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RESEARCH ARTICLE

The Prevalence of Herding in the Indian Auto Sector: Implications for Market Efficiency

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Abstract

Due to the spread of the Covid-19 virus, India had witnessed an explosive change in the economic activity, mainly in the investment pattern. This caused investors to panic trade by following what others were doing in the market. We offer an empirical analysis to examine the presence of herding in Indian Automobile Sector during pre-pandemic and pandemic period (COVID-19). To detect the presence of herding, we applied Cross Sectional Absolute Deviation (CSAD) and One-way ANOVA to examine whether there is any significant difference among the Auto index return during the sample period. The result shows that herding behaviour is driven by panic and shocks during the pandemic period. However, herding is not prevalent during the pre-pandemic period. This paper concludes that the Indian market is efficient unless there is any panic or fear among the investors.

Keywords: COVID-19, Herding behaviour, Investment

1. Introduction

The multiple episodes of financial crisis and market crashes over the past few decades in the global financial markets, made numerous researchers to extensively investigate the influence of investors behaviour on market efficiency (Doran, Peterson, and Wright 2010; Khawaja and Alharbi 2021; Shah, Ahmad, and Mahmood 2018). One of the most interested research topics among researchers is the examination of herding behaviour in the stock market, which refers to the situation where investors opt to mimic the trading practices of those they treated as better informed (Sias 2004; Nofsinger and Sias 1999; Avery, Zemsky, and Zemsky 1998; C. Chang, McAleer, and Wang 2020).

One of the major reasons for the sharp drop or rise in the stock prices is due to the presence of herding in the concerned stock. Herding behaviour in stock market leads to deviation of asset prices from its intrinsic value and thus it has a potential to

form bubbles resulting into market crashes. It may also be understood as tendency of investors to follow the actions and decisions of other investors, rather than making independent decisions based on their own analysis and research. This can lead to market trends and patterns that are not necessarily based on fundamentals or economic conditions, but rather on the collective psychology of investors. In the Indian stock market, herding behaviour may occur for a variety of reasons. For example, investors may follow the recommendations of financial analysts or media reports, or they may simply be influenced by the actions of other investors. This can lead to a situation in which a particular stock or sector becomes overvalued or undervalued based on the collective behaviour of investors, rather than on its underlying fundamentals.

The outbreak of Covid 19 pandemic has not only had a negative impact on people's lives but also spawned the economic activity of many nations (Nayak and Mishra 2022). A number of countries

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announced rigorous closure of national and international borders, and imposed travel restrictions in the form of lockdown to flatten the economic curve. All the sectors within the economy across the globe were operating in fear of financial distress. Various sectors in India also have been disrupted due to the announcement of lockdowns including the automobile sector. The Indian automobile sector is considered as the 4th largest in the world that employs 32 million people. As per the report of Economic Times published in 2020, the Indian automobile sector contributes about 7.5% of the overall GDP and 49% of the manufacturing GDP of the country. In the year 2019–20 the sector faced a serious turmoil in maintaining the profitability and sales during quarterly and yearly basis. And in August 2019 there was a drop in domestic sales (35.9%) of market leader Maruti mainly due to the subdued market confidence, liquidity crunch, slow economic growth, and breakout of coronavirus followed by lockdowns (Dhall and Singh 2020). All these were seriously impacted the automobile stock prices. It is important for investors to be aware of the potential for herding behaviour and to make investment decisions based on their own analysis and research, rather than simply following the actions of others. This can help to avoid making costly mistakes and to ensure that investments are based on sound principles and a solid understanding of the market. In this article, an attempt is made to investigate the presence of herding in Indian Automobile sector before and during the pandemic period.

The remainder of the paper is organized as follows: a brief literature review on investor herding behaviour in stock market during Covid 19 and uncertainty is presented in section 2. The data and technique used to detect herding were presented in section 3 and 4. The empirical findings are reported and discussed in section 5. The study is concluded in section 6.

2. Literature review

The term herding is widely endured in different academic domains including Zoology, Sociology, Psychology, Economics and Finance. Bon (1896) pointed the mantra that by following the crowd, the elements feel safe and difficulty in blaming the masses. The application of this herding behaviour in financial market becomes popular by the publication of article made by Banerjee (1992) and Bikhchandani, Hirshleifer, and Welch (1992) through the explanation of rational herding that may yield maximum return to the investor. Devenow and

Welch (1996) defined herding behaviour as a coordinated mechanism and that require widely spread rule to coordinate the elements using some signals like price movements or direct ability to observe colleagues' investment patterns. Simply speaking, it is a process when investors abandoned their own private information and following what has happened in the past (Avery, Zemsky, and Zemsky 1998) or moving together in a same direction (Nofsinger and Sias 1999) or mimicking one another's action for making investment decision (Spyrou, 2014).

