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SECTOR-WISE HERD BEHAVIOUR IN THE INDIAN STOCK MARKET DURING COVID-19

Charu Sharma*, Shilpa Lodha**

Abstract *The article examines the herd behaviour at sector level in the National Stock Exchange of India. The novel objective of the paper is to analyse the presence of herd behaviour during the whole, pre- and post-coronavirus disease 2019 (COVID-19) pandemic outbreak period. The popular model proposed by Chang et al. (2000) has been deployed to examine herd formation in each sector. Five major sectors namely auto, bank, fast moving consumer goods, information technology and pharma have been considered along with NIFTY50 consisting daily closing prices of 106 companies comprising 58 from five sectoral indices and 48 from NIFTY50 for the period from 2011 to 2021 considering 1 January 2011–29 January 2020 as before COVID-19 outbreak period and 30 January 2020–31 December 2021 as after COVID-19 outbreak period. Results revealed significant evidence of anti-herd behaviour before COVID19 outbreak. At the same time, significant evidence of the existence of herd behaviour in FMCG, auto and pharma sectors have been detected after the outbreak of COVID-19 pandemic which assumes that investors tend to imitate the investment decisions of other market participants during such adverse macro events around the globe. The study tried to enhance the knowledge of investors to develop their trading strategies in the volatile market conditions by investing vigilantly and keeping such phenomenon in concern.*

Keywords: *COVID-19, Herd Behaviour, Cross Sectional Absolute Deviation, NSE, Sector*

INTRODUCTION

Imitating the actions of the others is one of the most pervasive behaviour which individuals depict in their ordinary course of life. Herd behaviour is meant by just following what your predecessors have done, without using one's own information. It is like a group mentality, where everyone thinks or takes actions collectively but not individually. Herding is a key feature of behavioural finance in explaining market bubbles and crashes because it is reflected as a driving force of price bubble and deviation of stock prices from its fundamental value.

Nofsinger and Sias (1999) defined herd as a group of investors trading in the same direction over a period of time. Herd behaviour can be explained in two different ways, that is, rational and irrational. "Irrational herd can be explained as a tendency of investors irrationally ignoring their own analysis and information and conforming to the market consensus, even if they do not agree with that" (Christie and Huang, 1995). Rational herd is followed by investors to protect their reputation as they share similar education background and professional qualification so to maintain their status as a rational investor; they imitate the investment decisions of skilled investors. It is mainly followed by agents, traders, analysts, etc. In this article, it has been examined whether the COVID-19 (Coronavirus Disease) outbreak has caused herd formation in the stock markets, particularly at the industry level. On 30 January 2020, the first case of COVID-19 in India was reported in Kerala and by the third week of March, it became apparent to experts that the outbreak was entering in the exponential phase resulted in nationwide lockdown on 24 March 2020 to subdue the transmission chain of the virus. In the periods of market stress, for instance, the COVID-19 outbreak, investors become more inclined to follow the decision of crowd and suppressing their own information. The study has focused on the Indian stock market and examined whether herd behaviour is present in the sectors. Moreover, Herd behaviour has been tested during both the pre- and post-COVID-19 outbreak phases along with the whole period.

The reason to examine the herd behaviour from industry point of view is that the information dispersed at the industry level generally provide basis for asset managers' suggestions, financial analyst's analysis and investors' decisions (Demirer et al., 2010).

* Research Scholar, Department of Accountancy and Business Statistics, Mohanlal Sukhadia University, Udaipur, Rajasthan, India. Email: scharu53@gmail.com

** Assistant Professor, Department of Accountancy and Business Statistics, Mohanlal Sukhadia University, Udaipur, Rajasthan, India. Email: lodhashilpa80@gmail.com

Rest of the article has been structured as following:

The relevant literature has been discussed in Section II. The data and methodology are explained in Section III. Section IV discussed a relevant methodology for detecting herd behaviour in the stock market. The study's empirical findings have been discussed and presented in Section V. Section VI concluded the article and provided practical implications for the stock market's participants.

