Exploring Herding Behaviour in Indian Equity Market during COVID-19 Pandemic: Impact of Volatility and Government Response

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Abstract
This study investigates the behavioural bias of market-wide herding in the Indian equity market during the spread of COVID-19 pandemic. The study also examines the impact of market volatility and government response on herding during the sample period. We use the measure of cross-sectional absolute deviation and semi-parametric estimator of quantile regression for the period 1 January 2020 till 15 June 2020 for S&P CNX Nifty Index and its 50 constituent companies. The results obtained reveal significant herding in the Indian equity market that is aggravated by market volatility. Further, we find that the government response and control measures implemented are successful in reducing herd behaviour. The research calls for better information disclosure guidelines to promote market efficiency. We further suggest that during exogenous events, investors need to realign their portfolios and formulate trading strategies for better risk-return management.

Keywords
Herd behaviour, market volatility, cross-sectional absolute deviation, market efficiency, portfolio management

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I. Introduction

The spread of COVID-19 is a rare event like a ‘black swan’ (Yarovaya et al., 2020) that has impacted the economic cycles and financial markets causing reduced business investments (Fan, 2003) and inducing massive sale of risky assets (Baker et al., 2020; Ramelli & Wagner, 2020). In addition, the increased healthcare expenditures by governments and decrease in output due to closures and lockdowns have deepened the crisis causing major gyrations across the world. The International Monetary Fund has already called this crisis to be worse than the Global Financial Crisis of 2008 (International Monetary Fund, 2020). In times like these, the scarce and limited information on a disease that is so contagious and fatal has engulfed the economy and financial markets with fear and anxiety (Bloom et al., 2018). This makes the investors vulnerable to stress and shocks as they succumb to pessimism resulting in panic trading (Baker et al., 2012). The volatility in the financial markets amplifies investor irrationality as they diverge from reasonable cognitive assessment especially when the markets are inundated with negative news that drive changes in asset prices (Chen et al., 2014). The collective social anxiety makes the investors follow the crowd, manifesting herd behaviour.

Although extensive financial literature is available on herding, there are several gaps. First, there is a paucity of literature on the subject that study the impact of exogenous shocks and rare events on the equity market behaviour. Second, the limited academic studies have focussed on examining behavioural bias in developed equity markets with infant research on developing Asian economies with rapidly expanding financial markets. Third, the existing research focuses on the transactional data using surveys and primary datasets that identify the presence of irrational investment patterns instead of examining a specific behavioural bias in the stock market. Further, their results are inconclusive. Next, past studies observe the impact of localized epidemics such as SARS, HIV/AIDS and Ebola on financial markets (Loh, 2006; Pendell & Cho, 2013) with scarce research on the impact of global unprecedented shocks like COVID-19 on the equity markets. Against these gaps, this study finds motivation from three main research questions (RQ):

**RQ1.** Does the emerging Indian equity market witness market-wide herding during COVID-19 crisis?

Such unprecedented events coupled with insufficient information are thought to lower investor confidence and increase uncertainty (Fernández et al., 2011) causing irrational investment decisions (Chiang et al., 2013). We provide an insight into how markets process rare information and react to such “black swan” events. Also, available embryonic research on such events makes this question obvious and pertinent.

**RQ2.** How does the increased stock market volatility during COVID-19 infection spread impact herd behaviour?
The pandemic is primarily a healthcare scare with impact on the real economy initially and low correlation to the financial markets. However, the benchmark Nifty Index suffered a meltdown during the period of study as panic and volatility increased (Bloomberg Quint, 2020). Literature shows that herding behaviour is exacerbated during periods of high volatility (Dhall & Singh, 2020; Tan et al., 2008) as uncertainty and fear rise. We explore the impact of market volatility on herding during the period described as one of the most volatile periods of stock market (Bloomberg Quint, 2020).

