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Herd Bias in Indian Stock Market under Extreme Market Conditions

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Abstract- Behavioural Finance is an area that needs to be studied within the context of the Indian stock market to assist investors in making rational investment decisions. This study examines the existence of herding behaviour in the Indian stock market considering various determinants of herd formation such as rising and declining market conditions and extreme market situations. The study is based on 46 companies selected from NSE Nifty 50 index based on their trading period. The methodology applied to validate the presence of herd formation is Cross-Sectional Absolute Deviation (CSAD) method. The results revealed that over the study period of extreme up market condition and high trading volume has shown herding behaviour in the Indian stock market.

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Herd Bias in Indian Stock Market under Extreme Market Conditions

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Abstract- Behavioural Finance is an area that needs to be studied within the context of the Indian stock market to assist investors in making rational investment decisions. This study examines the existence of herding behaviour in the Indian stock market considering various determinants of herd formation such as rising and declining market conditions and extreme market situations. The study is based on 46 companies selected from NSE Nifty 50 index based on their trading period. The methodology applied to validate the presence of herd formation is Cross-Sectional Absolute Deviation (CSAD) method. The results revealed that over the study period of extreme up market condition and high trading volume has shown herding behaviour in the Indian stock market. On the other hand, every other result declined the presence of herding behaviour in the Indian stock market during the study period. Thus, it can be inferred that the Indian stock market is not efficient nits complete sense due to the presence of anomaly like herding behaviour and thus violates the Efficient Market Hypothesis.

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I. Introduction

Behavioural finance is a field of study that helps in analyzing the influence of psychology on the behaviouroffinancialmarketinvestorsandthesubsequenteffectonstockprices.Itexplains various anomalies in the capital market and also tries to identify why people make certain investment decisions by studying their biases. One such anomaly is herding. Herd instinct in finance is the phenomenon where the investors tend to mimic the actions of other market participants. Herding is a behavioural bias that arises when individual investors suppress their own emotions, beliefs and private information and there by follow the collective action of the market while making investment decisions. Social psychologists believe that investors herd to feel confident about their investment decisions when they encounter uncertainty and ambiguous information from the market. Thus, they follow the direction of others who they believe are better informed and possess information that is unavailable in the market. Therefore, herding behaviour gives an indication of market inefficiency because investors need not be necessarily rational, rather they abide by the decisions of other market participants thinking that they possess more reliable information.

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Thus, in a market where herding prevails, the Efficient Market Hypothesis (EMH) is said to be violated, which is a theory based on the assumption that all investors are rational, possess the same set of information, and stocks always trade at their true value on the stock exchanges.

Herding behavior can be either irrational or rational. Irrational in the sense, the investors simply ignore their own beliefs and information and blindly follow other's investment decisions to reduce uncertainty and avoid the fear of making a wrong decision. On the other hand, it is said to be a rational behaviour when one herd to protect his reputation. This occurs commonly among professional fund managers because their performance is evaluated based on their decisions. So, they are tempted to ignore their analysis and follow the decisions of other managers who might have access to more reliable information or possess better decision-making skills.

This research is an attempt to study herding behaviour in the Indian stock market under different market conditions.

II. Literature Review

A large number of studies have been conducted to identify the evidence of herding in international markets. Herding is linked with market inefficiency, indicating the existence of herding asymmetry in emerging markets. Christie &Huang (1995) adopted the cross-sectional standard deviation method to investigate herding behaviour and found that dispersions increase significantly during periods of large market movements indicating evidence against the presence of herding in developed US markets. Cheng Cheng and Khorana (2000) used the Cross-sectional Absolute Deviation of returns (CSAD), a modification of Christie &Huang's (1995)'s model for detecting herd formation in different international markets such as the US, Hong Kong, Japan, South Korea, and Taiwan. The empirical test results indicate that during periods of extreme price movements, equity return dispersions for the US, Hong Kong, and Japan tend to increase, providing evidence against herd behaviour. Still, in the case of South Korea and Taiwan, the evidence is in favour of herding.

