Since this time, the regulator of the Taiwan securities market has pursued a gradual opening-up policy to attract the attention of QFIIs. QFIIs, with larger scale and better investment capabilities than other foreign investor groups, tend to be more rational than general investors, and place greater emphasis on long-term strategies in comparison with domestic institutional investors in Taiwan. Their numbers and the weight of their trading dollar amounts are greater than those of other institutional investors, which causes their overbought and oversold to have a significant influence on the Taiwan stock market. Previous studies (e.g., Shiu and Liau, 2005) demonstrated that the overbuying and overselling activities of QFIIs affect the movement of the weighted stock price index, thereby becoming a reference for the investment decisions of other investors.

The difference among the benchmarks for overbought and oversold by foreign investors represents different information regarding trading volume, numbers, and dollar amounts; most previous studies tend to measure overbought and oversold by institutional investors based on the change in share ownership (Nofsingaer and Sias, 1999; Cai, Kaul and Zheng, 2000; Sias, Starks, and Titman, 2002). In contrast, Jones and Winters (1999) proposed that the number of institutional investors in a particular stock reflects new entrants and thus the possibility of additional analysis; they argued that the number of institutional investors in a stock captures the breadth of ownership and analyst coverage. Nevertheless, the LSV index proposed by Lakonishok, Shleifer and Vishny (1992), measured as the buy-and-sell numbers of mutual funds for each individual stock, fails to divide the buying and selling direction and is therefore unable to capture the interaction between the movement of buying or selling direction of institutional investors.

Wermers (1999) modified and improved the measuring index of Lakonishok et al. (1992) to a buying and selling conditional herding measure. Furthermore, Borensztein and Gaston (2003) proposed that when the trading of a particular stock is frequent and primarily flows in one direction, the direction with fewer trades might have the greater dollar amount. In detail, the overbought–oversold index based on the number of foreign investors joining or withdrawing represents the average overbought–oversold willingness of all foreign investors, whereas the overbought–oversold in dollar ratio based on the trading dollar amount of foreign investors implies a corresponding addition or withdrawing of capital.

The work of Wermers (1999), Borensztein and Gaston (2003) on the measure of overbought–oversold behavior by institutional investors, in conjunction with the study of Nofsinger and Sias (1999) on herding, feedback trading, and related issues have extended the dimensions of herding research. The integration of these two studies might well improve analyses of the related issues of herding by QFIIs in emerging markets such as Taiwan. Thus, this study combines the herding definition by Nofsinger and Sias (1999) and the herding measures of the buying number by Wermers (1999) and dollar amounts by Borensztein and Gaston (2003) to be applicable to the Taiwan stock market. Moreover, we want to clarify that QFIIs' herding effect in Taiwan mainly results from their feedback trading or the price-impact of herding.

LITERATURE REVIEW

Nofsingaer and Sias (1999), Cai, Kaul and Zheng (2000), Sias, Starks, and Titman (2002) documented a strong positive relation between changes in institutional ownership and returns measured over the same period. Moreover, we want to explore the relation between the herding measured by the buying number and dollar amounts of institutional investors and the corresponding returns. Additionally, Chakravarty (2001), Dennis and Weston (2000), and Sias, Starks, and Titman (2002) conclude that the relation between changes in institutional ownership and returns measured over the same period results primarily from price effects associated with institutional trading. However, previous studies by Grinblatt, Titman, and Wermers (1995), Wermers (1999, 2000), Nofsingaer and Sias (1999), and Sias, Starks and Titman (2002) have demonstrated the feedback trading of institutional investors. Thus, we want to further clarify the causal direction between the institutional herding measures and the corresponding returns in the different herding intervals. We also want to separately explore whether the feedback trading and the price-impact of institutional herding exist in the different herding intervals.

Hence, this study focuses on the following four topics. First, stocks are sorted separately based on the buy herding measure ($BHM_{i,t}$) and sell herding measure ($SHM_{i,t}$) by QFIIs; this identifies those overbought and oversold stocks with larger herding values. We also sort the stocks based on dollar ratio ($DR_{i,t}$) by QFIIs and identify stocks with overbought and oversold of $DR_{i,t}$ by QFIIs to obtain a more accurate observation. We then extend Nofsinger and Sias's (1999) work to separately examine the relationship between abnormal returns on securities and the overbought-oversold herding indexes of QFIIs to evaluate the importance of their herding behaviors. Second, we use the econometric causality test to confirm the causal directions of feedback trading and herding impacting price measured by the overbought–oversold herding indices of QFIIs. Third, we perform a significant examination of previous abnormal returns on the overbought–oversold herding indices of QFIIs and previous overbought–oversold herding indexes for QFIIs on those in the current phase to verify the existence of feedback trading and cascades by QFIIs. Finally, to verify the managerial implications of QFII's herding for investment decisions, we perform a significant examination of the influence of the overbought–oversold herding indices for QFIIs on subsequent abnormal returns.

The remainder of this article is organized as follows. Section 3 discusses research methods that include the econometric causality test between abnormal returns of securities and the overbought–oversold herding indexes by QFIIs and testing of the herding effect. Section 4 considers the herding effect, feedback trading, cascading, and the price impact of herding due to overbought–oversold herding indexes for QFIIs. Section 5 concludes this paper.

RESEARCH DESIGN AND METHOD

In this section we discuss the research design and methodology used in the paper. We begin by discussing the data utilized in the empirical tests. Next we discuss how herding behavior and abnormal returns are measured. Finally, we discuss impact of herding on stock price.

Data

The data analyzed in this study are the monthly individual stock returns of companies listed on TSEC (Taiwan Stock Exchange Corporation), weighted stock index returns, and the buying and selling numbers and dollar amounts for QFIIs between January 2002 and December 2007. There are 45,421 observations that were computed by the numbers of stocks listed in each month from 2002-2007 in our data. These data were further transformed into abnormal returns for individual stocks, overbought herding measure, oversold herding measure, and overbought–oversold in dollar ratio by QFIIs. Because no data exist for the buying and selling numbers and dollar amounts of QFIIs prior to 2002, it is impossible to transform relevant herding measures. Data are sourced from the Taiwan Economic Journal Data Bank. Returns on individual stocks are calculated for each month, while QFII's trading numbers and dollar amounts are derived from each trading day and accumulate until the end of each month. If the net trading accumulation of a particular stock by one of the QFIIs in a month is positive (negative), then that QFIIs is counted towards the buying (selling) numbers. To create sufficient restraints to formulate a meaningful QFII's herding calculation, this study follows the definition provided by Borensztein and Gaston (2003) in herding measures, which calculates only the overbought and oversold herding measures for individual shares of QFII's trading numbers that exceed five per month and calculates only the overbought–oversold in dollar ratio for individual shares of QFIIs for which the incoming or outgoing dollar amounts exceeded 3% of the total dollar amount to improve the credibility of the sample data.

Measure of Herding by QFII and Abnormal Returns

With regard to quantifying the herding degree of trading numbers among QFIIs, this study primarily cites indices of Wermers (1999) buy herding measure ($BHM_{i,t}$) and sell herding measure ($SHM_{i,t}$) to divide the shares into two categories: the buy herding measure that is greater than the expectation ratio of the buying number by QFIIs and the sell herding measure that is lower than that for any given month(s). The two categories of stocks are further sorted to select stock with greater herding values (the overbought herding measure and the oversold herding measure) according to the values of two separate indexes. The positioning and meaning of the herding measures described in this study are used to explore whether QFIIs move in the same direction more often than any individual QFII would expect if they independently and randomly traded. This article makes use of the buy and sell herding measures of Wermers (1999), vesting the directional characteristics of QFII's herding movement. Because the two herding measures can clearly indicate the existence of a "mutual" phenomenon of movement in the same direction among QFIIs, they can capture differences in the change in share ownership by QFIIs; this is known as the "reversely balancing" phenomenon, where the increase is matched by a reduction in share ownership by other investors. Moreover, when $BHM_{i,t}$ ($SHM_{i,t}$) is significantly greater than 0, the trading in stock i by QFIIs over a given period of t month(s) has a herding tendency towards the buyer (seller) relative to the average trading on all stocks; when the $BHM_{i,t}$ ($SHM_{i,t}$) increases, the measure for the degree of buying (selling) herding among QFIIs becomes more pronounced. The buy herding measure $BHM_{i,t}$ and sell herding measure $SHM_{i,t}$ expanded in this study are explained as follows:

$$BHM_{i,t} = HM_{i,t} / p_{i,t} > E[p_{i,t}] \text{ ,} \tag{1}$$

$$SHM_{i,t} = HM_{i,t} / p_{i,t} < E[p_{i,t}] \text{ ,} \tag{2}$$

$$HM_{i,t} = \left| p_{i,t} - E[p_{i,t}] \right| - E\left| p_{i,t} - E[p_{i,t}] \right| \tag{3}$$

$$p_{i,t} = \frac{B_{i,t}}{B_{i,t} + S_{i,t}} \text{ ,} \tag{4}$$

where $p_{i,t}$ is the proportion of all QFIIs trading stock *i* over *t* month(s) that are buyers, and $E[p_{i,t}]$ is the expected proportion of all QFIIs who are buyers over *t* month(s) in all traded stocks. An adjusting factor $E\left| p_{i,t} - E[p_{i,t}] \right|$ is then subtracted to allow for random variation around the expected value of $\left| \frac{B_{i,t}}{B_{i,t} + S_{i,t}} - E[p_{i,t}] \right|$ under the null hypothesis of no herding by QFIIs. Since $B_{i,t}$ follows a binomial distribution with probability $E[p_{i,t}]$ of success, $E\left| p_{i,t} - E[p_{i,t}] \right|$ is easily calculated given $E[p_{i,t}]$ and the number of QFIIs active in that stock over the given *t* month(s).