RQ 3. Does the government response to control the spread of infection affect herd behaviour? The spread of the pandemic, mortality rate, public place closures, and movement restrictions, all affect human behaviour that impacts the investment decisions (Ashraf, 2020). The infection containment measures imposed by the government supported with monetary and fiscal policies should reduce the COVID-19 shock (Wagner, 2020) and alleviate panic (Sharif et al., 2020), thereby impacting the market behaviour. This study explores the effect of government measures on market-wide herding.

Following the questions, there is novelty in this research as it provides an empirical analysis of the effect of pandemics and health crisis on the market-wide herd behaviour and further examines the impact of government intervention. This research contributes to the literature by providing a developmental base to the academic body in understanding how exogenous shocks and rare events impact the equity market behaviour. Second, the examination of herd bias in the emerging market of India is of interest due to the peculiar nature of the economy as investors share a common fear and experience panic following each other in and out of securities. Also, the Indian equity market has been criticized for inefficiency (Gupta & Basu, 2011) due to structural and cultural factors. This study will provide a formative ground in understanding the extent of inefficiency due to behavioural bias during exogenous shock. Next, to the best of our knowledge, no other study has examined the impact of government stringency measures on herding in India. Our study bridges the gap. Fourth, we use the semi-parametric estimator of quantile regression which is less sensitive to the presence of outliers and provides more robust results compared to ordinary least squares estimate (Pochea et al., 2017). The method has not been used to explore herding for India during pandemics.

Our objective of this article is to examine market-wide herd behaviour during the pandemic period in the Indian equity market. Further, the study also explores the impact of market volatility on herd behaviour during the COVID-19 infection spread and ascertains the impact of the Indian government response or stringency measures on market-wide herding during the pandemic period. The results indicate presence of significant herding for the sample period that are further amplified due to rising volatility. Also, the findings show that government intervention and control measures implemented had a negative effect on herd behaviour. The results of this study are useful for equity market participants for
better risk-return management. The rest of the article is arranged as follows: The second section reviews the existing literature followed by the third section on data and methodology. The fourth section is the analysis of empirical results followed by the fifth section of discussion of the results. The sixth section presents the conclusion and implications.

II. Literature Review

The literature provides evidence that market stress amplifies herd behaviour especially in emerging markets (Babalos et al., 2015; Balcilar & Demirer, 2015; Yao et al., 2014). During turbulent periods, investors suppress their private information and are inclined to follow the crowd (Chauhan et al., 2019). Heightened uncertainty aggravates speculative activities (Chiang et al., 2019) as investors observe the actions of others in the market more closely, sometimes leading to homogeneity in trading (Schmitt & Westerhoff, 2017) and following each other in and out of stocks as the market is overwhelmed with fear and sentiment (Aharon, 2020). Nath and Brooks (2020) find that herding emerges during the best and worst days of stock returns and volatility strengthens it. Christie and Huang (1995) in their seminal work conclude that investors in the US equity market follow their private information and do not herd even during extreme market movements induced by a crisis. Chang et al. (2000) in their study covering equity markets of the US, Japan and Hong Kong and developing Asian markets of South Korea and Taiwan conclude no significant herding in the US and Hong Kong equity markets; however, report herding in South Korea and Taiwan during extreme up and down-market phases.