A growing number of empirical studies confirmed herding behaviour during the period of financial crisis and uncertainty in global market (Balcilar, Bekiros, and Gupta 2017; Economou, Katsikas, and Vickers 2016; Espinosa-méndez and Arias 2021; Ferreruela and Mallor 2021). Espinosa-méndez and Arias (2021) reported herding behaviour in Australian stock market using the static model CSAD developed by E. C. Chang, Cheng, and Khorana (2000) during Covid 19. The researcher also found herding behaviour was apparent during crisis and extreme market conditions. Balcilar, Bekiros, and Gupta (2017) noted an asymmetric trading pattern and observed overconfidence or intensive 'flight to quality' after the global financial crisis and this leads to irrational trading behaviour among investors. A strong evidence of herding is detected during down market, high volume and high volatility days in Athens stock exchange (Economou, Katsikas, and Vickers 2016). Furthermore, herding is more pronounced during extreme market conditions (Chang, Cheng, and Khorana 2000; Economou, Kostakis, and Philippas 2011).

The outbreak of covid 19 in Wuhan, China and its massive spread to other countries severely disrupted economy as well as the financial markets (Goldstein and Kojen 2021). Deciphering this "Black Swan effect" (Yarovaya, Matkovskyy, and Jalan 2021), the research community have contributed an amount of articles for detailing the effect of Covid 19 on financial markets. Ferreruela and Mallor (2021) examined the imitation behaviour of investors during 2008 global financial crisis and recent coronavirus pandemic. In the energy market, herding is more pronounced during extremely low oil returns, that the investors panicked they may senselessly sell the stocks (Chang, McAleer, and Wang 2020). During covid 19, herding behaviour is significantly lower than usual in Chinese stock market (Wu, Yang, and Zhao 2020) and also found some signals of herding in the market as when there is any upside movement, lower trading volume and lower market volatility.

For the detection of herding behaviour in financial market there are various tools were encountered by different researchers. [Vo & Phan \(2019\)](#) investigated the impact of idiosyncratic volatility on the herd behaviour of individual investors in Vietnam stock market using Cross Sectional Standard Deviation (CSSD) of [Christie and Huang \(1995\)](#) and Cross Sectional Absolute Deviation (CSAD) of [Chang et al. \(2000\)](#) found the existence of herding behaviour. Investor sentiment and herd behaviour in KOSPI and KOSDAQ stock exchange was examined by [Choi and Yoon \(2020\)](#), identified investors herding in the extreme market conditions using CSAD. [Tinic et al. \(2020\)](#) examined the relationship between informed trade and herding using Fama's Macbeth regression and found when everybody in the market have same information the herding will rise. [Choi et al. \(2022\)](#) also administered CSAD measure to analyze the existence of herding behaviour in Korea's cryptocurrency market. [Omane-Adjepong et al. \(2021\)](#) adopted OLS and quantile regression under different time frame to detect significant crowd and imitation trading in cryptocurrency market. Recent studies deployed different econometric tools to detect the herding behaviour ([Clements et al., 2017](#); [Shih et al., 2012](#); [Vo & Phan, 2019](#)). But the application of CSAD posited by E. C. [Chang et al. \(2000\)](#) still has wider acceptability in the observation of herding in the financial market.

In Indian market [Dhall and Singh \(2020\)](#) examined the herding behaviour at the industry level during whole, pre and post pandemic basis by employing the [Chang et al. \(2000\)](#) model, reported covid 19 pandemic caused the creation of herding behaviour at the industry level. [Dhall and Singh \(2020\)](#) reported that there is no evidence of herding in full sample period and pre pandemic outbreak for all the sectors indicating the Indian market is free from industry wise herding ([Dhall and Singh 2020](#)). The outbreak of Covid 19 caused a sell side herding in Auto industry due to the change in government focus from fuel run automobile sector to electric vehicle automobile sector to protect the environment along with increase in interest rate, high fuel price and high inflation rates. [Bharti and Kumar \(2021\)](#) also detected significant herding in the Indian equity market and that is clustered by market volatility.

The review of literature points to the fact that the previous research related to herding in Indian Automobile sector during pre-pandemic and pandemic period is not deeply studied. To bridge the gap, this paper is an attempt to investigate whether herding is evident in the Indian Automobile sector during the pre-pandemic and pandemic period of Covid 19. For the purpose of this study, the

paper starts with an alternate hypothesis that the Indian Automobile sector is not efficient and investors herd in the market.