$$E\left| p_{i,t} - E[p_{i,t}] \right| = \sum_{k=0}^{n_{i,t}} \left[\left| \frac{k}{n_{i,t}} - E[p_{i,t}] \right| * C_k^{n_{i,t}} \left(E[p_{i,t}] \right)^k \left(1 - E[p_{i,t}] \right)^{n_{i,t} - k} \right] \tag{5}$$

Among them, $n_{i,t}$: the total trading numbers ($B_{i,t} + S_{i,t}$) of QFIIs active in given *t* month(s) on *i* stock. $C_k^{n_{i,t}}$: All the possible associative numbers of selecting k objects from n objects. Such a factor can adjust the difference caused by trading numbers. The factor will be close to 0 significantly greater than 0) if QFII's trading numbers increase (decrease) on any one stock *i*; however, given that Borensztein and Gaston (2003) consider that traded numbers of stocks are frequent and focused in one direction, there may be a greater traded dollar amount in the direction with less trade. The result of the dollar ratio of Lakonishok et al. (1992), which is one measure of excess demand, may be different from those of the buy or sell herding measures of Wermers (1999). In the event of arranging the stocks traded by QFIIs in given month(s) according to the size of the ratio, the stocks with a greater order can be considered as overbought stocks in dollar amounts by QFIIs in given month(s); in contrast, the stocks with a smaller order can be designated as stocks that are oversold in that group. As such, this article considers the measure of dollar ratio traded by QFIIs to be an additional institutional herding index used to obtain more complete information. We define the operation of the dollar ratio as follows:

$$DR_{it} = \frac{Inflow_{it} - Outflow_{it}}{Inflow_{it} + Outflow_{it}} \tag{6}$$

Among them, the inflow (outflow) is the dollar value where QFIIs increase (decrease) their holdings in stock *i* during a given *t* month(s).

In general, if $BHM_{i,t}$ ($DR_{i,t}$) is sorted into a greater positive value, it means that share *i* during *t* month(s) is categorized by the numbers (dollar amount) as a stock that is consistently overbought, or positive herding among QFIIs. In contrast, if $SHM_{i,t}$ ($DR_{i,t}$) is sorted as a greater positive value (negative value), it means that share *i* during *t* month(s) is categorized by the numbers (dollar amount) as a stock consistently oversold, or negative herding. The abnormal return of individual stock *i* for a given *t* month(s) is initially calculated based on a capital asset pricing model:

$$r_i^a = \left(r_{i,t1} - r_{f,t1}\right) - \beta_i\left(r_{m,t1} - r_{f,t1}\right) \qquad t1 = -11,\ldots,0 \tag{7}$$

$r_{i,t1}$ is the monthly return for individual stock i in this month and past eleven months; $r_{f,t1}$ is the risk-free rate in this month and past eleven months, which is the interest rate for a one-month term deposit offered by Taiwan First Bank; $r_{m,t1}$ is the change ratio of net value of TAIEX in this month and past eleven months.

This study employs the buy-and-hold method to calculate equally weighted buy-and-hold abnormal returns of stocks in overbought and oversold portfolios for each formation period during the test period. The average monthly buy-and-hold abnormal return at point T for a holding of k month(s) for each portfolio ($BR_{T,K}$ and $SR_{T,K}$) is then computed as follows:

$$BR_{T,k} = \left[\prod_{t=1}^{k}[1 + \frac{1}{B_T}\sum_{i=1}^{B_T}(r_{iB,T+t}^a)] - 1\right]/k \tag{8}$$

$$SR_{T,k} = \left[\prod_{t=1}^{k}[1 + \frac{1}{S_T}\sum_{i=1}^{S_T}(r_{iS,T+t}^a)] - 1\right]/k \tag{9}$$

B_T : Share number of overbought portfolio; S_T : share number of oversold portfolio;
$r_{iB,T+t}^a$ is the abnormal return of stock *i* of the overbought portfolio at T + *t*; $r_{iS,T+t}^a$ is the abnormal return of stock *i* of the oversold portfolio at T + *t*.

QFII's Herding Effect, Feedback Trading and Herding Impacting Price

This study extends the definition of the relative importance of institutional herding proposed by Nofsinger and Sias (1999), which in this study is termed the herding effect. If a positive (negative) relationship exists between the herding value of stocks with the overbought (oversold) herding measure by QFIIs and stock returns of the same interval, there is a buying (selling) force in the numbers among QFIIs. On the contrary, there is a buying (selling) force in the numbers among QFIIs. For the same reason, if a positive relationship exists between the herding value of the stocks with the overbought (oversold) in dollar ratio by QFIIs and stock returns of the same interval, there is a dollar increase (decrease) force by QFIIs in the given stocks. In contrast, there is a dollar increase (decrease) force exerted by QFIIs on the given stocks.

The research design of this article separately sorts the stocks of all listed companies into three (five) portfolios based on the degree of the buy and sell herding measures (in dollar ratio) for QFIIs to select stocks that are overbought–oversold.[3] If testing reveals the same (opposite) directional movement between the herding values of stocks with the overbought (oversold) herding measure or overbought–oversold in dollar ratio and abnormal returns for the same interval, we infer the existence of a herding effect among QFIIs. It may reflect the fact that stocks with the overbought-oversold herding indices of QFIIs reach a greater level on positive feedback trading. Alternatively, it may be because stocks with the overbought-oversold herding indices of QFIIs have a greater positive effect on the price. Thus, this study uses the widely accepted Granger causality test (Granger, 1969) to explore whether herding effects on the number and dollar amounts by QFIIs result from their positive feedback trading or the price-impact of their herding. Subsequently, we explore whether there are evidently positive or negative feedback trading and cascading in the number and dollar amounts traded by QFIIs. Finally, we evaluate whether other investors can positively or negatively follow the stocks of overbought/oversold herding measure and overbought/oversold in dollar ratio by QFIIs and for how long they should be followed to obtain optimal performance.

In addition, this study revises the cross-sectional weighted regressions of Jones and Winters (1999) by including QFIIs' overbought (oversold) herding measure (or dollar ratio) and abnormal returns to strengthen the examination of QFIIs' herding effect, feedback trading, cascading, and herding price impact. Equations (10-1) and (10-2) are the cross-sectional weighted regressions for testing QFIIs' herding effect.

$$R^a_{0-t} = \alpha_0 + \alpha_1 BHM^+_{0-t} + \alpha_2 SHM^+_{0-t} \tag{10-1}$$

$$R^a_{0-t} = \beta_0 + \beta_1 DR_{0-t} \tag{10-2}$$

R^a_{0-t} is the abnormal return in herding t month(s). BHM^+_{0-t} (SHM^+_{0-t}) is the overbought (oversold) herding measure among QFIIs in herding t month(s), and DR_{0-t} is the dollar ratio among QFIIs in herding t month(s).

Equations (11-1), (11-2), and (11-3) are the cross-sectional weighted regressions for testing QFIIs' feedback trading and cascading.

$$BHM^+_{0-t} = \alpha_0 + \alpha_1 BHM^+_{-t1-0} + \alpha_2 SHM^+_{-t1-0} + \alpha_3 R^a_{-t1-0} \tag{11-1}$$

$$SHM^+_{0-t} = \beta_0 + \beta_1 BHM^+_{-t1-0} + \beta_2 SHM^+_{-t1-0} + \beta_3 R^a_{-t1-0} \tag{11-2}$$

$$DR_{0-t} = \gamma_0 + \gamma_1 DR_{-t1-0} + R^a_{-t1-0} \tag{11-3}$$

R^a_{-t1-0} is the abnormal returns for pre-herding *t1* month(s). BHM^+_{-t1-0} (SHM^+_{-t1-0}) is pre-herding *t1*-month(s) overbought (oversold) herding measure among QFIIs, and DR_{-t1-0} is the pre-herding *t1* month(s) dollar ratio of QFIIs.