Tan et al. (2008) observed herding asymmetry in dual-listed Chinese A-share and B-share stocks. They report significant evidence of herd formation within both

the Shanghai and Shenzhen A-share markets that are dominated by domestic individual investors and also within both B-share markets, in which foreign institutional investors are the main participants. Investor herding is witnessed during periods of both a bull market and a bear market. Still, during times of rising markets, high trading volume, and high volatility, herding behaviour by A-share investors in the Shanghai market is more pronounced, while no asymmetry is apparent in the B-share market.

Demirer, Kutan, and Chen (2010) focused on an emerging market, namely the Taiwanese stock market, and concluded that Cross-Sectional Standard Deviation (CSSD) testing methodology yields no significant evidence of herding, In contrast, the non-linear model proposed by CCK (2000) has led to consistent results indicating strong evidence of herd formation. Chiang & Zheng (2010) examined herding behaviour in global markets. They find that it is prevalent in both rising and declining market situations but is more prominent in Asian markets when it follows a bullish trend. Bhaduri and Mahapatra (2012) provided another approach to check herding behaviour in the Indian equity market, especially during market crashes collecting the data of all the firms listed on the BSE 500 index from 2003 to 2008. It was observed that equity return dispersions during periods of acute price movements be inclined to decrease rather than increase provides evidence of herding. P. Lao & H. Singh (2011) facilitated their study to detect herding behaviour in the Indian and Chinese stock markets. Their findings suggest that herding asymmetry is more likely to exist during large market movements. Their study leads to results indicating strong evidence of herd formation in the Chinese market when the market is falling and trading volume is high. They found herding activity in the Indian market as low and only exist during a bull market.

Fu & Lin (2010), Lan & Lai (2011) investigated the turn over effect on herding behaviour in the Chinese stock market (China's A and B-markets) using the Christie & Huang (1995)'s model. Their results indicated that trading volume affected herd formation. Lan & Lai (2011), Lao & Singh (2011) find the existence of herd behaviour in the Chinese stock market during periods of down markets and high trading volumes, a lower prevalence of herding was detected in the Indian stock market concerning trading volume. Chiang, Li, Tan & Nelling (2013) attempted to analyse the investor herding behaviour for ten Pacific-Basin markets, namely Australia, China, Hong Kong, Indonesia, Japan, Malaysia, South Korea, Singapore, Thailand, and Taiwan. The study period ranges from July 2, 1997, to March 23, 2009. The test results reveal that the level of herding is time-varying and is present in both rising and declining market conditions. Garg & Jindal (2014) investigated the presence of herd behaviour in the Indian Stock Market during the period 2000-2012 by using methodologies suggested by Christie and Huang (1995) and Chang et al. (1995). Daily as well as monthly data have been considered for the same. The result indicates that herd behaviour is not present in the Indian stock market. Poshakwale & Mandal (2014) investigated herd behaviour in the emerging Indian stock market using the daily data of the S&P CNX Nifty 50 index of the National Stock Exchange throughout 1997–2012. The study confirmed that the investors in the Indian market show significant herding behaviour and are persistent in both bull and bear markets, and seem to increase in bear market conditions. Yao, Ma, & He (2014) opined that, in Chinese markets, more herding was detected during the period of the higher trading volume.

Dr Ashish Kumar, Ms Bharti & Dr Sanchita Bansal (2016) analysed the existence of herding behaviour in the Indian stock market using the daily closing prices of NSE's benchmark index Nifty and thirty-six companies that are listed in NSE for a period commencing from January 1, 2008, to December 31, 2015.The empirical results based on Chang et al. (2000) model confirm no herding in the Indian stock market for bull and bear market and also during the extreme price movements in the market, indicating that the investors tend to make investment decisions of their own and do not imitate the investment behaviour of other fellow investors.

