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Herding Behaviour in an Emerging Stock Market: Empirical Evidence from Vietnam

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ABSTRACT

This study examines the existence of herding behaviour in the Vietnamese stock market and the asymmetric effects of herding that are conditional on the direction of market movements. The evidence supports the presence of herding in the Vietnamese stock exchange with respect to different market periods and to alternative model specifications. Investor herding in this very immature stock market can be explained by a set of micro-structure characteristics typical of the Vietnamese stock market such as a lack of transparency in information and financial management, the high magnitude of market volatility and thin trading. Since herding is thought to increase the volatility of the market, the existence of herding may trigger some policy concerns about a potentially destabilizing effect on the financial market. In addition, the study indicates that upward markets have less return dispersions than downward markets. A possible implication of this finding is that investors in the Vietnamese stock market perform more uniformly in rising markets than in declining markets.

Key words: Herding behaviour, asymmetric effects, return dispersion, market consensus, linear relationship, non-linear relationship

INTRODUCTION

Herding behaviour is an alternative explanation of the way that investment choices are made by investors (Demirer and Kutun, 2006; Ferruz *et al.*, 2008). During the past decades, herding behaviour has received much attention from both academic researchers and practitioners. A large number of theoretical models have been developed and empirical studies undertaken in order to investigate the formation and causes of this phenomenon in financial markets.

Researchers in this field believe that the existence of herding may have implications for asset pricing models since it has a behavioural effect on stock price movements and correspondingly has an impact on the return and risk of the stock (Tan *et al.*, 2008; Seetharaman and Raj, 2011). If market participants follow trends, the volatility of returns might be aggravated and therefore the financial systems might be destabilized (Hadiwibowo, 2010), especially during a crisis period (Demirer and Kutun, 2006).

Herding is defined as the tendency to mimic the actions of other investors (Gleason *et al.*, 2004). For instance, past information of the investment trend by other investors is fairly useful for a new investor to make a current investment decision (Ferruz *et al.*, 2008). This tendency is supposed to

be strongest during a period of high market uncertainty. Investors are considered to be following herds when they change their investment decisions on the basis of other investors' actions (Ferruz and Vargas, 2007). In the asset pricing context, herding may cause stock prices to deviate from their fundamental values. As a result, investors are forced to trade at inefficient prices (Christie and Huang, 1995; Raja and Selvam, 2011). Thus, it is reasonable to argue that herding behaviour is more a case of irrational investor response rather than rational decision-making, with investors imitating the actions of others rather than trusting their own evaluation of the situation. In other words, when investors follow herds they show a willingness to downplay the importance of their own information and evaluation in favour of the aggregate market consensus. This implies that such investors need a larger number of securities in order to obtain the same level of diversification than would be the case in an otherwise normal market (Chang *et al.*, 2000). In particular, herding behaviour may result in more optimistically biased earning estimates and reduced perceptions of risk. Consequently, investors may earn abnormally low stock returns because of this misperception and the associated increased uncertainty about earning streams (Olsen, 1996).

Empirical studies have found evidence for the existence of herding behaviour in many market participants. For example, the evidence from studies by Olsen (1996) and Cote and Sanders (1997) supports the presence of this behaviour in analysts' forecasts. Wermers (1999) also found evidence of herding in mutual funds. In addition, in the study by Chang *et al.* (2000), South Korean, Taiwanese and Japanese investors were found to form herds. The existence of investor herding may have an impact on the risk and return characteristics of securities and hence has implications for asset pricing models (Tan *et al.*, 2008). This phenomenon may also be present in the Vietnamese stock market. Only recently established in 2000, the Vietnamese stock market is characterized by weak reporting requirements, poor regulations and low accounting standards. There have been few studies of the Vietnamese stock exchange, particularly dealing with herding issues. An exception is the study by Kallinterakis (2007) which analysed herding based on the factor-sensitivity of assets at the cross-sectional level of the market (cross-sectional dispersion of all individual betas in the market). This study focused on examining the impact of thin trading on the measurements of herding. The author found evidence supporting the presence of herding and concluded that there was a positive bias toward thin trading across the measurement of herding. However, he did not examine herding characteristics in this market in detail.

In this study, an application of the method proposed by Chang *et al.* (2000) and adjusted by Tan *et al.* (2008) is substantial to test for the existence of herding behaviour in the Vietnamese stock market in relation to daily returns data at the firm level. Hereafter, some specific objectives are listed out as follows:

- Contributing to the existing literature on herding in developing countries
- Investigating the herding patterns as well as the asymmetric effects of herding in the Vietnamese stock market
- Drawing attention to some potential concerns for policymakers in relation to the possible consequences of herding if herding characteristics are detected in the Vietnamese stock market

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Theoretical models of herding behaviour have been developed in some studies, such as Scharfstein and Stein (1990), Bikhchandani *et al.* (1992) and Devenow and Stickland (1996). This

part of the study mainly aims to provide a general picture of some empirical studies developed to model herding behaviour in financial markets. Some lines of approach have been employed to detect this trend in relation to different market participants, such as institutional investors, analysts and investors, in both emerging and developed markets. Nevertheless, the empirical evidence supporting this behaviour is inconclusive. Some studies report the presence of herding while others find no evidence.

Shiller and Pound (1986) used a survey approach to examine the presence of herding among institutional investors. They found that the advice of other professionals has a substantial impact on the decisions of these investors to buy or sell. While Shiller and Pound used a survey of institutional investors, Cote and Sanders (1997) conducted a field experiment to explore the herding behaviour of earnings forecasters who were members of National Association of Investors Corporation (NAIC) investment clubs and considered to be skilled investors. They found that this behaviour does exist among sophisticated earnings forecasters. In addition, their results also showed that some factors such as forecasting ability, the perceived credibility of the consensus forecast and the motivation to create or preserve reputations all determine the extent of herding. More specifically, herding concentration was found to increase when there was an increase in the credibility of the source of a consensus forecast, when there was increased concern about one's reputation or a lack of confidence in one's forecasting ability.

In line with Cote and Sanders (1997), approach Gonzalez *et al.* (2006) conducted an experimental study which simulated the behaviour of a board of directors, comprising a manager and two external directors, who had to approve or reject a project. This study examined the impact of herding behaviour inside the board of directors with the assumption that the voting is sequential (CEO first, then director A and finally director B) and that the reputations of the directors are important. The main findings confirmed the presence of herding behaviour and showed that director B had a tendency to ignore his or her personal interpretation of the information available and follow the other director's decision. Moreover, this result was strengthened by an econometric analysis.

Olsen (1996) used a sample of 520 stocks to investigate and suggest some of the implications resulting from herding behaviour among expert earnings forecasters. He measured the degree of herding using herding index values generated from five equally weighted stock portfolios. These portfolios were created on the basis of the Value Line earnings predictability index¹. Olsen proposed that herding will increase with the increase in earnings forecasting difficulty and that this behaviour among earnings forecasters is the result of the human desire for consensus which can lead to a decrease in the dispersion and an increase in the mean of the distribution of expert forecasts. This may induce the creation of positive bias and inaccuracy in published earnings estimates. Olsen's findings showed that herding does exist and that there are increases in the level of earnings unpredictability as a result of the large and increasing herding index. Furthermore, Olsen concluded that herding characteristics lead to more optimistically biased earnings forecasts and reduce perceptions of risk when unpredictable earnings occur. For that reason, the abnormally low returns for stocks with more uncertain earnings streams become more likely.

Grinblatt *et al.* (1995) used quarterly portfolio holdings for 274 mutual funds in the US to analyse the momentum investment strategies and 'herding' tendency of mutual funds. Using the

¹Olsen (1996) used a measure of historical earnings stability (i.e., standard deviation of quarterly earnings per share around a five-year trend) as a proxy for the Value Line index

‘unsigned herding measure’ and the ‘signed herding measure’, they were able to compare the level of herding on the buy side and the sell side of institutional trades. Grinblatt *et al.* (1995) found that 77% of the mutual funds are momentum investors. However, they found weak evidence in support of a fund’s tendency to buy and sell the same stocks at the same time. There are two possible reasons for this weak evidence. Firstly, it is perhaps too broadly based when measuring herding over a sample of investors. Secondly, the inclusion of stock quarters with very little trading by the mutual funds might be the reason why strong evidence of herding was not found.

Addressing the same question of whether mutual funds herd in their trading, Wermers (1999) used quarterly equity holdings of virtually all mutual funds based in the US from 1975 through 1994 to investigate this behaviour in relation to fund managers. To measure herding by the funds, he examined the proportion of funds that increase or decrease their holdings of a given stock during calendar quarters, in other words which are the so-called net buyers or sellers. If stocks showed a tendency towards large imbalances between the numbers of buyers and sellers, then funds were said to exhibit herding behaviour. The evidence revealed that while mutual funds trading in average stock present little sign of herding, those in trades of small stocks and trades of growth-oriented funds exhibit a much higher tendency. As Wermers explains, the differences in these observed levels of herding could be consistent with concerns about fund managers’ reputations or with the incisiveness of the differentiation of fundamental information. In addition, this study showed that stocks strongly bought by herds outperform stocks strongly sold by herds by four percent over the following six months. This discrepancy is more pronounced with respect to the return on small stocks.