Equations (12-1) and (12-2) are the cross-sectional weighted regressions for testing the price impact of QFII's herding.

$$R^a_{t-t2} = \alpha_0 + \alpha_1 BHM^+_{0-t} + \alpha_2 SHM^+_{0-t} \tag{12-1}$$

$$R^a_{t-t2} = \beta_0 + \beta_1 DR^+_{0-t} + \beta_2 DR^-_{0-t} \tag{12-2}$$

R^a_{t-t2} is post-herding t2-month(s) abnormal return(s). BHM^+_{0-t} (SHM^+_{0-t}) is the overbought (oversold) herding measure among QFIIs in herding t month(s), and DR^+_{0-t} (DR^-_{0-t}) is the overbought (oversold) dollar ratio of QFIIs in herding t month(s).

In summary, the test of the existence of a herding effect on QFII's numbers or dollar amounts is equal to the tests of the existence of a clearly positive (negative) relation between the mean herding value of stocks with the overbought herding measure BHM^+_{0-t} (oversold herding measure SHM^+_{0-t}) or overbought–oversold in dollar ratio DR^+_{0-t}, DR^-_{0-t} of QFIIs and abnormal returns of securities in the same interval R^a_{0-t}. If feedback trading exists among QFIIs, the previous abnormal returns R^a_{-t1-0} will clearly and positively (negatively) affect BHM^+_{0-t} (SHM^+_{0-t}) or DR^+_{0-t}, DR^-_{0-t} of QFIIs. If the herding among

QFIIs positively drives prices, BHM^{+}_{0-t} (SHM^{+}_{0-t}) or $DR^{+}_{0-t}, DR^{-}_{0-t}$ of QFIIs will clearly and positively (negatively) affect abnormal returns for the next period R^{a}_{t-t2} ; otherwise, there exists herding among QFIIs that negatively drives prices.

EMPIRICAL RESULTS

This section presents the empirical results. This section is organized as follows. First, the herding effect is discussed. Next we examine results that distinguish between feedback trading and the price impact of herding. The following section examines feedback trading and cascading. The final part of this section examines momentum and contrarian effects on herding measures.

The Herding Effect

Panels B1 and B2 in Table 1 report the time-series averages of the cross-sectional mean abnormal returns measured by the BHM^{+}_{0-t} and SHM^{+}_{0-t} and $DR^{+}_{0-t}, DR^{-}_{0-t}$ by QFIIs, respectively, over one, two, three, and six herding month(s). The T statistics are based on the standard errors used by Fama-MacBeeth (1973) (the time-series standard errors of each monthly cross-sectional mean). The empirical results clearly reveal that regardless of how many months the herding lasts, clearly positive relations are present between the BHM^{+}_{0-t} or SHM^{+}_{0-t} by QFIIs and R^{a}_{0-t} over the herding month(s), and that these numbers are all statistically significant. For the overbought herding measure over one, two, three and six months by QFIIs, the average abnormal returns of firms with the greatest herding degree should be 4.917%, 3.263%, 2.570%, and 2.099%, respectively; for the oversold herding measure over the same interval, the average abnormal returns of firms with the greatest herding degree should be 1.804%, 1.392%, 1.713%, and 1.824%, respectively. That is, the buying force in the numbers among QFIIs is more important than the selling force. The reason for this is either that positive feedback trading of stocks with the BHM^{+}_{0-t} (SHM^{+}_{0-t}) by QFIIs reaches (cannot reach) a greater degree or that the stocks with their BHM^{+}_{0-t} (SHM^{+}_{0-t}) positively (cannot positively) affect price to a greater extent. Moreover, there exists a significantly positive relationship between $DR^{+}_{0-t}, DR^{-}_{0-t}$ by QFIIs and R^{a}_{0-t} over the herding month(s).

For the overbought in dollar ratio over one, two, three and six months by QFIIs, the average abnormal returns of firms with the smallest herding degree should be –3.217%, –1.802%, –1.144%, and –2.031%, respectively, whereas the average abnormal returns of firms with the greatest herding degree should be 4.490%, 2.294%, 1.767%, and 1.268%, respectively. The dollar increase and decrease force exerted by QFIIs in the given stocks are all important. The reason could be that the positive feedback trading by stocks overbought /oversold in dollar ratio by QFIIs reaches a greater extent or that the stocks overbought/oversold in dollar ratio positively affect the price to a greater degree. In addition, Panels C1 and C2 in Table 1 show the results of regressing the average R^{a}_{0-t} over herding month(s) on the BHM^{+}_{0-t} , SHM^{+}_{0-t} and DR_{0-t} by QFIIs. The α_1 and α_2 coefficients on the BHM^{+}_{0-t} and SHM^{+}_{0-t} are significantly positive, revealing that stocks with greater average abnormal returns experience a greater overbought herding measure and oversold herding measure by QFIIs. The positive β_1 coefficient for the DR_{0-t} by QFIIs shows that the stocks with greater average abnormal returns experience a greater dollar ratio by QFIIs. On the basis of regression, however, we are still unable to determine whether the overbought herding measure, oversold herding measure, and overbought/oversold in dollar ratio by QFIIs are due to or caused by the average abnormal returns; rather, further testing is required to determine whether feedback trading or herding impacting price on these herding measures by QFIIs has a greater impact.

Table 1: The Herding abnormal Returns of BHM^{+}_{0-t}, SHM^{+}_{0-t}, DR^{+}_{0-t}, and DR^{-}_{0-t} by QFIIs

	BHM^{+}_{0-1}	SHM^{+}_{0-1}	BHM^{+}_{0-2}	SHM^{+}_{0-2}	BHM^{+}_{0-3}	SHM^{+}_{0-3}	BHM^{+}_{0-6}	SHM^{+}_{0-6}
Panel A1: The BHM^{+}_{0-t} and SHM^{+}_{0-t} of stocks Traded by QFII								
HM_{0-t} t=1,2,3,6	0.148	0.155	0.121	0.125	0.113	0.111	0.095	0.104
Panel B1: Herding Monthly Abnormal Returns (in percent)								
t=1,2,3,6	4.917	1.084	3.263	1.392	2.570	1.713	2.099	1.824
t-value	(10.71***)	(6.51***)	(12.34***)	(12.21***)	(11.66***)	(15.51***)	(11.30***)	(10.73***)

Panel C1: Regressing Herding Returns on the BHM^{+}_{0-1} and $SHM^{+}_{t=1}$ of Stocks Traded by QFII

	α_0	α_1	α_2	F-statistic	R^2
t=0 to 1	0.614	8.353	5.887	0.830	0.048
t-value	(0.849)	(5.756***)	(1.820*)		

	DR^{+}_{0-1}	DR^{-}_{0-1}	F-statistic	DR^{+}_{0-2}	DR^{-}_{0-2}	F-statistic
Panel A_2: The DR^{+}_{t} and DR^{-}_{t} of stocks Traded by QFII						
DR_{0-t} t=1,2	0.658	-0.721	10.158***	0.758	-0.655	6.850***
Panel B_2: Herding Monthly Abnormal Returns (in percent)						
t=1,2	4.490	-3.217	18.204***	2.294	-1.802	9.521***
t-value	(7.25***)	(-6.31***)		(6.42***)	(-4.73***)	

	DR^{+}_{0-3}	DR^{-}_{0-3}	F-statistic	DR^{+}_{0-6}	DR^{-}_{0-6}	F-statistic
Panel A3: The DR^{+}_{0-t} and DR^{-}_{0-t} of stocks Traded by QFII						
DR_{0-t} t=3,6	0.674	-0.611	7.734***	0.617	-0.658	8.052***
Panel B3: Herding Monthly Abnormal Returns (in percent)						
t=3,6	1.767	-1.144	9.215***	1.268	-2.031	11.325***
t-value	(7.45***)	(-3.93***)		(6.22***)	(-8.62***)	

Panel C2: Regressing Herding Returns on the DR_{0-1} of Stocks Traded by QFII

	β_0	β_1	F-statistic	R^2
t=0 to 1	0.962	8.244	1.488	0.042
t-value	(1.52)	(11.09***)		

Each one (two, three, or six) herding month (months), all listed firms are sorted into three portfolios based on the "buy herding measure," $BHM_{0-t=1,2,3,\ or\ 6}$, "sell herding measure," $SHM_{0-t=1,2,3,\ or\ 6}$ of individual stocks traded by QFIIs separately. In same herding interval, all listed firms are sorted into five portfolios based on the "dollar ratio", $DR_{0-t=1,2,3,\ or\ 6}$ of individual stocks traded by QFIIs. Panel A_1 and B_1 are the time-series average of the monthly cross-sectional mean of the overbought and oversold herding measure by QFIIs (BHM^{+}_{0-t} and SHM^{+}_{0-t}) and the corresponding abnormal returns for the portfolio of the biggest average in BHM_{0-t} and SHM_{0-t}. Panel A_2 and B_2 are time-series average of the monthly cross-sectional mean of the overbought and oversold in dollar ratio (DR^{+}_{0-t} and DR^{-}_{0-t}) by QFIIs and the corresponding abnormal returns for the portfolio of the biggest and smallest average in DR_{0-t}. The regression models of Panel C_1 and C_2 are presented as below: $R^{a}_{0-1} = \alpha_0 + \alpha_1 BHM^{+}_{0-1} + \alpha_2 SHM^{+}_{0-1}$ and $R^{a}_{0-1} = \beta_0 + \beta_1 DR_{0-1}$. R is the mean abnormal return in the herding month t(=1). BHM^{+}_{0-1} (SHM^{+}_{0-1}) is the monthly cross-sectional mean of the overbought (oversold) herding measure traded by QFII in the herding month (t=1). DR_{0-1} is the monthly cross-sectional mean of the dollar ratio traded by QFII in the herding month (t=1). The F-statistic is based on the null hypothesis that the time-series averages of cross-sectional means do not differ across the portfolios of the overbought and oversold in dollar ratio (DR^{+}_{0-t} and DR^{-}_{0-t}).