Previous studies have also provided the evidence that stress and crisis periods such as pandemics induce panic in the equity markets, exacerbate market volatility (Baker et al., 2020; Chen et al., 2014), cause multi-dimensional uncertainty (Avery & Zemsky, 1998), devaluate the asset prices (Ali et al., 2020; Gil-Alana & Monge 2020), increase the fragility of the markets (Javaira & Hassan, 2015) which may result in irrational behaviour among the market participants and may lead to herding. The extant literature further demonstrate that there exists a relationship between investor sentiment and herding (Economou et al., 2015; Lakonishok et al., 1992; Liao et al., 2011; Simões Vieira & Valente Pereira, 2015). Extreme volatility results in herding, especially for emerging equity markets such as Turkey (Balcilar & Demirer, 2015), Spain (Blasco et al., 2012; Pochea et al., 2017) and China (Chiang et al., 2015). The COVID-19 pandemic has engulfed financial markets with negative sentiment thereby increasing volatility (Ali et al., 2020; Chen et al., 2014; Haritha & Rishad, 2020; Naseem et al., 2021) which is the main reason for herding in the stock markets. Aslam et al. (2020) argue that European markets witnessed non-rational investing and behaved like roller coasters during COVID-19 outbreak period that resulted in herding. Dhall & Singh (2020) in their study provide the evidence of herding in Indian equity markets during the COVID-19 break. Chang et al. (2020) examine the renewable
energy stock markets for the US, Europe and Asia covering the period corresponding to the spread of SARS and COVID-19 to find that herding is prevalent during extreme low oil returns. Kizys et al. (2021) in their study including 72 markets from Europe, the US, South America, Asia, and Africa also report the existence of herding in most of the markets during the COVID-19 pandemic. Other notable studies which have reported the presence of herding in different markets during the pandemics of SARS and COVID-19 include inter alia, Asia–Pacific (Yang et al., 2015), Vietnam and Taiwan (Luu & Luong, 2020), Thailand (Kanthavit, 2020), Europe (Espinosa-Méndez & Arias, 2021), GCC countries (Abdeldayem & Dulaimi, 2020). The extant literature on the impact of pandemics on herding in equity markets is limited and still evolving, thus the present research will provide notable contribution to the literature.

### III. Data and Methodology

#### Data

The study examines herd behaviour using the daily closing values of the S&P CNX Nifty Index and its 50 constituent companies. CNX Nifty 50 Index is a widely tracked index covering 14 major sectors of the Indian economy and provides a proxy for an efficient market portfolio. The time period of this study is from 1 January 2020 to 8 June 2020. This period is significant as it covers the time when the novel coronavirus had started to spread until the end of the final lockdown phase coinciding with the beginning of the Unlock 1.0 phase in India when the Government began easing the restrictions. To examine the impact of market volatility, we use the India VIX Index that is disseminated by the National Stock Exchange of India (NSE). The Index gauges fear and panic in the market (Shaikh & Padhi, 2015; Whaley, 2000). The Indian government response data has been taken from the Oxford COVID-19 Government Response Tracker (OxCGRT) that gives the stringency index (SGI) values that help in tracking and comparing the government policy responses to contain the spread of the virus. The values of SGI, Nifty 50 Index and VIX have been mapped with each other as the Nifty Index and Volatility Index values are not available for weekends and holidays. We have a total of 106 days of observations. Table 1 summarizes the definition of the variables considered for the study.

#### Methodology

In order to examine herding extensively at the level of the market, the empirical literature uses dispersion measure. The dispersion quantifies the proximity of individual stock return to the market return and is calculated in two ways. The first measure is cross-sectional standard deviation (CSSD) as given by Christie and Huang (1995). CSSD is measured as:
| Variable                          | Description                                                                 | Measurement                                                                 | Frequency | Data Source                                                      |
|----------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------|------------------------------------------------------------------|
| S&P CNX Nifty Index              | Closing value of the S&P CNX Nifty 50 Index (CV) and its 50 constituent companies (P) on day t | Calculation of market return ($R_m$) and individual stock return ($R_i$).  
$R_{mt} = \ln \left( \frac{CV_t}{CV_{t-1}} \right) \times 100$  
$R_i = \ln \left( \frac{Pt}{Pt-1} \right) \times 100$ | Daily     | www.yahoofinance.com                                               |
| Volatility Index                 | Measure of the expected volatility for the next 30 days (VIX) based on price inputs of the S&P CNX Nifty Index. | DVIX-first difference of the volatility index | Daily     | www.yahoofinance.com                                               |
| Oxford COVID-19 Govt. Response Tracker (OxCERT) | Measure of the Indian government response through stringency index (SGI)  
DSGI-first difference of stringency index | Daily     | https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker |

**Source:** The authors.
All symbols have meanings as explained in Table 1. The market comprises of \( N \) number of firms and \( R_m \) and \( R_i \) are given as:

\[
R_m = \ln \left( \frac{CV_t}{1} \right) \times 100
\]

(2)

\[
R_i = \ln \left( \frac{Pt}{P_t - 1} \right) \times 100
\]

(3)

According to the Christie and Huang (1995), under the traditional models of finance, the individual stock return varies from the market return due to different sensitivity. As a result, the dispersion (CSSD) should increase. However, under conditions of unusual market movements and stress, investors are expected to ignore their private information and converge to a general market consensus and herd, thereby decreasing the CSSD measure. The relationship between market return \( (R_m) \) and dispersion \( (CSSD) \) can therefore be used to examine herding.

As per Christie and Huang (1995), asymmetrical market movements can be classified as up \((U)\) or down \((L)\). Following is the regression equation with dummy variable \( (D) \):

\[
CSSD_t = \alpha + \beta L D_t^L + \beta U D_t^U + \epsilon_t
\]

(4)

The dummy variable captures the differences in investor behaviour during extreme market movements. It takes the value of 1 (for both \( D_t^L \) and \( D_t^U \)) if the market return on day \( t \) lies in the extreme lower or upper tail of the return distribution, otherwise \( D = 0 \). Negative and significant values of \( \beta \) coefficient implies herd behaviour. The CSSD measure suffers from the following limitations: (1) The results are affected by outliers in the return distribution (Christie & Huang, 1995), (2) The model is linear and during periods of herding, the linear relationship between market return and dispersion does not hold true, so the Equation (4) is not valid, and (3) The model ignores the fact that herding can occur during normal periods of the market also in addition to the extreme movements. Thus, Equation (4) cannot be used under normal market conditions.

Following the limitations, our study employs the second dispersion measure of cross-sectional absolute deviation (CSAD) as proposed by Chang et al. (2000). CSAD is built on the intuition that the relationship between market return and dispersion is increasing and linear. However, during herding, this relationship does not hold true and can become non-linear increasing or decreasing. CSAD is calculated as:

\[
CSAD_t = \frac{1}{N} \sum_{i=1}^{N} |R_{i,t} - R_{m,t}|
\]

(5)

Following is the estimation equation:

\[
CSAD_t = \beta_0 + \beta_1 |R_{m,t}| + \beta_2 (R_{m,t}^2) + \epsilon_t
\]

(6)
Following the rationale by Christie and Huang (1995), periods of herd behaviour tend to decrease dispersion. The relationship between market return and CSAD is no longer linearly increasing, rather becomes non-linearly decreasing or increasing at a decreasing rate. In Equation (6), negative and significant coefficient value ($\beta_2$) of $R_m^2$ (non-linear term) implies herding.

The present study engages the quantile regression estimator to analyse the extreme tails of the distribution. It is a better modelled and powerful technique to analyse periods of crisis compared to other regression methods (Allen et al., 2009). Quantile regression helps in analysing the impact of the independent variables on CSAD over an entire family of the dispersion curves (Koenker & Bassett, 1978). The method has been widely used in the past to examine herd behaviour (Bharti & Kumar, 2019; Gebka & Wohar, 2013; Pochea, et al., 2017; Saastamoinen, 2008). We hypothesize that the relationship between dispersion (CSAD) and market return is non-linear during the study period. We use the following quantile ($\tau$) regression equation:

$$\text{CSAD} (\tau|x_t) = \beta_0 + \beta_1 x_t + \beta_2 x_t R_m + \beta_3 x_t R_m^2 + \epsilon_{\tau,t} \quad (7)$$