Batchu Satish & Dr Padmasree K (2018) examined herding behaviour in the Indian stock market with a sample of firms listed on the National Stock Exchange of India during the year from 2003 – 2017. CSAD methodology was used to study the effect of the global financial crisis on herding behaviour. The study found no herd formation during the pre-financial crisis period, crisis period, and post-financial crisis period and the market is in arising and declining state, but the volatility of the stock is high. Babu J, James V, & Anooja S (2018), in their study, concluded that investors in the Indian stock market do not exhibit any kind of herding activity during rising and declining market conditions. At the same time, Kumar & Sharma (2018) reported weak evidence of herding during different market conditions.

III. Data and Methodology

a) Research Data

The data used for the study include the closing prices of the Nifty 50 index and closing prices of shares of 46 selected companies for 2011-2019. Also, to study the effect of trading, volume on herding behaviour, volume data for the period of 2013-2019 has been collected. The empirical study on herding behaviour with different data frequency provides mixed results and thereby felt to use daily data, will be helpful to capture the short-term herding behaviour prevailing in the market. In addition to this, many studies like Christie and Huang (1995), Henker, and et al. (2006), Christoffersen

and Tang (2009), Zhou and Lai (2009) suggested that since herding is a short-lived phenomenon, high - frequency data would provide more accurate results.

b) Research Methodology

i. *Unit Root Test (Stationarity Test)*

Unit root examines the stationarity of data using an autoregressive model. There will be serious mistakes in the inferences if we use non-stationarity data for the analysis. Brooks (2008) defined a stationary series as "one with a constant mean, constant variance and constant auto covariances for each lag". It can be explained as, a series is said to be stationary if it has a time-independent mean, variance, and autocorrelation, which are consistent over time. In this study, the null hypothesis is set as CSAD has a unit root. If the null hypothesis is accepted, it means that the series is non-stationary. The Augmented Dickey-Fuller test (ADF test) is the unit root test used in this study for testing the stationarity of data.

ii. *Cross Sectional Absolute Deviation (CSAD) Model*

Christie & Huang (1995) suggested the first established methodology to study herd formation in the stock market. They used the CSSD (Cross-Sectional Standard Deviation) model to test the presence of herding in the market. Since this model was influenced by outliers and gave biased results, Changet. Al (2000) suggested modified methodology which was CSAD (Cross-Sectional Absolute Deviation). CSAD can be explained as the absolute average of the aggregate difference between the expected return of individual securities and market return. The study employs the methodology suggested by Chang et al. (2000) of Cross-Sectional Absolute Deviation (CSAD) to test the presence of herding behaviour in the Indian stock market.

According to CSAD Approach, when the investors tend to herd in the stock market, the absolute dispersion between the market return and the individual stock return decreases or increases at a decreasing rate. Thus, the individual stock returns tend to cluster around the overall market return resulting in lesser dispersion. Chang et al. (2000) proposed that the relationship between market return and CSAD should be negative and non-linear. The CSAD is calculated using the following equation:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N} \left| R_{i.t} - R_{m.t} \right|_{m.t} \quad \text{Eq (1)}$$

$$CSAD_t = \alpha + \gamma_1 |R_{m.t}| + \gamma_2 R^2 + \varepsilon_t \quad \text{Eq (2)}$$

Where N is the number of securities, $R_{i.t}$ is the individual stock return on firm *i* at time *t*, $|R_{m.t}|$ is the average return of the equal-weighted market portfolio at time t, γ_1 is the coefficient of $|R_{m.t}|$, $R^2_{m.t}$ is the square of $|R_{m.t}|$ and $\gamma_2$is the coefficient of$R^2_{m.t}$.

In a rational market, the relationship between individual securities return and market return is positive and linear. If the investors exhibit herding behaviour the difference between individual securities return and market return will decrease or may increase at a decreasing rate. This indicates the violation of a positive and linear connection between return dispersion and market return. Therefore, in Eq 2, if γ_2 coefficient is negative, there exists herding behaviour.

