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Herding behaviour in the Indian stock market: An empirical study

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ABSTRACT

The rapid growth of the Indian stock market in recent decades has prompted much study on investing, focusing on understanding and analysing investors' tactics for investment and trading. Over the years, researchers have cited and conducted in-depth investigations into various psychological biases. Herding bias is extensively studied to understand how investors participate in investment and trading in the Indian stock market. The current study on herding provides an investigation into the existence of herd activity in the share market of India. The study attempts to identify herd activity during positive, negative, extreme positive, and extreme negative market conditions, as well as during structural breakpoints and trade volumes that are low as well as high. The researchers have used the modified CSAD (Cross Sectional Absolute Deviation) model to enhance its validity. The findings reveal the rationality of investors during the different market states. However, herding behaviour was evidenced during certain periods at the structural breakpoint. This implies that during positive as well as negative market conditions, herding behaviour is absent, except during certain structural breakpoints and high trading volumes.

Contribution/ Originality: The present research establishes itself among the pioneer studies that identify and study structural breakpoints as well as high and low trading transaction volumes to test for the prevalence of herd tendencies in the Indian Equity Market.

1. INTRODUCTION

Investments in the stock market have caught the interest of investors for decades. These investments, however, come with risks as a result of various conditions that affect market movements. The inevitability of the risk factor accompanying stock market investments has led managers of portfolios, stock brokerage agents, and research scholars to track and potentially predict the varying factors' effect on the stocks' performance in the market. In an attempt to do so, theorists and market experts have, over the decades, proposed various theories that aim to explain the operation of markets and the investment patterns, motivations, and results of investors. The Efficient Market Hypothesis was one such theory that led to the reasoning that markets and investors are always rational. This, however, did not explain the reasons for major booms and bursts in the market. In an attempt to understand and explain market booms and bursts, Mackay (2003) questioned the concept of investors' rationality that was proposed by the Efficient Market Hypothesis by drawing attention to the inevitable reality of investors' irrationality. Statman (1999) also claimed that it was nearly impossible to have completely rational investors as long as the market existed. Research by Statman (1999) claimed that people are 'normal' rather than rational, and this makes investors realistic behaviour agents who

are prone to biased decision making. This led researchers to look into alternative explanations regarding investors' performance and the process of decisiveness in the market.

Psychology plays a part in the process of investors' decisions-taking, and this has been a point of debate in the past few decades. Sewell (2011) states psychology as an influencing factor in financial practitioners' behaviour, which subsequently impacts the stock markets. As a response to the Efficient Market Hypothesis, Behavioural Finance aims to fill the gaps regarding the role of psychology in investors' behaviour and decision-making patterns. Further, knowledge about behavioural biases can provide deeper insight that will provide a better understanding of the psychology of market agents.

One such widely studied behavioural bias called 'Herding' is a psychological tendency to imitate and replicate others' behaviour resulting in similar behavioural patterns among a group of people. According to, Nofsinger and Sias (1999), herding is the situation in which investors enter and exit the market in groups and trade in a similar direction for a predetermined period of time.

Christie and Huang (1995) opined that herd investors, in any given setting of market, are characterized by individuals suppressing personal principles and using the collective movements of markets as a basis to take their investment-related decisions, even in a scenario wherein they disagree with its predictions. Deviation of prices from fundamental value and presentation of profitable trading opportunities may be caused by dependence on information that is collective rather than private, which leads to fascination among practitioners and academic researchers about the occurrence of herding bias. Morris and Shin (1999); Persaud (2000); and Shiller (1990) among other researchers, have expressed a concern that herd activities by market participants intensify volatility and contribute to the destabilization of the market, hence rendering the financial system fragile.