LITERATURE REVIEW

Collected literature has been classified on the basis of their objectives, tools used and findings. A summary has been presented below:

Stock markets are always prone to pandemics, lockdowns or any other major event. It may be impacted positively or negatively with the events and activities in the country or globe, for instance, decisions on any government policy, during the announcement of budget, voting, modification in trade policies between countries, etc. Herd behaviour is one of the factors that induces stock market volatility and disrupts the financial system, and is thus a significant factor for policymakers who seek to stabilise markets (Demirer & Kutan, 2006). Several researchers around the globe tried to examine the presence of herd behaviour in different markets, for instance, commodities market (Klotzle et al., 2019; Babalos et al., 2015), cryptocurrency market (Kaiser & Stockl, 2019; Klotzle et al., 2019; Ballis & Drakos 2019, mutual fund (Cai et al., 2019; Deng et al., 2018). Many of the researchers conducted study on examining the presence of herd behaviour in the stock markets specifically during extreme market conditions (Adem, 2020; Satish & Padmasree 2018; Deng et al., 2018; Zheng et al., 2017; Mobarek et al., 2014; Jlassi & Bensaida, 2014; Abbi et al., 2014; Lan, 2014; Al-Shboul, 2013; Kostakis et al., 2011; Bowe & Domuta, 2004; Hwang & Salmon, 2004). Chawla and Sharma (2021) focused on cross sectional sustainability earning and found operating elements of earnings to be higher than the non-operating elements of earnings and positive association between intensity of operating earnings measures and sustainability of earnings. When it was tried to classify the previous studies on the basis of their findings, some researchers found that United States stock market is free from herd formation (Chang et al., 2000); (Chiang & Zheng, 2010). Significant evidence of herd behaviour was found in South Korean and Taiwanese stock markets (Chang et al., 2000); Dubai, Kuwait, Qatar and Saudi Arabian stock markets (Balcilar et al., 2014); Indian and Chinese stock markets (Lao & Singh, 2011); Asian markets (Chiang & Zheng, 2010). Some researcher found significant evidence of herd behaviour in the stock market during extreme market conditions (Tan et al., 2008); (Caparrelli et al., 2004). In context to Indian stock market, many studies did not find the significant presence of herd behaviour among the investors (Kumar et al., 2016; Dutta et al., 2016; Ganesh et al., 2016). The outbreak of COVID-19 pandemic has made investors in dilemma and fear that resulted in high volatility in the market, low dispersion and inability to mobilise new investment. Rizvi et al. (2022) suggested that the long-term investor may focus at their financial goals and risk profile while choosing stocks for their portfolio, rather than being influenced by swings in the markets. Nanda et al. (2023) recommended investors to keep their eyes vigilant while making investment decisions. Therefore, on the basis of above recent studies, it has been assumed that herd formation is not present in the Indian stock market and an attempt has been made to know the impact of COVID-19 outbreak on the Indian stock market specifically at industry level.

Statement of Problem

The previous literatures define "herd behaviour" as a tendency of investors to imitate the actions of others. This behaviour becomes more prominent and common during the times of macroeconomic announcements, for instance, natural calamity, political disturbances, scientific inventions, pandemics, war like situations, etc. The outbreak of COVID-19 pandemic has turned to be a global financial crisis as well along with being health hazardous. The stock markets all around the world has been extremely affected with the concerned outbreak and lockdowns that were imposed by governments of many countries. Since two years has been passed of the outbreak of COVID-19, it becomes imperative to study the impact of novel COVID-19 pandemic as it can depict better results for the existence of herd behaviour in the Indian stock market specifically, at the industry level of the National Stock Exchange (NSE).

RESEARCH METHODOLOGY

Following research methodology was adopted for the present study:

Research Design

The study is empirical in nature. It attempts to examine the presence of herd behaviour in the Indian stock market at industry level.

Objectives

- To find out the presence of herd behaviour in the Indian stock market at sector level.

- To know the impact of COVID-19 pandemic on herd behaviour in the selected sectors of NSE.
- To examine the presence of herd behaviour in selected sectors of NSE during extreme market conditions.

Hypotheses

- H_{01}: Herd behaviour is not present in the Indian stock market at sector level.
- $H_{02:}$ The outbreak of novel COVID-19 pandemic has no significant impact on the stock prices of companies at sector level.

Sample and Data Collection

For the sample, companies listed in NIFTY50 as on 15 January 2022 and different sectors as 13 January 2022 on listed that are listed in NSE, that is, auto, bank, IT, FMCG and pharma are included in the study constituting 58 companies in the sectoral indices and 48 companies constituting NIFTY50 excluding Balkrishna Industries in Automobile sector and Natco Pharma in the pharmaceutical sector as the data was missing of the two companies, also excluding two companies from NIFTY50 namely SBILIFE and HDFCLIFE due to data unavailability from the NSE official website as these companies were not listed before 2017 in the NSE. The sample sectors drawn are purposively selected assuming their sensitivity to the market makes their relevance higher in the Nation. The study is based on closing prices of stocks that constituent the sectoral indices of NSE. The companies taken as sample for the study have been recorded in Fig. 1 which presents the details of the sample for the study, indicating sectoral index, industry name corresponding to sectoral index, the abbreviation of sector name used in the analysis and the number of companies constituting the index corresponding to the sector. The WHO announced the COVID-19 pandemic as a PHEIC on 30 January 2020 and alerted the countries regarding its contagion effect. Later, the WHO declared COVID-19 as a pandemic on 11 March 2020. To spot the presence of herd behaviour among stock market participants pre and post the COVID-19 outbreak, the full sample data has been subdivided according to the WHO timeline. Therefore, the cut-off date for the study has been decided to subdivide the full sample data into pre and post the COVID-19 outbreak as 30 January 2020, when WHO declared COVID-19 as a PHEIC. Therefore, the full sample data have been divided from 01 January 2011 to 31 December 2021 into three subsamples as follows:

- Whole period: from 01 January 2011 to 31 December 2021.
- Pre-COVID-19 period: from 01 January 2011 to 29 January 2020.
- Post-COVID-19 period: from 30 January 2020 to 31 December 2021.

In normal circumstances, it has been assumed that people have sufficient time to collect adequate information, analyse the market and make decisions rationally (Mertzanis & Allam, 2018). Therefore, we took more than five years of data, and it has been assumed that the market was normally trading before the COVID-19 outbreak and consequently more than eight years of data has been collected before the COVID-19 pandemic to analyse the herd behaviour in the stock market. All data sets have been compiled from the official website of NSE of India. Further, the entire data set has been analysed using Microsoft Excel and EViews software.

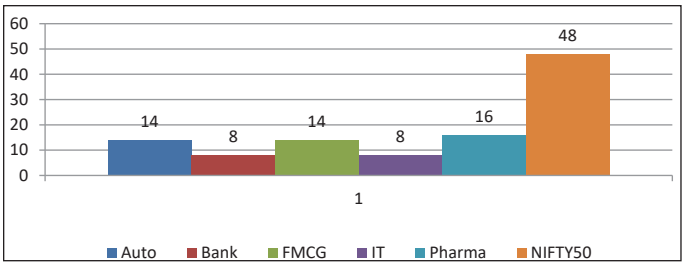

Fig. 1: Number of Companies Included in Respective Indices

Methodology

First, the daily return of stock i on day t have been derived using the following equation:

$$R_{i,t} = ln\left[\frac{P_{i,t}}{P_{i,t-1}}\right] \times 100 \qquad \text{Equation 1}$$

where, $R_{i,t}$ stands for stock return i on day t, ln is the natural logarithm, $P_{i,t}$ represents the closing price for stock i on day t and $P_{i,t-1}$ is the closing price of stock i in the previous trading day. After calculating individual returns, cross-sectional average return which can also be referred as market return ($R_{m,t}$) has been calculated by taking an average of all individual stock return on day t according to the following equation:

$$R_{m,t} = \frac{\sum R_{i,t}}{N} \qquad \text{Equation 2}$$

where $R_{i,t}$ is the estimated stock return of firm i at time t, and N is the number of firms included in the sectoral index.

METHODOLOGY FOR DETECTING HERD BEHAVIOUR

Two schools of thought has been broadly classified as per literature review: One is based on trading data, buy and sell orders executed by investors in the given time period (Lakonishok et al., 1992), and another one is based on financial assets returns that is organised into groups of similar characteristics (Chang et al., 2000; Christie & Haung, 1995). Since, the data collected consist of returns of financial asset, second school of thought has been followed to examine the presence of herd behaviour at industry level in NSE by examining the CSAD of stock returns in three phases, respectively, whole period, pre-COVID-19 period and post-COVID-19 period. Reviewed literatures suggested two extensively used measures to detect herd behaviour. One model is prosed by Christie and Huang (1995) and another is proposed by Chang, Cheng and Khorana (2000). Christie and Huang (1995) proposed cross sectional standard dispersion (CSSD) model and Chang et al. (2000) proposed cross sectional absolute deviation (CSAD) model which is a modified model of Christie and Huang (1995) method. Model of Christie and Huang (1995) proposes a linear relationship between CSSD of returns and absolute returns of market during the existence of herd behaviour. However, it has been noticed in the findings of Lux (1995), Lux and Marchesi (1999), (Mertzanis & Allam, 2018) that herd behaviour is capable of introducing non-linear dynamics in the market and CSSD tends to be sensitive to outliers. Therefore, the study adopted CSAD model proposed by Chang et al. (2000) defined CSAD as follows:

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

where $CSAD_t$ indicates the distance from the market average return, how much of the individual stock returns are dispersed around the average return, N is the total number of stocks in sectoral index, $R_{i,t}$ denotes the return of stock i on day t and the $R_{m,t}$ is the cross-sectional average market return at day t. Presence of herd behaviour has been examined using modified regression model following Lee et al. (2013) study as per following equation:

$$CSAD_t = \alpha + \beta_1 R_{m,t} + \beta_2 |R_{m,t}| + \beta_3 R_{m,t}^2 + \varepsilon_t$$

