The Study of Taiwan Real Estate Stocks Herded By Foreign Institutional Investors

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ABSTRACT

This paper analyses the relations between Taiwan real estate stocks herded by foreign institutional investors and abnormal returns with factoring in the impact from stock characteristics, macroeconomic conditions, real estate market conditions as well as overseas conditions. The empirical results of this study find that foreign institutional investors herding on the real estate stocks in the previous month significantly affect the abnormal returns in the current month. By using panel regression, we demonstrate an obviously positive relationship between abnormal returns after foreign institutional investors herding and stock characteristics, such as earnings per share, price-to-book ratio, buy/sell difference, return on equity and turnover; in terms of macroeconomic factors, a positive relationship between abnormal returns after foreign institutional investors herding and monetary supply and a negative relationship between fluctuations of Taiwan dollars v.s. US currency. By using pooled regression, we show an obviously positive relationship between abnormal returns after foreign institutional investors herding and real estate market conditions , such as mortgage rate and home price indices. We also find a negative relation between abnormal returns and overseas stock index.

Keywords : Herding, Real estate stocks, Abnormal returns, Foreign institutional investors

1. Introduction

The building construction companies are the cycle effect and high rate of return, in statistics, the year of 2000 to 2012 the Gross returns raised high and continuously keep in 30% high. Besides, the year 2000 to 2002 the worldwide down-economic and low-interest rate impacted. In Taiwan, the study on performance the building construction companies are more in financial performance analysis and indicators chosen such as Haung(2008). In Haung(2008) applied financial ratios to establish the profitable performance indicated. Change(2006) used the construction industry characteristics and land developing decision making topics to have productivity efficiency analysis. Chiang(2008) established the warning system of construction industry by financial model. These studies provide the investor as reference in investment. However, stock-buyer refer to the basic analysis of securities investment in individual industry company operated strategy, we also can study on buy/sell difference by technical analysis of securities investment (TASI).

[insert Table 1-1 here]

Foreign institutional investors (FIIs) are not only more rational than general investors but also place greater emphasis on long-term strategies in emerging stock markets than do domestic institutional investors (e.g., Lu, Fang and Nieh, 2012). Spano (2013) proposes that emerging countries, especially those that show high GDP growth rates, result from massive accumulation of foreign capital inflow. The dollar amounts traded by FIIs in emerging stock markets are substantially higher than the amounts traded by other institutional investors (e.g., Fang, Lu and Yau, 2013a; Fang et al., 2013b). Chang (2010) found that when FIIs change their weightings in particular sectors, the weightings of other institutional investors, such as security dealers and mutual funds, change positively during the same and subsequent periods. Thus, FIIs' trading behavior typically serves as a reference for the investment decisions of other investors. Moreover, based on competition and a lack of familiarity with the target country, some FIIs may follow each other into and out of the same securities, a behavior referred to as 'FII herding' (e.g., Fang et al., 2013b). Gur, Canpolat and Ozel (2011) argue that the herd behavior of institutional speculators can be one of the causes that result in the recent financial crisis. Because Taiwan's stock market has a plain-plate market structure, the impact of FII herding on the post-herding abnormal returns of these stocks is larger than the impact in developed stock markets. Therefore, this study explores whether FIIs' overbought trading strategies are correlated with significant changes in post-herding abnormal returns. Furthermore, exploring the types of stocks that are herded by foreign institutional investors and that have higher abnormal returns in Taiwan's stock market is worthwhile for investors.

This study is to use a pooled / panel regression model to examine whether subsequent abnormal returns from FII herding behavior are different in real estate stock characteristics, Real Estate Market and Economic variables are evaluated separately as Control variables. The way will fill the gap in the literature of the price impact of institutional herding. The layout of this paper is as follows. Literature reviews are following section 2. Section 3 explains the research design and methodology, including the data scope, the measurement of the variables, and the establishment of the research model. Section 4 discusses the empirical results, including the results on different markets over stock and real estate. Section 5 presents the conclusions.

2. Literature Reviews

The majority of previous studies have measured institutional investors' overbought and oversold stocks based on the change in share ownership (Nofsinger and Sias, 1999; Dennis and Weston, 2001; Chakravarty, 2001; Cai, Kaul, and Zheng, 2000; Sias, Starks, and Titman, 2002). Alternatively, Jones and Winters (1999) indicated that the number of institutional investors in a particular stock captures the breadth of ownership and analyst coverage, which reflects new entrants and thus the possibility of additional analysis. The herding measure developed by Lakonishok, Shleifer, and Vishny (LSV) (1992)

tests the levels of cross-sectional variation in the proportion of a stock that fund managers purchase across all stocks in a specific period; this measure has become a standard test in the herding-related literature. Wylie (2005) employed the LSV measure with an adjustment for biases and found evidence of fund manager herding in the largest and smallest individual UK stocks even if minimal herding occurred in other stocks. However, the LSV index is unable to capture the interaction between movements in the buying and selling directions of institutional investors because it does not consider buying and selling separately. Wermers (1999) expanded the LSV measure to a buying and selling conditional herding measure. Chang, Chen and Jiang (2012) use HM, BHM, and SHM measures on both institutional and individual investors' trading data to investigate the profitability of investment strategies based on herding measures.