In the next step, we gauge the effect of “investor fear” captured using VIX, on herd behaviour. Extreme volatility can cause structural changes in the systems (Becketti & Sellon, 1989) causing irrational trade behaviour where investors ignore fundamentals and destabilize the price (Friedman, 1953) as they chase crowd (Philippas et al., 2013). We therefore hypothesize that increasing market volatility reduces CSAD thereby aggravating herd behaviour. To gauge the effect of volatility, we add DVIX$_{IND}$, the first difference of the volatility index as the explanatory variable where a negative and significant coefficient ($\beta_2$) of non-linear $R_m^2$ implies herding:

$$\text{CSAD}_t = \beta_0 + \beta_1 x_t + \beta_2 x_t R_m + \beta_3 x_t R_m^2 + \beta_4 (\text{DVIX}_{IND,t}) + \epsilon_{\tau,t} \quad (8)$$

Further, to understand the impact of government control measures on herding, we include difference of stringency index (DSGI) in the Equation (8) as a regressor. SGI for the analysis is measured as the first DSGI to make the data stationary. Studies demonstrate that government policy response impacts trading behaviour (Ashraf, 2020; Ibrahim et al., 2020; Lin & Lin, 2014). During the spread of infection, the government intervened to provide relief. The effect of the containment measures is two-fold. First, the lockdowns imposed and movement restrictions led to increase in unemployment and fear among investors. Second, the expansionary monetary and fiscal policy measures provide a boost to the economy that stabilized investor sentiment and affect the herd behaviour. We hypothesize that the government response and control measures can mitigate herd behaviour by contributing to the investor information and reducing uncertainty. The coefficient of DSGI ($\beta_4$) provides the impact of government response on herd behaviour. A significant and negative value of $\beta_2$ implies herd pattern.

$$\text{CSAD}_t = \beta_0 + \beta_1 x_t + \beta_2 x_t R_m + \beta_3 x_t R_m^2 + \beta_4 (\text{DSGI}_t) + \epsilon_{\tau,t} \quad (9)$$
For the analysis, the quantile values (τ) of 5%, 10%, 25%, 50%, 75%, 90% and 95% have been considered. The range of quantiles chosen is important as it encompasses an entire series of the distribution to gauge the bias better.

IV. Empirical Results

Table 2 exhibits the descriptive statistics of the variables. The average daily market return during the sample period is –0.1965%. The negative value shows bearish sentiment in the Indian equity market due to the meltdown. The value of SGI is in the range of 0 to 100, with higher values denoting more stringent response. The average daily value of the index is 50.30 with a deviation of 39.57%. The daily average value of volatility index is 32.55 and deviation is 17.90%. The kurtosis values reveal that $R_m$ is leptokurtic while others exhibit platykurtic distributions. The skewness values of the variables show that the daily return is negatively skewed while CSAD is positively skewed. This validates the use of quantile regression as a better estimator (Howard, 2018).

Table 3 provides the quantile regression results for the sample using Equation (7). The coefficient of the non-linear term ($R_m^2$) is negative for all quantile levels;

Table 2. Descriptive Statistics for the Entire Sample Period.

|          | Rmt  | CSAD | DSGI  | DVIXIND |
|----------|------|------|-------|---------|
| Mean     | –0.196 | 1.878 | 50.308 | 32.555 |
| Median   | –0.088 | 1.755 | 73.145 | 30.212 |
| Standard deviation | 2.796 | 0.882 | 39.571 | 17.900 |
| Kurtosis | 6.100 | 1.020 | –1.781 | 0.034 |
| Skewness | –1.195 | 1.088 | –0.080 | 0.869 |
| Minimum  | –13.903 | 0.728 | 0 | 11.49 |
| Maximum  | 8.400 | 5.049 | 100 | 83.607 |
| Count    | 107 | 107 | 107 | 107 |

Source: The authors.