Bikhchandani and Sharma (2000) have presented three reasons for herding behaviour and according to Devenow and Welch (1996), the initial two reasons display the rationality of investors' herd activity; the third is related to irrationality that forms part of the investors' psyche. The first reason is that investors who engage in herd behaviour believe that other investors' trading strategies that bring superior returns are a reflection of the private information held by them. The second reason is that investors who display herd tendencies aim to maintain continuity in employment and compensation schemes. Third, investors who herd tend to do so in disregard of their own prior beliefs and in an attempt to attain satisfaction of their preference to conform to others.

India, an emerging market that is carving its niche among the prominent world markets, is witnessing constant evolution and adaptation to different market trends. A thorough study is therefore vital in order to study the correlation between the prices of shares, volatility, and arbitrage opportunities as a potential effect of the herd behaviour of investors. The return potency of this market that is unfolding shows a considerable difference in comparison to markets that are mature.

The majority of herding-related research is concentrated on markets that are developed, and some of the research is based on emerging markets. The emerging Indian stock Market lays out a plethora of new research avenues. One such avenue lies in the area of behavioural bias known as herding. Taking forward the extant literature on the actuality of herd tendencies in the Indian market, the present study aims to contribute to literature by exploring seldom-visited aspects of the stock market in the Indian context. In addition to exploring herding behaviour during positive, negative, as well as extreme positive and extreme negative market states, the current research stands apart from extant research in its identification of structural breakpoints and analysis of high and low trading transaction volume to test for herding behaviour.

The current study is organized in the following manner: A review of the literature is presented in Section 2. Research methodology and data are put forth in Section 3; Section 4 is a report of an analysis of data, while Section 5 is an exhibition of the implications as well as concluding remarks of the study.

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2. LITERATURE REVIEW

Various theorists have presented models and research related to herding in foreign as well as Indian equity markets. Researchers Chiang and Zheng (2010) investigated investors' herding behaviour in 18 countries, classifying these countries' stock markets in the following manner: advanced, Asian, and Latin American. The authors found significant evidence in support of presence of herding in each national market, excluding the markets of the US and Latin America. Subsequently, Lao and Singh (2011) examination of herd tendencies in markets in China and India found that there is a greater herd tendency at times of falling market action and a higher trading volume in the Chinese market. In the Indian market, it occurs during upswings in the market. Yao, Ma, and He (2014) studied the pervasiveness of investor herd tendencies in the A and B Chinese markets.

The research conducted by Christie and Huang (1995) as well as Chang et al. (2000) used a model that studied weekly data on stock prices for all the companies listed on the Stock Exchanges of Shanghai as well as Shenzhen. The study revealed weighty evidence of herd tendency in share markets, namely Shanghai and Shenzhen B, but significantly no signs of herd activity were found in the market, namely A-share. In recent times, Maquieira and Espinosa Méndez (2022) found that herding behaviour was proven to be higher during the COVID-19 crisis period in Oceania's financial markets. Similar results were found in the investigation conducted on six Asian markets using CSSD (Cross sectional Standard Deviation) and CSAD in alignment with two models, namely the Hwang and Salmon (2004) model and Markov- switching regression to test for herding (Jiang, Wen, Zhang, & Cui, 2022). Similarly, Jirasakuldech and Emekter (2021) perform an investigation of Thai investors under varying market conditions, periods of crises, and major structural changes. Revelations of results showed herding behaviour during market movements that were extreme, during falling markets, during high trading volume, and during the downturn of the economy. Herding behaviour was also evidenced during the 1997 Asian crisis. Herding did not exist during the period when platforms for internet trading, futures electronic exchanges, and bond electronic trading exchanges were being established.