Moreover, the results of Hung, Lu, and Lee (2010) demonstrated that price persistency following buying herding behavior by mutual funds is value-relevant information, whereas return reversal following funds' selling herding behavior is non-informational in Taiwan. Additionally, Nofsinger and Sias (1999) and Wermers (1999) found that stocks bought by institutional investors outperformed stocks sold by these investors. The results of Chen, Kao, and Liu (2005) demonstrated that in the Taiwanese stock market, abnormal returns driven by the buying herding behavior of mutual funds are larger than those driven by selling herding behavior. Additionally, because investors in Taiwan are prohibited from selling stocks, this study only uses the buy herding measure (BHM) to determine FIIs' buying herding direction.

Numerous empirical studies have examined the price effects of institutional herding but with differing results (Grinblatt, Titman, and Wermer 1995; Nofsinger and Sias, 1999; Wermers, 1999; Dennis and Weston, 2001; Sias, Starks, and Titman, 2002; Sias, 2004). Sias (2004) and Grinblatt, Titman, and Wermer (1995) reported that institutional herding is weakly positively correlated with future returns. Hung, Lu, and Lee (2010) proposed that there will be no price reversals from institutional herding if institutional herding is informational. However, Dennis and Weston (2001), Chakravarty (2001), and Sias, Starks, and Titman (2002) documented that the subsequent returns from institutional herding driven by fads, reputation herding, or characteristic herding are significantly reversed. These different conclusions imply that several important variables are potentially ignored when analyzing the price impact of institutional herding. Thus, this paper examines whether post-herding abnormal returns in stocks herded by FIIs are significantly positive and analyzes the characteristics of these stocks to determine whether FII herding is based on value-relevant information.

Numerous studies have demonstrated the existence of return momentum (Jegadeesh and Titman, 1993; Grinblatt, Titman, and Wermer, 1995; Chan, Hameed, and Tong, 2000; Chen and Wu, 2008; Fama and French, 2012), and Grinblatt, Titman, and Wermer (1995), Wermers (1999, 2000), Nofsinger and Sias (1999), Grinblatt and Keloharju (2000), and Phansatan et al. (2012) found that institutions adopt a return momentum strategy. However, a number of studies have documented the existence of a contrarian strategy and have found market overreaction (Lo and Mackinlay, 1990; Fama and French, 1996). Moreover, Lang and McNichols (1997) found that the investing strategy of an institution is related to positive or negative earnings information when earnings are announced. Beaver (1989) indicated that the impact of earnings information on stock price efficiency is related to the market efficiency created by institutional investors. Additionally, numerous studies demonstrated earnings momentum produced by past earnings and future returns (Foster, Olsen, and Shevlin, 1984; Bernard and Thomas, 1989; Chan, Jegadeesh, and Lakonishok, 1996; Schneider and Gaunt, 2012; Chen, Chen, Hsin and Lee, 2014). However, Chan, Jegadeesh, and Lakonishok (1999) found a weak positive relationship between return momentum and earnings momentum, which reflects differences in informational content. The results of Chan, Jegadeesh, and Lakonishok (1996) indicated that an earnings variable is a better predictor of future return performance than past returns, whereas its persistence is shorter. Moreover, LSV (1994) demonstrated that based on the consideration of the agency problem and short-term performance evaluations, institutional investors prefer to invest in

glamour stocks rather than to invest in short-term value stocks with poor performance. However, Fama and French (1992, 1993, 1995, 1996) and Daniel and Titman (1997) indicated that the book-to-market ratio could positively affect the cross-sectional expected returns of stocks. Thus, considering FIIs' post-herding abnormal stock returns, we explore whether the return performance of stocks with previously higher returns, earnings, or book-to-market ratios is superior.

Campbell et al. (2001) and Chordia, Roll, and Subrahmanyam (2001) noted that markets experience substantial increases in share turnover and firm-specific risk over time. Bennett, Sias, and Starks (2003) speculated that institutional investors' herding behavior might vary over time because the environment that investors face is dynamic. The bullish and bearish periods in stock markets create the most universally dynamic environment among the various financial markets faced by institutional investors. Several studies, including Hwang and Salmon (2004), proposed that institutional herding behavior exists in both bearish and bullish stock markets, whereas numerous studies, including McQueen, Pinegar, and Thorley (1996), Chang, Cheng, and Khorana (2000), Gleason, Mathur, and Peterson (2004), Demirer and Kutan (2006) and Demirer et al. (2010), verified that investors' herding behavior is more significant in bearish markets than in bullish markets. Thus, another objective of this paper is to clarify whether the price impact of FIIs' herding behavior exists regardless of whether FIIs operate in a bullish or bearish stock market or whether the impact exists in a bearish period because of investors' quick reactions to negative news in such a market. Furthermore, this study explores whether the price impact of FIIs' herding behavior on the characteristics of stocks is different during bullish and bearish periods because the stock characteristic incentives for FIIs' herding behavior might differ during the different types of trading periods.