De Bondt and Forbes (1999) used another method to study herding behaviour. This study investigated the phenomenon in analyst forecasts of Earnings-Per-Share (EPS) in the United Kingdom. De Bondt and Forbes (1999) defined herding as ‘excessive agreement’ among analyst predictions. Their analysis was based on the hypothesis that if the forecasts of rational analysts originate exclusively or to a high degree from privately collected information and the accuracy of these forecasts is the main concern, then analyst disagreement should increase along with the length of the forecast horizon and analyst coverage. Despite the fact that earnings estimation is a difficult task and is easily subject to large error, the EPS predictions of individual analysts may be quite close to one another. In particular, if in an extreme case the herding is very strong this may lead to a decline in the disagreement shown by analysts in relation to the forecast horizon. As a result, herding acts as an opposing force in relation to the forecast horizon which has a tendency to produce ‘excessive agreement’. De Bondt and Forbes (1999) measured analyst disagreement using two variables (1) RANGE (the range of individual analyst predictions, that is, the high minus the low forecast) and (2) the cross-sectional standard deviation of individual predictions for any single month. They examined whether these measures systematically deviated from the forecast of an individual analyst in any single month and from the forecast horizon. De Bondt and Forbes report some evidence of herding behaviour among analysts.

Christie and Huang (1995) tested the presence of herd behaviour in equity returns by employing daily data for NYSE and Amex firms from July 1962 to December 1988 and monthly data for NYSE firms from December 1925 to December 1988. Their model was based on the hypothesis that the standard deviation of returns, as a measure of dispersion in return, will be relatively low when individual investors tend to suppress their private evaluation in favour of the market consensus. This argument contrasts with the rational asset pricing model which predicts an increase in dispersion when an individual investor uses their own information to trade during

periods of market swings. They found no evidence of the presence of herding behaviour for either daily or monthly returns. Following the same procedures used by Christie and Huang (1995) and Demirer and Kutun (2006) examined herding in Chinese markets using individual firms as well as sector-level data. Similar to Christie and Huang (1995), s findings Demirer and Kutun (2006) conclude that both daily and monthly returns do not indicate the presence of herding during periods of large price movements.

The study by Chang *et al.* (2000) used yet another approach to test herding behaviour. Their model takes into account the non-linear relationship between the dispersion in individual asset returns and the returns of a market portfolio. Unlike Christie and Huang (1995), they used the cross-sectional absolute deviation of returns (CSAD) as a measure of dispersion. This measure requires the use of the conditional version of the CAPM to estimate the time-variant systematic risk beta, to calculate an absolute value of the deviation (AVD). ²They used daily stock prices and returns' time series, along with year-end market capitalization for each firm and an equally weighted index return, to investigate the behaviour of market participants in many international markets with special regard to their herding tendency. No evidence of herding was found on the part of the US and Hong Kong markets while partial evidence was found in Japan. In particular, they found significant herding behaviour in two emerging markets-South Korea and Taiwan. According to Chang *et al.* (2000), there are three main reasons why herd behavioural intensity in South Korea and Taiwan differs from the US and Hong Kong. Firstly, a relatively high degree of government intervention may lead to differences in herding among countries. These actions can consist of either relatively frequent changes in monetary policy or large direct buy and sell orders in the emerging financial markets. Secondly, herding differences are perhaps a result of a scarcity of rapid and accurate micro-information in these markets. The paucity of this essential information about firms may cause investors to concentrate more on macroeconomic signals. Finally, the presence in South Korea and Taiwan of more speculators with relatively short investment horizons which is believed to result in some types of informational inefficiencies, is likely to be a source of herding. More recently, Rhaïem *et al.* (2007a) examined the relationship between the return of the stock and its systematic risk in the CAPM at different scale for the French's stock market.

In line with the approach of Chang *et al.* (2000) and Tan *et al.* (2008) investigated herding characteristics in dual-listed Chinese A-share and B-share stocks. However, the measure of the return dispersion in this case was different from that of Chang *et al.* (2000) and Tan *et al.* (2008) used the standard deviation calculation adopted by Christie and Huang (1995) as they considered the accuracy of the beta estimation proposed by Chang *et al.* (2000) to be suspect. They examined the existence of herding in both Chinese A-share and B-shares stocks, in both the Shanghai and Shenzhen markets.³ In addition, they also examined the asymmetric effect of herding by varying the market states of market return, trading volume and volatility. As a result, they document pronounced herding behaviour in A-share investors in the Shanghai market under rising market conditions, high trading volume and high volatility while there is no apparent effect in B-shares. In fact, they reveal that the differences in the intensity of herding in each market may result from the discrepancy in investor characteristics within A-share and B-share markets. The predominant force in the A-share market is domestic individual investors, who are believed to be typically

²CSAD at time t is the average of AVD at time t

³A-shares are predominantly in local currency and are traded only by domestic (Chinese) investors; both foreign and domestic investors have traded B-shares since February 2001 (only foreign investors did so before that period)

deficient in significant investment knowledge and experience. However, the main participants in the B-share market are foreign institutional investors who are more likely to be knowledgeable and more sophisticated than their counterparts in the A-share market. Their finding is inconsistent with those of Demirer and Kutun (2006), who also used Christie and Huang (1995) approach in their analysis of the daily data from 375 Chinese stocks but found no herding behaviour. Tan *et al.* (2008) explain this dissimilarity as perhaps being the result of the difference in the sample of firms.

Using both of the approaches mentioned above and relying on intraday data, Gleason *et al.* (2004) identified the possibility of the presence of herding behaviour in nine-sector Exchange Traded Funds (ETFs) that were traded on the American Stock Exchange. ⁴Their findings revealed no evidence of herding behaviour by investors under extreme market movements. They argue that each sector ETF represents multiple firms and thus, although there is a paucity of information at the firm level to some extent, investors could combine information about all firms in a sector to obtain an overall evaluation of that sector. As a result, investors can make their own decision based on this sufficiently aggregated information which results in no presence of herding in ETF trading. In addition, Gleason *et al.* (2004) documented a weak presence of an asymmetric effect. Specifically, the study provides weak support for the notion that investors are more inclined to herd in downward markets.

Using a different method, Kallinterakis (2007) examined herding in the Vietnamese stock market. In this study, the author used the cross-sectional dispersion of all individual betas in the market to explore whether herding exists. ⁵He assumed that behavioural biases may result in a distortion of the investors' perceptions of the risk-return relationship with respect to their assets. If investors follow 'herds', individual asset returns possibly change with the direction of the market. As a result, a stock's beta will move away from its equilibrium position and fluctuate with variations in investor sentiment. On the basis of this argument, a particular market will be considered to exhibit herds if the cross-sectional dispersions of the stocks' betas have smaller values (asset betas have a tendency to converge towards unity or the beta of the market). Kallinterakis chose to use monthly windows to reduce the estimation error of the betas as well as to guarantee sufficient observations to detect herding. He found evidence supporting the presence of significant market-wide herding in the Vietnamese market. Kallinterakis concluded that thin trading has a positive effect on herding due to evidence of the insignificance of herding as thin trading is corrected. The author attributes this finding to a possible delay in the execution of orders which can be readily observed in illiquid markets such as that in Vietnam. As a matter of fact, the Vietnamese stock market is subject to some limits on participation, such as entry restrictions for foreigner investors, trading limits and market frictions. He argues that substantial illiquidity in emerging markets may induce lower frequency in the execution of trades in comparison with developed capital markets. Thus, the accumulation of excess demand/supply during 'active' trading days might occur, leading to a greater possibility of the evolution of buy/sell herding on such days.

As indicated by the literature discussed above, herding behaviour is frequently found both in developed as well as in emerging markets. Moreover, the reasons behind the existence or non-existence of herding among market participants also vary. Herding might be the result of the paucity of essential micro-information or due to different degrees of governmental intervention.

⁴Nine-sector EFTs consist of basic industries, consumer services, energy, financial, industrial, technology, consumer staples, utilities and cyclical/transportation

⁵This empirical framework was originally developed by Hwang and Salmon (2004)

Clearly, there is still much room for research into the reasons behind the existence or non-existence of this behaviour. Studies testing this phenomenon in the Vietnamese stock market are also limited. Therefore, the following research question will be examined in this study:

To what extent do market participants in the Vietnamese stock market exhibit herding behaviour?: In recent years, although Vietnam's economy has experienced remarkable growth and gradually integrated with the global market, its financial market has remained small and underdeveloped. Established in July 2000 with only two stocks, the Vietnamese stock market has grown to include 192 listed companies, with a market capitalization of USD 13.9 billion in 2006 (which accounted for 25% of Vietnam's GDP). In addition to its limited size and its number of participants, the Vietnamese stock market is governed by a poor institutional and regulatory environment. The regulations for financial disclosure are inadequate and are therefore likely to cause a lack of transparency. This could lead to a greater possibility of trading based on market consensus among investors.