Table 3. Quantile Regression Results for Herding During the Sample Period.

|         | 0.05  | 0.1   | 0.25  | 0.5   | 0.75  | 0.9   | 0.95  |
|---------|-------|-------|-------|-------|-------|-------|-------|
| $C$     | 0.669*** | 0.657*** | 0.833*** | 1.051*** | 1.551*** | 1.913*** | 2.256*** |
|         | (4.918) | (4.270) | (8.369) | (9.348) | (9.710) | (11.406) | (12.651) |
| $|R_m|\$ | 0.273 | 0.391 | 0.372*** | 0.456*** | 0.476*** | 0.510*** | 0.442*** |
|         | (1.438) | (1.959) | (4.375) | (5.313) | (5.119) | (4.879) | (4.795) |
| $R_m^2$ | –0.010 | –0.0240 | –0.005 | –0.012 | –0.016** | –0.020*** | –0.017*** |
|         | (–0.414) | (–0.8740) | (–0.801) | (–1.835) | (–2.531) | (–2.958) | (–2.872) |

Source: The authors.

Notes: t-statistics in parenthesis.

*** and ** mean significant at 1% and 5%, respectively.
however significant only for higher quantile values of 75%, 90% and 95% indicating the evidence of herd behaviour during the period of study. The finding is not surprising as the equity markets plunged to historic lows due to the uncertainty surrounding the pandemic. The weak sentiment and worries of slowdown put pressure on the market as India became the 4th worst pandemic hit country globally (The Economic Times, 2020). Such factors contribute to investor panic, thereby magnifying the irrational herd mentality. Our results are further substantiated by Figure 1 that shows the relationship between CSAD and daily market return. The plot is indicative that CSAD and market return (\( R_m \)) do not vary linearly, and the slope of the graph is also steep for both the sides of market return supporting the empirical result of significant herding.

Next, we demonstrate the impact of volatility on herd behaviour using (8). The results reported in Table 4 show significant market-wide herding for lower and higher-level quantiles with negative coefficients for the non-linear term of \( R_m^2 \). Further, the negative and significant relationship between volatility and CSAD at

![Figure 1. Plot of Daily CSAD and the Corresponding Equally Weighted Market Return (\( R_{m,t} \)) Values for Nifty 50 Index (1 January 2020–15 June 2020).](image)

**Source:** The authors.

**Table 4.** Quantile Regression Results for the Impact of Volatility Index on Herding.

| Quantiles | Coeff. | 0.05 | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 | 0.95 |
|-----------|-------|------|-----|------|-----|------|-----|------|
| \( C \)   | 0.614*** | 0.631*** | 0.809*** | 1.077*** | 1.570*** | 1.985*** | 2.226*** |
|           | (4.743) | (4.073) | (8.883) | (10.000) | (9.490) | (11.850) | (14.245) |
| \( |R_m| \) | 0.373** | 0.409** | 0.436*** | 0.449*** | 0.443*** | 0.507*** | 0.459*** |
|           | (2.248) | (2.123) | (6.284) | (5.768) | (4.838) | (4.889) | (5.094) |
| \( R_m^2 \) | −0.019 | −0.022 | −0.010* | −0.011* | −0.014** | −0.021*** | −0.019*** |
|           | (−0.787) | (−0.813) | (−1.791) | (−1.767) | (−2.123) | (−2.899) | (−2.886) |
| \( DVIXIND \) | −0.007 | −0.010 | −0.019** | −0.031*** | −0.002 | 0.017 | 0.017 |
|           | (−0.744) | (−0.952) | (−2.477) | (−3.375) | (−0.120) | (0.600) | (0.653) |

**Source:** The authors.

**Notes:** t-statistics in parenthesis.

***, ** and * mean significant at 1%, 5% and 10%, respectively.
25% and median quantile values show that increasing volatility causes the dispersion to reduce leading to extensive herd behaviour. Thus, our hypothesis that rising volatility magnifies herd behaviour holds valid.