In other words, this paper assumes that the price impact of FII herding behavior may be influenced by returns, earnings, and book-to-market ratios, which would exhibit a different impact among different individual stocks such as real estate stocks. To allow for such a different impact, this study adopts a panel regression model to avoid the possible limitation that price effects from institutional herding behavior cannot be continually divided, as noted in previous studies by Wermers (1999), Sias, Starks, and Titman (2002), and Sias (2004).

[insert Table 2-1 here]

3. Data, Variables, and Methodology

3.1 Data scope

In the Taiwanese real estate stock market, foreign institutional investors place a greater emphasis on long-term strategies than domestic institutional investors do. These foreign investors often overbuy or oversell stocks during a sectional period, even for many days or several weeks, to drive stock prices up or down. Because of this behavior, we use monthly data instead of daily data to measure the degree of FIIs' herding behavior. The raw data analyzed in this study are the monthly individual stock returns of real estate companies listed on the Taiwan Stock Exchange Corporation (TSEC), weighted stock index returns, and FII buying and selling statistics between January 2007 and June 2012, 75 individual real estate stocks . These data were further transformed into the abnormal returns of individual stocks and the BHM for FIIs. Moreover, this study downloaded and divided the time bases of returns, earnings, and book-to-market ratios on a monthly basis and adjusted the data for the same period. The data were obtained from the Taiwan Economic Journal Data Bank. FII trading numbers were derived from each trading day and accumulated until the end of each month. If the net trading accumulation of a particular stock by one FII during a given month was positive (negative), then that FII was counted as buying (selling).

3.2 Variable measures

3.2.1 BHM

With regard to quantifying the degree of herding in trading numbers among FIIs, this study used the BHM ($BHM_{i,t}$) proposed by Wermers (1999) to identify all FIIs that have a higher-than-expected ratio for buyers. However, the study does not use the sell herding measure ($SHM_{i,t}$) for any given month because in practice, securities authorities encourage investors to buy rather than sell stocks; therefore, the price impact of institutional investors selling stocks is smaller than the price impact of their stock purchases.Thus, we do not consider the price impact of FIIs selling stocks. Because BHMs can clearly indicate the existence of a mutual movement in buying direction among FIIs, these measures can capture differences in FIIs' increases in share ownership. That is, when $BHM_{i,t}$ is significantly greater than zero, the trading behavior in stock *i* by FIIs over a given month *t* has a herding tendency towards the buyer relative to the average trading of all stocks. The $BHM_{i,t}$ cited in this study is expressed as follows:

$$BHM_{i,t} = HM_{i,t} \big/ p_{i,t} > E\left[p_{i,t}\right] \quad (1)$$

$$HM_{i,t} = \left|p_{i,t} - E\left[p_{i,t}\right]\right| - E\left|p_{i,t} - E\left[p_{i,t}\right]\right| \quad (2)$$

where $p_{i,t}$ is the proportion of all FIIs buying stock *i* during month *t*, $p_{i,t} = \frac{B_{i,t}}{B_{i,t} + S_{i,t}}$, and $E\left[p_{i,t}\right]$ is the expected proportion of all FIIs who are buyers during *t* month in all traded stocks. An adjusting factor $E\left|p_{i,t} - E\left[p_{i,t}\right]\right|$ is then subtracted to allow for random variation around the expected value of $\left|\frac{B_{i,t}}{B_{i,t} + S_{i,t}} - E\left[p_{i,t}\right]\right|$ under the null hypothesis of no herding by FIIs.

3.2.2 Abnormal returns

The abnormal return of an individual stock *i* for a given month is calculated based on the capital asset pricing model. $r_{i,t-j}$ represents the monthly return of an individual stock *i* in the current month and during the past 11 months; $r_{f,t-j}$ represents the risk-free rate in the current month and during the past 11 months, which is the interest rate for a one-month term deposit offered by Taiwan First Bank; $r_{m,t-j}$ represents the return of the TAIEX stock price index in the current month and the previous 11 months. The abnormal return ($R^a_{i,t}$) of stock *i* during month *t* is defined as follows:

$$R^a_{i,t} = \left(r_{i,t-j} - r_{f,t-j}\right) - \beta_i \left(r_{m,t-j} - r_{f,t-j}\right), \qquad t1=0,\ldots,11. \quad (3)$$

3.2.3. Measurement of earnings

This study used 'standardized unexpected earnings' (SUE) as proposed by Chan, Jegadeesh, and Lakonishok (1996) to measure the expected earnings during the sample period. However, quarterly earnings per share were converted into monthly earnings per share to analyze monthly frequency. The formula for SUE was modified as follows:

$$SUE_{it} = \frac{e_{im} - e_{im-12}}{\sigma_{it}}, \quad (4)$$

where e_{im} represents the monthly earnings per share of stock *i* in month *t*, e_{im-12} represents the monthly earnings per share of stock *i* in the preceding 12 months, and σ_{it} represents the standard deviation of $e_{im} - e_{im-12}$ over the previous two years of unexpected earnings.