Equation 4

where, $R_{m,t}$ denotes the cross-section average return of sample on day t and is used to account for asymmetric behaviour under different market conditions; $|R_{m,t}|$ is the absolute market return at day t, used to account for the magnitude only and not the direction of the stock market; $R^2_{m,t}$ is the squared value of the equally weighted portfolio; $R_{m,t}$ captures the non-linear relationship that would arise because of the herd behaviour in the market. According to Chang et al. (2000), a significant negative non-linear coefficient β_3 confirms the presence of herd behaviour; otherwise, a statistically positive β_3 represents no evidence of herd behaviour in the market.

Previous research studies documented that the rate of increase in dispersion with respect to aggregate market returns is higher in upward market trends compared to downward trends. Regression coefficients have been estimated distinctly for positive and negative market returns to analyse the asymmetry in bull and bear market conditions, precisely, using the following models:

$$CSAD_t^{Up} = \alpha + \beta_1^{Up}\left|R_{m,t}^{Up}\right| + \beta_2^{Up}(R_{m,t}^{Up})^2 + \varepsilon_t$$

Equation 5

$$CSAD_t^{Down} = \alpha + \beta_1^{Down}\left|R_{m,t}^{Down}\right| + \beta_2^{Down}(R_{m,t}^{Down})^2 + \varepsilon_t$$

Equation 6

where, $CSAD_t^{Up}$ and $CSAD_t^{Down}$ are the CSAD at day *t* corresponding to returns during rising and declining market respectively. $CSAD^{Up}$ is calculated when $R_{m,t} > 0$ and $CSAD^{Down}$ is calculated when $R_{m,t} < 0$. $R_{m,t}^{Up}$ *and* $R_{m,t}^{Down}$ denotes equal weighted portfolio returns during bull and bear market condition on *t* and $(R_{m,t}^{Up})^2 (R_{m,t}^{Down})^2$ signifies the squared value of the equal-weighted portfolio to examine the non-linearity in market returns during rising market declining market.

DATA ANALYSIS

Descriptive Statistics

Table 1 represents the results of descriptive statistics of $CSAD_t$ of all five sectors particularly along with NIFTY50 for the whole sample period. In order to analyse the existence of herd behaviour in the stock market, the data has been separated into three panels being panel A indicating the whole sample period, panel B presents before the COVID-19 outbreak period and panel C indicating after the COVID-19 outbreak period.

Tables 2 and 3 has provided results of descriptive statistics of industry-wise daily CSAD and also for NIFTY50 in extreme market movements, under bullish and bearish market conditions, respectively. To specifically examine the presence of herd behaviour during upward trends and downward trends, whole sample data further divided into three panels, namely, panel A representing the whole sample period, panel B indicating pre-COVID-19 and panel C presented the post-COVID-19 period.

Table 1: Descriptive Statistics for Daily CSAD

	Panel A: Whole Period 04/01/2011 to 31/12/2021					Panel B: Pre COVID-19 04/01/2011 to 29/01/2020					Panel C: Post COVID-19 30/01/2020 to 31/12/2021				
Indices	**Mean**	**SD**	**Ske**	**Kurt**	**Obs**	**Mean**	**St Dev**	**Ske**	**Kurt**	**Obs**	**Mean**	**St Dev**	**Ske**	**Kurt**	**Obs**
AUTO	1.24	1.27	24.28	749.08	2725	1.20	0.72	16.17	434.33	2246	1.46	2.58	14.47	230.36	479
BANK	1.08	1.80	18.45	399.27	2725	1.04	1.93	18.23	371.69	2246	1.26	1.02	4.44	36.27	479
FMCG	1.18	0.69	13.20	321.40	2725	1.22	0.63	8.83	112.85	2246	1.12	0.49	1.87	7.55	479
IT	1.14	1.19	17.67	459.41	2725	1.15	1.28	17.27	419.44	2246	1.10	0.64	2.16	10.80	479
PHARMA	1.27	0.96	15.50	349.66	2725	1.27	1.02	15.66	334.38	2246	1.26	0.61	1.71	6.88	479
NIFTY50	1.24	0.63	8.02	98.94	2725	1.22	0.63	8.83	112.85	2246	1.35	0.66	5.00	51.41	479

Note: SD represents the standard deviation, Ske denotes skewness, kurt representing kurtosis and Obs represents observations.