Distinguishing Feedback Trading from Price Impacting of Herding

We employ the Granger causality test to assess the relation between the average herding values of the BHM^{+}_{0-t}, SHM^{+}_{0-t}, or DR^{+}_{0-t}, DR^{-}_{0-t} and the corresponding average R^{a}_{0-t}. First, we separately perform an ADF test on the origin or post-difference series of the average herding values of the stocks under each herding measure and interval and the corresponding average abnormal returns to ensure that these series are stationary or transform the series to stationary. The testing reveals that the ADF statistics in most of these variable sequences do not exist in the unit root after taking the difference. Thereafter, this study uses these stationary variables to conduct the Granger causality test. With regard to the lag period, this study uses the shorter of the lag periods chosen by AIC and SBIC to perform an examination of the model. The analytical results in Table 2 show that one or two lags will minimize the values of the information criteria under each herding measure and interval. Thus, we use the optimal one or two lags to evaluate the degree of causation between the average herding values and the corresponding average abnormal returns.

In Panel A of Table 2, under the null hypothesis that the corresponding average R^{a}_{0-1} (average herding value BHM^{+}_{0-1}) of the one-month overbought herding measure by QFIIs will not affect the average herding value BHM^{+}_{0-1} (average R^{a}_{0-1}), the p-value of the F statistic is smaller than 0.1% (5%), demonstrating a mutual causation between BHM^{+}_{0-1} and the corresponding R^{a}_{0-1}, in which the effect of the feedback trading of R^{a}_{0-1} on BHM^{+}_{0-1} is especially clear. The p-values of the remaining F statistics in Panel A, however, do not reach the 10% significance level, indicating a lack of causation between the average herding values BHM^{+}_{0-t} by QFIIs in other intervals and the corresponding average R^{a}_{0-t}. In addition, the corresponding p-values for all F statistics in Panel B consistently fail to reach the 10% significance level, indicating a lack of mutual causation between the average herding values of the short- to long-term SHM^{+}_{0-t} by QFIIs and the corresponding average R^{a}_{0-t}.

In Panel C, under the null hypothesis where the average herding values of the DR^{+}_{0-1}, DR^{+}_{0-2}, and DR^{+}_{0-3} (DR^{+}_{0-6}) by QFIIs do not affect the corresponding average R^{a}_{0-1}, R^{a}_{0-2}, and R^{a}_{0-3} (R^{a}_{0-6}), the p-values of the F statistics are less than 5% or 10% (greater than 10%). This reveals a causation of the price impact of QFII's herding where DR^{+}_{0-1}, DR^{+}_{0-2}, and DR^{+}_{0-3} (DR^{+}_{0-6}) have (do not have) an significant impact on the corresponding average R^{a}_{0-1}, R^{a}_{0-2}, and R^{a}_{0-3} (R^{a}_{0-6}). In Panel D, however, under the null hypothesis in which the average R^{a}_{0-2} and R^{a}_{0-6} (R^{a}_{0-1} and R^{a}_{0-3}) of the oversold in dollar ratio over do not affect the corresponding average herding values of the DR^{-}_{0-2} and DR^{-}_{0-6} (DR^{-}_{0-1} and DR^{-}_{0-3}) by QFIIs, the p-values of the F statistics are less (greater) than 10%. This indicates a causation of feedback trading where R^{a}_{0-2} and R^{a}_{0-6} have a clear impact on the corresponding DR^{-}_{0-2} and DR^{-}_{0-6}, while there exists no significant correlation between DR^{-}_{0-1} and R^{a}_{0-1} or between DR^{-}_{0-3} and R^{a}_{0-3}.

For the Taiwan stock market, our results reveal that the herding effect between BHM^{+}_{0-1} by QFIIs and the corresponding average R^{a}_{0-1} primarily results from their positive feedback trading. There is no causation between the average herding values of the short-, mid-, and long-term SHM^{+}_{0-t} and the corresponding average R^{a}_{0-t}; this is consistent with the reduced importance of the selling force in numbers among QFIIs and the non-existence of the herding effect. Moreover, the herding effects between DR^{+}_{0-1}, DR^{+}_{0-2}, and DR^{+}_{0-3} by QFIIs and the corresponding average R^{a}_{0-1}, R^{a}_{0-2}, and R^{a}_{0-3} are primarily caused by the effect of their overbought in dollar ratio on abnormal returns. We found, however, that the herding effects between DR^{-}_{0-2} and DR^{-}_{0-6} by QFIIs and the corresponding average R^{a}_{0-2} and R^{a}_{0-6} are caused primarily by their positive feedback trading. More importantly, the above results clearly show that in the Taiwan stock market, positive feedback trading by QFIIs is more pronounced for stocks of the short-term overbought herding measure and longer-term oversold in dollar ratio by QFIIs, whereas the price impact of QFII's herding is clearly evident for stocks of the short-mid-term overbought in dollar ratio.

Feedback Trading and Cascading

The results shown in Panels A1-A4 in Table 3 show that QFIIs prefer to overbuy stocks that have had clearly positive abnormal returns in the pre-herding one, two, three, and six months; however, they prefer to oversell stocks that have had more pronounced positive abnormal returns in all of the pre-herding periods. QFIIs consistently focus on positive feedback trading of stocks with their overbought herding measure, while they focus on negative feedback trading of stocks with their oversold herding measure. In addition, the results in Panels B1-B4 of Table 3 show that QFIIs strongly prefer to overbuy (oversell) the stocks that have had significantly positive (negative) average returns in the pre-herding period. This indicates that positive feedback trading with the overbought/oversold in dollar ratio is more significant. Based on the three-month overbought (oversold) herding measure, QFIIs tend to overbuy (oversell) the stocks in the pre-herding one, two, three, and six months where the average abnormal returns attain 1.703% (2.201%), 1.444% (2.054%), 1.138% (2.034%), and 1.158% (1.969%), respectively. Based on the one-month overbought (oversold) in dollar ratio, QFIIs tend to overbuy (oversell) stocks where the average abnormal returns in the pre-herding one, two, three, and six months attain 1.794% (–0.538%), 1.246% (–0.655%), 0.402% (–0.360%), and –0.124% (–0.747%), respectively. The results of overbought herding measure and overbought in dollar ratio both indicate that the shorter the observation period prior to trading, the larger the required average abnormal returns for which QFIIs overbuy; nevertheless, negative (positive) feedback trading of stocks with QFII's SHM^{+}_{0-3} (DR^{-}_{0-6}) is the most obvious.

The results in Panels C1 and C2 of Table 3 reveal that in terms of BHM^{+}_{0-1}, SHM^{+}_{0-1}, and DR^{+}_{0-1}, DR^{-}_{0-1}, QFIIs prefer to overbuy (oversell) the stocks which they have overbought (oversold) the previous month. Most importantly, QFII's cascades are obvious regardless of their numbers or dollar amount. Panes D1 and D2 in Table 3 show the results of regressing QFII's BHM^{+}_{0-1} (SHM^{+}_{0-1}) simultaneously on BHM^{+}_{-1-0}, SHM^{+}_{-1-0}, and R^{a}_{-1-0}. The significantly positive $\alpha_1(\beta_2)$ coefficient of BHM^{+}_{-1-0} (SHM^{+}_{-1-0}) is greater than the significantly negative $\alpha_2(\beta_1)$ coefficient of SHM^{+}_{-1-0} (BHM^{+}_{-1-0}), implying that at least for herding over one month, QFIIs tend toward to cascade on the numbers. In addition, the analytical results in Panel D3 by simultaneously regressing QFII's one-month DR_{0-1} on the previous one-month DR_{-1-0} and R^{a}_{-1-0} reveal that the coefficient γ_1 of DR_{-1-0} is a clearly positive value, meaning that QFIIs clearly prefer to cascade on the dollar amount. Furthermore, the insignificant coefficient of R^{a}_{-1-0} reveals that, corresponding to the weakness of feedback trading by QFIIs, the impact of QFII's cascades on the numbers and dollar amount is significantly greater. The analytical results are inconsistent with the findings of Jones and Winters (1999), who stated that institutional investors would more evidently undertake positive feedback trading than cascades, but the results are consistent with those of Lu, Wong and Fang (2007), exploring the feedback trading and cascades of the three major institutional investors in the Taiwan stock market based on share ownership adjustment of institutional investors. The analytical results of this study reflect learning and imitation among foreign institutional investors.