3.2.4. Measurement of book-to-market ratio

The book-to-market ratio is measured by dividing the net value per share by the closing price of ordinary shares, where the net value per share is the result of dividing the book value of common stock by the number of ordinary shares outstanding. The book-to-market ratio ($BM_{i,t}$) of stock *i* during month *t* is defined as follows:

$$BM_{i,t} = \frac{BE_{i,t} / Q_{i,t}}{P_{i,t}}. \quad (5)$$

where $BE_{i,t}$ represents the book value of the equity of stock *i* during month *t* and $Q_{i,t}$ ($P_{i,t}$) represents the number of shares outstanding (the closing price) of stock *i* during month *t*.

3.3 Methodology

Identifying subsequent abnormal returns from FIIs' buying herding as significantly positive (negative) indicates the existence of a buying force among FIIs that positively (negatively) drives prices. Moreover, a number of studies observed return momentum and earnings momentum (Jegadeesh and Titman, 1993; Grinblatt, Titman, and Wermer, 1995; Chan, Hameed, and Tong, 2000; Chen and Wu, 2008; Ball and Brown, 1968; Foster, 1977; Jones and Litzenberger, 1970; Latane and Jones, 1979; Foster, Olsen, and Shevlin, 1984; Bernard and Thomas, 1989; Chan, Jegadeesh, and Lakonishok, 1996) and numerous studies demonstrated that the book-to-market ratio has a significantly positive influence on subsequent performance (Fama and French, 1992, 1993, 1995, 1996; Daniel and Titman, 1997). To evaluate the price impact of FIIs' buying herding behavior and respective returns, earnings, and book-to-market ratios on individual stocks, this study separately regressed the abnormal returns (($R^a_{i,t}$)or (Y1)) of stock *i* in the current month on FII buying herding ($BHM_{i,t-1}$ or (XB)) of stock *i* in the previous month and the respective returns ($R_{i,t-1}$), earnings ($SUE_{i,t-1}$ or (X1)) and book-to-market ratio ($B/M_{i,t-1}$ or (X2)) of stock *i* in the previous month in a pooled and panel model expressed as follows:

$$R_{i,t} = \beta_0 + \beta_1 BHM_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

$$R^a_{i,t} = u_i + \beta_1 BHM_{i,t-1} + \beta_2 q_{i,t-1} + \varepsilon_{i,t}, \quad (7)$$

where $q_{i,t-1}$ represents the control variable (i.e., X1~X7 or Wi).

The coefficient of β_1 represents the extent of the price impact from FIIs' buying herding and the coefficient of β_2 represents the extent of the return momentum, the earning momentum, or the effects of the book-to-market ratio(X2) or X3~X7. The same model used in the regressed the abnormal returns (($R^a_{i,t}$)or (Y1)) of stock *i* in the current month on FII buying herding ($BHM_{i,t-1}$ or (XB)) of stock *i* in the previous month and the respective on the control variable on real estate and macro-economic market to evaluate the price impact of FIIs' buying herding behavior.

4. Empirical Results

The models separately used in the regressed the abnormal returns (($R^a_{i,t}$)or (Y1)) of stock *i* in the current month on FII buying herding ($BHM_{i,t-1}$ or (XB)) of stock *i* in the previous month and the respective on the control variable on real estate stock characteristics and real estate and macro-economic market to evaluate the price impact of FIIs' buying herding behavior. The real estate stocks in this study included a set of 75 firms from January 2007 to June 2012, and the sample was designed for balanced panels. The variables used in this empirical study to list the summary statistics on Table 4-1 and the Figure 4-1 shown the trend of real estate stock characteristics, the abnormal returns (Y1).

[insert Table 4-1 here] [insert Figure 4-1 here]

The means of Earnings per share (X1), Price-to-book ratio(X2), Buy/sell difference(X3), Size of company(X4), Abnormal returns(Y1), Operating profit rRatio (X5), Return on equity(X6), Turnover (X7), Foreign institutional investors herding(XB) are 0.02,1.38, 7.02, 17906.67, -0.45, -52.48, 0.62, 16.89 and 0.51 respectively, and the standard deviations, maximum values, minimum values, skewness, and kurtosis of these variables are also shown. The variable Size of company(X4) has the largest standard deviation, 29250.89, whereas abnormal returns(Y1) has the standard deviation, 9.99.