On observing the results of descriptive statistics from the Table 1, mean value of pharma sector has been found maximum for the whole period which means that average dispersion of returns is maximum in pharma sector followed by auto sector and NIFTY50 Index being 1.27 (SD = 0.96), 1.24 (SD = 1.27) and 1.24 (SD = 0.63), respectively. The mean value of pharma industry found maximum for the whole period as well as for the pre-COVID-19 period but the case is not same for the post-COVID-19 period. Panel B provided evidence that mean values of CSAD corresponding to all sectors and NIFTY50 are lower than in panel A except FMCG and IT sector, and keeping same the mean value of pharma sector for panels A and B. Panel C revealed that mean values of CSAD corresponding to AUTO, BANK and NIFTY50 are marginally higher than in panels A and B being 1.46 (SD = 2.58), 1.26 (SD = 1.02) and 1.35 (SD = 0.66). The normality test revealed that all series of CSAD are not normal because the values under skewness are significantly far from 0, and coefficients of kurtosis largely exceed 3. The sector whose skewness and kurtosis found nearest to thresholds, that is 0 and 3, respectively, is PHARMA industry with (ske = 1.71) and (kurt = 6.88) in panel C which represents post-COVID-19 period.

Industry-Wise Herd Behaviour in the Indian Stock Market

Table 2, 3 and 4 provides the regression results for all selected sectors as per Equation (4). Table 2 has provided the results for the full sample period corresponding to all industries; Table 3 depicts the regression result for Pre-COVID19 outbreak period and Table 4 shows the result of post-COVID19 outbreak period.

Table 2: Regression Coefficients of the Daily $CSAD_t$ for Whole Period

Indices	α	β_1	β_2	β_3	F-Stat	Adj. R^2
AUTO	1.149**	0.0175	-0.132**	0.107**	2226.829**	0.710
BANK	0.923 **	-0.0175	-0.0859**	0.0657**	3421.744**	0.790
FMCG	0.956**	-0.017	0.237**	0.058**	573.637**	0.387
IT	0.804**	-0.093**	0.262**	0.044**	2226.829**	0.655
PHARMA	1.065**	-0.049**	0.065**	0.102**	1456.738**	0.615
NIFTY50	0.924**	-0.081**	0.418**	0.0002	471.483**	0.341

Notes: ** and * indicates significance at 1% and 5% respectively.

It has been observed from the Table 2 that except NIFTY50, the estimated coefficient β_3 in all the sectors found to be statistically significantly positive, representing that investors intend to anti-herd behaviour in these sectors. Since, β_3 found positive and statistically significant, which indicate no evidence of herd behaviour because industry dispersion increases as the rate increases, thus showing efficiency in the Indian stock market rather than herd behaviour. The results found consistent with findings of Ganesh et al. (2016) who concluded that the sector-wise Indian stock market does not mimic the investment pattern of others. The value of adjusted R-square is in the range of 34–80%, implying the model has ability to explain the variability in the data. Significant F-values implied robustness of the regression model. The results accepted first hypothesis that herd behaviour is not present in the Indian stock market as the coefficient β_3 found positively significant.

Table 3: Regression Coefficients of the Daily $CSAD_t$ for Pre-COVID-19 Period

Indices	α	β_1	β_2	β_3	F-Stat	Adj. R^2
AUTO	1.073**	-0.023**	/-0.015	0.093**	844.644**	0.530
BANK	0.861**	-0.049**	-0.059**	0.073**	7307.590**	0.907
FMCG	1.009**	0.002	0.087**	0.139**	1145.388**	0.605
IT	0.706**	-0.134**	0.434**	0.038**	1977.307**	0.725
PHARMA	1.025**	-0.046**	0.121**	0.117**	2004.348**	0.728
NIFTY50	1.099**	-0.081**	-0.087**	0.193**	787.424**	0.512

Notes: ** and * indicates significance at 1% and 5% respectively.

Table 3 has revealed the regression result for pre-COVID-19 period for all sectors. Positive coefficient β_3 for all sectors has been noticed that suggested the anti-herd behaviour in Indian stock markets. Results also revealed that market participants traded away from the market consensus before the COVID-19 outbreak. For robustness of predictive models, the value of adjusted R-square detected to be in the range of 50–90% implying the model explains upto 90% variability in the data. Significant F-values have implied appropriateness of the model for all selected sectors. Similarly, results of Table 3 found consistent with findings of Ganesh et al. (2016) and contradicted with the results of Lao and Singh (2011).

Table 4: Regression Coefficients of the Daily $CSAD_t$ for Post-COVID-19 Period

Indices	α	β_1	β_2	β_3	F-Stat	Adj. R^2
AUTO	1.349**	0.115**	-0.372**	0.128**	583.901**	0.785
BANK	0.804**	0.067**	0.247**	0.008**	117.605**	0.423
FMCG	0.864**	0.037*	0.349**	-0.012*	66.892**	0.292
IT	0.807**	0.033*	0.190**	0.011*	77.873**	0.325
PHARMA	0.920**	0.055**	0.309**	0.0001	82.388**	0.338
NIFTY50	0.975**	0.0159	0.388**	-0.007	97.898**	0.378

Notes: ** and * indicates significance at 1% and 5% respectively.