Examination by Mobarek, Mollah, and Keasey (2014) of herding specific to country in European liquid constituent indices from 2001 to 2012 using CSAD model, reported inconsequential results for the entirety of the study period, while it documented consequential herd patterns during period of crises as well as conditions where there exists asymmetry in market (Galariotis, Krokida, & Spyrou, 2016) attempted to capture equity liquidity through employment of Amihud (2002) illiquidity measure; additionally, in order to study herd tendencies, they made use of CSAD model by investigation of data of equity price of the markets grouped as G5 namely Japanese, French German, American and the United Kingdom between January 2000 and January 2015. The study found no herding in any market for the full sample tests. However, concerning liquidity of stocks in all countries, significant herd behaviour was evidenced for stocks of high as well as medium liquidity for the greater part of the sub periods. A sole deviation is Germany, as the German market displayed weaker herding in cases of stocks where liquidity was high during the crisis (Vo & Phan, 2017). An examination of the Vietnam market for the actuality of herd behaviour employed models Christie and Huang (1995) as well as Chang et al. (2000), indicating the existence of herding in Vietnam market. The short-lived bias of herding has received confirmation through both results that are drawn from two different approaches.

Guney, Kallinterakis, and Komba (2017) investigated African frontier markets for herding using (Chang et al., 2000) method. The revelation of the research indicated herd activity across the entirety of eight markets. Shah, Shah, and Khan (2017) initiated an investigation into the herd behaviour of PSX's (Pakistan Stock Exchange) investors through the incorporation of analysis of daily data on share prices as well as all PSX companies' volume of trading. Results indicated that individual companies stock returns do not witness herd activities in the direction of market index. An investigation of herding in companies that have industry portfolios put forth the results that during 5% rising action, companies that are individuals have a tendency to engage in herd activities towards industry portfolios; there is noticeably no significant evidence of herd mentality at times of declining movements in returns of portfolios.

Clements, Hurn, and Shi (2017) investigated herd activity in the 30 Dow Jones Industrial Average and used the Granger causality test, which is a time-varying test, the basis of which is a model called vector autoregressive (VAR) as well as a rolling window algorithm. A new testing framework shows convincing substantiation of herd activity in 30 Dow Jones Industrial Average. Blasco, Corredor, and Ferreruela (2017) measured the influence of herding activity on volatility during those periods when the market witnesses bull and bear extreme conditions. A study tested if the intensity of investor herding behaviour rises significantly at times of crises. The current study found that during a crisis period, investors follow other investors in a more intense manner than at a time when the market is simply bullish or bearish, but that effect is not the same. During days where market conditions are extremely bullish, investing individuals copy in a more intense manner to the seller but are more prone to follow the buys during extreme bearish days.

Batmunkh, Choijil, Vieito, Espinosa-Méndez, and Wong (2020) used a cross-sectional absolute deviation model and data from the Mongolian stock exchange and found evidence of herding bias during up- and down-market periods and also during high and low volatility states of markets. Similarly, Arjoon, Bhatnagar, and Ramlakhan (2020) found proof of herding bias during growing market conditions. These herd activities are revealed to be both unintentional as well as intentional for the market overall as well as portfolios that are larger, but for portfolios that are smaller, it is shown to be intentional.

In the literature reviewed so far, it can be noted that in foreign markets, while herding is found in certain market situations, it is absent in others. In the context of the Indian stock market, Prosad, Kapoor, and Sengupta (2012) studied the presence of herding behaviour in conditions of extreme market stress on the market as a whole. The study found no evidence of herding behaviour in the Indian market. The results also found significant herding when bullish periods alone were considered. Poshakwale and Mandal (2014) examined the existence of herding behaviour in the Indian equity market using the Hwang and Salmon (2004) model and tested for herding before, after, and during crisis periods. The results of the research exhibited significant herd activity in the Indian share market. Additionally, there is substantiation that herd activity makes itself present in the Indian market during conditions wherein the market is in decline as well as in rise; herd activity is revealed to be prominent during market falls rather than rises. Recent studies of the COVID-19 pandemic were conducted by Bharti and Kumar (2022) on market-wide herding in the Indian context.