4.1 Findings of the panel unit root and basic statistics

To avoid spurious regressions, the variables in the pooled and panel regressions model must be stationary. We use the well-known LLC (Levin, Lin, and Chu, 2002), IPS (Im, Pesaran, and Shin, 1997) and Hadri (2000) methods to proceed with the panel unit root test because only panel data are considered in this study. Regardless of the stationary test used, all real estate stock panels hold stationary characteristics, which advance the estimations of the pooled and panel regressions model. The panel unit root test results shown on Table 4-2. Table 4-3 show the panel unit root test results of real estate and macro-economic market variables. The variables need to be difference and hold stationary shown in Table 4-4. The control variables listed the illustrated more detail on Table 4-5.

[insert Table 4-2 here] [insert Table 4-3 here] [insert Table 4-4 here]
[insert Table 4-5 here]

4.2 Results for the Real Estate Stocks

In advance the estimations of the pooled and panel regressions model we have PLS1~ PLS8 for the real estate stocks. The coefficients of the pooled regression, panel regression, and associated *t*-statistics (computed from the time-series standard errors) in Equation (6) & (7) are reported in Table 4-6 ~ Table 4-9.

[insert Table 4-6 here]

The results of the Hausman test helped to determine the use of a fixed effects model for all transition variables. Except for the results of the pooled regression in Table 4-6, the results in Table 4-7 consistently indicate that subsequent abnormal returns using returns and the book-to-market ratio are separately significantly positive, and those of FIIs' buying herding are all significant even after the respective control variable is considered. In addition, the average coefficient associated with the lagged FIIs' buying herding is larger than the average coefficients associated with the lagged SUE and returns. In summary, the price impact of FIIs' buying herding is significant when we separately treat SUE, returns, and the book-to-market ratio as control variables. The price impact of FIIs' buying herding is larger than the price impact of stock SUE and returns in the Taiwanese stock market.

[insert Table 4-7 here]

2.3 Results for the Real Estate & Macro-economic Markets

We use pooled regressions for real estate & macro-economic markets in Taiwan to test whether the price impacts of FIIs' herding exist regardless of whether the respective control variable is real estate & macro-economic markets or stock characteristics or whether such impacts are more significant. Table 4-8 presents our results, which indicate that the subsequent abnormal returns of FIIs' buying herding are primarily significantly positive even after the respective control variable is considered, regardless of whether a bearish or bullish stock period is analyzed. and the respective control variable on stock characteristics

[insert Table 4-8 here]

To further analyze whether the price impacts of FIIs' herding and the respective control variable on different characteristics are different, this study separately examines the price impacts of FIIs' herding and the respective control variable affected by stock characteristics.
The results of the Hausman test helped to determine the use of a fixed effects model for some variables. Except for the results of the pooled regression in Table 4-9, the results in Table 4-9 consistently indicate that subsequent abnormal returns using returns and the book-to-market ratio are separately significantly positive, and those of FIIs' buying herding are all significant even after the respective control variable is considered. In addition, the average coefficient associated with the lagged FIIs' buying herding is larger than the average coefficients associated with the lagged SUE and returns. In summary, the price impact of FIIs' buying herding is significant when we separately treat SUE, returns, and the book-to-market ratio as control variables. The price impact of FIIs' buying herding is larger than the price impact of stock SUE and returns in the Taiwanese real estate stock market.

[insert Table 4-9 here]

5. Conclusion

This paper explores the characteristics of the stocks with abnormally high returns overbought by FIIs in the Taiwanese stock market, as measured using a BHM indicator. Our results confirm that the price impact of FIIs' buying herding is determined by various stocks' characteristics in Taiwan. That is, the positive price impact of FIIs' buying herding centers on stocks with lower earnings and lower returns. The positive price impact of FIIs' buying herding is also focused on undervalued value stocks.

By dividing the entire sample period into bullish and bearish stock periods, our results demonstrate that the subsequent abnormal returns from FIIs' buying herding are most significantly positive after adding the respective control variables for both the bearish and bullish periods. Investors in the Taiwanese real estate stock market could follow FIIs and purchase the stocks that they buy in different macro-economic factors to improve the performance of their portfolios. This paper also contributes to the literature in which studies on the price impact of institutional herding behavior are integrated with a series of studies on real estate stock characteristics.

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Table 1-1 Literature Reviews of profitability performance indices

Authors / Profitability indicators	Shai M.L.（1981）	Lu K.D.（1994）	Cho P.D.（1994）	Calantone et.al.（1995）	Si M.T.（1998）	Ko S.S.（1998）	Shia D.S. et. al.（1998）	Haung S.S.（1999）	Sua S.S.（1999）	Chan S.P.（2000）	Shan H.C.（2000）	Lin S.L.（2001）	Lee S.L.（2002）	Chang K.O.（2003）	Ko K.Y.（2004）	Chang.& Chang（2005）	Ho & Mallick（2006）	Haung K. L.(2008)	Hu G.G.(2011)	Yu & Lin (2011)
Return on equity	*	*	*			*	*	*	*	*	*	*	*		*	*		*	*	*
Rate of return on asset	*	*	*	*	*		*	*	*		*				*	*			*	*
Profit margin	*	*				*	*		*		*	*			*			*		*
Earnings per share		*			*	*	*		*	*	*	*				*		*	*	
Profit margin before tax		*									*									
Rate of operating profit to rate of paid up capital		*				*					*									
Operating Profit Ratio			*					*		*										
Gross margin return														*						
Return on equity before tax					*															
Return on equity after tax								*												
Total asset turnover	*																			*
Non-operating Revenue																	*	*		
Net operation income																	*	*		
R&D operation fee																	*	*		
Salary, operation cost and operation fee																	*	*		

Data source :Haung K.L.(2008) and Self-research.