Table 4 has presented the regression result of the post Covid-19 period for all selected industries. Results of Table 4 provided the positive coefficient β_3 for all sectors that suggest the anti-herd behaviour in Indian stock markets except FMCG (-0.012*) and NIFTY50 (-0.007). Result provided negative coefficient β_3 for NIFTY50 but insignificant and found significantly negative coefficient for FMCG sector that reveals the anti-herd behaviour in the FMCG sector after COVID-19 outbreak. The value of adjusted R-square is in the range of 29–78%, implying appropriateness of the model for all selected sectors. The estimated coefficient β_3 for AUTO, BANK, IT and PHARMA are found positively insignificant implying no evidence of herd behaviour in respective industries after COVID-19 outbreak. The second null hypothesis cannot be accepted as pharma industry depicts herd behaviour in the Indian stock market post-COVID-19.

Sector-Wise Herd Behaviour under Bull Market Conditions

During the bull market conditions, some previous studies found out those investors were inclined to form herd behaviour (Lee et al., 2013; Tan et al., 2008). Whole sample has been distributed into two subsamples using the stock returns of companies for each selected sector, positive and negative industry stock returns, respectively. Tables 5, 6 and 7 provide the regression results of herd behaviour during the bull market conditions (positive returns) of all selected sectors as per Equation (5).

Table 5: Regression Coefficients of the Daily $CSAD_t$ in Bull Market Conditions for Whole Period

Indices	α	β_1	β_2	F-Stat	Adj. R^2
AUTO	0.97**	0.29**	-0.0002	232.13**	0.24
BANK	0.86**	0.056*	0.0337**	207.04**	0.22
FMCG	0.95**	0.34**	0.0004	207.04**	0.22
IT	0.86**	0.24**	0.005	185.76**	0.20
PHARMA	0.97**	0.34**	-0.005	242.79**	0.25
NIFTY50	0.87**	-0.07*	0.067**	3174.05**	0.83

Notes: ** and * indicates significance at 1% and 5% respectively.

Table 5 provided regression results of herd behaviour for all sectors for the full sample period during positive returns. Result shown in Table 5 has indicated no evidence of herd behaviour for whole period under bull market conditions. Result reported β_1^{up} coefficient for up market returns found to be positive and significant except NIFTY50 (-0.07). Result found significantly positive coefficient β_2^{up} for BANK and NIFTY50 sectors implying strong anti-herd behaviour in the respective sectors. Moreover, the results of the whole sample period indicate that investors do not mimic

the herd behaviour during up market movements. Therefore, results found to be consistent with the findings of Ganesh et al. (2016), Kumar et al. (2016) and Dutta et al. (2016) who couldn't find significant evidence of herd behaviour during up market conditions in the Indian stock market.

Table 6: Regression Coefficients of the Daily $CSAD_t$ in Bull Market Conditions for Pre-COVID-19 Period

Indices	α	β_1	β_2	F-Stat	Adj. R^2
AUTO	0.995**	0.254**	-0.005	126.044**	0.175
BANK	0.773**	0.201**	-0.013	55.009**	0.084
FMCG	1.00**	0.196**	0.074**	169.082**	0.215
IT	0.889**	0.217**	0.013	103.712**	0.148
PHARMA	1.039**	0.174**	0.051**	152.037**	0.198
NIFTY50	1.051**	0.093**	0.061**	145.062**	0.192

Notes: ** and * indicates significance at 1% and 5% respectively.

Table 6 reported the regression results of herd behaviour at the industry level before the COVID-19 outbreak period during up market trends. The results of Table 6 showed that β_1 coefficients for the up-market returns are significantly positive for all selected industries, while β_2 coefficients found to be significantly positive that revealed the anti-herd behaviour in the FMCG, PHARMA and NIFTY50. The β_2 coefficients for up market returns found negative but insignificant for AUTO and BANK industries. The values of adjusted R-square found between 8 and 21%. The explanatory power of the model corresponding to all sectors found lesser in Table 6 as compared to Table 5. The findings of Table 6 are consistent with findings of Table 5, which failed to find evidence of herd behaviour during bull market conditions. Moreover, result has provided that herd behaviour was not prevalent in the Indian stock market before the outbreak of COVID-19 pandemic in India.