Moreover, there is a relatively high degree of government involvement in the operations of the equity market, with the imposition of many restrictions, such as price limits, no short-selling and an intraday trading ban. The heavy intervention of the central bank in adjusting interest rate policy is thought to have some impact on investors in this market, especially in the case of upward adjustments. As banks mobilize capital at higher costs, they are obliged to raise their lending interest rates on securities loans which might reduce investors' profitability. More seriously, when stock prices go down and the interest rate increases, investors who fund their securities through loans have to sell their holdings at a loss in order to pay interest to banks or even give up their mortgaged stocks. Another activity of the central bank that may influence investors is its involvement in credit control in relation to the commercial banks' supply of money for stock investment, especially in cases of tight monetary policy during high inflation periods. At such times, the central bank may constrain loan provisions for stock investment by commercial banks. Investors may therefore encounter limits in their pursuit of investment opportunities. In addition, there are few alternatives for investors, as the bond and the real estate markets are inadequately developed. As a result of having only a few alternatives, together with the high degree of government involvement, investors are more likely to speculate on Vietnam's stock exchange which may cause a large degree of market volatility (Demirer and Kutan, 2006). This potentially leads to a stronger tendency towards investor herding. Furthermore, emerging markets in general and Vietnam in particular are believed to exhibit 'thin trading' which as we saw above has been found to introduce positive biases into herding measurements (Kallinterakis, 2007)⁶.

Given the structure of the Vietnamese stock market, investors are more likely to follow the actions of others believed to be better informed about the market. This trading behaviour can in many ways be similar to that of investors in other emerging markets that have been found to exhibit herding behaviour (Taiwan and Korea). In line with Kallinterakis (2007) findings I also expect this behaviour to exist in the Vietnamese stock market. The following hypothesis will therefore be tested:

⁶Thin trading refers to the situation where stocks are not frequently traded and a relative inertia in prices therefore occurs

- **Hypothesis 1:** Herding behaviour exists in the Vietnamese stock market

Presumably, investor behaviour might be influenced by the direction of the market. In fact, some studies have found that the level of herding behaviour changes under different market conditions, depending on whether the market is rising or declining. It is therefore hypothesized that investors have a greater tendency to herd in downward markets than in upward markets. It can be argued that the fear of the potential loss when the market is decreasing looms larger than the pleasure of potential gain when the market is increasing (Tversky and Kahneman, 1986). As a result, this behaviour is likely to induce investors to mimic the aggregate market when it is falling (Gleason *et al.*, 2004). A possible explanation for this behaviour is that investors may experience less disappointment when others also make the same investment decision and this decision eventually turns out to be poor (Nofsinger, 2008). Thus, herding behaviour is expected to be more pronounced when a market is falling than when it is rising. In addition, McQueen *et al.* (1996) found that while all stocks tend to respond quickly to negative macroeconomics news, small stocks tend to exhibit a delay in reacting to positive macroeconomics news. Since good macroeconomic news often entails an increase in stock prices, the slow reaction implies a postponement in the incorporation of good news into the prices of small stocks. This may therefore lead to an extra increase in market return dispersion (as a function of the aggregate market returns) in an increasing market but not in a declining market. This implies that herding is likely to be more pronounced in downward markets that are characterized by small stocks (Chang *et al.*, 2000). Given the small scale of the Vietnamese stock market, this argument seems logical and leads to the second hypothesis:

- **Hypothesis 2:** Herding behaviour is more pronounced in a declining market than in a rising market

In addition, it is interesting to investigate potential asymmetric effects during times of large market stress.⁷ Herding is supposed to be more intensive during extreme downwards rather than extreme upwards movements of the market due to a 'flight to safety' in the market consensus during times of crisis (Demirer and Kutan, 2006; Saha and Chakrabarti, 2011). This argument leads to the third hypothesis:

- **Hypothesis 3:** Herding behaviour is greater during extreme downward market movements than during extreme upward market movements

METHODOLOGY AND DATA

Economic model: The methodology employed by Christie and Huang (1995) is based on the idea that market participants make their own investment choices based on general market conditions. They suppose that when there are no large price swings, individual investors trade on the basis of their own private information and evaluation. This induces dispersions in returns to widen as the absolute value of market returns increase. This proposition would be consistent with the prediction of the rational asset pricing model. However, it could be argued that investors are likely to invest based on the collective actions of the market and to suppress their own private beliefs during

⁷Observations lie in the extreme tails (the first, second and fifth percentiles) of the symmetrically standardized distribution of daily market returns

periods of extreme market movement. This argument implies that security returns do not deviate much from market returns. Christie and Huang (1995) used a cross-sectional standard deviation to measure return dispersion. These authors used one and five percent cut-off points as criteria to define extreme market movements. As such, an observation of daily market returns is considered as an extreme movement if it lies in the first or fifth lower or upper percentile of the market return distribution. They apply two dummy variables to capture the dispersion in stock returns during these market periods.

Christie and Huang (1995), their approach however, suffers from a major drawback which originates from the proposed definition of extreme returns. The cut-off points (one and five percent) used to assign observations to the upper and lower tails in the distribution of stock returns are rather arbitrary. It appears that Christie and Huang (1995) only captures herding characteristics under the condition of extreme returns. However, investors may differ in what they consider extreme returns. Additionally, herding behaviour may emerge to some extent over the entire return distribution, becoming more prevalent under abnormal market changes (Tan *et al.*, 2008). Another problem emerges in applying this procedure to the Vietnamese context. Given that the Vietnamese stock market has only recently been established, only limited data is available and extreme returns are therefore difficult to observe. Furthermore, Tan *et al.* (2008) argue that the approach used by Christie and Huang (1995) is actually a stringent test, since it requires a greater magnitude of non-linearity before determining that herding evidence can be found.

In order to avoid the shortcomings of Christie and Huang (1995), this study uses the methods of both Chang *et al.* (2000) and Tan *et al.* (2008) to examine herding behaviour across the dispersion of market returns. The model applied relies on the relationship between market return and its dispersion to detect herd behaviour (Chang *et al.*, 2000). A specification of this model will make it possible to detect herding characteristics over the entire distribution of market returns. Its specification is as follows:

$$CSAD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \varepsilon_t \quad (1)$$

where, $CSAD_t$ is the cross-sectional absolute deviation which is a measurement of return distribution. It is obtained from the equation:

$$CSAD_t = \frac{1}{N} \sum_{i=1}^N |R_{i,t} - R_{m,t}| \quad (2)$$

where, $R_{m,t}$ is the equally weighted average return on day t and $R_{i,t}$ is the stock return of firm i at time t . It should be noted that both the absolute value of market returns at time t and its squared term are included as independent variables in Eq. 1.

The economic meaning behind this model specification is that, as mentioned above, a linear relationship between the dispersion in individual stock returns and the market returns is expected under a rational asset pricing model. It follows that an increase in the absolute value of market returns will result in a rise in the dispersion of individual stock returns. Thus, a positive and statistically significant coefficient of γ_1 will be in line with the predictions of the rational asset pricing model.

Investors might also have a tendency to react in the same manner during periods of relatively large market price movements which leads to a higher correlation among the stock returns

(Eriki and Rawlings, 2008). In turn, the dispersion among returns is liable to decrease or at least increase at a decreasing rate, with an increase in the absolute value of the market return reflecting this increase in correlation (Chang *et al.*, 2000). In other words, a non-linear relationship is expected. For this reason, the square term of the market return is included in the model. This argument also implies that a significantly negative coefficient γ_2 indicates the presence of herding behaviour. In that case, it is shown that investors are inclined to act in line with the consensus of the market and suppress their own evaluations when there is a large market price movement (Tan *et al.*, 2008).

It is important to note that the dependent variable in the study by Tan *et al.* (2008) is different from that used in Chang *et al.* (2000). The measurement of cross-sectional absolute returns in this study is consistent with that of Christie and Huang (1995) which does not require the beta estimation. Tan *et al.* (2008) questioned the accuracy of Chang *et al.* (2000) procedure in the measurement of beta because it was based on the specification of a single market factor (CAPM), whose estimation requires a set of assumptions. Kallinterakis (2007) method also suffers from this drawback since his study extracts herding on the basis of factor-sensitivity in assets (betas) which is also estimated using the CAPM model (Rhaïem *et al.*, 2007b).

In addition, Chang *et al.* (2000) assumes that the risk does not vary over time. In order to measure this risk, it is necessary to specify an appropriate time window. However, the length of a time window in practice is likely to be arbitrary (Tan *et al.*, 2008).