Table 2: Causation between BHM^+_{0-t}, SHM^+_{0-t}, DR^+_{0-t} or DR^-_{0-t} and Abnormal Returns

Null Hypothesis	Lag Period	AIC/SBIC	F-statistic	p-value
Panel A: Examine if There Is a Granger Cause Relationship between R^a_{0-t} and BHM^+_{0-t} by QFII				
Null Hypothesis	Lag Period	AIC/SBIC	F-statistic	p-value
R^a_{0-1} does not Granger Cause BHM^+_{0-1}	2	AIC: 1.854	9.5010	0.0007***
BHM^+_{0-1} does not Granger Cause R^a_{0-1}		SBIC: 2.308	3.4924	0.0443**
R^a_{0-2} does not Granger Cause BHM^+_{0-2}	2	AIC: 1.021	0.0337	0.9669
BHM^+_{0-2} does not Granger Cause R^a_{0-2}		SBIC: 1.479	0.1711	0.8436
R^a_{0-3} does not Granger Cause BHM^+_{0-3}	1	AIC: 0.162	0.5851	0.4505
BHM^+_{0-3} does not Granger Cause R^a_{0-3}		SBIC: 0.437	1.2058	0.2812
R^a_{0-6} does not Granger Cause BHM^+_{0-6}	1	AIC: -2.187	0.8999	0.3515
BHM^+_{0-6} does not Granger Cause R^a_{0-6}		SBIC: -1.905	0.0074	0.9322
Panel B: Examine if There Is a Granger Cause Relationship between R^a_{0-t} and SHM^+_{0-t} by QFII				
Null Hypothesis	Lag Period	AIC/SBIC	F-statistic	p-value
R^a_{0-1} does not Granger Cause SHM^+_{0-1}	1	AIC: 1.967	0.4952	0.4867
SHM^+_{0-1} does not Granger Cause R^a_{0-1}		SBIC: 2.233	1.6275	0.2112
R^a_{0-2} does not Granger Cause SHM^+_{0-2}	1	AIC: 0.067	0.2401	0.6276
SHM^+_{0-2} does not Granger Cause R^a_{0-2}		SBIC: 0.336	0.0816	0.7770
R^a_{0-3} does not Granger Cause SHM^+_{0-3}	1	AIC: 0.128	0.2165	0.6452
SHM^+_{0-3} does not Granger Cause R^a_{0-3}		SBIC: 0.403	0.3809	0.5419
R^a_{0-6} does not Granger Cause SHM^+_{0-6}	1	AIC: -1.859	0.0185	0.8930
SHM^+_{0-6} does not Granger Cause R^a_{0-6}		SBIC: -1.576	0.3868	0.5394
Panel C: Examine if There Is a Granger Cause Relationship between R^a_{0-t} and DR^+_{0-t} by QFII				
Null Hypothesis	Lag Period	AIC/SBIC	F-statistic	p-value
R^a_{0-1} does not Granger Cause DR^+_{0-1}	1	AIC: 5.647	0.7655	0.3881
DR^+_{0-1} does not Granger Cause R^a_{0-1}		SBIC: 5.913	6.9464	0.0128**
R^a_{0-2} does not Granger Cause DR^+_{0-2}	2	AIC: 4.062	1.5727	0.2259
DR^+_{0-2} does not Granger Cause R^a_{0-2}		SBIC: 4.334	2.8451	0.0756*
R^a_{0-3} does not Granger Cause DR^+_{0-3}	1	AIC: 2.647	0.6267	0.4350
DR^+_{0-3} does not Granger Cause R^a_{0-3}		SBIC: 2.921	6.4281	0.0169**
R^a_{0-6} does not Granger Cause DR^+_{0-6}	1	AIC: 1.424	0.0008	0.9780
DR^+_{0-6} does not Granger Cause R^a_{0-6}		SBIC: 1.706	0.9886	0.3293
Panel D: Examine if There Is a Granger Cause Relationship between R^a_{0-t} and DR^-_{0-t} by QFII				
Null Hypothesis	Lag Period	AIC/SBIC	F-statistic	p-value
R^a_{0-1} does not Granger Cause DR^-_{0-1}	1	SBIC: 7.085	0.1857	0.6695
DR^-_{0-1} does not Granger Cause R^a_{0-1}			1.4040	0.2451
R^a_{0-2} does not Granger Cause DR^-_{0-2}	1	SBIC: 5.144	3.0027	0.0934*
DR^-_{0-2} does not Granger Cause R^a_{0-2}			0.5711	0.4557
R^a_{0-3} does not Granger Cause DR^-_{0-3}	1	AIC: 3.405	0.3324	0.5687
DR^-_{0-3} does not Granger Cause R^a_{0-3}		SBIC: 3.681	0.5988	0.4453
R^a_{0-6} does not Granger Cause DR^-_{0-6}	1	AIC: 1.640	3.6798	0.0661*
DR^-_{0-6} does not Granger Cause R^a_{0-6}		SBIC: 1.923	0.3587	0.5544

In Panel A, B, C and D, this study uses the Granger (1969) causality test to identify the causation between the cross-sectional mean of overbought herding measure, oversold herding measure or overbought and oversold in dollar ratio of QFIIs and the cross-sectional mean of abnormal returns in the same herding months separately. Testing if the average $BHM^+_{,t}$ of QFIIs Granger-Cause the average abnormal return, the complete model is $R^a_t = \sum_{j=1}^{p} d_{21,j} BHM^+_{t-j} + \sum_{j=1}^{p} d_{22,j} R^a_{t-j} + \gamma_{2,t}$, and the reduced model is when H_0: $d_{21,1}=d_{21,2}=\ldots\ldots d_{21,p}=0$. Also, testing if the average abnormal return Granger-Cause the average $BHM^+_{,t}$ of QFIIs, the complete model is $BHM^+_t = \sum_{j=1}^{p} d_{11,j} BHM_{t-j} + \sum_{j=1}^{p} d_{12,j} R^a_{t-j} + \gamma_{1,t}$, and the reduced model is when H_0: $d_{12,1}=d_{12,2}=\ldots\ldots=d_{12,p}=0$. ***, **, and * statistically significant at the 1, 5, and 10 percent levels, respectively.

Table 3: Feedback Trading and Cascading of BHM^{+}_{0-t} , SHM^{+}_{0-t} , DR^{+}_{0-t} , and DR^{-}_{0-t} by QFIIs.

Panel A_1: Pre—Herding 1 Month (SHM^{+}_{0-1} and BHM^{+}_{0-1}) Abnormal Return (in percent)		
Total Period:	SHM^{+}_{0-1}	BHM^{+}_{0-1}
−1 to 0 t-value	1.172 (6.714***)	1.543 (4.365***)
−2 to 0 t-value	0.984 (6.376***)	1.191 (4.926***)
−3 to 0 t-value	1.329 (13.010***)	0.766 (3.397***)
−6 to 0 t-value	1.288 (17.529***)	0.593 (3.255***)
Panel A_2: Pre—Herding 2 Months (SHM^{+}_{0-2} and BHM^{+}_{0-2}) Abnormal Return (in percent)		
Total Period:	SHM^{+}_{0-2}	BHM^{+}_{0-2}
−1 to 0 t-value	2.055 (8.650***)	1.131 (3.926***)
−2 to 0 t-value	2.037 (10.545***)	0.808 (4.089***)
−3 to 0 t-value	1.920 (11.817***)	0.826 (4.700***)
−6 to 0 t-value	1.755 (14.783***)	1.020 (4.918***)
Panel A_3: Pre—Herding 3 Months (SHM^{+}_{0-3} and BHM^{+}_{0-3}) Abnormal Return (in percent)		
Total Period:	SHM^{+}_{0-3}	BHM^{+}_{0-3}
−1 to 0 t-value	2.201 (8.252***)	1.703 (5.561***)
−2 to 0 t-value	2.054 (10.372***)	1.444 (6.399***)
−3 to 0 t-value	2.034 (14.122***)	1.138 (6.206***)
−6 to 0 t-value	1.969 (17.859***)	1.158 (5.703***)
Panel A_4: Pre—Herding 6 Months (SHM^{+}_{0-6} and BHM^{+}_{0-6}) Abnormal Return (in percent)		
Total Period:	SHM^{+}_{0-6}	BHM^{+}_{0-6}
−1 to 0 t-value	1.655 (9.093***)	1.496 (5.149***)
−2 to 0 t-value	1.710 (12.684***)	1.139 (5.139***)
−3 to 0 t-value	1.932 (14.753***)	1.010 (4.819***)
−6 to 0 t-value	1.800 (13.110***)	1.240 (6.123***)

Table 3: Feedback Trading and Cascading of BHM_{0-t}, SHM_{0-t}, DR^{+}_{0-t}, DR^{-}_{0-t} by QFIIs (Continued).