The impact of market volatility and the response of the government to herding during this period were examined. The results were indicative that there was significant herding in the Indian equity market, which was aggravated by market volatility. In terms of government response and implementation of control measures, it proved to be successful in reducing herd behaviour. Similarly, Vidya, Ravichandran, and Deorukhkar (2023) examined herding during 3 phases associated with the COVID-19 pandemic, that is, the periods prior to, during, and post the 2020 pandemic period, in eight of the prominent markets across Asia. Strong evidence was found in support of herding in Vietnam, India, South Korea, Singapore, and Indonesia. It was further revealed that there was a dominance of herding during the pandemic period in India, Vietnam, and Indonesia; in post-pandemic time, the potency of herding was dominant in China and Vietnam. It is to be noted that an anti-herding tendency is prevalent in Hong Kong, China, and Singapore.

Ganesh, Naresh, and Thiyagarajan (2017) examined the herding behaviour in the Indian market by employing the CCK model developed by Chang et al. (2000). The authors concluded that the result of the study is an indication of the great resilience and rationality of the Indian market. Kumar, Bharti, and Bansal (2016) examined the presence of herding behaviour in the bear and bull Indian equity market. The study indicates the absence of herding behaviour during bull and bear phases of markets and also during extreme market conditions. Satish and Padmasree (2018) examined herding behaviour in the Indian financial market using the CSAD model to measure securities dispersion from market returns. The authors found no indication of herd activity prior to, post-, or during the crisis among the stocks of the Indian market. Chauhan, Ahmad, Aggarwal, and Chandra (2020) analysed investor's behaviour in large-

cap and small-cap stocks and found significant evidence of herding behaviour in two different cross sections of Indian financial markets.

3. RESEARCH METHODOLOGY AND DATA

Tan, Chiang, Mason, and Nelling (2008) suggest that daily data provides a better reflection of herd levels as compared to research that is dependent on data that is weekly and monthly. Conclusions by Christie and Huang (1995) support the fact that herd behaviour is only short-term and that a more robust estimation of herd behaviour can be arrived at if the data frequencies are higher.

There are 50 companies listed on the Nifty 50 index of the National Stock Exchange. To meet the objectives of the research, daily data on closing stock prices has been collected for the stocks listed on the Nifty 50. The return for each stock and Nifty 50 is calculated as $R_t = 100 \times (P_t - P_{t-1})/P_{t-1}$ where P_t is the daily closing price.

The time period selected for the study is from January 2015 to December 2022. During this period, some companies were replaced. The CSAD model that has been employed for the study requires that the highest possible number of listed stocks on Nifty 50 index for the entire period of the study be considered in order to get accurate results regarding herding behaviour.

To achieve accurate results, the data of the replaced companies from the start of the study period until the date of replacement was taken into consideration; the data of the new stocks that replaced the previous stocks was considered from the date of replacement until the end of the study period.

The use of CSAD models to examine herding behaviour, requires one to measure the extent to which investors differentiate between stocks in order to make their investment decisions. The level of investors' ability to analyse and understand the differences between the stocks is measured for an accurate examination of herding behaviour. In the event of evidenced herding behaviour in stock markets, there will be no deviation of the security returns from market returns. The reason for this is that investors are making parallel decisions, resulting in a relatively low dispersion of equity returns.

The use of the Return dispersion of stocks by Christie and Huang (1995) is used as a measurement of herding tendencies, as depicted below in Equation 1.

$$CSSD_t = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(R_{i,t} - R_{m,t})^2} \qquad (1)$$

N, in Equation 1 is the number of firms in totality within a portfolio. Each firm's (i) actual return of stocks at time (t) is depicted by $R_{i,t}$. Finally, the cross-sectional average returns of N stocks are depicted by $R_{m,t}$ in a portfolio at time t.

There is, however, a stumbling block in the use of CSSD, as the data containing outliers will result in a biased valuation of CSSD. The solution lies in the modification of CSAD by Chang et al. (2000). Their modification involved consideration of the aggregate absolute value derived after finding the difference between the returns of individual stocks and returns of market. The modification of CSAD as depicted below in Equation 2.

