Section A-Research paper

AN EMPIRICAL INVESTIGATION OF HERDING BEHAVIOUR IN INDIAN BOMBAY STOCK EXCHANGE

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Abstract

Drawing upon prior research on the Indian stock market, they examine whether the Bombay Stock Exchange (BSE) exhibits herding behaviour, and whether herding behaviour differs when the market recovers (up or down).Data from January 1, 2017 to December 31, 2020 was investigated for herding. The paper presents an alternative approach to testing herding behavior in the Indian stock market using the measure of cross-sectional absolute deviation and a semi-parametric estimator of quantile regression. Data analysis shows that tthroughout the whole span, herding behaviour is clearly evident. When the market is volatile, there is little evidence of herding. Another study found herding behaviour in fluctuation markets in India, though it is more pronounced in up markets, which is steady with the overall results. The study has limitations because we used monthly traded stock values of five IT businesses and the SENSEX to compare market performance. Herding behaviour is analysed using market returns solely. This study applies to real-world financiers, regulators, and lawmakers. The COVID-19 pandemic has created a "new set of normalcy" for merchants. Any behavioural bias might cause asset valuation inefficiencies. Herding behaviour hinders rational asset pricing theories under exogenous events. Thus, scholars must create new value models. Disruption and information asymmetry damage the market. Instead of following the crowd, investors should have a "investment vision" that guides their decisions. The study investigate herding behaviour in Bombay Stock Exchange (BSE) and fluctuation markets in India

Keywords: herding behaviour, stock market, market returns.

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Introduction

After the financial crises, the term "herding" has become ubiquitous. Individuals herd by responding to and copying the actions of others in order to maximise results. Humans are prone to herd mentality, when they replicate others' activities in circumstances like buying and investing. Investors follow the herds to maximise their profits. Risk-reward tradeoffs are depicted as being unknowledgeable by fund managers. Investors that prefer to herd other market participants' behaviour over their own proficiency and proof are assumed to be herding (Hwang 2004). This behaviour has been presented as a plausible enlightenment for investors' ultimate investment decisions (Demirer, 2010). It's rational or ridiculous. Herding occurs when investors make decisions based on blindly copying the activities of others (Devenow and Welch, 1996). Herding may be rational when other market applicants are thought to be better knowledgeable and have more trustworthy information (Hwang and Salmon, 2004). This study will examine candidates' herding behaviour at the BSE in India. The world's oldest stock exchange is in Mumbai, India. To explore herding behaviour in the Indian stock market, answer the following questions.

• *Is there evidence of herding at the Bombay Stock Exchange?*

• *Does herding behaviour change when the market returns (up or down)?*

This research on herding has been linked to increased market volatility, destabilization, and financial system instability. Fundamental values alter due to herding, resulting in an incorrect stock price. The depositor's necessity to trade with distorted stock prices. Herding violates the risk-reward criterion and produces market bubbles. Thus, determining herding behavior is crucial. Traders on the Bombay Stock Exchange analyse their closing values every day. The All Share Index ran from January 1, 2010 to December 31, 2020.

Literature Review

Our daily decisions may be influenced by what others are doing, and we may wind up going along with the crowd. Consider Banerjee's (1992) fundamental choice: between A and B, two unidentified companies. The author said that 100 individuals would have to choose between the two establishments. Even if investors disagree, financial markets exhibit comparable herd behaviour (Christie 1995). It occurs when traders mimic each other's moves (Bikhchandani 2001). It is nonsensical in the financial markets (Christie and Huang, 1995). For example, when other market players are more knowledgeable than you (Hwang and Salmon, 2004), According to Bikhchandani (2001), investors make the same decision when faced with the same issue or facts. This herding method is believed to work. However, because investment decisions are influenced by so many variables, separating "spurious herding" from "intentional herding" may be difficult. This can amplify and destabilise market volatility. Blasco (2012) studied the Spanish stock market, while Avramov (2006) studied the NYSE Amex. Financial market herding exemplifies the link between herding and pricing inefficiencies. When herding develops in a stock market, individual information is not efficiently integrated. (Cipriani, 2009).