Additionally, potential asymmetric effects in herding behaviour will be examined further using the following equations:

$$CSAD_t^{UP} = \alpha + \gamma_1^{UP} |R_{m,t}^{UP}| + \gamma_2^{UP} (R_{m,t}^{UP})^2 + \varepsilon_t \text{ if } RM_t > 0 \quad (3)$$

$$CSAD_t^{DOWN} = \alpha + \gamma_1^{DOWN} |R_{m,t}^{DOWN}| + \gamma_2^{DOWN} (R_{m,t}^{DOWN})^2 + \varepsilon_t \text{ if } RM_t < 0 \quad (4)$$

where, $R_{m,t}^{UP}$ is the market return at time t when the market rises; $(R_{m,t}^{UP})^2$ is the quadratic term of the previous one; $CSAD_t^{UP}$ is the CSAD at time t corresponding to $R_{m,t}^{UP}$. Similar symbols with superscript 'down' are used, respectively, in the case of the market declines. In addition, the absolute values of $R_{m,t}^{UP}$ and $R_{m,t}^{DOWN}$ are used to facilitate the comparison of the linear term coefficients in Eq. 3 and 4.

It should be noted that the effect of positive and negative market returns will be tested separately. These models allow for an examination of the extent of herding behaviour conditional on whether the market is rising or falling. As mentioned above, it is believed that market stress will make herding behaviour more pronounced (Tan *et al.*, 2008). The market is considered to be rising when its equally weighted return is larger than zero, otherwise it is regarded as falling.

In addition, some residual tests such as the Jarque-Bera test, the Durbin-Watson test, the White test and an ARCH test will be conducted to examine the normality, heteroskedasticity and autocorrelation of the error terms as well as the existence of ARCH effects in the model, respectively. If one of these violations occurs, appropriate steps will be taken to guarantee the rigour of the estimated output and the validity of the chosen model. In particular, to solve the problem of non-normality, it is recommended that either outliers are removed, variables transformed or other methods based on non-normality assumption are used. To modify the standard errors in the case of the presence of both heteroskedasticity and autocorrelation, Newey and West consistent estimators will be determined. A GARCH specification will be more appropriate if ARCH

effects exist, since it is more powerful in explaining some common features in the financial data such as leptokurtosis, volatility and leverage effects.

Robustness checks: In spite of its limitations, the approach proposed by Christie and Huang (1995) is used as a robustness check to see whether the conclusion of this study is consistent with that of other procedures, as well as whether the evidence found for herding is sensitive to the model specification used. In particular, this approach will be used to test the third hypothesis in this study with regard to the case of extreme movements in the market.

In addition, the data from the entire sample will also be split into two sub-periods for the purpose of checking the consistency of the findings. This is because 2006 witnessed a remarkable growth in the Vietnamese stock market with the number of listed firms increasing noticeably, along with market capitalization. Therefore, the first sub-period is from 3 March 2002 to 1 January 2006 and the second sub-period is the time following this up to 20 July 2007, thereby taking into consideration this significant change in market development. Thus, the former is characterized by a relatively stable period while the latter exhibits a large range of fluctuations. This partition will allow us to examine how herding behaviour differs in two different market settings.

As mentioned above, the method used by Christie and Huang (1995) built on the argument that individuals tend to ignore their own beliefs and make decisions in line with collective market actions. According to their argument, herding behaviour is most likely to occur during extreme market movements and the presence of this trend results in stock returns that do not deviate greatly from the overall market return. The model is developed by Christie and Huang (1995) as follows:

$$S_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L + \varepsilon_t \quad (5)$$

where, $D_t^L = 1$ if the market return on day t lies in the extreme lower tail of the return distribution and zero otherwise; $D_t^U = 1$ if the market return on day t lies in the extreme upper tail of the return distribution and zero otherwise; S_t is the cross-sectional standard deviation, a measure of the return dispersion at time t , calculated as follows:

$$S_t = \sqrt{\frac{\sum_{i=1}^n (r_{i,t} - \bar{r}_t)^2}{n-1}} \quad (6)$$

where, n is the number of firms in the aggregate market portfolios, $r_{i,t}$ is the observed stock return on firm i for day t and $\bar{r}_t$ is the cross-sectional average of the n returns in the market portfolio for day t .

The dummy variables in Eq. 5 are used to capture the dispersion in stock returns during periods of extreme market movement. One, two and five percent are used as the criteria to define extreme market movements. It follows that market return on day t is considered as an extreme movement if it lies within one, two and five percent of the lower or upper tail of the market return distribution. The significantly positive coefficients for β_1 and β_2 are consistent with the prediction of the rational asset pricing model while the significantly negative ones are consistent with the presence of herding behaviour. In addition, the coefficient α denotes the average dispersion of the sample, excluding the regions covered by the two dummy variables.

Study location and data description

A brief introduction to the Vietnamese stock market and its performance: The Vietnamese stock market was formally launched on 28 July 2000. It is known as the Securities Trading Center (STC) and located in Ho Chi Minh City. In the first trading session there were only two stocks with a total market capitalization of VND 444,000 million (USD 27.52 million).⁸ Initially, there were three trading sessions (Monday, Wednesday and Friday). From 1 March 2003, trading was conducted daily, with two order matching sessions. Since 30 July 2007, continuous trading has occurred in the STC. In addition, there was a restriction placed on the level of individual investments as well as that of foreign institutional investors. The aggregated ownership of all foreign investors in any listed company was limited to 30% of a firm's equity. After five years of operation, at the end of 2005, the number of listed firms had grown to 32, with a total market capitalization of VND 6,337,478 million (USD 392.78 million). Although the market has developed significantly, it is still rather small in comparison to other stock markets in the Asian region (Truong *et al.*, 2006).

Nevertheless, in 2006 the Vietnamese stock market showed impressive growth. In October 2005, a new investment law was passed by the Vietnamese government, its purpose being to increase the liquidity of the stock market. This law raised the foreign ownership limit for listed equities (excluding banks) from 30 to 49%. As a consequence of this revised foreign-ownership rule, together with some other catalysts such as the listing of state-owned enterprises and increased capital flows into the Asian region, there was a massive expansion of the Vietnamese stock market. The number of listed firms increased dramatically to 192 and its stock market capitalization jumped to USD 13.9 billion in 2006 which accounted for 25% of Vietnam's GDP. At the end of 2007, the number of listed companies rose to 240 and the percentage of its market capitalization in relation to GDP had already surpassed the 30 to 40% which was the government's target for the year 2010. ⁹Securities dealings in Vietnam are organized into two stock market trading platforms, namely the Ho Chi Minh Stock Exchange and the Hanoi Securities Trading Center (which was established on 8 March 2005). The Vietnamese Stock Index (VNINDEX) used in this research is a capitalization-weighted index of all the companies listed on the Ho Chi Minh Stock Exchange. This index was created with a base index value of 100 as of 28 July 2000.

It can be said that the Vietnamese stock market has experienced some bearish and bullish periods as well as exhibiting great fluctuations in recent years. From a base index value of 100 in July 2000, VNINDEX rose significantly reaching its first record level of nearly 600 points in June 2001. One of the reasons behind this rise was a large imbalance between supply and demand in securities. In fact, the government made a great effort to support this growth by privatizing state-owned enterprises as well as providing incentives to stimulate the public listing of these firms. After this early period, the market index declined considerably, falling to 131 points in October 2003. Since then, VNINDEX has recovered and gradually surged. It had broken new record levels many times before hitting a historic peak of 1170.67 on March 2007. However, VNINDEX experienced a sharp decline immediately following this peak and exhibited high variation before finally plunging to nearly 500 points in early May 2008, hitting 507.31 points on 8 May 2008 (Fig. 1).

⁸The exchange rate as of May 9, 2008 of 1 USD was 16,135 VND

⁹redit Suisse Worldwide, <<http://emagazine.credit-suisse.com/app/article/>, 06-5-2008>

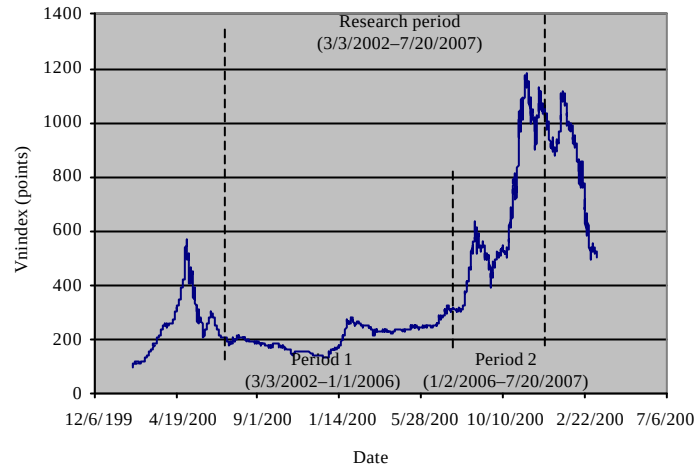


Fig. 1: The development of VNINDEX (points) from its date of establishment on 28 July 2002 until 8 May 2008

This sharp decline may have been the result of the excessive valuations which took place in the market from the beginning of 2007 as well as a lack of attractive new stock listings to sustain interest in the market. Furthermore, it possibly emanated from the direct influence of an unstable macroeconomic environment in Vietnam during that period, a hefty inflow of foreign capital and excess liquidity in the financial system. In addition, the threat of inflation in Vietnam remained at a high level. Thus, in order to stabilize the stock market as well as to defuse the risk of a stock market bubble, the government implemented a number of policies, such as reducing share trading amplitude and requiring banks to delay offloading mortgaged shares. In addition, the government has now adopted a policy of selective monetary tightening in the coming quarters to curb inflationary pressure.