3. Data

The data comprising to a series of daily stock prices of 15 automobile companies (14 stocks and one DVR stock) which are listed in National Stock Exchange of India. These fifteen stocks are included in Nifty Auto Index, and the daily closing price of these stocks were taken from the official website of National Stock Exchange of India (www.nseindia.com). Time period covers from April 1, 2017 to March 31, 2022. The full sample period is divided into 2 subsamples: the pre pandemic period and pandemic period to detect the herding behaviour in automobile sector during different time horizon. The pre-pandemic period ranges from June 1, 2017 to May 31, 2019 and the pandemic period covers June 1, 2019 to May 31, 2021, and it consisting of 1237 observations for each stock. The five-year data including two-year subsample period each would provide a better understanding of herding in auto sector.

It is evident from [Fig. 1](#), there is a sharp fall in the price movement of Auto nifty during the period of Covid 19. In this paper, we are estimating whether this drop is due to the presence of herding behaviour. Market caps of various auto stocks listed in National Stock Exchange of India and its percentage increase from its previous year for a period of 3 year is given in [Table 1](#).

Market cap of all stocks except Escort Koborta has fallen during march 2020 due to the spread of Wuhan virus from China followed by the global pandemic and closure of international borders. But all stocks regain their momentum to the positive direction in march 2021 with the spread of positive news regarding introduction of vaccines for corona virus. And its increase is visible in following year (March 2022), when the market cap is positive for majority of all the auto stocks.

4. Methodology

As herding can be easily detected in high frequency data (daily data) than weekly or monthly data ([Tan et al., 2008](#)), we have collected the daily closing prices of each automobile stocks for the entire sample period. Based on the daily closing prices, the daily closing stock return is calculated by using the following equation

$$Y = \frac{P_1}{P_0 - 1} \quad (1)$$



Fig. 1. Chart of Nifty Auto during the pre-pandemic, pandemic, and post Pandemic period. (Source: Published on [TradingView.com](https://www.tradingview.com), January 02, 2023 13:25:44 IST).

Table 1. Automobile companies name with market capitalization.

Company Name	Market Cap (in Lakh). As on January 31, 2019	Market Cap (in Lakh). As on March 31, 2020	Market Cap (in Lakh). As on March 31, 2021	Market Cap (in Lakh). As on March 31, 2022
Eicher Motor	5,183,771	3,575,779 (-31%)	7,117,531 (99%)	67,180,416 (844%)
Maruti	20,061,590	12,954,099 (-35%)	20,720,275 (60%)	22,841,180 (10%)
Tata Motors	5,231,876	2,194,716 (-58%)	10,020,689 (357%)	14,403,371 (44%)
Bajaj Auto	7,392,025	5,852,014 (-21%)	10,621,506 (82%)	10,570,577 (-0.5%)
M & M	8,454,331	3,542,477 (-58%)	9,886,489 (179%)	10,026,969 (1.4%)
Hero MotoCorp	5,220,564	3,188,739 (-39%)	5,820,796 (83%)	4,583,986 (-21%)
Ashok Leyland	2,386,584	1,263,744 (-47%)	3,331,823 (164%)	3,441,906 (3.3%)
TVS Motor	2,375,436	1,413,622 (-40%)	2,779,497 (97%)	2,972,383 (7%)
Escort Kubota	808,517	812,194 (0.5%)	1,736,400 (114%)	2,279,850 (31%)
Olectra	173,030	40,384 (-77%)	178,361 (342%)	549,572 (208%)
VST Till Tract	137,964	57,751 (-58%)	154,902 (168%)	207,409 (34%)
SML Isuzu	86,251	43,437 (-50%)	65,477 (51%)	71,707 (10%)
Atul Auto	67,047	30,578 (-54%)	39,223 (28%)	35,427 (-10%)
Hindustan Motor	15,962	6364 (-60%)	13,876 (118%)	25,248 (82%)

(Source: www.nseindia.in).

Note: The Percentage increase or decrease from the previous year is given in brackets.

Herding can be detected with the levels of individual stock return dispersion from the average market return (Kallinterakis, Munir, and Radovic-Markovic 2010). Based on the previous literature there are two static measures: Cross Sectional Standard Deviation (CSSD) and Cross-Sectional Absolute Deviation (CSAD) that are widely applied by various researchers for detecting herding in stock market.