Table 2-1 Literature Reviews on Real estate market & Macroeconomic Factors (Continuous)

Authors	The year of published	The study topics	Economic indicators
Lin & Haung	1995	The study on relationship between Taipei housing price index and macro-economic variables.	Housing price and macro-economic Factors : Wage, CPI, Income, M2, Stock price, Exchange rate, Mortgage rate.
Yin	2002	The study on relationship between Taiwan, Taipei Real estate market and macro-economic.	GDP, Stock price, Mortgage rate., M1B
Pang, Lin & Yung	2004	Housing price structure change factors analysis— Taipei city & New Taipei city	Housing price structure change factors, Housing price, M1b, Stock price, Building construction By area.

Table 2-1 Literature Reviews on Real estate market & Macroeconomic Factors

Authors	The year of published	The study topics	Economic indicators
Chang	2006	The herded behavior in Real estate market the empirical study	Monetary supply, GDP growth rate, savings, Household income, The depth of Markets, Pre-rate of return on market.
Lee	2009	The study on co-movement relationship between Taipei housing price index and macro-economic cycle	Taipei existing and pre-sale house price, Macroeconomic Factors : CPI, Mortgage rate, Stock price index, Monetary supply M2.
Change	2010	The study on relationship between Taipei housing price index and macro-economic variables.	The rate of return in real estate and Macroeconomic Factors :CPI %, Mortgage rate, Stock price index, Monetary supply M2, GDP growth rate, Un-employing rate.
Sang	2010	The herded behavior in Housing market and Macroeconomic Factors study	The herded behavior in Housing market or not, Real estate transaction and macro-economic factors :: Mortgage rate, Monetary supply M2, GDP growth rate, CPI---Year-Rent growth rate, Building construction price year growth rate, Building construction By area, Building construction Stock.

Table 4-1 Variables Statistics

Variables	Earnings per share	Price-to-book ratio	Buy/sell difference	Size of company	Abnormal returns
Statistics/ Label	X1	X2	X3	X4	Y1
Mean	0.02	1.38	7.02	17906.67	-0.45
Median	0	1.19	0.44	8152.5	-1.07
Maximum	8.25	6.21	4710.96	235589	83.92
Minimum	-8.73	0.25	-5585.13	442	-38.86
Std. Dev.	1.61	0.75	448.78	29250.89	9.99
Skewness	0.19	1.86	-0.12	3.66	1.19
Kurtosis	4.23	8.33	38.04	18.64	8.99
Variables	Operating Profit Ratio	Return on equity	Turnover	Foreign institutional investors herding	
Statistics/ Label	X5	X6	X7	XB	
Mean	-52.48	0.62	16.89	0.51	
Median	1.26	0.47	10.78	1	
Maximum	8172.58	15.73	173.15	1	
Minimum	-38844.41	-20.18	0.27	0	
Std. Dev.	1058.91	1.55	18.02	0.5	
Skewness	-23.26	-0.46	2.34	-0.04	
Kurtosis	682.72	33.96	10.94	1	