Data description: The data used in this study primarily consists of daily price series of all securities in the Ho Chi Minh Stock Trading Center (STC), the oldest STC in Vietnam, from 3 March 2002 to 20 July 2007. The data is supplied by the Securities Company of the Vietnam Foreign Trade Bank. This data set is transformed to a time series of continuously compounded returns with 1,097 observations. The market return is an equally weighted average of individual returns. The daily returns are calculated as follows:

$$r_{i,t} = \log(p_t) - \log(p_{t-1}) = \log\left(\frac{p_t}{p_{t-1}}\right) \quad (7)$$

where, p_t and p_{t-1} are the index values at times t and $t-1$.

It should be noted that in order to reduce a potential bias of thin trading over the measurement of herding as previously reported in Kallinterakis (2007) study and due to a constraint on updating new stock prices for all securities in the market in recent times, the period examined is limited to 3 March 2002 to 20 July 2007, when the number of listed firms had significantly increased.¹⁰

¹⁰There were only 5, 10 and 20 stocks listed in the Vietnamese stock market in 2000, 2001 and 2002, respectively (Truong *et al.*, 2006)

Table 1: Descriptive statistics for daily market returns and cross-sectional absolute deviation (CSAD) for the Vietnamese stock market (3 March 2002 to 20 July 2007)

Statistical analysis	Daily returns ($R_{m,t}$)	CSAD	R-UP ^a	R-DOWN ^b	CSAD-UP ^c	CSAD-DOWN ^d
Mean	0.0009	0.0175	0.0097	-0.0085	0.0158	0.0194
Median	0.0004	0.0154	0.0054	-0.0049	0.0132	0.0169
Maximum	0.0467	0.0645	0.0467	0.0000	0.0412	0.0645
Minimum	-0.0533	0.0000	0.0000	-0.0533	0.0000	0.0072
Std. Dev.	0.0138	0.0079	0.0107	0.0010	0.0067	0.0085
Skewness	0.08	2.04	1.64	-2.07	1.25	2.39
Kurtosis	5.60	9.21	5.12	7.13	4.03	9.98
Jarque-Bera	309.59***	2525.42***	359.48***	752.30***	173.09***	1577.71***
Observations	0.1097	0.1097	0.568	0.529	0.568	529

***= Significant at the $p < 0.01$. ^aThe market return at time t when the market rises ($R > 0$): $R_{m,t}^{UP}$. ^bThe market return at time t when the market falls ($R < 0$): $R_{m,t}^{DOWN}$. ^cThe CSAD at time t corresponding to $R_{m,t}^{UP}$. ^dThe CSAD at time t corresponding to $R_{m,t}^{DOWN}$.

Table 1 provides descriptive statistics on daily market returns and the average level of return dispersion, together with their associated standard deviations. In addition, the summary statistics for the rising and the declining markets are reported. The average daily return of the Vietnamese stock market over the period studied is 0.09% while those of upward and downward markets are 0.97 and -0.85%, respectively. When the market is split into a rising and a falling market, the corresponding numbers of observations are 568 and 529. The equity market return in Vietnam exhibits a relatively high magnitude of volatility with a standard deviation of 1.38% per day for the entire market and 1.07 and 0.1% for the rising and the declining markets, respectively. In addition, the maximum and minimum values of the market return in this table show that its largest increase over the period studied are 4.67% while its largest decline is 5.33% in one day.

The average level of dispersion (cross-sectional absolute deviation-CSAD) in the overall market return is 1.8% a day, with a standard deviation of 0.79%. At first glance, the summary statistics reveal that the upward market displays less dispersion than the downward market (1.58 and 1.94%, respectively). This evidence is inconsistent with the belief that investors may display so-called 'loss aversion' behaviour. According to this belief, investors may fear potential losses in the downward market price swing more than they enjoy the potential gain in the counter-market which leads them to be likely to follow 'herds', the consequence being a reduction in return dispersion (Gleason *et al.*, 2004). This characteristic will be further examined later in this study.

Furthermore, the significant probabilities of the Jarque-Bera test indicate that the residual distribution of the market return and its dispersion are non-normal. The values of skewness and kurtosis mean that the distribution of these variables has a leptokurtosis feature (the tendency of distributions to have a fat tail and excess peakedness at the mean). This implies that the subsequent test of OLS should take into account this violation of the normality assumption.

EMPIRICAL FINDINGS

Determinants of the herding behavior: In this section, results in relation to each estimation strategy will be presented. Table 2 shows the results of regression (1) which aims to detect herding behaviour with respect to the overall market for the entire sample. The second column reports the outcomes for the OLS model. A significant coefficient of the absolute market return indicates a linear relationship between stock market returns and their dispersion which is in line with the prediction of rational asset pricing models. A negative coefficient of the square term of market

Table 2: Analysis of herding behaviour in the Vietnamese stock market (3 March 2002 to 20 July 2007)

	Regression (1)	Regression (1) with Newey-West consistent estimators	GARCH model
Mean equation			
Constant	0.01*** (39.48)	0.01*** (29.73)	0.01*** (50.21)
Absolute market return	0.49*** (8.49)	0.49*** (4.51)	0.55*** (16.41)
Square term of market return	-1.88 (-1.29)	-1.87 (-0.48)	-2.61*** (-3.40)
Conditional variance equation			
RESID (-1) ^2			0.16*** (8.69)
GARCH (-1)			0.85*** (69.08)
R ² (%)	30.31	51.15	29.23
Adj. R ² (%)	30.18	51.06	28.90
F-statistic	237.89***	572.77***	90.11***

***: Significant at the $p < 0.01$. The estimated equation is: $CASD_t = \alpha + \gamma_1 |R_{m,t}| \gamma_2 R_{m,t}^2$. Where, $CASD_t$ is the cross-sectional absolute deviation and $R_{m,t}$ is the equally weighted average return on day t. Coefficients are given in each cell followed by t-ratios in parenthesis

return means that herding behaviour seems to be present in the Vietnamese stock market. However, it is not statistically significant. In other words, herding is not observed in the Vietnamese stock market. This finding implies that participants in this market make investment decisions rationally. The R-squared value of 30.31% for the first model shows that 30.31% of the variation in cross-sectional absolute deviations can be explained by daily market returns and their square term.

In addition to the regression results, residual tests are also reported. Indeed, the OLS model exhibits some problems in the error terms as seen from Table 4. The statistically significant probabilities for the Jarque-Bera test and White test, together with the small value of the Durbin-Watson test, point to the presence of non-normality, heteroskedasticity and autocorrelation in the error terms of the return dispersions, respectively. In addition, ARCH effects are also found in the disturbances for model (1).

The first model therefore was re-estimated using Newey-West consistent estimators to take into account the presence of heteroskedasticity and autocorrelation. As shown in the third column of Table 3, higher R-squared values and adjusted R-squared values (51.15 and 51.06%, respectively) obtained from this estimation indicate that the model using Newey-West consistent standard errors fits the data better than the previous estimation. Nevertheless, the coefficients drawn from this adjustment do not alter the results, as previously found. It is probable that this estimation is not powerful enough to fix the reported violations and the residual post-tests after this modification confirm that violations in the disturbances have still not been corrected (see the third column of Table 4).