We estimated the herding behaviour in automobile sector by using the Cross Sectional Absolute Deviation (CSAD) proposed by (Chang, Cheng, and Khorana 2000) despite of all other available alternative models because of its wide usage in previous

researches (Espinosa-m and Arias 2021; Choi, Kang, and Yoon 2022; Chauhan et al., 2020; Choi and Yoon 2020; Chen, Wu, and Huang 2017), and it would be able to compare our results with the previous one.

(Chang, Cheng, and Khorana 2000) started the model illustration by defining the variables from the theory of Capital Asset Pricing Model (CAPM) (Black, 1972). The equation for CSAD were estimated from this theory is:

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

The CSAD model represents how much is the individual stock return is dispersed from the market average return. Here, N is the total number of companies selected from the automobile sector, $R_{i,t}$ is the individual stock return at time t , and $R_{m,t}$ is the cross sectional average market return. We have used daily closing price for determining the stock return. Thus, the time t is representing in terms of days Chang, Cheng, and Khorana (2000) argued that during the periods of intensive price changes, the linear relationship established between market return and individual stock return based on Capital Asset Pricing Model will no longer being sustained and can become nonlinear. Thus (Chang, Cheng, and Khorana 2000), proposed the following specifications for estimating the herding behaviour:

$$CSAD = \alpha + \beta_1 r_m + \beta_2 |r_m| + \beta_3 r_m^2 + \epsilon \quad (3)$$

5. Result and discussion

The difference in market capitalization provided in Table 1 also indicate that this difference has also seen in the stock prices and returns during the sample period. We formulated a hypothesis to test whether there are any statistically significant differences in the movement of Auto index returns during these periods. For this purpose, One Way ANOVA is used and Auto index Return from April 1, 2018 to March 31, 2022 (4 years data) were taken.

H1. There is a significant difference in Auto index returns among the sample periods.

Table 2 illustrates whether there is any difference in the index return of Auto Nifty among the sample periods. The result of One Way ANOVA shows that there is a significant difference in the Auto index return during these periods. The F value is 4.455 and P value is less than 0.01 (0.004**), thus the result supports the hypothesis at 1% level. It is evident from the table that based on the mean score and standard deviation, there are much difference in the index returns among these 4 years. To identify which specific group is showing statistical difference, we find out this with Post hoc test and the result is depicted in multiple comparison table.

We used Tukey post hoc test out of the many for finding which group (year) is different with each other in terms of Auto index return and it is shown in Table 3. From the multiple comparison table, it is clear that Auto index return for the year 2018–2019 is showing statistically significant difference with the index returns of 2020–2021 (P value = 0.033*) and the returns of 2019–2020 is different with the year 2020–2021 (P value = 0.003**). The Auto Nifty is showing a downward movement due to the outbreak of corona virus from December 2019 onwards. The panic created among the investors during the covid 19 period forced them to sell the auto stocks.

The descriptive statistics for CSAD measure and market return for the whole period, before covid-19, and during covid-19 is presented in Table 4, where it can be noted that, CSAD Measure and market return is higher during Covid 19 period in terms of Mean, Median, Standard deviation and Skewness. High values for mean and standard deviation indicates significantly higher market variation across stock returns which may provide insights regarding these stock returns having abnormal cross-sectional variations due to unexpected events.

Table 5 shows the result of CSAD measure during 3 periods: Whole period, Before covid 19, and the pandemic period. It confirms some signals regarding the presence of herding in Indian Automobile sector during the period of Covid 19. The β_3 coefficient is negative (–0.526) but not significant for

Table 3. Multiple comparison.

Year	Year (2)	Mean difference	P value
2018–2019	2019–2020	0.11010%	0.886
	2020–2021	–0.41180%*	0.033*
	2021–2022	–0.13564%	0.806
2019–2020	2018–2019	–0.11010%	0.886
	2020–2021	–0.52190%*	0.003**
	2021–2022	–0.24574%	0.365
2020–2021	2018–2019	0.41180%*	0.033*
	2019–2020	0.52190%*	0.003**
	2021–2022	0.27616%	0.260
2021–2022	2018–2019	0.13564%	0.806
	2019–2020	0.24574%	0.365
	2020–2021	–0.27616%	0.260

Note: * means the mean difference is significant at 1% level. ** denotes the mean difference is significant at 5% level.

Table 2. One way ANOVA for difference in the returns of auto nifty index among the sample periods.

Variable	2018–2019	2019–2020	2020–2021	2021–2022	F Value	P Value
Nifty Auto Index Return	–0.098% (1.196%)	–0.208% (2.027%)	0.314% (1.928%)	0.038% (1.437%)	4.455	0.004**

Note: ***denotes significant at 1% level. Values given in () are the standard deviations.