Herding Behaviour and its Market Significances

What others' deeds might influence our daily decisions, and we may end up following the crowd. Think about Banerjee's (1992) basic situation: choosing between A and B, two unknown businesses. 100 people, according to the author, would have to pick between the two restaurants. Take into account that the first person to arrive was told that cafeteria A is better and was directed to eat there. The remaining 99 people were instructed to vote for choice B. When the second person came, he understood that the first person had gotten an altered signal and opted to trust restaurant A's judgments. Herding occurs when market participants copy each other's actions. Bikhchandani and Sharma, 2001. To the contrary, herding is a good tactic when other market contributors are more educated (Hwang and Salmon, 2004). Sharma (2001) distinguishes "deliberate herding" from "spurious herding," which occurs when a group of investors face the same situation and make the same decision. Rather than following others, investors in this case are responding to publicly available data. However, because investing decisions are influenced by so many variables, separating "spurious" from "intentional" herding may be difficult (Bikhchandani and Sharma, 2001).

Herding increases and destabilises market volatility. Much of the research on the Spanish and New York stock markets has linked herding with market volatility (NYSE Amex). Investors buy and sell stocks depending on previous performance, according to Bikhchandani and Sharma (2001). As a result, market volatility may rise (Bikhchandani and Sharma, 2001). When the stock market herds, the private information of investors is not adequately integrated (Cipriani 2009). This market's lack of reflection may be linked to investors who ignore and suppress their own personal information.

Explanations of Herding Behavior

Informational Cascades: Bikhchandani and Sharma proved information cascades (2001). For example, the market's conclusion may be based on the actions of early-stage investors, whose judgement may be flawed. Individuals' actions are also uninformative since they repress their own information and follow others' actions (Hirshleifer 2003). When the information cascade begins, no one else has access to confidential information (Bikhchandani 2001).

Compensation Based Herding: The reimbursement mechanism adds to the marketplace herding comprehension. It's possible that a manager's pay is based on enactment compared to other experts in their area (Bikhchandani and Sharma, 2001). Admati (1997) determined that benchmark-based compensation for portfolio managers is wasteful.

Herding for Investigation: Investigative herding occurs when a predictor explores facts he expects others to study (Graham, 1999). He

believes he has received knowledge primary, late-informed depositors will impulsion the asset price in the path he projected, allowing him to quickly reverse his position. This benefit would not be available if he was the only stockholder. These models also illustrate that long-term investor's can only profit if other market participants act on the same knowledge.

Empirical Evidence

D**eveloped Market Herding:** Several studies in established markets have examined herding. Many approaches were used to identify stock market herding, but the results were inconsistent and there was no consensus. Christie (1995) recommended using equity return dispersion tools to uncover the behaviour. Christie and Huang's cross-sectional standard deviation wasn't enough for Chang, (2000), so they used return dispersion instead (1995). The same findings were found for the other two developed markets, Hong Kong and Japan. The non-linear model created by Chang et al. (2000) looked for evidence of herding behaviour throughout the entire sample. This sample includes subsets for both up and down markets.

Emerging Market Herding: Taiwan and South Korea showed herding behaviour in up and down markets. Chiang (2010) observed similar results in Asian markets like China, South Korea, and Taiwan. Herding behaviour was evident in all markets. A Chinese upgrade revealed signs of increased herding behaviour. Lao and Singh (2011) researched herding behaviour using daily stock market data from China and India. According to statistics, herding behaviour was only evident in affluent environments. According to Prosad, Kapoor, and Sengupta (2012), the Indian stock market shows evidence of herding exclusively in affluent areas. Tan et al. (2010) examined 1996–2007. Gark and Jindal (2014) found no indication of herding in Indian stock markets during an upscale, although Lao and Singh (2011) did. Like the Chinese market, each study's sample can vary.