Panel B1: Pre—Herding 1 Month (DR^{+}_{0-1} and DR^{-}_{0-1}) Abnormal Return (in percent)

Total Period:	DR^{-}_{0-1}	Decile 3	DR^{+}_{0-1}	F-statistic
−1 to 0 t-value	-0.538 (-0.873)	1.521 (2.198**)	1.794 (2.626**)	18.083***
−2 to 0 t-value	-0.655 (-1.577)	0.283 (0.744)	1.246 (2.600**)	12.514***
−3 to 0 t-value	-0.360 (-1.012)	-0.232 (-0.918)	0.402 (1.109)	4.100**
−6 to 0 t-value	-0.747 (-3.147***)	-0.027 (-0.124)	-0.124 (-0.540)	3.236

Panel B₂: Pre—Herding 2 Months (DR^{+}_{0-2} and DR^{-}_{0-2}) Abnormal Return (in percent)

Total Period:	DR^{-}_{0-2}	Decile 3	DR^{+}_{0-2}	F-statistic
−1 to 0 t-value	0.069 (0.120)	1.156 (2.530**)	1.440 (2.626**)	7.002***
−2 to 0 t-value	0.031 (0.066)	1.267 (2.959***)	0.407 (0.863)	3.881*
−3 to 0 t-value	0.186 (0.422)	0.859 (2.275**)	0.255 (0.602)	2.030
−6 to 0 t-value	0.169 (0.682)	0.285 (1.935*)	0.579 (2.097**)	2.956

Panel B₃: Pre—Herding 3 Months (DR^{+}_{0-3} and DR^{-}_{0-3}) Abnormal Return (in percent)

Total Period:	DR^{-}_{0-3}	Decile 3	DR^{+}_{0-3}	F-statistic
−1 to 0 t-value	-0.079 (-0.174)	3.247 (5.297***)	0.608 (1.459)	2.986
−2 to 0 t-value	-0.161 (-0.417)	1.384 (4.627***)	0.813 (2.484**)	3.908*
−3 to 0 t-value	-0.055 (-0.147)	0.794 (3.195***)	0.913 (3.586***)	5.827**
−6 to 0 t-value	0.144 (0.610)	0.609 (2.945***)	0.425 (2.597**)	2.005

Panel B₄: Pre—Herding 6 Months (DR^{+}_{0-6} and DR^{-}_{0-6}) Abnormal Return (in percent)

Total Period:	DR^{-}_{0-6}	Decile 3	DR^{+}_{0-6}	F-statistic
−1 to 0 t-value	-1.588 (-2.334**)	1.873 (4.345***)	1.079 (2.341**)	9.164***
−2 to 0 t-value	-1.297 (-2.969***)	1.498 (4.211***)	0.352 (1.072)	5.123**
−3 to 0 t-value	-0.957 (-2.854***)	1.213 (4.947***)	0.373 (1.410)	2.770
−6 to 0 t-value	-0.765 (-4.000***)	1.253 (5.957***)	0.326 (1.554)	2.854

Table 3: Feedback Trading and Cascading of BHM_{0-t}, SHM_{0-t}, DR^{+}_{0-t}, DR^{-}_{0-t} by QFIIs (Continued).

Panel C1: The BHM^{+}_{-t1-0} and SHM^{+}_{-t1-0} before the BHM^{+}_{0-1} and SHM^{+}_{0-1} of stocks Traded by QFIIs (in percent)

	SHM^{+}_{0-1}	BHM^{+}_{0-1}
-1 to 0 t-value	0.064 (8.428***)	0.038 (10.321***)
-2 to 0 t-value	0.030 (5.756***)	0.030 (9.900***)
-3 to 0 t-value	0.026 (7.019***)	0.031 (13.933***)
-6 to 0 t-value	0.019 (3.215***)	0.028 (11.215***)

Panel C2: The DR^{+}_{-t1-0} and DR^{-}_{-t1-0} before the DR^{+}_{0-1} and DR^{-}_{0-1} of Stocks Traded by QFIIs (in percent)

	DR^{-}_{0-1}	Decile 3	DR^{+}_{0-1}	F-statistic
-1 to 0 t-value	-0.170 (-6.073***)	0.042 (0.148)	0.054 (2.026**)	6.958***
-2 to 0 t-value	-0.018 (-0.739)	0.044 (0.192)	0.091 (3.519***)	8.123***
-3 to 0 t-value	-0.033 (-1.680*)	0.127 (1.504)	0.114 (4.402***)	9.235***
-6 to 0 t-value	-0.007 (-0.429)	0.014 (0.123)	-0.019 (-1.207)	2.751

Panel D1: Regressing the BHM^{+}_{0-1} of Stocks Traded by QFIIs on BHM^{+}_{-t1-0}, SHM^{+}_{-t1-0}, and R^{a}_{-t1-0}

	α_0	α_1	α_2	α_3	F-statistic	R^2
-1 to 0 t-value	0.035 (3.397***)	0.301 (14.695***)	-0.290 (-13.053***)	-0.001 (-0.979)	0.963	0.085

Panel D2: Regressing the SHM^{+}_{0-1} of Stocks Traded by QFII on BHM^{+}_{-t1-0}, SHM^{+}_{-t1-0}, and R^{a}_{-t1-0}

	β_0	β_1	β_2	β_3	F-statistic	R^2
-1 to 0 t-value	0.046 (3.72***)	-0.119 (-9.408***)	0.199 (15.207***)	0.001 (0.552)	1.199	0.104

Panel D3: Regressing the DR_{0-1} of Stocks Traded by QFIIs on DR_{-t1-0} and R^{a}_{-t1-0}

	γ_0	γ_1	γ_2	F-statistic	R^2
-1 to 0 t-value	-0.001 (-0.226)	0.179 (11.153***)	-0.006 (-0.759)	1.432	0.082

The division method of the portfolios, the test statistics and the choice of the sample period are the same as Table I. In panel A and B, the periods-t1 to 0 (t1= one, two, three and six) indicate the periods between the first, second, third, and sixth month before the herding month to the herding month, respectively. Panel A_1, A_2, A_3 and A_4 report the results of feedback trading in the "overbought herding measure" BHM^{+}_{0-t} and "oversold herding measure" SHM^{+}_{0-t} of individual stocks traded by QFIIs each one (two, three, or six) herding month (months) separately. Panel B_1, B_2, B_3 and B_4 report the results of feedback trading in the overbought and oversold in dollar ratio (DR^{+}_{0-t} and DR^{-}_{0-t}) of individual stocks traded by QFIIs in the same herding interval separately. Panel C_1 and C_2 report the results of cascading in BHM^{+}_{0-t}, SHM^{+}_{0-t}, DR^{+}_{0-t} and DR^{-}_{0-t} by QFIIs in the same herding interval respectively. Panel D_1, D_2 and D_3 are the regression models of cascading and feedback trading in BHM^{+}_{0-t}, SHM^{+}_{0-t} and DR_{0-t}, represented as

$BHM^{+}_{0-1} = \alpha_0 + \alpha_1 BHM^{+}_{-t1-0} + \alpha_2 SHM^{+}_{-t1-0} + \alpha_3 R^{a}_{-t1-0}$, $SHM^{+}_{0-1} = \beta_0 + \beta_1 BHM^{+}_{-t1-0} + \beta_2 SHM^{+}_{-t1-0} + \beta_3 R^{a}_{-t1-0}$ *and*

$DR_{0-1} = \gamma_0 + \gamma_1 DR_{-t1-0} + \gamma_2 R^{a}_{-t1-0}$. ****, **, and * statistically significant at the 1, 5, and 10 percent levels, respectively.*

MOMENTUM AND CONTRARIAN EFFECTS ON HERDING MEASURES

The results in Panels A1, A2, A3, and A4 of Table 4 reveal that with the exception that overreaction of returns exists in those stocks with the BHM^{+}_{0-1} by QFIIs, the stocks with the BHM^{+}_{0-2}, BHM^{+}_{0-3}, and BHM^{+}_{0-6} show an underreaction of returns. These are positive, but the positive abnormal returns begin to reverse after the stocks have been held for six months or so. Overreaction consistently and obviously exists in those stocks with their oversold herding measure. Moreover, the results in Panels B1, B2, B3, and B4 of Table 4 demonstrate that while the post-herding abnormal returns of stocks with the $DR^{+}_{0-1}, DR^{-}_{0-1}$ by QFIIs represent the contrarian effect, those of stocks with their $DR^{+}_{0-2}, DR^{-}_{0-2}$, $DR^{+}_{0-3}, DR^{-}_{0-3}$, $DR^{+}_{0-6}, DR^{-}_{0-6}$ present obvious evidence of the momentum effect. Similar results were obtained in Panels C1, C2, C3, and C4 of Table 4. It is appropriate for other investors to buy the stocks with the BHM^{+}_{0-2}, BHM^{+}_{0-3} by QFIIs and to hold these stocks for three and two months respectively; the average abnormal returns will reach approximately 0.373% and 0.467%. It is also appropriate for other investors to sell those stocks with the BHM^{+}_{0-1} by QFIIs for six months, as the average abnormal returns will amount to approximately 0.527%. If other investors buy the stocks oversold by QFIIs on the numbers and hold for one month, however, the average abnormal returns will reach approximately 2.132%. Our results of the overbought and oversold herding measures by QFIIs are inconsistent with the results obtained by Wermers (1999). This demonstrates that the returns on stocks with the oversold herding measure are superior to those for stocks with overbought herding measure. The first reason is collective overselling among QFIIs in the Taiwan stock market so as to subsequently buy at low prices or anticipate large-scale changes in stock ownership. The second reason is that QFIIs go on arbitrage or hedge in the futures or options markets, ensuring that those stocks oversold by QFIIs in the numbers in the spot market are unable to reach relatively high prices and provide significantly greater abnormal returns in subsequent months.