As a next step, regression (1) was re-estimated with a GARCH (1.1) model which has more power to explain some of the common features in the financial data. Interestingly, the outcomes of the mean equation of this specification reveal a negative and statistically significant coefficient of the square term of market return. This finding suggests that herding behaviour does exist in the Vietnamese stock market, as predicted by the first hypothesis. This result is consistent with the

Table 3: Analysis of herding behaviour in a rising and declining Vietnamese stock market (3 March 2002 to 20 July 2007)

	Regression (3) rising market	Regression (4) declining market	Regression (3) with Newey-West consistent estimators rising market	Regression (4) with Newey-West consistent estimators declining market
Panel A: Regression results				
Constant	0.01*** (28.88)	0.01*** (30.42)	0.01*** (27.59)	0.01*** (26.63)
Absolute Up/downward market return	0.46*** (6.63)	0.60*** (7.41)	0.46*** (4.86)	0.60*** (3.98)
Square term of Up/downward market return	-4.07** (-2.30)	-0.79 (-0.39)	-4.07 (-1.26)	-0.79 (-0.15)
R ² (%)	25.07	44.97	25.07	44.97
Adj. R ² (%)	24.81	44.76	24.81	44.76
F-statistic	94.52***	214.90***	94.52***	214.90***
Panel B: Test for asymmetric reactions in upward and downward markets				
$\gamma_z^{\text{UP}} - \gamma_z^{\text{DOWN}}$		-3.28		-3.28
F-statistic		61.37***		44.09***

, *: Significant at the p<0.05 and 0.01, respectively. The estimated equations are Eq. 3 and 4. Where, $R_{m,t}^{\text{UP}}$ is the market return at time t when the market rises; $(R_{m,t}^{\text{UP}})^2$ is the quadratic term of the previous one; $\text{CASD}_t^{\text{UP}}$ is the CSAD at time t corresponding to $R_{m,t}^{\text{UP}}$. Similar symbols with superscript 'down' are used, respectively, in the case of the market declines. Coefficient equality in Panel B is conducted with Chow test. Coefficients are given in each cell followed by t-ratios in parenthesis

Table 4: Residual Tests (3 March 2002 to 20 July 2007)

Statistical test	Regression (1)	Regression (1) with newey-west consistent estimators	Regression (3) rising market	Regression (4) declining market
Durbin watson	1.07	1.07	0.93	0.86
Jarque-Bera	923.21***	923.21***	94.52***	648.11***
White test				
F-statistic	143.96***	143.96***	17.74***	146.88**
Obs*R-squared	378.74***	378.74***	63.56***	279.62**
ARCH test				
-F-statistic	157.41***	157.41***	26.81***	31.28***
-Obs*R-squared	137.86***	137.86***	25.03***	28.57***

, *: Significant at the p<0.05 and 0.01, respectively

findings of herding behaviour in emerging markets such as Taiwan and Korea by Chang *et al.* (2000) and in Vietnam by Kallinterakis (2007).

In addition, the significance of the GARCH factor in the conditional variance equation means that there are GARCH effects in the dispersion of market returns. In addition, the sum of the coefficient on the lagged squared error and lagged conditional variance are equal to one, implying that shocks to the conditional variance will be highly persistent.

Table 3 reports outcomes of the tests for herding in the rising and the declining markets in Vietnam. As we can see, the negative coefficients of square terms of market return in the first two columns imply the presence of herding in rising and falling markets. However, the latter coefficient is not statistically significant. Thus, it can be concluded that herding only exists in upward markets. This finding is consistent with Tan *et al.* (2008), who report that herding behaviour is more pronounced among A-share investors in rising Shanghai markets. Furthermore, residual tests for these two regressions show the presence of non-normality, heteroskedasticity, autocorrelation and

an ARCH effect in the error terms of return dispersion (Table 4). ARCH estimation requires a continuous sample, thus we could not re-estimate these equations with a GARCH model as the sample had been split into the rising and the declining markets. To control for heteroskedasticity and autocorrelation, the Newey and West procedure was introduced. Nevertheless, the coefficient associated with herding in upward markets in the preceding case becomes statistically insignificant with this adjustment. Hence, the positive linear relationship between the cross-sectional absolute deviations and absolute market returns holds in both upward and downward markets. In other words, it could be concluded that the data does not support the existence of herding behaviour in generally upward or downward markets when the entire sample is considered. The estimated coefficients for absolute market return variables in the two adjusted regressions are similar to those found in the OLS model.

Furthermore, the equality tests in Panel B of Table 3 reveal that the dispersion of market returns in the rising markets is significantly lower than that of the declining markets. Hence, the second hypothesis is not supported in this case.

Intuitively, the scatter plot also indicates a structural break at the return value of zero. The structural test as shown in Appendix A supports this fact. The F-value of the test which has the null hypothesis that all estimated coefficients in the two rising and declining market equations are identical, is 61.37. This value is statistically significant at the 1% level. It is therefore plausible to split the whole market sample into rising and declining markets using the market return of zero as a structural break point for a further examination of herd behaviour.

At first glance, the CSAD market return relation gives some impression of being non-linear on the positive side of the market return distribution as shown in the graph. The non-linearity is probably not intensive enough to provide statistically significant evidence for herding in the rising markets. This observation seems consistent with the empirical evidence that herding behaviour does not exist conditionally for either the rising or the declining market.

It is visually ambiguous to infer from the graph the direction of the linear relationship between the daily market returns and their dispersion in the negative side of the scatter plot. On the one hand, some extreme observations in the upper-left corner of the scatter plot may cause a downward slope in the decreasing markets. On the other hand, many observations located in the lower-left area may result in the upward direction. However, the estimation results of the decreasing market equation indicate that the linear relationship is upward given the significantly positive coefficient of market returns (Table 3).

Robustness checks: Panel A in Table 5 summarizes the results of various tests of Eq. 5 using 1, 2 and 5% as criteria for identifying extreme market movements. A negative significance of β_1 and β_2 is supposed to be associated with herding behaviour. The coefficients of β_2 for all three thresholds are found to be positive and statistically significant. This result supports the prediction of the rational asset pricing model that equity market returns increase during periods of stress. In other words, the result provides little support for herd formation in extreme downward market movements. This finding supports the main model which did not reveal the existence of herding behaviour in declining markets. However, the results show the presence of herding behaviour in extreme upward markets, though not statistically significant at the 5% cut-off point.¹¹ Hence, this finding is inconsistent with the conclusion of the main model that no herding occurs in upward

¹¹Note that R-squared values for all cases are small since the number of observations being considered as extreme market return movements only accounted for a small proportion of the whole sample

Table 5: Regression results for the daily cross-sectional absolute deviation during periods of market stress (3 March 2002 to 20 July 2007)

	Regression (5) 1% Criterion	Regression (5) 2% Criterion	Regression (5) 5% Criterion
Panel A: Regression results			
Constant	0.02*** (49.55)	(49.87) 0.02*** (48.32)	0.02*** (48.32)
Return in upper tail (β_1)	-0.01*** (-3.09)	(-3.22) -0.002 (-1.23)	-0.01*** (-1.23)
Return in lower tail (β_2)	0.01*** (4.00)	(3.16) 0.01*** (4.91)	0.01*** (4.91)
R ² (%)	1.87	2.34	2.33
Adj. R ² (%)	1.69	2.16	2.15
F-statistic	10.43***	13.12***	13.06***
Panel B: Test for asymmetric reactions in upward and downward markets			
$\beta_1^U - \beta_2^L$	-0.015	-0.015	-0.011
F-statistic	20.78***	25.89***	20.02***
Chi-square	20.78***	25.89***	20.02***

***: Significant at the $p < 0.01$. The estimated equation is: $St = \alpha + \beta_1 D_t^U + \beta_2 D_t^L$ where, $D_t^U (D_t^L) = 1$ if the market return on day t lies in the extreme lower (upper) tail of the return distribution and zero otherwise; St is the cross-sectional standard deviation. The differences in coefficients in Panel B are performed by Wald Test. Coefficients are given in each cell followed by t-ratios in parenthesis

markets when 1 and 2% cut-off points are used to differentiate returns in the upper extreme market movements. This result implies that when the market shows extreme upward movements, investors tend to ignore their own beliefs and act on the market consensus.

Panel B of Table 5 provides negative signs for $\beta_1^U - \beta_2^L$, implying that the dispersion of market returns during the extreme upward markets is statistically lower than that of extreme downward markets at all cut-off points. This finding indicates that stock returns behave more similarly during extreme rises in the market and therefore have lower market dispersions. Hence, the third hypothesis, suggesting more pronounced herding behaviour during extreme downward movement in comparison to periods of extreme upward market movement is not supported in this case.

The estimated results in two sub-periods (before and after 1 January 2006)

The first period (3 March 2002-1 January 2006): Information displayed in Appendix B shows the presence of herding behaviour in the Vietnamese stock market in the first period, as previously reported when the entire research period was considered. The residual tests for the first regression in this period neither reveal any evidence of ARCH effects, nor evidence of autocorrelation in the error terms. However, they uncover the presence of heteroskedasticity. The first regression with a Newey-West consistent standard error is therefore reported. Nevertheless, the outcome of the Newey-West procedure's coefficients is similar to the preceding results of the OLS model.

With regard to herding in the rising and the declining markets, Coefficients displayed in Appendix C shows evidence of the existence of this phenomenon in both market conditions. Accordingly, investors are inclined to behave similarly during upward and downward circumstances in the first period.¹² This finding is different from the previously reported result that herding is not

¹²Regressions (3) and (4) are only estimated with the OLS model in the first period since the violations and disturbances are not serious

present in either rising or falling markets for the whole period. In addition, the coefficient test reveals that herding behaviour under upward market conditions is significantly more pronounced than in downward market conditions. This result is in line with the outcome of the coefficient test for the whole sample.