Methodology and Data Analysis

Return Dispersion Measurement: Christie (1995) demonstrated that the dispersion of equity returns can be used to identify herding behaviour. Rational asset pricing models can also predict dispersion behaviour. According to these models, dispersion will grow when the sensitivity of certain assets to market returns fluctuates during market stress (Christie and Huang, 1995). Herding behaviour and rational asset pricing theories anticipate contradictory behaviour of dispersions under market stress.

Exhausting Christie and Huang's (1995) technique,

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

Assume CSSDt is the cross-section variance at time t. Our market portfolio has N businesses. Returns on I stock at time t, and returns on Rm stock at time t. Rm is the cross-sectional average of the N-returns at time t. Portfolio's cross-sectional return over N periods equals t.

We utilise return squared to calculate cross-sectional SD. (Chiang et al. (1995) evaluated the dispersion of equity returns using CSAD. Their method assumed that in rational asset pricing models, the connection between equity and market returns is linear. The conditional zero-beta (CSAD) can be represented by the Chang, Cheng, and Khorana (CAPM) framework:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N} AVD_{i,t} = \frac{1}{N}\sum_{i=1}^{N}|\beta_{i,t} - \beta_{m,t}|E_t(R_{m,t} - \gamma_{0,t}) \quad (2)$$

This is the absolute value deviation between the expected and actual return on investment (ROI). I is the stock's time-invariant systematic risk, and m is the market portfolio's systematic risk. These are determined at the time of the current occurrence.

Chang (2000)'s method involves estimate of beta as in equation (2). As stated by Chiang (2010), an updated CSAD can increase the findings' correctness and eliminate any potential specification mistake associated with a single-factor CAPM. CSAD is calculated as follows:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N}|R_{i,t} - R_{m,t}| \quad (3)$$

Rm, t is the market portfolio's equally weighted return at t, and Ri is the return of firm I's stock at t.

Linear Herding Model: Between herding behaviour dispersion projections and rational asset pricing models may deepen throughout periods of market activity (Christie 1995). Herding behaviour was tested by Christie (1995). Individual asset volatility increases dispersion. In a volatile market, people tend to disregard their own intuitions and survey the market consensus.

Christie (1995) suggested a regression model for investigating return dispersion in volatile markets.

$$CSADt = \alpha + \beta_1 D^{L}_{t} + \beta_2 D^{U}_{t} + \varepsilon t \quad ($$

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CSADt by Chiang (2010),: DtL = 1 if the day's market return is in the lower tail of the return distribution. DtL = 0 if DtL = 0. For a t-day market return, DtU = 1. DtU = 0 else. The coefficient represents the sample's average dispersion due to the two fake variables. The rational asset pricing models assume large positive coefficients for 1 and 2, whereas large negative coefficients for 1 and 2 would suggest herding.

Non-linear Model of Herding: If individuals hide their own evidence and obey the market agreement, dispersion and returns will vanish. For example, the relationship may grow non-linearly or even decline. Chang, (2000) created a non-linear technique to combat market herding. Chang, Cheng, and Khorana (2000) used a conditional form of Black's CAPM (1972).

$$E_t(R_i) = \gamma_0 + \beta_i E_t(R_m - \gamma_0)$$

Where I is the time-invariant systematic risk measure of the particular stock, I = 1... and t = 1... T.

$$\beta_m - \frac{1}{N}\sum_{i=1}^{N}\beta_i \qquad (6)$$

The AVD (absolute value of the deviation) of the stock I from its expected return over the tth period is:

$$AVD_{i,t} = |\beta_i - \beta_m| E_t(R_m - \gamma_0)$$

The authors calculated the ECSAD at time t using the formula:

$$ECSAD_t = \frac{1}{N}\sum_{i=1}^{N} AVD_{i,t} = \frac{1}{N}\sum_{i=1}^{N}|\beta_i - \beta_m| E_t(R_m - \gamma_0) \qquad (8)$$