Table 7: Regression Coefficients of the Daily $CSAD_t$ in Bull Market Conditions for Post-Covid-19 Period

Indices	α	β_1	β_2	F-Stat	Adj. R^2
AUTO	0.877**	0.441**	-0.011**	78.124**	0.372
BANK	1.013**	0.037	0.043**	144.853**	0.533
FMCG	0.879**	0.379**	-0.013	49.600**	0.272
IT	0.726**	0.310**	-0.003	69.490**	0.338
PHARMA	0.849**	0.509**	-0.029**	66.786**	0.344
NIFTY50	1.022**	0.322**	0.009	100.819**	0.412

Notes: ** and * indicates significance at 1% and 5% respectively.

Table 7 reported the regression results of herd behaviour for all selected industries after the spread of COVID-19 outbreak period in bull market conditions. Estimated coefficients β_2 of AUTO and PHARMA sectors found negative and significant, indicating that the investors were inclined to herd behaviour in these industries during up market movements. The justification of herd behaviour in the PHARMA sector is that the pharmaceutical industry was at the forefront fighting against the COVID-19 pandemic. Indian pharmaceutical companies ensured the adequate supplies of medicines and essential items like masks, sanitizers, etc. to its customers across the world regardless of the supply chain disruptions and the lockdown restrictions in various countries along with India. The outbreak of COVID-19 pandemic, high interest rates, high fuel price and high inflation have resulted in contraction of demand for vehicles and during the lockdown, people were bound to stay at their home which led to less movement of vehicles, loss of a numerous jobs. Therefore, it seem like the outbreak of COVID-19 have caused sell-side herd behaviour in the Automobile sector after the outbreak of COVID-19 pandemic.

Sector-Wise Herd Behaviour under Bear Market Conditions

Table 8, 9 and 10 represents the regression results of herd behaviour during the bear market conditions (negative returns) of all selected sectors as per Equation (6).

Table 8: Regression Coefficients of the Daily $CSAD_t$ in Bear Market Conditions for Whole Period

Indices	α	β_1	β_2	F-Stat	Adj. R^2
AUTO	1.15**	-0.19**	0.11**	2173.07**	0.77
BANK	0.87**	-0.06*	0.07**	3174.05**	0.83
FMCG	0.91**	0.27**	0.06**	504.55**	0.45
IT	0.68**	0.42**	0.04**	1528.30**	0.71
PHARMA	1.03**	0.08*	0.11**	1452.99**	0.70
NIFTY50	0.84**	0.58**	-0.01	347.76**	0.36

Notes: ** and * indicates significance at 1% and 5% respectively.

Table 8 reported the regression results of herd behaviour for all industries, using the whole sample period in negative returns. The estimated coefficient β_2 of the regression model for NIFTY50 was found to be negative and insignificant indicating that herd behaviour was not found in the sector during the whole period sample. On the other side, findings of Table 8 revealed that estimated coefficient β_2 is significantly positive for all the sectoral indices considered in the study except NIFTY50 indicating the anti-herd behaviour in all five sectors namely, AUTO, BANK, FMCG, IT and PHARMA.

Table 9: Regression Coefficients of the Daily $CSAD_t$ in Bear Market Conditions for Pre-COVID-19 Period

Indices	A	β_1	β_2	F-Stat	Adj. R^2
AUTO	1.036**	-0.032	0.108**	1108.628**	0.676
BANK	0.753**	0.031	0.072**	9321.952**	0.946
FMCG	0.970**	0.116**	0.138**	1193.254**	0.700
IT	0.520**	0.679**	0.034**	1831.994**	0.776
PHARMA	0.955**	0.218**	0.114**	1808.023**	0.779
NIFTY50	1.078**	-0.055	0.218**	724.467**	0.583

Notes: ** and * indicates significance at 1% and 5% respectively.

Table 9 presented the results of the regression model industry-wise before the outbreak of COVID-19 pandemic in India in bear market conditions. The estimated coefficient β_2 of the regression model found positive and significant for all the indices implying that anti-herd behaviour in all industries before the COVID-19 pandemic under bear market conditions. It indicates when the market goes down people think and take investment decision rationally in the market and do not mimic the other participants in the market. For robustness of predictive models, the value of adjusted R-square is in the range of 58–95%, implying robustness of the model for all indices.

Table 10: Regression Coefficients of the Daily $CSAD_t$ in Bear Market Conditions for Post-COVID-19 Period

Indices	α	β_1	β_2	F-Stat	Adj. R^2
AUTO	1.490**	-0.598**	0.136**	478.289**	0.815
BANK	0.786**	0.245**	0.002	71.679**	0.386
FMCG	0.843**	0.325**	-0.012*	48.903**	0.306
IT	0.862**	0.106*	0.017**	48.778**	0.314
PHARMA	0.970**	0.136**	0.021**	62.438**	0.352
NIFTY50	0.959**	0.394**	-0.009	54.668**	0.358

Notes: ** and * indicates significance at 1% and 5% respectively.