The daily closing prices of the Nifty 50 index and 46 selected companies are converted into a log form, to smoothen the data, to enable the use of parametric statistical tools. Using the log values of closing prices, log returns are computed using the following equations.

$$R_{i.t} = [\log(P_t) - \log(P_{t-1})] \times 100 \quad \text{Eq(3)}$$

Where $logP_t$ is the price of the stock at time t, and $logP_{t-1}$ is the price at time t-1and t stands for the specific day.

Herding behaviour during increasing and decreasing markets:

$$CSAD_t^{Down} = \alpha + \gamma_1 \left| R_{m.t} \right| \times D_t^L + \gamma_2 R^2_{m.t} \times D_t^L + \varepsilon_t, if R_{m.t} < 0 \quad \text{Eq (4)}$$

$$CSAD_t^{Up} = \alpha + \gamma_1 \left| R_{m.t} \right| \times D_t^U + \gamma_2 R^2_{m.t} \times D_t^U + \varepsilon_t, if R_{m.t} > \quad \text{Eq (5)}$$

Here the level of herding is examined by introducing dummy variables D_t^L and D_t^U, where $D_t^L = 1$ if the market returns on day t depict a decreasing market condition and equal to zero otherwise, and $D_t^U = 1$if the market return on day t depicts an increasing market condition and equal to zero otherwise.

c) Herding Behaviour During Extreme Market Conditions

It is believed that herding behaviour is more likely to exist in extreme up or down market conditions due to psychological reasons. Christie & Huang (1995) employed 1% and 5% levels of significance as the cut-off points to determine extreme up and down returns in their study. In this study, we employ a 5% level of significance to determine the extreme up and down-market conditions. The extreme up market is defined as 5% of the upper tail of the market returns distribution, whereas the extreme down market is defined as 5% of the lower tail of the market returns distribution.

Herding behavior under extreme market situations is computed using the following equation:

$$CSAD_t^{Down} = \alpha + \gamma_1 \left| R_{m\,t}^{Down} \right| + \gamma_2 (R_{m\cdot t}^{Down})^2 + \varepsilon_t \quad \text{if} \quad R_{m\cdot t} < 0 \qquad \text{Eq(6)}$$

$$CSAD_t^{UP} = \alpha + \gamma_1 \left| R_{m\cdot t}^{UP} \right| + \gamma_2 (R_{m\cdot t}^{UP})^2 + \varepsilon_t \quad \text{if} \quad R_{m\cdot t} > 0 \qquad \text{Eq (7)}$$

Where ${}_1\gamma^{Down}$ is the coefficient of the equally weighted market portfolio return at time t when the market return lies in the extreme lower tail of the distribution, R^{Down} is the equally weighted market portfolio return at time t when the market return falls in the extreme lower tail of the distribution, the case for an extreme up market condition is similar.

d) Herding Behaviour under high and low trading volume state

In this study, we also check for herding behaviour during high and low volume days. Previous studies suggest that trading volume varies according to the information in the market and subsequent revision by investors.

Herding behaviour under high and low volume state is computed using the following equation:

$$CSAD_t^{V-high} = \alpha + \gamma_1^{V-high} \left| R_{m.t}^{V-high} \right| + \gamma_2^{V-high} (R_{m.t}^{V-high})^2 + \varepsilon_t \qquad \text{Eq(8)}$$

$$CSAD_t^{V-low} = \alpha + \gamma_1^{V-low} \left| R_{m.t}^{V-low} \right| + \gamma_2^{V-low} (R_{m\,t}^{V-low})^2 + \varepsilon_t \qquad \text{Eq(9)}$$

Where γ^{V-high} is the coefficient of the equally weighted market portfolio return at time t where the market is in high volume state, $R_{m.t}^{V-high}$ is the equally weighted market portfolio return at time t when the market is in high volume state; the case is similar for a low volume state.