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

In Equation 2 $CSAD_t$ is a measure of average absolute return dispersion from $R_{m,t}$ to measure return dispersion. $|R_{m,t}|$ and $R_{i,t}$ are the absolute value of market return and individual stock return of stock i, respectively.

In accordance with the hypothesis of rational expectations, there is linearity and a positive relationship between return dispersion and overall market returns. The reason for this is that in a scenario of market rationality, there should be different reactions among individuals to the market, as this is a reflection of one's personal beliefs. This evidences the fact that an increase in the absolute value of market returns should bring with it an increase in the return dispersion among the various stocks. The prediction, however, is that there is a likeliness of herding around market consensus among investors as a result of investor psychology, an occurrence specific to periods wherein

market stress is higher with extreme movements in the market. During periods in which the market is highly volatile, in the case of herd behaviour, there should be a complete fading of a linear incremental correlation between return dispersion and market return. This means that in the event of herding behaviour, there should be a deviation of individual security returns from the absolute value of market returns. Equation 3 is a regression equation that is used to test the hypotheses by adopting the Chiang and Zheng (2010) model.

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} + \gamma_2 |R_{m,t}| + \gamma_3 (R_{m,t})^2 + \varepsilon_t \quad (3)$$

Equation 3 presents the returns on market portfolio depicted by $R_{m,t}$ at time t. The herd behaviour of investors is depicted through $(R_{m,t})^2$. The coefficients of regression depicted as $\gamma_0, \gamma_1, \gamma_2$ and γ_3, and error terms are depicted by ε_t. The rational assets pricing model should have a positive γ_2 value and an insignificant non-linear term, that is, γ_3 .

The negative coefficient γ_3 is demonstrative of herding patterns in the market. In the scenario where, during considerably significant market movement, herd patterns are witnessed, a larger movement will take place in the direction of selecting assets that are similar across the portfolio, hence leading to low return dispersion. The expectation is that herd patterns among investors will result in a nonlinear and negative relationship that exists between market returns and return dispersion.

$|R_{m,t}|$ and $(R_{m,t})^2$ show high correlation with each other, thus, resulting in multicollinearity which is likely to result in a standard error that is relatively high. The resolution is a removal of the mean value from returns of market; this will lead to a reduction in the standard errors of regression parameters, hence, increasing the validity of Equation 3. There is a transformation, therefore, of $R_{m,t}$ into $R_{m,t} - \overline{R_m}$; $\overline{R_m}$ is a representation of the mean value of returns of the market at time t. Moreover, the financial market's high frequency time series data is highly sequentially auto correlated leading to a reduction in the precision of CSAD. On consideration of the autocorrelation property of data, $CSAD_t$ lag terms are incorporated into the model as independent variable (Jiang et al., 2022). Equation 4, a result of these modifications, is used to test herding behaviour for the entire period of the study. Additionally, the conduct of tests to find out the structural break by detecting the breakpoints revealed a division of the entire period in accordance with the dates of the critical breakpoint (Jirasakuldech & Emekter, 2021). This was used in the analyses of herding activities. Equation 4 is as follows:

$$CSAD_t = \gamma_0 + \gamma_1 R_{m,t} - \overline{R_m} + \gamma_2 | R_{m,t} - \overline{R_m} | + \gamma_3 (R_{m,t} - \overline{R_m})^2 + \gamma_4 CSAD_{t-1} + \varepsilon_t \quad (4)$$

In accordance with Equation 4 if investors' behaviours are to be considered herding, then there should be a negative γ_3 which has significance.