The results of Table 10 revealed that the regression coefficient β_2 of the regression model is positive and significant for AUTO, IT and PHARMA indicating anti-herd behaviour in these sectors before the outbreak of COVID-19 pandemic. Additionally, the regression coefficient β_2 of the regression model under bear market conditions after the COVID-19 outbreak found negative and significant in only FMCG sector implying the tendency of herd behaviour in the concerned sector. The rationale of herd behaviour in FMCG industry is that during lockdown people were remain idle at their homes with no work, supply chain became interrupted which led to less demand of many consumable products. Moreover, the results of Table 10 provided weak evidence of herd behaviour after the coronavirus outbreak under bear market conditions.

CONCLUSION AND DISCUSSIONS

The objective of this article was to examine the presence of herd behaviour after the COVID-19 outbreak as well as before it has prevailed in India. Incorporating daily data from NSE, the article enquired about the existence of sectoral herd behaviour among investors during different market movements and time horizons. By applying different models proposed by Chang et al. (2000), herd behaviour has been examined in whole period, in the pre- and post-COVID-19 outbreak, and during both bull and bear market conditions. All the models were found to be a good fit (Significant F-values).

The findings of this article for the whole sample and before the COVID-19 outbreak period failed to provide a significant evidence of herd behaviour for all sectors, but suggested significant evidence of anti-herd behaviour in the sectors that also showed non-linearity implying sectoral dispersion increases as the return rate increases and representing efficiency in the sectors of the Indian stock market. The results found consistent with Ganesh et al. (2016), Kumar et al. (2016) and Dutta et al. (2016) who suggested that the Indian stock market is free from sectoral herd behaviour. But the findings contradicted with Lao and Singh (2011) who found significant evidence of herd behaviour in the Indian stock market. The rationale for findings of the article being contradicted with Lao and Singh (2011) is twofold. First, Lao and Singh (2011) have observed the herd behaviour at market level, whereas this article is focused to examine the herd behaviour at sector level. Second, Lao and Singh (2011) considered the data of firms listed in Bombay Stock Exchange Index (BSE) from July 1 1999 to June 30 2009 to examine the herd behaviour and the Indian stock market could be inefficient at that duration. On the other hand, this article consists of latest data of five sectors along with NIFTY50 from the NSE over the period from January 1 2011 to December 31 2021 to examine the presence of herd behaviour. Third, in recent years, the Securities and Exchange Board of India (SEBI) has maintained information symmetry, allowing investors to make informed decisions.

Furthermore, during bull market conditions, the findings revealed weak evidence of herd behaviour for the whole sample and pre-COVID-19 period but detected significant evidence of anti-herd behaviour in the FMCG, PHARMA and NIFTY50 indices. After the outbreak of COVID-19 pandemic, results provided strong evidence of herd behaviour in auto and pharma sectors implying that investor followed the investing patterns of other investors in these sectors after the first COVID-19 case reported in India during bullish market while significant evidence has been found of anti her behaviour in banking sector during post COVID-19 period.

Moreover, in the bear market conditions, significant evidence of anti-herd behaviour has been detected in all concerned sectors along except NIFTY50 during the whole sample period but during pre-COVID-19 period, significant evidence of anti-herd behaviour was detected in all six indices implying the sector-wise market was efficient before the COVID-19 outbreak. Further, results suggested the evidence of herd behaviour during the post COVID-19 outbreak period for FMCG sector only and found strong evidence of anti-herd behaviour in auto, IT and pharma sectors implying investors has taken investment decision rationally.

The article has certain significant implications for investors, market regulators and policymakers in market instability phase like the COVID-19 pandemic. Investors must consider the role of herd behaviour while making investment decision as knowledge of herd behaviour at sector level would help investors in making rational and effective financial decisions in the pandemic regime. Easy accessible and quality information influences the decision of investors and boost them to invest in risky assets which result in market volatility. However, market regulators has taken necessary steps for instance, SEBI has requested listed companies to disclose the economic impact of COVID-19 pandemic on its operation. Some more measures that market regulators may ensure can be orderly trading and settlement, reduced market-wide position limits for volatile stocks, increased margin and restriction of positions. The article employed F-test and adjusted R-square values as diagnostics and tried to examine the presence of herd behaviour applying the model suggested by Chang et al. (2000). Scope for further research can be assumed in many ways for instance, future researchers can use other regression models as diagnostics for results to be robust. Trading volumes can also be used as a proxy variable to detect the presence of herd behaviour.

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