IV. Results

Table 4.1: Descriptive Statistics of Cross-Sectional Absolute Deviation (CSAD)

	CSAD
Mean	0.529732
Median	0.506427
Maximum	1.558260
Minimum	0.184270
Std. Dev.	0.143436
Skewness	1.531356
Kurtosis	8.280507
Jarque-Bera	3729.501
Probability	0.000000
Observations	2402

Table 4.1 explains the descriptive statistics of the variables under study. The data is for the period 01-01-2010 to 11-11-2019 and the table shows the details of the daily data. Table 4.1 shows that the average CSAD for the whole study period is 0.529732, and the standard deviation is 0.143436. The standard deviation will be higher if the market had a higher level of cross-sectional variation due to unexpected news or shocks and explain higher volatility in the market and this can also be attributed to higher information asymmetry existed in the market.

Skewness helps to assess the level of asymmetry in the probability distribution. Since the value of skewness of CSAD here is 1.531356, the series is said to be positively skewed. Also, the value of Kurtosis is 8.280507 (which is more than 3), and thus, the series depicts leptokurtic features. Jarque-Bera (JB) is a test that is used to test the normality of the distribution. In the study, the value of Jarque-Bera (JB) is so high for CSAD (i.e., 3729. 501), indicating that stock returns differ significantly from the normal distribution.

Table 4.2: Testing Stationarity using ADF (Augmented Dickey-Fuller Test)

		t-statistic	Prob*
Augmented Dickey-Fuller test statistic		-10.28813	0.0000
Test critical values:	1% level	-3.432886	
	5% level	-2.862546	
	10% level	-2.567351	

Stationarity is an important feature of time series data. A preliminary analysis, the Stationarity of the data series is tested using the Augmented Dickey-Fuller test (ADF). The results from Table 4.2 show that the series is stationary at the level itself. Here, since the t-statistic value is more than the critical value, there is a possibility of rejecting the null hypothesis that there is a unit root in the selected variable. Hence the series is stationary.

Table 4.3: Overall Market Regression Results

(Analysis of herding in NSE stocks)

$CSAD_t = \alpha + \gamma_1 \mid R_{m,t} \mid + \gamma_2 R^2_{.t} + \varepsilon_t \; m$	
A	0.475328
γ_1	0.115820
γ_2	0.096127

The above table analyses the level of herding in different NSE stocks from 1st January 2010 to 11th November 2019. As per the CSAD model, herding will be significant only when the $\gamma_1$coefficient becomes negative and significant. The result of regression analysis shows that the γ_2 coefficient is positive, indicating that there is no significant herding behaviour in the Indian stock market. The relatively lower incidence of herding in the Indian stock market may be due to the large institutional investors in the Indian market. They are believed to have better information sources, more skilled traders and are therefore less likely to herd.

Table 4.4: Regression Results for Increasing Market

$CSAD^{Up}_{t1} = \alpha + \gamma \lvert R \rvert \times D^{U}_{m.tt} + \gamma R^2 \times D^{U}_{m.t} + \varepsilon$, if $R_{ttm.t} > 0$	
α	0.523247
γ_1	-0.111683
γ_2	0.268582

Table 4.4 contains the regression results of analyzing herding for an increasing market for the given period. All daily returns which are equal to or above zero are considered to be an increasing or rising state. From the given table, it is understood that both the coefficients are positive. Since the herding coefficient (γ_2) is positive for up market it indicates the absence of herd formation for the given period.

Table 4.5: Regression Results for Declining Market

$CSAD^{Down}_{t} = \alpha + \gamma_1 \lvert R_{m.t} \rvert \times D^{L}_{tm.tt} + \gamma_2 R^2 \times D^{L} + \varepsilon_t$, if $R_{m.t} < 0$	
α	0.513410
γ_1	0.040631
γ_2	0.114390

The table given above reports the results of regression analysis of herding for decreasing markets. In this case also both the coefficients are positive. Hence the results suggest that the investors did not exhibit herding behaviour in the Indian stock market during a declining state for the given period. As a result, it shows a positive and linear relationship between the market return and stock return.