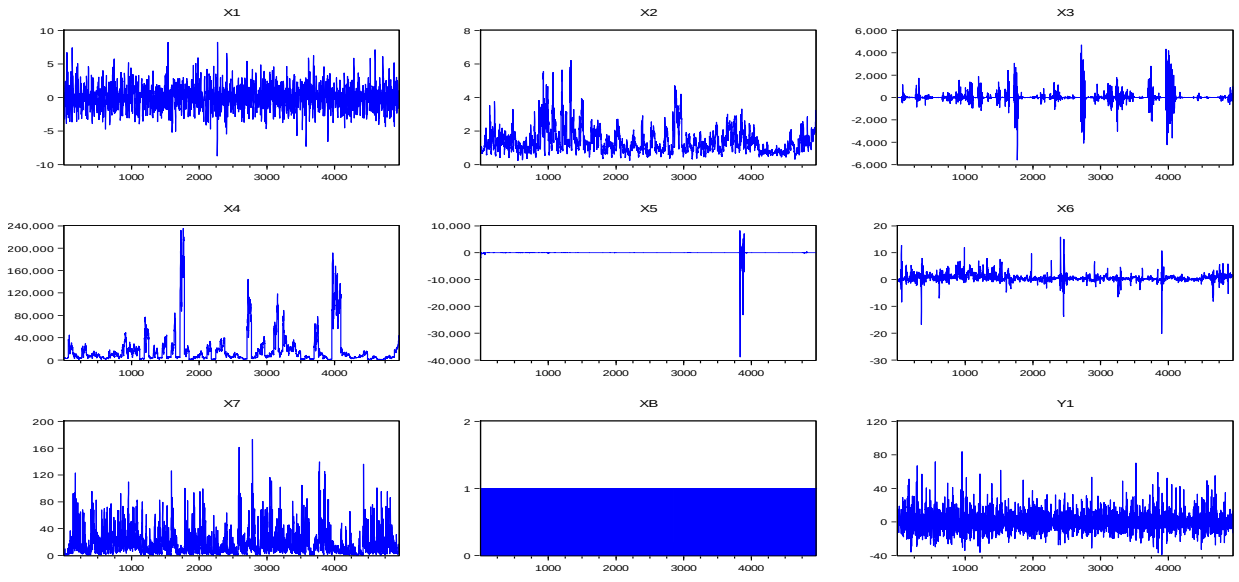

Figure notes: X1~ Y1 Variables Label refered as Table 3-1。

Figure 4-1 Variables Distribution of Stock Characteristics

Table 4-2 Stock Characteristics Variable Unit root Test

Variables	Earnings per share	Price-to-book ratio	Buy/sell difference	Size of company	Operating Profit Ratio	Return on equity	Turnover
Test /Label	X1	X2	X3	X4	X5	X6	X7
IPS	-9.8	-7.42	-53.05	-6.47	-4.89	-5.1	-27.15
p-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADF	390.72	273.57	2347.01	267.09	251.79	338.82	1034.11
p-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PP	312.29	275.22	2433.88	267.04	342.39	399.28	1052.06
p-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table notes: **p-value < 0.1represent significance reject the null hypothesis test.**

Table 4-3 Real estate market & Macroeconomic Factors Variable Unit root Test

Variables	monetary supply	Mortgage rate	Building construction By area	Building Construction loan	Si-Yi housing price index-Taipei city	Si-Yi housing price index-Taiwan	Exchange rate /USA Currency	housing price index-USA	Stock price index-USA
Test /Label	W1	W2	W3	W4	W51	W57	W6	U12	U13
IPS	18.83	3.10	-26.51	21.44	15.44	22.54	-8.12	-24.13	1.62
p-Value	1.0000	0.9900	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.9500
ADF	2.16	57.85	969.72	1.24	4.22	0.78	268.18	872.94	77.50
p-Value	1.00	1.00	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
PP	3.61	54.63	972.56	2.27	3.21	0.37	84.33	432.07	103.86
p-Value	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000

Table 4-4 Real estate market & Macroeconomic Factors Variable Unit root Test(after Difference)

Variables	monetary supply	Mortgage rate	Building construction By area	Building construction loan	Si-Yi housing price index-Taipei city	Si-Yi housing price index-Taiwan	Exchange rate /USA Currency	housing price index-USA	Stock price index-USA
Test /Label	DW1	DW2	W3	DW4	DDW51	DW57	DW6	U12	DU13
IPS	-12.63	-20.67	-26.52	-6.94	-12.9	-4.35	-13.8515	-24.13	-20.33
p-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADF	406.62	718.14	969.73	235.49	415.97	173.77	448.998	872.94	703.58
p-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PP	1615.93	704.37	972.57	1057.79	542.81	378.23	1283.57	432.07	2046.71
p-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table notes : The front of variable label added D denoted difference. For example as（DWt=Wt-Wt-1）and as (DDWT=DWt-DWt-1)

Table 4-5 Variables Attributes

Variables Attributes	Label	Variables illustrated	Unit	Expected Sign
Dependent V.				
Abnormal returns $R_{i,t}$	Y1	**Abnormal returns**	%	
Herded V.				
$BHM_{i,t-1}$ Foreign institutional investors herding	XB	**Foreign institutional investors herding yes or no**	0: **None herding** 1: **herding**	+
Control V.				
Stock Characteristics	X1	**Earnings per share**	Yen (Taiwan dollar NTD)	+
	X2	**Price-to-book ratio**	%	+
	X3	**Buy/sell difference**	Taiwan dollar NTD million	+
	X4	**Size of company**	Taiwan dollar NTD million	+
	X5	**Operating Profit Ratio**	%	+
	X6	**Return on equity**	%	+
	X7	**Turnover**	%	+
Real Estate Market V. and Economic V.	W1	**monetary supply**	Taiwan dollar NTD 100 million	+
	W2	**Mortgage rate**	%	+
	W3	**Building construction By area**	Square meter	+
	W4	**Building Construction loan**	Taiwan dollar NTD million	+
	W51	**Si-Yi housing price index-Taipei city**	Indices	+
	W57	**Si-Yi housing price index-Taiwan**	Indices	+
	W6	**Exchange rate/USA Currency**(Taiwan dollar NTD/ **USA Currency**)	Yen (Taiwan dollar NTD)	-
Foreign Effect V.	U12	U.S. Housing price index	Indices	-
	U13	**Stock price index-USA**	Indices	-