They discovered the subsequent link between increasing dispersion and time-varying market expected returns:

$$\frac{\partial\, ECSAD_t}{\partial\, E_t(R_m)} = \frac{1}{N}\sum_{i=1}^{N}|\beta_i - \beta_m| > 0, \qquad (9)$$

$$\frac{\partial^2\, ECSAD_t}{\partial\, E_t(R_m)^2} = 0 \qquad (10)$$

Based on past findings, Chang, (2000) propose the following another method for recognising HB in the stock market.

$$CSAD_t = \alpha + \gamma_1|R_{m,t}| + \gamma_2 R^2{}_{m,t} + \varepsilon_t \qquad (11)$$

The market return squared term is R2m, t. A highly negative 2 coefficient challenges the normal asset pricing model's premise of a linear relationship among dispersion and market return. In Eq. (11) CSADt reaches its maximum at Rm = - (1/ 22), the quadratic relation suggested in Eq (11). As a result, CSADt will decrease as Rm approaches (or falls below) Rm (or increase).

Herding in volatile markets: Market returns can influence individual behaviour, and the dispersal level can change based on the market's position. According to Economou, Kostakis, and Philippas (2011), the following empirical specification can be used to explore the anticipated differential in HB under increasing and decreasing market returns:

$$CSAD_t = \alpha + \gamma_1 D^{UP}|R_{m,t}| + \gamma_2(1 - D^{UP})|R_{m,t}| + \gamma_3 D^{UP}(R^2{}_{m,t}) + \gamma_4(1 - D^{UP})(R^2{}_{m,t}) + \varepsilon_t \qquad (12)$$

On days with positive market returns (Rm > 0), assume DUP = 1, and Rm = equal to the market return squared (R2m). Market returns with negative 3 and 4 coefficients may indicate herding. It is expected to be stronger on up market days, hence 4> 3 is predicted. (5)

Robustness Tests

Herding Behavior across Time: The first test will look for changes in herding behaviour over time. We'll examine data after liberalisation to assess if the Saudi stock market's herding behaviour has changed. The regression will be calculated independently for each period using the same empirical specification in Eq. (11). A

$$CSAD_t^{Before} = \alpha + \gamma_1^{Before}|R_{m,t}^{Before}| + \gamma_2^{Before} R^{2\,Before}_{m,t} + \varepsilon_t \qquad (13)$$

$$CSAD_t^{After} = \alpha + \gamma_1^{After}|R_{m,t}^{After}| + \gamma_2^{After} R^{2\,After}_{m,t} + \varepsilon_t \qquad (14)$$

A statistically significant negative 2 coefficient indicates herding behaviour. The following equations, based on Eq. (12), will be used to assess herding behaviour in both up and down market returns:

$$CSAD_t^{Before} = \alpha + \gamma_1 D^{UP}_{Before}\left|R_{m,t}\right| + \gamma_2\left(1 - D^{UP}_{Before}\right)\left|R_{m,t}\right| + \gamma_3 D^{UP}_{Before}(R^2{}_{m,t}) + \gamma_4\left(1 - D^{UP}_{Before}\right)(R^2{}_{m,t}) + \varepsilon_t \qquad (15)$$

$$CSAD_t^{After} = \alpha + \gamma_1 D^{UP}_{After}\left|R_{m,t}\right| + \gamma_2\left(1 - D^{UP}_{After}\right)\left|R_{m,t}\right| + \gamma_3 D^{UP}_{After}(R^2{}_{m,t}) + \gamma_4\left(1 - D^{UP}_{After}\right)(R^2{}_{m,t}) + \varepsilon_t \qquad (16)$$

The dummy variables DBeforeUP and DBeafterUP are 1 when the market returns are positive (Rm > 0), and 0 otherwise. Positive 3 and 4 coefficients imply herding behaviour in

both up and down markets, while 4>3 suggests herding behaviour increases in rising markets.