In addition to this, studies have been conducted that are demonstrative of a behaviour related to asset returns that is considered asymmetric (Ball & Kothari, 1989; Bekaert & Wu, 2000; Conrad, Kaul, & Nimalendran, 1991). Chang et al. (2000) highlight the need for investigation into the different reactions of investors on positive days in the market versus negative market days, as they are of the belief that the behaviour of investors may be affected differently according to market direction. The belief is also held that there tends to be a more marked herd effect in a market that is facing a downturn. This can be said to be a result of investors holding concerns regarding losses that they have incurred, and this is followed by an attempt to adhere to the consensus of the market in attempts to stir clear of losses. Equation 5 is used to test this:

$$CSAD_t = \gamma_0 + \gamma_1 D_t^{Negative} | R_{m,t} - \overline{R_m} | + \gamma_2 (1 - D_t^{Negative}) | R_{m,t} - \overline{R_m} | + \gamma_3 D_t^{Negative} (R_{m,t} - \overline{R_m})^2 + \gamma_4 (1 - D_t^{Negative}) (R_{m,t} - \overline{R_m})^2 + \gamma_5 CSAD_{t-1} + \varepsilon_t \quad (5)$$

In Equation 5: Negative portfolio returns that are otherwise 0 is represented as $D_t^{Negative} = 1$. When significance is found in the values of γ_3 and γ_4, there is an identification of herding activities during market states that are negative and positive. $\gamma_3 > \gamma_4$ in the event that measurement by return dispersion reveals stronger signs of herd tendencies during those states where the market is negative as opposed to positive market states.

Furthermore, research brings to the fore the likeliness on the part of investors to disregard their personal beliefs and their tendency to gravitate towards the decisions that other people have taken. This is more prominent at times of high tumult in the market.

In a scenario where exclusive percentile function is used to find the 95th percentile and 5th percentile in order to test herding in market conditions that are extreme. If market returns cross the 95th percentile, it is taken to be an extreme positive market; similarly, if market returns are below the 5th percentile, it is indicative of an extreme negative market. Equation 6 is used to test herding in extreme market condition.

$$CSAD_t = \gamma_0 + \gamma_1 D_t^{Extreme} \left| R_{m,t} - \overline{R_m} \right| + \gamma_2 (1 - D_t^{Extreme}) \left| R_{m,t} - \overline{R_m} \right| + \gamma_3 D_t^{Extreme} (R_{m,t} - \overline{R_m})^2 + \gamma_4 (1 - D_t^{Extreme})(R_{m,t} - \overline{R_m})^2 + \gamma_5 CSAD_{t-1} + \varepsilon_t \quad (6)$$

In Equation 6, the dummy variable $D_t^{Extreme}$ assumes 1 as the value at times when on day t returns of the market are found to lie in the extreme upper tail or lower tail distributions; at other times, it is 0. To be considered herding, there needs to be significance of γ_3 and it also needs to be negative.

Extending the research, a proverb famous on Wall Street highlights how "It takes trading volume to make market prices move" (Chen, Firth, & Rui, 2001). It is to be noted that high volumes of trade are indicative of the levels of activity that participants within the market engage in as a response to a flow of information that is deemed to be away from the usual or normal flow. As a result, the behaviour of investors as well as the trading volume size can be said to be influenced by the availability of information in the market. Moreover, the excessiveness of trade volume as well as volatility results from the push to stock prices made by investors in a way that stock prices are pushed to swerve away from the fundamental value (Bikhchandani, Hirshleifer, & Welch, 1992; Nofsinger & Sias, 1999), consequently leading to the associative relationship of herd behaviour with trade volume. It may be noted that there is a greater extent to which herd behaviour exists when the trading volume is high as in cultures like that of India, where collective existence is prominent, there is an expectation that investors will mimic others. Volume is high at times when the trade volume is higher as compared to the previous day's weighted 30-day trading volume. Equation 7 analyses the effect of trade volume on herd behaviour.

$$CSAD_t = \gamma_0 + \gamma_1 D_t^{HVolume} \left| R_{m,t} - \overline{R_m} \right| + \gamma_2 (1 - D_t^{HVolume}) \left| R_{m,t} - \overline{R_m} \right| + \gamma_3 D_t^{HVolume} (R_{m,t} - \overline{R_m})^2 + \gamma_4 (1 - D_t^{HVolume})(R_{m,t} - \overline{R_m})^2 + \gamma_4 CSAD_{t-1} + \varepsilon_t \quad (7)$$