Table 4. Descriptive statistics for CSAD measure and market return.

Period	Variable	Mean	Median	Standard deviation	Kurtosis	Skewness	Minimum	Maximum
Whole Period	CSAD	0.016	0.015	0.007	9.500	2.210	0.004	0.077
	Rm, t	0.001	0.001	0.012	20.206	-1.307	-0.130	0.088
Before Covid	CSAD	0.014	0.013	0.005	3.976	1.452	0.004	0.043
	Rm, t	0.0005	0.001	0.007	1.465	-0.015	-0.027	0.037
During Covid	CSAD	0.018	0.016	0.008	8.303	2.200	0.006	0.076
	Rm, t	0.001	0.002	0.016	14.391	-1.283	-0.130	0.088

Note: The table reports the descriptive statistics of CSAD and Rm, t. Market return is the stock market index return (Nifty 50), CSAD is the measure of return dispersion defined in Eq. (2).

Table 5. Estimates of herding behaviour with CSAD measure.

Period		α	β_1	β_2	β_3
Whole period	Coef.	0.013***	0.084***	0.370***	-0.526
	t value	(47.048)	(5.324)	(10.471)	(-1.053)
Before covid	Coef.	0.0130***	0.0025	0.1286	2.6033
	t value	(29.591)	(0.083)	(1.248)	(0.547)
During covid	Coef.	0.0139***	0.1033***	0.4483	-1.3355*
	t value	(27.572)	(4.877)	(8.563)	(-2.037)

Note: The table reports the results of CSAD measure by estimating Eq. (3): $\alpha + \beta_1 r_m + \beta_2 |r_m| + \beta_3 r_m^2 + \epsilon$. The t statistics are reported in parentheses. ***, and * denotes statistical significance at 1%, 5% level.

the whole sample period. Thus, we cannot make any strong confirmation regarding the presence of herding in the Indian Automobile Sector during this period and this result is consistent with the findings of (Ganesh, Naresh, and Thiyagarajan 2016; Kumar, Bharti, and Bansal 2016; Dhall and Singh 2020). It implies that these results prove the theoretical findings of previous literature are not true on the fact that the developing market are weak and these markets are incapable of collecting the market information.

The pre pandemic period also signals anti herding in Indian automobile sector. This result is consistent with the findings of (Dhall and Singh 2020). Here the β_3 coefficient is positive and significant evidencing the market efficiency.

The result of CSAD for pandemic period provided that the β_3 coefficient is negative and significant at 5% level, indicating some evidence of herding in automobile industry. The outbreak of covid 19 creates a decline in the market price of auto stock followed by increased inflation rate, fuel price and interest rate (Dhall and Singh 2020). The increase in number of death cases and fluctuations in the macroeconomic variables creates panic and fear among investors (Economou, Hassapis, and Philip-pas 2018; Huang and Wang 2017) and they started selling the shares by following the market consensus. Although the result confirms the presence of herding in automobile sector only during the pandemic. The panic and fear among the investors during these periods were pushed them to

follow what others were doing in the market. As it is observed, the coefficient during pandemic period on days with negative returns indicates a greater intensity of herding than the usual market conditions. The result not supported the alternate hypothesis for the whole period sample and pre pandemic period of Covid 19. But the results of pandemic period support the hypothesis. However, it provides some indication of herding during the pandemic period. The investors were showing a stronger degree of loss aversion and follow the market consensus when there is uncertainty and fear in the market.

6. Conclusion

In this study, we examined whether herding is evident in Indian Automobile sector during the pandemic era of Covid 19. The sample data were analyzed using Cross Sectional Absolute Deviation measure proposed by Chang et al. (2000), and the result indicates that the auto stocks in National Stock Exchange of India is characterized by investor herding only during the period of covid pandemic. There are no strong signals for herding during the period of pre pandemic, and whole period. Further, the results provide insights that the developing markets are efficient unless the existence of fear or uncertainty in the market. Finally, the findings from this paper assists the researchers, investors, behavioralists, policymakers, and government for making decisions related to investment. This study only confined to the detection of herding in automobile sector by analyzing the deviation of stock return from the market return. By including variables such as market volume, segregating the return for up and down-market conditions would give much better predictions regarding herding behaviour. Also, this study took only 14 auto mobile companies which constitute to the Auto Nifty, it would have been better to analyze herding behaviour in auto sector by adding auto part manufactures in the sample category. Further research in this area by adding auto part manufactures in the sample will help all

the stakeholders to understand herding in more deeper ways.

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Conflict of interest

The authors declare that there are no competing interest.

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