Impact of a modified regression model on herding results: Run a second robustness test using a fresh regression model. Eq. (11) will be examined to see if adding an extra independent variable enhances herding behaviour identification. They add the following regression model to Chang, (2000) non-linear model:

$$CSADt = \alpha + \gamma 1 R_{m,t} + \gamma 2 |R_{m,t}| + \gamma 3 R^2_{m,t} + \varepsilon t \quad (17)$$

The extra word accounts for asymmetric investor behaviour in various market situations. To Chiang and Zheng, the market return dispersion is 2+1 once the market be up (Rm >0) and 2+1 when the market is down (Rm, 0). (2010). Rm, t 0 The (2+ 1)/ (2) ratio represents an irregularity among market return and stock return dispersion (Duffee, 2001,). A negative 3 coefficient may suggest herding behaviour.

Data Analysis

The BSE in India used the monthly closing prices of five IT businesses to assess herding behaviour. From 1 st January 2017 to 31 st December 2020, the prices were obtained from the money control for all bourse listed companies (BSE SENSEX). The data collection includes monthly stock closing prices. The epidemic and stock market swings are vividly noticed in 2020. Thus, 2020 is the year with the most notable stock price movements. The sample is divided into two for the robustness test. The epidemic period is January 1 to December 31, 2020.

The final data set used in the analysis covers monthly prices for the top five IT sector corporations traded on the BSE. The nominated stocks are prominent players in the Indian IT sector and dominate the Bombay Stock Exchange.

Table 1. Presents chosen company information.

Company Name	Identifier code
TCS	532540
HCL	532281
Infosys	500209
Wipro	507685
Tech Mahindra	532755

To determine the return on stocks, use the following formula:

$$Ri,t = Pi,t - Pi,t-1$$

$$R_{m,t} = \frac{\sum_{i=1}^{N} R_{i,t}}{N}$$

at time t, and the equation was: There are N stocks at time t.

Empirical Results

Descriptive Statistics: Table 2: Returns (Rm) and CSSD for five equities (BSE SENSEX). The study will run from January 1 until December 31, 2020. The average market return (Rm) is 0.01341, with a high of 0.144192 and a low of -0.23053. This value includes the 0.057897 SD. The data set is skewed.

Table 2. Indian stock market returns and CSSD

Variables	CSSD	Market Returns	CSAD	Market Returns
Mean	0.073111	0.013411	0.055388941	0.013411
Median	0.068887	0.011275	0.049554812	0.011275
Standard Deviation	0.036592	0.057897	0.030699411	0.057897
Kurtosis	2.193511	5.972709	2.547417913	5.972709
Skewness	1.143925	-1.34162	1.338377412	-1.34162
Minimum	0.019257	-0.23053	0.014573497	-0.23053
Maximum	0.202618	0.144192	0.164814808	0.144192

Thus, the cross sectional data standard deviation. CSD level 0.07311, max 0.202618, standard deviation 0.036592. The data are skewed. The CSAD is 0.055388941% with 0.030699411 standard deviation. It ranges from 0.164814808 to 0.014573497 percent. Our sample has a lone…

Linear Herding Model Results: Table 3 presents the linear regression model findings in Eq (4). Using dummy variables to represent the era, the equation seeks to find herding behaviour during periods of in height market volatility. Demirer, (1995) employed the 95th and 95th percentiles of return to identify extreme market swings (2010). Asymetric dispersion is better understood with dummy variables.

There is no proof of herding amid market stress. There is no indication of herding amid market

stress. The model shows that during large market fluctuations, dispersion tends to increase rather than decrease. The rational asset pricing model is supported, but not herding. These coefficients show that the dispersion of equity return values is increasing when the 95 % and 5 % criteria values climb. Chen says the results support the findings (2013). Using the same approach in India revealed no evidence of HB.

Table 3. Results of Linear Model of Herding

	α	β_1	β_2
BSE	0.069127	0.041034	0.052557
	(1.62)***	(2.08)***	(13.006)***

Results of non-linear herding model: The non-linear model examines CSAD, weighted market returns (Rm, t), and the non-linear squared term (R2m, t). Table 4 presents the findings of the non-linear model in Eq 11. The data reveals little evidence of herding, as shown in table 3. The nonlinear model has a coefficient of 2.