4. DATA ANALYSIS

The current study included the performance of a unit root test with the use of a test called Augmented Dickey-Fuller. A reflection of the results can be found in Table 1, which shows stationarity. The results are considered to be favorable in the context of the study. Table 2 reports the summary statistics of CSAD and market returns. The stocks in NIFTY 50 show an average CSAD of 1.12% with a variation of 0.26%. An observation of the results derived from the table is indicative of the existence of herding behaviour. The revelation by CSAD is the departure from normality, as indicated by the Jarque-Bera test. Additionally, market returns (Nifty 50) show an average daily return of 0.08% with a variation of 0.77%. The market returns showed maximum returns of 2.20% and minimum returns of -2.06% for the period from 2015 to 2022. Jarque-Bera depicts the normality of the Nifty 50.

Table 3 is an estimation of the relationship that is shared between CSAD as a dependent variable and the squared value of market return as an independent variable. If the coefficient of nonlinear market return is negative and significant with a p value less than 0.05, it is taken as evidence of significant herding. Output shows a positive and significant value of the coefficient γ_3. This is in accordance with the data presented by Ganesh et al. (2017) and Naina and Gupta (2022).

Table 4 and Table 5 report herding activity results by estimation of CSAD resulting in positive values of coefficient γ_3 and γ_4 (Table 4) and γ_3 (Table 5) are indications that there is no herding behaviour during negative and positive market states, as well as during extreme market states, as also proven in the research by Kanojia (2020).

Table 6 reports the results of Structural Break Points derived from the Bai Perron Test. The five breakpoints are January 2015 to February 2017 (Breakpoint 1), March 2017 to March 2018 (Breakpoint 2), April 2018 to November 2020 (Breakpoint 3), December 2020 to January 2022 (Breakpoint 4), and February 2022 to December 2022 (Breakpoint 5). Table 7 reveals the results of herding tendencies by estimating CSAD. Results indicate that breakpoints 3 and 5 that have negative coefficient value γ_3 point towards the presence of herding behaviour during those structural breakpoints. Similar results were found by Bharti and Kumar (2022) and Vidya et al. (2023) in Indian stock market. In contrast, owing to significantly positive values of coefficient γ_3, breakpoints 1, 2, and 4 do not witness herding behaviour. Table 8 related to herding tendencies reveals that as coefficient γ_3 is negative and significant, indicates the presence of herd behaviour during high volume. These findings in the Indian stock market are similar to research by Tan et al. (2008) conducted in Shanghai market (A – Share). The present research also found γ_4 to be insignificant indicating absence of herding behaviour during low trading volume. This is keeping in line with research by Lao and Singh (2011) in Indian stock market.

Table 1. Results of Augmented Dickey Fuller (ADF) test.

Particulars	CSAD	$\lvert R_{m,t} - \overline{R_m} \rvert$	$(R_{m,t} - \overline{R_m})^2$
Intercept	-8.83***	-42.12***	-29.03***

Note: *** represent statistical significance at the 1%

Table 2. Results of descriptive statistics of CSAD and market return (Nifty 50).

Particulars	CSAD	NIFTY 50
Mean	1.12	0.08
Median	1.10	0.06
Maximum	1.86	2.20
Minimum	0.43	-2.06
Std. deviation	0.26	0.77
Skewness	0.45	-0.06
Kurtosis	2.87	3.04
Jarque – Bera	69.27***	1.51
P value	0.00	0.46
Observation	1980	

Note: *** represent statistical significance at the 1%

Table 3. Results of herding behaviour (2015 to 2022).

Variable	Coefficient	t-stats.
γ_0	0.62	24.91***
γ_1	0.01	1.68*
γ_2	0.04	0.19
γ_3	0.03	0.04***
γ_4	0.40	0.00***
N. obs.	1980	

Note: *** and * represent statistical significance at 1% and 10% levels, respectively.