With reference to herding associated with extreme upward market movements, the conclusion for the first period (in the overall sample) is inconsistent with the results reported for the period studied independently. While the presence of herding is prominent in extreme upward market movements (at 1 and 2% cut-off point criteria) over the whole sample, it appears trivial over the first period at all upper cut-off points (Panel A of Appendix D). Moreover, as previously noted, Panel B (of Appendix D) reports that the market return dispersions for the first period are significantly lower during extreme upward movements compared to downward market movements.

The second period (2 January 2006-20 July 2006): In the second period, herding behaviour is documented for the Vietnamese equity market in the GARCH-specified mean equation. This result is also found in the first period sample as well as in the entire sample. However, the evidence of herding behaviour in the rising and the declining markets for the second period is different from what was found for the first period, as well as for the overall sample. As such, Appendix E only reports the presence of herding in the rising markets for the second period. The evidence of herding cannot be found with respect to both upward and downward markets over the entire sample. It is, on the contrary, found for the first period. With reference to asymmetric effects in the second period, consistent with the results of equality tests reported for the first period sample and over the whole sample, the dispersion in upward markets is found to be significantly lower than that of downward markets (Panel B of Appendix F).

When herding characteristics during the extreme markets are considered (Appendix G) there is evidence of herding only in extreme upwards movements (2 and 5% criteria). ¹⁹This outcome is consistent with the previous conclusion for the whole sample but inconsistent with that concerning the first period. In addition, the asymmetric test indicates less return dispersions in extreme upward markets than in extreme downward markets. However, the difference in coefficients is only statistically significant at the 5% criterion.

When examining non-linearity in two periods by means of a plot between the equally weighted market returns and their dispersions, the graph provides clear visual evidence of non-linearity for the first period. It should be noted that since there are not many extreme observations in this phase, herding is therefore hardly to be found in such extreme cases. In addition, in the second period, the visual evidence is likely to support a relatively intensive non-linearity in upward markets rather than in downward markets. As seen, this evidence is in line with the previous empirical outcomes for both phases.

DISCUSSION AND CONCLUSION

Discussion: The results of this study point to an interesting pattern of herding for the Vietnamese stock market. With respect to the outcomes of the main model, herding behaviour is evident for this market. Investors have a tendency to follow the actions of those who are believed to be better informed. The inadequacy of the regulatory framework in the Vietnamese market (for example, a

¹⁹Regression (7) could not be estimated with a 1% criterion in the second period because of a near singular matrix

lack of transparency or an efficient mechanism for reporting information) prevents investors from collecting accurate and rapid firm-specific information for their own evaluation. This informational inefficiency together with a relatively high degree of market volatility may induce investors to make decisions based on consensus which leads to higher correlations among stock returns.¹⁴ The dispersion among returns is therefore likely to decrease or at least increase at a decreasing rate, thereby reflecting this increase in correlation. As a result, herding is observed.

Contrary to this evidence of herding in the entire market, investor herding is not found when looked for in rising and declining markets alone. A possible explanation is that when the sample is split into two separate market conditions, the non-linearity between market returns and their dispersions is not rigorous enough to prove the presence of herding. Another possibility is that the separation of upward and downward markets is not an appropriate criterion for measuring an asymmetric effect in this case. This provides an incentive for further studies which might consider other criteria, such as trading volume and the volatility of the Vietnamese stock market, in analysing the asymmetric effect of herding behaviour.

As shown from equality tests, upward markets have less return dispersions than downward markets. In other words, investors appear to perform more uniformly in the rising markets than in the declining markets. This result can be interpreted as a phenomenon observed only in the Vietnamese equity market. As a matter of fact, most listed firms in Vietnam have originated from state-owned enterprises that were equitized as part of the equitization programme in Vietnam which started in 1992 (Truong *et al.*, 2006). These companies used to receive strong support from the government with respect to financing, inputs for production and the product distribution network. Given this context, in addition to an inadequately transparent environment such as that found in Vietnam, if market conditions turn out favourable, investors in this equity market tend to anticipate that the stock prices will continue to increase. Accordingly, they tend to make investment decisions based on the consensus belief and perform more uniformly in rising markets which induces a decrease in market return dispersions. If the market falls, a common action of investors is to withdraw so as to protect their capital. However, another group of investors may believe there will be government intervention to avoid a stock market crash. Even though they may experience disappointment from a paper loss, they still expect the stock prices to bounce back (Tan *et al.*, 2008). Such a belief may prevent this group of investors from exhibiting 'a flight to safety'. Consequently, different opinions and decisions in declining markets might increase the dispersion of market returns.

In order to check for the sensitiveness of herding behaviour under different model specifications, Christie and Huang (1995) method was used. This method allows for the investigation of herding during periods of extreme market movement.¹⁵ The results drawn from this method reveal the presence of herding behaviour in periods of extreme upward market movements. Alternatively, the main model, using the approach of Chang *et al.* (2000) and Tan *et al.* (2008), provides evidence that does not support the existence of investor herding under general upward and downward market conditions.¹⁶ It seems that evidence of herding is sensitive to the specific

¹⁴Truong *et al.* (2006) concludes that the Vietnamese stock market is inefficient in the weak form of the Efficient Market Hypothesis

¹⁵One, two and five percent are used as cut-off points

¹⁶The market is regarded as rising or declining if its equally weighted market return is positive or negative, respectively

model used. Nonetheless, both models lead to the same conclusion: that the dispersion of market returns is statistically lower during periods of extreme upward market movement than during periods of extreme downward market movement.

In an attempt to examine how different herding behaviour is exhibited during different periods, the entire sample was divided into two separate phases. The results indicated the presence of herding with respect to the overall market for both phases. However, the patterns for herding were different, depending on generally rising and declining markets as well as extreme cases. With reference to general upward and downward markets while evidence of herding behaviour was found in both market conditions for the first period, herding was evident only in rising markets for the second period. With reference to extreme cases while no sign of herding was revealed for the first phase, evidence in favour of herding was found in periods of extreme upward market movement for the second phase. These differences could have originated from dissimilarities in market conditions in the two phases. While the former is characterized by moderate increases, the latter exhibits a high range of fluctuations. It appears that herding patterns with respect to different market directions are sensitive to the chosen research period. In particular, equality tests of the coefficients provided consistent evidence that upward markets have less return dispersions than downward markets regardless of model specifications or market periods.

In summary, we believe our research contributes to the existing literature on herding in emerging markets. Present study examined herding patterns for the Vietnamese stock market in detail and also provided some evidence of the asymmetric effects of herding in this market. In addition, as Vietnam's government has made efforts towards the financial liberalization of the market in recent years, such as an increased limit for foreigner ownership and changes in price limit regulations, herding patterns may vary with these changes. The relevance of these factors to herding characteristics should be the subject of further research.

This study examined the existence of herding behaviour in the Vietnamese stock market and the asymmetric effects of herding in rising and falling market conditions using daily return data from all securities in the Ho Chi Minh Stock Trading Center (STC) from 3 March 2002 to 20 July 2007. Using models developed by Chang *et al.* (2000) and Tan *et al.* (2008), the study analysed the relationship between market returns and their dispersion in order to detect herd behaviour over the entire distribution of market returns. Within this framework, rather than a linear relationship between market returns and their dispersion, as predicted by a rational asset pricing model, a non-linear relationship was expected.

The empirical tests showed evidence of herding behaviour in the Vietnamese stock market regardless of the model specification or market period. This result is supported by Kallinterakis (2007). This outcome implies that market consensus belief has a significant influence on the decision-making process of participants in the Vietnamese stock exchange. Some micro-structure characteristics typical of Vietnam's institutional environment such as a lack of transparency in information and financial management, a high degree of market volatility and thin trading, are supposed to induce investor herding in this young stock market. Although market transparency in Vietnam has improved through the application of stricter requirements for listed firms as well as punishment for violations, it seems that it remains inadequate. In addition, due to the continued existence of many government restrictions on the operation of the stock market and the underdevelopment of the bond and real estate markets, the possibility of investors' speculating on

Vietnam's stock exchange remains likely. This may result in continued volatility in the Vietnamese stock market. The descriptive statistics demonstrate that equity market returns in Vietnam exhibit a relatively high degree of volatility, with a standard deviation of 1.38% per day for the entire market. Moreover, despite a significant growth in investor participation, there is still a substantial level of thin trading in the Vietnamese stock market, as manifested by its small trading value and low ratio of trading value over GDP (Truong *et al.*, 2006).¹⁷ As a consequence of these factors, herding behaviour is likely to prevail in this equity market, as evident from this study. Since herding behaviour is thought to intensify the volatility of the market, the existence of herding may trigger some policy concerns about a potentially destabilizing effect in the financial market.