0.088588	-1.0876	0.343705
After Pandemic		

Stock return dispersion and market return dispersion appear to be unrelated. The relationship between market return (Rm) and daily CSAD (Figure 1) shows that the two variables are not linearly related.

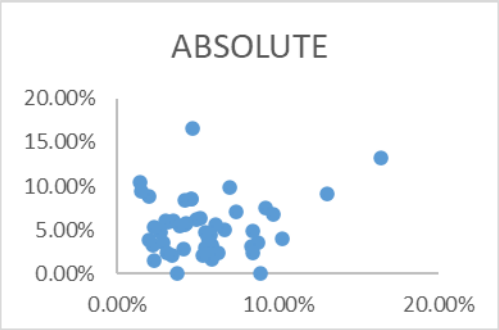

Table 4. Results of the non-linear model of herding

	A	γ_1	γ_2	$Adj.R^2$
BSE	0.05 4081	0.105 9866 8	1.7852 92955	-0.01062

Robustness Tests Results

Results of Herding Behavior over Time: The robustness test determines if herding behaviour is stable across time. It aids in comprehending the period's impact of pandemics and their role in herding. The sample period is divided into two parts: before and after the pandemic. Table 5 shows the test results.

Table 5. Results of Herding Behaviour in Different Periods - Before Pandemic

0.017696	-0.4020	9.070282
Before Pendemic		

The results have clearly changed since the testing. The Indian stock market herds according to the robustness tests (BSE SENSEX). This conclusion was based only on the BSE's reaction to COVID-19. The stock market fell with the investors. A pandemic has an effect on share prices. And the tests conducted even in different historical periods show that the potential of herding is low.

Table 6. Results of Herding Behaviour in Different Periods - After Pandemic

Limitations of the Study and Future Research

The study has its limitation as we are using the can be used monthly traded stock values of five IT companies and the SENSEX were compared as market returns we also have another market as well nifty 500 as market returns Nifty 50 which also can be used as market return. The study is using the limited stock as a sample due to the longer period and unavailability of data. In the shorter period, it can increase the number of companies to analyse the herding behaviour that can give a good picture as well. The study is limited to market returns only we are not taking particular sector or theme indices to analyse herding behaviour.

This study result will be helpful for the researcher to help them to search further related areas by taking the herding behaviour in other class assets with the share price. For investors & traders to help them take the better decision using these results as the traders & investors become emotional & take the decision wrongly in short scenario volatility. Results are also helpful for the regulator to make the market more efficient & protect investor interest.

Organizational implications and Conclusions

This study has real-world relevance for financiers, regulators, and lawmakers. To begin, the COVID-19 crisis has introduced a "new set of normality" to the markets, one that is different from what traders are used to. When it comes to asset values, any kind of behavioural bias might cause inefficiencies. When exogenous events occur, herding behaviour makes it so that rational asset pricing theories don't always apply. As a result, scholars and researchers need to create new value models. These occurrences wreak havoc on the market by causing disruption and exacerbating information asymmetry. Instead of blindly following the herd, investors should have a "investment vision" that guides their decision-making. Understanding the phenomenon of herd behaviour will help people make better choices, particularly in the face of such exogenous disturbances. More securities are needed to attain the same amount of diversification due to herding. Hence, stronger portfolio management is implied. Last but not least, the equity markets may help alleviate the strain on government coffers and meet the pressing need for capital in times like these by luring massive investment. It is crucial, then, that market fluctuations stick to fundamentals rather than follow the crowd.

It is returning to normal following massive drops due to the pandemic. The numbers indicate the importance of herding, which is easy to understand. When calculating CSSD, the stock returns are associated to the market returns. However, the Standard Deviation shows little evidence of stock market herding. The CSAD is almost nil. The outcome is good, so it isn't herding, but the value demonstrates there is herding and it is simple. Finally, greater study of the topic is needed to aid in the creation of laws and procedures that will give the financial markets the desired power and scale.

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