It is appropriate for other investors to buy those stocks with the DR^{+}_{02}, DR^{+}_{03}, and DR^{+}_{06} by QFIIs and to hold them for one month; the average abnormal returns will reach approximately 1.504%, 1.236%, and 2.240%, respectively. It is also appropriate for other investors to sell those stocks with the DR^{+}_{01} by QFIIs and to last for six months; the average abnormal returns will reach approximately 0.729%. If other investors buy the stocks with the DR^{-}_{01} by QFIIs and hold for one month, the average abnormal returns will be maximized, reaching approximately 1.443%. If other investors sell the stocks oversold by QFIIs on the dollar amount over two and three (six) months and last for six (three) months, however, the average abnormal returns will reach approximately 0.998% and 0.475% (1.019%), respectively. The direction of the oversold in dollar ratio that drives prices positively is the opposite to that of the oversold herding measure that drives prices negatively. The reason may be that the stocks oversold by QFIIs on the dollar amount at the mid-to-long-term continuously and significantly exist in the rational herding behaviors of selling at a high price; such herding behaviors tend to generate a momentum effect.

The results in Panel C1 of Table 4 show that for selling (buying) stocks with the BHM^{+}_{01} (SHM^{+}_{01}) by QFIIs and lasting for six (two) months rather than one (one) month, the BHM^{+}_{01} (SHM^{+}_{01}) has a stronger negative impact on post-herding abnormal returns. The results in Panel C2, however, indicate that for buying the stocks with the BHM^{+}_{03} (SHM^{+}_{03}) by QFIIs and holding for two (one) months rather than one or six (two or six) months, the BHM^{+}_{03} (SHM^{+}_{03}) has a stronger positive (negative) impact on post-herding abnormal returns. The results in Panel C3 show that for selling (buying) stocks with the DR^{+}_{01} (DR^{-}_{01}) by QFIIs and lasting for six (one) months rather than one (six) month,

Table 4: Momentum Effects of QFIIs

Panel A₁: Post—Herding 1 Month (SHM^{+}_{0-1} and BHM^{+}_{0-1}) Abnormal Return (in percent)		
	SHM^{+}_{0-1}	BHM^{+}_{0-1}
1 to 2 t-value	2.083 (11.088***)	-0.294 (-1.070)
1 to 3 t-value	1.389 (10.668***)	-0.488 (-2.179**)
1 to 4 t-value	0.919 (6.787***)	-0.357 (-2.057**)
1 to 7 t-value	1.301 (14.688***)	-0.527 (-5.033***)
Panel A₂: Post—Herding 2 Months (SHM^{+}_{0-2} and BHM^{+}_{0-2}) Abnormal Return (in percent)		
	SHM^{+}_{0-2}	BHM^{+}_{0-2}
2 to 3 t-value	2.044 (12.630***)	0.133 (0.573)
2 to 4 t-value	1.221 (6.261***)	0.114 (0.638)
2 to 5 t-value	1.090 (6.375***)	0.373 (2.405**)
2 to 8 t-value	1.292 (4.921***)	-0.079 (-0.064)
Panel A₃: Post—Herding 3 Months (SHM^{+}_{0-3} and BHM^{+}_{0-3}) Abnormal Return (in percent)		
	SHM^{+}_{0-3}	BHM^{+}_{0-3}
3 to 4 t-value	2.210 (15.130***)	0.446 (1.723*)
3 to 5 t-value	0.979 (4.620***)	0.467 (2.818***)
3 to 6 t-value	1.249 (6.717***)	0.346 (2.435**)
3 to 9 t-value	1.239 (4.029***)	-0.167 (-1.679*)
Panel A₄: Post—Herding 6 Months (SHM^{+}_{0-6} and BHM^{+}_{0-6}) Abnormal Return (in percent)		
	SHM^{+}_{0-6}	BHM^{+}_{0-6}
6 to 7 t-value	2.191 (15.774***)	0.368 (1.340)
6 to 8 t-value	1.919 (7.519***)	0.252 (1.300)
6 to 9 t-value	2.011 (10.751***)	0.190 (1.060)
6 to 12 t-value	2.139 (5.880***)	-0.124 (-0.913)

Table 4: Momentum Effects of QFIIs (Continued)

Panel B_1: Post—Herding 1 Month (DR^{+}_{0-1} and DR^{-}_{0-1}) Abnormal Return (in percent)				
	DR^{-}_{0-1}	Decile 3	DR^{+}_{0-1}	F-statistic
1 to 2 t-value	1.443 (1.707*)	0.694 (1.079)	-0.209 (-0.371)	10.821***
1 to 3 t-value	0.490 (1.038)	-0.080 (-0.206)	-0.246 (-0.624)	6.281**
1 to 4 t-value	0.013 (0.058)	-0.425 (-1.332)	-0.487 (-1.752*)	3.937*
1 to 7 t-value	-0.220 (-1.614)	-0.419 (-2.543**)	-0.729 (-5.74***)	1.009
Panel B_2: Post—Herding 2 Months (DR^{+}_{0-2} and DR^{-}_{0-2}) Abnormal Return (in percent)				
	DR^{-}_{0-2}	Decile 3	DR^{+}_{0-2}	F-statistic
2 to 3 t-value	0.538 (0.898)	0.967 (1.905*)	1.504 (2.722***)	7.934***
2 to 4 t-value	-0.323 (-0.723)	0.411 (1.029)	0.622 (1.473)	5.438**
2 to 5 t-value	-0.771 (-2.163**)	0.213 (0.695)	0.815 (2.543**)	6.465**
2 to 8 t-value	-0.998 (-4.227***)	0.650 (4.769***)	1.121 (4.70***)	8.990***
Panel B_3: Post—Herding 3 Months (DR^{+}_{0-3} and DR^{-}_{0-3}) Abnormal Return (in percent)				
	DR^{-}_{0-3}	Decile 3	DR^{+}_{0-3}	F-statistic
3 to 4 t-value	0.036 (0.089)	1.215 (2.594**)	1.236 (2.632**)	3.890*
3 to 5 t-value	0.421 (1.172)	0.811 (2.101**)	0.776 (2.633**)	3.857*
3 to 6 t-value	0.067 (0.198)	0.521 (1.911*)	0.522 (2.310**)	3.872*
3 to 9 t-value	-0.475 (-2.608***)	1.176 (5.999***)	0.072 (0.602)	3.001
Panel B_4: Post—Herding 6 Months (DR^{+}_{0-6} and DR^{-}_{0-6}) Abnormal Return (in percent)				
	DR^{-}_{0-6}	Decile 3	DR^{+}_{0-6}	F-statistic
6 to 7 t-value	0.094 (0.183)	-0.181 (-0.457)	2.240 (5.214***)	6.232**
6 to 8 t-value	-0.725 (-2.135**)	-0.510 (-2.001**)	1.554 (5.295***)	5.548**
6 to 9 t-value	-1.019 (-3.556***)	-0.529 (-2.358**)	1.466 (5.780***)	7.246***
6 to 12 t-value	-0.678 (-2.826***)	-0.429 (-2.239**)	0.952 (7.114***)	5.850**

Table 4: Momentum Effects of QFIIs (Continued)

Panel C_1: Regressing Post—Herding Return on the 1-month Herding Measure by QFII (in percent)					
	α_0	α_1	α_2	F-statistic	R^2
1 to 2 t-value	2.014 (2.982***)	-0.991 (-1.020)	3.884 (4.763***)	1.752	0.079
1 to 3 t-value	1.058 (1.706*)	-1.760 (-1.682*)	2.105 (1.957*)	1.658	0.058
1 to 7 t-value	1.102 (1.599)	-1.982 (-1.750*)	2.034 (1.679*)	1.596	0.046
Panel C_2: Regressing Post—Herding Return on the 3-months Herding Measure by QFII (in percent)					
	α_0	α_1	α_2	F-statistic	R^2
3 to 4 t-value	1.785 (1.905*)	2.126 (2.008**)	5.218 (3.935***)	3.853	0.083
3 to 5 t-value	1.983 (2.034**)	2.997 (2.758***)	2.235 (2.125**)	2.752	0.067
3 to 9 t-value	2.004 (1.986**)	1.650 (1.670*)	3.812 (2.980***)	3.847	0.075
Panel C_3: Regressing Post—Herding Return on the 1-month Dollar Ratio by QFII (in percent)					
	β_0	β_1	β_2	F-statistic	R^2
1 to 2 t-value	3.128 (3.254***)	-1.028 (-1.199)	2.132 (1.988**)	3.958	0.095
1 to 7 t-value	4.051 (2.250**)	2.005 (-1.890*)	-0.518 (-1.09)	3.870	0.087
Panel C_4: Regressing Post—Herding Return on the 6-months Dollar Ratio by QFII (in percent)					
	β_0	β_1	β_2	F-statistic	R^2
6 to 7 t-value	2.435 (2.537**)	4.227 (5.438***)	0.125 (0.170)	5.809	0.112
6 to 9 t-value	2.065 (1.704*)	2.673 (3.745***)	-1.989 (-3.012***)	6.700	0.296