Table 4. Results of herding behaviour in positive and negative market states.

Variable	Coefficient	t-stats.
γ_0	0.48	18.19***
γ_1	-0.20	-3.90***
γ_2	-0.18	-3.44***
γ_3	0.16	5.20***
γ_4	0.17	5.08***
γ_5	0.60	34.68***
N. obs.	1980	

Note: *** represent statistical significance at 1%.

Table 5. Results of herding behaviour in extreme positive and negative market states.

Variable	Coefficient	t-stats.
γ_0	0.63	24.49***
γ_1	0.02	0.30
γ_2	-0.03	-0.73
γ_3	0.04	0.89
γ_4	0.11	2.75***
γ_5	0.40	19.94***
N. obs.	1980	

Note: *** represent statistical significance at 1%

Table 6. Results of structural break points derived from bai perron test.

Break points	Break points derived from Bai Perron test
1st break point	January 2015 to February 2017
2nd break point	March 2017 to March 2018
3rd break point	April 2018 to November 2020
4th break point	December 2020 to January 2022
5th break point	February 2022 to December 2022

Table 7. Results of herding coefficients of CSAD for each break point.

Break points	$\gamma 0$	$\gamma 1$	$\gamma 2$	$\gamma 3$	$\gamma 4$	N. obs.
1st break point	0.68 (48.81***)	0.002 (0.17	0.008 (0.13)	0.058 (1.71*)	0.34 (8.82***)	533
2nd break point	0.58 (9.82***)	0.02 (1.24)	0.04 (0.50)	0.03 (0.57)	0.36 (6.47***)	267
3rd break point	0.79 (16.58***)	0.02 (1.85**)	0.10 (1.67*)	-0.004 (-0.11***)	0.29 (8.01***)	660
4th break point	0.55 (8.71***)	-0.00 (-0.01)	0.05 (0.62)	0.03 (0.65)	0.45 (8.88***)	293
5th break point	0.66 (9.27***)	0.007 (0.38)	-0.08 (-0.83)	-0.12 (-2.34***)	0.32 (5.45**)	227

Note: ***, **, and * represent statistical significance at 1%, 5%, and 10% levels, respectively.

Table 8. Results of herding behaviour for high and low trading volume.

Variable	Coefficient	t-stats.
γ_0	0.68	27.57***
γ_1	0.27	7.25***
γ_2	-0.14	-3.85***
γ_3	-0.09	-4.17***
γ_4	0.14	6.13***
γ_5	0.35	17.95***
N. obs.	1980	

Note: *** represent statistical significance at 1%.

5. CONCLUSIONS AND IMPLICATIONS

Most studies related to herding are found in developed countries, with limited studies conducted in developing countries. The current research tested herd activity in the Indian equity market during positive and negative market conditions, extreme market conditions, structural breakpoints, and high and low trading volumes. Findings revealed that herding doesn't exist in the Indian equity market for the time period studied. It was also observed that during the positive and negative market states, investors did not let go of their fundamentals and were rational in their investment decisions. This leads us to the conclusion that herding behaviour was absent during the study period of these market states.

The study has attempted to identify the structural breakpoints and understand whether investors herd during the structural breakpoints. It was found that the 3rd and 5th breakpoints witnessed herding behaviour. Herding was also found at times when trading volumes were high, and it was absent at times of low trading volumes.

The current research is a contribution to the literature based on herding in the Indian stock market during a recent period, and this can be beneficial to helping financial agencies and other regulatory authorities understand herding tendencies and devise strategies to enable the maintenance of a stable financial environment, especially during structural break points and periods of high trading volume.

There is scope to carry the current research forward through the identification and examination of specific events during the proposed structural breakpoint period to test for herding existence. This can be enhanced by a comprehensive study of sectorial herding behaviour.

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