Table 4-6 Pooled Regression Stock Attributed Variables

Models	(α) Int.	p-Value	(β1) BHM(XB)	p-Value	(β2)	p-Value	C.V.	S.E. Regression
PLS-1	-0.9515	0.0000	0.9764	0.0006	0.2480	0.0047	X1	9.9673
PLS-2	-1.1961	0.0003	0.9931	0.0005	0.1740	0.3567	X2	9.9745
PLS-3	-0.8184	0.0001	0.6888	0.0155	0.0025	0.0000	X3	9.9122
PLS-4	-0.9777	0.0000	0.9956	0.0005	0.0000	0.8112	X4	9.9753
PLS-5	-0.9495	0.0000	0.9920	0.0005	0.0001	0.4265	X5	9.9747
PLS-6	-1.0160	0.0000	0.9930	0.0005	0.0976	0.2854	X6	9.9742
PLS-7	-2.5968	0.0000	0.9924	0.0004	0.0972	0.0000	X7	9.8204
PLS-8	-0.9552	0.0000	0.9922	0.0005			XB	9.9744

Table 4-7 Pooled Regression Economics Attributed Variables

模型	(α) 截距	p-值	(β1) BHM(XB)	p-值	(β2)	p-值	C.V.	S.E. Regression
PLS-9	-2.0563	0.0000	0.9804	0.0005	0.0012	0.0000	DW1	9.7781
PLS-10	-0.7210	0.0004	0.9911	0.0016	5.8774	0.0012	DW2	9.9156
PLS-11	1.2947	0.0181	0.9911	0.0005	-0.0011	0.0000	W3	9.9557
PLS-12	-0.3416	0.1282	0.9220	0.0012	0.0000	0.0000	DW4	9.9063
PLS-13	-0.7908	0.0001	0.9428	0.0010	0.4469	0.0001	DDW51	9.9569
PLS-14	-1.4256	0.0000	0.9166	0.0012	0.4602	0.0000	DW57	9.8909
PLS-15	-0.9035	0.0000	0.9424	0.0009	-2.8320	0.0000	DW6	9.8617
PLS-16	3.3923	0.0012	0.9719	0.0006	-0.0277	0.0000	U12	9.9573
PLS-17	-0.7956	0.0001	0.9294	0.0010	-0.0184	0.0000	DU13	9.8632

Table 4-8 Panel Regression Stock Attributed Variables

Models	(α) Int.	p-Value	(β1) BHM(XB)	p-Value	(β2)	p-Value	C.V.	S.E. Regression	Effect
GLS-1	-0.9414	0.1483	0.9544	0.0001	0.3089	0.0001	X1	8.6122	R
GLS-2	-2.7281	0.0014	0.9837	0.0007	1.2862	0.0462	X2	8.6564	FR
GLS-3	-0.8307	0.1939	0.7182	0.0037	0.0021	0.0000	X3	8.5773	R
GLS-4	-0.9412	0.1509	0.0776	0.0001	0.0000	0.9312	X4	8.6258	R
GLS-5	-0.9439	0.1470	0.9786	0.0001	0.0001	0.4768	X5	8.6253	R
GLS-6	-1.0555	0.1038	0.9799	0.0001	0.1722	0.0317	X6	8.6224	R
GLS-7	-2.4162	0.0002	0.9638	0.0001	0.0874	0.0000	X7	8.5181	R
GLS-8	-0.9534	0.0000	0.9888	0.0001			XB	8.6256	R

Table 4-9 Panel Regression Economics Attributed Variables

Models	(α) Int.	p-Value	(β1) BHM(XB)	p-Value	(β2)	p-Value	C.V.	S.E. Regression	Effect
GLS-9	-2.0373	0.0064	0.9434	0.0001	0.0012	0.0040	DW1	8.6310	R
GLS-10	-0.7415	0.2485	0.9401	0.0002	5.8710	0.4643	DW2	8.6310	R
GLS-11	1.3011	0.5835	0.9787	0.0001	-0.0011	0.3246	W3	8.6256	R
GLS-12	-0.3513	0.6473	0.9410	0.0002	0.0000	0.3144	DW4	8.6309	R
GLS-13	-1.4537	0.0585	0.9419	0.0001	0.4602	0.1226	DDW51	8.6625	R
GLS-14	-1.4378	0.0727	0.9407	0.0002	0.4602	0.1782	W57	8.6310	R
GLS-15	-0.9032	0.1523	0.9418	0.0002	-2.8320	0.0662	DW6	8.6309	R
GLS-16	3.3889	0.4651	0.9779	0.0001	-0.0277	0.3451	U12	8.6256	R
GLS-17	-0.8016	0.2019	0.9412	0.0002	-0.0184	0.0694	DU13	8.6309	R