Panel A_1, A_2, A_3 and A_4 report the momentum effects in the "overbought herding measure" BHM^{+}_{0-t} "oversold herding measure" SHM^{+}_{0-t} of individual stocks traded by QFIIs each one (two, three, or six) herding month(s) separately. Panel B_1, B_2, B_3 and B_4 report the momentum effects in the "overbought and oversold in dollar ratio" (DR^{+}_{0-t} and DR^{-}_{0-t}) of individual stocks in the same herding interval respectively. The periods t= one to two (t = one to three), for example, indicate holding or continuing one (two months) after BHM^{+}_{0-1}, SHM^{+}_{0-1}, DR^{+}_{0-1} or DR^{-}_{0-1} of individual stocks traded by QFIIs. Panel C_1, C_2, C_3 and C_4 report the respective results of regressing post-herding mean abnormal return on BHM^{+}_{0-t}, SHM^{+}_{0-t} or DR^{+}_{0-t}, DR^{-}_{0-t} of QFII. Illustrate the regression models of Panel C as below.

Panel C_1: $R^{a}_{1-2} = \alpha_0+\alpha_1 BHM^{+}_{0-1} +\alpha_2 SHM^{+}_{0-1}$

$R^{a}_{1-3} = \alpha_0+\alpha_1 BHM^{+}_{0-1} +\alpha_2 SHM^{+}_{0-1}$

$R^{a}_{1-7} = \alpha_0+\alpha_1 BHM^{+}_{0-1} +\alpha_2 SHM^{+}_{0-1}$

Panel C_2: $R^{a}_{3-4} = \alpha_0+\alpha_1 BHM^{+}_{0-3} +\alpha_2 SHM^{+}_{,0-3}$

$R^{a}_{3-5} = \alpha_0+\alpha_1 BHM^{+}_{0-3} +\alpha_2 SHM^{+}_{,0-3}$

$R^{a}_{3-9} = \alpha_0+\alpha_1 BHM^{+}_{0-3} +\alpha_2 SHM^{+}_{,0-3}$

Panel C_3: $R^{a}_{1-2} = \beta_0+\beta_1 DR^{+}_{0-1} +\beta_2 DR^{-}_{0-1}$

$R^{a}_{1-7} = \beta_0+\beta_1 DR^{+}_{0-1} +\beta_2 DR^{-}_{0-1}$

Panel C_4: $R^{a}_{6-7} = \beta_0+\beta_1 DR^{+}_{0-6} +\beta_2 DR^{-}_{0-6}$

$R^{a}_{6-9} = \beta_0+\beta_1 DR^{+}_{0-6} +\beta_2 DR^{-}_{0-6}$

***, **, and * statistically significant at the 1, 5, and 10 percent levels, respectively.

The overbought / oversold in dollar ratio has a stronger negative impact on post-herding abnormal returns. The results in Panel C4, however, show that or buying (selling) stocks with the DR^{+}_{06} (DR^{-}_{06}) by QFIIs and lasting for one (three) months rather than three (one) months, the overbought / oversold in dollar ratio has a stronger positive impact on post-herding abnormal returns. The analytical results presented in Panels C in Table 4 are largely consistent with those of Panels A and B. Furthermore, the above conclusion is inconsistent with the results of the US stock market undertaken by de Long *et al* (1990). Our results indicate that positive feedback trading by QFIIs in the Taiwan stock market leads to an overreaction, not just when they ignore fundamentals and create systemic pricing errors. For the one-month overbought herding measure or overbought / oversold in dollar ratio by QFIIs, positive feedback trading and overreaction of abnormal returns exist simultaneously. Most importantly, this implies a market inefficiency in the Taiwan stock market for the overbought herding measure, oversold herding measure, and overbought / oversold in dollar ratio by QFIIs; this positively or negatively drives post-herding returns.

CONCLUSION

This study employs the overbought-oversold indices of the buy herding measure and sell herding measure raised by Wermers (1999), and the overbought–oversold indices of dollar-ratio raised by Lakonishok et al. (1992) and Borensztein and Gaston (2003). This requires them to be indexed to measure herding behaviors by QFIIs in the Taiwan stock market in order to extend the study of Nofsinger and Sias (1999) and provide a clear operational definition for the herding effect, feedback trading, cascading, and herding impacting price by QFIIs. The econometric causality test is also invoked to determine whether the herding effect caused by QFIIs overbought–oversold in the Taiwan equity market primarily results from feedback trading or herding impacting price. We confirm the statistical causality direction between the herding behaviors on the numbers or dollar amount by QFIIs and abnormal returns, indicating a connection between the series of studies on feedback trading and momentum strategies in the securities market and related studies on herding behaviors of the numbers and dollar amount by institutional investors.

Empirical investigations reveal an obvious herding effect in the short-term overbought herding measure and longer-term oversold in dollar ratio by QFIIs in the Taiwan securities market. This results primarily from positive feedback trading by QFIIs; however, none of the oversold herding intervals of QFIIs show a herding effect. Moreover, there exits an obvious herding effect in the short- to mid-term overbought in dollar ratio, which results from the momentum effect of abnormal returns caused by QFII's herding. The impact of cascading on the numbers and dollar amount by QFIIs is greater than that of the feedback trading.

This study also demonstrates that except where portfolios with the one-month overbought herding measure by QFIIs drive post-herding abnormal returns in reverse, the stocks with the overbought herding measure over two, three, and six months will positively drive in post-herding abnormal returns. Nevertheless, the oversold herding measure of QFIIs will drive reverse post-herding abnormal returns to positive returns. Our results present that stocks institutional investors selling outperform those they buying in the number traded by QFIIs, which disagrees with the conclusions of U.S. proposed by Wermers (1999). Moreover, stocks with the one-month overbought (oversold) in dollar ratio by QFIIs present a contrarian effect, whereas stocks with the overbought (oversold) in dollar ratio over two, three- and six months display a significant momentum effect. More importantly, empirical results that the overbought herding measure, oversold herding measure, and overbought–oversold in dollar ratio by QFIIs clearly drive returns indicate that the Taiwan equity market is not an efficient market. Investors who positively or reversely follow the signals derived from the numbers and dollar amount of QFIIs in establishing securities portfolios and maintaining proper continuing periods are likely to obtain abnormal returns.

This paper helps in establishing the herding measures of the overbought herding measure, oversold herding measure, and overbought–oversold in dollar ratio to be used in measuring the herding of QFIIs in the Taiwan securities market. It is also revealed that the statistical causality direction between the herding behaviors on the numbers or dollar amounts among QFIIs and the corresponding abnormal returns. Our results confirm that the herding effect of short-term overbought herding measure and longer-term oversold in dollar ratio by QFIIs is mainly a result of positive feedback trading among QFIIs, whereas the herding effect of the short- to mid-term overbought in dollar ratio by QFIIs is primarily the result of "momentum persistence of abnormal returns." Results of this study contribute to studies of herding effect measured by the numbers and dollar amounts of institutional investors; these studies will be integrated with a series of studies on reactions to information on the securities market.

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END NOTES

1. The maximum individual investment for QFIIs investing in the equity market has been adjusted upward from US$50 million in 1991 to US$3 billion in 2001. The number of QFIIs has increased from 227 in 2001 to 536 in 2007. The ratio of trading dollar amounts by all foreign investors to the total trading volume increased from 5.9% in 2001 to 14.9% in June, 2007. These data were provided by the Taiwan Stock Exchange Corporation.
2. Although the number of institutional investors does not directly measure analyst coverage, Arable, A., Carvel, S. and Strobe, P. (1983) pointed out that the number of institutional investors in any one stock is strongly correlated with the number of analysts covering that stock. This is logical because sell-side analysts follow stocks as a service to institutional clients.
3. [3] The number of listed companies in the Taiwan stock market differs from those in the American stock market, and they are divided into no more than five portfolios. As the number of companies listed on the NYSE and NASDAQ stock markets approaches 3000, authors in America prefer to divide them into 10 groups. On the other hand, if we divide these companies into fewer portfolios, the differences among different portfolios may be insignificant.
4. [4] Because parts of the herding measures and the corresponding abnormal returns are negative, we are unable to directly extract the natural logarithm for them; instead, we use the difference or original series in conducting a subsequent ADF test. If these series do not have any unit root before the difference, they are maintained as the original series; otherwise, they are transformed into difference types to ensure the stability of the variable series.

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