Table 4.6: Regression Results for Extreme Up Market Conditions

$CSAD_t^{UP} = \alpha + \gamma_1 \left\| R_{m.t}^{UP} \right\| + \gamma_2 (R_{m.t}^{UP})^2 + \varepsilon_t$	
α	0.357872
γ_1	0.083208
γ_2	-0.855510

During extreme up market conditions, as shown in Table 4.6, the $\gamma_2$coefficient is significantly negative and thus proves the existence of herding behaviour during the given condition. It may be due to the irrational behaviour of inexperienced investors who are easily misled by media and blinded by greed and envy. During up market condition, the institutional investors, rather than relying on their analysis, they tend to follow the market consensus by engaging in positive feedback trading.

Table 4.7: Regression Results for Extreme down Market Condition

$CSAD_t^{Down} = \alpha + \gamma_1 \left\| R_{m.t}^{Down} \right\| + \gamma_2 (R_{m.t}^{Down})^2 + \varepsilon_t$	
α	0.447222
γ1	0.228208
γ2	0.018667

The above table 4.7 shows the regression results of analyzing herding behavior under extreme down-market condition. Since the $\gamma_2$coefficient is positive, it is interpreted that there was no herding behaviour in the Indian stock market under the given condition during the period of study. In a down market, investors in the Indian market seem to base their decisions on their analysis rather than following market consensus. This may be because investors may be long-term investors who do not panic and sell in a hurry under an extremely down-market situation.

Table 4.8: Regression Results High Trading Volume Situation

$CSAD_t^{V-high} = \alpha + \gamma_1^{V-high} \left\| R_{m.t}^{V-high} \right\| + \gamma_2^{V-high} \left(R_{m.t}^{V-high}\right)^2 + \varepsilon_t$	
α	0.592082
γ_1	0.245381
γ_2	-0.009119

The results from table 4.8 suggest that during the period of high trading volume, investors showed herding behaviour. This is evident because the $\gamma_2$coefficient is negative.

Table 4.9: Regression Results for Low Trading Volume Situation

$CSAD_t^{V-low} = \alpha + \gamma_1^{V-low} \left\| R_{m.t}^{V-low} \right\| + \gamma_2^{V-low} \left(R_{m.t}^{V-low}\right)^2 + \varepsilon_t$	
α	0.441447
γ_1	0.405885
γ_2	0.046262

The above table 4.9 shows that during the period of low trading volume, herding behaviour is not detected in the Indian stock market since the γ_2 coefficient is positive. Thus, we can infer that investors act more rationally during the low trading volume and do not tend to follow the market consensus.

V. Conclusion

Herding Behavior is a component of behavioural finance. The investors ignore their analysis of information and tend to imitate the action of others, thus causing the price of the shares to deviate from its fundamental value which ultimately results in market inefficiency. Investigating herding behaviour helps to identify the potential risks and guide the investors in forming proper strategies while making investments in these markets.

Using the CSAD approach suggested by Chang et al. (2000), this study measures the presence of herding behaviour in the sampled stock market under rising and declining market situations, extreme market conditions, and also during changing trading volume

situations. Accordingly, the results reveal that herding behaviour exists under extreme up market condition and during the state of the high trading volume. Thus, the concerned authorities like SEBI must take appropriate measures to avoid herd formation under these situations. However, no herding behaviour was detected during the other states of the market under study. It is assumed that investors react more rationally under these situations and do not follow the market consensus. The results of previous studies revealed that herding behaviour was rarely present in the Indian stock market. But from our study, we can conclude that over the period the attitudes of investors have changed, and there has been herd formation under various extreme situations. So, this is to be noted by the concerned authorities, and remedial measures need to be adopted to ensure market efficiency in the Indian stock market.

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