Conclusion: The evidence presented does not support the existence of herding behaviour in upward and downward markets over the entire sample period. However, the results drawn from the robustness checks show that herding behaviour exhibits a slightly different pattern in rising and declining markets, as well as in extreme movements, compared with those of the main models. It appears that herding patterns with respect to different market directions are sensitive to the chosen research period. In addition, although herding behaviour cannot be found in upward and downward markets, the results of equality tests suggest that upward markets have less return dispersions than downward markets, irrespective of the model specification or market period. This implies that investors perform more uniformly in upward markets than in downward markets.

APPENDIX

Appendix A: The results of a structural test (Chow test)^a

Null hypothesis	F_statistic
$\alpha^{UP} = \alpha^{DOWN},$	61.37***
$\gamma_1^{UP} = \gamma_1^{DOWN},$	
$\gamma_2^{UP} = \gamma_2^{DOWN}$	

*** = Significant at the $p < 0.01$. -The two rising and declining market equations are: Eq. 3 and 4. Where, $R_{m,t}^{UP}$ is the market return at time t when the market rises; $(R_{m,t}^{UP})^2$ is the quadratic term of the previous one; $CSAD_t^{UP}$ is the CSAD at time t corresponding to $R_{m,t}^{UP}$. Similar symbols with superscript 'down' are used, respectively, in the case of the market declines

Appendix B: Analysis of herding behaviour in the Vietnamese stock market for the first period (3 March 2002 to 1 January 2006)

	Regression (1)	Regression (1) with Newey-West consistent estimators
Constant	0.01***(23.04)	0.01***(20.25)
Absolute market return	0.87***(18.16)	0.87***(10.32)
Square term of market return	-16.96***(-13.75)	-16.96***(-5.04)
R ² (%)	36.60	36.60
Adj. R ² (%)	36.42	36.42
F-statistic	204.97***	204.97***

***: Significant at the $p < 0.01$. -: The estimated equation is $CSAD_t = \alpha + \gamma |R_{m,t}| + \gamma_2 R_{m,t}^2$. Where, $CSAD_t$ is the cross-sectional absolute deviation and $R_{m,t}$ is the equally weighted average return on day t. Coefficients are given in each cell followed by t-ratios in parenthesis

¹⁷Kallinterakis (2007) concludes that thin trading introduces a bias into herding estimations

Appendix C: Analysis of herding behaviour in a rising and declining Vietnamese stock market for the first period (3 March 2002 to 1 January 2006)

	Regression (3) Rising market (a)	Regression (4) Declining market (b)
Panel A: Regression results		
Constant	0.01***(21.12)	0.01***(15.56)
Absolute Up/downward market return	0.89***(17.05)	0.74***(10.08)
Square term of Up/downward market return	-20.22***(-15.49)	-7.76***(-3.77)
R ² (%)	46.21	43.34
Adj. R ² (%)	45.90	43.03
F-statistic	147.33***	139.22
Panel B: Test for asymmetric reactions in upward and downward markets		
$\gamma_2^{UP} - \gamma_2^{DOWN}$	-12.45	
F-statistic	33.46***	

***: Significant at the $p < 0.01$. The estimated equations are Eq. 3 and 4 where $R_{m,t}^{UP}$ is the market return at time t when the market rises; $(R_{m,t}^{UP})^2$ is the quadratic term of the previous one; $CASD_t^{UP}$ is the CSAD at time t corresponding to $R_{m,t}^{UP}$. Similar symbols with superscript 'down' are used, respectively, in the case of the market declines. Coefficient equality in Panel B is conducted with Chow test. Coefficients are given in each cell followed by t-ratios in parenthesis

Appendix D: Regression results for the daily cross-sectional absolute deviation during periods of market stress for the first period (3 March 2002 to 1 January 2006)

	Regression (5) 1% criterion	Criterion regression (5) 2% criterion	Criterion regression (5) 5% criterion
Panel A: Regression results			
Constant	0.01*** (44.24)	0.01*** (43.68)	0.01*** (43.34)
Return in upper tail (β_1)	-0.002 (-1.01)	-0.0006 (-0.36)	0.001 (0.77)
Return in lower tail (β_2)	0.02*** (6.79)	0.01*** (6.70)	0.01*** (7.22)
R ² (%)	6.26	5.99	6.87
Adj. R ² (%)	6.00	5.72	6.61
F-statistic	23.72***	22.61***	26.19***
Panel B: Test for asymmetric reactions in upward and downward markets			
$\beta_1^U - \beta_2^L$	-0.019	-0.015	-0.014
F-statistic	38.62***	31.72***	30.69***
Chi-square	38.62***	31.72***	30.69***

***: Significant at the $p < 0.01$. The estimated equation is: $s_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L$, where $D_t^L (D_t^U) = 1$ if the market return on day t lies in the extreme lower (upper) tail of the return distribution and zero otherwise; St is the cross-sectional standard deviation. The differences in coefficients in Panel B are performed by Wald Test. -Coefficients are given in each cell followed by t-ratios in parenthesis

Appendix E: Analysis of herding behaviour in the Vietnamese stock market for the second period (2 January 2006-20 July 2007)

	Regression (1)	Regression (1) with newey-west consistent estimators	GARCH model
Mean equation			
Constant	0.02*** (17.91)	0.02*** (10.43)	0.01*** (21.95)
Absolute market return	0.22*	0.22	0.59***

Appendix E: Continued

Mean equation	Regression (1)	Regression (1) with newey-west consistent estimators	GARCH model
	(1.80)	(0.86)	(8.01)
Square term of market return	0.04 (0.01)	0.04 (0.00)	-13.90*** (-8.17)
Conditional variance equation RESID(-1)^2			0.29*** (5.75)
GARCH (-1)			0.72*** (18.90)
R ² (%)	8.04	8.04	
Adj. R ² (%)	7.56	7.56	
F-statistic	16.63***	16.63***	

*, ***, Significant at the p<0.10 and 0.01, -The estimated equation is $CSAD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2$. Where $CSAD_t$ is the cross-sectional absolute deviation and $R_{m,t}$ is the equally weighted average return on day t, -Coefficients are given in each cell followed by t-ratios in parenthesis

Appendix F: Analysis of herding behaviour in a rising and declining Vietnamese stock market for the second period (2 January 2006-20 July 2007)

	Regression (3) with newey-west consistent estimators rising market	Regression (4) declining market	Regression (3) with newey-west consistent estimators rising market	Regression (4) newey-west consistent estimators declining market
	(a)	(b)	(c)	(d)
Panel A: Regression results				
Constant	0.02*** 0.02***	(14.12) (9.57)	0.02*** 0.02***	(11.68) (11.68)
Absolute up/down market return	0.63*** 0.63***	(4.60) (3.73)	-0.02 -0.02	(-0.08) (-0.08)
Square term of up/down market return	-14.65*** -14.65***	(-4.32) (-3.01)	9.29 9.29	(1.12) (1.12)
R ² (%)	8.82	20.71	8.82	20.71
Adj. R ² (%)	7.99	19.71	7.99	19.71
F-statistic	10.59***	20.64***	10.59***	20.64***
Panel B: Test for asymmetric reactions in up and down markets				
$\chi^2_{UP} \chi^2_{DOWN}$	-23.94		-23.94	
F-statistic	13.88***		4.21***	

***: Significant at the p<0.01. The estimated equations are Eq. 3 and 4. Where, $R_{m,t}^{UP}$ is the market return at time t when the market rises; $(R_{m,t}^{UP})^2$ is the quadratic term of the previous one; $CASD_t^{UP}$ is the CSAD at time t corresponding to $R_{m,t}^{UP}$. Similar symbols with superscript 'down' are used, respectively, in the case of the market declines. Coefficient equality in Panel B is conducted with Chow test -Coefficients are given in each cell followed by t-ratios in parenthesis

Appendix G: Regression results for the daily cross-sectional absolute deviation during periods of market stress for the second period (2 January 2006-20 July 2007)

	Regression (5) 2% Criterion	Regression (5) 5% Criterion
Panel A: Regression results		
Constant	0.02*** 0.03***	(37.81) (38.05)
Return in upper tail (β_1)	-0.02** -0.01***	(-2.10) (-3.94)

Appendix G: Continued

	Regression (5) 2% Criterion	Regression (5) 5% Criterion
Return in lower tail (β_2)	-0.002	(-0.47)
	-0.003	(-1.13)
R ² (%)	1.19	4.16
Adj. R ² (%)	0.67	3.65
F-statistic	2.30	8.26
Panel B: Test for asymmetric reactions in up and down markets		
$\beta_1^U - \beta_2^L$	-0.016	-0.011
F-statistic	2.65	5.41**
Chi-square	2.65	5.41**

***: Significant at the $p < 0.01$. -The estimated equation is. $S_t = \alpha + \beta_1 D_t^U + \beta_2 D_t^L$ where, D_t^L (D_t^U) = 1 if the market return on day t lies in the extreme lower (upper) tail of the return distribution and zero otherwise; S_t is the cross-sectional standard deviation The differences in coefficients in Panel B are performed by Wald Test Coefficients are given in each cell followed by t-ratios in parenthesis

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