We examine the impact of government response on market-wide herding using (9). The results reported in Table 5 reveal that the stringent government restrictions were successful in mitigating herd behaviour as depicted from the positive relationship between CSAD and SGI for higher quantiles of 90% and 95%. The relationship between daily CSAD and SGI can also be visualized from Figure 2, which shows that dispersion rises for the days when control measures are tightened as the two plots move in unison. The Indian government imposed the strictest

| Quantiles | Coeff. | 0.05 | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 | 0.95 |
|-----------|--------|------|-----|------|-----|------|-----|------|
| C         | 0.614*** | 0.631*** | 0.809*** | 1.070*** | 1.562*** | 1.978*** | 2.216*** |
|           | (4.677) | (4.030) | (8.596) | (9.802) | (8.980) | (11.185) | (13.62) |
| $|R_m|^1$   | 0.372**  | 0.409*** | 0.435*** | 0.460*** | 0.462*** | 0.531*** | 0.491*** |
|           | (2.244) | (2.124) | (6.363) | (5.929) | (4.713) | (5.365) | (5.705) |
| $R_m^2$   | −0.019 | −0.022 | −0.016* | −0.010 | −0.016** | −0.030** | −0.027** |
|           | (−0.777) | (−0.802) | (−1.806) | (−1.619) | (−1.990) | (−3.631) | (−3.77) |
| DVIXIND   | −0.006 | −0.010 | −0.0198** | −0.030*** | −0.0008 | 0.016 | 0.015 |
|           | (−0.757) | (−0.967) | (−2.320) | (−3.039) | (−0.038) | (1.128) | (1.055) |
| DSGI      | 0.014 | 0.010 | 0.008 | −0.012 | 0.014 | 0.093*** | 0.0792** |
|           | (0.638) | (0.414) | (0.384) | (−0.616) | (0.231) | (2.887) | (2.517) |

**Source:** The authors.

**Notes:** t-statistics in parenthesis.

***, ** and * mean significant at 1%, 5% and 10%, respectively.

Figure 2. Plot Between the Daily Cross-sectional Absolute Deviation (CSAD) and Stringency Index (1 January 2020–15 June 2020).

**Source:** The authors.
lockdowns at the early phase of the pandemic (*The Indian Express*, 2020) that provided some confidence to the market reducing the possibility of ‘irrational crowd behaviour’.

**V. Discussion of Results**

Our results provide evidence of significant herding in the Indian equity market during the period of study that is exasperated by panic and fear (Kim & Wei, 2002), higher uncertainty and information asymmetry (Yousaf et al., 2018) about the spread of the pandemic and recovery thereafter that affects asset prices and trading behaviour (Epstein & Schneider, 2008). The severity and shock of this human health crisis (Liu et al., 2020) is still not completely known which adds to the multi-dimensional uncertainty aggravating herd pattern (Avery & Zemsky, 1998). The panic caused by COVID-19 infection has exposed the vulnerability and fragility of the emerging financial markets that experienced much swing and volatility, like no other past event (Baker et al., 2020) that magnified herding.

In response to the pandemic, the Indian government imposed stringent lockdowns and introduced several monetary and fiscal policy measures that had dual impact. First, the lockdowns caused corporate contract cancellations (Ozili & Arun, 2020) and sudden slump in economic demand and supply (International Monetary Fund, 2020) that depressed the Indian business confidence index by 62% on a year-on-year basis (*The Business Standard*, 2020) and the consumer confidence index at the level below 100 (Reserve Bank of India, 2020). Second, the monetary and fiscal policy measures taken by the government, for instance, stimulus package of USD 266 billion worth 10% of the country’s GDP (Outlook Money, 2020) and setting up of task forces by various government departments to closely monitor the spread of the pandemic contributed to the investor confidence affecting their trading behaviour.

We argue that emerging markets experience limitations with respect to information disclosures, transparency, investor education and market regulations (Pattnaik, et al., 2013). These factors have the potential to induce negative sentiment and fear during such crisis periods causing behavioural pitfalls (Chen et al., 2014) aggravating herd behaviour. Our results are consistent with the studies of Lao and Singh (2011), Bhaduri and Mohapatra (2013) and Dhall and Singh (2020). The latter study uses sector-level data to find some evidence of herding at industry level during post-COVID-19 outbreak period. Studies argue that in integrated financial markets, there is co-movement between sector returns (Barberis et al., 2005; Evans & McMillan, 2009) and market participants have a tendency to crowd around specific ‘hot sectors’ making the examination of herding at industry level relevant. Although the argument is valid, yet this study focuses on aggregate market for the following reasons:

1. The sample period covers an exogenous event that was unanticipated and abrupt in occurrence. As a result, aggregate market behaviour is a better representation of the trading decisions rather than sector-specific study.
2. Literature shows that sector-specific index values are influenced by the changes in the sector-specific stocks (Sehrawat & Giri, 2017). As the severity of the pandemic was unknown during the sample period, and its impact on specific sectors was not clear, examination of sector-level data may not give accurate and true results.

3. Nifty 50 is a well-diversified index that is tracked by portfolio and fund managers for benchmarking. It comprises 50 stocks from 15 sectors and therefore provides an acceptable proxy for the entire market to examine herding rather than sector index that have only a limited number of stocks that are prone to less frequent trading which may give inaccurate results (Galariotis et al., 2016).

4. The one-year correlation between returns of sector indices (all sectors) and Nifty 50 Index is in the range of 0.70–0.90 and beta close to one. Thus, the movement of sectoral indices follows the composite index and latter can be used for the study as it is more diversified.

VI. Conclusion and Implications

The present research examines market-wide herd behaviour in the Indian equity market. Further, we study the impact of volatility and government stringency measures on herd behaviour during the outbreak of COVID-19 pandemic. Using daily data and quantile regression estimator, we document significant herding for the sample period. The findings reveal that an increase in market volatility exacerbates herding while stringent government control measures mitigate herd behaviour. The lockdowns imposed to control the virus spread, monetary policy measures and stimulus announced to revive the economy lends consistency and boosts investor confidence thereby decreasing anxiety and irrational herding.

This research has practical implications for investors, policymakers, and regulators. First, the COVID-19 crisis has presented the markets with a “new set of normality”, different from the one that the market participants have experienced. Any behavioural bias has the potential to distort the asset valuations leading to inefficiency. The presence of herding during exogenous events imply that rational asset pricing models cannot be used universally for all market conditions. There is therefore a need to develop new valuation models by academicians and researchers. Second, such events cause disruption in the normal functioning of the market and aggravate information asymmetry. Policymakers and regulators should therefore ensure full information disclosures to instil confidence so that minimum disruption is caused by the rumours. In light of this, the market regulator, Securities Exchange Board of India (SEBI) has advised listed entities to make suitable qualitative and quantitative disclosures relating to the financial impact of the pandemic on the operations. This also puts the sense of responsibility on the corporates to publish real and correct information instead of selective and biased news. Third, the investors should have an “investment vision” instead of simply following the crowd while making their investment choices. The knowledge of existence of herd behaviour will aid in informed decision making especially
during such exogenous events. Also, herding implies the need for better portfolio management as a greater number of securities are required to achieve the same level of diversification. Fourth, during times like this, the government budgets are overstretched and there is a dire need for capital that equity markets can facilitate by attracting huge investments. It is therefore vital that the market movements pursue fundamentals and not chase the herd. Such events are exceptional in occurrence and the role of regulators to strengthen the surveillance systems becomes vital to promote integrity and stability. Policymakers and regulators during such circumstances should ensure transparency and proactiveness and clear communication of messages to the investors. Volatility management tools should be properly calibrated and ad-hoc measures can be used judiciously to manage sudden spurts in volatility. This study provides a formative view in this direction for framing policies to make the markets resilient and less vulnerable, especially during tail end events. Finally, more research on the subject will aid in developing policies and practices that will provide the desired strength and scale to the financial markets.

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